PUBLIC REPORT OF INDEPENDENT INVESTIGATION OF ALLEGED NON-ENFORCEMENT OF NATIONAL AMBIENT AIR QUALITY STANDARDS BY THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

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On April 26, 2021, the Colorado Department of Law (CDOL) issued a Request for Information seeking the services of a legal services firm to represent the Governor and the Colorado Department of Public Health and Environment (CDPHE) and serve as Special Assistant Attorneys General to conduct an independent investigation of allegations made by three CDPHE employees regarding non-enforcement of National Ambient Air Quality Standards. CDOL engaged the law firm of Troutman Pepper Hamilton Sanders LLP to conduct the investigation.[1]

As set forth in the Request for Information, the scope of the investigation includes:

(1) An independent and thorough investigation of factual allegations raised by CDPHE employees Rosendo Majano, DeVondria Reynolds, and Bradley Rink in their letter dated March 30, 2021 to the U.S. Environmental Protection Agency's Office of Inspector General (EPA OIG);

(2) An independent legal analysis of CDPHE's statutory authority and discretion regarding Colorado's legal obligations under the National Ambient Air Quality Standards program, considering arguments and allegations advanced in the letter to EPA, including evaluating CDPHE's discretion regarding minor source air quality modeling and changes to CDPHE's modeling policy for minor sources made on or about March 15, 2021; and

(3) A public report.

This is the public report. The report sets forth factual findings and legal analysis within the scope of the Request for Information. This report was provided to CDOL on September 16, 2021 and to CDPHE on September 22, 2021. No substantive changes have been made to this report as a result of comments received from either CDOL or CDPHE.

EXECUTIVE SUMMARY

This report addresses two issues raised in the letter to EPA OIG. The first issue is *whether* air quality modeling is required or warranted for minor sources. The second issue is *how* the modeling of specific minor sources was conducted. For the second issue, this report primarily focuses on allegations regarding the modeling analysis conducted for a specific permit

[1]The investigation was led by Charles E. Peeler, a former United States Attorney for the Middle District of Georgia with extensive experience leading civil and criminal government enforcement actions against corporations and their employees, officers, and directors, and by Carroll Wade McGuffey III, an air quality legal specialist with nearly two decades of experience in major and minor source air permitting and the use of modeling to support such permits. The investigation included the collection and review of approximately 1,000 documents, interviews of twelve current and prior employees, and extensive legal research. Access to CDPHE documents and witnesses was coordinated through the Colorado Department of Law. The investigators were granted access to all documents and witnesses to which access was requested.

application for the Cripple Creek & Victor Gold Mine (CC&V), including claims of falsified data, suppression of information, and a conflict of interest.

The primary findings of this investigation are as follows:

- Modeling of minor sources is discretionary, but the law requires state permitting authorities to have a justified and enforceable means of ensuring all sources will not violate EPA's health-based national ambient air quality standards (NAAQS).

- Due to the discretionary nature of the relevant statutory and regulatory provisions and a lack of EPA guidance on the issues, the requirements for modeling minor sources are sometimes unclear.

- CDPHE had two conflicting policies on minor source modeling, one based on an unsupported extension of EPA's permitting threshold for existing major sources, and one that was well-supported by technical analyses, but overly conservative. The co-existence of these two conflicting policies caused confusion within CDPHE.

- CDPHE's decision to rely solely on EPA's permitting threshold for existing major sources in determining whether to model minor sources left CDPHE without a well-supported policy for ensuring minor source permits would not exceed a NAAQS. However, that decision was not motivated by an intent to circumvent the law, but rather to resolve the conflict in CDPHE's policies.

- CDPHE issued permits with unaddressed modeled NAAQS exceedances, although modeled exceedances do not necessarily indicate a permitted minor source has actually violated or will violate the NAAQS.

- CDPHE admitted that the modeling analysis for CC&V contained errors, but CDPHE used an ambient monitoring strategy to demonstrate compliance with the NAAQS following issuance of the permit.

- The allegations in the letter from CDPHE employees to EPA OIG regarding claims of "falsified data" and "suppressing information" in the context of modeling the CC&V facility are unsubstantiated.

- Air Pollution Control Division (APCD) Director Garrison Kaufman had a potential conflict of interest with respect to the CC&V mine, which he did not report for two and a half years in violation of CDPHE policy, but the conflict was resolved prior to issuance of the final permit.

The issues raised in the letter to EPA OIG arise in the context of a highly technical and complex facet of air permitting for stationary sources of air pollutants: the use of computer-generated simulations known as "air quality models" to predict whether a source or project emitting air pollutants will violate the NAAQS established by EPA. Although modeling requirements for higher emitting facilities known as "major sources" are clearly outlined in EPA

and Colorado regulations, modeling requirements for lower emitting "minor sources" are less well-defined. EPA lacks clear guidance on the issue, leaving states to craft their own.

The APCD first developed a comprehensive "Modeling Guideline" in 2002, after a four-year effort involving opportunities for peer and public review, including presentation to the Colorado Air Quality Control Commission. The Modeling Guideline covers both major and minor sources, and it includes emission rate thresholds for use in determining when to model minor sources that were based on extensive hypothetical modeling analyses. Since emission rates below these thresholds were determined to be unlikely to exceed the NAAQS, the thresholds served as an easy-to-apply tool in deciding whether to model a minor source, although use of that tool still required expert judgment; it was not intended as a "bright line" exemption.

In 2010, EPA adopted new NAAQS for nitrogen dioxide (NO_2) and sulfur dioxide (SO_2). Although these pollutants were already subject to a NAAQS based on an annual average, the new NAAQS adopted in 2010 were based on a single hour, making them much more stringent. The APCD modeling group sought to expand the Modeling Guideline to include new modeling thresholds for the 1-hour NAAQS, but when they conducted the same type of hypothetical modeling used to develop the original annual thresholds, they found much lower hourly thresholds were needed to ensure compliance. Whereas the original analysis concluded that a threshold of 40 tons per year (tpy) would protect the annual NAAQS, the new analysis concluded that a threshold of 0.46 pounds per hour (lb/hr) was needed for the 1-hour NAAQS. That new threshold equated to only 2 tpy, even though sources below 5 tpy are not required to obtain a minor source permit for those pollutants.

Shortly after the APCD modeling group developed the new hourly modeling thresholds, the APCD permitting group developed its own guidance to implement the 1-hour standards for NO_2 and SO_2. Based on EPA guidance for major sources, and a belief that minor sources should not be regulated more stringently than major sources, APCD's permitting group prepared an interoffice communication entitled "PS Memo 10-01." That memorandum indicated modeling should only be required for minor sources that exceed the 40 tpy emission rate that EPA uses as a trigger for major permitting at an existing major source. PS Memo 10-01 did not evaluate whether that annual threshold would prevent exceedances of the 1-hour NAAQS.

The conflict between the 0.46 lb/hr modeling threshold in the Modeling Guideline and the 40 tpy modeling threshold in PS Memo 10-01 caused confusion. The permitting group, relying solely on PS Memo 10-01, did not require permit applicants with emissions below 40 tpy to model for NO_2 or SO_2, even though that threshold was not well-supported. Conversely, the modeling group often performed its own modeling for facilities with emissions over the Modeling Guideline threshold of 0.46 lb/hr, even though that threshold was highly conservative. In some cases, the modeling group predicted exceedances of the NAAQS, but APCD issued permits without addressing those predicted exceedances.

These circumstances led to tension between the APCD modeling and permitting groups. In March 2021, APCD management decided to withdraw the Modeling Guideline and rely solely on the annual 40 tpy thresholds referenced in PS Memo 10-01, at least until new guidance could be developed. Although that decision was not motivated by an intent to circumvent the law, but rather to resolve the conflict in APCD's own guidance, the decision left APCD without a well-

justified approach for determining whether emissions from a minor source may exceed a NAAQS. That decision led three members of the modeling group to elevate their concerns about APCD's permitting and modeling procedures, culminating in their letter to the EPA OIG.

The letter to EPA OIG raises some valid concerns, but some are overstated. Although the letter claims all minor sources must "verify through air quality modeling" that emissions from the source will not "cause or contribute" to an exceedance of the NAAQS, that requirement only applies to major sources, and the requirements for minor sources are different. That said, the letter is correct that APCD may not ignore the air quality impacts of a minor source simply because it does not have the potential to emit more than 40 tpy, particularly given that its own modeling group has determined that emissions of 40 tpy are likely to exceed the 1-hour NAAQS.

On the general issue raised in the letter to EPA about *when* to model minor sources, APCD must implement legally enforceable procedures to ensure minor sources will not exceed the NAAQS, but those procedures need not require air quality modeling for every permit issued. Other tools may also suffice, including qualitative evaluations, hypothetical modeling, and ambient air monitoring. Accordingly, the letter to EPA OIG is incorrect in alleging that APCD must conduct air quality modeling for all minor source permits. APCD's policy, however, was inadequate to ensure minor sources would not exceed the NAAQS.

Even so, APCD's inadequate policy regarding minor sources did not necessarily result in actual NAAQS exceedances. When the results of a modeling analysis indicate a source's emissions may exceed a NAAQS, such modeled exceedances are most often resolved via more refined modeling. Although determining whether any permitted minor sources actually exceeded a NAAQS is beyond the scope of this investigation, the state of Colorado remains in attainment for the NAAQS that are the primary focus of the letter to EPA—the 1-hour NO_2 and SO_2 NAAQS. Although Colorado has an ozone nonattainment area, and NO_2 is a precursor to ozone, predicted exceedances of the 1-hour NO_2 standard do not necessarily indicate a source will cause a violation of the ozone NAAQS.

On the specific issue raised in the letter to EPA OIG about *how* to model a minor source, the letter is correct that the modeling analysis conducted for CC&V was not properly justified. APCD managers admitted that some aspects of the modeling analysis were incorrect, but chose not to correct those errors. However, the APCD managers installed an air quality monitor near the facility to help identify any possible exceedances of the NO_2 NAAQS, and none have occurred to date—actual, measured NO_2 concentrations remain well below the NAAQS, as well as below all of the modeling results.

The allegations in the letter to EPA OIG regarding claims of "falsified data" and "suppressing information" in the context of modeling CC&V are unsubstantiated. The modeling analysis conducted for that facility was based on actual facts, not fabrications, even though some facts were insufficiently justified or incorrectly applied. Moreover, all relevant information remained open to public review, including a revised analysis that corrected the errors, even though that corrected analysis was not ultimately accepted as the final result. Finally, while APCD Director Garrison Kaufman had a potential conflict of interest with respect to CC&V, and failed to report that conflict in violation of APCD policy, the conflict was resolved prior to issuance of the final permit.

I. THE CLEAN AIR ACT & EPA REGULATIONS

The Clean Air Act (CAA) contains several interconnected programs designed to prevent and control air pollution.[2] The programs relevant to this investigation require: (1) the United States Environmental Protection Agency (EPA) to establish "national ambient air quality standards" (NAAQS);[3] (2) each state to develop and obtain EPA approval of a "state implementation plan" (SIP) to attain the NAAQS;[4] and (3) owners and operators of stationary sources of air pollutants to obtain permits required by the CAA consistent with the state's SIP.[5]

A. NAAQS

EPA must establish NAAQS at a level "requisite to protect the public health," "allowing an adequate margin of safety."[6] For each NAAQS, EPA establishes four components—an indicator, a level, an averaging time, and a form. In some cases, the standard relies on a single "indicator" for a group of related pollutants. For example, nitrogen dioxide (NO_2) is the indicator for nitrogen oxides (NO_x),[7] and sulfur dioxide (SO_2) is the indicator for sulfur oxides (SO_x).[8] The "level" is a concentration of the indicator in the air, usually expressed in parts per million (ppm), parts per billion (ppb) or micrograms per cubic meter (ug/m^3). The "averaging time" is the period of time for individual measurements or data points, either annual or short-term averages such as daily or hourly. The "form" is the statistic used to determine whether an area is attaining the standard. The current NAAQS most relevant to this investigation, namely NO_2, SO_2, fine particulate matter ($PM_{2.5}$), and ozone, are listed below:[9]

Indicator	Level	Averaging Time	Form
NO_2	53 ppb	1 year	Annual Mean
	100 ppb	1 hour	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
SO_2	75 ppb	1 hour[10]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
$PM_{2.5}$	12.0 $\mu g/m^3$	1 year	Annual mean, averaged over 3 years
	35 $\mu g/m^3$	24 hour	98th percentile, averaged over 3 years
Ozone	0.070 ppm	8 hours	Annual 4th highest daily maximum 8 hour concentration, averaged over 3 years

Some of these pollutants, like NO_2 and SO_2, are directly released by human activities, such as the combustion of fuel. Others are generated indirectly by chemical reactions in the atmosphere, including ozone, which is formed when two "precursors"—NO_2 and volatile organic

[2] 42 U.S.C. § 7401(a).
[3] 42 U.S.C. § 7409.
[4] 42 U.S.C. § 7410.
[5] 42 U.S.C. § 7410(c).
[6] EPA must set a primary and secondary NAAQS, but this investigation focuses solely on the primary NAAQS.
[7] *See* 40 C.F.R. § 50.11.
[8] See 40 C.F.R. § 50.17.
[9] *See* www.epa.gov/criteria-air-pollutants/naaqs-table. Colorado has also adopted ambient air quality standards, most notably a 3-hour standard for SO_2. While not separately addressed herein, the same principles generally apply.
[10] Colorado also has a state-specific SO_2 ambient standard that is based on a 3-hour averaging time.

compounds (VOC)—mix in sunlight. $PM_{2.5}$ is both emitted directly from human activities and formed via secondary chemical reactions from several precursors, including NO_x, SO_x, ammonia, and others. Accordingly, some pollutants are considered both an indicator for one NAAQS and a precursor for another. For example, NO_2 is both the indicator for the NO_x NAAQS and a precursor to ozone, and SO_2 is both the indicator for the SO_x NAAQS and a precursor to $PM_{2.5}$.

EPA periodically revises the NAAQS based on new scientific information. In making those revisions, EPA sometimes revokes and sometimes retains the prior NAAQS, depending on whether EPA decides that the existing NAAQS is still needed to protect human health. For example, when EPA adopted the 1-hour SO_2 NAAQS of 75 ppb in 2010, it revoked the prior annual and 24-hour NAAQS originally adopted in 1971. In contrast, when EPA adopted the 1-hour NO_2 NAAQS of 100 ppb in 2010, it retained the 1971 annual NAAQS of 53 ppb. For pollutants addressed via multiple NAAQS, compliance with one standard does not ensure compliance with another—states must meet both to be designated "attainment" for that pollutant.

Attainment of the NAAQS is typically demonstrated via measurements collected by a network of monitoring stations that sample the "ambient air" (*i.e.*, air to which the general public has access[11]). If the data indicate an area is not attaining the standard, EPA may designate the area as "nonattainment," which triggers additional permitting and regulatory requirements for the state and regulated facilities in the area. If sufficient data is not available, attainment status of an area may also be evaluated using computer modeling. Since concentrations of a pollutant in the ambient air are the result of many different factors and emission sources, EPA has repeatedly made clear that compliance with the NAAQS is an obligation of states via implementation of plans that impose enforceable requirements on individual emission sources.[12]

B. SIPs

The CAA requires each state to develop a SIP for implementation, maintenance, and enforcement of the NAAQS.[13] The SIP must be supported by a rigorous analysis, which often includes extensive air quality modeling, to demonstrate that the provisions it contains will be sufficient to attain and maintain the NAAQS. Each SIP must also include a program to regulate the construction and modification of "*any* stationary source" "as necessary to assure [the NAAQS] are achieved."[14] As a condition for issuance of any air permit, the SIP must also require the owner or operator to show to the satisfaction of the permitting authority that the project will comply with all CAA requirements.[15]

[11] 40 C.F.R. § 50.1(e).
[12] *See, e.g.*, 80 Fed. Reg. 75178, 75192 (Dec. 1, 2015) ("[S]ources are not directly responsible for demonstrating that an area is meeting an ambient standard; rather that burden falls on states."); 57 Fed. Reg. 32250, 32276 (July 21, 1992) ("Under the Act, NAAQS implementation is a requirement imposed on States in the SIP; it is not imposed directly on a source.").
[13] 42 U.S.C. § 7410(a)(1).
[14] 42 U.S.C. § 7410(a)(2)(C).
[15] 42 U.S.C. § 7410(j).

C. Preconstruction Permits for Major Sources

The CAA expressly requires a "preconstruction" permit for all "major emitting facilities" under a program often referred to as "New Source Review" (NSR).[16] A "major emitting facility," also referred to as a "major stationary source,"[17] is defined as one with the potential to emit any pollutant over certain annual thresholds (100 tons per year (tpy) or 250 tpy, depending on the type of source). Preconstruction permits are also required for "major modifications," defined as projects at an existing major source that are projected to increase emissions above pollutant-specific *de minimis* thresholds (*e.g.*, 40 tpy of SO_2, 40 tpy of NO_x, and 10 tpy $PM_{2.5}$), referred to as "significant emission rates" (SER).

NSR requirements differ depending on the air quality status of the area. Nonattainment areas are subject to Nonattainment New Source Review (NNSR), whereas attainment areas are subject to Prevention of Significant Deterioration (PSD). The PSD program is so named because it not only prohibits major sources from exceeding a NAAQS, it also prohibits major sources from exceeding a "maximum allowable increase,"[18] referred to as a "PSD Increment."[19] This demonstration is almost always made via modeling because EPA's PSD regulations expressly require air quality modeling for any increases in emissions above the SER.[20]

D. Preconstruction Permits for Minor Sources

Sources that are not "major sources" are often referred to as "minor sources," although the CAA does not define or use that term.[21] EPA has adopted regulations in 40 C.F.R. Part 51, Subpart I, requiring states to develop and implement preconstruction permitting programs for minor sources. Those regulations are far less prescriptive than EPA's rules for major sources. However, they do contain certain mandatory requirements that apply to each state in developing their SIPs. For example, 40 C.F.R. 51.160(a) requires:

> Each plan must set forth legally enforceable procedures that enable the State or local agency to determine whether the construction or modification of a facility, … will result in … [i]nterference with attainment or maintenance of a [NAAQS].

Those "legally enforceable procedures" are further defined in 40 C.F.R. 51.160(b) as follows:

> Such procedures must include means by which the State … will prevent such construction or modification if … [i]t will interfere with the attainment or maintenance of a [NAAQS]

The procedures must "discuss the air quality data and the dispersion or other air quality modeling used," and the models must be based on EPA's modeling regulations and guidelines.[22]

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[16] 42 U.S.C. § 7475, 7479(1).
[17] 40 C.F.R. § 52.21(b)(1). *See also* 42 U.S.C. 7602(j).
[18] 42 U.S.C. § 7475(a)(3).
[19] 42 U.S.C. § 7473; 40 C.F.R. 52.21(c).
[20] 40 C.F.R. § 52.21(k),(l), & (m).
[21] *Cf.* 42 U.S.C. § 7602(x) (defining "small source").
[22] 40 C.F.R. § 51.160(f).

Accordingly, the preconstruction permitting requirements for major and minor sources are different. Major NSR expressly requires a modeling analysis to determine if any NAAQS or PSD Increment could be exceeded. Minor NSR, on the other hand, does not expressly require modeling, so long as the state has adopted and implemented a procedure to ensure they will not violate the NAAQS. Since the analysis required for major sources must demonstrate they will not violate a NAAQS, that analysis also satisfies the requirements for minor sources. However, sources or projects that do not trigger the major sources requirements are not simply ignored—the CAA and EPA's regulations independently impose a requirement on states to prevent the construction of "any" source that may violate the NAAQS, regardless of whether the source is major or minor.

II. AIR QUALITY MODELING

Air quality modeling is an important tool in air quality protection. Simply put, air quality models convert the emission rate of a source into a predicted maximum ambient concentration (*e.g.*, ppb or ug/m^3) that can be compared to a NAAQS or PSD Increment. Modeling is the only means of quantitatively predicting the potential impact of a new source or project prior to construction, since measuring the impact of a source or project not yet constructed is impossible. As EPA explains, "[t]he impacts of new sources that do not yet exist, and modifications to existing sources that have yet to be implemented, can only be determined through modeling. Thus, models have become a primary analytical tool in most air quality assessments."[23]

The ability of modeling to provide accurate estimates of future impacts depends on the type of model used and the assumptions used as inputs to the model. Due to the increasing complexity of air quality models, EPA notes that "it is increasingly important that they be directed by highly competent individuals with a broad range of experience and knowledge in air quality meteorology," and that "they should be coordinated closely with specialists in emissions characteristics, air monitoring and data processing." When modeling is utilized, it must be performed separately for each NAAQS, even for different NAAQS for the same pollutant, because the modeling analysis must take into account the averaging time of each standard.

A. Appendix W Modeling Guideline

To provide consistent guidance on the use of air quality models, EPA developed a "Guideline on Air Quality Models," which EPA codified in 1993 as Appendix W to 40 C.F.R. Part 51.[24] According to EPA, Appendix W "serves to identify, for all interested parties, those modeling techniques and databases that the EPA considers acceptable." EPA cautions that the Guideline "is not intended to be a compendium of modeling techniques," but rather "a common measure of acceptable technical analysis when supported by sound scientific judgment." EPA also warns that "a model applied improperly or with inappropriate data can lead to serious misjudgments regarding the source impact or the effectiveness of a control strategy."

Appendix W also provides some guidance on selecting the site-specific data needed to run a model. Of relevance to this investigation, Appendix W states that a "new or modifying

[23] 40 C.F.R. Part 51, Appendix W (hereinafter "Appendix W"). All quotes in this section are to Appendix W unless otherwise stated.
[24] 58 Fed. Reg. 38,816, 38,822 (July 20, 1993).

stationary point source shall be modeled with 'allowable' emissions," which EPA defines as "the emissions rate of a stationary source calculated using the maximum rated capacity of the source."[25] Maximum allowable emission rates are modeled to ensure the analysis is conservative and confirms the source or project will not threaten the NAAQS, regardless of the circumstances. However, a source may reduce the modeled emission rate by accepting a limit to lower its allowable emissions. Because such determinations are site-specific, Appendix W advises consultation with the appropriate reviewing authority in deciding what emission rates to model.

1. Available Air Quality Models

In Appendix W, EPA describes three types of models currently available, with "each having strengths and weaknesses that lend themselves to particular regulatory applications." For example, EPA notes that "Gaussian plume models" are effective at estimating impacts associated with distribution of a plume of emissions at a relatively high resolution, but they are only able to evaluate "relatively inert pollutants" and may not be appropriate "if more advanced considerations of chemistry are needed." At the other end of the spectrum are "photochemical grid models" that use a three-dimensional grid to "simulate a more realistic environment for chemical transformation," but "have difficulty with fine scale resolution of individual plumes," and are more "resource intensive." In between are "Lagrangian puff models" that allow more complex considerations than Gaussian models but less than photochemical grid models.

Due to the differences among the models available, EPA also requires different models depending on the characteristic of the pollutant under review. Since Guassian plume models are effective at estimating the dispersion of relatively inert emissions from individual sources, EPA requires them for SO_2, NO_2, and direct emissions of $PM_{2.5}$. EPA's preferred model for this purpose is the "American Meteorological Society (AMS) / EPA Regulatory Model" referred to as "AERMOD." AERMOD simulates the transport and dispersion of a plume of emissions over an hour and estimates the resulting concentration at various locations surrounding the emission point, referred to as receptors. That simulation is repeated using various meteorological conditions based on data from weather stations that are representative for the area. The resulting concentrations are evaluated to compare the maximum potential impact against the relevant NAAQS (and PSD Increments, for major sources).

Appendix W also provides specific guidance on certain pollutants. For example, as relevant here, Appendix W provides the following discussion of NO_2 modeling:

> Impact of an individual source on ambient NO_2 depends, in part, on the chemical environment into which the source's plume is to be emitted. This is due to the fact that NO_2 sources co-emit [nitrogen oxide] NO along with NO_2 and any emitted NO may react with ambient ozone to convert to additional NO_2 downwind. Thus, comprehensive modeling of NO_2 would need to consider the ratio of emitted NO and NO_2, the ambient levels of ozone and subsequent reactions between ozone and NO, and the photolysis of NO_2 to NO.

[25] 40 C.F.R. § 52.21(b)(16).

In other words, NO_2 modeling is complicated because NO_2 reacts with NO and ozone. To address this complexity, EPA allows the use of a "multi-tiered screening approach," with each higher tier accounting for increasingly complex considerations of NO_2 chemistry. Specifically, tier 1 assumes 100% conversion of NO to NO_2 (resulting in the highest possible NO_2 concentration), tier 2 allows use of site-specific ambient and in-stack ratios of NO_2 to NO (reducing the potential NO_2 concentrations), and tier 3 incorporates assumptions about the effect of ambient ozone levels (a potential limiting factor on ambient NO_2 concentrations). Use of the higher tiers requires use of site-specific information that must be properly justified.

Appendix W addresses modeling of ozone and secondarily formed $PM_{2.5}$ in a completely different chapter because of the very different characteristics of those two pollutants.[26] These pollutants are referred to as "secondary pollutants" because they are not emitted directly from human activities but rather are formed in the atmosphere through chemical reactions. Ozone and secondarily formed $PM_{2.5}$ are closely related to each other in that they are formed from similar precursors. Therefore, "[m]odeled strategies designed to reduce ozone or $PM_{2.5}$ levels typically need to consider the chemical coupling between these pollutants." Appendix W notes in particular that "[c]ontrol measures reducing ozone and $PM_{2.5}$ precursor emissions [*e.g.*, NO_x and SO_x] may not lead to proportional reductions in ozone and $PM_{2.5}$."

As a result of these complexities, predicting the impact of an individual source of emissions on ambient concentrations of secondary pollutants is extremely difficult and beyond the capability of Gaussian plume models like AERMOD. In fact, Appendix W expressly states that "[t]here is no preferred modeling system or technique for estimating ozone or secondary $PM_{2.5}$ for specific source impacts or to assess impacts from multiple sources." Because modeling for ozone and secondary formation $PM_{2.5}$ requires the use of resource-intensive photochemical grid models, Appendix W only recommends modeling those pollutants on a regional scale primarily to guide states in developing strategies for attainment of the NAAQS. However, EPA has adopted guidance to assist states and sources in evaluating these pollutants.[27]

2. Modeling Procedures

Regardless of the specific model employed, EPA recommends "begin[ning] an air quality analysis by using simplified and conservative methods followed, as appropriate, by more complex and refined methods." These "screening" methods typically rely on conservative assumptions to reduce the resources needed to run the model. Screening assessments typically evaluate the impact of a source alone, while more refined assessments provide a holistic evaluation of air quality by accounting for other nearby sources and background concentrations. Screening assessments are less accurate in certain circumstances, such as in areas with "complex terrain," where surrounding terrain exceeds the height of the stack(s) being modeled.

If the initial screening analysis of a single source indicates that its impacts are *de minimis*, no additional analysis of other sources or background concentrations may be needed. EPA's PSD rule defines *de minimis* thresholds, termed "significant impact levels" (SILs), for most NAAQS pollutants, as the level of impact below which more extensive modeling is not

[26] 40 C.F.R. Part 51, App. W, Ch. 5.

[27] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and $PM_{2.5}$, EPA-454/R-16-005 (Dec. 2016).

warranted in most cases. If modeling of a source or project alone indicates impacts may exceed the SIL, cumulative modeling of the source, other nearby sources, and background concentration is needed to confirm the source or project will not exceed the NAAQS or PSD Increment. Notably, there is no SIL for ozone because ozone is not typically modeled in permitting individual sources or projects.

Importantly, while both SILs and SERs are *de minimis* thresholds, they serve different purposes. SERs, expressed as an emission rate (in tpy), determine whether a project at a major source triggers major NSR and for which pollutants. Once that determination is made, SILs, expressed as a concentration (ppb or ug/m^3), are used to determine, for each pollutant subject to major NSR, whether screening modeling is sufficient or cumulative modeling is needed.

In 2013, the D.C. Circuit adjudicated a petition to review EPA's $PM_{2.5}$ SILs and held that states must be able to exercise discretion with respect to use of the SILs in evaluating air quality impacts of a major source, a point EPA conceded.[28] The court held that SILs cannot automatically exempt a major source from the statutory requirement to demonstrate that it will not cause or contribute to an exceedance of a NAAQS or PSD Increment because even an impact less than the SIL might push an area above the NAAQS if the area is already close to a violation. However, the court stopped short of holding that SILs are *per se* illegal. Instead, it recognized that EPA may be able to adopt and implement SILs in a way that preserves state discretion. EPA has issued revised guidance in response to the court's decision that continues to support the use of SILs under certain circumstances in determining when cumulative modeling is required.[29]

3. Modeling Results

A modeling analysis is considered sufficient to make the demonstration needed to obtain a major NSR permit if the results of a model indicate the air quality impact of a source alone is *de minimis* (below the SIL) or cumulative modeling shows concentrations will remain below all NAAQS and PSD Increments. However, a modeling result that indicates an exceedance of a NAAQS or PSD Increment does not necessarily mean a permit cannot issue. Modeled exceedances are most often addressed by refining the modeling analysis rather than by making any actual changes to the source or its emission rates. Possible refinements include use of more precise source-specific data or assumptions as inputs to the model, as well as the use of more complex models and modeling techniques.

If refining the model does not reduce impacts below the NAAQS and PSD Increments, the source may also conduct a "culpability analysis" to determine whether the source's own contribution to any of the modeled exceedances identified is *de minimis* (below the SIL).[30] If the culpability analysis confirms that the source's emissions contribute to the modeled exceedances, then a change to the source or project may be needed. Changes to the source could include increasing stack heights (within good engineering practice) or changing the distance between an emission point and ambient air, either by changing the location of an emission point or excluding

[28]*Sierra Club v. EPA*, No. 10-1413 (Jan. 22, 2013).
[29]EPA Memorandum, *Guidance on Significant Impact Levels for Ozone and Fine Particles in the [PSD] Permitting Program*, Peter Tsirigotis, Director, Office of Air Quality Planning and Standards (Apr. 17, 2018).
[30]*Id*. at 18.

the general public from the areas where an exceedance is predicted. A source may also reduce its modeled emission rate by accepting a limit or installing lower emitting equipment or controls.

4. Alternatives to Modeling

Although modeling is the primary means of *quantitatively* evaluating the ambient air impacts of a new source or project, other options are available. In some cases, a *qualitative* analysis of ambient conditions and emission inventories may provide an appropriate basis for concluding that the risk of exceeding a NAAQS is low. Hypothetical modeling may also be conducted to determine an emission threshold below which source emissions are not expected to cause or contribute to modeled exceedances, and in fact that is how EPA developed the SILs. Hypothetical modeling can also be used to develop "general permits" that can be issued for an entire category of low-emitting sources without the need to specifically evaluate each one.[31]

These qualitative alternatives to modeling can help reduce the administrative resources needed to implement a state's permitting program, since states are unlikely to have sufficient resources to model every source that requires an air permit. They can also be important where modeling is infeasible or cost-prohibitive, such as modeling secondary pollutants like ozone and $PM_{2.5}$. In addition, modeling cannot be used to demonstrate a source will not cause or contribute to a NAAQS exceedance in an area that already exceeds the NAAQS, since the maximum modeled impact of additional emissions will never be lower than current conditions. In such case, offsets are typically used as an alternative to modeling to demonstrate that a project will not cause or contribute to an exceedance of the NAAQS that is already occurring.

B. Modeling for Minor Sources

In codifying Appendix W, EPA made clear that its modeling guidelines are relevant to both major sources subject to NSR and minor sources subject to permitting programs established in a SIP.[32] However, while EPA has provided extensive guidance on the use of modeling in issuing permits for major sources in both Appendix W and other documents,[33] EPA has provided almost no guidance on modeling for minor sources, although EPA's minor NSR rules for "Indian Country," where EPA is the permitting authority, is instructive.

1. EPA's Minor Source Permitting Program for Indian Country

EPA has made several statements regarding minor source modeling in the context of adopting its own rules for minor sources in "Indian Country." Since most Native American reservations do not have their own air permitting authority, they rely on EPA to develop their air quality plans and issue air permits. In a 2006 rule proposal, EPA made the following statement:

> Typically, for a new or modified minor source permit application, your reviewing authority would not require an Air Quality Impacts Analysis (AQIA). In rare instances, if your reviewing authority has reason to be concerned that the construction of your minor source or modification could cause or contribute to a

[31]EPA Region 7 Permit by Rule Guidance for Minor Source Preconstruction Permits (Sept. 12, 2003).
[32]60 Fed. Reg. 40465 (Aug. 9, 1995) (citing both 40 C.F.R. § 51.160 as well as 40 C.F.R. § 52.21).
[33]*See, e.g.*, New Source Review Workshop Manual, at Chapter C (Oct. 1990 Draft).

> NAAQS or PSD increment violation, to ensure protection of the NAAQS, we are proposing that your reviewing authority may require you to conduct an AQIA using dispersion modeling in accordance with 40 CFR part 51, appendix W to determine the impacts that will result from your new source or modification. If the AQIA demonstrated that the construction of your source or modification would cause or contribute to a NAAQS or PSD increment violation, you would be required to further reduce its impact before you could obtain a permit.[34]

In short, EPA suggested modeling is not "typically" required for minor sources, but may be required in "rare" cases. When EPA finalized the proposal in 2011, it modified its statements somewhat, but nevertheless confirmed that modeling for minor sources is discretionary.

> We continue to believe that allowing reviewing authority discretion for when an AQIA might be required ensures that construction of new minor sources or modifications at existing minor sources do not cause or contribute to a NAAQS or PSD increment violation when needed, but limits overburdening all minor sources in Indian country with these types of air quality analysis. …. We are also eliminating the language in the proposal preamble that stated (71 FR 48704) that AQIAs will be required "[i]n rare instances." Since the reviewing authority has the discretion to require an AQIA, it is difficult to predict that such AQIAs will be required only in rare instances.[35]

EPA's final rule confirms modeling of minor sources is discretionary in Indian Country:

> When may the reviewing authority require an air quality impacts analysis (AQIA)?
>
> (1) If the reviewing authority has reason to be concerned that the construction of your minor source or modification would cause or contribute to a NAAQS or PSD increment violation, it may require you to conduct and submit an AQIA.
>
> (2) If required, you must conduct the AQIA using the dispersion models and procedures of part 51, Appendix W of this chapter.
>
> (3) If the AQIA reveals that construction of your source or modification would cause or contribute to a NAAQS or PSD increment violation, the reviewing authority must require you to reduce or mitigate such impacts before it can issue you a permit.[36]

EPA reiterated this position in 2016, confirming that "the Federal Indian Country Minor NSR rule does not require an air quality analysis (and the modeling that would accompany it) in all instances when a permit is issued even with a source-specific permit."[37]

[34] 71 Fed. Reg. 48,696, 48,704 (Aug. 21, 2006).
[35] 76 Fed. Reg. 38,748, 38,671 (July 1, 2011).
[36] 40 C.F.R. § 49.154(d).
[37] 81 Fed. Reg. 35,944, 35,963 (June 3, 2016).

Statements on EPA's website reveal that EPA does not have a clear policy on when to model minor sources. Specifically, the website for EPA's minor NSR program for Indian Country in Region 8 (which covers Colorado) currently states the following:[38]

> Region 8 is developing guidance for when modeling will be required for proposed new minor sources, minor modifications at an existing minor sources, synthetic minor sources or modifications, or minor modifications at existing major sources in Indian country. Keep visiting this page for updates on available minor source modeling guidance for Indian country. Until guidance is available, consult guidance available from the state CAA permitting jurisdictions near the area of Indian country your proposed project will be located and schedule a pre-application meeting with Region 8 for project-specific modeling guidance.

2. State Minor Source Modeling Policies

State regulations typically parrot EPA's highly general language in 40 C.F.R. 51.160 that leaves the decision to model to the discretion of the designated permitting authority. South Dakota provides a recent example. In April 2018, EPA proposed to approve revisions to South Dakota's SIP[39] even though South Dakota's minor source permitting rules state only that dispersion modeling "may" be required.[40] EPA noted that, while the state's regulation contained a general requirement to show that new sources and modifications will not prevent or interfere with attainment or maintenance of a NAAQS, that demonstration may be made using "ambient monitoring data, emissions inventories, air dispersion modeling, or a combination of these data in a comprehensive analysis."[41]Based on a survey conducted by the National Association of Clean Air Agencies (NACAA) in 2015, the results of which were provided by CDPHE, state policies on when to model minor sources appear to vary substantially from state to state.

III. THE COLORADO AIR POLLUTION PREVENTION AND CONTROL ACT, REGULATION 3, AND MODELING GUIDELINES AND POLICIES

The Colorado Air Pollution Prevention and Control Act provides the statutory authority to protect air quality in the state and meet the requirements of the CAA. Under that authority, the Air Quality Control Commission (AQCC) is appointed by the governor to adopt "a cost-effective and efficient air quality management program," including permitting programs for stationary sources. The Air Pollution Control Division (APCD) of the Colorado Department of Public Health and the Environment (CDPHE) oversees air permitting. APCD is divided into programs, and the programs are divided into units. Notably, the permitting and modeling functions are performed by different programs. Permits are issued by the Permitting Program or the Oil and Gas Program (formerly the Stationary Source Program),[42] and modeling is performed by the Modeling and Emissions Inventory Unit (MEIU) of the Technical Services Program.

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[38]https://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8 (last visited Sept. 14, 2021).
[39]83 Fed. Reg. 18,496 (Apr. 27, 2018).
[40]ARSD 74:36:20:05.
[41]83 Fed. Reg. at 18,498.
[42]For convenience, "Permitting Program" is used herein to mean both the Permitting and Oil & Gas Programs.

Colorado's air statute requires any person seeking to "construct or substantially alter" a source of air pollution to first obtain a construction permit.[43] It requires the AQCC to adopt regulations regarding construction permits, and specifically directs the AQCC to "designate by regulation those classes of minor or insignificant sources of air pollution which are exempt from the requirement for a permit because of their negligible impact on air quality." Those regulations are codified as "Regulation 3," which has six parts. The three most directly relevant to this investigation are Part A ("General Provisions"), Part B ("Construction Permits"), and Part D ("Major Stationary Source New Source Review and Prevention of Significant Deterioration").

Part F of Regulation 3 is also helpful in that it provides statements of basis for various rule revisions made over time. For example, it explains that Part B originally contained the construction permitting requirements for both major and minor sources. However, to avoid confusion between the requirements applicable to major and minor sources, the rule was reorganized in 2004 to move the construction permitting requirements that apply only to major sources to Part D.[44] Accordingly, minor source permits must comply with only Parts A and B, whereas major source permits must comply with Parts A, B, and D.[45] Part F also confirms that the original intent of the regulations was to parallel EPA policies and rules, and expressly discusses the few ways in which Regulation 3 differs from its federal equivalents.[46]

Similar to EPA's PSD rule, major sources subject to Part D are required to "demonstrate to the Division that allowable emission increases from the proposed source or modification in conjunction with all other applicable emissions increases or reductions (including secondary emissions) will not cause or contribute to concentrations of air pollutants in the ambient air in violation of any [NAAQS or PSD Increment]."[47] That provision does not appear in Part B. Instead, Part B contains the following requirements:

> III.B.5. Except for applications for sources subject to the requirements of Section VI. of Part D of this regulation (Prevention of Significant Deterioration), the Division shall prepare its preliminary analysis within sixty calendar days after receipt of a complete permit application. The preliminary analysis allows the Division to determine whether the new source will, at date of commencement of operation, comply with: …
>
> III.B.5.d. Any applicable ambient air quality standards and all applicable regulations. …
>
> When the preliminary analysis includes modeling, the model used shall be an appropriate one given the topography, meteorology and other characteristics of the region that the source will impact. Use of any non-

[43]C.R.S.A. § 25-7-114.2
[44]Regulation 3, Part F, Section I.FF.
[45]Sources deemed "major" for purposes of the operating permit program must also comply with Part C.
[46]*Compare* Regulation 3, Part F, 1.A. ("The Commission has made an effort to formulate a permit program meeting the requirement of and paralleling of the provisions EPA policies and rules") *with* I.C. ("In several important areas the Commission has tailored these regulations to meet the concerns of Colorado citizens."). *Accord Center for Biological Diversity and Sierra Club v. APCD*, No. 2019CV30048 (Colo. App. filed Apr. 13, 2021) (APCD Answer Brief) (arguing Regulation 3 mirrors federal regulations in a case involving challenges to a minor source permit).
[47]Regulation 3, Part D, Section VI.A.2.

guideline model requires U.S. EPA approval under Section VIII.A. of Part A of this regulation.

III.D.1 Requirements applicable to all construction permit applications … the Division shall grant the permit if it finds that:

III.D.1.c. The proposed source or activity will not cause an exceedance of any National Ambient Air Quality Standards;

III.D.1.d. The source or activity will meet any applicable ambient air quality standards and all applicable regulations;

These requirements apply to any minor source that must get a permit under Part B, which includes sources that are not major but have the potential to emit more than certain thresholds that vary depending on whether the area is in attainment of the NAAQS. For example, in a nonattainment area, a source must get a minor NSR permit under Part B if it has the potential to emit 5 tpy or more of NO_x or SO_2, but that threshold is 10 tpy for attainment areas.[48]

Part A also provides general instructions that are applicable to both major and minor sources regarding the models that may be used to estimate ambient concentrations:

> All estimates of ambient concentrations required under this Regulation Number 3 shall be based on the applicable air quality models, databases, and other requirements generally approved by U.S. EPA and specifically approved by the Division.[49]

This particular language mirrors provisions found in EPA's PSD rule for major sources,[50] but, since it appears in Part A of Regulation 3, it applies to all sources in Colorado.

These provisions have been approved by EPA as part of the federally enforceable Colorado SIP[51] and confirm that, like EPA's regulations, the APCD is required to evaluate the air quality impacts of the construction permits issued to minor sources. They also provide that any modeling that is "required" to complete that evaluation must be conducted consistent with EPA's Appendix W Modeling Guideline.

APCD has issued two different guidance documents on modeling, (1) a "Modeling Guideline" prepared by the MEIU in the Technical Services Program, and (2) an interoffice memorandum entitled "PS Memo 10-01" prepared by the Permitting Program.

A. The Colorado Modeling Guideline

The "Colorado Modeling Guideline for Air Quality Permits" was developed by the MEIU to help all interested stakeholders "understand [APCD's] expectations for the ambient air impact analysis and to prevent unnecessary delays in the permit process." In short, the guideline

[48]Regulation 3, Part B, II.D.2 & D.3.
[49]Regulation 3, Part A, Section VIII.A.1.
[50]40 C.F.R. § 52.21(l).
[51]40 C.F.R. § 52.320 (Regulation 3, Part B, Section III most recently approved by EPA on October 12, 2017).

provides a "starting point" for modeling analyses and "a guide through modeling-related regulations and procedure." According to its preface, the guideline "helps permit applicants understand when modeling is warranted" and "clarifies what modeling-related information and data should be included with a permit application." And, of relevance to this investigation, it contains NAAQS-specific "modeling thresholds"—emission rates above which modeling is "usually warranted" for a new source or project.

Development of the guideline began in 1998, and the first version was issued in 2002. The guideline begins with a general discussion acknowledging that federal law requires APCD to have procedures in place to prevent construction or modifications that may interfere with attainment of the NAAQS. However, the Guideline recognizes Regulation 3 "does not explicitly require modeling." It explains that the potential impact of source or project must be evaluated prior to issuance of a permit, but states that an "impact analysis can be done using quantitative (modeling) or qualitative (non-modeling) methods, as appropriate." The guideline states that, if modeling is employed, "EPA models or methods must be used," citing Regulation 3, Part A, Section VIII (quoted above). It also indicates that APCD will perform a screening analysis if feasible, but "does not usually perform refined-level modeling" because the applicant is typically required to complete any refined modeling that may be warranted.

At the time the 2002 version of the guideline was prepared, EPA had not yet adopted the current 1-hour NO_2 and SO_2 NAAQS, so the guidelines focused solely on the annual NAAQS for those pollutants. The original 2002 version of the modeling thresholds also did not address the $PM_{2.5}$ NAAQS at all, perhaps because it had only been adopted one year prior to APCD's effort to develop the modeling thresholds. Although most of the thresholds established in 2002 were set at the same emission rate as the SER in EPA's NSR rule (*e.g.*, 40 tpy for NO_2), the guideline confirms that the thresholds were not merely assumed to be appropriate on that basis alone. Rather, the 2002 version introduced the modeling thresholds with the following discussion:

> The modeling thresholds were developed to identify new sources and modifications that would have relatively small impacts and do not warrant further analysis with respect to applicable air quality standards. The development of these thresholds is intended to assist the Division Staff, permit applicants, air quality consultants, and others decide when modeling is warranted to determine the impact from a source. This section introduces de minimis emissions, which have a low probability of causing or contributing to an exceedance of an air quality standard. By using this approach, permitting costs associated with the impact analysis required by Regulation No. 3 can be minimized.
>
> Air quality modelers developed the modeling thresholds in Table 1 during a technical peer review of the Division's modeling practices. The Division performed dispersion modeling to help demonstrate that the thresholds in Table 1 are appropriate.

A new "Appendix A" added to a 2018 draft of the guideline sheds additional light on the analysis underlying the 2002 modeling thresholds.[52] It provides a step-by-step explanation of the extensive modeling analysis of numerous hypothetical cases that were used to confirm NAAQS exceedances would be unlikely at those emission rates under most circumstances. That modeling confirmed, for example, that exceedances of the annual NO_2 NAAQS were unlikely for sources with the potential to emit less than the 40 tpy SER.

In 2010, new modeling thresholds were developed for the $PM_{2.5}$ NAAQS that had been adopted in 1997 and the new 1-hour NO_2 and SO_2 NAAQS adopted in 2010. Again, MEIU conducted hypothetical modeling to determine an emission rate at which violations of the NAAQS would be unlikely under most circumstances. However, since the new short-term NAAQS were more stringent than the annual NAAQS, the hypothetical modeling exercise resulted in much lower modeling thresholds.

Although EPA set the 1-hour NO_2 and SO_2 NAAQS at a higher level than the existing annual NO_2 and SO_2 NAAQS (100 ppb compared to 53 ppb, and 75 ppb compared to 30 ppb, respectively), the shorter 1-hour averaging time resulted in a more stringent standard.[53] As a result of that increased stringency, MEIU set the short-term modeling threshold for both the 1-hour NO_2 and SO_2 NAAQS at 0.46 pounds per hour (lb/hr), which equates to just 2 tpy, a 95% reduction from the 40 tpy modeling thresholds set for those pollutants in 2002.

The Appendix A added to the 2018 draft of the guideline explains how the thresholds, both the original annual thresholds and the newer short-term standards, are intended to function:

> Clearly, these studies show that it is problematic to use only emission rates to determine when modeling is warranted. Many factors (including dispersion characteristics of the proposed source) should be considered in the decision to perform modeling. Consequently, the Division opposes the adoption of bright line exemptions from modeling that are based solely on emission rates. Furthermore, due to the complexity of pollution dispersion in the atmosphere, it is not realistic to develop a simple look-up table that adequately accounts for all of the important factors that affect air pollution dispersion.
>
> The study shows that, in cases where a source has good dispersion characteristics and the existing air quality is well below ambient air quality standards, there is a low probability that the source will cause or contribute to a modeled violation of ambient air quality standards. Thus, it is reasonable to conclude that modeling is not warranted for minor sources and minor modifications with good dispersion at emission rates below the thresholds in Table 1 of the Colorado Modeling Guideline.

At first glance, these two paragraphs may appear inconsistent. The first suggests that use of emission rates to make judgements about ambient impacts are problematic because emission rates alone do not account for dispersion characteristics. The second indicates that use of the

[52]Colorado Department of Public Health and Environment, Air Pollution Control Division, Technical Services Program, Modeling and Emissions Inventory Unit, *DraftColorado Modeling Guideline for Air Quality Permits, Draft* (May 2018) (enclosed as Appendix A).
[53]75 Fed. Reg. 6,474, 6,484 (Feb. 9, 2010) (discussing the need for a new more stringent NO_2 standard).

emission rate thresholds to determine when modeling is warranted is nevertheless reasonable where a source has good dispersion characteristics and existing air quality is well below the standards. Together, these paragraphs confirm that the modeling thresholds are merely a tool that must be used along with the exercise of expert judgment in deciding when to model.

The 2018 version of the modeling thresholds, the most recent draft to be released to the public, is provided below:

Table 1. Modeling Thresholds

If emission rate is less than threshold, a qualitative description of impact may be adequate unless a situation warrants modeling.[1]

Pollutant	Requested Emission Rate from New Source or Facility-Wide Net Emissions Increase from a Modification	
	Long Term (tons per year)	Short Term (pounds per hour)
Carbon Monoxide (CO)	23 pounds per hour	
Nitrogen Oxides (NO_x)	40	0.46
Sulfur Dioxide (SO_2)	40	0.46
Particulate Matter < 10 µm (PM_{10})	82 pounds per day	
Particulate Matter < 2.5 µm ($PM_{2.5}$)	5	11 pounds per day
Lead (Pb)	25 pounds per 3-months	

[1]Circumstances where source may cause or contribute to a violation of applicable ambient air quality standards despite being below the thresholds:

(a) Sources of SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO, or Pb where a substantial portion of the new or modified emissions have poor dispersion characteristics (e.g., rain caps, horizontal stacks, fugitive releases, or building downwash) in close proximity to ambient air at the site boundary

(b) Sources located in complex terrain (e.g., terrain above stack heights in close proximity to the source)

(c) Sources located in areas with poor existing air quality

(d) Modification at existing major sources, including grandfathered sources that have never been modeled before

Of particular note is the footnote to the Table 1 modeling thresholds. In that footnote, MEIU made clear that the modeling thresholds do not establish a bright-line exemption, but rather serve as guidelines that should only be applied in certain circumstances. The footnote explains that a violation of a NAAQS may be possible at emission rates lower than the thresholds if a source (a) has poor dispersion characteristics, (b) is located in complex terrain, (c) is located in an area with poor existing air quality, or (d) has never been modeled before. According to the Guideline, modeling may be warranted in such cases, regardless of emission rate.

A draft work plan developed in 2020 for revising the modeling thresholds, drafted by two of the authors of the letter to EPA OIG, confirms the basis of these caveats:

> To keep the number of variables assessed manageable, all these model runs were conducted with the same receptor grid, with flat terrain, assuming a full conversion of NO_x to NO_2, and without considering the influence of nearby facilities and the existing background concentrations. All those additional variables that were not assessed in that study were included as caveats to consider when using the resulting threshold, which introduces some degree of subjectivity based on the professional judgement of the person applying the thresholds to specific situations.[54]

The work plan also makes clear that, while extensive, the hypothetical modeling analysis underlying the Modeling Guideline thresholds have limitations, and those limitations must be considered in applying the thresholds in individual cases, where site-specific circumstances might differ substantially from the assumptions used to generate the thresholds.

The work plan also suggests the thresholds may be overly conservative in some cases. It notes that, of the 22 scenarios used in the hypothetical modeling analysis underlying the 1-hour modeling thresholds, violations occurred in only 3 of 22 scenarios at the emission rate of 0.46 lb/hr and in only 10 of 22 scenarios at an emission rate of 9.13 lb/hr (equivalent to the annual threshold of 40 tpy). The work plan also explains that the 2010 analysis used to develop the 0.46 lb/hr threshold "left out" a "decisive" variable by assuming 100% NO_x to NO_2 conversion, which is the most conservative assumption possible. To better reflect the actual site-specific probability of a NAAQS violation, the work plan proposed to refine the 2010 modeling thresholds using a refined estimate of NO_x to NO_2 conversion reflecting different ambient air conditions in different areas of the state.

B. PS Memo 10-01

Shortly after the MEIU developed new short-term modeling thresholds in 2010, the Permitting Program prepared a two-page "Inter-office Communication" entitled "PS [Permit Section] Memo 10-01."[55] The stated purpose of the memo is to establish new guidance for modeling minor sources "in a manner consistent with the EPA guidance for PSD sources." The memo relies solely on EPA guidance stating that an "ambient air quality impact analysis" is not necessary for PSD major sources with a potential to emit less than the SER of 40 tpy of NO_2 and SO_2. Based on the theory that "the same principles apply to minor sources," APCD extended that EPA policy to create a policy for modeling minor sources: "[APCD] will apply EPA's SERs for NO_x and SO_2 to the 1-hour NO_2 and 1-hour SO_2 standards for all stationary source permitting activities, including determining when ambient air quality impact analyses are necessary."

In essence, PS Memo 10-01 relies on EPA's SER trigger for the major source PSD requirement for an "ambient air quality impact analysis" as the basis for modeling of minor sources for the 1-hour NO_2 and SO_2 NAAQS. APCD has interpreted and applied the memo to

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[54]Rosendo Majano & Bradley Rink, Modeling and Emissions Inventory Unit, Air Pollution Control Division, Colorado Department of Public Health & Environment, *Work Plan to Derive Emissions Modeling Thresholds for the 1-hr NO2 NAAQS* (Sept. 3, 2020).

[55]Interoffice Communication from Kirsten King and Roland C. Hea, Colorado Department of Public Health and Environment, Stationary Sources Program / Air Pollution Control Division, to Stationary Sources Staff, Local Agencies, Regulated Community, *PS Memo 10-01, Permit Modeling Requirements for the 1-Hour NO_2 and SO_2 NAAQS* (Sept. 20, 2010).

mean that modeling is not warranted for minor sources under the SER of 40 tpy. The memo made no mention of the short-term modeling threshold of 0.46 lb/hr for those pollutants that was contemporaneously developed by the MEIU. The memo also made no mention of the requirements in the Colorado SIP, Regulation 3, requiring APCD to evaluate the potential impacts of a new source or project in some fashion prior to issuing a permit.

IV. ALLEGATIONS IN THE LETTER TO EPA OIG

In a letter dated March 30, 2021,[56] three members of the MEIU requested review by the EPA Office of Inspector General (OIG) of alleged "intentional non-enforcement" of the NAAQS. Submitted on the letterhead of an organization named "Public Employees for Environmental Responsibility" (PEER), the employees alleged "unlawful acts and omissions by CDPHE," including:

- Suppressing information demonstrating that pending permits would lead to modeled violations of NAAQS;

- Approving air quality permits which violate NAAQS; and

- Ordering modeling staff to ignore modeled NAAQS violations which would conflict with nonbinding agency guidance documents.

More specifically, the employees alleged that "[o]n March 15, 2021, CDPHE issued a blanket prohibition on air quality modeling staff from reviewing NAAQS compliance for hourly [NO_2 and SO_2] limits, 3-hour standards for SO_2, and daily standards for $PM_{2.5}$." They also claim to have been "ordered by our management to not perform certain [ ] legally required duties." The employees summarized the legal authority underlying their claims as follows:

> In short, CDPHE is required to verify through air quality modeling that a new major or minor stationary source, or a modification to an existing source, will not cause or contribute to a NAAQS exceedance.Issuing an air permit for a minor source without verifying NAAQS compliance violates the requirements of the New Source Review permitting program outlined in the EPA-approved SIP: Colorado's AQCC Regulation 3.

As evidence of their allegations, the employees quoted an email sent by the APCD Technical Services Program Manager. In that email, the manager indicated that "effective immediately, the short-term thresholds in the Modeling Guideline will not be used and that modeling only be performed using the following thresholds," listing only the annual modeling thresholds and none of the short-term modeling thresholds. The email also indicated that the Modeling Guideline would be removed from the website "pending further discussions and

[56]Letter from Rosendo Majano, DeVondria Reynolds, & Bradley Rink to U.S. Environmental Protection Agency Office of Inspector General Sean W. O'Donnell, *Request for Review of Intentional Non-Enforcement of National Ambient Air Quality Standards by Colorado Department of Public Health & Environment Pursuant to State Implementation Plan Under the Clean Air Act, 42 U.S.C. § 7401 et seq.* (Mar. 30, 2020) (enclosed as Appendix B).

revisions." In a follow-up email from the Supervisor of the Modeling Unit, the Technical Services Program Manager stated the following:

> No, we are not to address the short-term standards... "the short-term thresholds in the Modeling Guideline will not be used."

(emphasis and quotes in original). The employees claim the policy stated in these emails violates Colorado's SIP and the minor NSR program established under the CAA because "it exempts new stationary sources and modifications from demonstrating compliance with short term NAAQS by simply not considering them." The letter alleges that these violations are "contributing directly to chronic health problems, premature deaths, and severe injury to the environment" and that the policy was implemented "in secret."

In addition to challenging the direction provided in the March 15, 2021 email, the employees criticize the historical guidance underlying it: PS Memo 10-01. They claim APCD has allowed that memo to supersede statutory and regulatory requirements by "issuing permits to facilities that had small annual emissions rates but still caused a disproportionately severe impacts [sic] on local air quality, particularly regarding the hourly NAAQS," citing several examples. The examples focus on the short-term NAAQS, namely 1-hour NO_2 and SO_2 and 24-hour $PM_{2.5}$, although the primary air quality concern cited by the authors of the letter to EPA OIG is the Denver nonattainment area for 8-hour ozone resulting from excess NO_2 emissions.

The employees also allege that they were ordered to "falsify data" even when modeling was conducted. These claims center primarily on the permit issued in November 2020 to the Cripple Creek & Victor (CC&V) Gold Mine in Teller County, CO, for a permit application submitted in March 2013. Correspondence attached as an appendix to the letter spell out specific concerns that the employees had with the way they were asked to model that facility:

- Non-Road Engine Loads and Emissions: The employees claim they were ordered to use estimates of engine loads based on fuel consumption data that were too low because they failed to use basic statistical techniques in the handling of the raw data.

- NO_2/NO In-Stack Ratios: The employees claim they were ordered to use an NO_2/NO ratio that was too low (as low as 0.01), which they did not believe to be technically supported, instead of the EPA default ratio of 0.5.

- Source Groups and OLMGROUP ALL Algorithms: The employees claim that they were ordered to rely on the results of modeling conducted using two algorithms that EPA had indicated should not be used in the same analysis.

In subsequent correspondence focused exclusively on the allegations associated with the CC&V mine,[57] one of the employees noted additional concerns, including:

[57]During the investigation, PEER provided a follow-up analysis prepared by one of the authors of the PEER Letter to EPA OIG providing additional details on the concerns with the CC&V modeling analysis. Rosendo Majano, *Mishandling of the Air Permit Application Submitted to the Colorado Department of Public Health and Environment by the Cripple Creek & Victor Gold Mine* (Aug. 1, 2021). The information in that subsequently

- NO_2 Background: The employee claimed background concentrations were "falsified" because the modeling analysis relied on three months of data from a new monitor placed near the CC&V mine instead of a pre-existing monitor located further away.

- EPA's "MOtor Vehicle Emission Simulator" (MOVES): The employee claimed that the CC&V mine had not been required to use MOVES to estimate emissions from large diesel engines even though APCD typically requires the use of MOVES.

- Tampering with Final Modeling Analysis Results: Referring to the prior claim regarding the Source Groups and OLMGROUP ALL algorithms, the employee claimed that APCD ordered the final results to be changed back to the version relying on both algorithms instead of using new results that corrected for the alleged error.

In response to the March 30 letter from PEER, the Executive Director of CDPHE sent a letter to PEER dated April 14, 2021, indicating that PS Memo 10-01 had been "retired."[58] The letter also announced two "anticipated changes" during an "interim period:" "1) removing the reference to the PS Memo 10-01 so all know that the revised modeling guidelines are the single source of information related to modeling, and 2) communicating that APCD will not require modeling of sources that have very low NOx and SO2 emissions, but the modeling unit may consider the low short-term thresholds when evaluating whether modeling is appropriate." The letter promised further action and additional correspondence within the next thirty days. The Director sent another letter to PEER on May 14, 2021, indicating that the state had begun the process of conducting an independent investigation, through the selection of a Special Assistant Attorney General outside of the Attorney General's Office, as PEER had requested in a letter to Colorado Attorney General Phil Weiser dated April 25, 2021.

V. LEGAL ANALYSIS

In the letter to EPA OIG, the CDPHE employees essentially raise two different types of claims: (1) generalized claims about APCD's guidance and practices with respect to modeling of minor sources, and (2) facility-specific claims about how modeling analyses were actually conducted for an individual minor source.

The first and more generalized claims focus on the requirements for ensuring the construction of new minor sources and projects at existing minor sources will not exceed a NAAQS. The employees assert that "CDPHE is required to verify *through air quality modeling* that a new *major or minor* stationary source, or a modification to an existing source, will not cause or contribute to a NAAQS exceedance" (emphasis added). As such, the employees assert APCD has failed to meet this requirement in two ways—by failing to require permit applicants to perform air quality modeling, and by issuing permits even when modeling analyses predicted a project may cause a NAAQS exceedance. Since the claims and evidence provided in the letter to EPA OIG focus primarily on the 1-hour standards for NO_2 and SO_2, and far less on claims

provided analysis has been evaluated to the extent it relates to and supports the original claims made in the letter to EPA OIG.

[58]Letter from Jill Hunsaker Ryan, MPH, Executive Director, to Chandra Rosenthal, Rocky Mountain PEER Director, Public Employees for Environmental Responsibility (Apr. 14, 2021) (enclosed as Appendix C).

related to other standards, such as the 3-hour SO_2 standard and the 24-hour PM standard, this investigation likewise focused on 1-hour NO_2 and SO_2, although the same principles apply to all of the short-term standards identified in the letter.

The second and more specific claims focus on how modeling was conducted for specific facilities in cases where modeling did not predict an exceedance, but the employees disagreed with the inputs to the model or the way the model was run. Most of the support provided for this type of claim focuses on a single facility: CC&V. The employees assert that the analysis for that facility was conducted incorrectly, or at least in a manner that was inconsistent with EPA guidance, for the purpose of obtaining results that were more favorable to the permittee. Most notably, the employees claim they were forced to "falsify data" to ensure the results of the modeling analysis did not predict a NAAQS exceedance and "suppress information" regarding errors in the modeling analysis.

Each of these two types of claims, (1) failure to model or issuing permits with modeled exceedances, and (2) improper modeling to eliminate modeled exceedances, is addressed separately below. In short, APCD has discretion in deciding whether to model minor sources and which minor sources to model. However, this investigation determined that APCD did not appropriately exercise that discretion to ensure that construction or modification of minor sources would not exceed a NAAQS. Additionally, some aspects of the modeling analysis for CC&V were inconsistent with EPA's modeling guidelines and relied on assumptions that were not properly justified, but APCD took other steps to ensure compliance with the NAAQS, and the claims regarding intentional falsification of data and suppression of information were not substantiated.

A. The 40 TPY Threshold in PS Memo 10-01 Fails to Ensure Construction or Modification of Minor Sources Will Not Interfere with Attainment of the NAAQS.

The employees' letter claims CDPHE must "verify through air quality modeling" that a minor source "will not cause or contribute" to a NAAQS exceedance. While this statement accurately reflects the modeling requirements applicable to major sources, the requirements for minor sources are different. Even so, APCD's policy for modeling minor sources did not properly ensure minor sources would not exceed a NAAQS.

1. Modeling Minor Sources Is Discretionary.

As discussed in Section I above, the CAA and EPA's rules for major sources clearly require the permittee itself to demonstrate that any proposed construction will not "cause or contribute" to a NAAQS exceedance. EPA's regulations also make clear that major sources must make that required demonstration using computer modeling that follows EPA's Appendix W modeling guideline (at least where it is possible to do so, and unless an alternative approach is approved by EPA). Therefore, major sources must "verify through air quality modeling" that projects "will not cause or contribute" to a NAAQS exceedance.

However, unlike the statutory provisions applicable to major sources, the CAA does not contain an express provision that directly requires minor sources to demonstrate whether a

project will "cause or contribute" to a NAAQS exceedance. Instead, the CAA directs *states* to develop implementation programs to regulate the construction and modification of any stationary source "as necessary to assure that [the NAAQS] are achieved."

Like the statute, EPA's regulations do not expressly require minor sources to conduct modeling or even make a "cause or contribute" demonstration in every case. Rather, EPA's regulations require states to have "legally enforceable procedures" in place that allow the state to determine whether a project at a minor source will "interfere with attainment." EPA's own regulations for minor sources in Indian country, where EPA is the direct permitting authority, confirm that modeling is not required for every permit. In developing those rules, EPA made clear statements as recently as 2016 confirming that modeling for minor sources is discretionary, at one point even opined that modeling of minor sources was "rare," and later admitted that it was difficult to predict when modeling for minor sources would be needed.

The Colorado regulations and SIP are consistent with this interpretation of the CAA and EPA regulations. As an initial matter, Part F of Regulation 3 makes clear in several places that the permitting requirements in the Colorado SIP are intended to parallel EPA requirements. Where the Colorado SIP differs from EPA regulations, those differences are expressly addressed, and there is no indication in Part F that Colorado intended for its SIP to differ from EPA requirements with respect to modeling of minor sources.

Furthermore, Part B of Regulation 3, like the CAA and EPA's regulations, does not contain a clear mandatory requirement for modeling of all minor sources. Instead, those regulations contain general requirements that are only directed toward APCD, requiring it to ensure compliance with the NAAQS. Specifically, the first provision cited by the employees in Regulation 3 Part B Section III.B.5. directs "the Division" to determine whether a new source will comply with the NAAQS. Another provision in Section III.D.1., outlining the requirements for all construction permits, likewise focuses on "the Division," and requires it to ensure a proposed source or activity will not cause an exceedance of the NAAQS.

Accordingly, the assertion in the employees' letter is overstated. While the letter suggests APCD is legally required in every case to "verify through air quality modeling" that a minor source "will not cause or contribute" to a NAAQS exceedance, the law grants the state discretion in deciding when to model minor sources. Other documents prepared by the authors of the letter to EPA OIG, such as the work plan to revise the Modeling Guideline, confirm they agree "Regulation 3 does not explicitly require modeling for minor sources, and therefore the impact analysis can be performed using quantitative (i.e. modeling) or qualitative methods."[59]

2. APCD Did Not Properly Justify Its Policy on Modeling Minor Sources.

Although the relevant law confirms modeling is discretionary, the law does impose a mandatory obligation: APCD must determine whether the construction or modification of minor sources will interfere with attainment of the NAAQS and prevent exceedances of the NAAQS. This requirement is made clear in the CAA itself, by requiring each SIP to regulate the

[59]2020 Work Plan, at 1.

construction and modification of any stationary source "as necessary to assure that [the NAAQS] are achieved." The requirement is also made clear in EPA's minor NSR regulations, by requiring each SIP to have "legally enforceable procedures" that enable the State or local agency to determine whether a project will interfere with attainment a NAAQS, and, if so, prevent the construction of the project. Colorado's SIP mirrors EPA's regulations by requiring APCD to determine whether a project will comply with the NAAQS and by requiring APCD to issue a permit only if the project will not cause an exceedance of the NAAQS.

In other words, APCD has a duty to prevent NAAQS exceedances by any source, whether major or minor, even though it has discretion in deciding how best to satisfy that duty for minor sources. Modeling is not required in all cases; but, in the absence of modeling, APCD must still satisfy its duty to ensure compliance with the NAAQS in some other way. Stated in the reverse, as long as APCD properly justifies and implements policies and procedures that demonstrate the permits it issues will not interfere with attainment of the NAAQS, APCD is not required to model every permit and source. However, for more than ten years, APCD had two directly conflicting policies—the Modeling Guideline and PS Memo 10-01—leading to internal and external confusion and, ultimately, a failure of APCD to satisfy its duty to ensure compliance with the NAAQS.

a. The Modeling Guideline Is Properly Justified, but Overly Conservative.

The Colorado Modeling Guideline differs from PS Memo 10-01 in several ways:

- It was developed over a four year period (1998-2002), well before PS Memo 10-01. It was also updated over time—new versions were released in 2005 and 2018, and minor revisions were made to the modeling thresholds in between versions as well.

- It was developed through a more formal, deliberative, and public process. The original version was "based on comments from a technical peer review conducted in 2000 and 2001, public comments, and comments from several stakeholder meetings." The Guideline was also presented to and considered by the AQCC twice in 2001.

- It is more comprehensive than PS Memo 10-01, addressing not only when modeling is warranted but also a wide variety of specific modeling issues relevant for all sources. The most recent version spans 125 pages including appendices.

Most importantly, unlike PS Memo 10-01, the Modeling Guideline was based on a rigorous scientific analysis of dozens of hypothetical modeling runs with varying assumptions that differentiated between the different NAAQS as they were adopted over time. For example,[60] while the MEIU determined in 2002 that exceedances of the annual NO_2 NAAQS would be unlikely at an emission rate of 40 tpy, they recognized in 2010 that the newly adopted 1-hour NO_2 NAAQS required a separate evaluation. Accordingly, the MEIU conducted a similar analysis in 2010 and found exceedances of the 1-hour NAAQS were likely to occur at an hourly rate that was equivalent to 40 tpy, so they re-ran the models with lower rates until they found one

[60]Although this analysis will focus primarily on NO_2, similar concepts generally apply to SO_2 and $PM_{2.5}$.

unlikely to cause exceedances: 0.46 lb/hr (equivalent to 2 tpy). The work plan developed in September 2020 by the authors of the letter to EPA OIG confirms the rigor of analysis underlying the 0.46 lb/hr modeling thresholds:

> [T]he current 0.46 lb/hr modeling threshold for the 1-hr NO_2 NAAQS was derived by conducting a set of 4,312 model runs, testing 22 different source operating scenarios, 49 years of meteorological data, and 4 different emission rates. To keep the number of variables assessed manageable, all these model runs were conducted with the same receptor grid, with flat terrain, assuming a full conversion of NO_x to NO_2, and without considering the influence of nearby facilities and the existing background concentrations.[61]

By adopting separate thresholds for the 1-hour NAAQS, the Modeling Guideline did something PS Memo 10-01 did not—it recognized that some pollutants are subject to more than one NAAQS, and that compliance with one does not ensure compliance with the other. NO_2, for example, is subject to two different NAAQS: the annual standard first adopted in 1971, and the 1-hour standard adopted in 2010. Although both of those standards rely on NO_2 as the indicator, they are different standards. In the preamble to EPA's final rule to adopt the 1-hour NO_2 standard, EPA explained why two different standards were needed:

> In addition to setting a new 1-hour standard, the Administrator retains the current annual standard with a level of 53 ppb. The new 1-hour standard, in combination with the annual standard, will provide protection for susceptible groups against adverse respiratory health effects associated with ***short-term exposures to NO_2*** and effects potentially associated with ***long-term exposures to NO_2***.[62]

Even when the indicator is the same, demonstrating compliance with different NAAQS requires separate analyses, and an area can be designated nonattainment for one or the other, or both, depending on the results. If modeling is used to evaluate the potential impacts of an individual source, different modeling must be conducted to provide results that are relevant to each standard, just as different modeling would be needed for entirely different pollutants. The Modeling Guideline inherently accounted for these differences; PS Memo 10-01 did not.

Moreover, unlike PS Memo 10-01, the Modeling Guideline recognized modeling is just a tool for satisfying the underlying requirement to ensure all permits will not exceed a NAAQS. The Modeling Guideline confirmed that, without modeling, a "qualitative" analysis was still required to demonstrate compliance. It also provided a framework for doing so, in the form of emission thresholds determined to be unlikely to violate the NAAQS via hypothetical modeling, with caveats that allow for consideration of site-specific characteristics and the exercise of expert judgment. PS Memo 10-01 provided no guidance on what sort of evaluation might be needed when modeling was not required, leaving the reader with the impression that nothing more was required for sources below the cited emission rate threshold of 40 tpy.

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[61] 2020 Work Plan, at 3.

[62] 75 Fed. Reg. 6,474, 6,502 (Feb 9, 2010). While EPA recognized the evidence is less clear on the health impacts of long-term exposures than for short-term exposures, *see id.* at 6,481, EPA still retained the annual standard to support the effort to reduce short term exposures and protect against the potential risks of long term exposures.

While the thresholds in the Modeling Guideline were well-justified, they raised practical concerns. At the equivalent of just 2 tpy for both 1-hour NO_2 and SO_2, the thresholds suggested almost every minor source permit would need to be modeled for those pollutants, given that minor source permits are only required for sources above 5 tpy or 10 tpy of those pollutants, depending on the attainment status of the area. Since APCD receives thousands of minor source permit applications every year, it does not have sufficient resources to model every single one. Recognizing the Guideline was based on highly conservative assumptions, and the need for a more practical approach, MEIU began reevaluating the thresholds in 2020. In the work plan for that effort, two authors of the letter to EPA OIG recognized that the thresholds in the Modeling Guideline are likely overly conservative, stating that "it has become clear that some revisions to those two hourly thresholds [for NO_2 and SO_2] are necessary to address some deficiencies …."

b. PS Memo 10-01 Lacked a Proper Justification.

The Permitting Program prepared PS Memo 10-01 in September 2010, shortly after the MEIU added the new hourly modeling thresholds in April 2010 and August 2010 for the 1-hour NO_2 and SO_2 NAAQS, respectively. Although PS Memo 10-01 was issued at about the same time as the revised Modeling Guideline thresholds and addressed the same question, the differences are stark. Not only is PS Memo 10-01 far shorter (just four paragraphs long), the discussion in the memo is entirely different in character. Instead of providing comprehensive guidance backed by expert analysis based on a peer-reviewed approach, PS Memo 10-01 relied solely on EPA guidance for major sources to address the single question of when modeling of minor sources is warranted for the 1-hour NO_2 and SO_2 NAAQS.

The answer provided in PS Memo 10-01 is in direct conflict with the answer to that same question in the Modeling Guideline. Whereas the Modeling Guideline recognized that the new 1-hour NAAQS required new lb/hr modeling thresholds that equate to 2 tpy of NO_2 and SO_2, PS Memo 10-01 determined that 40 tpy, the original threshold for modeling annual NO_2 and SO_2, and EPA's trigger for major NSR permitting of project at existing major sources, should also be the threshold for modeling minor sources for 1-hour NO_2 and SO_2.

A close review of the EPA guidance for major sources cited in PS Memo 10-01 confirms that it does not support a 40 tpy threshold for modeling minor sources. The EPA guidance contained two key policy statements. First, EPA indicated that states could continue using the 40 tpy SERs as a *de minimis* threshold for requiring a major NSR permit. Second, EPA indicated new SILs were needed as a *de minimis* threshold in deciding whether modeled impacts of a major source are "significant" enough to warrant cumulative modeling.

These two policy statements differ in an important way. In retaining the 40 tpy SERs, EPA confirmed that the *de minimis* threshold for determining when a major permit is required did not need to change to reflect the new averaging time of the 1-hour NAAQS. That is, the emissions level defining a "major modification" at a "major source" could remain the same. In contrast, by adopting new SILs, EPA recognized that the *de minimis* level for determining whether ambient impacts are "significant" must change to reflect the new 1-hour standards. That is, the level of impact deemed "significant" must be different for the new shorter-term NAAQS. Thus, EPA allowed the major NSR permitting threshold to remain the same, but required the modeling threshold to change.

Despite this distinction, PS Memo 10-01 adopted EPA's 40 tpy major NSR permitting threshold as a modeling threshold for minor sources. The memo justifies this approach in two ways, first by assuming that "the same principles" relied upon by EPA in its guidance for major sources should apply to minor sources, and second by noting APCD "is aware of no factual basis to impose more stringent requirements on minor sources than EPA would impose" on major sources. In its conclusion, PS Memo 10-01 states APCD will apply the annual SERs in determining when "*ambient air quality impact analyses*" are necessary.

However, PS Memo 10-01 uses the phrase "*ambient air quality impact analysis*" to mean something other than what EPA intended. EPA used that phrase to reference the mandatory modeling imposed by statute and regulation under major NSR, which includes review of not only potential violations of the NAAQS but also PSD Increments, a more extensive analysis than the discretionary modeling of minor sources for potential NAAQS violations. PS Memo 10-01, on the other hand, used the phrase "ambient air quality impact analysis" to mean modeling of any kind, or at least that is how the memo was applied in practice for over a decade. As applied, the conclusion of PS Memo 10-01 can be restated as follows: *APCD will apply EPA's annual SERs to the 1-hour standards in determining when modeling is necessary for minor source permitting.*

PS Memo 10-01 does not attempt to determine whether the annual SERs are actually an appropriate modeling threshold for the 1-hour NAAQS, and EPA's original justification for the annual SERs suggests that they are not. EPA developed the annual SERs in 1980 by analyzing data from sources that had already been permitted under the PSD program at that time. Based on that information, EPA performed modeling to determine an emission level at which impacts would be unlikely to exceed the annual NO_2 standard and an annual and 24-hour SO_2 standard. The preamble to EPA's adoption of the SER thresholds confirms that the annual averaging time of the standards was critical to EPA's analysis underlying the 40 tpy SER:

> [T]he Administrator has decided to use four percent of the 24-hour primary standard as a design value for both PM and SO_2 . These ambient levels correspond to emissions rates of 25 tons per year for PM and 40 tons per year for SO_2 ….*Because the nitrogen dioxide standard is expressed only as an annual average, a factor of two percent was used to determine the design value. There were two reasons for this decision. First, for a given level of emissions, a predicted annual concentration will be smaller than a short-term value*. Conversely, therefore, a lower percentage for the annual standard than for a shorter term standard is indicated if one is to maintain a reasonably consistent rationale for emissions rates.Second, the emissions rate corresponding to two percent of the standard is 40 tons per year, which is comparable to the rate established for SO_2. Both these pollutants are frequently emitted from the same source, in roughly equivalent amounts …."[63]

EPA's 2010 guidance, the sole basis for PS Memo 10-01, likewise confirms averaging time was critical in deciding what concentration constitutes a "significant" impact to air quality:

[63]45 Fed. Reg. 52,676, 52,708 (Aug. 7, 1980) (establishing "significant emission rates" in response to the decision of the D.C. Circuit in *Alabama Power Company v. Costle*, 636 F.2d 323 (D.C. Cir. 1980)) (emphasis added).

> As explained in the preamble to the 1980 rulemaking and the supporting documentation, EPA decided to use 4% of the 24-hour primary NAAQS for PM and SO_2 to define the significant emissions rates (SERs) for those pollutants. It was noted that, *at the time, only an annual NO_2 NAAQS existed*. Thus, for reasons explained in the 1980 preamble, to define the SER for NOx emissions we used a design value of 2% of the annual NO_2 NAAQS. *Looking now at a short-term NAAQS for NO_2*, we believe that it is reasonable as an interim approach to use a SIL value that represents 4% of the 1-hour NO_2 NAAQS.[64]

Thus, within the EPA guidance relied upon in PS Memo 10-01 is an explanation for why the 40 tpy SERs, although likely to be *de minimis* for the annual NAAQS, would not necessarily be *de minimis* for the 1-hour NAAQS. PS Memo 10-01 also fails to acknowledge and address the fact that the MEIU had already conducted extensive hypothetical modeling and concluded that a 40 tpy modeling threshold could violate the 1-hour NAAQS in many cases.

In addition, the two justifications provided in PS Memo 10-01 do not withstand scrutiny. Contrary to the first justification, the "same principles" do not necessarily apply to major and minor sources. Projects at major sources below the SER must still get a minor NSR permit, and therefore must still demonstrate the project will not exceed the NAAQS, but PS Memo 10-01 would exempt that same project at a minor source from any air quality evaluation whatsoever. EPA itself noted this difference when it first adopted the 40 tpy SERs in 1980. Specifically, in responding to concerns about projects that might fall below the SERs, EPA stated the following:

> Although such [minor] sources would not get PSD permits, they do not go unreviewed. Most, if not all, will be permitted under ongoing state NSR programs pursuant to 40 CFR 51.18.[65]

The rule referenced, 40 C.F.R. § 51.18, was later reorganized as 40 C.F.R. § 51.160. That rule, as noted above, is EPA's rule for minor NSR, which requires states to adopt procedures to ensure minor sources will not exceed the NAAQS. In other words, the principles for exempting major and minor sources from certain requirements are different because projects excused by EPA from major NSR modeling are still subject to the backstop of minor NSR, whereas projects excused by PS Memo 10-01 from minor NSR modeling were not evaluated at all.

This point also calls into question the second justification provided in PS Memo 10-01 regarding more stringent requirements on minor sources than major sources. That concern appears grounded in an assumption that major sources would not need to perform any modeling for a pollutant that did not exceed the SER, but that is not what EPA's guidance says. It says that emissions increases below the SER do not constitute "major modifications," and thus an ambient impact analysis via modeling is not mandatory, but it does not say anything about evaluating emissions below the SER. EPA did not address the independent requirement for states to

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[64]EPA Memorandum, *General Guidance for Implementing the 1-hour NO_2 National Ambient Air Quality Standard in Prevention of Significant Deterioration Permits, Including an Interim 1-hour NO_2 Significant Impact Level*, Anna Marie Wood, Acting Director, Air Quality Policy Division, at 12 (June 28, 2010)

[65]45 Fed. Reg. 52676 (Aug. 7, 1980) (establishing "significant emission rates" [SERs] in response to the decision of the D.C. Circuit in *Alabama Power Company v. Costle*, 636 F.2d 323 (D.C. Cir. 1980).

determine whether any source or project will violate a NAAQS, whether through modeling or other tools, and thus PS Memo 10-01 fails to address that requirement as well.

In sum, PS Memo 10-01 (1) improperly relied on EPA's *annual* SERs as a minor source modeling threshold for the *1-hour* standards, (2) failed to address the direct conflict with the analysis conducted by the MEIU just a few months earlier, and therefore (3) lacked a justified means of satisfying the requirement in the Colorado SIP, Regulation 3, Part B for ensuring all permits do not allow an exceedance of the NAAQS.

c. APCD's Decision to Rely Solely on PS Memo 10-01 Failed to Ensure Minor Source Permits Would Not Exceed a NAAQS.

The conflict between PS Memo 10-01 and the Modeling Guideline resulted in a confusing permitting process. In general, the permit engineer decided which pollutants, if any, warranted modeling prior to issuance of a minor source permit. As such, the MEIU would only have an opportunity to review permits if the permit engineer first decided that modeling of at least one pollutant was needed. Based on interviews of current APCD employees, permit engineers in the Permitting Program typically relied on PS Memo 10-01 in determining which pollutants should be modeled, and thus would not request modeling for any pollutants below the annual thresholds (*e.g.*, 40 tpy of NO_2).

However, if another pollutant warranted modeling because it exceeded the annual thresholds, the permit engineer would require the source to conduct modeling for that pollutant, and the permit engineer would send the analysis to MEIU for review and approval. Once the modeling analysis for one pollutant was submitted to the MEIU, the MEIU would also review the emission rates for other pollutants that the permit engineer had not asked the applicant to model. If the facility had the potential to emit more than a short-term modeling threshold in the Modeling Guideline (*e.g.*, 0.46 lb/hr of NO_2), the MEIU would conduct modeling for that additional pollutant and put the results in a modeling report that was sent back to the permit engineer, along with an evaluation of the original modeling analysis submitted by the applicant.

As a result, the permitting file might indicate a potential violation of a NAAQS even though the permit engineer decided modeling of that pollutants was not warranted under PS Memo 10-01. Thus, a modeled violation might go unnoticed unless identified and addressed by either the permit engineer or the applicant, which was unlikely in light of PS Memo 10-01. At best, this process created tension between the Permitting Program, the MEIU, permit applicants, and APCD management. At worst, it resulted in issuance of permits with inconsistent records indicating that modeled violations of the NAAQS had not been addressed because modeling was not required under PS Memo 10-01.

Recognizing the dysfunction in the process generated by the two conflicting guidance documents, APCD management decided in March 2021 that PS Memo 10-01 should control. That decision was communicated in the meeting held on March 15, 2021, and it was confirmed via two emails on March 15 and 16, 2021, which are quoted in the letter to EPA OIG. Based on an interview with the author of the emails, the policy APCD intended to communicate may have been to use PS Memo 10-01 to override the Modeling Guideline only temporarily until revised modeling thresholds could be developed, and that modeling could be required at less than 40 tpy

on a case-by-case basis. However, the plain language of the emails asks APCD employees to ignore the 1-hour NAAQS at sources with emissions below 40 tpy, which, as discussed above, fails to ensure minor sources will not exceed the 1-hour NAAQS.

3. APCD Issued Permits With Unaddressed Modeled NAAQS Exceedances.

As examples of the problems described above, the letter to EPA OIG lists several permits for which they claim modeled violations were identified by the MEIU but left unaddressed when the permit was issued. At a minimum, these examples indicate that APCD did not have adequate procedures in place to consistently respond to circumstances that arose repeatedly, in which the MEIU conducted modeling that predicted NAAQS violations for pollutants that the Permitting Program did not ask the permit applicant to model. Since Regulation 3 requires APCD to determine whether minor sources will comply with the NAAQS, and only issue permits that will not violate the NAAQS, APCD's failure to resolve the modeling results prepared by its own modeling group constituted a failure to satisfy that duty. APCD should have resolved such modeling results prior to issuing a permit.

Nevertheless, the examples provided in the letter to EPA OIG indicate permits were issued with modeled NAAQS violations. However, neither the allegations made in the letter nor the information supporting those allegations indicate that any individual facility has actually violated a NAAQS because predicted violations will not necessarily materialize. Since modeled violations can be addressed in many ways, including refined modeling assumptions, new enforceable limits, or changes to the source or project, any outstanding concerns regarding the results of modeling previously conducted would require a case-by-case evaluation to determine the best course of action, which exceeds the scope of this investigation.

While a full review of the lawfulness of the permits issued for each of the listed facilities exceeds the scope of this investigation, the following provides a brief summary of information identified during the investigation that supports or contradicts the claims made:

- Williams Willow Creek Gas Plant. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour SO_2 NAAQS. A modeling report prepared by the MEIU in February 2012 indicates a modeled concentration of 139.47 ppb from the facility alone, without background, which exceeds the 1-hr SO_2 NAAQS of 75 ppb. The report contains an email dated April 1, 2011, indicating the 1-hour SO_2 NAAQS was not evaluated because the application was submitted prior to EPA's adoption of the 1-hour SO_2 NAAQS. However, the modeling report also indicates the permit was not issued until 2016.

- ColoWyo Coal Mine. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS. The permit for that facility was challenged in court, and that challenge was resolved through additional permit conditions and modeling analyses that appear to have addressed the alleged modeled violations. A 2019 modeling report explains that, with the recommended permit conditions in place, "the minor modification to the ColoWyo Coal Mine demonstrates compliance with all applicable pollutants and averaging periods."

- Asphalt Specialties Central Plant. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS and with suspected violations of the PM_{10} and $PM_{2.5}$ NAAQS. Permit conditions were imposed to address the modeling results for CO, but a 2019 modeling report indicated a modeled concentration[66] for 1-hour NO_2 of 172.12 ug/m^3 that, when combined with a background value of 113 ug/m^3, would exceed the 1-hour NO_2 NAAQS of 188 ug/m^3. However, the report recognizes that the modeled results for 1-hour NO_2 reflect an assumption of 100% NO_x to NO_2 conversion, which is the most conservative assumption possible for that input. The modeling report also indicates that violations of the PM_{10} and $PM_{2.5}$ NAAQS were suspected due to a failure to conduct cumulative modeling of fugitive emission sources.

- Martin Marietta Monaghan Facility. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS. A 2020 modeling report indicates that, with a conservative background assumption of 60 ppb, modeled 1-hour NO_2 concentrations "indicate that this project will cause or contribute to a [1-hour] NO_2 NAAQS violation." However, the report also recognizes that the result "may be mitigated with more refined modeling."

- Aggregate Industries Oxford Asphalt Plant. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS. A 2020 modeling report indicates a facility-specific impact of 127.96 ug/m^3 that, combined with an assumed background concentration of 113 ug/m^3, resulted in a total impact of 240.96 ug/m^3, above the 188 ug/m^3 NAAQS. As a result, the report states that "the facility has not demonstrated compliance with the 1-hr NO_2 NAAQS," based on the modeling performed by the MEIU. The report recommends that additional modeling be performed using a more refined estimate of NO_x to NO_2 conversion, but opines that exceedances remain likely due to the levels identified in the modeling performed.

- Bighorn Pad. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS. A 2017 modeling report indicates that modeling performed by the MEIU indicated that maximum modeled concentrations for the facility alone would be 633 ppb, well above the 100 ppb NAAQS, and thus "the MEIU believes a more refined quantitative analysis" "is warranted in this case."

- Martin Marietta Materials Highway 34 Facility. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS. A 2017 modeling report recommends permit conditions to restrict public access and limit operations to address the modeling results for 24-hour PM_{10}, but concludes that "the Martin Marietta Highway 34 facility causes and/or contributes to modeled violations of the 1-hr NO2 NAAQS." That conclusion is based on modeling performed by the MEIU indicating a maximum modeled concentration for the facility alone of 212.28 ug/m^3, compared to the 1-hour NO_2 NAAQS of 188 ug/m^3.

[66]Concentrations provided in ug/m^3 instead of ppb to be consistent with the form used in the modeling report.

- JBS Swift Beef Company. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 NAAQS, but APCD managers have indicated that the permit is intended to reduce emissions (from 91.3 tpy to 33.0 tpy), and neither a modeling report nor the permit has been issued.

- McCormick Asphalt Plant. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hour NO_2 and 1-hour SO_2 NAAQS. However, a 2020 modeling report indicates the facility does not cause or contribute to a modeled violation once recommended permit conditions were imposed, including limits on hours of operation and throughput, precluding public access from certain areas, and raising the height of the stacks to 20 meters.

- Asphalt Specialties 62nd Ave. Asphalt Plant. The letter to EPA OIG claims the facility was permitted with modeled violations of the 1-hr NO_2 NAAQS and a "high potential" for violation of the PM_{10} and $PM_{2.5}$ NAAQS. A 2021 modeling report indicates maximum modeled concentrations for 1-hour NO_2 of 596.42 ug/m^3, above the 188 ug/m^3 NAAQS. As a result, the report "strongly recommended" more refined modeling. With respect to PM, the report indicated that insufficient information had been provided on fugitive emissions, but that "it is with certainty that the 24-hr $PM_{2.5}$ and 24-hr PM_{10} standard will be exceeded" if the fugitive emissions were modeled, since the modeled impacts of point sources alone exceeded the NAAQS.

4. APCD Managers Did Not Intend to Violate the Law.

Although PS Memo 10-01 lacked a proper justification, and therefore APCD's decision to rely on it exclusively was contrary to law, no evidence has been identified that would suggest that the APCD managers intended to violate the law. While their analysis of the law was incorrect, their actions were understandable, in light of the circumstances.

The crux of the errors appears to be a lack of understanding of the minor NSR permitting requirements and the EPA guidance underlying PS Memo 10-01. Better communication between the Permitting Program and the MEIU during their parallel efforts to implement the 1-hour NO_2 and SO_2 NAAQS likely would have avoided the issuance of inconsistent guidance. In addition, the current APCD managers did not understand that PS Memo 10-01 lacked justification because they did not develop it and relied on the judgment of the Permitting Program manager who did. That author could not be interviewed because he is deceased, but his supervisor, who left CDPHE in 2014, confirmed that the overarching intent of PS Memo 10-01 was simply to follow EPA guidance. With that intent in mind, the policy set forth in the memo appeared reasonable on its face, and that appearance of reasonableness was supported by several factors.

First, in light of confusion over modeling, APCD sought clarification from EPA, but EPA failed to provide any guidance—EPA sent APCD an email on April 17, 2017, stating:

> [F]or minor source issues, EPA has minimal requirements and typically defers to states to implement their SIPs. … We do not plan to provide any further, more specific guidance on this issue at this time.[67]

This response is consistent with the statements found on EPA's website for minor NSR permitting in Indian Country, which confirm EPA is still developing a policy on when to model minor sources, and for the time being will rely on the policies of nearby states and case-by-case decisions by individual reviewing authorities. This lack of on-point guidance from EPA created a vacuum in which states like Colorado were left to rely on their own interpretation of the law in crafting a policy for modeling minor sources.

Second, APCD managers believed that their approach to modeling minor sources was fully consistent with, if not more protective than, the modeling policies of other states. Specifically, APCD learned in an October 2012 meeting hosted by EPA Region 8 and attended by other states' permitting managers that, of the five other states in EPA Region 8, two followed the same 40 tpy modeling threshold, one relied primarily on its monitoring network to evaluate potential ambient impacts, and one did not model minor sources at all. The APCD managers also referred to results of a nationwide survey conducted in 2015 by NACAA that confirmed state policies on modeling minor sources varied significantly, with many following the same 40 tpy modeling thresholds that were adopted in PS Memo 10-01.

Third, PS Memo 10-01 also addressed a critical issue for APCD: allocation of limited resources. Although the Modeling Guideline was backed by a scientific modeling evaluation demonstrating that NAAQS violations may occur at 40 tpy, a threshold of only 2 tpy meant that far more minor permits would require modeling for the 1-hour NO_2 and SO_2 NAAQS. Since minor sources are only required to get a permit if they emit more than 5 tpy or 10 tpy of those pollutants (depending on the area), a modeling threshold lower than the permitting threshold likely seemed unrealistically low. The vast majority of the permits issued by APCD are for minor sources, and the volume of applications typically ranges between 50-100 per month, according to information provided during this investigation, so a threshold requiring modeling for every minor source permit application was not feasible.

Fourth, and related to the concern over limited resources, the APCD managers believed that modeling the 1-hour standards was less likely to provide meaningful environmental benefits than other strategies for protecting air quality. Colorado currently does not have, and never has had, any nonattainment areas for the 1-hour NAAQS for NO_2 or SO_2, so modeling for those NAAQS was a lower priority than evaluating and reducing emission of other pollutants. Although NO_2 is a precursor for ozone, and thus any emissions of NO_2 could potentially exacerbate ozone levels in the nonattainment area surrounding Denver, a modeled exceedance of the 1-hour NO_2 standard elsewhere in the state would not necessarily result in a significant impact to ambient ozone concentrations. As noted above, 1-hour NO_2 can be modeled with AERMOD, but ozone cannot be modeled in the same way, due to the complex chemical

[67]Email from Scott Jackson, Unit Chief, Indoor Air, Toxics and Transportation Unit, U.S. Environmental Protection Agency Region 8 (Apr. 7, 2017).

reactions affecting ambient levels of ozone that can only be evaluated with far more resource-intensive photochemical grid models.

If nothing else, the theory in PS Memo 10-01 seems logical: if EPA does not model major sources under 40 tpy, why should APCD model minor sources under 40 tpy? The disconnect is that EPA did not entirely excuse major sources from all modeling, it only said that projects below 40 tpy do not trigger the mandatory modeling prescribed for major NSR. EPA simply did not address the independent minor NSR requirement for states to ensure permits issued to minor sources will not allow NAAQS violations, which must be satisfied, either through modeling or some other means.

From this perspective, the actions of the APCD managers were understandable. While their actions were erroneous, the claims in the letter to EPA OIG that the APCD managers acted with mal-intent were not substantiated.

B. While Aspects of the CC&V Modeling Were Improperly Justified, the Permit Was Not Based on "Falsified Data," and APCD Monitored Compliance with the NAAQS.

In addition to the generalized claims regarding a failure to model or address modeled exceedances, the letter to EPA OIG includes specific allegations regarding practices employed or authorized by APCD when it *did* require modeling for a minor source. Those claims focus primarily on the inputs, assumptions, and techniques used in evaluating the potential impacts of a single facility, CC&V, for which multiple modeling analyses were conducted over several years in the context of a permit application for an expansion. In addition to claiming the modeling failed to comply with mandatory requirements and relied on incorrect assumptions, the letter to EPA OIG claims CDPHE "suppress[ed] information demonstrating that pending permits would lead to modeled violations of NAAQS" and that "a CDPHE modeler was ordered to falsify data."

These claims raise three questions: (1) whether the modeling analysis failed to comply with mandatory requirements, (2) whether, within the discretion allowed by mandatory requirements, the inputs, assumptions, and techniques used were properly justified, and (3) whether APCD management authorized or required the use of information known to be false or suppressed information known to be true. While APCD failed to follow mandatory requirements for some modeling inputs and failed to properly justify others, this investigation has not identified evidence of an intent to falsify data or suppress information.

1. Modeling for Minor Sources Should Comply With Appendix W.

Every modeling analysis relies on assumptions because direct measurements of critical inputs are typically unavailable, particularly for a source or project not yet constructed. In the absence of direct measurements, assumptions must be made based on the best data available, typically estimates developed from measurements taken at other facilities that are expected to be representative of the source under review. Appendix W establishes an outer bound for what constitutes a justified approach to developing the assumptions needed to complete a valid air quality modeling analysis, but Appendix W also requires the exercise of judgment.

For example, Section 8.0 of Appendix W contains general instructions for identifying appropriate source emission rates, background concentrations, and meteorological data for use in an air quality model. However, it does not provide significant detail on how to develop that information for individual types of sources. EPA has developed separate supporting mathematical models and other resources that are cross-referenced in Appendix W,[68] and EPA maintains a "Support Center for Regulatory Atmospheric Modeling" (SCRAM),[69] but every individual modeling analysis is necessarily a case-by-case evaluation.[70]

A threshold question raised by the letter to EPA OIG is whether Appendix W is mandatory for minor source modeling. As noted above, Appendix W clearly applies to the mandatory modeling of major sources, but the regulations are less clear on whether Appendix W applies with equal force to the modeling of minor sources, given that the modeling of minor sources is discretionary. Nevertheless, the best reading of the relevant regulations is that Appendix W is equally applicable to minor sources, for two reasons.

First, Part A of Regulation 3, which applies to both major and minor sources, contains a provision that is best interpreted to require APCD to follow EPA's modeling guideline any time modeling is performed. The language of the Part A provision is somewhat ambiguous because it requires that "all estimates of ambient concentrations *required* under [Regulation 3]" shall be based on "applicable air quality models, databases, and other *requirements* generally approved by *U.S. EPA*." This provision could be read narrowly to exclude minor source modeling, since modeling of minor sources is not "required," but discretionary. But while the decision to model a minor source may be discretionary, once that discretion is exercised, the modeling becomes a "required" part of APCD's obligation to ensure a source will not exceed a NAAQS. In addition, Regulation 3, Part B, which also applies to both major and minor sources, makes clear that "*[w]hen* the preliminary analysis includes modeling," the "[u]se of any *non-guideline* model requires U.S. EPA approval under Section VIII.A. of Part A of this regulation."

A narrow interpretation would also be inconsistent with EPA's minor NSR regulations for Indian Country. As noted above, those regulations provide relevant insight into EPA's interpretation of the CAA requirements for SIP-based minor NSR programs. EPA's Indian County minor NSR program regulations clearly recognize that modeling of minor sources is discretionary,[71] but they also clearly require any modeling performed for minor sources to follow Appendix W.[72] Thus, the fact that modeling of minor sources is discretionary does not render Appendix W inapplicable to any modeling actually performed.

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[68]App. W. § 10 (referencing dozens of additional EPA publications).
[69]https://www.epa.gov/scram.
[70]App. W. § 1.0.c. ("the diversity of the nation's topography and climate, and variations in source configurations and operating characteristics dictate against a strict modeling "cookbook." There is no one model capable of properly addressing all conceivable situations even within a broad category such as point sources. … [T]hus, case-by-case analysis and judgment are frequently required.")
[71]40 C.F.R. § 49.154(d)(1) ("If the reviewing authority has reason to be concerned that the construction of your minor source or modification would cause or contribute to a NAAQS or PSD increment violation, it may require you to conduct and submit an [air quality impacts analysis] AQIA.").
[72]40 C.F.R. § 49.154(d)(2) ("If required, you must conduct the AQIA using the dispersion models and procedures of part 51, Appendix W of this chapter.").

Second, from a policy-focused perspective, there is no apparent logical or scientific reason for modeling minor sources differently than major sources. While minor sources do not have the potential to emit above a certain threshold, pollutants emitted from minor sources will not behave any differently than those emitted from a major source. All emissions from any source, major or minor, will follow the same laws of physics and chemistry, regardless of whether the annual total of those emissions could potentially exceed a specific amount. Therefore, the procedures that EPA has developed to most accurately predict the dispersion and formation of emissions in the ambient air are just as relevant for minor sources as they are for major sources.

2. APCD Failed to Follow Appendix W and/or Failed to Provide Sufficient Justification for Several Aspects of the CC&V Modeling Analysis.

Interviews with APCD managers confirmed they did not view EPA's Appendix W modeling guideline as mandatory for minor sources. Rather, the managers believed they had just as much discretion in deciding whether to follow Appendix W for minor sources as they had in deciding whether to model minor sources at all. However, determining whether any individual modeling analysis directly conflicts with Appendix W can be difficult, given the technical nature of the guideline and the many documents and resources that are incorporated into the guideline only by reference. As a result, many of the claims made by the authors of the EPA OIG letter cannot be fully confirmed. But regardless of whether the issues identified represent clear deviations from Appendix W, all modeling inputs, assumptions, and techniques must be supported by proper justification. Several of the modeling issues raised in the letter are evaluated below to determine whether they represent deviations from Appendix W or rely on inputs, assumptions, or techniques that were not properly justified.

a. Non-Road Engine Loads and Emission Rates

Email correspondence from the authors of the EPA OIG letter to the APCD managers criticized the assumptions for non-road engine loads and emission rates used in the CC&V analysis, asserting they were inappropriately low due to the reliance on site-specific averages of fuel consumption data instead of EPA's MOVES model. That email correspondence indicates the APCD managers preferred the site-specific average approach over the MOVES model at least in part because they believed that Appendix W did not apply. Specifically, one email indicates the managers "[did not] agree with the conclusion that state and federal regulations require the use of [potential to emit] in characterizing emissions from the non-road engines for modeling purposes," and that "[b]ecause this is a minor source permit the federal regulations set forth in Appendix W do not directly apply."[73] These statements suggest that the managers believed the engine loads and emission rates used in the modeling did not comply with Appendix W because the assumptions relied on "actual" emissions instead of "potential to emit."

However, Appendix W does not expressly require or even mention the MOVES model, and the letter to EPA OIG does not cite any specific provision of Appendix W requiring use of the MOVES model. In fact, Appendix W does not expressly discuss non-road engines at all.

[73] *See* Appendix to PEER Letter (enclosed at Appendix B), at 56.

Instead, with respect to emission rates, Section 8.0 of Appendix W states only that the "appropriate reviewing authority [in this case, APCD[74]] should be consulted to determine appropriate source definitions and for guidance concerning the determination of emissions from and techniques for modeling the various source types."[75] One author of the EPA OIG letter recognized in subsequent correspondence to PEER that the alternative approach used by APCD was "sound in principle," and had the "advantage" of using site-specific data. Based on these statements, the author does not appear to believe that use of site-specific averages in lieu of the MOVES model constitutes a clear deviation from Appendix W, despite the claims raised in the letter to EPA OIG.

Even so, the authors of the EPA OIG letter also criticized the statistical method used to develop the loads and emission rates for non-road engines because they were based on long-term averages across a wide range of engine types and sizes. Those concerns are supported by an email attached to the letter in which the Director of the APCD acknowledged that "modeling based on these load factors was improper." Despite this admission, APCD did not require CC&V to conduct new modeling with proper load factors because CC&V had used this approach through multiple modeling iterations in the past. Since past use of an improper calculation method does not constitute a proper justification for repeated use of that method, the non-road engine loads and emission rates are not well-supported.

b. NO_2/NO_x In-Stack Ratios

Email correspondence attached to the letter to EPA OIG claims that the CC&V modeling was performed using an artificially low NO_2/NO_x in-stack ratio based on site-specific values as low as 0.01, a level that one author of the letter criticized as so low that it "defies science." Other emails attached to the EPA OIG letter clarify that the 0.01 value was just one value in an average of the in-stack ratios provided for 66 different engines by the manufacturer, resulting in a ratio of 0.0927 that was used in the CC&V analysis for all engines.

Appendix W does not mandate a specific ratio when site-specific values are used or dictate how they are calculated. Instead, Appendix W lays out requirements for three different tiers to account for the complex chemical reactions among NO, NO_2, and ozone. The third and least conservative tier indicates "alternate information may be used to justify a source's anticipated NO_2/NO_x in-stack ratios, such as manufacturer test data."[76] Thus, use of a site-specific ratio, in and of itself, does not appear to directly contravene Appendix W. However, Appendix W makes clear that use of the Tier 3 approach allowing site-specific NO_2/NO_x in-stack ratios must be conducted in consultation with the EPA regional office,[77] and no evidence has been identified of an approval from EPA Region 8 for a Tier 3 analysis. As a result, the site-specific NO_2/NO_x in-stack ratios may represent a deviation from Appendix W to the extent that APCD did not receive approval from EPA for use of the Tier 3 approach.

[74]App. W. § 3.0.
[75]App. W. § 8.2.1.d.
[76]App. W. § 4.2.3.4.d.
[77]App. W. § 4.2.3.4.e. ("Because of the additional input data requirements and complexities associated with the Tier 3 options, their usage shall occur in consultation with the EPA Regional Office in addition to the appropriate reviewing authority.").

The email correspondence attached to the EPA OIG letter also raises valid concerns about the decision of the Director to accept such an unusually low ratio at face value despite the concerns raised by the MEIU. The value used in the final analysis was based solely on information provided by the applicant and manufacturer, but further evaluation was warranted once the MEIU opined that such a low value was not realistically possible.

c. "Source Groups" and "OLMGROUP ALL" Algorithms

The email correspondence attached to the letter to EPA OIG asserts the CC&V modeling analysis improperly used both the "Source Groups" algorithm and the "OLMGROUP ALL" algorithm simultaneously to estimate the interactions between NO_2, NO, and ozone for groups of sources. Appendix W does not expressly reference these algorithms, and the letter does not cite to any provision of Appendix W supporting this claim. In fact, the only reference provided in support of this claim is an EPA presentation at a 2018 "modeler's workshop" that does not appear to be referenced in Appendix W.

However, email correspondence from the APCD Technical Services Program Manager attached to the letter to EPA OIG indicates he agreed that the use of the "Source Groups" and "OLMGROUP ALL" algorithms in the same modeling analysis was "incorrect." Nevertheless, APCD continued to allow the use the results from that incorrect analysis, instead of a separate analysis performed by MEIU that corrected the error and revealed potential NAAQS violations. Other email correspondence attached to the EPA OIG letter indicates the decision to leave the error uncorrected was based on a policy of allowing errors to remain if APCD had previously instructed a permit applicant to run the model incorrectly. Again, since past use of an improper technique does not justify repeated use of that technique, the concern expressed by the authors of the EPA OIG letter regarding these algorithms appears to be valid.

Notably, this claim is the primary basis of the assertion made in the letter to EPA OIG that APCD managers asked one of the authors of the letter to "remove the concentration exceeding the NAAQS" and "replace" it with "a value that was lower and that was based on incorrect data" (*see* Section V.B.4. *infra*).

d. Background Concentrations

The claim regarding NO_2 background concentrations appears to identify a direct conflict with Appendix W. In relevant part, Appendix W states the following with respect to determining background concentrations:

> The monitoring network used for developing background concentrations is expected to conform to the same quality assurance and other requirements as those networks established for PSD purposes. Accordingly, the air quality monitoring data should be of sufficient completeness and follow appropriate data validation procedures.[78]

The information provided in the letter to EPA OIG indicates the background NO_2 concentrations used in the modeling analysis for CC&V were obtained from a monitor that did

[78]App. W. § 8.3.1. (internal citation to another EPA publication omitted).

not meet standard quality assurance requirements. Specifically, the monitor was installed onsite by the permit applicant and apparently operated only from March 26, 2015 through July 22, 2015, and there were also were significant gaps in the monitoring data. With less than four months total time and only three months of data, the authors of the EPA OIG letter claim it would not capture seasonal variability. A memo prepared by the APCD Technical Services Program Manager at the time admitted that the monitor did not comply with EPA accepted procedures, but justified the approach by asserting "[t]here was no requirement that this be a full reference level monitoring project."[79] Therefore, the decision to use the data from the onsite monitor to establish background concentrations constitutes a clear deviation from Appendix W.

In addition, the Technical Services Program Manager, who had significant experience in air monitoring, admitted that the monitor used to develop background was not appropriately sited. That admission is consistent with an internal APCD memo that chronicles the myriad problems with CC&V's monitor and admits that "APCD has allowed this one time only deviation from standard monitoring practices in an effort to expedite the modeling and permitting process." Accordingly, the background concentrations used in the CC&V modeling appear to both deviate from Appendix W and lack a proper justification.

In sum, the allegations raised in the letter to EPA OIG and supporting materials indicate a high likelihood that APCD failed, at times, to follow the requirements of Appendix W, and those claims are consistent with statements made by APCD managers themselves that Appendix W did not apply to the modeling analysis for CC&V. Regardless of whether the allegations identify clear deviations from legally binding requirements, they demonstrate that many of the inputs, assumptions, and techniques used in modeling CC&V lacked a proper justification. This report does not determine whether any of these errors would have resulted in modeled NAAQS violations, or whether those modeled violations could have been addressed in some other fashion (*e.g.*, via refined modeling, permit conditions, or emission reductions).

3. APCD Did Not Rely on Modeling Alone to Ensure CC&V Would Not Violate the 1-Hour NO_2 NAAQS; It Also Installed an Ambient Monitor.

Although the modeling conducted for CC&V relied on some inputs that either did not follow EPA's modeling guidelines, lacked a proper justification, or both, APCD did not rely solely on those modeling results to ensure CC&V would not violate the 1-hour NO_2 NAAQS. It also placed an ambient monitor in the town of Victor, downwind of CC&V, to confirm compliance with the NO_2 NAAQS. Based on information provided by APCD managers in the course of this investigation,[80] to date, that monitor indicates that ambient concentrations of NO_2 are unlikely to exceed the NAAQS because the 98th percentile of the measurements taken in each

[79]Memorandum from Gordon Pierce, Technical Services Program Manager, and Cindy Wike, Quality Assurance Unit Supervisor & QA Officer, Air Pollution Control Division, to Doris Jung, Permit Modeling Lead, *Cripple Creek & Victor Gold Mining Co., NO_2 Data* (Oct. 1, 2015).

[80]The data provided by APCD managers from the monitor in the Town of Victor does not appear on APCD's website for air quality monitoring data. *See* https://www.colorado.gov/airquality/.

of the last three years was well below the 100 ppb NAAQS—less than 50 ppb in 2018 and 2019 (albeit with a limited data set), and less than 70 ppb in 2020.[81]

Therefore, while the CC&V modeling results may be questionable, APCD did not rely solely on those results in determining whether the CC&V permit would violate a NAAQS. As noted above, modeling for minor sources is just one tool states can use in meeting their obligation to ensure that permits will not violate the NAAQS. In the case of CC&V, APCD used another tool—the ambient monitor in Victor—to ensure compliance with the NAAQS, and that monitor has confirmed that, at least to date, emissions from CC&V have not violated a NAAQS.

4. APCD Did Not Suppress Information or Falsify Data.

The letter to EPA OIG asserts APCD managers intentionally suppressed information and falsified data, essentially claiming intentional circumvention of air permitting requirements. To support these claims, the letter cites to an email in which one of the authors of the letter asserts an APCD manager asked him to "remove the concentration exceeding the NAAQS from the [modeling] report and to replace them [sic] with a value that was lower and that was based on incorrect data." A subsequent analysis prepared by that same author more specifically claims that the engine loads and background concentrations used in the modeling analysis were "falsified" and "fraudulent."

These claims illustrate the conflict between MEIU and the APCD managers with respect to the CC&V modeling analysis, and they demonstrate the problems that can arise under a policy that allows APCD the discretion to stray from EPA's modeling guideline. However, no evidence has been identified to support the claims of intentional violations. While the managers actions failed to comply with statutory and regulatory requirements that they misunderstood, and failed to sufficiently justify modeling inputs they assumed to be representative, those actions had some rational, albeit incorrect, basis. Accordingly, the evidence does not suggest the APCD managers acted with an intent to circumvent the law.

The Merriam-Webster Dictionary defines "falsified" to mean "falsely created or altered in order to deceive."[82] Thus, "falsified" data is not just data that is actually false or incorrect, but data that the actor knows to be false but uses anyway with an intent to deceive or defraud. There is no evidence of such mal-intent in the APCD managers' actions with respect to the modeling analysis for CC&V. While in some cases incorrect and in others unjustified, the modeling inputs authorized by the managers were not fabricated. The APCD managers were aware that certain inputs and techniques did not comply with Appendix W or adhere to other more typical or standardized modeling practices, but the managers did not believe different inputs or techniques were required. The factual bases underlying the inputs and techniques preferred by the managers also confirm that the managers did not believe the inputs were false or likely to lead to false

[81]There have been 10 individual hours in 2020 and 2021 during which measured NO_2 concentrations were above the 100 ppb level of the NAAQS. For example, NO_2 concentrations eclipsed 300 ppb once in December 2020 and again in June 2021. But individual hours above that level do not constitute a violation of the NAAQS, since the form of the NAAQS is based on the 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
[82]https://www.merriam-webster.com/dictionary/falsified.

modeling results. In fact, the managers believed the inputs they preferred actually provided a better reflection of reality than the more conservative estimates preferred by the MEIU.

For example, the non-road engine loads authorized by the managers were based on site-specific averages of actual data recorded by the facility. As such, the inputs had a basis in fact, notwithstanding the concerns raised by the authors of the EPA OIG letter regarding the statistical methods used. Although the authors of the letter disagreed with the engine loads, there is no evidence to suggest that the managers were requiring use of information they knew was false. Instead, email correspondence cited in the letter confirms the managers' preference was grounded in a desire for values reflecting "actual" emissions in lieu of a more conservative "potential to emit."[83] Therefore, the claim in the letter to EPA OIG regarding engine loads appears better characterized as a disagreement over which facts to use, not "falsified data."

The background concentrations preferred by the managers were likewise based on actual facts—measurements and data from an ambient monitor—not fabrications intended to deceive. The managers knew the background data was developed from a monitor that failed to meet the requirements that typically apply in determining background, but their decision to accept that data was not based on a fraudulent intent to use false values. On the contrary, the APCD manager who approved the use of the monitor did so because he believed the data was likely to be more site-specific than the monitor preferred by the MEIU, which was further away. He also believed the onsite monitor would be conservative. Since the on-site monitor could detect emissions from the facility itself and count them as background, the manager expected the background concentrations to be conservatively high, increasing the overall modeling results. Therefore, the claims regarding background concentrations used in the CC&V model likewise reflect a disagreement, not falsification.

The claims of information "suppression" also appear overstated. The Merriam-Webster Dictionary defines "suppress" to mean "to keep from public knowledge,"[84] but no evidence has been identified to suggest that an APCD manager intended to hide any information or analyses from the public. The changes that the managers asked the MEIU to make to the discussion of the various issues in the modeling report were relatively minimal. In fact, one manager directly instructed an author of the EPA OIG letter to ensure the "corrected" results would remain part of the public record.[85]

> [A]s I requested (and you mention), please make sure that the results with the correction are part of the write-up in the report. As you say, and I agree, it is not correct to conceal or downplay it.

This statement confirms that the APCD managers did not ask to hide the "corrected" results from the public. Rather, the managers asked the modelers to move the corrected results from the summary table to the discussion below the table.

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[83] *See* Appendix to PEER Letter (enclosed at Appendix B), at 56.
[84] https://www.merriam-webster.com/dictionary/suppress.
[85] *See* Appendix to PEER Letter (enclosed at Appendix B), at 47.

In short, the claims of "falsified data" and "suppression of information" allege an intent to use data known to be false and hide data known to be true, but neither appears to have occurred during the evaluation of air quality impacts of the CC&V permit application.

5. APCD Director Garrison Kaufman Had a Reportable Potential Conflict of Interest with Respect to the CC&V Permitting Action.

In comments on the draft CC&V air permit submitted on August 19, 2019, PEER questioned whether APCD Director Garrison Kaufman's prior legal representation of Newmont Corporation in connection with the CC&V permit application created a conflict of interest that should have prohibited him from working on the permit after rejoining CDPHE. Kaufman left CDPHE in 2014 to join the Denver office of the law firm Holland & Hart as of counsel, where he advised Newmont Corporation on the CC&V application and met with CDPHE to advocate for issuance of the permit. In February 2017, Kaufman returned to CDPHE as APCD Director.

As APCD Director, Kaufman participated in the examination of the CC&V air permit application by providing substantive comments and otherwise directing work on the application. Following the August 2019 public comment by PEER raising the potential conflict of interest issue, Kaufman was removed from supervising the application and Kaufman's supervisor, John Putnam, was substituted in Kaufman's place. By the time the CC&V permit issued on November 17, 2020, Kaufman was no longer involved in the review or approval of the permit.When asked about his involvement in the CC&V permit, Kaufman represented he (1) retained no financial interest in Holland & Hart after departing the firm and (2) has no other financial interest in the issuance or non-issuance of the CC&V air permit.

Conflicts of interest at CDPHE are analyzed under Policy 13.6 entitled "Conflict of Interest,"[86] which defines the following terms:

- "Department employees are required to disclose actual conflicts of interest and perceived or potential conflicts of interest at the time of employment and annually thereafter…"

- "Conflict of Interest" means "when financial or other personal or professional considerations compromise an individual's objectivity, professional judgment, professional integrity, and/or ability to perform his or her work."

- "Perceived or potential conflict of interest" means **"**when an employee or an employee's immediate family member has financial interests, personal relationships, or professional associations with an individual or outside organization such that the employee's work activities could appear to be negatively affected by that interest or relationship in favor of the financial or nonfinancial benefit of the employee or the employee's immediate family member."

[86]Colorado Department of Public Health and Environment, *Policy Number 13.6, Conflicts of Interest* (June 2017) (enclosed as Appendix D).

Other relevant portions of the policy provide:

- "No later than June 30 of each year, employees shall complete a Conflict of Interest Disclosure Form for the next state fiscal year to report any actual, perceived or potential conflict of interest"

- "Conflict of Interest Disclosure Forms shall be submitted to the employee's supervisor for review and determination of actual, perceived and potential conflicts of interest, which review shall include a determination of whether any entities disclosed by the employee have a current contract or purchase order with the department. If an actual conflict or perceived or potential conflict of interest exists, the employee's supervisor shall draft a management plan for review and approval by the department's Conflict of Interest Panel."

- "A management plan shall include all of the following:

    a. Identification of the conflict or potential conflict of interest

    b. Any necessary modification to the employee's duties, such as restrictions on work related to the conflict, or termination or reduction in projects related to the conflict

    c. Any necessary modification of the employee's outside interests that create the conflict, such as divesture of financial interests in an outside organization, stepping down from board membership of an outside organization, or formal termination of the conflicting outside interest

    d. Identification of an individual to monitor any ongoing conflicts

    e. At a minimum, annual review of the conflict to determine any impact to the employee's work activities."

Policy 13.6 is accompanied by "Frequently Asked Questions" which provide additional guidance regarding the conflict of interest analysis.[87] The FAQs provide, in pertinent part:

- A conflict of interest may exist or be perceived as such when reviewers [ ] are closely professionally affiliated with an applicant, as a result of having in the last six years [ ] been employed by the institution, when an institution is the applicant;

The Frequently Asked Questions also state that: "Conflicts of interest may be difficult to identify. Here's a few items to consider when filling out your form: Consider any prior employment you have had in the last two years and how it relates to your current position or the work of the department."

[87]Colorado Department of Public Health and Environment, *Conflicts of Interest FAQ and Disclosure Form Instructions* (enclosed as Appendix E).

Pursuant to CDPHE guidance, Kaufman's prior representation of Newmont on the CC&V air permit application created a potential conflict of interest that should have been disclosed by Kaufman on his annual Conflict of Interest Disclosure Form. On this point, CDPHE guidance specifically encourages employees to consider prior employment relationships with applicants and how such prior employment relates to the employee's work at CDPHE. While there is no information indicating that Kaufman would have benefitted financially by the issuance of the CC&V air permit, his very recent employment as an attorney representing Newmont on the CC&V permit application creates the appearance that his work on the CC&V permit application for CDPHE could have been influenced by that prior relationship. This potential conflict of interest was exacerbated by the level of involvement that Kaufman had in the permitting process, during which he relied on his prior knowledge of the facility gained during his representation of the facility as counsel to its owner.

Had Kaufman disclosed his prior relationship with Newmont on his first annual disclosure form upon employment in February 2017 and annually thereafter, the potential conflict of interest could have been identified and analyzed by his supervisor much earlier than his eventual recusal in late August 2019. Early identification of the potential conflict would have given CDPHE the opportunity to develop an appropriate management plan to address the concern and ensure Kaufman did not have direct involvement in the CC&V application. As a result of Kaufman's failure to take the steps necessary to initiate the procedures for addressing potential conflicts of interest, he remained involved in the permitting process for CC&V for almost two and a half years, during which time the draft permit was developed.

Ultimately, Kaufman ceased his involvement in the CC&V permit application prior to issuance of the permit, which was an appropriate measure to address this potential conflict of interest. Moreover, there is no indication that Kaufman's prior representation of Newmont was not generally known at CDPHE. Therefore, there is no indication that the failure to disclose this potential conflict of interest on an annual disclosure form impacted the issuance of the CC&V permit or otherwise serves as an independent ground to invalidate the permit.