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FINAL SUBMITTAL

SUMMARY OF
DELAWARE 2005 RATE-OF-PROGRESS PLAN
FOR KENT AND NEW CASTLE COUNTIES

For Demonstrating Progress toward Attainment of the 1-Hour National Ambient Air Quality Standard for Ground Level Ozone

Submitted to:

U.S. Environmental Protection Agency

By

Delaware Department of Natural Resources and Environmental Control
in Conjunction with
Delaware Department of Transportation

December 2000

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Acronym List

AIRS	-	EPA's Aerometric Information Retrieval System.
AFS	-	AIRS Facility Subsystem.
AMS	-	AIRS Area and Mobile Subsystem.
AQM	-	Air Quality Management Section
BEA	-	Bureau of Economic Analysis
CAAA	-	Clean Air Act Amendments of 1990
CMSA	-	Consolidated Metropolitan Statistical Area
CO	-	Carbon Monoxide
DelDOT	-	Delaware Department of Transportation
DNREC	-	Delaware Department of Natural Resources and Environmental Control
EPA	-	United States Environmental Protection Agency
EPS2.0	-	EPA's Emissions Preprocessor System software
FMVCP	-	Federal Motor Vehicle Control Program
HPMS	-	Highway Performance Monitoring System
I/M	-	Inspection and Maintenance
LEV	-	Low Emission Vehicle
MPO	-	Metropolitan Planning Organization
mmBTU	-	Million British Thermal Unit
mmcf	-	Million Cubic Feet
NAAQS	-	National Ambient Air Quality Standard
NLEV	-	National Low Emission Vehicle
NOx	-	Oxides of Nitrogen
OTAG	-	Ozone Transport Assessment Group
OTC	-	Ozone Transport Commission
OTR	-	Ozone Transport Region
PAPS	-	Point and Area Projection System
PERC	-	Perchloroethylene
POTW	-	Publicly Owned Treatment Works
RACT	-	Reasonably Available Control Technology
RPP	-	Rate-of-Progress Plan
RVP	-	Reid Vapor Pressure
SCC	-	Source Classification Code
SIC	-	Standard Industrial Classification
SIP	-	State Implementation Plan
VHB	-	Vanasse Hangen Brustlin, Inc.
VOC	-	Volatile Organic Compound

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INTRODUCTION

1. Background

This document contains Delaware's State Implementation Plan (SIP) revision for the milestone year of 2005 to address adequate rate of progress toward attainment of the 1-hour ground level ozone National Ambient Air Quality Standard (NAAQS) as set forth in the Clean Air Act Amendments of 1990 (hereafter referred to as CAAA).[1] The plan is hereafter referred to as "Delaware 2005 Rate-of-Progress Plan", or simply as "the 2005 RPP".

The CAAA sets forth the National Ambient Air Quality Standards for six air pollutants that pose public health risks and environmental threats. Delaware exceeds the standard for only one of these pollutants, i.e., the ground-level ozone. High levels of ozone can harm the respiratory system and cause breathing problems, throat irritation, coughing, chest pains, and greater susceptibility to respiratory infection. High levels of ozone also cause serious damage to forests and agricultural crops, resulting in economic losses to logging and farming operations. Ozone is generally not directly emitted to the atmosphere, but formed in the atmosphere by chemical reactions between volatile organic compounds (VOC), nitrogen oxides (NOx), and carbon monoxide (CO) in the presence of sunlight. Consequently, in order to reduce ozone concentrations, the CAAA requires specific amounts of reductions in anthropogenic VOC emissions and/or NOx emissions over a specified period of years until the ozone standard is attained. These periodic emission reductions are termed as "rate of progress" toward the attainment of the ozone NAAQS.

The CAAA defines five nonattainment classifications for areas that exceed the 1-hour ozone NAAQS based on the severity of the pollution problem. In order of increasing severity, they are marginal, moderate, serious, severe, and extreme. Attainment dates depend on the classification designation for individual areas.[2] The CAAA also establishes the Ozone Transport Region (hereafter referred to as OTR) where the interstate transport of air pollutants from one or more states contributes significantly to violations of the ozone NAAQS in one or more other states. This single transport region for ozone includes the states of Delaware, Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and the Consolidated Metropolitan Statistical Area (CMSA) that includes the District of Columbia.[3] The OTR includes the Philadelphia Consolidated Metropolitan Statistical Area (CMSA) which is classified as a severe nonattainment area (Figure 1). As shown in Figure 1, Kent and New Castle Counties in Delaware fall within the Philadelphia CMSA. Thus, these two counties are subject to all requirements set forth for the severe ozone nonattainment class. All discussions and data presented in this document apply only to Kent and New Castle Counties.

Section 182 (d) of the CAAA requires states to submit a State Implementation Plan (SIP) to the United States Environmental Protection Agency (EPA), for each ozone nonattainment area classified as severe or above, that achieves a 15% net reduction of actual anthropogenic

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[1] Federal Clean Air Act, 42 *U.S.C.A.* 7401 *et seq*., as amended by the Clean Air Act Amendments of 1990, P.L. 101-549, November 15, 1990.

[2] Clean Air Act Amendments of 1990, Title 1, Part D, Section 181.

[3] Clean Air Act Amendments of 1990, Title 1, Part D, Section 184 (a).

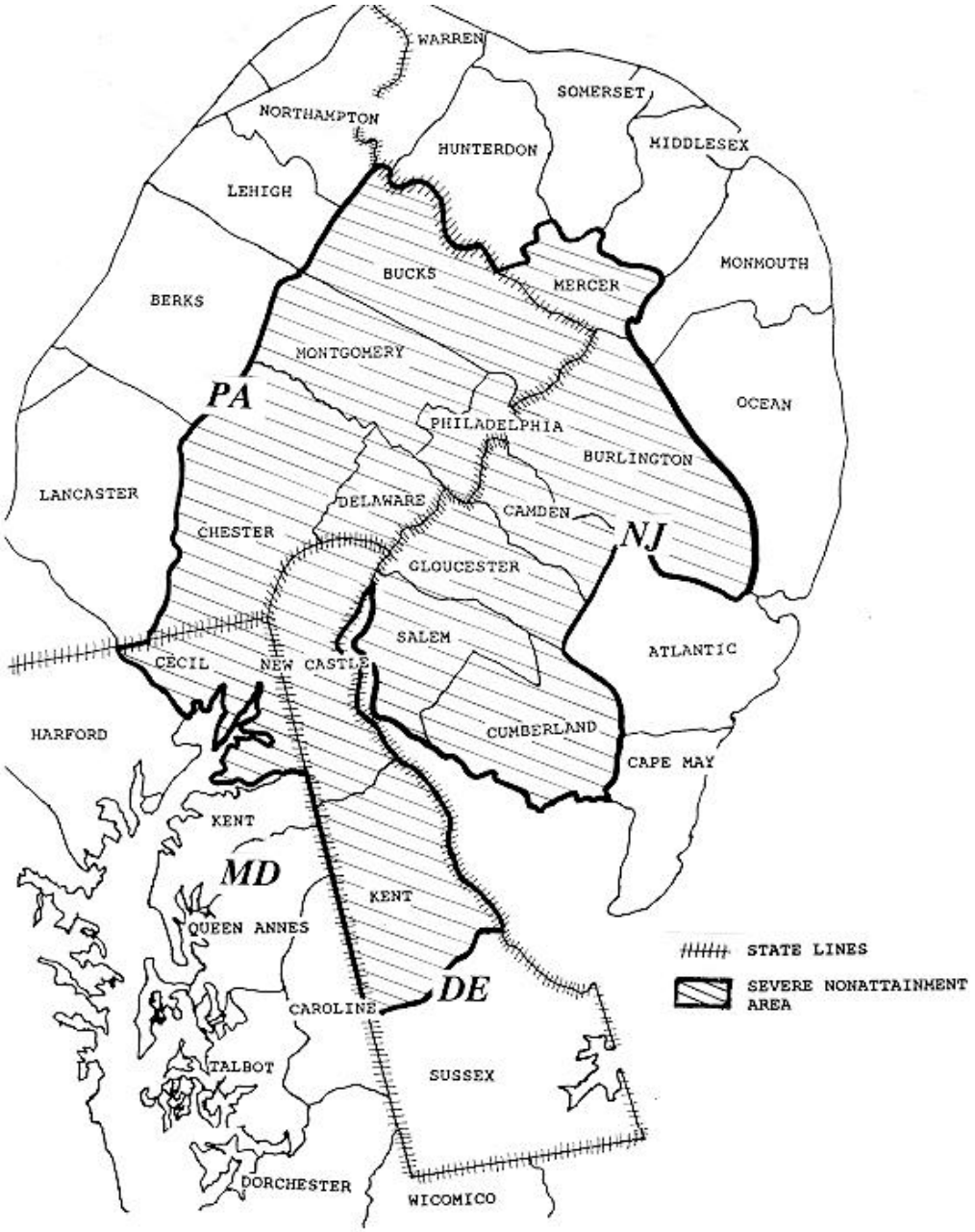

Figure 1. Philadelphia Consolidated Metropolitan Statistical Area (CMSA) Nonattainment Area.[4]

[4] This map is adapted from *Major CO, NO_2 and VOC Sources in the 25-Mile Boundary Around Ozone Nonattainment Areas, Volume 1: Classified Ozone Nonattainment Area*,EPA/4-92-005a, U.S. Environment Protection Agency, Office of Air Quality Planning and Standards, Office of Air and Radiation, Research Triangle Park , NC, February, 1992.

(human-caused) volatile organic compound (VOC) emissions by November 15, 1996. In addition to the 15% reduction, Section 182(d) also requires states to submit SIP revisions that achieve actual VOC emission reductions of at least 3% per year averaged over each consecutive 3-year period beginning November 15, 1996, until the area's applicable attainment date. These rate-of-progress emission reductions are based on the states' 1990 emission levels. The SIP revision for the 1990-1996 reductions is termed as "the 15% Rate-of-Progress Plan (RPP)", and the plans for an average 3% per year reduction over each 3-year period after 1996 are termed as "the Post-1996 Rate-of-Progress Plans". The CAAA also provides for crediting of VOC emissions reductions achieved in the 1990-1996 period to the post-1996 rate-of-progress plans if they are in excess of the 15% VOC reductions requirement, and substitution of any anthropogenic nitrogen oxides (NOx) emissions reductions, net of growth, occurring in the post-1990 period for the post-1996 VOC emission reduction requirements. In addition to the average annual 3% VOC/NOx emission reduction, Section 182(d) of CAAA also requires the States to provide for photochemical grid modeling demonstrations for the attainment of ozone NAAQS by the applicable attainment dates.

Through a memorandum dated on March 2, 1995, from Mary D. Nichols, Assistant Administrator for Air and Radiation, EPA provides for the States with serious and above ozone nonattainment areas a two-phased approach to the post-1996 RPPs.[5] Briefly, in Phase I, the States are required to develop a plan for the milestone year of 1999 which includes necessary control measures to achieve a 9% reduction of VOC and/or NOx emissions between 1996 and 1999. In Phase II, the States are required to assess the regional and local control measures necessary to meet the rate-of-progress requirements and achieve attainment. On December 23, 1997, EPA provided further guidance, along with a memorandum from Richard D. Wilson, Acting Assistant Administrator of Air and Radiation, on how to prepare the Phase II submittal.[6]

2. Delaware State Implementation Plan Submittals

All the rate-of-progress emission reductions aforementioned are based on the States' 1990 emission levels. Delaware's *1990 Base Year Ozone Emission Inventory*, which is an inventory of the 1990 actual VOC, NOx, and CO emissions from all sources in Delaware, was submitted to EPA as a SIP revision on May 27, 1994, and was approved by EPA on March 25, 1996. Since the ozone NAAQS attainment date for Kent and New Castle Counties is 2005, Delaware is required to submit the 15% RPP, and RPPs for three post-1996 milestone years, i.e., 1999, 2002, and 2005. Delaware's 15% RPP was submitted to EPA as a SIP revision in February, 1995. In this document, Delaware showed that, by implementing necessary control measures, the required 15% VOC emission reduction could be successfully met by 1996. The 15% RPP was conditionally approved by EPA in May 1997, and fully approved by EPA in October 1999. Delaware's 1999 RPP, the first post-1996 SIP revision developed according to the Phase I requirements set forth in the Nichols' Memorandum (please see Footnote 4), was submitted to EPA in December, 1997. In June 1999, Delaware submitted to EPA the Amendments of the 1999 RPP. In the 1999 RPP (as

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[5] *Memorandum: Ozone Attainment Demonstrations*, Mary D. Nichols, Assistant Administrator for Air and Radiation, U.S. EPA, Washington, D.C. 20460, March 2, 1995.

[6] *Memorandum and Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS*, Richard D. Wilson, Acting Assistant Administrator for Air and Radiation, U.S. EPA, Washington, D.C. 20460, December 23, 1997.

amended in April 1999), Delaware shows that the 9% VOC and/or NOx emission reductions required for the 1996-1999 period can be successfully met by implementing additional control measures in this time period. Delaware also demonstrates that an additional 3% VOC/NOx emission reduction can be achieved, without further rulemaking activities, to meet the contingency requirements specified by EPA.[7] In May 1998, Delaware submitted to EPA the Phase II attainment demonstration document based on EPA's guidance. In this Phase II document, Delaware makes a commitment to submit a SIP revision to EPA before the end of 2000 to address the emission reductions for the post-1999 rate-of-progress milestone years up to the attainment date for the 1-hour ozone NAAQS (Delaware's attainment date for the 1-hour ozone NAAQS is 2005). The Phase I submittal is currently under EPA's review. For the Phase II submittal, EPA published its proposal for approval in Federal Register on December 16, 1999.

On July 18, 1997, EPA revised the 1-hour ozone NAAQS with an 8-hour standard at a level of 0.08 ppm.[8] However, the 1-hour standard will continue to apply to a nonattainment area for an interim period until EPA makes a determination that the area has air quality meeting the 1-hour standard. As a consequence, the provisions of Section 182 of the CAAA will continue to apply to the subject nonattainment areas until EPA makes determinations that these areas have met the 1-hour ozone standard (please see Footnote 5). The continuation of the 1-hour standard requires that Delaware submit to EPA, before the end of 2000, fully adopted Rate-of-Progress Plans for the milestone years of 2002 and 2005 to demonstrate adequate progress toward attainment of the 1-hour standard in 2005. Delaware fulfilled its Rate-of-Progress Plan for the milestone year of 2002 (i.e., the 2002 RPP) and submitted it to EPA for review and approval in February 2000. The document presented herein is Delaware's Rate-of-Progress Plan for the milestone year of 2005.

3. Organization of the 2005 Rate-of-Progress Plan

This document is a revision of Delaware's State Implementation Plan to fulfill (1) the CAAA rate-of-progress requirements toward attainment of the 1-hour ozone NAAQS, and (2) the commitment made in Delaware's Phase II submittal. The document is a fully-adopted Rate-of-Progress Plan with (1) emission target calculations for the milestone year of 2005, and (2) all control measures resulting from regulations adopted or to be adopted as necessary to achieve the rate-of-progress requirements set forth for 2005.

Based on the suggestion of EPA Region III Office, Delaware decides to use EPA's MOBILE5b model, instead of the MOBILE5a model used in Delaware's previous RPPs, to estimate more accurately VOC and NOx emissions in 2005 from on-road mobile vehicles. According to EPA's guidance on the use of MOBILE5b, Delaware must use MOBILE5b to reevaluate the mobile source emissions for the 1990 baseline inventory and the emission projections inventories of all the milestone years, i.e., 1996, 1999, 2002 and 2005.[9] The

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[7] *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration*, Office of Air Quality Planning and Standards, US EPA, Research Triangle Park, NC, February 1994.

[8] Environmental Protection Agency: *National Ambient Air Quality Standard for Ozone;* Final Rule. *Federal Register*, Vol. 62, No. 138, Friday, July 18, 1997.

[9] Memorandum: *Summary of Comments and Guidance for Use of MOBILE5b*, Philip A. Lorang, Director, Assessment and Modeling Division, Office of Mobile Sources, US EPA, August 17, 1997.

reevaluations of these emission inventories using MOBILE5b are included and discussed in the appropriate locations in this document. In general, this rate-of-progress plan contains five parts as explained below.

Part I. The 1990 Base Year Inventory Summary and 2005 Target Levels of VOC and NOx Emissions

The 2005 Target Levels of VOC and NOx Emissions are the maximum amounts of anthropogenic VOC and NOx emissions allowed in the years of 2005 in Kent and New Castle Counties in order to meet the 3% per year VOC/NOx reduction requirements. As previously mentioned, the basis for calculating these target levels is the 1990 Base Year Emission Inventory, which is an inventory of actual VOC, NOx, and CO emissions that occurred in Delaware in 1990. Section 182(c)(2)(C) of CAAA allows NOx reductions that occur after 1990 to be used to meet the post-1996 rate of progress requirements. The condition for meeting the rate-of-progress requirements is that the sum of all creditable VOC and NOx emissions must equal 3% per year averaged over the applicable milestone period. In the event of NOx substitution, separate target levels of emissions will have to be calculated for VOC and NOx. Part I presents a summary of the 1990 Base Year Inventory, as well as the 6-step process for determining the 2005 target levels of VOC and NOx emissions. To meet EPA's requirements for using MOBILE5b, Part I in the 2005 RPP also presents (1) reevaluations of controlled emission projections (i.e., the control strategy projections) of VOC and NOx in 1996, 1999, and 2002, and (2) calculations of VOC and NOx emission target levels in 1996, 1999 and 2002.

Part II. The 2005 Current Control Projection Inventory & Required VOC and NOx Emission Reductions

The Current Control Projections are estimates of the amount of VOC and NOx emissions that will occur in 2005, taking into account the effects of economic growth, and assuming no new emission control measures would be implemented between 1990 and the corresponding milestone year, i.e., 2005. The purpose of calculating the 2005 Current Control Projection Inventory is to determine the amount of growth in VOC and NOx emissions by 2005 that must be offset. Part II discusses the methodology for developing the emission growth factors and demonstrates how the growth factors are used to determine the Current Control Projection Inventory for VOC and NOx emissions in the year 2005. Since Delaware decides to use MOBILE5b to estimate on-road mobile source emissions, the current control projection inventories for 1996, 1999 and 2002 are also reevaluated for MOBILE5b in this part. The reevaluated 2002 current control inventory is then used to calculate emission increase from 2003 to 2005.

Part III. The 2005 Control Strategy Projection Inventory and Emission Control Measures

The 2005 Control Strategy Projections are estimates of the amount of VOC and NOx emissions that will occur in 2005, taking into account the effects of economic growth and continued benefits of control strategies in the 15% RPP, the 1999 RPP, the 2002 RPP, and

including the benefits from new control measures that will be implemented during the 2003-2005 period. The purpose of calculating the 2005 Control Strategy Projection Inventory is to determine if the new national, regional and state level control measures, which will be implemented between 2003 and 2005 will reduce VOC and/or NOx emissions sufficiently to offset growth and to meet the 2005 Target Levels of VOC and NOx emissions calculated in Part I. Part III discusses the methodology used to develop the 2005 Control Strategy Projection Inventory and presents the individual control measures to be implemented by 2005 with their VOC and NOx emission reductions. The control strategy projections for on-road mobile sources are estimated using EPA's MOBILE5b model.

Part IV. Contingency Plan for the 2005 RPP

Contingency measures are required by the CAAA to be included in the rate-of-progress plans to remedy the state's failure to meet the emission reduction target in a milestone year. The CAAA requires that, in the event of such a failure, the contingency measures can be implemented (1) without any further rulemaking actions by the state, and (2) to achieve an additional 3% emission reduction over the 1990 baseline level.[10] Part IV discusses the contingency measures and the potential emission reductions associated with each measure.

Part V. Documentation

Numerous appendices are included in this part to backup the discussion and conclusions in Part I through Part IV. These appendices include background information, emission data, projection methodologies and calculations, relevant guidance memorandums from EPA, and other references cited in Part I through Part IV.

It should be pointed out that there exist minute discrepancies among numbers in various parts in this document. Those discrepancies are due to calculation rounding errors that are of a magnitude of $\pm$0.001 TPD. Those discrepancies do not affect the final calculation results and the conclusions of the plan.

4. Responsibilities

The agency with direct responsibility for preparing and submitting this document is the Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Air and Waste Management, Air Quality Management Section (AQM), under the direction of Darryl D. Tyler, Section Administrator. The Delaware Department of Transportation (DelDOT), in conjunction with the consulting firm Vanasse Hangen Brustlin, Inc. (VHB), Watertown, MA, is responsible for providing input data files regarding emissions of the on-road mobile source portions of the 2005 RPP. The Ozone and Mobile Sources Branch of EPA Region III Office provides significant help and guidance in estimating mobile source emissions for 2005. Other Delaware agencies, including the Department of Labor, the Department of Public Safety, and the

[10] Memorandum: *Guidance on Issues Related to 15 Percent Rate-of-Progress Plans*, Michael H. Shapiro, Acting Assistant Administrator for Air and Radiation, US EPA, August 23, 1993.

Department of Agriculture, provide information used in some portions of the 2005 RPP. These agencies will be referred to and acknowledged in appropriate locations in the document.

The working responsibility for Delaware's air quality planning falls within the Planning and Community Protection Branch of the Air Quality Management Section of DNREC, under the management of Raymond H. Malenfant, Program Manager. Joseph Cantalupo, Manager of DelDOT's Intergovernmental Coordination Section, Office of Planning, is responsible for managing the work associated with the on-road mobile source portions of this document. Thomas F. Wholley, Director of Air Quality Services, Vanasse Hangen Brustlin, Inc., is responsible for contract work associated with the on-road mobile source portions of this document.

The following personnel of AQM's Planning and Community Protection Branch are instrumental in completing this document:

Project Leader and Principal Author:

Frank F. Gao, Ph.D., P.E., Environmental Engineer

Technical Editing Reviewer:

Alfred R. Deramo, Environmental Resource Planner

Quality Assurance Reviewer:

Mohammed A. Majeed, Ph.D., P.E., Environmental Engineer

Technical Supporting Staff:

Point sources:	Bhavesh V. Amin, P.E., Manager PCP's Emission Inventory Development Program
	Marian A. Hitch, Senior Environmental Compliance Specialist.
Area Sources:	Jack L. Sipple, Environmental Scientist
	Mark D. Eastburn, Environmental Scientist
Off-Road Mobile Sources:	Margaret A. Jenkins, Environmental Scientist
On-Road Mobile Sources:	Phillip A. Wheeler, Resource Planner

PART I

THE 1990 BASE YEAR INVENTORY SUMMARY AND THE 2005 TARGET LEVELS OF VOC AND NOx EMISSIONS

Under the rate-of-progress provisions in Section 182(d) of the Clean Air Act Amendments of 1990 (CAAA), Delaware is required to achieve an average 3% per year VOC emission reduction from the 1990 baseline emission levels in Kent and New Castle Counties in the milestone period of 2003-2005. In order to determine necessary and adequate control strategies for achieving the required emission reductions in this 2005 RPP, the target level of VOC emissions in the milestone year of 2005 must first be calculated. In addition, Section 182(c)(2)(C) of the CAAA permits the substitution of NOx emission reductions for the post-1996 VOC emission reductions required for the adequate rate-of-progress. Such NOx substitutions for VOC emission reductions require the calculation of the 2005 target level of NOx emissions.

The 3% per year rate-of-progress reductions in VOC and NOx emissions for the 2003-2005 period are determined from the 1990 Base Year Inventory after the inventory is adjusted for non-creditable emission reductions due to (1) Federal Motor Vehicle Control Program (FMVCP) tailpipe or evaporative standards promulgated prior to 1990, (2) Federal regulations specifying Reid Vapor Pressure (RVP) limits on gasoline for nonattainment areas, (3) State regulations required to correct deficiencies in Reasonably Available Control Technology (RACT) rules, and (4) State regulations required to establish or correct Inspection and Maintenance (I/M) programs. In this part, a summary of the 1990 Base Year Inventory for Kent and New Castle Counties is first presented, followed by the procedures and calculations for estimating the 2005 target levels of VOC and NOx emissions.

1.1. The 1990 Base Year Inventory Summary

The rate-of-progress provisions in the CAAA require states in nonattainment areas to submit to the EPA a current inventory of actual emissions from all sources of relevant pollutants.[11] This inventory is to be used as the basis for determining required emissions reductions. The calendar year 1990 is the time frame for this current emissions inventory which is called the 1990 Base Year Ozone State Implementation Plan (SIP) Emissions Inventory (hereafter referred to as the 1990 Base Year Inventory). Delaware's 1990 Base Year Inventory was submitted to the EPA as a SIP revision on May 27, 1994, and approved by EPA on March 25, 1996 (Reference 1, hereafter referred to as Delaware's 1990 Base Year Inventory).

The 1990 Base Year Inventory is categorized into point, stationary area, off-road mobile, on-road mobile, and biogenic sources of emissions. Volatile organic compounds (VOC), nitrogen oxides (NOx), and carbon monoxide (CO) are the ozone precursor emissions reported for each category in the 1990 Base Year Inventory. Because CO is only marginally reactive in producing ozone, the CO component of the 1990 Base Year Inventory does not figure into the rate of progress

[11] CAAA, Title I, Part D, Sec. 172(c)(3) and Sec. 182

requirements. Therefore, only the VOC and NOx components of the 1990 Base Year Inventory are summarized here. The results of Delaware's 1990 Base Year Inventory are summarized in Table 1-1 for VOC and NOx emissions from Kent and New Castle Counties. The values in Table 1-1 are reported in tons per day (TPD) in the peak ozone season. The peak ozone season for Delaware is defined as from June 1 through August 31.

Table 1-1
1990 Base Year Inventory Summary of VOC and NOx Emissions (in TPD)
by County in Peak Ozone Season

	Kent		New Castle		Total NAA	
Source Category	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
Point Sources	3.242	6.130	27.078	85.767	30.320	91.897
Stationary Area Sources	12.967	1.202	34.754	5.398	47.721	6.600
Off-Road Mobile Sources	3.494	7.891	16.674	18.777	20.168	26.668
On-Road Mobile Sources	13.07	10.62	35.28	27.06	48.35	37.68
Biogenic Sources*	32.46	0.00	17.51	0.00	49.97	0.00
Total Emissions	**65.233**	**25.843**	**131.296**	**137.002**	**196.529**	**162.845**

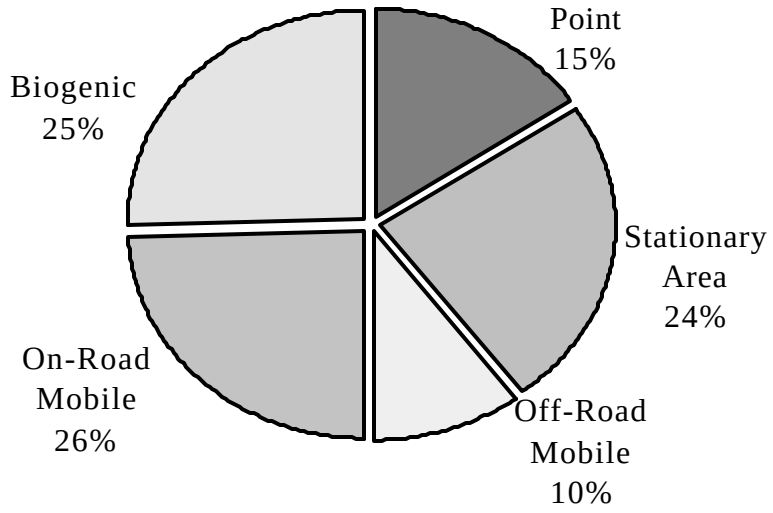
* NOx emissions from biogenic sources are considered negligible.

The percent VOC contribution of each source component listed in Table 1-1 to the total VOC emissions from Kent and New Castle Counties is shown in Figure 1-1. These relative proportions are shown both for the total inventory of all sources, and for the anthropogenic inventory which excludes biogenic emissions. The anthropogenic inventory is the inventory from which the Base Year Inventory is adjusted and the 2005 Target Levels of VOC (and NOx) emissions are calculated.

The percent NOx contribution of each source component listed in Table 1-1 to the total NOx emissions from Kent and New Castle Counties is shown in Figure 1-2. All NOx emissions in the 1990 Base Year Inventory are from anthropogenic sources. The NOx emissions from biogenic sources are considered negligible and are not included in the 1990 Base Year Inventory.

A more detailed explanation of the 1990 Base Year Inventory data and the methods used to develop the data is contained in Delaware's *1990 Base Year Ozone SIP Emissions Inventory for VOC, CO, and NOx*, Department of Natural Resources and Environmental Control, Air Quality Management Section, Dover, DE, revised as of May 3, 1994 (Reference 1).

(a) Total VOC Emissions, 196.529 TPD



(b) Anthropogenic VOC Emissions, 146.559 TPD

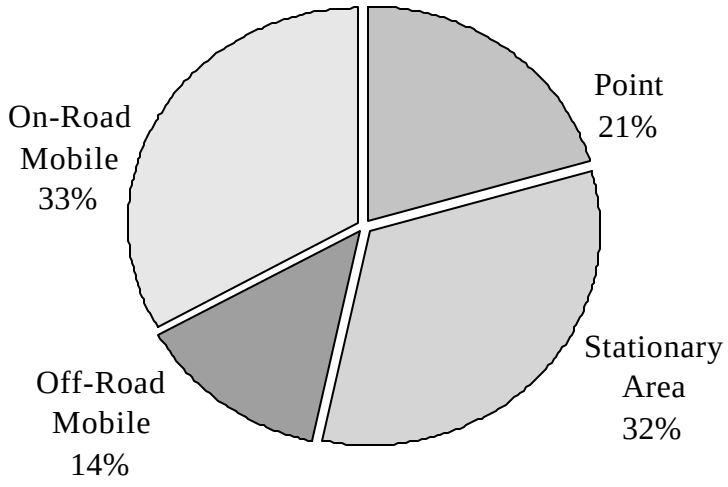


Figure 1-1. Contribution of Source Components to Total 1990 Base Year VOC Emissions in Delaware's Non-Attainment Area (NAA).

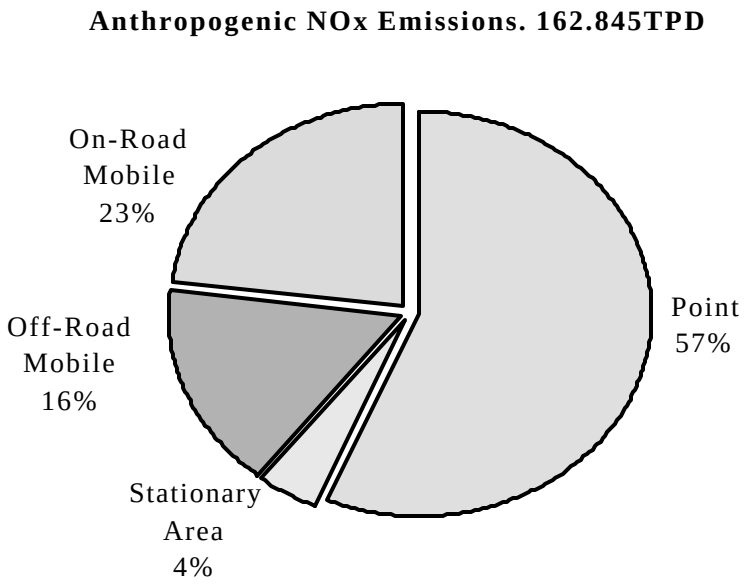


Figure 1-2. Contribution of Source Components to Total 1990 Base Year VOC Emissions in Delaware's Non-Attainment Area (NAA).

1.2. Guidance for Calculating Emission Target Levels for Post-1996 Milestone Years

The Clean Air Act Amendments of 1990 (CAAA) is the principal guidance for determining the target levels of VOC and NOx emissions in a state's Rate-of-Progress Plans (RPP). Based on the CAAA, EPA has issued various guidance documents for States to follow in their RPP development. This section briefly outlines the requirements and procedures specified in the CAAA and relevant EPA guidance documents for determining emission target levels in the rate-of-progress milestone years. In a later section, details of how Delaware determines the target levels of VOC and NOx emissions in 2005 will be presented.

The target level of VOC emissions (and NOx emissions when appropriate) for a milestone year is the maximum amount of total anthropogenic VOC (and NOx) emission to be allowed for the entire subject nonattainment area (NAA) in that specific milestone year. The CAAA sets forth restrictions on the acceptability of certain control measures toward the VOC emission reductions to meet the rate-of-progress requirements. Briefly, all real, permanent, and enforceable post-1990 VOC emission reductions are creditable toward the rate-of-progress reductions except (1) the Federal Motor Vehicle Control Program (FMVCP) tailpipe or evaporative standards promulgated prior to 1990, (2) the Federal Regulations specifying Reid Vapor Pressure (RVP) limits for gasoline for nonattainment areas, (3) the State regulations required to correct deficiencies in Reasonably Available Control Technology (RACT) rules, and (4) the State regulations required to

establish or correct vehicle Inspection and Maintenance (I/M) programs.[12] After adjustments for these non-creditable emission reductions and for emissions of any photochemically non-reactive VOCs such as perchloroethylene (PERC), the 1990 Base Year Inventory for Anthropogenic Emissions is termed as the 1990 Adjusted Base Year (or Baseline) Inventory. This adjusted baseline inventory forms the basis for determining the rate-of-progress (i.e., percentage) emission reductions, and the corresponding emission target levels for individual milestone years. The basic procedures for developing the adjusted base year inventory are outlined in an EPA document entitled "*Guidance on the Adjusted Base Year Emissions Inventory and the 1996 Target for the 15 Percent Rate-of-Progress Plans*" (Reference 2, hereafter referred to as *The Guidance on the Adjusted Base Year Inventory*).

For the milestone year of 1996, the target level is required for VOC emissions only. This can be done by multiplying the VOC emission level in the 1990 Adjusted Base Year Inventory by 15% to obtain the required emission reduction, and subtracting it from the 1990 adjusted level. Details of Delaware's 1996 emission target calculations can be found in *The Delaware 15% Rate-of-Progress Plan*, Delaware Department of Natural Resources and Environmental Control, Dover, DE, February, 1995 (Reference 3). For the post-1996 milestone years, the target levels are to be calculated for VOC emissions, as well as for NOx emissions if NOx substitution is selected by states to meet the required rate-of-progress reductions. Section 182(c)(2)(C) of the CAAA allows states to use actual NOx emission reductions obtained after 1990 to meet the post-1996 VOC emission reduction requirements. If a state chooses to substitute its NOx emission reductions for VOC emission reductions, such substitution must meet the criteria outlined in the EPA's *NOx Substitution Guidance* (Reference 4). These criteria are (1) the sum of all creditable VOC and NOx emission reductions must equal 3% per year averaged over each applicable milestone period, and (2) the overall VOC and NOx emission reductions must be consistent with the area's modeled attainment demonstration. The second criterion, i.e., the consistency requirement, is modified by a policy memorandum issued by EPA on July 12, 1994.[13] The modification requires that (1) the State must have adopted RACT regulations for NOx emission control, and (2) the State must demonstrate, through modeling of at least one episode with photochemical Urban Airshed Modeling (UAM) or Regional Oxidant Modeling (ROM), the usefulness of NOx controls in reducing the ground-level ozone concentrations. The State of Delaware satisfies these two requirements. Delaware adopted NOx RACT regulations on November 24, 1993 and these regulations became effective on May 31, 1995 (Reference 5). The Sensitivity Analysis conducted by Rutgers University for the Philadelphia-New Jersey UAM Airshed has demonstrated that as much as 75% of VOC and 75% of NOx reductions could be necessary for the entire domain to achieve the ground-level ozone standard. Details of this analysis are presented in *The Delaware 1999 Rate-of-Progress Plan for Kent and New Castle Counties*, Department of Natural Resources and Environmental Control, Dover, DE, as amended in June 1999 (Reference 6). Delaware's two nonattainment counties (i.e., Kent and New Castle) are included in the modeled airshed domain. In addition, the Regional and Urban Scale Modeling (RUSM) performed by Ozone Transport Assessment Group (OTAG) has shown that NOx emission and transport controls are crucial for Delaware to reach attainment of the ozone standard (Reference 8). Therefore, Delaware meets the consistency requirement and can choose to control NOx emissions and substitute NOx emission

[12] Clean Air Act amendment of 1990, Title I, Part D, Section 182(b)(1)(D).

[13] Memorandum: *Clarification of Policy for Nitrogen Oxides (NOx) Substitution*, John S. Seitz, Director, Office of Air Quality Planning and Standards, US EPA, July 12, 1994.

reductions for VOC emission reductions to meet the rate-of-progress requirements.

To determine the control strategies for achieving a 9% VOC/NOx emission reduction for each 3-year period after 1996 (hereafter termed as milestone period), the target levels of VOC and NOx emissions for the three post-1996 milestone years (i.e., 1999, 2002, and 2005 for Delaware) need to be calculated. For these post-1996 milestone years, the target levels of VOC and NOx emissions for a subject milestone year depend on the target levels in the previous milestone year. According to EPA's *Guidance on the Post-1996 Rate-of-Progress Plan and the Attainment Demonstration* (Reference 9, hereafter referred to as *The Guidance on the Post-1996 RPP*), the following equation should be used for calculating emission target levels for a subject milestone year

$$TL_x = TL_y - BG_r - FT_x \qquad (1\text{-}1)$$

where:
- x = subject milestone year (e.g., 2005),
- y = previous milestone year (e.g., 2002),
- TL_x = target level of emissions for year x,
- TL_y = target level of emissions for year y,
- BG_r = Emission reduction required for year y,
- FT_x = Fleet turnover correction for year y to year x.

In the following sections, procedures of how Delaware determines its target levels of VOC and NOx emissions for the milestone year 2005 are presented. It should be pointed out that based on the suggestion of EPA Region III Office, Delaware decides to use EPA's MOBILE5b model, instead of MOBILE5a model, to better estimate VOC and NOx emissions in 2005 from on-road mobile vehicles. Since the target levels of VOC and NOx emissions in the previous milestone years are needed for calculating the target levels for a later milestone year, the EPA's guidance requires that Delaware uses MOBILE5b to estimate mobile source emissions in 1990, 1996, 1999 and 2002.[14] Details of MOBILE5b modeling and the emission results are included and discussed in the main plan of the 2005 RPP.

1.3. The 2005 Target Levels of VOC and NOx Emissions

From Equation 1-1, it can be seen that the target level of VOC emissions for a subject milestone year (i.e., 2005) is calculated by subtracting, from the target levels in the previous milestone year (i.e., 2002), the required rate-of-progress emission reductions (i.e., 9% for the period of 2003-2005) and the fleet turnover correction for the corresponding milestone period. There are six major steps in calculating the target emission levels for the milestone year 2005.

Step 1. Development of the 1990 Base Year Inventory

The 1990 Base Year Inventory is an inventory of actual annual and daily (typical

[14] Memorandum: *Summary of Comments and Guidance for Use of MOBILE5b*, Philip A. Lorang, Director, Assessment and Modeling Division, Office of Mobile Sources, US EPA, August 17, 1997.

weekday in the peak ozone season) emissions of VOCs (as well as NOx and CO emissions) from four source categories, i.e., point, stationary area, mobile and biogenic. This work has been fulfilled in Delaware's 1990 Base Year Ozone SIP Emission Inventory (Reference 1). A summary by source sector of the 1990 Base Year Inventory of VOC and NOx emissions in Delaware's two severe nonattainment counties (Kent and New Castle) has been presented in Table 1-1.

Step 2. Development of the 1990 Rate-of-Progress or Baseline Inventory

The 1990 Baseline Inventory is the "baseline" from which Delaware calculates the 9% rate-of-progress emission reductions for each 3-year milestone period. Delaware's 1990 baseline inventory accounts for only anthropogenic emissions from sources within Kent and New Castle Counties. Therefore, this baseline inventory is obtained by removing, from the 1990 Base Year Inventory, (1) biogenic emissions, (2) any emissions from sources outside Kent and New Castle Counties, and (3) the non-reactive perchloroethylene (PERC) emissions (for VOC inventory only). In addition, the 1990 baseline inventory needs to be amended for switching from MOBILE5a model to MOBILE5b model (Table 1-1 contains mobile emissions estimated by MOBILE5a).

Delaware's 1990 Base Year Inventory for Kent and New Castle Counties (Table 1-1) does not include emissions from any outside sources. It does include, however, the biogenic and PERC emissions. Perchloroethylene was originally classified by EPA as a photochemically reactive VOC for emission inventory purposes. The EPA reclassified PERC as photochemically ***non-reactive*** after Delaware's 1990 Base Year Inventory was compiled. Because only the photochemically ***reactive*** VOCs participate in the formation of ozone, the PERC emissions, which are now considered not participating in the formation of ozone, need to be subtracted from the 1990 Base Year Inventory. Calculations for the 1990 Baseline Inventory for VOC emissions are shown below.

1990 Base Year Total VOC Emissions (Kent and New Castle Counties Only):

65.233 TPD (Kent) + 131.296 TPD (New Castle) = 196.529 TPD

Emissions from Outside Nonattainment Area: None

1990 Base Year Total Biogenic VOC Emissions:

32.460 TPD (Kent) + 17.510 TPD (New Castle) = 49.970 TPD

1990 Base Year Total PERC Emissions: 0.716 TPD

1990 Base Year Mobile Source VOC Emission (MOBILE5b):

12.890 TPD (Kent) + 34.070 TPD (New Castle) = 46.960 TPD

1990 Baseline VOC Emissions = 1990 Base Year Inventory - (Outside Emissions

+ Biogenic Emissions + PERC Emissions)
- MOBILE5a Emission + MOBILE5b Emission
= 196.529 - (0 + 49.970 + 0.716) -48.350 +46.960
= **144.453 TPD**

The MOBILE5a emission in the above calculation is obtained from Table 1-1.

The 1990 Baseline Inventory for NOx emissions will not have the three minus corrections since (1) biogenic NOx emissions are negligible, (2) there are no NOx emissions from outside sources in the 1990 Base Year Inventory, and (3) correction for PERC emissions does not apply to NOx emissions. The only correction is for MOBILE5b:

1990 Base Year Mobile Source NOx Emission (MOBILE5b):

10.620 TPD (Kent) + 27.040 TPD (New Castle) = 37.660 TPD

1990 Baseline NOx Emissions = 1990 Base Year Inventory - MOBILE5a Emission
+ MOBILE5b Emission
= 162.845 - 37.680 + 37.660 = **162.825 TPD**

The MOBILE5a emission in the above calculation is obtained from Table 1-1. The 1990 Baseline Inventory for both VOC and NOx emissions is summarized in Table 1-2.

Table 1-2
1990 Baseline Inventory Summary for VOC and NOx Emissions (in TPD)

	Kent		New Castle		Total NAA	
Source Sector	**VOC**	**NOx**	**VOC**	**NOx**	**VOC**	**NOx**
Point Sources	3.242	6.130	26.938	85.767	30.180	91.897
Stationary Area Sources	12.779	1.202	34.366	5.398	47.145	6.600
Off-Road Mobile Sources	3.494	7.891	16.674	18.777	20.168	26.668
On-Road Mobile Sources	12.89	10.62	34.07	27.04	46.96	37.66
TOTAL EMISSIONS	**32.405**	**25.843**	**112.048**	**136.982**	**144.453**	**162.825**

Step 3. Development of the 1990 Adjusted Baseline Inventory

According to Section 182(b)(1)(D) of the CAAA, emission reductions that resulted from the Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP) regulations promulgated prior to 1990 are not creditable for achieving the adequate rate- of-progress emission reductions. Therefore, the 1990 Baseline Inventory needs to be adjusted by subtracting the VOC (and NOx) emission reductions that are expected to occur between 1990 and individual milestone years due to the FMVCP and RVP regulations. The result of this adjustment is called "the 1990 Adjusted Baseline Inventory relative to the subject milestone year."

The FMVCP/RVP VOC and NOx emission reductions that are expected to occur between 1990 and a subject milestone year are determined using EPA's on-road mobile source emission modeling software, MOBILE5b. The MOBILE5b input files for the 1990 Adjusted Baseline Inventory for on-road mobile sources are provided by Delaware Department of Transportation (DelDOT), through its contractor, Vanasse Hangen Brustlin, Inc., Watertown, MA (hereafter referred to as VHB). With these input files, the MOBILE5b modeling work has been performed by DNREC staff with immediate help and close direction of EPA Region III. The input files and the modeling output files are included in Appendix B of the 2005 RPP. The emission reduction that will occur between 1990 and a subject milestone year (i.e., 1996, 1999, 2002, or 2005) as a result of the FMVCP and RVP regulations is determined by subtracting the 1990 Adjusted Base Year Inventory of On-Road Mobile Source Emissions (described in Appendix B of the 2005 RPP) from the 1990 Baseline Inventory of On-Road Mobile Source Emissions. The calculations and results for the non-creditable FMVCP/RVP emission reductions for individual milestone years are presented in Table 1-3.

Table 1-3
Non-Creditable FMVCP/RVP Emission Reductions (in TPD)

Description	**VOC**	**NOx**	
1990 Baseline On-Road Mobile Source Emissions	46.96	37.66	(a)
1990 Adjusted Base Year On-Road Mobile Source Emissions			
Adjusted for 1996	38.73	34.75	$(b)_{1996}$
Adjusted for 1999	36.83	33.80	$(b)_{1999}$
Adjusted for 2002	35.63	33.37	$(b)_{2002}$
Adjusted for 2005	35.00	33.21	$(b)_{2005}$
FMVCP/RVP Emission Reductions			
For 1990-1996	8.23	2.91	$(a)-(b)_{1996}$
For 1990-1999	10.13	3.86	$(a)-(b)_{1999}$
For 1990-2002	11.33	4.29	$(a)-(b)_{2002}$
For 1990-2005	11.96	4.45	$(a)-(b)_{2005}$

The 1990 Adjusted Baseline Inventory relative to a subject milestone year is obtained by subtracting the corresponding FMVCP/RVP emission reductions from the 1990 Baseline Inventory presented in Step 2. The calculations and results are shown in Table 1-4. This all-source adjusted inventory is the baseline for calculating the required rate-of-progress emission reductions, as shown in the following steps.

Step 4. Calculation of Corrections for Fleet Turnover

It is anticipated that there will be some decrease in motor vehicle emissions for many years as a result of fleet turnover, i.e., the gradual replacement of older pre-control vehicles

Table 1-4
1990 Adjusted Baseline VOC and NOx Emissions (in TPD)

Description	VOC	NOx	
1990 Baseline Inventory (All Sources)	144.453	162.825	(a)
FMVCP/RVP Emission Reductions			
For 1990-1996	8.230	2.910	$(b)_{1996}$
For 1990-1999	10.130	3.860	$(b)_{1999}$
For 1990-2002	11.330	4.290	$(b)_{2002}$
For 1990-2005	11.960	4.450	$(b)_{2005}$
1990 Adjusted Baseline Emissions			
Relative to 1996	136.223	159.915	$(a)-(b)_{1996}$
Relative to 1999	134.323	158.965	$(a)-(b)_{1999}$
Relative to 2002	133.123	158.535	$(a)-(b)_{2002}$
Relative to 2005	132.493	158.375	$(a)-(b)_{2005}$

by newer vehicles with the control required by the CAAA, even in the absence of any additional and new controls. The CAAA does not allow States to take credit from these fleet-turnover reductions for achieving rate-of-progress. Therefore, the emission reductions due to any fleet turnover during the post-1996 milestone periods are not creditable for the corresponding milestone year. The fleet turnover correction for each post-1996 target level is obtained by subtracting the 1990 Baseline On-Road Mobile Source Emissions adjusted to the subject milestone year (i.e., 2005) from the 1990 Baseline On-Road Mobile Source Emissions adjusted to the previous milestone year (i.e., 2002). The calculations and results for each post-1996 milestone period are shown in Table 1-5.

Table 1-5
Fleet Turnover Corrections for On-Road Mobile Source
VOC and NOx Emissions (TPD)

Fleet Turnover Correction	VOC	NOx	*
For 1996-1999	1.90	0**	$(b)_{1996}-(b)_{1999}$
For 1999-2002	1.20	0.43	$(b)_{1999}-(b)_{2002}$
For 2003-2005	0.63	0.16	$(b)_{2002}-(b)_{2005}$

* Data are from Table 1-3. ** Fleet turnover is not needed for NOx in 1999 target calculation.

Step 5. Calculation of Required VOC and NOx Emission Reductions

The rate-of-progress reductions in VOC and NOx emissions for each three-year milestone period are calculated separately. However, the sum of all creditable VOC and NOx emission reductions must be equal to 9% with respect to the corresponding 1990 adjusted baselines.

The VOC emission reduction that can be applied for a milestone year is obtained by subtracting (1) the non-creditable fleet turnover correction, and (2) the expected VOC emission level in the subject milestone year (e.g., 2005), from the target level of the previous millstone year (e.g., 2002). The fleet-turnover corrections will be calculated in the next step. Calculations of the creditable VOC emission reductions for the three milestone years are presented in Table 1-6. Also presented in Table 1-6 are percentages of these creditable VOC reductions with respect to their 1990 adjusted VOC baselines.

The percentages of creditable VOC reductions in Table 1-6 determine the percentages of NOx emission reductions to meet the 9% rate-of-progress requirements. For example, the percentage of creditable VOC reduction for the milestone year 1999 is **Error! Not a valid link.** , as shown in Table 1-6. Thus, the percentage of NOx reduction for substitution must be at least 7.45% (i.e., 9% - **Error! Not a valid link.** = 7.45%). This percentage is then multiplied with the 1990 adjusted NOx baseline (relative to 1999) to determine the required tonnage of NOx reduction for the milestone year 1999. Calculations for the required NOx emission reductions for all three milestone years are presented in Table 1-7.

Table 1-6
Creditable VOC Emission Reductions (in TPD) for Three Milestone Years

Description	**Emissions**	
1999 Milestone Year		
1990 Baseline VOC Emission Adjusted for 1999	134.323	(a)
1996 VOC Target Level	115.790	(b)
VOC Fleet Turnover Correction for 1996-1999	1.900	(c)
1999 VOC Control Strategy Projection	111.806	(d)
Creditable VOC Emission Reductions for 1999	2.084	(e)=(b)-(c)-(d)
% of VOC Reductions for 1999 Rate-of-Progress	1.55%	(f)=(e)/(a)x100
2002 Milestone Year		
1990 Baseline VOC Emission Adjusted for 2002	133.123	(a)
1999 VOC Target Level	111.806	(b)
VOC Fleet Turnover Correction for 1999-2002	1.200	(c)
2002 VOC Control Strategy Projection	99.082	(d)
Creditable VOC Emission Reductions for 2002	11.524	(e)=(b)-(c)-(d)
% of VOC Reductions for 2002 Rate-of-Progress	8.66%	(f)=(e)/(a)x100
2005 Milestone Year		
1990 Baseline VOC Emission Adjusted for 2005	132.493	(a)
2002 VOC Target Level	99.082	(b)
VOC Fleet Turnover Correction for 2003-2005	0.630	(c)
2005 VOC Control Strategy Projections	95.414	(d)
Creditable VOC Emission Reductions for 2005	3.038	(e)=(b)-(c)-(d)
% of VOC Reductions for 2005 Rate-of-Progress	2.29%	(f)=(e)/(a)x100

Table 1-7
Required NOx Emission Reductions (in TPD) for Three Milestone Years

Description	NOx Emissions	
1999 Milestone Year		
1990 Baseline NOx Emission Adjusted for 1999	158.965	(a)
% VOC Reductions for 1999 Rate-of-Progress	1.55%	(b)
% NOx Reductions for 1999 Rate-of-Progress	7.45%	(c)
Total % of VOC/NOx Reduction	9.00%	(d)=(b)+(c)
NOx Emission Reductions Required for 1996-1999	11.841	(e)=(a)x(c)
2002 Milestone Year		
1990 Baseline NOx Emission Adjusted for 2002	158.535	(a)
% VOC Reductions for 2002 Rate-of-Progress	8.66%	(b)
% NOx Reductions for 2002 Rate-of-Progress	0.34%	(c)
Total % of VOC/NOx Reduction	9.00%	(d)=(b)+(c)
NOx Emission Reductions Required for 1999-2002	0.544	(e)=(a)x(c)
2005 Milestone Year		
1990 Baseline NOx Emission Adjusted for 2005	158.375	(a)
% VOC Reductions for 2005 Rate-of-Progress	2.29%	(b)
% NOx Reductions for 2005 Rate-of-Progress	6.71%	(c)
Total % VOC/NOx Reduction	9.00%	(d)=(b)+(c)
NOx Emission Reductions Required for 2003-2005	10.622	(e)=(a)x(c)

Step 6 - Calculation of 2005 Target Levels of VOC and NOx Emissions

The target levels of VOC and NOx emissions in each milestone year are calculated using Equation 1-1, i.e., by subtracting the required emission reductions (in Step 4 above) and the fleet turnover corrections (in Step 5 above) from the target levels of the previous milestone year. One exception is the calculation of NOx emission target for the 1999 milestone year. Since 1999 is the first milestone year with respect to NOx emission reduction, according to EPA's guidance document (*The Guidance on the Post-1996 RPP*, Reference 9), the target calculation does not need to subtract the fleet turnover. Since Delaware uses MOBILE5b in estimating the on-road mobile source emissions, the VOC and/or NOx target levels for 1996, 1999 and 2002 are also reevaluated for MOBIOE5b. The calculations and results are summarized in Table 1-8. In Table 1-8, the VOC target level in a milestone year is also the reevaluated total VOC control strategy projection in the previous milestone year.

The target levels shown in Table 1-8 are the maximum VOC and NOx emissions to be allowed in 2005 under the requirements of adequate rate-of-progress toward the attainment of the 1-hour ozone standard for Delaware's two severe nonattainment counties, i.e., Kent and New Castle Counties. Delaware must limit its VOC and NOx emissions in Kent and New Castle Counties to or below these target levels in 2005.

Table 1-8
Target Levels of VOC and NOx Emissions (in TPD) in Each Milestone Year

Description	Emissions (TPD) VOC	NOx	
1996 Target Level-VOC	**115.790**		(a)
1990 Baseline Adjusted for 1999-NOx		**158.965**	
1999 Milestone Year			
Emission Reduction for Rate-of-Progress	2.084	11.841	(b)
Fleet Turnover Correction for 1996-1999	1.900	0	(c)
Target Level for 1999	**111.806**	**147.124**	(d)=(a)-(b)-(c)
2002 Milestone Year			
Emission Reduction for Rate-of-Progress	11.524	0.544	(e)
Fleet Turnover Correction for 1999-2002	1.2	0.43	(f)
Target Level for 2002	**99.082**	**146.150**	(g)=(d)-(e)-(f)
2005 Milestone Year			
Emission Reduction for Rate-of-Progress	3.038	10.622	(h)
Fleet Turnover Correction for 2003-2005	0.63	0.16	(i)
Target Level for 2005	**95.414**	**135.368**	(j)=(g)-(h)-(i)

PART II

THE 2005 CURRENT CONTROL PROJECTION INVENTORY AND THE REQUIRED VOC AND NOx EMISSION REDUCTIONS

Section 182(c)(2) of the Clean Air Act Amendments of 1990 (CAAA) requires Delaware's two severe ozone nonattainment counties (Kent and New Castle Counties) to achieve a 3% per year emission reduction averaged over each consecutive 3-year period after 1996, plus offsetting emission growth, until 2005, the year of attainment. For each post-1996 three-year, the required VOC and/or NOx emission reductions from the 1990 adjusted baselines have been calculated in Section 1.3 in Part I of this document. The results have been presented in Table 1-6 and Table 1-7 for VOC and NOx reductions, respectively. Part II of this document presented herein describes the methodology used in determining the total amount of VOC and NOx emission reductions required for the 2005 Rate-of-Progress Plan, including the emission reductions that are required to offset emission growth.

To determine the total amount of VOC and NOx emission reductions required for the 2005 Rate-of-Progress Plan, the emission levels in the milestone year 2005 must be estimated. For this purpose, the 2005 growth factors are developed for the various source categories of emissions based on economic indicators. The 1990 baseline emissions are multiplied by these growth factors, and the resulting inventory is called the 2005 Current Control Projection Inventory. The 2005 current control projections are estimates of VOC and NOx emissions that will occur in 2005 if no new emission control measures are implemented between 1990 and 2005. The differences between the 2005 current control projections and the 2005 target levels of emissions (discussed in Part I of this document) are the total VOC and/or NOx emissions that Delaware must plan to reduce in order to meet the VOC and/or NOx reduction requirements for the milestone year of 2005.

2.1 Summary of Current Control Projection Inventories

The 2005 Current Control Projection Inventory of VOC and NOx emissions for Kent and New Castle Counties is summarized in Tables 2-1 for VOC and Table 2-2 for NOx. Also included in these tables, for comparison purposes, are the 1990 Baseline Inventory emissions from individual source sectors. The 1990 Baseline Inventory emissions have been determined in Part I of this document, with on-road mobile source emissions estimated using MOBILE5b emission factors. The 1990 data presented in Tables 2-1 and 2-2 are obtained from Table 1-2 in Part I. The Current Control Projection and Baseline VOC and NOx emission data are shown graphically in Figures 2-1 and 2-2, respectively. Figure 2-3 shows the relative proportions of VOC and NOx emissions for each source sector in the 2005 Current Control Projection Inventory for the entire severe nonattainment area (NAA) in Delaware. Figures 2-4 and 2-5 respectively show the 2005 Current Control Projection Inventory VOC and NOx emissions by county.

The point, stationary area, and off-road mobile source portions of the 2005 Current Control Projection Inventory are essentially created by multiplying 1990 Baseline Inventory emission

levels by the appropriate growth factors. The on-road mobile source emissions are projected by multiplying the MOBILE5b emission factors generated by the projected 2005 vehicle miles traveled (VMT), as discussed in Section 2.3 of the 2005 RPP.

Table 2-1
Summary of VOC Emissions in 2005 Current Control Projection Inventory (in TPD)

Source Sector	Kent County		New Castle		Total NAA	
	1990	**2005**	**1990**	**2005**	**1990**	**2005**
	Baseline	Projection	Baseline	Projection	Baseline	Projection
Point	3.242	3.440	26.938	28.561	30.180	32.001
Stationary Area	12.779	14.026	34.366	37.979	47.145	52.005
Off-Road Mobile	3.494	4.210	16.674	18.559	20.168	22.769
On-Road Mobile	12.890	16.860	34.070	40.450	46.960	57.310
Total Emissions	**32.405**	**38.536**	**112.048**	**125.549**	**144.453**	**164.085**

* 1990 Baseline Inventory data are obtained from Table 1-2 in Part I.

Table 2-2
Summary of NOx Emissions in 2005 Current Control Projection Inventory (in TPD)

Source Sector	Kent County		New Castle		Total NAA	
	1990*	**2005**	**1990***	**2005**	**1990***	**2005**
	Baseline	Projection	Baseline	Projection	Baseline	Projection
Point	6.130	7.343	85.767	99.424	91.897	106.767
Stationary Area	1.202	1.377	5.398	6.178	6.600	7.555
Off-Road Mobile	7.891	9.305	18.777	21.799	26.668	31.104
On-Road Mobile	10.620	13.890	27.040	36.150	37.660	50.040
Total Emissions	**25.843**	**31.915**	**136.982**	**163.551**	**162.825**	**195.466**

* 1990 Baseline Inventory data are obtained from Table 1-2 in Part I.

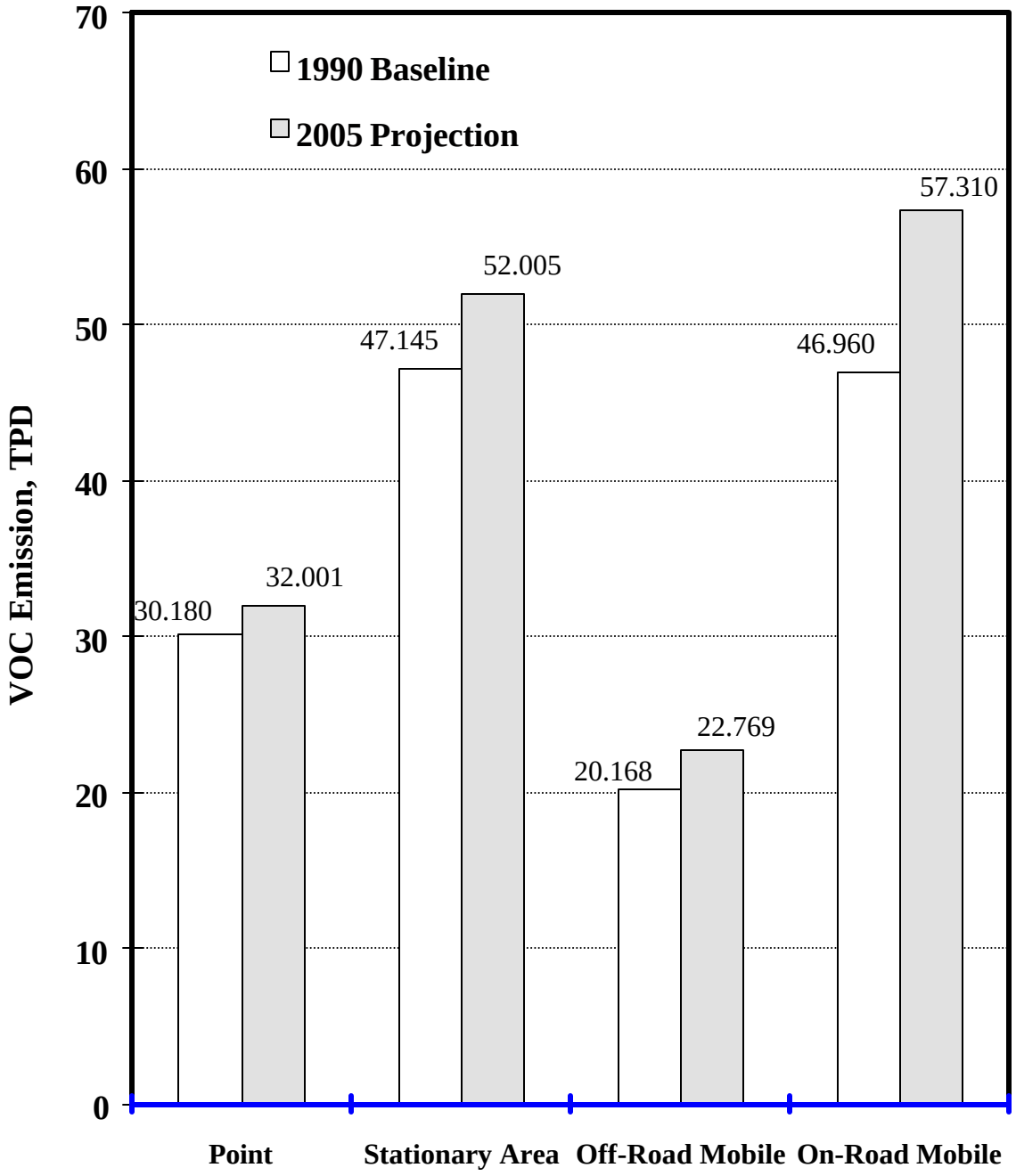


Figure 2-1. Comparison of VOC Emissions in 2005 Current Control Projection Inventory and 1990 Baseline Inventory.

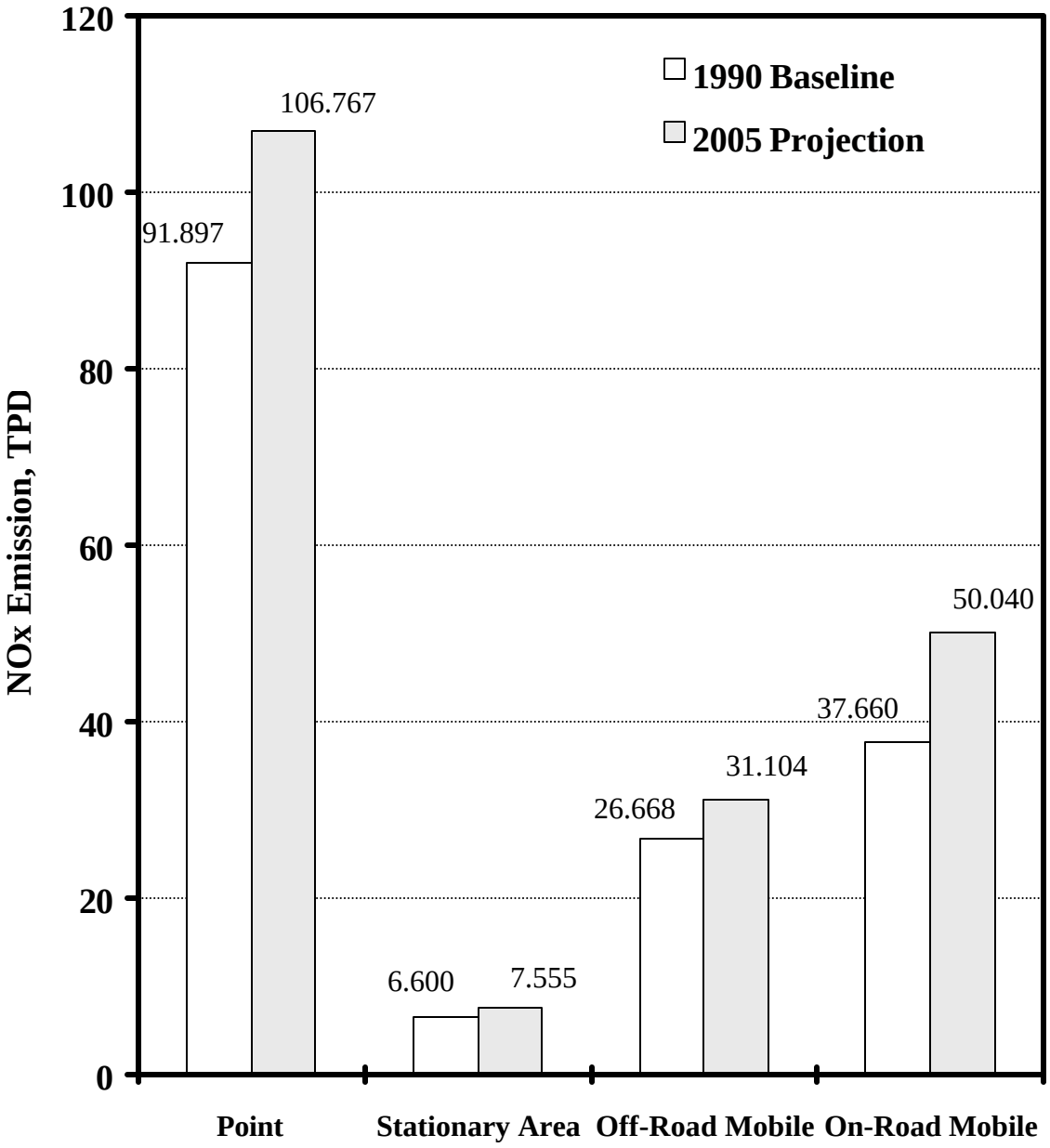
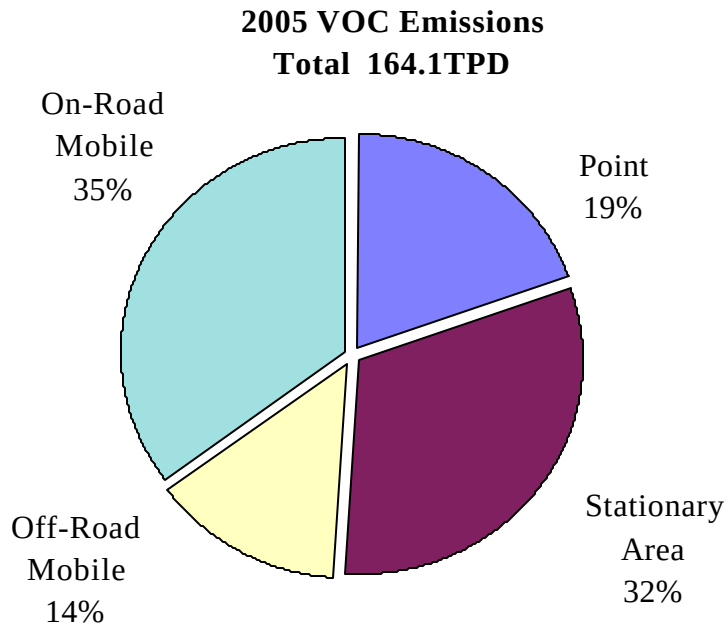


Figure 2-2. Comparison of NOx Emissions in 2005 Current Control Projection Inventory and 1990 Baseline Inventory.



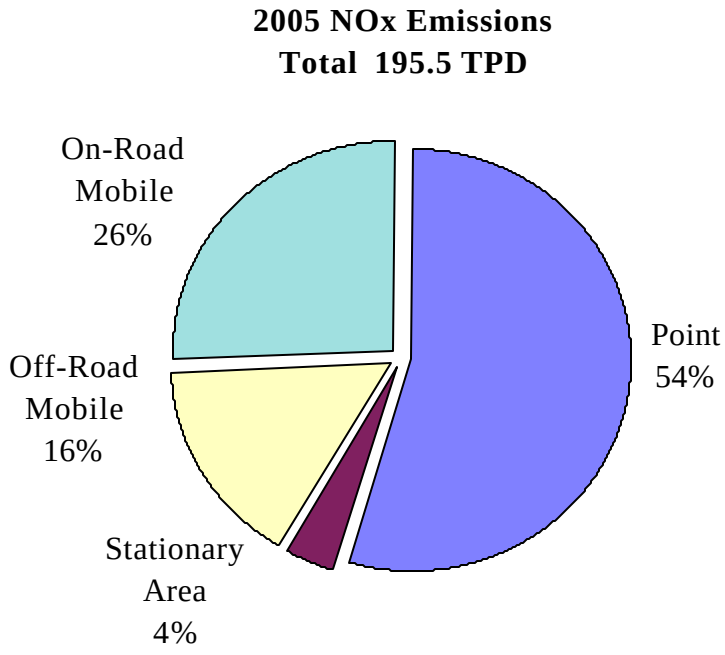
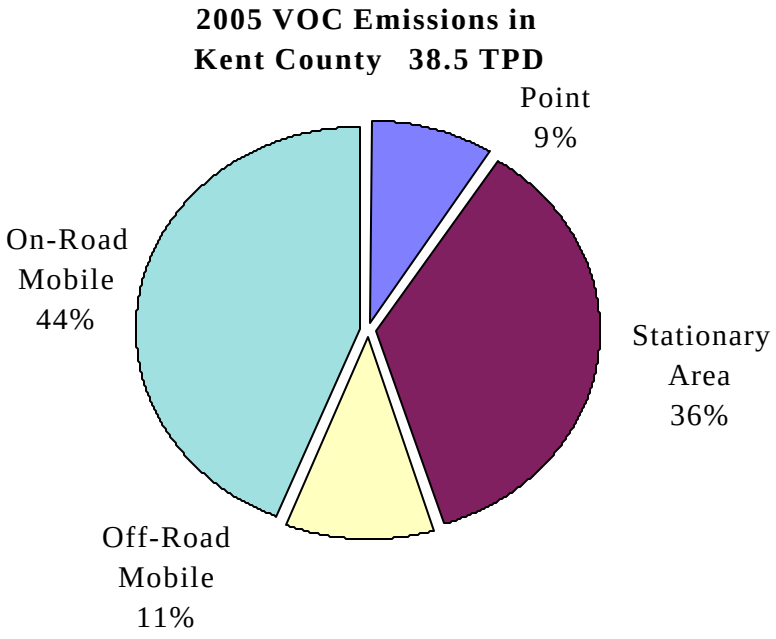


Figure 2-3. Total 2005 Current Control Projection Inventory VOC and NOx Emissions by Source Sector



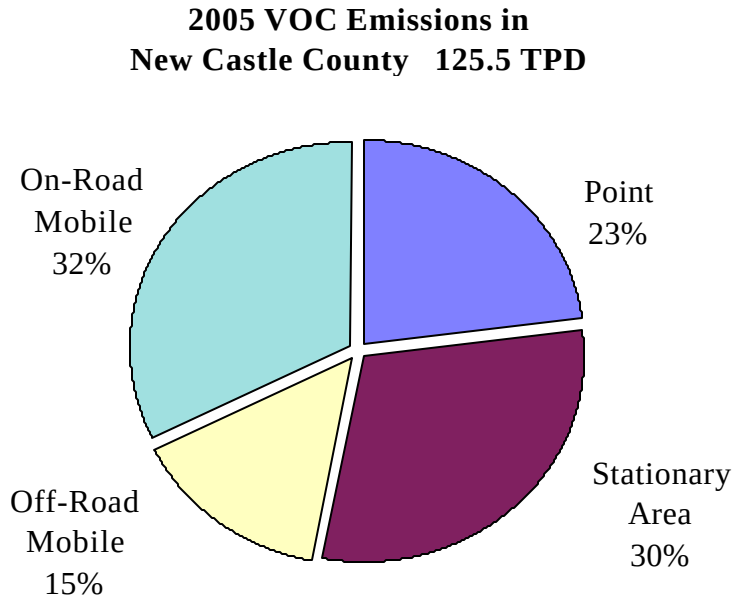
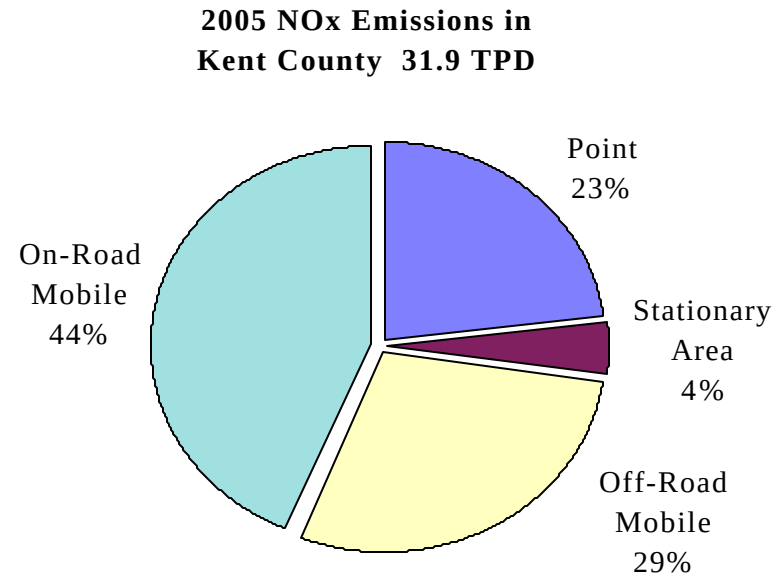


Figure 2-4. Total 2005 Current Control Projection Inventory VOC Emissions by County and Source Sector



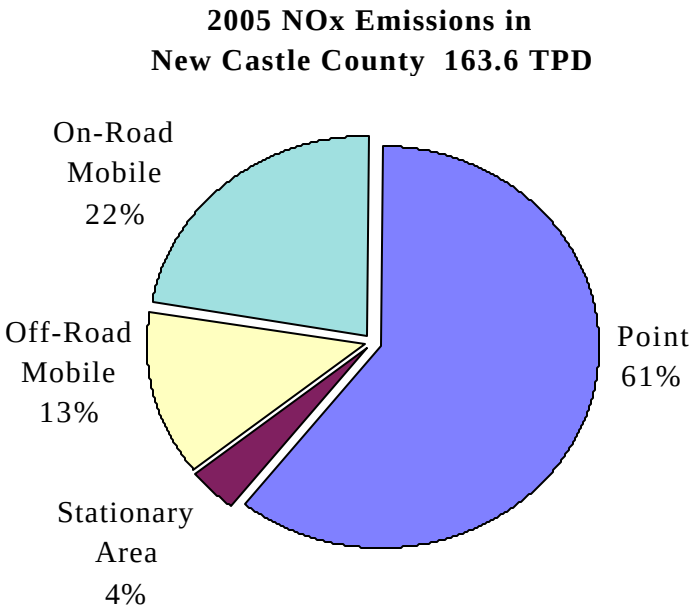


Figure 2-5. Total 2005 Current Control Projection Inventory NOx Emissions by County and Source Sector

2.2 Determination of Emission Growth Factors and Emissions in 2005

Growth factors are ratios that compare the amount of emission-producing activity expected in the projection year (i.e., 2005) to that occurred in the base year (i.e., 1990). Thus, growth factors reflect the proportional increase or decrease that economic growth or decline is expected to have on emission levels from 1990 to the projection year 2005. Because growth in emissions for all source categories cannot be directly determined, growth factors are derived using surrogate measures of growth which are indirect but quantifiable measures of activities that are expected to grow in a manner similar to emissions from the various source categories. For example, the population growth can serve as a good indicator of expected increases in emissions from residential fuel use.

Sources of data used to derive Delaware's emission growth factors include the following: (1) population statistics from *Population Projections, Version 1992.0*, Delaware Population Consortium, Dover, DE, January 1992 (Reference 10, hereafter referred to as Delaware Population Projections), (2) earnings and employment data by industry type from *BEA Regional Projections to 2040, Volumes I, II, and III*, Bureau of Economic Analysis (BEA), U.S. Department of Commerce, Washington, D.C., U.S. Government Printing Office, October 1990 (Reference 11, hereafter referred to as BEA Regional Projections), and (3) local surveys conducted by the Air Quality Management Section of the Delaware Department of Natural Resources and Environmental Control (DNREC). The growth factors have been derived according to *Procedures for Preparing Emissions Projections*, EPA-450/4-91-019, July 1991, (Reference 12, hereafter referred to as *Procedures for Projections*), and the *Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans*, EPA-452/R-93-002, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC March 1993 (Reference 13, hereafter referred to as the *Guidance for Growth/Projections/Strategies*). A detailed explanation of the methodology used to determine Delaware's emission growth factors is included in Appendix C of the 2005 RPP.

After the emission growth factors for the 1990-2005 period are determined, they are applied to the 1990 base year emissions for point, stationary area and non-road mobile sources to project the current control emission projections for the milestone year of 2005. The projections are performed following EPA's *Guidance for Growth/Projections/Strategies* (Reference 13). The current control projections for the on-road mobile source sector are conducted using EPA's MOBILE5b computer model. Details in calculating the current control projections are presented in Part II of the 2005 RPP. The summary of the 2005 current control projections have been already presented in Table 2-1 and Table 2-2 for VOC and NOx emissions, respectively.

2.3 Calculation of Required VOC and NOx Emission Reductions in 2005

According to the rate-of-progress provisions in the CAAA, Delaware's 2005 RPP for the severe nonattainment area (i.e., Kent and New Castle Counties) is required not only to achieve a 9% of the 1990 baseline from the 2002 targets, but also to offset any growth in emissions between 2002 and 2005. The total emission reductions for meeting the adequate rate of progress consist of two components: (1) reductions to offset any growth in emissions occurring between 2002 and

2005 that must be offset, plus (2) the average 3% per year emission reductions for the 2003-2005 period. The methods of estimating these two components are presented in the following subsections.

2.3.1. Determination of Growth in Emissions for the 2003-2005 Period

The growth in emissions for the 2003-2005 period can be determined by subtracting the 2002 current control projections from the 2005 current control projections. Details of the calculations are presented in Part II of the 2005 RPP. A summary of the growths in VOC and NOx emissions for the 2003-2005 period is presented in Table 2-3. As indicated in Table 2-3, a growth of 5.078 TPD in VOC emissions and a growth of 8.605 TPD in NOx emissions for the 2003-2005 period must be offset in Delaware's nonattainment area.

Table 2-3
Summary of Emission Growths between 2002 and 2005 (in TPD)

	Growth in VOC Emissions			Growth in NOx Emissions		
Source Sector	**Kent**	**New Castle**	**Total NAA**	**Kent**	**New Castle**	**Total NAA**
Point	0.079	0.647	0.726	0.354	4.584	4.938
Stationary Area	0.264	0.752	1.016	0.030	0.142	0.172
Off-Road Mobile	0.117	0.389	0.506	0.281	0.624	0.905
On-Road Mobile	0.600	2.230	2.830	0.710	1.880	2.590
Total Emissions	1.060	4.018	5.078	1.375	7.230	8.605

2.3.2. Determination of VOC and NOx Emission Reductions for the 2005 RPP

In Part I of this document, Delaware has determined its 2002 and 2005 target levels of VOC and NOx emissions to meet the rate-of-progress requirements (Table 1-8). The VOC and NOx emission reductions required to meet the 2005 target levels can be determined as follows:

VOC Reduction Without Growth = 2002 Target Level - 2005 Target Level

= 99.082 – 95.414 = 3.668 TPD

Total VOC Reduction Required beyond the 2002 RPP Target Level

= Emission Growth + Reduction Without Growth

= 5.078 + 3.668 **= 8.746 TPD**

The total VOC emission reduction of 8.746 TPD, besides the 159.007 - 99.082 = 59.925 TPD of VOC emission reductions required the 2002 RPP, is the additional VOC emission reduction needed to meet the 2005 target level of VOC emissions. In other words, Delaware's 2005 RPP for Kent and New Castle Counties must show a total reduction of 8.746 + 59.925 = 68.671 TPD in VOC emissions from the 2005 Current Control Projections. The same total reduction can be calculated by taking the difference of the 2005 current control projection and the 2005 target level of VOC emissions, as shown below:

Required VOC Reduction for 1990-2005 Period

= 2005 Current Control Projection - 2005 Target Level
= 164.085 – 95.414 = **68.671 TPD**

The required NOx emission reductions can be determined using the similar procedures:

NOx Reduction Without Growth = 2002 Target Level - 2005 Target Level
= 146.150 – 135.368 = 10.782 TPD

Total Required NOx Reduction beyond 2002 RPP Target Level

= Emission Growth + Reduction Without Growth
= 8.605 + 10.782 **= 19.387 TPD**

The total NOx emission reduction of 19.387 TPD, besides the 186.861 - 146.150 = 40.711 TPD reduction to satisfy the 2002 RPP requirements, is the additional NOx reductions needed to meet the 2005 target level of NOx emissions. In other words, the total nonattainment area of Kent and New Castle Counties must show a total NOx emission reduction of 19.387 + 40.711 = 60.098 TPD from the 2005 Current Control Projection of NOx emissions. The same reduction can be obtained by taking the difference of the 2005 current control projection and the 2005 target level of NOx emissions, as shown below:

Required NOx Reduction for 1990-2005 Period

= 2005 Current Control Projection - 2005 Target Level
= 195.466 – 135.368= **60.098 TPD**

A summary of the required VOC and NOx emission reductions is presented in Table 2-4. These required reductions form the basis on which Delaware develops its emission control strategies in the 2005 Rate-of-Progress Plan.

Table 2-4
VOC and NOx Emission Reductions Required in the 2005 RPP (in TPD)

VOC Emissions			**NOx Emissions**		
Target Level	Current Control Projection	Required Reduction	Target Level	Current Control Projection	Required Reduction
95.414	164.085	68.671	135.368	195.466	60.098

PART III

THE 2005 CONTROL STRATEGY PROJECTION INVENTORY AND EMISSION CONTROL MEASURES

In Part I of this document, Delaware has determined its VOC and NOx emission targets in the milestone year of 2005 to meet the average 3% per year rate-of-progress requirement, plus offsetting the emission growth. In Part II of this document, Delaware has determined that, in order to meet those emission targets, a 68.671 TPD VOC emission reduction and a 60.098 TPD NOx emission reduction must be achieved in this 2005 Rate-of-Progress Plan for Kent and New Castle Counties. These emission reductions will be accomplished by implementation of VOC emission control measures proposed in Delaware's 15% RPP, VOC and NOx emission controls in Delaware's 1999 and 2002 RPPs, and additional national, regional and state control measures necessary for further VOC and NOx emission reductions. In order to show that the reductions associated with these control measures are adequate to meet the 2005 VOC and NOx emission targets, the 1990 Baseline emissions are projected to 2005 including the effects of both growth and the new control measures. The resulting inventory is called the 2005 Control Strategy Projection Inventory. The total VOC and NOx emissions in the 2005 Control Strategy Projection Inventory must be equal to or less than the 2005 target levels of VOC and NOx emissions in order to show that the control measures are adequate for fulfilling the rate-of-progress requirements of VOC and NOx emission reductions.

The 2005 target levels of VOC and NOx emissions have been calculated (in Part I of this document) to be 95.414 TPD and 135.368 TPD, respectively. Part III of this document discusses the 2005 Control Strategy Projection Inventory, the control measures that Delaware will implement to meet the average 3% per year rate-of-progress requirement for the 2003-2005 period, the sources affected by these control measures, and the expected reductions from each control measure.

3.1 The 2005 Control Strategy Projection Inventory Summary

The 2005 Control Strategy Projection Inventory is summarized in Tables 3-1 and 3-2 for VOC and NOx emissions, respectively. As shown in Tables 3-1 and 3-2, the total 2005 Control Strategy Projections for VOC and NOx emissions are 95.414 TPD and 134.243 TPD, respectively, in the peak ozone season. The 2005 Control Strategy Projection of VOC emissions is the same as the target level, and the total 2005 Control Strategy Projection of NOx emissions is less than the required target level of 135.368 TPD. Therefore, the control measures that are included in the 2005 Control Strategy Projection are adequate for meeting the average 3% per year rate-of-progress requirement, plus offsetting the emission growth for the 2003-2005 period.

Figure 3-1 shows a graphic comparison by source sector for VOC emissions of the 1990 Baseline Inventory (from Part I, Table 1-2), the 2005 Current Control Projections (from Part II, Table 2-1), and the 2005 Control Strategy Projections (from Table 3-1). Figure 3-2 shows the relative proportions of the 2005 Control Strategy Projections of VOC emissions from each source sector for the entire nonattainment area. Figure 3-3 shows the relative proportions of the 2005

Control Strategy Projections of VOC emissions by county.

Table 3-1
Summary of 2005 Control Strategy Projection Inventory VOC Emissions (in TPD)

Source Sector	Kent County	New Castle County	Total NAA
Point	1.403	22.824	24.227
Stationary Area	10.039	26.909	36.948
Off-Road Mobile	2.647	11.990	14.637
On-Road Mobile	4.839	14.763	19.602
Total Emissions	**18.928**	**76.486**	**95.414**

Table 3-2
Summary of 2005 Control Strategy Projection Inventory NOx Emissions (in TPD)

Source Sector	Kent	New Castle	Total NAA
Point	3.953	67.497	71.450
Stationary Area	1.009	4.960	5.969
Off-Road Mobile	7.998	18.001	25.999
On-Road Mobile	7.905	22.920	30.825
Total Emissions	**20.865**	**113.378**	**134.243**

Figure 3-4 shows a graphic comparison by source sector for NOx emissions of the 1990 Baseline Inventory (from Part I, Table 1-2), the 2005 Current Control Projections (from Part II, Table 2-2), and the 2005 Control Strategy Projections (from Table 3-2). Figure 3-5 shows the relative proportions of the 2005 Control Strategy Projections of NOx emissions from each source sector for the entire nonattainment area. Figure 3-6 shows the relative proportions of the 2005 Control Strategy Projections of NOx emissions by county.

The 2005 Control Strategy Projections for point sources, stationary area sources, and off-road mobile sources are calculated primarily using the projection equations provided in the *Guidance for Growth Factors, Projections, and Control Strategies for the 15 Percent Rate-of-Progress Plans*, EPA-452/R-93-002, Office of Air Quality Planning and Standards, US EPA, March 1993 (Reference 13, hereafter referred to as *Guidance for Growth/Projections/Strategies*). Other equations are also used for some specific cases. Those equations are either obtained from other EPA guidance documents or derived from emission-related data provided by EPA. The control strategy projections of the on-road mobile sources are developed using EPA's MOBILE5b software in accordance with *Procedures for Preparing Emissions Projections* (EPA-450/4-91-019, Office of Air Quality Planning and Standards, US EPA, July 1991, Reference 12) and EPA's guidance memorandum for use of MOBILE5b (Philip A. Lorang, Office of Mobile Sources, US EPA, August 11, 1997, included in Appendix H of the 2005 RPP).

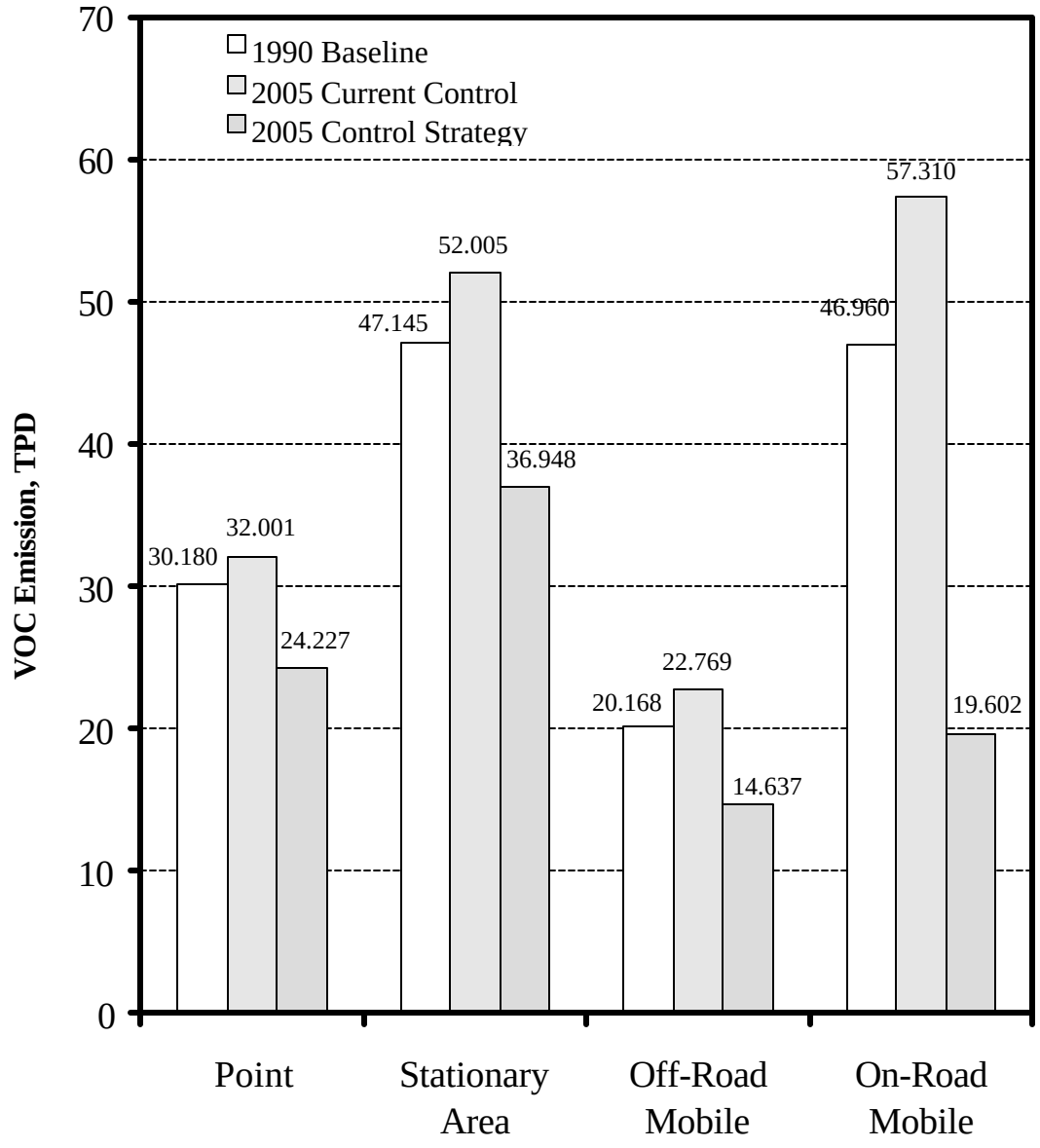


Figure 3-1. Comparison of VOC Emissions in 1990 Baseline, 2005 Current Control Projection, and 2005 Control Strategy Projection Inventories.

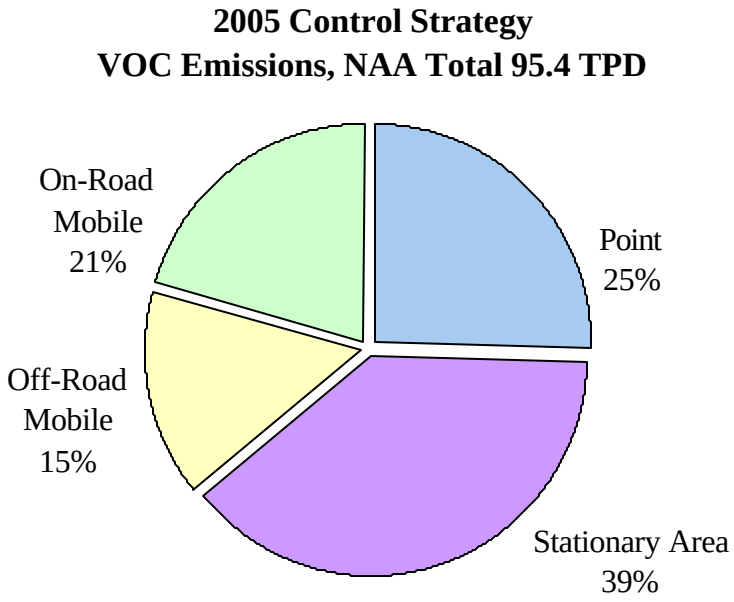
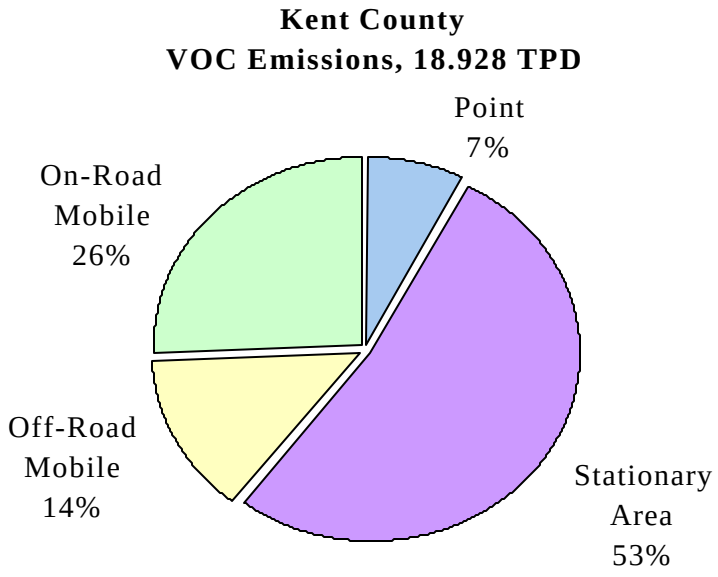


Figure 3-2. Contribution of Each Source Sector to Total 2005 VOC Control Strategy Projection in Delaware's Nonattainment Area (NAA).



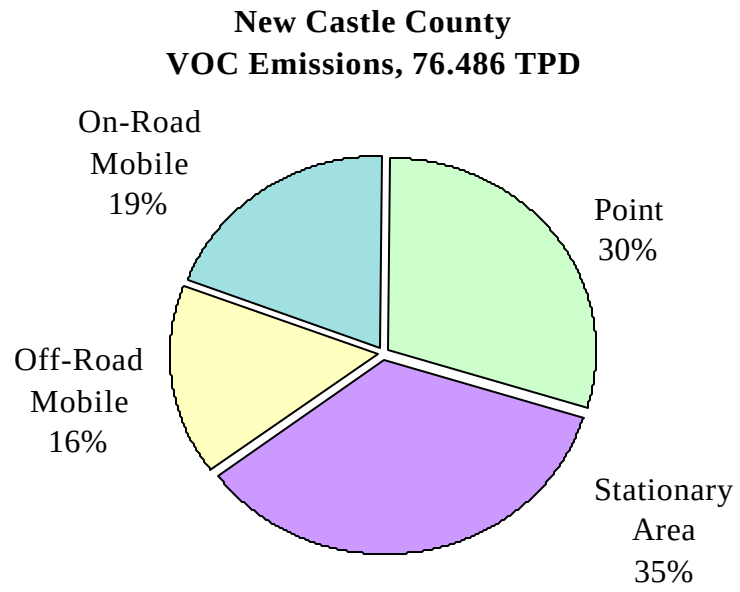


Figure 3-3. Contribution of Each Source Sector to 2005 VOC Control Strategy Projection in Each Nonattainment County.

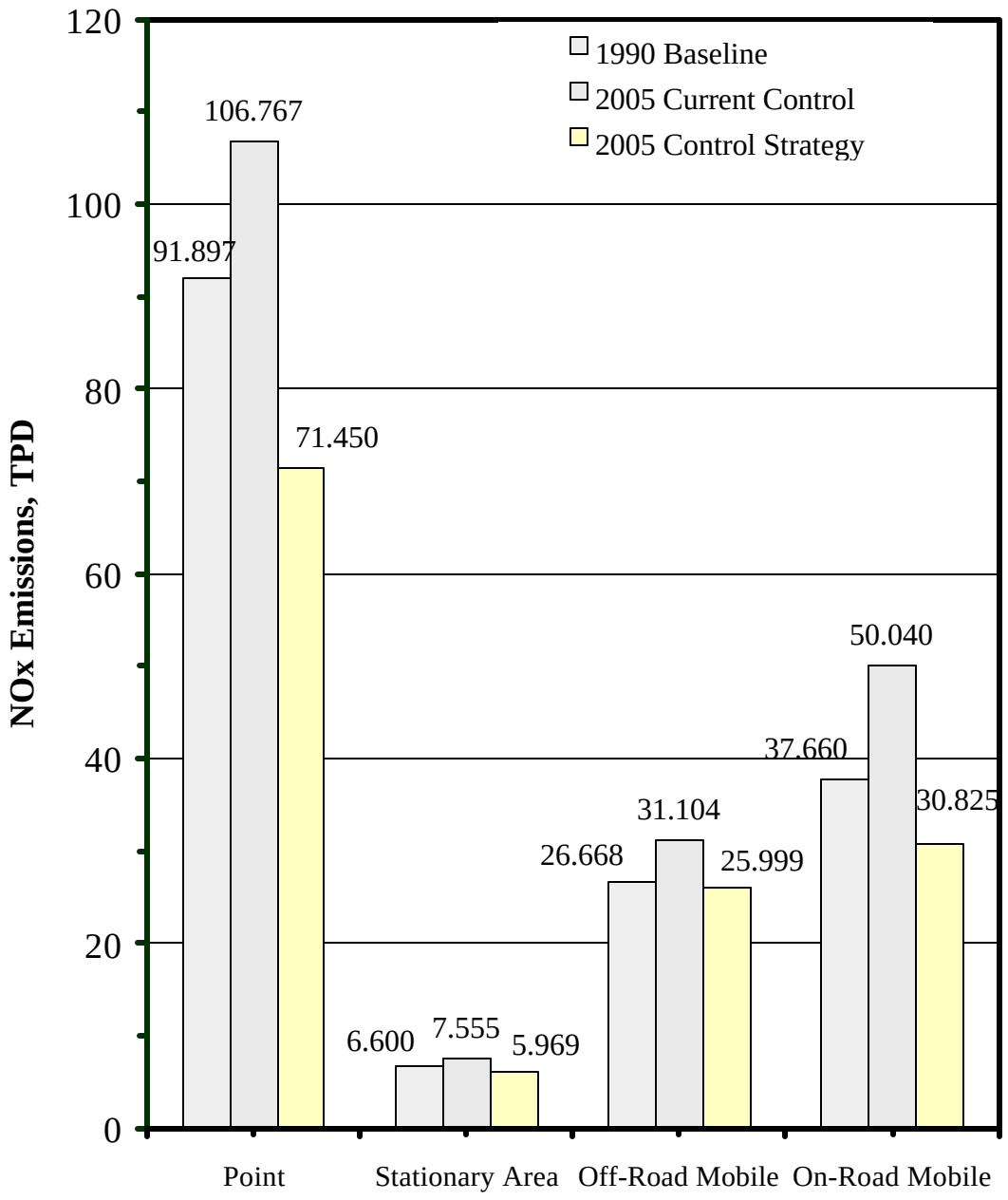


Figure 3-4. Comparison of NOx Emissions in 1990 Baseline, 2005 Current Control Projection, and 2002 Control Strategy Projection Inventories.

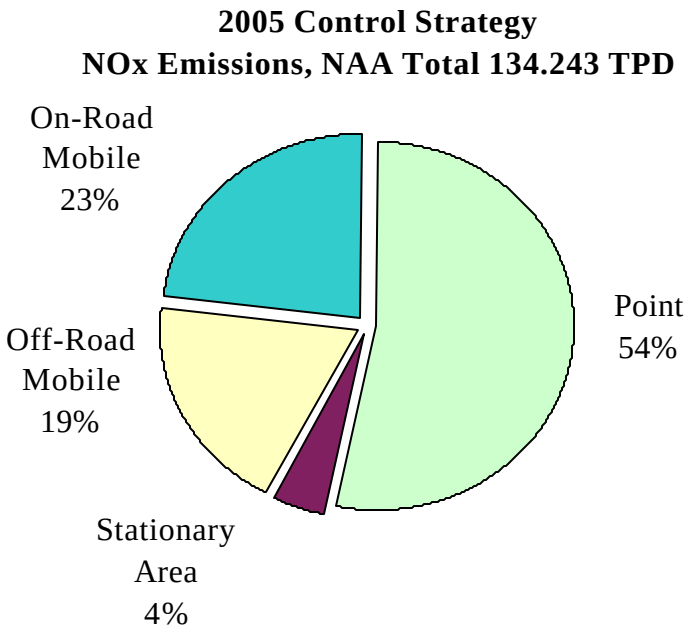
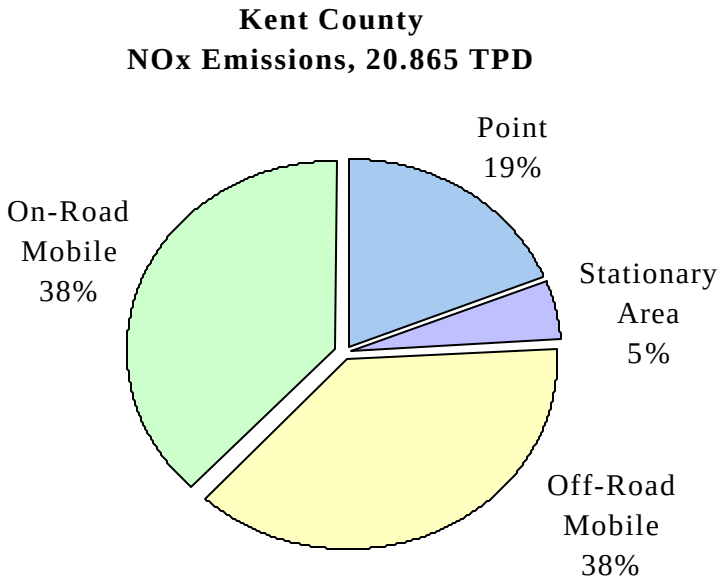


Figure 3-5. Contribution of Each Source Sector to Total 2005 Control Strategy Projection NOx Emissions in Delaware's Nonattainment Area (NAA).



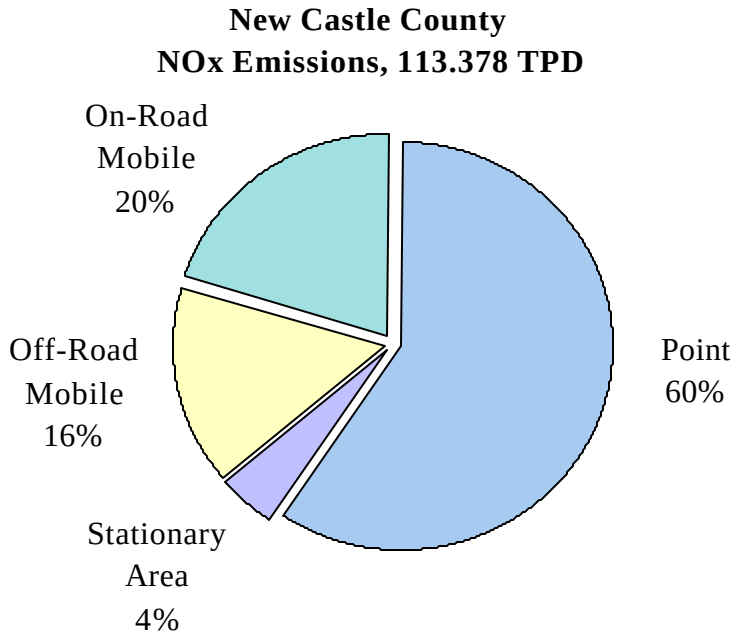


Figure 3-6. Contribution of Each Source Sector to 2005 Control Strategy Projection NOx Emissions in Each Nonattainment County.

3.2 The 2005 Control Strategy Projections for Point Sources

Emissions from point sources are projected on a source-specific (process-by-process) basis in accordance with the *Guidance for Growth/Projections/Strategies* (Reference 13). In this guidance document and its following memoranda for amendments and corrections, EPA provides methods and projection equations for estimating future year emissions from individual point sources. Selection of method or equation to be used to project emissions from a point source is dependent on whether or not the source will have new controls by the milestone year of 2005.

A. Method 1

The VOC and NOx emissions for point sources that will have new controls by 2005 are projected at allowable emissions rates using the point source projection equations from Section 6.4 of the *Guidance for Growth/Projections/Strategie*s (Reference 13). These same equations have been used to determine the 2005 Current Control Projections in Part II of this document. However, the projection data used for the 2005 Control Strategy Projections differ from those used for the 2005 Current Control Projections. For the control strategy projections, the controlled emissions factors, process control efficiencies (*CE*), controlled emissions rates, and rule effectiveness (*RE*) values for the processes with new controls by 2005 are used to reflect the controls that will be in place in 2005. For the current control projections in Part II, all parameters are related to controls, if any, that were in place in 1990.

For sources that will have new controls by 2005, the Control Strategy Projections are determined using one of the following five projection equations (Reference 13):

$$EMIS_{py} = ORATE \times EMF_{py,pc} \times \left[1 - \frac{CE_{py}}{100} \times \frac{RE_{py}}{100}\right] \times GF_{py} \qquad \text{(P-1)}$$

$$EMIS_{py} = ORATE \times EMF_{py} \times \frac{200 - RE_{py}}{100} \times GF_{py} \qquad \text{(P-2)}$$

$$EMIS_{py} = CRTPOL \times \frac{1 - \frac{CE_{py}}{100} \times \frac{RE_{py}}{100}}{1 - \frac{CEQEFF}{100} \times \frac{RULEFF}{100}} \times GF_{py} \qquad \text{(P-3)}$$

$$EMIS_{py} = CRTPOL \times \frac{\frac{200 - RE_{py}}{100}}{\frac{200 - RULEFF}{100}} \times \frac{EMF_{py}}{EMF_{by}} \times GF_{py} \qquad \text{(P-4)}$$

$$EMIS_{py} = ER_{py} \times \frac{CRTPOL}{EMIS_{bya}} \times \frac{200 - RE_{py}}{100} \qquad \text{(P-5)}$$

where:

$EMIS_{py}$	= Projection Year Emissions (Tons per Peak Ozone Season Day);
$ORATE$	=1990 Base Year Ozone Season Operating Rate (Production Units/Day);
$EMF_{py,pc}$	= Projection Year Pre-control Emissions Factor (Mass of Pollutant/Production Unit);
CE_{py}	= Projection Year Control Efficiency (Percent);
RE_{py}	= Projection Year Rule Effectiveness (Percent);
GF_{py}	= Projection Year Growth Factor (Dimensionless);
EMF_{py}	= Projection Year Post-control Emissions Factor (Mass of Pollutant/Production Unit);
$CRTPOL$	= 1990 Baseline Ozone Season Actual Emissions (Tons Per Peak Ozone Season Day);
$CEQEFF$	= 1990 Base Year Control Efficiency (Percent);
$RULEFF$	= 1990 Base Year Rule Effectiveness (Percent);
EMF_{by}	= 1990 Base Year Emissions Factor ;
ER_{py}	= Projection Year Annual Emissions Cap (Mass of Pollutant/Year);
$EMIS_{bya}$	= 1990 Base Year Annual Emissions (Tons Per Year).

Depending on the method that is used to estimate the 1990 Baseline emissions and the type of projection year control data available, one of these five equations is used to project emissions from each process that will have new controls by 2005. Equation P-1 is used when the 1990 baseline emissions are calculated using a pre-control emission factor, and a control efficiency is used to factor the control measure into the emissions estimation. Equation P-2 is used when emissions are calculated using a post-control emissions factor; that is, the emissions factor accounts for the affect of the control measure on emissions. Equation P-3 is used when 1990 baseline emissions are calculated by material balance or test data, and a control efficiency is used to factor the control measure into the emissions estimation. Equation P-4 is used when 1990 baseline emissions are calculated by material balance or test data, and the control level is represented by an emissions factor rather than by a control efficiency. Equation P-5 is used when permit limits or emission caps are used to represent the effect of the control measures on emissions. This equation is originally presented in the aforementioned EPA's document and recently amended by EPA in a guidance memorandum[15]. According to this memorandum, the term ER_{py} can be an emission cap on other than an annual basis, and then the term $EMIS_{bya}$ should be modified to reflect the same time period.

Delaware has compiled the 2005 control data for point sources from Federal and State

[15] Memorandum: Correction Errata to 15 Percent Rate of Progress Guidance Document. G.T. Helms, Group Leader, Ozone Policy and Strategies Group, Office of Air Quality Planning and Standards, US EPA, Research Triangle Park, NC, March 17, 1999. The memorandum is included in Appendix H.

regulations and air emissions permits that have been issued in the post-1990 time frame. The required emission and control data are inserted into the appropriate projection equation for each process. Wherever applicable, a default RE value of 80% for the projection year is used, as suggested by EPA (Reference 14). The calculation results from these equations, which include the effects of both emission growth and new controls, are the 2005 Control Strategy Projections of emissions from individual processes.

The following is an example of control strategy projection calculation for a point source that will have new controls by 2005.

Example of Point Source Emission Projection Calculation

The Delaware Regulations Governing Solid Waste have been revised in 1990 to include requirements for installation of gas control systems at all sanitary landfills. Control efficiencies for each affected landfill are determined based on design data for the proposed gas control systems. For the Cherry Island facility located in New Castle County, with a control device efficiency (flare efficiency) of 98%, the overall control efficiency for the landfill is estimated to be 98%. Other projection data for the Cherry Island landfill are:

$CRTPOL$	= 0.268 TPD in the peak ozone season;
RE_{2005}	= 80%;
$CEQEFF$	= 0%;
$RULEFF$	= 0%;
GF_{2005}	= 1.09.

Using Equation P-3, the 2005 VOC control strategy emission projection for the Cherry Island landfill can be calculated as:

$$EMIS_{2005} = 0.268 \times \frac{1 - \frac{98}{100} \times \frac{80}{100}}{1 - \frac{0}{100} \times \frac{0}{100}} \times 1.11 = 0.064\, TPD$$

B. Method 2

All sources that will not have new controls by 2005 are projected by multiplying their 1990 baseline emissions with the appropriate growth factors, that is,

$$EMIS_{py} = CRTPOL \times GF_{py} \qquad \text{(P-6)}$$

Therefore, for sources that will not have new controls by 2005, the 2005 Control Strategy Projection emissions are equal to the 2005 Current Control Projection emissions which are determined in Part II of this document. A summary of the 2005 control strategy emission projections for point sources is presented in Table 3-3 by source SIC category.

Table 3-3
2005 Control Strategy Projections for Point Source Emissions (in TPD)

Source		Kent		New Castle	
SIC	Category Name	VOC	NOx	VOC	NOx
16	Construction	0.061	0.079	0.022	0.028
20	Food Manufacturing	0.031	0.061	0.000	0.000
22	Textiles	0.000	0.000	1.027	0.101
25	Furniture and Fixtures	0.502	0.011	0.000	0.000
26	Paper Manufacturing	0.030	0.087	0.264	0.135
28	Chemicals & Allied Products	0.202	0.056	6.452	3.748
2911	Petroleum Refining	0.000	0.000	4.766	47.481
2951	Asphalt Paving Mixtures	0.000	0.000	0.022	0.028
30	Rubber/Plastic Manufacturing	0.000	0.000	0.982	0.003
33	Primary Metal Industry	0.046	0.000	0.000	0.000
34	Fabricated Metal Products	0.000	0.000	0.078	0.000
37	Transportation Equipment	0.000	0.000	7.206	0.672
38	Meas/Analyz/Control Instrumentation	0.056	0.000	0.000	0.000
42	Motor Freight Transportation	0.000	0.000	0.033	0.015
46	Pipelines	0.002	0.000	0.000	0.000
4911	Electric Utilities & Generators	0.049	3.567	0.260	14.357
4952	POTWs	0.220	0.000	1.346	0.000
4953	Landfills	0.022	0.000	0.101	0.000
80	Health Services	0.000	0.000	0.011	0.139
82	Educational Services	0.000	0.000	0.000	0.026
87	Engineering, Research	0.000	0.000	0.202	0.765
97	Federal, Civilian Government	0.181	0.093	0.052	0.000
Total Emissions by County		1.403	3.953	22.824	67.497
Total NAA Emissions		**VOC:**	24.227	**NOx:**	71.450

3.3 The 2005 Control Strategy Projections for Stationary Area Sources and Off-Road Mobile Sources

Stationary area and off-road mobile source emissions are projected according to the *Guidance for Growth/Projections/Strategies* (Reference 13). The projection method for stationary area and off-road mobile sources is dependent on whether or not sources will be subject to new controls by 2005. Stationary area and off-road mobile sources that will not be subject to new controls by 2005 are projected using the following equation:

$$EMIS_{py} = CRTPOL \times GF_{py} \quad \text{(A-1)}$$

where $EMIS_{py}$ = emission in projection year (TPD in Peak Ozone Season);
$CRTPOL$ = 1990 baseline actual emission (TPD in Peak Ozone Season);
GF_{py} = growth factor for projection year (dimensionless).

For stationary area and non-road mobile sources that are subject to new controls by 2005, the 2005 Control Strategy Projections are determined in a manner similar to the point source 2005 Control Strategy Projections, using projection equations from the *Guidance for Growth/Projections/ Strategies*. The main difference between the point source projections and the stationary area and off-road mobile source projections is that point source emissions are projected on a process-by-process basis as described previously, while stationary area and off-road mobile source emissions are projected on a category-wide basis. Therefore, the 2005 Control Strategy Projection Inventory for stationary area and off-road mobile sources is determined using category-wide activity level data versus the process operating data that is used for point source projections.

The stationary area and off-road mobile source projection data reflects 2005 controls and rule effectiveness values. A rule penetration value is also factored into the emissions projection. Rule penetration factors are used in conjunction with rule effectiveness (as defined in Part II of this document) to adjust regulated stationary area source emissions estimates. Rule penetration is the portion of an area source category that is affected by a regulation. If a regulation applies to only a certain percentage of sources within a source category, a rule penetration factor is applied to ensure that the control efficiency and rule effectiveness adjustment affect only the emissions values for those regulated sources, and not the emissions values for the unregulated sources in the category.

The equations used to project stationary area and off-road mobile sources that will be subject to new controls by 2005 are discussed in the following paragraphs.

1. Stationary Area Sources

In general, stationary area sources that will be subject to new controls by 2005 are projected using the following equation:

$$EMIS_{py} = ACTLEV \times EMF_{py} \times GF_{py} \times \left[N - \frac{CE_{py}}{100} \times \frac{RE_{py}}{100} \times \frac{RP_{py}}{100} \right] \quad \text{(A-2)}$$

where $EMIS_{py}$ = emissions in projection year (TPD in Peak Ozone Season);
$ACTLEV$ = 1990 baseline activity level (activity units per day in Peak Ozone Season);
EMF_{py} = projection year emissions factor (mass of pollutant per activity unit);
GF_{py} = projection year growth factor (dimensionless);
CE_{py} = projection year control efficiency (percent);

RE_{py} = projection year rule effectiveness (percent);

RP_{py} = projection year rule penetration (Percent);

N = 1 if the future control is accounted for the CE factor, or

= 2 if the future control is accounted for the EMF factor, and in which case, CE should be set equal to 100% (see EPA's memorandum on March 17, 1999, included in Appendix H).

This equation is originally presented in the aforementioned EPA's document and amended by EPA in a guidance memorandum (See footnote 15 on page 40). In cases where the emission factor in a projection year (EMF_{py}) is equal to the 1990 baseline emission factor (EMF_{by}), the corresponding 1990 baseline emission ($CRTPOL$) can be used in Eq.(A-2) to replace the 1990 baseline activity level ($ACTLEV$) and the projection year emissions factor (EMF_{py}). This is because when $EMF_{py} = EMF_{by}$, $CRTPOL$ is equal to $ACTLEV$ times EMF_{py} in Eq.(A-2). Then, Eq.(A-2) becomes

$$EMIS_{py} = CRTPOL \times GF_{py} \times \left[1 - \frac{CE_{py}}{100} \times \frac{RE_{py}}{100} \times \frac{RP_{py}}{100}\right] \qquad \text{(A-2b)}$$

For gasoline dispensing facilities that will be subject to the Stage II vapor recovery controls, the projection equation differs slightly due to the nature of the projection year emission factor for Stage II vapor recovery. The projection year emission factor for Stage II Vapor Recovery is produced by modeling using EPA's MOBILE5a software on the basis of the state-specific motor vehicle input parameters. This emissions factor has already included the effects of the control efficiency, rule effectiveness, and rule penetration in the projection year. Therefore, the term $\frac{CE_{py}}{100} \times \frac{RE_{py}}{100} \times \frac{RP_{py}}{100}$ in Eq.(A-2) is not required for emission projections for those sources with the Stage II Vapor Recovery controls. Thus, for projecting emissions from sources affected by Stage II Vapor Recovery, Eq.(A-2) becomes:

$$EMIS_{py} = ACTLEV \times EMF_{py} \times CF \times GF_{py} \qquad \text{(A-3)}$$

where $EMIS_{py}$ = emission in projection year (TPD in Peak Ozone Season);

$ACTLEV$ = 1990 baseline activity level (gallons gasoline per day in Peak Ozone Season);

EMF_{py} = emissions factor in projection year from MOBILE5a (grams VOC per gallon gasoline);

CF = Conversion Factor (grams/gallon to tons/gallon);

GF_{py} = Growth Factor for projection year.

The details of the Stage II Vapor Recovery Program are discussed in the subsection "3.5.2. Control Measures for Stationary Area Sources" of the 2005 RPP.

The following is a calculation example of 2005 Control Strategy Projection for a stationary area source category that will have new controls by 2005.

Example of Projection Calculation for Stationary Area Source

Section 34 of Delaware Air Regulation 24 prohibits the manufacture, mixing, storage, use, and application of cutback asphalt during the ozone season. The 2005 projected VOC emissions from cutback asphalt for Kent County can be determined using stationary area source projection Equation A-2 (or A-2b). The projection data for cutback asphalt emissions in Kent County are:

$ACTLEV$	= 45 tons asphalt/yr or 0.173 tons asphalt/day in Peak Ozone Season;
EMF_{2005}	= EMF_{1990} = 420 lbs VOC/ton asphalt;
CE_{2005}	= 100%;
RE_{2005}	= 80%;
RP_{2005}	= 100%;
GF_{2005}	= 0.91.

The control efficiency and rule penetration are determined to be 100% from Section 34 of Regulation 24. The EPA's default 80% value is used for the projection year rule effectiveness. Using Equation A-2, the projected VOC emission is:

$$EMIS_{2005} = 0.173 \times 420 \times 0.91 \times \left[1 - \frac{100}{100} \times \frac{80}{100} \times \frac{100}{100}\right] \times \frac{1ton}{2000lbs} = 0.007TPD$$

2. Off-Road Mobile Sources - Using Reformulated Gasoline

Using reformulated fuel is one of the control measures that will affect off-road mobile source emissions by 2005. Emissions from off-road mobile sources that will be affected by reformulated fuel are projected using information provided in a memorandum entitled *VOC Emission Benefits for Nonroad Equipment with the Use of Federal Phase 1 Reformulated Gasoline* (Phil Lorang, Director, Emission Planning and Strategies Division, Office of Mobile Sources, U.S. Environmental Protection Agency, Ann Arbor, Michigan, August 18, 1993, included in Appendix K of the 2005 RPP). According to the memorandum, reformulated fuel will affect the exhaust and evaporative VOC emission components of the 2-stroke and 4-stroke engine categories. For Delaware, 86.51% of the VOC emissions from 2-stroke and 4-stroke engines is exhaust and 5.58% is evaporative. The remaining 7.91% of the VOC emissions from 2-stroke and 4-stroke engines is not significantly affected by reformulated fuel. The VOC emissions reduction is estimated to be 3.3% of the exhaust emissions and 3.5% of the evaporative emissions. Therefore, VOC emissions from 2-stroke and 4-stroke engines were projected using the following equation:

$$EMIS_{py} = CRTPOL \times GF_{py} \times [86.51\% \times (1 - 3.3\%) + 5.58\% \times (1 - 3.5\%) + 7.91\%] \\ = CRTPOL \times GF_{py} \times 0.9695 \quad \text{(A-4)}$$

where $EMIS_{py}$ = emission in projection year (TPD in Peak Ozone Season);
GF_{py} = growth factor for projection year;
$CRTPOL$ = 1990 baseline emissions (TPD in Peak Ozone Season).

3. Off-Road Mobile Sources - New Emissions Standards

The EPA is under court order to promulgate new emissions standards for Heavy-Duty Compression Ignition (CI) engines, small nonroad Spark Ignition (SI) Engines, and Outboard/Inboard Marine Engines. These new standards will result in VOC and/or NOx emission reductions from a wide variety of nonroad engines. Details of how Delaware estimates VOC and NOx emission reductions from these new standards are discussed in a subsection under the heading of "3.5.3 Control Measures for Nonroad Mobile Sources" in the 2005 RPP. The control strategy projections are summarized in Tables 3-4 and 3-5 for stationary area and non-road mobile sources, respectively, by the 4-digit source classification codes (SCC).

Table 3-4
2005 Control Strategy Projections for Stationary Area Source Emissions (in TPD)

Source		Kent		New Castle	
SCC	Category Name	VOC	NOx	VOC	NOx
2102	Industrial Fuel Consumption	0.007	0.502	0.037	2.957
2103	Commercial/Instit. Fuel Consumption	0.007	0.181	0.034	0.833
2104	Residential Fuel Consumption	0.153	0.175	0.104	0.634
2301	Chemical Manufacturing	0.008	0.000	0.160	0.000
2302	Food and Kindred Products	0.076	0.000	0.304	0.000
2308	Rubber/Plastics Production	0.076	0.000	0.442	0.000
2399	Industrial Processes: NEC	0.095	0.000	0.190	0.000
2401	Surface Coating	2.658	0.000	11.653	0.000
2415	Degreasing	0.740	0.000	2.964	0.000
2420	Dry Cleaning	0.105	0.000	0.217	0.000
2425	Graphic Arts	0.307	0.000	0.006	0.000
2461	Misc. Commercial Solvent Use				
	Pesticide Use	1.146	0.000	1.242	0.000
	Cutback & Emulsified Asphalt	0.013	0.000	0.007	0.000
2465	Misc. Consumer Solvent Use	0.893	0.000	3.481	0.000
2501	Petroleum Product Storage	0.436	0.000	1.333	0.000
2505	Petroleum Product Transport	0.869	0.000	1.822	0.000
2601	On-Site Incineration	0.161	0.037	0.707	0.213
2610	Open Burning	0.484	0.097	1.760	0.320
2660	Leaking Underground Storage Tanks	0.003	0.000	0.002	0.000
2810	Misc. Sources: Other Combustion				
	Structural & Forest Fires	0.104	0.017	0.014	0.003
	Prescribed Burning	0.009	0.000	0.001	0.000
2830	Accidental Releases	1.689	0.000	0.430	0.000
Total Emissions by County		10.039	1.009	26.909	4.960
Total State NAA Emissions		**VOC:**	**36.948**	**NOx:**	**5.969**

Table 3-5
2005 Control Strategy Projections for Off-Road Mobile Source Emissions (in TPD)

Source		Kent		New Castle	
SCC	Category Name	VOC	NOx	VOC	NOx
2260	2-Stroke Gasoline Vehicles	0.571	0.047	1.388	0.431
2265	4-Stroke Gasoline Vehicles	0.448	0.032	1.977	0.191
2270	Diesel Vehicles	0.438	3.354	0.930	9.266
2275	Aircraft	0.497	0.630	0.230	0.093
2280	Commercial Marine Vehicles	0.593	3.745	1.097	6.467
2282	Recreational Marine Vessels	0.076	0.008	6.262	0.786
2283	Military Marine Vessels	0.004	0.021	0.007	0.038
2285	Railroads	0.021	0.162	0.100	0.729
Total Emissions by County in 2005		2.647	7.998	11.990	18.001
Total State NAA Emissions in 2005		**VOC:**	**14.637**	**NOx:**	**25.999**

3.4 The 2005 Control Strategy Projections for On-Road Mobile Sources

The on-road mobile source portion of 2005 Control Strategy Projection Inventory has been determined using the 2005 emission factors generated by EPA's computer model MOBILE5b and the 2005 projected vehicle-miles-traveled (VMT) on the 2005 Delaware roadway network. The 2005 VMT projections are determined using the network-based travel-demand models for Kent and New Castle Counties. The 2005 VMT projections and the 1990 VMT projections, both calculated by the travel-demand models, are used to derive a growth factor for each functional vehicle class. The growth factor is then applied to the 1990 VMT from the Highway Performance Monitoring System (HPMS) data. This methodology provides consistency with the 1990 Base Year Inventory methodology, since they are both based on VMT from HPMT. The input data for MOBILE5b and 2005 VMT data are provided by Delaware Department of Transportation through its consulting contractor Vanasse Hangen Brustlin, Inc. (VHB), Watertown, MA. Modeling work of MOBILE5b and calculations for mobile source emissions are conducted by DNREC-AQM's technical staff under direct guidance of EPA Region III Office.

Control measures included in MOBILE5b modeling are Federal Motor Vehicle Control Program (FMVCP) and Reid Vapor Pressure (RVP), Tier I vehicle emissions standards, inspection and maintenance (I/M) program, anti-tampering program (ATP) and pressure test, reformulated fuel, heavy duty diesel standards, the national low emission vehicle (NLEV) program, Tier II vehicle emission standards and low-sulfur fuel requirements. More discussions of mobile source emission projections are presented in a section entitled "3.5.4 On-Road Mobile Source Control Measures" in the 2005 RPP. A summary of the 2005 control strategy on-road mobile source emissions is presented in Table 3-6. It should be pointed out that the emission levels in Table 3-6 also serve as the on-road mobile source emission budgets for Kent and New Castle Counties for the purposes of meeting the transportation conformity requirements set forth in Section 182 of the CAAA.

Table 3-6
2005 Control Strategy Projections for On-Road Mobile Source Emissions (in TPD)

County	VOC	NOx
Kent	4.839	7.905
New Castle	14.763	22.920
Total NAA	**19.602**	**30.825**

3.5 Emission Control Measures and Emission Reductions

The control measures that Delaware includes in the 2005 RPP are listed in Table 3-7 for VOC sources and in Table 3-8 for NOx sources, along with implementation dates for individual control measures. The estimated VOC and NOx emission reductions from individual control measures are also listed in the tables (in TPD in the peak ozone season). As indicated in Table 3-7 and Table 3-8, the total VOC and NOx emission reductions for Delaware's nonattainment area (i.e., Kent and New Castle Counties) for the 2005 RPP are 68.671 TPD and 61.225 TPD, respectively. As calculated in Part II of this document, the emission reductions that Delaware needs to meet the 3% per year rate-of-progress requirement plus offsetting the growth for the 2005 milestone year are 68.671 TPD and 60.098 TPD for VOC and NOx, respectively. Therefore, the control measures listed in Table 3-7 and Table 3-8 are not only adequate to meet the emission reduction requirements for the 2005 milestone year, but also generate 1.127 TPD of surplus for NOx emission reductions (61.225 - 60.098 = 1.127 TPD). Delaware decides to use this NOx emission surplus in the contingency plan of the 2005 RPP to meet the contingency requirements set forth in the CAAA (See Part IV of this document for the contingency plan).

The control measures in Table 3-7 and Table 3-8 are grouped by point, area, off-road mobile, and on-road mobile source sectors. Several control measures affect both point and area sources, and therefore are listed under both source sectors. For sources that will be subject to new controls by 2005, the emission reductions are determined by subtracting the 2005 Control Strategy Projection emissions (described in this part) from the 2005 Current Control Projection emissions using the following equation:

$$ER_{2005} = \textit{Current Control Projection} - \textit{Control Strategy Projection} \quad \text{(R-1)}$$

where ER_{2005} stands for "Emission Reduction (*ER*) in 2005". For sources that will not have new controls or will not be affected by new rules by 2005, their control strategy projections will be equal to their current control projections. Thus, emission reductions from those sources will be zero. Details of individual control measures, affected sources, control strategy emission projections and emission reductions for individual source sectors are presented in Section 3.5 of the 2005 RPP.

Table 3-7
VOC Emission Control Measures and Expected Emission Reductions for 2005 (in TPD)

Control Measures And Regulations	Expected VOC Emission Reduction		
	Kent	New Castle	Total NAA
Point Source Controls			
RACT "Catch-Ups" in Kent County:			
Solvent Metal Cleaning	0.540	N/A	0.540
Surface Coating of Metal Furniture	0.074	N/A	0.074
Leaks from Synthetic Organic Chemical, Polymer, and Resin Manufact. Equip.	0.005	N/A	0.005
New RACT Regulations:			
Bulk Gasoline Marine Tank Vessel Loading Facilities	N/A	1.896	1.896
SOCMI Reactor Processes and Distillation Operations	N/A	0.026	0.026
Batch Processing Operations	0.404	0.040	0.444
Offset Lithography	N/A	0.085	0.085
Aerospace Coatings	0.007	0.007	0.014
Industrial Cleaning Solvents	N/A	0.532	0.532
Non-CTG RACT	0.161	0.223	0.384
Federal Benzene Waste Rule and Delaware Air Regulation 24.28	N/A	1.319	1.319
Other Delaware Regulations:			
Sanitary Landfills	0.078	0.365	0.443
Irreversible Process Changes	0.768	1.245	2.013
Total VOC Reductions Point Sources	**2.037**	**5.739**	**7.776**
Stationary Area Source Controls			
RACT "Catch-Ups" in Kent County:			
Solvent Metal Cleaning	0.138	N/A	0.138
Cutback Asphalt	0.026	N/A	0.026
New and Revised RACT Regulations:			
Stage I Vapor Recovery-Gas. Disps. Facil.	0.499	0.160	0.659
Emulsified Asphalt	0.026	0.027	0.053
Motor Vehicle Refinishing	0.273	1.087	1.360
Offset Lithography	0.084	0.001	0.085
Aerospace Coatings	N/A	0.034	0.034
Stage II Vapor Recovery	0.593	1.962	2.555
Other Delaware Regulations:			
Open Burning	1.876	5.937	7.813

Table 3-7 (Continued)
VOC Emission Control Measures and Expected Emission Reductions for 2005 (in TPD)

Control Measures And Regulations	Expected VOC Emission Reduction		
	Kent	**New Castle**	**Total NAA**
Stationary Area Source Controls (Cont'd)			
Federal Rules			
Consumer Products	0.192	0.765	0.957
Architectural Coatings	0.276	1.099	1.375
Total VOC Reductions Area Sources	**3.982**	**11.072**	**15.054**
Off-Road Mobile Source Controls			
Reformulated Fuel	0.007	0.027	0.034
New Emis. Standards:			
For Small Spark Ignition Engines	1.190	3.795	4.985
For Compression Ignition Engines	0.339	0.730	1.069
For Marine Engines	0.025	2.019	2.044
For Locomotives	0.001	0.001	0.002
Total VOC Reductions Off-Road Sources	**1.562**	**6.571**	**8.133**
On-Road Mobile Source Controls			
Controls present after 1990, including	11.860	25.150	37.010
FMVCP and RVP Tier I Vehicle Emissions Standards Basic I/M for Kent County ATP and Pressure Test for Kent ATP and Pressure Test for New Castle Reformulated Fuel Heavy Duty Diesel Standards NLEV Program			
Tier II Emission Standards/Low Sulfur Fuel	0.161	0.537	0.698
Total VOC Reductions On-Road Sources	**12.021**	**25.687**	**37.708**
Total VOC Reductions from All Controls	**19.602**	**49.070**	**68.671**

Table 3-8
NOx Emission Control Measures and Expected Emission Reductions for 2005 (in TPD)

Control Measures And Regulations	Expected NOx Emission Reduction		
	Kent	**New Castle**	**Total NAA**
Point Source Controls			
Delaware NOx RACT	0.019	2.371	2.390
NOx SIP Call Regional Control	3.371	29.557	32.928
Total for Point Source	**3.390**	**31.928**	**35.318**
Stationary Area Source Controls			
Open Burning	0.368	1.219	1.587
Total for Area Source Reductions	**0.368**	**1.219**	**1.587**
Off-Road Mobile Source Controls			
New Emission Standards:			
For Spark Ignit. (Gasoline) Engines	0.011	0.052	0.063
For Compression Ignit. (Diesel) Engines	1.154	3.228	4.382
For Marine Engines	-0.001	-0.107	-0.108
For Locomotives	0.142	0.626	0.768
Total for Off-Road Mobile Source	**1.306**	**3.799**	**5.105**
On-Road Mobile Source Controls			
Controls present after 1990, including FMVCP and RVP Tier I Vehicle Emissions Standards Basic I/M for Kent County ATP and Pressure Test for Kent ATP and Pressure Test for New Castle Reformulated Fuel Heavy Duty Diesel Standards NLEV Program	5.080	10.520	15.600
Tier II Emission Standards/Low Sulfur Fuel	0.905	2.710	3.615
Total for On-Road Mobile Source	**5.985**	**13.230**	**19.215**
Total Reductions from All Controls	**11.049**	**50.176**	**61.225**

PART IV

CONTINGENCY MEASURES

4.1 Contingency Requirements for Emission Reductions

The CAAA requires States with nonattainment areas to implement specific control measures if the area fails to make reasonable further progress, fails to meet any applicable milestone, or fails to attain the national ambient air quality standards by the applicable attainment date.[16] The EPA has interpreted this CAAA provision as a requirement for States with moderate and above ozone nonattainment areas to include sufficient contingency measures in their Rate-of-Progress Plans so that, upon implementation of such measures, additional emission reductions of at least 3% of the adjusted 1990 base year emissions would be achieved (Reference 13). Under the same provision of the CAAA, EPA also requires that the contingency measures must be fully-adopted control measures or rules, so that, upon failure to meet milestone requirements or attain the standards, the contingency measures can be implemented without any further rulemaking activities by the States and/or EPA.

To meet the requirements for contingency emission reductions, EPA allows States to use NOx emission reductions to substitute for VOC emission reductions in their contingency plans. The condition set forth by EPA for NOx substitution is that States must achieve a minimum of 0.3% VOC reductions of the total 3% contingency reduction, and the remaining 2.7% reduction can be achieved through NOx emission controls (Reference 9). Delaware decides to include both VOC and NOx emission controls in its contingency plan for the 2005 Rate-of-Progress Plan.

4.2 Control Measures to Meet Contingency Requirements

Delaware proposes to achieve the required contingency emission reductions through controls over both VOC and NOx emissions. The VOC emission reductions will be obtained from (1) implementing an annual inspection schedule for the Stage II Vapor Recovery Systems, and (2) from the open burning control in New Castle County. The NOx emission reductions will be achieved through a combination of controls on various sources in the peak ozone season, as well as through improvement of rule effectiveness (*RE*) for the regional NOx emission control rule in Delaware. The contingency measures and the associated VOC and NOx emission reductions are discussed in detail in the following subsections.

4.2.1 Stage II Vapor Recovery System with Annual Inspections

The CAAA requires States with moderate and above ozone nonattainment areas to submit a SIP revision requiring owners or operators of gasoline dispensing facilities to install and operate a system for gasoline vapor recovery during refueling process for motor

[16] CAAA, Title I, Part D, Section 172(c)(9) and Section182(c)(9).

vehicles.[17] Under this requirement, Delaware has developed its Stage II Vapor Recovery Program, which is defined in Section 36 of Delaware Air Regulation 24 (Reference 5). The Delaware's stage II vapor recovery regulation gives the regulatory agency the right to perform compliance inspections as needed. Currently, a triennial inspection schedule is performed by the responsible agency (Underground Storage Tank Branch of DNREC). Delaware has taken credit for VOC emission reductions from this triennial inspection schedule in Part III of the 2005 RPP, where the emission reductions are estimated using a control efficiency (CE) of 95%, a rule penetration (RP) of 97%, and a rule effectiveness (RE) of 65.3% according to an EPA's guidance document. The total creditable VOC emission reduction from the triennial inspection is 2.56 TPD, as indicated in Part III of the 2005 RPP.

Additional VOC emission reductions can be obtained from the Stage II Vapor Recovery Program when the inspection frequency is increased. If the program is conducted with an annual inspection schedule, the rule effectiveness (*RE*) value of this control will increase from 65.3% to 90.5%, resulting in additional VOC emission reductions. In other words, the program is more effective for reducing VOC emissions with a higher inspection frequency. Delaware proposes to perform an annual inspection schedule for its Stage II Vapor Recovery Program as a contingency measure. Implementing the annual inspection does not need any further rulemaking activities at both state and federal levels. Based on a 95% control efficiency, a 97% rule penetration, and a 90.5% rule effectiveness, the emission factors estimated by MOBILE5b are 0.53 g/gal and 0.48 g/gal for Kent and New Castle, respectively. The MOBILE5b input and output files for estimating the 2005 Stage II VOC emission factors with annual inspection are provided in Appendix N of this document.

According to EPA's guidance document *Procedures for Emissions Inventory Preparation, Volume IV: Mobile Sources* (Reference 22), the in-use efficiency of stage II vapor recovery system applies to both spillage and displacement. As determined in the 2005 RPP, the annual inspection in Stage II Vapor Recovery Program will lead to additional VOC emission reductions of 0.05 TPD and 0.19 TPD from spillage and displacement, respectively. The total additional reduction is therefore 0.24 TPD (0.05 + 0.19 = 0.24).

4.2.2 VOC Emission Reduction from Open Burning Control

As indicated in Part III of the 2005 RPP, Delaware decides to use 0.16 TPD VOC emission reduction from the open burning control in New Castle County for the contingency requirements. Since the open burning regulation is an adopted state rule, inclusion of the 0.16 TPD for contingency reduction will not need any further rulemaking activities by the States and/or EPA.

The total VOC emission reduction from Stage II Vapor Recovery and the open burning control is 0.24 + 0.16 = 0.40 TPD. In Part I of this document, Delaware has determined its

[17] CAAA, Title I, Part D, Section 182(b)(3).

1990 adjusted baseline inventory level of VOC emissions to be 132.493 TPD (Table 1-4). The additional 0.40 TPD VOC emission reduction is (0.40/132.493) = 0.0030 = 0.30% of the 1990 adjusted base year VOC emissions, thus, satisfying the 0.30% minimum requirement on VOC emission reductions for the contingency plan. The rest of the contingency reductions will be obtained through NOx controls, which will be discussed in the following subsection.

4.2.3 NOx Emission Controls in Peak Ozone Season

As determined above, 0.30% of the 3.00% contingency requirement will be obtained by VOC emission reductions from annual inspection of the Stage II vapor recovery program and the open burning regulation. The remaining 2.70% (i.e., 3.00% - 0.30% = 2.70%) is the percentage required for NOx reduction substitution. The adjusted 1990 base year NOx emission level has been determined to be 158.375 TPD in Part I (Table 1-4). Thus, the NOx emission reductions for contingency purpose will be at least 158.375 x 2.70% = 4.28 TPD.

In Subsection 3.5, Part III of this document, Delaware has demonstrated that, through adequate NOx emission controls, a 1.13 TPD NOx emission reduction will be achieved, in addition to those needed to meet the minimum rate-of-progress requirements for the 2005 RPP. Delaware decides to use this additional 1.13 TPD NOx emission reduction in this contingency plan based on the following judgements. First, this additional reduction shall be achieved from a combination of control measures in the 2005 RPP. Second, all these control measures are fully adopted measures or rules. Thus, no further rulemaking actions by the State and/or EPA are needed when this 1.13 TPD NOx reduction surplus becomes necessary to serve the contingency purpose. The remaining NOx emission reduction for contingency purpose becomes 3.15 TPD (4.28 - 1.13 = 3.15).

Delaware has promulgated the federal NOx SIP Call Rule through its Regulation 39 (*Delaware NOx Emission Trading Program*, Reference 18). In Part III of the 2005 RPP, Delaware has shown that the regional NOx control rule (the trading program) has enabled Delaware to achieve a significant NOx emission reduction, with a default *RE* value of 80%, in the milestone year 2005. Through a thorough analysis of Regulation 39, Delaware has demonstrated that the stringent provisions in Regulation 39 and the nature of trading program can improve the rule effectiveness from the default value of 80% to 97%. As shown in the 2005 RPP, applying the improved *RE* of 97% will produce a total NOx emission reduction of 36.41 TPD from the affected NOx sources. If compared with the total reduction of 32.93 TPD obtained with the default RE of 80% (Table 3-17 in Part III of the 2005 RPP), the additional reduction will be 3.48 TPD (i.e., 36.41 – 32.93 = 3.48). Since Regulation 39 is a state adopted rule, the additional 3.48 TPD NOx emission reduction can be obtained through *RE* improvement without any further rule-making activities at both State and federal levels.

4.3 Summary of Contingency Measures and Emission Reductions

A summary of the contingency measures and the associated additional VOC and NOx emission reductions are presented in Table 4-2. As shown in Table 4-2 and in the discussions above, the contingency measures will produce a total of 4.61 TPD of NOx emission reductions, which is greater than the required reduction of 4.28 TPD. Thus, the contingency measures proposed herein are adequate for meeting the contingency requirements set forth by EPA.

Table 4-2. Summary of Contingency Measures and Emission Reductions

	Emission Reduction (TPD)	
Contingency Measures	**VOC**	**NOx**
Stage II Vapor Recovery with Annual Insp.	0.24	-
Open Burning	0.16	
Total VOC Emission Reductions	0.40	
Required VOC Emission Reductions	0.40	-
NOx Controls in Peak Ozone Season	-	1.13
RE Improvement on Regional NOx Control Rule	-	3.48
Total NOx Emission Reduction	-	4.61
Required NOx Emission Reductions	-	4.28

PART V

DOCUMENTATION

This part of the 2005 Rate-of-Progress Plan contains a collection of supporting documents referred to in Part I through Part IV of the plan. The documents are in appendix form and include the following:

APPENDIX A: Perchloroethylene Emissions from Delaware 1990 Base Year Emission Inventory (Electronic file available).

APPENDIX B: MOBILE5b Input and Output Data for the 1990 Adjusted Base Year Inventories Relative to Individual Milestone Years (Only hard copy available).

APPENDIX C: Development of Emission Growth Factors for Delaware's 2002 and 2005 Rate-of-Progress Plans (Electronic file).

APPENDIX D: Point Source Emission Projections for the 2005 Current Control Projection Inventory (Electronic file).

APPENDIX E: Stationary Area and Off-Road Mobile Source Emission Projections for the 2005 Current Control and Control Strategy Inventories (Electronic file).

APPENDIX F: MOBILE5b Input-Output Data and Calculation of On-Road Mobile Source Emission Projections for Individual Milestone Years (Hard copy only).

APPENDIX G: Point Source Emission Projections for the 2005 Control Strategy Inventory (Electronic file).

APPENDIX H: Collection of EPA Guidance Documents and Memorandums Cited in the 2005 RPP (Hard copy only).

APPENDIX I: VOC Emissions Reductions from the Federal Benzene Waste Rule and Delaware Regulation 24 Section 28 (Electronic file).

APPENDIX J: MOBILE5b Input and Output Data for the 2005 Stage II Vapor Recovery with Triennial Inspection (Electronic file).

APPENDIX K: Estimating VOC and NOx Emission Reductions from New Federal Emission Standards on Nonroad Diesel Engines (Electronic file).

APPENDIX L: Mobile Source VOC and NOx Emission Reductions from Federal Tier 2 Standards and Low-Sulfur Content Fuel (Hard copy only).

APPENDIX M: MOBILE5b Input and Output Files for the 2005 Stage II Vapor Recovery with Annual Inspection (Electronic file).

APPENDIX N: Improvement of Rule Effectiveness for NOx Emission Sources Covered by the Federal NOx SIP Call Rule and Delaware Regulation 39 (Electronic file).

Some of these appendixes are not available in electronic form. However, hard copies are available upon written request. Written request should be addressed to Dr. Frank F. Gao, Air Quality Management Section, DNREC, 156 South State Street, Dover, DE 19901, or through fax at (302)739-3106, or via e-mail at fgao@state.de.us.