ENVIRONMENTAL PROTECTION AGENCY
40 CFR Part 58
[FRL- 6198-6]
RIN 2060-AH92

Air Quality Index Reporting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: Today, EPA proposes to change the uniform air quality index used by States for daily air quality reporting to the general public in accordance with section 319 of the Clean Air Act (Act). These proposed changes include the addition of the following elements: a new category described as “unhealthy for sensitive groups,” new breakpoints for the ozone (O_3) sub-index in terms of 8-hour average O_3 concentrations, a new sub-index for fine particulate matter ($PM_{2.5}$), and conforming changes to the sub-indices for inhalable particulate matter (PM_{10}), carbon monoxide (CO), and sulfur dioxide (SO_2). These proposed changes reflect the revisions to the health-based primary national ambient air quality standards (NAAQS) for O_3 and particulate matter (PM) published in the Federal Register on July 18, 1997. This document discusses the development of related informational materials on pollutant-specific health effects and sensitive groups and on precautionary actions that can be taken by individuals to reduce exposures of concern. This document also discusses the interrelationship between the uniform air quality index and other programs

that provide air quality information and related health information to the general public, including State and local real-time air quality data mapping and community action programs.

DATES: Written comments on this proposed rule must be received by [insert date 45 days after date of publ].

ADDRESSES: Submit comments (in duplicate if possible) on the proposed rule to: Air and Radiation Docket and Information Center (6102), Attn: Docket No. A-98-20, Environmental Protection Agency, 401 M St., SW, Washington, DC 20460.

FOR FURTHER INFORMATION CONTACT: Terence Fitz-Simons, MD-14, Office of Air Quality Planning and Standards, EPA, Research Triangle Park, NC 27711, telephone (919) 541-0889, e-mail fitz-simons.terence@epamail.epa.gov. For health effects information contact Susan Lyon Stone, MD-15, Office of Air Quality Planning and Standards, EPA, Research Triangle Park, NC 27711, telephone (919) 541-1146, e-mail stone.susan@epamail.epa.gov.

SUPPLEMENTARY INFORMATION:

In compliance with President Clinton’s June 1, 1998 Executive Memorandum on Plain Language in government writing, this package is written using plain language. Thus, the use of “we” or “us” in this package refers to EPA.

The use of “you” refers to the reader and may include industry, State and local agencies, environmental groups and other interested individuals.

Docket

Docket No. A-98-20, containing information relating to the EPA's revision of the uniform air quality index, is available for public inspection in the Air and Radiation Docket and Information Center of the Environmental Protection Agency, 401 M St. SW, room M-1500, Washington, DC. The docket may be inspected between 8:00 a.m. and 4:00 p.m., Monday through Friday, excluding holidays. A reasonable fee may be charged for copying.

Availability of Related Information

Certain documents are available from the U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. Available documents include:

(1) The Review of the National Ambient Air Quality Standards for Ozone: Assessment of Scientific and Technical Information (“Staff Paper”)(EPA-452/R-96-007, June 1996, NTIS # PB-96-203435, $67.00 paper copy and $21.50 microfiche). (Add a $3.00 handling charge per order.)

(2) Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of

Scientific and Technical Information (“Staff Paper”) (EPA-452/R-96-013, July 1996, NTIS #PB-97-115406, $47.00 paper copy and $19.50 microfiche). (Add a $3.00 handling charge per order.)

The following document will be available in January 1999 from the National Center for Environmental Publications and Information (NCEPI). Requests for this publication can be mailed to: U.S. Environmental Protection Agency, NCEPI, P.O. Box 42419, Cincinnati, OH, 45242. Your request may also be phoned in to NCEPI at 1-800-490-9198 or faxed to 513-489-8695.

(1) Community Action Programs: Blueprint for Program Design (EPA 420-R-98-003).

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I. **Background**

A. *What are the Legislative Requirements?*

Section 319 of the Act governs the establishment of uniform air quality index for reporting of air quality. This section directs the Administrator to “promulgate regulations establishing an air quality monitoring system throughout the United States which utilizes uniform air quality monitoring criteria and methodology and measures such air quality according to a uniform air quality index” and “provides for daily analysis and reporting of air quality based upon such uniform air quality index...”.

B. *What is the History of the Air Quality Index?*

In 1976, we established a nationally uniform air quality index (AQI), called the Pollutant Standard Index

(PSI), for use by State and local agencies on a voluntary basis (41 FR 37660). This uniform index was established in light of a study conducted by EPA and the President's Council on Environmental Quality (CEQ, 1976). This study found that the 55 urban areas in the U.S. and Canada reporting an index of air quality used 14 different indices, in conjunction with different cautionary messages, such that in essence 55 different indices were being used to report air quality. This diversity of indices sent a confusing message about air quality to the public. Based in part on this study, we developed an index to meet the needs of State and local agencies that has the following advantages: it sends a clear and consistent message to the public by providing nationally uniform information on air quality; it is keyed to the NAAQS and the significant harm level (SHL)[1] which have a scientific basis relating air quality and public health; it is simple and easily understood by the public; it provides a basis for accommodating changes to the NAAQS; and it can be forecasted to provide advance information on air quality.

The PSI, which is also commonly referred to by some State and local agencies as the AQI, includes sub-indices

[1]Significant harm levels are those ambient concentrations of air pollutants that present an imminent and substantial endangerment to public health or welfare, or to the environment, as established in 40 CFR part 51.151.

for O_3, PM, CO, SO_2, and nitrogen oxide (NO_2), which relate ambient pollutant concentrations to index values on a scale from 0 through 500. This represents a very broad range of air quality, from pristine air to air pollution levels that present imminent and substantial endangerment to the public. The index is normalized across pollutants by defining an index value of 100 as the numerical level of the primary NAAQS for each pollutant and an index value of 500 as the SHL.[2] Such index values serve to divide the index into categories, with each category being identified by a simple informative descriptor. The descriptors are intended to convey to the public information about how air quality within each category relates to public health, with increasing public health concerns being conveyed as the

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[2]Intermediate index values of 200, 300, and 400 were defined and are the basis for the Alert, Warning, and Emergency episode levels included in 40 CFR part 51, appendix L, as part of the Prevention of Air Pollution Emergency Episodes program. This program requires specified areas to have contingency plans in place and to implement these plans during episodes when high levels of air pollution, approaching the SHL, are in danger of being reached. Changes to this emergency episode program will be proposed in the near future.

Below an index value of 100, an intermediate value of 50 was defined either as the level of the annual standard if an annual standard has been established (for PM_{10} and SO_2), or as a concentration equal to one-half the value of the short-term standard used to define an index value of 100 (for O_3 and CO). Inhalable particulate matter, PM_{10}, refers to particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

categories range to the upper end of the scale. Additional information about the general health effects associated with each category, and precautions that sensitive groups and the general public should take to avoid exposures of concern, has been made available through an informational booklet, updated as appropriate, that also presents and explains the PSI (EPA, 1994).

In 1979, we made changes to the PSI, in part to reflect revisions to the NAAQS for O_3, and to establish requirements for PSI reporting (44 FR 27598). The requirement for State and local agencies to report the PSI appears in 40 CFR part 58.50, and the specific requirements (e.g., what to report, how to report, reporting frequency, calculations) are in appendix G to 40 CFR part 58.

C. *What Programs are Related to the PSI?*

Historically, State and local agencies have used primarily the PSI, or other AQIs, to provide general information to the public about air quality and its relationship to public health. In recent years, many States and local agencies, as well as EPA, have been developing new and innovative programs and initiatives to provide more information to the public, in a more timely way. These initiatives, including real-time data reporting through the Ozone Mapping Project and community action programs, can serve to provide useful, up-to-date, and timely information

to the public about air pollution and its effects. Such information will help individuals take actions to avoid or reduce exposures of concern and can encourage the public to take actions that will reduce air pollution on days when levels are projected to be in air quality categories of concern to local communities. Thus, these programs are significantly broadening the ways in which State and local agencies can meet the nationally uniform AQI reporting requirements, and are contributing to State and local efforts to provide community health protection and to attain or maintain compliance with the NAAQS. We and State and local agencies recognize that these programs are interrelated with AQI reporting and with the information on the effects of air pollution on public health that is generated through the periodic review, and revision when appropriate, of the NAAQS.

The most recent revisions to the O_3 and PM NAAQS, the Ozone Mapping Project, and community action programs are discussed briefly below. In light of the interrelationships among these programs, we have developed the revisions to the uniform AQI being proposed today with the goal of creating a revised AQI that can effectively serve as a nationally uniform link across these programs. In so doing, we intend to support and encourage State and local participation in real-time data reporting initiatives and the development and

implementation of community action programs that serve public education and health protection goals.

1. *Ozone and Particulate Matter NAAQS revisions*. On July 18, 1997, we revised the primary NAAQS for O_3 and PM based on a thorough review of the scientific evidence linking exposures to ambient concentrations of these pollutants to adverse health effects at levels allowed by the previous NAAQS. In particular, we replaced the 1-hour O_3 NAAQS with an 8-hour O_3 NAAQS and supplemented the PM NAAQS with 24-hour and annual standards for fine particulate matter (measured as $PM_{2.5}$[3]). These revisions provide the basis for changes to the PSI to maintain the relationship between an index value of 100 and the level of the NAAQS, as well as to establish the relationships between ambient concentrations of these pollutants and index values across the full scale of index values from 0 to 500.

In addition, as a result of the reviews of the scientific information upon which the O_3 and PM NAAQS are based, an expanded understanding emerged as to the nature of the relationships between exposure to ambient concentrations of these pollutants and the health effects likely to be experienced, especially near the level of the NAAQS. We and

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[3]$PM_{2.5}$ refers to particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

the Clean Air Scientific Advisory Committee (CASAC)[4] recognized that for these pollutants there are no discernible thresholds below which health effects are not likely to occur in the most sensitive individuals, but rather there is a continuum of effects potentially extending down to background levels. As ambient concentrations increase, the proportion of individuals likely to experience effects and the seriousness of the health effects increase. Thus, the standards are not risk free. While the standards protect public health with an adequate margin of safety, in accordance with sections 108 and 109 of the Act, including the health of sensitive groups, exposures to ambient concentrations just below the numerical level of the standards may result in exposures of concern for the most sensitive individuals. Conversely, exposures to ambient concentrations just above the numerical level of the standards are not likely to result in exposures of concern for most healthy people. This expanded understanding is reflected in the new forms of the standards, which allow for multiple days above the numerical level of the standards.

These understandings were reflected in CASAC's advice to the Administrator during the O_3 NAAQS review, urging

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[4]CASAC is a scientific advisory committee established under the Act to review the scientific criteria and standards and to advise the Administrator on revision of the NAAQS, as appropriate.

expansion of the public health advisory system (i.e., a uniform AQI) and communication to the public of the nonthreshold nature of the health effects. More specifically, a number of CASAC panel members recommended "that an expanded air pollution warning system be initiated so that sensitive individuals can take appropriate 'exposure avoidance' behavior" (Wolff, 1995). Consistent with this advice, in the preamble to the proposed revisions to the O_3 NAAQS (61 FR 65733-4), the Administrator requested comment on the usefulness of providing specific health effects information when ambient concentrations are around the numerical level of the standard, the appropriateness of using the PSI to convey such information to the public, the possible addition of two new PSI categories (one just above and one just below the numerical level of the standard) and associated descriptors and levels, as well as related health effects and cautionary statements.

Broad support for modifying the PSI was received in public comments on this aspect of the O_3 NAAQS proposal, as discussed in the final rule establishing revisions to the O_3 NAAQS (62 FR 38873-4). Commenters overwhelmingly endorsed expanding the use of the PSI for various reasons, while many expressed concern with the possible category descriptors suggested in the proposal (i.e., "moderately good" and

"moderately unhealthful"). Many commenters felt that an expanded PSI could help particularly sensitive people take action to minimize their exposures, and that the PSI could be combined with community action programs to reduce ambient concentrations when the numerical level of the standard was forecasted to be exceeded. Some commenters endorsed increasing the specificity of health and cautionary statements related to the PSI categories. Commenters from State and local agencies encouraged us to develop any approaches to revising the PSI in consultation with them, specifically in the areas of sharing real-time monitoring data, risk communication with the public, and coordination of a national program.

2. *Real-time data reporting initiative (Ozone Mapping Project)*. The Ozone Mapping Project is part of EPA's Environmental Monitoring for Public Access and Community Tracking (EMPACT) initiative - a new approach to providing timely environmental information to communities. It is a cooperative effort of the EPA, State and local air pollution control agencies, and regional organizations including the Mid-Atlantic Regional Air Management Association (MARAMA), the Northeast States for Coordinated Air Use Management (NESCAUM), the northeast Ozone Transport Commission (OTC), and the Lake Michigan Air Directors Consortium (LADCO).

During the summer of 1998, EPA's Office of Air Quality Planning and Standards assumed coordination of the project.

The Ozone Map provides simple and timely information about ground-level O_3. During the 1998 O_3 season it was available on EPA's AIRNOW web site (http://www.epa.gov/airnow) and on some local television and news reports. It is an animated contour map that shows concentrations of O_3, in categories ranging from good to moderate to varying degrees of unhealthy, based on PSI values, as it develops across the eastern US. It was created from real-time, hourly O_3 data provided by a network of more than 400 air monitoring stations from South Carolina to Wisconsin and Maine. When accessed on a computer, cautionary statements for each category could be displayed by running a cursor over the legend. Also available on the AIRNOW web site were still maps of maximum values and forecasted values, and archived animated maps.

Along with the Ozone Map, the AIRNOW web site contains information about O_3 health effects in the "Health Facts" section, and emission reduction activities in the "What You Can Do" section. It also provides links to real-time data, and community action program web sites, that are maintained by State and local agencies around the country. The goals of the web site are to: 1) provide real-time air pollution data in an understandable, visual format, 2) provide

information about the public health and environmental effects of air pollution, and 3) provide the public with information about ways in which they can protect their health and actions they can take to reduce pollution.

3. *Community action programs*. The implementation of community action programs (also referred to as episodic emission control programs) is becoming increasingly popular across the country as an innovative approach used to reduce emissions of O_3 precursors, CO, and PM. Motivation for implementation of this type of program often stems from local government and business concerns about the NAAQS attainment status of the area and the restrictions, additional controls, and costs associated with being classified as a nonattainment area. Many areas are also motivated by public health concerns and believe that increasing the amount of air quality information available to sensitive populations raises awareness and results in significant health benefits. Specific goals which are usually associated with community action programs include: 1) educate the public and enhance protection of public health; 2) attain or maintain NAAQS attainment status and the associated economic benefits; 3) meet specific emission reduction targets; and 4) manage/reduce traffic congestion.

Community action programs are usually voluntary and generally provide multiple steps that the public, business,

and industry can take to reduce emissions when higher levels of air pollution are forecast to occur, including in particular transportation-related measures such as trip reduction, postponement of certain activities such as vehicle refueling, and maintenance of cars. The programs emphasize educating the public about the impact of individual activities on local air quality and the basics of air pollution. The educational component of these programs also helps to create a strong link between environmental goals and associated public health benefits.

Most of these programs are based on the categories of the PSI and make use of the PSI descriptors and related health effects and cautionary statements on action days. By linking action days to the PSI, local control programs hope to alter individual behavior to reduce emissions and to reduce exposures to the population. In addition to reduced pollutant exposure of the general population due to improved air quality, there are other health benefits directly associated with community action programs that can be enhanced by linkage to the PSI. Different population groups are more sensitive to the harmful effects of the different air pollutants included in the PSI, and the revisions to the PSI proposed today, together with related informational materials, will significantly improve the effectiveness of communications with these groups. Public education or

programs directly targeting these groups may provide the most significant benefits of a community action program. Forecasting days with elevated pollution levels, and then communicating effectively about air quality and associated health effects, may help these groups selectively limit their outdoor activities and, therefore, limit their potential for exposures of concern.

We are committed to providing States and local agencies with support in their efforts to meet air quality standards, to inform the public about air quality, and to educate the public about the impacts of air pollution. The revisions to the PSI being proposed today have as a goal the creation of a revised PSI that can effectively serve as a nationally uniform link across the range of programs (e.g., real-time data reporting initiatives, community action programs) that have these functions.

In support of community action programs, we have developed informational materials related to the PSI, including the health effects and cautionary statements associated with each category and more detailed health effects information (see section II.B.3), available on the AIRNOW web site, that State and local agencies may use to enhance their community action programs. Focusing on transportation measures that are often a major component of community action programs, EPA’s Office of Mobile Sources

(OMS) has developed a report entitled, “Community Action Programs: Blueprint for Program Design.” This document describes the major steps needed to put together a successful episodic control program and provides criteria that State and local agencies can use to examine and evaluate their own programs. The report will be available in January 1999 from NCEPI (See Availability of Related Information).

II. **Rationale for Proposed Revisions**

In developing the revisions to the PSI that are being proposed today, we sought extensive input from State, local agencies, and from the public. As discussed below, we sponsored a workshop with State and local agencies, participated in numerous meetings, prepared and made available a staff draft revision to the PSI sub-index for O_3 for use during the 1998 O_3 season, and conducted several focus groups to obtain public input on the effectiveness of draft revisions to the PSI and related O_3 maps and informational materials.

A. *What was the Early Input from State/local Agencies?*

In January 1998, we conducted a workshop for State and local air pollution control agencies on the PSI and related programs. The objectives of the Workshop were: 1) to give State/local agencies a preview and opportunity for input on

anticipated revisions to the PSI, with particular focus on the O_3 sub-index; 2) to provide information and generate discussion regarding the expansion of the Ozone Mapping Project and air quality forecasting approaches; 3) to share information about State/local real-time data reporting and Ozone Action Day programs (community action programs); and 4) to explore cross-cutting issues focusing on how these tools to facilitate communication (i.e., the PSI, Ozone Maps, forecasting) can best be linked to State/local programs. The Workshop provided a forum for broad discussion of these topics, among the participants, with many different points of view expressed.

With regard to revisions to the PSI, broad consensus seemed to exist on the key issues of maintaining simplicity in the structure of the PSI and of providing up-to-date, consistent information relating air quality and public health. More specifically, it was the consensus view that the PSI should be kept as simple as possible, while being consistent with the expanded health information that emerged from the recently completed review of the O_3 and PM NAAQS. The creation of two possible new categories (i.e., one just above and one just below the numerical level of the standard), as described in the O_3 NAAQS proposal (61 FR 65733-4) and final decision (62 FR 38873-4) notices, seemed to evoke negative reactions from most participants for

varying reasons (e.g., too complex, too much information, too difficult to forecast in the narrow ranges suggested). Most participants favored creation of a new category *above* the numerical level of the standard (i.e., dividing the current “unhealthful” category into two categories) considering both the expanded health information and linkages to community action programs. Creation of a new category *below* the level of the standard (i.e., dividing the current “moderate” category into two categories) was less generally supported — some felt that a new category just below the level of the standard was important for communicating risks and appropriate cautions, whereas many seemed to feel it was an unnecessary complication that could be confusing to the public.

The Workshop discussion also produced consensus among the participants that any revisions to the descriptors used for PSI categories above the numerical level of the NAAQS should maintain the root word “health” rather than more neutral air quality descriptors (e.g., unsatisfactory). The Workshop participants generally preferred the use of the plain English word “unhealthy” to the currently used word “unhealthful.”

The Workshop participants generally encouraged us to revise the calculation methods for the PSI to be consistent

with the conventions used in defining the NAAQS. More specifically, the participants supported changing the conventions for rounding numbers in calculating the PSI to be consistent with the rounding conventions used for the NAAQS. This revision would avoid situations where a health advisory could be issued that describes the air as unhealthy, when in fact the numerical level of the standard has not been exceeded.

With regard to forecasting air quality and associated PSI values, Workshop participants generally recognized that for standards that have an averaging period longer than 1-hour (e.g., the 8-hour O_3 NAAQS), forecasting becomes increasingly important. Such forecasts can help people plan to avoid exposures of concern and can provide a basis for providing advance public notice of community action programs. There was strong support for us to prepare guidance on air quality forecasting, especially on using hourly O_3 concentrations as predictors for 8-hour averages.

The Workshop participants expressed strong support in general for enhancements to the Ozone Mapping Project, including real-time data reporting and forecasting. The selection of colors to be associated with the PSI categories depicted on the maps was the subject of much discussion. While there was broad recognition of the importance of using colors with such air quality maps, different views were

expressed as to which colors should be associated with specific categories. For example, some participants from areas that had already developed or were developing community action programs expressed the view that the use of the color red on the map should be used for the category that triggers their programs' "code red" days. However, different programs have or intend to use different PSI index values to trigger action days, depending on the general level of air quality in the area and the objectives of the action day program in that area.

In summary, Workshop participants encouraged us to develop revisions to the PSI with immediate emphasis on a revised sub-index for O_3, reflecting the 8-hour O_3 NAAQS. Many participants expressed an interest in using such a revised index during the 1998 O_3 season. The participants also encouraged us to prepare additional information, including appropriate cautionary statements that could be used in conjunction with reporting a revised O_3 sub-index and more in-depth information on O_3 health effects to help meet the educational goals of community action programs.

Following the Workshop, we continued coordination with State and local air agencies and associations as part of the process of developing draft revisions to the PSI, particularly the O_3 sub-index, and related informational materials. Some of the agencies and associations that

participated in meetings and discussions with us were the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), the OTC, NESCAUM, MARAMA, the California Air Resources Board, the California Air Pollution Control Officers Association (CAPCOA), and the South Coast Air Quality Management District. While different points of view were expressed, all of these discussions reflected the importance of having a nationally uniform advisory system to present consistent health effects information that is related to air quality levels. These discussions helped shape the preparation of a staff draft PSI sub-index for O_3, related O_3-specific cautionary statements, and a draft booklet on O_3 health effects, "SMOG - Who Does It Hurt?".

B. *Staff Draft Revisions to PSI Sub-index for Ozone*

1. *Availability for use in the 1998 ozone season*. Building on health effects information from the review of the O_3 and PM standards, comments received on the O_3 NAAQS proposal, and input from State, local agencies, and associations, EPA staff prepared draft revisions to the PSI sub-index for O_3. Recognizing that some State and local agencies wanted to use a sub-index based on the new 8-hour O_3 NAAQS for the 1998 O_3 season, in early March we made the draft revised O_3 sub-index available through our AIRNOW web

site and through appropriate organizations across the nation. The availability of this revised O_3 sub-index made possible uniform reporting of the PSI during the 1998 O_3 season based on the 8-hour O_3 NAAQS for those agencies that chose to do so.[5] The draft sub-index categories, descriptors, and related O_3 concentrations, together with related cautionary statements, were the basis for the 1998 O_3 maps produced by the Ozone Mapping Project. The draft O_3 sub-index also provided a link to the 8-hour O_3 standard for use in O_3 action programs around the country.

2. *What were the staff draft revisions*? Draft revisions to the PSI and the O_3 sub-index, together with new O_3-specific cautionary statements, were based on the expanded understanding of O_3 health effects gained during the review of the O_3 NAAQS, comments received on the O_3 NAAQS proposal and subsequent input from State and local agencies, and consideration of the implications of the draft revisions for the pollutants other than O_3 that are included in the PSI.

The staff draft O_3 sub-index reflected general changes to the structure of the PSI as well as specific changes to

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[5]For the 1998 O_3 season, State and local air agencies could use either the staff draft revised O_3 sub-index based on the 8-hour O_3 standard, or the PSI based on the 1-hour O_3 standard.

reflect the new 8-hour O_3 NAAQS. In particular, the primary change to the structure of the PSI was to divide the "unhealthful" category (PSI values of 101 to 200) into two categories, "unhealthy for sensitive groups" and "generally unhealthy." The use of the descriptor "unhealthy for sensitive groups," for PSI values from 101 to 150, was intended to appropriately caution members of sensitive groups[6] without unduly alarming the general public. This revision recognized that the NAAQS are established to protect sensitive groups, such that at air quality concentrations just above the numerical level of NAAQS the general population is unlikely to experience exposures of concern. Secondly, while the "moderate" category (PSI values of 51 to 100) was not divided into two categories, allowance was made to create, in essence, a sub-category in the upper half of this range (PSI values of 76 to 100) for pollutants for which a limited health notice might be appropriate. Such a limited notice would recognize that the

[6]The staff draft recognized that groups may be "sensitive" or particularly at-risk to the effects of a pollutant due to inherent sensitivity, medical conditions and exposure conditions. More specifically, sensitive groups at increased risk to O_3 effects, include active children and outdoor workers who regularly engage in outdoor activities and people with preexisting respiratory disease (e.g., asthma, chronic obstructive lung disease). Some individuals within these groups are unusually responsive to O_3 and may experience much greater functional and symptomatic effects from exposure to O_3 than the average person in the group.

NAAQS are not risk free, and that even at concentrations below the numerical level of a NAAQS some extremely sensitive individuals may experience exposures of concern for some pollutants. The only other change made to the PSI was to replace the descriptor “very unhealthful” (PSI values from 201 to 300) with the descriptor “very unhealthy.” The other categories of “good” (PSI values from 0 to 50) and “hazardous” (PSI values from 301 to 500) were left unchanged.

Consistent with these structural changes and with the new 8-hour O_3 NAAQS, the staff draft identified breakpoints for the O_3 sub-index in terms of 8-hour O_3 concentrations to the extent possible based on the available health effects information. A breakpoint between the good and moderate categories needed to be defined since there is no annual standard for O_3 to use as the breakpoint. An 8-hour O_3 concentration of 0.06 ppm was identified based in part on risk estimates done in conjunction with the review of the O_3 NAAQS which suggested that risk to healthy people likely becomes negligible at this level (Whitfield et al., 1996). This consideration was judged by staff to be a more appropriate basis for distinguishing between good and moderate categories than the historical approach of setting this breakpoint equal to one-half the numerical level of the short-term standard in the absence of an annual standard.

Further, a breakpoint at this level would result in a sufficiently broad range of concentrations for the moderate category to facilitate forecasting and to make gradations in air quality more visually apparent in the Ozone Map. On the other hand, the concentration of 0.07 ppm, 8-hour average, was judged by staff as the appropriate breakpoint for starting to convey a limited health message for extremely sensitive individuals. Thus, this intermediate level of 0.07 ppm, associated with a PSI value of 75, resulted in essentially creating a sub-category in the upper half of the moderate category. Conveying such a limited health message for extremely sensitive individuals at concentrations just below the level of the NAAQS is consistent with the advice of CASAC during the review of the O_3 NAAQS (Wolff, 1995).

For PSI categories above the numerical level of the O_3 NAAQS, staff again drew in part upon the risk assessment (Whitfield et al., 1996) done in conjunction with the review of the NAAQS to provide a basis for selecting the breakpoint between the generally unhealthy and very unhealthy categories (corresponding to a PSI value of 200). Our risk assessment estimates that above a level of 0.12 ppm, 8-hour average, healthy individuals (adults and children) at prolonged, moderate exertion would likely experience the following risks: 1) approximately 50 percent are estimated to experience temporary moderate lung function impairment,

2) approximately 20 percent are estimated to experience temporary large lung function impairments, and 3) approximately 10 to 15 percent are estimated to experience temporary moderate to severe respiratory symptoms (e.g., chest pain and aggravated cough). Individuals with asthma or other respiratory conditions would be more severely impacted than healthy individuals, leading some to increase medication usage and seek medical attention, such as increased doctor visits, increased emergency room and clinic visits, and increased hospital admissions. Staff judged that it was appropriate to characterize risks at these levels and above as being very unhealthy. The draft breakpoint between the two new categories (corresponding to a PSI value of 150) was set at 0.10 ppm, 8-hour average. This is the level at which staff judged that exposures are associated with an increase in the number of individuals who could potentially experience effects, including possible respiratory effects in the general population and a greater likelihood of respiratory symptoms and breathing difficulty in sensitive groups. For many locations across the country, this 8-hour average breakpoint of 0.10 ppm approximately corresponds to a 1-hour average concentration of 0.12 ppm, the level of the 1-hour O_3 standard.

Since no human health effects information was available for 8-hour average O_3 concentrations at significantly higher

levels, the breakpoints at the upper end of the PSI scale (between the very unhealthy and hazardous categories and the SHL which corresponds to the top of the PSI scale of 500) were retained in terms of the existing 1-hour average concentrations.

3. *Related informational materials*. In April, 1998, we put on the AIRNOW Web site a draft booklet, called “SMOG - Who Does It Hurt? What You Need To Know About Ozone and Your Health,” that provides information for the general public about O_3 health effects and is based on scientific information gained in the recent review of the O_3 standard. The impetus for the development of this booklet was the recognition that many members of the public would appreciate more detailed information about the health effects associated with different levels of air pollution, especially since better understanding of health effects empowers individuals to make personal decisions regarding exposure reduction. This recognition was encouraged by commenters on the O_3 NAAQS proposal who endorsed increasing the specificity of warnings with regard to health effects. Such commenters noted that citizens are capable of dealing with complex information and that individuals with respiratory disease and their families appreciate such information. “SMOG - Who Does It Hurt?” was designed to provide, in simple language, enough detail for individuals

to understand who is at most risk from O_3 exposure and why, the nature of O_3 health effects, and a detailed explanation of how individuals can reduce the likelihood of exposure using common everyday activities as examples. This booklet was also intended to support programs such as the Ozone Mapping Project and State/local community action programs.

Currently, there are other materials available that provide information about O_3 and the PSI on the AIRNOW web site. Information about ground-level as contrasted to stratospheric O_3 may be found in EPA's publication "Ozone: Good Up High, Bad Nearby." The EPA's video "Ozone Double Trouble" also provides information about ground-level and stratospheric O_3 and the health effects associated with exposure to ground-level O_3, or smog. A short fact sheet, called the "Air Quality Guide," provides information about O_3 health effects and the sources of ground-level O_3. The brochure "The Pollutant Standards Index" (EPA 1994) will be updated to reflect final revisions to the PSI and will include as guidance pollutant-specific health effects and cautionary statements.

4. *What was the feedback on the staff draft*?

a. *Focus Groups*. We sponsored eight focus groups to help evaluate how effectively the PSI descriptors and the colors used with the Ozone Map, the related cautionary

statements, and the O_3 health effects booklet communicate air quality and health effects information. The focus groups were conducted by a contractor, including the selection of participants, securing meeting facilities, and producing necessary materials. The methods and materials used and the results from the focus groups are summarized below and presented in a final report, "Report of the Focus Groups on the Ozone Map, the Pollutant Standards Sub-Index for Ozone, and the Ozone Health Effects Booklet," (SAIC, 1998) available in the docket.

Background. From August to October, 1998, focus groups were held in eight locations around the country that have different air quality with respect to ozone. Five focus groups, held in Denver, CO; Atlanta, GA; Houston, TX; San Bernardino, CA; and St. Louis, MO; were comprised of members of the general public. A focus group held in Miami, FL was comprised of people over 50 years of age with chronic lung disease (asthma, chronic bronchitis, or emphysema). Another focus group, held in Chicago, IL was comprised of urban parents of children with asthma. Lastly, in October, a focus group was conducted in Los Angeles that was comprised of journalists. Twelve participants and three alternates were recruited for each of the eight focus groups. Participants in the general public focus groups were selected to fit a profile that matched the demographic

characteristics of each city in terms of ethnicity, age, gender, and education level. The participants in the Miami and Chicago focus groups were selected to represent target audiences that EPA believes may benefit most from understanding and applying the information provided by the PSI, the Ozone Map, and the O_3 health effects booklet. Journalists were selected as a target audience because they use these informational materials to inform and educate the public.

At the focus groups, participants were asked about various versions of the Ozone Map, and the PSI descriptors presented in the legends of the maps, related informational materials such as the cautionary statements and O_3 health effects booklet, and the Index name. Four different versions of the Ozone Map were compared for effectiveness in conveying information about air quality and associated health effects. Each version of the map showed O_3 levels in the eastern third of the U.S. on a day with high O_3 concentrations. The first three maps differed only in the descriptors used in the legend (Maps 1 and 2) and in the addition of the definition of sensitive groups to the bottom of the map (Map 3). The fourth map used two shades of yellow in the moderate category to depict a subcategory that could be associated with a limited health message. The comparison of these maps evaluated the most basic

configuration of information, the colors and descriptors associated with different PSI categories, which are used not only with the Ozone Map, but are also often used in newspaper reports. With a minimal introduction, the participants were asked questions about each map to determine if they understood what that map says about air quality and associated health effects. In addition, the four maps were displayed side-by-side and participants were asked: Which map does the best job of communicating whether air quality was good or bad for your health? Which map did you prefer?

Lastly, because comments received earlier from many State and local agencies indicated a preference for the name "Air Quality Index (AQI)," rather than the "PSI," participants in four of the seven focus groups (Atlanta, Houston, Miami and Chicago) were asked which of two names (Pollutant Standards Index or Air Quality Index) they preferred and why.

Participants also were shown the cautionary statements included with the staff draft (and used in conjunction with the Ozone Map) for the "moderate," "unhealthy for sensitive groups," and "generally unhealthy" categories, and were asked questions to evaluate the effectiveness of the statements in providing cautionary information. In addition, the O_3 health effects booklet, "SMOG - Who Does It

Hurt?" was evaluated to assess how well it conveys information in an easily understandable form about three basic concepts, O_3 health effects, sensitive groups, and ways to minimize exposures of concern. The booklet was designed to communicate these three basic concepts that staff believe are important to enhance people's understanding of the PSI. Participants read the booklet and then answered questions to determine if they understood the three basic concepts.

Results. The results of the focus groups held across the nation were fairly consistent. Only the results pertaining to the maps and descriptors are discussed below, since these results were considered in the development of this proposal. Results pertaining to the cautionary statements and the O_3 health effects booklet have been considered in revising these related informational materials.

The messages of the maps were generally well understood. Comments indicated that the descriptor "unhealthy for sensitive groups" communicates the intended health effects information. Participants identified that at this level only members of sensitive groups, and not the general population, should be concerned about personal exposure. Many participants in each group preferred the simpler descriptor "unhealthy" to "generally unhealthy."

Considering the first three maps, participants commented that the definition of sensitive groups, added in Map 3, provides information that they found useful. Whereas most participants expected the sensitive groups to include those with respiratory diseases, such as asthma, the inclusion of healthy active children and outdoor workers in the definition of sensitive group was a surprise to many participants. The majority of participants agreed that Map 3 communicated air quality and health effects information most effectively, and it was also the preferred Map. There were a couple of participants in each group who preferred a simpler map.

The responses from the focus groups about Map 4 reflected confusion on the part of many participants about the two shades of yellow used to depict the moderate category. This confusion was due in part because only one shade of yellow was apparent in the legend. Although many participants understood that the lighter shade of yellow represented better air quality, many felt this information was of questionable value since the legend did not explain what this meant in terms of a health message. Some noted that without an associated health message, it was not clear why different colors or shadings would be used to depict the “moderate” category. As part of further discussion on the cautionary statement associated with the “moderate”

category, participants learned that there was, in essence, a subcategory at the upper end of this range for extremely sensitive individuals. Some participants then questioned why the lower end of the moderate range should not just be included in the good category if there was no associated health message.

Almost all of the participants preferred the name Air Quality Index to Pollutant Standards Index. In general, participants felt that the name Air Quality Index communicates what the index is about more effectively than the name Pollutant Standards Index. Participants noted, for example, that the name Pollutant Standards Index does not indicate that the index is about air quality rather than pollution in general.

b. *State/local agencies*. In the many meetings with State and local agencies and national and regional associations, one key issue that continued to be discussed in the context of the Ozone Map and community action programs was the issue of what colors to associate with the "unhealthy for sensitive groups" and "generally unhealthy" categories in particular. These discussions typically focused on which category should be associated with the color red. As at the January workshop, some have maintained that red should be used for the "unhealthy for sensitive groups" category. Others expressed the view that red should

be used when air quality is in the “generally unhealthy” category and that orange should be used for the “unhealthy for sensitive groups” category. These commenters have argued that given the form of the standard, using red at the level of the standard could allow many days to be classified as “code red” days in community action programs, even when the standard is attained in that area and public health is being protected. One commenter from a State agency that used the categories and health advisories from the staff draft, together with the color orange when air quality was in the “unhealthy for sensitive groups” category and red when air quality was in the “generally unhealthy” category, indicated that their agency encouraged the same emissions reductions activities when air quality was in either category. The commenter reported that people appeared to understand the difference in the health advisories and to take both levels of air quality advisories seriously.

C. *What is the Basis for the Proposed Revisions?*

The primary consideration that shaped these proposed revisions is the importance of providing nationally uniform health information associated with daily ambient levels of the air pollutants included in the index, consistent with the requirement of section 319 of the Act for an index to achieve national uniformity in daily air quality reporting. More specifically, the revisions to the O_3 and PM NAAQS

provide the basis for the proposed specific changes to the PSI sub-indices for O_3 and PM to maintain the relationship between an index value of 100 and the level of the NAAQS, and to establish the relationships between ambient concentrations of these pollutants and index values across the full scale of index values from 0 to 500. The proposed general changes to the structure of the PSI and to related informational materials are based on the expanded understanding that emerged during these reviews as to the nature of the relationships between exposure to ambient concentrations of these pollutants and the health effects likely to be experienced, consideration of the implications of changes for the other pollutants, and the broad input from State and local agencies and the public discussed above. The proposed general changes to the PSI and related informational materials will expand the use of the PSI to provide more pollutant-specific health information, especially when ambient concentrations are close to the level of the primary NAAQS.

1. *What are the proposed general changes?*

a. *Categories and related descriptors, index values and colors.* The PSI currently incorporates the pollutants

O_3, PM, CO, SO_2, and NO_2. Index values range from 0 to 500,[7] and the index is segmented into five categories named by descriptor words that were chosen to characterize the relationship between daily air quality and public health. To reflect better the current understanding of the health effects associated with exposure to these air pollutants, we are proposing to revise the PSI index values, descriptors, and associated colors as shown below in Table 1.

Table 1. Proposed Category Index Values, Descriptors, and Colors.

Index Values	**Descriptor**	**Color**	**Purpose**
0 - 50	Good	Green	Convey positive message about air quality
51 - 100	Moderate	Yellow	Convey message that daily air quality is acceptable from public health perspective, but every day in this range could result in potential for chronic health effects; and for O_3, convey a limited health notice for extremely sensitive individuals
101 - 150	Unhealthy for Sensitive Groups	Orange	Health message for members of sensitive groups
151 - 200	Unhealthy	Red	Health advisory of more serious effects for sensitive groups and notice of possible effects for general population when appropriate

[7]For NO_2, the index ranges from 200 to 500, since there is no short-term NAAQS for this pollutant.

201 - 300	Very Unhealthy	Purple	Health alert of more serious effects for sensitive groups and the general population
301 - 500	Hazardous	Maroon	Health warnings of emergency conditions

These proposed changes reflect the addition of a new category above the level of the standard (above a PSI of 100), created by dividing the current “unhealthful” category into two categories. The “unhealthy for sensitive groups” category would start just above the level of the standard, and index values would range from 101 to 150. The “unhealthy” category would start at an index value of 151 and range to an index value of 200.

When air quality is in the “unhealthy for sensitive groups” range, people that are in the sensitive group, whether the sensitivity is due to medical conditions, exposure conditions, or inherent sensitivity, may experience exposures of concern. However, exposure to ambient concentrations in this range are not likely to result in exposures of concern for most healthy people. The descriptor “unhealthy for sensitive groups” was chosen to convey this message clearly. Participants in focus groups clearly understood that “sensitive groups” does not refer to the general public, indicating that this descriptor

effectively communicates the intended health message. This category would include a caution that while perhaps of interest to all citizens, would be of particular interest to individuals and families of individuals who are members of sensitive groups.

As air quality moves into the “unhealthy” range, exposures are associated with an increase in the number of individuals who could potentially experience effects and includes a greater proportion of members of the general public. Based on input received on the staff draft revisions, the descriptor “unhealthy” appropriately characterizes air quality in this range and does not need to be modified further by the word “generally” as in the staff draft.

In addition to an increasing number of exposures of concern, when air quality moves into the “unhealthy” range and above, individuals who were affected at lower levels, typically members of sensitive groups, are likely to experience more serious health effects than members of the general public. To reflect this understanding, it is appropriate to convey two messages in the cautionary statements for both the “unhealthy” and “very unhealthy” categories. One message is directed to members of sensitive groups, and the other is directed to the general public. The use of a distinct cautionary message for members of

sensitive groups is entirely consistent with an original goal that the index be based on the relationships between pollutant concentrations and adverse health effects within various groups, e.g., aggravation of disease in people with respiratory disease and incidence of respiratory effects in healthy people. Guidance on pollutant-specific cautionary statements related to the categories of the PSI is discussed below in section II.C.3.

We are not proposing to add a new category or subcategory below the numerical level of the standard to caution extremely sensitive individuals, as was previously contemplated or included in the staff draft. While commenters on the O_3 NAAQS proposal broadly endorsed expanding the use of the PSI to provide more specific health information around the level of the standard, many commenters did not support the addition of another category below the level of the standard to convey this message. Many commenters expressed the view that the addition of two new categories would unduly complicate the index. Further, we recognize that while such a category may be meaningful and appropriate for O_3, based on the expanded information from the most recent O_3 NAAQS review, it would not be an appropriate distinction for the other pollutants included in the index. Rather, this proposal addresses these issues by setting the breakpoint between good and moderate categories

for O_3 at the concentration where a limited health message for extremely sensitive individuals could appropriately be conveyed and by providing guidance on pollutant-specific cautionary statements for use in conjunction with PSI reporting (discussed in section II.C.3 below and in a related guidance document). This approach is intended to retain simplicity in the index while allowing for more detailed cautionary information to be made available to the public when appropriate.

Consistent with the overarching goal of national uniformity in the reporting of air quality, we are proposing that the specific colors listed in Table 1 be associated with each category. While the PSI can be reported without the use of colors (through text and numbers alone), when the index is reported using colors, we propose to require that only these specified colors be used. Three examples of PSI reports that use color are the color bars that appear in many newspapers, the color scales on State and local agency web sites, and the color contours of the Ozone Map. We have participated in many discussions with State and local agencies and associations regarding which specific colors should be associated with the PSI categories, particularly above the level of the standard. These discussions typically have been in the context of either the Ozone Mapping Project or community action programs. It is clear

that the color associated with a category can be part of the health effects and cautionary message being conveyed, and that different colors convey different messages to different people. Were various State and local agencies to use different colors to represent the same category, and thus the same level of air quality, it could well send a confusing message about air quality and associated health effects to the public. Because it is a fundamental goal of the PSI to provide nationally uniform information about daily air quality and the public health messages that are appropriately associated with various daily air quality levels, in a format that is timely and easily understood, we believe that requiring specified colors when the PSI categories are reported in color format is both necessary and appropriate.

Further, we believe that the specific colors being proposed are appropriate for the health messages being conveyed in each category. As discussed in the section above, the results of the focus groups indicate that, above the level of the standard, the combination of colors and descriptors proposed by us effectively communicates the intended health effects message. The comments of focus group participants (SAIC, 1998) support the generally accepted view that the color red sends a strong cautionary message. We believe that this color is most appropriate to

use when effects are likely to occur in the general population, and when more serious effects are likely in members of sensitive groups. We believe that the combination of the use of orange and red for the two categories above the level of the standard appropriately conveys a gradation of concern that is consistent with our understanding of the likely public health effects associated with these categories. We note that the numerical levels of the 8-hour average O_3 NAAQS and the 24-hour average PM NAAQS were set in conjunction with specific forms of these standards which have the effect of allowing multiple days a year during which the level of the standard can be exceeded. These combinations of levels and forms provide the requisite degree of public health protection, even when some days reach air quality levels above the level of the standards. Thus, it is consistent with the selection and definition of these NAAQS that a gradation of colors be used, and that the color red be specified for the PSI category with a stronger cautionary message.

As an alternative to requiring the use of specified colors, we are soliciting comment on the option of recommending, rather than requiring, the use of these colors when reporting agencies choose to report the PSI in color format. In soliciting comment on this alternative, we are seeking to allow communities maximum flexibility in PSI

reporting, while still preserving a nationally uniform air quality index. We therefore request that commenters addressing this issue discuss how this more flexible approach would satisfy the statutory language requiring a nationally uniform air quality index if different colors may be used across the nation to represent the same range of air quality.

b. *Reporting requirements*. We propose to change 40 CFR part 58.50 to require reporting of the PSI in all Metropolitan Statistical Areas (MSAs)[8] with a population over 350,000, instead of all urbanized areas with a population over 200,000. This change is being proposed for consistency with the other monitoring regulations in part 58, which are or will be based on MSAs. This change does not, however, have a significant impact on who is required to report, since virtually the same number of cities would be covered under the proposed reporting requirement as are covered under the existing requirement.

Consistent with early input from State and local agencies, we are proposing to change the rounding conventions used to calculate index values corresponding to pollutant concentrations at and above the numerical level of

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[8]A complete list of MSAs and their boundaries can be found in the Statistical Abstract of the United States (1998).

the NAAQS to be consistent with the rounding conventions used in defining the NAAQS for each pollutant. This will avoid situations where a health advisory could be issued that describes the air as unhealthy, when in fact the numerical level of the standard has not been exceeded. The revised rounding conventions are presented below in the proposed appendix G -- Uniform Air Quality Index and Daily Reporting.

The proposed rule retains the requirements to identify the area for which the PSI is being reported, the time period covered by the report, the “critical” pollutant for which the reported PSI value was derived, the PSI value, and the associated category descriptor. The proposed rule adds two requirements, 1) to report the associated category color if a color format is used and, 2) to report all PSI values greater than 100. Because different sensitive groups are at-risk from different pollutants, issuing advisories for all sensitive groups who may be affected at PSI values greater than 100 clearly improves public health protection. The proposed rule continues to encourage, but does not require, that PSI reports include the PSI for sub-divisions of the MSA (if there are important differences in air quality across sub-divisions of the MSA), the actual pollutant concentrations, possible causes for high index values, and appropriate health effects and cautionary

statements (based on the guidance discussed in section II.C.3 below). These topics are also discussed in our updated "Guideline for Public Reporting of Daily Air Quality - Pollutant Standards Index (PSI)" (EPA 1998b).

The proposed rule emphasizes the importance of forecasting the PSI by specifying that forecasted values should be reported, when possible, but does not require that forecasted values be reported. Given the importance of the O_3 sub-index in a large number of MSAs, and the use of an 8-hour averaging time for calculating the O_3 sub-index value, forecasting the O_3 index value is now more beneficial than before. For a health advisory system to be effective, people need to be notified as early as possible to be able to avoid exposures of concern. Because the proposed O_3 sub-index is based on the 8-hour O_3 NAAQS, forecasting O_3 concentrations clearly would have increased value in providing cautionary statements to the public. In the past, when a health advisory was issued because the PSI value of 100 had been exceeded for the 1-hour O_3 NAAQS, people potentially had time to avoid exposures of concern because O_3 levels tend to remain elevated for several hours during the day. With an 8-hour standard, however, this would not be the case, since by the time the level of the 8-hour NAAQS has been exceeded and a health advisory issued, the potential for exposures of concern would likely have passed

for that day. Forecasting 8-hour maximum O_3 concentrations would facilitate the risk-reduction function of the PSI by giving people time to limit or avoid exposures of concern. We recognize that many State and local air agencies are already issuing health advisories based on forecasted O_3 concentrations. Since we have determined that forecasting would add much to the benefits of PSI reporting, we will be making available guidance on starting a forecasting program (EPA 1999) in an area or MSA where forecasting is not presently done. Included in the document will be guidance on using hourly O_3 concentrations as predictors for 8-hour averages.

c. *Index name*. Many State and local agencies have encouraged us to change the name of the PSI to the Air Quality Index, or AQI, since many agencies already use the name AQI when reporting the PSI value to the public. Most participants in the focus groups preferred the name AQI, commenting that it more clearly identified the index as relating to the quality of the air rather than to environmental pollution in general. On the other hand, we note that changing the name may result in confusion due to historical familiarity and usage, not only in the U.S. but internationally, since the PSI has been used by many countries throughout the world for many years. Based on these considerations, we are soliciting comment on changing

the name of the Pollutant Standards Index (PSI) to the Air Quality Index (AQI).

2. *What are the proposed changes to the sub-indices*? To conform to the proposed general changes to the PSI discussed above, and to reflect the recent revisions to the O_3 and PM NAAQS, we are proposing changes to the sub-indices for O_3, PM, CO, and SO_2; no conforming changes are necessary for the NO_2 sub-index. The proposed sub-indices are summarized below in Table 2, in terms of pollutant concentrations that correspond to breakpoints in the index, and are discussed in the following sections. These sub-indices are presented in more detail in the proposed appendix G to reflect the proposed changes to the numerical rounding conventions for calculating index values.

Table 2. -- Breakpoints for O_3, $PM_{2.5}$, PM_{10}, CO, and SO_2 Sub-indices

PSI value	O_3		PM		CO, 8-hr (ppm)	SO_2, 24-hr (ppm)
	8-hr (ppm)	1-hr (ppm)	$PM_{2.5}$, 24-hr ($\mu g/m^3$)	PM_{10}, 24-hr ($\mu g/m^3$)		
50	0.07	-	15	50	4	0.03
100	0.08	0.12	65	150	9	0.14
150	0.10	0.16	100*	250	12	0.22
200	0.12	0.20	150*	350	15	0.30
300	0.40 (1-hr)	0.40	250*	420	30	0.60

400	0.50 (1-hr)	0.50	350*	500	40	0.80
500	0.60 (1-hr)	0.60	500*	600	50	1.00

*If a different SHL for $PM_{2.5}$ is promulgated, these numbers will change accordingly.

a. *Ozone sub-index*. On July 18, 1997, we revised the O_3 primary NAAQS to replace the 1-hour standard with a new standard with an 8-hour average at a level of 0.08 ppm and a form based on the 3-year average of the annual fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area (62 FR 38856-38896). These revisions were based on findings from the most recent review of the NAAQS indicating that the new primary standard will provide increased protection to the public, especially children active outdoors and other sensitive groups, against a wide range of O_3-induced health effects, including decreased lung function; increased respiratory symptoms; hospital admissions and emergency room visits for respiratory causes, among children and adults with pre-existing respiratory disease such as asthma; inflammation of the lung; and possible long-term damage to the lungs. In setting this standard, we recognized that there is no discernible threshold below which health effects do not occur, that the standard is not risk free, and, thus, that exposures of concern are possible below the numerical level

of the standard for some extremely sensitive individuals.

Based on feedback on the staff draft, above a PSI value of 100, we propose to adopt the revisions to the O_3 sub-index that were presented in the staff draft, and to make changes to the staff draft below that value. The proposed revisions to the O_3 sub-index above the level of the standard, and the rationale for these proposed revisions, are discussed above in section II.B.2. Below the level of the standard, at a PSI value of 50, we propose that 0.07 ppm, 8-hour average, be the breakpoint between the good and moderate categories. As in the staff draft, this concentration is judged by staff as an appropriate breakpoint for starting to convey a limited health message for extremely sensitive individuals. This breakpoint was adopted because comments received indicated that the draft subcategories within the moderate category created confusion, and that having a distinct subcategory within moderate with no health message was unnecessary. We recognize that this breakpoint defines a category with a somewhat narrower range of concentrations. However, we believe this breakpoint makes an important distinction to emphasize the limited health message for extremely sensitive individuals. The effect of this range on forecasting is addressed in the forecasting guidance. Beyond this issue, comments received on the staff draft O_3 sub-index, discussed

in section II.B.4, have been generally positive and have focused on the presentation of the sub-index through the Ozone Mapping Project and on the wording of associated cautionary statements included as guidance. These proposed revisions are consistent with the proposed general changes to the PSI discussed above in section II.C.1.a.

These proposed revisions reflect the new 8-hour O_3 NAAQS and will in almost all areas result in a more health protective index than the current index based on the 1-hour O_3 standard. However, we recognize that a very small number of areas in the U.S. have atypical air quality patterns, with very high 1-hour daily peak O_3 concentrations relative to the associated 8-hour average concentrations. In such areas, the use of the current 1-hour sub-index may be more health protective on a given day than the proposed 8-hour sub-index. To allow for the reporting of the more health protective sub-index value, we also propose to retain the 1-hour sub-index at and above PSI values of 100 and to allow the reporting of the higher of the two O_3 sub-index values. Thus, both the new 8-hour and the current 1-hour sub-indices, as shown in Table 2, are included in the proposed appendix G. To conform to the proposed general changes to the PSI, a breakpoint of 0.16 ppm, 1-hour average, has been added to the 1-hour sub-index at a PSI value of 150. This value is the mid-point of the breakpoints at PSI values of

100 and 200. Since for the large majority of areas the 8-hour sub-index will be more health protective, we are not proposing to require all areas to calculate both sub-index values. Rather, we are proposing to allow areas the flexibility to calculate both sub-index values and, when both sub-index values are calculated, to require that the higher value be reported. We are specifically soliciting comment on this proposed approach.

b. *PM sub-index*. On July 18, 1997, we revised the PM NAAQS by adding a new set of standards for fine particles, or $PM_{2.5}$, set at levels of 15 µg/m_3 (annual) and 65 µg/m_3 (24-hour average) (62 FR 38652-38760). These revisions were based on findings from the most recent review of the PM NAAQS that recently published studies have indicated that serious health effects were more closely associated with the levels of the smaller particle subset of PM_{10}. These health effects include premature mortality and increased hospital admissions and emergency room visits, primarily in the elderly and individuals with cardiopulmonary disease; increased respiratory symptoms and disease in children and individuals with cardiopulmonary disease such as asthma; decreased lung function, particularly in children and individuals with asthma; and alterations in respiratory tract defense mechanisms. In addition, PM_{10} standards were retained at the same levels of 50 µg/m^3 (annual) and 150

$\mu g/m^3$ (24-hour average) to continue to provide protection against health effects associated with the coarse particle subset of PM_{10}, including aggravation of asthma and respiratory infections. To reflect these revisions to the PM NAAQS, we are proposing to add a new sub-index for $PM_{2.5}$, and to make conforming changes to the sub-index for PM_{10}, consistent with the proposed general changes to the PSI described above in section II.C.1.a. These proposed sub-indices are summarized above in Table 2 and discussed below.

New $PM_{2.5}$ sub-index. Consistent with the basic structure of the PSI, an index value of 100 corresponds to the level of the 24-hour $PM_{2.5}$ NAAQS, 65 $\mu g/m^3$, and an index value of 50 corresponds to the level of the annual NAAQS, 15 $\mu g/m^3$. Also consistent with the basic structure of the PSI, the upper bound index value of 500 corresponds to the SHL, established in section 51.16 of the CFR under the Prevention of Air Pollution Emergency Episodes program. The SHL is set at a level that represents an imminent and substantial endangerment to public health. In mid-1999, we will propose revisions to the Prevention of Air Pollution Emergency Episodes program, which will include an SHL for $PM_{2.5}$. In advance of proposing an SHL for $PM_{2.5}$, we are now proposing to establish a $PM_{2.5}$ concentration[9] to be associated with a

[9]Should the final SHL for $PM_{2.5}$, when promulgated, be different from this concentration, we will revise this $PM_{2.5}$

$PM_{2.5}$ index value of 500.

In proposing to establish this $PM_{2.5}$ concentration to be associated with a $PM_{2.5}$ index value of 500, the primary focus is on evidence linking mortality with increases in PM concentration. The current SHL for PM_{10} (600 μg/m^3) was established on the basis of the increased mortality found during historical wintertime pollution episodes in London, where PM concentrations, measured as British Smoke, were in the range of 500 to 1000 μg/m^3 (52 FR 24687-24688). We believe that these studies still provide the best scientific support for significant harm levels for PM. British Smoke provides an approximate measurement of fine particles, since it is considered to measure PM with a cut-point of approximately 4.5 microns. While some coarse mode particles are included, it has been found that mainly fine mode particles are collected using the British Smoke method. In establishing the SHL for PM_{10}, we used an assumption that a concentration of PM_{10} can be estimated by adding 100 to a concentration measured in terms of British Smoke (52 FR 24688). For the purposes of proposing to establish a $PM_{2.5}$ concentration to be associated with a $PM_{2.5}$ index value of 500, we are assuming that particle mass concentration measured by the British Smoke method is approximately

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sub-index accordingly.

equivalent to a $PM_{2.5}$ mass concentration.

For intermediate breakpoints in the PSI between values of 100 and 500, $PM_{2.5}$ concentrations are proposed that generally reflect a linear relationship between increasing index values and increasing $PM_{2.5}$ values. The available scientific evidence of health effects related to population exposures to $PM_{2.5}$ concentrations between the 24-hour NAAQS level and the proposed SHL suggest a continuum of effects in this range, with increasing $PM_{2.5}$ concentrations being associated with increasingly larger numbers of people likely experiencing serious health effects (62 FR 38675; Staff Paper, p. VII-27) The proposed generally linear relationship between PSI values and $PM_{2.5}$ concentrations in this range, rounded to increments of 50 μg/m^3 to reflect the approximate nature of such a relationship, is consistent with this evidence.

Conforming changes to the PM_{10} sub-index. Consistent with the retention of the levels of the PM_{10} NAAQS, we are proposing to retain the PM_{10} sub-index generally and to add a new breakpoint at an index value of 150 to conform to the proposed additional PSI category. We propose that this breakpoint be set at a PM_{10} 24-hour average concentration of 250 μg/m^3, the mid-point between the breakpoints associated with index values of 100 and 200. We believe that the PM_{10} sub-index, with this conforming change, remains appropriate

for the public health protection purposes of the PSI.

c. *Conforming changes to the CO and SO_2 sub-indices*. Since the current PSI sub-indices reflect the current NAAQS for CO and SO_2, the only change being proposed today for these sub-indices is to add a breakpoint to each sub-index at an index value of 150 to conform to the proposed additional PSI category. We propose that these breakpoints be set at concentrations at the mid-points between the breakpoints associated with index values of 100 and 200, consistent with the approach described above for conforming changes to both the 1-hour O_3 sub-index and the PM_{10} sub-index. These proposed breakpoints are summarized in Table 2 and presented in more detail in appendix G to reflect the proposed changes to the numerical rounding conventions used to calculate index values. These sub-indices will be reviewed in conjunction with the future reviews of the CO and SO_2 NAAQS.

3. *What are the changes to related informational materials*? We have edited related informational materials on O_3 prepared in conjunction with the staff draft O_3 sub-index, such as the cautionary statements, to reflect the input from the focus groups and from national, State and local agencies and associations. The edits include some of the wording changes suggested to the cautionary statements,

as well as clarification of the health/air quality message associated with the moderate category. In the “unhealthy” and “very unhealthy” categories, there are distinct cautionary statements for members of sensitive groups and the general public. In addition, because different conditions make individuals and groups susceptible to the effects of different air pollutants, we have developed pollutant-specific health effects and cautionary statements for the other pollutants in the index, including $PM_{2.5}$, PM_{10}, CO, SO_2, and NO_2. The health effects and cautionary statements may be found on AIRLINKS (http://www.epa.gov/airlinks). Our draft guidance on PSI reporting, “Guideline for Public Reporting of Daily Air Quality -- Pollutant Standards Index (PSI)” (EPA 1998b), which includes the health effects and cautionary statements, is available in the docket and on AIRLINKS.

The brochure “The Pollutant Standards Index” (EPA 1994), contains information about the general health effects associated with each category, and precautions that sensitive groups and the general public should take to avoid exposures of concern. Currently, it contains one set of health effects and cautionary statements that are generally applicable to all of the pollutants currently included in the PSI, and does not identify specific sensitive groups for each of the pollutants. In changes to this brochure, we

will revise the categories and descriptors to be consistent with final revisions to the PSI, identify sensitive groups in the health effects statements for each of the pollutants, and will include the pollutant-specific health effects and cautionary statements discussed above.

The booklet, “SMOG - Who Does It Hurt?,” was developed using health effects information from the review of the standard and therefore already incorporates the concepts of sensitive groups and a continuum of effects to background levels of O_3. Revisions to this booklet will be based on final revisions to the PSI, information from the focus groups, and comments from national, State and local agencies and associations. Based on these comments, the distinction between stratospheric and ground-level O_3 will be made clearer, and the section “What does exertion have to do with O_3-related health effects?” will include clarification of the effect of individual conditioning on exertion levels. In addition, we are planning to develop a shorter, summary brochure about O_3 health effects to complement the “SMOG - Who Does It Hurt?” booklet, to translate both “SMOG - Who Does It Hurt?” and the shorter summary booklet into Spanish, and to develop informational materials about O_3 health effects for primary care providers. All of these documents will be made available when revisions to the PSI are final, including on the AIRNOW web site.

III. **Regulatory and Environmental Impact Analyses**

A. *Executive Order 12866: OMB review of “significant actions”*

Under Executive Order 12866, the Agency must determine whether a regulatory action is "significant" and, therefore, subject to Office of Management and Budget (OMB) review and the requirements of the Executive Order. The order defines "significant regulatory action" as one that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

(2) create a serious inconsistency or otherwise interfere with an action taken or planned by another Agency;

(3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations or recipients thereof; or

(4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

The OMB has advised us this proposal should be construed as a "significant regulatory action" within the meaning of Executive Order 12866. Accordingly, this action was

submitted to the OMB for review. Any changes made in response to OMB suggestions or recommendations will be documented in the public record and made available for public inspection at EPA's Air and Radiation Docket Information Center (Docket No. A-98-20).

B. *Regulatory Flexibility Analysis/Small Business Regulatory Enforcement Fairness Act*

Under the Regulatory Flexibility Act (RFA), 5 U.S.C. 601 et seq., EPA must prepare a regulatory flexibility analysis assessing the impact of any proposed or final rule on small entities. Under 6 U.S.C. 605(b), this requirement may be waived if EPA certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small not-for-profit enterprises, and governmental entities with jurisdiction over populations less than 50,000 people.

Today's proposal to revise the PSI program modifies existing air quality reporting requirements for MSA's with populations over 350,000 people. Today's proposal, if promulgated, will not establish any new regulatory requirements affecting small entities. On the basis of the above considerations, EPA certifies that today's proposal will not have a significant economic impact on a substantial number of small entities within the meaning of the RFA.

Based on the same considerations, EPA also certifies that the new small-entity provisions in Section 244 of the Small Business Regulatory Enforcement Fairness Act (SBREFA) do not apply.

C. *Unfunded Mandates Reform Act*

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any 1 year.

EPA has determined that today’s proposal, if promulgated, would not include a Federal mandate that may result in estimated costs of $100 million in any 1 year to either State, local, or tribal governments, in the aggregate, or to the private sector. Accordingly, EPA has determined that the provisions of section 202 of the UMRA do not apply to this rulemaking.

D. *Paperwork Reduction Act*

Today’s proposal does not establish any new information

collection requirements beyond those which are currently required under the Ambient Air Quality Surveillance Regulations in 40 CFR part 58 (OMB #2060-0084, EPA ICR No. 0940.15). Therefore, the requirements of the Paperwork Reduction Act do not apply to today's action.

E. *Executive Order 13045: Children's Health*

Executive Order 13045, entitled "Protection of Children from Environmental Health Risks and Safety Risks" (62FR19885, April 23, 1997), requires Federal agencies to ensure that their policies, programs, activities, and standards identify and assess environmental health and safety risks that may disproportionately affect children. In today's proposal, EPA identified children as one of the sensitive groups which may be at increased risk of experiencing the effects of concern following exposure to ozone. The proposed PSI categories, descriptors, and cautionary statements all take into consideration the increased health risk to children which may result from such exposures. Therefore, today's action does comply with the requirements of E.O. 13045.

F. *Executive Order 12848: Environmental Justice*

Executive Order 12848 requires that each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate,

disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minorities and low-income populations in the United States.

The nature of today's action is to inform the general public, including minorities and low-income populations, about the nature of the air pollution in the areas they live. Today's action establishes a uniform tool for States to use to develop programs which will caution particularly sensitive people to minimize their exposures and educate the public about general health effects associated with exposure to different pollution levels. States may also use information established as part of the PSI to trigger programs designed to reduce emissions to avoid exceedances of the NAAQS. Therefore, today's action will help facilitate public participation, outreach, and communication in areas where environmental justice issues are present.

G. *Executive Order 12875: Enhancing Intergovernmental Partnerships*

Under Executive Order 12875, EPA may not issue a regulation that is not required by statute and that creates a mandate upon a State, local or tribal government, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by those governments,

or we will consult with those governments. If EPA complies by consulting, Executive Order 12875 requires us to provide to OMB a description of the extent of our prior consultation with representatives of affected State, local and tribal governments, the nature of their concerns, copies of any written communications from the governments, and a statement supporting the need to issue the regulation. In addition, Executive Order 12875 requires us to develop an effective process permitting elected officials and other representatives of State, local and tribal governments "to provide meaningful and timely input in the development of regulatory proposals containing significant unfunded mandates."

Today's rule implements requirements specifically set forth by the Congress in section 319 of the Act without the exercise of any discretion by us. Accordingly, the requirements of section 1(a) of Executive Order 12875 do not apply to this rule.

H. *Executive Order 13084: Consultation and Coordination with Indian Tribal Governments*

Under Executive Order 13084, EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian tribal governments, and that imposes substantial direct

compliance costs on those communities, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the tribal governments, or EPA will consult with those governments. If EPA complies by consulting, Executive Order 13084 requires us to provide to OMB, in a separately identified section of the preamble to the rule, a description of the extent of our prior consultation with representatives of affected tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires us to develop an effective process permitting elected officials and other representatives of Indian tribal governments "to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities."

Today's rule implements requirements specifically set forth by the Congress in section 319 of the Act without the exercise of any discretion by us. Accordingly, the requirements of section 3(b) of Executive Order 13084 do not apply to this rule.

I. *National Technology Transfer and Advancement Act*

As noted in the proposed rule, Section 12(d) of the National

Technology Transfer and Advancement Act of 1995 (NTTAA), Pub L. No. 104-113, § 12(d) (15 U.S.C. 272 note) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies. The NTTAA directs EPA to provide Congress, through OMB, explanations when the Agency decides not to use available and applicable voluntary consensus standards. This action does not involve technical standards. Therefore, EPA did not consider the use of any voluntary consensus standards.

IV. **References**

EPA, (1994) Measuring Air Quality: The Pollutant Standards Index, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards (MD-10), Research Triangle Park, NC, 27711, EPA 451/K-94-001.

EPA, (1997) Review of the National Ambient Air Quality Standards for Particulate Matter: Policy Assessment of Scientific and Technical Information, OAQPS Staff Paper, Office of Air Quality Planning and Standards, Research

Triangle Park, NC 27711, EPA-452/R-96-013.

EPA, (1998a) Community Action Programs: Blueprint for Program Design, U.S. Environmental Protection Agency, Office of Mobile Sources, Ann Arbor, MI, EPA 420-R-98-003.

EPA, (1998b) Guideline for Public Reporting of Daily Air Quality - Pollutant Standards Index (PSI), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 27711, draft document.

EPA, (1999) Guideline for Starting an Air Pollution Forecasting Program, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 27711, in preparation.

Science Applications International Corporation, (1998) Report of Eight Focus Groups on the Ozone Map, the Pollutant Standards Sub-index for Ozone, and the Ozone Health Effects Booklet, Science Applications International Corporation, McLean, VA.

U.S. Department of Commerce, Statistical Abstract of the United States, 1998, U.S. Bureau of the Census.

Whitfield, R.G.; Biller, W.F.; Jusko, M.J.; Keisler, J.M. (1996) A probabilistic assessment of health risks associated with short-term exposure to tropospheric ozone . Report prepared for U.S. EPA, OAQPS. Argonne National Laboratory; Argonne, IL.

Wolff, G.T., (1995) Letter from Chairman of Clean Air Scientific Advisory Committee to the EPA Administrator, dated November 30, 1995. EPA-SAB-CASAC-LTR-96-002.

List of Subjects in 40 CFR Part 58

Environmental protection, Air pollution control, Air quality surveillance and data reporting, Ambient air quality monitoring network design and siting, Intergovernmental relations, Pollutant standards index, Quality assurance program.

Dated:

_____

_____
Carol M. Browner,
Administrator.

For the reasons set forth in the preamble, chapter I of title 40 of the Code of Federal regulations is proposed to be amended as follows:

PART 58 - AMBIENT AIR QUALITY SURVEILLANCE

1. The authority citation of part 58 continues to read as follows:

Authority: 42 U.S.C. 7410, 7601(a), and 7619.

2. Section 58.50 is revised to read as follows:

§ 58.50 Index reporting.

(a) The State shall report to the general public through prominent notice an air quality index in accordance with the requirements of appendix G to this part.

(b) Reporting is required by all Metropolitan Statistical Areas with a population exceeding 350,000.

(c) The population of a Metropolitan Statistical Area for purposes of index reporting is the most recent decennial U.S. census population.

3. Appendix G is revised to read as follows:

Appendix G - Uniform Air Quality Index and Daily Reporting

GENERAL REQUIREMENTS

1. What is the PSI?
2. Why report the PSI?
3. Must I report the PSI?
4. What goes into my PSI report?

GENERAL REQUIREMENTS

1. <u>What is the PSI?</u>

The Air Quality Index (PSI) is a tool that simplifies reporting air pollution to the general public. The PSI incorporates into a single index concentrations of 5 criteria pollutants: ozone (O_3), particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). The scale of the index is divided up into general categories that are associated with health messages.

2. Why report the PSI?

The PSI offers various advantages:

a. It is simple to create and understand.

b. It conveys the health implications of air quality.

c. It promotes uniform use throughout the country.

3. Must I report the PSI?

You must report the PSI daily if yours is a metropolitan statistical area (MSA) with a population over 350,000.

4. What goes into my PSI report?

Your PSI report must contain the following:

a. The reporting area(s) (the MSA or subdivision of the MSA).

b. The reporting period (the day for which the PSI is reported).

c. The critical pollutant (the pollutant with the highest index value).

d. The PSI (the highest index value).

e. The category descriptor and index value associated with the PSI and, if reported in a color format, the associated color. Use only the following descriptors and colors for the six PSI categories:

for this PSI	use this descriptor	and this color
0 to 50	“Good”	Green
51 to 100	“Moderate”	Yellow
101 to 150	“Unhealthy for Sensitive Groups”	Orange
151 to 200	“Unhealthy”	Red
201 to 300	“Very Unhealthy”	Purple
301 and above	“Hazardous”	Maroon

When appropriate, your PSI report may also contain the following:

a. The name and index value for other pollutants, particularly those with an index value greater than 100.

b. The index values for sub-areas of the reporting area.

c. Actual pollutant concentrations.

d. Causes for unusual PSI values.

5. What colors do I use when I report the PSI?

If reporting in color format, you must use the colors listed above. More specifically the colors you must use are defined in the following table for both red, green, blue (RGB) and cyan, magenta, yellow, and black (CMYK) color formulas.[1]

Table 1. Color Formulations for reporting the PSI.[2]

Color	R	G	B	C	M	Y	K
Green	0	228	0	224	0	224	30
Yellow	255	255	0	0	0	255	0
Orange	255	126	0	0	132	255	0
Red	255	0	0	255	255	0	0
Purple	153	0	76	0	153	80	102
Maroon	76	0	38	0	76	38	179

[1] The RGB model is traditionally used for TV or computer monitor colors while CMYK is traditionally used for color printers.

[2] The color models are based on a 0 - 255 scale (e.g., 50

percent is 126).

6. Is my PSI report for my MSA only?

Generally, your PSI report applies to your MSA only. However, your report does not apply to just your MSA in two situations:

a. If a significant air quality problem exists (PSI greater than 100) in areas next to your MSA but not in it (for example O_3 concentrations are often highest downwind and outside an urban area), your PSI report should apply to these areas also.

b. If different PSI categories apply to different definable parts of your MSA, you should report a separate PSI for each part of your urban area.

7. How do I get my PSI report to the public?

You must furnish the daily report to the appropriate news media (radio, television, and newspapers). You may make the daily report publicly available at one or more places of public access, or you may disseminate it by a recorded phone message or a public Internet site.

8. How often must I report the PSI?

You must report the PSI at least 5 days per week. Exceptions to this requirement are in Section 9 below.

9. May I make exceptions to these reporting requirements?

If the index for a particular pollutant remains below 50 for

a season or year, then you may exclude the pollutant from your calculation of the PSI in Section 13.

If the PSI remains below 50 for a year, then you may report the PSI at your discretion.

CALCULATION

10. How does the PSI relate to air pollution levels?

For each pollutant, the PSI transforms ambient concentrations to a scale from 0 to 500. The PSI is related to the National Ambient Air Quality Standard (NAAQS) for each pollutant. The index value of 100 is always associated with the numerical level of the standard for each pollutant. The index value of 50 is associated with annual standards (if they exist) for each pollutant. Higher categories of the index are based on increasingly serious health effects and increasing proportions of the population that are affected. The EPA relates the index to other air pollution concentrations through linear interpolation based on these levels. The PSI is equal to the highest of the numbers corresponding to each pollutant. The pollutant responsible for the highest number (the reported PSI) is called the “critical” pollutant.

11. Where do I get the pollutant concentrations to calculate the PSI?

You must use concentration data for four of the five PSI criteria pollutants from the State/Local Air Monitoring

Station (SLAMS) or parts of the SLAMS required under 40 CFR 58.20. For PM, you need only calculate and report the PSI on days for which you have measured air quality data (e.g., particulate monitors often report values only every sixth day). You may use particulate measurements from monitors that are not reference or equivalent methods if you can relate these measurements by linear regression to reference or equivalent method measurements.

12. Do I have to forecast the PSI?

You should forecast the PSI at least 24-hours in advance using the most accurate and reasonable procedures considering meteorology, topography, availability of data, and forecasting expertise. Since ozone is a dominant pollutant in air pollution and the form of the ozone standard is an 8-hour average, the timing of how the public is informed is an important issue. In order for affected people to take advantage of this information, it is necessary to consider at least a short term forecast or prediction of 8-hour ozone levels for the purposes of reporting the PSI. Guidance to this appendix suggest ways to do this which require less resources than 24-hour advance forecasts (EPA 1999).

13. How do I calculate the PSI?

The PSI is the highest value calculated for each pollutant as follows:

a. Truncate the pollutant concentration from the monitor recording the highest concentration in the reporting area to one more than the significant digits used in the NAAQS for that pollutant. This is equivalent to the rounding conventions used in the NAAQS.

b. Using Table 2, find the two breakpoints that contain the concentration.

c. Using Equation 1, calculate the index.

d. Round the index to the nearest integer.

Table 2. Breakpoints for the PSI

These Breakpoints						equal these PSIs...		Category
O_3 (ppm) 8-hour	O_3 (ppm) 1-hour[1]	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	CO (ppm)	SO_2 (ppm)	NO_2 (ppm)	PSI	
0.000-0.069	-	0 - 54	0.0 - 15.4	0.0 - 4.4	0.000 - 0.034	([2])	0 - 50	Good
0.070-0.084	-	55 - 154	15.5 - 65.4	4.5 - 9.4	0.035 - 0.144	([2])	51 - 100	Moderate
0.085-0.104	0.125-0.164	155 - 254	65.5 - 100.4[5]	9.5 - 12.4	0.145 - 0.224	([2])	101 - 150	Unhealthy for sensitive groups
0.105-0.124	0.165-0.204	255 - 354	100.5[5] - 150.4[5]	12.5 - 15.4	0.225 - 0.304	([2])	151 - 200	Unhealthy
0.125-0.374 (0.155-0.404)[4]	0.205-0.404	355 - 424	150.5[5] - 250.4[5]	15.5 - 30.4	0.305 - 0.604	0.65 - 1.24	201 - 300	Very unhealthy
([3])	0.405-0.504	425 - 504	250.5[5] - 350.4[5]	30.5 - 40.4	0.605 - 0.804	1.25 - 1.64	301 - 400	Hazardous
([3])	0.505-0.604	505 - 604	350.5[5] - 500.4[5]	40.5 - 50.4	0.805 - 1.004	1.65 - 2.04	401 - 500	

[1] Areas are required to report the PSI based on 8-hour ozone values. However, there are areas where a PSI based 1-hour ozone values would be more protective. In these cases, the index for both the 8-hour and the 1-hour ozone values may be calculated and the maximum PSI reported.

[2] NO_2 has no short-term NAAQS and can generate a PSI only above a PSI value of 200.

[3] 8-hour O_3 values do not define higher PSI values ($\geq$ 301). PSI values of 301 or higher are calculated with 1-hour O_3 concentrations.

[4] The numbers in parentheses are associated 1-hour values to be used in this overlapping category only.

[5] If a different SHL for $PM_{2.5}$ is promulgated, these numbers will change accordingly.

If the concentration is equal to a breakpoint, then the index is equal to the corresponding index in Table 2. However, Equation 1 can still be used. The results will be equal. If the concentration is between two breakpoints, then calculate the index of that pollutant with Equation 1. You must also note that in some areas, the PSI based on 1-hour O_3 will be more protective than using 8-hour values (see footnote 1 to Table 2). In these cases you may use 1-hour values as well as 8-hour values to calculate the index and then use the maximum PSI value as the index for O_3.

Equation 1

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{HI} - BP_{Lo}}(C_p - BP_{Lo}) + I_{Lo}.$$

Where I_p = the index for pollutant $_p$

C_p = the truncated concentration of pollutant $_p$

BP_{Hi} = the breakpoint that is greater than or equal to C_p

BP_{Lo} = the breakpoint that is less than or equal to C_p

I_{Hi} = the PSI value corresponding to BP_{Hi}

I_{lo} = the PSI value corresponding to BP_{Lo}.

If the concentration is larger than the highest breakpoint in Table 2 then you may use the last two breakpoints in Table 2 when you apply Equation 1. If your O_3 values (1-hour and 8-hour) are

in the overlapping category (very unhealthy, see footnote 4 to Table 2) then you must use Equation 1 for both values and use the larger index value for O_3.

14. How do I use Table 2 and Equation 1 to calculate the PSI?

If you observe a 1-hour O_3 value of 0.156 ppm, an 8-hour O_3 value of 0.130 ppm, and a PM_{10} value of 210 µg/m^3, then do this:

a. Find the breakpoints for PM_{10} at 210 µg/m^3 as 205 µg/m^3 and 354 µg/m^3 corresponding to index values 151 and 200;

b. Find the breakpoints for 1-hour O_3 at 0.156 ppm as 0.155 ppm and 0.404 ppm corresponding to index values 201 and 300;

c. Find the breakpoints for 8-hour O_3 at 0.130 ppm as 0.125 ppm and 0.374 ppm corresponding to index values 201 and 300;

d. Apply Equation 1 for 210 µg/m^3, PM_{10}:

$$\frac{200-151}{354-205}(210-205)+151=153.$$

e. Apply Equation 1 for 0.156 ppm, 1-hour O_3:

$$\frac{300-201}{.404-.155}(.156-.155)+201=201$$

f. Apply Equation 1 for 0.130 ppm, 8-hour O_3 :

$$\frac{300-201}{.374-.125}(.130-.125)+201=203$$

g. Find the maximum, 203. This is the PSI.

BACKGROUND AND REFERENCE MATERIALS

15. What additional information should I know?

The EPA has developed a computer program to calculate the PSI for you. The program works with Windows 95, it prompts for inputs, and it displays all the pertinent information for the PSI (the index, color, category, health effects, and cautionary language). You can download the program at www.epa.gov/airnow. The EPA also publishes a brochure on the PSI that explains the index in detail (EPA 1999b), guidance that provides associated health effects and cautionary statements (EPA 1998), and guidance that explains the steps necessary to start an air pollution forecasting program (EPA 1999a).

16. References

EPA, (1998) Guideline for Public Reporting of Daily Air Quality-Pollutant Standards Index (PSI), U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, 27711, draft document.

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