THE DEC POLICY SYSTEM

New York State
Department of Environmental Conservation

PROGRAM POLICY	**Department ID:** **DAR-1**	**Program ID:** **Air Guide 1**
Title: Guidelines for the Control of Toxic Ambient Air Contaminants		
Issuing Authority:	**Originating Unit:**	
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Abstract:

This policy provides guidance for the control of toxic ambient air contaminants in New York State and outlines the procedures for evaluating sources of air pollution for those chemical contaminants directly addressed by New York State or federal regulations and those for which no State or federal ambient air quality standards exist.

Related References:

All applicable rules, regulations and federal requirements are listed in DAR-1.

I. PURPOSE

This policy is written to provide to the facilities a discussion of the various regulatory considerations and mandates as they apply to toxic air contaminants. This policy supersedes Air Guide-1 previously issued by the Division of Air Resources.

II. BACKGROUND

The changes in rules, regulations and federal requirements have necessitated the issuance of DAR-1 to assist facilities in understanding the review mechanism of the Division of Air Resources.

III. POLICY

This policy is written to assist the facilities, required to submit applications for a Permit to Construct or a Certificate to Operate, with an understanding of the review procedures required by the Division of Air Resources and to further insure consistency in the review of the submitted permit applications.

IV. RESPONSIBILITY

The Division of Air Resources Central Office and Regional staff have the responsibility for carrying out the responsibilities of DAR-1.

V. PROCEDURE

This policy, under the name "Air Guide 1", was last issued in 1991. No changes have been made to this document since that time.

New York State Department of Environmental Conservation

NEW YORK STATE
DAR-1

GUIDELINES
For the Control of
Toxic Ambient Air Contaminants

Division of Air Resources 1991 Edition

TABLE OF CONTENTS

AIR GUIDE-1

GUIDELINES FOR THE CONTROL OF TOXIC AMBIENT AIR CONTAMINANTS

I. INTRODUCTION

This 1991 Edition of DAR-1, (AG-1), provides guidance for the control of toxic ambient air contaminants in New York State. AG-1's purpose is to describe the Division of Air Resources' basic programmatic guidelines for making air toxics related permitting decisions by DEC Regional Air Pollution Control Engineers (RAPCEs) and their staff.

The procedures for evaluating sources of air pollution outlined in this document are applicable both for those chemical contaminants directly addressed by NYS or federal regulations and those for which no state or federal ambient air quality standards exist. This edition supersedes all previous editions and printings of DAR-1 as well as Chapters 3900 and 4100 of the Process Source Handbook.

Although the guidelines contained herein are useful in many air quality assessment activities, they are primarily intended for use in conjunction with the permitting authority and regulatory concerns found in 6NYCRR Parts 200, 201, 212 and 257. The development of AG-1 is founded in the need to provide reasonable and prudent direction for reviewing sources of toxic air contaminants by incorporating current toxicological information for these contaminants in an accessible format.

To achieve this goal, the opening text presents a broad discussion of the various regulatory considerations and mandates as they apply to toxic air contaminants. Figure 1, page 3 presents a simplified flow diagram describing the basic components (sections) of the AG-1 review process. In each section of this figure a question is posed that is discussed in the main text. Figure 2, page 4, details the procedure outlined in Figure 1 and shows the intermediate decision making steps which must be addressed before the general questions posed in Figure 1 can be answered. Decisions are contained in diamond shaped boxes and are discussed under individual section headings in the main text. Figure 3, page 10, details the procedure for dealing with contaminants not found in Tables II, III or IV of Appendix C.

Two complimenting sections: "APPENDIX A - ASSIGNING ENVIRONMENTAL RATINGS UNDER 6NYCRR PART 212" and "APPENDIX B - AMBIENT AIR QUALITY IMPACT SCREENING ANALYSIS," describe important programmatic and technical aspects of performing a comprehensive AG-1 review. These appendices are briefly discussed in the main text to describe how they relate to the overall process.

As in previous editions, the fundamental AG-1 strategy is to link each chemical contaminant, referred to throughout AG-1 as an "Air Toxic," to information known about it which will facilitate an informed and responsible review protective of public health and the environment. To achieve this goal, APPENDIX C, "TOXICITY CLASSIFICATION AND GUIDELINE DEVELOPMENT METHODOLOGY," lists information on ranking chemicals according to toxicity.

In APPENDIX C, each contaminant is identified by its CAS number and assigned into one of three toxicity classifications: HIGH, MODERATE or LOW. These toxicity classifications serve as qualitative indicators of a contaminant's toxicity. Each contaminant, if sufficient data exists, is assigned an annual and short-term ambient exposure guideline value. These exposure values, Annual and Short-term Guideline Concentrations (AGCs & SGCs), are used to quantitatively assess a contaminant's potential impact on public health and the environment. The toxicological bases for these three classifications and the criteria used for developing these guidelines are given in detail in the opening pages of APPENDIX C.

Please note that a new regulation, 6NYCRR Part 258, which deals with the DAR-1 approach to controlling Air Toxics, is currently under discussion. This proposed regulation is intended to formalize some of the classification procedures described in this document. The NYS Environmental Notice Bulletin and the NYS Register will announce this initiative at a later date.

DAR-1 is the combined effort of the NYS DEC Division of Air Resources Bureau of Air Toxics (BAT) and Bureau of Impact Assessment and Meteorology (BIAM). APPENDIX C, "TOXICITY CLASSIFICATION AND GUIDELINE DEVELOPMENT METHODOLOGY," was developed by the BAT Toxic Assessment Section in collaboration with the NYS Department of Health Bureau of Toxic Substance Assessment.

II. PERMIT APPLICATION SUBMITTAL REQUIREMENTS

The Environmental Conservation Law and the regulations promulgated within (see 6NYCRR Parts 200 and 201) require virtually all sources of air contaminants to have a Permit to Construct (PC) and a Certificate to Operate (CO). The NYSDEC (or in some areas, a county or city agency) issues PCs and COs based upon a complete review of the source and the appropriate regulations. DAR-1 serves as a guideline for this review.

Upon receipt of an application Division of Regulatory Affairs (DRA) has 15 calendar days to determine "completeness" for most air permits. Once determined "complete," the permit is then forwarded to Division of Air Resources (DAR) staff for technical review.

II.A. APPLICATION COMPLETENESS

It is DRA's responsibility to determine whether or not an application is "complete." To be "complete," an applicant must submit all the material required by 6NYCRR Parts 621.3 and 621.4, referenced indirectly by the applicable regulations and/or specified in the Part 212 instructions (publication 76-11-12). Experience has shown that required information is often missing from an applicant's submittal. An adequate AG-1 review requires that the contaminants be precisely identified and that the information _must_ be included with a PC/CO permit application:

Figure 1
AIR GUIDE-1 REVIEW PROCESS
SIMPLIFIED FIGURE

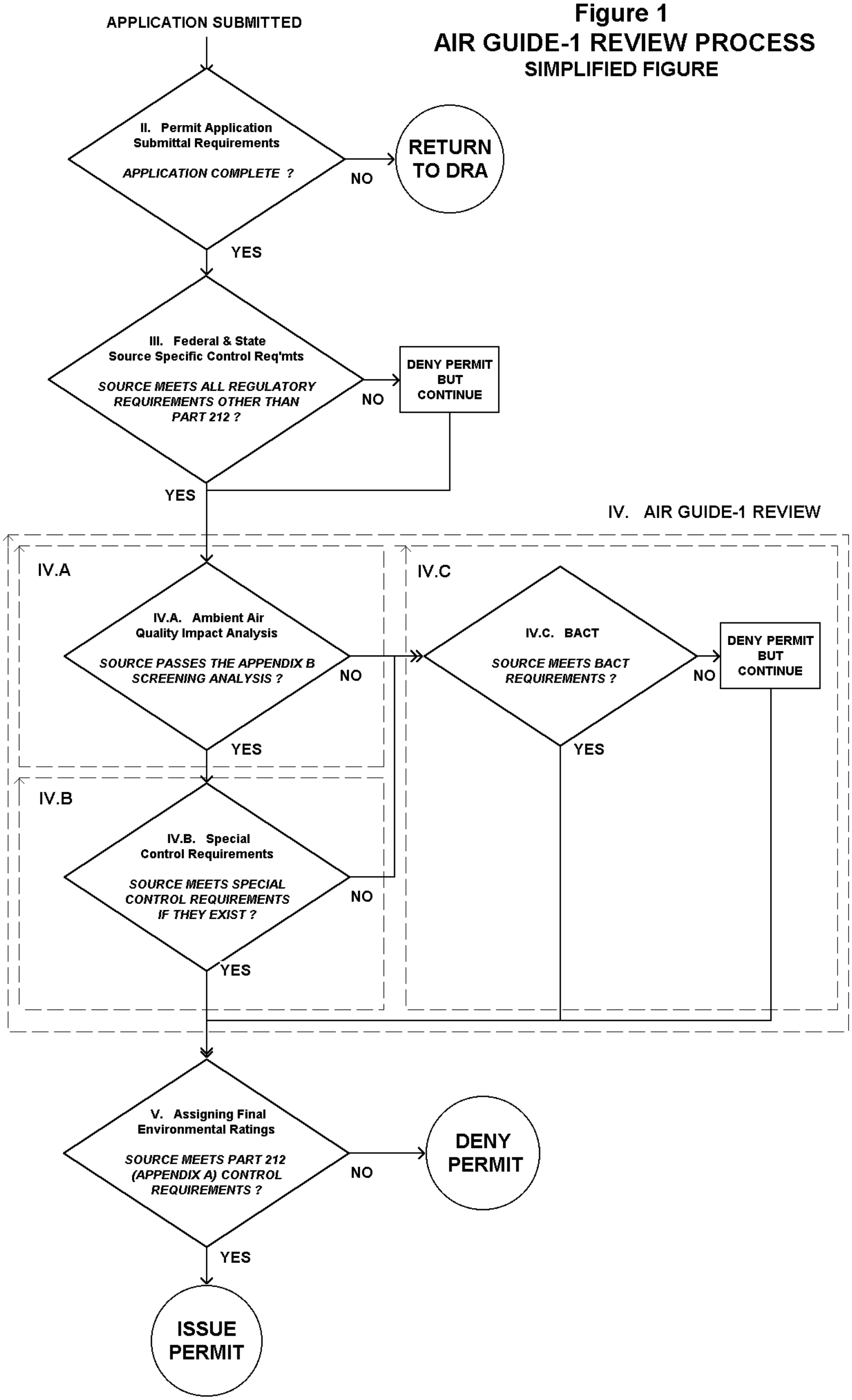
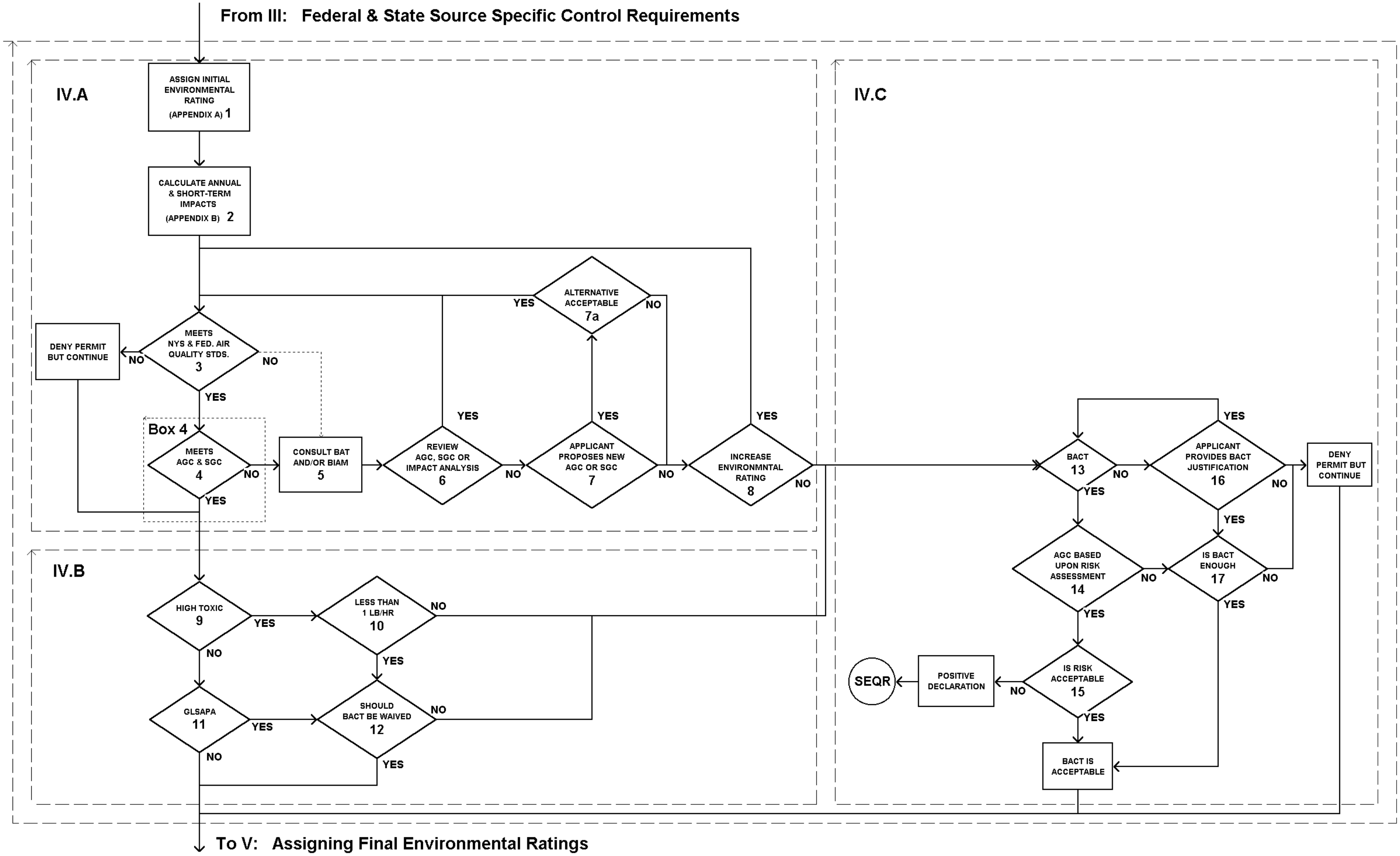


Figure 2
AIR GUIDE-1 REVIEW



1) Each Contaminant must be listed by its chemical name; i.e., no trade-names, common names, etc. [If not too long, (maximum, 20 characters), the American Chemical Society's Chemical Abstract Service (CAS) Index Name (9CI) is preferred];

2) Each contaminant must be identified by its CAS Registry Number, i.e., "CAS Number;"

3) A Material Safety Data Sheet (MSDS) must be included for each contaminant (both CAS Numbers and chemical names are commonly found on the MSDS);

4) A facility plot plan, to scale, as specified by publication 76-11-12, (page 10, Sections J. 2.a. through f.) must be included. The plot plan must show North orientation and property lines, the elevation and location of existing and proposed sources, and the location and dimensions of existing facility structures and nearby receptors.

If the contaminants are listed in AG-1, or, if the application is for a CO renewal, the MSDS requirement may be waived. Also, requirements #3 and #4 may be waived for CO renewals.

Experience has shown that the contents of both Sections C, "Process Description," and E, "Calculations," of form 76-19-3 are frequently incomplete. To perform a comprehensive source review it is essential that these sections clearly describe the proposed process so that an informed analysis is possible. Any unclear, inconsistent or missing information should be noted and requested from the source owner before an application can be considered administratively "complete."

After a permit has been determined "complete" by DRA, it is forwarded to the Division of Air Resources for technical review. However, sometimes critical technical data is still missing. This material may be supplemental information as specified by 6NYCRR Part 621.4(g)(1) or additional information as specified by Part 621.15(b). Additional information necessary for an informed analysis may be requested of the applicant at any time during the review. Only when all necessary data is "in-hand" is the application "technically complete."

III. FEDERAL AND STATE SOURCE SPECIFIC CONTROL REQUIREMENTS

The DAR-1 review process, discussed in the next section, primarily addresses 6NYCRR Part 212 control requirements. However, there are many other regulations which may be applicable to a given source. Prior to conducting an DAR-1 review, all federal and state regulations should be checked for applicability and compliance with any specific control requirements. For criteria pollutants, sources must comply with the federal NSPS and PSD regulations; for non-criteria pollutants, applicable sources must comply with the NESHAPS regulation. Sources also must comply with the source specific New York State regulations; e.g., 6NYCRR Parts 205, 209, 213, 214, 216, 219, etc. After determining all applicable regulatory requirements, the RAPCE shall select the most restrictive regulatory requirements as the basis for establishing controls.

Any questions concerning federal or NYS regulations should be referred to the Bureau of Source Control at 518-457-2044.

IV. DAR-1 REVIEW

DAR-1 should be used to determine the appropriate Environmental Rating and control requirements for all criteria and non-criteria pollutants regulated under 6NYCRR Part 212. APPENDIX A specifically addresses the iterative process of assigning Environmental Ratings for Part 212 sources. This process begins by assigning an initial rating and then determining compliance with the SGC and AGC. Rerating may be necessary after the initial review if the guideline concentrations are not met.

APPENDICES B and C describe the steps necessary to perform an air quality impact estimate or contaminant toxicity evaluation essential to the Environmental Rating assignment process. These procedures may also be used in other non-Part 212 situations where similar analyses are needed.

Note that the DAR-1 approach requires that a source be evaluated on an individual contaminant by contaminant basis. That is, the total impact (atmospheric concentration) of each chemical contaminant from a source is individually assessed and compared to either the ambient air quality standard or guideline value to determine the appropriate regulatory action. The AG-1 ambient guideline concentrations and methodologies are presented for that purpose.

Section IV of Figure 2 outlines the basic DAR-1 review process. This process can be broken down into the three basic sections described below.

IV.A. AMBIENT AIR QUALITY IMPACT ANALYSIS

The first step in performing an DAR-1 review is the assignment of an initial Environmental Rating to each contaminant listed on the application. This is done primarily by consulting the tables in Appendix C to determine the toxicity category it has been placed in. Refer to Appendix B for a more detailed discussion.

After assigning an initial environmental rating, per 6NYCRR Part 212, the DAR-1 review process continues with Step #2 of Figure 2. This step requires that an ambient Air Quality Impact Analysis be conducted. Techniques to be used to carry this out are detailed in Appendix B. Using the emission and engineering data supplied by the applicant, long term (annual) and short-term (1 hour) concentrations are estimated. These impacts are compared against NYS or federal standards or AG-1 Annual and Short-term Guideline concentrations. The standards are listed in Table I of APPENDIX C, while guideline concentrations (AGCs and SGCs) are listed in Tables II, III and IV. This comparison is the essence of Steps 3 and 4 of Figure 2. The impacts from <u>all</u> sources at the facility (Facility Incremental Impact) plus any additional impacts from all other significant industrial sources should be added to the appropriate background concentration in this step.

Ultimately, it is the source owner's responsibility to provide adequate toxicity information to allow a comprehensive permit review. Decision Steps 7 through 7a (Figure 2, page 4) provide for an iterative interaction between NYS and the source owner to address this concern. Step 6 may be initiated either by the DEC reviewing engineer (usually) or the source owner. New or modified guidance proposed by a source owner must be approved by DEC. Questions on this procedure should be referred to TMS at 518-457-7688.

The impacts calculated by the APPENDIX B screening procedure are generally conservative. Therefore, when a calculated impact is predicted to exceed an AGC or SGC, it may be appropriate to request site-specific modeling from the source owner. The source owner should be made aware that denial of the permit is being considered at this point. Section I.D. of APPENDIX B discusses refined air quality analyses in greater detail.

IV.A.1. Federal and State Air Quality Standards

Table I of APPENDIX C presents a summary of Federal and State ambient air quality standards. Standards are not guideline values. Prior to issuing a source permit under 6NYCRR Part 212, the demonstration (Step 3, Figure 2) must show compliance with Federal and State ambient standards. If a refined impact analysis shows non-compliance, the permit application must be denied.

IV.A.2. Guideline Concentrations

New York State uses both Annual and Short-term Guideline Concentrations (AGCs & SGCs) to help establish appropriate control requirements in PCs and COs issued under 6NYCRR Part 212. A full description of the derivation of AGCs and SGCs is found in APPENDIX C: "TOXICITY CLASSIFICATION AND GUIDELINE DEVELOPMENT METHODOLOGY." Tables II, III and IV of this appendix list AGC/SGC guidance for those contaminants which have been classified HIGH, MODERATE and LOW toxicity, respectively.

When Annual Guideline Concentrations (AGCs) are based on potential carcinogenic risks, they represent estimates of air concentrations associated with an excess cancer risk of one-in-a-million from lifetime inhalation exposures. If the AGC is based on non-carcinogenic effects and is lower than those associated with carcinogenic end-points, the more stringent value will be listed in APPENDIX C.

When available toxicological data is insufficient to develop either annual or short-term guideline concentrations or if DEC staff resource constraints have precluded their derivation to date, NYS toxicologists may calculate Interim AGCs and Interim SGCs by applying uncertainty factors to available occupational exposure limits or other appropriate toxicological data. The terms "Interim AGC" and "Interim SGC" are used to describe guidance which is calculated directly by the AG-1 user following the instructions contained in Section IV.A.2.a. To evaluate chemicals which are not currently listed in AG-1, see Figure 3, page 10.

IV.A.2.a. Annual Guideline Concentrations

AGCs are ambient Annual-average-based Guideline Concentrations. AGCs are developed to protect the environment and the public health from effects which may be associated with long-term exposure to the contaminant. Calculated annual impacts for each contaminant from a source being considered should be evaluated against its AGC. APPENDIX B details the procedure whereby the impacts from all significant industrial sources are added to the "background" level and the resultant sum compared to the AGC.

IV.A.2.a.1. Interim Annual Guideline Concentrations

If a contaminant under review is either not contained in the AG-1 tables or is listed but no AGC value is given, interim guidance is available to allow permitting decisions to be made through the deviation of an Interim AGC.

An interim AGC can be assigned only if the contaminant has a recognized occupational exposure limit (either the ACGIH TWA-TLV or NIOSH TWA-REL) and does not fit the APPENDIX C definition of a HIGH toxicity contaminant. Absent any specific information to the contrary, a contaminant fulfilling this criterion may be assumed to be of MODERATE toxicity. Regional DEC staff should contact the BAT Toxics Management Section(TMS) at 518-457-7688 for guidance when making this determination.

After determining that a HIGH toxicity classification would be unlikely, the Interim AGC can be calculated by applying an uncertainty factor to the most restrictive recognized occupational exposure limit (TWA-TLV or TWA-REL) using:

MODERATE TOXICITY CONTAMINANTS:

$$\text{Interim AGC} = \frac{\text{Occupational Exposure Limit}}{420}$$

LOW TOXICITY CONTAMINANTS:

$$\text{Interim AGC} = \frac{\text{Occupational Exposure Limit}}{42}$$

These factors are used by NYS to calculate interim AGC guidance for chemicals classified MODERATE and LOW toxicity. Once assigned, an Interim AGC is used like a published AGC in the DAR-1 review.

If a contaminant is likely to be classified HIGH toxicity, or its emissions are significant (see *de minimis* considerations below), numerical AGC and SGC guidance will be developed by NYS. Such contaminants should be referred by the reviewer to the Toxic Management Section (see Section IV.A.2.c. on page 12 for additional guidance on this procedure).

NOTE: Under all circumstances, before making a referral to BAT, an ambient impact should be calculated following APPENDIX B procedures. The estimated impact value(s) and information clearly identifying the contaminant should be referred in writing to TMS for an AG-1 toxicity classification and guideline (AGC/SGC) development. When such a referral is made the following information is required: chemical name, CAS number, emission rate (actual and potential in lb/hr), calculated annual and short term impacts (µg/m^3), source name and location, the presence of other sources of the contaminant at the facility, and whether the application is for a new PC or a CO renewal or modification. If a Material Safety Data Sheet (MSDS) is available, a copy should be forwarded to BAT.

Chemicals which are regulated by the EPA under the Federal Insecticide, Fungicide and Rodenticide Act, must be accompanied by their EPA Fact Sheet.

IV.A.2.a.2. *DE MINIMIS* Concentrations

The procedures for obtaining guidance for contaminants which are not currently listed in AG-1 are described in Section IV.A.2.c. This work may require extensive research and will delay the completion of a permit application review.

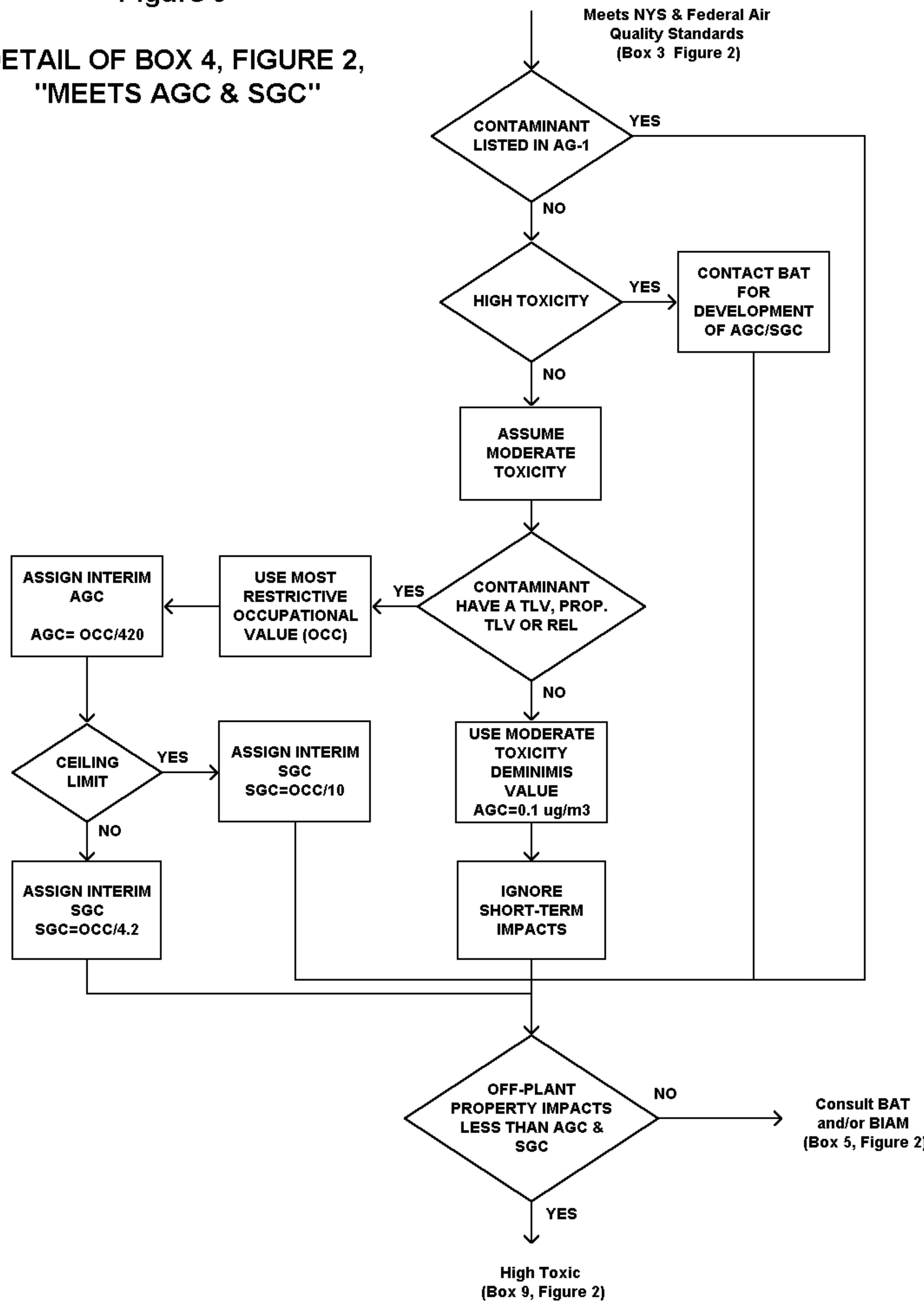
Therefore, the 0.1 µg/m^3 screening *de minimis* value has been developed to allow some permitting decisions to go forward even if the contaminant has no specific numerical AG-1 guidance.

If a contaminant is known not to fit the APPENDIX C HIGH toxicity definition, and if its projected annual ambient impact is less than 0.1 µg/m^3, the source may be permitted. Additionally, if a chemical is known to be classifiable as an APPENDIX C LOW Toxicity contaminant, and if its calculated annual ambient impact is less than 1.0 µg/m^3, the *de minimis* value for chemicals classified LOW toxicity, the source may be permitted. Assistance from BAT is available for these decisions.

Contaminants classified HIGH toxicity will automatically merit the development of AGC and SGC guidance. Sources of HIGH toxicity contaminants which do not have AGC or SGC listings may require special attention in establishing control requirements.

Figure 3

DETAIL OF BOX 4, FIGURE 2, "MEETS AGC & SGC"



IV.A.2.b. Short term Guideline Concentrations

To preclude any significant health or environmental effects which might be associated with acute exposures to sources of air contaminants, Short-term ambient Guideline Concentrations (SGC) are listed in APPENDIX C. When used in conjunction with the APPENDIX B short-term screening procedures, they aid in establishing appropriate short-term control requirements.

As with the annual guidance contained in APPENDIX C, it is DEC's intention to eventually list chemical specific SGCs for all AG-1 contaminants. To date, several contaminant specific SGCs have been developed. However, the SGC listed for most chemicals are interim values derived from the most restrictive occupational exposure limit.

In a procedure analogous to that used with the annual ambient impact based AGCs, short-term (#1-hour) impacts are modeled following APPENDIX B procedures and then are compared to the SGC to determine the acceptability of a proposed source.

The use of screening tests to evaluate short-term impacts is not as straightforward as for annual impacts. The use of the appropriate background data is critical. Refined site-specific modeling may be required to accurately assess total multiple source related short-term impacts for those contaminants which have predicted SGC exceedance using the APPENDIX B short-term ambient screening procedures. Consult APPENDIX B and the Bureau of Impact Assessment and Meteorology(BIAM) 518-457-7450, for guidance.

IV.A.2.b.1. Interim Short term Guideline Concentrations

For chemicals listed in APPENDIX C which do not have contaminant specific SGCs and contaminants which are not listed that have recognized occupational exposure limits (either ACGIH TWA-TLVs or NIOSH TWA-RELs), an Interim SGC may be assigned for the purposes of performing an AG-1 screening analysis.

If the chemical does not fit the definition of a HIGH toxicity contaminant divide the most restrictive of the occupational exposure values (either TWA-TLV or TWA-REL) by 4.2. That is:

$$\text{Interim SGC} = \frac{\text{(Smaller of TWA-TLV or TWA-REL)}}{4.2}$$

For all contaminants which fit the APPENDIX C definition of HIGH toxicity and for any contaminant that has an occupational exposure value which is designated as a "ceiling" limit obtain the Interim SGC by dividing the more restrictive of the occupational exposure values by an uncertainty factor of ten (10). Any contaminant which appears to fit the APPENDIX C HIGH toxicity definition should be referred to the Toxic Management Section for AG-1 guidance development.

IV.A.2.c. Contaminant Classification and Guideline Development

The task of classifying contaminants into the HIGH, MODERATE and LOW toxicity categories and the development of numerical guidance (AGCs and SGCs) is an ongoing process. Figure 3, page 10, describes the overall process of locating and/or developing AG-1 guidance for a contaminant. This figure is an expansion of Step 4 in Figure 2.

If a proposed contaminant is not listed in AG-1, it is likely that it has not yet been referred to BAT for evaluation. Where toxicological information on a requested contaminant is limited or not readily available, a comprehensive evaluation and inclusion of this information into AG-1 may be delayed.

IV.A.2.c.1. Options When No AG-1 Guidance Exists

When reviewing an application for an emission source of contaminants having no listed AG-1 guidance and no interim guidance can be calculated following the procedures described in IV.A.2.a.1 (annual) or IV.A.2.b.1. (short-term) above, the following guidance applies:

i.) ***De minimis*** Permitting: Contaminants which have been classified MODERATE or LOW toxicity, but do not have numerical AGC guidance, and that have projected annual facility impacts less than the ***de minimis*** values of 0.1 μg/m^3 for MODERATE and 1.0 μg/m^3 for LOW toxicity can be permitted following the APPENDIX A procedures.

ii.) Required Referrals: When MODERATE and LOW toxicity contaminants exceed the ***de minimis*** values of 0.1 μg/m^3 and 1.0 μg/m^3 respectively, TMS should be contacted (518-457-7688) for specific guidance. TMS should also be contacted when there is no numerical guidance for any listed HIGH toxicity contaminants.

Contaminants awaiting AG-1 guidance development are prioritized by TMS based on urgency/utility of information need, potential toxicity, source size/location and PC/CO status. Currently there is a backlog for classification and AGC/SGC development.

IV.A.2.c.2. Guideline Revision and External AGC/SGC Development

Step 6 of Figure 2 indicates that when a proposed source is predicted to result in impacts that exceed the AGC/SGC values, one option is to review the guidance used in the analysis. This is because these AG-1 criteria are guidelines, not pass-fail standards. AGCs and SGCs are established following procedures described in this document. Since toxicological information is routinely updated, the listed AG-1 guidance can only reflect the nature and quality of the information which existed at the time the guidance was developed.

A DEC permit reviewer may request that any listed guidance be reevaluated. This is usually requested only if an air quality analysis predicts an exceedance and the guideline levels are occupational exposure based.

When an unlisted contaminant is encountered and the time frame for the review is limited, or the situation described in the first paragraph above exists, the applicant may submit a proposed AGC and/or SGC value to DEC. Such submittals are to be directed to TMS for review, and should follow the general guidelines for AGC/SGC development described in APPENDIX C.

Since toxicological data is continually being developed which may be critical to public health, the following special condition should be added on all PCs and COs issued as a result of an AG-1 analysis: **"Should new scientific evidence from a recognized institution result in a decision by DEC that lower ambient guideline concentrations must be established, it may be necessary to reduce emissions from this source prior to the expiration of this PC/CO."**

IV.A.3. Guidelines vs. Standards

In the air quality impact analysis described above and in APPENDIX B, predicted ambient impacts are compared to guideline values to assess the acceptability of a proposed new source. The word guideline is stressed because these values are developed to aid in the regulatory decision making process. Although these guidelines are based on the best professional assessments of currently available toxicological data, they have not undergone the rigorous regulatory scrutiny that would be afforded a proposed Federal or State standard.

New York State has not proposed adoption of these "guideline values" as standards for several very practical reasons: (1) if adopted as standards they would be difficult to modify as new toxicological data becomes available; (2) there would be no flexibility in the application of standards to allow for the most current toxicological information; (3) a significant proportion of the AGCs and SGCs are interim guidelines based on occupational values, and do not reflect the extensive toxicological review necessary to establish a standard; (4) for many contaminants new standards might have to be adopted before any permitting decisions could be made; and finally (5) to adopt these guideline values as standards would require an extensive administrative effort on New York State's part, both in terms of staff resources, time and money; this could present an unwarranted delay in the NYS regulatory process.

Therefore, the use of guideline values in place of adopting "standards" allows the State to make essential regulatory decisions protecting public health and the environment in a timely, effective manner while considering the most current toxicological information.

IV.A.4. Background Concentrations

"Background" has been defined many ways in ambient air quality modeling applications. For the purposes of the NYS Air Toxics program, "background" is defined as the ambient level of a contaminant that can be expected to be present not considering the facility's (source's) contribution nor that of adjacent sources. Naturally occurring and anthropogenic activities contribute to background levels.

An important consideration for the application of "background" in AG-1 is that all sources must be accounted for and the total concentration of each contaminant must be determined when assessing the acceptability of the operation of the proposed new source. This means that the impacts of the facility under evaluation in addition to those for nearby sources must be superimposed on the "background" levels of each contaminant and the resultant total then compared to both the AGC and the SGC.

Unfortunately, very little toxic ambient air quality data exists to enable DEC to adequately quantify background levels for the almost two thousand contaminants being emitted in New York State. Thus, the inclusion of "background" in the permit review process is in anticipation of future data availability. Monitoring efforts in several areas of the State are currently underway and it is expected that information on these may be available in the future. As this data is developed it will be included in future editions of AG-1. In the absence of background data, the permit reviewer may assume the background concentration is zero for non-criteria pollutants. Refer to Appendix B for additional guidance.

IV.B. SPECIAL CONTROL REQUIREMENTS

Section IV.B of Figure 2 shows a flow chart of the special control requirements for HIGH toxicity and Great Lakes States Air Permitting Agreement (GLSAPA) contaminants. The controls required for sources of contaminants identified by GLSAPA and those classified in APPENDIX C Table II HIGH toxicity contaminants are discussed below:

IV.B.1. HIGH Toxicity Contaminants

HIGH toxicity contaminants are known or potential human carcinogens and other substances posing a significant risk to humans. The control of HIGH toxicity contaminants is a regulatory priority. All contaminants currently classified HIGH toxicity are listed in Table II of APPENDIX C.

All HIGH toxicity air contaminants must receive an "A" 6NYCRR PART 212 Environmental Rating. "A" rated contaminants require "99% or greater" pollution control or the application of "Best Available Control Technology." Additionally, the maximum annual average ambient impact should not exceed the AGC nor should the maximum one hour short-term impact exceed the SGC.

APPENDIX A describes the regulatory mandates and other considerations supporting this policy. The procedures described therein must be utilized to properly evaluate and control air toxic sources.

IV.B.1.a. <u>HIGH Toxicity less than 1 lb/hr</u>

Contaminants that are classified HIGH toxicity and are listed in Table II of APPENDIX C are required to receive an "A" Environmental Rating. 6NYCRR PART 212 specifies in Table 1 that for "A" rated sources with emission rate potentials of less than one pound per hour the "degree of air cleaning shall be specified by the Commissioner" (Steps 9, 10 & 12 in Figure 2). In the past, many of these small "A" rated HIGH toxic sources have received a "BACT waiver" (Step 12, Figure 2), or no control requirements. As sources emitting HIGH toxicity contaminants with ERPs of less than one pound per hour are not uncommon, and it is the express policy of New York State to minimize public exposure to toxic contaminants, this practice is inappropriate in most instances.

Therefore, even when emissions are less than one pound per hour the long and short-term ambient impacts of all HIGH toxicity contaminants, either as calculated by APPENDIX B screening procedures or by acceptable refined modeling procedures (Step 6 of Figure 2), or as established by actual on-site monitoring, shall be less than the AGC and SGC.

"A" rated contaminants emitted at rates of less than one pound per hour should be controlled where this is practicable, irrespective of AGC and/or SGC attainment. A full BACT analysis is not required in these instances. However, the applicant shall be directed to evaluate control alternatives including the zero control option if this is appropriate. If the hourly emission rate is less than 0.1 pound per hour and the ambient impact is less than both the AGC and the SGC, the no control option may be considered by the RAPCE.

Questions on this policy should be directed to TMS, especially in cases where a Table II contaminant has no listed AGC or SGC.

IV.B.1.b. <u>Carcinogenic Air Contaminants Not Exemptible Under the Provisions of 6 NYCRR201.6(j)</u>

Laboratory hoods are exempt from the Department's permit requirements as long as carcinogenic or radioactive air contaminants are not discharged (See 6NYCRR Part 380.3(e) for radioactive air contaminant exemptions). For the purpose of regulating laboratory hoods under 6NYCRR Part 201.6(j) refer to Air Program Memo 91-AIR-36.

IV.B.2. <u>Great Lakes States Air Permitting Agreement (GLSAPA) Contaminants</u>

The seven contaminants listed below have been targeted for stringent control by an interstate compact amongst the governors of the states surrounding the Great Lakes:

- Alkylated Lead Compounds
- Benzo-a-pyrene
- Hexachlorobenzene
- Mercury
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin
- 2,3,7,8-Tetrachlorodibenzofuran
- Total Polychlorinated Biphenyl

All sources of these contaminants within the Great Lakes watershed shall be assigned an "A" Environmental Rating; all sources of these contaminants are required to be equipped with "Best Available Control Technology" (BACT). For the purposes of this policy, all sources in DEC Regions 6, 7, 8, and 9 are considered to be in the Great Lakes watershed. Additional contaminants may be added to this list at a later date.

Regulatory Authority - 6NYCRR Part 212 requires that a contaminant be assigned an Environmental Rating based on its potential health or environmental effects. The GLSAPA requirement that the above contaminants be controlled at least as stringently as AG-1 HIGH toxicity contaminants is based upon a consensus assessment of their aggregate environmental effects on the Great Lakes watershed rather than on their health effects.

Additionally, the GLSAPA requires that if any proposed source of these contaminants requires an Environmental Impact Statement (EIS), that EIS must specifically assess the potential adverse impact of these persistent contaminants on the Great Lakes.

Further, upon issuance of the Permit to Construct, the DEC reviewing engineer shall complete both the BACT/LAER Clearinghouse and National Air Toxic Clearinghouse forms for each of the above contaminants and forward the forms to the Clearinghouse. The GLSAPA provides that Air Program administrators from the other Great Lakes States must be notified of all permit applications for sources of the above contaminants which require a notice for public comment (i.e. SEQR positive declarations). Notification shall consist of the public notice.

Questions concerning implementation of the GLSAPA should be referred to the director of the Bureau of Air Toxics at 518-457-7688.

IV.C. <u>BEST AVAILABLE CONTROL TECHNOLOGY (BACT)</u>

Section IV.C of Figure 2 describes the process for determining the acceptability of BACT for a new source application. A critical element of that determination is shown as Step 14. In this step a determination is made as to whether or not an AGC is based upon a quantitative health risk assessment. When this is the case, the Department, in certain circumstances, will approve a permit application when BACT is applied even if a facility incremental impact exceeds an AGC. If an AGC is not based upon a quantitative health risk assessment, an applicant or the regional reviewer must demonstrate that off-plant property impacts will not exceed the AGCs and SGCs. Both of these concepts are discussed below.

Best Available Control Technology is defined in 6NYCRR Part 200.1(i) as "an emission limitation or equipment standard based upon the maximum degree of reduction of each contaminant emitted from a stationary air contamination source which the department determines is achievable for such a source on a case-by-case basis considering:

1) process, fuels and raw materials available to be used;
2) engineering aspects of the application of various types of control technology which has been adequately demonstrated;
3) process and fuel changes;
4) respective cost of the application of all such control technologies, process changes, alternative fuels etc;
5) applicable State and Federal emission standards.

In no event shall the application of BACT result in emissions of any contaminant which will exceed the emissions allowed by any applicable standard established." Prior to conducting an DAR-1 review determine rule applicability as discussed in Section III.

Requiring Best Available Control Technology (BACT) for "A" rated sources of toxic air contaminants is an important aspect of New York State's permitting program. The BACT requirement serves to minimize public exposure to potentially harmful emissions beyond the simple attainment of an AGC. The objective of the policy is to achieve the greatest possible emissions reduction to protect public health and the environment without placing an unreasonable financial or technical burden on a source owner.

As noted in the regulatory definition above, BACT is an approach that incorporates several basic considerations in assessing options for the control of toxic air emissions. Among these are the various control equipment types, process modifications, and an assessment of their technical feasibility, including economics and air quality benefits to be gained from the adoption of each available alternative. All potential points of emission associated with a source's operation at a facility (including stack, fugitive, storage, transfer and handling releases) should be examined in a complete BACT analysis.

Steps 13 through 17 of Figure 2 ask a series of questions that address the process by which BACT is determined. Each specific BACT proposal is evaluated independently to determine the adverse effects on public health and the environment.

Step 13 asks whether a given proposed control scenario constitutes BACT. In the near future, information on New York State BACT for different source categories may be retrievable from the DAR Source Management System. For the present, the USEPA maintains a nationwide BACT information database through its National Air Toxics Information

Clearinghouse at 919-541-0800. This resource may be valuable when permitting new source types or to explore approaches used in other states.

IV.C.1. <u>BACT Acceptability</u>

Ultimately, the primary regulatory consideration when determining the acceptability of BACT is the projected health impact. Air quality impacts should be shown to be below those causing unacceptable health effects. This is done by comparing predicted off-plant property impacts, including background and other significant industrial sources, to the AGC and SGC. The predicted off-plant property or total ambient impact represents a property or total ambient impact represents a conservative estimate of inhalation exposure. That exposure estimate is the sum of the facility incremental impact, other industrial source impact and the "background" concentration. The facility incremental impact represents the impact from all sources, existing and new, of the contaminant at the facility under consideration. "Background" is defined in Section IV.A.4. on page 14.

IV.C.1.a. **BACT, Background, Guideline Exceedance and Permitability Concerns**

Step 15 of Figure 2 asks the question: "Is Risk Acceptable?" That is, does the application of BACT result in a level of control which lowers the risk to the public and the environment to an "acceptable" level? Since the AG-1 ambient guideline concentrations listed in APPENDIX C are <u>guidelines</u> and because they are developed from data which represents different levels of toxicological knowledge, the permitting guidance in Section IV.C.2. below is to be used when the total ambient impact as calculated by APPENDIX B procedures is predicted to approximate or exceed the numerical guidelines.

The guidance presented below is predicated on conditions discussed above having been met, i.e., all of the facility source data is correct; that all estimated impact concentrations are calculated to a reasonable level of certainty either by APPENDIX B screening calculations or by acceptable refined modeling techniques; that each contaminant has been assigned a proper Environmental Rating following APPENDIX A procedures and that the 6NYCRR PART 212 control requirements are actually met.

IV.C.2. **<u>Permitting Guidance</u>**

The following instructions are to be followed when making permitting decisions. They, in part, summarize the above control requirement discussions and incorporate a decision making sequence to answer the risk management question presented in Steps 15 and 17 of Figure 2:

1) If the total ambient impacts are less than both the AGC and the SGC, PERMIT the source;

2) If the total ambient impacts are greater than the AGC and/or the SGC, and the guidance is based on an occupational exposure limit [i.e., ACGIH TWA-TLV (T), NIOSH TWA-REL (R) (see Section IV.A.2.b.)], DENY the permit. The applicant may choose to propose additional toxicological information (See Step 7, Figure 2) and ask for a re-evaluation of the application.

3) If the AGC is based on a one-in-a-million risk level as calculated with an inhalation cancer risk value, (i.e., the AGC is set at the 10^{-6} risk level; AGC has a (U) footnote or otherwise indicated), the source, if it has BACT installed, may be permitted if the risk associated with the total ambient impact is less than 10^{-5} (one-in-a-hundred-thousand). In this particular case, a 10^{-5} level of risk is associated with a predicted ambient concentration of 10 times the AGC.

4) If the AGC is based on an inhalation cancer risk value, as described above, and if the total ambient impact is greater than 10^{-5}, the source may be permitted if it has BACT installed and if the risk associated with the facility alone, excluding background, is less than 10^{-5}, i.e., facility impact is less than 10 times the AGC. Notification of BAT is appropriate in these situations.

5) If the AGC is based on an inhalation cancer risk value, as above, and the risk associated with the facility impact alone is greater than 10^{-5}, propose to DENY the permit and issue a positive SEQR declaration. This will allow broader public input as to the acceptability of this proposed activity in the community. This option is available only when the AGC is derived from a risk-assessment analysis.

Existing "Background" levels for certain contaminants may themselves approach or exceed the ambient guideline concentrations listed in APPENDIX C. This condition may indicate an existing unacceptable risk level due to anthropogenic activities and the need for the implementation of comprehensive abatement strategies. The DEC Air Program is currently assembling a statewide ambient air toxic database to assess this situation. Contaminants identified as exceeding guideline levels will be the object of future abatement planning activities. Regional staff encountering such situations are advised to notify TMS.

V. ASSIGNING ENVIRONMENTAL RATINGS UNDER 6NYCRR PART 212

APPENDIX A discusses assigning appropriate Environmental Ratings under Part 212. Although this appendix duplicates some of the discussions and considerations contained above in the main text, it is presented in an iterative, decision forcing format. This appendix is a valuable aide in determining the proper Environmental Rating for a proposed or existing source.

VI. MONITORING QUALITY ASSURANCE

The following sampling procedures are suggested for use by DEC regional air staff to assure consistency with the intent of this policy. The choice of monitoring methods depend on the magnitude of the source, potential exposure of receptor and frequency of emissions from the source.

a. Monitoring by the source owner or his authorized agent:
   1. Stack testing and site specific air quality impact analyses (compliance).
   2. Ambient sampling at off-site receptors.
   3. Combination of (a) and (b).

b. Selected sampling by appropriate DEC staff:
   1. Stack testing (surveillance).
   2. Ambient sampling (short-term).
   3. Existing ambient air monitoring activities.

Questions or problems arising from the use of DAR-1 should be directed to Messrs. Stanley Byer, Eric Wade, Matthew Reis or Patrick Lavin at the NYSDEC, Bureau of Air Toxics, Toxics Management Section, 518-457-7688.

APPROVED

Thomas M. Allen, P.E.
Director
Division of Air Resources

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APPENDIX A

ASSIGNING ENVIRONMENTAL RATINGS UNDER 6NYCRR PART 212

I. INTRODUCTION

The following is a stepwise procedure for assigning Environmental Ratings under 6NYCRR Part 212. Contained in this regulation - the primary rule under which toxic air contaminants are controlled - is Table 1 of Section 212.9. This table outlines the criteria for assigning Environmental Ratings. Contaminants are rated individually (A,B,C or D) and that rating, along with the Emission Rate Potential (ERP), defines the "Degree of Air Cleaning Required."

Table 1 of Section 212.9 is reproduced below with some of the key wording underlined:

Section 212.9, Table 1
Environmental Rating Criteria

Rating

A An air contaminant whose discharge results or may result in serious adverse effects on receptors or the environment. These effects may be of a health, economic or aesthetic nature or any combination of these.

B An air contaminant whose discharge results or may result in only moderate and essentially localized effects or where the multiplicity of sources of the contaminant in any given area would require an overall reduction of the atmospheric burden of that contaminant.

C An air contaminant whose discharge may result in localized adverse effects of an aesthetic or nuisance nature.

D An air contaminant whose discharge will not result in measurable or observable effects on receptors, nor add to an existing or predictable atmospheric burden of that contaminant which may cause adverse effects, considering properties and concentrations of the emissions, isolated conditions, stack height and other factors.

The following items will be considered in making a determination of the environmental rating to be applied to an air contaminant:

a) Toxic and other properties and the emission rate potential of the air contaminant;

b) Location of the source with respect to residences or other sensitive environmental receptors, including a consideration of the area's anticipated growth;

c) Emission dispersion characteristics at or near the source, taking into account the physical location of the source relative to surrounding buildings and terrain; and

d) The projected maximum cumulative impact of taking into account emissions from all sources in the facility under review and the pre-existing ambient concentration of the air contaminant under review.

Consistent with the regulatory considerations described in the above table, especially item a), the predominant factor affecting a contaminant's Environmental Rating is its AG-1 APPENDIX C Toxicity Classification. However, an initial rating based upon toxicity should be reevaluated after conducting an air quality impact analysis to determine the adequacy of controls. Such an impact analysis requires the prediction of ambient air concentrations which in turn help define the potential health and environmental impacts from operating the proposed new sources(s). A thorough impact analysis will consider contaminant toxicity, modeled ambient impacts (annual and short-term), deposition estimates, existing as well as new sources, background concentrations, economics, odors, emission opacity and other concerns.

The stepwise procedure follows:

II. DETERMINE THE INITIAL RATING OF THE CONTAMINANT.

As defined in APPENDIX C, AG-1 listed chemicals are classified as either HIGH, MODERATE or LOW toxicity contaminants. Based upon this classification, the following ratings below should initially be assigned to each category:

A Rating- HIGH toxicity contaminants should always be assigned "A" Environmental Ratings. Additionally, in Regions 6, 7, 8 & 9, GLSAPA contaminants should receive "A" ratings.

B Rating- MODERATE toxics should initially be assigned "B" ratings.

C Rating- LOW toxics should initially be assigned "C" ratings.

D Rating- "D" ratings should only be given to water mist (CAS Number: 07732-18-5) and simple asphyxiants as defined by the ACGIH TLV handbook. These are contaminants whose discharge will "not result in measurable or observable effects ... nor add to an existing or predicted atmospheric burden."

The initial rating above represents a starting point. It should then be reevaluated based upon the "Air Quality Impact Analysis" described in Sections III and IV below.

III. **EVALUATE THE ANNUAL AIR QUALITY IMPACTS FOR EACH CONTAMINANT**.

Determine the actual annual and potential annual air quality impacts for each contaminant. Compare these impacts to the appropriate Federal or State Standard or Annual Guideline Concentration (AGC). Use this comparison to determine the level of control required. All sources of a contaminant, existing and new, must be considered. Additionally, other nearby significant industrial sources and "background" (if available) should be considered. Use the methodology described in APPENDIX B to calculate these impacts.

III.A. Calculate the actual annual impact for each contaminant. The actual annual impact should be based on the reported annual emission rate(s). This impact should be used to reevaluate the initial Environmental Rating.

III.B. Calculate the potential annual impact for each contaminant. The potential annual impact should be based on the potential annual emission rate (actual lbs/hr x 8760 hrs/year). This represents the legally enforceable limit unless special conditions are attached to a permit. Without these conditions, a source owner could legally operate 8,760 hours per year. Therefore, the potential annual impact should be calculated to determine if a source's increased operation might cause a violation of a standard or exceedance of an AGC.

If the potential annual impact exceeds an AGC or standard, include special permit conditions on the PC/CO to limit the source's hours/year of operation. The allowable hours/year of operation should then reflect compliance with the standard or Annual Guideline Concentration.

III.C. Determine the level of control necessary to meet the AGC or standard. Use that determination to help define BACT, RACT or, the "Commissioner specified Degree of Air Cleaning Required:"

III.C.1. Part 212 specifies that "A" rated contaminants require 99% or greater control or Best Available Control Technology (BACT). BACT is defined in Part 200.1.i., and is determined on a case specific basis. It is a control strategy that is sufficient to meet the AGC, at a minimum, while achieving the greatest degree of control that is both technologically and economically feasible.

III.C.2. Part 212 also states that the Commissioner will specify the "Degree of Air Cleaning Required" for "A" rated sources less than 1 lb/hr and "B" and "C" rated sources less than 10 lbs/hour. Use the determination in III.C. to help define the "Degree of Air Cleaning Required."

III.C.3. AGCs Based Upon "one in a million risk:" The main text of Air Guide-1 contains special permitting guidance for sources with AGCs based upon "one in a million risk." These AGCs are coded "U" in Appendix C of the document. The following briefly summarizes that guidance:

III.C.3.a. Sources controlled with BACT: When all sources of a contaminant have been controlled with BACT, it is not necessary to meet the AGC if the FACILITY annual impact is less than 10 times the AGC or the equivalent of "one in a hundred thousand risk." For some sources, BACT may be determined to be "no control" if not technically or economically feasible. The FACILITY annual impact represents the impact from all sources at a facility and does not include other industrial sources and background.

III.C.3.b. Sources without BACT: When all sources at a facility are not equipped with BACT, the annual impact must be less than the AGC. All sources of a contaminant, existing and new, must be considered. Additionally, other significant industrial sources and "background" (if available) should be considered.

III.C.4. Under Part 212, Reasonably Available Control Technology (RACT) is required for B, C and D rated sources emitting greater than 3.5 pounds/hour of Volatile Organic Compounds (VOCs) in the New York City Metropolitan Area. RACT is defined in Part 200 as the control technology that is reasonably available considering technological and economic feasibility. The RACT definition does not consider the level of control necessary to meet the AGC.

When RACT is not sufficient to meet an AGC, the source should be given an "A" Environmental Rating. That rating would then require 99% control or greater or BACT. The level of control required and BACT should then be evaluated by the DAR-1 procedures.

III.C.5. In summary, based upon the calculated level of control necessary to meet the AGC, the initial Environmental Rating should be reevaluated.

NOTE: Under no circumstances should a contaminant be given a "D" rating unless the chemical is a "simple asphyxiant" or water mist and meets all the criteria in Table 1 of Part 212.9.

IV. **EVALUATE THE SHORT-TERM AIR QUALITY IMPACT FOR EACH CONTAMINANT**

Determine the short-term air quality impact for each contaminant. Compare that impact to the appropriate Federal or State Standard or Short-term Guideline Concentration (SGC). Use that comparison to determine the level of control required. All sources of the contaminant, existing and new, must be considered. Additionally, other significant industrial sources and "background" (if available) should be considered. Use the methodology described in APPENDIX B to calculate the short-term impact.

IV.A. Calculate the short-term impact (1 hour) from each contaminant.

IV.B. Determine the level of control necessary to meet the SGC. Based upon this determination, the initial Environmental Rating should be reevaluated and adjusted upward if necessary.

IV.C. Odor detection values may also be used to evaluate acceptable short-term impacts. However, as a general rule, an Environmental Rating should not be assigned based solely upon a modeled potential odor impact. This is due to the subjective quality and variability of odor data. Therefore, odor detection information should not be used quantitatively. This information should be used qualitatively to resolve Part 211 and 257 nuisance odor complaints. BAT should be contacted for guidance on specific contaminants.

V. **EVALUATE PRIOR ENVIRONMENTAL RATINGS AND BACT AVAILABILITY**.

Determine what Environmental Ratings have been given to this contaminant in the past and what existing control technology is available. Data on prior environmental ratings is available from the Source Management System and information on BACT is available through the EPA clearinghouse (919-541-0900). Consider this information when making the BACT and RACT determinations. Additionally, statewide rating uniformity is a programmatic priority. Therefore, this information must be considered when assigning Environmental Ratings. If there is a great deal of disparity in the observed ratings, contact BAT for guidance.

VI. **ASSIGN THE FINAL ENVIRONMENTAL RATING FOR THIS CONTAMINANT.**

VI.A. If the new source meets the "Degree of Control Required" by Tables 2 or 3 of Part 212, the PC/CO should be issued. If the application is for a modified existing source (CO), the source should be inspected prior to its issuance.

VI.A.1 The following message should be included as a special permit condition on every new "Process, Exhaust or Ventilation System" PC/CO permit and CO renewal:

"Should significant new scientific evidence from a recognized institution result in a decision by DEC that lower ambient guideline concentrations must be established, it may be necessary to reduce emissions from this source prior to the expiration of this PC/CO."

VI.B. If the new source can not meet the "Degree of Control Required" in Tables 2 and 3 of Part 212, the PC/CO must be denied. The source owner should then be advised that a revised application must be submitted prior to building the source. That revised application must reflect the following:

VI.B.1. The source owner may choose to install a more efficient control device to obtain the necessary "Degree of Air Cleaning Required" as specified by the contaminant's Environmental Rating.

VI.B.2. The source owner may provide additional information to NYSDEC to justify the acceptability of the permit application:

VI.B.2.a. By submitting toxicological information that justifies a modification of the Environmental Rating. This information would necessitate a revision to the AGC, SGC or Toxicity Classification of the critical contaminant. If the source owner wishes to attempt this demonstration, the Bureau of Air Toxics, 518-457-7688, should be contacted for guidance.

VI.B.2.b. By performing a refined, site specific air quality modeling analysis to demonstrate that the air quality impact is acceptable. Acceptability is judged by the DAR-1 permit review procedures. If the source owner wishes to attempt this demonstration, the Bureau of Impact Assessment and Meteorology, 518-457-7450 should be contacted for guidance.

VI.B.3. <u>AGCs Based Upon "one in a million risk" & BACT</u>: When all sources at a facility are equipped with BACT, a permit application should be denied if the FACILITY annual impact is greater than 10 times the AGC. However, the source owner may continue with the permit application process. A positive declaration would then be issued under SEQR and a DEIS and Health Risk Assessment would be required. A notice of the Type I action would then be published in Environmental Notice Bulletin.

VII. **RERATING EXISTING PERMITTED SOURCES**.

Environmental Ratings should be reviewed for each contaminant when a Certificate to Operate (CO) comes up for renewal. At that time, the permit should be reevaluated on a contaminant specific basis to determine the appropriateness of the assigned Environmental Rating(s). Environmental Ratings should be changed based on the following criteria:

VII.A. New Toxicological Evidence: Environmental ratings should be reevaluated on a contaminant specific basis whenever an AGC/SGC is lowered or a contaminant is reclassified and assigned to the High Toxicity Table of Appendix C. When this "new toxicological evidence" warrants a stricter Environmental Rating, the rating must be changed. If the revised rating requires additional control, a timetable for compliance should be negotiated between the source owner and Regional staff.

VII.B. "D" Environmental Ratings: All "D" Environmental Ratings should be reevaluated whenever a Certificate to Operate (CO) comes up for renewal. In general, "D" ratings are inappropriate for most contaminants. Only simple asphyxiants, such as inert gases, and water mist are eligible for "D" Environmental Ratings. If a "D" rating has previously been assigned to a contaminant and that contaminant is not a simple asphyxiant or water, the rating should be changed. If additional control is required, a timetable for compliance should be negotiated between the source owner and the DEC regional staff.

This approach to controlling emissions is an implementation of the DEC Commissioner's Waste Reduction Policy Statement O&D 87-13, as interpreted by the Division of Air Resources. Essentially, the Commissioner's policy calls for emissions reductions of all toxic air contaminants, even those for which projected impacts are less than the ambient guideline concentrations. Some of these contaminants may have been given "D" ratings in the past.

This policy is consistent with the long-standing Part 212 Table 1 criterion for assigning "D" Environmental Ratings. The regulation states that "D" ratings only appropriate for contaminants "whose discharge will not result in measurable or observable effects on receptors, nor add to an existing or predictable burden of that contaminant which may cause adverse effects..." This requirement is intended to minimize aggregate environmental degradation from all sources - both small and large.

IMPORTANT NOTICE

The procedures outlined below for calculating area source impact do not conform to the latest revisions to the EPA Guidelines on Air Quality Models (Supplement C; August 9, 1995). This version of Appendix B could underestimate impacts at close-in distances from area sources by a factor of up to three. Thus, in those instances where the impacts are problematic (i.e. approach the SGC or AGC within the factor of three) or a better estimate is desired, the EPA SCREEN3 and ISCST3/ISCLT3 models should be used. To convert the 1 hour SCREEN3 impacts to annual impacts, a 0.1 factor is recommended.

APPENDIX B

AMBIENT AIR QUALITY IMPACT SCREENING ANALYSES

I. INTRODUCTION

DAR-1 requires an ambient air quality impact analysis for all new or modified sources of air contaminants regulated under 6NYCRR Part 212. The analysis requires the evaluation of both annual and short-term air quality impacts. This appendix outlines the procedures for conducting a screening level analysis.

NOTE: This screening procedure presents a major modification to the previous version of the standard point source method. The new method will assure that conservative impacts are calculated under all source conditions, including the source environment: rural or urban (see Section IV.H). The need for and the derivations of the new formulations are detailed in a November 1, 1993 paper "Modifications to the DAR-1 Appendix B Screening Analysis Methods" by Leon Sedefian and Eric Wade of BARP. The new procedures may result in higher impacts than the previous point source equation by up to a factor of ten. Some of the basic assumptions and considerations which are associated with the screening methods are described in Section IV of this Appendix. These should be reviewed prior to the use of the methods.

In addition to this document, a refined version of these screening procedures is contained in an AG-1 computer program formulated by Eric Wade. These extended procedures can significantly reduce the conservativeness of the hand calculation methods. The computer program contains revised short-term methods to emulate more closely the SCREEN2 model. In addition, the program's refined annual impact procedure includes use of the ISCLT2 model. The software program is a very powerful and versatile tool which can simulate a number of situations, which are either not addressed or roughly approximated by the procedures in this document. Some of the major advantages of the AG-1 software package are:

1) The program is "user friendly" and "smart". The program assigns default, worst-case stack, building, and modeling parameters whenever unknown.

2) It allows access to a file containing all AGC's, SGC's and standards as contained, or incorporated by reference, in Appendix C of AG-1.

3) It can import downloaded source files from the Source Management System.

4) The program can calculate annual impacts using both screening and refined methods. This allows the user to quickly assess contaminant impacts from one or more facilities using the screening methods and then to refine the assessment using the ISCLT2 model.

5) The short-term method incorporates revisions to the point and area source screening methods. The point source procedure utilizes several regression curves and credits a linear reduction factor for stack height to building height ratios greater than 1.2 and less than 2.5. The cavity

method closely simulates SCREEN2 model results. Also, the area source method allows the calculation of impacts at user specified downwind distances.

6) An enhanced version of the ISCLT2 model has been integrated into the AG-1 software program. This model is less conservative than the screening methods and has several enhancements to improve its performance. The enhanced ISCLT2 model improves upon the annual impact screening estimates in the following ways:

a) It allows for the calculation of more realistic individual source impacts other than the worst case conditions simulated by the screening methods.

b) It provides a better estimation of building downwash effects by considering building orientation. The program has the option for calculating the crosswind building width for each wind direction to better define building downwash. This may greatly reduce downwash impacts for a given wind direction. Generally this occurs when a building is tall rather than squat.

c) Simulates cumulative source impacts by separating sources properly, instead of adding the maxima from each source.

d) Incorporates regional meteorological data sets for more site specific analyses.

e) Provides impacts at a grid of receptors surrounding the facility, down to a very fine resolution. The user can then control reiterative model executions for different grid displays while looking at the modeling output.

f) It can download modeled impacts which can be imported into other programs to generate modeled isopleths.

g) It can predict impacts, impact/AGC ratio's, inhalation cancer risks and hazard indices.

Thus, it is strongly recommended that the AG-1 computer program be used as the primary tool to implement the necessary ambient impact analyses. Furthermore, any inquiries to Central Office on AGC and SGC exceedances should be done only after the AG-1 software program has been used.

Appendix B has four major sections, including this introduction. Section II addresses building cavity impacts. These impacts occur when a source has poor dispersion characteristics and should be evaluated as part of this screening analysis. Following that evaluation, the user should conduct the ambient air quality impact assessment outlined in Section III. Section III is the main component of the method. It outlines several procedures for calculating the maximum annual and short-term impacts from all sources of a contaminant. The assumptions, qualifications and further considerations relating to this appendix are discussed in Section IV. It should be consulted for guidance on some of the more common issues of concern.

It should be noted that terrain effects and elevated receptors are not considered in the Section III methodologies. Thus, if there are significant terrain features above the height of the stack, within one-half mile of a source, care should be taken when interpreting the screening model results. When significant terrain features (e.g., hills and mountains) are nearby, the screening procedures may underestimate the maximum ambient impacts. This same concern for underestimating impacts applies to urban areas, like New York City, where the elevated receptors may be man-made. These man-made receptors may represent multi-story apartment dwellings or ventilation system air intakes. Elevated receptors should also be considered when evaluating the impacts from infectious waste incinerators as specified in Air Program Memo 93-AIR-28.

Any questions concerning the methodology presented in this appendix should be directed to the DEC Bureau of Application Review and Permitting (BARP), Impact Analysis Section (IAS: (518)-457-7688). It's staff is responsible for all modeling procedures contained in this appendix. The basic procedures were derived from "Screening Procedures for Determining Ambient Impacts of Toxic Contaminants," June 1979 by Leon Sedefian of BARP. The procedures were then modified or supplemented by Leon Sedefian and Eric Wade (BARP) in the above mentioned 1993 Paper to derive the revised screening methodology presented in this appendix.

II. **CAVITY IMPACT EVALUATION PROCEDURE**

The first phase of the Appendix B screening analysis requires an evaluation of building cavity impacts. Cavity impacts occur when stack emissions have poor dispersion characteristics. They do not occur when a stack is designed using Good Engineering Practice (GEP). These poor dispersion characteristics are generally associated with "short" stacks or vents that have little plume rise. The stacks are "short" in relation to the recommended GEP stack height, which is defined as the building height (h_b) plus 1.5 times, the smaller of the building height or the horizontal dimensions. When the plume rise is not sufficient to escape a building's aerodynamic effects, the cavity impact occurs if the pollutant becomes entrained into the cavity region that develops downwind of the source building. The extent of that cavity region is defined by the building dimensions. When the cavity region is confined on-site and there is no public access to that area, it is not necessary to calculate cavity impacts. However, when it extends beyond a facility's property line, the cavity impacts must be calculated.

Cavity impacts should be evaluated for each building separately when using these screening procedures. The contribution from other facility and industrial sources should be ignored in this section. They are addressed in Section III. Sources tall enough to escape a building's aerodynamic effects do not have cavity impacts. Those with release heights (h_e or h_s) less than the cavity height (h_c) have cavity impacts, as the emissions become entrained into the cavity region. These impacts should be summed to determine each building's annual and short-term cavity impacts. Alternately, the building's total emissions may be summed and applied directly to the impact calculation equations in Sections II.A. and II.B. as an initial screening technique.

Two separate methods are presented below for calculating building cavity impacts: the Basic Cavity Impact Method (II.A.) and the Refined Cavity Impact Method (II.B.). Either method may be used, although the second method is "more refined" and generally less conservative. Once calculated, the impacts should be evaluated using the Cavity Impact Evaluation Method presented in Section II.C.

II.A. **BASIC CAVITY IMPACT METHOD**

II.A.1. Define the horizontal extent of the cavity as $3h_b$, where h_b is the building height. Then, define the shortest distance from the building to the property line (all directions) as D_{pl}. If D_{pl} is greater than $3h_b$, then cavity impacts (if they occur) are confined to on-site receptors, and this building's cavity impacts do not need to be calculated. Otherwise, continue with the next step.

II.A.2. Define the building cavity height, h_c, as $h_c = 1.5\ h_b$. If the physical stack height (h_s) is greater than h_c, no annual or short-term cavity impacts occur from this source. If the stack height is below h_c, continue with the next step.

II.A.3. Calculate the worst case Annual Cavity Impact, C_C, from the equation:

$$C_C(\mu g/m^3) = \frac{1.72\ \ Q_a}{h_b^2}$$

where Q_a is the annual emission rate in lbs/year and h_b, the building height, in feet.

II.A.4. Calculate the worst case Short-Term Cavity Impact, C_{CST}, from the equation:

$$C_{CST}(\mu g/m^3) = \frac{904000.\ \ Q}{h_b^2}$$

where Q is the reported hourly emission rate in lbs/hour and h_b, the building height, in feet.

II.B. **REFINED CAVITY IMPACT METHOD**

II.B.1. Define the horizontal extent of the cavity as $3h_b$, where h_b is the building height. Then, define the shortest distance from the building to the property line (all directions) as D_{pl}. If D_{pl} is greater than $3h_b$, then cavity impacts (if they occur) are confined to on-site receptors, and this building's cavity impacts do not need to be calculated. Otherwise, continue with the next step.

II.B.2. Determine the length (L_{max}) and width (L_{min}) of the source building. If the largest building dimension, L_{max}, is less than h_b, then redefine the horizontal extent of the cavity as $3L_{max}$. If D_{pl} is greater than $3L_{max}$, the cavity impacts are confined to on-site receptors and, this building's cavity impacts do not need to be calculated. Otherwise, continue with the next step.

II.B.3. Define the building cavity height, h_c, as $h_c = 1.5\ h_b$. If the physical stack height (h_s) is greater than h_c, no annual or short-term cavity impacts occur from this source. If the stack height is below h_c, continue with the next step.

II.B.4. Redefine the building cavity height, h_c, for short squat buildings. That is, if h_b is less than 1/2 L_{min} then, $h_c = h_b$. Otherwise, $h_c = 1.5h_b$.

NOTE: The AG-1 software program uses a more precise formula for calculating the building cavity height, h_c. This same formula is used in the SCREEN2 model for evaluating short-term cavity impacts, although the AG-1 program limits the maximum cavity height to $1.5h_b$. The computer program defines h_c as shown below:

$$h_c \text{ (feet)} = h_b(1+1.6*e^{(-1.3L_{min}/h_b)})$$

If $h_c > 1.5h_b$, set $h_c = 1.5h_b$

II.B.4.a. If h_s is now greater than h_c, no annual or short-term cavity impacts occur for this source.

II.B.4.b. If h_s is still less than or equal to h_c, continue with the next step to consider plume rise.

II.B.5. **Plume Height with Momentum Flux** - **NOTE: The consideration of momentum plume rise is valid only for emissions from vertically oriented discharges, but not for capped stacks or "goose necks".**

II.B.5.a. Calculate the Momentum Flux (F_m) from:

$$F_m\ (ft^4/sec^2) = \frac{T_a}{T}\ V^2\ \ R^2$$

Where:	English Units
T = exit temperature	(ER), (Box 34+460ER)
V = exit velocity	(ft/sec), from Box 35
R = stack outlet radius	(ft), (Box 33)/24
T_a = ambient temperature = 510ER, (assumption)	

II.B.5.b. Calculate the effective stack height (h_e) from:

$$h_e \text{ (feet)} = h_s + 0.25 (F_m h_b)^{1/3}$$

If h_e is greater than h_c (see II.B.4.), the plume is assumed to escape the cavity region and no annual or short-term cavity impacts occur for this source. Otherwise, continue with the next step.

II.B.6. Calculate the building's minimum vertical cross-sectional area (A) for all wind directions from:

$$A \text{ (ft}^2\text{)} = h_b \times L_{min}$$

where h_b is the building height in feet and L_{min}, the smaller of the horizontal building dimensions (feet).

II.B.6.a. If L_{min} exceeds $5h_b$, then recalculate A as, $A = 5h_b^2$.

II.B.7. Calculate the worst case Annual Cavity Impact, C_C, from the equation:

$$C_C (\mu g/m^3) = \frac{1.72 \quad Q_a}{A}$$

where Q_a is the annual emission rate in lbs/year and A, the minimum vertical cross-sectional building area (ft^2).

II.B.8. Calculate the worst case Short-Term (1 hour) Cavity Impact, C_{CST}, from the equation:

$$C_{CST} (\mu g/m^3) = \frac{904000. \quad Q}{A}$$

where Q is the reported or maximum hourly emission rate in lbs/hour and A, the minimum vertical cross-sectional building area (ft^2).

II.C. **CAVITY IMPACT EVALUATION METHOD**

Building cavity impacts must be considered when using the Appendix B screening procedures. For a permit application to be acceptable, both the annual and short-term building cavity impacts must be less than the appropriate air quality standards or guideline concentrations. To calculate a building impact, the individual source cavity impacts must be summed. Alternately, and more conservatively, the building's impacts may be calculated by summing the emissions and applying them in the impact calculation equations.

When a building cavity impact exceeds a standard or guideline concentration, the cavity impacts should be reevaluated using the AG-1 computer program followed, if necessary, by the SCREEN3 model. These models use a less conservative approach for determining whether cavity impacts will occur beyond a facility's property line. Additionally, both models utilize less conservative methods for calculating short-term impacts. Thus, when the Appendix B screening procedures indicate that cavity impacts will occur off-site, this assertion should be verified using the other models if the impacts are critical (e.g., when the SGCs are exceeded).

NOTE: The SCREEN3 model is generally less conservative than the AG-1 software program. However, the SCREEN3 model cannot calculate annual cavity impacts. The method for calculating these annual impacts in the computer program is identical to the Refined Cavity Impact Method (II.B.). Therefore, with this exception, the SCREEN3 model should be used as the last step in the analysis procedure, as there are no refined dispersion models for assessing building cavity impacts.

II.C.1. **GEP Stack Height Considerations**.

In some instances a source's cavity impacts are so pronounced that additional measures must be taken to eliminate a source's poor dispersion characteristics. Under this condition, the stack height of the source should be adjusted in line with Air Program Memo 95-AIR-18 and the GEP stack height regulations. This action should be taken independent of any control requirements that may be imposed. That is, the source owner must meet the AGC, SGC, and standards in concert with any action taken to alleviate the source's poor dispersion characteristics. Under the following conditions the source owner should be required to raise the physical or effective stack height of the source to eliminate the cavity impacts:

a) When a predicted cavity short-term impact is more than two times the appropriate standard or SGC.

b) When both the annual and short-term cavity impacts exceed the appropriate standards or guideline values.

c) When both the annual cavity and maximum point source actual annual impacts (in Section III) exceed the appropriate standard or AGC.

III. POINT AND AREA SOURCE AIR QUALITY IMPACT ASSESSMENT

The second phase of the Appendix B screening analysis requires an assessment of the ambient air quality beyond the cavity region. This assessment must consider the impact from all sources of a contaminant. This includes other significant industrial sources and "background" (see Section IV.B.). Predicted worst case total annual and short-term ambient impacts should then be compared to the appropriate standard or guideline concentrations to assess the acceptability of a source's impacts.

Three different methods are presented below for assessing ambient air quality: the Standard Point Source Method (III.A.), the Area Source Method (III.B.) and the Alternate Area Source Method (III.C.). The methodologies are presented as if a single source is being evaluated. However, this generally is not the case, as most facilities have multiple sources of the same contaminant. <u>When there are multiple sources of a contaminant, the individual source impacts should be summed to determine a worst case total ambient impact. Alternatively, an impact may be estimated by summing the emissions and assuming a single point source is discharging the contaminant.</u> Once calculated, the impacts should be evaluated using the Ambient Impact Evaluation Method in Section III.D.

When using these screening procedures, the impact from all sources of a contaminant must be considered. However, for most permitting applications, "background" and the impact from <u>other</u> facility industrial sources have little contribution to the maximum impacts from the facility under review and need not be considered. This assumption is not valid if appropriate monitoring data is available to define "background", or there are sources in adjacent (contiguous) facilities that emit the contaminant under review. When such sources exist, their impact should be calculated using the Standard Point Source Method. That impact should then be added to the total impact from all sources of the facility under review. If a significant source is identified at a non-adjacent facility and there is a great separation between sources (see section IV.E), the maximum impact from all sources can be estimated using the enhanced version of the ISCLT2 model contained in the AG-1 software program.

An additional simplification can be allowed for short-term (1 hour) impacts: these impacts may be evaluated on a per building basis, similar to the cavity method. The maximum 1 hour impacts from all sources in a particular building are generally not influenced significantly by the contribution from other sources. That is, the impacts from all sources should be calculated, summed and evaluated for each <u>building</u> separately. In some instances, such as at large facilities, cumulative short-term impacts should be performed in a refined site specific analysis where <u>all</u> of the facility sources can then be appropriately modeled.

The various methodologies presented below allow the calculation of an actual annual impact, a potential (maximum) annual impact and a short-term impact. The potential annual impact should be compared to the AGC to determine if special permit conditions should be added to a permit restricting the hours per year of operation. This should be done if a source's increased hours of operation might cause an exceedance of an AGC. A source's reported hours per year of operation are only enforceable when special conditions are attached to a permit.

<u>All impacts should be evaluated using the guidance in section III.D.</u>

III.A. **<u>STANDARD POINT SOURCE METHOD</u>**

NOTE: The methodologies outlined below replace the previous Appendix B worst case point source equations. The revisions were necessary because the old equations underestimated impacts under severe

downwash and limited plume rise situations. Additionally, the modifications assure consistancy with current EPA/DEC guidance and models.

The following standard point source method predicts impacts at the point of maximum concentration. The methodology considers possible building downwash effects and is applicable in both rural and urban settings (see Section IV.H). A point source is generally associated with a single stack emission source. However, several sources or an entire facility can be represented as a single point source if the emissions are summed and all sources have similar stack heights and emission characteristics. Even if the stack heights and emission characteristics are dissimilar, they still can be represented as a single point source by assigning the smallest stack height, stack diameter, lowest exit temperature, and exit velocity (lowest) to the aggregate source. When some or all of these data are missing, a worst case contaminant impact can be calculated by assigning the default parameters listed in Section IV.C. The software program of DAR-1 assigns any or all of these default values when data is missing. In general, if source specific data is known, it should be used; the more precisely a source is depicted when using the methodology described below, the more accurate are the predicted ambient impacts.

The stepwise procedure outlined below provides worst case annual impacts in either a rural or urban environment. It simulates worst case building downwash effects for either a squat (building height less than the horizontal building dimensions) or a tall structure. For cases where downwash is not so severe, or a GEP stack height exists, reduction factors are provided to calculate appropriately lower worst case impacts.

III.A.1 Allow limited plume rise for some stack height to building height ratios. Calculate h_s/h_b for the source.

NOTE: For horizontally released, capped or "gooseneck" stacks no plume rise should be allowed. For these sources, set the effective stack height (h_e) equal to the physical stack height (h_s) and go to step III.A.2.

III.A.1.a. If the stack height to building height ratio (h_s/h_b) is less than 1.5, then assume no plume rise exists. Set h_e equal to h_s and continue with step III.A.2.

III.A.1.b. If the ratio (h_s/h_b) is equal to or greater than 1.5, but less than 2.5, credit some momentum plume rise as follows:

$$h_e(\text{feet}) = h_s + 1.1(F_m)^{1/3}$$

where F_m is from II.B.5.a. and h_s is the stack height in feet. Continue with step III.A.2 to calculate the annual impact.

III.A.1.c. If the ratio (h_s/h_b) is <u>equal to or greater than 2.5</u> (GEP stack), account for buoyancy final rise. First, determine the buoyancy flux parameter (F) from:

$$F\ (m^4/sec^3) = 0.276\ \frac{VR^2\ (T-510)}{T}$$

where V is the exit velocity in ft/sec, R, the stack outlet radius in feet, and T the stack exit temperature in Rankine.

III.A.1.d. Determine the effective stack height from:

$$h_e\ (feet) = h_s + 7.0(F)^{3/4} \quad \text{for } F < 55$$

$$h_e\ (feet) = h_s + 12.7(F)^{3/5} \quad \text{for } F \geq 55$$

where h_s is the stack height in feet. Continue with next step to determine the annual impact.

III.A.2. Calculate the maximum Actual Annual Impact, C_a, from the point source using the effective stack height, h_e, and the annual emission rate, Q_a, in the equation below:

$$C_a\ (\mu g/m^3) = \frac{6.0 *\ Q_a}{h_e^{2.25}}$$

where Q_a is in lbs/year, h_e in feet.

III.A.3. Calculate the maximum Potential Annual Impact, C_p, from the point source using the effective stack height, h_e, and the reported hourly emission rate, Q, in the equation below:

$$C_p\ (\mu g/m^3) = \frac{52500 *\ Q}{h_e^{2.25}}$$

where Q is in lbs/hour; h_e in feet.

This impact (C_p) assumes continuous operation of the source. Permit conditions restricting the hours per year of operation should be considered if C_p > AGC, but C_a < AGC.

III.A.4. Calculate a reduction of impacts under the following conditions:

III.A.4.a. If the stack height to building height ratio (h_s/h_b) is greater than 1.5, but less than 2.5, then reduce C_a and C_p from above by a factor of 0.75.

III.A.4.b. If the h_s/h_b ratio is equal to or greater than 2.5 (GEP stack), then multiply the original C_a and C_p values from above by a 0.4 factor.

III.A.5. Calculate the maximum Short-Term Impact, C_{ST}, from the point source using the equation below:

$$C_{ST}\ (\mu g/m^3) = C_p * 65$$

where C_p is the maximum Potential Annual Impact as adjusted in III.A.4 above.

III.B. **AREA SOURCE METHOD** **-Read "IMPORTANT NOTICE" after front cover.**

This method may be used to determine the maximum overall actual annual, potential annual, and short-term impacts from an area source. The maximum impact is predicted to occur just outside the area source at a distance 0.564S from the center, where S is the area source side length. When there are multiple area sources, the annual and short-term impacts should be summed. For short-term impacts, this may be very conservative, if all the area sources are not aligned with the dominant wind direction. The procedure was developed primarily for ground level sources meeting the general source characteristics in Section IV.F. If there is a distinct height to the area source, the predicted impacts will be conservative.

NOTE: The screening portion of the AG-1 software program allows for the calculation of maximum impacts at specified downwind distances outside an area source. Additionally, the refined ISCLT2 model considers the release height of emissions and individual source locations.

The method follows:

III.B.1. Determine the side length, S, of the area source in feet. The area source should be square. The side length, S, should be greater than 30 feet but less than 3300 feet.

III.B.2. Calculate the maximum Actual Annual Impact, C_a, from the area source using the equation below:

$$C_a\ (\mu g/m^3) = \frac{76.6 * Q_a}{S^{1.8}}$$

where Q_a is the annual emission rate in lb/year, and S is the area side length in feet.

III.B.3. Calculate the maximum Potential Annual Impact, C_p, from the area source using the equation below:

$$C_p\ (\mu g/m^3) = \frac{670600 * Q}{S^{1.8}}$$

where Q is the hourly emission rate in lb/hr, and S is as defined above.

III.B.4. Calculate the maximum Short-Term Impact, C_{ST}, from the area source using the equation below:

$$C_{ST}\ (\mu g/m^3) = C_p * 25$$

where C_p is the maximum Potential Annual Impact as defined above.

NOTE: The factor of 25 is <u>only applicable when used with the maximum overall annual impacts from above</u>. For <u>specific downwind distances</u>, the AG-1 program can provide the appropriate annual and short-term impacts.

III.C. <u>ALTERNATE AREA SOURCE METHOD</u>

The following alternate area source method was developed specifically for remediation projects and urban scale emissions. It has the flexibility to permit the calculation of the maximum annual concentration <u>within</u> an area source. However, the method has not been developed to estimate short-term impacts. Short-term area source impacts can be estimated using the equation in Section III.B.4 or the EPA SCREEN3 model. The method will perform better, the closer the source characteristics and assumptions approximate those specified in Section IV.F. The contribution from nearby area sources can be calculated by the procedure given below. Only sources located within a distance of 3S (S is the side length of the area source) from the source being analyzed need be considered. A better approach for calculating multiple source effects and impacts at specific downwind distances is to use the AG-1 software program.

The following procedures are most appropriate for ground level area sources, effectively less than 10 feet in height, with side lengths greater than 330 feet:

III.C.1. Determine the area source emission rate (Q_A) in units of lb/(hr-ft^2) by dividing the total annual emission rate, Q_a (lb/hr), by the area, A (ft^2), of the source.

$$Q_A \frac{(\text{lb})}{(\text{hr-ft}^2)} = \frac{(\text{emission rate})}{(\text{area})} = \frac{Q_a}{A}$$

III.C.2. Calculate the maximum Actual Annual Impact, C_a, <u>within</u> the area source as defined below:

$$C_a(\mu g/m^3) = K * Q_A * C_m$$

Where: $K = 15$ for $330\ \text{ft} \leq S < 3300$ ft
$K = 30$ for $S \geq 3300$ ft
$C_m = 1.355 \times 10^6$, a conversion factor from lb/(hr-ft^2) to $\mu g/m^2$-sec).

III.C.3. If there are other area sources (ideally contiguous to the source being analyzed) within 3S distance from the source being considered, then the contribution of these sources can be determined by redefining Q_A in Step III.C.2. (lb/(hr-ft^2)) as:

$$Q_A = (Q_{A0} + .32Q_{A1} + .18Q_{A2} + .13Q_{A3})$$

Where Q_{A0} represents the emissions from the source under consideration and Q_{A1} to Q_{A3} represent emissions from sources (if they exist) which are at upwind distances of 1S, 2S, and 3S, respectively, from the Q_{A0} source. It must be noted that the nearby sources are assumed to be of about the same size as the source under consideration.

III.D. AMBIENT IMPACT EVALUATION METHOD

An ambient air quality impact assessment is required as part of the Appendix B screening procedure. That assessment requires a comparison of predicted worst case annual and short-term impacts with the appropriate standards or guideline values. When building cavity impacts exceed the point source method impacts, these concentrations become critical for determining the appropriate Environmental Rating under 6NYCRR Part 212.

It is important to understand that the Appendix B screening methods are generally conservative. This is especially true for the short-term impact hand calculation methods. When these screening impacts exceed the appropriate standards or guideline values, the AG-1 software program and/or SCREEN3 model should be used to perform a more precise and less conservative analysis. The SCREEN3 model should be used as the last step in the short-term impact screening procedure before a refined air quality impact analysis (III.D.1.) is required.

When there are multiple sources of a contaminant and a large separation between sources (see Section IV.E), the conservatism in the short-term methods may be pronounced. In such a case, summing short-term impacts may be unrealistically conservative. That level of conservatism increases with greater variations in stack heights and source separation. It becomes critical in cases where it is unlikely that all sources will impact the point of maximum concentration for a given wind direction. To address this concern, the screening short-term cavity and point source impacts are evaluated on a per building basis. When assessing annual impacts, the conservatism of adding maximum multiple source impacts is not as critical, because wind direction varies over a yearly period. Therefore, because the wind direction changes, all sources generally impact the point of maximum concentration in varying degrees.

The Appendix B screening analysis must demonstrate that both the annual and short-term impacts are below the appropriate standards or guideline values. When these values are exceeded using the screening methods or the AG-1 program, a refined Air Quality Analysis may be required.

III.D.1. **Refined Air Quality Analysis**

When the DAR-1 software program analysis shows that impacts are unacceptable, IAS staff should be contacted for guidance (518-457-7688) as it may be possible to reduce the conservatism in the analysis. If the level of conservatism cannot be reduced, a site specific analysis should be required if the permit is to be approved. As an initial step, the source owner should be provided with Air Guide 26 to facilitate development of a modeling protocol. Questions on the protocol should be directed to IAS staff, who will provide guidance to both the source owner and Regional Offices on the selection and execution of these models.

IV. **ASSUMPTIONS, QUALIFICATIONS AND FURTHER CONSIDERATIONS CONCERNING APPENDIX B**

The methodologies behind the development of the initial Appendix B screening procedures are described in the 1979 Sedefian paper. These procedures were revised by Sedefian and Wade in the November 1, 1993 paper, previously referenced. Both should be reviewed to understand most of the assumptions and qualifications associated with these stepwise procedures. The Cavity and the Standard Point Source Method equations were formulated to calculate worst case impacts under building downwash effects. These equations are consistent with EPA procedures found in the SCREEN2 and the ISC2 (Version 93109) models. The modified screening methods calculate conservative impacts under all conditions. Thus, the method will likely overestimate the point source impacts predicted by the more refined techniques found in the AG-1 software program, SCREEN3 and ISC3 models. Some of the more notable assumptions and qualifications relating to this appendix are as follows:

IV.A. **Worst Case Assumptions of the Standard Point Source Method**

The worst case impact method of Section III.A assumes the most conservative downwash effects under the most conservative environmental setting (RURAL or URBAN). These conditions were determined from model sensitivity runs using the SCREEN2 and ISCLT2 models.

For the annual method and no plume rise assumption, the maximum impacts occur under building downwash conditions. Specifically, when the stack height is equal to the building height ($h_s=h_b$) and the building is just squat ($h_w=h_b$, where h_w is the horizontal crosswind building dimension). For this configuration, the rural and urban maximum impacts are nearly identical. Since these conditions are the bases of the worst case point source equation, there may be many instances when the screening methods will be overly conservative.

For example, the screening methods may be overly conservative under the following situations: 1) when the source is in a rural setting and the h_s/h_b is greater than 1.5; 2) when the source has a significant plume rise (e.g. large flow and high temperature); and 3) when the source is tall, instead of squat in the predominant wind direction and h_s is greater than h_b. The conservatism can be reduced by using the AG-1 software program, especially in the ISCLT2 mode.

For the short-term method, the maximum impacts occur in a rural setting under the worst case downwash conditions. These occur when a source has no plume rise and the stack height to building height ratio is just greater than 1.2 for a squat building ($h_b=h_w$). In general, the short-term method can be overly conservative for the examples noted above in the annual impact method. However, the impacts calculated using the short-term method are generally more sensitive to the h_w/h_b ratio. The conservatism of the short-term screening methods may be reduced by using the SCREEN2 model or the AG-1 program.

IV.B. **Background Concentrations**

Insufficient data currently exists for establishing credible, non-industrial background concentrations for almost all the non-criteria pollutants addressed by DAR-1.

Therefore, in almost every instance, one may assume the background concentration is insignificant or zero for non-criteria pollutants.

The assumption that background is insignificant is valid for most contaminants in terms of relative contribution. Those that are significant will be identified through the DEC Toxic Sampling Network and/or as a result of the Clean Air Act Amendments of 1990. However, nearby industrial source impacts are not to be considered as part of the general background concentration. The contribution from these nearby industrial sources must be considered when assessing ambient air quality as required by Section III screening methods. Nearby sources, for the most part, are those located within adjacent facilities. However, there may be other significant sources in non-adjacent facilities. The significance of these other sources can be determined by using the AG-1 software program.

In situations where adequate ambient monitored data exists, it may be valid to establish a background concentration. Background concentrations should then be added to the screening model estimates. Caution is advised, because in most instances monitoring information is not of sufficient duration to be representative of long-term averages. Additionally, it is often difficult to separate background from industrial contributions. However, if annual background data exists, the background concentrations should be added to the screening model estimates.

IV.C. **DAR-1 Default Values**

When information is not available to conduct an DAR-1 review, any of the following Default Values may be assumed for use with these screening procedures:

Height Above Structure		=	0.	feet
Stack Height[1]	h_s :	=	33.	feet
Inside Dimension		=	4.	inches
Stack Outlet Radius,	R :	=	.17	feet
Exit Temperature		=	51.	degrees F.
Exit Temperature,	T :	=	511.	degrees R.
Exit Velocity,	V :	=	.01	ft/sec
Exit Flow Rate		=	.05	ft^3/sec
Ambient Temperature,	T_a :	=	510.	degrees R.
Building Height[1]	h_b :	=	h_s	
Building Width[1]	L_{min} :	=	h_b	
Building Length	L_{max} :	=	h_b	
Side Length of Area Source,	S :	=	30.	feet
Distance to Property Line[2]	D_{pl} :	=	1.	foot
Momentum Flux,	F_m :	=	0.	ft^4/sec^2
Effective Stack Height[1]	h_e :	=	33.	feet
Buoyancy Flux Parameter,	F :	=	0.	m^4/sec^3

[1] For cavity concentration calculations, set h_s and L_{min} to 33ft as defaults. This may not always be conservative for stacks and building heights which are less than 33 feet.

[2] By assuming D_{pl} equal to 1 foot, the method will force the calculation of a worst case cavity impact. That cavity may occur on plant property. The correct D_{pl} must be used to determine whether the cavity impact occurs on plant property.

IV.D. **Receptor Distance and Location**

The concentrations obtained by the standard point source method (Section III.A.) represent the maximum impacts at any receptor location. The area source methods (Section III.B.) will predict the maximum impacts, independent of wind direction, just outside the area source (0.564S). Impacts at specific downwind distances for both types of sources can be calculated by the AG-1 program.

IV.E. **Multiple Point Source Impacts**

The procedures described in Section III perform initial and conservative impact calculations followed by a source specific summation of impacts. The calculations using source specific emission parameters add the maximum impacts from each source to determine the total impact, regardless of spatial considerations. These impacts may be overly conservative under conditions such as a large separation between sources (e.g., over 100 meters), a factor of two or more variation in stack heights (especially for stacks below 30 meters) and non-alignment of all sources with the predominant wind direction for the given area. In these instances the AG-1 program or a site specific analysis may predict a significantly lower impact. Additionally, if the impact of concern is not at the point of maximum concentration, but at a location where downwind distance or wind direction frequency could influence the impact, then the AG-1 program or a site specific model may provide a more accurate and lower impact estimate. Furthermore, if it is determined that the facility source configuration is too complex for these screening procedures and the AG-1 program, a refined site specific analysis can be requested of the source owner. IAS staff should be contacted for guidance on this or any other consideration.

IV.F. **Area Sources**

An area source can be used to model many different types of sources including stack emissions. However, in general, stack emissions should not be modeled as area sources. Area sources best describe emissions uniformly distributed over an area, such as fugitive emissions from a coal pile or from a sewage treatment plant lagoon. For the purposes of this screening model, area sources can be used to model waste disposal sites, fugitive and primary facility-wide emissions, and urban area sources.

Two different procedures are presented in Section III to estimate the ambient impacts from area sources. Both procedures are useful, although the impact equation in the first method is preferred, simpler, and allows for the calculation of short-term impacts. The second, alternate method has the advantage of permitting the calculation of the ambient annual impact within the area source. **Note: Neither method is in accord with current EPA Modeling Guidance.**

Both these methods will perform more accurately, the closer the source characteristics approximate the following conditions:

1) The emissions in the area source are uniformly distributed with variations not exceeding 25%.

2) The area source is square. If it is not square, it should be broken up into smaller square sources or, approximated by a square source with an equivalent area.

3) The emissions are continuous and not a function of meteorological conditions.

IV.G. **"New York County" Source Impacts: Elevated Receptors and Elevated and/or Multiple Sources**

For the County of New York (Manhattan) and similar urban areas characterized by elevated (>33ft) receptors and elevated and/or multiple sources (4 or more), the point source procedures in III.A. are not appropriate due to the constraints imposed by the possibility of large numbers of sources and elevated receptors being located in a small geographical area. A simple method to determine the acceptability of a source's impact is to compare the emission rate of the source (in lb/hr) with Q_c where Q_c = AGC/200 and the AGC is defined in $\mu g/m^3$ for the pollutant. If the emission rate is less than Q_c, then the impact of the source is acceptable as long as the size of the source is not considerably larger than the typical sources noted below.

The above method was derived from the analysis performed for the quantification of lead in waste oil as discussed in the report "Determination of Acceptable Lead and Chlorine Content Limits for Waste Oil Based on Modeled Impact Results," 12/7/82 by L. Sedefian. This analysis indicates that the NAAQS for lead of l.5 $\mu g/m^3$ will be met by a multitude of typical sources of 1 to 10 MMBtu/hr, with average burning rate of 40 gal/hr, as long as the lead content of the waste fuel is below 25 ppm. The latter corresponds to an uncontrolled emission rate of 0.008 lb/hr. The above equation results from taking the ratios of emission rates to AGCs of lead or any other pollutant. This method should not be used for sources larger than the typical sources just noted, which correspond to large apartment or commercial building boilers in New York County. Additionally, the method should not be used if only a single source of the contaminant exists in the area being considered. In this case, the cavity method of Section II and point source method in Section III.A, or a refined analysis should be used.

IV.H. Urban Versus Rural Source Impacts

The dispersion over cities and other built-up areas is enhanced due to increased surface roughness and heating relative to those over flat and open (rural) terrain. This enhanced dispersion is characterized by a set of urban dispersion curves developed from a synthesis of several studies, and used in regulatory models such as ISC2. EPA has developed certain criteria to determine whether these urban curves should be used for specific source applications. The most common procedure is the land use method whereby a 3km area around the source is classified according to land cover. If 50% or more of this classification is of compact industrial, commercial or residential type, then the urban curves should be used. Thus, all metropolitan areas and city centers should be modeled with the urban dispersion parameters. In addition, the heat generated at large industrial facilities enhances the thermal dispersion to a degree that the urban curves are appropriate. Thus, such large facilities (e.g., Kodak Park, Bethlehem Steel) should also be modeled with the urban curves.

FIGURE B-1

GLOSSARY

Nomenclature and Variables in Appendix B:

Variable		English Units	PC/CO (76-19-3) Reference
Q	= Reported Actual Hourly Emissions	lb/hr	Box 65
Q_a	= Annual Emission Rate	lb/year	Box 66
Q_A	= Area Source Emission Rate per Square Area	lb/(hr-ft^2)	-
C_C	= Annual Cavity Impact	µg/m^3	-
C_{CST}	= Short-Term Cavity Impact	µg/m^3	-
C_a	= Actual Annual Impact	µg/m^3	-
C_p	= Potential Annual Impact	µg/m^3	-
C_{ST}	= Short-term Impact	µg/m^3	-
h_c	= Cavity Height	feet	-
h_b	= Building Height ((Box 32) - (Box 31))	feet	-
h_s	= Stack Height	feet	Box 32
h_e	= Effective Stack Height	feet	-
D_{pl}	= Distance from Building to Property Line	feet	-
L_{max}	= Largest Building Dimension (length)	feet	-
L_{min}	= Smallest Building Dimension (width)	feet	-
h_w	= Horizontal Crosswind Building Dimension	feet	-
F_m	= Momentum Flux	ft^4/sec^2	-
T	= Stack Exit Temperature	Rankine	Box 34 +460
T_a	= Ambient Temperature (Assumed= 510 R)	Rankine	-
V	= Exit Velocity	ft/sec	Box 35

FIGURE B-1 (Continued)

GLOSSARY

Nomenclature and Variables in Appendix B:

Variable		English Units	PC/CO (76-19-3) Reference
e	= 2.718282		-
R	= Stack Outlet Radius	feet	(Box 33)
A	= Vertical Building Cross-Sectional Area	ft^2	-
F	= Buoyancy Flux Parameter	m^4/sec^3	-
S	= Side Length of Area Source	feet	-
K	= Area Source Impact Factor	-	-
C_m	= Area Source Conversion Factor	-	-

APPENDIX C

TOXICITY CLASSIFICATION AND GUIDELINE DEVELOPMENT METHODOLOGY

I. INTRODUCTION

DAR-1 is intended to be used as a guideline and does not establish ambient air quality standards. APPENDIX C describes general risk assessment methodologies for establishing Annual Guideline Concentrations (AGCs) and Short-term Guideline Concentrations (SGCs). These guidelines are intended to protect the general public from adverse health effects that may be induced by exposure to ambient air contaminants.

II. TOXICITY CLASSIFICATION OF AIR CONTAMINANTS

To classify air contaminants, the selected chemicals are listed in three different categories as follows:

II.A. HIGH TOXICITY AIR CONTAMINANTS

Definition: Human carcinogens, potential human carcinogens, and other substances posing a significant risk to humans.

The AGC values derived by DEC/DOH for human carcinogens are based on an ambient air concentration which corresponds to an increased lifetime cancer risk of $1x10^{-6}$. When the USEPA Unit Risk values are used to derive AGCs they are also based on a $1x10^{-6}$ increased risk.

II.A.1. Chemicals Assigned to HIGH Toxicity List

II.A.1.a. Human Carcinogens

Those chemicals for which there is sufficient or limited evidence from epidemiological studies to support a causal association between exposure to the chemicals and cancer induction. In general, chemicals assigned to USEPA Groups A and B1, the International Agency for Research on Cancer (IARC) Group I, and the American Conference of Governmental Industrial Hygienist (ACGIH) Group A1 are within these guidelines.

II.A.1.b. Potential Human Carcinogens

The experimental evidence required for identification as a potential human carcinogen would be positive evidence of oncogenicity in: (i). two mammalian species; (ii). one mammalian species, independently reproduced; (iii). one mammalian species, to an unusual degree with respect to incidence, latency period, site, tumor type or age at onset; or (iv). one mammalian species, supported by positive results in short-term tests which are indicative of potential oncogenic activity.

Chemicals meeting the above criteria for potential human carcinogens will be placed on the HIGH toxicity list if the daily intake estimated to be associated with an excess lifetime risk of one-in-one million (as calculated using the most appropriate low-dose extrapolation model) is 0.5 µg or less.

II.A.1.c. Other Chemicals Posing a Significant Risk

1) Those chemicals for which significant adverse effects, particularly irreversible or progressive detrimental effects have been observed in humans.

2) Those chemicals that are known to cause adverse reproductive developmental outcomes in humans.

3) Those chemicals which are persistent in the environment and are estimated to have a half-life of $\geq$ 1 year in the atmosphere, water or soil; or chemicals which have the ability to bioconcentrate or biomagnify in the food chain and have bioconcentration factors (BCFs) $\geq$ 1000 in fish or shellfish.

4) Because the toxicological data base for many chemicals is limited, a chemical will be classified as a HIGH toxicity contaminant if its:

   a) LD_{50} (dermal) is equal or less than 200 mg/kg; or

   b) LC_{50} (inhalation) is equal or less than 200 ppm; or

   c) LD_{50} (oral) is equal or less than 50 mg/kg.

II.B. MODERATE TOXICITY AIR CONTAMINANTS

Definition: Animal oncogens, developmental and reproductive toxicants, genotoxic chemicals and other chemicals posing a health hazard to humans.

II.B.1. Chemicals Assigned to the MODERATE Toxicity List

II.B.1.a. Animal Oncogens

Those chemicals for which oncogenicity has been demonstrated in at least one mammalian species, but do not meet the carcinogenicity criteria for HIGH toxicity classification.

II.B.1.b. Genotoxic Chemicals

Those chemicals which have been shown to damage DNA or chromosomes in in-vitro and/or in-vivo short-term tests.

II.B.1.c. Reproductive and Developmental Toxicants

Those chemicals that are known to cause adverse reproductive and developmental effects in at least one mammalian species which do not meet the criteria for HIGH toxicity classification.

II.B.1.d. Other Chemicals Posing a Health Risk to Humans

1) Those chemicals that when inhaled have caused significant chronic adverse effects in test animals.

2) Those chemicals which are irritants to sensitive members of the population at concentrations equal to or below the Threshold Limit Value (TLV-TWA).

3) Because the toxicological data base for many chemicals is limited, a chemical will be classified as a MODERATE toxicity contaminant if its:

(a) LD_{50} (dermal) is greater than 200 mg/kg but less 1000 mg/kg; or

(c) LC_{50} (inhalation) is greater than 200 ppm but less than 2000 ppm; or

(d) LD_{50} (oral) is greater than 50 mg/kg but less than 500 mg/kg.

II.C. LOW TOXICITY AIR CONTAMINANTS

Definition: Those chemicals for which irritation is the primary toxicological concern.

II.C.1. Chemicals Assigned to LOW Toxicity List

Those chemicals that might cause irritation or reversible effects to sensitive members of the population, and which do not meet the criteria for classification as HIGH or MODERATE toxicity contaminants.

III. PROCEDURES FOR CLASSIFYING AIR CONTAMINANTS

Epidemiological studies (e.g., cohort, case-control, cross-sectional) will be used as the basis for classifying chemicals according to relative degree of toxicity, especially for those exhibiting carcinogenic potential. However, epidemiological studies are available for a very limited number of chemicals. Additionally, the results from chronic studies with experimental animals will also be used. To apply such data to human subjects, the use of assumptions and extrapolation methodology is required.

In order to assign air contaminants to the HIGH, MODERATE or LOW toxicity classifications, a thorough review of the published scientific and medical literature is conducted. This review may include on-line database searches such as the National Library of Medicine, CAS-ONLINE, the USEPA Integrated Risk Information System (IRIS) and the National Air Toxics Information Clearinghouse (NATICH).

If available, the following information is reviewed: toxicity data from subacute, acute, subchronic and chronic studies in humans and/or experimental animals after inhalation, and data resulting from oral and/or dermal exposure studies. In addition, information from reproductive and teratogenicity studies are reviewed. Inhalation studies take precedence over studies involving other routes of exposure when developing AGC and SGC guidance.

Particular attention is given to any available information on carcinogenic and genotoxic potential. This information includes route of exposure, duration of exposure, types of tumors and target sites; if the carcinogen is epigenetic or genotoxic and other pertinent information. Epidemiological studies, such as cohort studies of workers or individuals exposed to chemicals or a chemical process, have a priority in reaching a decision concerning the carcinogenic potential of the chemical under study.

Other effects considered in the classification process are: target organ toxicity (e.g., cardiovascular, central nervous system (CNS)) and any other related information (e.g., chemical structure and activity relationship) available that could provide additional evidence in the classification.

The above information for each air contaminant under assessment is thoroughly evaluated before a toxicity classification for such air contaminant is made. In making a final decision, professional and scientific judgements are key factors in assigning a toxicity classification for an air contaminant.

IV. PROCEDURE FOR DERIVING AMBIENT GUIDELINE CONCENTRATIONS

IV.A. GENERAL

It is the goal of the Division of Air Resources to base every Ambient Guideline Concentration on a chemical specific evaluation conducted by the Agency. However, due to the number of chemicals manufactured and used in the State of New York, and within the resources presently available it is takes a long time for DEC to conduct a specific evaluation for each chemical. As a result, DEC will use other qualitative and quantitative information sources to derive AGCs and SGCs.

The hierarchy to be followed for developing APPENDIX C guidance is as follows:

1) Toxicological Assessments Conducted By DEC
2) Toxicological Assessments Conducted By DOH
3) Information from U.S. EPA-Integrated Risk Information System (IRIS)
4) Information from U.S. EPA Health Assessment Documents
5) Information from the National Toxicology Program
6) Data from ACGIH-TLVs and NIOSH-RELs. (Whichever is more restrictive)

This hierarchy reflects that evaluations done by New York State take precedence over other information sources.

IV.B. PROCEDURE FOR DERIVING ANNUAL GUIDELINE CONCENTRATIONS (AGCs) BASED ON CARCINOGENIC EFFECTS

AGCs based on carcinogenic effects will be calculated following the procedures described in "U.S. EPA 1986 Guidelines for Carcinogenic Risk Assessment."[1] Any official revisions of the guidelines will supersede the cited guidelines. The DEC procedures include:

1) Carcinogenic risks are calculated using dose-response data from scientifically valid animal or human studies. If available, estimates based on adequate epidemiologic data are preferred over estimates based on animal data. Models or procedures which incorporate low-dose linearity should be used unless there is sufficient scientific evidence to support the use of an alternative extrapolation model.

2) When several chronic studies in test animals on a specific contaminant are available, the biologically acceptable data from these studies showing the greatest sensitivity shall be used as a basis to derive a AGC.

   Other factors considered when selecting dose-response data from carcinogenic bioassays include the biological and statistical significance of tumor type incidence and the duration and route of exposure.

3) In the absence of substantial information about the mechanistic aspect of the carcinogenic process the 95 percent upper limit risk estimate using the linearized multistage procedure shall be the basis of the AGC. The AGC will be an estimate of the contaminants' ambient air concentration that corresponds to an excess human cancer risk of one in one million after lifetime exposure.

4) In the absence of comparative toxicological, physiological, metabolic and pharmacokinetic data the animal dose shall be converted to a human dose using the surface area conversion rule.

5) The AGC ($\mu g/m^3$) shall be based on an average 70 kilogram adult breathing 20 cubic meters of air per day for a period of 70 years.

IV.C. PROCEDURE FOR DERIVING ANNUAL GUIDELINE CONCENTRATIONS (AGCs) BASED ON NON-CARCINOGENIC EFFECTS

To evaluate the non-carcinogenic effects of exposure to air contaminants, derivation of Annual Guideline Concentrations will be based on the following hierarchy:

IV.C.1. NOELs and LOELs

A dose (expressed as milligrams of chemical per kilogram of body weight per day) that does not produce an observed effect (no-observed effect level - NOEL) is derived from the results of scientifically valid human or animal studies determined most appropriate, considering factors, including but not limited to, route and duration of exposure, effects, species and statistical significance. If a valid NOEL has not been determined, the lowest-observed effect level (LOEL) will be used.

1) The NOEL or LOEL is divided by an uncertainty factor to obtain an reference dose (RfD). The magnitude of the uncertainty factor can range several orders of magnitude and reflects the quantity and quality of the toxicologic data, the degree of confidence in the data and the nature of the effects of concern.

   The uncertainty factor used in calculating the RfD reflects scientific judgment regarding the various types of data used to estimate these values. An uncertainty factor of 10 is usually used to account for variations in human sensitivity when extrapolating from valid human studies involving subchronic or long-term exposure of average, healthy subjects. An additional 10-fold factor is usually used for each of the following extrapolations: from long-term animal studies to the case of humans, from a LOEL to a NOEL, and from subchronic to chronic studies. In order to reflect professional assessment of the uncertainties of the study and database not explicitly addressed by the above uncertainty factors (e.g., completeness of the overall database), an additional uncertainty factor or modifying factor ranging from >0 to 10 is applied. The default value for this modifying factor is 1. Uncertainty factors used in the derivation of RfD usually range from 10 to 1,000.

2) AGCs are based on an average 70 kilogram adult breathing 20 cubic meters of air a day.

IV.C.2. Occupational Standards and Guidelines

Occupational guidelines will be used to derive Interim AGCs when toxicological data about a contaminant is inadequate or non-existent. APPENDIX C guidance will be derived from published information from the National Institute of Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH). NIOSH has developed recommended exposure limits (RELs) and ACGIH has developed threshold limit values (TLVs).

Interim AGCs will be determined by taking the lowest value of either a REL or TLV for a chemical and adjusting it by an uncertainty factor. The uncertainty factor for a chemical classified as HIGH or MODERATE toxicity is 420. The uncertainty factor for a chemical classified as LOW toxicity is 42. The uncertainty factors are based on adjusting the 8-hour work day exposure to a 24-hour exposure and a 5-day work week to 7-day exposure, and by applying an additional factor of 10 for LOW toxicity contaminants or 100 for MODERATE and HIGH toxicity contaminants to compensate for applying on occupational standard to the general population.

IV.C.3. Structure - Activity Relationships

If information about a chemical is limited, structure activity relationships of chemicals of close or similar structure will be used to calculate Interim AGCs. It is recognized, however, that even subtle changes in structure (e.g., stereochemical differences) can dramatically alter a substance's bioactivity. An evaluation based on structure/activity relationship may not reflect the true toxicity of the chemical being evaluated, but given the lack of any other information may be the only approach available.

IV.D. PROCEDURES FOR DERIVING OF SHORT-TERM GUIDELINE CONCENTRATIONS (SGCs)*

The derivation of short-term guideline concentrations (SGCs) on the basis of developmental, irritational and other acute effects information is currently under review.

*See SGC discussion in main text, Section IV.A.2.b, page 9.

V. GUIDELINES FOR HEALTH RISK ASSESSMENT OF CHEMICAL MIXTURES

DEC has not developed guidelines for assessing the toxicity of mixtures of air contaminants. It is largely unknown if mixtures of air contaminants will induce additive, synergistic, potentiating or antagonistic effects. However, in the absence of information to the contrary, the methodology proposed by the American Conference of Governmental Industrial Hygienist (ACGIH) should be used (refer to ACGIH Appendix C)[2] and limitations to this approach as described therein should be acknowledged.

REFERENCES

1. United States Environmental Protection Agency (U.S. EPA). 1986. Guidelines for Carcinogen Risk Assessment. Fed. Register. 51:33992-34003. (9/24/86).

2. American Conference of Governmental Industrial Hygienists (ACGIH). 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Ohio, Cincinnati.

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