Chapter 8

Looking Beyond Current Requirements

U.S. EPA periodically reviews existing air quality standards in light of emerging epidemiological and toxicology studies. More stringent standards with new attainment deadlines present additional challenges for the Basin that need to be considered in the planning process.

In This Chapter

Introduction

This chapter presents additional analyses which are not legally required, but are presented here for informational purposes to initiate stakeholder discussion on future air quality planning. The content will also help place the 2016 AQMP in context with the long-range transformation needed for this region to meet more recently promulgated health-based air quality standards.

Criteria Pollutant NAAQS Review

CAA Section 109(d) requires U.S. EPA to periodically review the existing air quality standards in light of findings of new and emerging epidemiological and health studies. If appropriate, such review may consider revision of existing air quality standards to reflect advances in scientific knowledge on the effects of the pollutant on public health and welfare. U.S. EPA reviews the scientific basis for these standards by preparing an Integrated Science Assessment (ISA), formerly called an Air Quality Criteria Document (AQCD). The evidence and conclusions presented in the ISA directly inform the technical and policy assessments conducted by the Office of Air Quality Planning and Standards (OAQPS). Collectively, these documents form the scientific and technical bases for the U.S. EPA's decisions on the adequacy of existing NAAQS and the appropriateness of new or revised standards. This process is a five-year review cycle that considers the following:

Established in 1977 under the CAA Amendments of 1977 *(42 U.S.C. § 7409(d)(2))* and part of U.S. EPA's Science Advisory Board (SAB), the Clean Air Scientific Advisory Committee (CASAC) provides independent advice to the U.S. EPA Administrator on the technical basis for the NAAQS, as well as addresses research related to air quality, sources of air pollution, the strategies to attain and maintain air quality standards, and to prevent significant deterioration of air quality. More specifically, CASAC is charged with independent expert scientific review of U.S. EPA's draft ISAs and other technical and policy assessments. CASAC provides advice to the U.S. EPA Administrator on the technical foundation for the NAAQS based on a peer review of extensive scientific information. The advice provided by CASAC assists the U.S. EPA in deciding whether the existing primary standard[1] is "requisite to protect public health with adequate margin of safety." A secondary standard[2] must "specify a level of air quality the attainment and maintenance of which is requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutant in the ambient air." Primary standards are designed to protect public health, such as the health of "sensitive" populations, including persons with asthma, children, and the elderly. Secondary standards protect public welfare, such as protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Figure 8-1 provides an overview of the U.S. EPA process in establishing, approving, and re-evaluating a NAAQS for a particular pollutant.

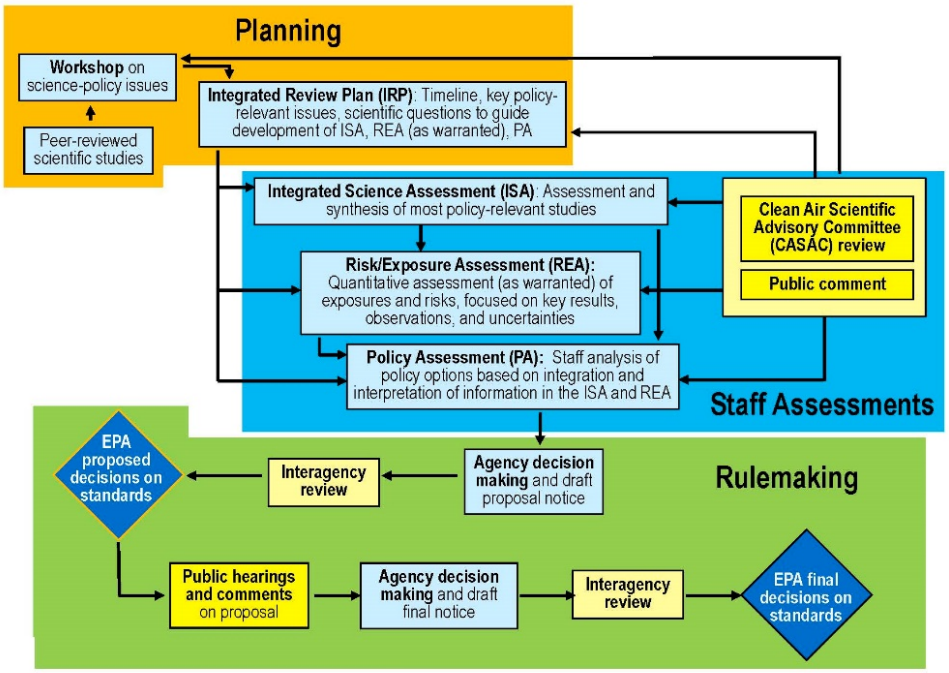

FIGURE 8-1 OVERVIEW OF THE U.S. EPA NAAQS REVIEW PROCESS

[1] CAA § 109 (b)(1), 42 U.S.C. 7409.

[2] CAA § 109 (b)(2), 42 U.S.C. 7409.

Changes in the Federal Ozone Standard

Background

Since the adoption of the 2008 8-hour ozone NAAQS of 0.075 ppm, the U.S. EPA carefully evaluated the latest available scientific literature on the health and welfare effects (primary and secondary standards, respectively) of ozone, focusing particularly on the new literature available since the conclusion of the previous review in 2008. In January 2010, U.S. EPA proposed to revise the 8-hr ozone NAAQS in the range of 0.060 ppm to 0.070 ppm. In September 2011, consistent with the direction of President Obama, the Administrator of the Office of Information and Regulatory Affairs (OIRA), Office of Management and Budget (OMB), returned the draft final rule to U.S. EPA for further consideration. Between 2008 and 2014, U.S. EPA prepared draft and final versions of the Integrated Review Plan (IRP), Integrated Science Assessment (ISA, the Health and Welfare Risk and Exposure Assessment (REA), and the Policy Assessment (PA). Multiple drafts of these documents were available for public review and comment and were peer-reviewed by CASAC. The final documents reflect U.S. EPA staff's consideration of the comments and recommendations made by CASAC and the public on draft versions of these documents.

In April 2014, the U.S. Court of Appeals for the District of Columbia issued a ruling ordering U.S. EPA to propose a rule based on latest ozone NAAQS review by December 1, 2014 and finalize by October 1, 2015. Figure 8-2 displays the timeline involved in the recent development and approval of the 8-hour ozone standard.

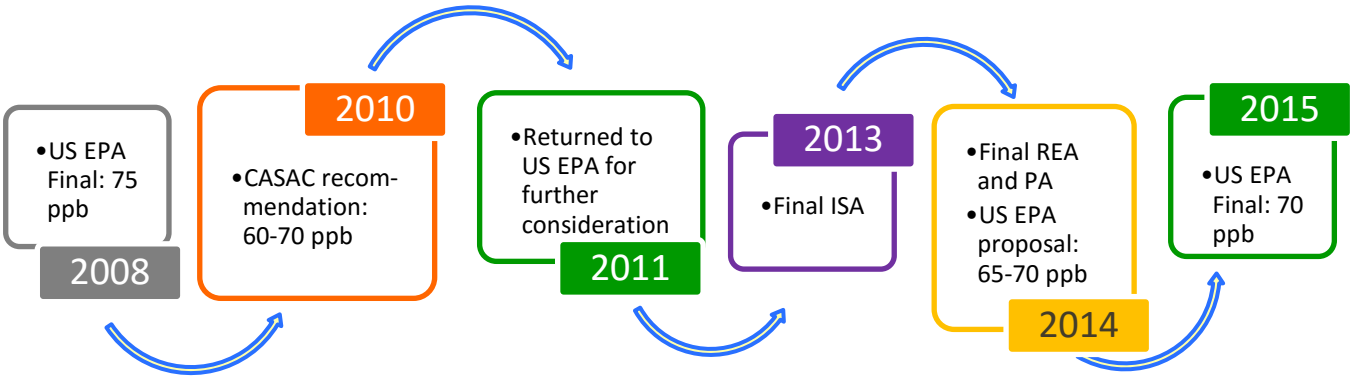

FIGURE 8-2

RECENT DEVELOPMENT AND APPROVAL OF 8-HOUR OZONE STANDARD

On December 17, 2014, U.S. EPA concluded that the primary ozone standard of 0.075 ppm is not requisite to protect public health with an adequate margin of safety, and that it should be revised to provide increased public health protection. Specifically, U.S. EPA proposed to retain the indicator, averaging time (8-hour) and form (annual fourth-highest daily maximum, averaged over three years) of the existing primary ozone standard and proposed to revise the level of that standard to within a range of 0.065 ppm to 0.070 ppm. U.S. EPA proposed this revision to increase public health protection, including for ''at-risk'' populations such as children, older adults, and people with asthma or other lung diseases, against an array of ozone-related adverse health effects. For short-term ozone exposures, these effects include decreased lung function, increased respiratory symptoms and pulmonary inflammation, effects that result in serious indicators of respiratory morbidity such as emergency department visits and hospital admissions, and all-cause (total non-accidental) mortality. For long-term ozone exposures, these health effects include a variety of respiratory morbidity effects and respiratory mortality.

Recognizing that CASAC recommended a range of levels from 0.060 ppm to 0.070 ppm in 2010, and that levels as low as 0.060 ppm could potentially be supported, the U.S. EPA Administrator solicited comments on alternative standard levels below 0.065 ppm, and as low as 0.060 ppm. However, the U.S. EPA Administrator noted that setting a standard below 0.065 ppm, down to 0.060 ppm, would inappropriately place very little weight on the uncertainties in the health effects evidence and exposure/risk information. The secondary standard was also proposed to be revised within the range of 0.065 to 0.070 ppm.

On October 26, 2015, U.S. EPA revised the primary and secondary ozone NAAQS (effective December 28, 2015) to a level of 0.070 ppm (or 70 ppb) retaining their indicators, forms, and averaging times. U.S. EPA also made corresponding revisions in data handling conventions for ozone and changes to the Air Quality Index (AQI), revised regulations for the PSD program to add a transition provision for certain applications, established exceptional events schedules, and provided information related to implementing the revised standards. Figure 8-3 displays the anticipated milestones for the 2015 8-hour ozone NAAQS.

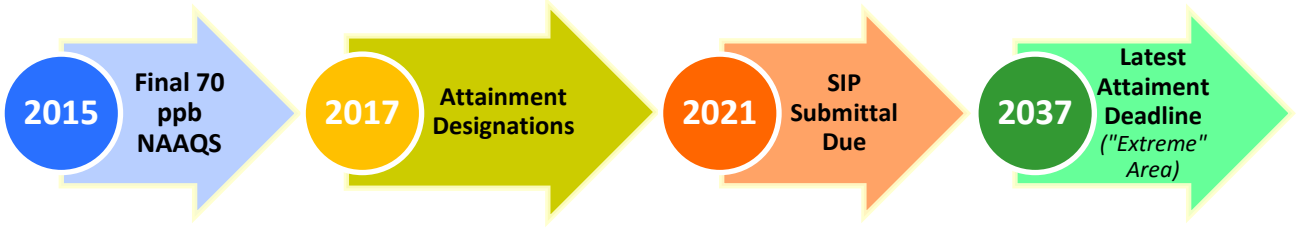

FIGURE 8-3
ANTICIPATED MILESTONES FOR 2015 8-HOUR OZONE NAAQS

Next Steps

After U.S. EPA establishes new or revised NAAQS, the CAA directs U.S. EPA and states to ensure the new or revised NAAQS are met. Areas of the country are identified as either in attainment of the new or revised NAAQS or not in attainment. Upon designation of nonattainment areas, certain states are required to develop SIPs taking into account projected emission reductions from existing federal, state, and local regulations already adopted at the time of the SIP submittal as well as additional measures as may be needed to attain the standards, including specific CAA requirements. Nonattainment designations for the 2015 ozone standard are expected to be identified in 2017 triggering the four-year deadline[3] to submit a Plan by 2021. If the region is determined to be in "extreme" nonattainment, the latest statutory deadline to demonstrate attainment would be approximately 2037 (20 years from the effective date of designation).

Implications of a New Ozone Standard for the Basin

Based on the modeling results presented in Chapter 5 and Appendix V (Modeling and Attainment Demonstration), the Basin can demonstrate attainment with the existing federal 8-hour ozone standards by the corresponding attainment deadlines (2023 and 2032). In order to meet the 80 ppb ozone level in 2023 and 75 ppb in 2031, an approximate additional 45 percent and 55 percent reduction, respectively, in NOx emissions will be necessary beyond already adopted measures. In some areas, VOC reductions are not as effective as NOx reductions, but certain concurrent VOC reductions would reduce some of the needed NOx reductions. A full discussion of the emission reductions needed to meet current ozone standards is included in Chapter 5 and Appendix V.

As stated above, the 8-hour ozone standard has been lowered to a level of 70 ppb in 2015. Therefore, in order to demonstrate attainment in the 2037 time frame, an additional 62 percent NOx emission reduction is anticipated to be needed from the 2037 baseline. Assuming the 75 ppb standard is met in 2031 with a 96 TPD NOx carrying capacity helps to illustrate the significant reductions needed to meet a new 70 ppb 8-hour ozone standard. A 70 ppb standard represents an approximately 25 TPD additional NOx reduction between 2031 and 2037. NOx emission reductions continue to be the most effective strategy to lower ozone levels.

[3] Based on CAA, Title I, Part D, Subpart 2, §182 and Final Ozone Implementation Rule (March 2015) for ozone attainment demonstration four years after effective date of designation.

Review of Federal PM Standards

On December 3, 2014, the U.S. EPA's Office of Research and Development's National Center for Environmental Assessment (NCEA) announced that it is preparing an ISA as part of the review of the primary and secondary NAAQS for PM. This ISA is intended to update the scientific assessment presented in the "ISA for Particulate Matter" published in December 2009. The public and interested parties were invited to assist U.S. EPA in developing and refining the scientific information base for the review of the PM NAAQS by submitting research studies that have been published, accepted for publication, or presented at a public scientific meeting. Figure 8-5 provides some of the studies that U.S. EPA is seeking to acquire during the process in considering the PM NAAQS.

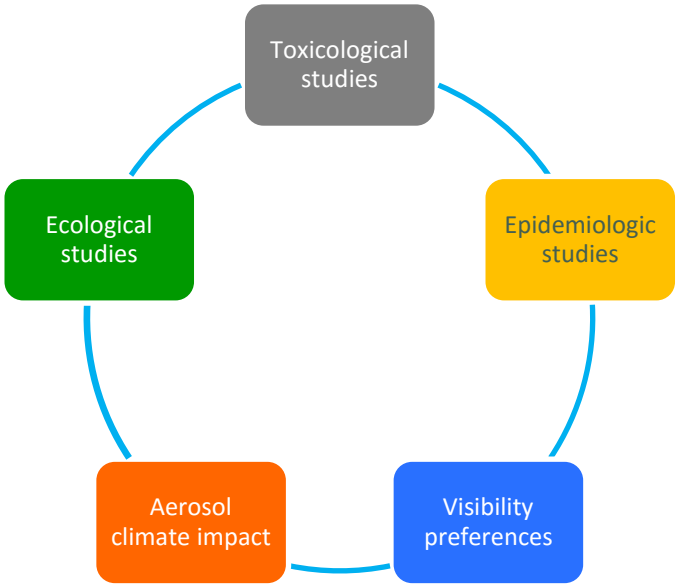

FIGURE 8-5
INFORMATION U.S. EPA IS SEEKING IN THE REVIEW OF THE PM NAAQS

For the review of the PM NAAQS, U.S. EPA is interested in obtaining additional new information concerning:

(a) toxicological studies of effects of controlled exposure to PM on laboratory animals and humans;
(b) epidemiologic (observational) studies of health effects associated with ambient exposures of human populations to PM;
(c) quantification of light extinction (loss of visibility) in urban and non-urban areas, such as new studies regarding visibility preferences, including studies in additional urban and non-urban areas that disentangle visibility preferences from health preferences, the sensitivity of visibility preferences to survey methods, and/or preferences regarding intensity versus frequency of visibility impairment;
(d) climate impacts from PM-related aerosols, particularly regarding the quantification of anthropogenic aerosol effects on radiative forcing; and

(e) ecological studies that examine the effects on agricultural crops and natural terrestrial and/or aquatic ecosystems from ambient exposures to PM, including information regarding interactions with other ecosystem stressors and co-occurring pollutants.

U.S. EPA is also seeking recent information in other areas of PM research such as chemistry and physics, sources and emissions, analytical methodology, transport and transformation in the environment, and ambient concentrations. Selected literature relevant to a review of the NAAQS for PM will be assessed in the forthcoming PM ISA. U.S. EPA has also held recent workshops on ultrafine particles and has indicated that a review of the relevant scientific information could be addressed in this review. The evaluation of PM and ecological effects will not include studies that examine effects due to the deposition of NOx or SOx in the particulate form (e.g., ammonium sulfate), that will be covered in the ongoing review of the NOx/SOx secondary standard.

The review and research process will provide an opportunity for experts to highlight significant new and emerging PM research, and to make recommendations to U.S. EPA regarding the design and scope of the review for the primary (health-based) and secondary (welfare-based) PM standards. This will ensure that the review addresses key policy-relevant issues, and considers the new and emerging science that is relevant to informing U.S. EPA's understanding of these issues.

As a result of this process, U.S. EPA developed a draft Integrated Review Plan (IRP) for the PM NAAQS that was released for public review and comments on April 19, 2016. The draft IRP outlines the schedule, process, and approaches for evaluating the relevant scientific information and addresses the key policy-relevant issues to be considered in this review. CASAC is reviewing the draft IRP and held a teleconference on May 23, 2016. The public had the opportunity to comment on the draft IRP until June 23, 2016. The final IRP, prepared in consideration of CASAC and public comments, will outline the process and schedule for conducting the review and the planned scope of the assessment documents (e.g., an ISA, an REA, and a PA) as well as the key relevant policy issues/questions that will guide the review.

The federal PM standards were reviewed in 2006 when U.S. EPA proposed to revise the level of the primary 24-hour PM2.5 standard from 65 to 35 $\mu g/m^3$ and retain the primary ("health-based") annual PM2.5 standard. The primary 24-hour PM10 standard would also be retained but the annual PM10 standard would be revoked. Finally, the secondary ("welfare-based") standards would be identical to the primary standards. Subsequent litigation concluded that U.S. EPA needed to explain why the secondary standard, identical to the primary standard, would provide the required protection from PM-related visibility impairment. This review took place between 2007 and 2011 with the preparation of the ISA, REA and PA documents that were peer reviewed by CASAC. In December 2012, U.S. EPA proposed to revise the annual PM2.5 standard by lowering the level from 15 $\mu g/m^3$ to 12 $\mu g/m^3$. With regard to the secondary standards, U.S. EPA proposed to retain the secondary standard because the visibility analysis conducted concluded that protection from visibility would not change with the adoption of a distinct visibility index. The final rule became effective on March 18, 2013.

The current review of the PM air quality criteria and standards is anticipated to involve finalizing the draft IRP by the end of 2016, the release and review of the ISA and REA from 2017 to 2019, the PA release and review taking place from 2018 to 2019, initial rulemaking in 2020, and finalizing a standard in 2021.

World Health Organization Air Quality Standards

The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that is tasked with addressing international public health by mitigating communicable and non-communicable diseases, establishing policies to enhance health equity, promoting a healthier environment, and educating the public on nutrition, occupational health, and substance abuse. In reference to air quality, the WHO recognizes that "lower levels of air pollution generate better cardiovascular and respiratory health of the population long- and short-term.[4]" The WHO published air quality guidelines offering global guidance on thresholds and limits for key air pollutants that pose health risks. The WHO guidelines are not regulatory limits but provide a basis for protecting public health from adverse effects of air pollutants (outdoor and indoor), to eliminate or reduce exposure to hazardous air pollutants, and to guide national and local authorities in their risk management decisions.

There are a number of considerations when establishing outdoor air quality guidelines, such as background levels of pollution, mainly of anthropogenic origin, the location of the pollution (urban vs. rural, developed vs. developing countries), effects on children and the elderly compared to healthy adults. For example, WHO's Air Quality Guidelines for Europe[5] recommend a level for ambient ozone of 100 $\mu g/m^3$ (50 ppb) for a daily maximum 8-hour average that "will provide adequate protection of public health," which is lower than the recently U.S. EPA-approved 2015 8-hour ozone NAAQS at 70 ppb. It should be noted the same guidelines provide an interim target level at 160 $\mu g/m^3$ (80 ppb) for 8-hour ozone, at which "measurable (though transient) changes in lung function and lung inflammation among healthy young adults have been demonstrated during intermittent exercise in controlled chamber tests."

Health effects from PM2.5 concentrations are measured, similar to the U.S. EPA NAAQS, on a short-term (24-hour) and long-term (annual) basis. The WHO guidelines[6] recommend 10 $\mu g/m^3$ for PM2.5 on an annual basis, which is lower than the current U.S. EPA annual PM2.5 NAAQS of 12 $\mu g/m^3$. However, the WHO guidelines suggest interim targets higher than the U.S. EPA annual PM2.5 NAAQS ranging from 35 $\mu g/m^3$ to 15 $\mu g/m^3$ lower the risk of premature mortality as the target concentrations are decreased. For 24-hour PM2.5 concentration, the WHO guidelines recommend a daily level of 25 $\mu g/m^3$, which is lower than the current 24-hour PM2.5 NAAQS of 35 $\mu g/m^3$, but suggests interim targets that are higher than the 24-hour PM2.5 NAAQS ranging from 75 $\mu g/m^3$ to 37.5 $\mu g/m^3$ lower the short-term mortality as the target concentrations are decreased. See Table 8-1 for a comparison of the air quality standards.

Protecting public health is based on a number of public policies and scientific documentation supporting those policies and decisions. Both U.S. EPA and WHO have set out to establish an effective public health policy with air quality standards that evolve over time as new scientific studies are conducted and new information is discovered. While the current U.S. EPA NAAQS seek to protect the nation from harmful

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[4] http://www.who.int/mediacentre/factsheets/fs313/en/.

[5] World Health Organization, Air Quality Guidelines (2005) pp. 324-326 http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/.

[6] World Health Organization, Air Quality Guidelines (2005) pp. 278-279 http://www.who.int/phe/health_topics/outdoorair/outdoorair_aqg/en/.

adverse air pollution levels, other global health organizations working in parallel may provide additional insight on how to move forward and make progress in achieving public health goals.

TABLE 8-1

WHO Guidelines Standards Compared to U.S. EPA Standards

Pollutant	WHO Recommendation	Latest U.S. EPA-Approved NAAQS
8-hour Ozone	50 ppb	70 ppb
8-hour Ozone Interim Target	80 ppb	n/a
Annual PM2.5	10 µg/m^3	12 µg/m^3
Annual PM2.5 Interim Targets	15–35 µg/m^3	n/a
24-hour PM2.5	25 µg/m^3	35 µg/m^3
24-hour PM2.5 Interim Targets	37.5–75 µg/m^3	n/a

n/a = not applicable