SECTION 2

STATIONARY POINT SOURCES

The point source inventory represents facility-specific data for larger stationary sources. Emissions data for all other source categories are reported at the county level. Point sources typically include large industrial, commercial and institutional facilities. Manufacturing facilities, within the industrial sector, comprise the majority of all reporting point sources. The institutional sector includes hospitals, universities, prisons, military bases, landfills, and wastewater treatment plants.

Unlike other source sector emissions which are estimated by AQMS, point source emissions data are submitted to AQMS by the facilities. Emissions are reported at the process level and include both confined (stack) emission points as well as unconfined (fugitive) emission sources. A key aspect of point source data is the inclusion of facility coordinates to accurately allocate emissions spatially within a county for purposes of performing air dispersion modeling.

The planning and execution of the point source inventory was accomplished in the following chronological manner:

- Define the purposes of the inventory (already defined in Section 1 of this report);
- Establish the reporting criteria and list of facilities to survey;
- Obtain inventory data from facilities;
- Perform administrative and technical review of data received from facilities;
- Seek resubmissions/corrections from facilities based on data review;
- Perform internal data manipulation (i.e., apply rule effectiveness for VOC and NO_x) and augmentation (for $PM_{2.5}$); and
- Prepare inventory data files, report, and supporting documentation.

Quality control/assurance is not listed in the chronology above since these activities were performed throughout the point source inventory development process. Quality control/assurance efforts are presented throughout this section and in the quality assurance section of this report.

Since there may be overlap between point sources and stationary non-point source categories, one final activity required of the point source inventory staff is to provide point source back out data where appropriate. Point source back out data includes emissions, throughput, or employees, depending on the non-point source category methodology.

2.1 Reporting Criteria

Based on the purposes of the 2002 inventory, the following criteria were established within the point sources inventory preparation plan (IPP) (DNREC, 2003) for defining the universe of facilities to be surveyed:

- Facilities that held a Title V permit in 2002;

- Any facility with emissions of VOCs greater than 5 TPY for any of the years 1999, 2000, or 2001, as previously reported to the AQMS inventory program;
- Any facility falling into one of the following industry sectors:
  - Hot-mix asphalt plants,
  - Hospitals that use ethylene oxide for sterilization,
  - Electric generating units (EGUs); and
  - Facilities using anhydrous ammonia as a refrigerant;
- Any facility for which AQMS does not have previous inventory data that appears may be a significant source.

Subsequent to establishing these criteria, chrome plating was considered important to the air toxics study due to emissions of hexavalent chromium. A review of the permit and Maximum Achievable Control Technology (MACT) standard files revealed four facilities in Delaware that perform chrome plating. These facilities were included in the overall point source inventory; however, these facilities have no reported particulate matter or particulate precursor emissions and are not included in this inventory.

Prior to the establishment of these criteria, AQMS considered including all facilities within the following additional industry sectors:

- Feed mills;
- Concrete plants;
- Sand and gravel operations;
- Hazardous waste treatment, storage, and disposal facilities (TSDFs);
- Publicly-owned treatment works (POTWs);
- Bulk petroleum plants (for VOCs);
- Dry cleaners (for VOCs);
- Active and inactive landfills (for VOCs); and
- Chrome plating operations (considered after the development of the reporting criteria.)

Feed mills, concrete plants, and sand and gravel operations – These industry sectors were considered a source of particulate matter, both from material handling processes and fugitive dust (i.e., storage piles). Many large feed mills in Delaware already met the criteria for reporting as a Title V facility due to combustion emissions from process boilers and grain dryers. The lack of quality emissions data (i.e., emission factors) for feed mills persuaded AQMS from inventorying smaller feed mills. Lack of data was also the reason for not further considering concrete plants. Sand and gravel plants were surveyed and inventoried under the stationary non-point sources inventory.

TSDFs – The number of TSDFs within Delaware has steadily declined in the past ten years and recent inventories indicated emissions were very low. The Solid and Hazardous Waste Management Branch of DNREC was contacted to determine the list of TSD facilities within the State. As of 2002, there were three TSDFs operating in Delaware. All three sites were located at facilities that already met other reporting criteria. These facilities were asked to report emissions for their TSDF. Therefore, TSDFs were not included in the point source inventory specifically as an industry sector. Finally, two of the TSDFs were storage only, and have since closed.

POTWs - Other than one Title V permitted facility (Wilmington WWTP), POTWs were considered an insignificant source of criteria and air toxic pollutants. Rather than including POTWs within the point source inventory, throughput data available from the Division of Water Resources NPDES program was used to estimate emissions for each facility, then aggregated to the county level in the stationary non-point source inventory.

Bulk petroleum plants - After reviewing internal records (EPCRA Tier II data) and contacting several bulk plants, AQMS determined that very little throughput at these facilities includes highly volatile products such as gasoline. Emissions from less volatile products, such as distillate and residual oils, were too small to be considered for inclusion in either the point or stationary non-point source inventories.

Dry cleaners – Dry cleaners in Delaware predominantly use perchloroethylene as the cleaning solvent. Perchloroethylene is a negligibly-reactive VOC, and is not included in the VOC emissions from dry cleaners. With more than 80 facilities throughout Delaware, the number of facilities was considered too large and emissions too small to include as point sources. Therefore, dry cleaners were handled as an area source with VOC emissions aggregated to the county level.

Active and inactive landfills – All active municipal solid waste landfills in the State (one per county) and one large inactive landfill were Title V permitted facilities in 2002 and thus already met the reporting criteria. It should be noted that fugitive dust emissions were not estimated for these landfills. The remaining inactive landfills throughout Delaware have not accepted waste for nearly 20 years as of 2002, and VOC emissions from these sites are minimal. Therefore, inactive landfills were not included in the point source inventory. County-level estimates of VOC emissions from inactive landfills were included in the non-point source inventory.

As a result of the passage of the new fine particulate standard, ammonia, which is a precursor of $PM_{2.5}$ in the formation of ammonium sulfates and nitrates, was elevated to the status of a criteria pollutant (similar to how VOCs are viewed in the formation of ozone.) Therefore facilities using anhydrous ammonia for refrigeration were identified.

2.2 Initial List of Facilities

Once the reporting criteria were establish, AQMS point source inventory staff compiled an initial list of facilities to be compared against the reporting criteria. A list of facilities that were Title V (TV) or Synthetic Minor (SM) permitted facilities at the end of 2002 was provided by the Engineering and Compliance Branch of AQMS. AQMS staff included all of these facilities (150) in the initial list.

Facilities within the emission inventory database that were not designated as TV or SM were evaluated against the criterion of five tons of annual VOC emissions in any of the three years prior to 2002. This review resulted in the addition of two facilities to the initial list. As stated previously, four chrome plating operations were added to the list of point sources.

The following additional data sources were reviewed to identify facilities that might have met one or more of the reporting criteria:

- Toxics Release Inventory (TRI, SARA 313) – 1999 through 2001 data;
- Hazardous Chemical Inventory (Tier II, SARA 312) – 2001 data;
- AQMS Accidental Release Prevention (ARP) Program facility list.

AQMS inventory staff reviewed the three most recent years of TRI data, and found that all facilities within TRI with more than five tons per year air emissions of VOC compounds were already included in the initial list due to TV or SM status. However, when the 2002 TRI data were made available in late 2003, AQMS decided to include several facilities for purposes of the air toxics project. In doing so, the individual compounds reported by these facilities to TRI were also reported as particulates or VOCs, as appropriate. The review of TRI data resulted in the addition of four facilities to the initial list.

The Tier II data were reviewed mainly to identify facilities that used anhydrous ammonia. Furthermore, the ARP Program within DNREC maintains a list of facilities that have a significant amount of anhydrous ammonia stored on site, due to the acute hazard ammonia poses should a catastrophic release occur. Finally, telephone listings were reviewed for otherwise unidentified ice suppliers and ice skating rinks. Altogether, 23 facilities not already on the initial list were added to capture potential ammonia emissions.

The complete initial list included 183 facilities. A spreadsheet was developed by AQMS point source staff containing a record of every facility included on the initial list of facilities. The spreadsheet includes the reason the facility was placed on the initial list. For facilities that were inventoried, the spreadsheet indicates which reporting criteria were met. The spreadsheet is included in the supporting documentation contained on a CD accompanying this report.

2.3 Facilities Inventoried

The facilities on the initial list were evaluated using the reporting criteria established in the IPP. As stated previously, additional criteria specifically based on air toxic emissions were included.

Title V facilities are required to report regardless of the amount of emissions. Therefore, all 85 Title V facilities were included in the final list of point sources, unless a facility was closed for the entire 2002 calendar year. The list of Synthetic Minor facilities were evaluated against the reporting criteria. As a result, 28 of the 65 SM facilities were dropped from further consideration since no criterion was met.

Eight facilities thought to be using anhydrous ammonia reported using another type of refrigerant or otherwise did not use anhydrous ammonia. These facilities were not included in the final list of point sources. It is important to note there were several facilities that used anhydrous ammonia as a refrigerant but reported no ammonia system recharge (the approximation used to determine that emissions had occurred) for 2002. These facilities were retained in the final list of point sources, even though emissions are reported as zero.

Three facilities were identified as being closed prior to calendar year 2002. Three non-SM facilities were evaluated against the reporting criteria and were determined to not meet the criteria. Finally, a mobile crusher used at several hot-mix asphalt plants was identified as its own

facility in the initial list of facilities. However, since for purposes of the point source inventory, all emissions must be assigned to a fixed site, emissions from the crusher were assigned to the facility at which it operated the majority of the time.

The final list included 140 facilities inventoried. Of these, 136 facilities reported on primary particulate matter and/or particulate precursors (SO_2, NO_x, NH_3, and VOC), and thus are included in the 2002 base year $PM_{2.5}$ SIP inventory.

2.4 Survey Methods

In October 2002, the AQMS point source inventory staff began developing the survey methods and preparing reporting packages to be mailed to each facility. AQMS used two primary methods to gather information from most facilities for the 2002 inventory. Facilities either used an on-line reporting system or submitted paper activity data reporting forms. These two methods are described in detail below.

2.4.1 Electronic Reporting

Starting with the 2001 reporting cycle, AQMS has offered electronic reporting of emissions data through the Internet. The system is known as Terminal Server Satellite ***i***-STEPS®. Facilities have used Satellite ***i***-STEPS® software for reporting since 1995. Prior to the 2001 reporting cycle, facilities were given the Satellite ***i***-STEPS® software and a database containing the emission inventory reporting structure for their facility on magnetic media. The software and database was installed on a computer at the facility. Facilities would create and mail to AQMS a submission diskette containing their inventory data. With on-line reporting, the software and database remains on DNREC's server. The Internet provides the connection to the user's computer.

For the 2001 inventory year, AQMS offered a one-day training to facility representatives to provide guidance on how to use the new on-line reporting system and to reacquaint facilities with the Satellite ***i***-STEPS® reporting scheme. ***i***-STEPS® is the point source emission inventory data management system that AQMS has used since 1992 and is currently licensed to DNREC by MACTEC Federal Programs.

For the 2002 reporting cycle, the Terminal Server Satellite ***i***-STEPS® application was updated with the latest FIRE and AP-42 emission factors. Satellite ***i***-STEPS® is capable of calculating emissions based on information supplied on process throughput, operating schedule, and controls. A database specific to each facility was generated based on previously submitted inventories and other information (i.e., permitting files). Information expected to remain the same from year to year was pre-populated in the database, while throughput and emissions data were zeroed out. Facilities were expected to update pre-populated information as necessary and enter 2002 data for fields that were zeroed out.

2.4.2 Activity Data Reporting Forms

AQMS had learned over the years that staff at some smaller facilities had limited or no access to the Internet, had no experience with Internet reporting, or in some cases were lacking in

computer skills. For these facilities, the process of using Satellite ***i***-STEPS® was cumbersome and sometimes resulted in late reporting and incomplete or erroneous data. For those facilities with uncomplicated processes, AQMS developed one to two-page activity data report forms to simplify the reporting process. The activity data supplied by facilities, such as operating schedule and monthly throughputs, were used by AQMS staff to calculate emissions based on FIRE emission factors or material balance methodologies.

Activity data reporting forms were developed for the following processes:

- Boilers;
- Stationary diesel engines;
- Hot-mix asphalt production;
- Ammonia refrigeration;
- Ethylene oxide sterilization; and
- Chrome plating.

For facilities that used the activity data forms, AQMS already had detailed process and stack information on file. The activity data report forms are included in the supporting documentation contained on a CD accompanying this report.

2.4.3 Other Methods

In a limited number of cases where on-line reporting or the use of the activity data forms were not appropriate or useful, information was obtained from the facility via telephone, e-mail, fax or site visit. As an example, Metachem Products closed in 2002 and no technical staff was available during the data collection period. However, the president of the company was contacted and was able to provide 2002 production figures. AQMS staff calculated emissions for 2002 for non-combustion processes by scaling the reported 2001 emissions based on production level ratios.

Emissions data for seven facilities were obtained solely from TRI reports. These facilities were included in the 2002 inventory as a result of the DATAS project. For six of these facilities, the reported TRI chemicals were VOCs. The seventh facility reported particulate emissions of lead. These facilities were retained in the $PM_{2.5}$ SIP inventory.

Regardless of the survey methods used to obtain data from facilities, all data were entered into one database within ***i***-STEPS®.

2.5 Data Collection

Reporting packages were mailed in March 2003 to facilities identified as meeting one of more of the established reporting criteria. Two Synthetic Minor facilities that were sent reporting packages were subsequently dropped from further consideration based on conversations with the facilities.

Some facilities were identified for inclusion in the point source inventory after the initial reporting cycle began. These included one ammonia refrigeration facility, four chrome plating

operations, and seven TRI reporting facilities. The TRI facilities were not contacted by AQMS point source inventory staff. Emissions data were obtained from the DNREC TRI database. Table 2.1 provides the number of facilities inventoried by each survey method.

Table 2-1. Inventory Methods

Inventory Method Used	Number of Facilities
On-line reporting	86
Activity data report forms	44
Toxics Release Inventory	7
Other methods	3
Dropped from inventory[a]	3

[a]Dover Downs Entertainment and Kuehne Chemical. Tilcon mobile crusher was removed as a separate facility and allocated to one of Tilcon's facilities.

2.5.1 On-line Reporting

Terminal Server Satellite ***i***-STEPS® software reporting packages were sent to 82 facilities by certified mail on March 7, 2003. An additional six facilities received the mailing over the next month. Two of the 88 facilities receiving the reporting packages for on-line submissions were subsequently handled through the use of activity data report forms and one facility was dropped from further consideration (Kuehne Chemical). Finally, one facility (Pinnacle Foods), that originally received activity data reporting forms, reported using the on-line system.

The reporting package contained a cover letter and five pages of instructions. The reporting package is included in the supporting documentation. The instructions contained information on how to access the Terminal Server Satellite ***i***-STEPS®, user initials and passwords, AQMS contact information, information specific to the 2002 inventory, and an AQMS web page address where additional inventory documents were available. These documents included:

- *Issues, Updates and FAQs for Terminal Server Satellite **i**-STEPS®*;
- *Common Errors and Useful Information*;
- A power point presentation of the 2001 emission inventory training; and
- A detailed, 23-page set of instructions that provided information about the emission inventory structure and each data element.

A database was customized for each facility based on the process structure previously established for the facility. For new facilities using Satellite ***i***-STEPS®, the reporting structure was created by AQMS point source inventory staff with input from the facility. The database was pre-populated with general information about the facility, as well as a few other data elements not expected to change from year to year, such as stack parameters and design capacity. Other data elements were left blank or zeroed out, such as annual process rate, percent sulfur and ash of fuel burned, operating schedule, throughputs, capture and control efficiencies, and emission estimates.

Generally, it was the large, complex facilities with multiple processes that reported on-line. For facility representatives new to emissions inventory reporting or who had not reported in some time, AQMS inventory staff worked with them to understand the inventory structure. In three instances this included an on-site visit by AQMS staff. Assistance by phone or e-mail in completing the inventory was offered on an on-going basis for many facilities. Representatives from five facilities visited the AQMS offices seeking assistance. Terminal Server Satellite ***i***-STEPS® on-line reporting allowed point source inventory staff to work with a facility simultaneously on-line to resolve any issues a facility may have encountered.

The inventory information requested from facilities for the 2002 inventory is described in several EPA publications including *Emission Inventory Requirements for Ozone State Implementation Plans and Emissions Inventory Guidance* (EPA, 1991a) and *Emissions Inventory Improvement Program (EIIP), Volume II* (EPA, 1997). Facilities were requested to speciate non-combustion VOC emissions, allowing AQMS staff to back out any non-reactive compounds from the reported VOC total when necessary. All emissions were reported at the process level. Facilities were required to provide emission calculations and documentation in the Notes window within Terminal Server Satellite ***i***-STEPS® or in writing when submitting their certified emissions.

Terminal Server Satellite ***i***-STEPS® has built-in system checks for out of range values as well as relational errors. Field specific data entry checks were done by the software at the time the data was entered or when an attempt was made to save the data. The system prompted the user to make the needed corrections. In most cases a record could not be saved until all edit checks were satisfied. System functions and checks include:

- Data can be entered through the use of look-up tables;
- Data entered directly must match information in the look-up table;
- Total percent quarterly throughputs must be between 95 and 101;
- Alpha-numeric checks;
- Enforced relational database integrity;
- Mandatory field alerts;
- Stack assignment check (each process must have an assigned stack); and
- Automated emissions calculations.

Once a facility completed entering its data and information, the user had the ability to run the following reports:

- Group level emissions (facility summary);
- Process unit level emissions summary; and
- Detailed report (contains all entered and calculated data).

Facilities used the three reports to verify data they have entered and the emissions reported and/or calculated by the Terminal Server Satellite ***i***-STEPS®. Reports could be displayed to the screen or created as an Adobe Acrobat pdf file which is then automatically e-mailed to the user.

The process summary report provided emissions of each criteria pollutant for each process within an emissions unit. The detailed report lists the data following the Terminal Server

Satellite ***i***-STEPS® structure and contains all information that the facility entered as well information the system used to organize the inventory information or calculate emissions.

The facility summary report tabulates criteria pollutant emissions for each emission unit with a facility total at the bottom. This report also served as the emission certification page and thus contains a signature area for the "Responsible Official". When AQMS received a signed copy of this report, indicating the facility had completed the reporting process, AQMS set the Terminal Server Satellite ***i***-STEPS® to read-only for the facility.

Examples of the three reports are included on the CD accompanying this report.

2.5.2 Activity Data Reporting Forms

Activity data reporting packages were sent by certified mail to 37 facilities on March 14, 2003. An additional eight facilities received the mailing over the next several months. Two facilities that originally were expected to report on-line reported using the activity data forms. Conversely, one facility switched from activity forms to on-line reporting. One facility receiving the activity data reporting forms was dropped from further consideration and the Tilcon mobile crusher, which reported using the activity data forms, was removed as a separate facility.

The reporting packages included a cover letter, general facility information page, and the appropriate activity data reporting form(s) for each facility. The general facility information sheet contained preprinted general information about the facility. This information included facility name, mailing address, contact name, SIC and NAICS codes and phone and facsimile numbers. Facilities made corrections and returned these sheets along with their activity reports.

Those facilities targeted for ammonia refrigeration and chrome plating received activity data reporting forms only for ammonia usage and chrome plating activity, respectively. AQMS did not request data on any other processes that these facilities might have (i.e., a heater or boiler). All other facilities were mailed the appropriate activity data reporting forms for all emission processes at these facilities. Assistance in completing the activity reports was offered on an on-going basis. Assistance was provided via telephone calls, e-mail, facsimile and on-site visit.

2.6 Inventory Tracking

A log book was maintained to record and track the reporting status of the 133 facilities receiving a reporting package. The log book contained the facility name and identification number, the facility contact, the date the reporting package was mailed to the facility, the certified mail return receipt number and date it was returned, the original due date, an extension date, if given, the date the submission was received by AQMS, and notes on phone or e-mail communications with the facility.

In addition to the 2002 inventory log book, a Microsoft® Excel spreadsheet was maintained to track each facility from the initial mailing through all tracking and review steps including the final QA/QC process. Communications with facilities are noted in the spreadsheet, especially when facilities failed to meet their deadlines. On several occasions facility management was

contacted by AQMS to resolve difficulties and get the reporting process back on track. Besides two facilities that were dropped from further consideration, all facilities supplied either complete emissions data on-line or activity data on hard copy reporting forms.

2.7 Administrative Review

As soon as submissions were received, the review process began. The Administrative Completeness Determination (ACD) was performed as the first step in the review process. The ACD consisted of a one-page checklist which begins the audit trail associated with the review process. The ACD checklist was developed by the AQMS point source inventory staff over many years as a QA/QC tool for ozone SIP inventories. A checklist is completed and maintained in each facility file. An ACD is prepared for all facilities, whether Terminal Server Satellite ***i***-STEPS® or the activity data reporting forms were used to prepare their submission.

2.7.1 Administrative Review of On-line Submissions

The ACD performed on on-line submissions included the following steps:

Review cover letter - Facilities were asked to identify in their cover letter any operational changes and the impact such changes had on emissions. AQMS staff reviewed the cover letter noting any significant changes and highlighted it for future reference.

Emissions comparison - The 2002 facility-wide reported emissions for each criteria pollutant were compared to the 1999 Periodic Emission Inventory or to the most current information available. Significant differences between the two years were identified, investigated, and documented. Reviewing past and present detailed reports, process additions and deletions were compared, identified and highlighted for further investigation. If sufficient information was not provided in the cover letter, the facility was contacted to explain the differences. Emission comparisons and operational changes were compiled within a text document, which is included in the supporting documentation.

Accidental releases - Facilities were asked to identify accidental releases either through the assignment of a separate accidental release process or an explanation in their cover letter as to the accounting of the release(s) in their inventory. Throughout 2002, AQMS staff created a file of accidental releases for which DNREC received knowledge through incident reports and news articles. This information was checked against accidental releases identified in the emission inventory reports.

Other ACD checks – AQMS staff verified that the emission certification report (facility summary) was signed by the Responsible Official. Any request for confidential business information was forwarded to the AQMS paralegal staff for review. The tracking spreadsheet was updated to include any communications with the facilities and to document when the ACD was completed for each facility and when all issues, if any, were resolved. The completed ACD, cover letter, signed emissions summary page, submitted supporting calculation sheets, notes and other correspondence (i.e., e-mails) were placed in the facility file.

2.7.2 Administrative Review of Activity Data Report Forms

Activity data report form information was used to update facility general information and calculate emissions. Information from the activity reports were entered into the Terminal Server Satellite ***i***-STEPS® database by AQMS staff. The database maintained an audit trail (user ID and date stamp) of data added to the system.

For some activity data, emissions were equated directly to the activity data based on a mass balance approach. For example, all ethylene oxide (EO) used by hospitals for sterilization was assumed to be released to the atmosphere. Therefore, EO emissions were equated to EO purchased. Other activity data were used by the database to calculate emissions based on emission factors contained in the database. Fuel combustion throughputs for small boilers and generators were used in this way. Once emissions were estimated for a facility that reported activity data, the 2002 emissions could be compared to data from previous years.

All Title V permitted facilities are required to submit a signed emissions certification report as part of their permit requirements. For those Title V facilities that reported activity data, the AQMS point source inventory staff generated the emissions summary page based on emissions calculated within ***i***-STEPS® and mailed it to the facility for signature by the Responsible Official. The ACD was not complete until the signed emissions summary page was returned to AQMS and the signature verified. The date the emissions summary page was mailed to a facility was documented within the tracking spreadsheet, as well as the due date for receiving the signed document. Finally, the actual date it was received was recorded.

The tracking spreadsheet was updated to include any communications with the facilities and to document when the ACD was completed for each facility and when all issues, if any, were resolved. The completed ACD, signed emissions summary page, notes and other correspondence (i.e., e-mails) were placed in the facility file. The tracking spreadsheet is included in the supporting documentation accompanying this report.

2.8 Reported Data and Estimating Emissions

The 2002 stationary point source inventory included all criteria pollutants and their precursors (PM_{10}-PRI, $PM_{2.5}$-PRI, SO_2, NO_x, NH_3, VOC, and CO) and all hazardous air pollutants (HAPs). AQMS requested non-combustion HAP data from facilities for the purpose of identifying non-reactive VOCs and to serve as a check for VOC totals. The VOC and NO_x emissions included in the $PM_{2.5}$ SIP inventory were developed for Delaware's Ozone SIP and were not developed separately or treated differently for inclusing in the $PM_{2.5}$ SIP.

Prior to the 2002 reporting cycle $PM_{2.5}$ was not a criteria pollutant and was not reportable. At the time of the 2002 reporting cycle in early 2003, there were no $PM_{2.5}$ permit conditions or stack test data to use in determining emission estimates. Because of the lack of knowledge on the part of reporting facilities, and because AQMS had not yet populated the ***i***-STEPS® reporting software system with standard AP-42 and FIRE emission factors, AQMS did not have facilities report $PM_{2.5}$ emissions. As a result, AQMS augmented $PM_{2.5}$ emissions within the point source inventory either by using standard emission factors based on throughput information provided by

the facility or applying size particle multipliers to reported PM_{10} emissions. The details of this effort are provided in Section 2.11.

As a particulate precursor, ammonia was added to the list of reported pollutants. Most facilities had previously been reporting non-combustion emissions of NH_3. Facilities using anhydrous ammonia as a refrigerant were added to the list of reporting facilities. The addition of NH_3 emission factors to the ***i***-STEPS® emission factor table allowed facilities or AQMS to calculate NH_3 emissions that resulted from fuel combustion.

Emissions of sulfur dioxide were calculated using FIRE emission factors, except for large units that use CEMs to monitor SO_2. Percent sulfur in the fuel is critical in calculating accurate SO_2 emissions for combustion processes using emission factors. AQMS reviewed and worked with the facilities to resolve any issues associated with the reported percent sulfur.

AQMS required facilities to report data to the process level, identified by an eight-digit Standard Classification Code (SCC). Key data reported included SCC identification, product or fuel throughput, operating schedule, control equipment information (type, capture efficiency and control efficiency), stack parameters (height, diameter, flow rate, velocity and temperature), and emission factors, if FIRE factors were not used. Data collected was consistent with EPA's *Procedures Volume I* (EPA, 1991b), the Consolidated Emissions Reporting Rule (EPA, 2002), *Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Air Quality Standards (NAAQS) and Regional Haze Regulations* (EPA, 2005a) (hereafter referred to as *Emissions Inventory Guidance*), and EIIP documents.

2.8.1 Emission Estimation Methods

Annual emissions could either be calculated within ***i***-STEPS® using uncontrolled emission factors, throughput data, and control data, or outside the system using mass balance, stack tests, or other means. Terminal Server Satellite ***i***-STEPS® allowed for the use of nine emission estimation methods, which are presented in Table 2-2.

Table 2-2. *i*-STEPS® Emission Estimation Methods

***i*-STEPS® Method Code**	**Basis for Emissions Estimate**
1	Stack test data[a]
2	Material balance
3	Use of emission factor outside of ***i***-STEPS® or use of EPA TANKS software
4	Best engineering judgment
5	State or local agency emission factor
6	New construction/not yet operational (zero emissions)
7	Source closed/operation ceased (zero emissions)
8	***i***-STEPS® default emission factor
9	Facility-supplied emission factor

[a] includes Continuous and Predictive Emission Monitoring

Annual emissions are calculated by the database when Method Codes (MC) 8 or 9 is designated. The monthly fuel or process throughput rates obtained from the facility are summed to an annual rate and then applied to the relevant emission factor, either the system default (MC8) or one supplied by the facility (MC9). This calculation produces an annual emissions estimate in tons per year. Annual emissions may be calculated outside of ***i***-STEPS® with only the annual emissions entered in ***i***-STEPS®. Annual emissions calculated outside of ***i***-STEPS® are identified in the database by MC1 through MC4. Facilities were asked when deriving annual emissions from stack tests to take into consideration operating conditions during the stack tests, such as load and control efficiency, and be aware when stack test conditions were not representative of operating conditions in 2002.

For MC8 or MC9, emissions are calculated by the database through the use of a default or facility-supplied emission factor using the following equation for pollutant x:

$$E_a = [(Q_a) * (EF_x) * (FP) / 2000] * (1-CE_x)$$

where:

E_a	=	Annual emissions, tons per year
Q_a	=	Annual process throughput
EF_x	=	Emission factor for pollutant x
FP	=	Fuel parameter, such as percent sulfur or ash content
CE_x	=	Overall capture and control efficiency

When a facility chooses MC8 for a process, ***i***-STEPS® automatically selects the emission factor associated with the process SCC and calculates the emissions. For MC9, facilities were required to document facility-supplied emission factors. The emission factor must be documented by the facility or otherwise verified by AQMS. If not, AQMS replaced it with the current ***i***-STEPS® SCC emission factor. Facilities may choose to calculate emissions outside of ***i***-STEPS® and enter the emissions using MC3. If an emission factor is used by the facility to calculate the emissions, the factor must be documented by the facility or otherwise verified by AQMS. If not, AMQS changed the record to an MC8.

2.9 Technical Review Using the Detailed Report

Once issues from the completeness determination were resolved, the technical review would begin. The detailed report was the principal document used for the technical review. As with the ACD, the detailed report was printed for each facility and maintained in the facility file. The report allowed AQMS inventory staff to identify missing, suspicious or conflicting data. Any critical issues were identified and noted on the report. Corrections were made on the report as well as within the database.

Questionable data, missing information, and the correction of errors were handled in several ways. In all cases the AQMS staff maintained a paper or electronic trail of changes made by staff or the facility. When a problem was identified, such as missing data, a typographic error, or other simple errors in the data, a phone call or e-mail to the facility was usually sufficient to

resolve and document the issue. Usually no other correspondence was needed. For submissions where there were extensive problems, a facility usually met with AQMS staff to outline the issues and to develop ways to address the problems.

An example of a detailed report is provided in the supporting documentation. The detailed report contains the following information:

- General facility information
- Narrative descriptions of the following: group/point, process, SCC, SCC units, and pollutant;
- Design capacity and standard design capacity units;
- Operating schedule, percent quarterly throughputs, and fuel sulfur and ash content;
- Monthly and annual throughputs provided in the SCC units described;
- Process-level annual emissions for all pollutants for each process;
- Stack ID and parameters;
- Emission calculation method;
- Abatement equipment information, including capture and control efficiencies for each pollutant;
- Calculations and documentation entered by the facility into a Notes field; and
- A summary page of facility-wide annual emissions for each pollutant in the facility's database.

The detailed report contains six sections, including facility general, group/point (emissions unit), process unit (including stack information), process unit controls, process unit emissions and a facility emissions summary. The review of each section is described in detail below.

2.9.1 Facility General

The detailed report includes the following general information: facility name, facility site identification number, mailing address, year of inventory, Standard Industrial Classification (SIC) Code, American Industry Classification System (NAICS), contact person and phone number. Any questionable information, such as SIC, NAICS or an incorrect inventory year, was noted and resolved.

2.9.2 Group/Point (Emissions Unit)

Group information defines a piece of equipment, a group of related processes, or a particular activity at a facility. Data elements provided in this section of the detailed report are reviewed individually and in context with other information in this section.

A description of the equipment or activity is provided along with the design capacity and design capacity units. If the design capacity is missing for combustion equipment, an attempt is made to determine the design capacity of the equipment by reviewing permits or contacting the facility.

The operating schedule was reviewed for missing or inconsistent data. Hours per day and normal daily start and end times were also provided. The annual hours operated is calculated by ***i-***

STEPS® from the hours per day, days per week and weeks per year the facility enters into the system. A facility could override this calculated value by entering the actual number of hours operated for the year, if the facility had accurate records.

The percent quarterly throughput was corroborated with operating information. ***i***-STEPS® enforced a range of between 95 and 101 percent for the sum of the four quarterly throughputs. A review of the database indicated that all sums of the quarterly throughputs were within the range of 98 to 101 percent. In order to be consistent with the National Emissions Inventory system requirements, the first, second and fourth quarter percent throughputs were adjusted so the total would equal 100 percent. The third quarter (summer season) was not adjusted, since it was assumed the facility would have provided an accurate summer season value needed for Delaware's 2002 ozone SIP inventory.

2.9.3 Process Unit

Information provided in this section of the detailed report was reviewed individually and in context with other information in this section and related sections such as the group/point and stack information sections. Process unit information includes the process description, stack identifier, Source Classification Code (SCC), SCC description, percent sulfur and ash (for combustion units), and monthly throughput for most processes.

The process description field is a text field that is used to better define a process than can be defined by the SCC. A determination was made whether the process description provided by the facility was consistent with the SCC description. As an example, the process description may mention No.6 oil for a piece of combustion equipment; and therefore the SCC description must be for combustion equipment burning No.6 oil.

In most cases monthly throughputs were provided by facilities. ***i***-STEPS® sums the monthly throughputs and stores the value in the annual throughput field. In cases where there were significant changes in the group-level emissions as compared to a previous year, the annual throughputs were compared to previous data. The previous annual throughput is written on the detailed report for future reference. If the comparison of throughput explains the difference in emissions, such as fuel switching, or an increase or decrease in fuel usage, this was noted on the Administrative Completeness Determination page and added to the tracking spreadsheet.

Each SCC has associated standard units as defined by EPA in its master list of SCCs and are contained within ***i***-STEPS®. Facilities are given the option within ***i***-STEPS® to change the units to make them appropriate to the data they are reporting. AQMS staff compared the SCC units as reported by the facility to the standard units. If the two values did not match, AQMS staff determined if the revised units were properly applied in the emission calculations.

2.9.4 Stack Parameters

Each stack has an identification number and description assigned by AQMS. The stack parameters provided in the detailed report include height above ground, stack diameter, and exit gas temperature, velocity, and flow rate. If emissions were considered fugitive, then ***i***-STEPS®

requires only a stack identification number, a release point type (fugitive) and a height value. A default of ten feet was used for stack height when no fugitive height was provided.

If no stack information was provided for a process unit, AQMS would use stack information provided for the process in previous years and make the appropriate link within ***i***-STEPS® between the stack and process unit records. If no previous year stack data existed in the database, a stack record was created and linked to the process based on permit file information or subsequent discussions with the facility. During data entry of the process unit record by facilities, Terminal Server Satellite ***i***-STEPS® flashes a warning message, if a stack is not identified for the process.

2.9.5 Process Unit Control Equipment

The detailed report contained a section for control information for controlled processes. A control device identification number, an EPA control device code, pollutant-specific capture and control efficiencies, and a description of the abatement equipment provided by the facility are displayed in the detailed report.

Control issues were flagged and resolved if possible. Particulate, SO_2, NO_x, and VOC control devices were evaluated to determine if the control efficiency fell within a range expected for the identified control device.

2.9.6 Process Unit Emissions

Pollutants for each process were listed. The pollutant code (Chemical Abstracts Service number or the National Emission Inventory Input Format (NIF) version 3.0 code), pollutant name, the emission estimation method code, emission factor, the overall capture and control efficiencies, and annual emissions in tons per year are displayed in the detailed report.

The capture and control efficiencies were compared to the process unit control section. Issues associated with pollutant code or capture and control efficiencies were flagged, investigated, and resolved.

This section was flagged for further review if there was a throughput in the process unit section but emissions were not provided. If emissions were expected, but not provided, the process unit emissions for a previous year (usually 1999) were checked. Usually, in cases such as this, the facility provided an explanation in the process unit or process emissions Notes field. An example of this would be when CEMs are used for NO_x or SO_2 emissions from combustion sources that utilize more than one type of fuel. All NO_x or SO_2 emissions would be reported under the major fuel burned. The secondary fuel would have a throughput, but no process unit emissions.

2.9.7 Facility Pollutant Emissions Summary

Facility-wide emissions for each pollutant were provided in tons per year in this section of the detailed report. This is used primarily for reference, for comparison to other inventory years, or to compare to TRI reported air releases.

2.10 Technical Review Using Database Queries, Reports and Spreadsheets

Besides the detailed report, numerous database queries, reports and spreadsheets were created to identify information that appeared to be missing, in error or inconsistent with other related information. This included analysis of related operating schedule information. Another analysis compared the total non-combustion VOC emission estimate for a process to the sum of the individual VOC compounds reported. Air emissions of specific VOCs reported to TRI were compared to the inventory data.

2.11 PM_{10} and $PM_{2.5}$ Augmentation of Facility Reported Emissions

In past inventory reporting, facilities reported total particulate and "PM_{10}" emissions. Since the suffixes "PRI" or "FIL" were not previously used by EPA in the NEI, AQMS requested only PM_{10} to be reported by facilities. As a result, it was unclear if emissions reported by facilities as PM_{10} included the condensable portion of primary PM. Furthermore, as stated earlier, facilities were not required to report on $PM_{2.5}$ emissions since ***i***-STEPS® had not been populated with $PM_{2.5}$ emission factors. As a result, much work was necessary after the reporting cycle to develop a complete particulate inventory.

Pechan assisted the AQMS point sources staff in augmenting particulate matter emissions after the 2002 reporting cycle had concluded. Pechan reviewed the 2002 inventory as reported by facilities and assisted in identifying missing emissions for PM_{10} and $PM_{2.5.}$ Pechan compiled PM_{10} and $PM_{2.5}$ emission factors and supporting data for use in ***i***-STEPS®. Filterable and condensable emission factors were included in the suite of factors added to ***i***-STEPS®. Pechan also compiled NH_3 emission factors for fuel combustion processes and estimated primary PM_{10} and $PM_{2.5}$ emissions for certain processes.

For particulate emissions from non-combustion processes, PM_{10} reported by facilities was assumed to be only filterable PM after review of the data and AP-42. The pollutant codes for non-combustion PM_{10} emission records were changed to PM_{10}-FIL. Since the assumption was made there was no PM-CON component, PM_{10}-PRI emission records were created and equated to PM_{10}-FIL. Hot-mix asphalt production is considered a non-combustion process; however, the drum dryer burner combustion gases are used directly to heat the asphalt. Therefore, a condensable fraction is present for this process.

To insure PM_{10}-PRI, PM_{10}-FIL, $PM_{2.5}$-PRI, $PM_{2.5}$-FIL, and PM-CON were calculated for all combustion sources, AQMS with the assistance of Pechan, populated the ***i***-STEPS® emission factor table with all available uncontrolled combustion emission factors for PM_{10}-FIL, PM_{10}-PRI, $PM_{2.5}$-FIL, $PM_{2.5}$-PRI, and PM-CON. These factors were obtained from FIRE 6.24 or derived from FIRE factors. Appropriate control information was added to processes in the inventory database to accurately calculate controlled emissions. In some cases only controlled emission factors were available for some controlled process. These factors were used where appropriate. Care was taken not to have ***i***-STEPS® apply additional controls to processes where controlled emission factors were used. Once the ***i***-STEPS® emission factor table was updated, AQMS staff ran ***i***-STEPS® utilities to calculate or recalculate PM emissions.

In the case of coal and residual oils, FIRE PM emission factors were not available. However, FIRE did provide formulas to calculate PM emissions. Pechan developed spreadsheets to calculate uncontrolled emissions based on the FIRE formula and fuel throughput, percents sulfur, and percent ash values provided by facilities. If the process was controlled, the controlled emissions were calculated in the spreadsheet and entered into the database.

Numerous queries, spreadsheets and reports were developed to identify missing emissions or inconsistencies between the PM emission estimates for a given process. Missing emissions were determined as follows:

- If PM_{10}-PRI was missing, AQMS equated it to the sum of PM_{10}-FIL and PM-CON;
- For internal combustion processes, if $PM_{2.5}$-FIL and $PM_{2.5}$-PRI were missing AQMS assumed that $PM_{2.5}$-FIL equaled PM_{10}-FIL and $PM_{2.5}$-PRI equaled PM_{10}-PRI.;
- For processes where no $PM_{2.5}$ emission factors existed, EPA's PM Calculator program was used to estimate $PM_{2.5}$ based on a particle size profile related to reported PM_{10}. If the PM Calculator was unable to estimate $PM_{2.5}$, AQMS assumed that $PM_{2.5}$-FIL equaled PM_{10}-FIL and $PM_{2.5}$-PRI equaled PM_{10}-PRI;
- In instances where a facility reported only total particulate, the PM Calculator was used to determine PM_{10} and $PM_{2.5}$. When the PM Calculator was able to estimate only PM_{10}, AQMS assumed that $PM_{2.5}$ equaled PM_{10}. If neither $PM_{2.5}$ nor PM_{10} could be estimated, then both values were equated to the total particulate emissions reported by the facility.

Since primary emissions are the sum of the filterable and condensable components, queries and spreadsheet were developed to insure that the PM_{10}-PRI and $PM_{2.5}$-PRI were comparable to the sum of components for each pollutant.

In August 2005 EPA announced plans to recalculate PM_{10}-PRI and $PM_{2.5}$-PRI natural gas combustion emissions in the 2002 NEI using emission factors based on new information. In January 2007 AQMS located two documents on the 2002 National Emissions Inventory Data & Documentation web page in reference to this issue. The two point source inventory documents were "*Revision of the PM Emissions From Natural Gas Combustion in the Final Version of the 2002 NEI*" (EPA, 2005b) and an Excel file titled "*Ratios to Adjust PM*" containing SCCs, PM_{10}-PRI and $PM_{2.5}$-PRI emission factors (EPA, 2005c).

AQMS staff replaced the existing emission factors in the ***i***-STEPS® emission factor table with the new emission factors for the SCCs listed. PM_{10}-PRI and $PM_{2.5}$-PRI emissions were recalculated using an ***i***-STEPS® utility. Since no filterable or condensable emission factors were available based on the new information, emissions values for PM_{10}-FIL, $PM_{2.5}$-FIL, and PM-CON where changed to zero for these processes.

2.12 Review of NO_x and SO_2 Emissions from EGUs and Other Large Sources

AQMS staff conducted a review of NO_x and SO_2 emissions from all electric generation units (EGUs) that report emissions data based on CEMs to EPA's Emissions Tracking System (ETS). ETS contains emissions data to EPA's Acid Rain Program and to the Ozone Transport Commission's (OTC) NOx Budget Program. AQMS staff compared 2002 ETS emissions to

emissions reported to AQMS. A spreadsheet was developed for this review and contained the facility name, EGU description, ORIS ID, annual emissions reported to AQMS and to ETS, and the five-month ozone season emissions reported to ETS for the NO_x Budget Program.

There were 17 EGUs that reported annual emissions under the Acid Rain Program. NO_x and SO_2 emissions from these units could be directly compared to annual emissions reported to AQMS. These units also reported five-month ozone season NO_x emissions under the NOx Budget Program. Emissions of SO2 are not included in the NOx Budget Program. There were 17 additional units that reported NO_x emissions to ETS only under the NO_x Budget Program. For these EGUs, annual NO_x emissions are not provided to ETS. For those units that only reported five-month ozone season emissions, an annual estimate was needed to directly compare to the facility reported value. A NO_x emission factor was calculated in pounds of NO_x emissions/mmBTU using the five-month emission amount divided by the heat content of the fuel listed in ETS for the five months. Annual emissions were then calculated by applying this factor to the annual fuel heat content reported in ***i***-STEPS®.

NO_x emission estimates were compared and the results were added to the spreadsheet. Any significant discrepancies were resolved and an explanation added to the spreadsheet. AQMS staff determined annual NO_x emissions in ETS for one unit at Conectiv Edge Moor and one at the Premcor refinery were significantly inflated due to default maximum load values as required by EPA when the CEM is not functioning properly. AQMS staff worked with these facilities to determine the best estimate of actual NO_x emissions for the inventory. In another instance a facility included NO_x emissions in its report to AQMS associated with a testing period of the EGU, which was not reported to EPA.

There were six additional non-EGUs reported under the NOx Budget Program. These units were located at the Premcor Refinery and were evaluated using the same methodology as above. Three facilities do not report emissions from their EGUs to ETS. These included three boilers at Invista, six diesel generators at City of Seaford, and two at the City of Lewes. Invista used stack test data to develop site-specific emission factors. The City of Seaford used FIRE emission factors within ***i***-STEPS®. The City of Lewes provided fuel throughputs on the activity data report forms and FIRE emission factors were applied by AQMS.

Sulfur dioxide for the 17 EGUs reporting only under the NO_x Budget Program, the eleven additional EGUs at Invista, Seaford and Lewes, along with the six non-EGUs at Premcor, estimated annual emissions for SO_2 using CEMs, stack tests or FIRE emissions factors.

2.13 Methods for Correcting Erroneous Data

Questionable data, missing information, and the correction of errors were addressed in several ways. In all cases AQMS maintained a paper or electronic trail of changes made by staff or the facility. When a problem was identified, such as missing data, typographic error, or other simple errors in the data, a phone call or e-mail usually was sufficient to resolve and document the issue. Usually no other correspondence was needed.

If an issue had a significant impact on the facility's initially reported total emissions, AQMS may request documentation that the facility acknowledged the change in the emissions. The documentation may be in the form of a letter, e-mail, or fax from the facility. Title V facilities were required to resubmit a new emissions summary report signed by the Responsible Official.

For submissions where there were extensive problems, a facility may have been asked to meet with AQMS staff to outline the issues and to develop ways to address the problems. Once issues had been discussed and resolved, the facility may have been asked to resubmit information through the on-line reporting system. AQMS staff would reopen the facility's record within the Terminal Server Satellite ***i***-STEPS® on-line system to allow access for corrections and updates.

If issues were unable to be resolved with the facility, AQMS staff updated or modified the information submitted by the facility to the extent needed to develop emission estimates. This usually was acknowledged in correspondence with the facility.

2.14 Facility Site and Stack Coordinates

Accurate geographical coordinates were essential to the air toxics modeling project. Therefore, coordinates were verified for all facilities that reported for the 2002 inventory. Coordinates were verified through the use of high-resolution aerial photography that DNREC had previously placed in GIS. Existing site coordinates contained in ***i***-STEPS® were plotted and superimposed on the aerial photography. Staff from the Engineering and Compliance Branch met with inventory staff and reviewed the resulting facility locations on the aerial photographs. E&C staff was knowledgeable enough with the layout of the facilities they permit to identify them on the photographs. Based on the permitting engineer's advice, the facility point was moved, if necessary, to place it over the geographic center of emissions activity at the facility. For several facilities, ground reconnaissance was performed to verify a facility's location.

In addition to verifying the site coordinates, many stacks were individually identified on the aerial photographs and points were plotted for these stacks. For stacks and vents that were not able to be identified, the site coordinates were assigned to those stacks by default.

2.15 Database Management

The 2002 point source inventory database was managed using ***i***-STEPS® for Microsoft® SQL Server 5.0 data management system, associated utilities and applications including the Terminal Server Satellite ***i***-STEPS® on-line system and Microsoft® Access. Microsoft® Access was used to create queries and reports from the SQL tables. After the administrative review and a check of reasonableness of the facility-wide emissions were completed for most facilities, a copy of the Terminal Server database was produced as an archive of data reported by the facilities. A second database was created as the 2002 production database for purposes of developing the ozone SIP and $PM_{2.5}$ SIP inventories. This database was accessed and managed using the Agency ***i***-STEPS®.

DNREC's Office of Information Technology (OIT) provides computer network support and routine database management functions. Joseph Handley, Application Support Specialist, of the

OIT office served as liaison between AQMS inventory staff and OIT. Mr. Handley also helped with user network, Internet connectivity, and firewall issues.

i-STEPS® utilizes relational databases and contains functions and utilities to maintain database integrity. There are field-sensitive look up tables, and data element and record validation routines that ensure valid data and enforce database integrity. The system has a record level audit trail that records changes made to the records, identifies the user and the date the change was made. In addition, there are comment/note windows for each record where text can be added by the user and AQMS staff to clarify information provided or supply additional documentation.

2.16 Final Data Manipulation

Upon completion of the ozone SIP technical review and verification of the data within the production database, AQMS staff removed any non-reactive VOC emissions from the VOC totals, and applied rule effectiveness to controlled sources of NO_x and VOC.

2.16.1 Removal of Non-Reactive VOCs

Facilities were required to report speciated non-combustion VOC emissions. The definition of volatile organic compounds within AQMS Regulation 1 (DNREC, 1999) identifies the organic compounds that are considered to be negligibly reactive in the photochemical process of forming ozone. AQMS inventory staff verified whether or not these compounds were included in the process VOC emissions. The non-reactive VOCs were identified and subtracted from the emissions estimates at the process emissions level. This was done prior to rule effectiveness adjustments. Table 2-3 lists the processes with the four highest emissions of reported non-reactive VOC emissions.

Table 2-3. Significant Emissions of Non-Reactive VOCs for 2002

Facility Name	Process	Pollutant	TPY
Maritrans	Crude Oil Lightering	Methane and Ethane	324
General Motors	Misc. Solvent Usage	Acetone	18
DuPont Experimental Station	R&D	Acetone	4.22
Sunoco Refinery	CO_2 Recovery Unit	Methane	4.0

2.16.2 Rule Effectiveness

EPA has had a longstanding requirement that ozone SIP inventories consider and account for rule effectiveness (RE). AQMS staff initially made RE determinations in accordance with the *Guidelines for Estimating and Applying Rule Effectiveness for Ozone/CO State Implementation Plan Base Year Inventories* (EPA, 1992). Revised RE guidance was published in August 2005 and incorporated into *Emissions Inventory Guidance* (EPA, 2005a).

For the purposes of the ozone SIP inventory, RE determinations were made for VOC, NO_x and CO source emissions. RE adjustments in emissions made to NO_x sources at two facilities increased NO_x emissions by 0.22 TPY statewide. RE adjustments in emissions for VOC sources were made at five

facilities, which resulted in an increase of 189 TPY statewide. The adjustments in NO_x and VOC were retained for the $PM_{2.5}$ SIP inventory. Additional information on RE can be found in the *2002 Base Year Ozone State Implementation Plan Emissions Inventory for VOC, NO_x, and CO for the State of Delaware* (DNREC, 2007). AQMS opted not to consider rule effectiveness for PM_{10}, $PM_{2.5}$, SO_2 and NH_3.

2.17 NIF File Creation and Review

NIF 3.0 files in Microsoft® Access format were generated from the ***i***-STEPS® database. EPA's Basic Format and Content Checker (versions 3.0 and 3.1) were run numerous times on the eight NIF 3.0 point source inventory Access tables. All issues identified by the checker for mandatory and necessary fields were reviewed and resolved. The resolutions of the issues were as follows:

- A value was in error and the information was corrected; or
- A value was outside ranges determined by EPA, however the value was determined to be reasonable and correct based on information available. Upon completion of the review process less than a dozen records contained data that continued to fall outside the established ranges; or
- The operating hours per year did not match the calculated product of operating hours per day, days per week, and weeks per year. AQMS allows facilities to indicate their actual annual hours of operation independent of the typical operating schedule. Since the difference represents more accurate information, no further action was taken; or
- An SCC was flagged as being invalid. A check of EPA's master list of SCCs indicated the flagged values (five SCCs) are valid, so no further action was taken.

There are some non-mandatory/non-necessary fields of data in the NIF files that were flagged by the checker. Since AQMS does not populate these fields, no further action was taken. Few issues were identified by the Basic Format and Content Checker, since most issues had been identified and resolved in creating the ozone SIP NIF files six months earlier.

2.18 Source Sector Discussions

All facilities associated with hot-mix asphalt production, electric generation, and those utilizing ammonia refrigeration units are included in the 2002 $PM_{2.5}$ SIP point source inventory. Details of these industry sectors are presented below.

2.18.1 Hot-mix Asphalt Plants

Hot-mix asphalt (also known as asphaltic concrete or blacktop) production facilities have been historically tracked and permitted by the Department as point sources. There were 11 facilities in Delaware in 2002 and these are all included in the point source inventory. Delaware facilities employ both drum mixer and rotary dryer processes in the production of hot-mix asphalt. The appropriate SCCs were used to identify these processes. In 2002, all facilities collectively emitted 46 tons PM_{10}-PRI, 31 tons $PM_{2.5}$-PRI, 30 tons of SO_2, 55 tons of NO_x and 27 tons of VOC.

The activity data forms were used to obtain throughput asphalt production data from hot-mix asphalt plants. Data from the completed forms were entered into ***i***-STEPS® and standard emission factors were used for VOC, NO_x and SO_2 to calculate emissions. For one facility, Pure Green Industries, AQMS developed a site-specific emission factor for NO_x based on recent stack test data, then applied this factor to the asphalt production reported by the facility. Particulate emissions were calculated in an Excel spreadsheet, using AP-42 controlled emission factors.

Many asphalt plants also had crushing operations powered by diesel engines. Emissions for these diesel engines were estimated based on reported fuel usage and FIRE 6.24 emission factors. Five Tilcon facilities shared a mobile crusher that moved from facility to facility. Emissions for the mobile crusher were allocated to the Tilcon Horsepond Road facility which utilized the crusher the most.

2.18.2 Refrigeration Units and Other Ammonia Sources

As mentioned in Section 2.2, 23 new facilities were identified as having the potential of using anhydrous ammonia as a refrigerant. AQMS determined 14 of these facilities used ammonia as a refrigerant. Five facilities reported that they purchased ammonia during 2002 and the remaining nine facilities had no purchases.

The nature of ammonia refrigeration is that there can be continuous ammonia emissions (leakage) from the refrigeration system. Ammonia is purchased and used to recharge the system as needed which occurs at infrequent intervals. In a related project, AQMS also acquired ammonia purchases for calendar years 2001 and 2003. The additional two years of data verified the infrequent nature of purchases to recharge the refrigeration systems. There can also be accidental releases, where there can be significant releases of ammonia.

Ammonia emissions were equated directly to the activity data based on a mass balance approach. For example, all anhydrous ammonia purchased to recharge a refrigeration system was assumed to be released to the atmosphere. Therefore, ammonia emissions were equated to ammonia purchased. Emissions of 34 tons were associated with ammonia refrigeration statewide. This includes the five ammonia refrigeration facilities and an additional five facilities with ammonia refrigeration that have been inventoried in past years (food processing facilities).

Chemical manufacturing accounted for an additional 26 tons. Polyvinyl chloride (PVC) production accounted for 11 tons. The ammonia emissions resulting from the recycling of agricultural waste at Perdue Agrirecycle was 7 tons and 4 tons were associated with nylon production at Invista. Ammonia emissions from fuel combustion amounted to 119 tons, accounting for a majority of ammonia emissions reported by point sources.

2.18.3 Electric Generating Units (EGUs)

Delaware EGUs are represented by two large generating stations (NRG Indian River Power Plant and the Conectiv Edge Moor/Hay Road complex), a number of smaller private and municipal units, two industrial generators (Premcor Refinery and Invista), and several Conectiv peaking units. In total, there are 45 EGUs located at 15 facilities included in the point source inventory. EGUs in Delaware include external combustion boilers, combustion turbines and reciprocating diesel engines.

Small diesel generators used by businesses and institutions for emergency backup power and load management are not included in this discussion, and are generally not reported to the point source inventory. 2002 PM_{10}-PRI, $PM_{2.5}$-PRI, SO_2, and NO_x emissions from EGUs are presented in Table 2-4. Note that PM_{10} and $PM_{2.5}$ emissions given in the following tables represent primary emissions (i.e., filterable plus condensable).

SO_2 and NO_x emissions from EGUs represent 52% and 73%, respectively, of the statewide point source emissions of SO_2 and NO_x. Most peaking units operate exclusively during the summer to meet periods of high demand. Their operation may coincide with days when air quality is most likely to experience an exceedance of the daily fine particulate standard.

2.18.4 Emissions by Source Sector

Table 2-5 provides statewide PM_{10}-PRI, $PM_{2.5}$-PRI, SO_2, NO_x, NH_3 and VOC annual emissions grouped by source sector as defined by the first three digits of the SCC codes assigned to each process. The source sectors include various combustion and manufacturing processing, material storage and transfer operations, solvent evaporation, and solid waste disposal.

Combustion processes account for nearly all of the particulate, SO_2, and NO_x emissions from the point source sector. Utility and industrial external combustion boilers alone account for 90% of the statewide point source NO_x and $PM_{2.5}$ emissions and 95% of the SO_2 emissions.

Petroleum product transfers account for 39% of the statewide point source VOC emissions. Surface coating operations and petroleum industry processes and storage account for 21% and 12% of the statewide VOC emissions, respectively.

2.19 Emissions by Facility

Facility-level annual emissions for the 136 facilities included in the 2002 PM SIP inventory are provided by county in Tables 2-6 through 2-8. For recent facility name changes, the former name is included in parentheses.

2.19.1 Sources of $PM_{2.5}$ Emissions

NRG Indian River Power Plant and Conectiv Edge Moor/Hay Road complex are the first and third largest $PM_{2.5}$-PRI sources in Delaware. The coal-fired units at these facilities have particulate controls, which have the ability to capture filterable particulates only. NRG Indian River emitted 1,010 tons of $PM_{2.5}$-PRI, which contains 900 tons (89%) of condensables. Conectiv EM/HR's emitted 520 tons of $PM_{2.5}$-PRI of which 358 tons were condensables. The Premcor refinery is the second largest source of $PM_{2.5}$-PRI, emitting 904 tons in 2002. 97% of these emissions (876 tons) are associated with the catalytic cracker and coker CO boilers.

The top nine $PM_{2.5}$ sources, representing over 90% of statewide annual $PM_{2.5}$ emissions for 2002 from point sources, are presented in Table 2-9 and in Figure 2-1.

Table 2-4. 2002 $PM_{2.5}$ and Precursor Emissions for EGUs

Facility Name	Unit Description	Annual Emissions, TPY			
		PM_{10}	$PM_{2.5}$	SO_2	NO_x
City of Dover McKee Run	Boiler #1	2	1	23	23
	Boiler #2	2	1	25	22
	Boiler #3	43	33	700	345
City of Dover Van Sant	Turbine	3	0	7	13
NRG Energy Center Dover	Boiler	111	105	1,836	484
	Turbine #1			0	5
	Turbine #2			0	3
Warren F. Beasley Power	Turbine	1	1	0	5
Kent County Total		**162**	**141**	**2,591**	**899**
Conectiv Christiana	Turbine #11	1		3	13
	Turbine #14	1		3	13
Conectiv Delaware City	Turbine #10	1		2	9
Conectiv Edge Moor	Boiler #3	167	138	2,671	748
	Boiler #4	323	265	5,051	1,096
	Boiler #5	147	114	2,131	1,289
	Turbine	1		1	5
Conectiv Hay Road	Turbine #1	0	0	1	93
	Turbine #2	0	0	1	145
	Turbine #3	0	0	1	205
	Turbine #5	0	0	2	30
	Turbine #6	1	1	3	55
	Turbine #7	1	1	3	38
Conectiv Madison Street	Turbine	0		0	1
Conectiv West Substation	Turbine	1		2	8
Premcor Refinery (formerly Motiva Enterprises)	Boiler #1	44	34	335	370
	Boiler #2	1	0	1	205
	Boiler #3	42	33	1,108	342
	Boiler #4	66	51	974	419
	Turbine #1	5	5	46	63
	Turbine #2	2	2	15	34
New Castle County		**805**	**644**	**12,356**	**5,181**
City of Lewes Power Plant	Reciprocating Unit		0	0	1
	Reciprocating Unit		0	0	1
City of Seaford Power Plant	Reciprocating Unit	0	1	1	18
	Reciprocating Unit	0	1	1	17
	Reciprocating Unit	0	1	1	14
	Reciprocating Unit	0	1	1	14
	Reciprocating Unit	0	0	0	0
	Reciprocating Unit	0	1	1	21
Invista (formerly DuPont Seaford)	Boiler #1	48	44	741	311
	Boiler #2	79	74	1,263	634
	Boiler #3	67	62	1,092	547
NRG Indian River Power Plant	Boiler #1	227	207	3,953	666
	Boiler #2	213	194	3,838	621
	Boiler #3	314	286	4,694	663
	Boiler #4	394	322	7,504	2,365
	Turbine #10	0		0	4
Sussex County Total		**1,348**	**1,195**	**23,091**	**5,897**
STATE TOTAL		**2,315**	**1,980**	**38,038**	**11,977**

Table 2-5. 2002 $PM_{2.5}$ and Precursor Emissions by Industry Sector

SCC	SCC Description	Annual Emissions, TPY					
		PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH_3	VOC
101	External Comb. Boilers - Utilities	1,981	1,677	33,009	9,172	56	82
102	External Comb. Boilers - Industrial	1,395	1,161	37,414	5,610	61	264
103	External Comb. Boilers – Commercial	8	4	122	152	1	7
105	Ex. Comb. Boilers - Space Heaters	1	< 1	4	36	< 1	2
201	Internal Comb. Engines - Utilities	26	16	87	814	1	20
202	Internal Comb. Engines - Industrial	1	1	12	44	< 1	3
203	Internal Comb. Engines - Commercial	1	1	1	14	< 1	1
204	Int. Comb. Engines - Engine Testing	0	0	1	23	0	2
301	Chemical Manufacturing	98	91	635	88	17	377
302	Food and Agriculture	61	15	5	30	7	14
303	Primary Metal Production	48	38	11	125	0	67
304	Secondary Metal Production	< 1	< 1	0	0	0	0
305	Mineral Products	64	45	30	44	0	49
306	Petroleum Industry	91	57	2,357	133	0	467
307	Pulp, Paper and Wood Products	15	3	0	0	0	0
308	Rubber and Misc. Plastics Products	1	1	< 1	6	2	100
312	Machinery, Misc.	< 1	0	0	0	0	0
315	Photo. Equipment/Health Care/Labs	0	0	0	0	34	4
330	Textile Products	0	0	0	0	0	38
385	Cooling Tower	20	17	0	0	0	< 1
390	In-process Fuel Use	< 1	< 1	0	1	0	< 1
399	Misc. Manufacturing	< 1	0	< 1	< 1	< 1	19
401	Organic Solvent Evaporation	0	0	0	0	0	11
402	Surface Coating Operations	12	9	< 1	8	< 1	997
403	Petroleum Prod. Storage at Refineries	0	0	0	0	0	128
404	Petroleum Storage (non-Refinery)	0	0	0	0	0	10
405	Printing/Publishing	0	0	0	0	0	126
406	Transport/Marketing of Petrol. Prod.	0	0	0	5	0	1,879
407	Organic Chemical Storage	0	0	0	0	0	9
408	Organic Chemical Transportation	0	0	0	0	0	5
425	Fixed Roof Tanks	0	0	0	0	0	0
490	Organic Solvent Evaporation	< 1	0	< 1	< 1	0	37
501	Solid Waste Disposal - Government	1	1	1	1	0	13
502	Solid Waste Disposal – Comm./Inst.	14	9	20	29	0	25
503	Solid Waste Disposal - Industrial	19	16	< 1	32	0	18
651	Inorganic Chemicals Manufacturing	0	0	0	0	0	< 1
Statewide Total		**3,859**	**3,162**	**73,708**	**16,372**	**179**	**4,773**

Table 2-6. 2002 $PM_{2.5}$ and Precursor Emissions for Kent County Facilities

Facility Name	Annual Emissions, TPY					
	PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH_3	VOC
Burris Logistics - Harrington	0	0	0	0	4	0
Camdel Metals	0	0	0	0	0	7
City of Dover - McKee Run	46	36	748	392	4	4
City of Dover - Van Sant	3	< 1	7	13	< 1	0
Color-Box (Inland Paperboard and Packaging)	1	1	< 1	1	< 1	13
Delaware State University	< 1	< 1	2	4	< 1	< 1
Dover Air Force Base	2	1	12	57	< 1	38
Dow Reichhold	< 1	< 1	4	11	1	18
DSWA Central Landfill	5	5	4	14	0	7
Hanover Foods	2	1	15	9	5	< 1
Harris Manufacturing (General Clothing)	0	0	0	0	0	6
Hirsh Industries	< 1	< 1	< 1	1	0	19
ILC Dover	0	0	0	0	0	5
Kent General Hospital	< 1	< 1	1	2	< 1	< 1
Kraft Foods	2	< 1	< 1	7	< 1	< 1
Lehigh Valley Dairies	0	0	0	0	1	0
NRG Energy Center Dover	111	105	1,836	492	0	2
Perdue Farms - Milford	3	2	26	15	2	< 1
Proctor & Gamble Dover Wipes	20	6	54	19	< 1	8
Quality Kitchen	0	0	0	0	1	0
Tilcon - Bay Road	6	4	5	14	< 1	5
Tilcon – Horse Pond Road	1	4	5	8	0	1
Trappe Packing	0	0	0	0	0	0
United States Cold Storage	0	0	0	0	3	0
Warren F. Beasley Power Station	1	1	< 1	5	< 1	< 1
Kent County Total	**203**	**165**	**2,718**	**1,064**	**23**	**133**

Table 2-7. 2002 $PM_{2.5}$ and Precursor Emissions for New Castle County Facilities

Facility Name	PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH3	VOC
A.I. DuPont Hospital	5	3	91	28	< 1	1
Agilent - Little Falls (Hewlett-Packard)				0		1
Air Liquide - Delaware City				0	5	3
American Minerals	1	1	1	1		16
Ametek	< 1	< 1	< 1	2	< 1	1
Amtrak Maintenance Facility	< 1	< 1	< 1	3	< 1	1
Arlon				0		1
Astrazeneca Pharmaceuticals	< 1	< 1	3	14	< 1	2
Burris Logistics - New Castle					0	
Christiana Hospital	8	6	103	36	1	1
Christiana Materials	2	2	1	3	< 1	1
Ciba Specialty Chemicals	7	2	< 1	9	1	26
Claymont Steel (Citisteel USA)	57	45	11	125	< 1	67
Clean Earth of New Castle	10	6	10	18		11
Conectiv - Christiana	3		7	26		< 1
Conectiv - Delaware City	1		2	9		< 1
Conectiv - Edge Moor	638	517	9,854	3,138	30	36
Conectiv - Hay Road	3	3	11	566	< 1	10
Conectiv - Madison Street	< 1		<1	1		< 1
Conectiv - West Substation	1		2	8		< 1
Contractors Materials (New Castle Hot Mix)	5	2	< 1	2		2
Crowell	1	1	1	2	< 1	2
DaimlerChrysler	1	< 1	< 1	39	1	595
Dassault Falcon Jet	< 1	< 1	< 1	1	< 1	9
Del. Correctional Center - Smyrna	< 1	< 1	< 1	10	< 1	1
Delaware Recyclable Products	1	< 1	< 1	1		2
Diamond Materials	6	3	< 1	4	< 1	4
DSWA Cherry Island Landfill	0	0	< 1	0		12
DSWA Pigeon Point Landfill	< 1	< 1	1	1		3
DuPont - Chestnut Run	12	9	156	52	1	3
DuPont - Edge Moor	34	26	92	35	1	83
DuPont Building - Wilmington	4	3	65	24	< 1	< 1
DuPont Experimental Station	53	37	593	208	3	8
DuPont Stine-Haskell Lab	10	7	121	46	1	2
E-A-R Specialty Composites	< 1	< 1	< 1	1		5
Edgemoor Materials	2	2	< 1	2		2
FMC	19	18	< 1	< 1	< 1	< 1
Formosa Plastics	35	35	< 1	31	4	124
FP International	< 1	< 1	< 1	1	< 1	33
GE Energy - Pencader (Astropower)				0		14
General Chemical	17	16	340	91	1	2
General Motors	16	13	73	56	1	334
Hardcore Composites				0		< 1

continued next page

Table 2-7. continued

Facility Name	Annual Emissions, TPY					
	PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH_3	VOC
Hercules Research Center	7	5	86	31	< 1	1
Honeywell International (Allied-Signal)			0	0	3	46
International Petroleum	1	< 1	2	5	< 1	6
Johnson Controls Battery	< 1	< 1	0	0		0
Kaneka	6	6	4	5	7	19
Lafarge	9	8	1	69	1	10
Laidlaw				0		14
MacDermid	< 1	< 1	< 1	1		9
Magellan Terminals (Delaware Terminal)	< 1	< 1	5	4	< 1	1
Medal Air Liquide	0	0	0	0	0	1
Metachem Products (Standard Chlorine of Delaware)			0	0		20
Noramco	< 1	< 1	< 1	2	< 1	2
NVF - Yorklyn	< 1	< 1	< 1	16	< 1	1
Occidental Chemical	< 1	< 1	< 1	48	< 1	1
Pepsi Cola Bottling					0	
Premcor Bulk Terminal (Motiva)			0	0		29
Premcor Refinery (Motiva Enterprises)	1,122	904	34,096	3,555	43	829
Printpack	< 1	< 1	< 1	4	< 1	107
PTFE Compounds				0		14
Pure Green Industries	1	1	2	1	< 1	0
Rohm & Haas Electronic Materials (Rodel)	< 1	< 1	< 1	5	< 1	23
Spatz Fiberglass				0		2
SPI Polyols	44	32	493	150	3	2
St. Francis Hospital	< 1	< 1	< 0	3	< 1	0
Sunoco	16	12	826	610	8	49
The Pond Ice Arena					0	
Tilcon - Terminal Avenue	6	5	4	4		3
Uniqema	1	1	5	3	< 1	11
Unisource Worldwide	< 1	< 1	< 1	1	< 1	13
University of Delaware - Newark	< 1	< 1	3	23	< 1	5
Veterans Administration Hospital	< 1	< 1	< 1	4	< 1	< 1
VPI Mirrex (American Mirrex)	1	1	< 1	5		20
Westvaco	1	< 1	< 1	< 1	< 1	10
Wilmington Hospital	< 1	< 1	< 1	9	< 1	1
Wilmington Piece Dye	< 1	< 1	< 1	2	< 1	21
Wilmington WWTP	< 1	< 1	1	3	< 1	< 1
New Castle County Total	**2,168**	**1,733**	**47,070**	**9,157**	**118**	**2,687**

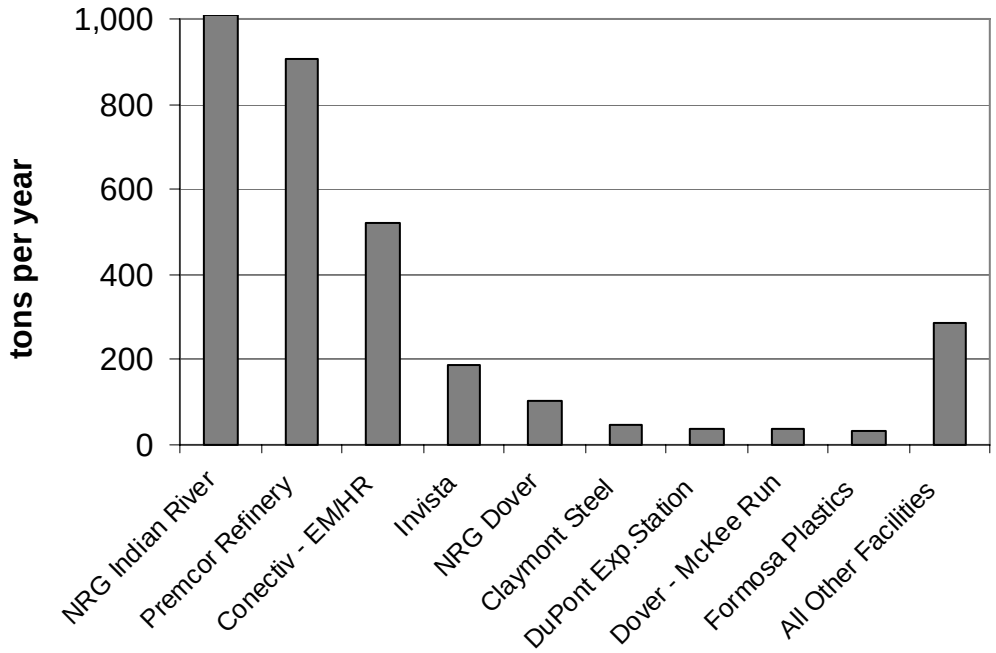
Table 2-8. 2002 $PM_{2.5}$ and Precursor Emissions for Sussex County Facilities

Facility Name	Annual Emissions, TPY					
	PM_{10}	$PM_{2.5}$	SO_2	NO_x	NH3	VOC
Allen Family Foods	3	2	44	7	3	0
Allens Milling	9	3	47	10	0	0
Cannon Cold Storage					0	
City of Lewes Power Plant	0	0	0	3		0
City of Seaford Power Plant	6	6	5	83	<1	4
DSWA Southern Landfill	8	7	5	20		9
Invista (DuPont Seaford)	208	189	3,262	1,563	6	14
J. G. Townsend Jr.					0	
Johnson Polymers	0	0	0	0	2	0
Justin Tanks	0	0	0	0	0	16
Kaye Construction	3	2	5	7	0	0
Lewes Dairy					1	
Marble Works				0		1
Maritrans				0		1,836
Mil-Del				0		2
Milford Memorial Hospital	0	0	10	3	0	0
Mountaire Farms - Frankford	17	4	64	10	0	0
Mountaire Farms - Millsboro	33	9	174	27	2	0
Mountaire Farms - Selbyville	6	4	90	13	6	0
Multi-Tech (D&B Industrial Group)				0		12
NRG Indian River Power Plant	1,148	1,010	19,990	4,319	9	34
Orient				0		1
Perdue Farms - Bridgeville	5	2	49	8	0	0
Perdue Farms - Georgetown	8	6	130	20	0	0
Perdue Farms Agrirecycle	16	11	3	23	7	0
Pictsweet					0	
Pinnacle Foods (Vlasic Foods)	2	1	26	9	0	12
Sea Watch International	<1	0	7	15	1	0
Seaford Ice					0	
Tilcon - Georgetown	5	3	6	6		3
Tilcon – Gumboro (I. A. Construction)	10	5	0	3		4
Sussex County Total	**1,489**	**1,264**	**23,920**	**6,151**	**38**	**1,952**

Table 2-9. 2002 Facility Ranking of $PM_{2.5}$ Annual Emissions

Facility Name	Major Activity	TPY
NRG Indian River Power Plant	Electricity Generation	1,010
Premcor Refinery and Terminal	Petroleum Refinery	904
Conectiv – Edge Moor/Hay Road	Electricity Generation	520
Invista	Nylon Production/Cogeneration	189
NRG Energy Center Dover	Electricity Generation	105
Claymont Steel	Steel Manufacturing	45
DuPont Experimental Station	R&D Hazardous Waste Incinerator	37
City of Dover McKee Run	Electricity Generation	36
Formosa Plastics	PVC Manufacturing	35
All Other Facilities		283
Statewide Total		**3,162**

Figure 2-1. 2002 $PM_{2.5}$ Annual Emissions by Facility



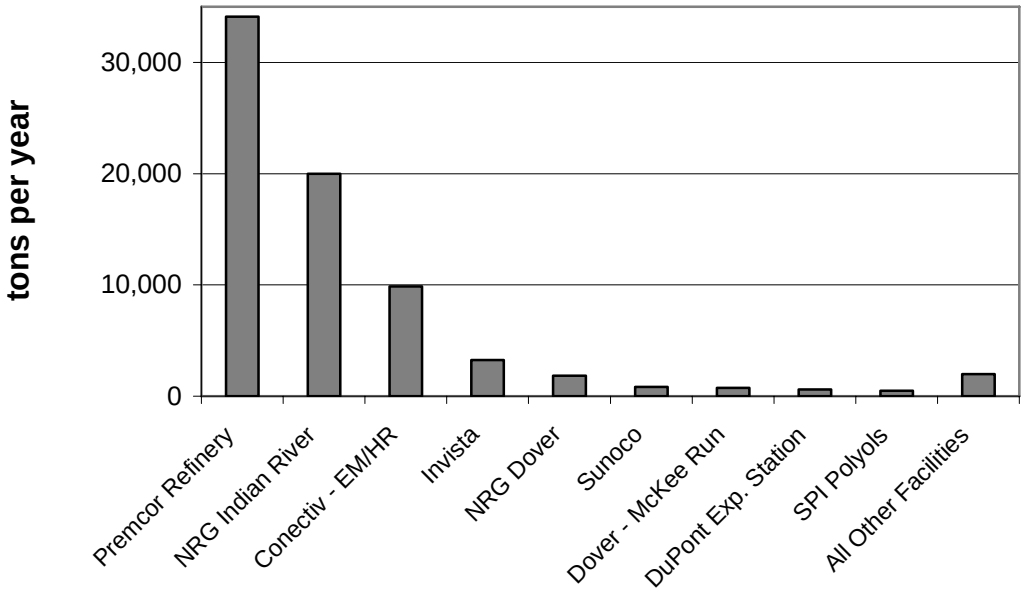
2.19.2 Sources of SO_2 Emissions

The top four facilities account for 91% of the statewide annual SO_2 emissions from point sources. The Premcor refinery accounts for 46% of the SO_2 emissions. The two largest electricity generation facilities (NRG Indian River and Conectiv EM/HR) account for 41%. The fourth largest source of SO_2 emissions is the Invista nylon manufacturing facility (formerly DuPont Seaford), which operates three cogeneration coal-fired boilers. The top nine SO_2 sources are presented in Table 2-10 and in Figure 2-2.

Table 2-10. 2002 Facility Ranking of SO_2 Annual Emissions

Facility Name	Major Activity	TPY
Premcor Refinery and Terminal	Petroleum Refinery	34,096
NRG Indian River Power Plant	Electricity Generation	19,990
Conectiv Edge Moor/Hay Road	Electricity Generation	9,865
Invista	Nylon Production/Cogeneration	3,262
NRG Energy Center Dover	Electricity Generation	1,836
Sunoco	Petroleum Refinery	826
City of Dover McKee Run	Electricity Generation	748
DuPont Experimental Station	R&D Hazardous Waste Incinerator	593
SPI Polyols	Chemical Manufacturing	493
All Other Facilities		1,999
Statewide Total		73,708

Figure 2-2. 2002 SO_2 Annual Emissions by Facility



2.19.3 Sources of NO_x Emissions

As presented in Section 2.18.3, NO_x emissions from Delaware point sources are primarily from electricity generation. The two large electricity generation stations in Delaware, NRG Indian River Power Plant and the Conectiv EM/HR complex, are the largest and second largest NO_x point sources for 2002. The third largest source of NO_x emissions is the Premcor refinery. A large majority of emissions (75%) from the refinery come from just a few processes, including the catalytic cracking unit, the fluidized coking unit, and four boilers used for electricity generation. The fourth largest source of NO_x emissions is the Invista nylon manufacturing

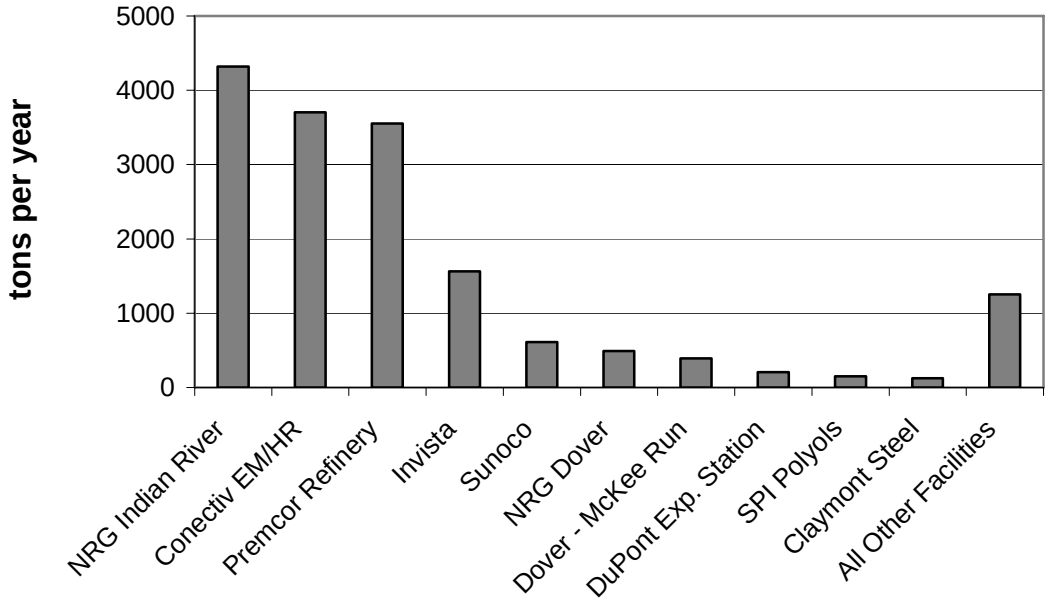
facility. The facility operates three coal-fired boilers to create heat and electricity for use at the plant. These boilers emit more than 95% of the NO_x emissions reported by the facility for 2002.

The top ten NO_x sources, representing 92% of annual statewide NO_x emissions for 2002 from point sources, are presented in Table 2-11 and in Figure 2-3.

Table 2-11. 2002 Facility Ranking of NO_x Annual Emissions

Facility Name	Major Activity	TPY
NRG Indian River Power Plant	Electricity Generation	4,319
Conectiv Edge Moor/Hay Road	Electricity Generation	3,704
Premcor Refinery & Terminal	Petroleum Refinery	3,555
Invista	Nylon Production/Cogeneration	1,563
Sunoco	Petroleum Refinery	610
NRG Energy Center Dover	Electricity Generation	492
City of Dover McKee Run	Electricity Generation	392
DuPont Experimental Station	R&D Hazardous Waste Incinerator	208
SPI Polyols	Chemical Manufacturing	150
Claymont Steel	Steel Manufacturing	125
All Other Facilities		1,254
Statewide Total		**16,372**

Figure 2-3. 2002 NO_x Annual Emissions by Facility



2.20 Facilities Since Closed

Several facilities included in the 2002 PM SIP inventory have permanently closed. Table 2-12 presents a list of closed facilities and the month and year operations ceased.

Table 2-12. 2002 Facilities That Have Ceased Operations

Facility Name	Date Closed
Metachem Products	May 2002
Lafarge	November 2002
Westvaco	May 2003
Kaneka	July 2003
VPI Film	July 2003
Wilmington Piece Dye	September 2003
General Chemical	June 2004
Laidlaw	August 2004
Conectiv - Madison Street	December 2004
Ametek	October 2005
Tilcon - Horsepond Road	December 2005
Hardcore Composites	May 2006

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