

Tables of Air Pollutants for North Carolina Emission Inventory and Permitting Purposes

Introductory Text and Log of Revisions

(Revised February 9, 2009)

This document is provided to aid determination of pollutants required to be reported to the North Carolina Division of Air Quality, especially pertaining to the federally mandated list of Hazardous Air Pollutants (HAPs) and the North Carolina Toxic Air Pollutants (TAPs) as well as other Clean Air Act (CAA) requirements. Criteria Pollutants are also listed for completeness and others, such as selected reduced sulfur compounds and other compounds that are to be reported in emission inventories or other (e.g. permitting) purposes. The DAQ has begun collecting Greenhouse Gas Emissions (as CO₂ equivalents) in Calendar Year 2008.

Authority

Federal laws, and the Statutes and rules of North Carolina, provide clear authority to the Director of the Division of Air Quality, acting on behalf of the Environmental Management Commission, to collect information on the quantities, locations, conditions and authenticity of emission of a wide range of pollutants to the atmosphere of North Carolina. These requirements are further supplemented in the Rules and normally reflected in permit conditions. Such data are necessary in order for the Division to fulfill its various responsibilities to attain and maintain air standards and other established requirements. Penalties are established in the law and rules to support this authority.

Changes Since Table Was Last Printed

This list of substances to be reported in the inventory has been revised several times, to reflect revisions to the list of Hazardous Air Pollutants (HAPs) specifically listed in Section 112 of the Clean Air Act (Amendments of 1990) and Toxic Air Pollutants (TAPs) specified in North Carolina Rules. Changes have also been made to clarify questions and issues related to some pollutants, reflect more detail of specific pollutants included in groups, remove some pollutants that were erroneously included in previous versions and to correct errors or uncertainties. Descriptive notations have been added to the tables to clarify or extend the usefulness of the tabulations. There will likely be further corrections and changes as specific issues are raised and resolved. See the list of changes at the end of this narrative. Please review the list and if there are questions or comments, please provide those promptly to DAQ as soon as practical. Where defined in legislation and regulations, those citations take priority over these tables.

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Groups of Pollutants

The text of the Clean Air Act contains a specific listing of Hazardous Air Pollutants (HAPs) and specifies several “groups of compounds” that include large numbers (often thousands) of individual compounds or substances. Likewise, the NC rules specify similar cases. Thus, this list can never be fully inclusive of all applicable compounds, but is intended to include the most commonly used compounds. Glycol ethers, for example, could number over 4500 compounds alone. In cases of heavy metals, the groups are also defined to include the un-reacted or elemental metal itself (e.g. lead metal). These situations are reflected in the tables. The “groups” should always total to the sum of all of the components. However, if you are using the on-line AERO system, the system automatically adds up the parts to arrive at the group total. In this situation, if you have an unknown group compound or a component compound that is part of a group, you may add it as other and may add it to a “comment” list so that it may be evaluated for addition to the system as a specific compound in the future.

These separately listed tables show many such groups and specific compounds. Groups are also listed with their most common components in separate tables. These tables are intended to represent only those components in most frequent use, and in most cases, are not intended to be a complete listing. As indicated above an “other” is provided to allow one to specify additional compounds. As these are reported, the list will be expanded.

On this list, there are indicators that identify compounds which are HAPs and/or TAPs. It should be clear that the group of compounds is usually the entity to which the fee or many rules apply. However, there are cases where a compound may be individually subject, as well as being part of the total group. The convention that is followed in this list is: if a compound is part of a group, it is designated as an individual HAP or TAP under that group also. In other words, **arsenic oxide** would be shown as an individual HAP, and as part of the **arsenic & compounds group**, even though there may not be a specific listing for the individual compound in the original (source) list. **Any time a compound is reported separately, it must also be summed and included in the appropriate group of which it is a part.** Due to this grouping relationship, an individual compound will normally appear on the list individually and again indented under the group to which it belongs.

HAPs/TAPs Also Reportable As VOC’s and Particulate Matter

This list of HAPs and TAPs is in no way intended to be inclusive of the Volatile Organic Compounds (VOC’s) and Particulate Matter (PM) that must be reported for “Criteria Pollutants.” Many compounds in this document will indeed be overlapping with those larger groupings but there are HAPs/TAPs that should be reported as such but are not included in the Federally defined VOC. The converse is also true. There is a list below of the exclusions from the federal definition of “photochemically reactive” VOC. Although there is not a similar list for PM, many particulate compounds exist that are not on the list and are thus still PM, but are not HAPs or TAPs.

Reporting in some cases may contain overlapping classifications. However, a fee will not be charged twice for the same emission (e.g. a VOC emission which is composed partially of specific HAPs).

Reporting Form (Mass) and Units

HAPs and TAPs are to be reported in pounds per year (criteria pollutants in tons). The values are to be for the mass of the total compound, not just the ion portion. For example, the value reported for Calcium Chromate should be the weight of the mass of the compound actually emitted and not just the chromium ion. In many cases, test reports only provide data for the (e.g. metal) ion mass that results

from an analysis. If it is not possible or practical to comply with the specification of the actual total compound mass with actual data, reasonable assumptions as to the species of the involved substances may be used to establish the compound mass total, as long as they are referenced and justification provided.

Searching for CAS Numbers

HAP/TAP pollutants are in alphabetical order. Chemical Abstract Services (CAS) has produced a system whereby every compound is given a number that helps to identify and distinguish synonyms for the same compound. If you have a need to search by CAS number, you may prefer to so by doing a “word search” for the specific CAS you need. This capability reduces the benefit of keeping two lists identical but ordered in a different manner. You may also search for a CAS or compound information on the Internet at such “free” sites as <http://chemfinder.cambridgesoft.com/>. Note that CAS numbers may be shown with dashes in many references. The dashes are omitted on this list, for ease in searching, etc.. The format/number of spaces is always the same in the far right fields (i.e. xxx-xx-x.).

Other Comments on Specific Groups or Substances

As mentioned previously, the list of HAPs in the Clean Air Act and the list included in the rules implementing the NC Toxics program contain several groups of compounds. Some specific comments and guidance on some of these and other specific compounds of note are provided below.

Criteria Pollutants

Though this document is primarily provided for the listing of HAPs and TAPs, the pollutants in the shaded area at the beginning are the so-called “criteria” pollutants, so named because the National Ambient Air Quality Standards promulgated for these pollutants are based on health and welfare “criteria” documents. These pollutants are further defined in the instructions for the emission inventory. Of particular note is PM_{2.5} (those particles less than 2.5 micrometers in aerodynamic particle size). Implementation of standards for PM 2.5 has been initiated, and portions of North Carolina have been determined to be in non-compliance with these standards.

□ Lead Compounds

Lead (and compounds) has a unique distinction in that it is a criteria pollutant and a HAP. In this list it appears with the HAPs as its quantities are normally better quantified as in pounds as a HAP, rather than in tons as is the convention for criteria pollutants.

□ Ozone

Ozone is a criteria pollutant. However, emissions of precursors are normally quantified for ozone (CO, NO_x and VOC) with the expectation that ozone is not significantly emitted directly from point sources to the atmosphere. Since there are a few rare occasions to this expectation, ozone is included on the list of HAP/TAP pollutants to allow for the cases where it occurs. Please note that in NC’s AERO web system that ozone is also listed with the HAP/TAP grouping and is entered in pounds.

□ Ammonia

Though Ammonia is shown as a TAP, it is also a very important precursor for fine particulate matter (PM 2.5) and every effort should be made to include this compound in the inventory. Ammonia is a fairly widespread pollutant, but often has been under-emphasized in the past.

More About Various Groups of Metals and Groups of other Compounds

As mentioned above, there are several metals and substances such as antimony, arsenic, beryllium, chromium, etc. where the un-reacted metal/substance is included in the definition. Generally, these are not significant, but the reporter of the information should be careful to include the mass of this material as well as the mass of each of the compounds. Each group has a list of “most used” compounds listed, but this is by no means complete. If there are other specific compounds, they should be identified and included in the “other” listing at the bottom. The Total for the group should be inclusive of all the individual compounds. These will not be double-counted by the DAQ in their various uses. Note also that the compounds listed beneath the group will normally appear also in their appropriate place alphabetically in the table. These individual compounds only need be reported once in the inventory.

There are a few special cases, such as the three categories of Chrome (VI), the Chromium All/Total, and individual compound listings where the values must be internally added as these are “nested” pollutants whose values are required in more than one form. There are also cases where a single compound is part of two groups (e.g. lead arsenate) and should be reported individually as a specific compound, but included as part of both group totals.

Chlorinated Dioxin Compounds of interest as HAP or TAP

This category is provided merely to provide a total for bookkeeping of these pollutants required under NC rules. The three specific compounds listed are specifically required to be reported for HAP or TAP purposes. The federal HAP reporting requirement is specific for 2378 Tetrachloro Dibenzo Para dioxin, though this is only the most potent isomer for health impact and others are also important. Thus, this may be increased in the future to allow for the calculation of a TEQ (“2378 TCDD – equivalent”) value.

Dibenzofurans

The Clean Air Act (Section 112) specifies Dibenzofurans as a group. The listing is very broad, though Congress may have intended to be more specific to chlorinated furans which (as a subgroup) are generally of higher health risk implications. This may be made more specific in the future, but for the current time, the broad category is specified. Any future increase in specification would involve a new and more detailed listing. Note also that these compounds are also defined as part of the definition of POM for Title V purposes, as specifically defined by EPA policy and guidance.

Glycol Ethers

One of the most difficult groups in Section 112 to deal with is glycol ether(s). There are approximately 4,500 potentially included compounds. However, only a few are in common use. Also, the EPA has revised the listing to be less inclusive than the original. The specific compounds included on this document are some of those that have been reported in the past to NC. The list will likely grow as other specifics are identified through this reporting process. However, the DAQ has a web site, which will assist the user in looking up specific compound of interest.

This web site is <http://daq.state.nc.us/toxics/glycol/> .

Hexane

Most groups of compounds include the parts. However, n-hexane is a specific pollutant and the "HEXANEISO" listing is for all other isomers, not including n-hexane.

POM or Polycyclic Organic Matter

This pollutant in the past has been reported very loosely. In some cases, Benzo (a) pyrene has been accepted as a surrogate. This is no longer the case. However, there are two sets of specific compounds that should be reported, one being overlapping of the other. The POM7 in the listing is used in the National Air Toxics Assessment (NATA or NIF) efforts and the POMTV is required for Title V assessments. Many compounds are listed specifically, many of which are difficult to quantify or are not routinely quantified. A special effort will be required to get this information.

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Changes for 6/6/02 Update

Several minor and more significant "corrections" were made on the list dated June 6, 2002. These include:

- Ozone moved to the criteria pollutant area of the table to reflect its correct status.
- Several minor alphabetical miss orderings were corrected.
- Removed "non-specific" POM (both federal definitions remain)
- Removed isocyanate compounds from cyanide group as they are not cyanide compounds according to federal definition: 40 CFR 372.65 Subpart D, defines: "Cyanide Compounds: X+ CN- where X = H - or any other group where a formal dissociation can be made. For example KCN, or Ca(CN)2." **Note** that some isocyanate compounds are HAPs/TAPs by unique or individual definition and must still be reported.
- Properly identified several CFC's as TAPs – corrected CFC 111 to CFC 11.
- Removed HCFC's and CFC's that are not HAPs or TAPs.
- CAS #'s were corrected for Antimony and Arsenic Trioxide, which had been reversed.
- Pages were renumbered to separate introduction from pollutant tables.

Changes for 9/20/02 Update

Spelling of Naphthalene is corrected.

Changes for 4/16/2003 Update

The major change was the inclusion of a *de minimus* reporting value for the facility-wide total. This value is a "lower limit" of what must be reported for the facility total. The list of values was developed in an attempt to lessen required reporting of small and meaningless values, while still maintaining a cautious sensitivity to the health risks involved and the regulatory requirements in place. Some of the values may still be conservative for many practical considerations, but should lessen the reporting burden somewhat below that of "no lower value" previously used.

If anyone has specific reason, data and need, to contend that any of these values should be revised, they may request the DAQ Toxics Protection Branch for review for a specific pollutant. This office is in the Raleigh Central Office of DAQ at the address on the front of this document.

Other changes that were made for this update were miscellaneous editorial corrections and refinements, some of which were caused by adding another column to the table. In a few cases, pollutants that were not previously shown in groups where they belonged were added there. In other cases, individual pollutants that were shown previously only as part of the group were added to their logical place in the alphabetical order as individual pollutants. Note that some changes add repetitions of the same pollutant to the list and appear to make the number of pollutants larger, but this is not really the case.

Changes for 6/20/2003 Update

- Revisions to the wording above for Ozone and Ammonia were made in this update in addition to other specific corrections listed below.
- Methylene diphenyl diisocyanate (MDI), CAS 101688 was listed with *de minimus* value of 10 pounds on page 15, and also on page 17 with *de minimus* value of 1 pound and an extraneous bracket in the CAS #. These are now consistent at 1 pound.

Changes for 10/1/2003 Update

- Clarification of discrepancy in tables for calcium chromate and calcium dichromate to indicate consistently that they are both HAPs and TAPs.
- Several minor typos, corrections, notes and synonyms.
- Correct Calcium cyanide listing to Calcium Cyanamide (Correct CAS 156-62-7 was already listed)
- Correct CAS for DDE and add full chemical name/synonym.
- Correct DEHP listing to show as a TAP, but not as a HAP.
- Add specifically reported compound Lead chromate (VI) oxide, CAS 18454121 to list as a HAP and TAP.
- Added note to indicate Tetraethyl lead should be included as a PBC.
- Delete pollutants from list as not needed:
 - o Boron
 - o Boron trifluoride
 - o Diborane
 - o Dichlorosilane
 - o Phosphorous oxychloride
 - o Phosphorous trichloride
 - o Silane
 - o Sulfur tetrafluoride
 - o Trichlorosilane

- Add TAPs (rules in progress):
 - o Butanol, n
 - o Glutaraldehyde
- Announce consideration of possible future greenhouse gas additions:
 - o Carbon dioxide
 - o Methane
 - o Sulfur hexafluoride
 - o Perfluorocarbons (PFC's)
 - o Hydrofluorocarbons (HFC's), and
 - o Nitrous Oxide (N₂O)

Changes made on 12/18/03 Update

Columns were added to indicate if the pollutant is a VOC or Particulate matter (PM). Note that in some cases a pollutant may meet the definition of a VOC under some conditions, but also be particulate matter (in solid form) under other conditions.

Changes made on 3/20/05 Update

Exclusion of Four Compounds as VOC's; (40 CFR Part 51, Federal Register, November 29, 2004 (Volume 69, Number 2281), Pages 69290-69298, , Air Quality: Revision to Definition of Volatile Organic Compounds--Exclusion of Four Compounds, (EPA), Final rule

n-Butanol - confirmed as a potential TAP - Required to be reported to enable evaluation of sources subject to future regulation

Chlorine Dioxide - confirmed as a potential TAP- Required to be reported to enable evaluation of sources subject to future regulation.

Ethylene Glycol mono-butyl ether (aka 2 butoxy ethanol or EGBE, CAS 111-76-2) -delisted as a HAP by EPA: 40 CFR Part 63, Federal Register Volume 69 pp 69320-69325, November 29, 2004. This compound was specifically delisted from the HAP group of glycol ethers (which covers several hundred compounds) by EPA with the above action. However, since this specific compound is also separately identified on this listing as a TAP, it continues to be required to be reported in NC.

Glutaraldehyde - confirmed as a potential TAP, in addition to HAP

Hexamethylene Diisocyanate (HDI) - identified as a potential TAP, in addition to HAP

Methanol - identified as a potential TAP, in addition to HAP

Methylene Diphenyl Diisocyanate (MDI) - identified as a potential TAP, in addition to HAP

Tertiary butyl acetate (or TBAC, CAS # 540-88-5), excluded from federal definition of reactive VOC, but not excluded from inventory and record keeping requirements (40 CFR Part 51, Federal Register; November 29, 2004 (Volume 69, Number 2281), pages 69298 - 69304) is added as a "non criteria, non-HAP/TAP pollutant" and **required to be included in North Carolina point source inventories** starting with emissions for CY 2005. See separate listing of such compounds.

Changes made on 8/25/06 Update

Benzene – previous version had erroneously omitted the check that benzene is a VOC. Benzene is definitely a VOC under the federal definition and should be inventoried both as VOC and as a HAP/TAP.

MEK – Methyl ethyl ketone (aka MEK, 2-butanone) was delisted as a HAP by amendment to Part 63, Title 40 of the Code of Federal Regulations on December 13, 2005. However, the pollutant is still a North Carolina TAP and should be included in the emission inventory and permit documentation for this state.

Butyl Cellosolve (CAS # 111-76-2) – Though still not excluded in the federal definition of a non-reactive VOC, this former HAP was included in the delisting of November 2004, but not properly reflected on the spreadsheet. It is now removed from the HAP/TAP list but should be included in the VOC emissions reported.

Arsenic Acid (CAS # 1327522) has been added to the list as a compound of interest to USEPA and to specifically show a differentiation from CAS (7778394) which EPA has adopted as a sum for all arsenic compounds. ASC (Arsenic and compounds – total) will now be provided to EPA in the form of CAS 777522.

Clarifications were added to make it more obvious that the “de minimis” values provided in the tables were primarily for emission inventory purposes and do not mean that modeling analysis required in the NC rules for various air toxics is no longer required.

A few minor editorial and clarifying revisions and word changes were made as needed.

Changes made on 02/09/2009 update

1. Added Nickel, soluble compounds listed in 2D .1103 definitions to TAP column and created NICKSOLCP group.
2. Added Strontium dichromate listed in 2D .1103 definitions to pollutant list as TAP/HAP/PM
3. Corrected CAS number for zinc dichromate and DDE.
4. Cas number 16984488/Fluorides changed description to 'sum of all fluoride compounds as mass of F ion' and removed from PM column
5. Nickel comment was 'Component of 373024/NIC'; however, 373024 is the CAS number for Nickel acetate, not the nickel compounds group so it was removed.
6. 12018018 Chromium dioxide has a valence of 4 not 6, corrected and removed from ChromVI group.
7. Based on HAP pollutant list note, all matching compounds with XXX-Other pollutant were included in the HAP column.
8. Made sure that Benzene is listed as VOC.
9. Verified HAP and TAP classifications.
10. Removed Chlorine dioxide, 10049044, only marked as TAP but not in TAP list.
11. Made cosmetic changes to make wording, spacing and capitalization is consistent.

Please identify any errors or inconsistencies to Tammy.Manning@ncmail.net .