



2026

Delaware Envirothon

Air Quality Student Guide

Point Sources, Regulation and Permitting

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Division of Air Quality (AQ)
AQ Envirothon Team



Section One: Introduction to Air Pollution

Air is a vital resource that is essential for life. From the smallest plant to the largest whale, we all need clean air to live and grow. Unfortunately, the air we breathe every day can be negatively affected by pollutants in our air. Air pollution is defined as gas and particle contaminants present in the atmosphere. These contaminants affect air quality on the local, state, national, and even global scale.

Air Pollutants Overview

While there are hundreds of different air pollutants, we will mainly focus our attention on those that are considered “key” air pollutants. Criteria Air Pollutants (CAPs) are a group of six pollutants that the U.S. Environmental Protection Agency (EPA) has defined as being harmful to public health and the environment. This guide will discuss these pollutants in depth, and they are described below in Table 1.

Table 1

Description of the six Criteria Air Pollutants (CAPs)

Carbon Monoxide (CO)	
Description	A colorless, odorless gas
Sources	Equipment that burns fossil fuels (vehicles, furnaces, gas stoves, etc.)
Health Effects	Reduced amount of oxygen that can be carried in the bloodstream (ex. dizziness, confusion, etc.)
Environmental Effects	Participates in chemical reactions in the atmosphere that produce ozone. An indirect contributor to climate change.
Lead (Pb)	
Description	Naturally occurring element found in the earth’s crust
Sources	Emitted into the environment from industrial sources and contaminated sites (ex. lead smelters)
Health Effects	Negatively impacts organ functions (nervous system, renal system, immune system, reproductive organs, developmental delays, cardiovascular system) in adults. Children are particularly sensitive to lead. People with elevated blood lead may develop physical growth/development problems and learning deficiencies as they mature.
Environmental Effects	Reduces growth and reproduction in plants and animals. Causes adverse neurological effects in vertebrates.
Nitrogen Dioxide (NO ₂)	
Description	A group of highly reactive gases known as Oxides of Nitrogen (NO _x). NO ₂ is used as the indicator for NO _x
Sources	Equipment that burns fossil fuels (vehicles, power plants, generators, etc.)
Health Effects	Irritation of the respiratory system (coughing, inflammation, etc.)
Environmental Effects	Contributes to the formation of ozone, acid rain, haze, ground and coastal water nutrient pollution

Table 1 (continued)

Ground Level Ozone (Ozone)	
Description	Found in the lower atmosphere, not directly emitted
Sources	Forms in the lower atmosphere by a reaction between, NO _x , and Volatile Organic Compounds (VOCs) reacting to heat and sunlight
Health Effects	Respiratory irritation and health hazard. Decreased lung function and harms lung tissue
Environmental Effects	Harms sensitive vegetation via a reduction in photosynthesis and plant growth
Sulfur Dioxide (SO₂)	
Description	Gas at ambient temperatures. Pungent and irritating odor
Sources	Larger sources: Power plants burning fossil fuels, industrial facilities Smaller sources: Industrial processes, volcanoes, vehicles, and heavy equipment burning high sulfur fuel
Health Effects	Harms the respiratory system. It makes breathing difficult.
Environmental Effects	Harms tree and plant foliage and growth rates. Contributes to acid rain.
Particulate Matter (PM) PM _{2.5} – diameter less than 2 microns PM ₁₀ – diameter less than 10 microns	
Description	Mixture of solid particles and liquid droplets in the air. Examples include dust or smoke
Sources	Emitted from smokestacks, reactions of chemicals, and or burning
Health Effects	PM ₁₀ – Increased irritation of the airways, coughing, difficulty breathing. PM _{2.5} – greater health concern due to being able to get deeper into lungs and the bloodstream
Environmental Effects	PM _{2.5} – Main cause of haze in parts of the USA

Note. Created by staff using data from U.S. Environmental Protection Agency [EPA], 2025q, Criteria Air Pollutants, <https://www.epa.gov/criteria-air-pollutants>

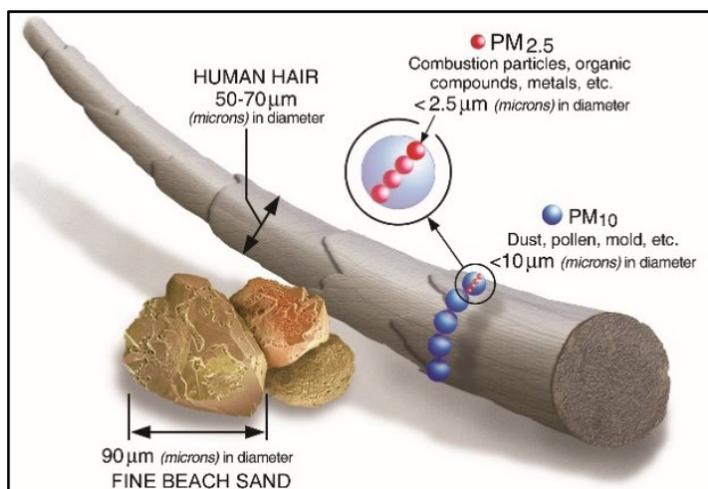
As Table 1 shows, each of the CAPs has unique characteristics and health/environmental effects. The impact of air pollution depends on the pollutant’s physical and chemical properties. For example:

- NO₂ and SO₂ are acidic compounds that can cause damage to respiratory systems when inhaled.
- Ozone is a powerful oxidant that reacts with and damages living cells, such as those in the lungs.

PM is classified by the diameter of the particle, which is often just a fraction of the size of a human hair, as shown in Figure 1. The size and composition of the particle impacts where the particle will travel/deposit and cause damage. People with heart or lung diseases, children, older adults, minority populations, and low socioeconomic status populations are the most likely to be affected by particle pollution exposure, either because they are more sensitive, or they may have higher rates of exposure.

Figure 1

Size comparisons for PM particles



Note. From EPA (2025i). Particulate Matter (PM) Basics, <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics#PM>

In addition to CAPs, volatile organic compounds (VOCs) are another group of pollutants mentioned throughout this guide. VOCs are emitted as gases from certain solids or liquids and include a variety of chemicals with short- and long-term adverse health effects. They are emitted by a wide array of products numbering in the thousands and are considered precursor pollutants because they also contribute to the formation of ground-level ozone. Some of these products may include paint, deodorants, disinfectants, pesticides, and more.

Another group of pollutants that will be mentioned throughout this guide are hazardous air pollutants, or HAPs. HAPs are pollutants that are either known or suspected of causing serious effects to human health or the environment. These effects may include cancer, reproductive effects, birth defects, or even adverse environmental effects. Some pollutants classified as VOCs may also be considered HAPs. There is currently a total of 188 pollutants classified as HAPs by the Clean Air Act (CAA). The CAA is further explained in Section Three: Policy.

Sources of Air Pollution

Air pollution comes from a variety of sources, and each air pollution source emits a different variety of air pollutants. For example, vehicles release CAPs into the air such as CO, NO_x, and VOC emissions, while power plants primarily emit SO₂, PM and NO_x (EPA, n.d.-a).

To keep track of air emissions, the EPA maintains the National Emission Inventory (NEI), the national database of air pollutant emissions information. The NEI is further discussed in Section Five: History and Trends. Air pollution sources are categorized to help create a complete emission inventory into the following groups: point, nonpoint, on-road, non-road, and event (EPA, 2025e).

Point sources include emission estimates for larger sources that are located at a fixed, stationary location. Point sources include large industrial facilities and electric power plants, airports, and smaller industrial, non-industrial, and commercial facilities.

Nonpoint sources include emission estimates for sources which individually are too small in magnitude to report as point sources. Examples include residential heating, commercial combustion, asphalt paving, and commercial and consumer solvent use.

On-road sources include emissions from on-road vehicles that use gasoline, diesel, and other fuels. These sources include light-duty and heavy-duty vehicle emissions from operation on roads, highway ramps, and during idling.

Non-road sources include off-road mobile sources that use gasoline, diesel, and other fuels. Examples include construction equipment, lawn and garden equipment, aircraft ground support equipment, locomotives, and commercial marine vessels.

Event sources include fires, such as wildfires and prescribed burns, volcanic eruptions, and some large dust storms.

Section Two: Introduction to Point Sources

What are they?

Point sources are single, stationary, identifiable sources where air pollutants are released. Examples include:

- factories
- industrial mills
- asphalt plants
- power plants
- incinerators
- other pollutant emitters

Most of these point sources release pollution into the atmosphere through chimneys, or other similar “smokestack” devices. In Delaware, point sources are further classified as Major sources, Synthetic Minor sources, Natural Minor sources, or Registered sources. This classification is done by determining a facility’s potential to emit (PTE), which is the highest amount of certain pollutants that a facility is capable of releasing into the air.

Figure 2

Delaware City Refinery stacks.



Note from Jacob Owens, Spotlight Delaware. July 15, 2025

Major Sources- also known as Title V

The EPA defines a Major source as a facility or point source that emits or has the PTE any CAP or HAP, at levels equal to or greater than the Major Source Thresholds set by Title V of the Clean Air Act; these are referred to as Title V facilities. Major source thresholds are described in more detail in Section 4.

Synthetic Minor Sources (SM)

Facilities that are classified as “Synthetic Minor” have the PTE at or above the major source emission thresholds, but have accepted enforceable restrictions on their emission rates, process controls, or other limitations to stay below major source emission thresholds. The benefits of being classified as a synthetic minor source include a less complex permitting process and simpler reporting requirements than that of a major source.

Natural Minor Sources (NM)

A Natural Minor source has the PTE regulated pollutants in amounts that are less than the major source threshold. There is no need for the facility to take any enforceable restrictions to reduce its PTE to lower levels.

Registered Sources (R)

Registered sources are processes whose combined emissions are less than ten pounds per day at Natural Minor Sources.

What are the Point Sources in Delaware?

Point sources in Delaware belong to a variety of industries and include facilities such as power plants, landfills, chemical plants, hospitals, and universities. To help define the different types of point sources, facilities are classified into sectors and industries using the North American Industry Classification System (NAICS). The NAICS is an industry classification system that groups establishments into industries based on the similarity of their production processes. Facilities are grouped into sectors and industries with an assigned NAICS code. The NAICS Manual identifies 20 sectors of industry in North America, which are shown in Table 2 (Executive Office, 2022). The 2017 NAICS Manual was used to draft Delaware’s 2020 inventory requirements, but the 2022 Manual is the most current version.

Table 2

North American Industry Classification Sectors

NAICS United States Sectors	
Accommodation and Food Services	Manufacturing
Administrative and Support & Waste Management and Remediation Services	Mining, Quarrying, and Oil and Gas Extraction
Agriculture, Forestry, Fishing, and Hunting	Other Service (except Public Administration)
Arts, Entertainment, and Recreation	Professional, Scientific, and Technical Services

Table 2 (continued)

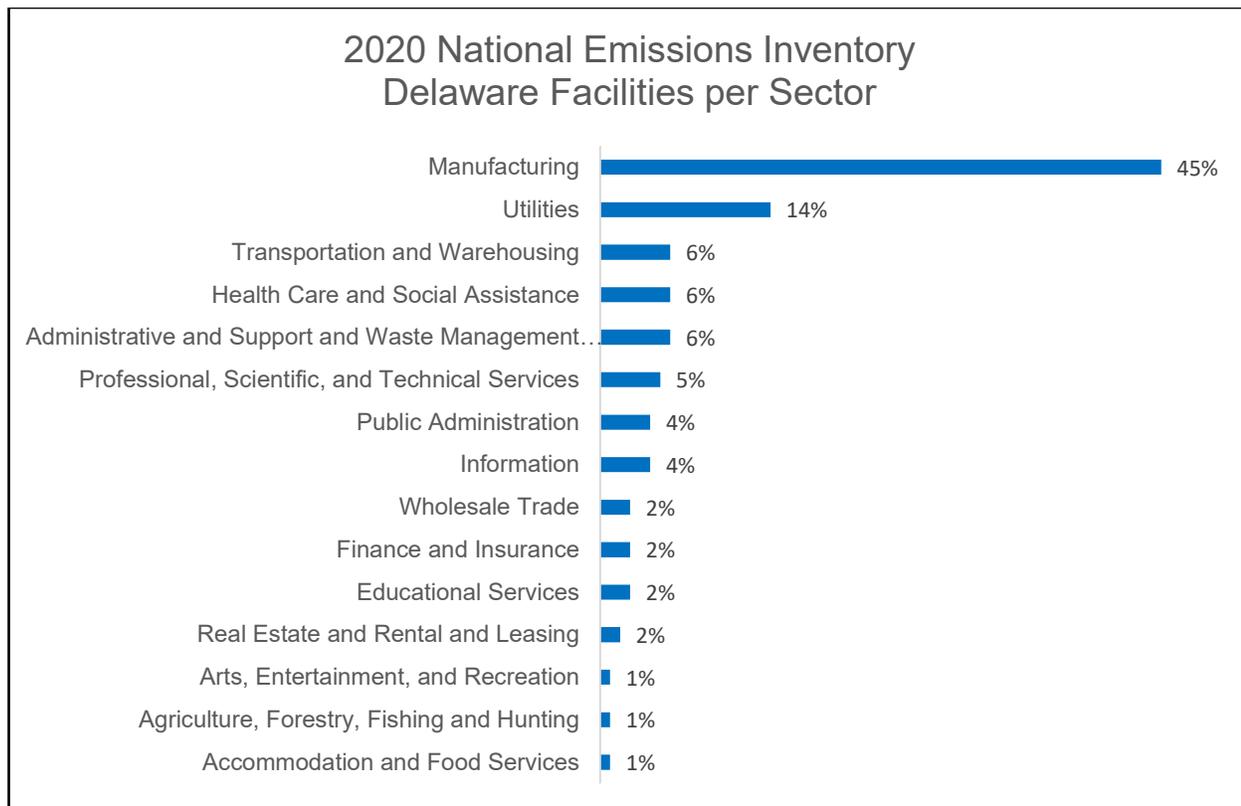
Construction	Public Administration
Educational Services	Real Estate and Rental and Leasing
Finance and Insurance	Retail Trade
Health Care and Social Assistance	Transportation and Warehousing
Information	Utilities
Management of Companies and Enterprises	Wholesale Trade

Note. From the North American Industry Classification System

Each Title V and SM facility included in the Delaware point source emissions inventory reports a NAICS code, which classifies that facility by sector and industry. The 2020 Delaware emissions inventory contains reporting facilities representing 14 of the 20 sectors. The majority of point source facilities in Delaware are manufacturing facilities (45%), followed by utilities (14%).

Figure 3

2020 National Emissions Inventory Delaware Facilities per Sector



Note. From the National Emissions Inventory data from EPA's Emission Inventory System

Section Three: Policy – the Overall Strategy and Regulation – the Detailed Steps to Achieve It

What is Policy and Regulation?

Public policy is a broad guiding plan that sets goals and direction and revolves around the actions that public entities take. Any decision that any public organization, such as a federal executive branch agency or a local school district makes can be considered public policy. For this guide, we will focus primarily on regulation. Regulation is a specific, legally enforceable rule created by administrative agencies to implement and enforce a law or policy.

Law vs. Regulation

A law is a rule that is created by the legislature, either the federal legislative branch or a state's legislative branch. A regulation is a rule created by an administrative agency of the executive branch, e.g. in Delaware this would be DNREC. However, regulations have the same power as laws, since people have to follow them, and can be fined or imprisoned for not following them. Why can an executive branch agency create a regulation that has the power of a law? This power is primarily lent to them from the Administrative Procedures Act (APA). The federal APA was passed in 1946 and granted the authority to administrative agencies to pass regulations, as long as they follow the procedures described in the APA.

Who sets Policy?

Any governmental body that has been given the authority to make rules may set policy. The boundaries of where a governmental agency can and cannot set policy are often described in the legislation that created the organization. Authority is also given to an organization through legislation after the body has been founded. For instance, the EPA has wide-ranging authority, but that authority has expanded over time. The authority of the EPA to regulate and enforce air quality regulations comes from the CAA. This act, which was legislation passed by Congress, gave EPA many new authorities. The original CAA of 1970 created the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIP), New Source Performance Standards (NSPS), and the National Emission Standards for Hazardous Air Pollutants (NESHAP). The 1970 CAA gave EPA the enforcement authority to implement these new regulatory programs. Later amendments to the CAA expanded EPA's authority and set new goals and priorities for the agency.

The general trend of federal regulatory agencies is:

1. Congress passed a law creating an agency or expanding an existing agency. In the law, congress sets out what the purpose and goals of the agency shall be, and the limits of its enforcement capabilities.
2. The agency may then create regulations to meet the goals set by Congress.

How is Policy Set?

The way policy is created depends on its type. A regulation is often a broad ranging rule that may have an economic impact, and as a result, there is a significant process that an agency must go through to create a regulation. This process is called the regulatory approval process.

The federal government, in the APA, describes the procedures for federal agencies to create regulations. Each state also has to decide how to allow state agencies to create state regulations. This means that each state also has its own version of the APA. Delaware's APA was passed in July 1976.

The federal APA defines two types of rulemaking: formal and informal. The EPA mostly uses the informal process to develop regulations which allows for public engagement and commenting during development.

Regulatory Development Process

For the EPA, the process of creating a regulation is generally three steps (read more here: <https://www.epa.gov/laws-regulations/basics-regulatory-process>).

Step 1: EPA proposes a regulation

The EPA will research and create the proposed regulation. The EPA has many technical experts on staff, and these experts will help create regulations where needed. Once the regulation is written, EPA creates a notice of proposed rulemaking. The EPA publishes this in the *Federal Register*, where anyone can see the proposed rule. The publication in the *Federal Register* also provides details about how to comment on the proposed rule, and for how long comments will be accepted. Once the comment period is over, EPA moves on to the next step.

Step 2: EPA considers public comments and issues a final rule

The EPA reviews all comments received. This process can be complicated, as some regulations have received over a million comments! After reviewing and responding to the comments, EPA will revise the rule as it deems necessary and will then publish the final rule in the Federal Register.

Step 3: The regulation is codified in the Code of Federal Regulations (CRF)

The regulation is officially codified once it is added to the CFR. After the regulation is codified, there is a period where the regulation can be appealed, and EPA faces lawsuits regarding many of their regulations.

Clean Air Act (CAA)

The Clean Air Act is the federal law that defines and controls air pollution (EPA, 2025p). The Act, as we know today, was originally passed in 1970 and was amended in 1977 and 1990. The CAA is highly influential and established new regulatory programs, including NAAQS for pollutants shown to threaten human health and welfare (EPA, 2025r). There are two levels of standards:

- primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly
- secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

The pollutants regulated under the NAAQS are the six criteria air pollutants, as described in Section One.

The CAA sets the stage for many other regulatory actions related to air pollution in the United States. Regulatory actions are required to employ the latest credible science for information on health and

environmental standards. The CAA is a federally governing piece of legislature that requires full participation and implementation from states and local governments. Public participation is an important part of the process. Actions implemented under the CAA enable flexibility to meet air quality standards. Affected sources are held accountable for the efforts required to achieve the standards.

The following sections provide a summary for each title of the CAA.

Title I – Air Pollution Prevention/Control

Title I of the CAA establishes some of the most fundamental and important aspects of how we measure and control air quality in the United States. The title is broken into four parts.

- Part A of Title I of the CAA is titled, “air quality and emission limitations”. This part describes the NAAQS, and how they will be updated in the future. This also provides funding for state and local governments to implement clean air regulations and funding for air quality research. Part A delineates what pollutants will be considered HAPs, defines interstate and international air pollution, and indicates what can be done about the transport of pollution. New source performance standards are also described in Part A.
- Part B of Title I was originally for the protection of stratospheric ozone, but the CAA amendments of 1990 repealed this section and replaced it with Title VI.
- Part C of Title I is titled, “prevention of significant deterioration of air quality”. This section puts restrictions on how much air quality can worsen, even if an area is meeting the NAAQS.
- Part D is the end of Title I, with “plan requirements for nonattainment areas”. This part has many subparts and describes in detail what must be done if an area is considered “nonattainment”; that is, if it exceeds the NAAQS limit for a pollutant.

Title II – Mobile Sources

Title II of the CAA sets requirements related to all types of mobile sources. Mobile sources are made up of both on-road and non-road sources. Emissions controls and more efficient technologies have helped curb emissions from motor vehicles and mobile sources, in general. The number of vehicles on roads continues to increase each year, causing mobile sources to generate a significant portion of ozone precursor emissions like NO_x and VOC.

The Clean Air Act Amendments (CAAA) of 1990 established many of the standards for mobile sources that are in place today. One of the most effective standards for pollution control was requiring stricter control on tailpipe emissions from vehicles. Criteria pollutants like CO and NO_x as well as precursors and other pollutants like VOC and CO₂ are emitted from vehicles as byproducts of the combustion of gasoline. Standards to tighten these emissions are implemented as new and improved technologies are developed.

In addition to standards on vehicles, the CAAA of 1990 introduced new standards for the quality of fuel used in vehicles. In general, the amendments require cleaner fuels. Reductions of sulfur in diesel fuels were phased in to decrease SO₂ emissions from diesel vehicles. Most notably, a phase-out of leaded gasoline and the production of vehicle engines that required leaded gasoline was established. Lead emissions have decreased by 99% nationally from 1980 to 2018, in large part due to the fuel standards imposed by the CAAA of 1990 (EPA, 2025h).

Title III – General

Title III of the CAA covers a diverse range of topics, ranging from citizen lawsuits regarding clean air, to certain requirements for states regarding monitoring and reporting. These sections may impact particular air programs in states, but they are primarily technical in nature.

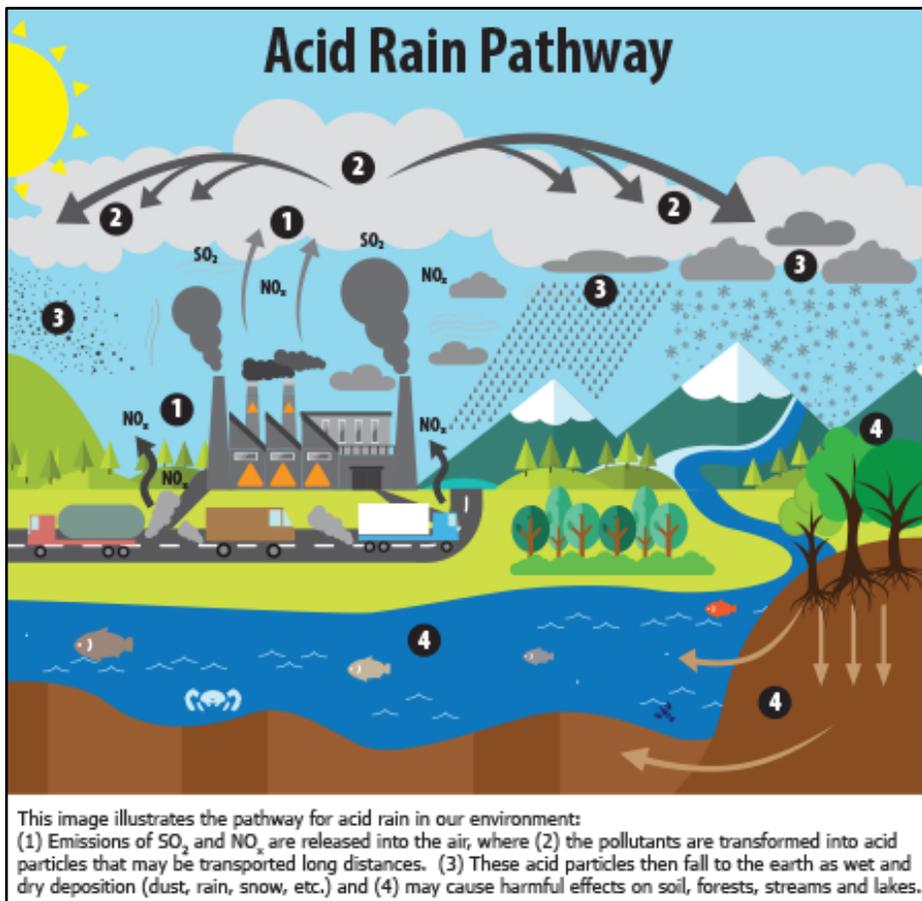
Title IV – Noise Pollution and Acid Deposition

Title IV has two sections. The first is on noise pollution, which EPA defines as, “unwanted or disturbing sound” (EPA, 2025f). While this section gives EPA the authority to regulate noise pollution, it has decided this is best left to states to enforce and therefore does not actively regulate noise.

The second section of Title IV is the control of acid deposition, also known as acid rain. Acid rain is when sulfur or nitrogen reacts with water and oxygen in the atmosphere and creates acidic solutions. These acids then fall to the ground, as shown in Figure 4, as precipitation (EPA, 2025b). Under this title, EPA created a cap-and-trade program, which successfully and dramatically decreased acid deposition in the United States. A cap-and-trade program sets a limit on a pollutant, and the industries that emit that pollutant must purchase credits in order to pollute.

Figure 4

Acid Rain Pathway



Note. From EPA, 2025, What is Acid Rain? <https://www.epa.gov/acidrain/what-acid-rain>

Title V – Permits

This CAA permit program ensures affected sources comply with each of their requirements. Permits provide an organized process so enforcement can be carried out at affected sources. The permitting process involves several key players at the federal, state, and source levels. States develop and issue the permit to the affected source, while EPA is responsible for reviewing permits that fall in the Title V program. If a state fails to develop and submit an acceptable permit, the EPA must enact a federal permit.

Permits contain information on the requirements for operating equipment to maintain compliance, among other information. Permitting in Delaware and the types of sources that require a permit can be found in Section Four.

Title VI – Stratospheric Ozone

Ozone in the stratosphere differs from ground level ozone. The stratospheric ozone layer provides an important function to health and the environment. It protects us from harmful ultraviolet rays from the sun. Human made chemicals that were typically used in air conditioners, refrigerators, aerosol cans, and more became a concern. Emissions of these chemicals – chlorofluorocarbons and halons – were found to deplete the stratospheric ozone layer, which allowed more harmful radiation from the sun to reach the Earth.

Stopping use of these chemicals requires a global effort. In 1985 a “hole” in the ozone shield over Antarctica formed. In 1987, over 190 countries signed the Montreal Protocol, which kick-started the development of rules to stop using ozone-depleting substances. However, the elimination of using these chemicals could not happen instantaneously. Title VI of the Clean Air Act established a phase-out schedule for the use and manufacture of these substances in the United States. Regulations developed under Title VI require safe handling and destruction when replacing older systems that use ozone-depleting substances.

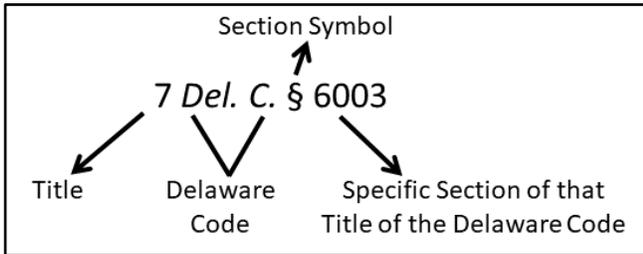
The Montreal Protocol is exclusively responsible for the substantial decrease of ozone depleting chemicals available for release into the atmosphere. The first signs of recovery appeared in 2018, and the ozone layer is not expected to return to the 1980 values until at least the mid 2030’s over the Arctic and the 2060’s over Antarctica (Britannica, 2025).

Delaware Air Regulations

Regulations provide requirements and prohibitions that the public, affected entities, products, etc. must follow to comply with the law in Delaware. The Delaware Code is the collection of all statutes enacted and codified into State law, which provides the authority and the legal basis for all regulations in Delaware. The State Constitution can also be found in the Delaware Code. The statutes in the Delaware Code are classified into 31 different Titles. Environmental legislation is found under Title 7, “Conservation,” and more specifically, legislation for “Natural Resources” is found in Part VII of Title 7. Statutory language related to environmental permitting is found in Section 6003 of Chapter 60 of Title 7 of the Delaware Code. An example citation for this is shown in Figure 5.

Figure 5

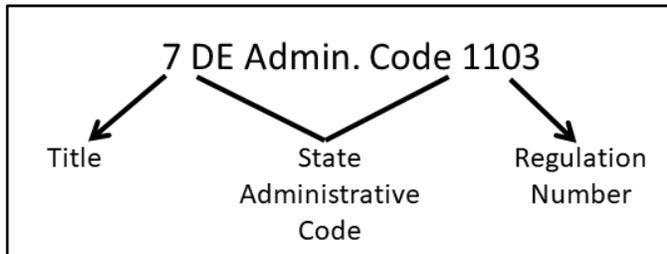
Example citation for the Delaware Code



All of Delaware’s regulations can be found in the State Administrative Code. Regulations associated with natural resources and environmental control are found in Title 7 of the Administrative Code. Clean air regulations can be found in Chapter 1100 of Title 7 of the Delaware Administrative Code. An example citation for the regulation for “Ambient Air Quality Standards” in Delaware is shown in Figure 6.

Figure 6

Example citation for Delaware Administrative Code



Regulatory Development Process

The regulatory development process for all of Delaware’s regulations must follow Delaware’s APA, which is found in Chapter 101 of Title 29 of the Delaware Code. The APA governs how state agencies exercise their statutory powers with regard to regulatory promulgations and requires that agencies be transparent in their actions and allow public participation in the process.

The DNREC has a 24-step Regulatory Development Process, which ensures that the Department will (1) give proper notice to the public of all proposed regulatory actions; (2) follow a predictable and open process; and (3) adhere to all legal and programmatic requirements. Transparency is an underlying theme in all regulatory actions. The following paragraphs and Figure 7 highlight this process.

Every DNREC regulatory action, whether developing a new regulation or amending or repealing an existing regulation, begins with the Department Secretary’s approval. It is the job of DNREC staff to prepare a document for the Secretary that describes the key details of the regulatory action and why it is necessary for the State of Delaware. The Secretary then makes an informed decision to approve or

disapprove the action or request more information. Once approved, the regulatory development process commences.

Public engagement in the regulatory development process begins with reaching out to relevant stakeholders. Stakeholders can refer to a variety of entities, including industry, trade associations, environmental groups, the public, and more. However, at this stage of the regulatory development process, it is important to engage with key stakeholders who will have valuable insight on how to craft the language of the regulation. For example, if a particular industry is affected by the regulation, it is important to have discussions with the specific companies that operate in that particular industry. The goal is to develop strong but fair language for the regulation.

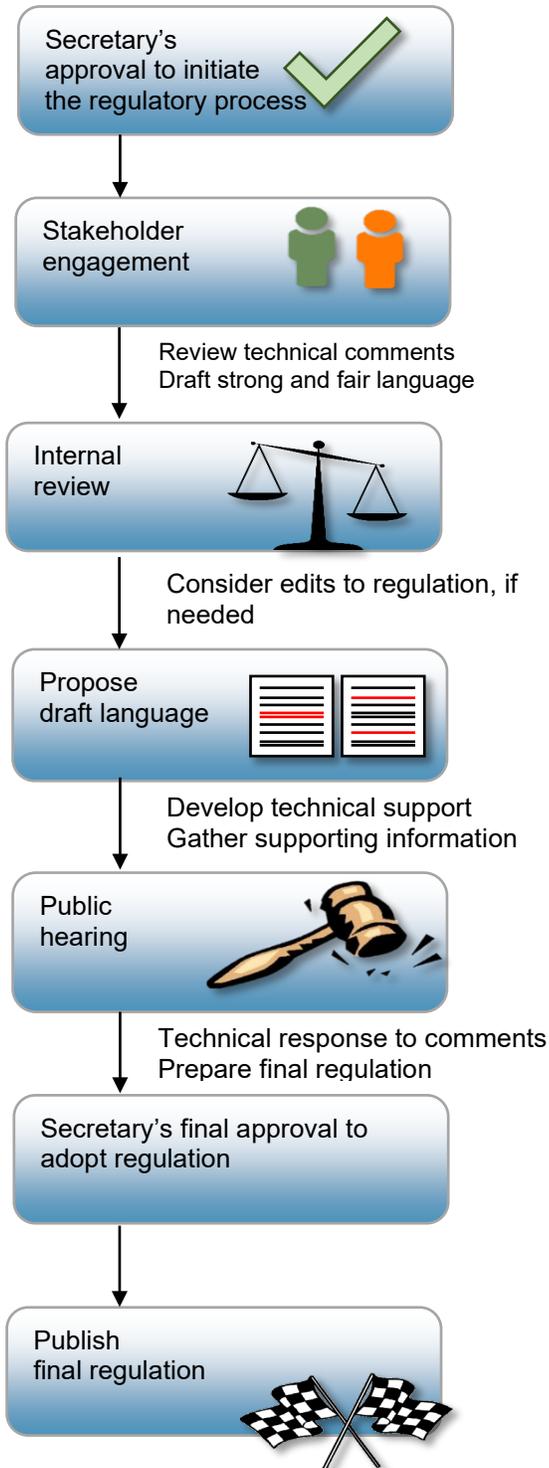
The draft regulatory language that is developed after participation and comments from stakeholders must then be reviewed by Department staff before the next step in the process. During this internal review, the draft language is carefully examined to ensure the regulation accomplishes its goal, is clear and concise, conforms to current statutes and regulations, and is legally defensible. After the draft regulatory language and any supporting documentation is reviewed and any necessary edits are made, the draft regulation may then be brought to an optional public workshop to seek input from the general public. The public may attend these informal workshops simply to become more informed on the regulatory action, or they may become directly involved by voicing concerns or supporting the action. Concerns raised during public workshops may result in further edits to the draft language. If there are no further edits to be made, the draft regulation is now considered a 'proposed' regulation and it is ready to go to a formal public hearing.

The proposed regulation and required supporting documentation are submitted for publication in the *Delaware Register of Regulations*. This is a monthly publication that comes out on the first of every month and lists current regulatory actions for all state agencies. This publication also serves to officially open the mandatory minimum 30-day public comment period for proposed regulatory actions. The public hearing is the formal setting (complete with a court reporter who prepares a verbatim transcript) at which DNREC presents their proposed regulatory action (new, amend or repeal) to the general public and where the public may offer their comments verbally. Written comments may also be submitted up to 15 days after the public hearing (and sometimes even longer for more complex matters).

After the public comment period ends, Department staff reviews and responds to all comments, fine-tunes the proposed regulation, if necessary, and provides the DNREC Secretary with all the supporting information the Secretary needs to decide on the proposed regulation. After review and approval, the Secretary signs an order (Secretary's order) to adopt the proposed regulation as final. An unapproved Secretary's order is not legally binding and has no effect. The regulation must once again be published in the monthly *Delaware Register of Regulations*, however, this time the language is considered final. Regulatory actions take effect ten days after the final version is published in the *Delaware Register of Regulations*. It is important to note that the public has a right to appeal the Secretary's decision on the final regulation to either the Environmental Appeals Board or to the Delaware Courts, depending upon the subject matter of the regulation. Appeals must be made within 20 or 30 days from the date of final publication in the *Delaware Register of Regulations*, depending on where the appeal is filed.

Figure 7

Flowchart showing highlights of DNREC's regulatory development process



Section Four: Permitting and Point Sources

Permitting

The stationary source air permitting program implements the regulations created to achieve compliance with the NAAQS. There are four source categories that a point source could fall under depending on their potential emissions of the CAPs or HAPs. These permitting categories include:

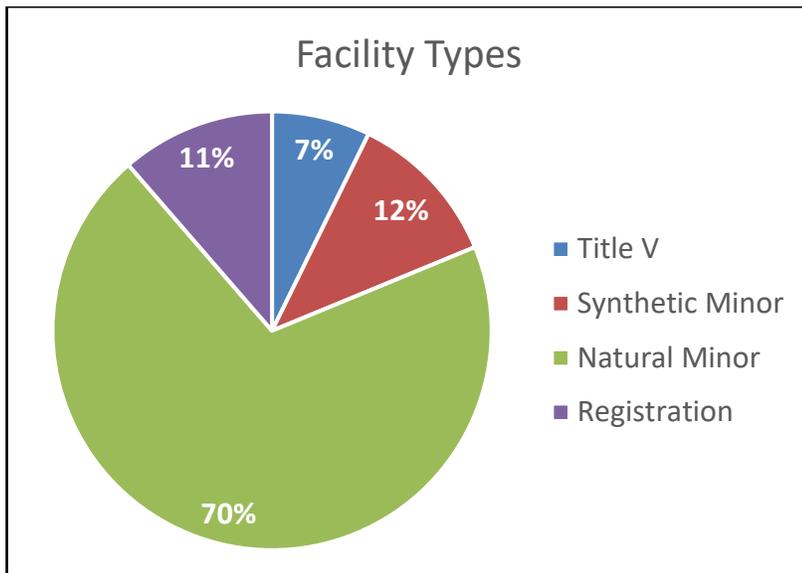
- Registration,
- Natural Minor,
- Synthetic Minor, and
- Title V permits.

If a point source's actual emissions are less than 10 pounds per day of any CAP or HAP, then no permit is required. Instead, the source would apply for a Registration and maintain records to show the AQ that the point source emits greater than 0.2 pounds per day but below 10 pounds per day of any of the CAPs or HAPs.

The Registration differs from a permit classification because it is not based on PTE and does not have the detailed requirements found in a standard permit. In the event a facility or process exceeds 10 pounds of emissions in any single day, it is no longer eligible for a Registration and must obtain a permit. Figure 8 shows the percentage of facilities of each type in Delaware in 2025. Natural Minor sources make up the bulk of permitted facilities in Delaware, but Synthetic Minor and Title V sources are the most regulated because of their potential to emit high quantities of pollutants.

Figure 8

2025 Delaware Facility Types



Note. Chart created by AQ staff with internal data

Potential to Emit

To determine the facility status of a point source, the PTE for the CAPs and any HAPs is calculated. The potential to emit is the quantity of pollutants emitted if a source were to operate at its highest ability for 24 hours per day, 365 days per year; engineers typically complete calculations using 8,760 hours per year (which is the total number of hours in a non-leap year). The facility's PTE includes all equipment on site that emits air pollutants. This site wide PTE value is then compared to the Major Source Thresholds. Delaware's Major Source Thresholds are shown in Table 3 as tons per year (TPY).

Table 3

Major Source Thresholds for Delaware Counties

	VOC	NO _x	CO	SO ₂	PM _{2.5}	PM ₁₀	HAP*	Other
New Castle	25	25	100	100	100	100	10	100
Kent	25	25	100	100	100	100	10	100
Sussex	50	100	100	100	100	100	10	100
	*The threshold of 10 TPY for HAP is for a single HAP. The annual total threshold for all HAP is 25 TPY.							

Note. From Delaware Department of Natural Resources and Environmental Control (2025, August 22). *Title V: Major Air Sources*. <https://dnrec.delaware.gov/air/permitting/major-air-sources/>

The Major source threshold is determined by a county's air monitoring data, which is used to determine if the county is in attainment with the NAAQS. The threshold is used to define which point sources are considered a major source. The Major source threshold is usually 100 tons per year for any single CAP, 10 tons per year for a single HAP, or 25 tons per year for the sum of all HAP types emitted by the facility. Lower threshold values are set in areas designated as non-attainment, areas where a CAP exceeds the NAAQS. In addition, the EPA set the VOC threshold to 50 tons per year for a group of northeast states that make up the Ozone Transport Region, which includes Delaware.

In Delaware, Kent County and Sussex County are in attainment for all CAPs. New Castle County is in attainment for all CAPs except ozone. The NAAQS for ozone is 0.070 ppm averaged over three years. While New Castle County air quality monitors currently meet the ozone NAAQS, New Castle County is currently in nonattainment for ozone as it is part of the Philadelphia-Wilmington-Atlantic City Non-Attainment Area (Designations of Areas..., 2024). Since ozone is a product of a reaction between VOC and NO_x, the Major source threshold for these pollutants is lowered to prevent the air quality from worsening and ideally reduce ozone levels below 0.070 ppm for the entire non-attainment area.

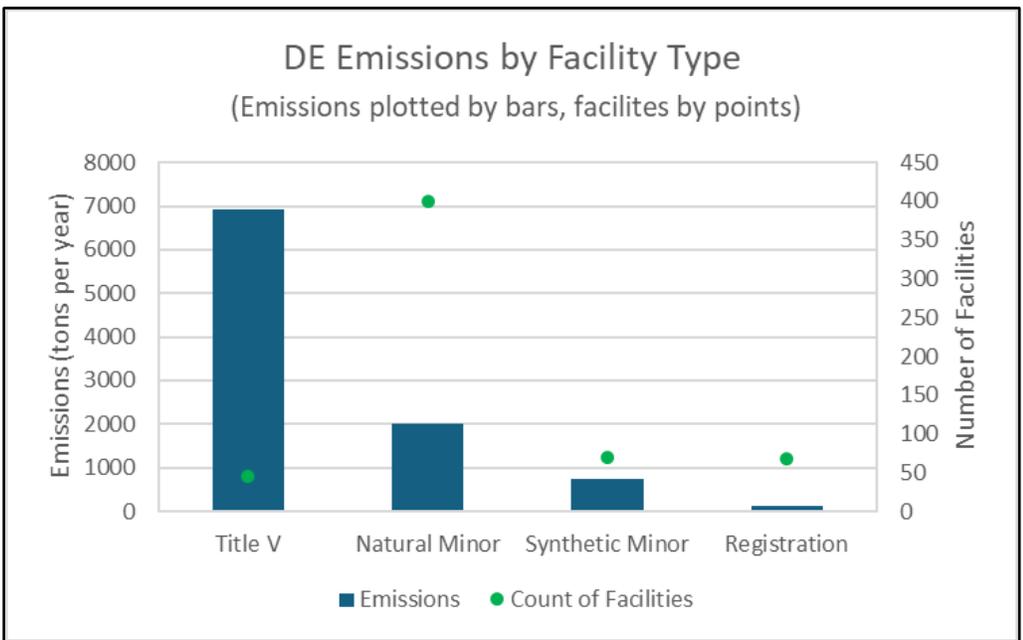
Kent County also has lowered VOC and NO_x thresholds even though it is now considered in attainment. This is because it was previously in non-attainment, and the levels have not been changed to prevent reverting back to non-attainment status.

The Major Source Threshold tells us what level of potential to emit is considered a major source. Major sources emit at or above at least one major source threshold level and require Title V permits.

Synthetic Minor sources have the potential to emit above the Major Source Threshold but have limits in a permit to keep their actual emissions below these levels. These limits could include limiting hours of operation, types of raw materials, the amount of raw materials used, quantity of final product produced, fuel usage, and/or by installing pollution control equipment. Figure 9 shows why regulating Title V facilities is so critical. Title V facilities make up a relatively small portion of regulated facilities in the state but contribute the largest percentage of total emissions. Nearly 7,000 tons of regulated pollutants were emitted in 2020 by 46 facilities.

Figure 9

Delaware emissions by facility type



Note. Natural minor sources are the largest category of permitted facilities but have relatively low emissions. Conversely Title V facilities make up a relatively small portion of permitted facilities, but are the largest contributors to pollution, making good regulatory oversight important. Created by AQ staff.

Both Title V and Synthetic Minor permits are federally enforceable, meaning they are reviewed by the EPA before being officially issued. The EPA retains the authority to conduct compliance inspections and enforcement actions at Title V and Synthetic Minor facilities, at their discretion. These permits are also site wide permits meaning they contain information pertaining to the whole site and not just one piece of equipment. Natural Minor sources have a PTE less than the Major Source Threshold and are only regulated at the state level. Natural Minor permits are for individual pieces of equipment and not the facility as a whole, although all emissions from the facility must be considered to determine source status.

In order to receive a new permit from AQ, or make any significant changes to a current permit, a facility must first submit an application. Applications include information on location, ownership, equipment type and model numbers, the quantity of raw materials used along with Safety Data Sheets, actual emissions calculations, potential emissions calculations, stack information, and information from manufacturers regarding operation, process flow diagrams, and site maps. An

engineer at AQ will review all the information in the application and check the calculations before working on a construction permit and technical memorandum.

Calculating Potential to Emit (EPA, 1998)

There are many ways to determine PTE, including material balance calculations, manufacturer provided data from stack testing, or EPA approved emission factors.

An emission factor is an estimate of how much pollutant is emitted based on a measure of production (for example: pounds of pollutant per gallons of fuel used). A list of EPA emission factors can be found in EPA's AP-42 document found at <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>.

Potential to Emit Example Calculation:

The facility needs to determine the maximum PTE for nitrogen oxide emissions for their 50 MMBtu per hour heat input, natural gas (NG) fired boiler. The heating value of natural gas is approximately 1,020 MMBtu/ MMscf, which stands for millions of British Thermal Units (Btu) per millions of standard cubic feet (i.e., how much heat energy is in an amount of natural gas).

Emission factor from AP-42 for small natural gas fired boilers: 100 lbs NO_x / MMscf

1. Determine the potential fuel usage per hour by dividing the rate capacity of the boiler by the heating value of natural gas.

$$\left(\frac{50 \text{ MMBtu}}{\text{hour}}\right) \div \left(\frac{1,020 \text{ MMBtu}}{1 \text{ MMscf NG}}\right) = 0.049 \frac{\text{MMscf NG}}{\text{hour}}$$

2. Multiply the hourly fuel usage by the emission factor for the NO_x pollutant to get the emission rate of NO_x.

$$\left(\frac{0.049 \text{ MMscf NG}}{\text{hour}}\right) \times \left(\frac{100 \text{ lbs NO}_x}{\text{MMscf NG}}\right) = 4.9 \frac{\text{lbs NO}_x}{\text{hour}}$$

3. Multiply the NO_x emission rate by the maximum operating hours per year to get the total pounds of NO_x emitted for the year. A boiler could potentially operate continuously for the whole year. There are 8,760 hours in 1 year, so this value is chosen.

$$\left(\frac{4.9 \text{ lbs NO}_x}{\text{hour}}\right) \times \left(\frac{8,760 \text{ hours}}{\text{year}}\right) = 42,924 \frac{\text{lbs NO}_x}{\text{year}}$$

4. The major source threshold is given in tons per year so to convert pounds to tons, divide by 2,000.

$$\left(\frac{42,924 \text{ lbs NO}_x}{\text{year}}\right) \times \left(\frac{\text{ton}}{2,000 \text{ lbs}}\right) = 21.46 \frac{\text{tons NO}_x}{\text{year}}$$

In conclusion, the boiler is below the major source threshold for NO_x in all counties in Delaware (see major source thresholds in Table 3).

Permitting Process

A facility must apply for and obtain a construction permit before they can start building or modifying any equipment at the site. The application process requires facilities to complete several forms that indicate the process/equipment they are applying for, the location of the units, and their emissions calculations; the complexity of the application varies based on many factors but those are the minimum requirements.

Once construction is complete, an AQ engineer will complete a “construction to operation” inspection where the facility will demonstrate that they can follow all the conditions of the permit and that the equipment installed is consistent with the application. If they pass the inspection, an operation permit is issued to the facility. All permits are reviewed, signed, and issued by the Program Administrator and Manager, both of whom must have a Professional Engineering license in the State of Delaware.

The public is also involved in this permitting process. Depending on the type of permit, the application or a draft of the permit is advertised both online and in local papers. The public can read the application or the draft permit and request a public hearing to voice any concerns. Environmental Justice (EJ) tools, e.g. detailed datasets and digital mapping tools, are used to evaluate communities that are located near facilities to ensure that information is shared with the public equitably. If needed, translation services are provided for those where English is a second language. Additionally, permit applicants may be required (depending on facility location) to seek out and establish a relationship with a contact person within the community they intend to operate. This community contact will be notified when the public notices are issued so they remain informed about the permit status and can keep the members of their community updated.

Before a construction permit is issued the permitting engineer conducts a regulatory review of all Delaware Air Quality regulations and all federal regulations to determine applicability to the point source. These regulations are listed in a technical memorandum that accompanies the construction permit and includes a description of the applicability of the regulation and how the facility will show that they are in compliance with each requirement. The technical memorandum also includes background information on the facility, emission calculations and totals, and AERSCREEN modeling as required.

AERSCREEN modeling is used to model the emissions for a specific source or site wide. The outputs are used to determine effects on the local communities surrounding the source. The model uses inputs specific to the emission source such as the stack height, exhaust temperature, and emission rate to calculate the Maximum Downwind Concentration (MDC) for pollutants which is the highest level of pollution a person would be exposed to at ground level. Delaware requires that the MDC of a pollutant from a specific source be 100 times less than the Threshold Limit Value (TLV); these are levels that people can be exposed to for a working lifetime without adverse health effects. This allows the State to assess that the public is reasonably protected from point source emissions. If a source does not pass the AERSCREEN model, additional controls or alternative operating parameters may be necessary before a construction permit is issued.

Each facility is required to meet all state and federal regulations applicable to a unit, process, or facility. The permit contains all the conditions in one place to make following the regulations easier on the facility and determining compliance easier for the regulatory bodies.

The components of a permit are described below, including examples of each:

1. General conditions:

Provides information that is the same in all permits. For example, what to do if ownership of the equipment changes, process changes, or location of the equipment changes. Some of the equipment that is regulated can be transported to various work sites so addresses are very important; examples of this kind of equipment are concrete crushers, stump grinders or other units that can be transported but when in operation are stationary. This does not refer to things like heavy construction equipment, farm/agricultural, or over-the-road vehicles.

2. Emissions limitations:

Provides short term (e.g. lbs/hr., lbs/day) and long term (e.g. tons/year) limits for all pollutants that the source or facility emits. Calculations can be made for individual units or combined facility-wide depending on several factors local to the installation.

Example: "NO_x emissions shall not exceed 11.0 pounds per hour when fired on No. 2 fuel oil and shall not exceed 21.7 tons per year in a 12-month rolling period regardless of fuel used ."

3. Operation limits:

Any operational requirements based on state and/or federal regulations or manufacturer recommendations. This section could include a variety of conditions including limiting the number of hours the equipment can operate a year, requiring only specific fuel to be used with the equipment and/or limiting the quantity of a raw material used. Operating conditions help to show compliance with the emissions limitations.

Example: "This boiler may only combust natural gas."

4. Monitoring:

The monitoring section includes any information on stack testing requirements. Other requirements, like visible emissions monitoring or continuous monitoring systems, are also included in this section.

Example: "The facility must conduct quarterly visible emissions observations, in each quarter that the boiler is operated."

5. Recordkeeping:

This section provides information on any logs and records that the operator must keep in order to show that they are in compliance with the emission limits, operation limits, and testing or monitoring requirements. Many times, the logs include when visible emission observations occurred, when maintenance was performed on equipment, fuel delivery reports, operation time, and operating parameters for each shift.

Example: "The facility shall maintain records for a minimum of five years of fuel usage, visible emissions observations, and annual tune-ups."

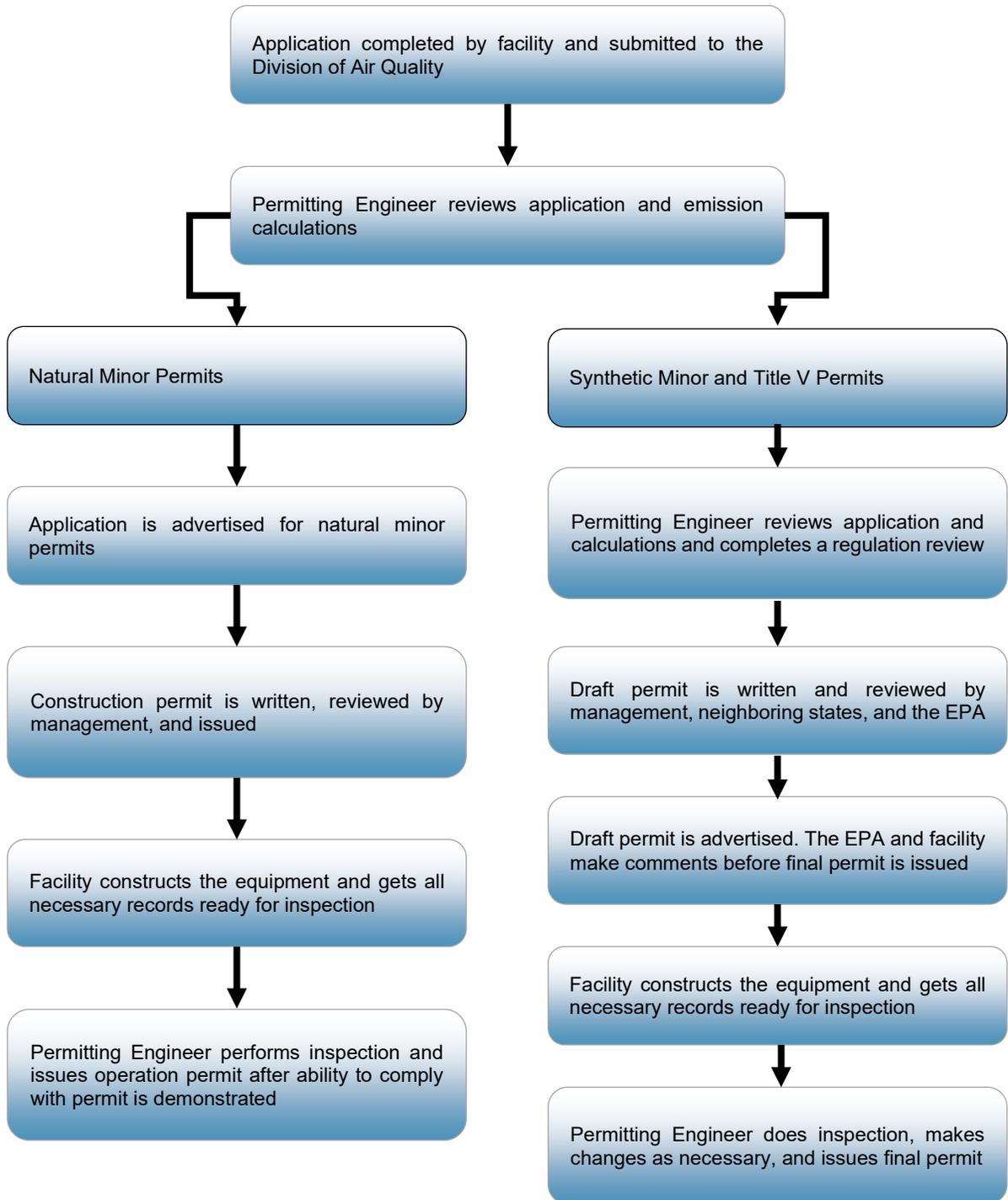
6. Reporting:

This section gives information on who to report to and how to report excess emissions or permit deviations.

Example: "Emissions in excess of any permit condition or emissions which create a condition of air pollution shall be reported to the Department immediately upon discovery."

Figure 10

Flowchart showing highlights of DNREC's air quality permitting process



Note. Created by AQ staff. Does not include steps taken when a comment or request for a public hearing is made.

New Source Review

New Source Review (NSR) is the EPA's required permitting program, carried out by the states, which protects air quality when new point sources are built, or existing point sources are modified. This program ensures that new industries are as clean as possible and that advances in pollution control technology are being used as industry is updated and expanded. Major sources in attainment areas are only allowed to increase emissions of each pollutant by a certain amount called the Prevention of Significant Deterioration (PSD) increment and would not be allowed to construct the emission source if its emissions would cause an attainment area to become a non-attainment area (EPA, 2025t). Major sources in non-attainment areas are required to install stringent control technology and offset emissions.

RACT/BACT/LAER

The terms "RACT," "BACT," and "LAER" are acronyms for different program requirements under the NSR program.

- BACT, or Best Available Control Technology, is required on major new or modified sources in areas meeting the NAAQS (attainment areas).
- RACT, or Reasonably Available Control Technology, is required for existing sources in areas that are not meeting NAAQS (i.e., non-attainment areas).
- LAER, or Lowest Achievable Emission Rate, is required for major new or modified sources in non-attainment areas (EPA, 2025m).

Major sources in attainment areas fall under the PSD category and are required to install the Best Available Control Technology, referred to as BACT. BACT technology is chosen on a case-by-case basis by considering environmental and economic impact. The BACT analysis can determine that control equipment is needed or that a modification to the production process would be a better option to prevent air quality deterioration while still allowing growth in industry and the economy. PSD also requires air quality analysis, additional impact analysis, and public involvement. The air quality analysis uses dispersion modeling and existing data to make sure that the new emissions do not cause a violation with the NAAQS. The additional impact analysis reviews how the new construction will impact soils, visibility, and water sources in the area.

RACT requirements are developed for existing sources, sources that were operating prior to implementation of applicable regulations. RACT (Wood, Anna, 2016) is defined as the "lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility." Like BACT, it is determined on a case-by-case basis but prioritizes cost effectiveness. It is important that emission controls continue to improve, but it can be particularly burdensome for an established facility to install control devices that may require additional retrofitting compared to a new facility making a first-time purchase.

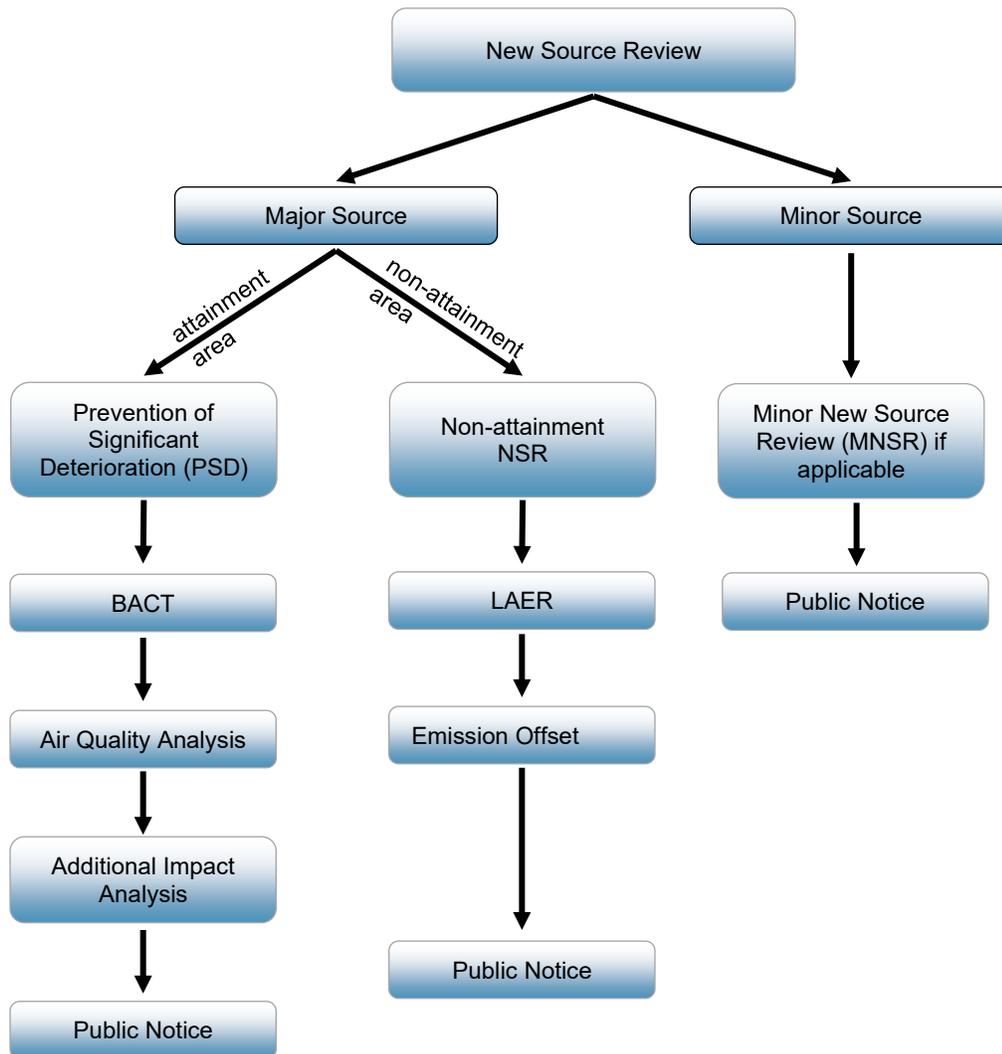
Conversely, major new sources in non-attainment areas are required to follow the strictest limitation on their emissions. This very strict limitation is called LAER. The EPA has a database which contains information on the strictest emission limit that different technologies and industries are able to achieve. To successfully achieve the lowest possible emission rate, a combination of many different strategies may be used. Some examples of emission limiting strategies include changing the raw material used, modifying the process, and/or adding controls to the process. Economic impact is not a factor in a LAER analysis. The non-attainment programs also require emission offsets and public involvement. Emissions offsets occur by reducing emissions at one existing source or by purchasing

credits generated from previously shut down sources to allow for the new source's emissions. Emission offsets are important because they allow for new industry and job growth while not increasing air emissions in an area that is already in non-attainment with air quality standards.

Minor sources require minor new source review permits (MNSR) to prevent new sources from interfering with attainment of the NAAQS. The emissions profile submitted by the facility will come under MNSR if the sources are greater than five tons per year for each pollutant individually. The source's air permit has conditions and includes all applicable regulatory requirements. Emissions greater than five tons per year of some CAPs and all HAPs require a BACT analysis to be performed.

Figure 11

Flowchart highlighting New Source Review process for Major and Minor Sources



Note. Created by AQ staff

Other programs include MACT, NESHAP, and GACT (which are especially concerned with emissions of HAPs and NSPS, which is divided up by industry sector.

- MACT, Maximum Achievable Control Technology, is required by sources of hazardous air pollutants
- NESHAP, or National Emissions Standards of Hazardous Air Pollutants, is a non-technology-based standard for major sources of hazardous air pollutants.
- GACT, Generally Available Control Technology, is applicable to natural minor sources of hazardous air pollutants.
- NSPS, New Source Performance Standards, are regulations that apply based on industry sector.

Control Technologies

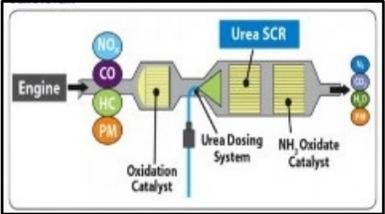
Control Technology is chosen based on the type of pollutant to be controlled, the desired removal efficiency, cost, and operation parameters. To reduce emissions from pollutants, control technology can be used, or the process could be modified. Common control technologies and the pollutants they control are listed in Table 4.

Table 4

Common control technology and the pollutants they control

Control Technology	Description	Controlled Pollutants	Image of Control Technology
Flare (EPA, 2019)	Combust pollutants in the ambient air to form fewer toxic components. For example, hydrocarbons react with oxygen to form carbon dioxide and water. Hydrogen sulfide (H ₂ S) reacts to form SO ₂ and water.	VOC HAP	
Thermal Oxidizer (EPA, 2025g)	Similar to flares in that combustion is used to break down pollutants into less harmful components. Thermal Oxidizers are enclosed to handle high VOC streams.	VOC HAP	
Fabric Filters / Baghouse (EPA-CICA, n.d.-b)	Operate like most standard filters to capture small particles, as the dust cake builds up, the baghouse tends to operate more efficiently. Most baghouses are equipped with self-cleaning methods where excess dust is shaken off into a collection hopper.	PM	

Table 4 continued

<p>Scrubber (EPA, 2016)</p>	<p>Use liquid to remove pollutants from gaseous exhaust streams. Liquids interact with pollutants in the gas to form droplets that can be collected while the cleaned gas moves up and out of the control device.</p>	<p>VOC SO₂ HAP PM</p>	
<p>Selective Catalytic Reduction (EPA-CICA, n.d.-c)</p>	<p>Introduces ammonia or urea into a NO_x containing waste gas stream. The ammonia and NO_x in the presence of the catalyst and oxygen react to form molecular nitrogen and water.</p>	<p>NO_x</p>	

Note. Table compiled by AQ staff. Image sources: Flare - Untitled photograph of a flare stack. (n.d.); Thermal Oxidizer - Regenerative Thermal Oxidizer, (n.d.); Fabric Filters/Baghouse - Gromicko, N. (n.d.); Scrubber - Untitled photograph of a wet scrubber, (n.d.); and Selective Catalytic Reduction – Diesel Tech Forum, (n.d.).

Compliance Monitoring

Inspections

The purpose of inspections is to ensure that permit holders are following the conditions of the permit as well as all state and federal regulations that apply to the permitted facility or equipment. The frequency of the inspections depends on the type of permit. Title V sources are required by the EPA to be inspected every two years and SM sources every five years. This required inspection is called a full compliance evaluation. Natural minor sources are also inspected approximately every five years. Additionally, facilities are inspected before an operation permit is issued. Inspections may also occur when a complaint is made by the public or if noncompliance is reported by the permit holder. The facility’s assigned engineer from AQ conducts the inspection. The assigned engineer usually meets with the facility’s environmental, health, and safety personnel, managers, maintenance team, unit operators, and/or environmental consultant during the inspection. On occasion, inspections involving multiple DNREC divisions (multi-media) or even other departments are necessary, especially when there are compliance concerns. These multi-media inspections could include divisions such as Air Quality, Waste and Hazardous Substances, and Water, or other departments including the Occupational Safety and Health Administration (OHS) or the Delaware Emergency Management Agency (DEMA).

For air quality, a compliant inspection is largely dependent on the facility’s ability to maintain good records. Records of maintenance, training, emissions, and exceedances are all critical in determining a facility’s compliance status. The engineer will review all applicable site records. The visual inspection gives the engineer the opportunity to view the site, talk to operators, ask questions, gain understanding on each process, and provide a heads up on upcoming regulatory changes. In addition, it is an opportunity to determine if there is equipment that should be permitted.

Most site visits require inspectors to wear some level of personal protective equipment (PPE) such as safety shoes, safety glasses or goggles, hearing protection, and hard hats. Some facilities may require flame retardant clothing, or H₂S monitors. Beyond PPE, an engineer may choose to bring certain monitoring or recording equipment such as a digital camera, a flame ionization device or photo ionization device to measure VOC concentrations, or a forward-looking infrared camera to view VOC leaks. A final tool engineers use during inspections is their ability to evaluate the opacity of smoke. Engineers are trained to do this and must be certified semi-annually to determine on site the opacity of white and black smoke. For most processes, opacity greater than 20% could lead to enforcement action.

Figure 12

Inspector performing a facility inspection



Note. Image taken by AQ staff

Stack Testing

A stack test, also referred to in EPA regulations as a performance or source test, measures the amount of a specific regulated pollutant, or surrogates being emitted; demonstrates the efficiency of a capture system; or determines the destruction or removal efficiency of a control device used to reduce emissions at facilities. Stack testing is an important tool used to determine a facility's compliance with emission limits, or capture or control efficiencies. Stack tests are typically required upon initial startup of a unit or control device and at regular intervals thereafter. The stack testing requirement is similar to the vehicle inspection requirement from the Division of Motor Vehicles. On a regular basis every vehicle must undergo testing to confirm that it is meeting safety requirements (Lund, Lisa, 2009).

Enforcement

Enforcement refers to consequences incurred when a facility does not meet its statutory, regulatory and/or permitting requirements. During an inspection, AQ or the facility may discover deviations and/or violations. Violations result in a Notice of Violation (NOV), which is a formal letter notifying the

company that the division has determined that the facility is non-compliant. The violations are listed along with corrective actions for the facility to return to compliance. Repeated or more substantial violations may result in enforcement. Enforcement can be in the form of an administrative action or a civil action, both of which can include a monetary penalty. An administrative action is an order signed by the DNREC Secretary and can include penalties and corrective actions. Another administrative tool is a cease-and-desist order that is in effect for 30 days and is used when the actions of the recipient are of great concern and immediate cessation of those actions is necessary. A civil action is one that is filed with Delaware's court system and expands the amount of penalty that can be assessed. Lastly, the Delaware Code sets forth penalties and consequences, such as imprisonment, for violations determined to be criminal in nature.

Section Five: History and Trends

National Emissions Inventory

An emissions inventory is a database that lists, by source, the amount of air pollutants discharged into the atmosphere during a specific period of time (EPA, 2024). Emissions inventories are critical for the efforts of state and federal agencies to attain and maintain the NAAQS for CAPs.

The EPA developed a central repository of inventory data for all states that is known as the National Emissions Inventory (NEI) (EPA, 2025j). The NEI is a comprehensive and detailed estimate of air emissions of CAPs, precursors of CAPs, and HAPs from air emission sources. The NEI includes emissions from point, nonpoint, on road, nonroad, and event sources.

The EPA compiles the NEI every three years through a collaborative development effort between state, tribal, and local air agencies, industry, and researchers. The NEI can be used to demonstrate national and state emission trends. In addition to developing emission trends, the NEI can be used for (EPA, 2023):

- Regional and state air quality control strategies
- Baseline screening for emission standards and air toxic risks
- Public education about the type of emissions, sources, and locations
- Emission characterization research and improvement programs
- International treaties and cooperative emission reduction strategies

NEI Point Sources and the Air Emissions Reporting Rule

NEI point sources include emission estimates for larger sources that are located at a fixed, stationary location, as described in Section Two. The emission potential of each facility determines whether that facility should be reported as a point source according to emission thresholds (shown in Table 5) set in the Air Emissions Reporting Rule (AERR) (40 C.F.R., 2025). The emission thresholds for point source determination are in terms of PTE, with the exception of lead, which is in terms of actual tons emitted. The point source reporting thresholds vary by attainment status for VOC, CO, and PM₁₀. Both PM₁₀ and PM_{2.5} are expressed as Primary Particulate Matter (PM₁₀) meaning they are emitted directly from sources, e.g. construction sites, wildfires, gravel pits, agricultural activities, etc.

Table 5*Emissions Thresholds by Pollutant for Treatment as Point Source Under the AERR*

Emission Thresholds by Pollutant for Treatment as Point Source Under the AERR (TPY)			
Pollutant	Every-year (Type A sources)	Triennial	
		Type B Sources	Nonattainment Area sources
SO ₂	≥2500	≥100	≥100
VOC	≥250	≥100	Ozone (moderate) ≥100 Ozone (serious) ≥50 Ozone (severe) ≥25 Ozone (extreme) ≥10
NO _x	≥2500	≥100	≥100
CO	≥2500	≥1000	Ozone (all areas) ≥100 CO (all areas) ≥100
Lead	N/A	≥0.5 (actual)	≥0.5 (actual)
PM ₁₀ -PRI	≥250	≥100	PM ₁₀ (moderate) ≥100 PM ₁₀ (serious) ≥70
PM _{2.5} -PRI	≥250	≥100	≥100
NH ₃	≥250	≥100	≥100

Note. 40 C.F.R. Appendix A to Subpart A of Part 51 – Tables. (2025, September 29). <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-51/subpart-A>

As shown in Table 5, Type A sources are a subset of the Type B sources and are the larger emitting sources by pollutant. Lead is the only pollutant that does not have a Type A source.

The AERR requires states and local agencies to collect and submit emissions inventories of criteria pollutants to the EPA's Emissions Inventory System (EIS). The EPA uses these submittals, along with other data sources, to build the NEI (EPA, 2025k).

Emissions Inventory Trends

Since 1970, the implementation of the CAA and technological advances have significantly improved air quality in the United States. Emission trends show progress toward cleaner air. Between 1970 and 2017, combined emissions of the six common pollutants (PM_{2.5} and PM₁₀, SO₂, NO_x, VOC, CO, and Lead) decreased 74% nationally (EPA, 2023).

More recently, national combined CAP and CAP-related emissions from all major emission source types have decreased by 34% between 2008 and 2020. Major emission source types include fires (prescribed

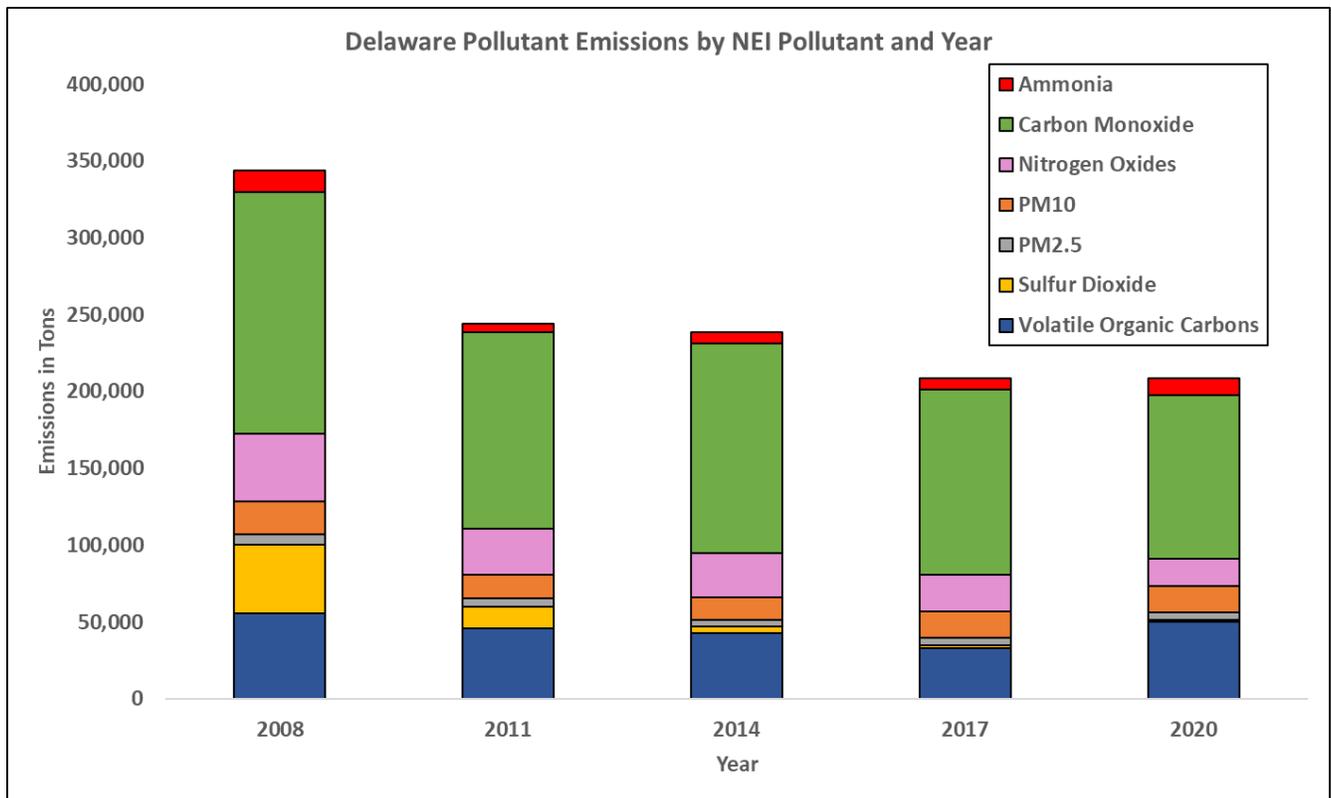
fires and wildfires), mobile sources (non-road and on-road), and stationary sources (fuel combustion for electric generation, fuel combustion for other purposes, and industrial and other processes). This downward trend is also apparent on the state level. Delaware combined CAP and CAP-related emissions from all major source types have decreased by 39% between 2008 and 2020.

Focusing only on stationary sources, national CAP and CAP-related emissions have decreased 27% between 2008 and 2020. Once again, Delaware specific trends show an even greater decrease. Delaware stationary source combined CAP and CAP-related emissions have decreased by 56% between 2008 and 2020.

Delaware specific trends for stationary sources only are shown in Figure 13.

Figure 13

Delaware specific trends by stationary sources



Note. Created by AQ staff with data provided by the US EPA's 2020 National Emissions Inventory and Trends Report (EPA, 2023).

Clean Air Progress

Stationary source emissions reductions can be attributed to efforts that result from CAA programs. For example, the CAA requires new industrial facilities to include good pollution control as part of their design. CAA programs have prompted technologies and have helped drive innovations that reduce emissions from stationary sources. Emission control technologies that are widely deployed today include (EPA, 2025c):

- Selective catalytic reduction (SCR) and ultra-low NO_x burners to reduce NO_x emissions
- Scrubbers achieve 95 percent and even greater SO₂ control on boilers
- Sophisticated new valve seals and leak detection equipment, including cameras that can see leaks, for refineries and chemical plants
- Routine use of continuous monitoring technology that provides data more quickly

Section Six: Point Sources and Air Toxics

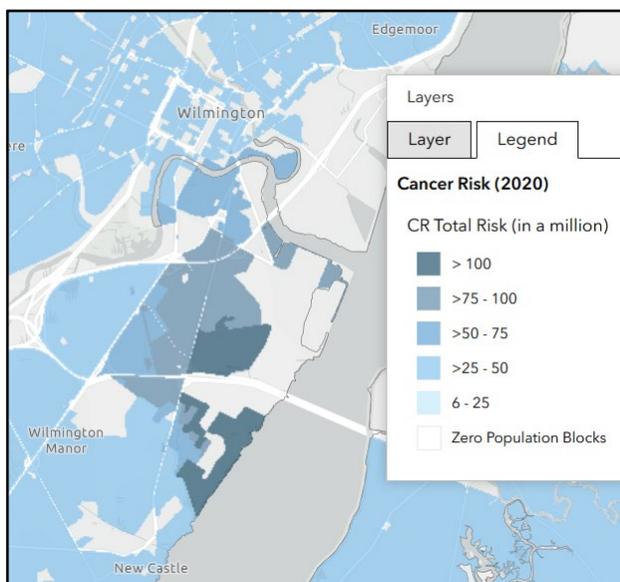
Stationary sources today emit about 1.5 million tons less toxic air pollution per year than in 1990. EPA has issued emissions standards to control toxic emissions from over 174 categories of industrial sources (e.g., chemical plants, oil refineries, aerospace manufacturing facilities, etc.), as well as from 68 categories of small “area” sources that represent 90% of the worst urban toxic pollutants. States have elected to administer or enforce many of these federal standards (EPA, 2025c). Individual area source facilities typically have much lower emissions, but these sources can be numerous and widespread, including in locations that are heavily populated. In some urban areas, the sum of area source emissions for a category can be much greater than emissions from Major sources. Tools such as the National Air Toxic Assessment allow local agencies to manage local air toxics and make further decisions for their communities.

National Air Toxics Assessment (NATA) (EPA, 2025s)

In 1990, the United States EPA designed NATA to be a comprehensive screening tool for state, local, and tribal air agencies, giving administrators and citizens alike a snapshot of outdoor air quality with respect to localized concentration emissions of air toxics.

Figure 14

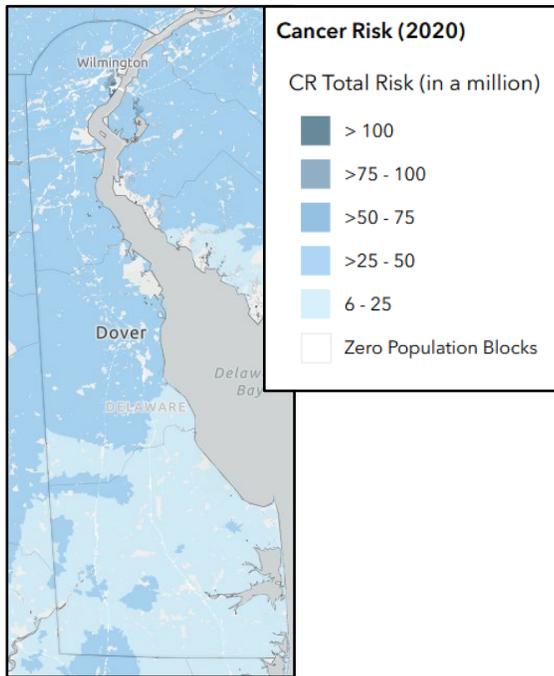
Cancer risk in a portion of New Castle County, Delaware



Note. Created by AQ staff using the AirToxScreen Mapping Tool (based on 2020 emissions)

Figure 15

Cancer risk in the state of Delaware



Note. Created by staff using the AirToxScreen Mapping Tool (based on 2020 emissions)

National Respiratory Risk by Source

The 2014 NATA National Respiratory Risk by Tract Source spreadsheet presents non-cancer hazard indexes for 14 target organ systems, or “endpoints.” Past NATA results suggest that the respiratory endpoint (the effect of air toxics on the lungs and the rest of the respiratory system) usually drives non-cancer health effects. Information on these endpoints, such as the critical concentration used for each, can be found in the Supplemental Data files for NATA. Often, more localized studies are needed to better characterize local-level risk. These studies often include air monitoring and more detailed modeling (EPA, 2025d).

Involvement from Point Sources

The NATA Results for stationary sources are broken into two groups: “point” and “nonpoint” sources. Each point source’s exact latitude and longitude coordinate is in the NATA source inventory. NATA uses the locations in modeling. Large industrial complexes often have many individual point sources (in Delaware’s case, the Delaware City Refining Company). NATA also models smaller sources, such as dry cleaners, as point sources. The preliminary step to the creation of the National Assessment was to compile an emissions inventory (NEI as discussed in Section Five) of outdoor air toxics sources, utilizing data that has been provided to state, local, and tribal air agencies. The data is acquired through summarized Continuous Emissions Monitoring (CEM) data, emissions results from source compliance testing, and data that has been provided by facilities.

AirToxScreen

In 2017, the EPA renamed the air toxics screening assessment (AirToxScreen) with some key changes such as having the report be conducted annually, instead of every three years like NATA was and with a more refined resolution. The new AirToxScreen shows results on a census block level which varies in size but can have anywhere between fewer than 10 inhabitants up to a few hundred inhabitants compared to the census tract level of detail consisting of around 4000 inhabitants for the NATA reports. While there is a new AirToxScreen report annually, the national emissions inventory (NEI) only takes place every three years, so AirToxScreen uses the most recent emissions data available along with TRI data, meteorological data, and estimates based on the most recent available data. This new report format also includes a mapping tool to more easily visualize health risk in an area.

EJScreen

In the early 2000s the EPA began working to develop public mapping tools that include environmental and demographic data to identify areas with environmental justice concerns.

The Environmental Justice Geographic Assessment Tool (later renamed EJView) was a publicly available online mapping application developed in 2005 that allowed users to view data and create a detailed map using census demographics, EPA compliance enforcement data, and other sources from federal agencies. These early mapping programs didn't allow users to view multiple layers of information at one time and had consistently issues between different states.

In 2015 EJSCREEN was released with newer data, higher resolution, indexes that combine environmental and demographic indicators, percentiles to put the numbers into perspective, and more environmental layers. This application continued to be the EPA's main tool for initial environmental justice screening and mapping until its shutdown in February 2025.

Some states have developed their own version of screening tools such as Delaware's EJ Area Viewer to help DNREC staff or the public identify communities disproportionately impacted by agency decisions and environmental issues.

The Toxics Release Inventory (TRI)

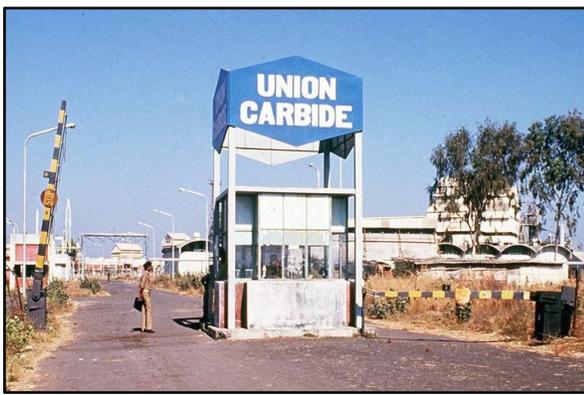
The Emergency Planning and Community Right-to-Know Act (EPCRA) (EPA, 2025a), is a tool used to track the management of certain toxic chemicals that may pose a threat to human health and the environment. In general, the chemicals covered by the TRI program are those that cause cancer or other chronic human health effects, significant acute health effects, and those that cause significant adverse environmental effects. TRI is a mandatory program that all U.S. facilities that meet TRI reporting criteria¹ must comply with (EPA, 2025n). There are currently 799 individually listed chemicals and 33 chemical categories covered by the TRI Program with recent additions including more PFAS compounds for a total of 196 reportable PFAS chemicals (EPA, 2025u). Facilities that manufacture, process or otherwise use these chemicals in amounts above established levels must submit annual reporting forms for each chemical. Creation of the TRI program was in response to several events that raised public concern about local preparedness for chemical emergencies.

Union Carbide Pesticide Chemical Plant

On December 4, 1984, a cloud of extremely toxic gas escaped from a Union Carbide chemical plant in Bhopal, India. The release amounted to at least 30 tons of the highly toxic gas called methylisocyanate, as well as a number of other poisonous gases. The pesticide plant was surrounded by informal housing settlements, leading to more than 600,000 people being exposed to the deadly gas cloud. An estimated two thousand people died that night in what is widely considered to be the worst industrial disaster in history. Thousands more died later as a result of their exposure, and survivors continue to suffer with permanent disabilities.

Figure 16

Entrance to Union Carbide chemical plant in Bhopal, India



Note. Image from Kemp, P., (2014, December 2). In December 1984, the entrance to the U.S.-owned Union Carbide plant in Bhopal, shortly after the release of poisonous gas. [Photograph]. The Atlantic. <https://www.theatlantic.com/photo/2014/12/bhopal-the-worlds-worst-industrial-disaster-30-years-later/100864/>

In 1985, a serious chemical release occurred at a similar plant in West Virginia. In 1986, Congress passed the EPCRA to support and promote emergency planning and to provide the public with information about releases of toxic chemicals in their community.

Mandatory Reportable Releases to the TRI

- **HAPs:** The CAA defined 188 pollutants or air toxics associated with various adverse health effects including cancer.
- **Urban Hazardous Air Pollutants (Urban HAP):** This is a subset of 30 of the 188 HAP determined to present the greatest threat to public health in the largest number of urban areas.
- **CAPs:** These are defined by the CAA and include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide.
- **Precursors to Air Pollutants:** The EPA classifies these chemicals as precursors of CAPs: VOCs, NO_x, and ammonia.
- **Persistent, Bioaccumulative and Toxic Chemicals (PBTs)** (EPA, 2025I) : These 16 chemicals and 5 chemical compounds, including lead, mercury, and dioxin-like compounds, are of particular concern not only because they are toxic but also because they remain in the environment for long periods of time, are not readily destroyed, and build up or accumulate in body tissue.

How the TRI Strengthens Toxic Management

The EPCRA requires facilities to adhere to policies set in place by TRI. Facilities are subject to federal fines of up to \$71,545 per day if they fail to report releases by July 1 of each year; and the data is also required by federal law to be publicly available (Civil Monetary Penalty, 2025). By making information about industrial management of toxic chemicals available to the public, TRI creates a strong incentive for companies to improve environmental performance. Information disclosure programs such as TRI are different than most federal environmental programs that are designed to achieve better environmental performance by setting standards and specifying how facilities must operate. Furthermore, the EPA requires reporting of toxic releases in pounds, rather than concentrations of volumes which can be difficult to convert or misguide the general public. TRI is recognized as a premier resource for accessing information on possible exposure to toxic chemicals and pollution prevention activities that can reduce and prevent exposures (EPA, 2025o).

The Delaware Environmental Release Notification System (DERNS) is a notification system that provides notice and information to Delawareans about releases or discharges of contaminants or pollutants that meet or exceed certain thresholds in their neighborhoods or throughout the state.

Section Seven: Summary

As we have discussed in this guide, air pollution affects our health and well-being, our economy, and degrades our natural environment. We have seen that you can divide the sources of air pollution into four types: point, nonpoint, mobile (which is comprised of on-road and non-road), and event. The United States has made great progress in the previous decades in reducing air pollution. From 1970 to 2017, the total emissions of CAPs nationwide decreased by about 74%. We have seen that pollution by stationary sources in the state of Delaware decreased by 55% between 2008 and 2020. Policy requiring reductions in pollution has been an integral part of these reductions.

While air pollution is often associated with large, stationary point sources like factories and power plants, nonpoint source pollution also plays a significant role in degrading air quality. Nonpoint sources—such as residential heating, solvent use, and small-scale combustion—emit pollutants like VOCs and PM, which contribute to the formation of ground-level ozone and haze. These pollutants are not released from a single, identifiable source, making them harder to regulate and control.

We have also discussed in this guide how regulation is set, the process required to make new regulations, and that the public has many opportunities to be involved in the process. We also compared state and federal policy and regulations. Persistent efforts by state and federal air pollution regulatory entities have worked to reduce air pollution in the United States. Continued efforts to limit the pollution from point sources, as well as from the other types of sources, are necessary if we want to ensure that our air is healthy and clean.

Acronyms

ACRONYM	DESCRIPTION
µg/m ³	Micrograms per cubic meter
AERR	Air Emissions Reporting Rule
AP-42	Compilation of air pollutant emission factors
APA	Administrative Procedures Act
AQ	Division of Air Quality
BACT	Best available control technology
btu	British thermal unit
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAP	Criteria air pollutant
CEM	Continuous emissions monitoring
CFR	Code of Federal Regulations
CO	Carbon monoxide
DEMA	Delaware Emergency Management Agency
DERNS	Delaware Environmental Release Notification System
DMV	Division of Motor Vehicles
DNREC	Department of Natural Resources and Environmental Control
EIS	Emissions Inventory System
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
FID	Flame ionization device
FLIR	Forward-looking infrared
GACT	Generally available control technology
H ₂ S	Hydrogen sulfide
HAP	Hazardous air pollutant
IQ	Intelligence quotient
LAER	Lowest achievable emission rate
lbs	Pounds
Lead	Pb
MACT	Maximum achievable control technology
MDC	Maximum downwind concentration
Mmbtu	Millions of btu
Mmscf	Millions of scf
MNSR	Minor New Source Review
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NATA	National Air Toxics Assessment
NEI	National Emission Inventory

NESHAP	National Emission Standards for Hazardous Air Pollutants
NG	Natural gas
NM	Natural minor
NO ₂	Nitrogen dioxide
NOV	Notice of violation
NO _x	Oxides of nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
OSHA	Occupational Safety and Health Administration
Pb	Lead
PBT	Persistent, bioaccumulative and toxic chemicals
PID	Photo ionization device
PM	Particulate matter
PM ₁₀	Particulate matter smaller than 10 microns
PM _{2.5}	Particulate matter smaller than 2.5 microns, fines
PPE	Personal protective equipment
ppm	Parts per million
PRI	Primary particulate matter
PSD	Prevention of Significant Deterioration
PTE	Potential to emit
R	Registered source
RACT	Reasonably available control technology
scf	Standard cubic feet
SCR	Selective catalytic reduction
SIP	State implementation plan
SM	Synthetic minor
SO ₂	sulfur dioxide
Title V	Sources defined as a major source
TLV	Threshold limit value
TPY	Tons per year
TRI	Toxic Release Inventory
VOC	Volatile organic compound

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