THE LATEST PREVENTION OF SIGNIFICANT DETERIORATION (PSD) WORKSHOP MANUAL WAS DRAFTED IN 1990

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Prevention of Significant Deterioration

Workshop Manual

October 1980

EPA

PREVENTION OF SIGNIFICANT

DETERIORATION

WORKSHOP MANUAL

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

October 1980

U.S. Environmental Protection Agency

PSD WORKSHOP
October 27, 28, 1980
Federal Building
26 Federal Plaza
(Broadway between Worth and Duane Street)
New York City

AGENDA

Day 1 - October 27		(Room 1400)
10:30		Opening Remarks: Applicability
12:30 - 2:00		Lunch
2:00 - 3:30		Applicability Continued
3:30 - 7:00		BACT
7:00		Adjourn
Day 2 - October 28		(Room 305A)
8:00		Air Quality Analysis
11:30 - 1:00		Lunch
1:00 - 3:00		Other Impact Analysis
3:00 - 4:00		SIP Requirements
4:00		Adjourn

10/27/80

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PREFACE

This manual is intended for use in conjunction with the 1980 PSD workshops. Although not essential, it is suggested that the reader attend a PSD workshop before using this manual for reference.

The PSD workshop and this manual serve two prime purposes:

1. To describe in simple terms the requirements of the 1980 PSD regulations found in 40 CFR 52.21; and

2. To provide suggested methods of meeting these requirements, which are illustrated by examples.

It must be noted, however, that this manual pertains only to the requirements of the <u>Federal regulations</u> and does not describe the requirements that will be designed into each State's implementation plan (SIP). Within the confines of the Federal requirements, States may revise portions of the PSD regulations to conform to their existing or proposed methods of implementing the PSD regulations. Generally, any provisions of an SIP that are different from those described in this manual will be more restrictive. The reader is cautioned to keep this in mind when using this manual for general guidance.

The detailed examples presented in this manual are presented for illustration only; numbers and values presented do not necessarily reflect any existing policies or U.S. Environmental Protection Agency (EPA) positions regarding their use. Although based on actual cases, these examples are fictitious and are designed to highlight many of the subtle aspects of the PSD regulations.

The single most important message transmitted in the PSD workshop and manual strongly suggests that the prospective PSD applicant work very closely with the PSD reviewing authority. Communication between the applicant and reviewing authority should be initiated well in advance of preparing a PSD application. The technical requirements of demonstrating compliance with the PSD regulations, such as modeling, are in processes of evolution. Therefore, a good working relationship between the applicant and reviewing authority can serve to minimize time and resources in processing a PSD application.

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ACKNOWLEDGMENT

This manual was prepared in conjunction with the PSD Workshops for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina by TRW Incorporated Environmental Engineering Division, Research Triangle Park, North Carolina.

The project was directed and managed by Mr. Leigh Hayes. Principal authors were Mr. Leigh Hayes, Mr. Jeff Shumaker, Mr. James Avery, and Mr. William Warren-Hicks. Assistance was provided by Ms. Lori Carter.

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PART I: APPLICATION GUIDANCE

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PART I: APPLICATION GUIDANCE

A. APPLICABILITY

The basic goal of prevention-of-significant-deterioration (PSD) regulations is to ensure that air quality in clean air areas does not significantly deteriorate while maintaining a margin for future industrial growth. The new PSD regulations continue to focus on those industrial plants, both new and modified, that create large increases in the emissions of certain air pollutants. The new PSD regulations, recently promulgated in response to an opinion of the U.S. Court of Appeals for the District of Columbia Circuit, redefine many basic PSD concepts.

This section should give the applicant an understanding of key PSD concepts. It offers specific guidance on how to determine if PSD review is required for proposed new and modified air pollution sources and on the review requirements that must be met by sources subject to PSD review.

The overall goals of applicability are to determine: (1) what proposed construction is subject to PSD review and (2) what analyses must be performed if PSD review is required. This section answers these questions.

A.1 DETERMINATION OF APPLICABILITY

PSD review requirements apply only in certain geographic areas of the United States. Specifically, PSD applies to construction in those areas designated as attainment or unclassifiable areas under Section 107 of the Clean Air Act for any criteria pollutant. Construction involving only pollutants for which an area is designated nonattainment does not require a PSD permit. The construction, though, must be reviewed in accordance with the nonattainment provisions of the applicable State implementation plan (SIP). Any part of the country with an attainment or unclassifiable designation for at least one criteria pollutant is known as a PSD area. Proposed new sources and modifications in these areas are potentially subject to PSD review. The types of construction subject to PSD review are new major sources and major modifications. Several criteria determine if proposed new construction is major. First, though, it is important to understand the PSD definition of a source.

A.2 DEFINITION OF SOURCE

A source is defined as all emissions units in the same industrial grouping located on contiguous or adjacent properties and under common ownership or control. An emissions unit is any part of a stationary source that emits or has the potential to emit any pollutant subject to regulation under the Act. The "major groups" or two-digit codes contained in the Standard Industrial Classification (SIC) manual define industrial groupings. The introduction and major group descriptions in the manual explain how primary industrial activity serves as the basis of classification. *

In most cases, a source can clearly be defined on the basis of the property boundary and ownership criteria of the definition. However, when a large industrial complex under common control is considered, it

* When considering a source as 2 separate entities, 2 criteria considered:

a) Significant employment @ and
b) Economic profile of each

may be necessary to segregate emissions units by industrial grouping and thus separate the complex into two or more correctly defined sources. However, since the major groups defined by two-digit SIC codes are broad, very few instances occur in which emissions units at a single location fall under different major groups. An example to illustrate this point is a chemical complex under common ownership manufacturing polyethylene, ethylene dichloride, vinyl chloride, and numerous other chlorinated organic compounds. Each product is made in separate processing equipment with each piece of equipment containing several emission units; all of the operations fall under SIC code 28, the major group for chemicals and allied products. Thus the complex and all its associated emissions units constitute one source.

A.3 POTENTIAL TO EMIT

Once a source is defined, the second step in determining PSD applicability is to determine if the stationary source is a major or minor (nonmajor) source. This determination is made on the basis of the source's potential to emit pollutants that are ~~regulated~~ subject to regulation by the Act. Potential to emit, or PE, is defined as the capability at maximum design capacity to emit a pollutant after air pollution control equipment has been applied, considering all federally enforceable permit restrictions that limit the design capacity utilization, hours of operation, or type or amount of material processed or stored. In the absence of federally enforceable limits, the potential to emit is based on full capacity and year-round continuous operation. Control equipment is incorporated into the potential to emit only to the degree that resulting emission reductions are federally enforceable.

The term "enforceable restrictions," in estimating the PE, generally refers to requirements for which an operator of a source can be held liable by EPA. Enforceability, therefore, is determined by two conditions: (1) the restriction must be required by a Federal or State permit granted under the applicable SIP or must be embodied in the SIP itself, and (2) the source and/or enforcement authority must be able to show compliance or noncompliance. For instance, the PE of a boiler with a designed capacity of 200 million Btu/hr could be based on a 100-million-Btu/hr fuel input rate if the State permit requires that a continuously recording fuel meter demonstrate capacity utilization not exceeding 50 percent, and that the boiler not exceed 100-million-Btu/hr heat input. In the case of a citrus dryer that only operates during the growing season, the PE could be limited by a permit requirement that the dryer not operate between November and March. Without such permit or other SIP conditions, the restrictions would not be enforceable and, therefore, could not be considered in determining the PE.

When determining the PE for a new source, emissions should be estimated using an engineering approach. Actual performance test data on units similar in design is the preferred basis for estimating PE. In all cases, PE should be estimated for individual emissions units; the individual values should then be summed for the source in question. For each emissions unit, the estimate should be based on the most representative data available. For proposed new emissions units, potential emissions are considered to equal proposed allowable emissions.

Methods of estimating PE may include:

- Federally enforceable allowable emission limits,
- Performance test data on similar units,

- Equipment vendor emissions data and guarantees,
- Emission limits and test data from EPA documents, including background information documents for new source performance standards, national emissions standards for hazardous air pollutants, and Section 111d standards for designated pollutants,
- AP-42 emission factors (see Table A-1, Reference 2),
- Emission factors from technical literature, and
- State emission inventory questionnaires for comparable sources.

Note that estimates must be made for individual emissions units before the PE of the entire source can be determined. These emissions should include all emissions from a source expected to occur on a continuous or regular basis.

A.3.1 Fugitive Emissions

Fugitive emissions, where quantifiable, are included in the potential emissions accounting procedure to determine if a source is major. Fugitive emissions are those emissions that cannot reasonably be expected to pass through a stack, vent, or other functionally equivalent opening, such as a chimney, roof vent, or roof monitor. Because fugitive emissions vary widely from source to source, they must be quantified through a source-specific engineering analysis. Common quantifiable fugitive emission sources include coal piles, road dust, and quarry emissions of particulate matter (PM). Other common quantifiable sources are fugitive hydrocarbon (HC) emissions from leaking refinery and organic chemical processing equipment. Suggested references for fugitive emission data and associated analytic techniques are discussed in the preamble to the 1980 PSD regulations and are listed in Table A-1.

Table A-1. SUGGESTED REFERENCES FOR ESTIMATING FUGITIVE EMISSIONS

1.	Emission Factors and Frequency of Leak Occurrence for Fittings in Refinery Process Units. Radian Corporation. EPA-600/2-79-044. February 1979.
2.	Compilation of Air Pollutant Emission Factors, 3rd ed. U.S. Environmental Protection Agency. AP-42 (including Supplements 1-8). May 1978.
3.	Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions. Pedco Environmental, Inc. EPA-450/3-77-010. March 1977.
4.	Fugitive Emissions from Integrated Iron and Steel Plants, Midwest Research Institute, Inc. EPA-600/2-78-050. March 1978.
5.	Survey of Fugitive Dust from Coal Mines. Pedco Environmental, Inc. EPA-908/1-78-003. February 1978.
6.	EPA Region VIII Paper on the Air Quality Review of Surface Mining Operations.
7.	Any other reference demonstrated to the reviewing authority to be applicable.

A.3.2 Secondary Emissions

Secondary emissions are not considered in the potential emissions accounting procedure. Secondary emissions are those emissions associated with a source that are not emitted from the source itself. For example, pollutants emitted by a ship carrying crude oil to a refinery are considered secondary. Although secondary emissions are excluded from potential emissions estimates, they must be considered in PSD analyses once a PSD review is determined to be required.

A.3.3 Regulated Pollutants

The emissions accounting to determine PSD applicability must be conducted separately for each pollutant emitted by the new source or modification subject to regulation under the Act. Currently, 15 pollutants consisting of 6 criteria pollutants and 9 noncriteria pollutants are regulated by the Act. They are listed in Table A-2.

A.4 SOURCES SUBJECT TO PSD REVIEW

New major stationary sources and major modifications meeting the test of geographic applicability are subject to PSD review. This subsection discusses two applicability tests that determine if proposed construction is major and, therefore, subject to PSD review. Because major modifications result from emission changes at existing major stationary sources, the primary step in assessing the applicability of both proposed new sources and proposed modifications focuses on the source.

A source, whether a proposed new source or an existing source, is considered major if: (1) it is one of the 28 named source categories listed in Section 169 of the Act and emits or has the potential to emit

Table A-2. REGULATED POLLUTANTS

Criteria pollutants	Noncriteria pollutants
Carbon monoxide	Asbestos
Nitrogen oxides	Beryllium
Sulfur dioxide	Mercury
Particulate matter	Vinyl chloride
Ozone (regulate VOC)	Fluorides
Lead	Sulfuric acid mist
	Hydrogen sulfide (H_2S)
	Total reduced sulfur (including H_2S)
	Reduced sulfur compounds (including H_2S)

100 tons per year or more of any pollutant regulated by the Act or (2) it is an unlisted stationary source that emits or has the potential to emit 250 tons per year or more of any pollutant regulated by the Act. The 28 named source categories are listed in Table A-3.

In many cases, the source may not clearly fall into any one category, thus making it difficult to determine if the source is major. This situation becomes especially meaningful when a source's potential emissions are greater than 100 tons per year but less than 250 tons per year and it is questionable whether the source is one of the 28 categories. In such cases, the applicant should consult the definitions of affected facilities in applicable new source performance standards. For instance, a 300 million Btu/hr boiler that burns refinery fuel gas does not fall within the 28 PSD source categories because refinery fuel gas is not considered a fossil fuel. However, if the boiler were to burn natural gas, fuel oil, or coal, it would be classified as one of the 28 PSD sources, a fossil fuel-fired steam generator with a heat input greater than 250 million Btu/hr. A fossil fuel-fired boiler with a maximum heat input of 240 million Btu/hr is not classified within one of the 28 categories. Such a source would be subject to the 250-ton-per-year emissions criterion.

A.4.1 <u>Applicability Test 1</u>

The first test in determining PSD applicability is to determine the status of a proposed new source or of an existing source in the case of a proposed modification. Applicability Test 1 applies the criteria of 100-or-250-ton-per-year potential emission thresholds against the total potential emissions estimate for each pollutant emitted by the source.

Table A-3. NAMED PSD SOURCE CATEGORIES

1.	Fossil fuel-fired steam electric plants of more than 250 million Btu/hr heat input
2.	Coal cleaning plants (with thermal dryers)
3.	Kraft pulp mills
4.	Portland cement plants
5.	Primary zinc smelters
6.	Iron and steel mill plants
7.	Primary aluminum ore reduction plants
8.	Primary copper smelters
9.	Municipal incinerators capable of charging more than 250 tons of refuse per day
10.	Hydrofluoric acid plants
11.	Sulfuric acid plants
12.	Nitric acid plants
13.	Petroleum refineries
14.	Lime plants
15.	Phosphate rock processing plants
16.	Coke oven batteries
17.	Sulfur recovery plants
18.	Carbon black plants (furnace process)
19.	Primary lead smelters
20.	Fuel conversion plants
21.	Sintering plants
22.	Secondary metal production plants
23.	Chemical process plants
24.	Fossil fuel boilers (or combinations thereof) totaling more than 250 million Btu/hr heat input
25.	Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
26.	Taconite ore processing plants
27.	Glass fiber processing plants
28.	Charcoal production plants

(Remember that potential emissions estimates incorporate the application of controls, enforceable permit restrictions, and quantifiable fugitive emissions.) If any regulated pollutant equals or exceeds the applicable 100-or-250-ton-per-year emissions criterion, the source is designated as a major stationary source. The emission of other pollutants in smaller quantities has no bearing on the source's designation as a major stationary source.

A.4.2 New Source Applicability

With few exceptions, new major stationary sources meeting the tests of geographic applicability require PSD review. For this reason, applicants proposing construction of new stationary sources need only consider Applicability Test 1 in determining if a PSD review is necessary. If new sources do not qualify for PSD review on this test, then the examination of the new sources for potential PSD review need not be continued. On the other hand, proposed modifications to existing sources must be further evaluated to determine PSD applicability.

A.4.3 Modification Applicability

A modification is generally a physical change in, or a change in the method of the operation of, a stationary source that increases that source's actual emissions of any pollutant regulated under the Act. A major modification subject to PSD review is defined simply as "any physical change or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act." Modifications that might require PSD review include new, modified, or replacement emissions units.

actual - those emissions representative over a 2-year period

permit conditions - conditions on permits issued pursuant to § 51.18

A.4.3.1 Significant Emission Rates. Significant emission rates for regulated pollutants, which are listed in Table A-4, have been set individually for each pollutant. The significant quantities range from 100 tons per year for carbon monoxide (CO) to less than 1 pound per year for beryllium. Consistent with the special emphasis Congress has placed on Class I areas in developing the Act, more stringent significance criteria apply to modifications at major stationary sources located near Class I areas. Any net emission increase in a regulated pollutant at a major stationary source that is located within 10 kilometers of a Class I area must be examined for significant impacts with an air quality analysis. If the maximum predicted impact on the Class I area exceeds 1 microgram per cubic meter on a 24-hour basis, the increase constitutes a major modification subject to PSD review.

A.4.3.2 Determining Net Emissions Change. Whether a significant emission increase will result from a proposed modification is determined by the net change in actual emissions. In assessing the net change, certain contemporaneous emission changes are considered with the increase from the modification. All changes, however, are assessed as actual emissions. Changes occurring from retiring equipment or other methods of emission reductions generally will be credited on the basis of the difference in the emissions unit's actual emissions before and after the reduction.

Actual emission estimates for new, modified or existing emissions units will generally be based on either (1) reasonable engineering assumptions regarding actual emission levels and facility operation over a 2-year history or (2) permitted allowable emissions determined on a

Table A-4. SIGNIFICANT EMISSION RATES[a]

Pollutant	Emissions Rate (tons/yr)
Carbon monoxide	100
Nitrogen oxides	40
Sulfur dioxide	40
Particulate matter	25
Ozone (VOC)	40 (of VOCs)
Lead	0.6
Asbestos	0.007
Beryllium	0.0004
Mercury	0.1
Vinyl chloride	1
Fluorides	3
Sulfuric acid mist	7
Hydrogen sulfide (H_2S)	10
Total reduced sulfur (including H_2S)	10
Reduced sulfur compounds (including H_2S)	10
Any other pollutant regulated under the Clean Air Act	Any emission rate
Each regulated pollutant	Emission rate that causes an air quality impact of 1 µg/m^3 or greater (24-hour basis) in any Class I area located within 10 km of the source

[a]Extracted from 40 CFR 52.21(b)(23).

site-specific, case-by-case basis such as those in PSD permits. In the case of emissions units for which permits have been issued or proposed according to PSD requirements, the PSD allowable emission rate will generally be used as the actual emission rate. Allowable emission rates consistent with general SIP requirements can exceed actual emissions (and in some cases, by a large margin). Where this situation exists, the allowable emission rate should not be used.

In all cases, emission reductions used for "netting" of emissions must fall within the guidelines defined for contemporaneous emissions changes. In the case of a proposed modification to an emissions unit, the accounting procedure to be used in quantifying emissions changes considers the proposed new emission rate and its actual emission level before the modification, which may be referred to as the emissions unit's change in representative actual emissions.

To illustrate representative actual emissions changes, consider the case of a boiler with the capability at maximum capacity and continuous operation to burn 20,000 barrels of fuel oil per year. The applicant has proposed to replace this unit with a new, identical boiler. In the 2-year period before retirement, the annual fuel consumption of the existing boiler averaged only 10,000 barrels. A net emission increase will result unless the new boiler's emissions are restricted by enforceable permit conditions, such as a limitation on the number of operating hours to one, rather than three, shifts per day. In this case, other permit conditions, such as requiring a lower sulfur content in the fuel oil may also be necessary to limit sulfur dioxide (SO_2) and PM emissions.

The net increase in a pollutant that a proposed modification might generate is calculated using the following formula:

Net increase = Change in actual emissions from the proposed new and modified emission units

- Creditable contemporaneous decreases

+ Creditable contemporaneous increases

The formula appears relatively simple, but actually quantifying the net increases for the proposed modifications can be quite complicated. Application of the formula is complicated by individual engineering analyses for each emissions unit included in determining actual emissions as well as the numerous conditions for determining creditability of individual contemporaneous changes. The conditions and terms necessary to correctly apply this formula will be further outlined.

A.4.3.2.1 Creditable contemporaneous changes. To be contemporaneous, and thus eligible for consideration in determining a net increase, a change in actual emissions must have occurred after January 6, 1975. The change must also occur within a period beginning 5 years before the date construction is scheduled to commence on the proposed modification and ending when the modification (and thus the emission increase) occurs. Figure A-1 depicts the procedure for determining a creditable, contemporaneous change.

There are further restrictions on the contemporaneous emissions changes that can be credited in determining net increases. To be creditable, a contemporaneous reduction must be federally enforceable under the applicable SIP or PSD review authority at and after the date construction on the modification begins. The reduction must occur before startup

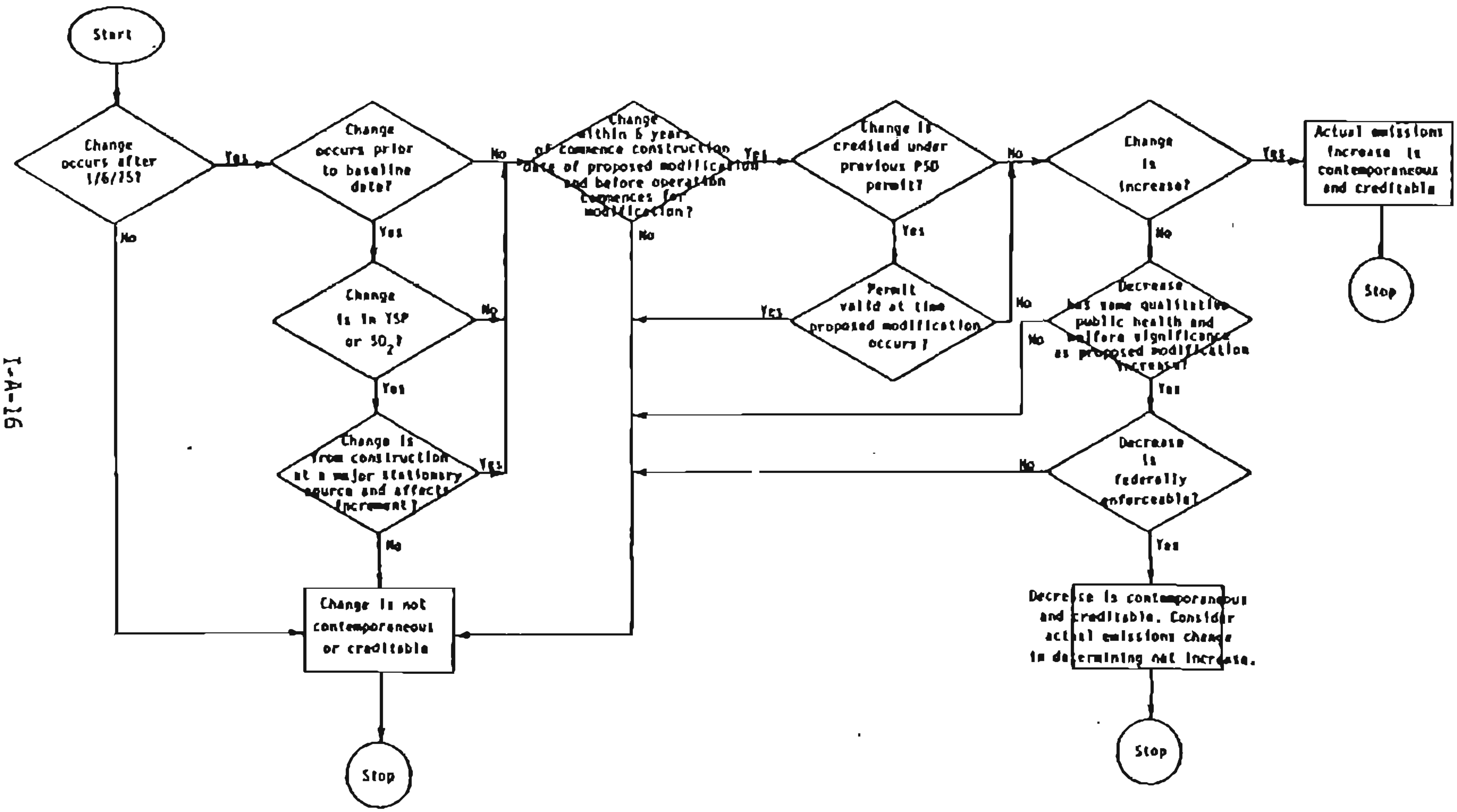


Figure A-1. Creditable contemporaneous changes.

of the new or modified emissions units. Also, reductions used to determine a net increase must be of the same pollutant type and must be qualitatively equivalent in their effects on public health and welfare. For instance, it would be inappropriate to consider a 50-ton-per-year reduction in remote haul road fugitive dust along with a 50-ton-per-year actual PM emission increase from a power plant stack to determine a zero net increase. The power plant could expose the public within 50 kilometers to respirable PM emissions, whereas the remote haul road emissions would affect a much smaller population and would cause exposure to partially nonrespirable PM.

Any change, whether an increase or decrease, cannot be credited more than once. A change credited in a previous PSD permit cannot be considered in determining the net change in a current or future modification. The applicant should also understand that creditable contemporaneous changes in PM and SO_2 are a subset of changes that affect increment. A change in SO_2 or PM that does not affect allowable PSD increment consumption cannot be creditable.

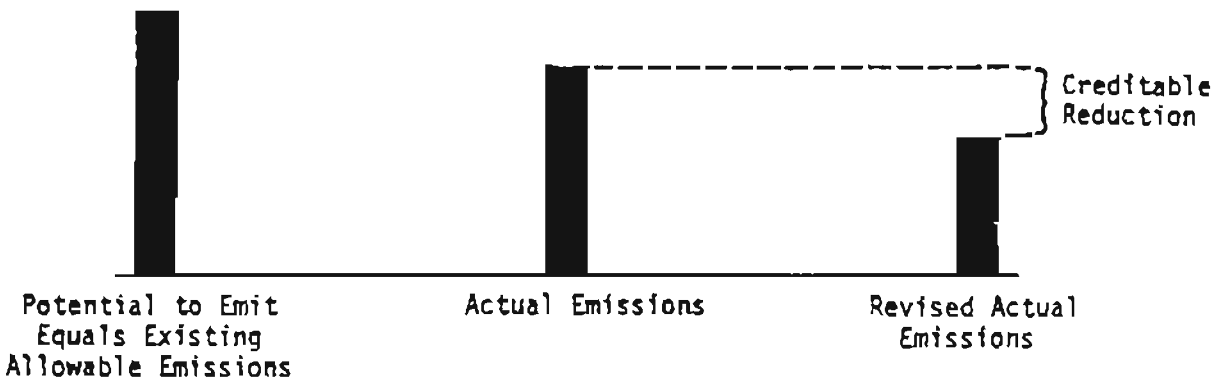
Consistent with the relationship between increment and creditability, any changes occurring after the established baseline date may be considered for possible credit as contemporaneous changes. Baseline dates are pollutant-specific and are established for an area by the date after August 7, 1977 that the first completed PSD application for a major modification or major stationary source subject to EPA's PSD regulations as amended on August 7, 1980 is submitted. The complete application receipt date determines the baseline date for each pollutant for which the construction described in the application significantly increases emissions.

To be creditable, changes in actual SO_2 or total suspended particulate (TSP) emissions occurring before the baseline date defined for an area must, however, be associated with construction at a major source. Generally, pre-baseline changes in SO_2 or TSP emissions caused by fluctuating market conditions or other reasons that do not result from construction are not creditable. Moreover, pre-baseline date changes at minor sources cannot be creditable because they do not affect increment.

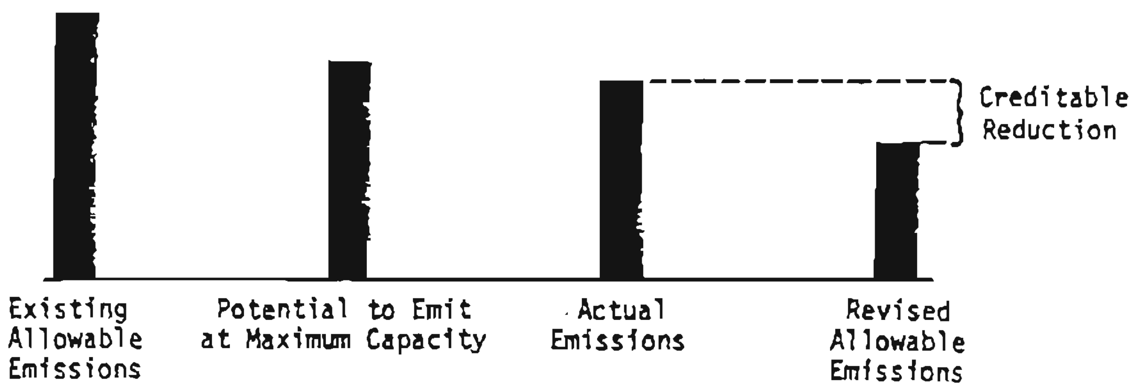
A.4.3.2.2 Creditable amount. Creditable contemporaneous decreases in actual emissions for a source are quantified by aggregating creditable decreases for individual emissions units. The creditable decrease for each emissions unit can best be illustrated graphically as shown in Figure A-2, Case I. Frequently, the potential to emit for an existing emissions unit, which is based on the existing allowable emission rate, is greater than the actual emissions, which are based on actual operating data. The creditable contemporaneous reduction in this case is the difference between the actual emissions and the revised allowable emissions. (Recall that for reductions to be creditable, the revised allowable emission rate must be ensured with federally enforceable limits.)

Figure A-2 also illustrates a case in which the previous allowable emissions were much higher than the potential to emit. Common examples are particular sources permitted according to process weight tables contained in most SIPs. Since process weight tables apply to a range of source types, they often overpredict actual emission rates for individual sources. In such cases, the only creditable contemporaneous reduction is the difference between the actual emissions and the revised allowable emission rate for the existing source.

Case I: Normal Existing Source



Case II: Existing Source Not Permitted Under Case by Case Review



Case III: Existing Source in Violation of State Permit

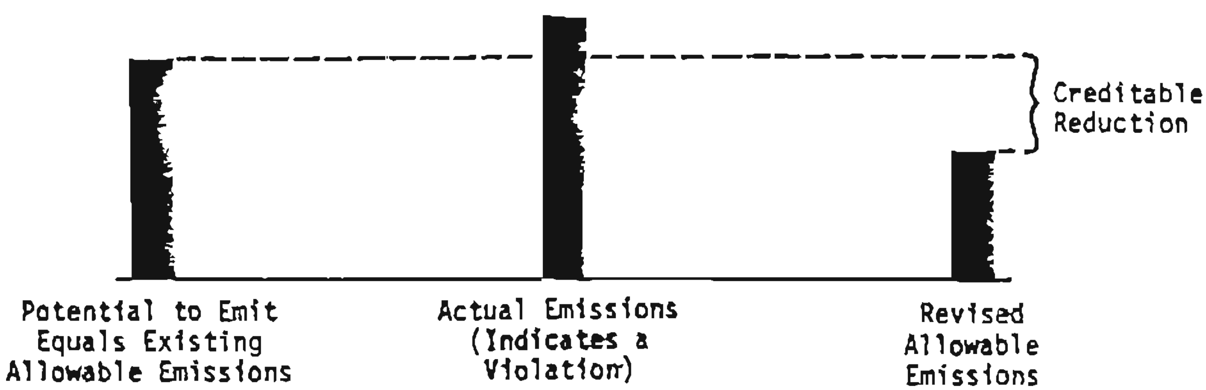


Figure A-2. Creditable reductions in actual emissions.

Finally, Case III of Figure A-2 illustrates a case in which actual emissions exceed allowable limits. The creditable reduction in this case is the difference between the potential or allowable emissions and the revised allowable limit. A situation in which actual emissions exceed the potential to emit occurs only when an existing source is in violation of an allowable limit.

A.4.3.3 Applicability Test 2. Once a change in an existing major stationary source's actual emissions is quantified, the next step in assessing applicability is to compare the net change against the significance levels to determine if the modification results in a significant emission increase. The comparison of the net change against the significance rates is the second applicability test. A significant net increase at a major stationary source constitutes a major modification subject to PSD review.

In summary, applicability for a proposed modification involves both Applicability Test 1, to determine that the existing source is major, and Applicability Test 2, to determine if a significant emission increase will occur. Note that both applicability tests are performed for each regulated pollutant emitted by the proposed construction. For PSD review to be required, the criteria for each test need be satisfied for only one pollutant and not necessarily for the same pollutant. For example, proposed construction that increases actual HC emissions by 40 tons per year at an existing source with the potential to emit over 250 tons per year of PM would require PSD review as a major modification.

A.4.4 Minor Source Modification Applicability

Emission increases at existing nonmajor (or minor) sources must also be examined for applicability to PSD review. In such instances, the emission increase or potential to emit for each pollutant from only the modification is compared against the 100/250 criterion. An increase in emissions of any pollutant equaling or exceeding the 100/250 criterion constitutes a major stationary source subject to PSD review, even though the existing source is not major when the modification is proposed.

For example, an applicant might propose to increase the emissions of an existing PSD-listed source with the potential to emit of 70 tons per year by 150 tons per year of a regulated pollutant. This modification would be subject to PSD review. Were the source to propose a modification that would only increase emissions of that pollutant by 80 tons per year, the modification would not be subject to PSD review. The modification would, however, create a major stationary source with a potential to emit of 150 tons per year. Subsequent modifications to this source would be scrutinized as modifications to a major stationary source as discussed previously.

A.5 LEVEL OF PSD REVIEW REQUIRED

The second goal of this section, which is to determine the level of PSD review required, is achieved with Applicability Test 3. Like Test 2, it compares the net actual emission increase for each pollutant against the significance criteria. For proposed new sources, actual emissions equal the potential to emit, and the potential to emit totals for the source are compared against the significance criteria. PSD review requirements must be met for each pollutant for which a significant net increase occurs.

A.5.1 PSD Review Requirements

New major stationary sources and major modifications subject to the PSD regulations must meet certain preconstruction review requirements.

The following analyses are performed for each pollutant emitted in significant quantities:

1. a BACT analysis,
2. an air quality impacts analysis, and
3. an additional impacts analyses.

Applicable control technologies and environmental impacts for each pollutant are evaluated through these analyses. The purpose of each analysis and guidance on how each analysis is performed is contained in later sections of the application guidance package.

Of these analyses, the air quality impact analysis may require site-specific ambient air quality monitoring. This decision is generally based on the existing ambient pollutant concentrations and the maximum expected air quality impacts of that pollutant resulting from the proposed emission increases.

A.6 EXEMPTIONS

This subsection explains exemptions to the 1980 PSD regulations. Proposed new major sources and modifications are exempt from the new monitoring requirements associated with the air quality impacts analysis (Section A.5.2) if an otherwise complete PSD application is submitted between August 7, 1980 and June 7, 1981, and the applicant complies with the 1978 PSD monitoring requirements (40 CFR 52.21(n)), promulgated June 19, 1978. However, a PSD application completed, except for the monitoring requirements, after June 7, 1981 would be partially subject to the additional monitoring requirements of the new PSD regulations through a phase-in approach. This phase-in approach is applicable to

PSD applications that are determined to be otherwise complete between June 7, 1981 and February 7, 1982.

Exemptions to PSD review are also granted in other cases. PSD review is required for sources locating in PSD areas or in areas designated attainment or unclassifiable for any criteria pollutant. PSD areas, however, can be designated nonattainment for one or more pollutants. In such areas, significant increases in pollutants for which the area is designated nonattainment under Section 107 of the Act are exempt from PSD review. These increases are instead reviewed according to State nonattainment provisions.

Certain major stationary sources or major modifications are exempt from PSD preconstruction review and the requirement to obtain a PSD permit if the source or modification is major only because quantifiable fugitive emissions were considered in calculating the source's potential to emit. This exemption applies to all sources except those classified under the 28 named PSD categories (Table A-3) and those regulated under Sections 111 or 112 of the Act as of August 7, 1980. No fugitive emission exemptions exist for other emissions accounting requirements. Quantifiable fugitive emissions are considered in determining net emissions changes for proposed modifications for all sources regardless of source type.

In addition, certain changes at a source are specifically exempted from the definition of major modifications. Changes that are exempt from PSD review include:

1. Routine maintenance, repair, and replacement;
2. Use of an alternative fuel or raw material by reason of an order under Sections (2)(a) and (b) of the Energy Supply and Environmental Coordination Act of 1974 (ESECA) or any superseding

legislation, or by reason of a natural gas curtailment plan pursuant to the Federal Power Act;

3. Use of an alternative fuel by reason of a rule or order under Section 125 of the Act;

4. Use of refuse-derived fuel from municipal solid waste at a steam-generating unit;

5. Change in ownership at a stationary source;

6. Use of an alternative fuel that was permitted in a State or Federal PSD permit;

7. Use of an alternative fuel or raw material that the source was capable of using before January 6, 1975; and

8. Increased hours of operation or production rate.

The last two examples are valid only if the change is not prohibited by certain federally enforceable permit conditions issued after January 6, 1975.

Nonprofit health or educational sources that would otherwise be subject to PSD review can be exempted if requested by the Governor. In addition, a portable major stationary source that has previously received a PSD permit and is to be relocated is exempt from PSD review if (1) emissions at the new location will not exceed previously allowed emission rates, (2) the emissions at the new location are temporary, and (3) the source will not, because of its new location, adversely affect a Class I area or contribute to any known increment or to a national ambient air quality standard (NAAQS) violation. However, the source must provide reasonable advance notice to the reviewing authority.

The 1980 PSD regulations exempt certain sources affected by previous PSD regulations. For example, sources for which construction began before August 7, 1977 are exempt from the 1980 PSD regulations and are instead reviewed for applicability under the PSD regulations as they existed before August 7, 1977. Several exemptions also exist for sources for which construction began after August 7, 1977, but before August 7,1980, the promulgation date of the 1980 PSD regulations. These exemptions and the criteria for qualifying for them are detailed in paragraph (i) of 40 CFR 52.21, as amended August 7, 1980. Other exemptions regarding the "50-ton" exemption, monitoring instrument sensitivity, and temporary emissions are explained in detail in the regulations.

A final exemption deals specifically with best available control technology (BACT) review requirements. Proposed new major stationary sources and major modifications for which a complete application was submitted to the review agency prior to August 7, 1980 are exempt from the more restrictive BACT requirements of the 1980 PSD regulations and instead are subject to the requirements of the PSD regulations that were in effect as of June 19, 1978.

A.7 APPLICABILITY DETERMINATION EXAMPLE

In this subsection, PSD applicability is determined for two examples. These examples are extended to illustrate the next three sections on PSD, including determination of BACT, air quality modeling, and the additional impacts analysis. The first example illustrates PSD applicability criteria for proposed new sources. The second example focuses on the key PSD criteria for a modification to an existing source.

Applicability is determined for the examples through a systematic, stepwise approach that subdivides the task into discrete steps and simplifies the overall process. New source applicability involves five steps which draw on the definitions and guidance already given in this section. The five steps to determining new source applicability are listed in Table A-5.

Applicability for modifications follows a similar procedure; however, two additional steps are required to determine if a significant net emission increase occurs. The seven steps to modification applicability are also outlined in Table A-5. The systematic approach is used in both the new source and modification examples.

A.7.1 New Source Applicability

In the first example, the proposed project will be a new coal-fired electric plant. Construction is scheduled to begin in 1981. The plant will have two 600-MW lignite-fired boilers. Because a surface lignite mine in dedicated service to the power plant will be located on adjacent properties, the power plant is classified as a minemouth power-generating station. The power plant will have onsite coal and limestone storage and handling facilities. The mine and the power plant will be under common ownership. Since the area is designated attainment or unclassifiable for all pollutants, it is classified as a PSD area.

Proposed pollution control devices include (1) an electrostatic precipitator (ESP) for PM emission control, (2) a limestone scrubber flue gas desulfurization (FGD) system for SO_2 emission control; (3) low-nitrogen oxide (NO_x) burners and low-excess-air firing for NO_x emission control; and (4) controlled combustion for CO emission control. In addition, a comparatively small auxiliary boiler will be installed to provide steam when the main boiler is inoperable.

The mining and power plant operations produce fugitive emissions. Power plant fugitive emissions include emissions from coal and limestone storage and handling and from onsite haul roads.

Table A-5. STEPS TO DETERMINING APPLICABILITY

New Sources
1. Define the source.
2. Estimate the potential to emit of the source.
3. Determine if the source is a major stationary source (use Applicability Test 1).
4. Determine what review requirements must be met (use Applicability Test 3 on potential emissions totals).
5. Evaluate exemptions.
Modified Sources
1. Define the existing source and understand the proposed modification.
2. Estimate the potential to emit of the existing source.
3. Determine if the existing source is a major stationary source (use Applicability Test 1).
4. Determine the net emissions change from the modification considering creditable contemporaneous changes.
5. Determine if a significant net emissions change occurred (use Applicability Test 2 on the net emission increases).
6. Determine what review requirements must be met (use Applicability Test 3 on the net emission increases for each pollutant).
7. Evaluate exemptions.

When examining this proposed construction for PSD applicability, the source or sources must first be determined. The PSD guidelines define a source as all pollutant-emitting activities associated with the same industrial grouping, located on contiguous or adjacent sites, and under common control or ownership. Industrial groupings are generally defined by two-digit SIC codes. In this case, the power plant, which is classified as SIC major group 49, and the adjacent mine, which is SIC major group 12, constitute separate sources.

The only emissions at the mine are fugitive PM emissions from mining operations. The coal is mined and then transported to the power plant to be crushed, screened, stored, and pulverized and fed to the boilers. A coal preparation plant, common to many coal mines, is not required at this lignite mine. Therefore, the emissions units are neither classified within one of the 28 PSD source categories nor regulated under Sections 111 or 112 of the Act. Thus fugitive emissions from mining operations are exempt from consideration in determining whether the mine is a major stationary source. With no point sources to consider, the mine is not subject to PSD review.

Emissions from the mine, however, are classified as secondary emissions with respect to the power plant and, therefore, must be considered in the air quality and additional impacts analyses of the proposed power plant construction.

The proposed power plant is a fossil fuel-fired steam electric plant with more than 250 million Btu/hr of heat input. Because the power plant is a PSD-listed source, it is subject to the 100-ton-per-year criterion for any regulated pollutant (including quantifiable fugitive emissions) used to determine a source's status.

The potential to emit of the proposed new source must be examined in the second step of determining PSD applicability. To arrive at this estimate, the applicant for the power plant permit must consider all quantifiable stack and fugitive emissions. Fugitive PM emissions from haul roads, disturbed areas, coal piles, and other sources must be considered in the accounting process.

Table A-6 gives potential emission estimates for the power plant. All stack and fugitive emission estimates have been obtained through detailed engineering analysis of each emissions unit using the best available data or estimating technique. In this case, fugitive emission factors for coal and limestone storage and handling were obtained from Technical Guidance for Control of Industrial Process Fugitive Particulate Emissions. (See Table A-1, No. 3.) These emission sources are added to the two main boiler emissions and the auxiliary boiler in order to arrive at the total potential to emit of SO_2, NO_x, PM, CO, and HC for this proposed plant. The auxiliary boiler in this case is restricted by enforceable limits on operating hours proposed to be included in the source's PSD permit. If the auxiliary boiler were not limited in hours of operation, its contribution would be based on full, continuous operation, and the resulting potential emissions estimates would be considerably higher.

The third step in determining PSD applicability occurs after summing all potential emissions. Applicability Test 1 compares potential emissions of each pollutant to the 100-ton-per-year criterion to determine if the source qualifies as a major source. The plant is classified as a major source because of its SO_2, NO_x, PM, and CO emissions. Emissions of these pollutants exceed 100 tons per year.

A-6. POTENTIAL POWER PLANT EMISSIONS
(tons/yr)

Emissions unit	SO_2	NO_x	PM	CO	HC
Main boilers (2)	20,000	20,000	1,000	4,500	32
Auxiliary boiler	5	2	1	N[a]	N[a]
Coal Fugitives					
• Storage			50		
• Handling			33		
Limestone Fugitives					
• Storage			3		
• Handling			3		
Haul Road Fugitives (Onsite)			10		
Fly Ash Fugitives					
• Truck haul			10		
TOTAL PE	20,005	20,002	1,110	4,500	32

[a]Negligible.

Once a new source is classified as a major source, PSD review is generally required for that source. However, the level of review required must still be determined. This is the fourth step in determining applicability. PSD review requirements must be met for each pollutant with a significant emission rate. Applicability Test 3 compares the emission rates of each pollutant against significance levels to identify PSD review requirements.

All pollutants with significant emission levels must meet BACT requirements and must be analyzed for air quality and additional impacts. These pollutants include SO_2, PM, NO_x, and CO. Since HC emissions are not significant, PSD review does not apply to this criteria pollutant. If HC emissions had exceeded the 40-ton-per-year significance level, PSD review would apply to hydrocarbons as well as to the other pollutants.

Note that, because the proposed construction site is not within 10 kilometers of a Class I area, the source is not subject to the more restrictive Class I area significance criteria. Noncriteria pollutants and lead emissions must also be considered in determining the level of PSD review required.

The applicant has adequately demonstrated through coal and captured fly ash analyses and through performance test results from existing sources burning equivalent coals, that source emissions of fluorides, beryllium, lead, mercury, and other regulated trace compounds do not exceed the significance levels, as shown in Table A-7. Fluoride compounds are contained in the coals in significant quantities; however, engineering analyses show fluoride removal in the proposed limestone scrubber will result in insignificant stack emissions. Similarly,

Table A-7. POWER PLANT POTENTIAL EMISSIONS
(noncriteria pollutants and lead)

Emissions units	Lead	Fluorides	Beryllium	Mercury	Other
Main boilers (2)	<0.6	<1	N[a]	<0.1	N
Auxiliary boiler	N	N	N	N	N
Fugitives	N	N	N	N	N
TOTAL PE	<0.6	<1	N	<0.1	N

[a]Negligible.

liquid absorption, absorption of fly ash removed in the ESP, and removal of bottom ash have been shown to maintain emissions of other regulated noncriteria pollutants below significance levels. For this reason, these pollutants are not subject to PSD review requirements.

In the final step to determine new source PSD applicability, exemptions must be considered. No exemptions apply to the proposed construction. Therefore, full PSD review requirements must be met for all pollutants emitted in significant quantities.

A.7.2 Major Modification

In the second example, a modification is proposed for a refinery constructed in 1965. The modification, to be completed in 1983, is the addition of a fluid catalytic cracking (FCC) unit and its associated emissions units. The FCC unit will increase gasoline production and, correspondingly, will decrease the production of heavy products. The quantity of crude oil processed at the plant will not change because of the modification. In 1978, a tail gas treatment unit was added to the refinery's sulfur recovery plant. The area in which this refinery is located is designated attainment for all criteria pollutants except ozone. The area is designated nonattainment for ozone.

To determine if the proposed FCC unit modification qualifies for PSD review, the existing source, the refinery, must be classified under a source category. Since refining is the primary activity at the location, the refinery falls under SIC code 29 for petroleum refineries. Because all emissions units are associated with the refining operations, the entire refinery constitutes one source.

In the second step of PSD scrutiny for modifications, the potential to emit of all emissions units associated with the existing source must be calculated and summed. These emissions are shown in Table A-8. Rigorous estimation of the existing refinery's PE is unnecessary because the existing source is emitting more than 100 tons per year of SO_2, PM, NO_x, CO, and HC. In the third step, the applicant uses Applicability Test 1 to compare the potential emissions totals against the 100-ton-per-year emissions criterion and determines that the existing source is a major stationary source.

Even though it is apparent that the refinery is an existing major stationary source, the modification must be examined more closely to determine if it should be classified as a major modification. The modification must be screened in conjunction with any previous and proposed emission increases and decreases to determine the net change in actual emissions. Each change must be contemporaneous (i.e., within the specific time frame) to be creditable. Decreases must also be federally enforceable before actual construction begins on the proposed modification.

The fourth step in determining PSD applicability for the modification is to quantify the net change in actual emissions. The formula for determining the net change is given in Section A.4.3.2. By definition, actual emissions for the new units equal the allowable emissions; both of these values are equal to the potential to emit.

The actual emission increases for this modification include all emissions from the new FCC unit plus any other modified unit as well as the fugitive HC emission increase created by an increase in the number of valves, pumps, and other fugitive emission sources.

Table A-8. EXISTING REFINERY POTENTIAL EMISSIONS
(tons/yr)

	SO_2	NO_x	PM	CO	HC	Other
Existing emissions units and fugitives	>100	>100	>100	>100	>100	>100

Table A-9, which gives actual refinery emissions, shows only one contemporaneous decrease. This decrease is due to reductions in SO_2 as a result of the tail gas treatment system and a corresponding decrease in hydrogen sulfide (H_2S) incineration. The construction of the tail gas treatment system in 1978 created a decrease that occurred after January 6, 1975 and within 5 years of the date to commence construction of the FCC unit (estimated to be 1982). Also, the decrease is enforceable under the applicable SIP, which includes allowable SO_2 emission limits for the sulfur recovery system. Note that, in quantifying the creditable decrease, not only the change in permitted allowable rates, but also the change in actual emissions, was considered.

The date on which construction commences is very important in determining if the change is contemporaneous and thus creditable. If construction on the FCC unit were to commence in 1985, the contemporaneous decrease created by the tail gas treatment system would not be creditable because of the 5-year limitation; thus, emission reduction credit capability would be lost for PSD purposes.

Contemporaneous creditable increases must meet the same criteria. The tail gas treatment modification increased SO_2 and NO_x emissions

Table A-9. ACTUAL REFINERY EMISSIONS
(tons/yr)

	SO_2	NO_x	PM	CO	HC	Other
Increases from new and modified facilities (1982)	5,300	1,400	260	500	1,800	N[a]
Contemporaneous increases (1978) from amine scrubber regenerator	10	30	N	N	N	N
Contemporaneous decreases (1978) from tail gas treatment	5,500	N	N	N	N	N
Net change in RAE	190 Decr.	1,430 Incr.	250 Incr.	500 Incr.	1,800 Incr.	N

[a]Negligible.

because of the installation of an amine regenerator. These increases resulted from the fuel consumed to regenerate the tail gas system scrubbing liquor. Although they meet the creditability criterion, the emission levels were sufficiently low and were not subject to PSD review in 1978. These increases, though, must be counted in determining the net emissions change for the modification.

An examination of Table A-9 for changes in emission levels of the pollutants shows that there is a net decrease for SO_2, but there are significant increases for NO_x, PM, HC, and CO. Significant increases in other regulated pollutant emissions did not occur.

The modification is thus considered major and must undergo PSD review. This comparison simultaneously uses Applicability Tests 2 and 3 in the fifth and sixth steps of determining PSD applicability for modifications. Test 2, having satisfied the significance criteria for any pollutant, triggers PSD review. Applicability Test 3 requires a comparison of all pollutants against the significance levels and determines that BACT, air quality, and additional impacts analyses must be conducted for NO_x, PM, and CO. HC is not included in this list because the area is designated nonattainment for ozone. For this pollutant, however, the source must be issued a permit in accordance with the State nonattainment provisions. before a PSD permit can be issued.

The FCC unit modification in this example would constitute both a physical change and a change in the method of operation of the source. It would result in a significant net increase in emissions of pollutants regulated under the Act at a major stationary source; therefore, PSD review is required.

The final step in evaluating applicability for the modification is to determine exemptions. In this case, HC emissions are not subject to PSD review since the area is designated nonattainment for ozone. No other exemptions apply to the proposed modification.

A.8 CONCLUSION

For a source subject to PSD to be granted a PSD permit, BACT must be determined and installed on each new emissions unit emitting a pollutant whose emission will significantly increase. BACT must also be installed on each modified emissions unit increasing the emissions of a pollutant whose emission will significantly increase. The source owner must also demonstrate through an air quality analysis that each significant emission increase resulting from the proposed construction will not cause or contribute to a violation of any allowable increment or an NAAQS. Finally, the impacts on soils, vegetation, visibility, and each potentially affected Class I area resulting from the proposed construction and its associated growth must be analyzed.

In cases in which emissions from a proposed new major source or major modification are expected to affect a Class I area, the Federal land manager in charge of the Class I area may recommend additional emission controls or other restrictions to ensure that impacts are minimal. For cases in which the Federal land manager opposes permitting the new emissions, the PSD regulations specify procedures involving the Governor of the State and, in some cases, the President for granting or denying the PSD permit.

A PSD application must include all of these analyses to be complete. The applicant may be asked to clarify the analyses presented in the application or to supply additional information during the technical review of the application. Later sections in the application guidance package offer specific guidance on fulfulling each PSD review requirement.

B. BEST AVAILABLE CONTROL TECHNOLOGY

B.1 DEFINITION AND PURPOSE OF BEST AVAILABLE CONTROL TECHNOLOGY

The construction and operation of a new or modified pollution-emitting unit has many complex and interrelated impacts on the energy availability, economy, and environment of the affected area. The concept of best available control technology (BACT) addresses these various impacts. A BACT analysis determines the control strategy to be required for a source undergoing the PSD review process; therefore, it also ultimately determines the emissions from a source that cause air quality-related impacts. Consequently, an accurate BACT analysis can be considered the focal point of a successful PSD review.

The BACT analysis is an important step in the PSD review process for several reasons. A BACT analysis and the results it produces provide the majority of the input data for the other two required PSD analyses: the air quality analysis and the additional impacts analysis. Results of the BACT analysis may reveal to the applicant that application of efficient emission controls may exempt the proposed construction from PSD review altogether. In addition, a comprehensive, correctly prepared BACT analysis enables an applicant to develop sufficient information on which to base corporate decisions concerning possible control strategies.

The BACT analysis simultaneously serves as an information source to the public that would be potentially affected by the construction under review.

B.2 FORMAT FOR BACT ANALYSIS

This subsection presents an analytic format consisting of four steps and three impact analyses, as shown in Figure B-1, that will help the applicant identify BACT requirements specific to his or her application. This subsection also suggests methods of demonstrating compliance with these requirements. The impact analyses to be conducted in conjunction with the four steps are described in Section B.3.

Before the elements of a BACT analysis can be understood and an actual analysis can be undertaken, the following criteria must be considered: (1) the energy and economic costs of emission controls should be considered reasonable and (2) direct and residual risks with, and impacts on, environmental factors must be considered. BACT analyses for the same types of emissions unit and the same pollutants in different locations or situations may determine that different control strategies should be applied to the different sites, depending on site-specific factors. Therefore, BACT analyses must be conducted on a case-by-case basis. With these criteria in mind, the applicant can begin the BACT analysis process.

B.2.1 Pollutant Applicability

The first step considers pollutant applicability. Pollutants regulated under the Act are subject to BACT analysis if they are emitted in significant quantities by a major new source or if their emissions

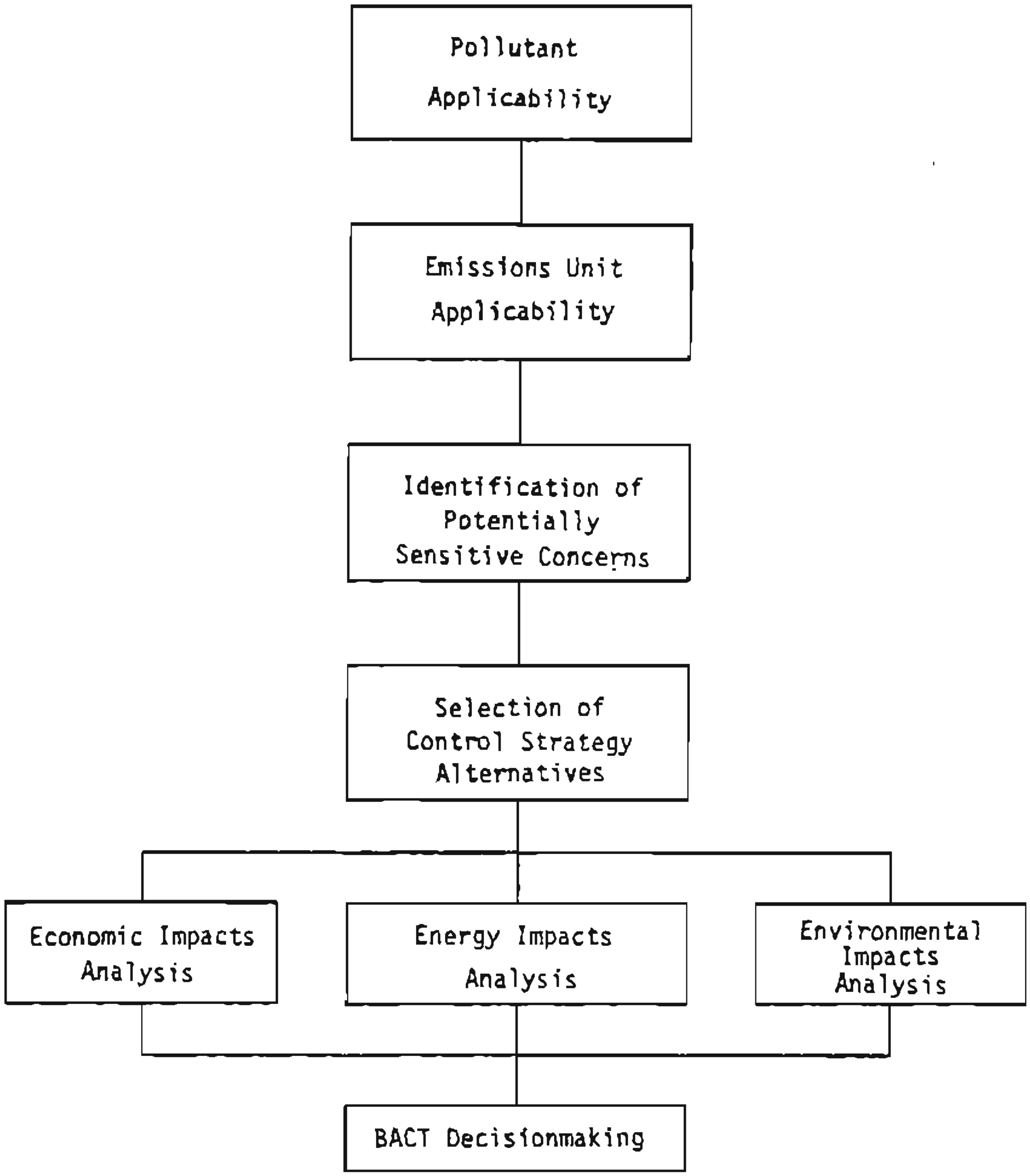


Figure B-1. BACT Process.

are significantly increased as a result of a major modification. This includes both criteria and noncriteria pollutants. As discussed earlier, all emissions at the source must be accumulated to determine if significant emissions will occur for each pollutant. These emissions include stack and fugitive emissions occurring or increasing at the source. Also, regulated pollutants that fall into two or more categories must be accumulated in each category. For example, some reduced sulfur compunds such as dimethyl sulfide are also volatile organic compounds (VOCs). Since VOCs and reduced sulfur compounds are regulated as separate categories of pollutants, dimethyl sulfide is accumulated for both categories.

B.2.2 Emissions Unit Applicability

The second step in the BACT analysis considers emissions unit applicability. All emissions units involved in a major modification or a new major source that emit, or increase emissions of (in the case of a modified emissions unit), applicable pollutants must undergo BACT analysis. Because each applicable pollutant must be analyzed, many emissions units, such as combustion sources, must undergo BACT analysis for more than one pollutant.

Units that are sources of fugitive emissions must also be included in a BACT analysis. Examples of these units include:

1. Valves, flanges, pumps, and related apparatuses in the service of gaseous or volatile liquids;
2. Coal, limestone, and other storage piles;
3. Outdoor conveyor belts; and
4. Volatile organic liquid storage vessels.

Fugitive emissions are usually induced by wind or pressure. Therefore, these emissions are difficult to quantify. BACT for these sources usually consists of equipment or work practice standards or a combination of both types of standards rather than a measurable allowable emission rate. For stack emissions, however, BACT consists of equipment and/or process standards and an enforceable allowable emission limit.

Exempt from BACT analysis are those emissions units that produce only secondary emissions. Examples of secondary emissions include emissions produced by:

1. Offsite vehicles and vessels coming to and from a major stationary source,

2. Increased utility boiler emissions caused by increased electrical demand, and

3. Increased offsite vehicular emissions caused by an increased number of employees.

* However, if the air quality impact analysis reveals that secondary emissions may cause potential air quality standard or increment violations, additional controls would have to be applied to eliminate the threat of such violations.

Similar emissions units should be analyzed together to evaluate the advantages of "economy of scale." For example, a flue gas desulfurization (FGD) system serving three boilers will cost less than three FGD systems, with each serving its own boiler.

All affected emissions units, regardless of size, must undergo BACT analysis. However, in light of the criterion of economic reasonableness, an analysis should only be as extensive as the quantity of pollutants emitted and the ambient air impacts created. Experience has shown that facilities that emit small amounts of pollutants have extremely high costs associated with the installation and operation of highly effective emission controls.

B.2.3 Identification of Potentially Sensitive Concerns

The third step is to identify areas of potentially sensitive concerns. A primary purpose of BACT is to minimize the consumption of PSD increment and thus expand the affected area's potential for future economic growth. Therefore, the identification of potentially sensitive concerns involving energy, economic and environmental factors are central to the concept of BACT. Furthermore, because of the case-by-case approach of a BACT analysis (which often produces very specific results), the identification of local concerns may form the framework of a BACT analysis. All potentially sensitive air quality concerns should apply specifically to the case under review. They should also, as much as possible, be quantifiable, so that the possible impacts of various control alternatives can be correlated and compared.

B.2.4 Selection of Alternative Control Strategies

The fourth step involves the selection of alternative control strategies. Based on the results of the BACT analysis up to this point, the applicant identifies applicable alternative control strategies. Information on possible alternative control strategies and their emission reduction efficiencies can be obtained from industry surveys and from EPA literature that describes the specific or industrial use of emission control techniques.

In selecting an alternative control strategy for consideration as BACT, the applicant must first determine its technical feasibility. A technically feasible control strategy is one that has been demonstrated to function efficiently on identical or similar processes. Control techniques that have not been so demonstrated but that may achieve greater emission reduction (or efficiency) than those currently in use are classified as innovative control techniques. To encourage their use, PSD regulations provide special consideration for innovative control techniques.

In order to rank the alternative control strategies and to consider them quantitatively, a base case should be established. The base case is the control strategy that, in the absence of BACT decisionmaking, would normally have been applied. The choice of the base case may be dictated by other existing regulations and/or by company practice standards or choices, if they provide a greater degree of emission reduction than that required by existing regulations (such as new source performance standards, national emission standards for hazardous air pollutants, etc.).

With the creation and analysis of a base case, alternative control strategies affording greater degrees of continuous emission reduction than the base case can now be ranked in order of control efficiency and should be analyzed for BACT. The only exception to this requirement is a case in which an applicant has demonstrated that this chosen control strategy, the base case, provides the highest degree of emission reduction available. In these cases, the analysis of the alternative strategies is not required. The various alternative control strategies can represent existing technology, transferable emission control technology, and innovative control technology.

Processes that inherently produce less pollution should also be considered as alternatives. For example, two basic cement manufacturing processes, the wet process and the dry precalcination system, generally differ significantly in resulting emissions. For nitrogen oxide (NO_x) emissions, the dry process will generally produce significantly less emissions when compared to the wet process and should be considered in a required NO_x BACT analysis for cement plants.

By being familiar with previous BACT determinations in their localities, PSD applicants may possibly use these determinations as a guide for their own facilities. A helpful source of this information is the BACT/LAER Clearinghouse reports published by EPA. However, since BACT is determined on a case-by-case basis, applicants should be aware, when reviewing available information, that similar emissions units at different sources may require significantly different control strategies. Since the allowable emission rate must be approved by the reviewing agency, the rate initially proposed by the applicant as BACT is not necessarily the rate that will ultimately be specified in the permit.

B.3 IMPACT ANALYSES

After deciding upon a set of alternative control strategies, the applicant then conducts three analyses for each strategy: (1) an economic impacts analysis, (2) an energy impacts analysis, and (3) an environmental impacts analysis. These analyses should identify quantifiable impacts.

Table B-1 is a blank form that applicants may find useful in conducting the impact analyses. Using the form, the applicant can compare alternative control strategies for each applicable pollutant emitted by the source

Table B-1. COMPARISON OF CONTROL STRATEGY ALTERNATIVES

POLLUTANT: ________		ECONOMIC IMPACTS			ENVIRONMENTAL IMPACTS			ENERGY IMPACTS		
Control alternative	Percent reduction	$/ton incremental	$/ton total	Impact on sensitive issues	Maximum G.L.C.'s[a,b]	Impact areas (km)	Impact on sensitive issues	Btu/ton incremental	Btu/ton total	Impact on sensitive issues
1. Best	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
2. Second highest	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
3. Other	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
4. Base case	( )	______	( )	( )	( )	( )	( )	______	( )	( )

[a]G.L.C. is ground-level concentration.

[b]Units of $\mu g/m^3$ - specify averaging period.

or modification under review. The completed chart then enables the applicant to compare the results of the impact analyses. The suggested approaches to these analyses follow.

B.3.1 <u>Economic Impacts Analysis</u>

The economic impacts analysis addresses the costs of emission control. In estimating the capital cost of each alternative control strategy, as in estimating all other costs, the applicant should rely on traditional engineering and accounting procedures and should present approximate, rather than rigorous, estimates. Standard engineering assumptions should be used. For example, instrumentation is generally estimated to be a certain percentage of the total equipment price. Ratios of installed costs to equipment costs can be used where applicable. Sufficient information on equipment costs can be found in several sources, such as a current <u>Chemical Engineering Equipment Buyers' Guide</u>. In calculating amortized capital costs, U.S. Internal Revenue Service criteria should be used to determine equipment life expectancy.

All standard operating costs, from labor costs to insurance costs, should be determined. The expected escalation of these costs over the life of the control equipment should be incorporated into these cost determinations. The costs of rectifying problems created by the control technique should also be estimated; for instance, in an evaluation of sludge-producing scrubbers, sludge disposal costs should be examined.

For consistency and ease of comparison, and in recognition of changing or variable tax environments, all data should be reported on a "before-taxes" basis. However, because special tax situations may be of significant economic importance, those situations should be noted, and their estimates provided, in addition to the "before-taxes" data. An example of this situation would be a significant tax advantage for certain energy conservation projects.

In determining the relative economics of the alternative control strategies, both total and incremental annual costs of the strategies should be compared to demonstrate the incremental costs of residual emission reduction. Incremental cost compares the emission reduction costs of two or more control strategies. Pollutant quantity reduction should be determined on an annual or other logical, cyclical basis that permits a realistic calculation of emissions considering maintenance or any other downtime associated with the emissions unit being reviewed. The alternative control strategy being analyzed is assumed to be operating in full compliance with anticipated allowable emission and permit limitations. In the case of alternative control strategies that abate emissions of more than one applicable pollutant, the control costs should be divided among all applicable pollutants and then included in each pollutant's analysis.

Significant impacts of the following economic factors should be considered by the applicant: (1) pollution-specific costs (dollars per ton of emissions controlled), (2) additional product costs (cents per unit of production), and (3) the ability to secure financing for the alternative control strategy. Although no universally accepted criteria exist for determining the dollar value of a ton of a particular pollutant reduced from emissions, information is available on the value of various emissions reductions that EPA and affected industries generally agree are reasonable. This information can be found in the background information documents (BIDs) issued by EPA to support new source performance standards. A new source performance standard (NSPS) is determined by weighing the ability of the industry to afford emission controls against the environmental benefit derived by the use of available control technologies. If information and data in these documents are used to compare pollutant control costs, the procedures and assumptions used in the case-by-case analysis should be identical to those used in the NSPS development. Through a survey of relevant BIDs, the applicant can develop general guidelines for estimating the cost to control a particular pollutant. BID information used by the applicant should be cited in the BACT analysis.

Additional product costs resulting from the alternative control strategies should also be evaluated in the economic impacts analysis. The percentage of total manufacturing costs that the additional emission control costs represent should be included in this evaluation. This information will determine if, and to what degree, the applicant will experience a competitive disadvantage in the marketplace because of the cost of an alternative control strategy. For instance, if an additional 5 cents per pound of product for emission control creates an intolerable increased product cost, the applicant should include that information.

The ability to secure financing is a critical consideration. If an applicant's plans to expand a plant require outside financing, additional financing required for an alternative control strategy may jeopardize the financing of the entire project.

B.3.2 <u>Energy Impacts Analysis</u>

The second analysis to be conducted for each alternative control strategy addresses energy impacts. Because the dollar value of energy costs can be significant, the energy impacts analysis should actually be conducted before the economic impacts analysis, even though energy is just one of the elements considered in the latter analysis. The energy impacts analysis should consider only direct energy consumption and not indirect energy impacts. Direct energy impacts should also be evaluated on a total and a pollutant-specific basis.

As in the economic analysis, energy impacts should be determined and analyzed on both an absolute and an incremental cost basis. Because energy costs consist of fuel usage, they should be converted to Btus and barrels-of-oil equivalents. Finally, in some cases, the combustion of fuels to provide energy for alternative control strategies might result in direct emissions of pollutants. These emissions, however, should be considered in the environmental impacts and air quality analyses.

B.3.3 Environmental Impacts Analysis

The consideration of environmental impacts is essential to the primary purpose of a BACT analysis, which is to minimize the consumption of PSD increments and to preserve the ambient concentrations of criteria pollutants in order to maintain the potential for future economic growth.

An air quality impacts analysis should be included in the environmental impacts analysis. It should consider the maximum ground-level impact and ground-level concentrations that would result from the emissions from the proposed new source or modification after each alternative control strategy is applied, as well as the size of the area significantly affected by these increased emissions (i.e., the impact area).

Using a modeling analysis of worst-case conditions, the applicant determines the maximum ground-level impacts and ground-level concentrations resulting from the hypothetical application of each alternative. This analysis is also used to determine the impact area of each alternative. Using the worst-case approach produces an analysis of the risks associated with pollutant concentration for the exposed population. For instance, consider the situation in which the use of low-sulfur fuel is compared to the use of an FGD system to control SO_2 emissions from a boiler. Even though the SO_2 emissions resulting from an FGD system may be significantly less than from the low-sulfur fuel, because of different stack parameters, dispersion modeling showed resulting SO_2 ambient impacts to be essentially the same for both cases. However, because of the lower SO_2 emission rate achieved by the FGD system, the impact area for the FGD system would be significantly smaller, thereby affecting less population. This factor may be significant in the analysis.

Other significant environmental impacts should be considered by the applicant if they result from the application of specific alternative control strategies. Scrubbers, for example, may affect water quality and land use, whereas strategies using cooling towers may affect visibility. Such impacts should be discussed and then summarized with other pertinent data in a format such as that shown in Table B-1.

Upon completion of the BACT analysis, the applicant possesses the information needed to accurately and comprehensively assess the available control technologies and can then perform the evaluation that will lead to proposal of BACT.

B.4 BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS EXAMPLE

To illustrate the BACT analytic process, the hypothetical case developed in Section A, the proposed modifications to an oil refinery, has been extended to include a BACT analysis.

B.4.1 Example: Pollutant Applicability

The first step in the BACT process, pollutant applicability, is to determine which pollutants emitted by the source must be analyzed. Table B-2 gives the proposed allowable emission increases, in tons per year, to be produced by the units involved in the proposed project. Because PSD regulations require that emission increases and decreases for the previous 5 years be considered, the emission increases from the new amine regenerator installed in 1978 are noted and accumulated with the estimated emissions of the proposed modifications, as are the emission decreases of a tail gas treatment system which came on line in 1979.

Summing the actual emissions changes with the proposed emission increases for the FCCU project shows a significant net emissions increase for NO_x, particulate matter (PM), carbon monoxide (CO), and VOCs. Because the tail gas incinerator was permitted under the State's new source review (NSR) program which reflects the required use of the tail gas treatment system, it is considered to have federally enforceable permit limitations. For this reason, it is seen that a net sulfur dioxide (SO_2) emission decrease occurs, considering the proposed and contemporaneous emissions changes. Therefore, SO_2 emissions are not subject to PSD review and are not required to undergo a BACT analysis. Since the petroleum refinery is located in a nonattainment area for ozone, its increased VOC emissions are also exempt from BACT and other PSD requirements if the applicant can demonstrate compliance with the applicable nonattainment provision of the appropriate State implementation plan (SIP). Therefore, the BACT analysis addresses only the NO_x, PM, and CO emitted by the modification under review.

Table B-2. BACT EXAMPLE - MAJOR MODIFICATIONS ACTUAL EMISSIONS CHANGES IN PAST 5 YEARS (tons/yr)

	SO_2	NO_x	PM	CO	VOC
EMISSION INCREASES					
Proposed Project (New)[a]					
FCCU	5,100	1,200	210	450	8
Heaters (2) & boiler (1)	200	200	50	50	2
Gasoline storage and loading	-	-	-	-	1,240
Other fugitive VOC sources	-	-	-	-	750
New Amine Regeneration System (1978)					
Heater	10	30	<1	<1	<1
EMISSION DECREASES					
Tail Gas Treatment (1979)					
Tail gas incinerator	(5,500)	(400)	(<1)	(20)	(<1)
Net Emission Changes	(190)	1,030	260	480	1,800
PSD Significant Levels	40	40	25	100	40
Significant Net Increase?	No	Yes	Yes	Yes	Yes
Subject to BACT?	No	Yes	Yes	Yes	No

[a]These emissions are proposed allowable emissions.

B.4.2 Example: Emissions Unit Applicability

In the second step, emissions unit applicability, the applicant defines the refinery facilities that must apply BACT. The emission units that do meet the criteria (Section B.2.2) and, therefore, must apply BACT are the four combustion sources associated with the proposed modification--a fluid catalytic cracking unit regenerator, two heaters, and a boiler. Although its emissions are accumulated for review, the amine regenerator heater is not subject to the BACT analysis because it was not subject to PSD review and was subsequently built under authority of the State permitting system.

The applicant then presents relevant data on these emission sources. As Table B-3 shows, the FCCU regenerator produces the most emissions; therefore, this subsection focuses primarily on the BACT analysis of this unit. The amine regenerator is not subject to the BACT analysis in this case for two reasons: (1) it is not directly related to the FCCU modification, and (2) it was previously permitted and constructed.

However, before considering the FCCU regenerator, the applicant summarizes the BACT analysis of the boiler and the two heaters. The use of alternative controls for NO_x and CO emissions, such as flue gas treatment or another innovative technology, has been demonstrated by the applicant to be economically unfeasible in light of the relatively small amount of NO_x and CO emitted. Instead, proposed BACT consists of the control techniques outlined below. The applicant proposes that the heater and boilers burn a low-sulfur oil (0.15 percent sulfur by weight) that also has a low-nitrogen content. In addition to sophisticated firebox design and combustion controls, NO_x and CO emissions will be further minimized by installing low-NO_x burners.

Table B-3. FACILITIES SUBJECT TO BACT

Facility	Proposed emissions, lb/hr				
	SO_2	NO_x	PM	CO	HC
FCCU	1,165	274	50	203	2
Heater	8	8	2	2	<1
Heater	14	14	3.5	3.5	<1
Boiler	24	24	6	6	<1

B.4.3 Example: Identification of Potentially Significant Concerns

In analyzing the FCCU regenerator, the applicant has identified potentially significant impacts, as the BACT analytic process suggests. The supply of skilled labor in the area, found by the applicant to be adequate, would not be potentially affected by any of the proposed control strategies. Energy was also found to be in adequate supply. Coal shipments were, however, found to be somewhat limited; no coal terminals could be located within a 100-mile radius of the source.

The applicant has determined that the limited availability of water could cause a potentially significant impact. The low annual rainfall, the unavailability of auxiliary sources of water, and the fact that farming is the primary commercial activity in the area has necessitated the rationing of water in this area on a priority basis. During a drought, municipal water policy requires that residential and irrigation areas be given priority over industrial needs. This factor may affect the feasibility of a control alternative requiring large amounts of water.

B.4.4 Example: Selection of Alternative Control Strategies

Based on the BACT analysis up this point, the applicant proposes the following alternative control strategies, also shown in Table B-4:

1. For PM emissions, the alternative control strategies are a high-efficiency electrostatic precipitator (ESP) with an efficiency of 99 percent, a low-efficiency ESP with an efficiency of 95 percent, a venturi scrubber with an efficiency of 90 percent, and tertiary cyclones with efficiencies of 85 percent.

Table B-4. ALTERNATIVE CONTROLS FOR FCCU

Alternative control strategies	Percent reduction
Alternative PM Controls	
High-efficiency ESP	99
Low-efficiency ESP	95
Venturi scrubber	90
Tertiary cyclones	85
Alternative CO Controls	
CO boiler	99.99
High-temperature regenerator	99
Alternative NO_x Controls	
Flue gas treatment	?
No control	0

2. For CO emissions, the alternative control strategies are a CO boiler with an efficiency of 99.99 percent and a high-temperature regenerator with an efficiency of 99 percent.

3. For NO_x emissions, the alternative control strategy is flue gas treatment.

The applicant obtained the information on alternative control strategies from petroleum refinery literature surveys and from the BID for the petroleum refinery NSPS.

An alternative control strategy, to be considered as BACT, cannot produce emissions in excess of any applicable NSPS or the allowable emission levels of an applicable SIP. For example, new source performance standards (40 CFR 60.100) limit PM emissions to 1 pound of PM to 1,000 pounds of coke burnoff and limit CO emissions to 500 parts per million in the regeneration gases. These emission levels are also required by the applicable SIP. Table B-5 gives the anticipated residual PM emissions of each alternative compared to the emission level required by the applicable NSPS. Because the tertiary cyclone cannot meet this level of PM emission reduction, it cannot be proposed as BACT. Since both CO alternative control strategies can attain the emission rate required by the NSPS, each is to be evaluated as a possible BACT.

Flue gas treatment has not yet been demonstrated to be a viable control technique for NO_x emissions and cannot be properly evaluated for BACT. Without demonstrated performance and adequate data for evaluation, flue gas treatment for NO_x emission control could be considered innovative at this time. However, the applicant has chosen instead to propose "no control" as BACT for NO_x emissions.

Table B-5. ESTIMATED PM EMISSION RATES

PM control alternative	PM (lb)/1000 lb coke burned
High-efficiency ESP	0.1
Low-efficiency ESP	0.5
Venturi scrubber	0.98
NSPS	1.0
Tertiary cyclones	1.5

The applicant must next determine which combination of alternative control strategies best controls PM and CO emissions. Table B-6 shows the control strategy options ranked in descending order of control. Because Option 6, the pairing of the venturi scrubber with high-temperature regeneration, is the alternative control strategy that produces the lowest degree of control and still meets the PM and CO emission levels required by NSPS, this combination is chosen as the base case.

B.4.5 Example: Impact Analyses

In evaluating the various control strategy options, the applicant should remember that, because PM and CO emissions are controlled through independent methods, control strategies for these pollutants should be evaluated separately. The applicant has chosen to evaluate the PM strategy first. Table B-7 gives the estimates of the installed and annualized costs of each of the three alternative PM control systems being considered. The cost estimates were based on vendor quotes, a projected equipment life of 16 years, and a capital lending rate of 10 percent. The Chemical Engineering Equipment Buyers' Guide was used for establishing the costs of each alternative.

The incremental, or differential, costs of each alternative control strategy were calculated and then used to determine the cost of residual PM emission control. The high-efficiency ESP is expected to cost about $200,000 more than the low-efficiency ESP, which, in turn, is expected to cost about $500,000 more than the scrubber.

The total and incremental PM emission reductions expected with each alternative control strategy are given in Table B-8. The low-efficiency

Table B-6. COMBINATIONS OF ALTERNATIVE CONTROL STRATEGIES FOR PM AND CO EMISSIONS FROM FCCU REGENERATOR

1.	High-Efficiency ESP	- CO Boiler
2.	High-Efficiency ESP	- High-Temperature Regeneration
3.	Low-Efficiency ESP	- CO Boiler
4.	Low-Efficiency ESP	- High-Temperature Regeneration
5.	Venturi Scrubber	- CO Boiler
6.	Venturi Scrubber (base case)	- High-Temperature Regeneration

Table B-7. PM CONTROL ALTERNATIVES' INSTALLED AND ANNUALIZED CAPITAL COSTS ($1,000s)

Alternative	Installed		Annualized	
	Total	Incremental	Total	Incremental
High-efficiency ESP	$1,700	$200	$212.5	$25
Low-efficiency ESP	1,500	500	187.5	62.5
Scrubber (base case)	1,000	-	125	

Table B-8. TOTAL AND INCREMENTAL PM EMISSIONS CONTROLLED

Alternative control strategy	PM emissions controlled, tons/yr	
	Total	Incremental
High-efficiency ESP	4,160	170
Low-efficiency ESP	3,990	210
Scrubber	3,780	-

ESP will control 210 more tons of emissions per year than the scrubber. The high-efficiency ESP will reduce PM emissions by 170 tons per year more than the low-efficiency ESP. Such emission reduction is known as incremental emission reduction. The venturi scrubber provides an environmental benefit by reducing SO_2 emissions from the FCCU by approximately 50 percent. Although, as discussed previously, SO_2 emissions are not subject to PSD review, this favorable impact may be a factor in the BACT decisionmaking. However, sludge disposal, an unfavorable environmental impact associated with venturi scrubbers, would also be considered.

The energy consumption of each alternative control strategy is given in Table B-9. Only direct energy consumption is considered. Fuel used for indirect purposes, such as associated energy costs of manufacturing the process materials, is not considered. For consistency, energy consumption is evaluated on a total and an incremental use basis. Energy consumption is also considered in calculating the operating costs for the economic impacts analysis.

Table B-10 gives the annual operating costs of each PM alternative control strategy during the first year of operation. These operating costs represent the most significant costs of operating the alternative control strategies and include utility, maintenance, process material, and other variable costs. The major utility cost for each control strategy is electricity. Maintenance material costs are assumed to be 1 percent of installed capital costs. Process material costs consist of the cost of ammonia for the ESP and the cost of water treatment chemicals for the scrubber. The most significant of the "other" variable costs is the cost of sludge disposal for the venturi scrubber. Inflation of

Table 8-9. DIRECT TOTAL AND INCREMENTAL ENERGY CONSUMPTION (million Btu/yr)

Alternative	Direct energy consumption	
	Total	Incremental
High-efficiency ESP	3.5×10^{11}	1.5×10^{11}
Low-efficiency ESP	2.0×10^{11}	1.99×10^{11}
Scrubber (base case)	1.1×10^{9}	-

Table B-10. OPERATING COSTS OF PM CONTROLS
($1,000/yr - 1st year operation)

	Scrubber	Low-efficiency ESP	High-efficiency ESP
Utilities	$ 24.2	$ 73.0	$106.8
Maintenance	25.0	25.0	35.0
Process materials	137.0	16.8	28.5
Other	80.0	17.0	18.0
TOTAL	$266.2	$131.8	$188.3

these operating costs is assumed to be 10 percent per year for the 5-year period following the startup of each alternative control strategy. Table B-11 shows the 5-year operating costs of each strategy adjusted for inflation. Again, for consistency, these costs are evaluated on both a total and an incremental basis. Note that the operating cost of the low-efficiency ESP is about $165,000 less per year than that of the scrubber.

Combining the annualized capital costs and average operating costs, as shown in Table B-12, gives the incremental and total annual costs of each alternative control strategy. Again, note that the total annual cost of the low-efficiency ESP is lower than that of the scrubber by about $100,000 per year.

The applicant then determines the cost-effectiveness of each control strategy by dividing the total annual costs of each strategy by the amount of emissions controlled by each strategy. Similarly, incremental cost-effectiveness is determined by dividing the incremental annual costs by the incremental emission reductions. The incremental cost-effectiveness value is a measure of controlling residual emissions of one control alternative by another alternative by higher emission reduction potential. This value is especially important when evaluating the reasonableness of emission control costs. Table B-13 shows the total cost-effectiveness of each PM alternative control strategy. Note that the cost-effectiveness of the three is approximately equal--about $100 per ton of PM emissions controlled. The incremental cost-effectiveness of the low-efficiency ESP compared to that of the scrubber is shown below:

$$\text{Incremental Cost-Effectiveness} = \frac{\$\text{-}101{,}600/\text{yr}}{210 \text{ tons/yr PM}} = \$\text{-}484/\text{ton}$$

Table B-11. TOTAL AND INCREMENTAL OPERATING COSTS OF PM CONTROLS (10% Annual Inflation Factor)

Alternative	Annual average cost First 5 years operation ($1,000/yr)	
	Total	Incremental
High-efficiency ESP	$229.8	$69.1
Low-efficiency ESP	160.9	(164.5)
Scrubber (base case)	325	–

Table B-12. ANNUALIZED CAPITAL AND OPERATING COSTS OF PM ALTERNATIVE CONTROL STRATEGIES

Alternative control strategy	Total annual costs, $1000/yr	
	Total	Incremental
High-efficiency ESP	$442.3	$93.9
Low-efficiency ESP	348.4	(-101.6)
Scrubber	450	--

Table 8-13. TOTAL COST-EFFECTIVENESS OF THE PM ALTERNATIVE CONTROL STRATEGIES

Alternative control strategy	Total cost-effectiveness
High-efficiency ESP	119
Low-efficiency ESP	87
Scrubber	106

Since the low-efficiency ESP is estimated to cost about $100,000 less per year than the scrubber, the incremental cost-effectiveness is negative or "favorable" because the low-efficiency ESP will reduce PM emissions by 210 more tons per year than the scrubber. Thus the low-efficiency ESP will reduce more emissions at a lower cost. This finding is significant.

The cost-effectiveness of the high-efficiency ESP versus the low-efficiency ESP is shown below:

$$\text{Incremental Cost-Effectiveness} = \frac{\$93{,}900/\text{yr}}{170\ \text{tons/yr PM}} = \$552/\text{ton}$$

Note that the cost of reducing 170 tons per year of PM emissions is expected to cost more than five times the cost of the initial 3,990 tons per year anticipated with the low-efficiency ESP. Thus a significant economic penalty would be associated with controlling the additional 170 tons per year of PM that would be possible with the high-efficiency ESP. To determine whether this additional economic burden is reasonable, the air quality impacts of the residual PM emissions from the fluid catalytic cracking unit must be assessed.

At this point, for several reasons, the applicant need no longer consider the impacts of the final PM emission control strategy based on the venturi scrubber. First, the applicant has already demonstrated that the scrubber is significantly more costly than either of the other two alternative control strategies. Second, a quick screening reveals that the scrubber has high ambient PM air quality impacts. Finally, the scrubber controls PM emissions to a lesser degree than the other control and, furthermore, causes other adverse impacts. (It must be noted that the applicant was not required to present the analysis for the venturi scrubber since, at this point in the evaluation, it is not being considered as BACT. The scrubber analysis was presented in this discussion to demonstrate the decisionmaking process for evaluating alternative control strategies.)

Now concentrating on the remaining two alternative control strategies, the applicant assesses the relative ambient air impacts of PM emissions by estimating stack parameters for these alternatives in order to create input for a dispersion model. The modeling results show that, under the worst-case meteorological conditions, the ambient impacts of PM of the two alternatives are approximately equal--5.9 vs. 5.4 micrograms per cubic meter. Thus the higher incremental control cost of the high-efficiency ESP cannot be justified on the basis of significant particulate ambient air quality benefits. To determine BACT, the economic, energy, and environmental impact analyses are evaluated against each other. The results of the BACT analysis are summarized in Table B-14. In this analysis, the applicant determines that the benefits of the high-efficiency ESP are negligible compared to its higher costs and proposes the low-efficiency ESP alternative control strategy as BACT for PM emissions.

Similarly, analyzing the CO emissions from the FCCU, the applicant determines that high-temperature regeneration should be BACT based on the high cost of waste gas incineration when compared to the relatively small emission reduction it affords. Therefore, in this PSD application, the applicant has proposed the following control strategies as BACT: (1) a low-efficiency ESP for PM emissions, (2) high-temperature regeneration for CO emissions, and (3) "no control" for NO_x emissions.

Table B-14. COMPARISON OF PM ALTERNATIVE CONTROL STRATEGIES

Control alternatives	Percent reduction	Economic impacts: \$/ton incremental	Economic impacts: \$/ton total	Economic impacts: Impact on sensitive issues	Environmental impacts: Maximum GLC[b] impacts, μg/m³	Environmental impacts: Impact area, km	Environmental impacts: Other environmental impacts	Energy impacts: Btu/yr incremental	Energy impacts: Btu/yr total	Energy impacts: Impact on sensitive issues
High-efficiency ESP	99	552	119	none	5.4	9	none	1.5×10^{11}	3.6×10^{11}	none
Low-efficiency ESP	95	-484[a]	87	none	5.9	10	none	1.99×10^{11}	2.0×10^{11}	none
Venturi scrubber	90	–	106	none	18	14	-SO_2 removal -sludge disposal -water requirement	–	1.1×10^{8}	none
Tertiary cyclones	85	not evaluated			not evaluated			not evaluated		

[a]Favorable – cost benefit.

[b]Ground level concentration.

NOTE:

Finally, it must be noted that the values presented in this example were not based on established criteria of reasonableness and are used only to demonstrate one example of the BACT decisionmaking process.

C. AIR QUALITY ANALYSIS

C.1 INTRODUCTION

A key element of the PSD review process is the air quality analysis. Before a PSD permit can be granted, the applicant must demonstrate that neither a National Ambient Air Quality Standard (NAAQS) nor an allowable PSD increment will be violated as a result of the emissions from a new major source or major modification subject to the PSD requirements. An air quality analysis must be conducted for each regulated pollutant subject to PSD review that is expected to be emitted from, or whose emission is expected to significantly increase in conjunction with, proposed construction. Included are applicable pollutants for which national ambient air quality standards exist, known as criteria pollutants and other affected pollutants regulated by the Act, known as noncriteria pollutants. An air quality analysis is also required in certain cases involving insignificant pollutant emissions from sources located near Class I areas.

It should be stressed that, although literature is available that suggests methods of conducting an air quality analysis, no two analyses are identical. A new major source in a remote area may need a rather simple, straightforward air quality analysis, whereas a major modification in a highly industrialized area would require a much more complex analysis.

Because of the unique characteristics of each analysis, a quick solution that will ensure the analysis adequately demonstrates compliance with all standards and increments is not available.

However, by following the five basic steps in an air quality analysis, the requisite time and resources can be minimized. The five steps are:

1. Defining the impact area of the proposed major source or major modification for each applicable pollutant,

2. Establishing appropriate inventories of each applicable pollutant from all sources contributing to air quality in the impact area,

3. Determining existing ambient air concentrations of those pollutants,

4. Performing a screening analysis for each applicable pollutant, and

5. Determining projected air quality resulting from emissions of applicable pollutants.

Depending on the amounts and types of regulated pollutants subject to an air quality analysis, there may be as many as three separate but interrelated phases of the analysis. They are:

1. To perform an increment consumption analysis for proposed sulfur dioxide (SO_2) and particulate matter (PM) emissions, for comparison to allowable increments,

2. To determine existing air quality for all pollutants subject to the air quality analysis, and

3. To analyze projected future air quality for all applicable criteria pollutants and any applicable noncriteria pollutants that the reviewing authority determines should be evaluated. The purpose of this phase is to determine if there will exist any NAAQS violation or very high ambient concentration of noncriteria pollutants that may pose a threat to health or welfare.

C.1.1 Total Ambient Air Concentrations and Allowable PSD Increment Consumption

Before the air quality analysis can be studied in detail, the relationship between total ambient air concentrations and allowable PSD increment consumption should be understood. Since allowable increments exist only for SO_2 and total suspended particulates (TSP), this discussion is confined to those pollutants. Total ambient concentrations of these two pollutants consist of two components, baseline concentration and increment concentration.

Baseline concentration is the adjusted ambient concentration at a given location existing at the time after August 7, 1977 when the first complete PSD application is submitted by a proposed major source or major modification subject to EPA's PSD regulations as amended August 7, 1980. The adjustment to this ambient concentration compensates for the impacts of actual emission changes resulting from construction at major stationary sources commencing after January 6, 1975. The baseline concentration also includes projected emissions of major sources commencing construction before January 6, 1975 but not in operation as of the baseline date. Conversely, increment concentration is, in general, that portion of ambient air concentration in an area which results from:

1. Emission increases and decreases at major stationary sources resulting from construction that began after January 6, 1975, and

2. Emission increases and decreases at all stationary sources occurring after the baseline date. *

In general, increment consumption and expansion are based on actual emissions. However, if little or no operating data are available, as in the case of permitted emissions units not in operation at the time of the increment analysis, the allowable emission rate must be used. In addition, if allowable emissions are the result of a case-by-case new source review, the PSD applicant may presume, subject to the approval of

* includes major and minor sources, and non-construction activities at major sources
Also secondary emissions

the reviewing agency, that allowable emissions may be used to represent actual emissions.

Since total air quality is the sum of baseline and increment concentrations, knowing any two of these values will yield the third. However, to obtain a permit, the PSD applicant need only demonstrate that the proposed emissions in conjunction with other applicable emissions will not cause or contribute to violations of two values--the allowable increment and the national ambient air quality standards. Since both of these demonstrations can be made without knowing the baseline concentration, the need to determine baseline concentration is often not very important.

For SO_2 and PM, both increment and total ambient concentration standards exist for annual and 24-hour periods, as shown in Table C-1. In addition, a 3-hour allowable increment and an NAAQS exist for SO_2. The national ambient air quality standards are defined in terms of total ambient pollutant concentrations that are not to be exceeded more than once per year for other than an annual time period. Allowable increments are defined as maximum allowable increases in ambient air concentrations that are also not to be exceeded more than once per year for other than an annual time period.

As indicated in the PSD regulations, all PSD areas have been classified as either Class I, Class II, or Class III areas, and different allowable increments of SO_2 and PM concentrations have been established for each type of area. As Table C-2 shows, the most restrictive allowable increments are for Class I areas, which are certain international and national parks

Table C-1. ALLOWABLE CONCENTRATIONS FOR SO_2 AND PM ($\mu g/m^3$)

Pollutant/time period	Controlling NAAQS	Class II Increment
Total Suspended Particulate Matter		
• annual	75	19
• 24-hour	150[a]	37[a]
Sulfur Dioxide		
• annual	80	20
• 24-hour	365[a]	91[a]
• 3-hour	1,300[a]	512[a]

[a]Not to be exceeded more than once a year.

Table C-2. ALLOWABLE PSD INCREMENTS
($\mu g/m^3$)

	Class I	Class II	Class III
Sulfur Dioxide			
• annual	2	20	40
• 24-hour	5[a]	91[a]	182[a]
• 3-hour	25[a]	512[a]	700[a]
Total Suspended Particulate Matter			
• annual	5	19	37
• 24-hour	10[a]	37[a]	75[a]

[a]Not to be exceeded more than once a year.

and wilderness areas. All other PSD areas have initially been designated as Class II areas. Under certain conditions and with the concurrence of its Governor and legislature, a State can designate a Class II area as Class III and thereby allow greater potential for industrial growth. Under no circumstances can air quality deteriorate beyond levels allowed by the national ambient air quality standards, regardless of the area's compliance status with applicable increments. An example is a Class II area for which the annual SO_2 baseline concentration is determined to be 70 micrograms per cubic meter. Even though the allowable PSD increment permits the annual SO_2 concentration to increase by 20 micrograms per cubic meter, a PSD applicant must demonstrate that, as a result of operation of the new major source or modification, the SO_2 concentration in that area will not increase beyond the NAAQS of 80 micrograms per cubic meter, an increase of only 10. On the other hand, if the annual SO_2 baseline concentration in the area is only 40 micrograms per cubic meter, the PSD applicant must demonstrate that SO_2 air quality will not deteriorate beyond 60 micrograms per cubic meter in that area. In the latter case, demonstration of compliance with the allowable PSD increments also demonstrates that the NAAQS for annual SO_2 concentration will not be violated.

C.1.2 Establishing the Baseline Area

As previously mentioned, the baseline concentration is established in an area for a given pollutant as of the date after August 7, 1977 on which a complete PSD application that is subject to the 1980 amended PSD regulations is submitted. The baseline date is established for a given pollutant only if the increase in emissions of that pollutant is significant. For instance, a PSD application for a new major source or modification that proposes significant SO_2 emissions but insignificant PM emissions will trigger the establishment of the SO_2 baseline date only. Therefore, the baseline dates for SO_2 and total suspended PM may be different in the same area.

The area in which the baseline date is triggered by a PSD permit application is known as the baseline area. The extent of a baseline area is confined to intrastate areas and the area or areas designated as attainment or unclassified under Section 107 of the Act in which the proposed major source or major modification is located or will have a significant impact. This baseline area includes all portions of any Section 107 area that the source emissions affect. For this purpose, such an impact is defined as at least a 1-microgram-per-cubic-meter annual increase in ambient concentrations of the applicable pollutant. Under Section 107 of the Act, all areas of the country have been given either an attainment, a nonattainment, or an unclassified designation for each criteria pollutant.

The following example, illustrated in Figure C-1, demonstrates the baseline concept. A new major source with significant SO_2 emissions proposes to locate in County C and submits a complete PSD application to the appropriate review agency on October 6, 1978. A review of the SO_2 attainment designations reveals that attainment status is listed by individual counties in the State. Since County C is designated attainment for SO_2 and the source proposes to locate there, the baseline date for SO_2 is therefore triggered for all portions of that county. Dispersion

107 areas can be AQCRs, counties or states, e.g.

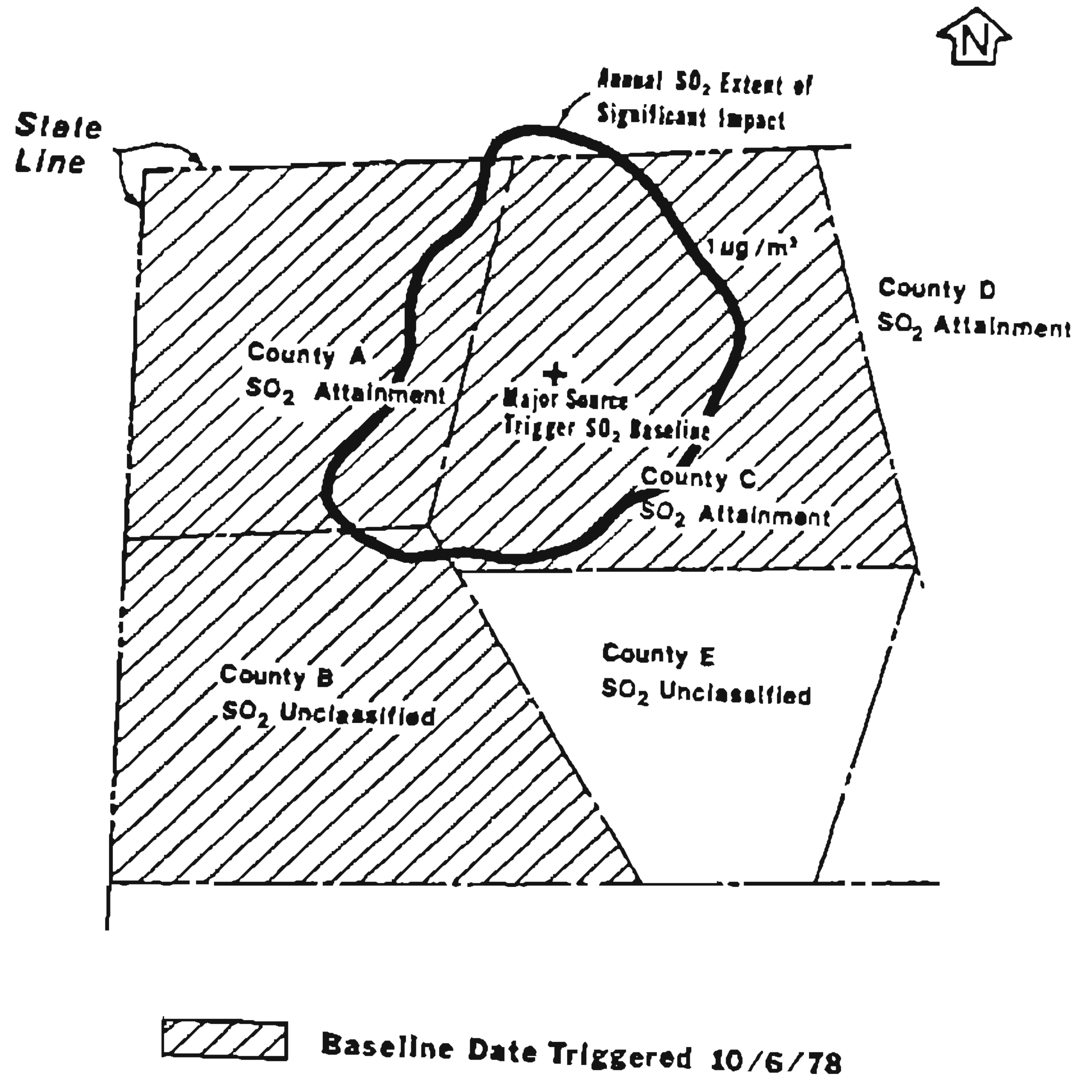


Figure C-1. Baseline area: Example I.

modeling of proposed SO_2 emissions in accordance with approved methods reveals that the annual SO_2 impact area of the proposed source extends into Counties A and B. The baseline date in all parts of these two counties also is triggered on this date. Although SO_2 increment will be consumed in the State to the north by the proposed emissions, the baseline date remains untriggered unless it has been previously triggered by a PSD permit application in that Section 107 area of the other State. Note that increment-consuming emissions affect the increment concentration at all places where they have an ambient impact regardless of the baseline date, including out-of-state areas.

Most emissions changes that will affect increment will occur at major stationary sources; therefore, the most significant date to consider for increment tracking is January 6, 1975, the date after which emissions resulting from construction at major stationary sources affect the increment. Once triggered, the baseline date establishes the time after which all other emissions changes at stationary sources affect the increment. However, a State may propose and be granted the approval to redesignate the boundaries of a Section 107 area. This action may "untrigger" the baseline and thus reduce the inventory of emissions in the redesignated area that affects increment. For instance, as shown in Figure C-2, part of County A has been redesignated a separate Section 107 area after the baseline date had been triggered. If the baseline date has not been established by another PSD application in the redesignated portion of the area, the SO_2 emissions changes occurring after October 6, 1978 from minor and area sources and nonconstruction-related activities at all sources in this area will be transferred into the

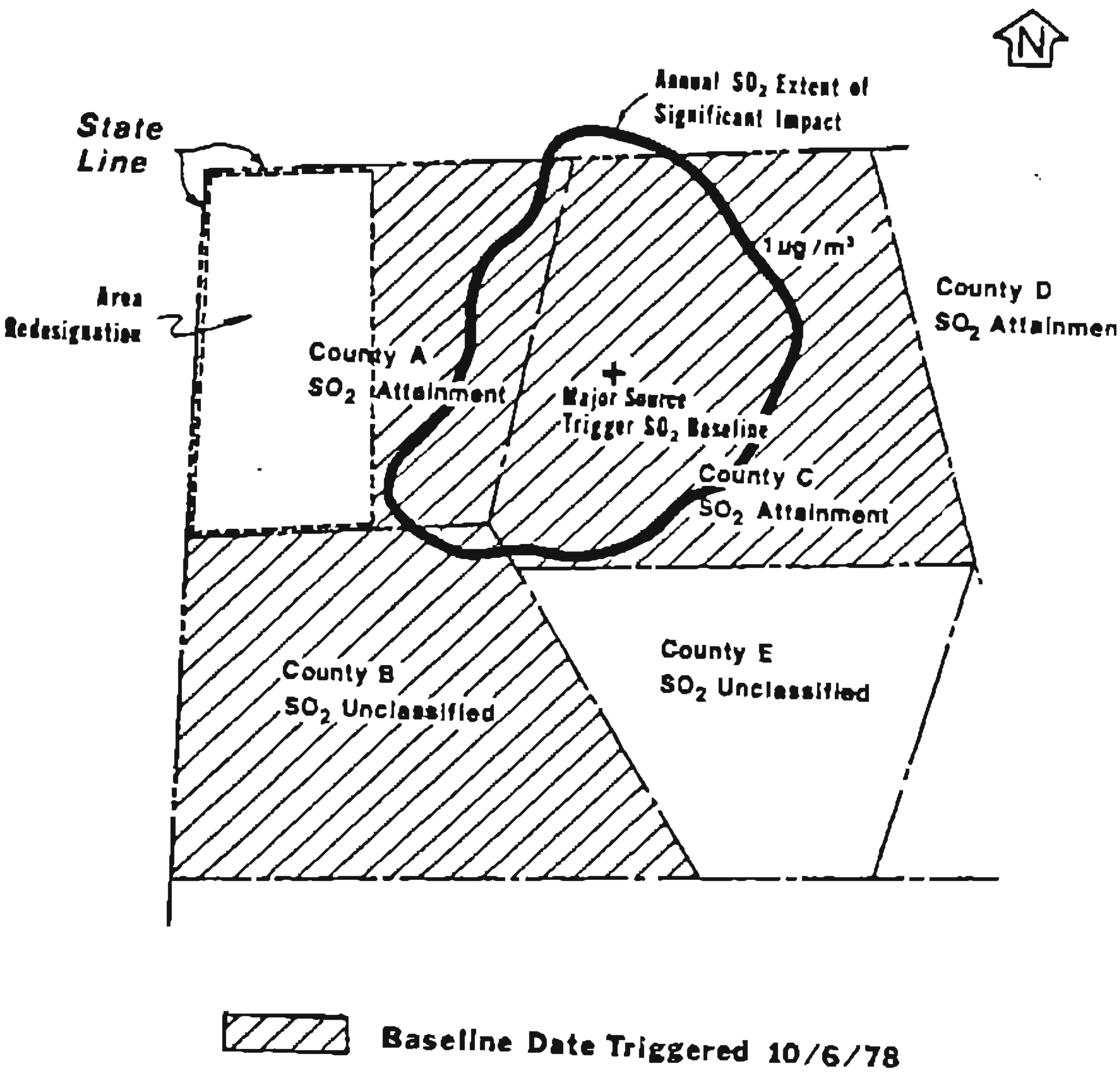


Figure C-2. Baseline area: Example II.

baseline concentration. In no event can any boundary of the redesignated area intersect the line around the annual impact area of the source triggering the baseline date.

C.2 ESTABLISHING THE IMPACT AREA

The previous example demonstrated the effect of the annual impact area of a PSD source triggering the baseline date. For all sources and modifications subject to PSD review, impact areas of applicable pollutants should also be established, but for another reason. They should be determined where the proposed emissions will have significant ambient concentrations in order to determine compliance with applicable ambient air standards and increments. The impact area should be established for each applicable pollutant for each averaging time for which an NAAQS exists. As shown in Figure C-3, the impact area is a circular area whose radius is equal to the greatest distance from the source to which approved dispersion modeling shows the proposed emissions will have a significant impact. Table C-3 gives the values of significant ambient air impacts.

Before continuing with impact area determination, the design heights of stacks proposed to be constructed or to otherwise be used to emit pollutants subject to the air quality analysis should be discussed. On January 12, 1979, EPA proposed a good engineering practice stack height rule, commonly known as GEP, which imposes limitations on the use of excessively high stacks. Included in the proposed rule and its technical criteria document are specific equations and methods to be used in determining GEP stack heights. Unless the applicant can demonstrate by acceptable methods that the stack or stacks must be constructed at a

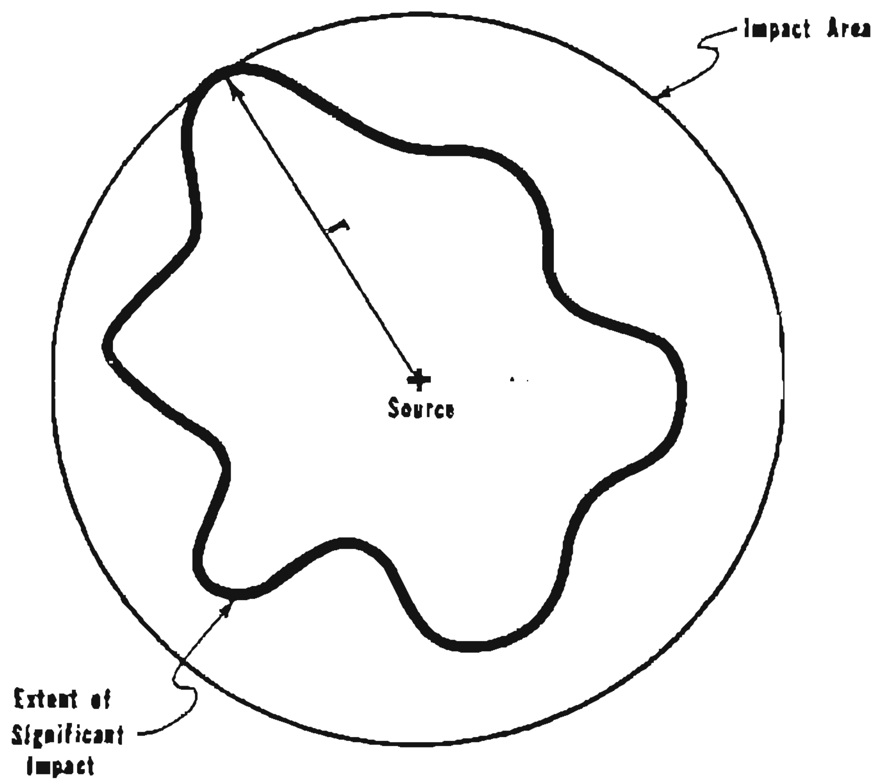


Figure C-3. Impact area.

Table C-3. SIGNIFICANCE LEVELS FOR AIR QUALITY IMPACTS

Pollutant	Averaging time				
	Annual, μg/m³	24-hour, μg/m³	8-hour, mg/m³	3-hour, μg/m³	1-hour, mg/m³
SO_2	1	5	–	25	–
TSP	1	5	–	–	–
NO_2	1	–	–	–	–
CO	–	–	0.5	–	2

height that exceeds the height determined by the GEP formula, dispersion modeling must be performed at the actual or GEP stack height, whichever is lower. If a source proposes increasing existing stacks in conjunction with a proposed modification, it may have to demonstrate through acceptable methods (fluid modeling or field studies) that the additional height is required in order to avoid excessive concentrations due to downwash. If, on the other hand, the actual stack height is significantly less than the GEP height, excessively high concentrations may result from downwash. In such a case, the applicant should demonstrate in the dispersion modeling that no violations of any increment or national ambient air quality standards will result from downwash. The Huber-Snyder downwash calculation method incorporated into some dispersion models is an acceptable technique. Further revisions of the proposed GEP rule must be followed, where applicable.

To properly establish the impact area, the PSD applicant should consult the review agency dispersion modeling contact to receive concurrence on (1) selection of an appropriate dispersion model, (2) use of adequate and representative meteorological data, and (3) techniques and assumptions to be used in the analysis.

The latest revisions of the EPA documents Guideline on Air Quality Models and the Guidelines for Air Quality Maintenance Planning and Analysis, Volume 10 serve as helpful guidelines for acceptable dispersion modeling procedures. However, since no two scenarios are identical, it is the PSD applicant's responsibility to receive review agency approval for methods and procedures to be used in performing dispersion modeling. Also, to avoid confusion, the applicant is encouraged to submit a dispersion modeling plan to the review agency for comment and concurrence before conducting detailed analyses. Failure to do so may result in use of improper or unacceptable techniques and may lead to serious delays and wasted resources. The dispersion modeling plan should include at least the following information:

- Nature of proposed construction,
- Pollutants to be modeled,
- Site characteristics,
- Topography within 50 kilometers of site,
- Proposed dispersion model and meteorological data,
- Proposed use of dispersion model options, and
- Emissions data.

Determination of the impact area of proposed construction must include all direct emissions including both stack and quantifiable fugitive emissions of applicable pollutants. However, temporary emissions, such as those related to construction, need not be considered.

The dispersion model input emission data should be based on the worst-case condition for the time period of concern. The worst-case condition is generally the maximum emission rate. However, depending on operating and stack characteristics, the worst-case condition may not be represented by the maximum emission rate; a simple hand calculation and spot check can usually determine if it is.

The actual, measured meteorological data, if used, should be obtained from either site-specific meteorological monitoring or the National Weather Service station closest to the site. If onsite data are used, the selected period should be demonstrated to be typical of the area.

If, for example, a chosen period indicates abnormally high amounts of rainfall, the period may not be typical. If National Weather Service information is used, 5 years of meteorological data will generally be required for input into dispersion models.

C.3 ESTABLISHING THE EMISSIONS INVENTORIES

Generally, the applicant must compile an emissions inventory of applicable criteria pollutants that have been demonstrated, as in the previous step, to result in significant impacts. In addition, an inventory of applicable noncriteria pollutants may be required to determine * if high concentrations of these pollutants exist or will exist that may pose a threat to health or welfare. If preliminary dispersion modeling demonstrates that proposed emissions of a criteria pollutant will have no significant impacts, further air quality analysis of that pollutant will generally not be required, unless the source is located near a Class I area. In such a case, an air quality analysis of the pollutant may be required if the proposed emissions are expected to exceed 1 microgram per cubic meter on a 24-hour basis in the Class I area.

Depending on the specific pollutant predicted to result in a significant impact, three inventories of emissions may have to be established:

1. An inventory of increment-consuming PM or SO_2 emissions.
2. An inventory of all existing emissions of applicable pollutants having an effect on air quality in the impact area of the proposed emissions.
3. An emissions inventory of applicable pollutants from permitted emissions units not yet operating that may have an effect on air quality in the impact area.

* Can use threshold level values (TLV.) or other standards for guidance.

If an air quality analysis is required for PM and SO_2 emissions, and both pollutants are predicted to have significant impacts, an increment inventory should consist of all PM and SO_2 increment-consuming emissions within the impact area and those emissions outside the impact area that may have a significant impact within the impact area. Thus a PSD applicant may have to consider large sources as much away as 50 kilometers outside his or her other impact area for increment-consuming emissions. Generally, on a short-term basis, such as a 24-hour or a 3-hour period, the PSD applicant need only identify those increment-consuming emissions within the respective impact area. However, for annual impact determinations, large emission sources located as far as 50 kilometers from the impact area may have impacts within the applicant's impact area.

As shown in Figure C-4, the annular ring outside the impact area is called the screening area. In determining which emissions sources in the screening area should be added to the emissions inventory, the applicant should consider three criteria: (1) annual emissions of the source, (2) degree of ambient impact, and (3) distance from the impact area. For example, a 100-ton-per-year source located 10 kilometers from the impact area generally can be excluded from the inventory because its effect on air quality in the impact area is expected to be insignificant. However, a 10,000-ton-per-year source located 40 kilometers from the impact area would probably have to be accounted for in the increment analysis. A simple screening model technique can be used to justify the exclusion of certain emissions from this analysis. Such exclusions should be justified and documented.

After identifying the emissions units to be included in the emissions inventory, the emission rates must be determined for input into the

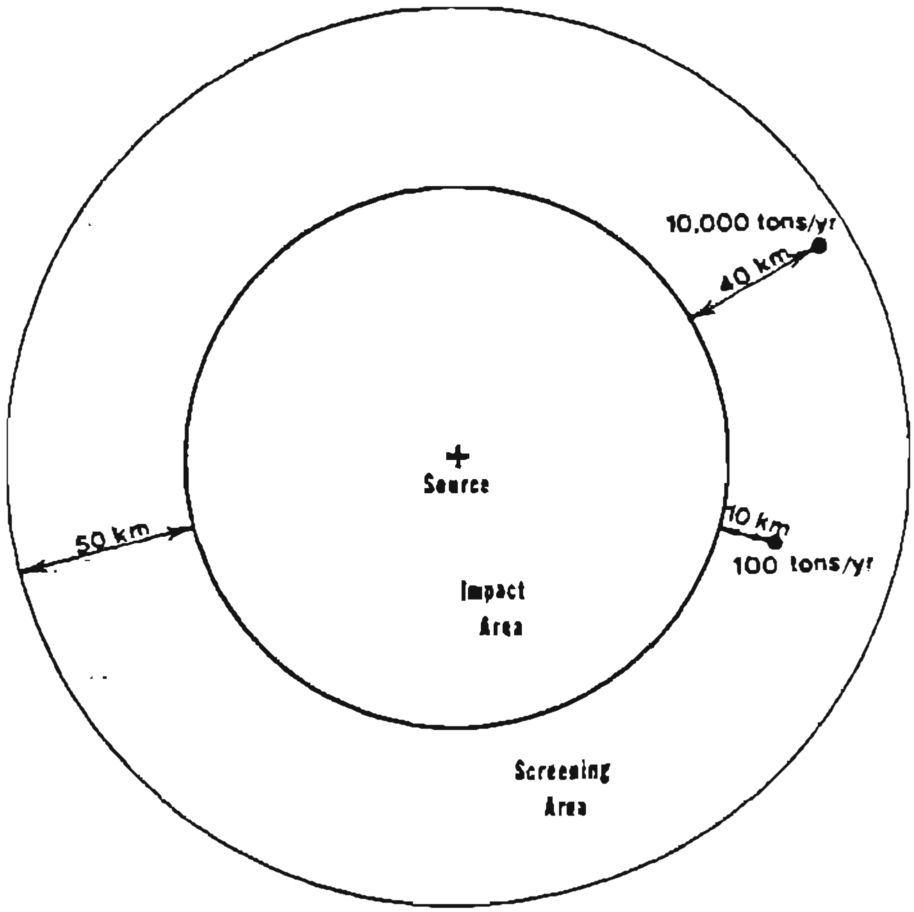


Figure C-4. Emissions inventory screening area.

proper dispersion model. Although allowable PSD increment consumption is based on actual emissions, the first attempt at performing the increment analysis should be based on allowable emissions. There are two reasons for this:

1. Allowable emissions rates are more readily available from State emission files, and
2. The resulting analysis will be more conservative.

State air emission files are the proper source of emissions information. If dispersion modeling with allowable emissions cannot demonstrate compliance with allowable PSD increment consumption, the applicant should then obtain actual emissions data. This information must be thoroughly documented and may be obtained through discussions with State agency personnel and source contacts.

Emissions inventories for the last two categories are for the purpose of demonstrating compliance with the applicable NAAQS and should be gathered and compiled in a similar manner to the increment emissions inventory. For existing sources, this inventory should be based on actual emissions if data are available. Actual emissions should be used in this case to reflect the impact that would be detected by ambient air monitors. In the case of permitted emissions units not yet operating, the only alternative is to use the allowable emission rate.

C.4 DETERMINING EXISTING AMBIENT CONCENTRATIONS

Perhaps one of the most critical aspects of PSD review is the requirement for the source owner to provide up to 1 year of preconstruction monitoring data. This requirement applies to all applicable criteria pollutants (with the exception of nonmethane hydrocarbons) that the source would emit in significant amounts, although it may apply to some noncriteria pollutants as well. Generally, continuous ambient air monitoring data will be required for all criteria pollutants for which there will be a significant increase in emissions. If, however, predicted impacts or existing air quality in the source's impact area are less than the values indicated in paragraph (i) of the PSD regulations, then, at the Administrator's discretion, site-specific monitoring may not be required. Therefore, the first step in determining monitoring requirements is to estimate source impacts on the air quality and to determine the total existing air quality in the area.

A PSD applicant can satisfy the monitoring requirement in two ways. First, under certain conditions, the applicant may rely on existing continuous monitoring data collected by Federal, State, or local air pollution control agencies. Secondly, the applicant may conduct site-specific monitoring for those pollutants that the proposed source would emit in significant amounts. EPA has published specific guidelines for a PSD applicant in the latest revision of Ambient Monitoring Guidelines for Prevention of Significant Deterioration. Meteorological monitoring is generally required when conducting site-specific monitoring and should be used in the subsequent dispersion modeling analysis.

Before using existing data, the applicant must first verify that the data meet certain criteria. These criteria are (1) data sufficiency or completeness, (2) data representativeness, and (3) data reliability. Although State and local agencies have generally monitored ambient air quality for several years, all the data collected are not adequate for the preconstruction analysis required under PSD. The ambient monitoring guidelines and the PSD review agency should be consulted for the minimum requirements on the usefulness of the data.

In a case in which site-specific monitoring is required of an applicant, the requirements focus on site selection and quality assurance. The site selection process involves dispersion modeling analyses of existing sources and of the proposed emissions to determine the most appropriate areas within the impact area of the proposed emissions to locate ambient air monitors. The applicant should reach agreement with the permit-granting authority on the number and locations of the monitors before monitoring operations are begun.

The primary requirement in conducting site-specific monitoring is that the owner or operator of the proposed source meet the quality assurance requirements of Appendix B to 40 CFR Part 58 during the operation of monitoring stations. Appendix B requires that the quality control program developed by the organization operating the monitoring network be described in detail, be suitably documented, and be approved by the permit-granting authority.

Long before a monitoring program begins, the PSD applicant should submit a monitoring plan to the permit-granting authority for comment and approval. The monitoring plan should include, at a minimum, a discussion of the following items: (1) the network description, (2) monitor site description, (3) monitor description, (4) sampling program description, and (5) quality assurance program. EPA's guidelines on PSD monitoring describe these requirements in greater detail.

Having collected and screened the data, the applicant should integrate the results of the monitoring into the air quality analysis. The amount of data and manner of presentation in the application depend on the requirements of the permit-granting authority. At a minimum, the data should be presented in a summary format showing highest and highest, second highest concentrations for pollutants with short-term standards and the appropriate long-term average associated with each standard. These concentrations effectively describe the existing ambient concentrations within the impact area attributable to actual emissions from existing sources.

In many cases, monitoring data may require adjustment to compensate for new emissions permitted in the impact area but not occurring during the monitoring period. The emissions inventory used for adjusting the monitoring data should be gathered as previously described and should be used to adjust the monitoring data by proper dispersion modeling procedures.

C.5 PERFORMING THE SCREENING ANALYSIS

As discussed in the Guideline on Air Quality Models, a screening modeling analysis is recommended before a refined analysis is conducted. The screening analysis will primarily provide the PSD applicant with these essential data:

1. An approximation of the maximum downwind impacts,
2. A general idea of the location of the maximum impacts, and
3. Quick preliminary results.

As in the impact area determination, both quantifiable fugitive emissions and stack emissions should be included in the screening analysis. In addition, if secondary emissions are quantifiable and are expected to affect the air quality in the impact area, they should also be included in the screening analysis.

The applicant must remember that the same GEP stack height criteria mentioned earlier also apply in the screening analysis and in any refined dispersion modeling analysis.

If the results of the screening analysis indicate that any increment or standard may be threatened, a refined dispersion modeling analysis should be conducted. A refined analysis must be conducted when screening results indicate total increment will be consumed or that total projected air quality will exceed 100 percent of its respective standard. However, if results do not exceed this 100-percent value, then these values may be used, subject to approval by the reviewing agency, to represent a conservative projection of total air quality and increment consumption.

C.6 DETERMINING PROJECTED AIR QUALITY

If, however, a refined analysis is required, the procedures described in the Guideline on Air Quality Models and the Guideline for Air Quality Maintenance Planning and Analyses, Volume 10 should be strictly followed. The applicant is advised to work closely with the review agency modeling contact during this process.

The refined dispersion modeling analysis will use the emissions inventory and all other data gathered up through the screening analysis. Many techniques and assumptions are available to assist the PSD applicants in the refined analysis. However, before performing elaborate and expensive tasks, the applicant is advised to secure the approval of the appropriate review agency modeling contact before assuming his or her techniques are valid for the particular case.

C.7 OTHER MODELING CONSIDERATIONS

In many cases, special considerations may arise that require particular attention. Such considerations include use of an alternative dispersion model that may be more appropriate for a specific analysis, for performing a dispersion modeling analysis in complex terrain, or for modeling nonpoint sources of emissions. Again, the PSD applicant is advised to work closely with the review agency modeling contact. If a modeling plan is to be submitted, these issues and proposed alternatives should be highlighted and discussed in the plan.

C.8 AIR QUALITY ANALYSIS EXAMPLE

All applications for a PSD permit subject to the requirements of the air quality impact analysis must include complete and accurate analyses to ensure compliance with the national ambient air quality standards and the PSD increments. To demonstrate compliance, the applicant should:

1. Define the impact area,
2. Compile an emissions inventory,
3. Determine existing air quality,
4. Perform a screening analysis, and
5. Determine the projected air quality.

This subsection applies those procedures to a hypothetical situation. The presentation of an example is difficult, because no two analyses are alike. An example that covers all possible modeling scenarios is impossible to present; however, in this example, several significant elements of the air quality analysis will be analyzed.

In the applicability example, an applicant proposed the construction of a new coal-fired, steam electric-generating station. This example is now extended to include the air quality analysis that might be conducted by the applicant. The coal-fired station is a new major source with significant emissions of SO_2, PM, nitrogen oxide (NO_x), and carbon monoxide (CO). An air quality impact analysis must be prepared for each of these pollutants, as indicated in the applicability example. In the analysis, concentrations for all four pollutants will be examined with respect to the NAAQS. The PSD increments for TSP and SO_2 will also be considered.

C.8.1 Definition of Impact Area

The first step in the analysis is to establish the impact areas for each pollutant. As a conservative approach, these can be defined as a circular area whose radius is equal to the greatest distance to which approved dispersion modeling shows the proposed emissions will have a significant impact. An impact area is predicted for each averaging period for each pollutant and the largest impact area for a given pollutant is selected as the impact area to be used in the air quality analysis. The modeling procedures used were determined to be in accordance with the procedures described in the Guideline on Air Quality Models and have been reviewed in advance by the appropriate modeling contact.

Several emissions units at the source will emit pollutants subject to the air quality analysis. First, of course, are the two main boilers that emit PM, SO_2, NO_x, and CO. A standby auxiliary boiler will also emit these pollutants, but only when the main boilers are not operating.

PM will also be emitted from coal-handling operations and from the limestone preparation process for the flue gas desulfurization (FGD) system. Emissions units associated with coal and limestone handling include:

- Point sources--the coal car dump, the fly ash silos, and the three coal baghouse collectors;
- Area sources--the active and the inactive coal storage piles and the limestone storage pile; and
- Line sources--the coal and limestone conveying operation.

Emissions units to be included in the impact area determination include the allowable emissions at the boiler stacks and fugitive emissions of PM associated with the power plant.

The results of the impact area analysis indicated that significant ambient impacts of NO_x and SO_2 extend to 32 and 50 kilometers, respectively. An impact area did not exist for CO because concentrations at all locations off the property were insignificant. Becaue of this, no further CO analysis was required. PM emissions caused a 2.2-kilometer impact area predominantly due to fugitive emissions.

Fugitive emissions from the adjacent mine are not considered in the impact area determination because they are considered secondary emissions; they must, however, be considered in the increment and NAAQS analysis.

C.8.2 Establishing an Emissions Inventory

With the impact area analysis complete, the applicant proceeded to establish three emissions inventories. The first was an inventory of existing sources that contributed to existing ambient air quality as measured by the continuous monitoring data collected for the air quality review. Dispersion modeling of this inventory was used to demonstrate that the continuous monitors were properly located. Source and emissions data for this inventory were extracted from State air permit and emissions inventory files.

The second inventory would have included those sources that were permitted to operate, but were not operational when the monitoring data were collected. However, no such sources were identified. Therefore, an inventory need not be established to correct the ambient monitoring data.

The third required inventory is the inventory of emissions that affect increment. It includes all increment emissions from sources within the impact area and those from sources outside the impact area that have been demonstrated to significantly affect the impact area. The establishment of the increment inventory requires that the baseline date be determined.

In this area of the State, SO_2 and TSP attainment status designations are listed by individual counties. Four counties are covered by the area within 100 kilometers of the proposed power plant, as shown in Figure C-5. A review of PSD application information revealed that the baseline dates for both SO_2 and TSP had been established in Counties A and B on November 2, 1977. However, the baseline date had not been previously established in Counties C and D. Therefore, in compiling the increment inventory, PM and SO_2 emissions occurring at minor and area sources located in Counties C and D were not considered. Similarly, emissions changes resulting from nonconstruction-related activities at major sources in these counties were also ignored. However, the State air permit and emission inventory files were searched for these types

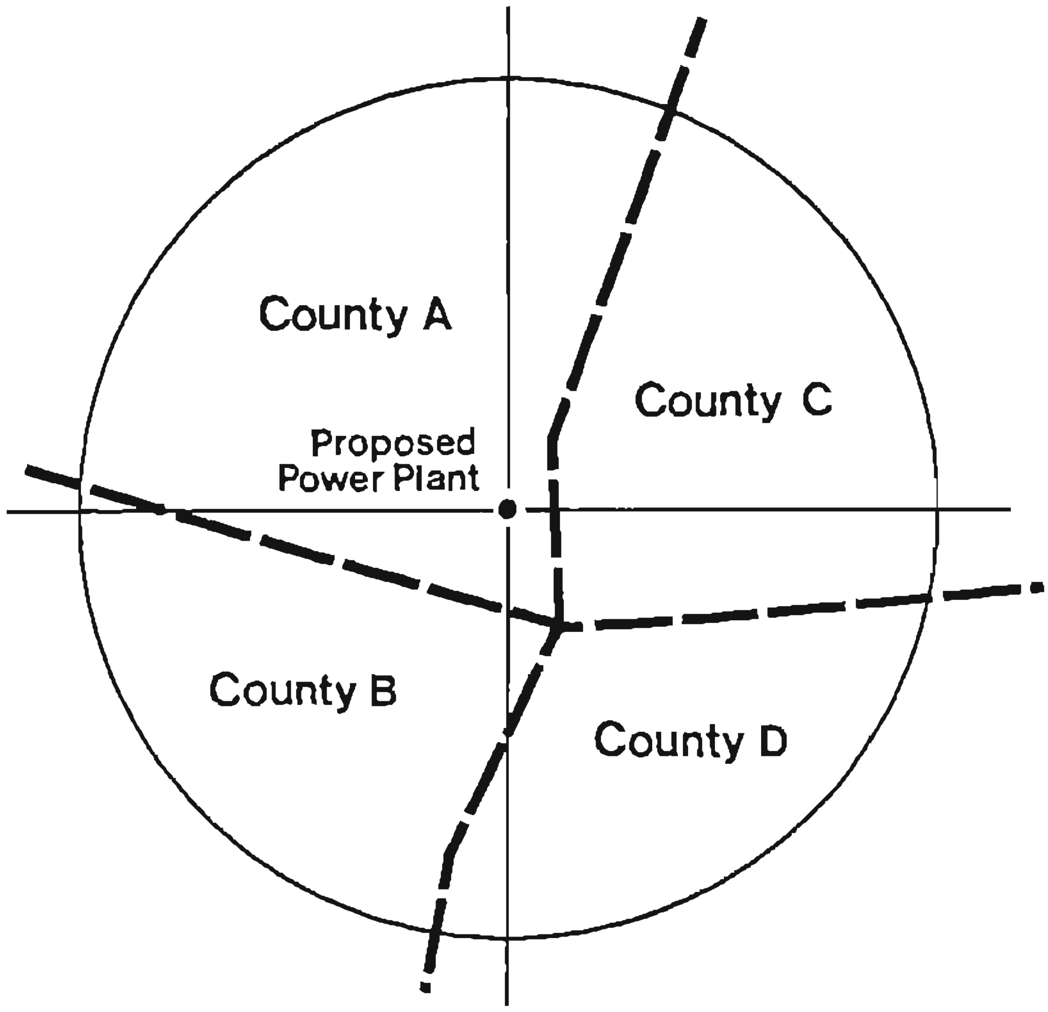


Figure C-5. Counties within 100 kilometers of proposed power plant.

of emissions changes in Counties A and B. No such emission changes were determined to have occurred since November 2, 1977. Regardless of baseline date, the increment inventory for SO_2 and PM included emissions changes at major sources resulting from construction commencing after January 6, 1975. The State and Federal air permit files were searched for sources in the latter category. The following sources were found: the associate lignite mine, Refinery A, Chemical Plant B, Petrochemical Complex C, Rock Crusher D, and Refinery E.

Additionally, a Portland cement plant, Plant F, lies just outside the SO_2 impact area about 70 kilometers northwest of the source. The only other source in the TSP impact area is the proposed lignite mine. A plot of these sources is shown in Figure C-6.

C.8.3 Establishing Existing Air Quality

The next step in the air quality analysis is to determine the existing air quality for applicable pollutants, which, in this example, are SO_2, NO_x, and PM. CO was eliminated from consideration because ambient impacts from the proposed source will be less than the monitoring significance level of 575 micrograms per cubic meter on an 8-hour average. An exemption from the monitoring requirement for CO was granted by the review agency. The other pollutant impacts and estimated existing ambient concentrations were above monitoring significance levels.

Before undertaking a site-specific monitoring program, the applicant first evaluated the use of existing continuous monitoring data collected by the State. For this example, the applicant contacted the State agency and found that the State operated a continuous monitoring station

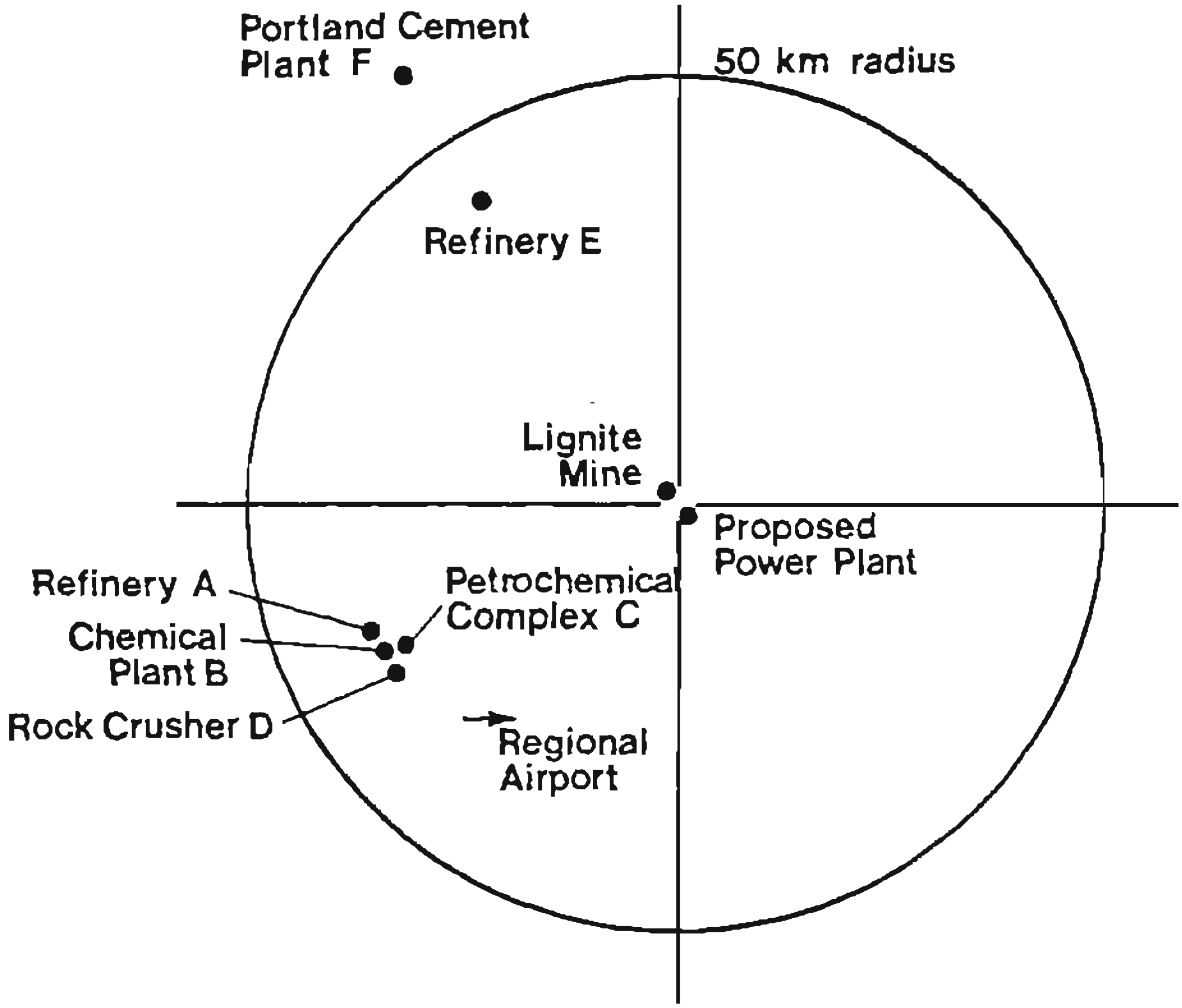


Figure C-6. Geographic location of sources.

near the regional airport. The station had been deployed 2 years before to measure the combined impacts from the sources located in the southwest quadrant of the proposed power plant's impact area. It was now to be demonstrated that the data met the criteria for (1) data sufficiency, (2) data representativeness, and (3) data reliability. An initial review of the data obtained from the State agency's data files revealed that continuous data were available for the preceding 2 years for all criteria pollutants.

The analysis of the data was conducted in accordance with procedures outlined in Ambient Monitoring Guidelines for Prevention of Significant Deterioration. The data sufficiency was established with an analysis of the extent of data capture. A modeling analysis using methods outlined in the Guideline on Air Quality Models was performed to show that the monitor was properly located to measure peak concentrations in the source impact area; it was therefore determined that the data represented the locations where maxima would occur.

Conversations with the State agency's monitoring representative revealed that measurements for all criteria pollutants were conducted using EPA reference or equivalent methods and that the State's quality assurance program exceeded the minimum quality assurance requirements of Appendix B 40 CFR Part 58. Review of the results from independent audits performed on each of the monitors revealed that the accuracy for all analyzers was within acceptable limits. Therefore, the data were felt to be a reliable and accurate representation of existing air quality levels.

In summary, the data collected by the State agency near the regional airport were evaluated for data sufficiency, representativeness, and reliability. The analysis of the data with respect to each of the preceding criteria indicated that the data were appropriate for inclusion in the air quality analysis, thus satisfying the PSD preconstruction monitoring requirement. The data further indicated that air quality levels within the power plant's impact area were well within the applicable NAAQS for all averaging times.

As previously mentioned, it was found that no sources had commenced construction or operation since the monitoring data collection for the preceding year began. Therefore, the monitored air quality levels were established as representing existing air quality in the impact areas of the proposed source. As shown in Table C-4, demonstration of compliance with the increments for TSP and SO_2 will ensure compliance with the respective NAAQS. The 24-hour TSP concentration is considered as an example. Based on the conservative assumption that all of the 24-hour TSP increment is available, the total possible future TSP air quality level could reach only 146 micrograms per cubic meter if no violations of the TSP increment occur. Similarly, for each averaging time for TSP and SO_2, the same rationale can be used. This is a conservative analysis, because undoubtedly some of the increment-consuming sources were measured by the continuous monitors. As a result of the simplification, only the following analyses require completion:

1. the SO_2 increment analysis,
2. the TSP increment analysis, and
3. the nitrogen dioxide (NO_2) total air quality analysis.

Table C-4. CONSERVATIVE DEMONSTRATION OF COMPLIANCE WITH NAAQS ($\mu g/m^3$)

	Existing air quality	Allowable increment	Total possible air quality	NAAQS
TSP				
• 24-hour	109	37	146	150
• annual	49	19	68	75
SO_2				
• 3-hour	358	512	870	1,300
• 24-hour	99	91	190	365
• annual	14	20	34	80

The required increment analysis consisted of modeling the impacts from the proposed sources together with impacts from the other six existing increment-consuming sources. For convenience, the allowable emissions of these six sources were initially assumed to represent actual emissions.

C.8.4 Screening Analysis

A screening analysis was not performed because experience has shown that a refined analysis will generally be required for a modeling situation involving large power plants such as this one. Therefore, the applicant proceeded directly to the refined analysis.

C.8.5 Model Air Quality and Increment Consumption

Once the impact area is defined, the inventory is established, and existing air quality data are gathered, the modeling analyses may begin. Steps in the modeling process include:

1. Selection of appropriate models,
2. Selection of meteorology,
3. Selection of critical meteorology,
4. Consideration of stack heights with respect to good engineering practice, and
5. Analysis of fugitive emissions.

The area within 3 kilometers of the proposed source was determined to be a rural area based upon a land-use study. For the short-term SO_2 modeling analyses, an appropriate model was selected based upon recommendations in the Guideline on Air Quality Models. It can be used to model short-term concentrations of SO_2 in a multiple-source rural environment.

Next, the meteorological data inputs to the model were collected. Because no onsite meteorological data were available, data from the nearest National Weather Service station (located at the regional airport) were gathered. Five years of hourly observations from 1975 to 1979 were used.

The auxiliary boiler was eliminated from further modeling considerations because it would not be permitted to operate when either of the main boilers were at sufficient load to provide plant steam requirements. A single-source model run for this emissions unit showed that its maximum ground-level impacts were insignificant so that it could not possibly contribute to violations of any air quality standard.

The next step was to perform the actual modeling for SO_2 emissions. As a conservative first attempt, the allowable emissions of all sources were modeled. Screening for critical meteorology and areas of expected peak concentrations was performed in accordance with the procedures outlined in the Guideline on Air Quality Models. The modeling was then repeated with a dense receptor grid with spacing of 100 meters in the areas where maximum concentrations were expected, as indicated from the results of the screening analysis.

A review of the results shows that, in the case of peak concentrations downwind of the southwest source conglomeration, the allowable SO_2 increment will be exceeded by 7 micrograms per cubic meter during the critical 24-hour averaging period. The violation includes significant impacts from the proposed power plant. Further analysis revealed that the chemical plant in the southwest quadrant was the major contributor to the receptors where it was predicted that the increment would be exceeded.

As a result of the predicted SO_2 violation, the permit may be denied. At this point, there are two options available to the power plant. First, additional controls beyond the level of control proposed as best available control technology (BACT) can be applied to decrease the size of the source impact area so that the increment violation is no longer in the impact area.

Secondly, actual emissions can be determined at the southwest source conglomerate. If there is a significant difference between actual and allowable emissions, modeling can then be performed using the actual rather than the allowable emissions. For this example, the power plant chose the latter option. Representatives of the proposed power plant contacted the State air pollution authorities as well as representatives of the industries in the southwest conglomeration. Inquiries revealed that the boiler at the chemical plant was permitted to burn oil with a sulfur content of 0.7 percent. It was further discovered that the boiler has burned natural gas rather than oil since 1977, when a dependable natural gas supply was secured. This was substantiated by the annual emission reports on file with the State air pollution agency. The actual emissions at the chemical plant based upon the use of natural gas during the preceding 2 years revealed a substantial difference between actual and allowable emissions. The applicant then modeled actual emissions at the chemical plant and allowable emissions for the refineries and the proposed power plant. Modeling was repeated for the critical periods.

The revised modeling demonstrated compliance with the allowable increment, and, therefore, no further short-term SO_2 modeling was required.

* If refinery goes back to oil (can do so because permitted), will be an [illegible] violation. [illegible] put in PSD permit conditions if refinery goes back to oil, power plant reduce capacity, e.g. Be very careful with actual emissions.

The maximum predicted SO_2 increment concentrations were 72 and 302 for the 24- and 3-hour averages, respectively.

The same SO_2 emissions data were used for input to the appropriate dispersion model for prediction of annual ambient SO_2 impacts. NO_x will be emitted from the same stacks as SO_2 emissions, and the proposed allowable emissions of both pollutants are identical. Making the conservative assumption that all NO_x will be emitted as NO_2, then the impacts of these pollutants were assumed to be identical. Because the proposed source is located in a predominantly rural area, a multiple-source rural model was selected.

A conservative first analysis was begun using the allowable emissions from the short-term analysis. The meteorology referred to earlier was also used. The results show no violations of any annual standard.

C.8.6 Particulate Matter

With the NO_2 and SO_2 analyses complete, the only remaining analysis required is the demonstration of compliance with the TSP increments and the NAAQS. Note that fugitive PM emissions from the lignite mine, although considered secondary, must be considered in evaluating the total air quality and the impact on allowable TSP increment. As indicated previously, compliance with the TSP increments will ensure compliance with the NAAQS. Therefore, the emissions units associated with the source include the two main boilers, fugitive emissions at the power plant, and the lignite mine. A multiple-source rural model was selected from the Guideline on Air Quality Models that adequately predicts the effects of fugitive emissions in addition to those of the point sources.

For the short-term analysis of PM emissions impact, only those emissions from the power plant and the mine needed to be considered. PM emissions from the other five sources within 50 kilometers of the impact area were shown not to significantly affect the TSP increment in the proposed source's impact area. In this case, the same 5-year period of meteorological data used for SO_2 modeling was input to the selected model with the proposed PM emissions from all emissions units. The results of the analysis show that the maximum predicted 24-hour PM increment concentration was 28 micrograms per cubic meter, which is within the allowable increment of 37. Therefore, the short-term analysis for PM is complete. Similarly, a long-term modeling analysis showed no violations of the annual TSP increment. Maximum annual PM impacts were predicted to be 13 micrograms per cubic meter.

The only remaining task for the analysis was to summarize the results and describe the analysis. As shown in Table C-5, no NAAQS or increment is expected to be violated as a result of the emissions of the power plant and associated mine. Recommendations for data format are available in the Guideline on Air Quality Models.

This example has shown that a comprehensive air quality modeling analysis requires a good understanding of modeling principles, PSD applicability, and the emissions established in the BACT analysis. An air quality modeling analysis begins with the establishment of an impact area and an emissions inventory. Existing air quality is determined, and a screening analysis is conducted. The increment consumption and total air quality within the impact area are predicted in the final steps of the air quality analysis. A comprehensive, well-organized

Table C-5. SUMMARY OF RESULTS
($\mu g/m^3$)

	Maximum increment consumed: Total	Maximum increment consumed: By power plant[c]	Maximum increment consumed: "By others"[c]	Allowable class II increment	Existing air quality[a]	Total projected air quality	NAAQS
SO_2							
• 3-hour	302	242	60	512	358	600	1,300
• 24-hour	72	56	16	91	99	155	365
• annual	18	13	5	20	14	27	80
TSP							
• 24-hour	28	28	0	37	109	137	150
• annual	13	13	0	19	49	62	75
NO_2							
• annual	18[b]	18[b]	0	NA	9	27	100

[a]For SO_2 existing air quality, concentrations shown partially consist of increment consumption by "others."
[b]This value is the maximum NO_2 impact and not an impact on PSD increments.
[c]At point of highest increment concentration in impact area.

air quality modeling analysis is essential to the PSD permitting process and ensures the preservation of one of our most valuable resources, air quality.

D. ADDITIONAL IMPACTS ANALYSIS

All applicants requiring a PSD permit must prepare an additional impacts analysis for each pollutant subject to review. This analysis is concerned with determining the air pollution impacts on soils, vegetation, and visibility caused by emissions from the source or modification under review, and the emissions resulting from associated growth.

D.1 DEFINITION AND PURPOSE

The purpose of this section is to help the PSD applicant fully consider those factors that are relevant to a complete additional impacts analysis. This section also offers suggestions as to what kind of analysis, organization, and method could most satisfactorily meet all PSD requirements, and to what degree the analyses should be performed. There are three basic purposes of an additional impacts analysis:

1. To determine the effects of emissions of applicable criteria and noncriteria pollutants to assist in best available control technology (BACT) decisionmaking,
2. To inform the general public of potential air quality-related impacts; and
3. To help provide the Federal land manager with information regarding potential impacts on Class I areas.

Several points regarding the overall direction of the entire analysis must be kept in mind by the applicant:

1. Although every applicant for a PSD permit must perform an additional impacts analysis, the depth of the analysis is generally dependent upon the quantity of emissions, the existing air quality, and the sensitivity of those emissions on local factors such as soils, vegetation, and visibility. The need for a rigorous additional impacts analysis is aimed primarily at those new major sources and major modifications that may reasonably be expected to result in significant impacts on these factors.

It is expected that small emissions increases in an area will not produce any major impacts on soils, vegetation, and visibility; however, the impact areas of new major sources and major modifications must be surveyed to verify and document the anticipation of "no significant impact."

2. Public information is a primary goal of the additional impacts analysis. Therefore, the applicant should prepare an analysis that will provide the public with an assessment of the relevant potential environmental air pollution impacts that may occur in the area affected by emissions of pollutants subject to review. The applicant should be particularly aware that any potential air pollution impacts on Class I areas are especially important and that these impacts should be assessed thoroughly.

3. An additional impacts analysis is triggered for those pollutants that will be emitted or increased in significant quantities. Thus, both criteria and noncriteria pollutants may cause the applicant to undertake an additional impacts analysis.

4. An additional impacts analysis is concerned with the air pollution effects on soils, vegetation, and visibility. This examination generally

requires an analysis of the projected ambient air concentrations and a correlation to potential impacts on these factors. The analysis must encompass potential impacts of direct emissions from the new major source or major modification and secondary emissions from associated residential, commercial, or industrial growth.

5. It is important that the analysis be fully documented. A PSD applicant must remember that an additional impacts analysis is, by definition, an analysis, and therefore, all conclusions should be carefully and sufficiently documented.

6. While this section offers applicants a basic method of approaching an additional impacts analysis, it must be stressed that no "hard and fast" formula, format, or "cookbook" approach to an additional impacts analysis exists. Regarding the analysis, what is most important is that all significant factors and the resulting impacts are recognized and carefully analyzed.

With these points in mind, an applicant can proceed in considering the following overview of the additional impacts analysis components.

D.2 FORMAT FOR THE ADDITIONAL IMPACTS ANALYSIS

The additional impacts analysis is made up of three component analyses: (1) a growth analysis, (2) a soils and vegetation impact analysis, and (3) a visibility impairment analysis.

D.2.1 Growth Analysis

The growth analysis is considered first, before the other components, because it provides information essential to the other component analyses. The elements of the growth analysis follow:

1. A projection of the associated industrial, commercial, and residential growth that will occur in the area.

2. An estimate of the air pollution emissions generated by associated permanent growth.

3. An air quality analysis which includes these estimates. The results from this analysis become the basis for determining the extent of the air pollution impacts in the impact area.

To determine the first element in the growth analysis, which is the projection of associated growth for the impact area, the applicant first should consider the availability of two types of support factors, local support factors and industrial support factors. Local support factors include situations such as the area's ability to house new employees and the commercial industries presently existing within the area that are available to support residential growth. For example, a large new major source that causes a permanent population growth may result in housing developments and associated air emissions. Examples of industrial support factors include industries that provide goods and services related to the source or modification. These types of industries include large industries providing raw materials and smaller industries providing maintenance and other support. For instance, a new major source using coal for fuel may attract coal mining operations for support.

Information on local and industrial support factors is readily available and can be obtained from State agencies, regional planning offices, the local Chamber of Commerce, through information contained in environmental impact statements, and in PSD applications previously prepared by other applicants.

After the applicant has assessed the availability of residential, commercial, and industrial services existing in the area, the next step is to predict how much new growth must occur to support the source or modification under review. The amount of residential growth will be dependent on the size of the available work force, the number of new employees, and the availability of housing in the area. Industrial growth is growth in those industries providing goods and services, maintenance facilities, and other large industries necessary for the operation of the source or modification under review.

Having completed this portrait of expected growth, the applicant then begins developing an estimate of the air pollution which likely would evolve from permanent residential, commercial, and industrial growth. Excluded from consideration are emissions from temporary sources and mobile sources. The applicant should generate emissions estimates by consulting such sources as manufacturer's specifications and guidelines, AP-42, other PSD applications, and comparisons with existing facilities.

The applicant arrives at an analysis of projected air quality by taking the air pollution estimates from all the variables of growth already surveyed and then combining these estimates with the estimates of applicable pollutant emissions that are expected to be produced directly by the source or modification. The combined estimate, through the modeling process, serves as the input to the air quality analysis, and what emerges is a prediction of the ground-level concentration of pollutants generated by the source and any associated growth.

D.2.2 Soils and Vegetation Analysis

The manifestations of air pollution impacts on soils and vegetation can be seen in such occurrences as premature bud loss, failure of flowering, leaf necrosis, and plant death. At high ambient concentrations, these acute affects can appear readily. However, many deleterious effects that are due to subtle but chronic exposure to pollutants over a long period of time also occur. Such time-delayed impacts can ultimately prove to be the most harmful.

A suggested informational basis for an analysis of air pollution impacts may be obtained by conducting a survey of the soil and vegetation types found in the impact area. This survey should include all vegetation with any commercial or recreational value. Surveys of this nature usually have been performed for the area and are readily available from conservation groups, State agencies, and universities. This comprehensive listing of soils and vegetation types then would allow the applicant to determine air pollution impacts by utilizing the method discussed below.

The modeling results of the air quality analysis, conducted to demonstrate compliance with national ambient air quality standards, will provide the applicant with estimates of the maximum ambient air concentrations for criteria pollutants under review in the impact area. For applicable noncriteria pollutants, the applicant should project future ambient air concentrations in accordance with the procedures outlined in the air quality analysis section in Section C. By consulting scientific literature, the applicant can assess the impacts of applicable pollutants on the soils and vegetation types in the impact area. The applicant can determine these impacts by correlating the known ambient air concentrations of pollutants with the types of soil and vegetation found in the survey of the area. The applicant should document all conclusions.

For most types of soils and vegetation, ambient air concentrations of criteria pollutants below the national ambient air quality standard (NAAQS) will not result in harmful effects. However, there are sensitive vegetation species and soil types that may experience harmful effects at low ambient air concentrations (i.e., soybeans and alfalfa). For this reason, the suggested initial soil and vegetation survey serves as an important basis for the analysis.

Noncriteria pollutants can result in harmful affects at generally lower concentrations than the criteria pollutants. For example, exposure of sensitive plant species to 0.5 micrograms per cubic meter of fluorides for 30 days has proven to result in significant foliar necrosis.

D.2.3 Visibility Impairments Analysis

In the visibility impairments analysis, the applicant is especially concerned with Class I area impacts, as well as with impacts that occur within the area affected by applicable emissions. The Clean Air Act specifically requires plans and procedures for maintaining the visual quality within Class I areas. The suggested components of a good visibility impairments analysis are:

1. An initial screening of emission sources that examines the possibility of visibility impairment.

2. If warranted, a more in-depth analysis involving computer models.

3. A determination of the visual quality of the area.

To successfully complete a visibility impairments analysis, the applicant is referred to a draft EPA document (July 1980) entitled "Workbook for Estimating Visibility Impairment." Although this is a draft document, this workbook can be used as general guidance. In this workbook, EPA outlines a screening procedure designed to expedite the analysis of emissions impacts on the visual quality of an area. The workbook was designed for Class I area impacts; however, the outlined procedures are generally applicable to other areas as well. The following sections are a brief synopsis of the screening procedures.

D.2.3.1 Screening Procedures: Level 1. The Level 1 visibility screening analysis is a series of conservative calculations designed to identify those emission sources that have little potential of adversely affecting visibility. Calculated values relating source emissions to visibility impacts are compared to a standardized screening value. Those sources with calculated values greater than the screening criteria are judged to have potential visibility impairments. If potential visibility impairments are indicated, then the Level 2 analysis is undertaken.

D.2.3.2 Screening Procedures: Level 2. The Level 2 screening procedure is similar to the Level 1 analysis in that its purpose is to estimate impacts during worst-case meteorological conditions; however, more specific information regarding the source, topography, regional visual range, and meteorological conditions is assumed to be available. The analysis may be performed with the aid of either hand calculations, reference tables, and figures, or a computer-based visibility model called the "plume visibility model."

D.2.3.3 Screening Procedures: Level 3. If the Level 1 and 2 screening analysis indicated the possibility of visibility impairment, a more detailed analysis is undertaken in Level 3 with the aid of the plume visibility model and meteorological and other regional data. The purpose of the Level 3 analysis is to provide an accurate description of the magnitude and frequency of occurrence of impact.

The procedures for utilizing the plume visibility model are described in the draft document entitled "User's Manual for the Plume Visibility Model," which is available from EPA.

To complete the visibility impairment analysis, the applicant is urged to provide a description of the visual quality of the area, which should include a discussion of any scenic vista in the area that may have public appeal or aesthetic value. What constitutes "scenic" and "aesthetic" is always open to the consideration of differing tastes. However, a broad consensus does exist as to what occurrences would or would not despoil the visual beauty of an area, and applicants should be sensitive to these commonly held aesthetic conventions. Applicants should contact the Federal land manager for the determination of scenic vistas for Class I areas and for construction projects subject to the PSD regulations if emissions may be expected to impact any Class I area. The completion of the visibility analysis marks the completion of the additional impacts analysis.

D.2.4 Summary

In preparing an additional impacts analysis, the applicant should realize that a primary intent of the analysis is to provide environmental impact information to the public regarding the air quality-related impairments of soils, vegetation, and visibility produced by the source or modification under review, and the associated growth that it generates. To convey this information in a comprehensive manner, the additional impacts analysis contains three component analyses that are related to each other in an informationally progressive manner. Also, the results of the additional impacts analysis will help define BACT for affected emissions units. The growth analysis leads to the soils and vegetation analysis, which in turn leads to the visibility analysis. All these analyses are concerned with the air quality-related impacts on an area, and the analyses should be fully documented. Hopefully, by using the suggested approach in this chapter, the applicant will become aware that what is under review is a unique set of circumstances particular to the source or modification and its surrounding area.

If the additional impacts analysis is approached in a conscientious manner, the applicant not only will have met the requirements of the PSD process, but will also have provided an analysis that can serve as a platform from which industry, the public, and the appropriate regulatory agencies can broaden their understanding of matters of local environmental concern.

D.3 ADDITIONAL IMPACTS ANALYSIS EXAMPLE

Sections D.1 and D.2 outlined, in general terms, the elements and considerations found in a successful additional impacts analysis. To demonstrate how this analytic process would be applied to a specific situation, a hypothetical but realistic case has been developed for a minemouth power plant. This section will show how an additional impacts analysis would be performed on that facility.

D.3.1 Example: Background Information

The minemouth power plant consists of a main body power plant and an adjoining lignite mine, which serves as the plant's source of fuel.

The plant is capable of generating 1,200 megawatts, which is expected to supply a utility grid, and little is expected to be consumed locally. This project is located in a sparsely populated agricultural area in the southwestern United States. The population center closest to the plant is the town of Clarksville, population 2,500, which is located 20 kilometers from the plant site. The next significantly larger town is Milton, which is 130 kilometers away and has a population of 20,000.

The nearest Class I area is more than 200 kilometers away from the proposed construction. Within the area under consideration there are no National or State forests, no areas which can be described as scenic vistas, and no points of special historical interest.

The company engineers and contractors have estimated that the construction of the power plant and the development of the mine would require an average work force of 450 people over a period of 36 months. Upon completion of all construction, it is expected that about 150 workers will be needed to operate the facilities.

To perform an additional impacts analysis of this project, an applicant begins a growth analysis by acquiring a projection of growth that would be associated with the construction and operation of the project. Following are some of the local support factors the applicant considers.

D.3.1.1 Work Force. Consulting the State employment office, local contractors, trade union officers, and other labor information sources, the applicant made the following estimates regarding worker availability.

Of the 450 construction jobs available, most will be filled by workers commuting various distances to the construction sites, with some workers coming from as far away as Milton. The applicant expects that some workers and their families can be expected to move to Clarksville for the duration of the construction. Of the permanent jobs, an estimated 100 will be filled by local workers. The remaining 50 permanent positions will be filled by nonlocal employees, because these jobs require a degree of skill, training, experience, or education that is not found in the area's existing work force. These workers and their families are expected to relocate primarily in the vicinity of Clarksville.

D.3.1.2 Housing. In contacts with local governmental housing authorities and realtors, and by scanning the classified advertisement sections of the local newspaper, the applicant learned that the predominant housing unit in the area is a single family house or mobile home. The applicant also learned that the easy availability of mobile homes, mobile home lots, and residential land provides a local capacity for quick housing expansion.

An examination of these local support factors led the applicant to conclude that there will be no substantial air quality-related impacts associated with residential growth. Although there will be some emissions associated with the construction of new homes, these emissions will be temporary, lasting only as long as the construction schedule. Because of the limited number of housing units expected to be constructed, these emissions are considered insignificant. The small number of new people brought into the community through employment at the plant is not expected to generate commercial growth. For example, the community will not need an increase in small industries that support the power plant (i.e., small foundries or rock crushing operations).

D.3.1.3 Industry. Because of the relatively self-contained nature of minemouth plant operations, no related industrial growth is expected to accompany the operation of the plant. Emergency and full maintenance capacity is contained within the power-generating station. With no associated growth projected, it then follows that there will be no growth-related air pollution impacts.

D.3.1.4 Soils and Vegetation. In preparing a soils and vegetation analysis, the applicant has acquired a listing of the soil and vegetation types native to the impact area. The vegetation is dominated by pine trees and hardwoods consisting of loblolly pine, blackjack oak, southern red oak, and sweet gum. Smaller vegetation consists of sweetbay and holly. Small farms are found west of the forested area. The principal commercial crops grown in the area are soybeans, corn, okra, and peas. The soils range in texture from loamy sands to sandy clays. The principal soil is sandy loam consisting of 50 percent sand, 15 percent silt, and 35 percent clay.

The applicant, through research, determined the sensitivity of the various soils and vegetation types to each of the applicable pollutants that will be emitted by the facility in significant amounts. The applicant then correlated this information with the estimates of pollutant ambient air concentrations which were calculated previously in the NAAQS analysis. Because the noncriteria pollutant emission rates already have been demonstrated in the applicability example of this case to be insignificant, the soils, vegetation, and visibility impacts are concerned only with applicable criteria pollutants.

According to the correlation results between the predicted ambient air concentrations and potential soils and vegetation impacts in the impact area, only soybeans prove to be potentially sensitive. A more careful examination of soybeans reveals that no adverse effects were expected at the low concentrations of pollutants predicted by the modeling analysis. Major sulfur dioxide (SO_2) impacts on soybeans have been demonstrated at greater than 0.1 ppm for a 24 hour period. This SO_2 ambient air concentration is greater than that predicted by the modeling analysis to result from the proposed emissions.

Fugitive emissions emitted from the mine and from coal pile storage will descend upon both the soil and leaves of vegetation in the immediate area of the plant and mine. Minor leaf necrosis and lower photosynthetic activity is expected, and over a period of time the vegetation's community structure may change. However, this impact occurs in an extremely limited area very near the emissions site and, in addition, rain fall can mitigate this effect. For these reasons, the impact is considered insignificant.

Limestone preparation and storage also must be considered for potential impacts. High relative humidity may produce a crusting effect of the fugitive limestone emissions on nearby vegetation; however, this impact is limited and only occurs very near the power plant site. For this reason and because of the mitigating effect of rain, this impact is considered insignificant. Additionally, BACT on the limestone storage piles will minimize the emissions.

D.3.1.5 Visibility Analysis. With the soils and vegetation analysis completed, the applicant performed a visibility analysis. The applicant performed a screening procedure similar to that outlined in the draft EPA document "Workbook for Estimating Visibility Impairment." The screening procedure is divided into three levels. Each level represents a screening technique for an increasing possibility of visibility impairment. The applicant executed a Level 1 analysis which involved a series of conservative tests that permitted the analyst to eliminate sources having little potential for adverse or significant visibility impairment. The applicant performed these calculations for various distances from the power plant. In all cases, the results of the calculations were numerically below the standardized screening criteria. Therefore, the applicant concluded that the Level 2 and Level 3 analyses were unnecessary and that no visibility impairments were expected to occur within the source area.

In preparing the suggested visual and aesthetic description of the area under review, the applicant noted the absence of scenic vistas. Thus with the visibility analysis completed, the applicant has performed all the component analyses of additional impacts.

D.3.2 Example: Additional Impacts Conclusions

After completing the visibility analysis, the applicant completed the additional impacts analysis. To aid in its review, the applicant documented every element of the analysis. Because a primary intention of the PSD permit process is to generate public information regarding pollutant impacts, the applicant prepared the report in straightforward and concise language.

The demonstration of an additional impacts analysis of a hypothetical minemouth power plant is realistic. Although, in this example, just the highlights of the analysis are presented, an actual analysis may contain more detailed considerations, and other types of facilities under review may produce more growth and more or different kinds of impacts. For example, the construction of a large manufacturing plant could easily generate air quality-related growth impacts, such as a large influx of new workers to an area and the growth of associated industries. In addition, the existence of particularly sensitive forms of vegetation, the presence of Class I areas, the presence of particular meteorological conditions, and the existence of scenic vistas or historical sites in the area would produce an analysis which would be of necessity greater in scope.

PART II: APPLICATION REVIEW

Requirements For States (SIPs)

) Must revise SIPs as per § 51.24

) Flexibility re

a) baseline area - can redesignate §107 areas
b) temporary exclusions to increment consumption (not > ~2 years)
c) contemporaneous timeframe (must be a definite #)
d) banking /offsets
e) Alternatives to increment allocation (rather than first come, first serve concept)
f) public participation

) No Flexibility re

a) increment levels
b) modeling - must be EPA or equivalent method
c) Class I area protection and Federal Land Manager notification
d) PSD applicability
e) BACT, at a minimum, must meet SIP or NSPS or NESHAPS
f) PSD definitions (source, major, modification, etc.)

A. APPLICABILITY

It is the responsibility of the review authority to carry out the requirements of the prevention-of-significant-deterioration (PSD) regulations. The broad goal of PSD is to prevent significant air quality deterioration in clean air areas and, at the same time, also provide a margin for future industrial growth.

The present PSD regulations (40 CFR 52.21) provide minimum standards for maintaining air quality increment until each state adopts the PSD program into its State implementation plan (SIP). Within guidelines, each State will tailor these PSD regulations to meet the specific needs of its area. Once State PSD regulations are incorporated into the existing SIP and have been approved, the States will have a more efficient regional air quality management tool that balances air quality resources with local needs for continued industrial growth. From that point on, PSD review will follow the guidelines and regulations described in each particular State implementation plan.

In the PSD review process the applicant is responsible for (1) performing all required analyses, (2) documenting the results in a clear and concise form in the permit application, (3) applying best available control technology (BACT) where required, and (4) maintaining compliance with all permit conditions.

The role of the review agency is to evaluate the preconstruction analysis performed by the applicant for compliance with statutory requirements, and to manage regional air quality through a collective assessment of industrial growth. By following these procedures, the reviewing authority meets its responsibility through the preconstruction permitting process. Because PSD regulations place the burden of analysis on the applicant, the engineering analysis provided must show that air quality standards and available increment will not be threatened and that BACT is applied. A thorough evaluation by the review agency of the analyses presented in the application is instrumental in maintaining the opportunity for future industrial growth in a particular area.

The permitting authority is not expected to redo an incomplete or unsatisfactory application. Analysis and thorough documentation is the responsibility of the applicant. When an incomplete application is submitted, or when the analyses presented do not adequately demonstrate compliance with PSD requirements, the applicant should be notified and required to correct any deficiencies.

This section of the guidance package suggests the logical steps needed to complete a thorough review of a proposed source's applicability under 40 CFR 52.21. Also, common oversights and errors made by the applicant will be examined. In addition, this section also includes methods the review agency can follow to reduce mistakes and minimize the review agency's manpower requirements.

A.1 PERMITTING PROCESS STEPS

The major steps in implementing the permit process are:

- the preapplication meeting,

- completeness review,
- preliminary determination,
- the opportunity for public review and comment, and
- the final determination with corresponding compliance checks.

During the preapplication meeting, the review agency should make a preliminary assessment of applicability which determines whether or not PSD review is necessary and what PSD review requirements must be met. An assessment of applicability, at this time, outlines the engineering analyses which must be performed, and is of prime concern to the source proposing construction. Also, PSD applicability assessment is the starting point of the review for completeness of a submitted application.

The review agency is responsible for both the application review and the development of the preliminary determination. The preliminary determination has a dual purpose: (1) it provides a comprehensive air quality-related environmental assessment of the key impacts from a proposed expansion, and (2) it provides the general public with a description of the project's impacts, requirements, and compliance demonstration. A suggested format for preliminary determinations is included in Appendix 1.

The last step in the review process is the publication of a public notice and a request for public comment on the preliminary determination. After the public comment period or public hearings are closed, and following an evaluation of public comments, the review agency must complete the process by making a final determination of approval, approval with conditions, or disapproval. The methods for compliance checks must be included with the final determination. Before a final determination is made, public comments should be made available to the applicant for the opportunity to provide responses to the PSD review agency.

A.2 EVALUATION OF APPLICABILITY

The determination of applicability is the focal point of the preapplication meeting and the completeness review, and also is crucial in determining which analyses must be performed. Therefore, it is critical that correct determinations be made as early as possible in the planning of a construction project. Incorrect or incomplete determinations can cause serious construction delays and add considerably to agency resource requirements through superfluous or redundant evaluations. This section, therefore, outlines the five steps necessary to fully evaluate applicability.

A.2.1 Identification of Source and Proposed Construction

The first step is to identify the source and understand the proposed construction. Has the applicant correctly defined the proposed new or existing source according to PSD definitions? For a modification to an existing source, has the applicant fully described the physical change or change in the method of operation of the source, and has he or she identified all additional new and modified emissions units? One helpful suggestion for a reviewer attempting to verify an applicant's work is to list the emissions units proposed for construction. For modifications, a listing of new and modified emissions units and emissions units involved in any associated contemporaneous changes is useful. Also, listing all existing emissions units can help define the existing source. Frequently, a PSD applicant may be unaware that there are more emissions units at his or her source than he or she anticipated. For instance, cooling towers are often ignored as a source of fugitive hydrocarbon (HC) emissions. For a general understanding of a process or source type which is new to a review engineer, consult AP-40 and AP-42. These publications will aid the reviewer's understanding of the proposed project.

A.2.2 Examination of Emissions Estimates

The next major step in applicability review is to check the applicant's emissions estimates. Any discrepancies in the emissions estimates, which are not identified and corrected, may result in an incorrect applicability determination. The keys for evaluating the emission estimates follow:

1. Make sure that every regulated pollutant which the source will emit is listed, and that each affected emissions unit is evaluated.

2. Check the basis for the potential to emit (PE) and for actual emissions estimates. Do all assumptions conform with the PSD definitions? Are they reasonable or conservative in an engineering sense? Did the applicant use less than maximum capacity for these estimates without demonstrating the existence of enforceable restrictions?

3. Determine if the applicant presented the accumulated increases and decreases for all emission units located at the source. Were the quantifiable fugitive emissions included where necessary? Will the described modification affect emissions units which are not discussed?

4. Remember that all claimed emissions changes must be contemporaneous and creditable. Refer to Section A.4.3.2 of the application guidance package, and the PSD regulations' definition of "net emissions increases" for assistance.

5. Finally, the reviewer must verify that the applicant's estimates of potential emissions and the "net change" in actual emissions are reasonable and consistent with definitions given in the PSD regulations. Guidance on these definitions is offered in Sections A.3 and A.4.3.2 of the application guidance package as well.

A.2.3 Examination of Location

The third major step in applicability review is to evaluate the location of the proposed construction. Has the applicant considered all Class I areas which are in that locale? Is the proposed construction site in or near a nonattainment area for any pollutant or an area of known increment violation for particulate matter (PM) or sulfur dioxide (SO_2)?

A.2.4 Applicability Tests

The fourth step is to perform the applicability tests outlined in the application guidance package. Has the applicant correctly applied these tests, to determine if the proposed source is subject to PSD review, and what requirements must be met?

A.2.5 Exemptions

The final step in determining applicability is to examine any exemptions claimed by the applicant. In many cases, exemptions are conditioned on the construction affecting no Class I areas, no nonattainment areas, and no known areas of increment violations.

A.3 COMMON OVERSIGHTS AND ERRORS

For those reviewers who are just beginning their work with PSD, there are several areas where applicants and reviewing authorities tend to make errors. These areas deserve particular attention.

A.3.1 Source Definition

Source definition can be a problem in an application. Sometimes the applicant will incorrectly define the source. For example, the applicant may consider only the new and modified emission units as the source. Although this is consistent with many State plans, it is inconsistent with the 1980 PSD regulations. The present definition includes all existing emissions units at a location which are associated under the same two-digit SIC code. Source definitions for preconstruction review under nonattainment provisions are not identical to PSD source definitions. Refer to the PSD regulations and Section A.2 of the application guidance package for a complete definition and guidance on correctly defining the source.

More subtle mistakes in source definition occur at large complexes which are proposing additions to the existing source. For these sources, the review agency should check files for previous source determinations conducted at the same location and for determinations on similar sources. Contacting local enforcement personnel to verify existing emissions units and to gain an understanding of the source is generally very helpful.

A.3.2 Emissions Estimates

Other mistakes in a PSD application occur in the emissions estimates. Both the PE and actual emissions estimates may be incomplete. For example, emissions units that should be included may be overlooked or ignored and pollutants regulated under the Clean Air Act may be excluded from the list of emissions estimates. Again, this is generally a definition problem. Also, pollutants may be missing from the emissions estimates because the applicant is unaware that PSD review applies to all pollutants regulated under the Act. Some applicants concentrate on SO_2 and PM, the pollutants for which increments have been established. Another common oversight is to concentrate on the criteria pollutants and to forget to present emissions estimates for the noncriteria pollutants regulated by the Act.

A similar problem occurs with emissions estimates for equipment types with a dominant pollutant. Examples are rock dryers, grain dryers, and asphalt plants that emit large quantities of particulate. Some applicants will focus on these emissions and overlook the emissions from combustion products released through fuel consumption to provide process heat. Nitrogen oxides (NO_x), carbon monoxide (CO), SO_2, hydrocarbons (HC), and all other regulated pollutant emissions must be estimated.

The experience of the reviewer is important in detecting these oversights, but an overall awareness of common problems in PSD analyses is also helpful. In addition, a pollutant checklist similar to Figure A-1 will aid in correcting these errors.

A.3.2.1 Fugitive Emissions. When checking an applicant's emissions estimates, the reviewer may find that estimates for fugitive emissions are absent. Quantifiable fugitive emissions estimates must be presented if they are expected to occur. However, a source may be eligible for an exemption if it would be designated a major source because of its fugitive emissions. This exemption applies only to sources other than the 28 named source categories and sources regulated under Sections 111 or 112 of the Act. Quantifiable fugitive emissions are considered in all other emissions estimates, including calculations of actual emissions and net changes in actual emissions, to determine the level of PSD review required.

CHECK	POLLUTANT	SIGNIFICANT NET INCREASE*
☐	Carbon monoxide	100 tpy
☐	Nitrogen oxides	40 tpy
☐	Sulfur dioxide	40 tpy
☐	Particulate matter	25 tpy
☐	Ozone (volatile organic compounds)	40 tpy
☐	Lead	0.6 tpy
☐	Asbestos	0.007 tpy
☐	Beryllium	0.0004 tpy
☐	Mercury	0.1 tpy
☐	Vinyl chloride	1 tpy
☐	Fluorides	3 tpy
☐	Sulfuric acid mist	7 tpy
☐	Hydrogen sulfide	10 tpy
☐	Total reduced sulfur (including H_2S)	10 tpy
☐	Reduced sulfur compounds (including H_2S)	10 tpy

* Tons per year.

Figure A-1. Checklist for pollutants regulated under the Clean Air Act.

A.3.2.2 Emission Factors. Another common mistake made by an applicant in determining both potential emissions and actual emissions is the use of inappropriate emission factors. The reviewer can make checks by consulting the emission estimates of other applications or by examining BACT/LAER Clearinghouse reports for similar source types. Identifying mistakes caused by overestimation of emissions can reduce review requirements and, in some cases, can eliminate a source from PSD review. In contrast, reviewers should also closely scrutinize estimates, and the basis for estimates, in cases in which the total source emissions fall just below the 100/250 ton criterion and in cases in which the net increase in actual emissions falls just below the defined significance level.

A.3.2.3 Potential and Actual Emissions Definitions. Finally, potential emissions and actual emissions definitions are sometimes misunderstood. The reviewer can check these definitions in the PSD regulations or the application guidance package. When an incorrect definition is used, an extensive revision to emissions estimates is commonly required.

Another emissions estimating error is pertinent only to potential emissions. Estimates for potential emissions are often based on average rather than maximum capacity operation. The only time maximum capacity operation should not be used in potential emissions estimates is if there are enforceable restrictions on a source's ability to emit a pollutant. Where restrictions are claimed by an applicant, they must be federally enforceable.

A.3.2.4 Net Emissions Changes. There are two common mistakes made in estimating the net change in actual emissions. First, the applicant may fail to accumulate all the creditable contemporaneous increases which have occurred at the source in the previous 5-year period. In addition, decreases that do not meet the criterion of contemporaneous may be claimed by the applicant. Decreases that are not federally enforceable cannot be credited in determining the net emissions change. Refer to the PSD regulations and Section A.4.3.2 of the application guidance package for special guidance on crediting contemporaneous emissions changes.

The second problem is the misinterpretation of actual operating data. Sometimes the assumptions used in calculating actual emissions are not indicative of actual operating records. The application should fully document the operating data on which actual emissions estimates are based. As a check, the reviewer should consult State emissions inventory questionnaires. A questionnaire response for that particular plant site or a similar plant type made on the basis of actual operating data may be available.

A.4 RECOMMENDATIONS

A.4.1 Preapplication Meeting

Although there are many common pitfalls in the PSD application process, the reviewer can help the applicant avoid many of the obvious problems. The preapplication meeting is the best time to communicate this type of information to the applicant.

After the reviewer has examined the applicant's general proposal, a preliminary assessment of applicability often can be made. Based on this assessment, the reviewer should be able to focus the applicant's attention on the likely review requirements. Sensitive issues, particular to the area of the proposed construction site, should be pointed out to the applicant. Moreover, the reviewer should indicate to the applicant the definitions and the regional policy on review requirements.

Baseline dates for each pollutant with an established baseline date and information on increment consuming sources also can be supplied at the preapplication meeting. A copy of the application guidance package tailored to meet a specific area's needs should be provided for the applicant at this meeting.

A.4.2 Completeness Review

During the time period allocated for the completeness review, the reviewer must determine if sufficient information has been supplied. A data summary sheet (Appendix 2) will help the reviewer make this assessment. Once an application is determined to be complete, the agency has a maximum time period to complete the PSD review. Because the application is restricted by a time schedule, the applicant has less incentive to supply additional information. Also, a considerable amount of time is often required to develop the additional information. Thus the applicant should be made aware of additional information requirements at the earliest possible date.

The date that a complete application is received generally determines permitting priority. Mistakenly identifying an application as complete may be unfair to another source in the same area.

Additional information sometimes necessitates a reevaluation of previously reviewed analyses, which is redundant and cost-inefficient. Therefore, emphasis on a thorough completeness review can expedite the overall PSD review process, minimize any effects on construction schedules, reduce agency resource expenditures, and aid the proper management of air quality resources.

A.5 CONCLUSION

In conclusion, the PSD application is an engineering analysis performed by the applicant. The applicant must document all assumptions made. In fact, the application stands as part of the public record. The review agency should make every effort to verify the information presented in the application, especially in the areas specified as problem areas. The PSD data summary sheets will help the reviewer complete this task (Appendix 2).

Each application will need to be examined for its own peculiarities, but when the reviewer carries out his or her job properly, the PSD program will serve as an effective air quality management tool, tailored to the needs of each individual State or air quality region.

B. BEST AVAILABLE CONTROL TECHNOLOGY

An applicant proposes best available control technology (BACT) emissions limitation for each applicable pollutant emitted from each new based on supporting evidence and documentation derived from a thorough analysis. The reviewer uses the analysis submitted by the applicant to establish the PSD permit conditions that will specify the operation of the control strategy for the source or modification under review.

To fully assess an applicant's BACT analysis, the reviewer must not only possess a broad knowledge of the information and situations referred to in the analysis, but also must be aware of the PSD requirements for the BACT analysis and the methods suggested for meeting these requirements.

It must be stressed that a BACT analysis is a case-by-case assessment generally limited in scope to the effects and operation of the source or modification under review. A BACT determination is dependent on the specific nature of the factors for that particular case. The depth of a BACT analysis should be based on the quantity and type of pollutants emitted and the degree of the resulting expected air quality impacts.

The purpose of a BACT analysis is to determine the lowest emissions that can be met by a source or modification, in light of economic, environmental, and energy impacts. The BACT analysis begins with an evaluation of emissions control options and ends with a proposed continuous or modified emission source subject to BACT. In assessing the BACT analysis, the reviewer may require a more stringent emission rate than that proposed by the applicant, providing that the reviewer's decision is based on factual information. Should the reviewer disagree with the proposed BACT, his or her reasons and justification should be made known to the applicant before continuing with the review. In these cases, informal meetings and negotiations may help resolve disagreements.

B.1 BACT ANALYSIS REVIEW

The reviewer's primary responsibility is to determine the best emissions strategy to balance the environmental benefits gained from applying pollution control technology with the prudent use of energy and justifiable industrial expenditures. To achieve this goal, the reviewer brings the following questions to bear on the BACT analysis under consideration:

- Is the analysis complete? The analysis must be pollutant- and emissions unit-specific because each affected new or modified emissions unit must be evaluated with respect to each pollutant subject to PSD review. Major emissions sources should be emphasized; however, the requirement for enforceable continuous limits remains, even for relatively minor emissions units. In general, the attention of the analysis should be focused where it can produce the most environmental benefits.

- Is the analysis thorough? Has the applicant evaluated the range of demonstrated options, including alternatives, that may be transferable or innovative? The applicant need not evaluate control alternatives that would result in greater emissions than those proposed as BACT. For example, in a sanding operation, the control options would be a cyclone collector, a baghouse, and an electrostatic precipitator. If the applicant had proposed a baghouse as BACT, a detailed analysis of the cyclone would generally be unnecessary.

- Are the cost estimates which appear in the analysis reasonable? Do they appear to contradict cost expectations and experience?

- Has the applicant made a good faith effort proposing BACT?

These questions will help identify those elements of a BACT analysis that may be incorrect or incomplete. This review approach places the burden of thorough documentation on the applicant.

Although the applicant is expected to provide the appropriate data to support conclusions, in those areas where the reviewer lacks extensive knowledge, he or she is encouraged to use the information contained in BACT/LAER Clearinghouse reports, literature references, national emission standards, and other EPA literature. Even after a PSD application is considered complete, the reviewer can still request additional information from the applicant to clarify the data and facilitate the BACT decision.

The reviewer should pay particular attention to the applicant's engineering analysis. The level of detail in the control options analysis should vary with the relative magnitude of the emissions reduction achievable. The reviewer may question information submitted by the applicant; however, he or she should not develop cost estimates for the applicant.

Where it is evident that the applicant has conducted a good faith engineering effort, the reviewer can proceed in the assessment of the analysis by examining the proposed BACT emissions limits. These limits can be considered the bottom line of the analysis. If the rest of the analysis appears satisfactory upon examination, the reviewer's resources are best utilized by concentrating on the area of emissions. If the applicant is proposing a control strategy that will produce the lowest emission rate of all alternatives, no further analysis is required. However, if it is apparent that the applicant has conducted an insufficient engineering analysis, it is the reviewer's responsibility to evaluate the design of the control system under review to ensure that the proposed technology is capable of achieving the proposed emissions limits. In those cases in which inadequacy is noted, the applicant should be questioned regarding these points.

B.2 CONCLUSIONS

BACT must be a system of continuous emission reduction. The applicant will suggest the control technology, but ultimately the reviewer is responsible for establishing the permit conditions that specify the operation of the control systems. Therefore, permitted emission rates must be specified on the basis of both total and specific allowable emissions. The total allowable emission rate (pounds per hour) of a unit is the anticipated emission rate when the unit is operating at its maximum capacity. However, because BACT is a system of continuous emission reduction, the allowable emissions must also consider the required control strategy at all other operating levels. This task is generally done by specifying, wherever possible, the allowable emissions in terms of process unit variables such as material processed or fuel consumed, or even by specifying an allowable pollutant concentration in stack gases. Allowable emissions such as pounds per million Btu or pounds per ton of product serve this purpose. However, no BACT can be any less stringent than any applicable new source performance standard (NSPS), national emission standard for hazardous air pollutants (NESHAP), or other SIP limitations. Therefore, the reviewer must check to see that the total system proposed by the applicant and the permit conditions are enforceable.

It is the reviewer's responsibility to specify enforceable equipment or work practice standards in those situations in which emissions are expected but are not measureable. An example of a system of enforcement might be recordkeeping regarding the emissions unit, in a situation in which a maintenance and monitoring program were the BACT for leaking valves in a petroleum refinery. The recordkeeping would serve to determine the success of the specified program.

To make BACT enforceable and continuous, the reviewer should realistically consider the reliability of the control systems. For example, the reviewer should consider the average efficiency and not the maximum efficiency of a control, and should devise compliance and monitoring systems that are repeatable and straightforward, if necessary.

Reviewers should also note that some applicants might be motivated to propose allowable emissions, that, in the opinion of the reviewer, are excessive. It is inefficient to try to squeeze the last ounce of allowable emissions from a proposed allowable emission rate. However, one of the prime objectives of PSD is to require emission control strategies that force the evolution of pollution control technology. Industrial motivation to force this technology will be reduced if allowable emissions can easily be met with a large margin of safety.

C. AIR QUALITY ANALYSIS

The agency responsible for reviewing the PSD permit applications must undertake a careful analysis of the data presented. The applicant is required to analyze the air quality impact of the proposed source or modification and present data to substantiate all analyses. The analyses must be complete and accurate and ensure compliance with the national ambient air quality standards and PSD increments.

C.1 AIR QUALITY AND MODELING APPLICATION REVIEW

The application presented for review must adequately address all relevant elements of PSD to be considered complete. Each element presented in the application must be carefully reviewed. The steps in this review include:

- A determination and quantification of those pollutants for which air quality review is required,
- A clear description of the proposed source or modification,
- A review of modeling techniques,
- A determination of existing air quality,
- A check for impact on Class I areas, and
- A comparison of analyses results with the national ambient air quality standards and allowable increments.

C.1.1 Pollutants Requiring Review

All regulated pollutants that may be emitted in significant quantities from the proposed source or modification are subject to the air quality review. The pollutants that must be part of the air quality review are generally identified in the applicability analysis, which determines if the proposed construction is subject to review and what analyses must be performed if a PSD permit is to be issued.

C.1.2 Description of the Source

The modeling analysis presented for the proposed source or modification must be reviewed for completeness and accuracy. However, before modeling analyses are reviewed, a thorough understanding of the project must be developed.

The model presented by the applicant is a mathematical respresentation of a physical situation. A clear picture of the physical setting of the proposed source is a prerequisite to properly reviewing the mathematical representation. Such an understanding should encompass all facets of the proposed source or modification. A description of all emissions units including allowable emissions, stack parameters, location, and nearby tall buildings is required. The review must also ensure the inclusion of all sources of fugitive emissions in the proposed project.

If the project is a modification, then changes in actual emissions at the source must be established. The review agency should carefully examine all changes in actual emissions. These must be carefully documented. A review of whether the changes are reasonable and in agreement with State files is a good check.

A plot plan can be useful in determining emissions unit location and possible critical meteorology. The plot plan will assist the reviewer in the analysis of source interaction and building downwash effects. In many cases, the applicant will make what he or she considers conservative assumptions in performing dispersion modeling. The plot plan is helpful in determining if these assumptions are indeed conservative.

C.1.3 Modeling Techniques

If a modeling plan has been submitted by the applicant, a quick check will provide the review engineer with the information necessary to determine if the applicant has completed his or her intentions. The review engineer should compare the procedures outlined in the PSD application with those in the modeling plan. This is especially important in cases in which the modeling plan has been approved with conditions and stipulations.

The modeling data presented by the applicant in his or her application should be complete and accurate. The reviewer should:

- Determine which models were used,
- Ensure that all sources are included in the inventory,
- Examine allowable and actual emissions for proper treatment,
- Check meteorological data used,
- Review modeling assumptions used, and
- Check good engineering practice (GEP) stack height regulations with respect to the operation.

C.1.3.1 Model Selection. All models used by the applicant must be examined by the reviewing agency. Acceptable models and procedures are those found in the latest revision of EPA's Guideline on Air Quality Models and the Air Quality Maintenance Planning and Analysis Guidelines, Volume 10.

In selecting a model, it is the applicant's responsibility to submit for review any modifications made to the guideline models. These modifications include any changes to the theory or computer code that may alter the results. Each modification requires review agency approval. A model should only be used in those applications for which it was designed. For example, the CRSTER model should be used for single-source rural modeling. However, a different model should be selected for multiple-source situations.

Approval for use of alternative models (i.e., models other than those specified in the Guideline on Air Quality Models) is given only if acceptable technical justification is presented. The alternative model must be sufficiently documented so the reviewer can understand the difference between alternative and recommended models. In addition, a comparative analysis between an alternative model and a recommended model must be presented. Guidelines for performing such a comparison are presented in the Guideline on Air Quality Models. This type of analysis should include several runs of each model that highlight the technical differences between the models. An applicant should be encouraged to discuss model selection with the review agency before performing the analysis.

An important element of model selection is land use within 3 kilometers of the source. Whether this area is rural or urban is a factor in determining what model is most appropriate for a given situation. The Guideline on Air Quality Models suggests methods for determining the land use of a given area.

C.1.3.2 Inventory. It is the responsibility of the applicant to establish an inventory for all sources of emissions within the impact area, as well as for large major sources within 50 kilometers of the impact area that may cause significant impacts in the impact area. The complete inventory consists of increment-consuming emissions and emissions that are not included in the estimate of existing air quality. Additionally, the applicant should use the appropriate emissions inventory to demonstrate that ambient air monitors were properly located.

The data presented by the applicant should make use of State and Federal air permit files. The review authority should perform checks on these inventories. State agency permit files or previous PSD permit applications in the area can be used for this purpose. The objective is to determine that all significant sources and all increment-consuming emissions are considered.

A critical element in establishing the increment inventory is the baseline date. This is the date after August 7, 1977 on which the first complete PSD application subject to the new regulations is submitted. The baseline date is pollutant-specific; therefore, a source that is not subject to PSD review for sulfur dioxide (SO_2) but that is subject for particulate matter (PM) may set the baseline date for PM but not for SO_2.

The reviewing authority should check that the baseline date is correctly established for all areas that contain sources whose emissions may affect increment consumption in the proposed source's impact area. Baseline date is important to the increment analysis because, after that date, all changes in emissions at both major and nonmajor sources will consume or expand increment. Thus, for new and existing sources for SO_2 or PM, changes in emissions resulting from construction commencing after January 6, 1975 consume or expand increment. This type of check can be conducted by the following steps:

1. Determine all Section 107 areas where the source will have a significant impact.

2. Establish nearby Section 107 areas within 50 kilometers of the proposed source's impact area, and then check for the date of the first complete PSD application submitted after August 7, 1977 in each area.

It is recommended that each review authority conduct an analysis for baseline dates as soon as possible so that confusion is avoided during the review of future applications. This is especially important for areas in and around heavily industrialized areas where PSD activity is expected to be substantial.

C.1.3.3 Documentation of Actual Emissions. In certain areas of the country, many increment sources are permitted to emit more pollutants, such as SO_2 than they regularly emit. In many cases, an applicant will use allowable emissions as a conservative estimate of actual emissions for the purpose of increment consumption analysis. If, however, he or she chooses to use actual emissions, the data must be adequately documented and verified. A review of the State air pollution control agency files may provide data on actual emissions. In the absence of substantive data in State files, plant authorities should be consulted for information about their actual emissions. If no data are available regarding actual emissions, then allowable emissions must be used.

After checking the applicant's source inventory against State records, a plot of all major sources should be prepared. The plot will reveal the lines of source interaction for the reviewer. In most cases, use of guideline models and techniques will produce results that predict maximum ambient concentrations in an area. The review engineer should check the results against the plot and against his or her own knowledge of meteorology and air quality in the area. The reviewer then must decide if the results are reasonable and whether they are consistent with results from other recent analyses in the area. The reviewing engineer should be convinced by the application data that there are no possible unconsidered situations that would lead to higher concentrations.

C.1.3.4 Meteorology. Meteorological data presented by the applicant for review must be typical of the area in question and may be gathered from sources in accordance with procedures in the Guideline on Air Quality Models. The applicant may gather data from the National Climatic Center in Asheville, North Carolina, which supplies hourly observations for many areas of the country. The applicant may alternatively secure data from an onsite monitoring program. The EPA regional meteorologist or reviewing authority meteorologist should be consulted regarding the use of meteorological data.

Site-specific arguments may be presented by the applicant. For example, the applicant may contend that winds along a given line of source interaction are uncommon in the region and that they cannot persist long enough to cause high concentrations. These arguments must be carefully scrutinized by the reviewer. A review of the meteorology should confirm such contentions.

C.1.3.5 Review Modeling Techniques. Several items need to be considered when reviewing the modeling analysis, including receptor locations, model inputs, and modeling assumptions. The correct placement of receptors is critical to the determination of maximum impact. The reviewer should check the placement of receptors against source locations on the impact area source plot and critical meteorology. This review will ensure that maximum impact is presented by the applicant. Misplacement of receptors can cause low concentrations to be predicted with otherwise critical meteorology. To determine the correct placement of receptors, the reviewer must carefully analyze the wind direction and source interaction lines. Any questions concerning receptor placement or any other modeling question should be directed to the EPA modeling contact or designated representative.

Once the receptors are placed and maximum concentrations are predicted by the applicant, then the receptor grid density around the maximum receptor should be increased to a 100-meter spacing to establish that the highest maximum has been found. If the initial modeling was completed using 1-kilometer spacing, then it is entirely possible that, with an increase in grid density, the concentration estimate may increase considerably.

Once a specific model has been chosen, the model must be applied properly. It is the responsibility of the reviewer to determine that the model has been applied properly and that the applicant has used the model correctly. An appropriate model for a given application can be incorrectly applied and thus produce erroneous results. Generally, a review of the input options will reveal any erroneous assumptions that were made for the model run. Approved models should be run with recommended options unless these options are inappropriate for an application. In this case, the reviewer must approve any alternative options. These options should be carefully evaluated with respect to the particular model application. Any deviation from modeling using the maximum allowable emission rate should be noted. This deviation may require an enforceable permit condition to restrict source operation at these rates. In some cases, however, a source may cause a higher ambient impact when operating at less than peak load. An analysis compatible with the Guideline on Air Quality Models should be performed by the applicant to ensure that sources are modeled to predict maximum ground-level concentrations.

C.1.3.6 Good Engineering Practice (GEP). A review of tall buildings near the proposed emission points that considers all possible downwash effects must be conducted. The good engineering practice (GEP) stack height regulations and their accompanying technical support document provide guidance on identifying potential downwash problems. The applicant should provide an analysis of downwash effects for any stacks significantly less than GEP height. The technical support document for the GEP regulations will guide the reviewer on how these analyses should be performed. If a source intends to construct a stack that exceeds GEP height, the source must model at GEP height. Each stack should undergo an analysis by the reviewing authority to determine that the GEP regulations are met.

C.1.4 Existing Air Quality

Data must be presented by the applicant to establish the air quality in a region prior to the introduction of a new source or modification. The determination of existing air quality usually takes place well in advance of the submittal of a PSD application. It includes either a demonstration that existing monitoring data are adequate to measure maximum concentrations in the source impact area or the results of a monitoring program conducted specifically for the proposed source or modification. Remember that the applicant may apply for an exemption from the monitoring requirements upon demonstration of sufficiently low ambient impacts or existing ambient air concentrations. In all cases, the applicant must follow the Ambient Monitoring Guidelines for Prevention of Significant Deterioration. The reviewing authority should review each air quality analysis carefully with respect to the PSD guideline.

C.1.5 Class I Areas

If a Class I area is within the air quality impact range of the source proposed by the applicant, then special care must be taken by the reviewer to ensure that all modeling procedures are precise. The Class I area analysis is more complex for the applicant because Class I increments are much smaller than Class II increments. The procedures for establishing an inventory and for modeling are the same as applied in Class II areas; however, the applicant must consider carefully all increment consumption at a Class I area. In these cases, little room is left for error.

C.2 SUMMARY

All modeling results presented by the applicant should be carefully reviewed. The modeling results should be substantiated by computer printouts from the modeling analysis. The reviewer should verify that an appropriate model has been applied properly and that the data presented is complete and accurate.

The job of the reviewer is critical to the preservation of the national ambient air quality standards and the PSD increments. The reviewer should address all data presented by the applicant with the intention of certifying that a thorough analysis of the predicted air quality around the source in question has been conducted. The critical items that should be reviewed with respect to air quality impacts follow:

- A determination of those pollutants for which a review is required,
- A clear description of the proposed source or modification,
- The proper selection and use of models,
- A determination of existing air quality,
- An analysis of any impacts on a Class I area, and
- A demonstration of compliance with the NAAQS and PSD increments by a careful examination of all results.

APPENDIX 1

PRELIMINARY DETERMINATION SUMMARY

D. ADDITIONAL IMPACTS ANALYSIS

A critical part of any PSD application is the additional impacts analysis, which is an analysis of the impacts of the proposed source or modification and its associated growth upon the soil, vegetation, and visibility in the areas surrounding the source. This section will provide the reviewer with a checklist to help ensure that the additional impacts are adequately defined and properly documented. The checklist contains a number of points the reviewer should consider before beginning a review of the additional impacts section of a PSD application.

Initially, the reviewer should determine the depth of analysis necessary for the particular source or modification under review. For example, the reviewer may reasonably assume that large sources of emissions, such as power plants and smelters, will probably require an extensive analysis. The depth of analysis for smaller sources of emissions should depend upon the air quality in the area and the sensitivity of local soils, vegetation, and visibility to the indicated air pollution impacts. The reviewer also should be aware of the location of the nearest Class I area. The additional impacts analysis must address potential impacts in Class I areas in greater detail than in other areas.

The 1980 PSD regulations require air quality analyses for both criteria and noncriteria pollutants that are emitted or increased in significant amounts. The predicted ambient air concentrations are used as a basis to assess the extent of soil, vegetation, and visibility impacts. Because national air quality standards for noncriteria pollutants do not exist, the additional impacts analysis serves a major role in establishing the air quality impacts of these pollutants.

Finally, the reviewer should note that applicants have a great deal of flexibility in their approach when undertaking an additional impacts analysis. It is the reviewer's responsibility to determine if the analysis presented by the applicant has been completed with sufficient depth to determine potential significant effects on soils, vegetation, and visibility resulting from air quality impacts. The reviewer must rely on information presented by the applicant as well as on his or her experience in determining the adequacy of the analysis.

Other major considerations of the additional impacts analysis review are presented below.

D.1 GROWTH ANALYSIS

In a growth analysis, the applicant must present a clear picture of the resulting air quality impacts after the source or modification is introduced. The application should project direct industrial, commercial, and residential growth, and the reviewer should decide whether the data presented are reasonable. It is important that the reviewer query regional planning offices or other State agencies to verify the data presented by the applicant. The reviewer may also check other PSD applications that are similar to the one under review. In addition, the reviewer should be able to delineate those types of situations that may lead to associated growth. For example, a labor-intensive industry, such as a large furniture manufacturing plant or textile mill built in a small, rural town, may result in increased residential and commercial growth that would affect the air quality of the area.

The growth projection analysis should be the first analysis undertaken by the applicant because it provides inputs into the modeling analysis, which in turn provides an essential framework for the soils, vegetation, and visibility analyses. In many cases, the reviewer must rely on data presented by the applicant to determine the type and amount of expected growth. If insufficient data are presented for review, the reviewer should request additional information from the applicant.

If the reviewer is in agreement with the projected growth analysis, the next step is to assess the data on air pollution that may result from this growth. Temporary growth, such as a construction work force, does not necessarily apply; therefore, data on emissions from temporary growth are generally not considered. The applicant should make logical conclusions from an analysis of the area and should address both long-term and short-term growth. The reviewer should verify the projected emissions by referring to manufacturer's specifications and guidelines, or by comparing the data to similar examples of growth and emissions found in other PSD applications. Additionally, the EPA publication, Compilation of Air Pollution Emission Factors (AP-42), is a good source of emissions data. The reviewer should also verify that all significant quantifiable emissions projected in the growth analysis are considered in the modeling analysis, because both applicable criteria and noncriteria emissions should be modeled. If no growth is projected as a result of the introduction of a new source or modification, then there will be no growth-related air quality impacts. Once the reviewer has a clear understanding of growth and its impacts, the next consideration in the additional impacts analysis should be the soils and vegetation analysis.

D.2 SOILS AND VEGETATION ANALYSIS

The soils and vegetation analysis examines the effect of predicted ambient air concentrations on soils and vegetation. The applicant could have approached the analysis from a variety of viewpoints; therefore, it is the reviewer's task to check any analysis for accuracy and credibility.

An applicant who has followed the suggested method of analysis will provide a categorization of the soil and vegetation types found naturally in the area. The reviewer should verify that this list is accurate and comparable to the assessments of other conservation groups, State agencies, or universities. The soils and vegetation survey is very important and should emphasize the sensitive species located in the area.

Reviewers should examine the modeling data presented in the PSD application to determine the maximum pollutant concentrations of each applicable pollutant in the impact area. The modeling should include applicable criteria and noncriteria pollutants. The applicant should present predictions, supported by scientific literature, of the effects of maximum concentration of pollutants on the types of soils and vegetation found within the impact area. Good references include the EPA Air Quality Criteria Documents and a U.S. Department of the Interior document entitled Impacts of Coal-Fired Power Plants on Fish, Wildlife, and Their Habitats.

For criteria pollutants with maximum predicted concentrations that are less than the secondary national ambient air quality standards, the impact on most soils and vegetation, in most cases, will be negligible. Because some sensitive species of plants may be directly affected by these lower concentrations, the list of vegetation for a particular area should emphasize these sensitive species. For example, alfalfa yield is decreased when alfalfa is exposed to sulfur dioxide (SO_2) concentrations of less than 100 micrograms per cubic meter for a period of 4 weeks. The reviewer must check any supporting documentation provided to ensure that the conclusions of the applicant are correct.

D.3 VISIBILITY ANALYSIS

In the last step, the reviewer should assess the applicant's visibility impacts analysis. Air pollution visibility impacts include visible stack emissions, mists associated with cooling towers, and any transformation of pollutants involved in atmospheric chemistry.

An assessment of visibility impacts, like all additional impacts analyses, is based on comprehensive data presented by the applicant. Data correlating emissions with visibility impacts must be properly applied. Currently, the suggested method for completing the visibility impairments analysis is the screening techniques outlined in the draft EPA document, "Workbook for Estimating Visibility Impairment." If the applicant has utilized the workbook as a guide, the reviewer should verify all calculations and conclusions presented by the applicant. If the applicant used a different method of analysis, the reviewer should check to see that the analysis is correct and should verify the applicant's conclusions by performing a separate visibility screening analysis. This technique is not time-consuming and serves as an excellent verification procedure.

For large sources of emissions resulting in possible visibility impairments, applicants have been urged to utilize the plume visibility model. The reviewer should consult with the regional meteorologist to verify both the proper application of the model and the results submitted by the applicant. The reviewer also should be familiar with the draft EPA document, "User's Guide for the Plume Visibility Model."

A major goal of the additional impacts analysis is to provide the local community with information that demonstrates how a new source will affect their enjoyment of the area. Areas that contribute to the common aesthetic enjoyment of a community should be part of the application. It is the responsibility of the reviewer to ensure that all the information presented by the applicant is descriptive.

The applicant must also submit an expanded visibility impairment analysis when primary or secondary emissions affect Class I areas or other areas of scenic beauty. Any potential impacts on Class I areas must be reviewed in a manner that adequately addresses the impacts on the recreational and scenic beauty of these areas.

D.4 CONCLUSIONS

After the reviewer has carefully examined all data on additional impacts, he or she must decide whether a particular applicant has met the standards of the review.

This decision is based on:

- Whether the applicant has given the reviewer a clear and accurate portrait of the soils, vegetation, and visibility in the proposed impacted area.
- Whether the applicant has provided adequate documentation of the potential impacts upon soils, vegetation, and visibility resulting from applicable pollutant emissions.
- Whether the data was presented in a logical manner (i.e., beginning with a growth analysis, followed by a visibility analysis, etc.)
- Whether the applicant, the reviewer, and the affected community understand the potential additional impacts generated from the source under review.

The additional impacts are sensitive community issues and must be properly assessed and clearly presented if a harmonious relationship is to exist between industry and the local community.

PRELIMINARY DETERMINATION SUMMARY

CONTENTS & FORMAT

I. APPLICANT'S NAME
MAILING ADDRESS

II. PROPOSED SOURCE OF MODIFICATION LOCATION

- County or Parish
- UTM coordinates or longitude and latitutde
- Street or road location

III. PROJECT DESCRIPTION

Generalized description of project and process weight rate, new, or modified. Emphasis should be on capacity or firing rate.

IV. SOURCE IMPACT ANALYSIS

This section should deal with an introduction as to what items the application was reviewed for:

1. BACT
2. NAAQS analysis
3. Increment analysis
4. Soils, visibility, and vegetation
5. Growth
6. Class I area analysis

The following discussion should backup or give the appropriate reasons why the application was reviewed for some or all of the above items.

Quote the appropriate paragraph number in the PSD regulation which demonstrates proper applicability or exemption.

This section should also include a statement and demonstration of the pollutants for which the source is considered major. Provide a table, labeled "Table 1," showing emissions of all pollutants being emitted at the source and those associated with the major source or major modification.

If applicant is required to perform an air quality review, copies of Table 1-1 and Table 1-2 must be included in the PDS. Revised copies of these tables are attached for use. They would be included in the preliminary determination summary (PDS) as Tables 2 and 3.

A. BACT

This section must discuss the applicant's proposed BACT. The alternatives must be discussed for each facility that emits (or increases) the emissions of an applicable pollutant.

For instance:

1. TSP
    a. Coal conveying
    b. Boilers X & Y
    c. Fly ash silo
2. SO_2
    a. Boiler X
    b. Boiler Y, etc.

If the resulting BACT is or results in emissions different than any applicable NSPS, give rationale.

Note: We do not want to issue a permit with an allowable emission so low that we feel it is unattainable even though the applicant feels he can meet it.

B. Increment Analysis

(This section, of course, is needed only for applicants subject to PSD for TSP or SO_2.)

This section must contain the following minimum information:

1. Computer model used, highlighting any modifications and why it was used and approved for use.
2. If applicant used resulting highest, second-highest values then he must use 5 years meteorological data. State whether the numbers reflect highest or highest, second-highest values.
3. The maximum impact area for TSP and/or SO_2.

4. List of other increment-consuming sources in the impact area and the source of this information such as the applicant or State agency, etc.
5. The maximum increment consumed as a result of the application.

   Note: Increment analysis is by modeling only and has nothing to do with monitored background data!

C. NAAQS Analysis

This section must contain a brief explanation of how the applicant obtained his conclusion; which monitor provided the background readings and which other sources in the area were modeled. This is a case-by-case analysis which must demonstrate that good engineering logic was used. The results should be in tabular form showing background plus other sources contributions plus the applicant's contribution and the resultant sum to arrive at the predicted worst case.

Also, state whether the applicant has demonstrated that Good Engineering Practice (GEP) has been applied to all emitting stacks and that no NAAQS violations are expected to occur as a result of downwash.

D. Soils, Vegetation, Visibility

This section should include a summary of the applicant's statement regarding anticipated harm to any of the above. Cite appropriate references and studies used for the applicant to reach his conclusions.

E. Growth Impacts

This should include a statement regarding any deterioration of air quality due to secondary emissions from associated industry, local rush hour traffic from employees, future phases of the project, etc.

Also, a statement should be made here about availability of future growth and increment consumed by this project.

F. Class I Area Analysis

State what impact, if any, will result from the project. Also state whether the source is (or is not) within 100 km of any Class I area.

V. CONCLUSIONS

This section should begin with a recommendation of approval or disapproval and the items of correspondence upon which the recommendation is made.

The remainder of this section is specific permit conditions:

1. Applicant will verify all emissions within 90 days of startup according to EPA methods of 40 CFR 60....etc.
2. Provide a table of allowable emissions, BACT, etc.
   For instance:

TSP

Facility	BACT	% Pollutant Reduction	Allowable Emission

Note: Provide values where applicable or available. Allowable emissions should be in the lbs/hr or lbs/million Btu heat input for combustion equipment.

3. For power-generating stations, the applicant should provide description of final design and received EPA approval before ordering equipment.
4. Any other condition(s) needed to ensure that EPA is not allowing any emissions greater than the modeling results were based on. This might include shutdown of equipment being replaced when new equipment is started up, etc.
5. Cite appropriate compliance methods.

Table 1-1. NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging time	Ambient ceilings,[a] μg/m³
Sulfur dioxide	Annual	
	Arithmetic mean	80
	24 - Hr.[b]	365
	3 - Hr.[b]	1,300
Particulate matter	Annual	
	Geometric mean	75
	24 - Hr.[b]	150
Carbon monoxide	8 - Hr.[b]	10[c]
	1 - Hr.[b]	40[c]
Nitrogen dioxide	Annual	
	Arithmetic mean	100
Ozone	1 - Hr.[b]	235
Lead	Calendar Quarter	1.5

[a]The lower concentration of either the primary or secondary NAAQS.

[b]Not to be exceeded more than once per year.

[c]Milligram/meter³.

Table 1-2. CLASS II INCREMENTS

Pollutant	Averaging time	Maximum allowable increases (increments) micrograms/meter^3
Sulfur dioxide (SO_2)	Annual mean	20
	24 - Hr.	91[a]
	3 - Hr.	512[a]
Particulate matter (TSP)	Annual mean	19
	24 - Hr.	37[a]

[a]The applicable maximum allowable increase may be exceeded during one such period per year at any receptor site.

APPENDIX 2

PSD COMPLETENESS DATA SUMMARY

PSD COMPLETENESS DATA SUMMARY/REVIEW WORKSHEET

COMPANY NAME:______________________ REVIEW DATE:__________

PSD NUMBER:__________ NMS or MM (circle one) REVIEWER:__________

BRIEF PROJECT DESCRIPTION ______________________________

____

I. DETERMINATION OF APPLICABILITY

For Proposed Construction, PSD Review - Applies - Does Not Apply - Undetermined* (Circle One)

*The following information is needed to complete the determination: ______________

____

REVIEW REQUIREMENTS ARE AS FOLLOWS (if subject to review):

Pollutant	BACT	Monitoring	AQ	Add'l Impacts	Net Emissions Increase (T/yr)
PM					
SO_2					
NO_x					
CO					
O_3(VOC)					
Other____					
Other____					

SIGNATURE OF REVIEWER:______________________

1. POTENTIAL EMISSIONS DATA SUMMARY FOR THE SOURCE (proposed new source or the existing source for a proposed modification):

Pollutant	PE[a] (T/yr)	Emission Units	Basis for Estimates[b] hrs/day	hrs/yr	% Capacity	Emissions Factor	Actual[c] (T/yr)	Allowable[c] (T/yr)
PM								
SO_2								
NO_x								
CO								
O_3(VOC)								
Other____								
Other____								

a. The source is a ____ 28-listed source or is a ____ non-28-listed source (100/250 major emissions criteria respectively).

b. If less than 8760 hrs/yr and 100%, do enforceable restrictions exist? __yes __no.

c. If PE, actual and allowable are not equal, explain why: ______________

____

____

2. NET CHANGES IN ACTUAL EMISSIONS? (for modifications only).

Describe modification including previous or planned emissions changes:

____

____

____

Pollutant	New & Mod. Units (T/yr)	Creditable Contemp. Increases (T/yr)	Creditable Contemp. Decreases[a] (T/yr)	Net Change in actual (T/yr)	Significance Criteria[b] (T/yr)
PM					25
SO_2					40
NO_x					40
CO					100
O_3(VOC)					40 (VOC)
Other____					
Other____					

a. Are decreases ensured by enforceable restrictions? __yes __no.

b. Is the source within 10 km of any Class I area? __yes __no.
If so, is maximum air impact (discussed below) $\geq$ 1 ug/m3 (24-hr)? __yes __no.

c. The baseline date(s) for this area are:______________________.

d. Do claimed emissions changes occur: 1) after 1/6/75 __yes __no; 2) after baseline date __yes __no (Note: Prebaseline changes must be due to construction at a MSS).

e. The area is designated non-attainment for what pollutants? ______________

BIBLIOGRAPHY

U.S. Department of Health, Education, and Welfare. 1967. Air Pollution Engineering Manual. Publication No. AP-40. Cincinnati, Ohio. 987 pp.

U.S. Department of the Interior. 1978. Impacts of Coal-Fired Power Plants on Fish, Wildlife, and their Habitats. Fish and Wildlife Service Publication No. OBS-78/29. Washington, D.C. 259 pp.

U.S. Environmental Protection Agency. 1980. User's Manual for the Plume Visibility Model. Research Triangle Park, North Carolina. 377 pp. (Draft Document submitted to EPA.)

_____. 1980. Workbook for Estimating Visibility Impairment. Research Triangle Park, North Carolina. 373 pp. (Draft document submitted to EPA.)

_____. 1978. Ambient Monitoring Guidelines for Prevention of Significant Deterioration. EPA-450/2-78-019. Research Triangle Park, North Carolina. 90 pp.

_____. 1978. Guideline on Air Quality Models. EPA/450-2-78-027. OAQPS No. 1.2.-080. Research Triangle Park, North Carolina. 83 pp.

_____. 1977. Compilation of Air Pollutant Emission Factors, 3rd ed. (including Supplements 1-7). Publication No. AP-42. Research Triangle Park, North Carolina. 500 pp.

_____. 1977. Guidelines for Air Quality Maintenance Planning and Analysis, Volume 10 (Revised): Procedures for Evaluating Air Quality Impact of New Stationary Sources. EPA-450/4-77-001. OAQPS No. 1.2-029R. Research Triangle Park, North Carolina. 75 pp.