# *Ozone Advance Path Forward*

Prepared by the New Mexico Environment Department
Air Quality Bureau

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## Introduction

### *Ozone Basics*

Ozone ($O_3$) is a highly reactive gas composed of three oxygen atoms. It is both a natural and a man-made product that occurs in the Earth's upper (stratosphere) and lower (troposphere) atmosphere. Ground level ozone, the ozone EPA sets national standards for, is both harmful to human health and damaging to the environment

Both short- and long-term exposure to ozone can lead to adverse health impacts. Short-term exposures to ozone can make it more difficult to take a full, deep breath by inflaming the airways and causing symptoms such as chest pain, coughing, wheezing and shortness of breath. These short-term exposures can also aggravate asthma and other respiratory diseases and can make people more susceptible to infections.

Long-term exposure to ozone is linked to the development and aggravation of asthma and a variety of other impacts to the respiratory system. Through continued research, scientists are finding that long-term exposure (i.e., for periods longer than eight hours) may increase the risk of early death. Anyone who spends time where ozone concentrations are high may be at risk of experiencing adverse health effects.[1]

According to the Environmental Protection Agency (EPA), ozone affects sensitive vegetation and ecosystems, including forests, parks, wildlife refuges and wilderness areas. Ozone can especially cause damage during the growing season. When enough ozone enters the leaves of a sensitive plant, it can reduce photosynthesis; slow the plant's growth; and increase sensitive plants' risk of disease, damage from insects, effects of other pollutants, and harm from severe weather. [2]

### *EPA Advance Program*

The EPA Advance Program began in April 2012 as a collaborative effort to encourage ozone and particulate matter (PM) emission reductions in attainment areas. Participants determine goals and measures they want to implement and achieve. Although participation in the program does not guarantee an attainment designation in the future, actions taken as part of the Ozone Advance Program could better position future non-attainment areas to develop an effective State Implementation Plan (SIP).

Ozone Advance provides emissions reductions that could result in a lower nonattainment classification or be credited in a future SIP. A key benefit to participating in the program is the flexibility to voluntarily reduce air pollution through control measures chosen to suit an area's social and economic demographics. Once designated nonattainment, the Clean Air Act affords less flexibility to select control measures.

### *Geographic Scope*

[1] From *Health effects of ozone pollution*, Environmental Protection Agency, https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution
[2] From *Ecosystem effects of ozone pollution*, Environmental Protection Agency, https://www.epa.gov/ground-level-ozone-pollution/ecosystem-effects-ozone-pollution

The New Mexico Environment Department (NMED) is participating in the Ozone Advance Program with respect to three full counties and one partial county in New Mexico to preserve or improve the air quality in these areas. These counties are San Juan (northwest NM), Lea (southeast NM), Eddy (southeast NM) and Doña Ana, excluding the Sunland Park nonattainment area (south central NM). Since our acceptance into the Ozone Advance Program in April 2019, ozone levels in Rio Arriba, Sandoval, Santa Fe, and Valencia counties either currently or recently have exceeded 95% of the 2015 8-hour Ozone NAAQS (67 ppb) and could soon violate this standard. In total, the Ozone Advance Path Forward and outreach efforts will include the following nine counties (figure 1): Chaves, Doña Ana, Eddy, Lea, Rio Arriba, San Juan, Santa Fe, Sandoval, and Valencia.

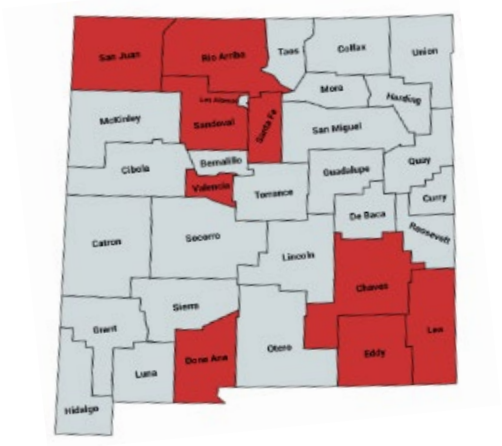


*Figure 1: Map of New Mexico Counties to be included in Ozone Advance Path Forward*

Although Chaves County does not have ozone monitors, the Bureau will include it in the Ozone Advance planning effort as it is part of the Permian Basin with Oil and Gas (O&G) emissions that contribute to high ozone levels in Lea and Eddy counties. NMED understands our efforts under Ozone Advance may benefit these areas by potentially (1) reducing air pollution in terms of ozone as well as other air pollutants, (2) ensuring continued healthy ozone levels, (3) maintaining the ozone NAAQS and helping the Sunland Park Nonattainment Area attain the 2015 Ozone NAAQS, (4) helping avoid violations of the NAAQS that could lead to a future nonattainment designation, (5) increasing public awareness about ozone as an indirect air pollutant, and (6) targeting limited resources toward actions to address ozone problems quickly. NMED's goal is to implement measures and programs to reduce ozone in the near term, and ultimately to effect changes that will protect community well-being into the future. NMED agrees it is in our best interest to work together and in coordination with stakeholders and the public to proactively pursue this goal.

This path forward plan outlines several relevant strategies to realize this vision. It recommends measures that we, as a state, can and are implementing to protect air quality across New Mexico.

*Background*

Ground-level ozone is created by chemical reactions between nitrogen oxides ($NO_x$) and volatile organic compounds (VOCs), with sunlight as the driver. VOC and $NO_x$ come in two forms: biogenic (natural), which is produced by vegetation: and anthropogenic, which is created by humans, primarily in industrial processes, and by modern transportation modes, particularly diesel and gas-driven motor vehicles. Hot, sunny days may produce unhealthy levels of ozone, especially in urban environments. Smoke from wildfires can also contribute pollutants that increase the formation of ozone.

High ozone levels in New Mexico are driven by different sources in different parts of the state. For example, $NO_x$ and VOC emissions from the ~~oil and gas~~O&G industry in Eddy, Lea, Rio Arriba and San Juan counties combined with abundant desert sunshine create some of the highest ozone levels in New Mexico. Likewise, plentiful sunshine mixed with concentrated vehicle emissions in the Albuquerque metro area contribute to high ozone in the Sandoval and Valencia counties. By and large, Doña Ana County's high ozone levels are influenced by emissions from the large metropolitan area of El Paso, Texas and Juárez, Mexico.

*Ozone Monitoring & Trends*

The Air Quality Bureau (AQB) operates and maintains fourteen (14) continuous ozone monitors across the state. Except for a small portion of Doña Ana County near the City of Sunland Park, all of New Mexico is currently classified as "attainment" for the 2015 8-hour ozone NAAQS. The Sunland Park area's ozone levels are largely influenced by sources and emissions from outside of New Mexico.

Although the health-based ozone standard is set at .070 ppm, New Mexico law [74-2-5.3 NMSA 1978] requires that NMED develop plans to reduce ozone once monitored design values (DVs) in an area that exceed 95% of the standard (i.e., 0.067 ppm). In Table 1, 2018-2020 Design Value data indicate ozone levels at or above 95% of the ozone NAAQS at several New Mexico air quality monitors in eight counties.

| County | Monitoring Location | 2018-2020 Design Value |
|---|---|---|
| Doña Ana | La Union | 70 ppb |
| | Chaparral | 72 ppb |
| | Desert View | 78 ppb |
| | Santa Teresa | 74 ppb |
| | Solano | 70 ppb |
| Eddy | Carlsbad | 78 ppb |
| Lea | Hobbs | 68 ppb |
| Rio Arriba | Coyote Ranger Station | 65 ppb |
| Sandoval | Bernalillo | 70 ppb |
| San Juan | Bloomfield | 66 ppb |
| | Navajo Lake | 68 ppb |
| | Substation | 69 ppb |
| Santa Fe | Santa Fe | 68 ppb |
| Valencia | Los Lunas | 69 ppb |

*Table 1: 2018-2020 Design Values for Monitoring Locations in New Mexico*

As shown in Figure 2, DVs for Doña Ana County have consistently exceeded the 2015 NAAQS standards, and have been continuing to rise since 2016-2018.

Eddy and San Juan counties' DVs remained constant from 2010-2012 through 2012-2014, dropped from 2013-2015 through 2014-2016, rose modestly from 2015-2017, then increased sharply from 2016-2018 through 2017-2019. San Juan has managed to remain just under the 2015 NAAQS standards in 2018-2020, but Eddy has shown a dramatic increase in ozone levels with a peak of 79 ppb in 2017-2019.

Sandoval County and Lea County have shown steady increases in ozone DVs between 2010-2012 and 2018-2020, rising from 61 to 70 ppb and 61 to 68 ppb, respectively. Valencia county has been steadily rising since 2014-2016.

The monitoring site at Rio Arriba first reported in 2014-2016 with an ozone DV of 64 ppb and rose to reach a peak of 70 ppb in 2017-2019, then decreased to 65 ppb for 2018-2020.

Between 2013-2015 and 2015-2017, all counties except Dona Ana showed a decrease in ozone DVs beginning to rise. Rio Arriba, Eddy, and Lea all had decreases in DV in 2018-2020, with the rest of the counties still rising.

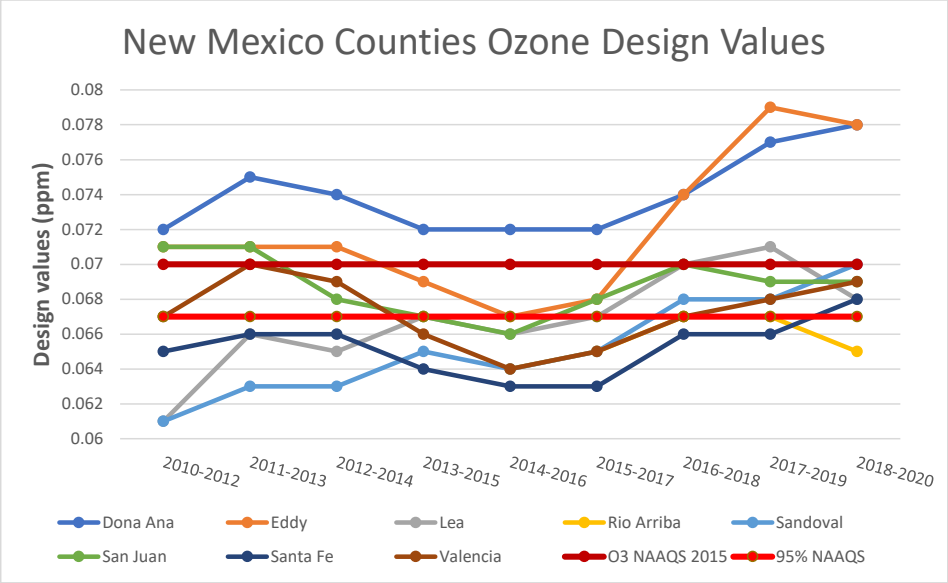


*Figure 2: Design values for New Mexico counties included in the Advance Program, 10-year trends*

**Key Sources of Ozone and Precursor Pollutants**

In addition to historical design value trends from 2010 through 2020, the 2017 NEI data was used to identify the major source categories. The National Emissions Inventory (NEI) is a comprehensive and detailed estimate of air criteria pollutant emissions, precursors, and hazardous air pollutants from air emissions sources.[3] Air pollution sources are separated into main source categories – point, nonpoint, on-road, and nonroad.

The point source category contains larger sources that are located at fixed, stationary locations. It includes large and certain smaller industrial facilities, (e.g., electric power plants, airports, non-industrial, and

[3] From *National Emissions Inventory*, Environmental Protection Agency, https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nei

commercial facilities). This category also includes a small number of portable sources, such as some asphalt or rock crushing operations, aircraft engine emissions (occurring during landing and takeoff operations), airport ground support and power unit equipment, and locomotive emissions at rail yards.[4]

Nonpoint sources include sources that individually are too small in magnitude to report as point sources. Examples include residential heating, commercial combustion, asphalt paving, and commercial and consumer solvent use. Non-railyard locomotive emissions, commercial marine vessel emissions (both underway and port emissions), dry cleaners, gas stations, and livestock facilities are also included as nonpoint sources.[5]

On-road sources are vehicles that use gasoline, diesel, and other fuels. These sources include light-duty and heavy-duty vehicles from operation on roads, highway ramps, and during idling.[6] Nonroad sources consist of off-road mobile sources that use gasoline, diesel, and other fuels. Source types in this category include construction equipment, lawn and garden equipment, locomotives, and commercial marine vessels.[7]

*General $NO_X$ and VOC Emission Trends*

The National Emissions Inventory provides data on criteria pollutants to better understand current emissions in different areas. Several monitors are placed throughout New Mexico which collect and report data spanning multiple years. Table 2 shows total emissions in tons of $NO_X$ and VOCs reported in the 2017 NEI in the counties that are included in the Ozone Advance Program. Both $NO_X$ and VOCs are precursors of ozone, meaning they interact with other compounds in the atmosphere to create ozone.

| | Dona Ana | Chaves | Eddy | Lea | Rio Arriba | Santa Fe | San Juan | Sandoval | Valencia |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 6,503 | 3,459 | 4,418 | 7,493 | 1,512 | 3,999 | 23,135 | 2,556 | 1,656 |
| VOC | 3,508 | 4,597 | 6,380 | 1,779 | 1,744 | 2,047 | 5,599 | 1,475 | 6,289 |

*Table 2: 2017 NEI NOx and VOC Emissions in tons for New Mexico Ozone Advance Counties*

NOx Emissions

Overall, San Juan County has the highest levels of estimated $NO_X$ emissions at 23,135 tons. Doña Ana and Lea counties' $NO_X$ emission estimates are 6,503 tons and 7,493 tons, respectively. $NO_X$ emissions for Eddy, Rio Arriba, Santa Fe, Sandoval, and Valencia counties are estimated below 5,000 tons for each county.

Eddy, Valencia, and San Juan counties have the highest and nearly equal estimated levels of VOC emissions at 6,380; 6,289; and 5,600 tons; respectively. Likewise, Lea, Rio Arriba and Sandoval counties had nearly equal but much lower estimated levels of VOC emissions at 1,779; 1,745; and 1,475 tons, respectively. Doña Ana County's estimated VOC emissions were 3,508 tons, with Santa Fe County at approximately 2,047 tons.

[4] Ibid.
[5] Ibid.
[6] Ibid.
[7] Ibid.

According to 2017 NEI data shown in Figure 3, the on-road sector accounts for 61% (Rio Arriba) to as much as 96% (Santa Fe) of estimated $NO_X$ emissions in Doña Ana, Rio Arriba, Santa Fe, Sandoval, and Valencia counties. The percentage of on-road $NO_X$ emissions in Eddy, Lea, and San Juan County are considerably lower at 28%, 20%, and 9%, respectively.

Point sources in San Juan account for 90% estimated $NO_X$ emissions in the county, this is 32% of all $NO_X$ emissions in the counties that are a part of the Ozone Advance plan. Lea County point source emissions account for 76% of $NO_x$ emissions in the county. Percentages for point source estimated $NO_X$ emissions for Eddy and Rio Arriba counties are significantly lower at 26% and 21%, respectively. Doña Ana and Valencia have low estimated $NO_X$ emissions at 15% and 11%, respectively, of the total $NO_X$ emissions for those counties. Santa Fe County point source emissions only account for 1.5% of $NO_x$ and Sandoval County's point source emissions are negligible at <1%.

Of all nine counties, Eddy County's Nonpoint sources are the greatest at 45% of estimated $NO_X$ emissions. Rio Arriba County's nonpoint source emissions account for 13% of $NO_X$ emissions. Santa Fe, Sandoval, Valencia, Doña Ana, Lea, and San Juan counties have 5% or less of nonpoint $NO_X$ emissions.

Non-road sources account for less than 10% of total estimated $NO_X$ emissions for Doña Ana, Eddy, Lea, Rio Ariba, San Juan, Santa Fe, and Valencia counties. Sandoval is the only county with non-road estimated $NO_X$ emissions slightly higher at 14%.

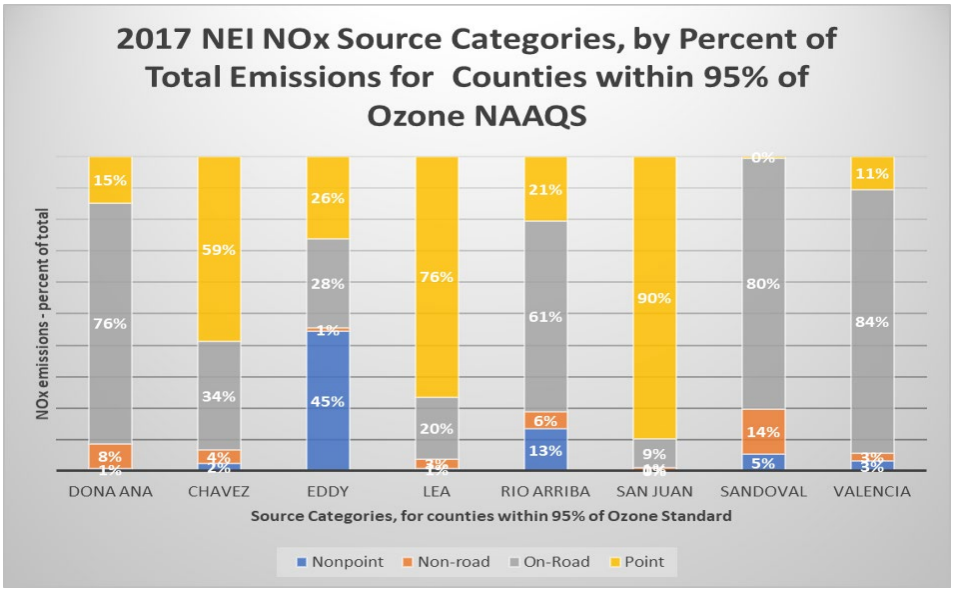

*Figure 3: 2017NEI NOx Source Categories for Counties within 95% of the Ozone Standard.*

VOC Emissions

According to 2017 NEI data (Figure 4), on-road source emissions in Santa Fe, Sandoval, and Doña Ana counties are 88%, 83%, and 64%, respectively, of the total estimated VOC emissions for these counties. Lea, Rio Arriba, & San Juan counties have moderate percentages of VOC emissions, between 21% and 38% from the on-road source sector. Eddy and Valencia counties have relatively low on-road VOC emissions at 9% and 12%, respectively.

Valencia and Eddy counties have the highest percentage of nonpoint VOC emissions at 87% and 78%, respectively. San Juan County has a moderately high percentage of nonpoint VOC emissions at 44%. Lea, Rio Arriba, and Doña Ana counties have relatively low percentages of nonpoint VOC emissions between 18% and 29%. Santa Fe and Sandoval Counties have a low percentage of nonpoint VOC emissions at 5% and 8% respectively.

Rio Arriba, Lea, and San Juan counties have moderately high percentages of point source VOC emissions at 43%, 42% and 33%, respectively. Eddy, Doña Ana, & Sandoval counties have point source VOC emissions percentages of 10% and less. Santa Fe County has the second lowest point source VOC emissions with just 1% and Valencia County's point source emissions are negligible at <1%. All seven counties have relatively low percentages of non-road VOC emissions of 11% or less.

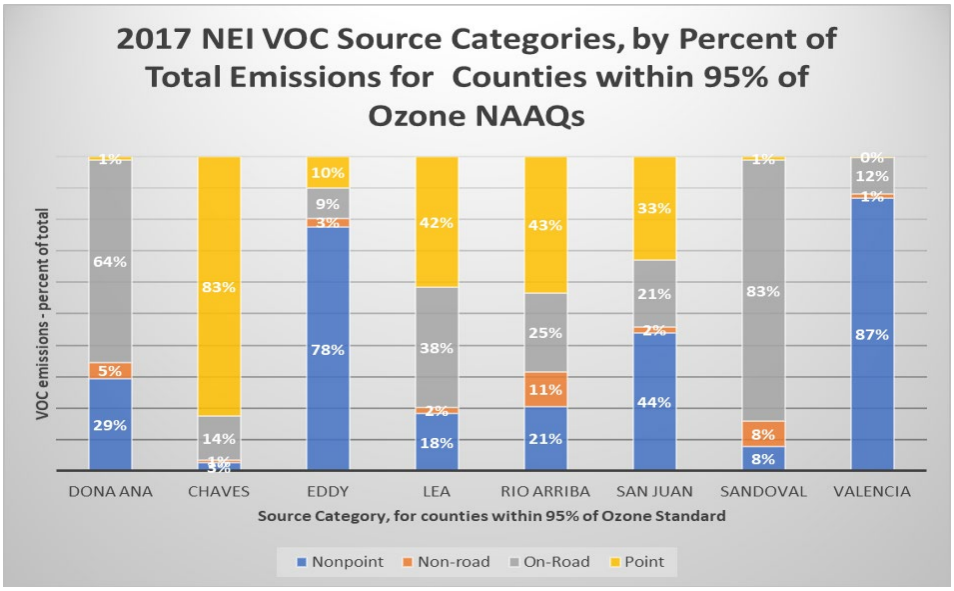


*Figure 4: 2017 NEI VOC Source Categories for Ozone Advance Counties*

**Technical Analyses and Modeling**

There are four interrelated but distinct conceptual models of ozone formation within New Mexico's airsheds: Albuquerque and surrounding areas, southcentral New Mexico, southeastern New Mexico, and northwestern New Mexico. They share the attribute that ozone transport from outside of New Mexico and/or the continental U.S. dominates ozone concentrations on all days. Days with the highest local ozone

formation are typically hot summer days with slow winds and without an excessive amount of precipitation (~~summer~~i.e., southwestern monsoon season).[8] To study how ozone forms in the state, NMED has participated in photochemical modeling studies over the past twenty years. Most recently, photochemical modeling was completed in May of 2021 for New Mexico's draft ozone rule with a focus on the counties included in this path forward.

*Photochemical Modeling for New Mexico*

The OAI modeling study for the draft ozone rule leverages the 2014 Photochemical Grid Model (PGM) modeling platform developed by the Western Regional Air Partnership (WRAP) in the Western Air Quality Study (WAQS). It enhances the PMG by adding a 4-km grid resolution modeling domain over New Mexico and surrounding areas, especially the ~~oil and gas~~O&G production regions in the Permian and San Juan Basins. The PGM modeling consists of 2014 base year modeling and model performance evaluation as well as 2028 future year modeling. The results of the 2028 future year modeling, source apportionment and control measure evaluation will assist the NMED in ozone air quality planning and rule development for the state.[9] Complete details and results of the project are available at http://wrapair2.org/NMOAI.aspx.

~~Preliminary conclusions indicate the draft ozone rule would reduce projected 2028 ozone DVs across New Mexico when compared to 2012-2016 DVs (Table 3).~~

Although the OAI PGM study was not part of the development of an ozone SIP, it was conducted following EPA's 2018 photochemical modeling guidance for ozone SIPs ("EPA 2018 PGM Guidance")[10]. This included preparing a modeling protocol at the outset of the study (May 2020) that provided a roadmap for how the study would be conducted and allow NMED and other interested parties to comment on the study approach prior to conducting the OAI PGM study.

The OAI PGM study used the Comprehensive Air-quality Model with extensions (CAMx[11]) PGM on a 36/12/4-km grid resolution nested modeling domains shown in Figure 2 with the 4-km domain covering New Mexico and nearby regions (e.g., the San Juan and Permian Basins). The CAMx 2014 36/12/4-km modeling platform was developed for the May-August 2014 base year period. The CAMx 2014 36/12/4-km modeling platform was based on the WRAP and WAQS CAMx 2014 36/12-km annual modeling platform.[12] Boundary Conditions for the OAI PGM study CAMx 36/12/4-km simulation were based on output from the WRAP-WAQS 2014 GEOS-Chem global chemistry model simulation. The OAI study conducted two Weather Research Forecast ("WRF") 2014 36/12/4-km meteorological model simulations that differed in the analysis fields used to initialize, provide BCs, and used in the four dimensional data assimilation that nudges the WRF meteorological model predictions to the observations. Details on the OAI PGM study 2014 WRF meteorological modeling are contained in Chapter 2 of the 2014v2 base case modeling report[13] and the Air Quality Technical Support Document ("AQ Technical Support Document").[14]

[8] New Mexico Ozone Attainment Initiative Photochemical Modeling Study – Draft Modeling Protocol, May 2020, Ramboll, https://www.wrapair2.org/pdf/NM_OAI_Modeling_Protocol_v5.pdf

[9] ~~Ibid.~~

[10] Environmental Protection Agency, *Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze*, EPA 454/R-18-009, November 2018.

[11] https://www.camx.com/

[12] https://views.cira.colostate.edu/iwdw/docs/WRAP_WAQS_2014v2_MPE.aspx

[13] https://www.wrapair2.org/pdf/NM_OAI_2014_BaseCase_MPE_v3.pdf

[14] https://www.wrapair2.org/pdf/NM_OAI_2028_AQTSD_v8.pdf

The modeled control scenario for the draft ozone rule (July 15, 2020 Stakeholder Engagement Draft) reduced projected 2028 ozone DVs across New Mexico when compared to 2012-2016 DVs (Table 3). The control scenario requirements were estimated to reduce projected 2028 future year ozone design values ("DVF") at New Mexico monitoring sites by between -0.2 to -1.5 ppb. The largest reductions in 2028 ozone DVFs occurs at the Navajo Lake (-1.5 ppb) and Substation (-1.2 ppb) monitoring sites in San Juan County in the San Juan Basin. The largest reductions in 2028 ozone DVFs in the Permian Basin occur at the Hobbs monitor (-0.7 ppb) in Lea County and the Carlsbad monitor (-0.3 ppb) in Eddy County. While the DVs from 2012-2016 show most sites to be within attainment of the NAAQS standards and the 95% threshold set for Ozone Advance, it should be noted that all sites have shown increases in Ozone levels in recent years (Table 1). The largest DV reductions by site are projected to be at the La Union monitoring site in Dona Ana County (6.3 ppb) and the Bernalillo site in Sandoval County (5.6 ppb).

~~The photochemical modeling shows a total of 60.3 ppb of ozone reduced in the Ozone Advance counties as a result of the Proposed Ozone Rule. Tables 3-5 show the predicted changes in DVs at 15 monitoring sites in the Ozone Advance counties in New Mexico.~~

| County | Site Name | 2012-~~2016 DVC (ppb)~~16 | Projected 2028 DVF~~ (ppb)~~ | | ~~Difference~~ |
|---|---|---|---|---|---|
| | | DVC | Base | Control | Control - Base |
| Rio Arriba | Coyote Ranger District | 64.0 | 60.8 | ~~-3.2~~60.0 | -0.8 |
| Sandoval | Bernalillo (E Avenida) | 64.0 | 58.4 | ~~-5.6~~58.1 | -0.3 |
| San Juan | Bloomfield | 64.3 | 61.0 | ~~-3.3~~60.2 | -0.8 |
| | Navajo Lake | 67.0 | 64.8 | ~~-2.2~~63.3 | -1.5 |
| | Substation | 63.7 | 60.8 | 59.6 | -1.2~~-9~~ |
| Santa Fe | Santa Fe Airport | 64.3 | 60.6 | ~~-3.7~~60.4 | -0.2 |
| Bernalillo | Del Norte HS | 66.3 | 60.9 | 60.7 | -0.2 |
| | Southeast Heights | 68.0 | 62.3 | 62.0 | -0.3 |
| | South Valley | 66.0 | 61.0 | 60.5 | -0.5 |
| | Westside | 67.0 | 62.6 | 62.1 | -0.5 |
| | Foothills | 65.0 | 59.1 | 58.8 | -0.3 |
| ~~Dona~~Doña Ana | La Union | 66.3 | 60.0 | ~~-6.3~~59.8 | -0.2 |
| | Sunland Park City Yard | 67.0 | 61.9 | 61.8 | -~~5~~0.1 |
| | Chaparral | 67.0 | 62.3 | ~~-4.7~~62.2 | -0.1 |
| | Desert View | 72.0 | 67.0 | ~~-5.0~~66.8 | -0.2 |
| | Santa Teresa | 71.3 | 66.1 | ~~-5.2~~66.0 | -0.1 |
| | Solano | 65.0 | 60.3 | ~~-4.7~~60.2 | -0.1 |
| Eddy | Carlsbad | 69.0 | 66.7 | 66.4 | -~~2~~0.3 |
| Grant | Chino Copper Smelter | 62.0 | 59.0 | 58.9 | -0.1 |

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|---|---|---|---|---|---|
| Lea | Hobbs Jefferson | 66.0 | 64.0 | ~~-2.0~~63.3 | -0.7 |
| Luna | Deming Airport | 66.0 | 62.7 | 62.5 | -0.2 |
| Valencia | Los Lunas (Los Lentes) | 66.3 | 62.2 | ~~-4.1~~62.0 | -0.2 |

*Table 3: ~~Differences in Design Values~~2014 centered averaged observed ozone design value and projected 2028 design values for the future year base case and O&G control scenario. All values provided in ppb ~~by Site in~~*

Ozone ~~Advance Counties throughout~~source apportionment modeling was also conducted for the 2028 O&G control strategy emissions scenario to examine source sector ozone contributions. This modeling found that Sites in northern New Mexico

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have the highest contributions from O&G sources and Electric Generating Unit (EGU) point sources due to being in or near the San Juan Basin and near an EGU located on tribal land, that is assumed to still be operating in 2028 (Table 4). Sites in central New Mexico (e.g., Bernalillo County) tend to have higher ozone contributions associated with sources related to population (e.g., mobile sources and other anthropogenic) due to being in or within proximity of Albuquerque, New Mexico's largest city. Sites in southern New Mexico include those in southern Doña Ana County on the border with Texas that tend to have mostly small contributions from New Mexico source sectors with the exception of EGU (0.7 to 0.9 ppb), due to the proximity of the Rio Grande Power Plant to some of the sites, and on-road mobile (0.4-0.5 ppb) due to population centers along I-25, with the Solano monitor having higher ozone contributions from mobile sources due to being close to emissions from the City of Las Cruces, the second largest city in New Mexico. Finally, the Carlsbad and Hobbs monitors are within the Permian Basin so have relatively high contributions from New Mexico O&G sources.

The results of the modeling further support the previous conceptual models of ozone formation in the state and the need for targeted control strategies to ensure emissions reductions across those sectors that cause elevated ozone. New Mexico O&G emissions still had substantial contributions to ozone concentrations even when accounting for estimated emissions reductions from the draft rule. For example, O&G emissions in the New Mexico portions of the Permian and San Juan Basins contributed as much as 2.0 to 3.0 ppb to the projected 2028 ozone DVF in the 2028 O&G control strategy. Likewise, the transportation sector contributes to high ozone near transportation corridors and urban areas like Albuquerque, Santa Fe, and Las Cruces supporting the need for lower emitting vehicles in the state.

| County | Site ~~Difference Average (ppb)~~Name | DVC | DVF | O&G | EGU | NonEGU | OnRoad | NonRoad | OAnth |
|---|---|---|---|---|---|---|---|---|---|
| Rio Arriba | Coyote | 64.0 | 60.0 | -0.7 | -0.5 | 0.0 | -0.2 | -0.1 | 0.0 |
| Sandoval | Bernalillo | 64.0 | 58.1 | -0.3 | -0.4 | -0.4 | -2.1 | -1.5 | -1.9 |
| San Juan | Bloomfield | 64.3 | 60.2 | -2.~~8~~1 | -1.9 | 0.0 | -0.4 | -0.1 | -0.1 |
| | Navajo Lake | 67.0 | 63.3 | -3.0 | -1.7 | -0.1 | -0.4 | -0.2 | -0.1 |
| ~~Dona Ana~~ | Substation | 63.7 | 59.6 | -2.1 | -3.1 | -0.1 | -0.5 | -~~5~~0.2 | -0.2 |
| Santa Fe | Santa Fe | 64.3 | 60.4 | -0.5 | -0.2 | -0.3 | -1.2 | -0.7 | -0.8 |
| Bernalillo | Del Norte HS | 66.3 | 60.7 | -0.5 | -0.5 | -1.0 | -2.7 | -2.0 | -3.6 |
| | Southeast Heights | 68.0 | 62.0 | -0.5 | -0.5 | -1.1 | -2.5 | -1.9 | -3.2 |
| | South Valley | 66.0 | 60.5 | -0.8 | -0.5 | -1.0 | -2.2 | -1.7 | -2.4 |
| | Westside | 67.0 | 62.1 | -0.6 | -0.4 | -0.4 | -1.6 | -1.2 | -1.8 |
| | Foothills | 65.0 | 58.8 | -0.5 | -0.5 | -0.7 | -2.5 | -2.0 | -3.0 |
| Doña Ana | La Union | 66.3 | 59.8 | -0.4 | -0.7 | 0.0 | -0.5 | -0.3 | -0.1 |
| | Sunland Park City Yard | 67.0 | 61.8 | -0.4 | -0.9 | 0.0 | -0.4 | -0.2 | -0.2 |
| | Chaparral | 67.0 | 62.2 | -0.2 | -0.3 | 0.0 | -0.2 | -0.1 | -0.1 |
| | Desert View | 72.0 | 66.8 | -0.5 | -0.9 | -0.1 | -0.5 | -0.3 | -0.2 |
| | Santa Teresa | 71.3 | 66.0 | -0.6 | -0.7 | -0.1 | -0.5 | -0.3 | -0.2 |
| | Solano | 65.0 | 60.2 | -0.4 | -0.2 | -0.2 | -1.2 | -0.7 | -0.3 |
| Eddy | Carlsbad | 69.0 | 66.4 | -1.0 | -0.2 | -0.1 | -0.3 | -0.2 | -0.1 |
| Grant | Chino Copper Smelter | 62.0 | 58.9 | 0.0 | 0.0 | 0.0 | -0.1 | -0.1 | 0.0 |

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|---|---|---|---|---|---|---|---|---|---|
| Lea | Hobbs Jefferson | 66.0 | 63.3 | -2.0 | -0.2 | 0.0 | -0.3 | -0.2 | -0.1 |
| Luna | Deming Airport | 66.0 | 62.5 | -0.3 | -0.2 | 0.0 | -0.6 | -0.4 | 0.0 |

*Table 4: Average ozone Design Value differences in counties with multiple monitors.*

| County | Total Ozone Reduced (ppb) |
|---|---|
| Rio Arriba | -3.2 |
| Sandoval | -5.6 |
| San Juan | -8.4 |
| Santa Fe | -3.7 |
| Dona Ana | -3.1 |
| Eddy | -2.3 |
| Lea | -2.0 |
| Valencia | -4.1 |

*Table 5: Total projected reductions in ozone as a result of the proposed rule.*

*: Source apportionment results for the 2028 control scenario. Values for each sector represent the drop in future year control scenario design value when that sector is removed from the modeling (i.e., the source sector contribution). Source sectors include Oil and Gas, Electric Generating Units, Non EGU Point Sources (NonEGU), On Road, Non-road, and other Anthropogenic (OAnth). All values are provided in ppb.*

**Path Forward – Planning Measures and Emission Reduction Strategies**

*Ozone Attainment Initiative and Ozone Precursor Rulemaking*

To address the high observed ozone concentrations in New Mexico, the NMED has embarked on an Ozone Attainment Initiative ("OAI")[15] to protect the ozone attainment status of the state and ensure health and welfare of the residents of the state for future generations.[16] In total, the Initiative's planning and outreach efforts will include the following nine counties: Chavez, Doña Ana, Eddy, Lea, Rio Arriba, San Juan, Santa Fe, Sandoval and Valencia. This Initiative is undertaken pursuant to the Air Quality Control Act at NMSA 1978, Section 74-2-5(C), which states:

> If the environmental improvement board ... ...determines that emissions from sources within [its] jurisdiction cause or contribute to ozone concentrations in excess of ninety-five percent of a national ambient air quality standard for ozone…[the] board shall adopt a plan, including rules, to control emissions of oxides of nitrogen and volatile organic compounds to provide for attainment and maintenance of the standard.

The OAI is a multi-year planning effort, beginning in the summer of 2018 and continuing indefinitely, as necessary. Three phases of implementation include: (1) an effort to educate the public and gather initial information and ideas; (2) development of appropriate rules and other programs based on scientific analysis and public input; and (3) development and implementation of the OAI plan, including rules to control sources contributing significantly to high ozone levels. NMED intends to use this Ozone Advance Path Forward document as the OAI plan required by New Mexico's Air Quality Control Act.

[15] From *Ozone Attainment Initiative*, NMED, https://www.env.nm.gov/air-quality/o3-initiative/
[16] New Mexico Ozone Attainment Initiative Photochemical Modeling Study – Draft Modeling Protocol, May 2020,Ramboll, https://www.wrapair2.org/pdf/NM_OAI_Modeling_Protocol_v5.pdf

*Ozone Precursor Rule – 20.2.50 NMAC, Oil and Gas Sector*

Beyond the statutory authority provided to NMED by the Air Quality Control Act, Governor Michelle Lujan Grisham issued Executive Order ("E.O.") 2019-003, which directs NMED and the New Mexico Energy, Minerals, and Natural Resources Department ("EMNRD") to "jointly develop a statewide, enforceable regulatory framework to secure reductions in ~~oil and gas~~O&G sector methane emissions and to prevent waste from new and existing sources". EMNRD adopted rules effective at the beginning of 2021 that prohibits venting and limits flaring at ~~oil and gas~~O&G well sites to minimize methane emissions.

Under the statutory authority of the OAI and E.O. 2019-003, the Department has developed its first rule to reduce emissions of ozone precursors. Regulations developed under the OAI to reduce emissions of ozone precursor pollutants will have the co-benefit of reducing methane emissions because methane is released along with volatile organic compounds in ~~oil and gas~~O&G operations. Thus, the Department worked in close coordination with EMNRD in developing 20.2.50 NMAC, and the agencies endeavored to align their respective ~~regulatory regimes~~rules as much as possible to avoid duplicative or conflicting requirements.

Beginning in the summer of 2019, the Department began an extensive stakeholder and public outreach process for its OAI and the NMED/EMNRD joint Methane Strategy. In June through August of 2019, NMED and EMNRD held numerous meetings throughout the State to provide information regarding the need for the regulatory initiatives and the relevant authorities for the regulatory actions; to hear input from stakeholders and members of the public; and to answer questions regarding the rulemaking process.

The agencies also convened a Methane Advisory Panel ("MAP"), consisting of technical stakeholders focusing on processes and equipment associated with ~~oil and gas~~O&G exploration, production, gathering, and processing. The MAP was comprised of 27 members with expertise in various parts of the ~~oil and gas~~O&G industry and included local and national environmental nongovernmental organizations as well as major and independent industry representatives from the upstream and midstream sectors. Additional expertise was provided by representatives from Los Alamos National Laboratory, Colorado State University, and the New Mexico Institute of Mining and Technology. The MAP met every other week over a four-month period and covered technical topics related to controlling VOC and methane emissions from equipment and operations employed in the oil and natural gas sector. Draft topic reports and all meeting presentations from the MAP meetings were posted online on both agencies' websites. In December of 2019, the MAP released a technical report for public review and input, and the agencies accepted comments on the report through February 20, 2020.

On July 20, 2020, NMED released an early stakeholder engagement draft of its ozone precursor regulation for the purpose of soliciting public and stakeholder input. In August of 2020, the Department met with stakeholder groups and held a public listening session during which participants were encouraged to provide both verbal and written feedback. The Department accepted written comments on the preliminary draft through September 20, 2020. A total of 524 written comments were received during the two-month comment period. From September 2020 through May 2021, the Department reviewed the input received from stakeholders and the public and made substantial revisions to the regulation based on that input.

The proposed draft regulation is the result of this two-year process of extensive public and stakeholder outreach and engagement, all of which is in addition to the public hearing process provided for by the

Board's rulemaking procedures at 20.1.1 NMAC. the Department will continue to work diligently beyond the requirements of those procedures to communicate and work with stakeholders and the public regarding the proposed regulation and the hearing process to ensure that everyone who has an interest in the rules can participate in the rulemaking process to the fullest extent possible. NMED's proposed rule will be brought before the Environmental Improvement Board ("Board") for adoption at a public hearing scheduled to begin on September 20, 2021.

*Low Emission/Zero Emission Vehicle Standard*

In 2019, Gov. Lujan Grisham announced New Mexico will adopt clean car standards that are more stringent than the federal standards. Pollution from transportation accounts for a large portion of New Mexico's greenhouse gas emissions and contributes heavily to the area's growing ozone problem. New Mexico's rule will adopt California's Low-Emission Vehicle criteria pollutant and greenhouse gas emission regulations and Zero-Emission Vehicle regulations under Section 177 of the Clean Air Act (42 U.S.C. §7507). The timeline for New Mexico to adopt the CA standards is in development, but the standards are likely to have an impact in areas with high levels of on-road emission sources as discussed previously.

*DERA Program*

In 2005, the U.S. Congress passed the Diesel Emission Reduction Act (DERA) as an amendment to the Energy Policy Act. DERA was designed to reduce diesel emissions from existing diesel fleets that did not meet the recently adopted federal emission standards. The goal of the New Mexico Clean Diesel Program is to reduce the amount of air pollution created by diesel-fueled heavy-duty trucks and buses to which the residents of New Mexico are exposed.[17] Diesel-powered vehicles and equipment account for nearly half of all $NO_x$ and more than two-thirds of all PM emissions from US transportation sources.[18] Since 2008, NMED has administered grant funds for the qualifying diesel emissions reduction projects in San Juan, McKinley, Luna, Santa Fe, Taos, and Bernalillo counties:

- School bus retrofits in Bloomfield, Central Consolidated, Farmington, and Gallup/McKinley County School District;
- Replacement of diesel vehicles with natural gas vehicles for the cities of Deming and Santa Fe, Taos County, and Albuquerque Public Schools; and
- Dock outlets for trailer refrigeration units, aerodynamic fairings, and low rolling resistance tires for New Mexico Association Food Banks.

*VW Settlement*

In 2015, Volkswagen admitted to purposely employing defeat devices on emissions controls for NOx on some of their Volkswagen, Audi, and Porsche diesel-fueled vehicles. In 2017, the U.S. District Court for the Northern District of California finalized Consent Decrees between Volkswagen, the United States, and the

[17] From *Diesel Emissions Reduction Act*, NMED, https://www.env.nm.gov/air-quality/diesel/
[18] From *Smog, Soot, and Other Air Pollution from Transportation*, Environmental Protection Agency, https://www.epa.gov/transportation-air-pollution-and-climate-change/smog-soot-and-local-air-pollution

State of California, adopting revisions made by the Trustee. New Mexico was eligible to receive over $17,900,000 to be used for $NO_x$ emission reduction projects.[19]

The NMED has had two rounds of funding for the Volkswagen Settlement Allocation. NMED approved funding for seven projects in the first funding cycle and 43 projects in the second funding cycle of New Mexico's Volkswagen Settlement Allocation.

First funding cycle projects include new school buses in the Gallup-McKinley and Albuquerque School Districts; a new Public Works Vehicle for San Juan County; electric ground support equipment and associated infrastructure for Southwest Airlines and the Albuquerque International Sunport; as well as compressed natural gas-powered refuse vehicles; and replacing diesel delivery trucks for Sysco Leasing. In total, 123 vehicles in New Mexico were replaced or repowered, reducing $NO_x$ emissions from both on-road and off-road diesel-fueled vehicles and equipment by roughly 160 tons in urban, rural, and Native communities in New Mexico.

In 2019, the Beneficiary Mitigation Plan (BMP) was revised and directed the remaining unallocated funds for future funding cycles to be used for the replacement of diesel-fueled vehicles with electric vehicles (EV), alternate-fueled vehicles, and light-duty zero emission vehicle (LDZEV) supply equipment. These projects will reduce emissions of $NO_X$ by more than 40 tons in areas of New Mexico where residents bear a disproportionate share of $NO_X$ pollution and in areas that are nearing the 2015 National Ambient Air Quality Standard for ground-level ozone.

The State remains committed to allocating the remaining 15% of the total funding (approximately $2.7 million) towards LDZEV infrastructure and has added a goal to focus efforts on a complete statewide electric vehicle charging network.[20]

**Provisions for Public and Stakeholder Involvement**

The AQB will conduct presentations for the industry, local governments, environmental groups, and school districts to garner support and participation in Ozone Advance. Also, the AQB will hold outreach and education events for businesses and private citizens to involve them in ~~developing a "path forward"~~the program ~~for implementation~~. This will be done through a variety of projects including the existing partnerships and air quality improvement groups that NMED participates in and the creation of the Permian Basin Air Quality Task Force. Of note, the City of Albuquerque Environmental Health Department has indicated that they intend to participate in EPA's Ozone Advance Program and NMED will work jointly to align our goals and objectives for the program.

NMED will provide additional opportunities to gather stakeholder input, hold ozone community workshops and develop voluntary ozone alert programs. Periodic update meetings will be held to keep stakeholders informed of progress and study results (e.g. rulemaking and modeling results) for all ozone advance path forward initiatives. This will allow for continuous feedback and participation as voluntary control measures, rules and programs are developed.

*Joint Advisory Committee*

[19] From *Volkswagen Settlement Information Fact Sheet*, NMED, https://www.env.nm.gov/wp-content/uploads/sites/26/2017/03/VW_Settlement_InBrief_November2017-1.pdf
[20] From *Volkswagen Settlement*, NMED, https://www.env.nm.gov/vw-settlement/

On May 7, 1996, the United States and Mexico included Appendix 1 to Annex V to the "La Paz Agreement" that defined the bi-national Paso del Norte Air Basin and created the committee The Joint Advisory Committee (JAC) is a bi-national group charged with the development and recommendation of air quality improvement initiatives under the La Paz Agreement and EPA's Border Program (i.e., Border 2025). It is comprised of a mixture of federal, state, and local government officials along with private citizens, university officials, and non-governmental organizations from the United States and Mexico. The JAC is governed by operating procedures contained in their by-laws and meets triennially at a rotating location in southern Dona Ana County, New Mexico, El Paso, Texas and Cd. Juárez, Mexico. The JAC's priorities are developed from the ground up, building upon local stakeholder input and concerns. All JAC meetings are open to the public and time is set aside at the beginning and end of each meeting for public comments.

*Four Corners Air Quality Group*

The original purpose of the 4CAQTF was to bring together a diverse group of interested parties to learn about and discuss air quality issues in the Four Corners area. Increased development in the Four Corners area including power plants, ~~oil and gas~~O&G production, and population growth were contributing to air quality concerns. Ozone levels in the region were close to exceeding the health-based national air quality standards for outdoor air. Task Force members developed a broad list of options for improving air quality in the area to aid the regulatory agencies in managing air quality impacts. These options were included in a report that was finalized in November 2007.[21]

Initial work of the 4CAQTF resulted in the implementation of one "interim" recommendation: the Bureau of Land Management required new and replacement internal combustion gas field engines to comply with more stringent emission standards in New Mexico and Colorado. These requirements apply to ~~oil and gas~~O&G development within the Bureau of Land Management's jurisdiction.[22] As a result of this work, the 4CAQTF continues to operate as the Four Corners Air Quality Group.

The Four Corners Air Quality Group (4CAQG) is a forum for individuals interested in air quality to meet, learn about current conditions, review progress on mitigation of air quality impacts, and generally contribute to clean air in the Four Corners Area. The 4CAQG includes NMED, Colorado Department of Public Health and Environment, US EPA, US Department of the Interior's National Park Service and Bureau of Land Management, US Department of Agriculture's Forest Service, the Southern Ute Indian Tribe, and the Navajo Nation. The Group meets at least once per year and more often if circumstances warrant it.

*Permian Basin Air Quality Task Force*

The NMED plans to create the Permian Basin Air Quality Task Force to bring together a diverse group of interested parties to learn about and discuss air quality issues in the Permian Basin. Increased ~~oil and gas~~O&G well development and population growth in the Permian Basin are contributing to air quality concerns. Ozone levels in the region are close to exceeding the health-based national air quality standards.

The first step will be to engage the Texas Commission on Environmental Quality (TCEQ) and the U.S. EPA to join NMED as a founding task force partner. Once this trilateral commitment is established, we can

[21] From *Four Corners Air Quality Group*, NMED, https://www.env.nm.gov/air-quality/fcaqg/
[22] Four Corners Air Quality Task Force Report of Mitigation Options, November 2007, https://www.env.nm.gov/wp-content/uploads/sites/2/2016/11/4CAQTF_Report_FINAL.pdf

engage and invite other stakeholders in the basin to become task force partners. Potential stakeholders include the ~~oil and gas~~O&G industry, local governments, environmental groups, and concerned citizens.

The Group will meet annually, biannually, and more often when necessary to discuss rule planning and initiatives. The Task Force members will be encouraged to develop a broad list of options that will aid the regulatory agencies in managing air quality impacts and improving air quality in the basin. These options will be included in a final report.

*Gather Stakeholder Input*

Understanding the concerns of impacted communities and stakeholders is an important part of creating an effective plan. As part of this initiative and in addition to the air quality groups listed above, NMED will hold meetings with various groups of stakeholders including environmental groups, tribes, the public, the regulated community, and local governments. The goal of these meetings will be to gather information about stakeholder concerns regarding ozone in their respective region and identify popular strategies that stakeholders are willing to participate in. NMED may also utilize focus groups comprised of various stakeholders to gather feedback on possible emission reduction activities. All these concerns will be taken into consideration as we assess our Ozone Advance plan in the future.

NMED understands that some people may not have the time or means to attend these meetings. To this end, NMED will also provide an opportunity for these groups and individuals to submit concerns and comments electronically, over the phone, or by mail. NMED may also provide surveys and other useful materials for stakeholders to complete.

*Ozone Community Workshops and Voluntary Ozone Alert Programs*

Community involvement in the Ozone Advance program will include workshops and voluntary ozone alert programs. The workshops will bring together community members and various stakeholders to learn about ozone and its impacts to their health, community, and the environment. This will also include training on how to minimize these impacts, particularly health impacts, during high ozone events and what voluntary actions individuals can do to minimize their ozone contribution.

If communities choose to, they can opt to creating a Voluntary Ozone Alert Program, crafted to the needs of their community. This program can include a variety of activities and projects such as, community-based air monitoring, flag programs, alert programs, and air quality training. These programs will also raise awareness for issues surrounding ozone in these communities.