NEVADA REGIONAL HAZE STATE IMPLEMENTATION PLAN FOR THE SECOND PLANNING PERIOD

A Plan for Implementing
Section 308 (40 CFR § 51.308)
of the Regional Haze Rule

Second Implementation Period (2018-2028)

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EXECUTIVE SUMMARY

The federal Regional Haze Rule (RHR) requires Nevada to address statewide emissions of visibility impairing pollutants that contribute to regional haze in each mandatory Class I area (CIA) located in Nevada and each mandatory CIA located in nearby or neighboring states. Jarbidge Wilderness Area (WA) is the only mandatory CIA located in Nevada. Under the RHR, Nevada is required to submit a State Implementation Plan (SIP) addressing the specific elements required by the RHR. This document serves as the State of Nevada's SIP submittal provided to the U.S. Environmental Protection Agency (EPA) Region 9 to satisfy the rule requirements outlined in 40 CFR Part 51, Subpart P, Section 51.308. This submittal is a revision to the regional haze SIP that Nevada submitted for the initial implementation period of the rule and amends the first round SIP when adopted.

The RHR covers a long period, broken into several planning phases to ultimately meet the national goal of returning visibility at all designated CIAs to natural conditions. The approach taken in preparing this RH SIP is to address the second planning period (2018 through 2028). Assuming natural visibility conditions are achieved by 2064, this plan meets the requirements of improving visibility for the most impaired days and ensuring no degradation in visibility for the clearest days for the period ending in 2028, the second planning period in the federal rule. Nevada's RH SIP has been prepared by the Nevada Division of Environmental Protection (NDEP) and contains strategies and elements related to each requirement of the federal rule. The SIP is based on data that existed as of December 2021.

Calculations of Baseline, Current, and Natural Visibility Conditions; Progress to Date; and the Uniform Rate of Progress

The RHR at 40 CFR 51.308(f)(1) requires the state to calculate baseline, current, and natural visibility conditions, which in turn are used to calculate progress to date and the uniform rate of progress (URP) per year necessary to achieve natural conditions by 2064. Although achieving natural visibility conditions by 2064 is not required by the RHR, or part of the national visibility goal, it is used by states as a reference point to develop the URP metric and measure progress between each decadal implementation period. To develop the URP, or glidepath, states must determine baseline visibility conditions for the period 2000 through 2004, current visibility conditions for the period 2014-2018, and natural background visibility conditions to be achieved by 2064. Achievement of natural visibility conditions by 2064 is only measured among the 20 percent "most-impaired" days (excluding episodic events like wildfire) of each year, while the 20 percent "clearest" days must not degrade beyond the 20 percent clearest days of the baseline visibility conditions measured during the first round.

NDEP has calculated the baseline, current, and natural visibility conditions record at Jarbidge WA during both the most impaired days and clearest days. During the most impaired days, visibility conditions at Jarbidge WA have shown a steady improvement in visibility since the baseline conditions were calculated during the initial implementation period and confirms that visibility conditions at Jarbidge WA are on track to achieve natural conditions by 2064. During the clearest days, NDEP has confirmed that current visibility conditions have not degraded since the previous round.

An analysis of pollutant species contributing to visibility impairment at Jarbidge WA, for both the most impaired and clearest days, indicates that ammonium sulfate (originating from anthropogenic sulfur dioxide emissions) and organic mass carbon (typically originating from wildfire emissions) are the top two pollutants of concern. Beyond these two pollutants, coarse mass (typically originating from windblown dust events and fugitive dust) is the third pollutant of concern. Ammonium nitrate (originating from anthropogenic oxides of nitrogen emissions) becomes a more significant visibility impairing pollutant at Jarbidge WA during the winter months. This data suggests that visibility at Jarbidge WA is significantly impacted by both anthropogenic and natural sources. High levels of organic mass carbon indicate that wildfire emissions still interfere with Nevada's ability to track visibility progress, despite the efforts of the new "most-impaired days" metric that aims to remove wildfire impacts.

Long-term Strategy for Regional Haze

The RHR at 40 CFR 51.308(f)(2) requires the state to submit a long-term strategy that addresses regional haze visibility impairment at all mandatory Class I areas that may be impacted by emissions from the state. The strategy must include enforceable emissions limitations, compliance schedules and other measures as necessary to achieve the state's reasonable progress goals. As part of the technical basis for the long-term strategy, the state must identify its baseline emissions inventory and all anthropogenic sources of visibility impairment. This SIP covers long-term strategies for visibility improvement between current conditions and visibility conditions projected for 2028.

An emission inventory, organized by sector and pollutant species, is provided for the current and 2028 projection conditions (representing the outcome of this SIP's efforts to improve visibility). In NDEP's projection of 2028 conditions, statewide emissions of visibility impairing pollutants are tremendously dominated by volatile organic compounds from natural biogenic emissions followed by coarse particulate matter from fugitive dust emissions. Statewide sulfur dioxide and nitrogen of oxides emissions, the anthropogenic pollutants considered for further reductions by NDEP, are miniscule compared to other pollutants and account for a small percentage of total statewide visibility impairing pollutants.

Visibility and source apportionment modeling show that Nevada's reduction in visibility impairing pollutants during the second implementation period will aid Jarbidge WA, and other out-of-state CIAs, in achieving the necessary visibility improvements toward natural conditions. Visibility projections for Jarbidge WA in 2028 show that enough visibility improvement will be achieved, as a result of the emission reductions of this round, to remain on track toward natural visibility conditions by 2064. Because of this, no further emission reductions are needed for the second implementation period.

To achieve additional emission reductions in Nevada as part of the SIP's Long-Term Strategy, NDEP identified eight point sources that reasonably emit pollutants impacting visibility impairment at Jarbidge WA. NDEP determined additional emission reduction measures necessary at each facility to achieve reasonable progress for the second implementation period by considering the four statutory factors: cost of compliance, time necessary for compliance, energy and non-air quality impacts, and the remaining useful life of the source. NDEP concluded that the closure of three electrical generating units, implementation of add-on controls at a lime production plant, new emission limits for existing controls at a facility, and the continued use of several existing controls are all necessary to achieve reasonable progress for this round.

Monitoring Strategy

The RHR at 40 CFR 51.308(f)(6) requires the state to develop a monitoring strategy for measuring, characterizing, and reporting regional haze visibility impairment that is representative of all mandatory Class I areas within Nevada.

Visibility conditions in mandatory Class I areas throughout the United States are presently measured by the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network, which is operated and maintained through a formal cooperative relationship between USEPA and Federal Land Manager (FLM) agencies. Nevada commits to continue using the IMPROVE monitoring data and to update Nevada's emissions inventory periodically, as required by the RHR. The inventory updates will be used for state tracking of emission changes and trends, to provide input into the evaluation of whether reasonable progress goals will continue to be achieved at Jarbidge WA and for other regional analyses.

State and Federal Land Manager Coordination

The RHR at 40 CFR 51.308(f)(2)(ii) requires states to coordinate with other states during the development of reasonable progress goals and emission management strategies. Nevada has met these requirements through participation in the Western Regional Air Partnership (WRAP) and commits to continue to coordinate via the WRAP for future implementation periods. In the WRAP process, Nevada participated in various forums and workgroups to help develop a coordinated emissions inventories and analyses of the impacts that sources have on regional haze in the west. In more direct discussions with neighboring states, NDEP has confirmed that no out-of-state Class I areas are reliant on further emission controls in Nevada beyond what is proposed in this SIP in order to achieve reasonable progress by the end of the second planning period.

40 CFR 51.308(i) further requires states to coordinate with FLMs in developing the RH SIP. States must provide a contact to whom FLMs can submit recommendations on the implementation of the RHR; provide FLMs an opportunity for consultation at least 60 days prior to holding any public hearing on the SIP; provide a public record of how the state addressed any FLM comments; and provide procedures for continuing consultation with FLMs on the implementation of the state's RH SIP. A draft of Nevada's RH SIP was provided to the FLMs with a 60-day comment period prior to the public hearing on the SIP. Documented in this SIP, NDEP has addressed comments provided by the FLMs before the commencement of public comment. NDEP commits to continuing these consultations with the FLMs in future planning periods.

Summary Figures and Tables

Figure ES-1 illustrates the observed visibility conditions at Jarbidge Wilderness Area, sorted by visibility impairing pollutants in ambient air. During the baseline years, from 2000 through 2004, the most impaired days are largely impacted by ammonium sulfate (32%), organic mass carbon (28%), and coarse mass (17%). During the same period for the clearest days, ammonium sulfate continues to dominate (42%), followed by organic mass carbon (27%). During the current period, from 2014 through 2018, the same trend continues with the most impaired days largely impacted by ammonium sulfate (29%), organic mass carbon (29%), and coarse mass (22%). The clearest days are impacted by the same three pollutant species: ammonium sulfate (42%), organic mass carbon (27%), and coarse mass (13%). Note that during the clearest days for both periods, which typically occur during the winter months, ammonium nitrate extinction contribution jumps up (~10%).

Table ES-1 outlines the incremental change in visibility conditions at Jarbidge WA across all major time periods (baseline, current, 2028 projection, and 2064 goal of natural conditions) and indicates a consistent downward trend in visibility impairment, or regional haze, during the most impaired days that is on track to achieve natural conditions by 2064. A similar downward trend is observed during the clearest days toward estimated natural conditions at Jarbidge WA, however, the RHR only requires that visibility conditions not degrade beyond the baseline conditions. Table ES-1 shows that the projected visibility condition during the clearest days in 2028 (1.72 dv) does no degrade beyond the baseline condition (2.56 dv).

Figure ES-2 graphically displays the visibility conditions outlined in Table ES-1 and compares these values to the uniform rate of progress (solid green line), clearest days baseline (solid brown line) and observed annual visibility conditions for both the most impaired days (dashed light blue line) and clearest days (dashed orange line). The figure shows that in order to achieve that national goal of natural visibility conditions of 7.39 dv by 2064, projected visibility conditions in 2028 at Jarbidge WA must be at least 8.20 dv, or below. NDEP predicts that visibility conditions during the most impaired days at Jarbidge WA will be 7.76 dv in 2028. NDEP also predicts that visibility conditions during the clearest days will be 1.72 dv in 2028, well below the goal of 2.56 dv.

Table ES-2 outlines the total emissions reductions in tons per year expected as a result of Nevada's Long-Term Strategy for the second implementation period. These reductions are achieved from new control measures identified as necessary to achieve reasonable progress after consideration of the four statutory factors. As seen in the table, roughly 2,300 tons per year of NO_x and SO_2 emissions are expected, or a total of 4,600 tons per year.

Figure ES-1: Baseline and Current Visibility Conditions for the Most Impaired and Clearest Days by Pollutant Species

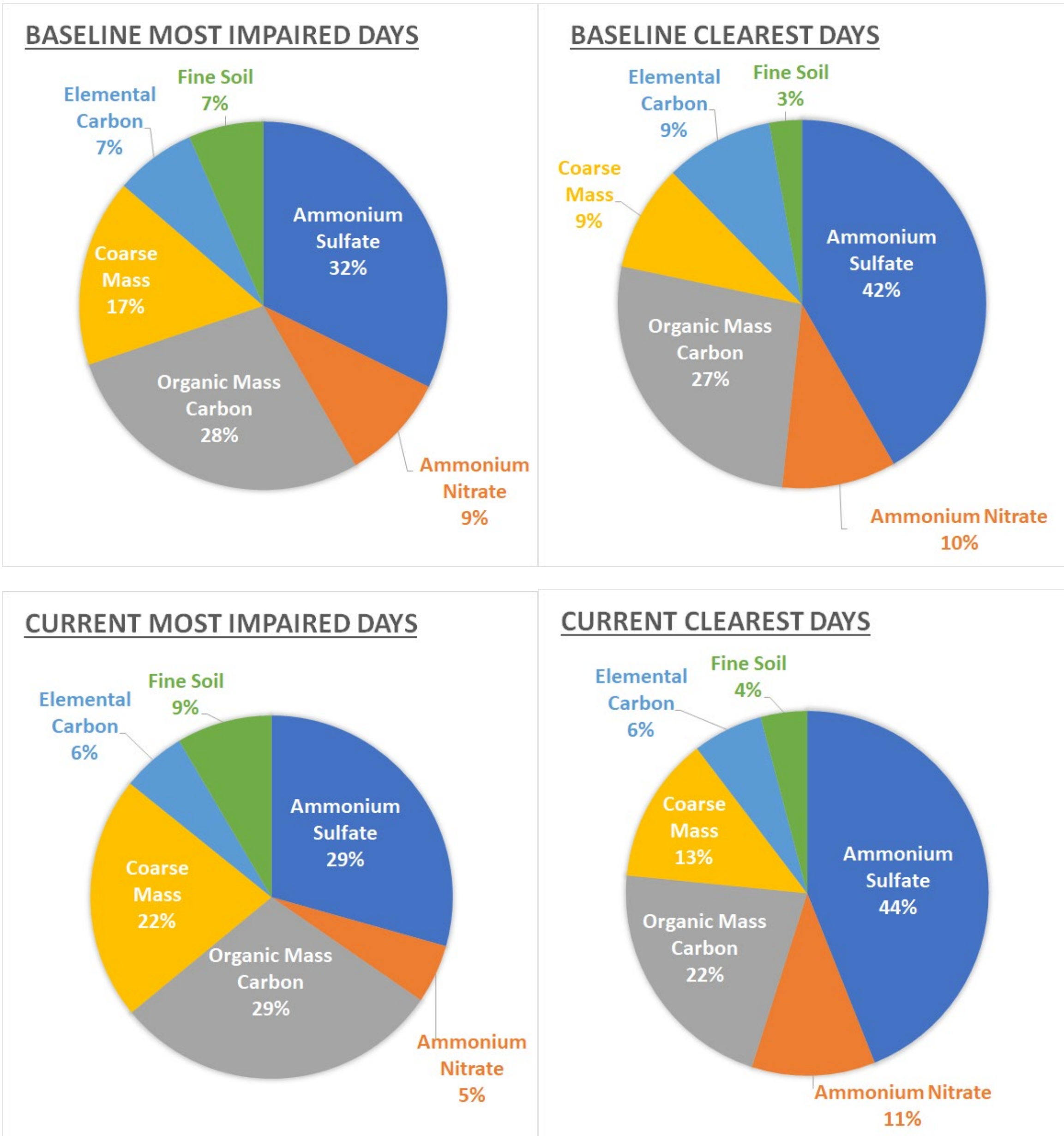

Table ES-1: Visibility Progress at Jarbidge Wilderness Area Toward National Goal of Natural Visibility Conditions by 2064 (deciviews)

Period	Years	Most Impaired Days Average	Clearest Days Average
Baseline Condition	2000-2004	8.73	2.56
Current Condition	2014-2018	7.97	1.84
Projected Condition	2028	7.76	1.72
Natural Condition Goal	2064	7.39	1.14

Figure ES-2: Uniform Rate of Progress for Jarbidge Wilderness Area

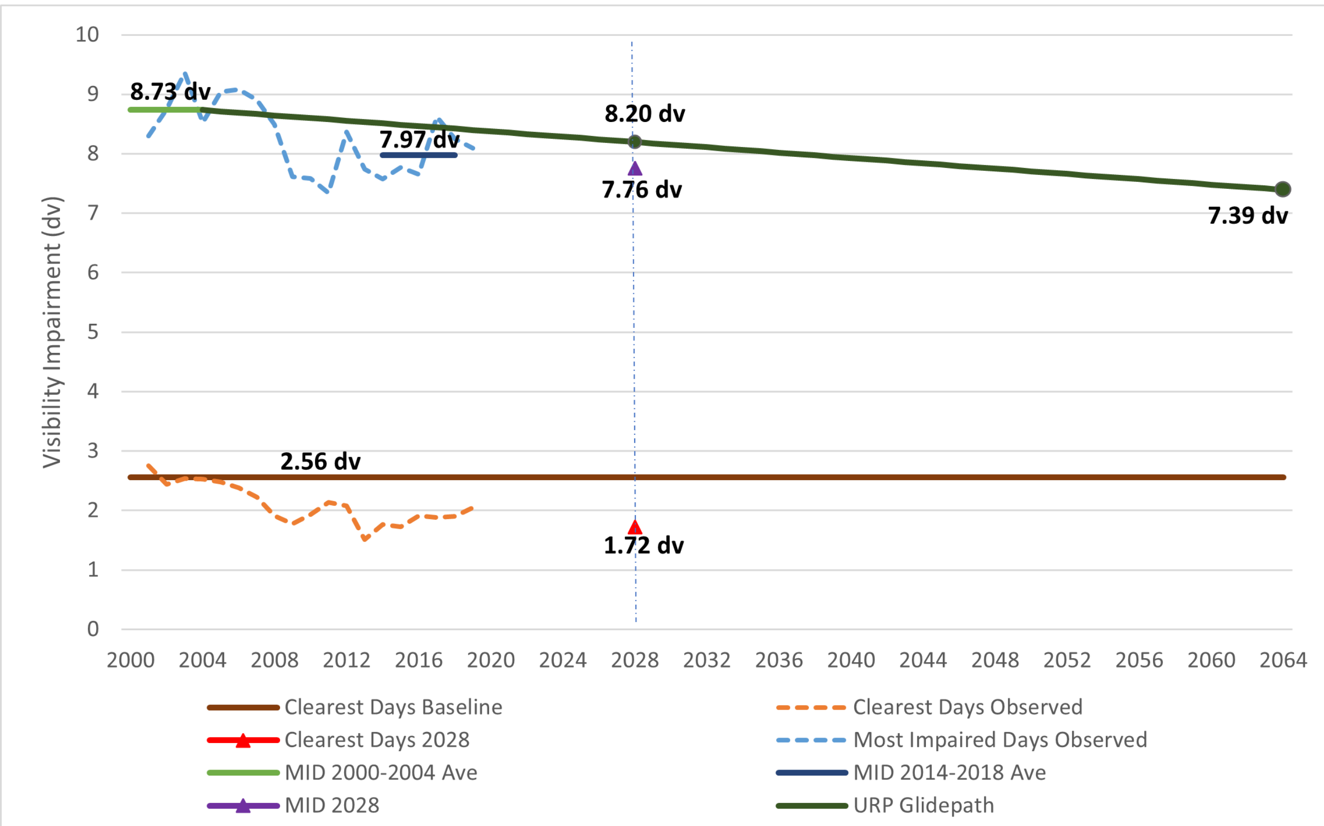

Table ES-2: Long-Term Strategy Emissions Reductions

NO_x	SO_2	PM_{10}	Total
2,239	2,313	60	4,612

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Acronyms, Abbreviations and Terms

2014v2	2014 Emissions Inventory Version 2
2028OTBa2	2028 On-the-Books/On-the-Way Emission Inventory Version 2
2028PAC2	2028 Potential Additional Controls Emission Inventory Version 2
AMET	EPA Atmospheric Model Evaluation tool
ARP	Acid Rain Program
BART	Best Available Retrofit Technology
BACT	Best Available Control Technology
BLM	Bureau of Land Management
CAA	Clean Air Act
CAMx	Comprehensive Air Quality Model with Extensions
CARB	California Air Resources Board
CASTNET	Clean Air Status and Trends monitoring network
CCDES	Clark County Department of Environment and Sustainability
CD	Consent Decree
CIA	Class I Area
CENWRAP	Central West Regional Air Partnership
CFR	Code of Federal Regulations
CM	Coarse Matter
CSN	Chemical Speciation Network
CTI	Cleaner Trucks Initiative
DERA	Diesel Emissions Reduction Act
EGU	Electrical Generating Unit
EIMP	Emission Inventories and Modeling Protocol Work Group
EJ	Environmental Justice
EWRT	Extinction-Weighted Residence Time
FGD	Flue Gas Desulfurization
FGR	Flue Gas Recirculation
FIP	Federal Implementation Plan
FLM	Federal Land Manager
FSWG	Fire and Smoke Work Group
FWS	Fish & Wildlife Service
GEOS-Chem	Goddard Earth Observing System global chemical model
GHG	Greenhouse Gas
HI	Haze Index
HMS	Hazard Mapping System
IMPROVE	Interagency Monitoring of Protected Visual Environments
IWDW	Intermountain West Data Warehouse
JARB1	Jarbidge Wilderness Area IMPROVE Monitor
LNB	Low-NO_x Burner(s)
LEV	Low-Emission Vehicle
LTS	Long-Term Strategy
MACT	Maximum Achievable Control Technology
MATS	Mercury and Air Toxics Standards
Mm^{-1}	Inverse Megameter
MOU	Memorandum of Understanding
MOVES	Motor Vehicle Emission Simulator
MW	Megawatts

NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NDEP	Nevada Division of Environmental Protection
NEI	National Emission Inventory
NEIv2	National Emission Inventory version 2
NG	Natural Gas
NPS	National Park Service
NRS	Nevada Revised Statutes
NSR	New Source Review
NTEC	National Tribal Environmental Council
OFA	Over-Fired Air
OGWG	Oil & Gas Work Group
PNG	Pipeline Natural Gas
PSAT	Particulate Source Apportionment Technology
PSD	Prevention of Significant Deterioration
PUC	Public Utilities Commission
RAVI	Reasonable Attributable Visibility Impairment
RepBase2	Representative Baseline Emission Inventory Version 2
RH	Regional Haze
RHPWG	Regional Haze Planning Work Group
RHR	Regional Haze Rule
RMC	Regional Modeling Center
RPG	Reasonable Progress Goal(s)
RPO	Regional Planning Organizations
RPS	Renewable Portfolio Standard
RRF	Relative Response Factor
SCR	Selective Catalytic Reduction
SEC	State Environmental Commission
SIP	State Implementation Plan
SMOKE	Sparse Matrix Operator Kerner Emissions
SNCR	Selective Non-Catalytic Reduction
TSS	Technical Support System
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
URP	Uniform Rate of Progress
VIEWS	Visibility Information Exchange Web System
WA	Wilderness Area
WAQS	Western Air Quality Study
WEP	Weighted Emissions Potential
WESTAR	Western States Air Resources Council
WGA	Western Governors Association
WPS	WRF Preprocessing System
WRAP	Western Regional Air Partnership
WRF	Weather Research and Forecasting
ZEV	Zero-Emission Vehicle

Chemicals and Chemical Compounds

CO	Carbon Monoxide
EC	Elemental Carbon
HNO_3	Nitric Acid
NH_3	Ammonia
NH_4	Ammonium
NH_4NO_3	Ammonium Nitrate
$(NH_4)_2SO_4$	Ammonium Sulfate
NMHC	Non-Methane Hydrocarbons
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NO_x	Oxides of Nitrogen
OC	Organic Carbon
OMC	Organic Matter Carbon
$PM_{2.5}$	Fine Particulate Matter (2.5 micrometers and smaller in diameter)
PM_{10}	Coarse Particulate Matter (10 micrometers and smaller in diameter)
POA	Primary Organic Aerosols
SO_2	Sulfur Dioxide
SO_4	Sulfate
VOC	Volatile Organic Compounds

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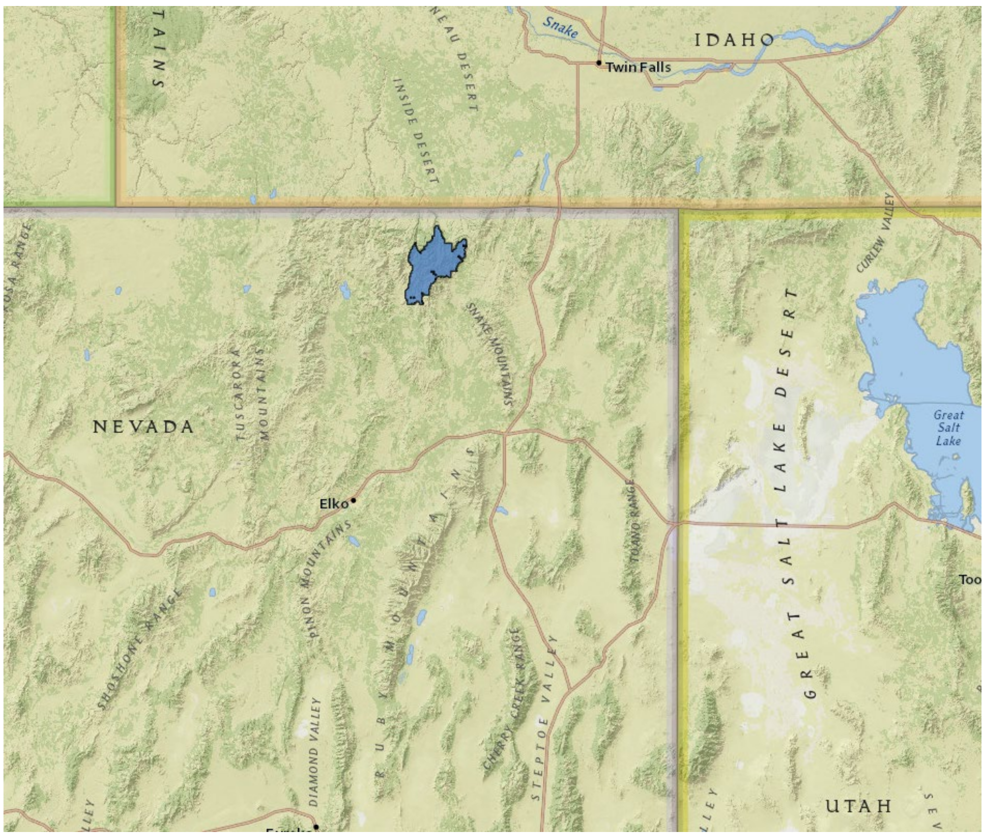
Chapter One – Overview

1.1 NEVADA'S CLASS I AREA – JARBIDGE WILDERNESS AREA

Nevada has one mandatory Class I Area, the 113,167-acre Jarbidge Wilderness Area (Jarbidge WA), located within the Humboldt National Forest in the northeastern portion of Nevada, as shown on Figure 1-1.

FIGURE 1-1

JARBIDGE WILDERNESS AREA LOCATION



Jarbidge WA lies near the Idaho border just north of the physical geographic boundary separating the Columbia Plateau region, including the Snake River Plain, and the Great Basin region to the south. It consists of the headwaters basin of the Jarbidge River East Fork that flows north from the center of the wilderness area, and the headwaters basin of Marys River that flows south from the center of the wilderness area, part of the Columbia River/Great Basin hydrographic divide. The terrain encompassed by the wilderness area consists of deep canyons with steep slopes. The Jarbidge River Canyon, which comprises the upper main headwaters of the Jarbidge River proper, is oriented south to north, with its mouth several miles to the north where it drains into the Bruneau River.

The area illustrates Nevada's typical basin and range topography with elevations ranging from 2,100 m (6,900 ft) where the Jarbidge River East Fork exits the wilderness into Idaho's Snake

River Plains to eight peaks over 3,000 m (~10,000 ft) high along the Jarbidge Mountain crest, which includes the highest peak, Marys River Peak at 3,170 m (10,398 ft).

Unlike the rest of the state, Jarbidge WA is unusually wet, with an average of 7-8 ft of total snowfall and 1-2 ft of total precipitation. The varied terrain is cut by deep canyons with steep slopes and supports a range of vegetation zones from sagebrush flats to glaciated alpine basins. During the warmer months, these scenic vistas and their 150 miles of hiking trails are a major tourist attraction.

1.2 VISIBILITY IMPAIRMENT

Regional haze is pollution from disparate sources that impairs visibility over a large region, including national parks, forests and wilderness areas (156 of which are termed mandatory federal Class I areas). Regional haze is caused by sources and activities emitting fine particles and their precursors. Those emissions are often transported over large regions. Particles affect visibility through the scattering and absorption of light, and fine particles – particles similar in size to the wavelength of light – are most efficient, per unit of mass, at reducing visibility. Fine particles may either be emitted directly or formed from emissions of precursors, the most important of which are sulfur dioxide (SO_2) and nitrogen oxides (NO_x). Reducing fine particles in the atmosphere is generally considered to be an effective method of reducing regional haze, and thus improving visibility. Fine particles also adversely impact human health, especially respiratory and cardiovascular systems.

Most visibility impairment occurs when pollution in the form of small particles scatter or absorb light. Air pollutants come from a variety of natural and anthropogenic sources. Natural sources include windblown dust and smoke from wildfires. Anthropogenic sources include motor vehicles, electric utility and industrial fuel burning, and manufacturing operations. Higher concentrations of pollutants result in more absorption and scattering of light, which reduce the clarity and color of a scene. Some types of particles, such as sulfates, are more effective at scattering light, particularly during humid conditions. Other particles like elemental carbon from combustion processes are highly efficient at absorbing light. Commonly, the receptor is the human eye, and the object may be a single viewing target or scene.

In the 156 mandatory Class I areas across the country, visual range has been substantially reduced by air pollution. In the West, visual range has decreased from an average of 140 miles to 35-90 miles. Much of the visibility impairment in the West can be attributed to natural emissions of smoke and dust with significant contributions resulting from international emissions from beyond the boundaries of the United States, including Canada and Mexico.

Some haze-causing particles are directly emitted to the air. Others are formed when gases emitted to the air form particles as they are carried many miles from the source of the pollutants. Some haze forming pollutants are also linked to human health problems and other environmental damage. Exposure to very small particles in the air has been linked with increased respiratory illness, decreased lung function and premature death. In addition, particles such as nitrates and sulfates contribute to acid deposition potentially making lakes, rivers and streams unsuitable for some forms of aquatic life and impacting flora in the ecosystem. These same acid particles can also erode materials such as paint, buildings, or other natural and manmade structures.

1.3 THE WESTERN REGIONAL AIR PARTNERSHIP AND NEVADA

USEPA initially funded five Regional Planning Organizations throughout the country to coordinate regional haze rule-related activities between states in each region. Nevada belongs to the Western Regional Air Partnership (WRAP), the consensus organization of western states, tribes, and federal agencies, which oversees analyses of monitoring data and preparation of technical reports regarding regional haze in the western United States.

The WRAP was formed in September 1997 as the successor organization to the Grand Canyon Visibility Transport Commission. It is administered jointly by the Western Governors Association (WGA) and the National Tribal Environmental Council (NTEC). The mission of the WRAP is to identify regional or common air management issues and to develop and implement strategies to address these issues. The WRAP is a partnership of states and tribes as well as federal agencies and was designated by USEPA to assist western states in the development of regional haze plans. It provides a coordination mechanism with regard to science and technology support for policy and programmatic uses in the western United States.

WRAP member states include Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Federal participants are the Department of the Interior (National Park Service and Fish & Wildlife Service,) the Department of Agriculture (Forest Service) and USEPA.

Work by WRAP committees, forums and workgroups is accomplished by the staff time contributed by state, tribal, Federal Land Manager (FLM), EPA and environmental, industry and public representatives, with the support of WRAP staffing through WGA and NTEC. WRAP work is also handled through contracts to environmental consulting firms, to analyze air pollution data collected by states and tribes in their regulatory programs as well as to prepare data and analyses for natural and/or uncontrollable air pollution sources.

The WRAP established stakeholder-based technical and policy oversight committees to assist in managing the development of regional haze work products. Working groups and forums were established to develop technical tools and work products the states and tribes needed to develop their implementation plans. Much of the WRAP's effort focused on regional technical analysis, which is the basis for developing strategies to meet the Regional Haze Rule (RHR) requirement to demonstrate reasonable progress towards natural visibility conditions in Class I areas. This includes the compilation of emission inventories, air quality modeling and ambient monitoring and data analysis.

The WRAP has developed a regionally-consistent and comparable body of technical data and analysis tools that has been invaluable in addressing regional haze in the west. These data and tools are provided for use and evaluation through a transparent and open network of interrelated data support web systems and a technical decision support system:

WRAP Technical Data Support Centers

- Intermountain West Data Warehouse (https://views.cira.colostate.edu/iwdw/): IWDW provides easy online access to monitored air quality data, gridded modeling products, emissions data, and an integrated suite of tools to help assess air quality on Federal lands.

WRAP Technical Decision Support System

- Technical Support System (http://views.cira.colostate.edu/tssv2/): TSS integrates a number of different data support resources under one web-based decision support umbrella for regional haze planning and implementation.

In addition to these technical tools and work products, the WRAP has provided a forum for coordination and consultation with other states, tribes and FLMs. The major amount of interstate consultation in the development of this SIP was through the Regional Haze Planning Work Group (RHPWG) of the WRAP. Nevada participated in the RHPWG, which took the products of the WRAP technical analysis and consultation process and developed a process for establishing reasonable progress goals in the western Class I areas. Chapter Nine of this document discusses the process that Nevada participated in to address the consultation requirements with FLMs, tribes and other WRAP states during the development of this plan and Nevada's commitments for future consultation.

1.4 TECHNICAL SUPPORT BACKGROUND

1.4.1 Regional Haze Monitoring Network

In response to the 1977 Clean Air Act Amendments, the IMPROVE program was established in 1985 to aid the creation of federal and state implementation plans for the protection of visibility in Class I areas. Air monitoring devices at these locations are operated and maintained through a formal cooperative relationship between the USEPA and the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management and U.S. Forest Service, collectively called the FLMs. In 1991, several additional organizations joined the effort: State and Territorial Air Pollution Program Administrators, the Association of Local Air Pollution Control Officials, Western States Air Resources Council, Mid-Atlantic Regional Air Management Association and Northeast States for Coordinated Air Use Management.

The IMPROVE program implemented an extensive long-term monitoring program to establish the current visibility conditions, track changes in visibility and determine causal mechanism for the visibility impairment in the national parks and wilderness areas. The data collected at the IMPROVE monitoring sites are used by land managers, industry planners, scientists, consultants, public interest groups and air quality regulators to better understand and protect the visual air quality resource in Class I areas. IMPROVE documents the visual air quality in wilderness areas and national parks throughout the United States.

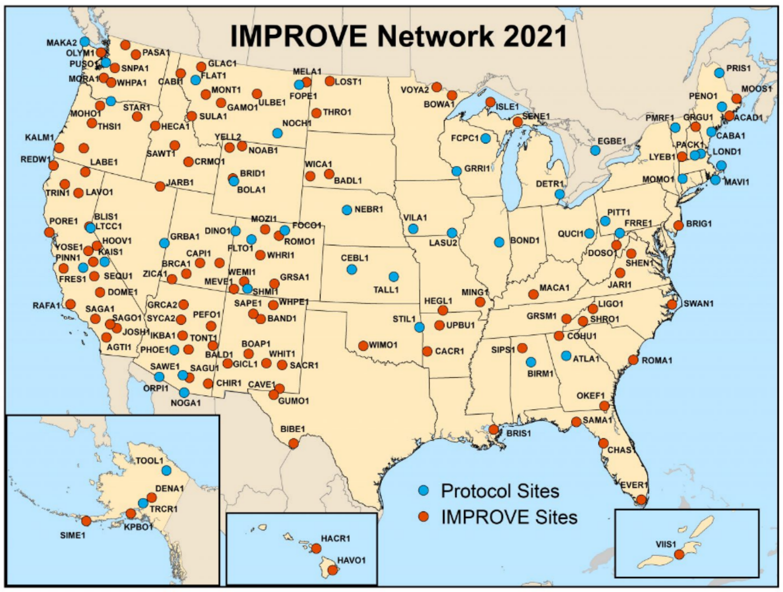
1.4.1.1 Overview of the IMPROVE Monitoring Network

The IMPROVE network focuses on rural areas in the western Unites States. Other visibility and aerosol monitoring networks, such as that of the National Weather Service Airport Visibility

Data, may focus on different air sheds and have different data collection objectives. In 1988, IMPROVE began with 20 monitoring sites. After publication of the regional haze rule in 1999, the first step in the implementation process was the upgrade and expansion of the IMPROVE network to 110 sites nationally. Figure 1-2 shows the IMPROVE monitoring network throughout the United States.

FIGURE 1-2

<u>MAP OF IMPROVE MONITORING NETWORK IN THE UNITED STATES</u>

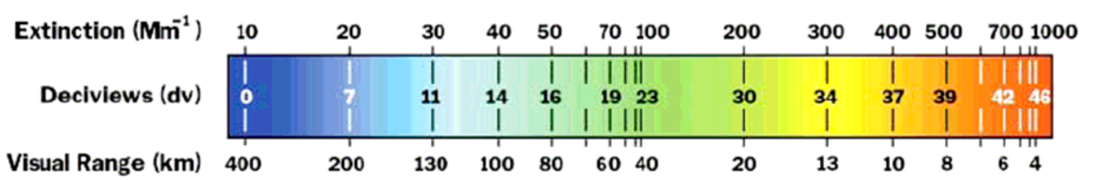


The IMPROVE network consists of aerosol and optical samplers. Every IMPROVE site deploys an aerosol sampler to measure speciated fine aerosols and coarse mass. Select sites also deploy a transmissometer and nephelometers to measure light extinction and scattering respectively, as well as automatic camera systems to visually measure the scene. Particulate concentration data are obtained every 24 hours and converted into reconstructed light extinction through a complex calculation using the IMPROVE algorithm which may be viewed at https://vista.cira.colostate.edu/Improve/the-improve-algorithm/. Light extinction, the impairment of visibility, occurs due to particles and gases that reflect and absorb light.

Reconstructed light extinction (denoted as b_{ext}) is expressed in units of inverse megameters (1/Mm or Mm^{-1}). The RHR requires the tracking of visibility conditions in terms of the Haze Index (HI) metric expressed in the deciview unit (40 CFR 51.308(d)(2)). The relationship between light extinction in Mm^{-1}, Haze Index in dv and visual range in km is indicated by the scale in Figure 1-3.

FIGURE 1-3

LIGHT EXTINCTION-HAZE INDEX-VISUAL RANGE SCALE



Generally, a one dv change in the Haze Index is likely humanly perceptible under ideal conditions regardless of background visibility conditions. More information regarding tracking visibility conditions is found in USEPA's *Guidance for Tracking Progress Under the Regional Haze Rule* at: https://www.epa.gov/visibility/visibility-guidance-documents.

The IMPROVE data undergo extensive quality assurance and control procedures and analyses by its contractors and the National Park Service before it is released. The aerosol and optical data are made publicly available approximately nine months after collection. In addition, seasonal and annual data reports, special study data reports, technical publications and other data and analysis reports are prepared. IMPROVE program resources are available at: http://vista.cira.colostate.edu/Improve.

1.4.1.2 IMPROVE Monitor JARB1

Two operating IMPROVE monitoring sites are located in Nevada, one at Great Basin National Park and the other at the Jarbidge WA. The Walker River Paiute Tribe, a third monitoring site in Nevada, operated from June 2003 to November 2005. The IMPROVE monitor representing the air quality at the Jarbidge WA is identified as JARB1.

JARB1 was among the first 20 IMPROVE sites to start operation in 1988 and is sponsored by the U. S. Forest Service. Generally, JARB1 is expected to be representative of aerosol characteristics in the Jarbidge WA especially when the atmosphere is well mixed and regionally homogeneous. However, the site is at a low elevation in the Jarbidge River Canyon that is separate from the Jarbidge WA and upper East Fork of the Jarbidge River. Consequently, the monitoring site may at times be isolated from wilderness locations and potentially impacted by different local emission sources. Figure 1-2 shows the location of the JARB1 monitoring site by a red dot located along the northern border of Nevada.

As does every IMPROVE site, JARB1 deploys an aerosol sampler to measure speciated aerosols and coarse mass. Along with other selected sites, JARB1 also has an automatic camera system to obtain a visual record, a transmissometer to measure light extinction, and a nephelometer to measure light scattering. Data from these sampling devices are used to determine the visibility status at the Jarbidge WA.

1.4.2 Emissions Analyses and Projections

USEPA's RHR requires statewide emission inventories of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I area. Nevada's inventories are presented in Chapter Three. These emissions inventories are available from the WRAP TSS (http://views.cira.colostate.edu/tssv2/Express/EmissionsTools.aspx). The TSS webpage has links to many references that describe in detail the emissions methods used in developing the point, area, mobile, dust, offshore and fire emission inventories.

Emissions scenarios used in the development of this SIP represent actual baseline emissions (2014v2), representative baseline emissions (RepBase2), and projected emissions (2028OTBa2 and 2028PAC2). The baseline period includes 2014 through 2018, represented by 2014, while the projected inventories denote 2028 emissions, as discussed below. The projected inventories take into account growth, "on-the-books" controls and regulations and the application of regional haze strategies. The year 2028 was selected as it represents the final year for demonstrating reasonable progress during the second implementation period. These inventories were used for visibility and source apportionment modeling.

The pollutants examined are sulfur dioxide (SO_2), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compound (VOC), primary organic aerosol (POA), elemental carbon (EC), fine particulate (PM fine or $PM_{2.5}$), coarse particulate (PM coarse or PM_{10}) and ammonia (NH_3). It is important to note that each of these pollutants have characteristics that differ in terms of ability to affect visibility. Assuming one emission unit of PM fine, for example, the same unit of SO_2 or NO_x would be about three times more effective at impairing visibility. Organic carbon is about four times more effective and elemental carbon about ten times more effective at impairing visibility. (Primary organic aerosols and elemental carbon are discussed in Chapter Four as part of the weighted emissions potential analysis.) Conversely, PM coarse is about half as effective as PM fine. Both VOC and NH_3 affect visibility only after certain chemical reactions occur and, therefore, cannot be compared in this manner.

1.4.2.1 Preparation of Baseline Emissions Inventories

2014 Base Case (2014v2) Inventory
The 2014v2 inventory used actual data reported by states, locals, tribes and USEPA databases, which evolved from states' actual emissions data submitted to USEPA for the 2014 National Emission Inventory. The WRAP RHPWG for Emissions Inventories and Modeling Protocol (RHPWG EI & MP)[1] contracted with Ramboll to improve upon the 2014 WRAP emissions inventory.[2] WRAP states replaced the 2014v2 NEI source sectors as listed below:

1. California Air Resources Board (CARB) provided emissions for all anthropogenic sectors in California.

[1] https://views.cira.colostate.edu/wiki/wiki/9191/western-us-regional-analysis-2014-neiv2-emissions-inventory-review-for-regi
[2] https://www.wrapair2.org/pdf/WRAP%20Regional%20Haze%20SIP%20Emissions%20Inventory%20Review%20Documentation_for_Docket%20Feb2019.pdf

2. WRAP states updated emissions for electric generating units (EGU), non-EGU point sources, and onroad mobile.
3. The WRAP Oil and Gas Workgroup (OGWG)[3] and its contractor Ramboll, Inc., defined a Roadmap for updating oil and gas inventories and delivered updated 2014 emissions (October 2018) for Colorado, Montana, New Mexico, North Dakota, South Dakota, Utah, and Wyoming (emissions for remaining WRAP states remain as in the EPA 2014v2 platform). [4]
4. The WRAP Fire and Smoke Work Group (FSWG) updated the 2014NEIv2 BlueSky/SmartFire emissions.[5]
5. Natural emissions were developed by WRAP for 2014v2 and held constant at 2014v2 levels for the Representative Baseline and future year scenarios.
6. All other WRAP emissions sectors and all Non-WRAP emissions for WRAP 2014v2 were based on the EPA 2014 modeling platform.[6]

TABLE 1-1

WRAP CAMx/PSAT DATA SOURCES

Source Sector	2014v2	RepBase2	2028OTBa2
California All Sectors 12WUS2	CARB-2014v2	CARB-2014v2	CARB-2028
WRAP Fossil EGU w/ CEM	WRAP-2014v2	WRAP-RB-EGU [1]	WRAP-2028-EGU [1]
WRAP Fossil EGU w/o CEM	EPA-2014v2	WRAP-RB-EGU [1]	WRAP-2028-EGU [1]
WRAP Non-Fossil EGU	EPA-2014v2	EPA-2016v1	EPA-2028v1
Non-WRAP EGU	EPA-2014v2	EPA-2016v1	EPA-2028v1
O&G WRAP O&G States	WRAP-2014v2	WRAP-RB-O&G [2]	WRAP-2028-O&G [2]
O&G WRAP Other States	EPA-2014v2	EPA-2016v1	EPA-2016v1 [3]
O&G non-WRAP States	EPA-2014v2	EPA-2016v1	EPA-2016v1 [3]
WRAP Non-EGU Point	WRAP-2014v2	WRAP-2014v2 [4]	WRAP-2014v2 [4]
Non-WRAP non-EGU Point	EPA-2014v2	EPA-2016v1	EPA-2016v1
On-Road Mobile 12WUS2	WRAP-2014v2	WRAP-2014v2	WRAP-2028-Mobile [5]
On-Road Mobile 36US	EPA-2014v2	EPA-2016v1	EPA-2028v1
Non-Road 12WUS2	EPA-2014v2	EPA-2016v1	WRAP-2028-Mobile [5]
Non-Road non-WRAP 36US	EPA-2014v2	EPA-2016v1 [6]	EPA-2028v1 [6]
Other (Non-Point) 12WUS2	EPA-2014v2	EPA-2014v2 [7]	EPA-2014v2 [7]
Other (Non-Point) 36US	EPA-2014v2	EPA-2016v1	EPA-2016v1
Can/Mex/Offshore 12WUS2	EPA-2014v2	EPA-2016v1	EPA-2016v1
Fires (WF, Rx, Ag)	WRAP-2014-Fires	WRAP-RB-Fires [8]	WRAP-RB-Fires [8]
Natural (Bio, etc.)	WRAP-2014v2	WRAP-2014v2	WRAP-2014v2
Boundary Conditions (BCs)	WRAP-2014-GEOS	WRAP-2014-GEOS	WRAP-2014-GEOS

1. WRAP-RepBase2-EGU and WRAP-2028OTBa2-EGU include changes/corrections/updates from WESTAR-WRAP states
2. WRAP-RepBase2-O&G and WRAP-2028OTBa2-O&G both include corrections for WESTAR-WRAP states.
3. O&G for other WRAP states and Non-WRAP states use EPA-2016v1 assumptions for 2028OTBa2 and unit-level changes provided by WESTAR-WRAP states.
4. WRAP-2014v2 Non-EGU Point is used for RepBase2 and 2028OTBa2, with source specific updates provided by WESTAR-WRAP states.
5. WRAP-2028-MOBILE is used for On-Road and Non-Road sources for the 12WUS2 domain.
6. EPA-2016v1 and EPA-2028v1 are used for On-Road and Non-Road Mobile for the 36km US domain.
7. Non-Point emissions use 2014v2 emissions for RepBase2 and 2028OTBa2 scenarios, including state-provided corrections.
8. RepBase fires are used for both RepBase2 and 2028OTBa2

[3] http://www.wrapair2.org/ogwg.aspx
[4] http://www.wrapair2.org/pdf/OGWG_Roadmap_FinalPhase1Report_Workplan_13Apr2018.pdf
[5] http://www.wrapair2.org/fswg.aspx
[6] https://www.epa.gov/air-emissions-modeling/2014-version-71-platform

The purpose of the 2014v2 scenario is to represent the actual conditions in calendar year 2014 with respect to ambient air quality and the associated sources of visibility-impairing air pollutants. The 2014v2 emissions inventories were used to validate the air quality model and associated databases and to demonstrate acceptable model performance with respect to replicating observed particulate matter air quality for use in the Comprehensive Air Quality Model with Extensions (CAMx) model performance evaluations.

2014 through 2018 Representative Baseline-Period (RepBase2) Inventory

The Representative Baseline (RepBase2) emissions scenario updates the 2014v2 inventory to account for changes and variation in emissions between 2014 and 2018 for key WRAP source sectors, as defined by the WRAP Emissions and Modeling Protocol subcommittee. The RepBase2 inventory was delivered as listed below:

1. California Air Resources Board (CARB) used the same source sector emissions as defined for 2014v2.
2. The WRAP EGU Emissions Analysis Project[7] developed a comprehensive database for fossil fuel electric generating units in 13 continental western states, including operating characteristics and emissions, for the period circa 2014-2018. Methods are defined in Center for New Energy Economy's analysis of WRAP fossil-fueled Electric Generating Units for Regional Haze Planning and Ozone Transport Contribution[8] (June 2019.)
3. The WRAP Oil and Gas Workgroup and its contractor, Ramboll, Inc., developed the circa2014 baseline oil and gas inventory[9] to apply to the RepBase inventory.
4. The WRAP Fire and Smoke Work Group (FSWG) worked with states, tribes, federal land managers and Air Sciences, Inc., to define 2014 to 2018 wildfire emissions for the Continental U.S. (36-km modeling grid) to represent a broader range of fire conditions (Representative Fire) than the single year 2014, as reported in Fire Emissions Inventories for Regional Haze Planning: Methods and Results.[10]
5. All other emissions sectors used the EPA 2016v1 platform[11] for RepBase2.

During state review of the Representative Baseline emissions, some errors and duplicate records were identified. WRAP states revised select EGU, non-EGU point, and oil and gas emissions for a revised Representative Baseline (RepBase2). Data sources for RepBase2 emissions are defined in Table 1-1. WRAP methods are further defined in Ramboll Inc.'s Run Specification Sheet for Representative Baseline (RepBase2) and 2028 On-the-Books (2028OTBa2) CAMx Simulations.[12]

[7] http://www.wrapair2.org/EGU.aspx
[8] https://www.wrapair2.org/pdf/Final%20EGU%20Emissions%20Analysis%20Report.pdf
[9] http://www.wrapair2.org/pdf/WRAP_OGWG_Report_Baseline_17Sep2019.pdf
[10] http://www.wrapair2.org/pdf/fswg_rhp_fire-ei_final_report_20200519_FINAL.PDF
[11] https://www.epa.gov/air-emissions-modeling/2016-version-1-technical-support-document
[12] https://views.cira.colostate.edu/iwdw/docs/WAQS_and_WRAP_Regional_Haze_spec_sheets.aspx

1.4.2.2 Projected 2028 Emissions Inventories

2028 On-the-Books (2028OTBa2) Inventory

The WRAP 2028OTBa emissions inventory projection followed the methods applied by EPA in the September 2019 Technical Support Document[13] for updated 2028 regional haze modeling. The WRAP states updated source sectors to account for implementation by 2028 of all applicable federal and state requirements for U.S. anthropogenic emissions as listed below:

1. California Air Resources Board (CARB) provided 2028OTB projections from 2014v2 for all anthropogenic source sectors.
2. WRAP states worked with western utilities and the Center for New Energy Economy to project EGU emissions for 2028 On the Books, as reported in WRAP EGU emissions for Representative Baseline and 2028 On the Books projections.[14]
3. The WRAP Oil and Gas workgroup and its contractor, Ramboll, Inc., projected 2028 Oil and Gas area and point source emissions for WRAP states as reported in Revised Final Report: 2028 Future Year Oil and Gas Emission Inventory for WESTAR-WRAP States, March 2020 version.[15]
4. WRAP 2028 CAMx-ready emissions for on-road and non-road mobile sources, including offshore shipping, rail and airports are reported in Mobile Source Emissions Inventory 2028 Projections Project.[16]
5. Wildfire, Wildland Prescribed fire, and agricultural fires for the 2028OTBa inventory were identical to RepBase fires.

In September 2020, the WRAP states made revisions to select EGU, non-EGU, and oil and gas emissions for the WRAP states in the updated 2028OTBa2 projection. EPA 2016v1 emissions were assigned to some source sectors for WRAP, non-WRAP, Canada and Mexico in lieu of EPA 2028v1 emissions to provide more conservative assumptions for the 2028OTBa2 projection.

2028 Potential Additional Controls (PAC2) Inventory

Some, but not all, western states made various enhancements beyond the 2028OTBa inventory to represent Potential Additional Controls resulting from the four-factor analyses conducted for the second implementation period to achieve reasonable progress. These updates reflected decreases in visibility impairing pollutants and were used to evaluate the potential visibility response in 2028. WESTAR-WRAP States and source sectors modified in the 2028 Potential Additional Controls (PAC2) modeling scenario compared to 2028OTBa2 are defined in Table 1-2.

[13] https://www.epa.gov/sites/default/files/2019-10/documents/updated_2028_regional_haze_modeling-tsd-2019_0.pdf
[14] https://www.wrapair2.org/pdf/Final%20EGU%20Emissions%20Analysis%20Report.pdf
[15] http://www.wrapair2.org/pdf/WRAP_OGWG_2028_OTB_RevFinalReport_05March2020.pdf
[16] http://views.cira.colostate.edu/wiki/wiki/11203/mobile-source-emissions-inventory-projections-project

TABLE 1-2

CHANGES TO 2028 PAC2 BY SOURCE SECTOR

2028PAC2 Changes to 2028OTBa2	EGU - Point	Non-EGU Point	Oil & Gas - Point	On-Road Mobile
Arizona (AZ)	X		X	
California (CA)				X
Colorado (CO)				
Idaho (ID)		X		
Montana (MT)	X			
Nevada (NV)	X	X		
New Mexico (NM)	X	X	X	
North Dakota (ND)	X			
Oregon (OR)	X	X	X	
South Dakota (SD)				
Utah (UT)				
Washington (WA)	X			
Wyoming (WY)				

Adjustments for the PAC2 modeling inventory were submitted to reflect potential reductions from control technology considered in draft four-factor analyses conducted by Nevada sources. Reductions achieved in the PAC2 inventory were based on assumptions relevant to the information of the draft four-factor analyses and do not represent final control determinations resulting from finalized four-factor analyses. Because of this, NDEP is not relying on the outputs of this model scenario for analyses in this SIP. Instead of using projected 2028 visibility conditions at Jarbidge WA from this model as Reasonable Progress Goals (RPGs) for the second implementation period, NDEP has made post-modeling adjustments to the RPGs calculated using the 2028OTBa2 model. This is discussed further in Chapter Six.

1.4.2.3 WRAP's Technical Support System

The Western Regional Air Partnership and Western Air Quality Study (WRAP-WAQS) 2014 Regional Haze modeling platform[17] is the latest of a series of regional modeling efforts supporting western U.S. air quality planning and management. The WRAP technical analyses follow the Environmental Protection Agency's (EPA) Modeling Guidance for Demonstrating Air Quality Goals for Ozone, PM2.5, and Regional Haze[18] (November 2018) and the Technical Support Document for EPA's updated 2028 regional haze modeling[19] (September 2019). The analyses fulfill the objectives of the WRAP 2018-2019 Workplan[20] as updated and approved by

[17] https://views.cira.colostate.edu/iwdw/docs/WRAP_WAQS_2014v2_MPE.aspx
[18] https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf
[19] https://www.epa.gov/visibility/technical-support-document-epas-updated-2028-regional-haze-modeling
[20] http://www.wrapair2.org/pdf/2018-2019%20WRAP%20Workplan%20update%20Board%20Approved%20April.3.2019.pdf

the WRAP Board on April 3, 2019 and have been collectively designed, implemented, and reviewed by the WRAP Technical Steering Committee and its workgroups and subcommittees.

The Western Regional Air Partnership (WRAP) Technical Support System (TSS)[21] hosts the visibility monitoring, emissions, and air quality modeling analyses that support the 15 western states in developing regional haze state implementation plans (SIPs). This reference document describes the WRAP emissions and modeling analyses and illustrates how the TSS products can be applied and interpreted to support the 2028 visibility progress demonstrations for western U.S. Class I areas.

1.4.3 Air Quality Modeling

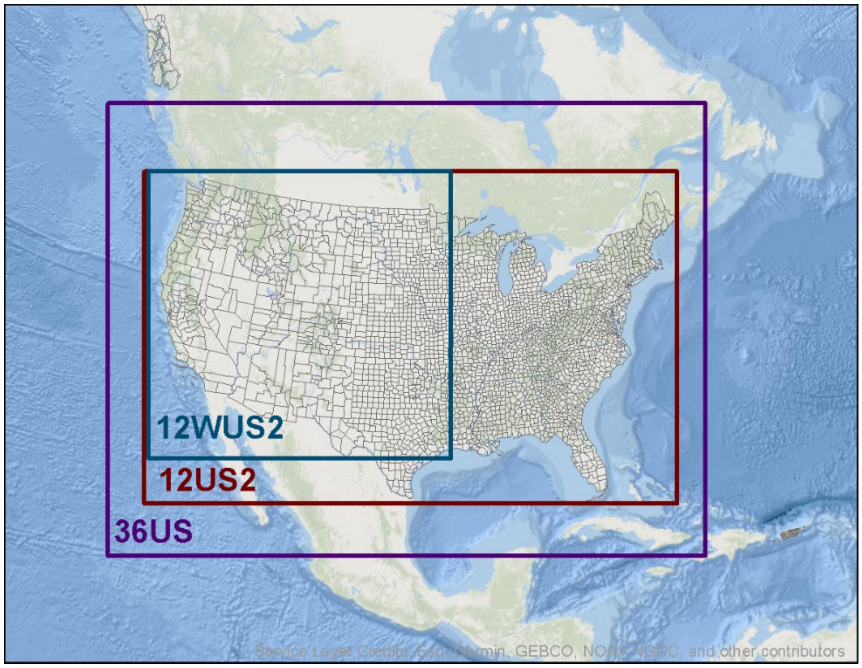
The sources of $PM_{2.5}$ are difficult to quantify because of the complex nature of their formation, transport and removal from the atmosphere. This makes it difficult to simply use emissions data to determine which pollutants should be controlled to most effectively improve visibility. Photochemical air quality models offer opportunity to better understand the sources of $PM_{2.5}$ by simulating the emissions of pollutants and the formation, transport and deposition of $PM_{2.5}$. If an air quality model performs well for an historical episode, the model may then be useful for identifying the sources of $PM_{2.5}$ and helping to select the most effective emissions reduction strategies for attaining visibility goals. Although several types of air quality modeling systems are available, the gridded, three-dimensional, Eulerian models provide the most complete spatial representation and the most comprehensive representation of processes affecting $PM_{2.5}$, especially for situations in which multiple pollutant sources interact to form $PM_{2.5}$.

The WRAP-WAQS 2014 modeling platform was developed and performed by Ramboll, Inc., under contract to WESTAR-WRAP. The 2014 modeling platform used the Weather Research and Forecasting (WRF) meteorological model, the Sparse Matrix Operator Kerner Emissions (SMOKE) model and the Comprehensive Air Quality Model with Extensions (CAMx) to project air quality for the 2014 base year. The Goddard Earth Observing System global chemical model (GEOS-Chem) provided global boundary conditions for the regional CAMx model for the 2014 base year. The CAMx 2014v2 final model configuration is defined in the WRAPWAQS 2014 modeling platform webpage. CAMx version 7beta 6 was used for the 2014v2 model performance run, while CAMx version 7.0 was used for the subsequent model scenarios. Figure 1-4 below illustrates the CAMx 36-km modeling domain covering the Continental United States and the 12-km modeling domain covering the western states.

[21] https://views.cira.colostate.edu/tssv2/

FIGURE 1-4

WRAP-WAQS 2014 MODELING PLATFORM DOMAINS



Comprehensive Air Quality Model with Extensions
The CAMx model was initially developed by ENVIRON in the late 1990s as a nested-grid, gas-phase, Eulerian photochemical grid model. ENVIRON later revised CAMx to treat PM, visibility and air toxics.

In support of the WRAP regional haze air quality modeling efforts, Ramboll developed air quality modeling inputs including annual meteorology and emissions inventories for a 2014 actual emissions base case, a planning case to represent the 2014 through 2018 regional haze baseline period using averages for key emissions categories, and a 2028 on-the-books base case of projected emissions.

WRF is a next-generation mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs. WRF contains separate modules to compute different physical processes such as surface energy budgets and soil interactions, turbulence, cloud microphysics, and atmospheric radiation. Within WRF, the user has many options for selecting the different schemes for each type of physical process. There is a WRF Preprocessing System (WPS) that generates the initial and boundary conditions used by WRF, based on topographic datasets, land use information, and larger-scale atmospheric and oceanic models.

All emission inventories were developed using the Sparse Matrix Operator Kernel Emissions (SMOKE) modeling system. Each of these inventories has undergone a number of revisions throughout the development process to arrive at the final versions used in the CAMx air quality modeling. The development of each of these emission scenarios is documented under the emissions inventory sections of the TSS. In addition to various sensitivities scenarios, the WRAP performed air quality model simulations for each of the emissions scenarios.

Boundary conditions specify the concentrations of gas and PM species at the four lateral boundaries of the model domain. Boundary conditions determine the amounts of gas and PM species that are transported into the model domain when winds flow is into the domain. Boundary conditions have a much larger effect on model simulations than do initial conditions. For some areas in the WRAP region and for clean conditions, the boundary conditions can be a substantial contributor to visibility impairment.

For this study boundary conditions data generated in an annual simulation of the global-scale GEOS-Chem model for calendar year 2014 were applied. Additional data processing of the GEOS-Chem data was required before using them in CAMx. The data first had to be mapped to the boundaries of the WRAP domain, and the gas and PM species had to be remapped to a set of species used in the CAMx model.

1.4.3.1 Visibility Modeling

The RHR goals include achieving natural visibility conditions at 156 federally mandated Class I areas by 2064. In more specific terms, that goal is defined as visibility improvement toward natural conditions for the 20 percent of days that have the most anthropogenically impaired visibility conditions (termed "20 percent most-impaired" visibility days), and no worsening in visibility for the 20 percent of days that have the clearest visibility ("20 percent clearest" visibility days). One component of the states' demonstration to USEPA that they are making reasonable progress toward this 2064 goal during the second implementation period is the comparison of modeled visibility projections for 2028 with what is termed a uniform rate of progress (URP) from baseline to natural conditions by 2064.

Preliminary 2028 visibility projections have been made using the 2028OTBa2 and PAC2 CAMx 36-km and 12-km modeling results, following USEPA guidance that recommends applying the modeling results in a relative sense to project future-year visibility conditions (U.S. EPA, 2001, 2003a, 2006). Projections are made using relative response factors (RRFs), which are defined as the ratio of the future-year modeling results to the current-year modeling results. The calculated RRFs are applied to the baseline observed visibility conditions to project future-year observed visibility. These projections can then be used to assess the effectiveness of the simulated emission control strategies that were included in the future-year modeling. The major features of USEPA's recommended visibility projections are as follows (U.S. EPA, 2003a,b, 2006):

- Monitoring data should be used to define current air quality.
- Monitored concentrations of PM_{10} are divided into six major components; the first five are assumed to be $PM_{2.5}$ and the sixth is $PM_{2.5-10}$.
  - SO_4 (sulfate)
  - NO_3 (particulate nitrate)
  - OC (organic carbon)
  - EC (elemental carbon)
  - OF (other fine particulate or soil)
  - CM (coarse matter).

- Models are used in a relative sense to develop RRFs between future and current predicted concentrations of each component.
- Component-specific RRFs are multiplied by current monitored values to estimate future component concentrations.
- Estimates of future component concentrations are consolidated to provide an estimate of future air quality.
- Future estimated air quality is compared with the goal for regional haze to see whether the simulated control strategy would result in the goal being met.
- It is acceptable to assume that all measured sulfate is in the form of ammonium sulfate [$(NH_4)_2SO_4$] and all particulate nitrate is in the form of ammonium nitrate [NH_4NO_3].

RRFs calculated from modeling results can be used to project future-year visibility. For the current modeling efforts, RRFs are the ratio of the 2028 modeling results to the 2014 modeling results and are specific to each Class I area and each PM species. RRFs are applied to the Baseline Condition observed PM species levels to project future-year PM levels, which are then used with the IMPROVE extinction equation listed above to assess visibility.

For all of the western Class I areas, the WRAP performed preliminary 2028 visibility projections and compared them to the 2028 URP using the 2028OTBa2 and PAC2 CAMx modeling results and the old and new IMPROVE equations.

1.4.3.2 Source Apportionment Modeling

Impairment of visibility in Class I areas is caused by a combination of local air pollutants and regional pollutants that are transported long distances. To develop effective visibility improvement strategies, the WRAP member states and tribes need to know the relative contributions of local and transported pollutants, and which emissions sources are significant contributors to visibility impairment at a given Class I area.

A variety of modeling and data analysis methods can be used to perform source apportionment of the PM observed at a given receptor site. One method is to implement a mass-tracking algorithm in the air quality model to explicitly track for a given emissions source the chemical transformations, transport and removal of the PM that was formed from that source. Mass-tracking methods have been implemented in the CAMx air quality model as PSAT.

Source apportionment for regional haze planning was conducted using various modeling techniques. The SO_x/NO_x Tracer and Organic Aerosol Tracer were performed using the regional PSAT air quality model. The WEP analysis included the synthesis of emissions data and meteorological back trajectories. The PMF Receptor Modeling and Causes of Dust analysis were complex statistical exercises involving IMPROVE monitoring data. Not all source apportionment techniques were applied to all pollutants.

Particulate Source Apportionment Technology
The main objective of applying CAMx/PSAT is to evaluate the regional haze air quality for conditions typical of the 2014 through 2018 representative baseline period (RepBase2) and future-year 2028 (2028OTBa2) conditions. These results are used:

- To assess the contributions of different geographic source regions (e.g., states) and source categories to current (2014-2018) and future (2028) visibility impairment at Class I areas, in order to obtain improved understanding of the causes of the impairment and which states are included in the area of influence of a given Class I area.
- To determine which source categories contributing to the area of influence for each Class I area are changing, and by how much, between the 2014 through 2018 and 2028 base cases. by varying only controllable anthropogenic emissions between the 2 PSAT simulations; and
- To identify the source regions and emissions categories that, if controlled to lower emissions rates than the 2028 base case levels, would produce the greatest visibility improvements at a Class I area.

The PSAT performs source apportionment based on user-defined source groups. A source group is the combination of a geographic source region and an emissions source category. Examples of source regions include states, nonattainment areas and counties. Examples of source categories include mobile sources, biogenic sources and elevated point sources; PSAT can even focus on individual sources. The user defines a geographic source region map to specify the source regions of interest. He or she then inputs each source category as separate, gridded low-level emissions and/or elevated-point-source emissions. The model then determines each source group by overlaying the source categories on the source region map. PM source apportionment modeling was performed for aerosol SO_4 and aerosol NO_3 and their related species (e.g., SO_2, NO, NO_2, HNO_3, NH_3, and NH_4).

The source apportionment model results are typically presented in two ways:

- *Spatial plots* showing the area of influence of a source group's PM species contributions throughout the model domain, either at a given hourly-average point in time or averaged over some time interval (e.g., monthly average).
- *Receptor bar plots* showing the rank order of source groupings that contribute to PM species at any given receptor site. These plots also can be at a particular point in time or averaged over selected time intervals—for example, the average source contributions for the 20 percent worst visibility days.

The primary products of the WRAP PSAT modeling were receptor bar plots showing the emission source groups that contribute the most to the model grid cells containing each IMPROVE monitoring site and other receptor sites identified by WRAP.

Two annual 36-km CAMx/PSAT model simulations were performed: one with the RepBase representative baseline case and the other with the 2028OTBa2 future-year case. It is expected that the states and tribes will use these results to assess the sources that contribute to visibility impairment at each Class I Area and to guide the choice of emission control strategies. The TSS web site includes a full set of source apportionment spatial plots and receptor bar plots for both RepBase2 and 2028OTBa2. These graphical displays of the PSAT results, as well as additional analyses of these results are available on the TSS under http://views.cira.colostate.edu/tssv2/Express/ModelingTools.aspx.

Additional information related to the CAMx air quality model and PSAT apportionment algorithm can be found at https://views.cira.colostate.edu/docs/iwdw/platformdocs/WRAP_2014/SourceApportionmentSpecifications_WRAP_RepBase2_and_2028OTBa2_High-LevelPMandO3_and_Low-Level_PM_andOptionalO3_Sept29_2020.pdf.

Weighted Emissions Potential

The WEP was developed as a screening tool for states to decide which source regions have the potential to contribute to haze formation at specific Class I areas, based on both the 2002 and 2018 emissions inventories. This method does not produce highly accurate results because, unlike the air quality model and associated PSAT analysis, it does not account for chemistry and removal processes. Instead, it relies on an integration of gridded emissions data, back trajectory residence time data, a one-over-distance factor to approximate deposition and a normalization of the final results. Residence time over an area is indicative of general flow patterns, but does not necessarily imply the area contributed significantly to haze at a given receptor. Therefore, users are cautioned to view the WEP as one piece of a larger, more comprehensive weight of evidence analysis.

The emissions data used were the annual, 36km grid SMOKE-processed, model-ready emissions inventories provided by the WRAP. The analysis was performed for nine pollutants (maps were generated for all but the last three):

- Sulfur oxides
- Nitrogen oxides
- Organic carbon
- Elemental carbon
- Carbon monoxide
- Fine particulate matter
- Coarse particulate matter
- Ammonia
- Volatile organic carbon

The following source categories for each pollutant were identified and preserved through the analysis:

- Biogenic
- Natural fire
- Point
- Area
- WRAP oil and gas
- Off-shore
- On-road mobile
- Off-road mobile
- Road dust
- Fugitive dust
- Windblown dust
- Anthropogenic fires.

The back trajectory residence times were provided by the WRAP. The project used NOAA's HYSPLIT model to generate eight back trajectories daily for each WRAP Class I area for the entire five-year baseline period (2014 through 2018). From these individual trajectories, residence time fields were generated for one-degree latitude by one-degree longitude grid cells. Residence time analysis computes the amount of time (e.g., number of hours) or percent of time an air parcel is in a horizontal grid cell. Plotted on a map, residence time is shown as percent of total hours in each grid cell across the domain, thus allowing an interpretation of general air flow patterns for a given Class I area. The residence time fields for the 20 percent most impaired and clearest IMPROVE-monitored extinction days were selected for the WEP analysis to highlight the potential emissions sources during those specific periods.

The WEP analysis consisted of weighting the annual gridded emissions (by pollutant and source category) by the most impaired and clearest extinction days residence times for the five-year baseline period. To account for deposition along the trajectories, the result was further weighted by a one-over-distance factor, measured as the distance in km between the centroid of each emissions grid cell and the centroid of the grid cell containing the Class I area monitoring site under investigation. (The "home" grid cell of the monitoring site was weighted by one fourth of the 36km grid cell distance, or one-over-9km, to avoid a large response in that grid cell.) The resulting weighted emissions field was normalized by the highest grid cell to ease interpretation.

The WEP is not a rigorous, stand-alone analysis, but a simple, straightforward use of existing data. As such, there are several caveats to keep in mind when using WEP results as part of a comprehensive weight of evidence analysis:

- This analysis does not take into account any emissions chemistry.
- While actual emissions may vary considerably throughout the year, this analysis pairs up annual emissions data with 20 percent most impaired/clearest extinction days residence times – this is likely most problematic for carbon and dust emissions, which can be highly episodic.
- Coarse particle and some fine particle dust emissions tend not to be transported long distances due to their large mass.
- The WEP results are unitless numbers, normalized to the largest-valued grid cell. Effective use of these results requires an understanding of actual emissions values and their relative contribution to haze at a given Class I area.

Additional information regarding WEP analysis can be found at https://views.cira.colostate.edu/tssv2/WEP-AOI/.

1.5 REFERENCES

U.S. EPA 2003. Guidance for Tracking Progress under the Regional Haze Rule. EPA-454/B-03-004. September 2003.

U.S. EPA 2013. General Principles for 5-year Regional Haze Progress Reports. April 2013.

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2019. Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. September 2019.

U.S. EPA 2020. Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. June 2020.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Two – Baseline, Current, and Natural Visibility Conditions and Uniform Rate of Progress

2.1 INTRODUCTION

The goal of the Regional Haze Rule (RHR)(64 FR 35714) is the restoration of natural visibility conditions in the 156 mandatory Class I areas identified pursuant to the 1977 Clean Air Act Amendments. Federal visibility regulations detail how to establish goals to restore visibility to natural conditions by the year 2064 for the Class I areas. These regulations also require states to calculate baseline, current, and natural visibility conditions, which in turn are used to calculate the uniform rate of progress per year to achieve natural conditions by 2064.

The RHR defines visibility impairment as "any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days." This alludes to natural visibility consisting of the difference between actual visibility conditions, and humanly perceptible changes in visibility due to anthropogenic air pollution.

Baseline visibility is the starting point for the improvement of visibility conditions. The baseline for this regional haze state implementation plan (SIP) is comprised of the years 2000 through 2004. Current conditions are assessed every five years as part of the SIP review, where actual progress in reducing visibility impairment is compared to the reductions committed to in the SIP. The current conditions for this regional haze SIP are the years 2014 through 2018.

The baseline and current visibility conditions for the Jarbidge Wilderness Area are based on measurements of particulate air pollution at the JARB1 Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring site, as discussed in Chapter One. The revised IMPROVE algorithm was used to calculate the Haze Index for the Jarbidge Wilderness Area.

This chapter presents and interprets the IMPROVE monitoring data to identify the role of individual components in visibility impairment at JARB1. The following chapters will present and interpret the emissions data and modeling results that, with this chapter, are the technical basis for determining Nevada's reasonable progress. The following paragraphs present a synopsis of the analyses of the IMPROVE monitoring data.

Analyses of the JARB1 monitor data have identified a baseline visibility condition of 8.73 deciviews (dv) and a current visibility condition of 7.97 dv. The natural visibility condition at Jarbidge WA is estimated to be 7.39 dv. Comparison of the initial baseline conditions or current conditions to natural visibility conditions indicates the amount of visibility improvement necessary to attain natural visibility conditions by 2064. The uniform rate of progress glidepath requires an average visibility condition at or below 8.20 dv during the most impaired days in 2028 in order to restore visibility back to natural conditions by 2064.

During the baseline period, organic matter carbon and elemental carbon extinction account for more than 35 percent of the total average annual reconstructed extinction at the JARB1 monitor for the 20 percent most impaired days. In addition, coarse and fine particle mass extinction account for an additional 23 percent of the average annual extinction at JARB1. Approximately 32 percent of the annual extinction budget is due to the formation of ammonium sulfate due to emissions of sulfur dioxide (SO_2) and approximately 9 percent of the annual extinction budget is due to the formation of ammonium nitrate due to emissions of nitrogen oxides (NO_x) from predominantly anthropogenic sources.

During the current period, organic matter carbon and elemental carbon extinction account for more than 35 percent of the total average annual reconstructed extinction at the JARB1 monitor for the 20 percent most impaired days. In addition, coarse and fine particle mass extinction account for an additional 30 percent of the average annual extinction at JARB1. Approximately 29 percent of the annual extinction budget is due to the formation of ammonium sulfate due to emissions of sulfur dioxide (SO_2) and approximately 5 percent of the annual extinction budget is due to the formation of ammonium nitrate due to emissions of nitrogen oxides (NO_x) from predominantly anthropogenic sources.

This data suggests significant contribution of natural fire emissions (indicated by high levels of organic matter carbon and elemental carbon) and windblown dust (indicated by high levels of coarse and fine particulate matter) to visibility impairment at the Jarbdige Wilderness Area. Among the two ambient air pollutants linked to anthropogenic emissions, ammonium sulfate and ammonium nitrate, it is clear that ammonium sulfate, or its precursor pollutant sulfur dioxide, is the primary anthropogenic pollutant of concern contributing to visibility impairment at the Jarbidge Wilderness Area.

2.2 BASELINE CONDITIONS FOR THE JARBIDGE WILDERNESS AREA

Baseline visibility is the annual average of the on-site IMPROVE monitoring data for the clearest days and most impaired days for the years 2000 through 2004, as specified in 40 CFR 51.308(f)(1). Nevada has established baseline visibility conditions for the clearest and most impaired visibility days at the Jarbidge Wilderness Area using data from IMPROVE monitor JARB1. The average was calculated for the years 2000 through 2004. The baseline calculations were made in accordance with 40 CFR 51.308(f)(1)(i) and USEPA's *Guidance for Tracking Progress Under the Regional Haze Rule* (EPA-454/B-03-004, September 2003).

Some IMPROVE sites, including JARB1, are missing complete data during this time period. JARB1 lacks complete data for the year 2000. To complete the missing data, USEPA published the Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period to provide states guidance on substituting missing data. Using the mechanisms listed in the guidance, JARB1 has complete data representing the 2000-2004 baseline. This new methodology constructs a new baseline using the Most Impaired Days metric, as opposed to Haziest Days, a new reading of current visibility conditions for the Most Impaired Days, and newly derived visibility for estimated Natural Conditions.

The baseline conditions are the average of the annual haze index calculated from the IMPROVE monitor data over the five-year baseline period 2000 through 2004 for both the 20 percent most impaired (8.73 dv) and 20 percent clearest (2.56 dv) days. Figures 2-1 and 2-2 are photographs of reference vistas representative of baseline extinction conditions for the clearest and most impaired days, respectively, at the Jarbidge Wilderness Area.

FIGURE 2-1

REFERENCE VISTA OF THE JARBIDGE WILDERNESS AREA
FOR BASELINE CLEAREST DAYS

Reference Vista: Mary's River Peak

Photo taken at 3:00 pm

Haze Index (HI) = 3 deciview

$B_{ext} = 13\ Mm^{-1}$

Visual Range = 300 km / 186 mi

FIGURE 2-2

REFERENCE VISTA OF THE JARBIDGE WILDERNESS AREA
FOR BASELINE MOST IMPAIRED DAYS

Reference Vista: Mary's River Peak

Photo taken at 9:00 am

Haze Index (HI) = 8 deciviews

$B_{ext} = 23\ Mm^{-1}$

Visual Range = 170 km / 106 mi

2.3 NATURAL CONDITIONS FOR THE JARBIDGE WILDERNESS AREA

Natural visibility represents the visibility condition that would be observed in the absence of human-caused impairment. The natural condition for each Class I area represents the visibility goal expressed in deciviews for the 20 percent most impaired and the 20 percent clearest days that would exist if there were only naturally occurring impairment. The 20 percent most impaired days natural conditions correspond to the long-term natural visibility goal. (40 CFR 51.308(f)(1)) Each state must estimate natural visibility levels for Class I areas within its borders in consultation with federal land managers (FLMs) and other states. 40 CFR 51.308(f)(1)(ii)

The natural conditions estimates were calculated consistent with USEPA's *Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule* (EPA-454/B-03-005, September 2003). Adjustments were made to the natural visibility conditions during the most impaired days to account for impacts from international emissions and prescribed fire burning, as allowed by the most recent 2017 revision of the Regional Haze Rule. These adjustments are detailed further in Chapter Six. The natural background visibility for Jarbidge is 7.39 dv for the 20 percent most impaired days and 1.14 dv for the 20 percent clearest days.

Figures 2-3 is a photograph of a reference vista representative of natural extinction conditions for the clearest days at the Jarbidge Wilderness Area.

FIGURE 2-3

REFERENCE VISTA OF THE JARBIDGE WILDERNESS AREA
FOR NATURAL CONDITIONS CLEAREST DAYS

Reference Vista: Mary's River Peak

Photo taken at 9:00 am

Haze Index (HI) = 1 deciview

B_{ext} = 11 Mm^{-1}

Visual Range = 350 km / 218 mi

2.4 CURRENT CONDITIONS FOR THE JARBIDGE WILDERNESS AREA

Current visibility is the annual average of the most recent five years of data and were calculated by the WRAP states using IMPROVE monitoring data for the clearest days and most impaired days for the years 2014 through 2018.

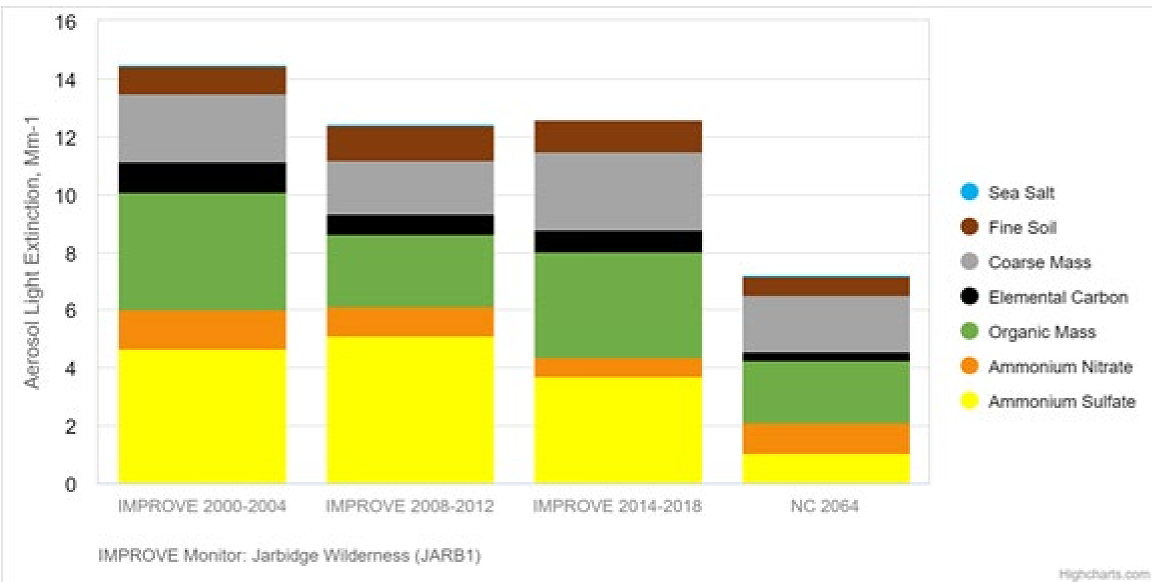
The current conditions are the average of the annual haze index calculated from the IMPROVE monitor data over the five-year current period 2014 through 2018 for both the 20 percent most impaired (7.97 dv) and 20 percent clearest (1.84 dv) days. Current visibility conditions at the Jarbidge Wilderness area were calculated for the 20 percent most impaired days and 20 percent clearest days in accordance with 40 CFR 51.308(f)(1)(iii).

2.5 PROGRESS TO DATE

Actual visibility progress to date for the 20 percent most impaired days at Jarbidge Wilderness area toward natural visibility conditions since the baseline period, previous implementation period, and current implementation period were calculated in accordance with 40 CFR 51.308(f)(1)(iv). As displayed in Figure 2-4, visibility conditions during the 20 percent most impaired days at Jarbidge Wilderness area show a general decrease in aerosol light extinction and show a consistent path toward natural conditions.

FIGURE 2-4

VISIBILITY PROGRESS TO DATE AT JARBIDGE WILDERNESS AREA
FOR MOST IMPAIRED DAYS



Although visibility at the Jarbidge Wilderness Area during the 20 most impaired days is generally improving toward the goal of natural conditions by 2064, IMPROVE monitoring data indicates that total aerosol light extinction observed during the current years 2014 through 2018 period slightly increased from the previous implementation period of years 2008 through 2012. As shown in Table 2-1, this is due to an increase in organic mass and coarse mass. Although the second implementation aims to remove episodic wildfire and windblown dust events from visibility analyses through use of the new most impaired days metric, this new method is not completely effective and still allows for episodic natural events to skew visibility data for regional haze purposes. Note that aerosol light extinction contributed by Ammonium Nitrate and Ammonium Sulfate decreased from the previous implementation period, confirming a decrease in anthropogenic emissions from the last round's efforts.

TABLE 2-1

VISIBILITY PROGRESS FOR THE MOST IMPAIRED DAYS
BY AEROSOL SPECIES

AEROSOL SPECIES (Mm^{-1})	IMPROVE 2000-2004	IMPROVE 2008-2012	IMPROVE 2014-2018	NC 1/1/2064
Ammonium Nitrate	1.36	0.98	0.66	1.03
Ammonium Sulfate	4.66	5.12	3.69	1.07
Coarse Mass	2.38	1.89	2.73	1.95
Elemental Carbon	1.03	0.66	0.72	0.31
Fine Soil	0.95	1.19	1.07	0.65
Organic Mass	4.07	2.55	3.70	2.14
Sea Salt	0.03	0.06	0.04	0.05
Deciview	8.73	7.88	7.97	5.23

Actual visibility progress to date for the 20 percent clearest days at Jarbidge Wilderness area toward natural visibility conditions since the baseline period, previous implementation period, and current implementation period were calculated in accordance with 40 CFR 51.308(f)(1)(iv). As displayed in Figure 2-5, visibility conditions during the 20 percent clearest days at Jarbidge Wilderness area show a general decrease in aerosol light extinction and confirm there has been no further degradation in visibility since the baseline period. Visibility conditions in deciviews listed in Table 2-2 also confirms this.

FIGURE 2-5

VISIBILITY PROGRESS TO DATE AT JARBIDGE WILDERNESS AREA
FOR THE CLEAREST DAYS

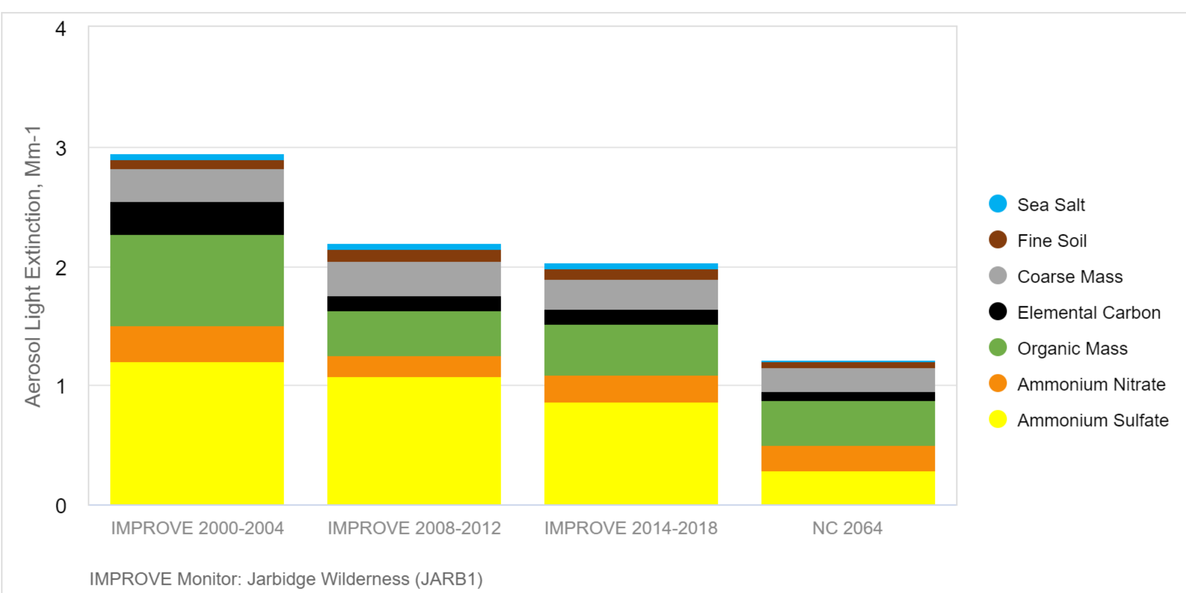


TABLE 2-2

VISIBILITY PROGRESS FOR THE CLEAREST DAYS
BY AEROSOL SPECIES

AEROSOL SPECIES (Mm^{-1})	IMPROVE 2000-2004	IMPROVE 2008-2012	IMPROVE 2014-2018	NC 1/1/2064
Ammonium Nitrate	0.291	0.181	0.218	0.211
Ammonium Sulfate	1.210	1.073	0.870	0.285
Coarse Mass	0.271	0.286	0.258	0.201
Elemental Carbon	0.276	0.125	0.124	0.073
Fine Soil	0.083	0.104	0.082	0.046
Organic Mass	0.771	0.381	0.428	0.385
Sea Salt	0.048	0.041	0.047	0.012
Deciview	2.565	1.963	1.837	1.140

Current conditions are calculated based on the average of the most recent five years of data and were calculated by the WRAP states using data from 2014-2018. Progress since the baseline (2000-2004) is indicated by taking the difference between current conditions and conditions during the baseline years. The difference between current and natural conditions indicates the remaining visibility improvements necessary to meet the goal of natural visibility by 2064. Table 2-3 shows the current conditions, progress made since the baseline and the remaining difference necessary toward attaining natural conditions by 2064. The difference between visibility conditions were calculated in accordance with 40 CFR 51.308(f)(1)(v), resulting in a difference between current and baseline conditions of 0.72 dv and 0.76 dv during the clearest days and most impaired days, respectively. The difference between current and natural conditions is 0.70 and 0.58 dv during the clearest days and most impaired days, respectively.

TABLE 2-3

DIFFERENCE BETWEEN VISIBILITY CONDITIONS

Class I Area	Current Conditions		Difference from Baseline		Difference from Natural	
	Clearest Days (dv)	Most Impaired Days (dv)	Clearest Days (dv)	Most Impaired Days (dv)	Clearest Days (dv)	Most Impaired Days (dv)
Jarbidge Wilderness Area (JARB1)	1.84	7.97	0.72	0.76	0.70	0.58

2.6 UNIFORM RATE OF PROGRESS GLIDEPATH TO NATURAL CONDITIONS IN 2064

Each state must set goals that provide for reasonable progress towards achieving natural visibility conditions by 2064. The reasonable progress goals must: 1) provide for improvement in visibility for the most impaired days over the period of the implementation plan; and 2) ensure no degradation in visibility for the least impaired days over the same period. States are directed to graphically show a uniform rate of progress (URP) toward natural visibility conditions for each Class I area within the State. The revised IMPROVE II algorithm was used for the calculation of the URP glidepath for the Jarbidge Wilderness Area.

A graph depicting the most impaired days glidepath for the Jarbidge Wilderness Area was developed in accordance with USEPA guidance for tracking progress (*Guidance for Setting Reasonable Progress Goals Under the Regional Haze Rule*, June 1, 2007), using data collected from the IMPROVE monitor JARB1. The glidepath is one of the indicators used to set reasonable progress goals and is simply a graph portraying a straight line drawn from the level of visibility impairment for the most impaired days baseline period to the natural background level with 2064 as the attainment date.

The URP is determined by the following equation, which calculates the slope of the glidepath in deciviews per year:

URP = (Baseline Condition – Natural Condition) / 60 years
URP = (8.73 dv – 7.39 dv) / 60 years
URP = 0.022 dv / year reduction

The uniform progress needed by 2028, the end of the second planning period, to achieve most impaired days natural visibility conditions by 2064 is calculated by multiplying the URP by the number of years in the first planning period (i.e. 2004 to 2028), as follows:

2028 URP = (URP) x (24 years)
2028 URP = 0.022 dv / year x 24 years
2028 URP = 0.536 dv reduction

The rule allows states to make adjustments to the URP endpoint to account for international and prescribed fire emissions, as they cannot be controlled. For an adjusted glidepath, haze contributions from international and prescribed fire emissions can be isolated through source apportionment modeling, discussed in Chapter Four, and added to the "natural conditions" endpoint in 2064. This decreases the slope of the URP glidepath and alters the visibility goal for 2028, as well as all other years.

Table 2-4 provides the URP data for the most impaired days and identifies the baseline for the clearest days. The baseline visibility for the 20 percent most impaired days at the Jarbidge Wilderness Area is calculated to be 8.73 dv. For the baseline 20 percent clearest days, visibility is calculated to be 2.56 dv. The URP glidepath is shown on Figure 2-6, which depicts the observed annual baseline visibility conditions by dark blue diamonds with the most impaired days baseline shown by the line through the dark blue diamonds. The glidepath for a URP toward reaching natural conditions is represented by the green, sloping line with triangles that identify specific URP values at five-year intervals. Natural conditions for the most impaired days are shown by the orange, horizontal line in the middle of the graph. The figure also shows the observed annual baseline conditions for the 20 percent clearest days by light blue diamonds with the baseline shown by the short line through the light blue diamonds. The reasonable progress goal must ensure no degradation in visibility during the clearest days from conditions observed during the baseline, or in other words, visibility conditions during the clearest days should not increase beyond 2.56 dv.

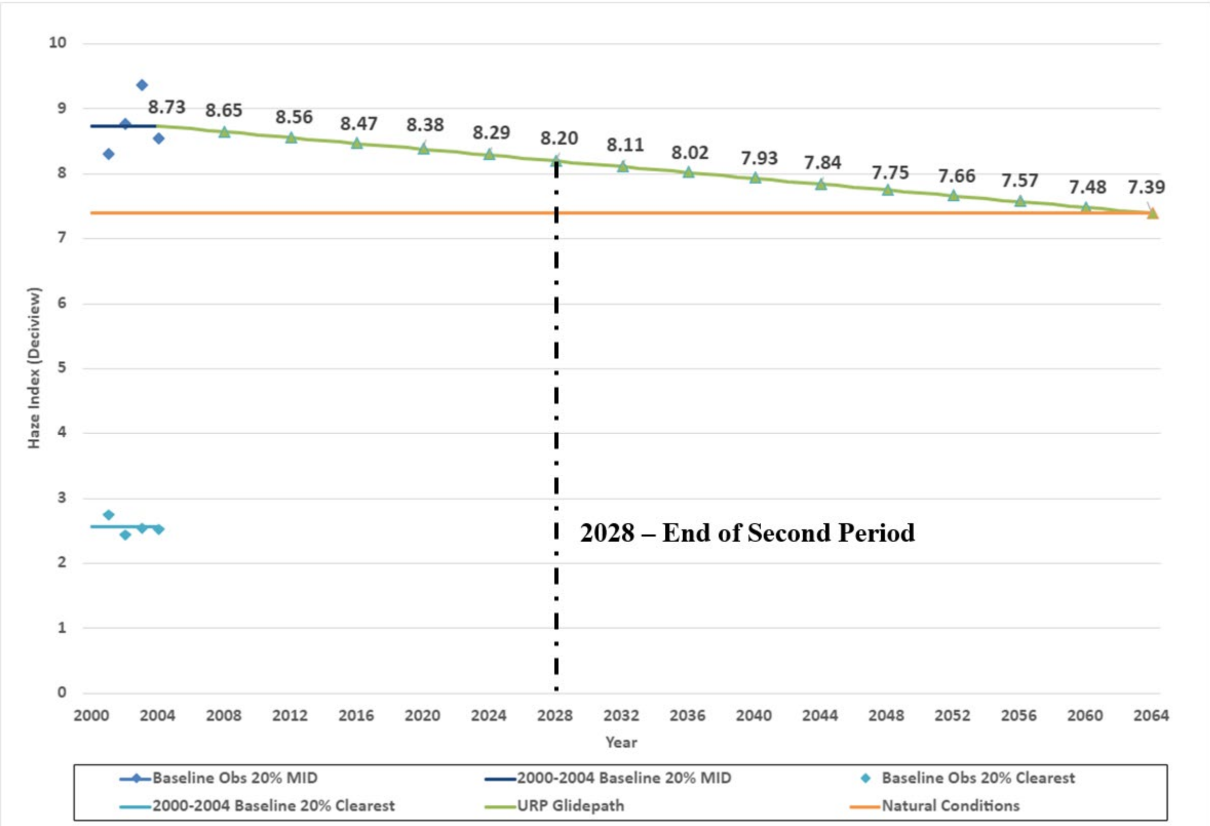
TABLE 2-4

UNIFORM RATE OF PROGRESS FOR THE
JARBIDGE WILDERNESS AREA

Class I Area	20% Most Impaired Days Baseline Condition (dv)	20% Most Impaired Days 2028 URP Goal (dv)	2028 Reduction Needed for 20% Most Impaired Days (dv)	20% Most Impaired Days 2064 Natural Conditions (dv)	2064 Reductions Needed for 20% Most Impaired Days (dv)	20% Clearest Days Baseline Condition (dv)
Jarbidge Wilderness Area	8.73	8.20	0.53	7.39	1.34	2.56

FIGURE 2-6

UNIFORM RATE OF PROGRESS GLIDEPATH FOR THE
JARBIDGE WILDERNESS AREA



2.7 HAZE IMPACTING PARTICLES – BASELINE PERIOD

Some of the fine particles that compose aerosols absorb light, while others reflect or scatter light, resulting in light extinction between the viewer and the light source. The IMPROVE monitor collects a 24-hour sample of these particles onto a filter, and they are analyzed at a laboratory to determine the standard components of the aerosol extinction.

Monitored Components

The monitored concentrations of PM_{10} are divided into six major components, the first five of which are assumed to be $PM_{2.5}$ and the sixth is $PM_{2.5-10}$. The monitored species are listed below by identifier with the common name in parenthesis.

- SO_4 (sulfate)
- NO_3 (particulate nitrate)
- OC (organic carbon)
- EC (elemental carbon)
- OF (other fine particulate or soil)
- CM (coarse matter)

The concentrations of these species are used in conjunction with the IMPROVE equation to calculate the light extinction.

Emission Species

The statewide emission inventory of pollutants that were used in the emission scenarios for this SIP include:

- SO_2 (Sulfur dioxide)
- NO_x (Nitrogen oxides)
- VOC (Volatile Organic Compounds)
- $PM_{2.5}$ (Particulate matter under 2.5 microns)
- PM_{10} (Particulate matter under 10 microns)
- NH_3 (Ammonia)
- CO (Carbon monoxide)

The baseline emissions and emission projections are discussed in detail in Chapter Three.

Extinction Species

Visibility conditions are then estimated by relating the IMPROVE 24-hour average PM mass measurements (i.e. concentration data for the species listed above) to the PM components of light extinction as identified in the IMPROVE equation. The extinction components are listed below. The bold text indicates how the monitored extinction components will be identified in the remainder of the SIP.

- Ammonium sulfate [$(NH_4)_2SO_4$] or **SO_4**
- Particulate ammonium nitrate [$(NH_4)NO_3$] or **NO_3**
- Organic matter carbon [**OMC**]
- Elemental carbon [**EC**]
- Fine soil [**SOIL**]
- Coarse matter [**CM**]

- **Sea Salt**

2.7.1 Aerosol Composition for the Jarbidge Wilderness Area

Analyses of the IMPROVE monitor data provides important insight to the relative importance of the components of measured visibility impairing pollutants. The monitoring data for the 20 percent most impaired, 20 percent clearest, and IMPROVE sample days were analyzed on an annual, monthly, and daily basis to evaluate the causes of visibility impairment during the baseline period.

2.7.1.1 Summary of Aerosol Composition at the Jarbidge Wilderness Area

This section describes the aerosol composition observed at the JARB1 IMPROVE monitor during the baseline period. The following sections present the monitoring data for the 20 percent most impaired days, 20 percent clearest days, and all IMPROVE sample days.

Organic matter carbon (OMC) is the most important contributor to fine particulate mass and light extinction on the most impaired days and for all IMPROVE sample days. OMC is also a significant contributor on the least impaired days of the baseline period at JARB1. Elevated levels of OMC and EC and their seasonal signature suggest impact from fire and biogenic sources, which are significant natural sources of primary organic aerosol (POA) and volatile organic compounds (VOCs), which are components of OMC. Anthropogenic emissions contributing to OMC include carbon from combustion of fossil fuels and wood burning but are not likely significant sources of OC emissions at this rural site. However significant visibility impacts due to OC emissions from natural fire events are common at the Jarbidge Wilderness Area and explain the large daily, seasonal, and annual variations of the reconstructed OMC extinction described in the next sections.

Coarse matter (CM) or particulate matter with particles having diameters between 2.5 and 10 microns is the second most important contributor to reconstructed extinction for the most impaired days of the baseline period. CM has a relatively small contribution to visibility impairment on the clearest days but is a significant contributor to visibility impairment for IMPROVE sample days. The light extinction efficiency of CM is very low compared to the extinction efficiency for sulfate, nitrate, and carbon, as described in Chapter One. The significant CM contributions to reconstructed extinction suggest the seasonal importance of local and regional transport of particulate matter due to naturally occurring windblown dust events.

Ammonium sulfate (SO_4) or sulfate is an important contributor to visibility impairment at JARB1 for the most impaired days and IMPROVE sample days. SO_4 is the most significant contributor on the clearest days. Sulfate particles are formed in the atmosphere from SO_2 emissions. Sulfate particles occur as hydrogen sulfate, ammonium bisulfate and ammonium sulfate depending on the availability of ammonia in the atmosphere. Although SO_4 contributions show some seasonal increases during the summer months, the lack of daily variability suggests the sulfate contributions are influenced by regional transport rather than local sources.

Soil (SOIL) or particulate matter with particles having diameters less than 2.5 microns is a minor contributor to reconstructed extinction for the most impaired, clearest and IMPROVE sample days of the baseline period. Episodes of relatively high SOIL contribution coupled with relative high CM contributions may be indicative of local and regional seasonal transport of particulate matter due to windblown dust events. Occasionally, elevated SOIL can be attributed to long-range transport of international dust episodes originating outside the US.

Elemental carbon (EC) is a minor contributor to visibility impairment at JARB1 for the most impaired, clearest and IMPROVE sample days of the baseline period. The light extinction efficiency of EC is high compared to the extinction efficiency for sulfate, nitrate and carbon, as described in Chapter One. Common sources of EC emissions are fire, including agricultural burning, prescribed fire, and natural fire, as well as incomplete combustion of fossil fuels. The seasonality and common trend shared with OMC extinction suggest fire emissions may also be the dominant source of EC extinction at JARB1.

Ammonium nitrate (NO_3) or nitrate is a minor contributor to reconstructed extinction for the most impaired, clearest and IMPROVE sample days of the baseline period at JARB1. However, NO_3 is a significant contributor for some individual days. NO_3 is formed in the atmosphere by the reaction of ammonia (NH_3) and nitrogen oxides (NO_x). NO_3 formation is limited by the availability of ammonia and temperature. Ammonia preferentially reacts with SO_2 and sulfate before reacting with NO_x. Particle nitrate is formed at lower temperatures, so NO_3 levels are lower in the summer months and higher in the winter months. Therefore, the relative NO_3 contribution to visibility impairment is seasonal as identified below. NO_x emissions are the result of fossil fuel combustion by point, area, on-road, and off-road mobile sources. The relatively minor contribution of NO_3 to reconstructed extinction at JARB1 suggests that formation is limited by both the availability of ammonia and the paucity of NO_x sources in this rural setting.

Sea Salt is a trace contributor to reconstructed extinction at JARB1. The new IMPROVE equation uses the chlorine ion from routine IMPROVE measurements to calculate sea salt levels, accounting for the occasional contribution of SEA SALT to extinction at JARB1.

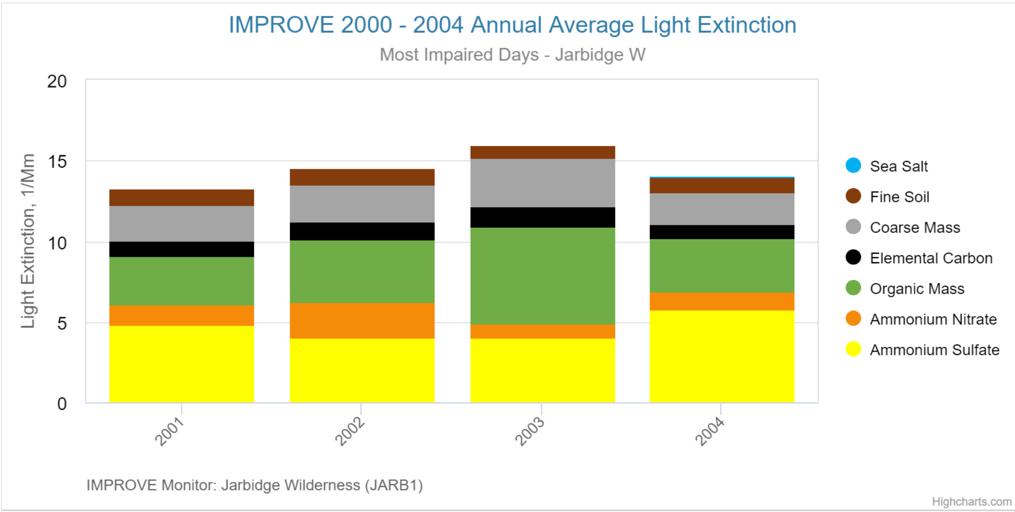
2.7.1.2 20 Percent Most impaired Days

<u>*Baseline Conditions*</u>
Figure 2-8 shows the annual reconstructed light extinction over the baseline period based on monitor data from JARB1 site for the 20 percent most impaired days. The variability of annual most impaired days reconstructed light extinction is nearly 3 Mm^{-1}.

The line graph shown as Figure 2-9 shows the individual components of the reconstructed light extinction over the baseline period based on JARB1 IMPROVE data for the 20 percent most impaired days. OMC and SO_4 are the most significant contributors to visibility impairment at JARB1 for the baseline period, followed by CM and NO_3. Soil, EC, and Sea Salt are less significant but sub-equal contributors to visibility impairment for the baseline period.

FIGURE 2-8

ANNUAL RECONSTRUCTED EXTINCTION FOR MOST IMPAIRED DAYS
OF THE BASELINE PERIOD



The baseline period annual variation for OMC is 3 Mm^{-1}, indicating the large range of annual effects produced by fire emissions, one of the dominant sources of OMC. Although 2002 was a bad fire year in the western US, OMC levels in 2003 spiked, as reflected on Figure 2-9 by the OMC trend. Days selected for the 20% most impaired days in 2003 may not have effectively screened out days impacted by wildfire, resulting in the spike seen in 2003.

FIGURE 2-9

ANNUAL RECONSTRUCTED EXTINCTION BY SPECIES FOR
MOST IMPAIRED DAYS OF BASELINE PERIOD

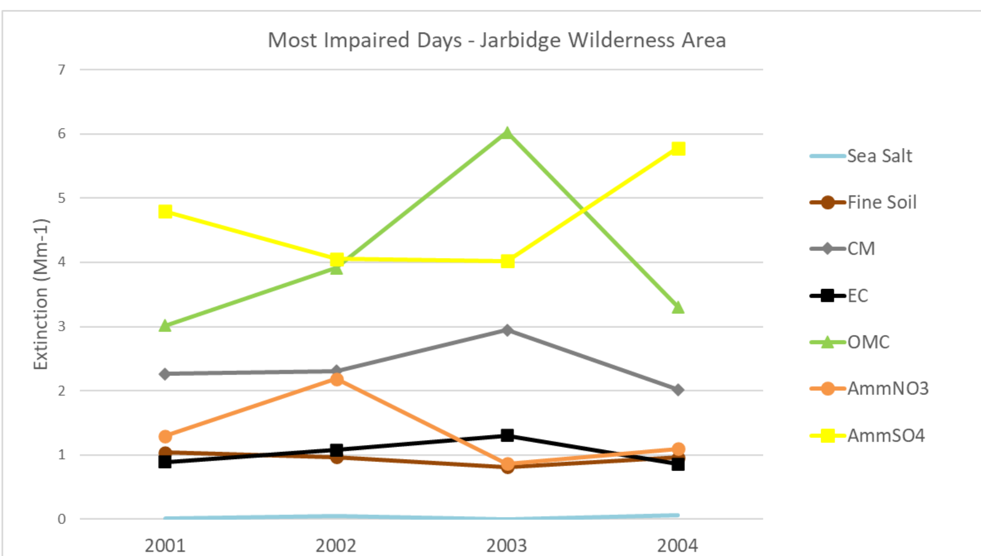
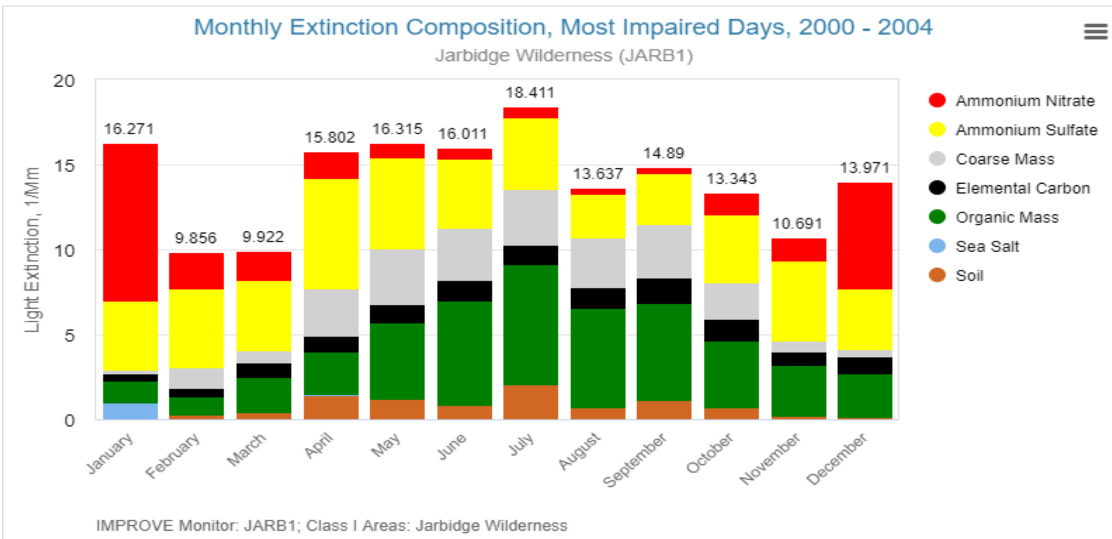


Figure 2-10 displays the monthly distribution of the reconstructed extinction for the 20 percent most impaired days averaged over the baseline period yea for the Jarbidge Wilderness Area. The most impaired days are generally summer events, occurring during the period April to the end of July of each year. Fires, dust events, and photochemical processes are elevated during this time frame, which maximizes OMC concentrations, CM and SOIL concentrations, and secondary particulate formation. Ammonium Sulfate remains a constant contributor to light extinction year-round with smaller variances, reinforcing that it is the primary anthropogenic pollutant at Jarbidge Wilderness Area. Ammonium nitrate contributions spike during the winter months of December and January.

FIGURE 2-10

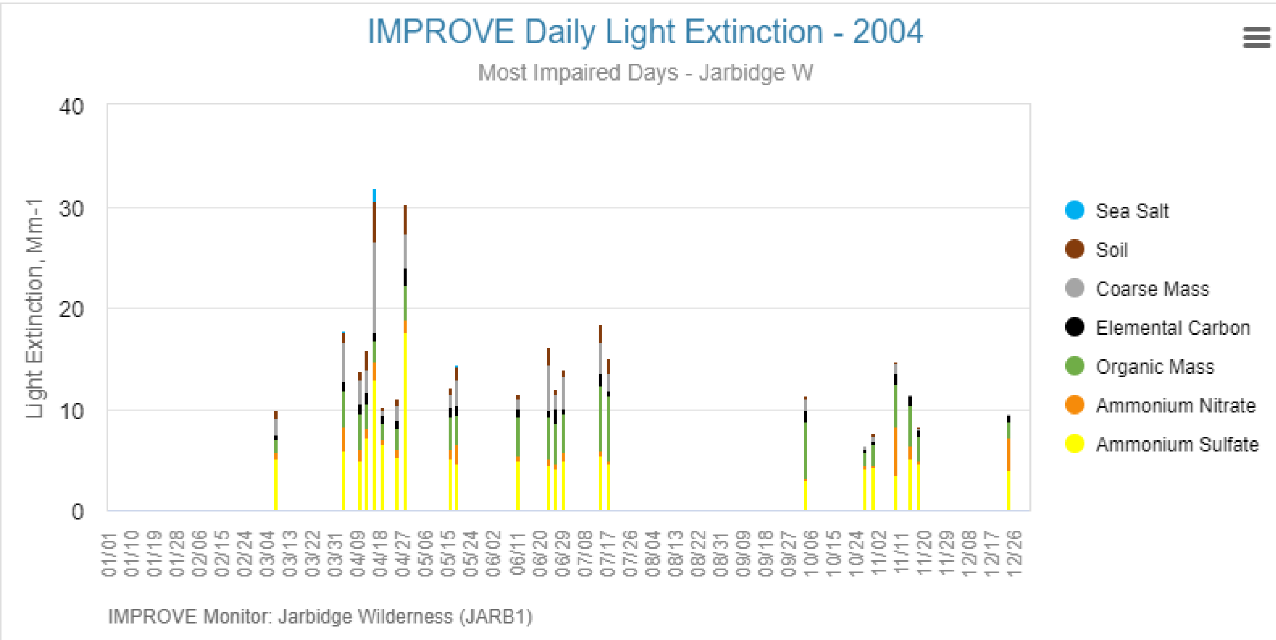
<u>MONTHLY DISTRIBUTION OF MOST IMPAIRED DAYS OF BASELINE PERIOD</u>



Daily reconstructed light extinction for the 20 percent most impaired days of the final baseline year, 2004, at JARB1 is presented in Figure 2-11 and shows SO_4 and OMC are generally the largest components of visibility impairment on the most impaired days at the Jarbidge Wilderness Area. EC and NO_3 are significant components for a handful of days.

FIGURE 2-11

DAILY RECONSTRUCTED LIGHT EXTINCTION FOR
MOST IMPAIRED DAYS OF BASELINE PERIOD



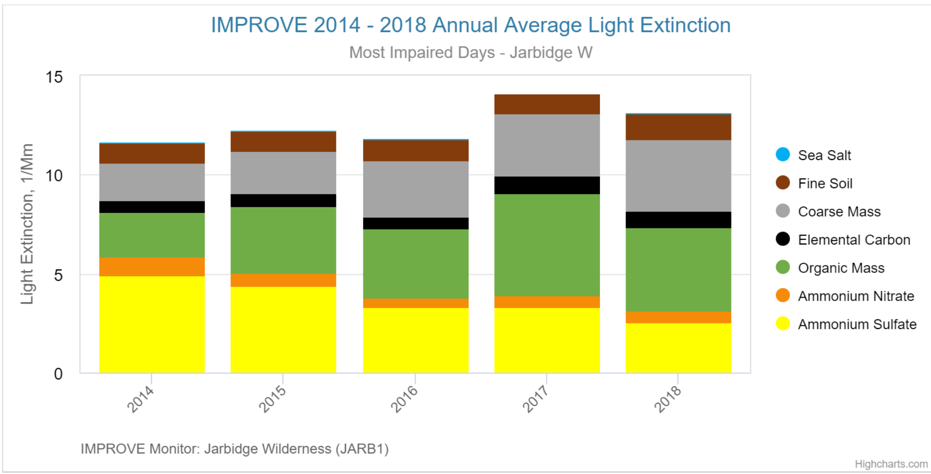
Current Conditions

Figure 2-12 shows the annual reconstructed light extinction over the current period based on monitor data from JARB1 site for the 20 percent most impaired days. The variability of annual most impaired days reconstructed light extinction is nearly 3 Mm^{-1}.

The line graph shown as Figure 2-13 shows the individual components of the reconstructed light extinction over the current period based on JARB1 IMPROVE data for the 20 percent most impaired days. OMC and SO_4 are the most significant contributors to visibility impairment at JARB1 for the baseline period, followed by CM. Although SO_4 is the largest contributor to light extinction at Jarbidge Wilderness area during the first two years of the current period, it shows a downward trend, falling below OMC and CM by 2018. OMC and CM show an increasing trend through the entire current period. This indicates that light extinction due to SO_4 is decreasing due to reductions in SO_2 emissions, and also indicates that wildfire and windblown dust events are increasing in occurrence near the Jarbidge Wilderness area. Soil, EC, and Sea Salt are less significant but sub-equal contributors to visibility impairment for the baseline period.

FIGURE 2-12

ANNUAL RECONSTRUCTED EXTINCTION FOR MOST IMPAIRED DAYS
OF THE CURRENT PERIOD



The current period annual variation for Coarse Mass is 2 Mm^{-1}, and the current period annual variation for OMC is 3 Mm^{-1}, indicating the large range of annual effects produced by fire emissions, one of the dominant sources of OMC and CM. In recent years, the drier climates of the western states have experienced an increase in wildfire activity during the summer months. Days selected for the 20% most impaired days in 2017 and 2018 may not have effectively screened out days impacted by wildfire and windblown dust, resulting in the spikes seen in 2017 and 2018.

FIGURE 2-13

ANNUAL RECONSTRUCTED EXTINCTION BY SPECIES FOR
MOST IMPAIRED DAYS OF CURRENT PERIOD

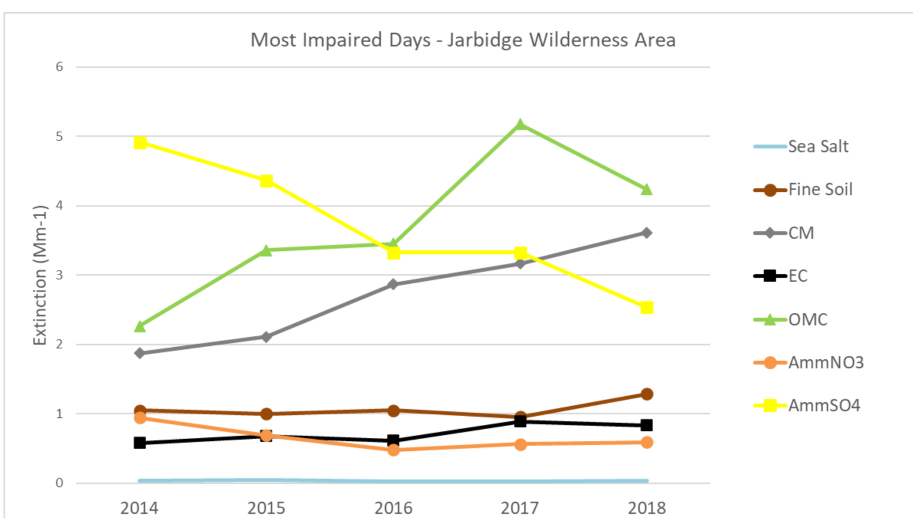
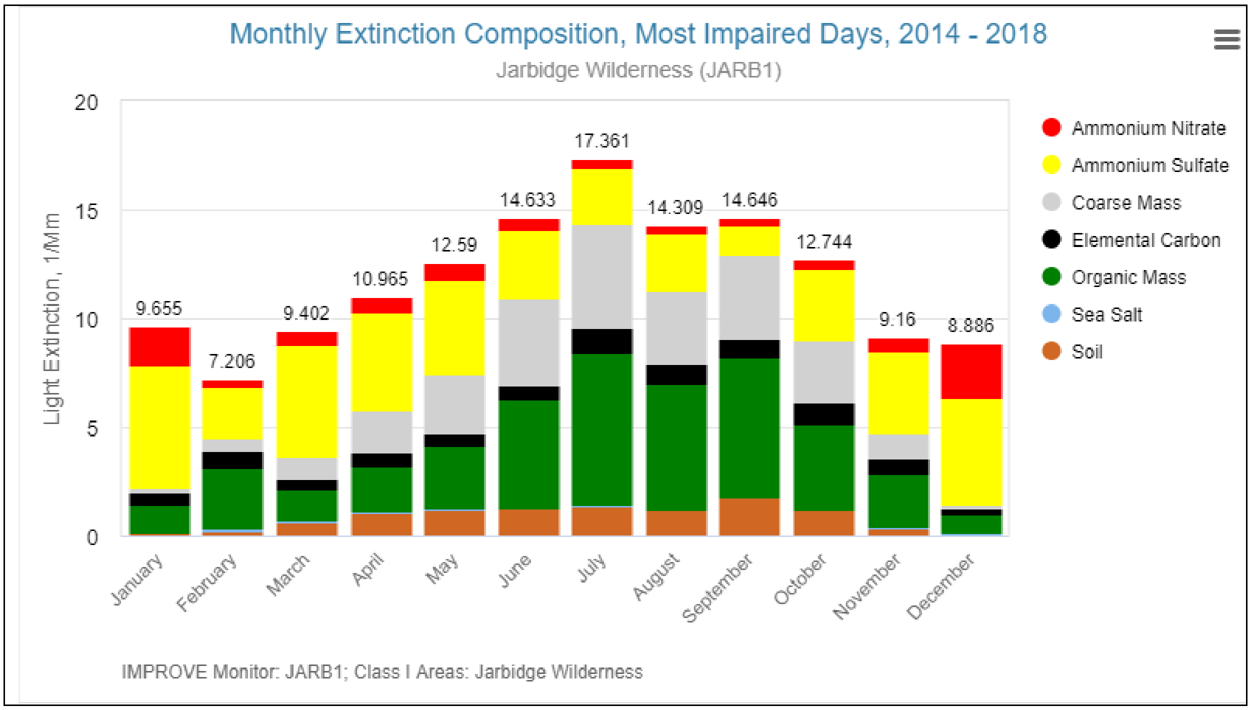


Figure 2-14 displays the monthly distribution of the reconstructed extinction for the 20 percent most impaired days averaged over the current period years for the Jarbidge Wilderness Area. The most impaired days are generally summer events, occurring during the period April to the end of October. Fires, dust events, and photochemical processes are elevated during this time frame, which maximizes OMC concentrations, CM and SOIL concentrations, and secondary particulate formation. Ammonium Sulfate remains a constant contributor to light extinction year-round with smaller variances, reinforcing that it is the primary anthropogenic pollutant at Jarbidge Wilderness Area. Ammonium nitrate contributions spike during the winter months of December and January.

FIGURE 2-14

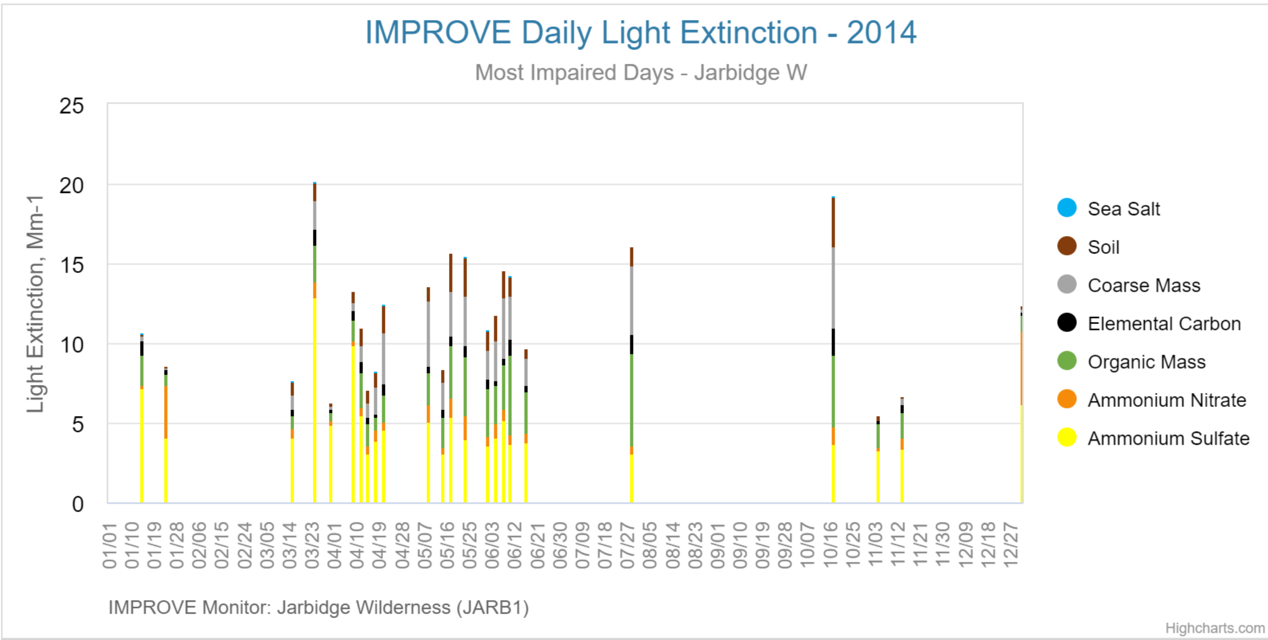
<u>MONTHLY DISTRIBUTION OF MOST IMPAIRED DAYS OF CURRENT PERIOD</u>



Daily reconstructed light extinction for the 20 percent most impaired days in 2014, the base year utilized for regional modeling, at JARB1 is presented in Figure 2-15 and shows SO_4 and OMC are generally the largest components of visibility impairment on the most impaired days at the Jarbidge Wilderness Area. CM is a significant component for a handful of days.

FIGURE 2-15

DAILY RECONSTRUCTED LIGHT EXTINCTION FOR
MOST IMPAIRED DAYS OF CURRENT PERIOD



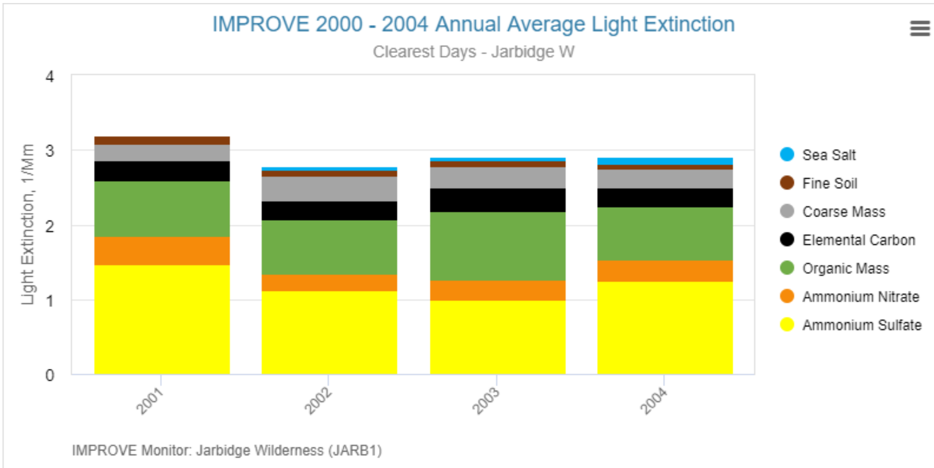
2.7.1.3 20 Percent Clearest Days

Baseline Conditions

The bar graph shown in Figure 2-16 shows the reconstructed light extinction over the baseline period for the 20 percent clearest days based on data from JARB1. Note the baseline period annual variation is less than 0.5 Mm^{-1} for the clearest days, much less than the variability shown for the most impaired days.

FIGURE 2-16

ANNUAL RECONSTRUCTED EXTINCTION FOR
CLEAREST DAYS OF BASELINE PERIOD



The line graph in Figure 2-17 shows the individual components of the reconstructed light extinction over the baseline period for the 20 percent clearest days at JARB1. SO_4 and OMC are the most significant contributors to visibility impairment for the clearest days of the baseline period, followed by sub-equal contributions from NO_3, EC, and CM. SOIL is a minor contributor to visibility impairment for the clearest days. SO_4 has approximately 0.5 Mm^{-1} variation, while OMC has approximately 0.2 Mm^{-1} variation for the clearest days of the baseline period.

FIGURE 2-17

ANNUAL RECONSTRUCTED EXTINCTION BY SPECIES FOR
CLEAREST DAYS OF BASELINE PERIOD

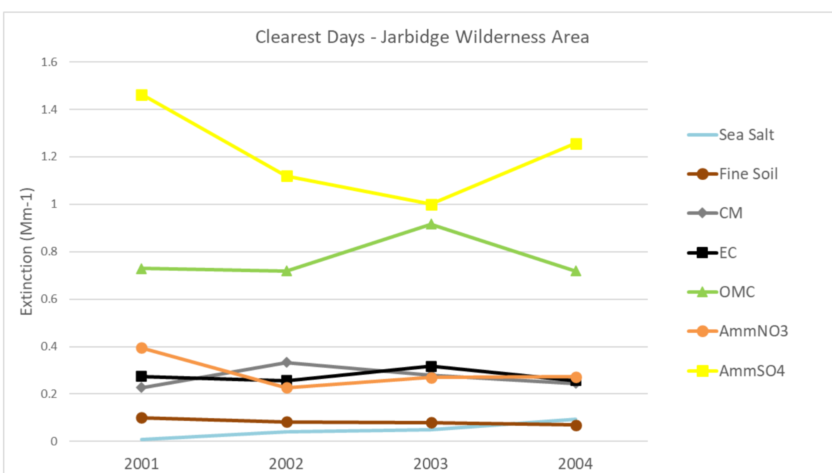
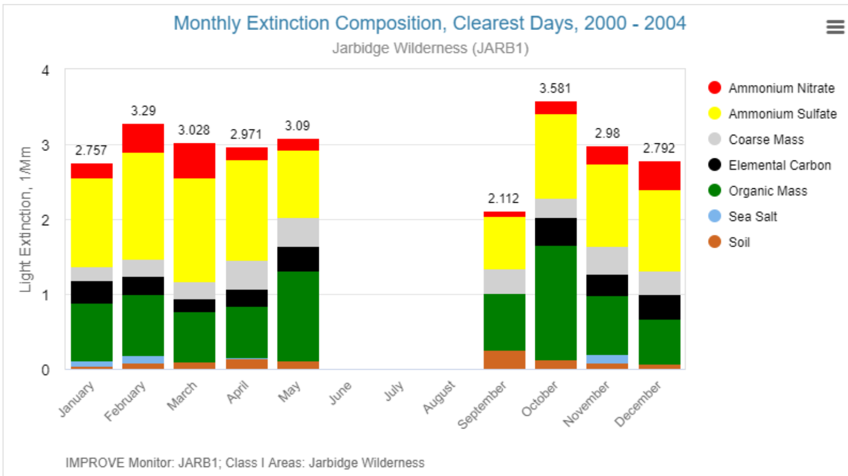


Figure 2-18 displays the monthly distribution of the reconstruction extinction for the 20 percent clearest days of the final baseline period for JARB1. The clearest days are generally winter events occurring from October to May of each year, when fires, dust events, and photochemical processes are at a minimum.

FIGURE 2-18

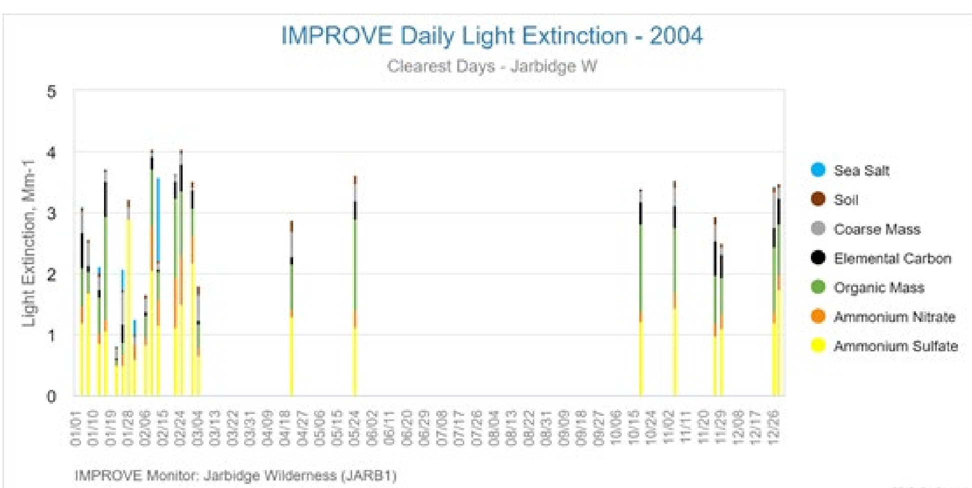
MONTHLY DISTRIBUTION OF CLEAREST DAYS OF BASELINE PERIOD



Daily reconstructed light extinction for the 20 percent clearest days of the baseline period at JARB1 is presented in Figure 2-19 and shows OMC and/or SO_4 are generally the largest components of visibility impairment on the clearest days at the Jarbidge Wilderness Area. NO_3, CM, and Sea Salt are significant components for a handful of days.

FIGURE 2-19

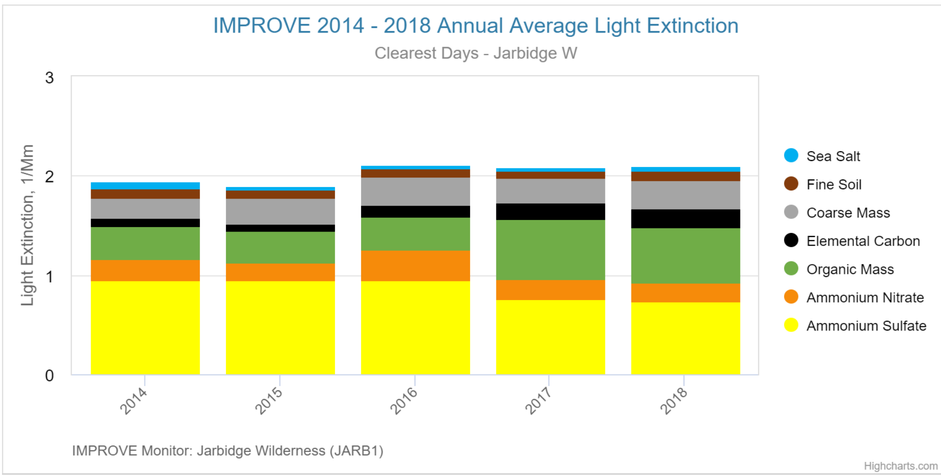
DAILY RECONSTRUCTED LIGHT EXTINCTION FOR
CLEAREST DAYS OF BASELINE PERIOD



Current Conditions
The bar graph shown in Figure 2-20 shows the reconstructed light extinction over the current period for the 20 percent clearest days based on data from JARB1. Note the current period annual variation is less than 0.5 Mm^{-1} for the clearest days, much less than the variability shown for the most impaired days.

FIGURE 2-20

ANNUAL RECONSTRUCTED EXTINCTION FOR
CLEAREST DAYS OF CURRENT PERIOD



The line graph in Figure 2-21 shows the individual components of the reconstructed light extinction over the current period for the 20 percent clearest days at JARB1. SO_4 and OMC are the most significant contributors to visibility impairment for the clearest days of the current period, followed by sub-equal contributions from NO_3, EC, and CM. SOIL is a minor contributor to visibility impairment for the clearest days. SO_4 has approximately 0.2 Mm^{-1} variation, while OMC has approximately 0.2 Mm^{-1} variation for the clearest days of the baseline period. In most recent years, SO_4 appears to be decreasing, while OMC appears to be increasing.

FIGURE 2-21

ANNUAL RECONSTRUCTED EXTINCTION BY SPECIES FOR
CLEAREST DAYS OF CURRENT PERIOD

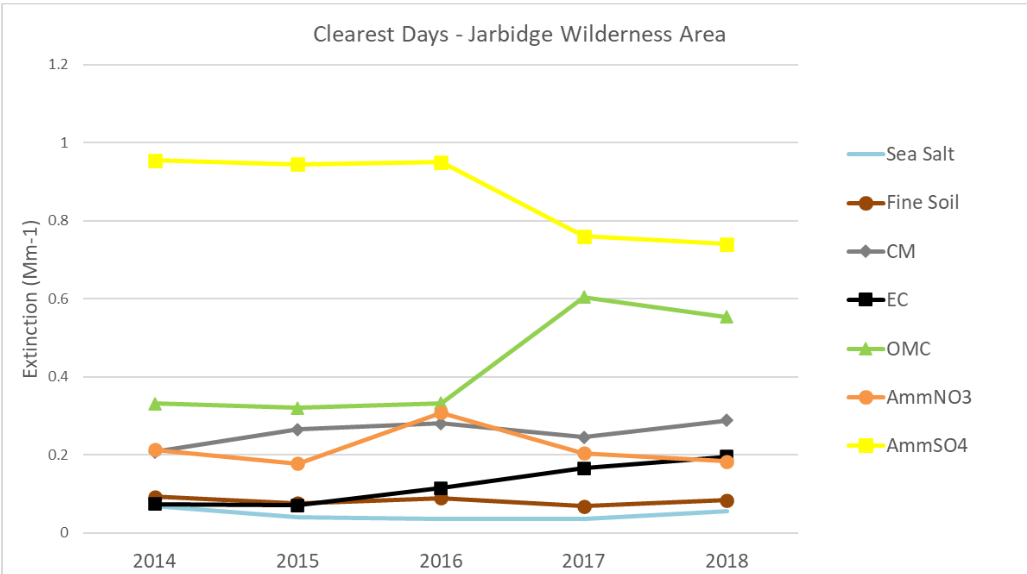
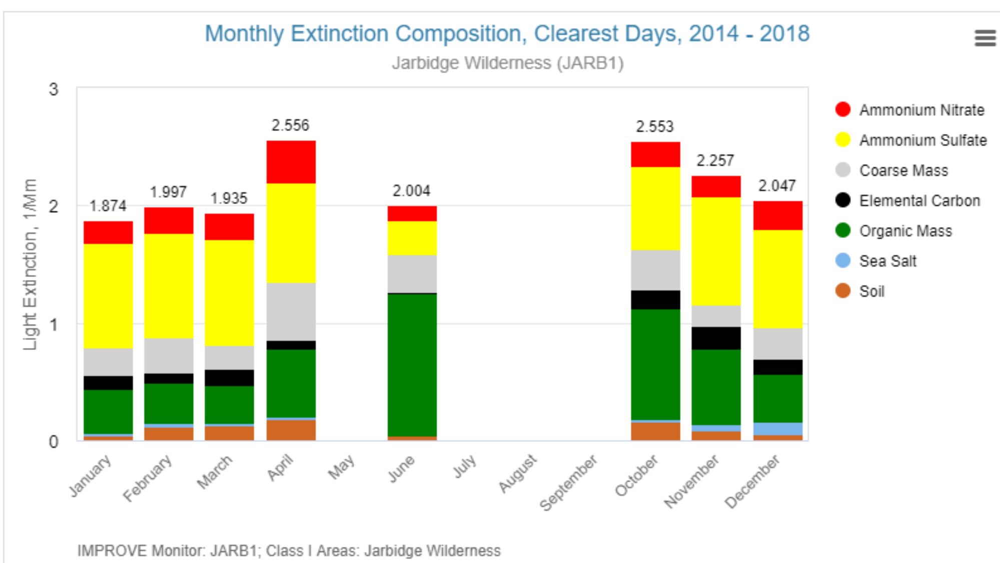


Figure 2-22 displays the monthly distribution of the reconstruction extinction for the 20 percent clearest days of the current period for JARB1. The clearest days are generally winter events occurring from October to April of each year, when fires, dust events, and photochemical processes are at a minimum.

FIGURE 2-22

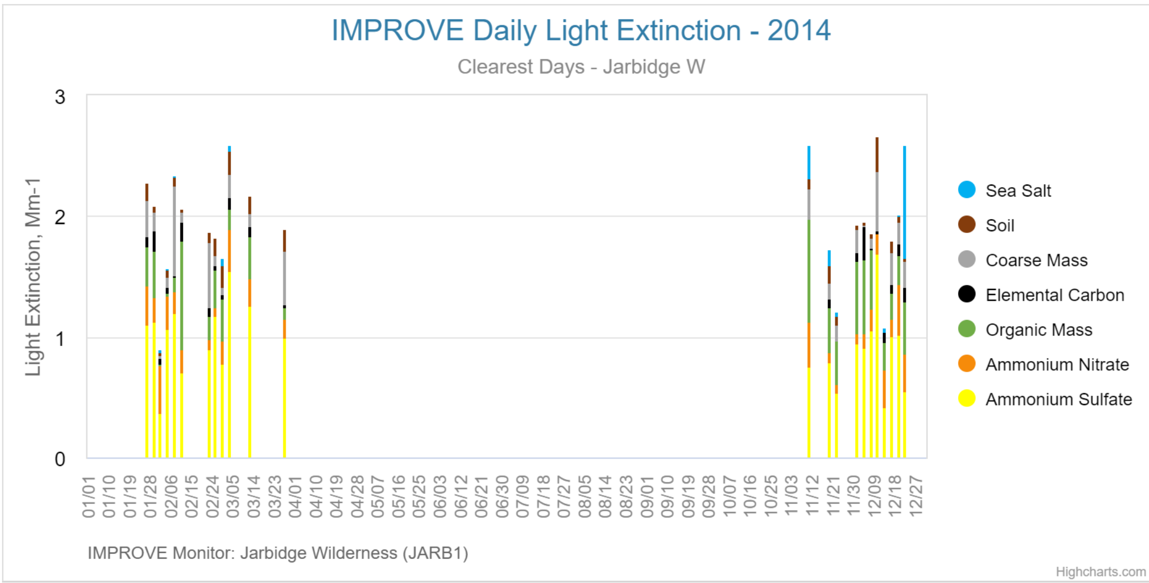
MONTHLY DISTRIBUTION OF CLEAREST DAYS OF CURRENT PERIOD



Daily reconstructed light extinction for the 20 percent clearest days of the current period at JARB1 is presented in Figure 2-23 and shows OMC and/or SO_4 are generally the largest components of visibility impairment on the clearest days at the Jarbidge Wilderness Area. NO_3, CM, and Sea Salt are significant components for a handful of days.

FIGURE 2-23

DAILY RECONSTRUCTED LIGHT EXTINCTION FOR
CLEAREST DAYS OF CURRENT PERIOD



2.7.2 Comparison of Extinction for Clearest and Most impaired Days

Baseline Conditions
Figure 2-24 compares the average baseline extinction for the 20 percent most impaired days with the 20 percent clearest days from the JARB1 monitor. All components of extinction are less on the clearest days, but significant reductions in CM and OMC extinction result in the majority of the visibility improvement on the clearest days, confirming the significant role of natural emissions in visibility impairment at the Jarbidge Wilderness Area. There are large reductions in SO_4 as well, indicating that SO_4 is the primary anthropogenic pollutant contributing to visibility impairment at Jarbidge Wilderness Area.

Table 2-5 presents the monitored contributions to reconstructed light extinction by species for the most impaired and clearest days of the baseline period based on data from the WRAP's Technical Support System. For the most impaired days, SO_4, OMC, and CM, on average, contribute more than three quarters of the extinction. Sources of OMC and CM emissions are predominantly natural and uncontrollable, as are SOIL and EC emission sources. NO_3 contributes less than 10 percent to reconstructed extinction for the most impaired and clearest days. Sources of SO_2 and NO_x emissions are largely anthropogenic and controllable.

FIGURE 2-24

COMPARISON OF BASELINE EXTINCTION FOR
MOST IMPAIRED AND CLEAREST DAYS OF BASELINE PERIOD

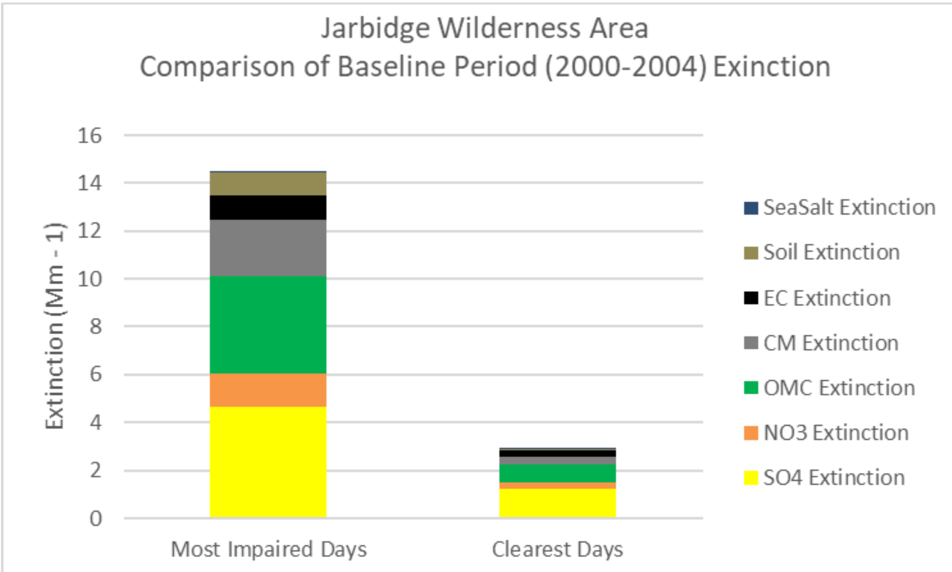


TABLE 2-5

MONITORED CONTRIBUTIONS TO ANNUAL RECONSTRUCTED
EXTINCTION BY SPECIES FOR BASELINE PERIOD

Year	SO_4 Extinction	NO_3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
20 Percent Most Impaired Days							
2001	36.0%	9.7%	22.7%	6.7%	7.8%	17.0%	0.1%
2002	27.9%	15.0%	26.9%	7.4%	6.7%	15.8%	0.3%
2003	25.2%	5.4%	37.7%	8.1%	5.1%	18.4%	0.0%
2004	41.0%	7.8%	23.5%	6.1%	6.8%	14.3%	0.5%
Average	**32.2%**	**9.4%**	**28.1%**	**7.1%**	**6.5%**	**16.4%**	**0.2%**
20 Percent Clearest Days							
2001	45.8%	12.3%	22.8%	8.6%	3.1%	7.1%	0.2%
2002	40.3%	8.2%	25.9%	9.2%	3.0%	12.0%	1.5%
2003	34.3%	9.2%	31.5%	10.9%	2.8%	9.6%	1.7%
2004	43.2%	9.4%	24.7%	8.8%	2.4%	8.4%	3.2%
Average	**41.0%**	**9.9%**	**26.1%**	**9.4%**	**2.8%**	**9.2%**	**1.6%**

Current Conditions
Figure 2-25 compares the average current extinction for the 20 percent most impaired days with the 20 percent clearest days from the JARB1 monitor. All components of extinction are less on the clearest days, but significant reductions in CM and OMC extinction result in the majority of the visibility improvement on the clearest days, confirming the significant role of natural emissions in visibility impairment at the Jarbidge Wilderness Area. There are large reductions in SO_4 as well, further supporting that SO_4 is the primary anthropogenic pollutant contributing to visibility impairment at Jarbidge Wilderness Area.

Table 2-6 presents the monitored contributions to reconstructed light extinction by species for the most impaired and clearest days of the baseline period based on data from the WRAP's Technical Support System. For the most impaired days, SO_4, OMC, and CM, on average, contribute more than three quarters of the extinction. Sources of OMC and CM emissions are predominantly natural and uncontrollable, as are SOIL and EC emission sources. NO_3 contributes less than 10 percent to reconstructed extinction for the most impaired and clearest days. Sources of SO_2 and NO_x emissions are largely anthropogenic and controllable.

Although extinction contributions for both the most impaired and clearest days during the baseline and current periods share similar trends and profiles, note that there has been a decrease in total light extinction for both the most impaired and clearest days from the baseline period to the current period. Light extinction during the 20 percent most impaired days decreased by 2 Mm^{-1} and 1 Mm^{-1} during the 20 percent clearest days.

FIGURE 2-25

COMPARISON OF CURRENT EXTINCTION FOR
MOST IMPAIRED AND CLEAREST DAYS OF CURRENT PERIOD

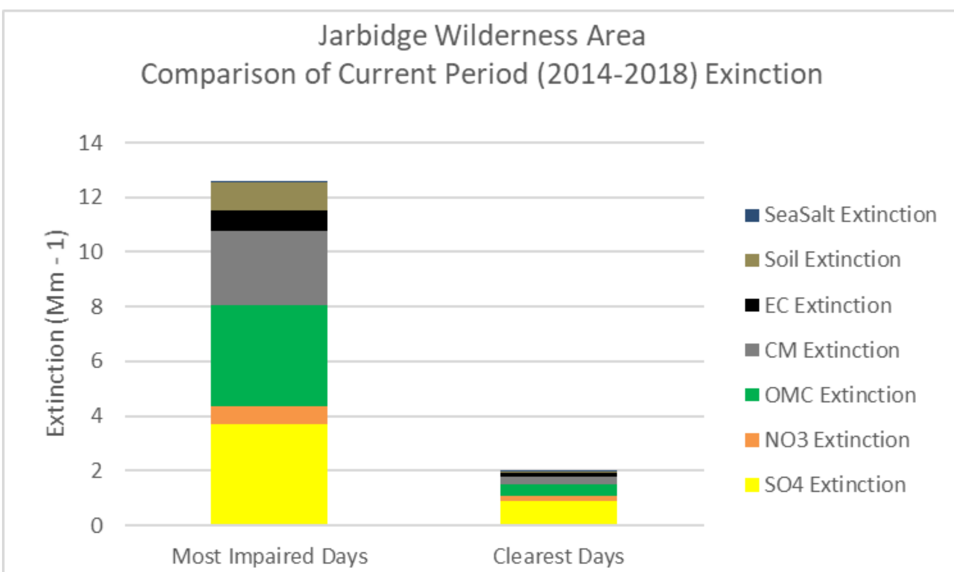


TABLE 2-6

MONITORED CONTRIBUTIONS TO ANNUAL RECONSTRUCTED
EXTINCTION BY SPECIES FOR CURRENT PERIOD

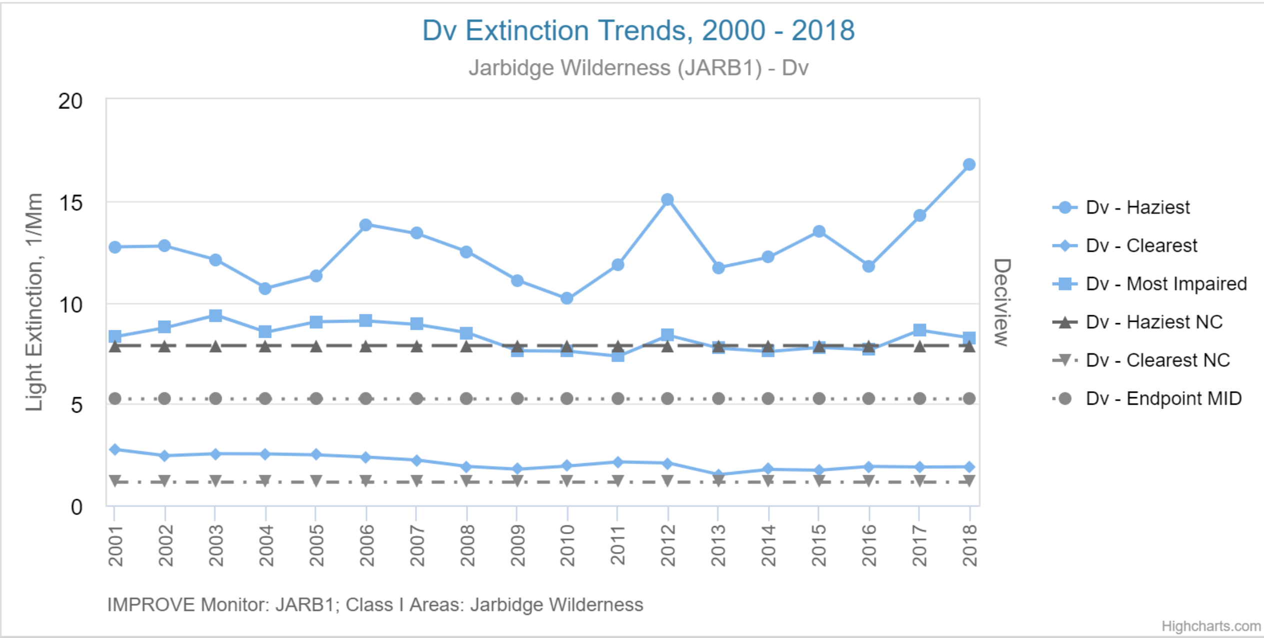
Year	SO_4 Extinction	NO_3 Extinction	OMC Extinction	EC Extinction	Soil Extinction	CM Extinction	SeaSalt Extinction
20 Percent Most Impaired Days							
2014	42.1%	8.1%	19.4%	5.0%	9.0%	16.1%	0.3%
2015	35.6%	5.7%	27.4%	5.6%	8.2%	17.2%	0.4%
2016	28.1%	4.1%	29.2%	5.2%	8.9%	24.2%	0.3%
2017	23.6%	4.0%	36.7%	6.3%	6.8%	22.4%	0.2%
2018	19.3%	4.5%	32.2%	6.4%	9.8%	27.5%	0.3%
Average	**29.3%**	**5.2%**	**29.3%**	**5.7%**	**8.5%**	**21.6%**	**0.3%**
20 Percent Clearest Days							
2014	49.1%	11.0%	17.1%	3.8%	4.8%	10.7%	3.5%
2015	49.8%	9.4%	16.9%	3.7%	4.0%	14.0%	2.1%
2016	45.0%	14.6%	15.7%	5.4%	4.3%	13.3%	1.7%
2017	36.5%	9.8%	29.0%	8.0%	3.3%	11.8%	1.7%
2018	35.2%	8.7%	26.4%	9.3%	4.0%	13.7%	2.6%
Average	**42.9%**	**10.7%**	**21.1%**	**6.1%**	**4.1%**	**12.7%**	**2.3%**

2.7.3 Aerosol Pollutant Trends

Figure 2-26 presents the annual monitored light extinction in deciviews for the 20 percent haziest, most impaired, and clearest days and corresponding trend lines for natural conditions goals. The long-term annual extinction trend for the 20 percent most impaired days, shown by the squares, and the 20 percent clearest days, shown by the diamonds, is essentially flat, although there are some annual variations. Both also show a slight downward trend indicating a gradual improvement in visibility impairment. The long-term annual extinction trend for the 20 percent haziest days shows significantly higher annual monitored light extinction with significant annual variations, confirming that the original "haziest" metric is sensitive to episodic events and that the new "most impaired" metric better isolates the year-round visibility impacts of anthropogenic emissions.

FIGURE 2-26

ANNUAL IMPROVE RECONSTRUCTED EXTINCTION TRENDS
FOR MOST IMPAIRED AND CLEAREST DAYS



Figures 2-27 through 2-33 show the annual extinction data on the 20 percent most impaired and clearest days for the seven haze causing pollutants from JARB1 for the years 2000 through 2018 with corresponding color-coded, long-term trend lines compared to the most impaired days natural conditions endpoint shown by grey circles. The graphs utilize valid data beginning with the baseline period and ending in the current period. from years prior to and including the baseline period. Data from 2000 did not meet the USEPA data completeness requirements (75 percent for the year and 50 percent for each quarter) and therefore does not have calculated annual concentrations.

Examination of the data provides insight into the long-term trends of haze causing pollutants at the JARB1 IMPROVE monitor. SO_4 and NO_3, considered to be emitted by mostly anthropogenic sources, have steep variations in light extinctions with slight downward trends beginning in 2013. These data suggest slight improvement, largely due to emission reductions achieved from the initial implementation period, in the long-term control of SO_2 and NO_x emissions impairing visibility at the Jarbidge Wilderness Area for the most impaired days. NO_3 extinction for the most impaired days has fallen below the natural conditions endpoint for the most impaired days in Figure 2-28. With NO_3 extinction already achieving the target goal of most impaired days natural conditions, and SO_4 extinction falling within 2 Mm^{-1} of the target goal in 2018, Nevada is well on track to reducing anthropogenic emissions, and corresponding visibility impairment contributions at Jarbidge Wilderness Area, back to natural conditions by 2064.

FIGURE 2-27

JARBIDGE WILDERNESS AREA
<u>SULFATE EXTINCTION TRENDS FOR MOST IMPAIRED DAYS</u>

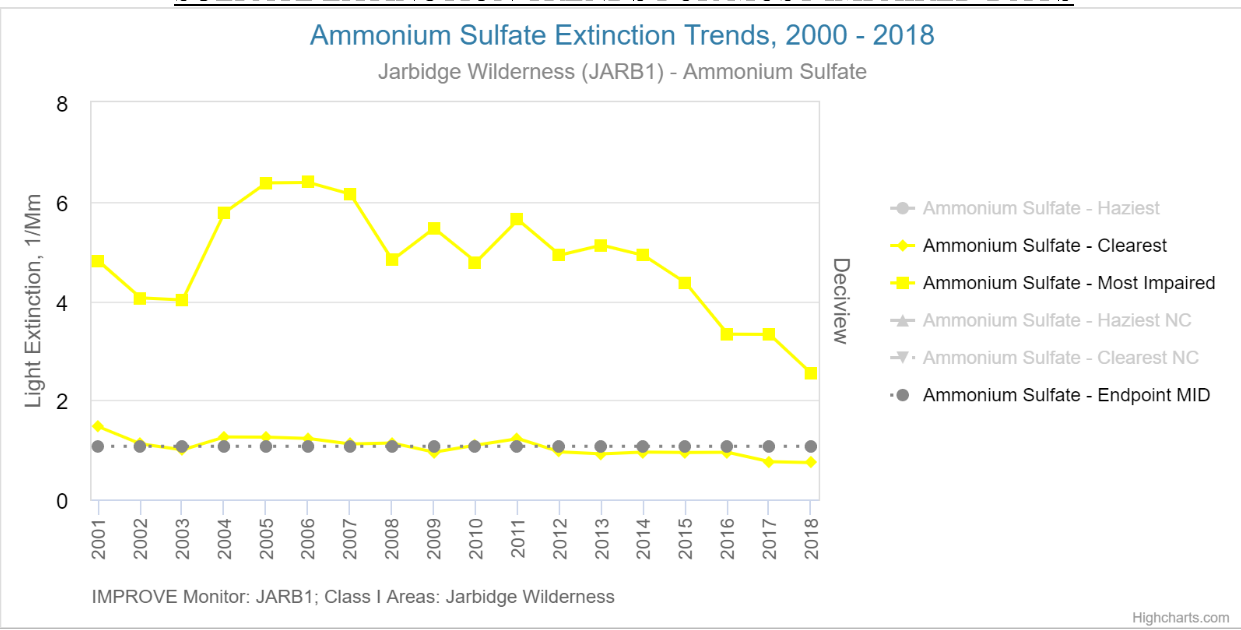
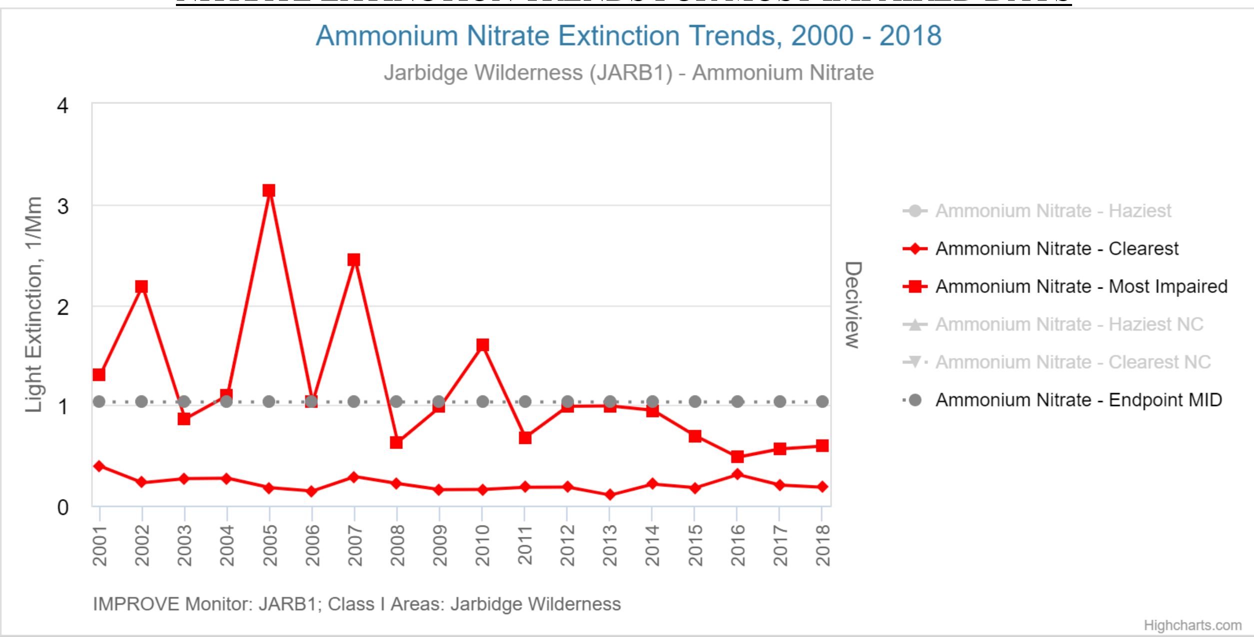


FIGURE 2-28

JARBIDGE WILDERNESS AREA
<u>NITRATE EXTINCTION TRENDS FOR MOST IMPAIRED DAYS</u>



OMC extinction, despite its large annual variation, has a well-defined, upward long-term trend beginning in 2013 and continuing through 2018, suggesting a larger role of fire emissions in regional haze with time. EC, also thought to be largely due to fire emissions, has an increasing trend over recent years beginning in 2013. This indicates that, although the new "most impaired days" metric effectively scrubs episodic fire events from the ambient air analyses, it does not accomplish this completely, and the effectiveness of the new metric appears to decrease as the intensity and occurrence of wildfires in the western U.S. continue to grow due to climate change.

FIGURE 2-29

JARBIDGE WILDERNESS AREA
ORGANIC MASS EXTINCTION TRENDS FOR MOST IMPAIRED DAYS

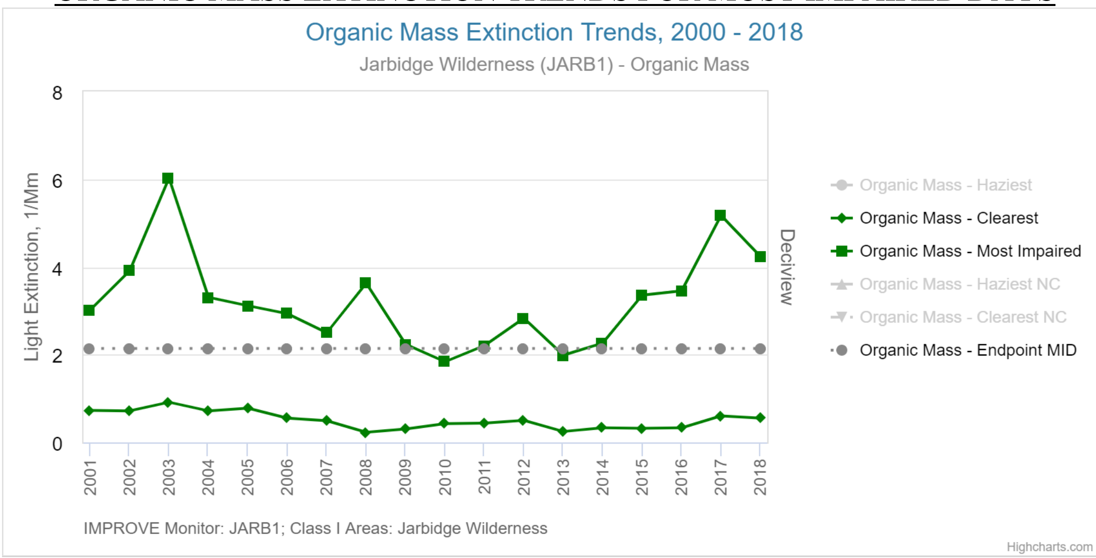
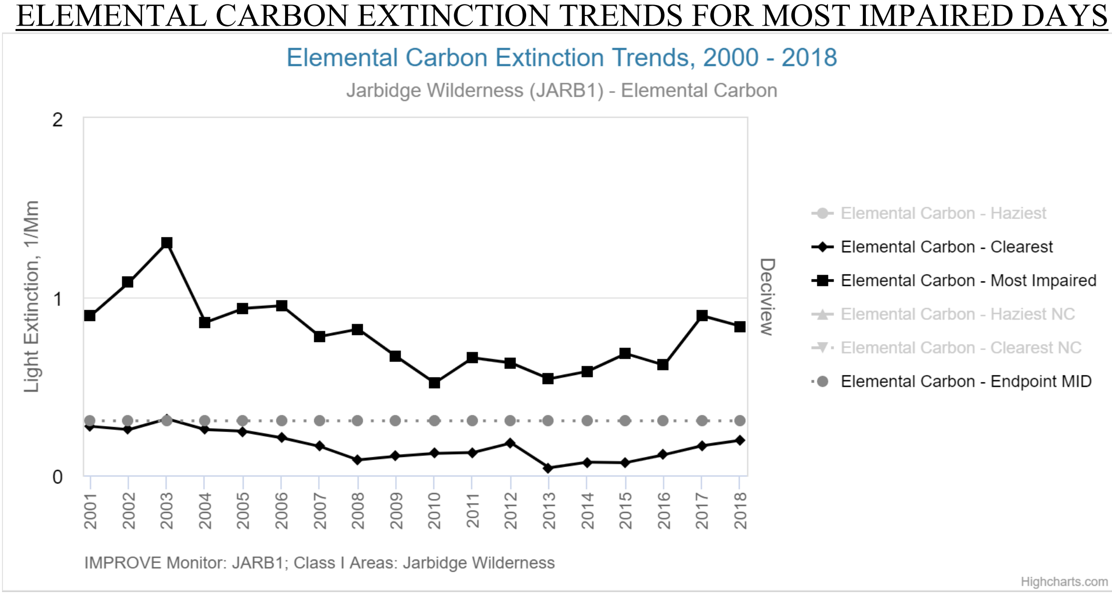


FIGURE 2-30

JARBIDGE WILDERNESS AREA
ELEMENTAL CARBON EXTINCTION TRENDS FOR MOST IMPAIRED DAYS



CM and Soil show large annual variations in light extinction, and do not show a clear downward or upward trend. CM shows a continuous increase in light extinction beginning in 2014 and may be due to an increase in fugitive dust impacts as Nevada's climate becomes drier. Although soil has an unpronounced trend, it remains steady in falling above the most impaired days natural conditions end goal. Sea salt impacts at Jarbidge Wilderness Area remain negligent, with annual light extinction never surpassing 0.25 Mm^{-1}.

FIGURE 2-31

JARBIDGE WILDERNESS AREA
COARSE MASS EXTINCTION TRENDS FOR MOST IMPAIRED DAYS

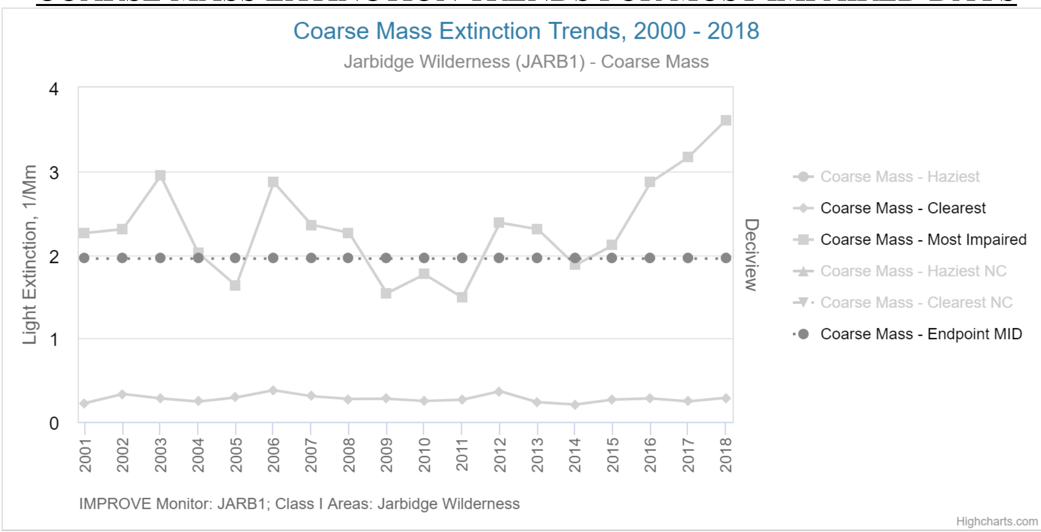


FIGURE 2-32

JARBIDGE WILDERNESS AREA
SOIL EXTINCTION TRENDS FOR MOST IMPAIRED DAYS

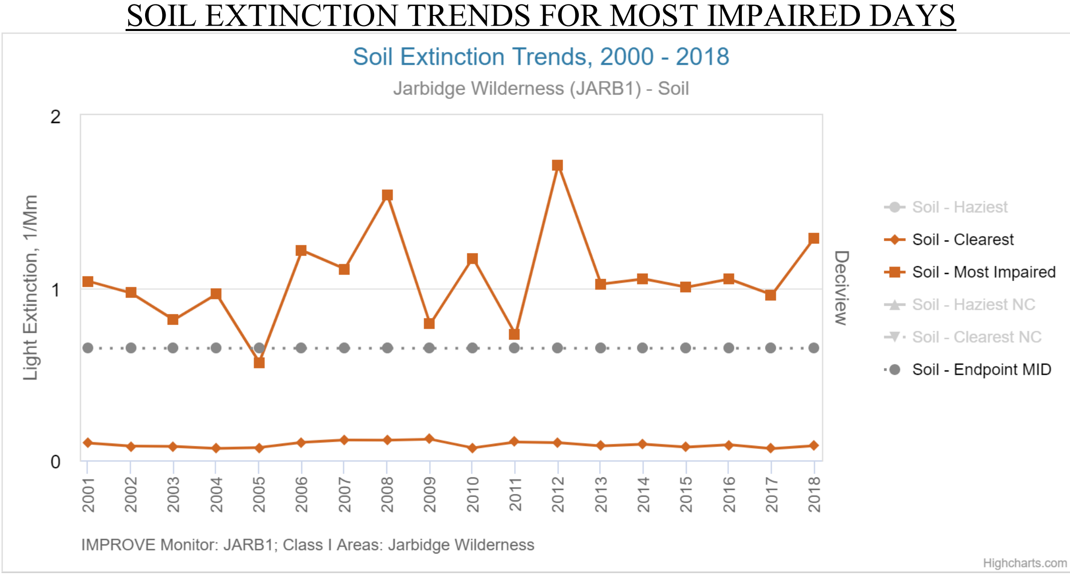
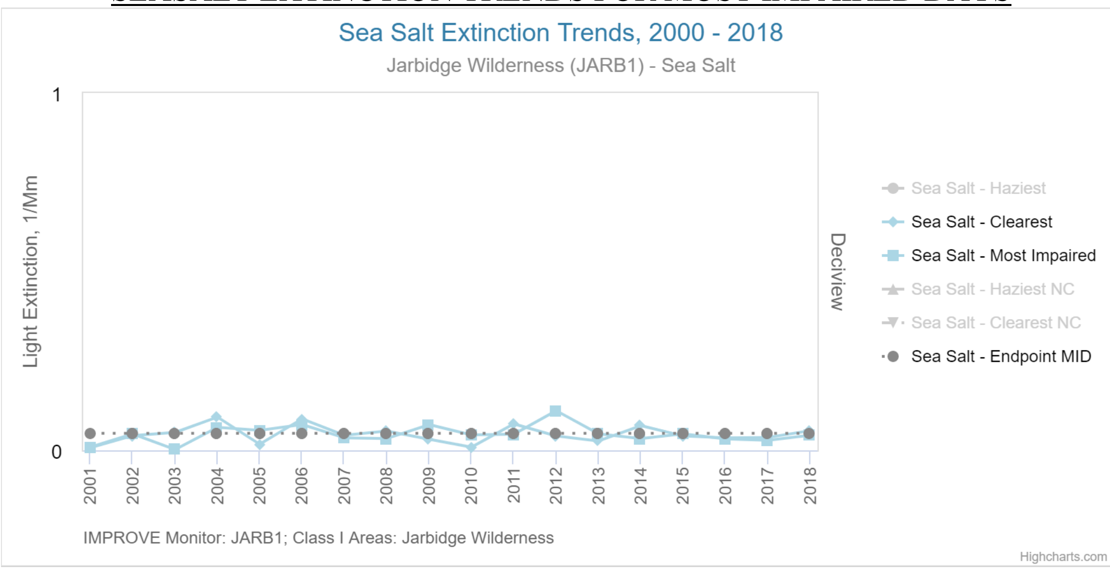


FIGURE 2-33

JARBIDGE WILDERNESS AREA
SEASALT EXTINCTION TRENDS FOR MOST IMPAIRED DAYS



Continued improvements in regional sulfate and nitrate levels are expected in the western states as further controls are realized on major sources as the result of BART and the implementation of other regional haze programs, as well as compliance with ozone and $PM_{2.5}$ standards. We expect these regional downward trends in SO_2 and NO_x emissions will provide continued visibility improvement.

However, the trends in OMC and SOIL are not so encouraging. The wide variations in annual concentrations on the 20 percent most impaired days may be related to alternating drought and normal precipitation conditions with corresponding increases in carbon emissions due to wildfires and increases in dust (e.g., CM and SOIL) emissions resulting from increasingly prevalent dry and dusty conditions.

NDEP has analyzed the JARB1 monitor data; identified the baseline, current, and natural visibility conditions; identified a 2028 URP value of 7.33 dv for the most impaired days; and determined SO_4, OMC, and CM extinction contribute the majority of visibility impairment on the most impaired days. These data suggest that visibility improvement due to emissions reductions of SO_2 and NO_x from anthropogenic sources may be overwhelmed by seasonally variable OMC and CM, as well as EC and SOIL, extinction contributions due to emissions from natural sources.

These data suggest control of sources of OMC, CM, and SO_2 may be the most effective means of improving visibility impairment at the Jarbidge Wilderness Area. The following chapter discusses Nevada's sources of visibility impairing pollutants.

2.8 REFERENCES

U.S. EPA 2003. Guidance for Tracking Progress under the Regional Haze Rule. EPA-454/B-03-004. September 2003.

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2020. Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. June 2020.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Three - Sources of Impairment in Nevada

3.1 BACKGROUND

Federal visibility regulations at 40 CFR 51.308(f)(2)(iii) require that states document the technical basis, including emissions information, on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory Class I Federal area it affects. States are also required by 40 CFR 51.308(f)(6)(v) to provide a statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any Class I area including emissions from the most recent year. The pollutants discussed in this chapter are sulfur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOC), , particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and ammonia (NH_3). Emission scenarios that were used for this analysis were the "RepBase2" and "2028OTBa2" inventories and were obtained from the Technical Support System (TSS) (http://views.cira.colostate.edu/tssv2/Express/EmissionsTools.aspx). These inventories represent a series of refinements to previous inventories reflecting increasing levels of quality control and quality assurance by states and Western Regional Air Partnership's (WRAP) Regional Modeling Center (RMC) contractors.

This chapter presents the analysis of the sources of emissions of visibility impairing pollutants identified above. Emission inventories form one leg of the analysis stool to evaluate sources' impacts on visibility. Emission inventories were created for all critical chemicals or species known to directly or indirectly impact visual air quality. These inventories were input into air quality models to predict concentrations of pollutants over a given space and time. In support of the WRAP Regional Haze effort, RMC developed emissions inventories representing:

- 2014 Actual Baseline Emissions (2014v2)
- 2014 Through 2018 Representative Baseline Emissions (RepBase2)
- 2028 On-the-Books Base Case Emissions (2028OTBa2)
- 2028 Potential Additional Controls Emissions (PAC2)

The base and plan inventories represent a series of refinements to each inventory reflecting increasing levels of quality control and quality assurance by states and RMC contractors. The purpose of the 2014v2 inventory is to represent the actual conditions in calendar year 2014 with respect to ambient air quality and the associated sources of visibility impairing air pollutants. The purpose of the RepBase2 inventory is to represent baseline emission patterns based on average, or "typical", conditions. It provides a basis for comparison with the 2028 projected emissions, as well as for gauging reasonable progress with respect to future year visibility.

2028OTBa2 represents conditions in future year 2028 with respect to sources of criteria and particulate matter air pollutants, taking into consideration growth and controls. The 2028OTBa2 emissions scenario includes reductions due to "on-the-way" and "on-the-books" controls, consent decree reductions, SIP control measures, and other relevant regulations that have gone into effect since 2014 or will go into effect before the end of 2028. Modeling results based on the 2028OTBa2 emission inventory are used to define the future year ambient air quality and visibility metrics.

The PAC2 inventory was created to establish the most representative source-specific emissions projections data as the basis for preparing regional haze plans. The PAC2 inventory includes reductions to NO_x and SO_2 based on presumptive add-on controls. Note that emission reductions assumed in the PAC2 inventory are preliminary results to the four-factor analyses that had not yet been finalized. Final controls determined necessary to make reasonable progress may differ from what was assumed in PAC2, as this model scenario was solely used as a reference to states in gauging potential visibility improvement from potential controls

Dispersion modeling predicts daily atmospheric concentrations of pollutants for the baseline year, and these modeled results are compared to monitored data taken from the Interagency Monitoring of Protected Visual Environments (IMPROVE) network. A second inventory is then created to predict emissions in 2028 based on expected controls, growth or other factors.

3.2 SOURCES OF VISIBILITY IMPAIRMENT

Emissions have been categorized by pollutant among the 13 continental WESTAR-WRAP states for 14 anthropogenic source sectors and 5 natural source sectors, as outlined in Table 3-1.

TABLE 3-1

SUMMARY OF POLLUTANTS, SOURCE SECTORS, AND SOURCE AREAS

Pollutants	Source Sectors	Source Areas
Sulfur dioxide (SO_2)	Electric Generating Units (EGU)	Arizona (AZ)
Nitrogen oxides (NO_x)	Oil & Gas – Point	California (CA)
Volatile organic carbon (VOC)	Industrial and Non-EGU Point	Colorado (CO)
	Oil & Gas – Non-point	Idaho (ID)
Particulate matter less than 10 microns (PM_{10})	Residential Wood Combustion	Montana (MT)
Particulate matter less than 2.5 microns ($PM_{2.5}$)	Fugitive Dust	Nevada (NV)
Ammonia (NH_3)	Agriculture	New Mexico (NM)
	Remaining Non-Point	North Dakota (ND)
	On-Road Mobile	Oregon (OR)
	Non-road Mobile	South Dakota (SD)
	Rail	Utah (UT)
	Commercial Marine	Washington (WA)
	Agricultural Fire	Wyoming (WY)
	Wildland Prescribed Fire	
	Wildfire	
	Biogenic	
	Lightning NO_x	
	Oceanic Sea Salt	
	Windblown	

Natural fire sources, biogenic sources and windblown dust are shown in *italics* to denote that they are natural sources; all other sources are anthropogenic.

3.2.1 Natural Visibility Conditions

The RHR defines visibility impairment as "any humanly perceptible difference due to air pollution from anthropogenic sources between actual visibility and natural visibility on one or more days," meaning, that natural visibility is the difference between actual visibility conditions and visibility impairment. Natural events (e.g. natural fire, biogenic emissions, and windblown dust) introduce pollutants that contribute to natural visibility conditions. In Nevada, natural sources are important contributors of NO_x, PM_{10}, $PM_{2.5}$, and VOC, however, these contributions to natural visibility conditions are not required to be reduced by the RHR, as natural visibility conditions are the national visibility goal.

3.2.2 Anthropogenic Sources of Visibility Impairment

Anthropogenic or human-caused sources of visibility impairment include anything directly attributable to human-caused activities that produce emissions of visibility-impairing pollutants. Some examples include point sources, area sources, mobile sources, oil and gas sources, road dust, fugitive dust and anthropogenic fires. Generally anthropogenic emissions include not only those that are generated or originated within the boundaries of the United States, but also international emissions that are generated outside of the United States but transported into the region. Some examples include emissions from Mexico, Canada and maritime shipping emissions in the Pacific Ocean. Note that Mexican and Canadian emission inventories include both anthropogenic and natural emissions.

Although international anthropogenic sources contribute to visibility impairment, they cannot be regulated, controlled or prevented by Nevada and, as with natural emissions, are beyond the scope of this planning document. Any reductions in international emissions would likely fall under the purview of the USEPA administrator. Table 3-2 shows that in Nevada, anthropogenic sources are important contributors of all pollutants except VOCs, which are largely contributed by natural sources at a much higher degree than the rest of the contributors. Although anthropogenic contributions typically have a higher percentage, total emissions show a higher contribution from natural sources because of VOC contributions. The source of data summarized in Table 3-2 is shown in more detail in Section 3.8.

TABLE 3-2

SUMMARY OF ANTHROPOGENIC AND NATURAL
EMISSION SOURCES IN NEVADA

Pollutant	2014 Anthropogenic Sources	2014 Natural Sources	2028 Anthropogenic Sources	2028 Natural Sources
SO_2	94%	6%	92%	8%
NO_x	53%	47%	34%	66%
VOC	6%	94%	5%	95%
PM_{10}	86%	14%	86%	14%
NH_3	93%	7%	93%	7%
$PM_{2.5}$	71%	29%	70%	30%
Total emissions:	33%	67%	27%	73%

3.3 DEVELOPMENT OF THE 2014 AND 2028 EMISSION INVENTORIES

In general, emission inputs were prepared by individual states and tribes for point, area and most dust emissions categories. With input and review by states, tribes and Federal Land Managers, WRAP forums and workgroups prepared consistent and comparable WRAP region emissions data for the mobile, fire, ammonia, area source oil and gas, eastern Pacific offshore shipping, some dust and biogenic emissions categories. The WRAP Emissions Inventory and Modeling Protocol Subcommittee gathered the latest, best and most representative emissions estimates at the time from the CENWRAP, Eastern U.S., Canada and Mexico regions in executing the sequence of modeling simulations discussed below. Boundary conditions reaching North America from the rest of the world were jointly prepared by all five Regional Planning Organizations (RPO)s from the GEOS-Chem global model.

The original inventories evolved from states' actual emissions data submitted to USEPA for the 2014 National Emission Inventory (NEI). The 2014 NEI consisted of a complete set of point, non-point and mobile data that had been submitted to EPA. The 2014v2 emission inventory was chosen to provide a baseline against which reductions in visibility-impairing pollutants could be measured over time. Emissions data recorded between 2014 and 2018 substituted data from the 2014 NEI to develop the Representative Baseline (RepBase2). The 2028 emission inventory was developed because 2028 is the year the second regional haze SIP planning period ends. Historical development of the different versions of the emission inventories that were developed for the 2014v2, RepBase2, 2028OTBa2 and PAC2 inventories is described in detail in Chapter One. For this chapter's discussion, the 2014 emission inventory refers to RepBase2 and the 2028 emission inventory refers to 2028OTBa2.

3.4 POINT SOURCE EMISSION INVENTORY

Point sources are identified by point locations, typically because they are regulated, and their locations are available in regulatory reports. Point sources can be further subdivided into EGU sources and non-EGU sources, particularly in criteria inventories in which EGUs are a primary source of NO_x and SO_2.

Compared to the surrounding continental WRAP states, Nevada generally contributes less emissions from the point source sector than most other states. Point source contributions for NO_x, SO_2, PM_{10}, $PM_{2.5}$, VOC, , and NH_3 state-wide emissions were compared among the western states. Point sources were divided into Oil & Gas Point, Industrial and Non-EGU Point, and EGU Point (indicated as maroon, purple, and green, respectively) and compared between the RepBase2 scenario and 2028OTBa2 scenario for each state.

Figure 3-1 shows NO_x emissions contributed by point sources among the western states. Nevada, with roughly 12,000 tpy in state-wide NO_x emissions, has the third lowest annual tonnage. These NO_x emissions are not contributed by Oil and Gas point sources but from EGU and Non-EGU point sources. Roughly two thirds of total NO_x emissions in the point source sector are contributed by Non-EGU/Industrial sources, and one third is contributed by EGUs. NO_x emissions projected in 2028 are similar to the representative baseline, with a slight decrease among EGUs.

FIGURE 3-1

POINT SOURCE NOx EMISSIONS PROFILE IN NEVADA COMPARED TO WESTERN STATES

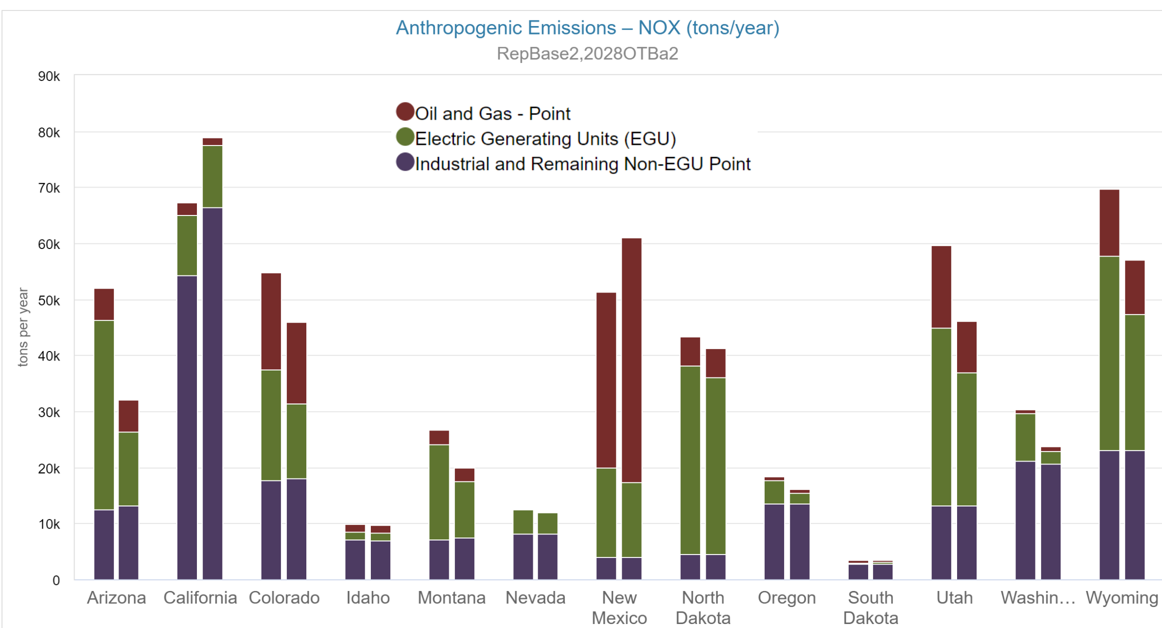


Figure 3-2 shows SO_2 emissions contributed by point sources among the western states. Nevada, with roughly 7,000 tpy in state-wide SO_2 emissions, has the third lowest annual tonnage. These SO_2 emissions are not contributed by Oil and Gas point sources but from EGU and Non-EGU point sources. Roughly three quarters of total SO_2 emissions in the point source sector are contributed by EGU sources, and one quarter is contributed by Non-EGUs/Industrial. A decrease in 2,500 tpy of SO_2 emissions are projected for EGUs in 2028.

FIGURE 3-2

POINT SOURCE SO_2 EMISSIONS PROFILE IN NEVADA COMPARED TO WESTERN STATES

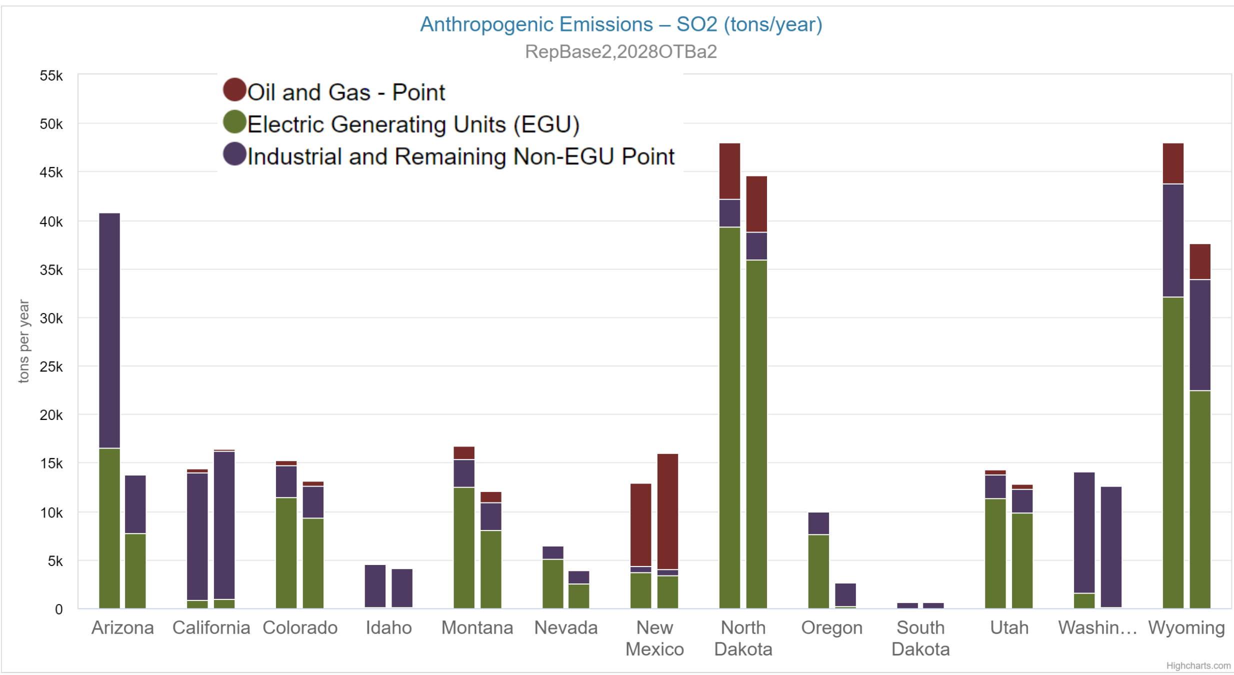


Figure 3-3 shows PM_{10} emissions contributed by point sources among the western states. Nevada, with roughly 4,000 tpy in state-wide PM_{10} emissions, has the third lowest annual tonnage. These PM_{10} emissions are not contributed by Oil and Gas point sources but from EGU and Non-EGU point sources. Roughly three quarters of total PM_{10} emissions in the point source sector are contributed by Non-EGU/Industrial sources, and one quarter is contributed by EGUs. A slight decrease in PM_{10} emissions are projected in 2028.

Figure 3-4 shows $PM_{2.5}$ emissions contributed by point sources among the western states. Nevada, with roughly 2,200 tpy in state-wide $PM_{2.5}$ emissions, has the third lowest annual tonnage. These $PM_{2.5}$ emissions are not contributed by Oil and Gas point sources but from EGU and Non-EGU point sources. $PM_{2.5}$ emissions are almost shared equally between EGU and Non-EGU point sources. There is no change in emissions from the representative baseline to 2028.

FIGURE 3-3

POINT SOURCE PM_{10} EMISSIONS PROFILE IN NEVADA COMPARED TO WESTERN STATES

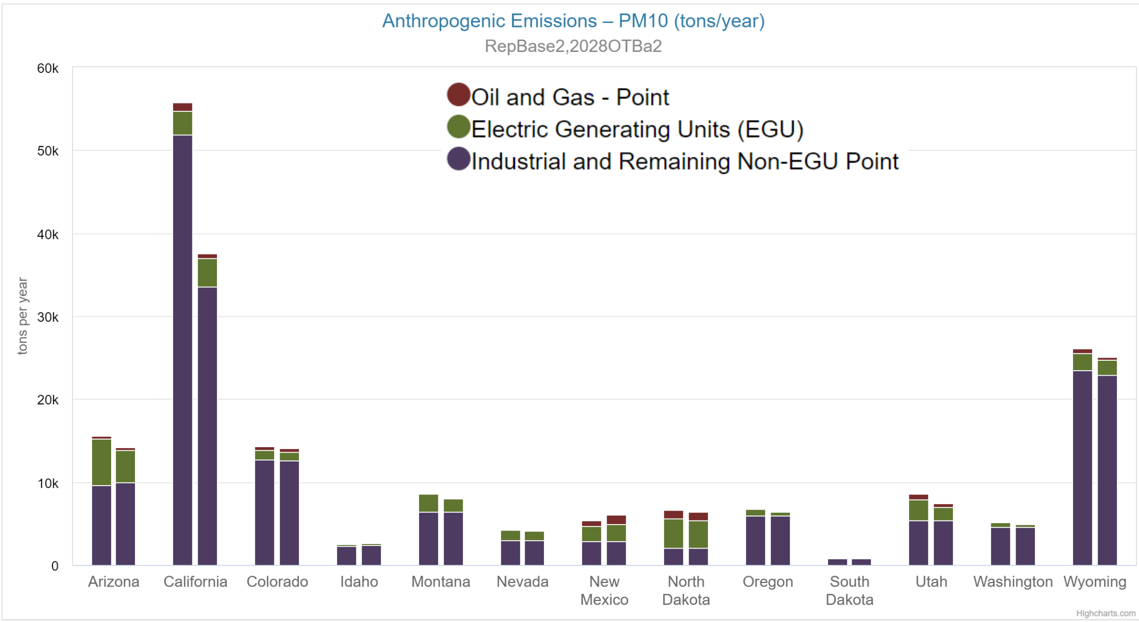


FIGURE 3-4

POINT SOURCE $PM_{2.5}$ EMISSIONS PROFILE IN NEVADA COMPARED TO WESTERN STATES

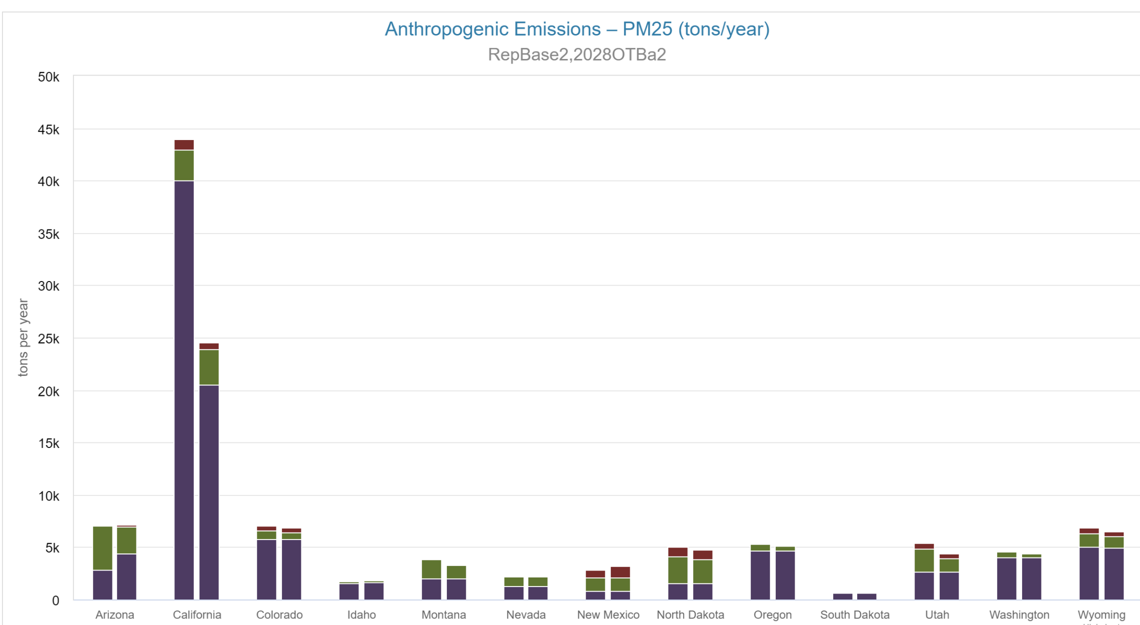


Figure 3-5 shows VOC emissions contributed by point sources among the western states. Nevada, with roughly 2,400 tpy in state-wide VOC emissions, has the third lowest annual VOC tonnage. The vast majority of VOC emissions are contributed by the Non-EGU/Industrial point sources. There is no change in emissions from the representative baseline to 2028.

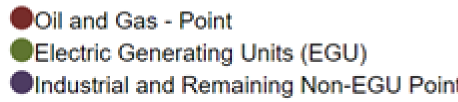


FIGURE 3-5

POINT SOURCE VOC EMISSIONS PROFILE IN NEVADA COMPARED
<u>TO WESTERN STATES</u>

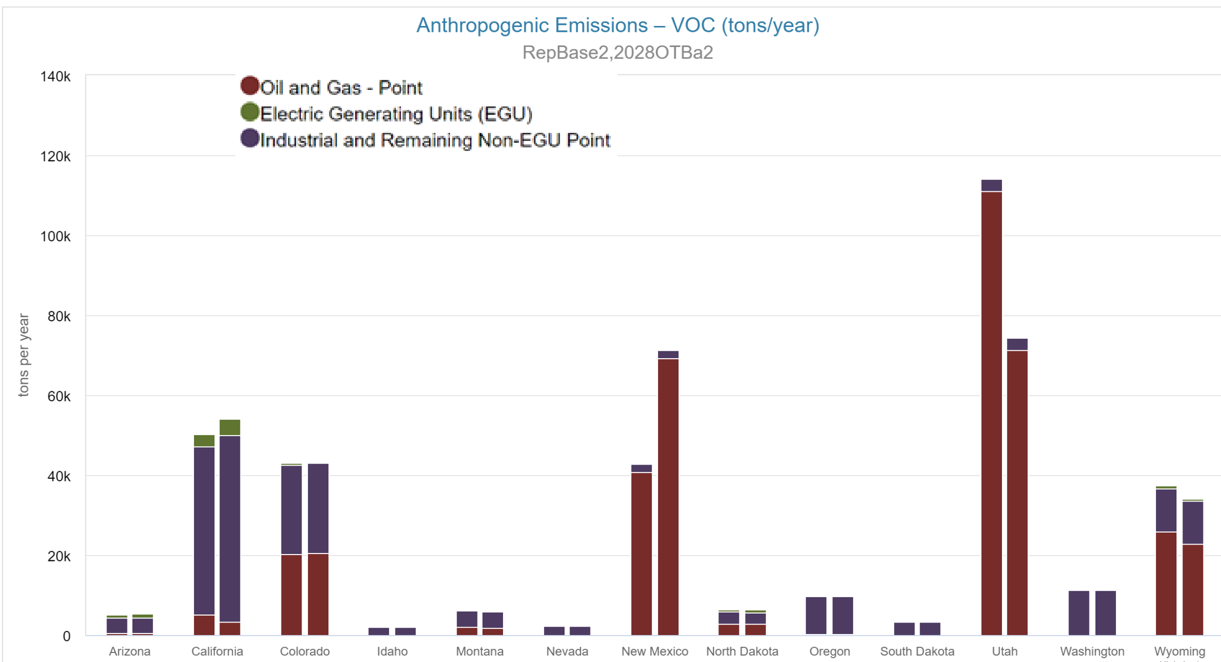
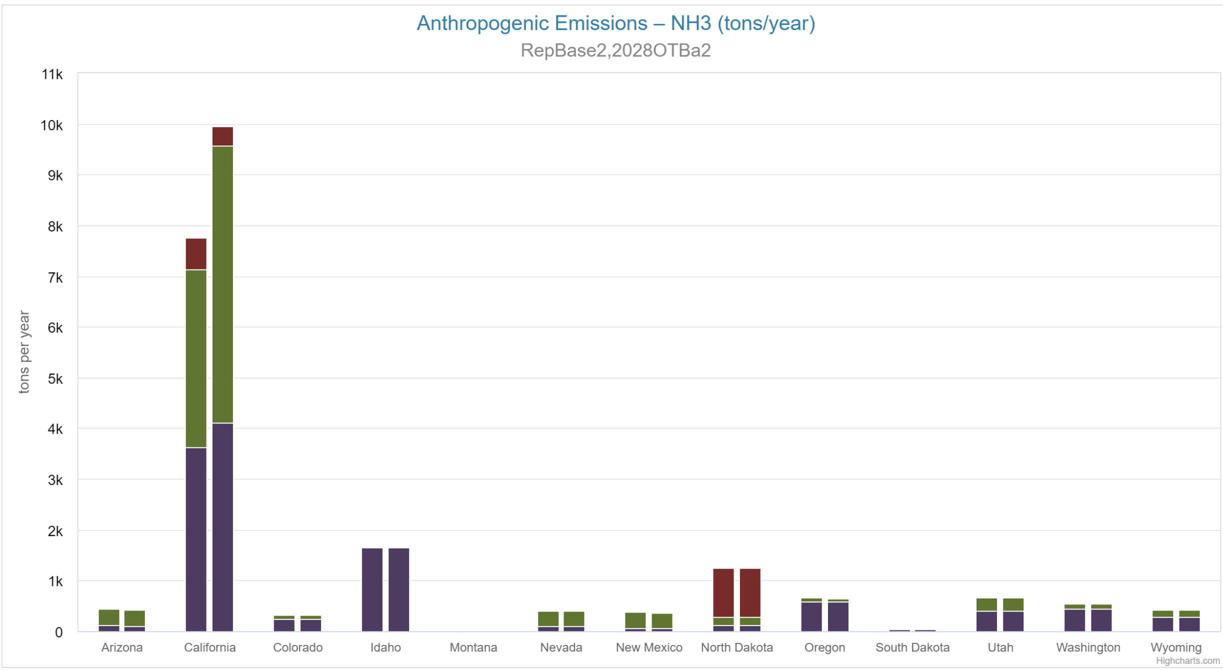


Figure 3-6 shows NH_3 emissions contributed by point sources among the western states. Nevada, with roughly 400 tpy in state-wide NH_3 emissions, is one of many states that are not significant contributors of NH_3 emission from point sources. NH_3 emissions are not contributed by Oil and Gas point sources but largely from Non-EGU point sources, accounting for three quarters of total emissions. There is no change in emissions from the representative baseline to 2028.

FIGURE 3-6

POINT SOURCE NH_3 EMISSIONS PROFILE IN NEVADA COMPARED TO WESTERN STATES



3.5 FIRE EMISSION INVENTORY

The Fire and Smoke Workgroup (FSWG) of the WRAP and its contractor, Air Sciences Inc., prepared a 2014 base year, representative baseline, and 2028 future year fire emission inventories. A document was produced April 2020 describing these inventories. http://www.wrapair2.org/pdf/fswg_rhp_fire-ei_final_report_20200519_FINAL.PDF. Inventory years 2014 through 2018 were used to estimate the emissions for the representative baseline period.

For the fire inventories in the 2014 base year inventory, EPA's 2014 Wildland Fire EI, version 2, was used. Adjustments submitted by states were incorporated into the fire inventory, however, Nevada did not make any adjustments. Other alterations to the 2014 base year fire inventory were made to incorporate information from the NOAA's Hazard Mapping System (HMS) and process misclassified fire events.

A representative single-year fire emission inventory to be used for regional haze planning was developed based on the typical activity observed during the 2014 through 2018 baseline years. This representative fire inventory further accounted for wildfire activity data, prescribed and agricultural fire activity, and calculated daily emissions for each fire event during the representative period.

Two future fire scenarios for the year 2028 were developed based on predictions of future conditions, both from a land management and climate change perspective. Each scenario scaled acres burned at the individual event level for one fire type. Methods of scaling differed for wildfire and prescribed fire; agricultural fires were left unchanged in both scenarios. Other aspects of future conditions, such as fuel loading or average consumptions, were not considered.

3.6 AREA SOURCE INVENTORY

The area source emission inventory was primarily taken from the 2014 NEIv2, using nonpoint source data that are provided by state, local, and tribal agencies, and for certain sectors and/or pollutants, they are supplemented with data from the EPA. Area source emissions typically rely on population and economic growth factors.

3.7 OVERVIEW OF EMISSION INVENTORY SYSTEM - TSS

The WRAP developed the Technical Support System version 2 (TSS) as an Internet access portal to all the data and analysis associated with the development of the technical foundations of regional haze plans across the Western US. The TSS provides state, county and grid cell level emissions information for typical criteria pollutants such as SO_2 and NO_x and other secondary particulate forming pollutants such as VOC and NH_3. Nineteen different emission inventories were developed comprising the following source categories: point, area, on-road mobile, off-road mobile, oil and gas, anthropogenic fire, natural fire, biogenic, road dust, fugitive dust and windblown dust. More detailed information on the emission inventory information can be found on the WRAP TSS website at the following link: http://views.cira.colostate.edu/tssv2/Express/EmissionsTools.aspx.

3.8 EMISSIONS IN NEVADA

The pollutants inventoried by the WRAP include SO_2, NO_x, VOC, CO, $PM_{2.5}$, PM_{10}, and NH_3. An inventory was developed for the 2014 baseline year, representative baseline period, and projections of future emissions for 2028 for modeling purposes. 2017 NEI emissions are also provided to confirm there are no significant differences between the emissions inventories developed and the most recent NEI to satisfy 40 CFR 51.308 (f)(2)(iii). Nevada will provide updates to the WRAP on this inventory on a periodic basis. For purposes of the Regional Haze SIP, the WRAP developed emission inventories for each state with input from participating stakeholders. Note that these emission inventories were developed solely to supplement certain model scenarios for baseline and future visibility conditions at Class I areas (presented in Chapter Four). These inventories do not include the final, actual reductions achieved as a result of additional controls required in the SIP's reasonable progress control analyses (Chapter Five). The difference between reductions assumed in the following inventories and actual reductions achieved are quantified and corrected in the final reasonable progress goals, or 2028 visibility projections outlined in Chapter Six.

The process for inventorying sources is similar for all species of interest. The number and types of sources is identified by various methods. For example, major stationary sources report actual annual emission rates to the USEPA national emissions database. Nevada collects annual emission data from both major and minor sources and this information is used as input into the emissions inventory. In other cases, such as mobile sources, a USEPA mobile source emissions model is used to develop emission projections. Nevada vehicle registration, vehicle mile traveled information and other vehicle data are used to tailor the mobile source data to best represent statewide and area specific emissions. Population, employment and household data are used in other parts of the emissions modeling to characterize emissions from area sources such as home heating. Thus, for each source type, emissions are calculated based on an emission rate and the amount of time the source is operating. Emission rates can be based on actual measurements from the source, or USEPA emission factors based on data from tests of similar types of emission sources. In essence, all sources go through a similar process. The number of sources is identified, emission rates are determined by measurements of those types of sources and the time of operation is determined. Annual emissions can be obtained by multiplying the emission rate times the number of hours of operation in a year.

Table 3-3 summarizes Nevada's statewide emissions for 2014 and 2028 projections in tons and are noted as either anthropogenic sources or natural sources. The percent change in tons from 2014 to 2028 is shown on a pollutant basis. Detailed discussions of each pollutant are described in the following sections. Based on the information presented in Table 3-3 the projected (2028OTBa2) sum of anthropogenic emissions for SO_2 and NO_x for all source categories is 5.8 percent of the total 2028 projected sum of emissions statewide.

The figures and tables in this section and the remainder of this chapter are based on the RepBase2 and 2028OTBa2 emission inventories, or 2014 and 2028 baseline emission inventories. Additional emission reductions achieved from reasonable progress controls are not included in the 2028 baseline emission inventory. Emission reductions achieved from reasonable progress controls are quantified and incorporated into the 2028 baseline emission inventory in Chapters Five and Six to develop Nevada's Reasonable Progress Goals for the second round.

TABLE 3-3

EMISSIONS SUMMARY TABLE FOR NEVADA FOR 2014 AND 2028:
NATURAL VS. ANTHROPOGENIC SOURCES

	2014				2028			
	Anthro-pogenic Source	Natural Source	Total Tons 2014		Anthro-pogenic Source	Natural Source	Total Tons 2028	Percent Change
SO_2	10,242	674	10,916		7,585	674	8,260	-24%
NO_x	81,651	72,847	154,498		37,487	72,847	110,334	-29%
VOC	71,339	1,067,220	1,138,559		56,675	1,067,220	1,123,894	-1%
$PM_{2.5}$	26,619	10,760	37,379		25,384	10,760	36,144	-3%
PM_{10}	147,267	22,348	169,615		137,292	22,326	159,618	-6%

NH_3	18,956	1,380	20,336		18,830	1,380	20,210	-1%
Total emissions:	345,290	1,175,207	1,520,496		283,253	1,175,207	1,458,460	-4%

3.8.1 Nevada SO_2 Emission Inventory for 2014 and 2028

Sulfur dioxide gases (SO_2) are formed when sulfur-containing fuels, such as diesel or coal, are burned, when gasoline is extracted from oil or when metals are extracted from ore. SO_2 dissolves in water vapor to form acid, and contributes to the formation of sulfate compounds [e.g. $(NH_4)_2SO_4$] when ammonia is available. These compounds can scatter the transmission of light, thus contributing to visibility reduction on a regional scale at our Class 1 Area.

Sulfur dioxide emissions produce sulfate particles in the atmosphere. Ammonium sulfate particles have a significantly greater impact on visibility than other pollutants like dust from unpaved roads due to the physical characteristics causing greater light scattering from the particles. Sulfur dioxide emissions come primarily from coal combustion at electrical generation facilities but smaller amounts come from natural gas combustion, mobile sources and even wood combustion.

A 24 percent statewide reduction in SO_2 emissions is expected by 2028 due to planned controls on existing sources; even with the growth consideration in electric generating power for the state. Point sources account for 59 percent of SO_2 emissions in the RepBase2 inventory and decrease to 47 percent for 2028OTBa2 projections as a result of on-the-books controls. These point-source reductions in SO_2 emissions are likely due to the closure of the Reid Gardner Generating Station in 2017. SO_2 emissions from mobile sources and rail are expected to decrease by 2028. Similar reductions in the west are expected from other states as BART and other planned controls take effect by 2028.

Figure 3-7 and Table 3-4 show the overall net decrease in emissions from 2014 to 2028 for SO_2 by source category. In all instances, source categories that do not have emissions contributed by the specific pollutant are not listed.

FIGURE 3-7

NEVADA SO_2 EMISSION INVENTORY – 2014 AND 2028

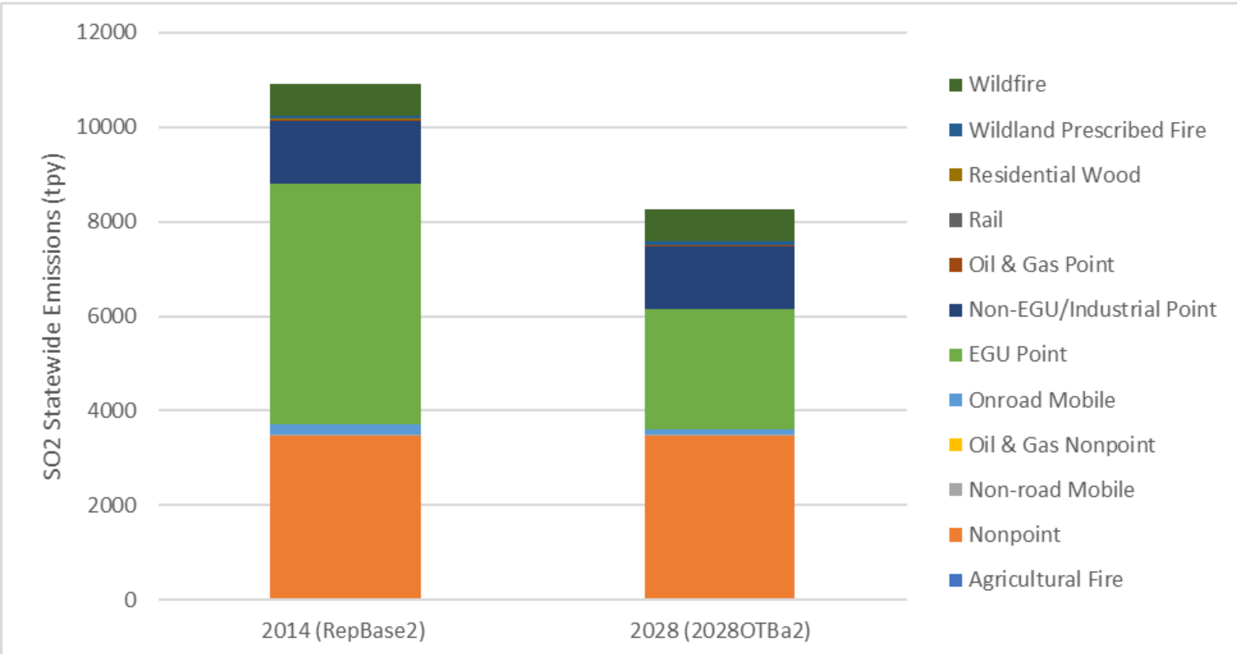


TABLE 3-4

NEVADA SO_2 EMISSIONS BY SOURCE CATEGORY FOR 2014 AND 2028

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Agricultural Fire	1	3	1	0%
Nonpoint	3473	247	3473	0%
Non-road Mobile	30	30	24	-20%
Oil & Gas Nonpoint	3	3	3	0%
Onroad Mobile	196	129	99	-49%
EGU Point	5109	1838	2556	-50%
Non-EGU/Industrial Point	1321	1854	1320	0%
Oil & Gas Point	16	17	16	0%
Rail	4	3	3	-25%
Residential Wood	22	24	22	0%
Wildland Prescribed Fire	67	30	67	0%
Wildfire	674	2162	674	0%
Total	10916	6340	8258	-24%

Figure 3-8, "Regional Maps of SO_2 Emissions for 2028," shows that Nevada, with 7,640 tpy statewide, is not a significant contributor to SO_2 emissions in the West compared to other states.

FIGURE 3-8

REGIONAL MAPS OF SO_2 EMISSIONS FOR 2028

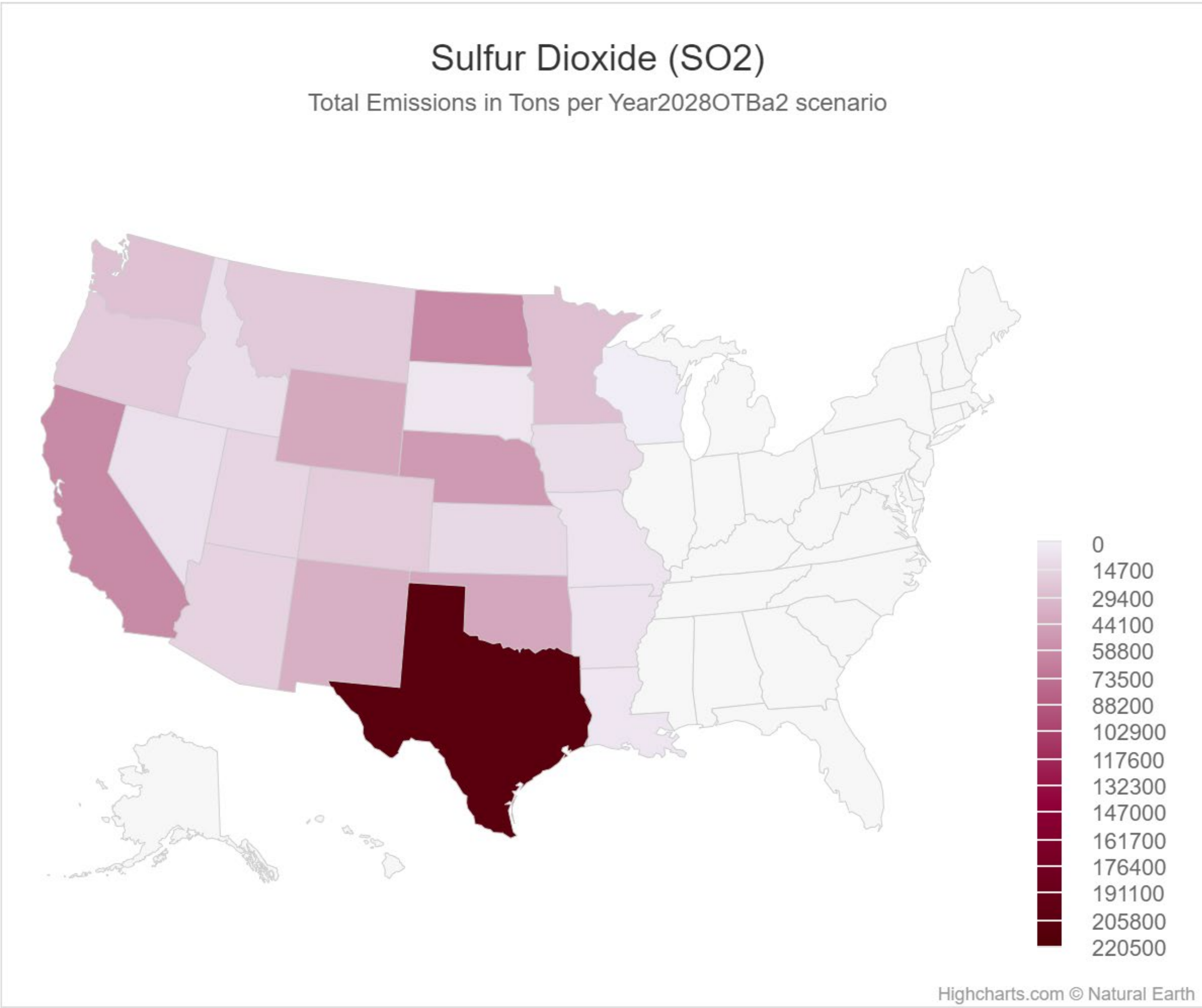
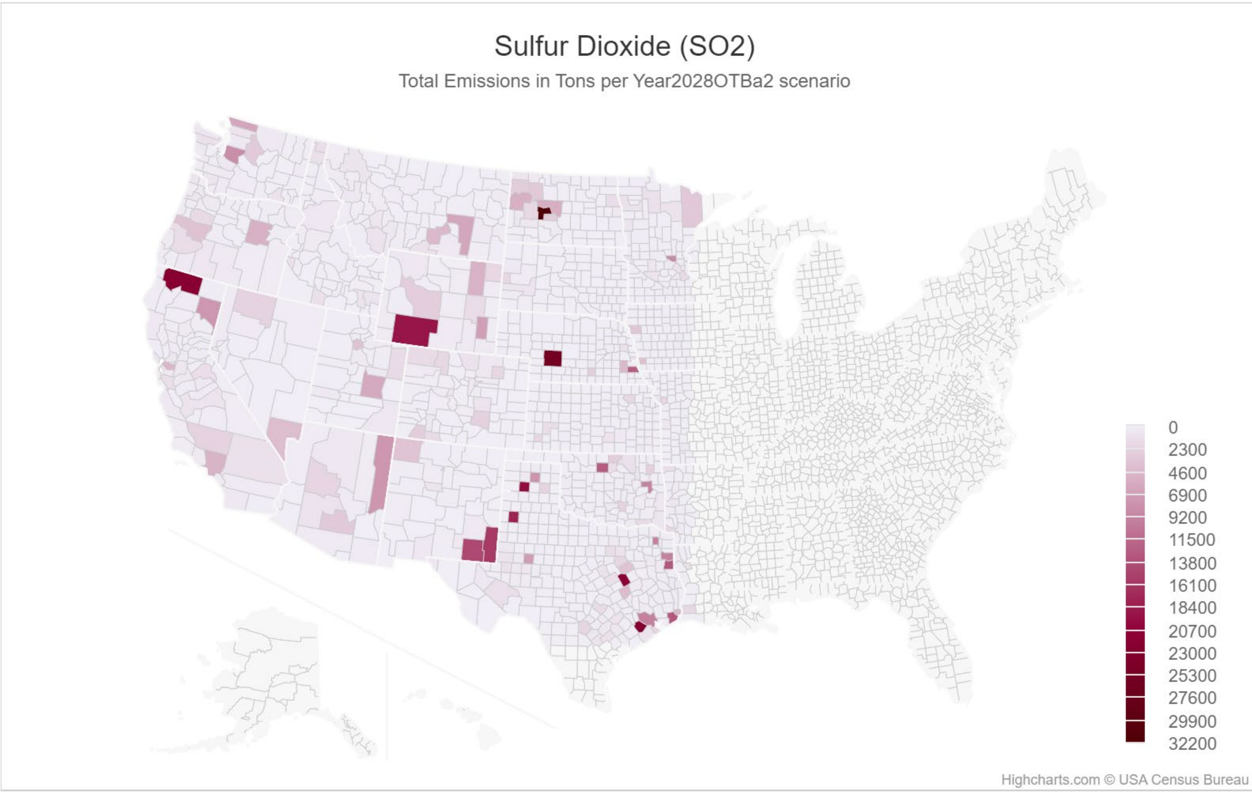


Figure 3-9, shows SO_2 emissions by county, indicating that Nevada's counties that emit the most SO_2 emissions are Clark County, including the Las Vegas metropolitan area, and Humboldt County, where some of Nevada's largest EGUs and industrial sources are located.

FIGURE 3-9

SULFUR DIOXIDE EMISSIONS BY COUNTY FOR 2028



3.8.2 Nevada NO_X Emission Inventory for 2014 and 2028

NO_x is generated during any combustion process where nitrogen and oxygen from the atmosphere combine together under high temperature to form nitric oxide and to a lesser degree nitrogen dioxide and in much smaller amounts, other odd oxides of nitrogen. These particles have a slightly greater impact on visibility than do sulfate particles and are four to eight times more effective at scattering light than mineral dust particles. These compounds can scatter the transmission of light, contributing to visibility reduction on a regional scale.

Point sources in Nevada contribute 8 percent of the total NO_x emissions from the RepBase2 inventory and are projected to contribute 11 percent of the overall inventory for 2028OTBa2. NOx emissions from EGU sources are expected to decrease, while NOx emissions from the Non-EGU and industrial sources remain the same.

Overall, NO_x emissions in Nevada are expected to decline by 29 percent, primarily due to significant reductions in emissions from non-road mobile sources (54 percent net decrease), on-road mobile sources (74% decrease), and rail (43% decrease) primarily due to new federal vehicle and locomotive emission standards. This equates to a 43,710 ton decrease in NO_x emissions from mobile and locomotive sources. Figure 3-10 and Table 3-5 show the breakdown of NO_x emissions by source category for 2014 and 2028.

FIGURE 3-10

NEVADA NO_x EMISSION INVENTORY – 2014 AND 2028

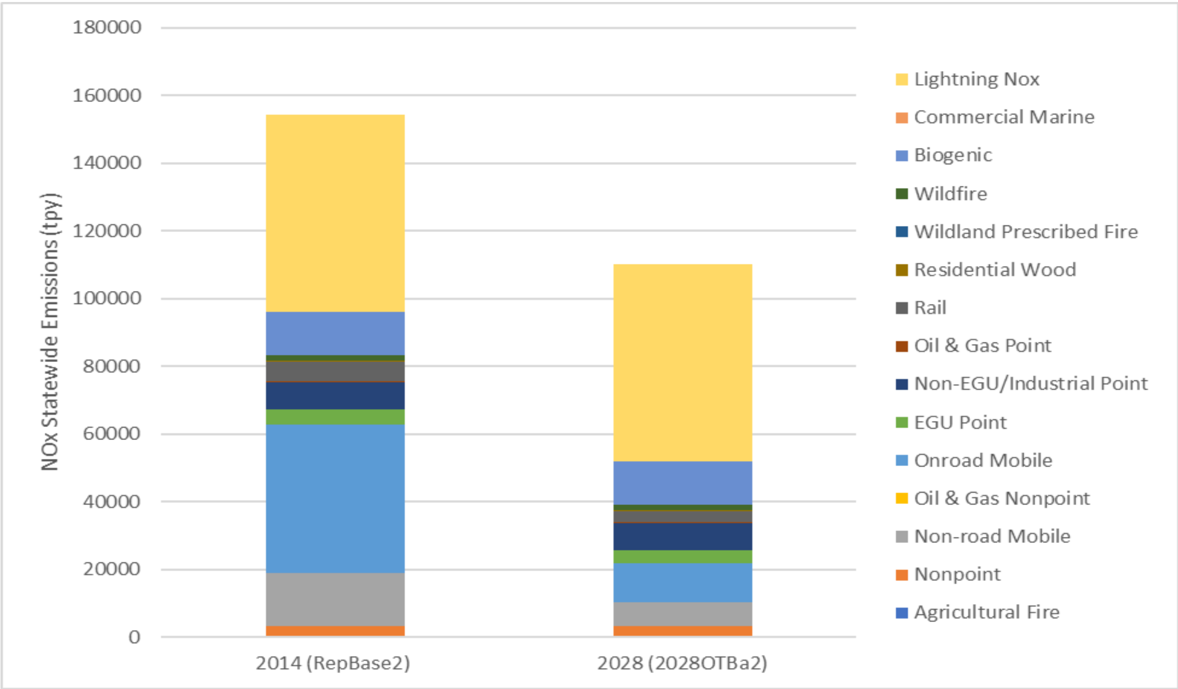


TABLE 3-5

NEVADA NO_x EMISSIONS BY SOURCE CATEGORY FOR 2014 AND 2028

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Agricultural Fire	5	11	5	0%
Biogenic	12613	38548	12613	0%
Commercial Marine	29	0	16	-45%
Lightning Nox	58480	0	58480	0%
Nonpoint	3297	9677	3296	0%
Non-road Mobile	15468	14589	7094	-54%
Oil & Gas Nonpoint	3	2	3	0%
Onroad Mobile	44155	28507	11282	-74%
EGU Point	4310	3162	3869	-10%
Non-EGU/Industrial Point	8129	8850	8129	0%
Oil & Gas Point	215	195	215	0%
Rail	5768	4353	3305	-43%
Residential Wood	181	183	181	0%
Wildland Prescribed Fire	91	59	91	0%

Wildfire	1754	4875	1754	0%
Total	154498	113011	110333	-29%

Figure 3-11, "Regional Maps of NOx Emissions for 2028," shows that Nevada, with 110,334 tpy statewide, is not a significant contributor to NOx emissions in the West compared to other states.

FIGURE 3-11

REGIONAL MAP OF NO_x EMISSIONS FOR 2028

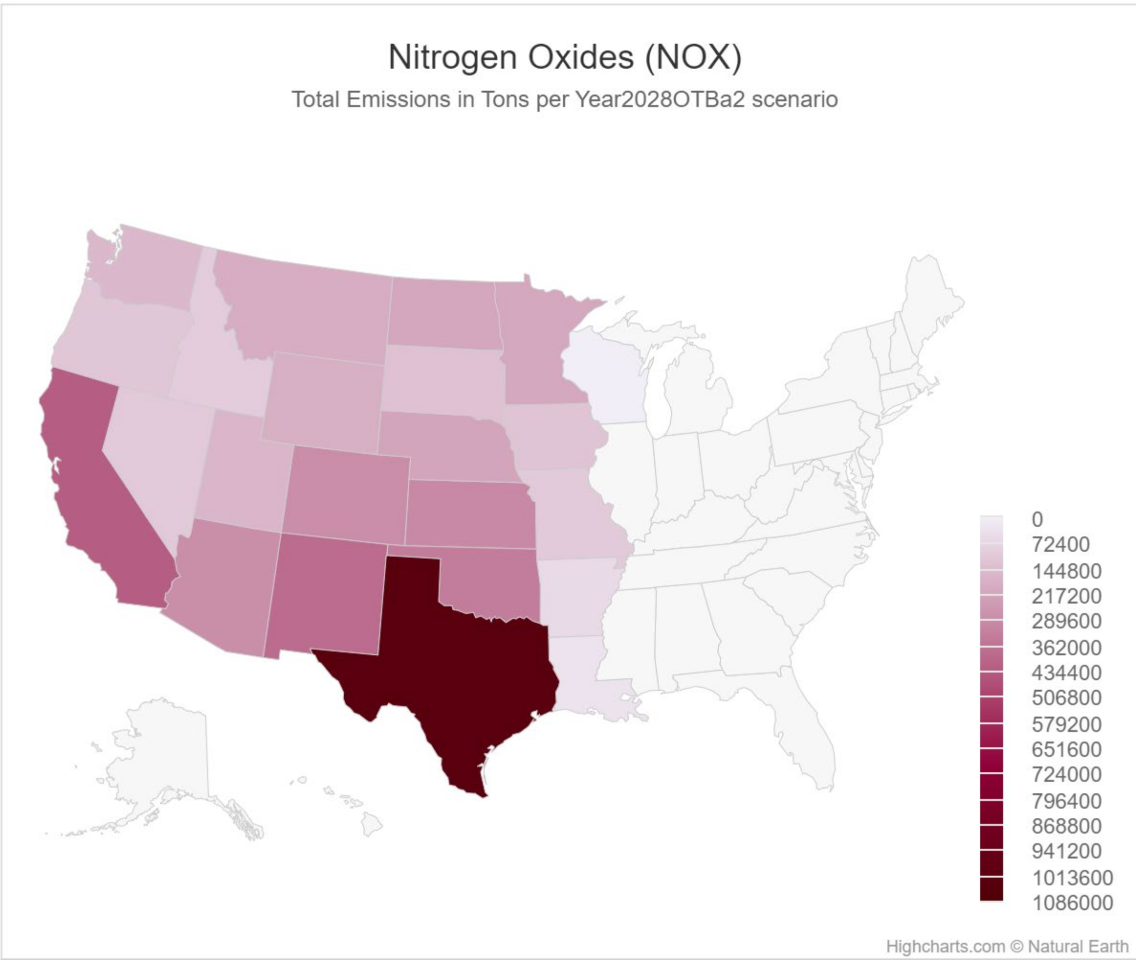
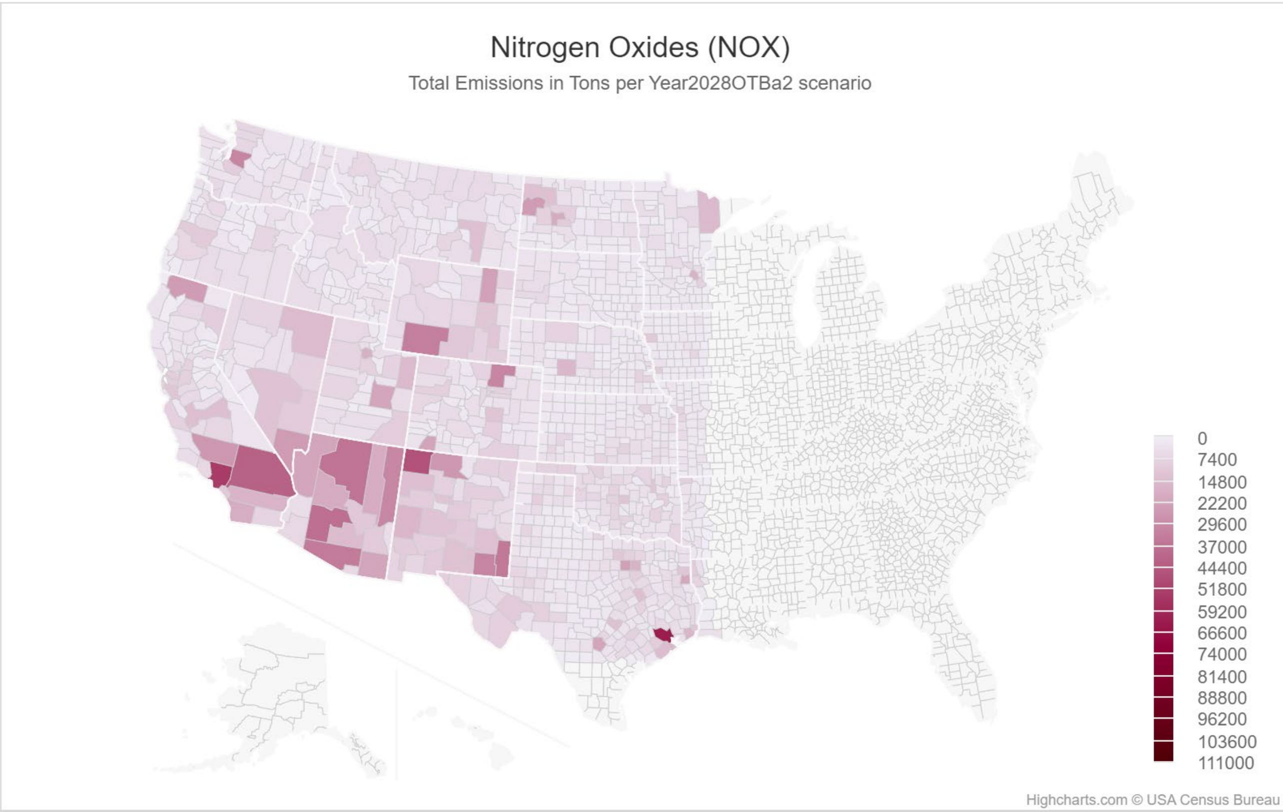


Figure 3-12, shows NOx emissions by county, indicating that Nevada's counties that emit the most NOx emissions are Clark County, emitting roughly 25,000 tpy NOx, and Elko county, emitting roughly 15,000 tpy. This is primarily due to the industrial facilities that are located in these counties.

FIGURE 3-12

NITROGEN OXIDES EMISSIONS BY COUNTY FOR 2028



3.8.3 Nevada VOC Emission Inventory for 2014 and 2028

VOCs are emitted as gases from certain solids or liquids. VOCs are emitted by a wide array of products numbering in the thousands. Examples include paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, craft materials including glues and adhesives, permanent markers and photographic solutions (https://www.epa.gov/indoor-air-quality-iaq/what-are-volatile-organic-compounds-vocs). Automobiles, industrial and commercial facilities, and refueling of automobiles all contribute to VOC loading in the atmosphere. Substantial natural emissions of VOCs come from vegetation; these emissions are categorized as biogenics. VOCs can directly impact visibility as emissions condense in the atmosphere to form an aerosol. Of more significance is the role VOCs play in the photochemical production of ozone in the troposphere. VOCs react with nitrogen oxides to produce nitrated organic particles that impact visibility in the same series of chemical events that lead to ozone. Thus, strategies to reduce ozone in the atmosphere often lead to visibility improvements. VOCs in Nevada are expected to decrease slightly (less than 1 percent) by 2028.

Figure 3-13 and Table 3-6 show the overall net zero percent change in emissions from 2014 to

2028 for VOCs. Biogenic sources, primarily from terpenes, dominate VOC emissions at approximately 90 percent for both 2014 and 2028. Overall, VOC emissions in Nevada are expected to decline, primarily due to significant reductions in emissions from non-road mobile sources (20 percent net decrease), on-road mobile sources (60 percent decrease), and rail (53 percent decrease) primarily due to new federal vehicle and locomotive emission standards. This equates to a 14,641 ton decrease in VOC emissions from mobile and locomotive sources.

FIGURE 3-13

NEVADA VOC EMISSION INVENTORY – 2014 AND 2028

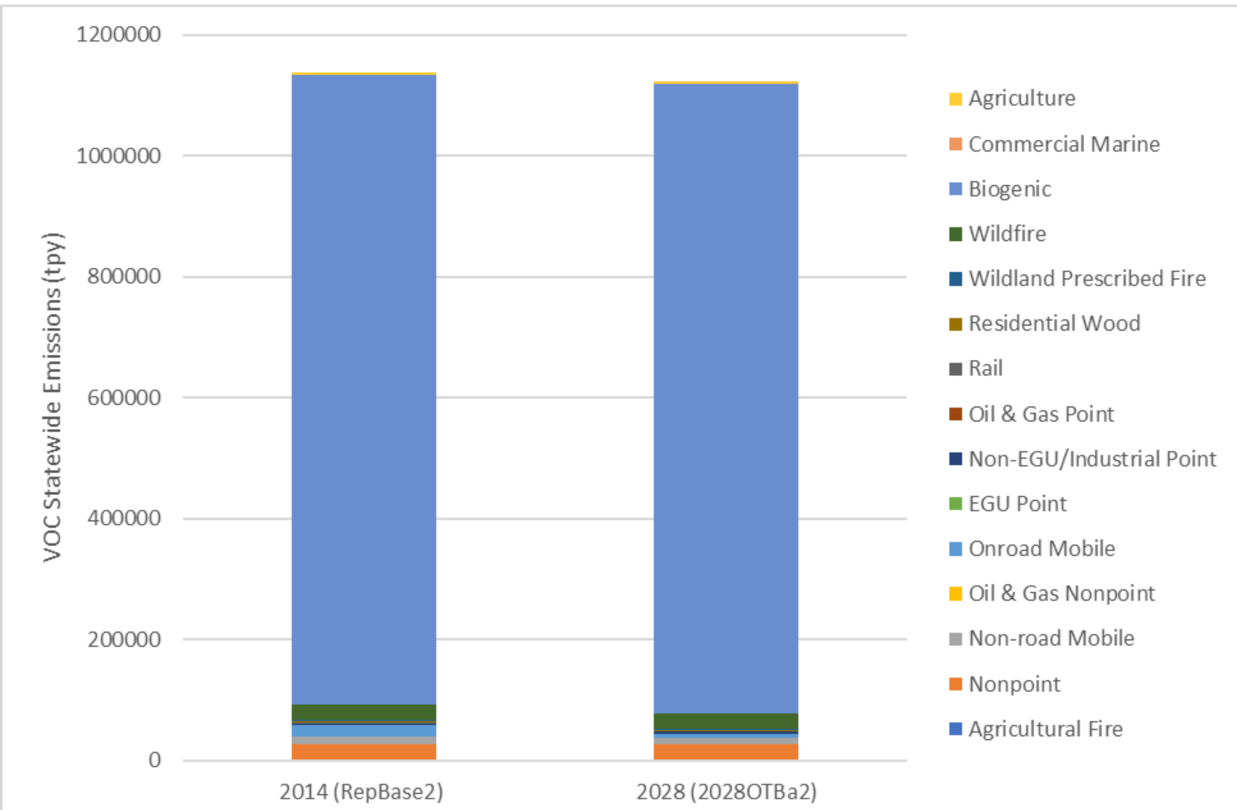


TABLE 3-6

NEVADA VOC EMISSIONS BY SOURCE CATEGORY FOR 2002 AND 2018

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Agriculture	3839	1390	3811	-1%
Agricultural Fire	8	47	8	0%
Biogenic	1041460	343041	1041460	0%
Commercial Marine	2	0	2	0%
Nonpoint	27641	32960	27650	0%

Non-road Mobile	10999	10135	8814	-20%
Oil & Gas Nonpoint	199	149	199	0%
Onroad Mobile	20353	16101	8055	-60%
EGU Point	106	454	102	-4%
Non-EGU/Industrial Point	2232	3013	2230	0%
Oil & Gas Point	54	32	54	0%
Rail	299	205	141	-53%
Residential Wood	2656	3811	2655	0%
Wildland Prescribed Fire	2951	838	2951	0%
Wildfire	25760	48005	25760	0%
Total	1138559	460181	1123892	-1%

Figure 3-14, shows relative contributions to VOC emissions among the western states. Nevada, although not the highest emitting western states, still emits a significant estimate of 1,123,892 tpy VOC for 2028 projections.

FIGURE 3-14

<u>REGIONAL MAP OF VOC EMISSIONS FOR 2028</u>

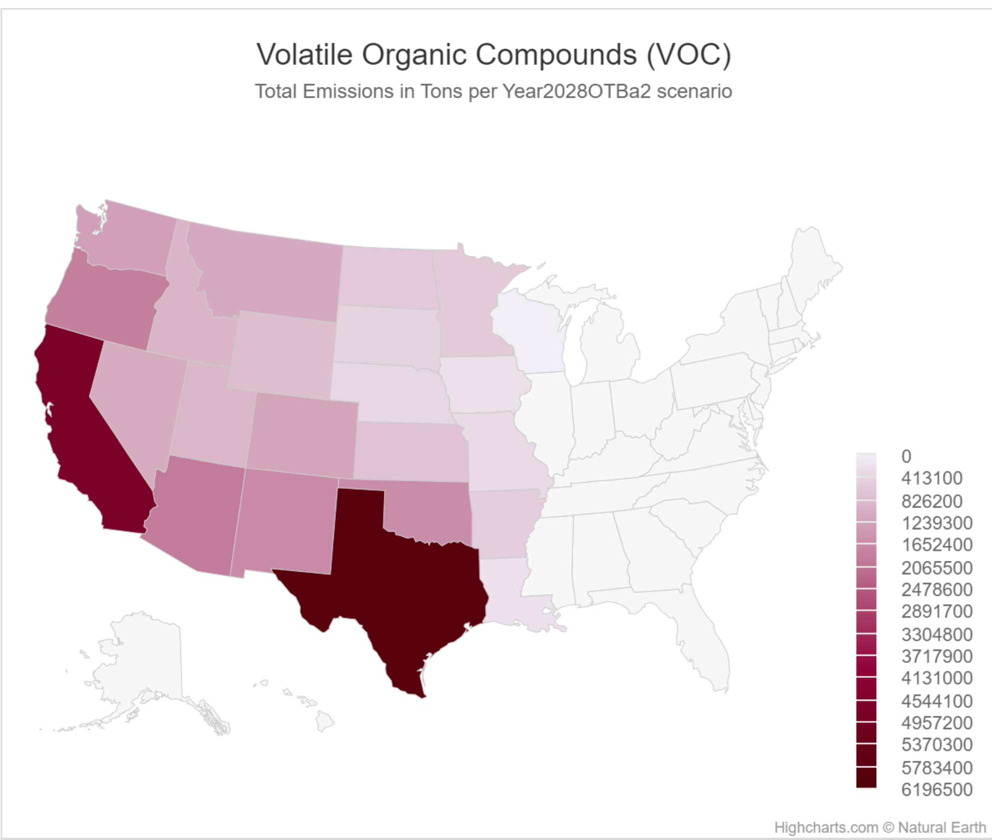
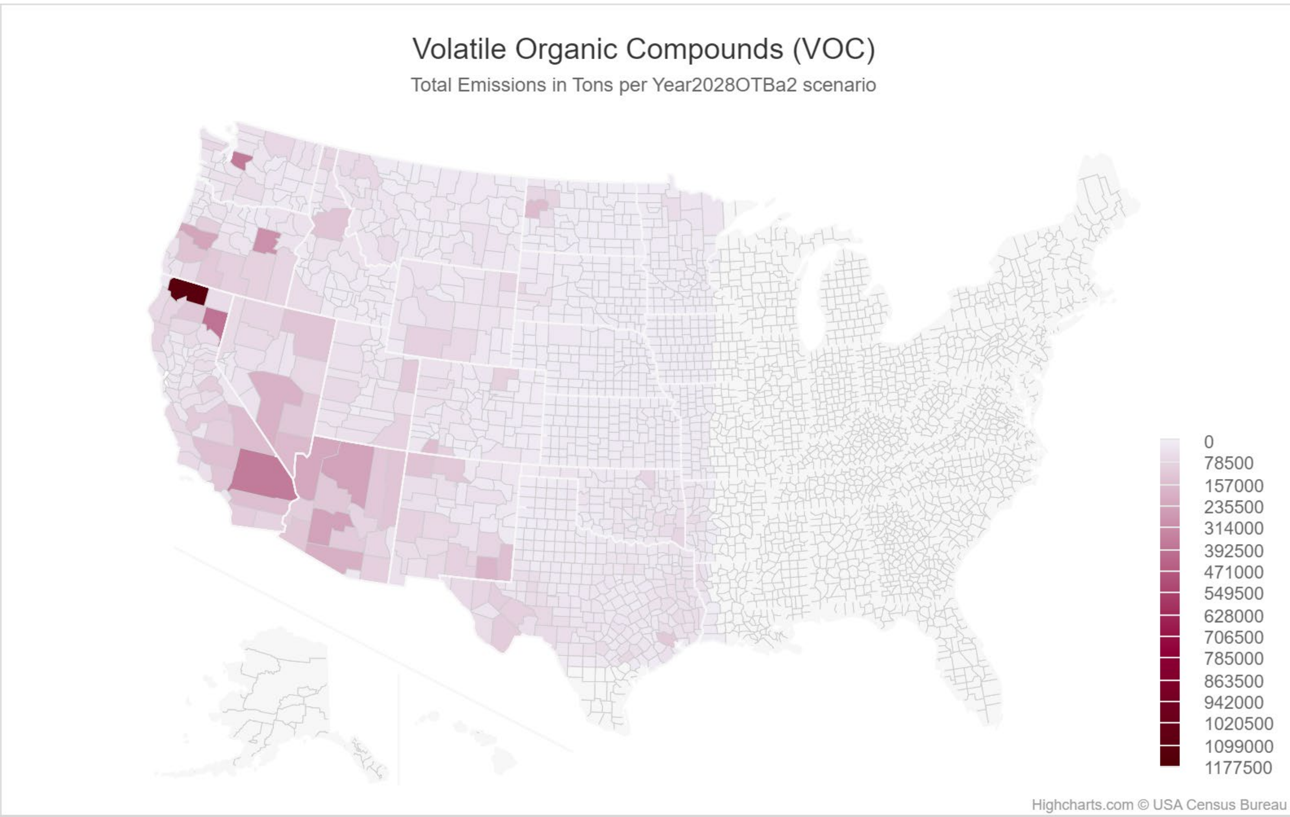


Figure 3-15 shows VOC emissions by county. Biogenic sources dominate the VOC emissions for all counties in Nevada. Biogenic and natural fire emissions were held constant for the 2028 projections.

FIGURE 3-15

VOLATILE ORGANIC COMPOUNDS EMISSIONS BY COUNTY FOR 2028



3.8.4 Nevada PM 2.5 Emission Inventory for 2014 and 2028

PM fine emissions are comprised of fine particulates under 2.5 microns that are generated mostly from area sources, road dust and fugitive dust, as observed at the Jarbidge Wilderness area. PM fine emissions are largely related to agricultural and mining activities, windblown dust from construction areas, and emissions from unpaved and paved roads. PM fine emissions are also generated from combustion sources. A particle of fine dust has a relative impact on visibility one-tenth as great as a particle of elemental carbon. For any given visibility event where poor visual air quality is present in a scene, the impact of dust can vary widely. Agricultural activities, dust from unpaved roads and construction are prevalent in this source category and changes in emissions are tied to population and vehicle miles traveled. Since PM fine emissions are not directly from the tailpipe of the vehicle, the mobile source categories do not show any fine particulates emissions; all vehicle-related emissions from paved and unpaved roads show up in the fugitive dust category. Fine particulate matter can remain suspended in the atmosphere for long periods of time and travel long distances. Fine particulates can efficiently scatter the transmission of light that contributes to visibility reduction on a regional scale at Class I areas. For 2028 projected emissions windblown dust was held constant.

In Figure 3-16 and Table 3-7, the projected statewide PM fine emission net decrease is 4 percent and is largely dominated by fugitive dust (expected to slightly increase) and wildfire (held constant for 2028 projections). Overall, VOC emissions in Nevada are expected to decline, primarily due to significant reductions in emissions from non-road mobile sources (49 percent net decrease), on-road mobile sources (53 percent decrease), and rail (49 percent decrease) primarily due to new federal vehicle and locomotive emission standards. This equates to a 1,530 ton decrease in $PM_{2.5}$ emissions from mobile and locomotive sources. A slight decrease in $PM_{2.5}$ emissions is also expected among Non-EGU or industrial point sources.

FIGURE 3-16

PM 2.5 (PM FINE) EMISSION INVENTORY – 2014 AND 2028

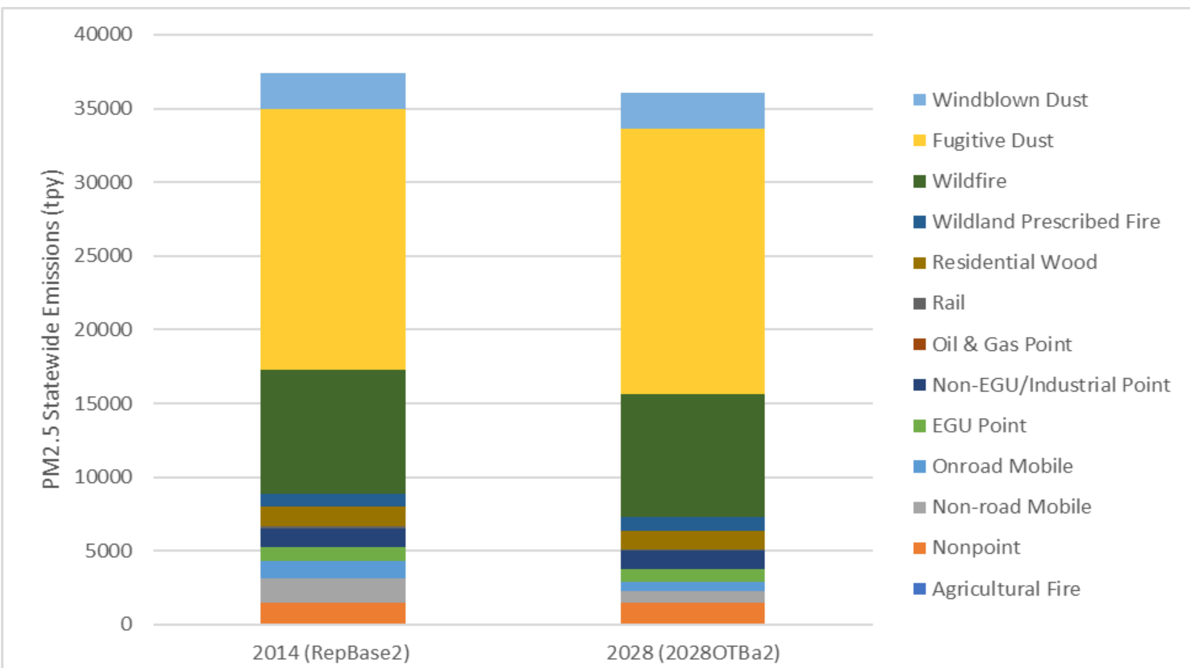


TABLE 3-7

PM 2.5 (PM FINE) EMISSIONS BY SOURCE CATEGORY FOR 2014 AND 2028

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Fugitive Dust	17719	17898	18016	2%
Agricultural Fire	23	46	23	0%

Nonpoint	1440	2394	1440	0%
Non-road Mobile	1625	1561	825	-49%
Onroad Mobile	1227	823	581	-53%
EGU Point	901	860	901	0%
Non-EGU/Industrial Point	1303	1995	1210	-7%
Oil & Gas Point	13	14	13	0%
Rail	170	125	86	-49%
Residential Wood	1300	1339	1299	0%
Wildland Prescribed Fire	898	314	898	0%
Windblown Dust	2416	0	2416	0%
Wildfire	8344	18938	8344	0%
Total	37379	46307	36052	-4%

Figure 3-17, "Regional Maps of $PM_{2.5}$ Emissions for 2028," shows that Nevada, with 36,000 tpy statewide, is not a significant contributor to $PM_{2.5}$ emissions in the West compared to other states.

FIGURE 3-17

REGIONAL MAP OF PM 2.5 EMISSIONS FOR 2028

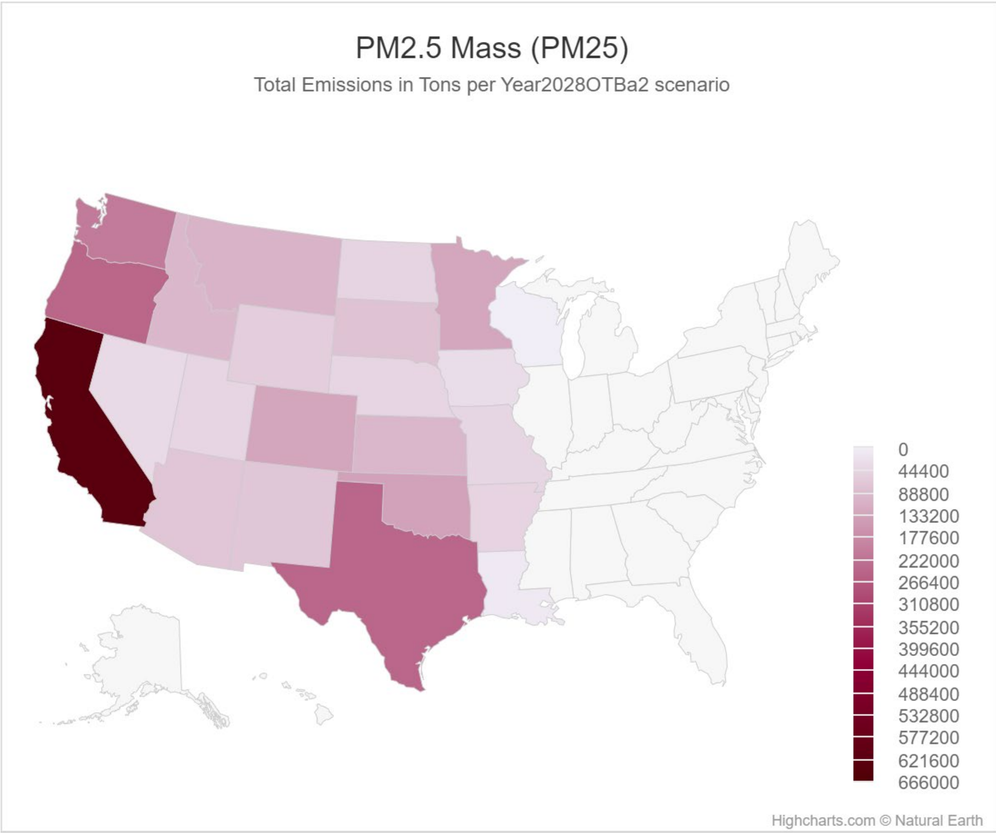
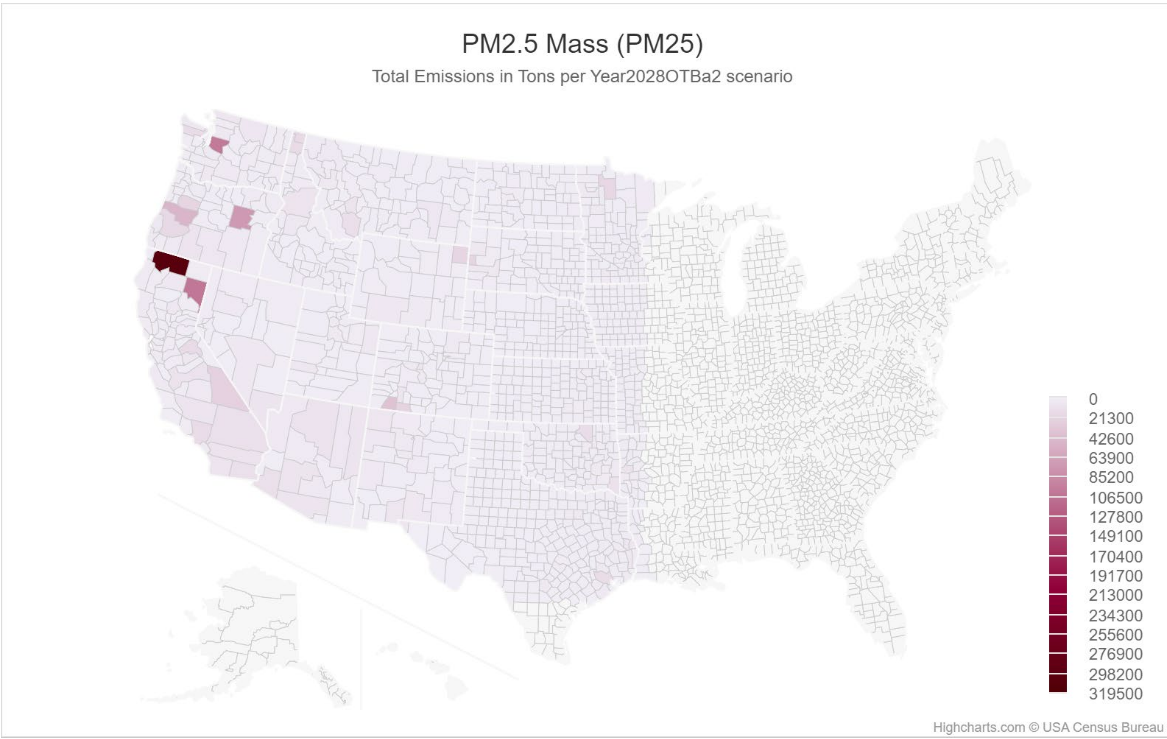


Figure 3-18 shows $PM_{2.5}$ emissions by county, indicating that none of Nevada's counties are a significant emitter of $PM_{2.5}$.

FIGURE 3-18

PM 2.5 EMISSIONS BY COUNTY FOR 2028



3.8.5 Nevada PM 10 Emission Inventory for 2014 and 2028

PM coarse emissions are closely related to the same sources as PM fine emissions but other activities like rock crushing and processing, material transfer, open pit mining and unpaved road emissions can be prominent sources. PM coarse emissions travel shorter distances in the atmosphere than other smaller particles but can remain in the atmosphere sufficiently long enough to play a role in regional haze. PM coarse emissions have the smallest direct impact on regional haze on a particle-by-particle basis where one particle of coarse mass has a relative visibility weight of 0.6 compared to a carbon particle having a weight of 10. Nevertheless, they are commonly present at all monitoring sites and are a greater contributor to regional haze than the PM fine component.

Figure 3-19 and Table 3-8 show the overall net decrease in PM coarse emissions of 0 percent, as the largest sources sectors of PM10 emissions were held constant. Large sectors that were held constant, or nearly constant, include fugitive dust, windblown dust, and wildfire emissions. NDEP considers these estimations very conservative, as the impacts of climate change and drier climate conditions in Nevada will likely lead to increases in windblown dust and wildfire emissions over future years. Although PM coarse emissions from fugitive dust decrease by 2 percent by 2028, fugitive dust is still the primary source category for these emissions. Fugitive dust is also projected to be the largest contributor to PM coarse emissions in 2028 at almost 80 percent of total statewide emissions.

FIGURE 3-19

PM 10 (PM COARSE) EMISSION INVENTORY – 2014 AND 2028

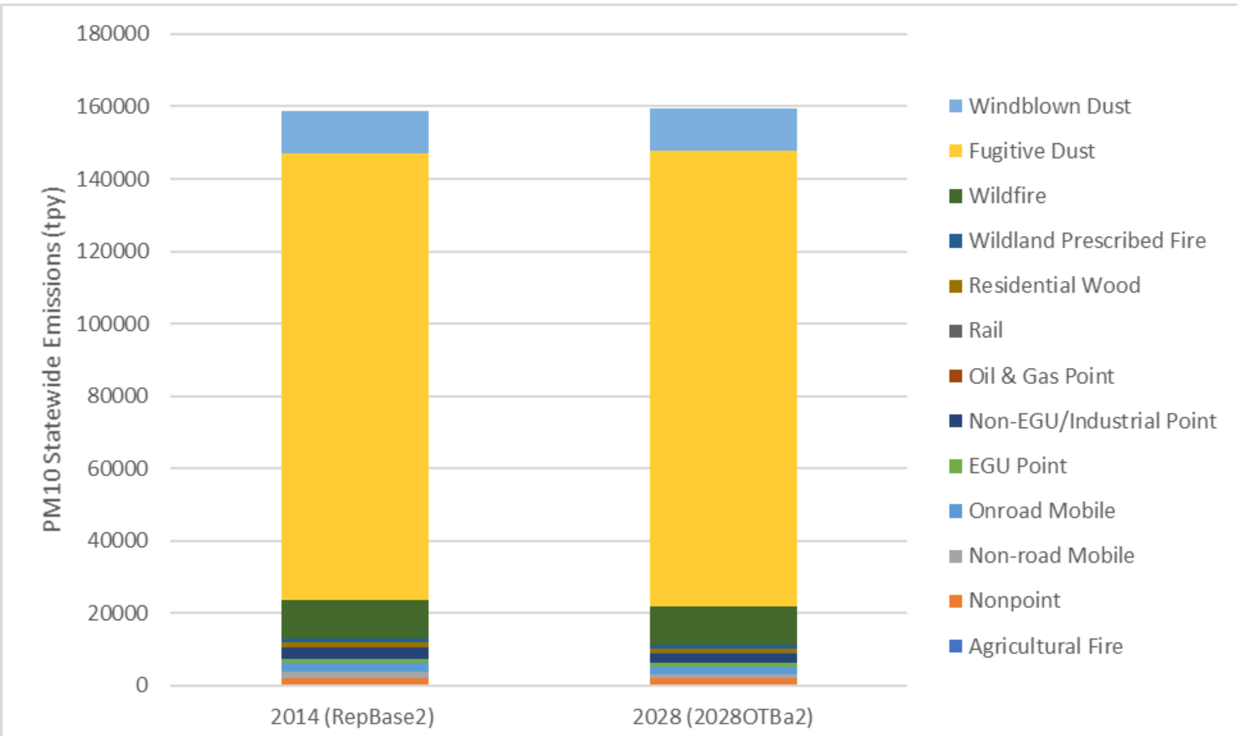


TABLE 3-8

PM 10 (PM COARSE) EMISSIONS BY SOURCE CATEGORY FOR 2014 AND 2028

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Fugitive Dust	123476	134709	125666	2%
Agricultural Fire	32	66	32	0%
Nonpoint	2025	2742	2025	0%
Non-road Mobile	1704	1636	878	-48%
Onroad Mobile	2477	1811	2157	-13%
EGU Point	1211	907	1034	-15%

Non-EGU/Industrial Point	3011	3540	2735	-9%
Oil & Gas Point	13	14	13	0%
Rail	184	129	88	-52%
Residential Wood	1303	1343	1303	0%
Wildland Prescribed Fire	1046	370	1046	0%
Windblown Dust	11685	0	11685	0%
Wildfire	10641	22347	10641	0%
Total	158808	169614	159303	0%

Figure 3-20 shows relative contributions to PM 10 emissions among the western states. Nevada, although not the highest emitting western states, still emits a significant estimate of roughly 160,000 tpy PM 10 for 2028 projections.

FIGURE 3-20

REGIONAL MAP OF PM 10 EMISSIONS FOR 2028

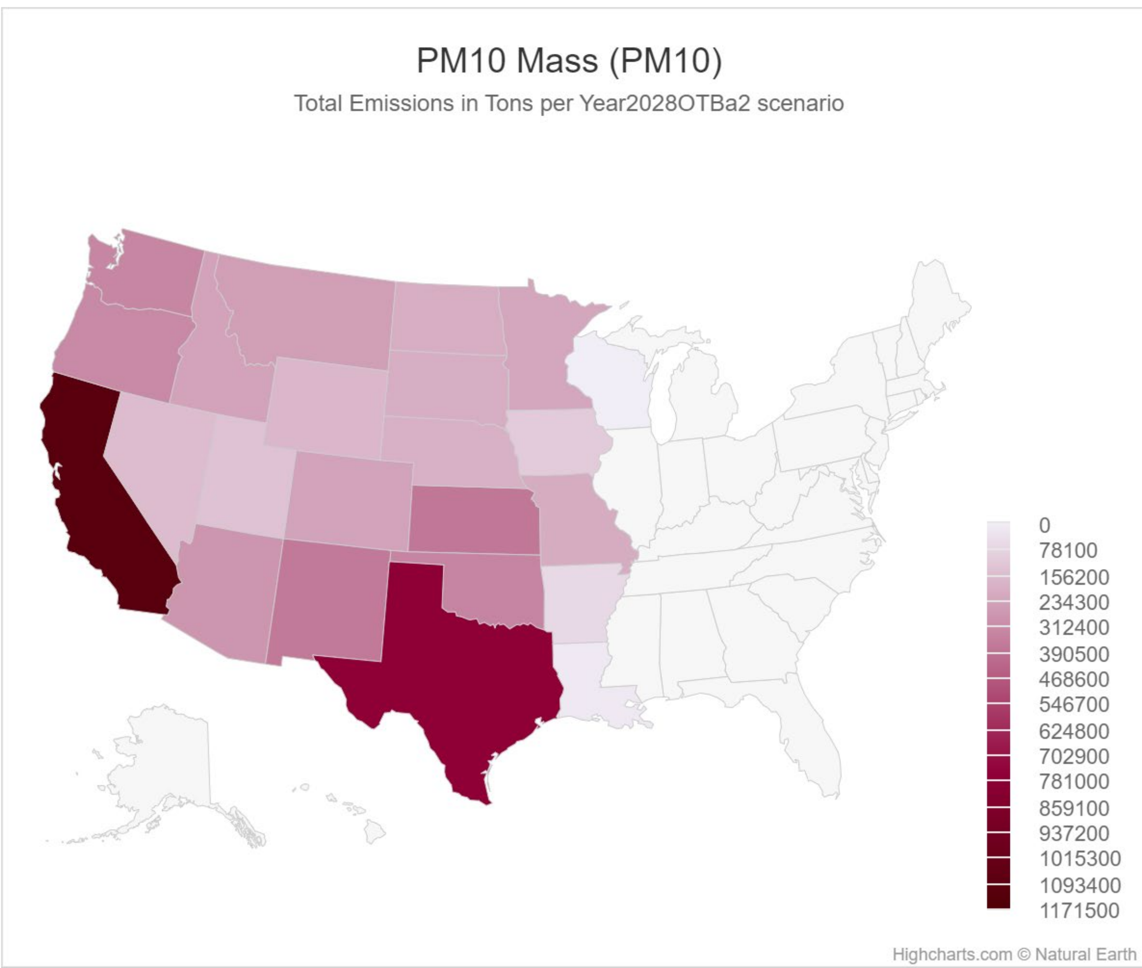
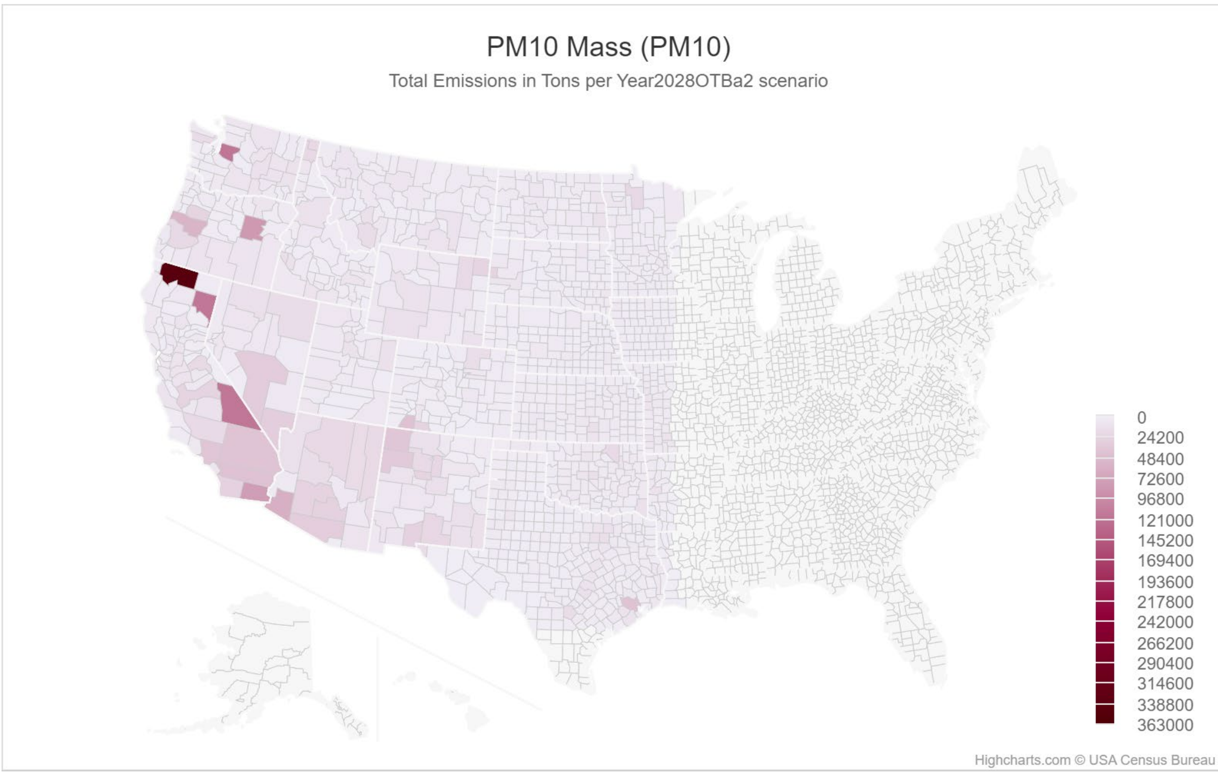


Figure 3-21, shows PM_{10} emissions by county, indicating that Nevada's counties that emit the most PM_{10} emissions are Clark County and Nye County, both emitting roughly 30,000 tpy.

FIGURE 3-21

PM 10 EMISSIONS BY COUNTY FOR 2028



3.8.6 Nevada NH_3 Emission Inventory for 2014 and 2028

NH_3 emissions come from a variety of sources including wastewater treatment facilities, livestock operations, fertilizer applications and mobile sources. NH_3 is directly linked to the production of ammonium nitrate and ammonium sulfate particles in the atmosphere when SO_2 and NO_x eventually convert over to these forms of particles. Increases in NH_3 emissions from the base case year to 2018 are linked to population statistics and increased vehicular traffic.

An EPA report "Estimating Ammonia Emissions from Anthropogenic Non-Agricultural Sources – Draft Final Report April 2004" documents that NH_3 measurements vary substantially by vehicle class in on-road mobile sources. Fleet-average NH_3 emissions are thought to be increasing as advanced catalyst-equipped vehicles make up a larger fraction of the fleet. Advanced catalysts have higher NH_3 emission rates stemming from an over-reduction of NO_x to NH_3.

Non-road mobile sources include exhaust emissions from a wide range of non-road engines. These include construction equipment, agricultural equipment, lawn and garden equipment, commercial and recreational marine vessels and locomotives. Non-road gasoline engines typically are not equipped with catalysts.

Figure 3-22 and Table 3-9, show an overall net decrease of NH_3 emissions of 1 percent. NH_3 emissions are dominated by agriculture emissions, accounting for over 80 percent of total statewide emissions. On-road mobile NH_3 emissions are projected to slightly decrease.

FIGURE 3-22

NEVADA NH_3 EMISSION INVENTORY – 2014 AND 2028

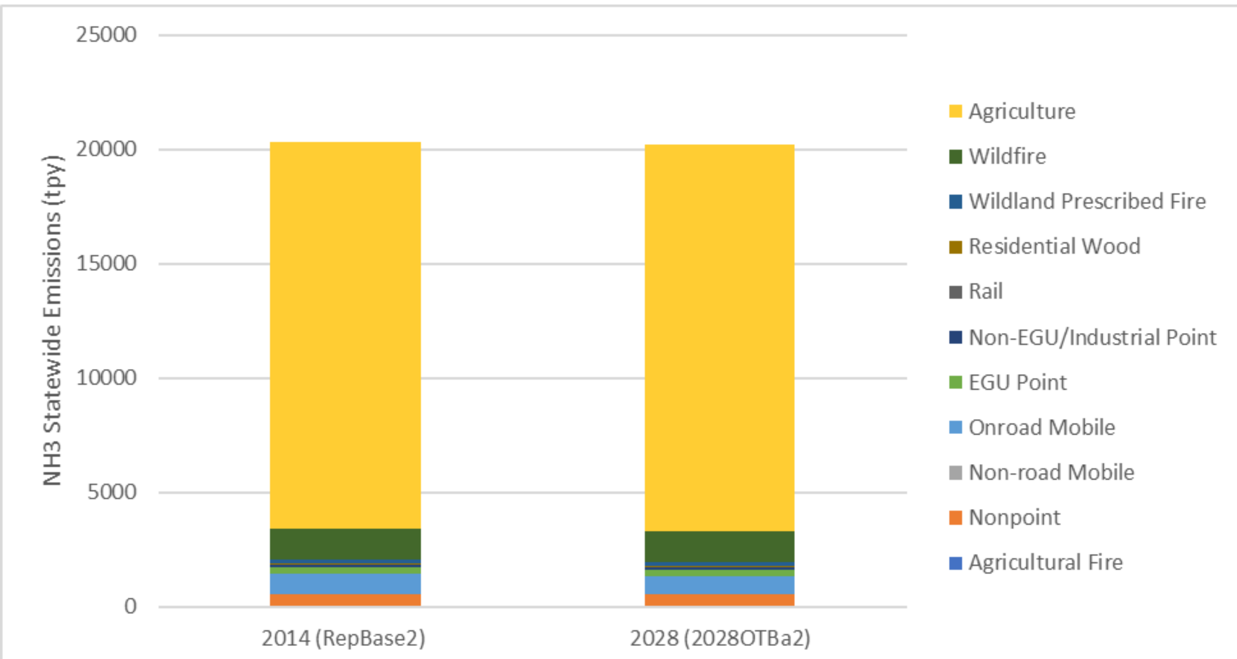


TABLE 3-9

NEVADA NH_3 EMISSIONS BY SOURCE CATEGORY FOR 2014 AND 2028

Source Category	2014 (RepBase2)	2017 (NEI)	2028 (2028OTBa2)	Net Change
Agriculture	16908	29306	16893	0%
Agricultural Fire	16	43	16	0%
Nonpoint	513	561	519	1%
Non-road Mobile	26	28	31	19%
Onroad Mobile	893	844	770	-14%
EGU Point	298	425	298	0%
Non-EGU/Industrial Point	100	65	100	0%
Rail	3	3	3	0%

Residential Wood	51	48	51	0%
Wildland Prescribed Fire	148	58	148	0%
Wildfire	1380	3339	1380	0%
Total	20336	34720	20209	-1%

Figure 3-23, "Regional Maps of NH_3 Emissions for 2028," shows that Nevada, with 20,000 tpy statewide, is not a significant contributor to NH_3 emissions in the West compared to other states.

FIGURE 3-23

<u>REGIONAL MAP OF NH_3 EMISSIONS FOR 2028</u>

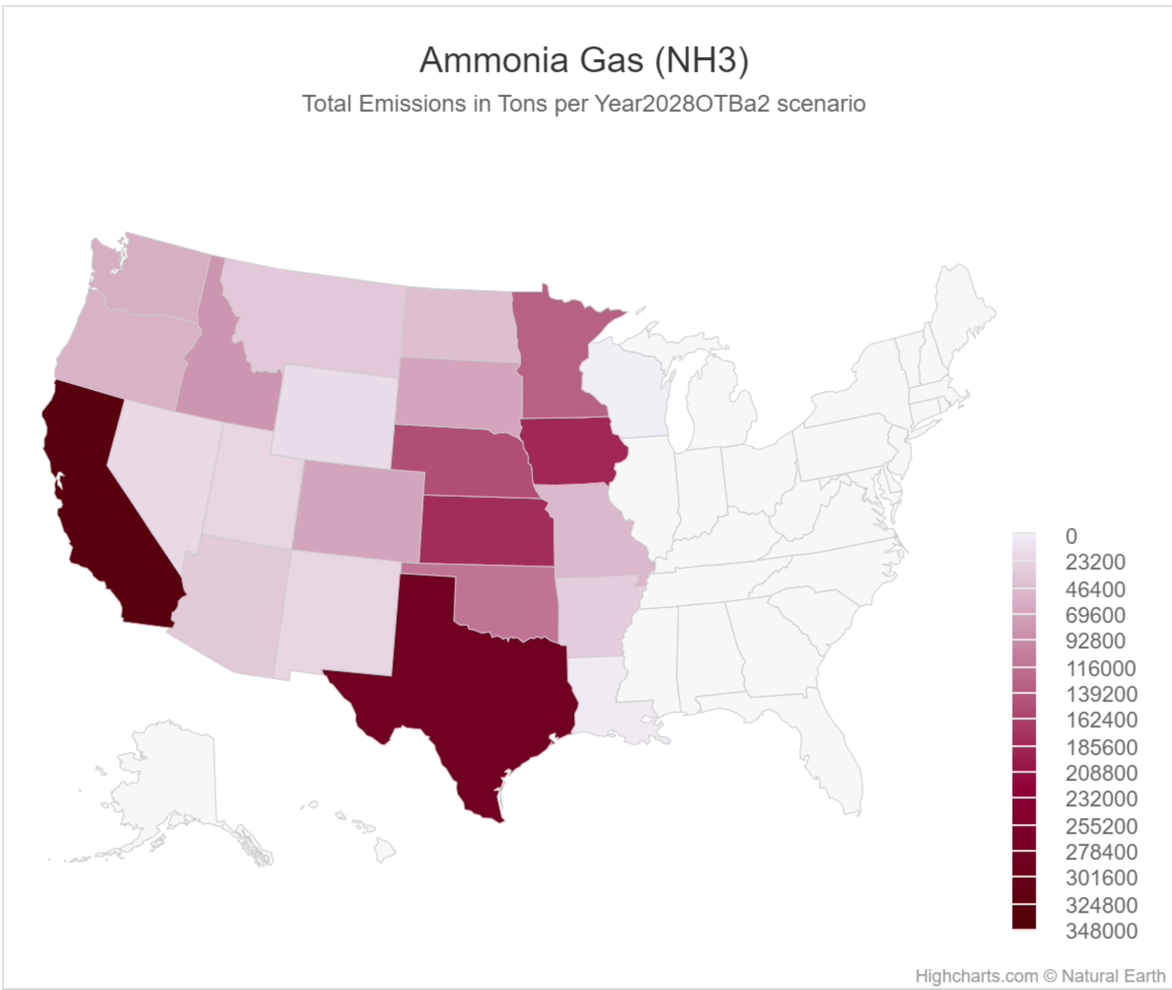
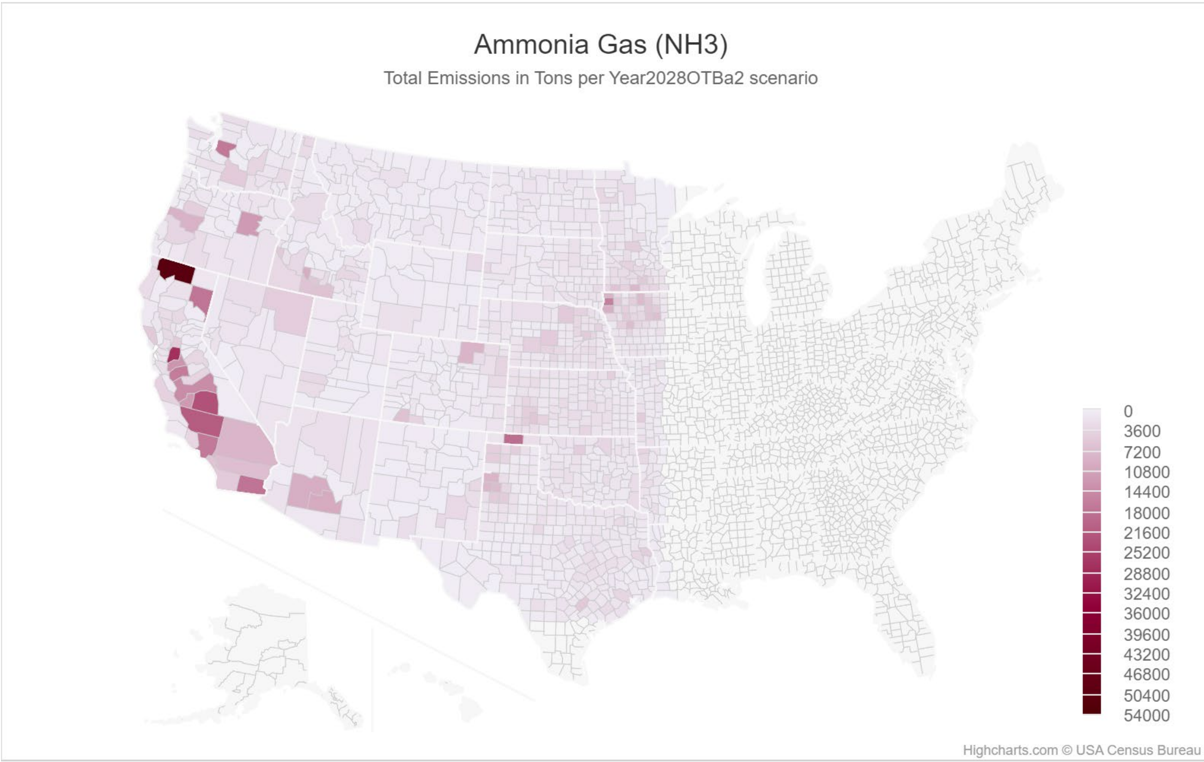


Figure 3-24 shows that Elko County is the highest emitter of NH_3 in Nevada, with roughly 4,000 tpy. Elko, being one of Nevada's more rural counties, has more emissions due to agriculture.

FIGURE 3-24

AMMONIA EMISSIONS BY COUNTY FOR 2028



3.9 SUMMARY OF 2028 EMISSION PROJECTIONS

Analysis of the IMPROVE monitoring network data demonstrates the following pollutants, ranked according to percent contribution to annual extinction (see Table 2-6), contribute to reconstructed light extinction at JARB1 for the 20 percent most impaired days of the baseline period.

- SO_4
- OMC
- CM
- NO_3
- EC
- Fine Soil
- Sea Salt

The emissions analysis is part of the technical basis for identifying Nevada's reasonable progress goal. At the beginning of this section, Table 3-2 summarizes the contribution from natural vs. anthropogenic sources for each pollutant in 2014 and 2028. It shows that approximately three quarters (73 percent) of emissions in 2028 are expected to be from natural sources and, therefore, uncontrollable. Table 3-10 shows percent contribution from anthropogenic sources and dominant source categories for each pollutant in 2028. The "Total Emissions from All Source Categories" column includes natural emissions and puts the contribution from each pollutant into perspective with respect to other visibility impairing pollutants in Nevada.

TABLE 3-10

PREDOMINANT SOURCES OF POLLUTANTS IN 2028

Pollutant	Total Emissions from All Source Categories in tpy *(percent of total)*	Percent from Anthropogenic Sources	Predominant Source and Percent from Predominant Source		Controllable
VOC	1,123,892 *(77)*	5	Biogenic	92	No
PM_{10}	159,618 *(11)*	86	Fugitive Dust	79	Yes
NO_x	110,334 *(8)*	34	Lightning NOx	53	No
			Biogenic	11	No
			Onroad Mobile	10	Yes
$PM_{2.5}$	36,144 *(2)*	70	Fugitive Dust	50	Yes
			Wildfire	23	No
NH_3	20,210 *(1)*	93	Agriculture	83	Yes
SO_2	8,260 *(<1)*	92	Nonpoint/Area	42	Yes
			EGU Point	31	Yes
			Non-EGU Point	16	Yes

In Nevada, anthropogenic sources are important contributors of SO_2, PM_{10}, $PM_{2.5}$, and NH_3 in 2028. SO_2 emissions are predominantly from nonpoint sources, 42 percent; point sources contribute 47 percent. PM_{10} emissions are predominantly from fugitive dust at 79 percent and $PM_{2.5}$ emissions are also predominantly from fugitive dust at 50 percent, along with wildfire at 23 percent. NH_3 emissions are predominantly from agriculture, at 83 percent.

VOC and NOx emissions are dominated by natural source categories, and primarily are not controllable for those sources. VOC emissions are largely dominated by biogenic at 92 percent. NO_x emissions are predominantly from lightning NOx, approximately 50 percent, while biogenic emissions account for 11 percent and mobile sources account for another 10 percent. The total projected emissions for all pollutants in 2028 are 1,458,458 tons and of that total, only 19 percent are controllable.

3.10 REFERENCES

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Four – Visibility and Source Apportionment Modeling

4.1 INTRODUCTION

Federal visibility regulations at 40 CFR 51.308(f)(2)(iii) require that states document the technical basis, including modeling, on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress in each mandatory Class I Federal area it affects. Air quality modeling analyses were performed to determine which Class I areas are affected by emissions from Nevada and to evaluate reasonable progress, as discussed in Chapter One. The Western Regional Air Partnership's (WRAP) Emissions Inventory and Modeling Protocols Subcommittee (EIMP), along with its contractor, Ramboll Inc., performed these modeling analyses for the WRAP states, including Nevada.

Visibility modeling results indicate that the Jarbidge Wilderness Area (Jarbidge WA) will meet the Uniform Rate of Progress (URP) for 2028. Note that 2028 visibility projections from the 2028OTBa2 do not accurately reflect the final expected emission reductions as a result of reasonable progress controls, which are larger than what was predicted in the model. Nevada's RPG reflecting actual achieved emission reductions is developed in Chapter Six, using 2028OTBa2 visibility projections as a foundation with adjustments made for corrected emission reductions.

The modeling results and technical analyses also indicate Nevada sources do contribute to visibility impairment at the Jarbidge WA, as well as Class I areas located in adjacent states. The modeling also indicates that international and natural sources have the greatest impact on regional haze in Nevada.

The visibility and source apportionment modeling described in this chapter provides, in conjunction with the monitoring and emissions analyses, the technical basis used to identify and evaluate reasonable progress for the Jarbidge WA.

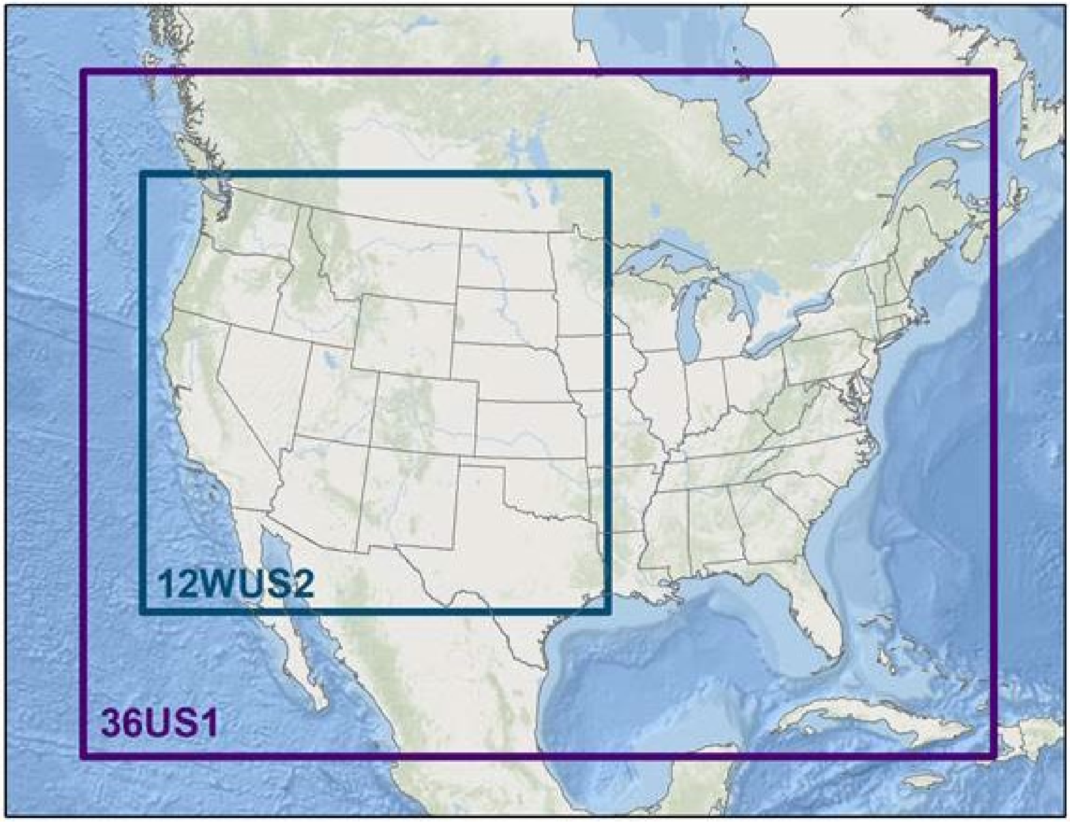
4.1.1 Air Quality Models

The WRAP-WAQS 2014 modeling platform was developed and performed by Ramboll, Inc., under contract to WESTAR-WRAP.[1] The 2014 modeling platform used the Weather Research and Forecasting (WRF) meteorological model, the Sparse Matrix Operator Kerner Emissions (SMOKE) model and the Comprehensive Air Quality Model with Extensions (CAMx) to project air quality for the 2014 base year. The Goddard Earth Observing System global chemical model (GEOS-Chem) provided global boundary conditions for the regional CAMx model for the 2014 base year. The CAMx 2014v2 final model configuration is defined in Table 1 of the WRAP-WAQS 2014 modeling platform webpage. CAMx version 7beta 6 was used for the 2014v2 model performance run, while CAMx version 7.0 was used for the subsequent model scenarios. Figure 1 below illustrates the CAMx 36-km modeling domain covering the Continental United States and the 12-km modeling domain covering the western states.

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

FIGURE 4-1

WRAP-WAQS 2014 MODELING DOMAINS



In addition to the 2014v2 model year, model runs were made using 2014 meteorology and with Representative Baseline (2014-2028, RepBase2), 2028 On the Books (2028OTBa2), 2028 Potential Additional Controls (2028PAC2), 2014 Hindcast, and Future Fire Sensitivities emission scenarios. Details are provided in model run specification sheets:

- Representative Baseline (RepBase2) and 2028 On the Books (2028OTBa2) CAMx simulations[2]
- Dynamic Evaluation – 2014 Simulations[3]
- Future Fire Sensitivity Simulations[4]

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2 https://views.cira.colostate.edu/docs/iwdw/platformdocs/WRAP_2014/EmissionsSpecifications_WRAP_RepBase2_and_2028OTBa2_RegionalHazeModelingScenarios_Sept30_2020.pdf

3 https://views.cira.colostate.edu/docs/iwdw/platformdocs/WRAP_2014/Run_Spec_WRAP_2014_Task3_Dynamic-Evaluation_v1.pdf

4 https://views.cira.colostate.edu/docs/iwdw/platformdocs/WRAP_2014/Run_Spec_WRAP_Future_Fire_Sensitivities_August4_2021_final.pdf

4.1.2 Model Performance Evaluation

The objective of the model performance evaluation was to compare model-simulated concentrations with observed data to determine whether the model's performance was sufficiently accurate to justify using the model for simulating future conditions, as discussed in Chapter One. The model was compared to ambient data for both particulate matter and gaseous species, for an annual time period and for a large number of sites. A summary of WRAP-WAQS 2014v2 CAMx Model Performance Evaluation is available by Ramboll Inc.[5]

The WRAP-WAQS 2014v2 modeling platform webpage includes statistical model performance measures compared to EPA goals and criteria, spatial data plots and timeseries plots for the aerosol species listed below. For aerosol species concentrations, CAMx 2014v2 model outputs are compared to 2014 observations from the IMPROVE, Chemical Speciation Network (CSN) and Clean Air Status and Trends (CASTNET) monitoring network.

- Ozone model performance is reported on the Intermountain West Data Warehouse.

CAMx 2014v2 performance was evaluated using the EPA Atmospheric Model Evaluation tool (AMET) to compare model outputs to 2014 ambient air quality measurements (in µg/m3) for:

- Particulate matter less than 2.5 micrometers
- Nitrate (NO_3)
- Sulfate (SO_4)
- Organic mass from carbon (OMC)
- Elemental carbon (EC)
- Fine soil (Soil)
- Coarse mass (particulate matter between 2.5 and 10 micrometers).
- Seasalt: performance is tracked separately for Sodium and Chloride

Spatial plots of the Normalized Mean bias statistic for the winter months January - March and Summer months July – September, for Nitrate and Sulfate, respectively, were provided for the WRAP State IMPROVE monitoring sites. IMPROVE sites are illustrated as circles, CSN sites as triangles, and CASTNET sites as squares. Nevada's Class I area, the Jarbidge Wilderness Area, is located along Nevada's northern border. In winter, Nitrates and Sulfates are overpredicted at Jarbidge, as shown in Figures 4-2 and 4-3. During the summer months, model performance is within 10 percent and are predicted accurately, as shown in Figures 4-4 and 4-5.

[5] http://vice.cira.colostate.edu/files/iwdw/platforms/WRAP_2014/MPE/WRAP-WAQS_2014v2_MPE_Summary.pdf

FIGURE 4-2

NORMALIZED MEAN BIAS FOR 2014v2 MODELED NITRATE COMPARISON DURING WINTER MONTHS

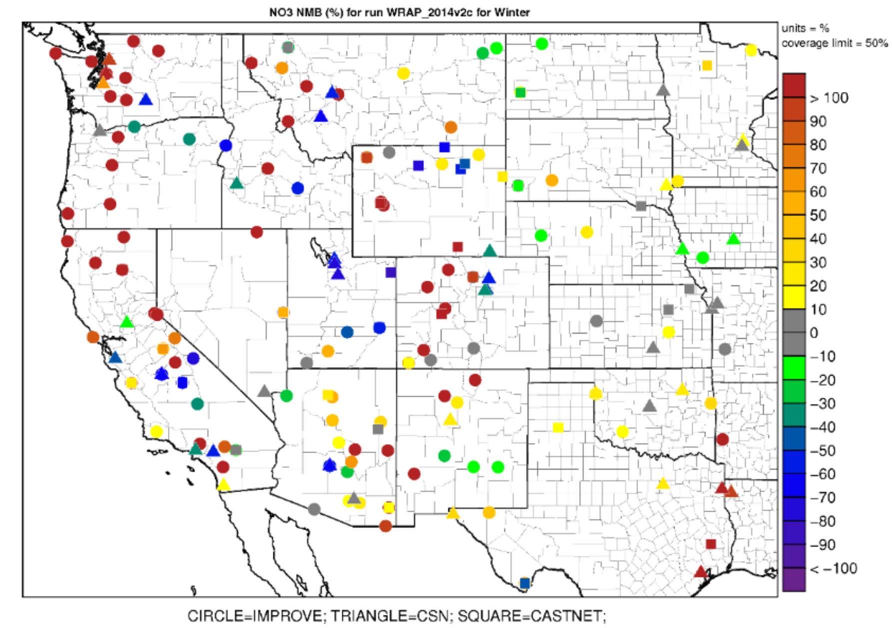


FIGURE 4-3

NORMALIZED MEAN BIAS FOR 2014v2 MODELED SULFATE COMPARISON DURING WINTER MONTHS

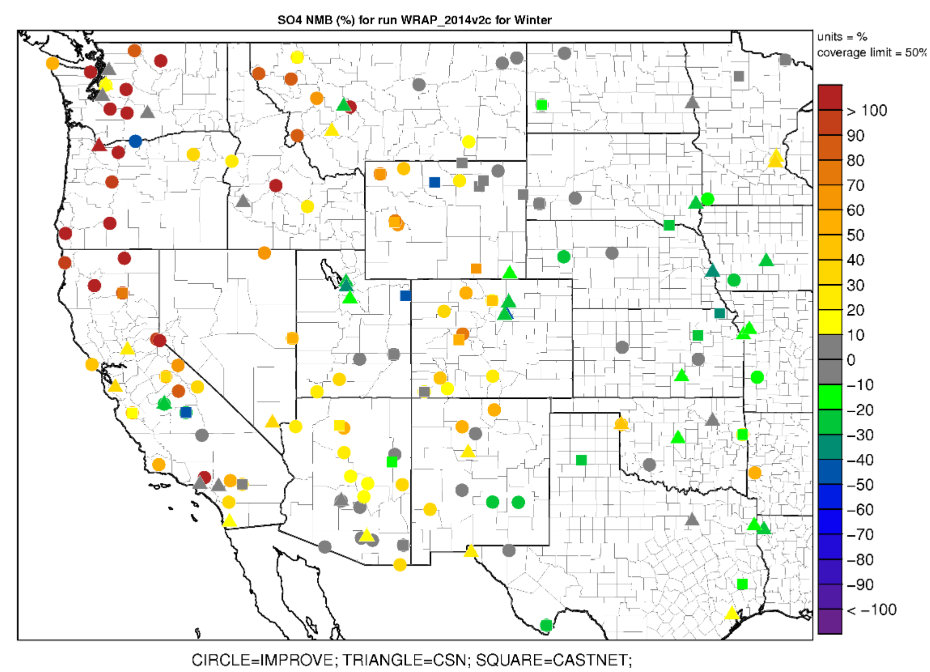


FIGURE 4-4

NORMALIZED MEAN BIAS FOR 2014v2 MODELED NITRATE
COMPARISON DURING SUMMER MONTHS

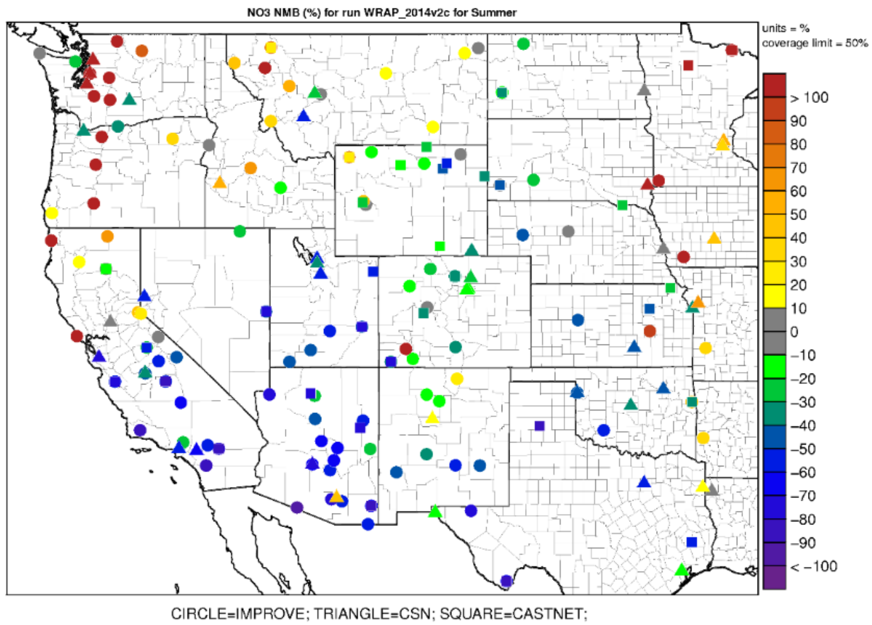
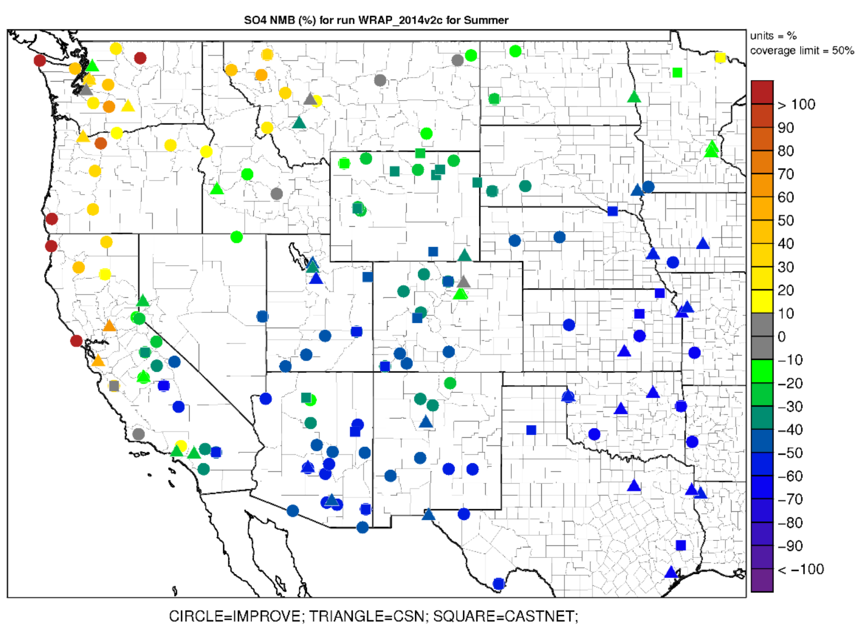


FIGURE 4-5

NORMALIZED MEAN BIAS FOR 2014v2 MODELED SULFATE
COMPARISON DURING SUMMER MONTHS



4.1.2.1 2014 Most Impaired Days Performance

CAMx model performance can be roughly judged by comparing the model predicted concentration (right column of Figure 4-6) against the monitored concentration from the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitor JARB1 (left column of Figure 4-6) for the most impaired days in 2014. As shown, the model generally underpredicts all pollutant species.

Figure 4-7 indicates the CAMx model under predicts, as shown by negative percentages, all six components of extinction for the most impaired days at JARB1. Nevada deems the model performance for the most impaired days is more accurate for sulfate (-34.1 percent), nitrate (-17.9 percent), organic matter (-22.0 percent), and elemental carbon (-31.0 percent), but is less accurate for soil (-92.4 percent) and coarse mass (-76.6 percent). Model performance for pollutants contributed by anthropogenic sources, like sulfate and nitrate, show a lesser margin of error, as these sources are most accurately inventoried. Pollutants contributed by natural sources, like soil and coarse mass, are represented in the model as estimated sources of emissions over vast regions and may not be as accurate to what was observed at the IMPROVE monitor.

FIGURE 4-6

CAMx MODEL PERFORMANCE FOR JARB1 2014 MOST IMPAIRED DAYS

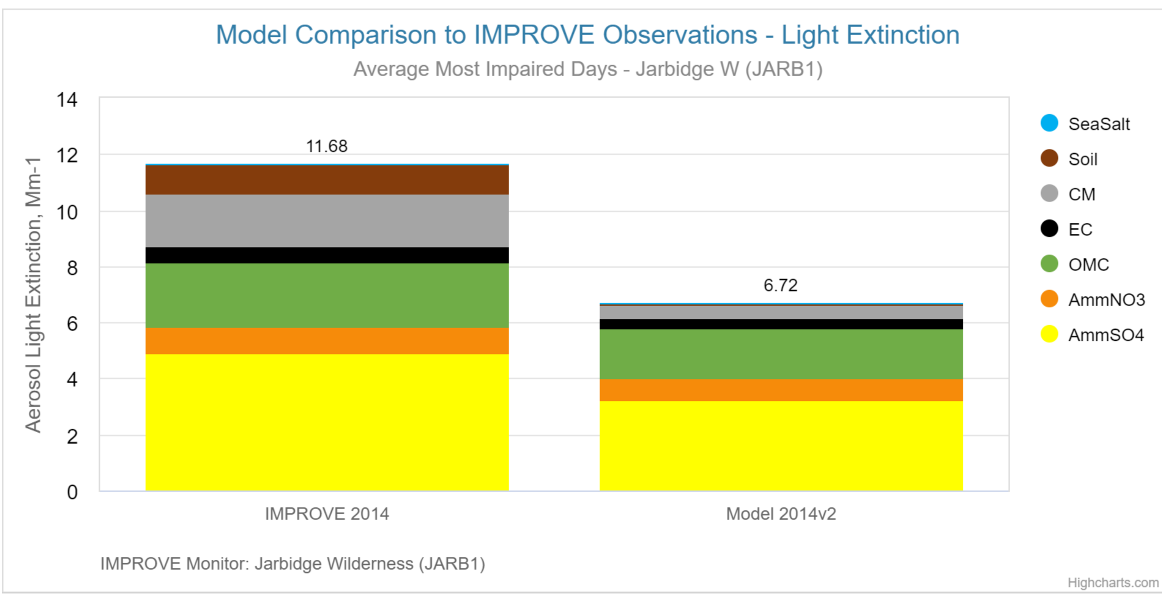
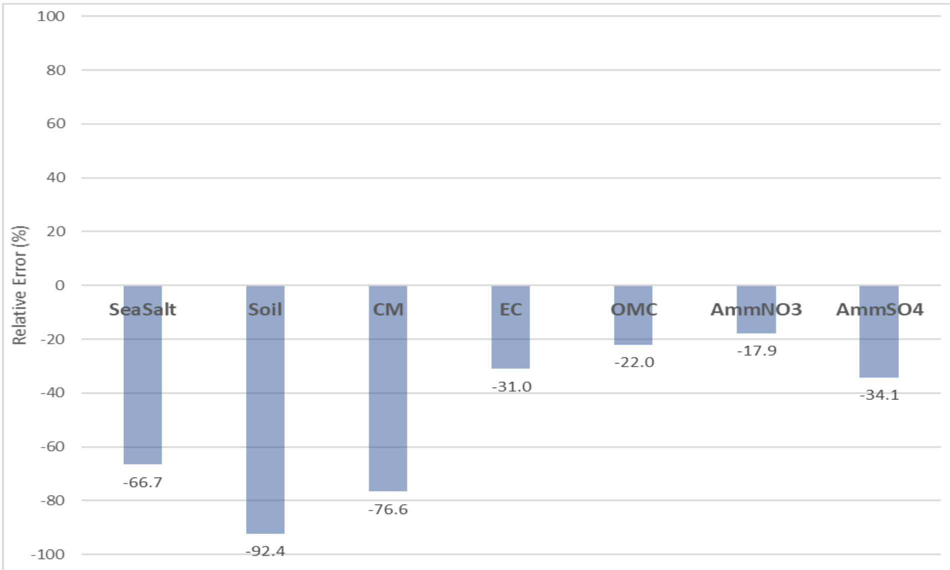


FIGURE 4-7

RELATIVE ERROR OF CAMx MODEL PREDICTION VERSUS
IMPROVE DATA FOR JARB1 2014 MOST IMPAIRED DAYS

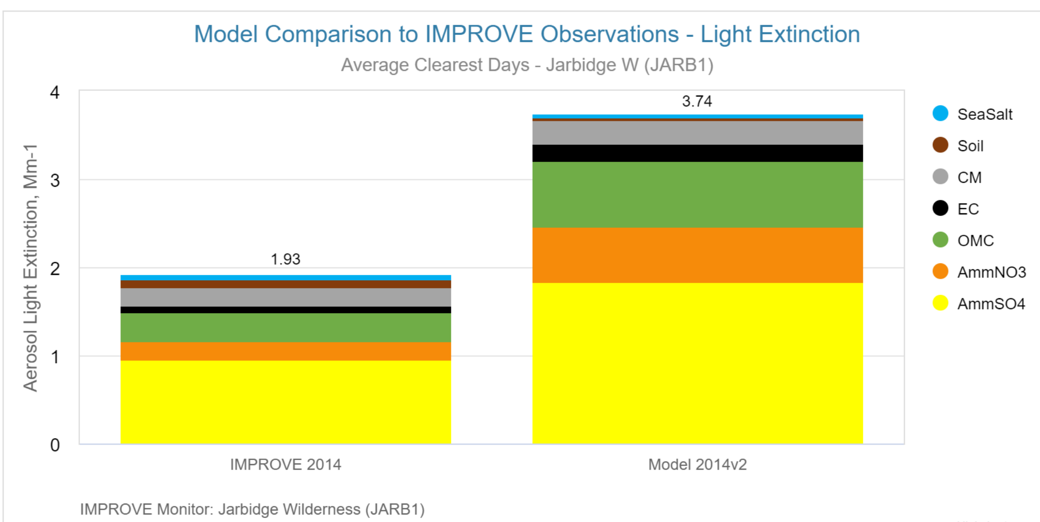


4.1.2.2 2014 Clearest Days Performance

Comparison of the model predicted concentration (right column of Figure 4-8) against the monitored concentration from the IMPROVE monitor JARB1 (left column of Figure 4-8) for the clearest days of 2014 shows a general overprediction.

FIGURE 4-8

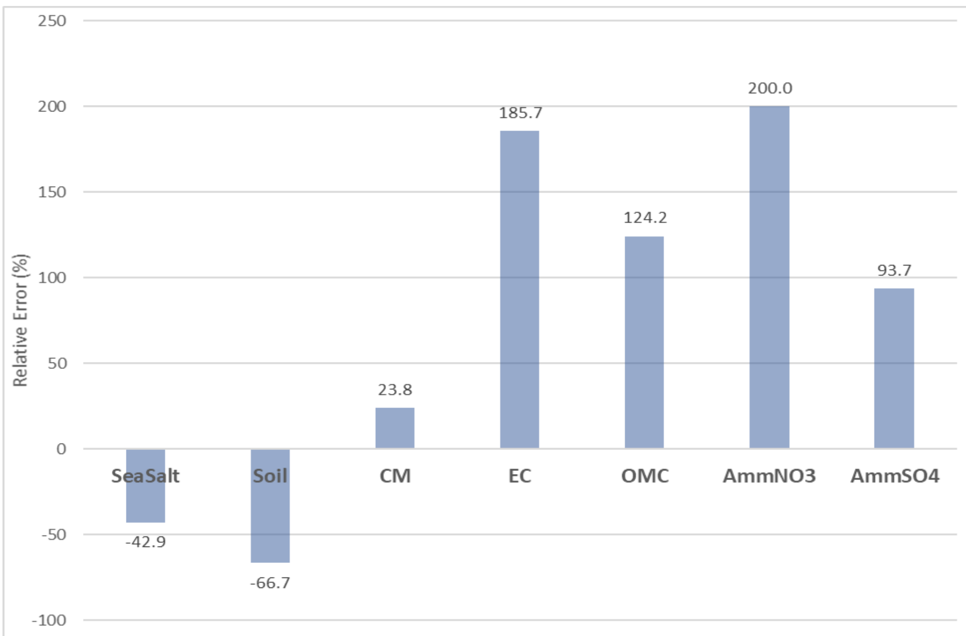
CAMx MODEL PERFORMANCE FOR JARB1 2014 CLEAREST DAYS



However, Figure 4-9 shows the model produces mixed predictions for the clearest days at JARB1. Nevada deems the model performance for the clearest days is most accurate for sea salt (-42.9 percent) and coarse mass (23.8 percent) but is marginally accurate for soil (-66.7 percent). Model performance for elemental carbon (185.7 percent), organic mass (124.2 percent), nitrate (+200 percent), and sulfate (+93.7 percent) are least accurate for the clearest days. Although the range of the percent error for these pollutants are unacceptable, these overpredictions in the model serve as a conservative estimate to visibility conditions for planning purposes.

FIGURE 4-9

RELATIVE ERROR OF CAMx MODEL PREDICTION VERSUS
IMPROVE DATA FOR JARB1 2014 CLEAREST DAYS



4.1.3 Weighted Emissions Potential Analysis

The WEP was developed as a screening tool for states to identify which source areas (e.g., states) have the potential to contribute to haze formation at specific Class I areas, based on both the 2014 and 2028 emissions inventories, as discussed in Chapter One. WEP was used to investigate the attribution of sources of nitrogen oxides (NO_x), sulfur oxides (SO_2), elemental carbon (EC), and organic aerosol (POA). The results of the WEP analyses are discussed below in section 4.4.

4.2 VISIBILITY MODELING RESULTS FOR 2028

Visibility modeling results indicate projected visibility conditions for the Jarbidge WA, based on the 2028OTBa2 emission inventory, will meet the URP required in 2028 (end of second implementation period) to achieve natural conditions by 2064.

4.2.1 2028 Visibility Projections for Jarbidge Wilderness Area

Table 4-1 lists the 2028 URP for the Jarbidge WA and the CAMx visibility modeling forecasts for baseline conditions in 2028. The results of this modeling will be used in establishing RPGs for the Jarbidge WA, discussed further in Chapter Six. The 2028 model forecasts indicate Jarbidge WA will meet the 2028 URP for the 20 percent most impaired days and will maintain visibility for the clearest days.

2028OTBa2 modeling results of 7.764 deciviews (dv) presented in Table 4-1 and Figure 4-10 (rounded to 7.76 dv and indicated by purple triangle in figure) show an improvement of 0.97 dv from the most impaired days baseline value of 8.73 dv for the Jarbidge WA using the USEPA default method. In order to remain below the URP glidepath in 2028, and meet natural visibility conditions by 2064, visibility conditions at Jarbidge WA must be below 8.2 dv. The 2028OTBa visibility projection of 7.764 dv is well below this, ensuring that visibility conditions at Jarbidge WA are on track to meet the national goal of natural visibility conditions.

During the 20 percent clearest days, 2028 visibility projections must not degrade beyond the baseline visibility conditions of 2.56. The 2028OTBa2 visibility projection for the clearest days satisfies this requirement at 1.724 dv (rounded to 1.72 and indicated by red triangle in figure), as shown in Table 4-1 and Figure 4-10.

TABLE 4-1

SUMMARY OF MODEL-PREDICTED VISIBILITY PROGRESS
IN 2028 AT JARBIDGE WILDERNESS AREA

Most Impaired Days (MID) Visibility Conditions (dv)				**Clearest Days** Visibility Conditions (dv)		
Baseline (2000-2004)	2028 URP Goal	2028 Model Projection	2028 Below Glidepath?	Baseline (2000-2004)	2028 Model Projection	2028 Below Baseline?
8.73	8.20	7.76	Yes	2.56	1.72	Yes

Figure 4-11 and Table 4-2 compare species-specific average annual light extinction between IMPROVE monitoring data observed from 2014 and 2018, or the representative baseline, and the modeled projection for 2028 (2028OTBa2).

All components show extinction reductions from the representative baseline conditions, except sea salt, which was held constant in emission inventories for the representative baseline period and the 2028 projection for the purposes of modeling.

FIGURE 4-10

MODEL PROJECTIONS IN HAZE INDEX
FOR JARB1 2028 MOST IMPAIRED DAYS

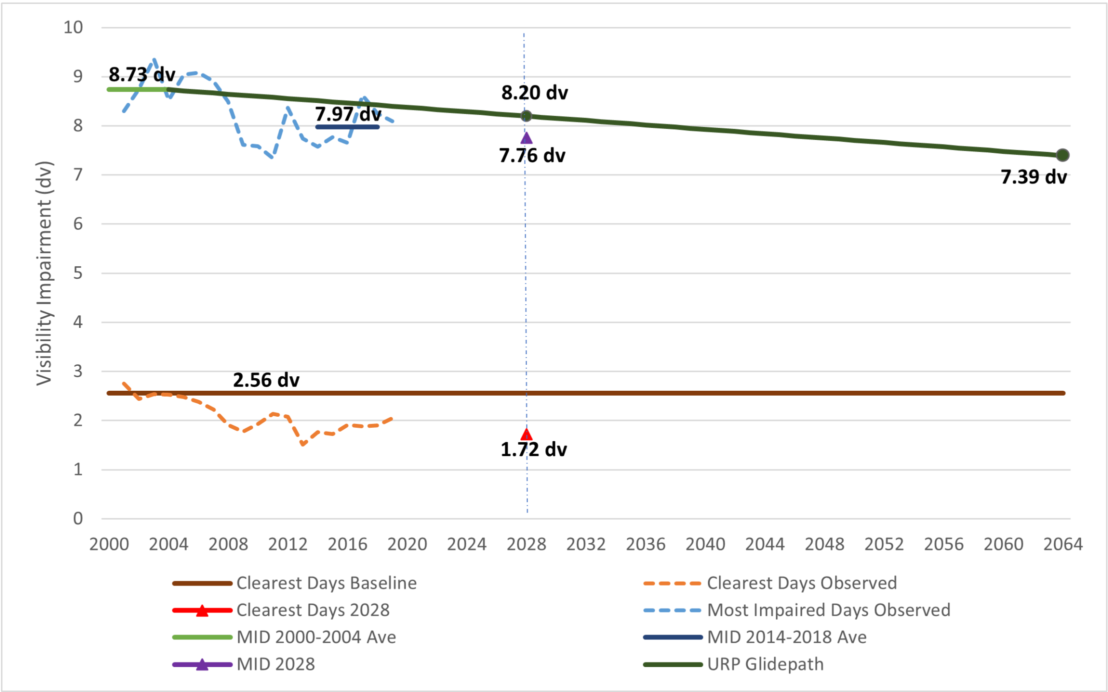


FIGURE 4-11

MODEL PROJECTIONS IN EXTINCTION
BY SPECIES FOR JARB1 MOST IMPAIRED DAYS

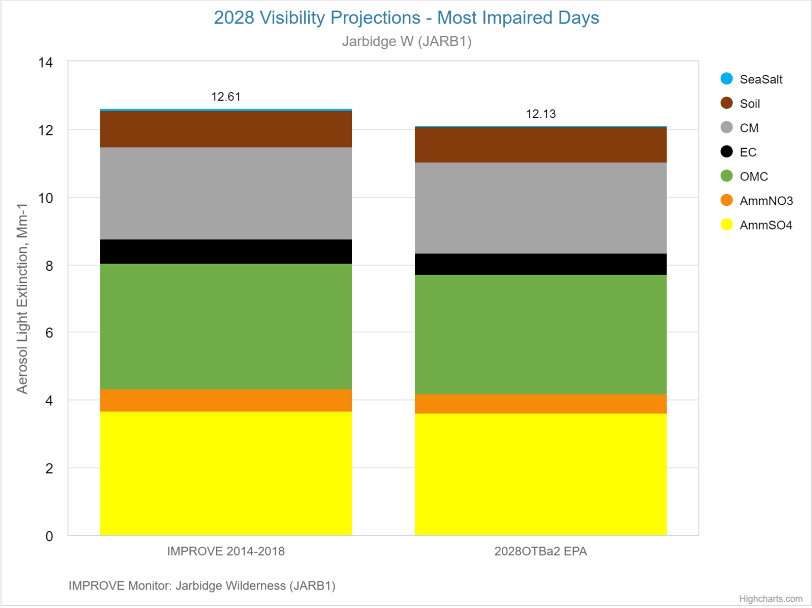


TABLE 4-2

SPECIES SUMMARY OF MODELED PROGRESS IN 2028 MID

	SeaSalt	Soil	CM	EC	OMC	Amm NO_3	Amm SO_4
IMPROVE 2014-2018	0.04	1.07	2.73	0.72	3.7	0.66	3.69
2028OTBa2	0.04	1.04	2.7	0.62	3.55	0.55	3.63
% Change from IMPROVE to 2028	0%	-2.8%	-1.1%	-13.9%	-4.1%	-16.7%	-1.6%

4.3 SOURCE APPORTIONMENT MODELING RESULTS

The CAMx photochemical model version 7.0 with the Particle Source Apportionment tool (PSAT) was applied at a regional level to separate U.S. anthropogenic contributions from those of fire, natural, and international anthropogenic contributions for a current period (2014-2018, RepBase2) and a future year, 2028OTBa2. CAMx with PSAT tracked gaseous and particle air emissions from sources through atmospheric dispersion, photochemical reactions, and transport to receptors (the 12-km modeling grid cell where the IMPROVE monitor is located). Aerosol concentrations at the receptor include the direct products of primary gaseous and particle emissions and secondary aerosol formation.

For the future year 2028OTBa2 model scenario, PSAT was applied to further define U.S. anthropogenic contributions to Ammonium NO_3 and Ammonium SO_4 aerosols at western Class I areas from each of 13 WESTAR-WRAP states and all other non-WRAP U.S. states combined. State contributions to Ammonium NO_3 and Ammonium SO_4 were subdivided into five anthropogenic source categories:

- electric generating units (EGU)
- oil and gas (area plus point sources) (OilGas)
- remaining point sources (non-EGU)
- Mobile onroad, nonroad, rail, and commercial marine vessels (CMV 1, 2, and 3) within 200 km of U.S. coast (Mobile)
- remaining anthropogenic sources (including Fugitive dust, Agriculture, Agricultural fire, residential wood combustion, and all remaining nonpoint sources)

For each Class I area, these results identify which source sectors and states are projected to have the greatest contributions in 2028OTBa2 to visibility impairment due Ammonium SO_4 and Ammonium NO_3. WRAP Source Apportionment methods are described in the run specification sheet for High-Level and Low-Level Source Apportionment Modeling using the RepBase2 and 2028OTBa2 modeling scenarios.[6]

6 https://views.cira.colostate.edu/docs/iwdw/platformdocs/WRAP_2014/SourceApportionmentSpecifications_WRAP_RepBase2_and_2028OTBa2_High-LevelPMandO3_and_Low-Level_PM_andOptionalO3_Sept29_2020.pdf

4.3.1 Key Pollutants and Sources of Impairment

The analyses of the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitor data, as presented in Chapter Two, identify sulfates (SO4), organic matter carbon (OMC), and coarse mass (CM) as the three most significant components of annual average visibility impairment at the Jarbidge Wilderness Area for the most impaired days of the current 2014 through 2018 period, together accounting for approximately 80% of total light extinction.

For these days, NO_3 accounts for only five percent of the extinction, as shown on Table 4-3, modified from Table 2-7.

TABLE 4-3

MONITORED CONTRIBUTIONS TO AVERAGE ANNUAL
RECONSTRUCTED EXTINCTION FOR CURRENT PERIOD

	OMC Extinction	CM Extinction	SO_4 Extinct ion	Soil Extinction	EC Extinction	NO_3 Extinct ion	Sea Salt Extinction
20% Most Impaired Days							
Average	**29.3%**	**21.6%**	**29.3%**	**8.5%**	**5.7%**	**5.2%**	**0.3%**
20% Clearest Days							
Average	**11.1%**	**6.7%**	**22.5%**	**2.1%**	**3.2%**	**5.6%**	**1.2%**

Compilation and analyses of baseline (2014-2018) and 2028 emissions inventories, presented in Chapter Three, demonstrate that nearly three quarters of Nevada's total emissions originate from natural (i.e., non-anthropogenic) sources, see Table 3-2. Sulfur dioxide (SO_2), ammonia (NH_3), and particulate matter ($PM_{2.5}$ and PM_{10}) are the only pollutants whose 2028 emissions are dominated by anthropogenic sources, although nitrogen oxides (NO_x) and carbon monoxide (CO) 2028 emissions are sub-equally divided between natural and anthropogenic sources. Note that the existing 2028 emission inventories do not include reductions resulting from reasonable progress determinations made from the four-factor analyses.

Analyses of the *projected 2028* emissions data have led to the following conclusions:

- The vast majority of volatile organic compounds (VOC) emissions are from biogenic sources (92 percent).
- Emissions of PM_{10} are dominated by fugitive dust emissions at 79 percent.
- Nonpoint sources account for 42 percent and point sources (EGU and Non-EGU) account for 47 percent of emissions of SO_2, a component of monitored species SO_4.
- Emissions of $PM_{2.5}$ are predominantly fugitive dust (50 percent), however, wildfire emissions (23 percent) are also a significant contributor.
- Lightning NO_x accounts for the majority (53 percent) of NO_x emissions, a component of monitored species NO_3; although mobile sources (16 percent) and biogenic emissions (11 percent) are also a significant contributors.
- Emissions of ammonia (NH_3) are dominated by agricultural emissions (83 percent)

Visibility modeling projections, shown in Figure 4-12 and Figure 4-13, indicate the relative contribution to 2028 visibility impairment at the Jarbidge WA for each visibility impairing species in units of inverse megameters (Mm-1). This graph shows an extinction reduction for each species by the end of the second planning period, except Sea Salt, Soil, and CM. CM and Soil emissions were held constant from the baseline to 2028 and Sea Salt is not an important component of extinction at JARB1. As noted above, VOC, CO, and NO_x emissions are dominated by natural sources. Jarbidge's three most significant components of annual average visibility impairment are SO_4, OMC, and CM. In Figure 4-13, SO_4 (dark blue line) and OMC (light blue line) both show a downward trend in light extinction. CM does not, as emissions were held constant.

The SO_4 and NO_3 source apportionment modeling identifies the relative concentration due to SO_x and NO_x emissions by source area and source category, as shown in Figure 4-14. Figure 4-14 shows the dominating effect of uncontrollable emissions from international anthropogenic and natural sources for SO_4 concentrations at the Jarbidge WA, accounting for more than 90 percent of total light extinction.

Figure 4-14 shows contributions to NO_3 concentrations at the Jarbidge WA is NO_x emissions is split evenly among international anthropogenic, US anthropogenic, and natural sources. Total NO_3 concentration is much less than total SO_4 concentration

FIGURE 4-12

MODEL PROJECTED EXTINCTION
BY SPECIES FOR JARB1 2028 MOST IMPAIRED DAYS WITH HINDCAST

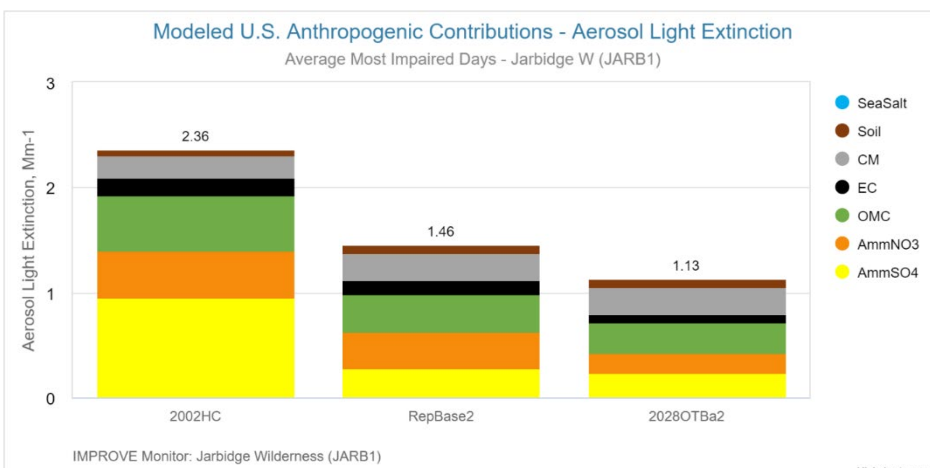


FIGURE 4-13

MODELED VISIBILITY EXTINCTION PROGRESS
BY SPECIES FOR JARB1 2028 MOST IMPAIRED DAYS

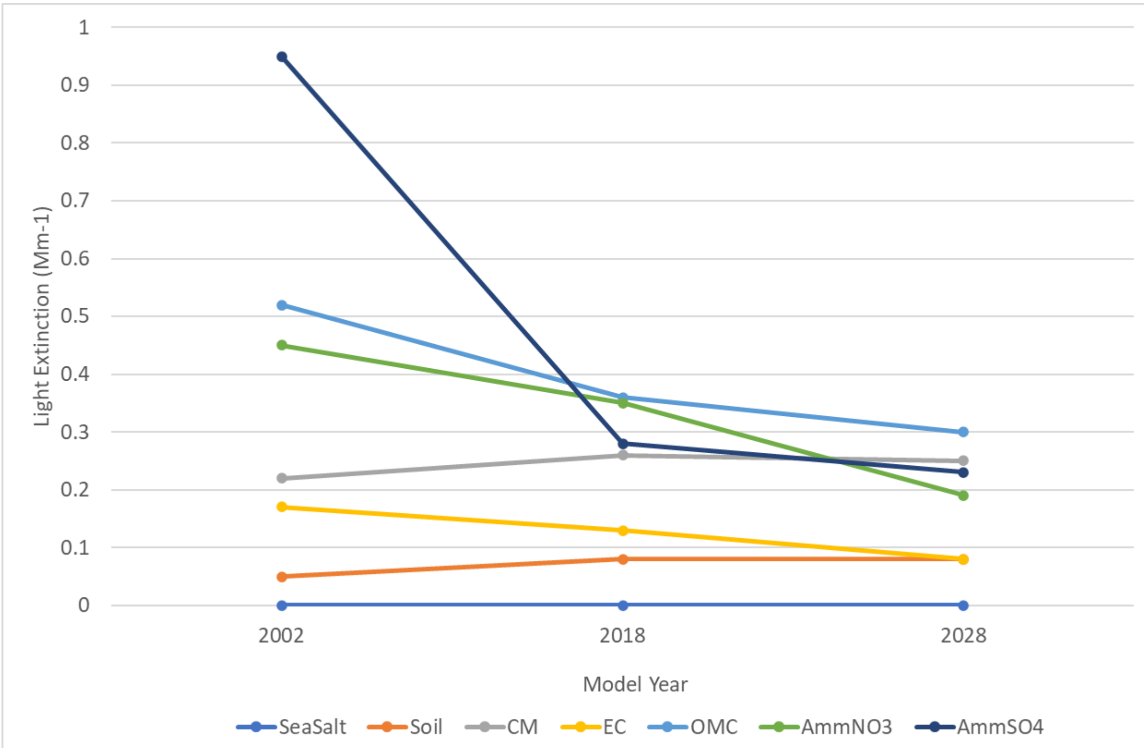
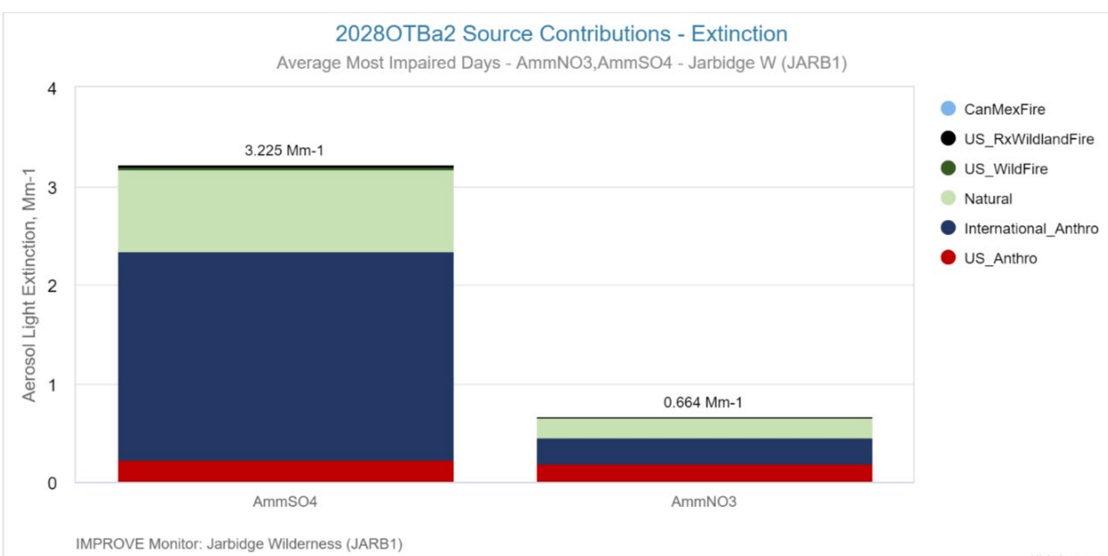


FIGURE 4-14

SULFATE AND NITRATE PSAT SOURCE REGION BAR
CHART FOR MOST IMPAIRED DAYS 2028



4.3.2 Sulfate Source Apportionment for Jarbidge Wilderness Area

Figure 4-15 displays the 2028 most impaired days particulate sulfate concentrations impacting the JARB1 monitor due to emissions from WRAP states. The chart provides details on the relative source contribution for each WRAP state in 2028. The data indicate the overall SO_2 emission sources for the most impaired days are primarily from the states of California, Idaho, Oregon and Washington. For all these states, contributions to sulfate are primarily from Non-EGU and industrial sources. Remaining anthropogenic source sectors outside of point and mobile sources is the next largest contributor among these states. Nevada's EGU sector is also one of the most significant contributors to ammonium sulfate extinction at Jarbidge Wilderness Area.

Figure 4-16 shows the contributions to sulfate concentration from all modeled source areas for the most impaired days of 2028 at the JARB1 monitor. This chart shows that emissions from international sources, including non-US fire, is the most significant contributor to light extinction at Jarbidge Wilderness area at about 89%.

FIGURE 4-15

SULFATE PSAT SOURCE REGION BAR
<u>CHART FOR MOST IMPAIRED DAYS AT JARBIDGE IN 2028</u>

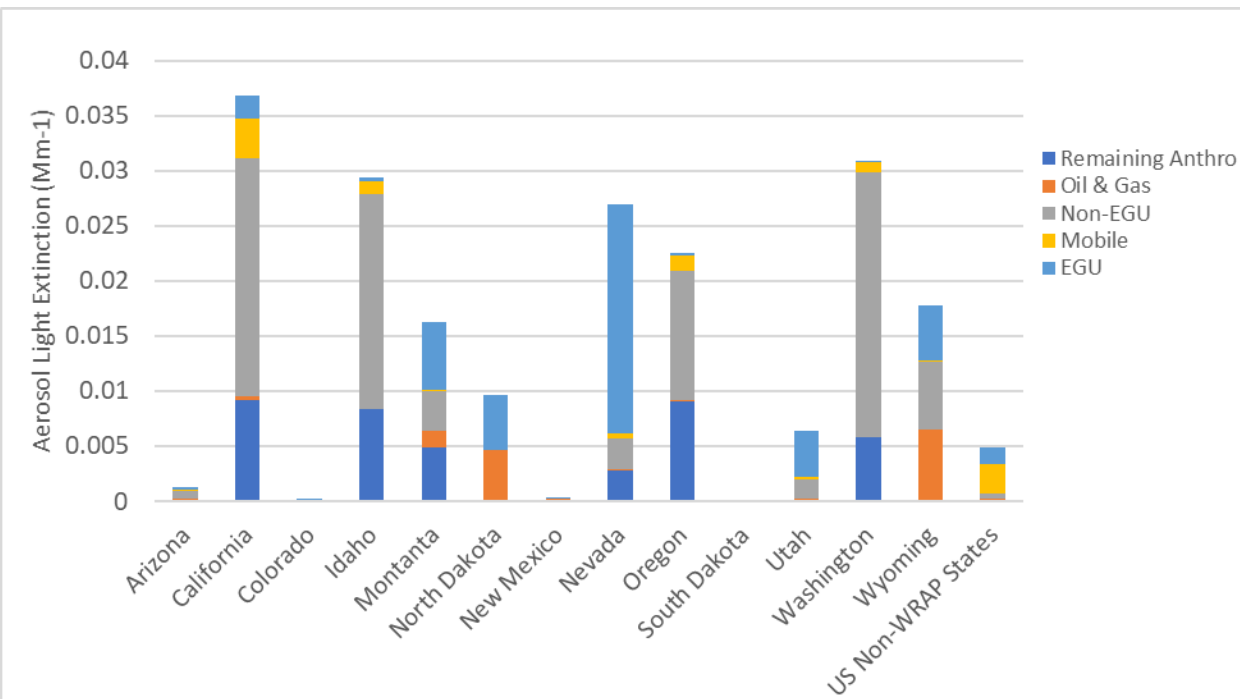
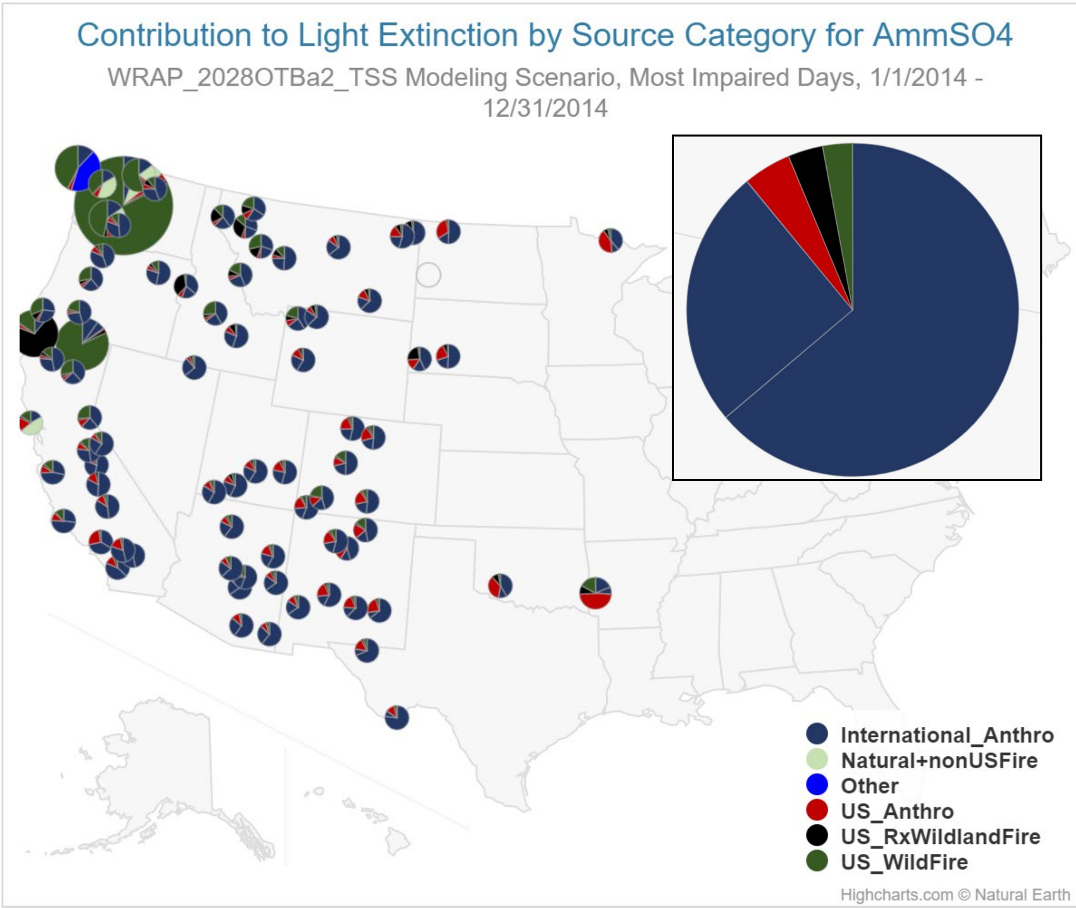


FIGURE 4-16

SULFATE PSAT REGIONAL PIE CHART FOR MOST IMPAIRED DAYS



* Dark blue includes international anthro and natural and non-US fire in pie chart
*Inset: Jarbidge WA $AmmSO_4$ pie chart

4.3.3 Nitrate Source Apportionment for Jarbidge Wilderness Area

Figure 4-17 displays the particulate nitrate concentrations for 2028 most impaired days for WRAP source areas at the JARB1 monitor. The chart provides details on the relative source contribution of each WRAP state during 2028. The data indicate the dominant WRAP source area contributions for the most impaired days are from California, Idaho, Oregon, and Washington. Mobile source emissions are the dominant source category for NO_x emissions, followed by Non-EGU and area sources.

FIGURE 4-17

NITRATE PSAT SOURCE REGION BAR
CHART FOR MOST IMPAIRED DAYS AT JARBIDGE IN 2028

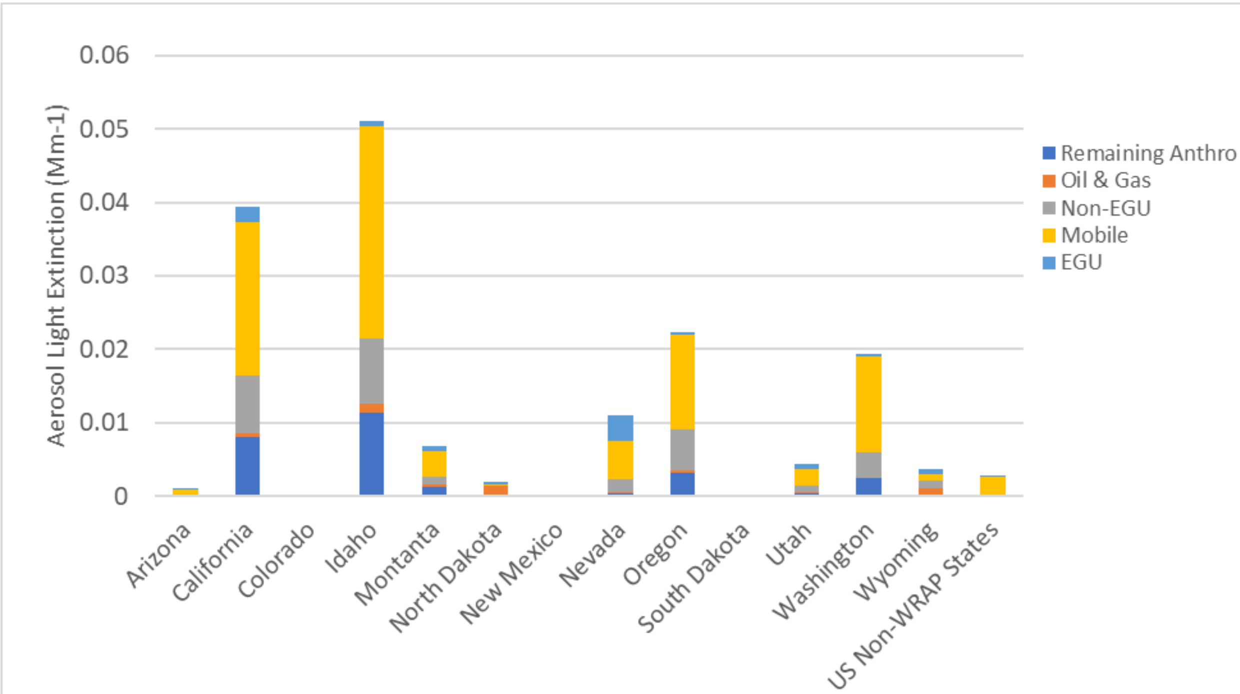
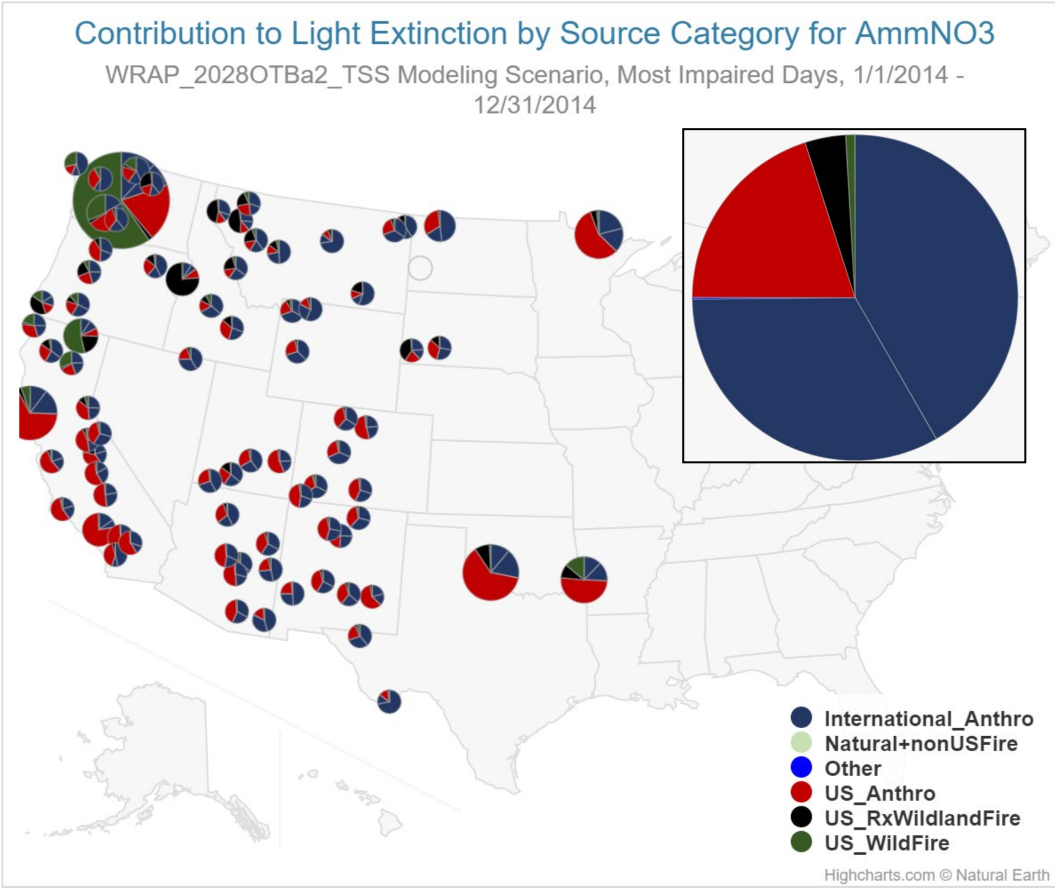


Figure 4-18 shows the contributions to nitrate concentration from all modeled source areas for the most impaired days of 2028 at the JARB1 monitor. This chart shows that emissions from international sources, including non-US fire, is the most significant contributor to light extinction at Jarbidge Wilderness area at about 75%.

FIGURE 4-18

NITRATE PSAT REGIONAL PIE CHART FOR MOST IMPAIRED DAYS



*Dark blue includes international anthro and natural and non-US fire in pie chart
*Inset: Jarbidge WA $AmmNO_3$ pie chart

4.3.4 Source Apportionment for Other Class I Areas

The PSAT source apportionment modeling results were evaluated to determine which Class I areas in adjacent states might be affected by emissions from Nevada sources. Table 4-4 presents the results of this evaluation for sulfate and nitrate extinction. The table identifies the rank and percentage of the total modeled concentration due to SO_2 and NOx emissions from sources within Nevada to the IMPROVE monitors representing all Class I areas in the five adjacent states. The rank and percentage contribution is based on contributions from all modeled source areas (13 continental western WRAP states and US Non-WRAP). The bolded values are the highest percentage contribution to visibility impairment at Class I areas in each of the five adjacent states due to emissions from Nevada sources for the most impaired days projected for 2028.

TABLE 4-4

NEVADA'S SULFATE AND NITRATE EXTINCTION CONTRIBUTION TO CLASS I AREAS OUTSIDE OF NEVADA

IMPROVE Site Code	IMPROVE Site Name	Extinction Contribution due to Nevada Emissions			
		Ammonium Sulfate		Ammonium Nitrate	
		Impact	Rank	Impact	Rank
Arizona					
BALD1	Mount Baldy	0.69%	6	0.66%	5
CHIR1	Chiricahua	1.67%	6	0.99%	6
GRCA2	Grand Canyon	3.58%	5	**2.15%**	6
IKBA1	Ike's Backbone	**4.24%**	5	1.28%	5
PEFO1	Petrified Forest	0.88%	7	0.64%	7
SAGU1	Saguaro	2.35%	4	1.62%	3
SIAN1	Sierra Ancha	3.06%	5	0.83%	4
TONT1	Tonto	3.16%	5	1.53%	5
California					
AGTI1	Agua Tibia	1.53%	3	0.42%	4
BLIS1	Desolation	**6.17%**	2	**11.44%**	2
DOME1	Dome Land	1.60%	3	0.56%	3
HOOV1	Hoover	2.40%	2	1.65%	2
JOSH1	Joshua Tree	1.63%	3	0.43%	3
KAIS1	Kaiser	1.57%	3	0.94%	3
LABE1	Lava Beds	3.51%	4	0.94%	5
LAVO1	Lassen Volcanic	1.87%	5	0.65%	5
PINN1	Pinnacles	1.13%	5	0.93%	4
PORE1	Point Reyes	0.60%	5	0.63%	5
RAFA1	San Rafael	2.03%	4	0.88%	4
REDW1	Redwood	0.13%	5	0.08%	5
SAGA1	San Gabriel	0.82%	4	0.29%	4
SAGO1	San Gorgonio	1.46%	3	0.43%	4
SEQU1	Sequoia	2.05%	3	0.96%	2
TRIN1	Trinity	1.19%	5	0.48%	5
YOSE1	Yosemite	1.93%	4	0.82%	3
Idaho					
CRMO1	Craters of the Moon	**10.78%**	3	**4.91%**	4
SAWT1	Sawtooth	6.86%	5	2.52%	7
SULA1	Sula Peak	2.53%	6	1.51%	9
Oregon					
CRLA1	Crater Lake	0.94%	5	0.71%	5
HECA1	Hells Canyon	**5.13%**	5	**2.35%**	5
KALM1	Kalmiopsis	0.70%	5	0.56%	6
MOHO1	Mount Hood	0.20%	7	0.15%	7
STAR1	Starkey	2.47%	7	0.89%	7
THSI1	Three Sisters	0.91%	5	0.43%	5
Utah					
BRCA1	Bryce Canyon	5.11%	7	6.02%	5
CANY1	Canyonlands	3.06%	8	1.53%	7
CAPI1	Capitol Reef	5.09%	7	4.37%	8
ZICA1	Zion Canyon	**8.72%**	5	**11.46%**	3

Nevada source-sector contributions identified for ammonium sulfate and ammonium nitrate extinction at out-of-state CIAs (Grand Canyon, Ike's Backbone, Desolation Wilderness, Craters of the Moon, Hells Canyon, and Zion Canyon) were identified through source apportionment modeling during the most impaired days in 2028. These CIA's were analyzed since they were identified as the CIA in each neighboring state most impacted by sulfate or nitrate extinction contributions from Nevada (bold values in Table 4-4). The anthropogenic source sectors considered are mobile, EGU, non-EGU, oil and gas, and remaining anthropogenic sources in Nevada. Total contributions from Nevada are compared to total sulfate light extinction at each CIA to determine NV's anthropogenic contribution to total sulfate (Table 4-5) and nitrate extinction (Table 4-6) by percent.

The highest contribution from Nevada anthropogenic sources to an out-of-state CIA's sulfate extinction in 2028 is Crater's of the Moon at 1.15%. Among all evaluated CIA's, EGU, non-EGU, and remaining anthropogenic sources tend to be the largest contributors to sulfate extinction. The highest contribution to an out-of-state CIA's nitrate extinction in 2028 is Desolation Wilderness at 6.16%. Among all evaluated CIA's, the mobile source sector is generally the largest contributor to nitrate extinction.

TABLE 4-5

NEVADA'S SULFATE EXTINCTION CONTRIBUTION TO
CLASS I AREAS OUTSIDE OF NEVADA BY SOURCE SECTOR

		Nevada Source Sector Impacts on Out-of-State CIA Sulfate Extinction (Mm-1)							
State	**CIA**	**Mobile**	**EGU**	**Non-EGU**	**Oil & Gas**	**Remaining Anthro**	**Total NV**	**Total Sulfate Light Extinction at CIA**	**% Anthro NV**
AZ	**Ike's Backbone (IKBA1)**	0.00008	0.00037	0.00043	0.00000	0.00139	**0.00227**	5.03	**0.05%**
CA	**Desolation Wilderness (BLIS1)**	0.00740	0.00577	0.00725	0.00007	0.01410	**0.03459**	4.47	**0.77%**
ID	**Craters of the Moon (CRMO1)**	0.00055	0.02662	0.00460	0.00008	0.00656	**0.03841**	3.34	**1.15%**
OR	**Hells Canyon (HECA1)**	0.00041	0.01615	0.00317	0.00006	0.00366	**0.02345**	4.44	**0.53%**
UT	**Zion Canyon (ZICA1)**	0.00099	0.00414	0.00480	0.00006	0.01482	**0.02481**	4.18	**0.59%**

TABLE 4-6

NEVADA'S NITRATE EXTINCTION CONTRIBUTION TO
CLASS I AREAS OUTSIDE OF NEVADA BY SOURCE SECTOR

		Nevada Source Sector Impacts on Out-of-State CIA Nitrate Extinction (Mm-1)							
State	**CIA**	**Mobile**	**EGU**	**Non-EGU**	**Oil & Gas**	**Remaining Anthro**	**Total NV**	**Total Sulfate Light Extinction at CIA**	**% Anthro NV**
AZ	**Grand Canyon (GRCA1)**	0.00392	0.00053	0.0015	0.00003	0.00078	**0.00676**	0.83	**0.81%**
CA	**Desolation Wilderness (BLIS1)**	0.06265	0.00222	0.01155	0.00006	0.00794	**0.08442**	1.37	**6.16%**
ID	**Craters of the Moon (CRMO1)**	0.01967	0.00598	0.0069	0.00018	0.00258	**0.03531**	4	**0.88%**
OR	**Hells Canyon (HECA1)**	0.01233	0.00494	0.00411	0.0002	0.00139	**0.02297**	9.77	**0.24%**
UT	**Zion Canyon (ZICA1)**	0.01262	0.00166	0.00577	0.00011	0.00361	**0.02377**	0.88	**2.70%**

4.4 WEIGHTED EMISSIONS POTENTIAL ANALYSES RESULTS

The Weighted Emissions Potential (WEP) tool is an analysis technique that identifies the predominant emission source regions contributing haze-forming pollutants at each Class I area based on 5 years of historical meteorology during the most impaired days, as described in Chapter One.

The WEP analysis results in two graphical displays of the data: WEP maps of extinction-weighted residence times (EWRT) for visibility impairing pollutant species and normalized, weighted emissions potential (WEP). The maps show the location of the Jarbidge WA with a green star. Extinction weighted residence time shows different colors for different regions to indicate the contribution percentage of pollutant species observed at Jarbidge Wilderness area.

For WEP maps, the areas shaded in different colors identify those 36 km grid cells with the potential of contributing emissions to JARB1 for the most impaired days in 2028. Geographical regions and individual grid cells with greater potential to impact the Jarbidge WA are easily distinguished in the maps by referencing the color scale for the grid cells, while the white areas denote those grid cells with negligible emission potential.

4.4.1 Nitrogen Oxides – Regional WEP Analysis for 2028 Most impaired days

Examination of Figures 4-19 and 4-20 shows the point source contributions from the industrialized portions of northern Nevada and along the Snake River Plain of Idaho, as well as more distant areas in southern Nevada and portions of California, including the Bay Area, Central Valley and Los Angeles area, to 2028 NO_x concentrations at JARB1. These figures also show contributions from the main transportation corridors and population centers along I-80 in Nevada and Utah, I-84 in Utah, Idaho, and Oregon, and I-5 in California to NO_x emissions at JARB1.

The WEP illustrates that Idaho has point sources that yield up to five to ten percent (maroon grid cells) of total anthropogenic NOx emissions of the region that contribute to ammonium nitrate extinction at Jarbidge, while one Oregon source reaches up to three to five percent (orange grid cell), and the Bay Area of California and Northern Nevada have sources that reach up to one to three percent (lime green grid cells).

FIGURE 4-19

REGIONAL NITRATE EWRT FOR 2028 MOST IMPAIRED DAYS

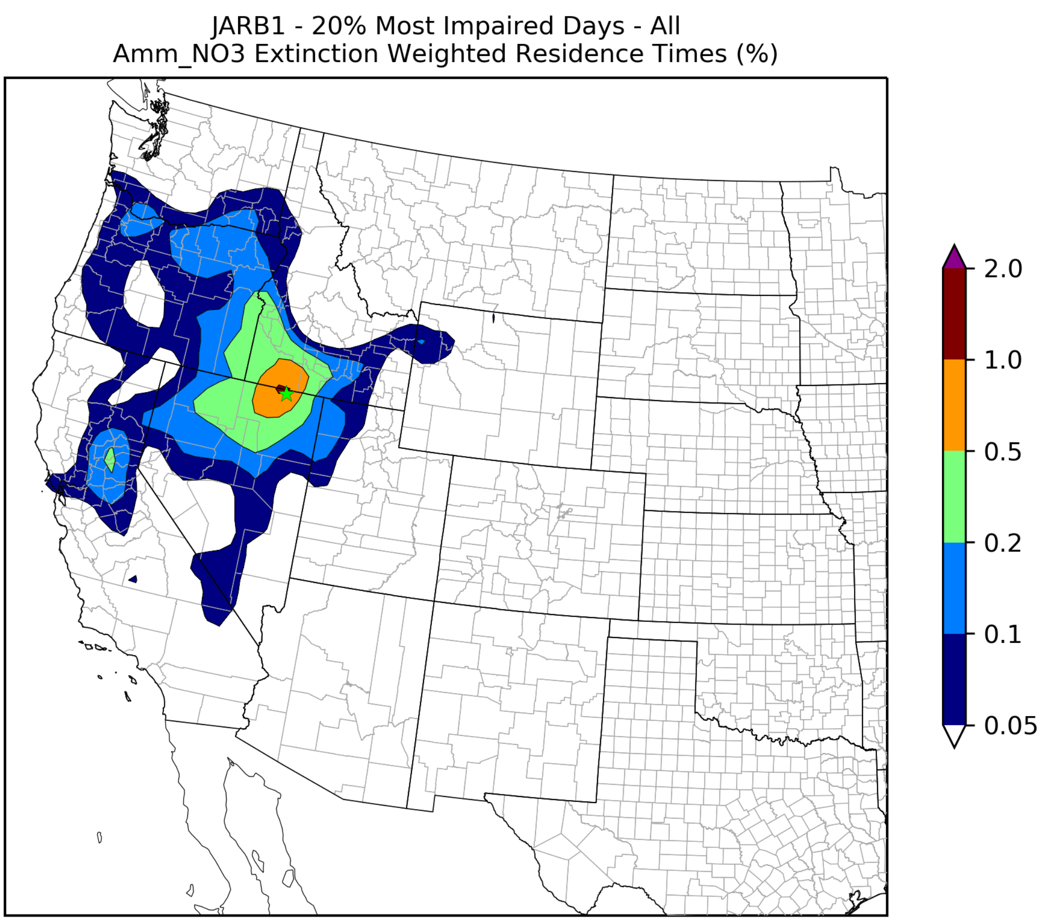
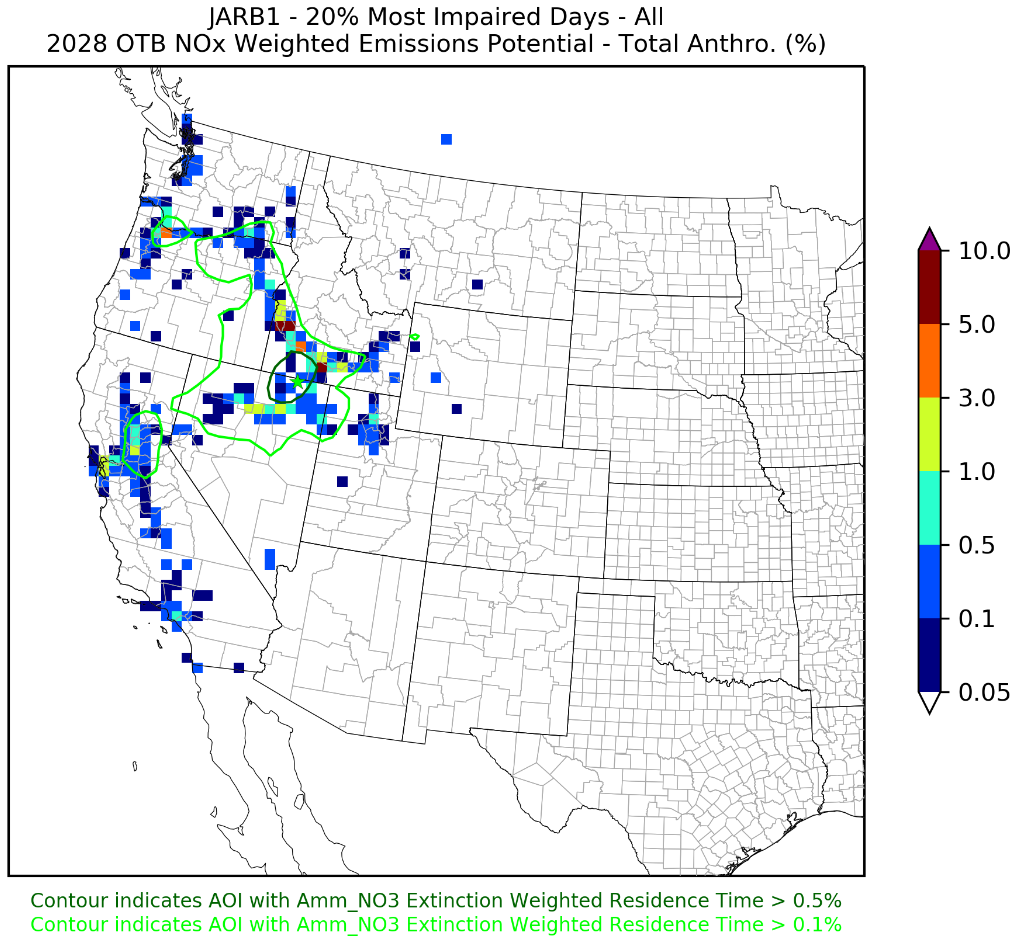


FIGURE 4-20

REGIONAL NO_x WEP FOR 2028 MOST IMPAIRED DAYS



4.4.2 Sulfur Oxides – Regional WEP Analysis for 2028 Most impaired days

Figure 4-21 shows the normalized regional contributions to residence time- and distance-weighted SO_2 emissions for JARB1. Examination of Figures 4-21 and 4-22 shows the large point source contributions from the industrialized portions of northeastern Nevada and along the Snake River Plain of Idaho, as well as more distant areas in the Bay Area of California and Northwest Oregon to 2028 SO_2 concentrations at JARB1.

The WEP illustrates that Idaho has two point sources that yield ten percent and above (purple grid cells) of total anthropogenic SOx emissions of the region that contribute to ammonium sulfate extinction at Jarbidge, while Nevada has one point source that yields ten percent and above, and California has one point source that yields three to five percent (orange grid cell) in the Bay Area. Washington, Oregon, and Utah have at least one point source that yields one to three percent (lime green grid cells).

FIGURE 4-21

REGIONAL SULFATE EWRT FOR 2028 MOST IMPAIRED DAYS

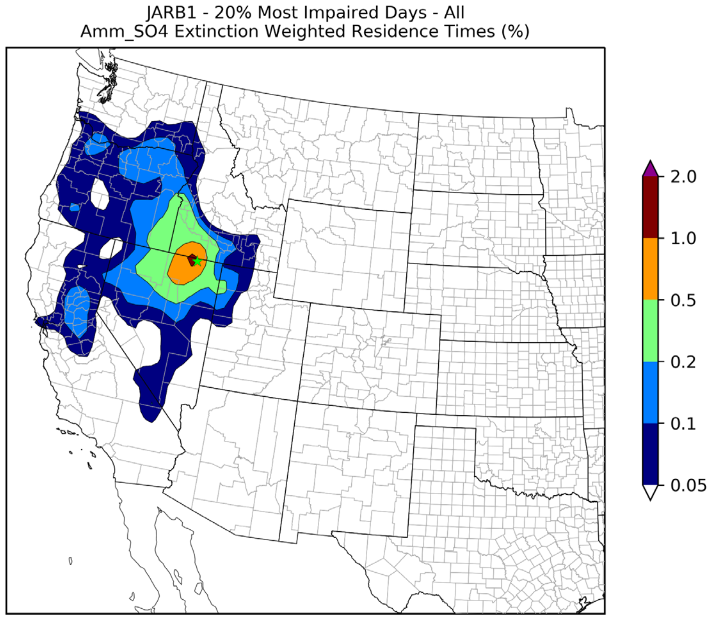
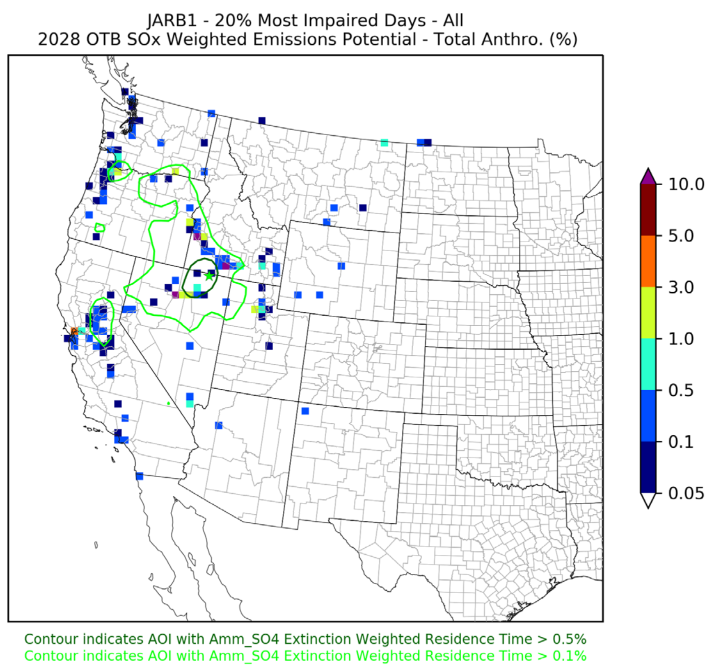


FIGURE 4-22

REGIONAL SO_X WEP FOR 2028 MOST IMPAIRED DAYS



4.4.3 Primary Organic Aerosol – Regional WEP Analysis for 2028 Most impaired days

Examination of Figures 4-23 and 4-24 shows the point source contributions from the industrialized portions of northern Nevada and along the Snake River Plain of Idaho, as well as more distant areas in southern Nevada and portions of California, including the Bay Area, Central Valley and Los Angeles area to 2028 NO_x concentration at JARB1. These figures also show contributions from the main transportation corridors and population centers along I-80 in Nevada and Utah, I-84 in Utah, Idaho, and Oregon, and I-5 in California to NO_x emissions at JARB1.

The WEP results indicate that Idaho sources are the largest contributors of organic aerosols impacting extinction at Jarbidge Wilderness Area, with several sources yielding between one percent and above ten percent. Oregon has one point source yielding three to five percent (orange) and California and Nevada both have one point source contributing one to three percent (lime green).

FIGURE 4-23

REGIONAL POA EWRT FOR 2028 MOST IMPAIRED DAYS

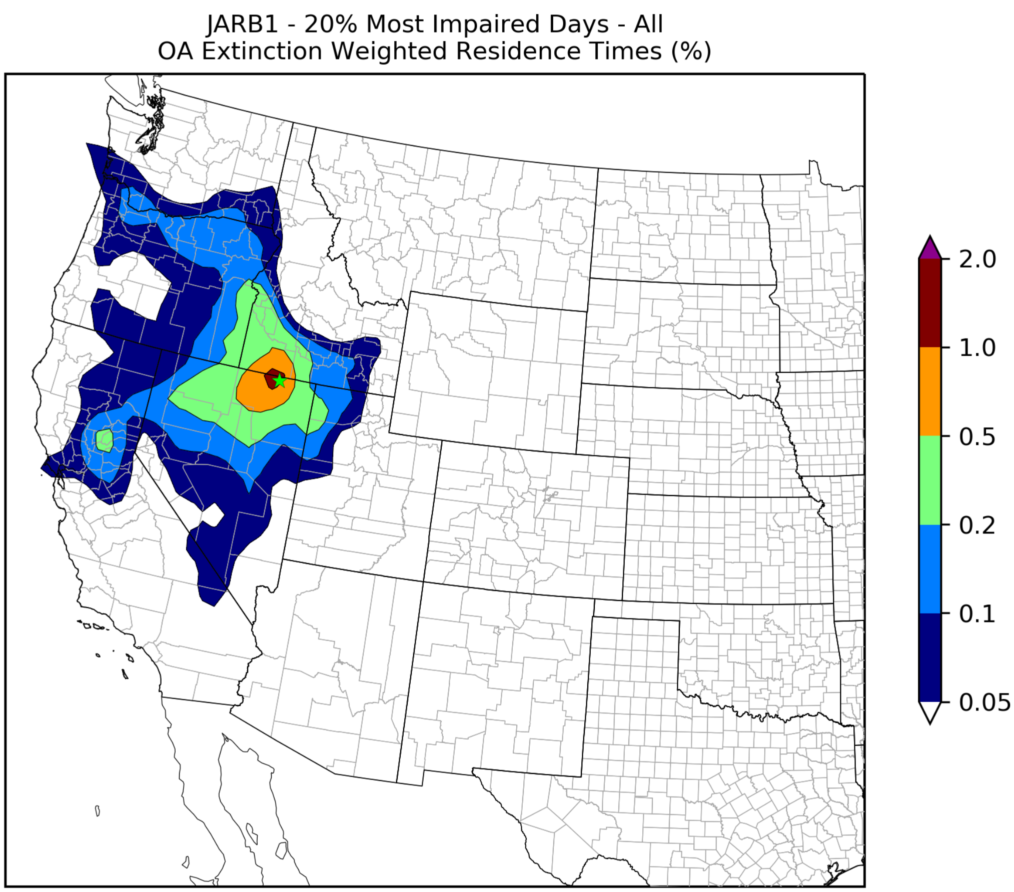
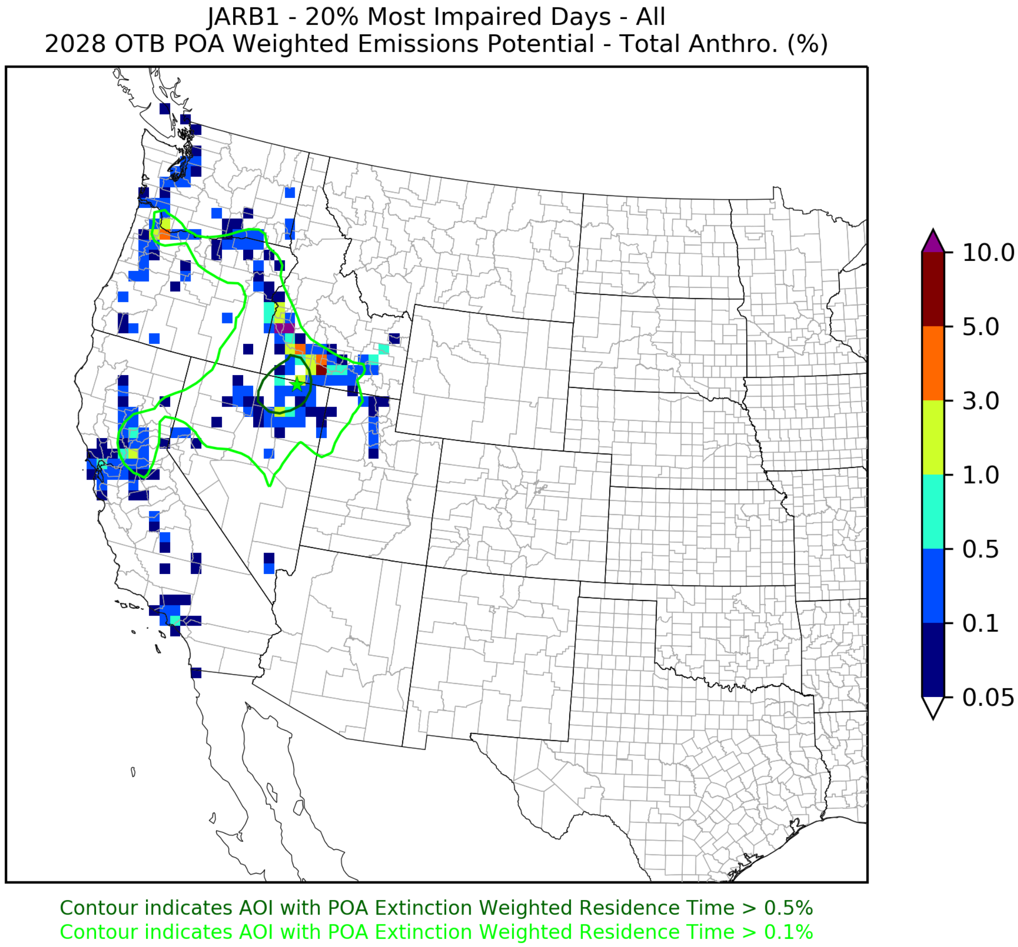


FIGURE 4-24

REGIONAL POA WEP FOR 2028 MOST IMPAIRED DAYS



4.4.4 Elemental Carbon – Regional WEP Analysis for 2028 Most impaired days

Figure 4-25 shows the normalized regional contributions to residence time- and distance-weighted primary EC emissions for JARB1. The WEP bar charts, shown as Figure 4-26, display normalized (unitless), residence time- and distance-weighted annual primary EC emissions values, by emissions source region. The contribution distribution shown by EC is very similar to that shown by OC. Examination of Figures 4-25 and 4-26 shows the large, natural fire-source contributions from diffuse areas of California, Idaho, northern Nevada, Oregon, Utah and Washington to 2028 EC concentrations at JARB1. These figures also show the contribution of area and off-road mobile sources from population centers along the Snake River Plain of Idaho, the Central Valley and Bay Area of California, the Portland area of Oregon and the Seattle area of Washington.

The WEP results indicate that Idaho sources are the largest contributors of organic aerosols impacting extinction at Jarbidge Wilderness Area, with several sources yielding between one percent and ten percent. Oregon has one point source yielding three to five percent (orange) and California and Nevada both have at least one point source contributing one to three percent (lime green).

FIGURE 4-25

REGIONAL EC EWRT FOR 2028 MOST IMPAIRED DAYS

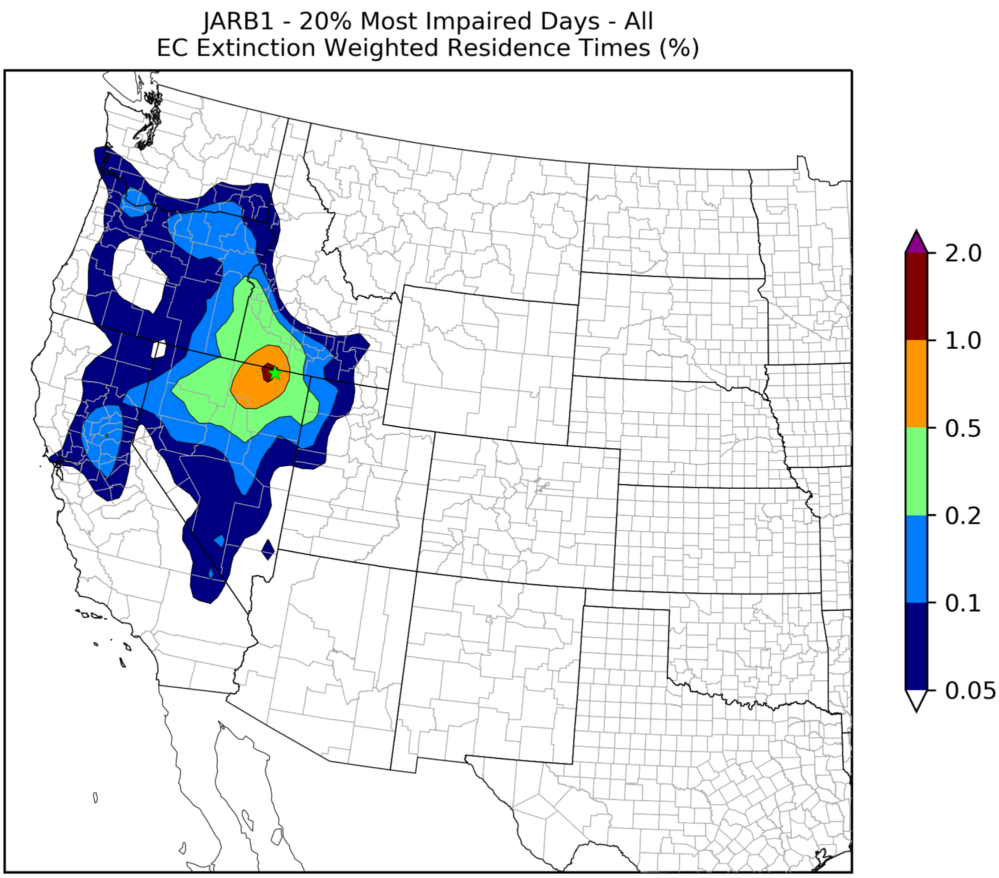
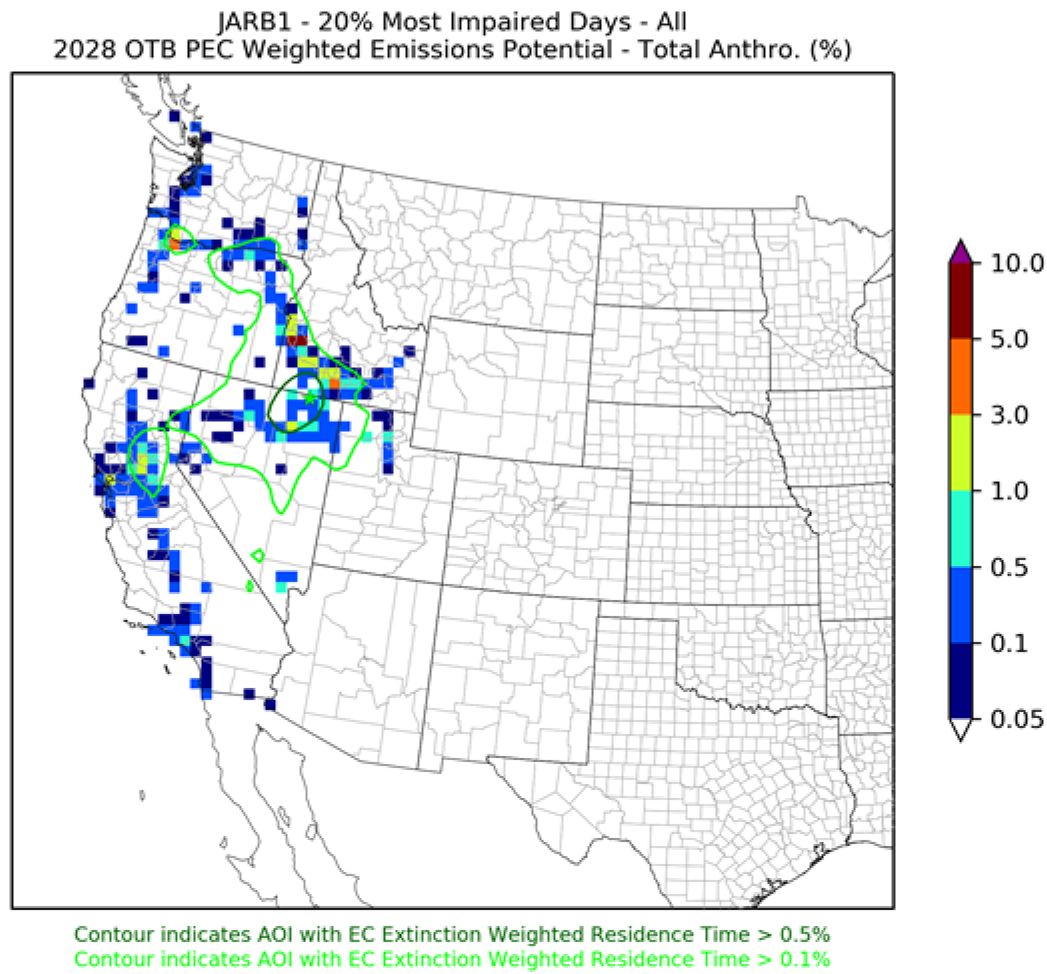


FIGURE 4-26

REGIONAL EC WEP FOR 2028 MOST IMPAIRED DAYS



4.5 VISIBILITY AND SOURCE APPORTIONMENT MODELING SUMMARY

Results of the CAMx visibility modeling forecasts indicate the Jarbidge WA will meet the URP for 2028 for the most impaired days with no degradation of clearest days.

Results of the PSAT source apportionment modeling identify the source areas contributing to sulfate and nitrate extinction at the JARB1 monitor. Figure 4-27 lists the six source areas and the corresponding contribution of SO_2 and NO_x to JARB1 based on the source apportionment modeling. The area with the greatest sulfate contribution is international anthropogenic emissions, followed by natural emissions. US anthropogenic emissions is not a significant contributor of sulfate at the Jarbidge WA.

For nitrate extinction at Jarbidge WA, contributions are similarly split among US anthropogenic, international anthropogenic, and natural emissions.

FIGURE 4-27

SUMMARY OF 2028 MODEL RESULTS FOR JARBIDGE WILDERNESS AREA

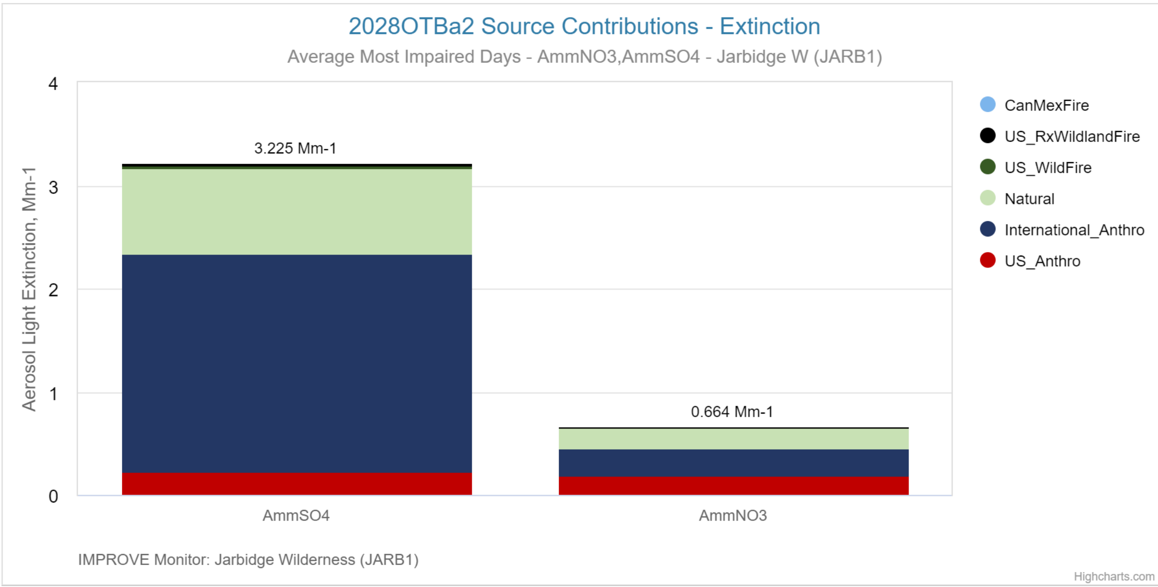


Table 4-7 lists the 2028 modeled particulate sulfate and nitrate concentrations at the Jarbidge WA for the most impaired days. The 2028 PSAT modeling forecasts that US anthropogenic emissions will only contribute 7.16% of total sulfate extinction at Jarbidge WA, and only 28.31% of total nitrate extinction.

TABLE 4-7

CHANGE IN MOST IMPAIRED DAYS MODELED CONCENTRATIONS OF SULFATE AND NITRATE

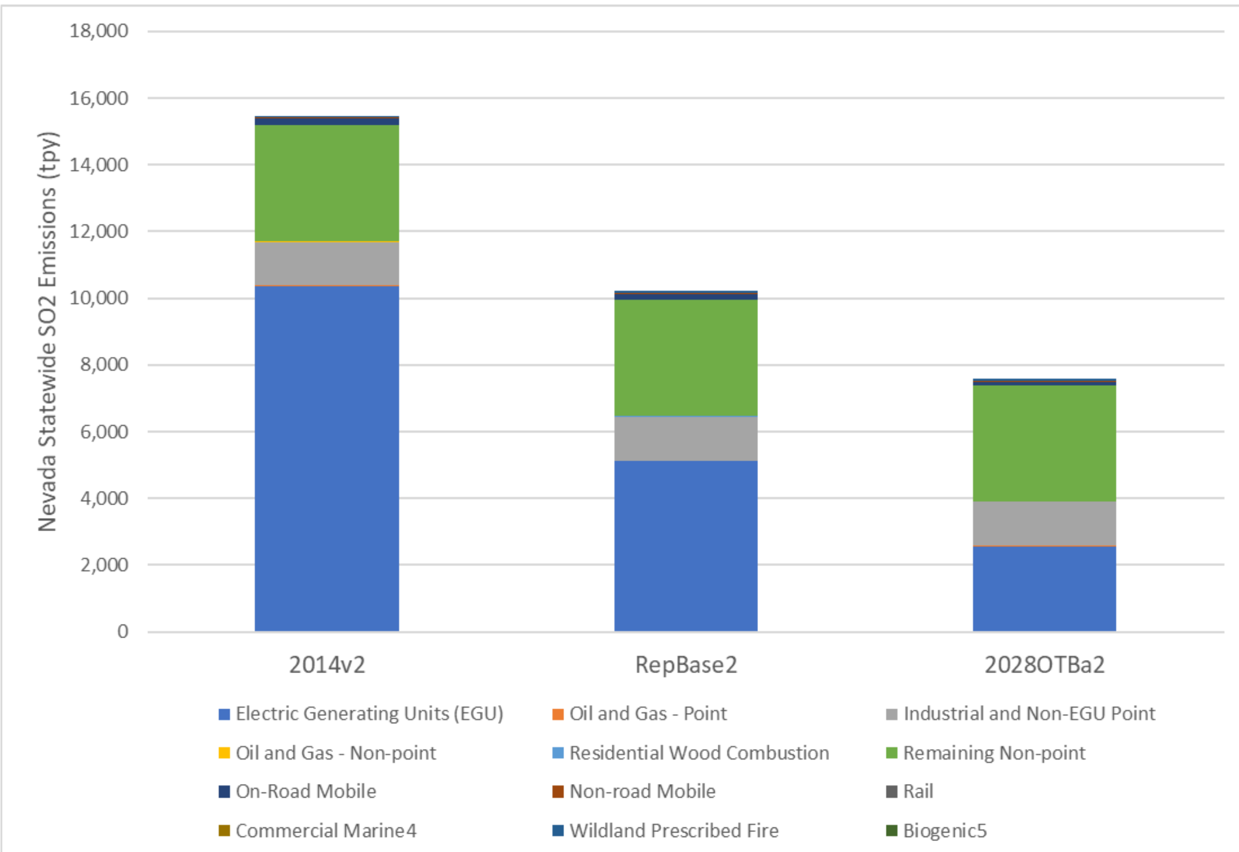
Class I Area	Year	Total SO_4 (Mm^{-1})	US Anthro SO_4 (Mm^{-1})	US Anthro Share SO_4	Total NO_3 (Mm^{-1})	US Anthro NO_3 (Mm^{-1})	US Anthro Share NO_3
Jarbidge Wilderness Area	2028	3.225	0.231	7.16%	0.664	0.188	28.31%

Figure 4-28 summarizes the Nevada SO_2 inventories, while Figure 4-29 summarizes the Nevada NO_x inventories. The projected 2028 emissions inventories for both SO_2 and NO_x show substantial overall reductions from the 2014 baseline inventories. The 2028OTBa2 SO_2 projected inventory shows great reductions from 2014 for EGU point sources. For NO_x emissions, the total projected reductions are very similar, with the largest reduction occurring between RepBase2 and 2028OTBa2.

Comparison of the RepBase2 and 2028OTBa2 emission inventories shows Nevada's total SO_2 emissions decreased by 24 percent from the representative baseline period to 2028, while SO_2 point source emissions decreased by 40 percent. Similarly, Nevada's total NO_x emissions decreased by 46 percent from the representative baseline to 2028, while NO_x point source emissions decreased by 3 percent.

FIGURE 4-28

NEVADA SO_2
EMISSION INVENTORY COMPARISON

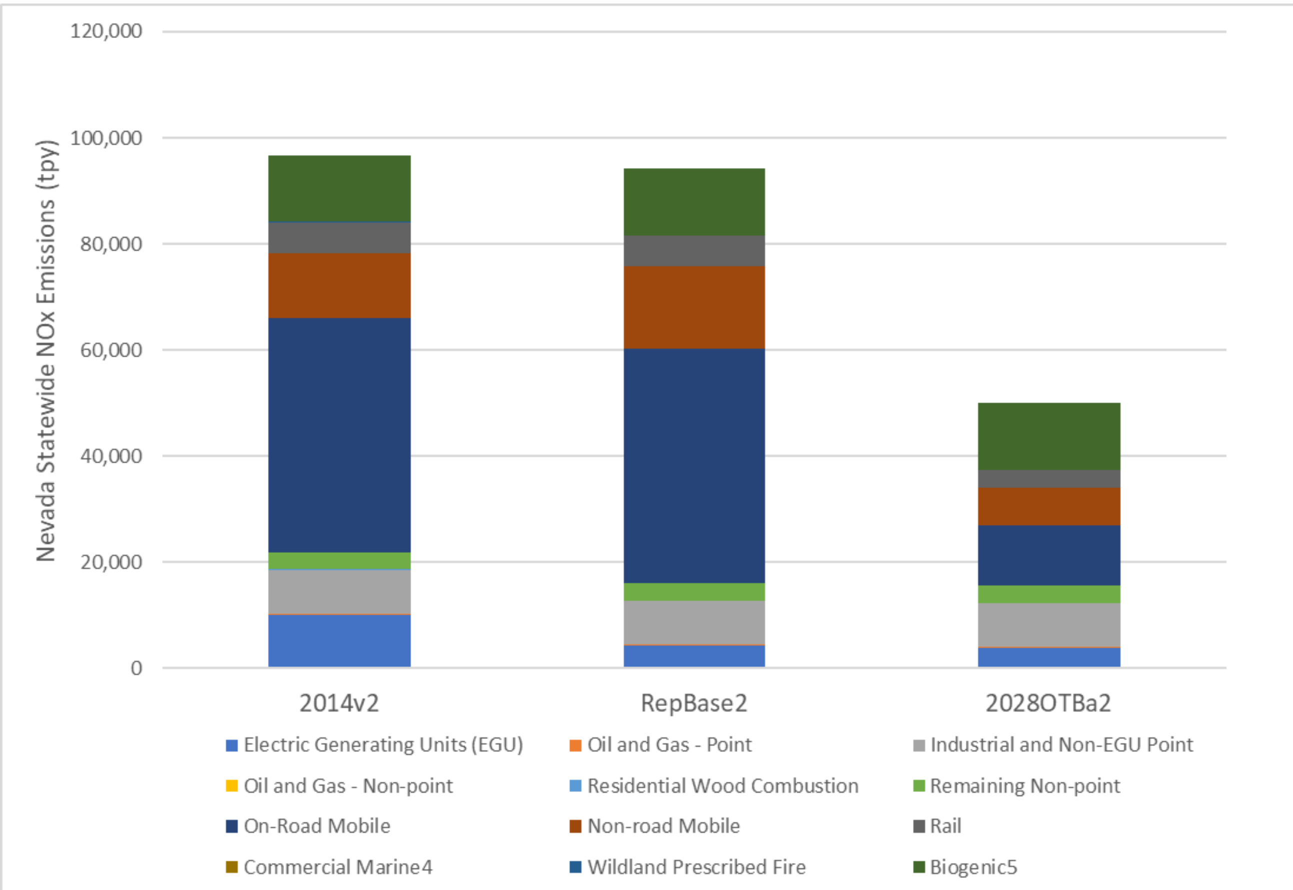


Note that these figures do not reflect all SO_2 and NO_x reductions achieved from point sources for the second implementation period, as the 2028OTBa2 model only serves as baseline 2028 conditions. Additional emission reductions achieved from reasonable progress controls are discussed in Chapter Five and corresponding visibility impacts at Jarbidge WA due to these controls are discussed in Chapter Six. The projected overall particulate sulfate and nitrate concentration reductions at JARB1 are due to Nevada's and regional reductions of SO_2 and NO_x emissions from on-the-books controls.

Regional PSAT and WEP analyses appear to confirm the important contributions of projected sulfate and nitrate emissions from point sources in Idaho and Nevada, as well as the influence of nitrate emissions from mobile sources in the states adjacent to Nevada, to visibility impairment at JARB1 in 2028.

FIGURE 4-29

NEVADA NO_x
EMISSION INVENTORY COMPARISON



4.6 REFERENCES

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2019. Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. September 2019.

U.S. EPA 2020. Recommendation for the Use of Patched and Substituted Data and Clarification of Data Completeness for Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. June 2020.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Five – Four-Factor Control Determinations

5.1 OVERVIEW OF THE FOUR-FACTOR ANALYSIS PROCESS

40 CFR 51.308(f)(2)(i) focuses on the control analyses needed to determine what emission reduction measures will be necessary to make reasonable progress in each state's Long-Term Strategy. States are required to select sources for analysis of control measures, identify emission control measures to be considered for these sources, and evaluate potential controls based on the four statutory factors: costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life.

States are required to evaluate major and minor stationary sources or groups of sources, mobile sources, and area sources. NDEP considered evaluating all groups but determined that more reductions would be achieved from major stationary sources and that any control analyses on minor sources would reasonably determine no controls as cost-effective. Area sources that may be contributing to visibility impairment at Nevada's Class I area were evaluated and it was concluded that most area source emissions were due to fugitive dust, however, no potential controls that could reasonably be implemented and enforced under the agency's local authority were identified. NDEP is depending on current and future federal/state regulations applicable to mobile sources to achieve reductions in that sector.

40 CFR 51.308(f)(2)(iii) requires that states document the technical basis, including cost, engineering, and emissions information, on which the state is relying to determine the emission reduction measures that are necessary to make reasonable progress. This chapter describes the selection of sources to conduct a four-factor analysis, NDEP's coordination with sources and other agencies in developing the four-factor analyses, and the final control determination for each source, including control requirements needed for the Long-Term Strategy.

5.2 SOURCE SCREENING IN NEVADA

NDEP and the air quality agencies of the WRAP used the Q/d method in identifying sources that are reasonably contributing to visibility impairment at any Class I area. Although not as sophisticated as modeling, this surrogate for source visibility impacts is significantly less resource intensive, while still providing a reliable method in determining which in-state sources should conduct a four-factor analysis.

Q/d represents a source's annual emissions in tons (Q) divided by the distance in kilometers (d) between the source and the nearest Class I area. For regional haze purposes, only primary visibility-impairing pollutants were included in a source's total Q: NO_x, SO_2, and PM_{10}. Emissions used to calculate a source's total Q were taken from the 2014v2 NEI. All sources, and their respective total Q, were inventoried and ranked by largest total Q to least. A Q/d threshold of 5 was set, identifying 8 sources that contributed to approximately 77% of statewide total NO_x, SO_2, and PM_{10} emissions. Table 5-1 outlines the sources identified by the Q/d analysis listed in order of potential visibility impacts based on the Q/d value. Aside from the Reid Gardner Station and McCarran International Airport, additional Q/d values are provided in Table 5-1 for the second and third closest Class I areas. These sources provide geographic representation of the three primary industrial areas in the state: the greater Reno area, the Las Vegas area, and the Interstate 80 industrialized corridor. Having sources from a broad geographic cross section of the state provides confidence that the selected stationary sources include those most likely to impair visibility at Class I areas both in Nevada and in neighboring states.

TABLE 5-1

SOURCES IDENTIFIED BY Q/D ANALYSIS TO CONDUCT
A FOUR-FACTOR ANALYSIS

Nearest Class I areas	CIA State	Total Q (tpy)	Distance to CIA (km)	Q/d	Percent of Statewide Q	Running Total of Percent of Statewide Q
Reid Gardner Station Power Plant						
Grand Canyon NP	AZ	6,944	84	**82.56**	19.8%	19.8%
North Valmy Generating Station						
Jarbidge Wilderness Area	NV	12,173	162	**75.10**	34.6%	54.4%
South Warner Wilderness	CA		255	47.74		
Mokelumne Wilderness	CA		330	36.89		
McCarran International Airport						
Grand Canyon NP	AZ	2,770	107	**25.97**	7.9%	62.3%
Lhoist North America Apex Plant						
Grand Canyon NP	AZ	1,662	88	**18.84**	4.7%	67.0%
Zion NP	UT		195	8.52		
Bryce Canyon NP	UT		277	6.00		
Nevada Cement Fernley Plant						
Desolation Wilderness	CA	1,482	102	**14.55**	4.2%	71.2%
Mokelumne Wilderness	CA		136	10.90		
Emigrant Wilderness	CA		180	8.23		
Tracy Generating Station						
Desolation Wilderness	CA	683	82	**8.33**	1.9%	73.1%
Mokelumne Wilderness	CA		122	5.60		
Emigrant Wilderness	CA		167	4.09		
TS Power Plant						
Jarbidge Wilderness Area	NV	834	131	**6.39**	2.4%	75.5%
South Warner Wilderness	CA		309	2.70		
Craters of the Moon NM	ID		362	2.30		
Graymont Pilot Peak Plant						
Jarbidge Wilderness Area	NV	673	131	**5.13**	1.9%	77.4%
Craters of the Moon NM	ID		263	2.56		
Sawtooth Wilderness	ID		297	2.27		

Of the sources listed above, three were considered and later removed from the four-factor analysis requirement. Reid Gardner Station Power Plant was identified using emissions data from the 2014v2 NEI, however, the entire facility ceased operation and was decommissioned in 2017 and has now been completely dismantled.

McCarran International Airport, now named the Harry Reid International Airport, was removed from the four-factor requirement as the vast majority of emissions are due to aircraft takeoffs, landings and ground movement, falling outside of the local air agencies' scope of authority. Table 5-2 lists the facility-wide allowable emissions for NO_x, SO_2, and PM_{10} at McCarran Airport that are listed in the Clark County Department of Environment and Sustainability (CCDES) air quality operating permit. Isolating only the maximum allowable, or controllable, emissions within the permit, a new Q/d of 1.35 is calculated for McCarran Airport, well below NDEP's Q/d threshold of 5.

TABLE 5-2

MCCARRAN AIRPORT CONTROLLABLE EMISSIONS
AND NEW Q/D

Facility	Nearest CIA	Distance to CIA (km)	Facility-Wide Permitted Allowable Emissions (tpy)			New Total Q	New Q/d
			NO_x	SO_2	PM_{10}		
McCarran Int'l Airport	Grand Canyon NP	88	87.95	2.35	28.82	119.12	1.35

5.3 NEVADA FOUR-FACTOR APPROACH

Each source that was identified in the source selection step elected to submit their own four-factor analyses to evaluate existing controls and consider potential additional control measures that may be necessary to achieve reasonable progress during the second implementation period of the Regional Haze Rule in Nevada. NDEP has reviewed, and in some cases revised, the information and data used in the facility's four-factor analyses to ensure the method of evaluating control measures necessary to achieve reasonable progress agrees with the Regional Haze Rule regulatory language, USEPA Final Guidance for the second implementation period of the Regional Haze Rule, USEPA Clarifications Memo, and USEPA Control Cost Manual. In the event that no additional control measures are necessary to make reasonable progress at a source, NDEP evaluated whether existing control measures implemented at the source are necessary to make reasonable progress.

For the majority of the sources, NDEP requested additional information that is supplemental to the initial four-factor analyses submitted by sources, resulting in multiple response letters from the sources to bolster the information and data assumed in the four-factor analysis. NDEP has conducted "Reasonable Progress Control Determinations" that outlines the information assumed in considering control measures necessary for reasonable progress (considering the four statutory factors), and specifies what information was manipulated by NDEP to ensure each source's four-factor analysis meets applicable requirements.

All documentation needed to evaluate the legality and reasonableness of Nevada's reasonable progress conclusions are provided in Appendix B. Each sub-appendix under Appendix B pertains to one source, beginning with NDEP's "Reasonable Progress Control Determination" for the source, followed by the four-factor analysis submitted by the source, and any subsequent response letters. Table 5-3 below outlines Appendix B and where four-factor analysis documents can be located.

TABLE 5-3

LOCATION OF FOUR-FACTOR ANALYSES

Facility	Appendix Location of Four-Factor Analysis Documents
Apex Plant, Lhoist North America	B.1
Pilot Peak Plant, Graymont Western	B.2
TS Power Plant, NNEI	B.3
Fernley Plant, Nevada Cement Company	B.4
Tracy Generating Station, NV Energy	B.5
Valmy Generating Station, NV Energy	B.6

An emissions baseline for each unit evaluated in a four-factor analysis consists of emissions reported in a recent and relevant historical period. An emissions baseline derived from the average emissions of a time frame within 2014 and 2019 was selected by sources to reflect normal operations that is expected to continue through the remainder of the implementation period. If recent emissions varied, years with higher reported emissions were incorporated into the baseline to support a conservative analysis, unless verifiable documentation was provided to confirm that lower emissions will continue and not increase in future years.

Sources required to conduct a four-factor analysis included two EGUs, two lime production plants, and one cement production plant. Typically, these types of facilities, or units, evaluated similar suites of feasible control measures. Although source screening considered emissions reported for NO_x, SO_2, and PM_{10}, most analyses primarily focus on control measures for NO_x and SO_2 emissions, as all sources currently operate PM_{10} controls achieving at least 90% removal efficiency. Table 5-4 outlines the feasible add-on control measures considered. Operational and maintenance improvements were also considered.

TABLE 5-4

ADD-ON NO_x AND SO_2 CONTROLS CONSIDERED IN
FOUR-FACTOR ANALYSES

NO_x Control Measures	SO_2 Control Measures
Selective Non-Catalytic Reduction (SNCR)	Limestone/Lime-Based Flue Gas Desulfurization (FGD)
Selective Catalytic Reduction (SCR)	Dry Sorbent Injection (DSI)
Low NO_x Burners (LNB)	Alternative Low Sulfur Fuels
Dry Low NO_x Combustor	Wet Scrubbing
Over Fired Air (OFA)	Semi-Wet/Dry Scrubbing

All four statutory factors were evaluated and considered in control decisions for reasonable progress. Energy and non-air quality impacts and remaining useful life were considered as separate factors, but typically contributed to adjustments to the cost of compliance. Adverse energy and non-air quality impacts and a short remaining useful life were not used to preclude selection of an otherwise cost-effective control, rather these were considerations that inflated costs. Time necessary for compliance was used to determine a compliance date for controls selected for reasonable progress.

NDEP is relying on a cost-effectiveness ($/ton reduced) threshold of $10,000/ton when considering potential new control measures during the second implementation period. Compared to the BART threshold used during the first implementation period of $5,000/ton, the new threshold for reasonable progress controls is double. This is to ensure that the entire fleet of potential new control measures throughout Nevada are thoroughly considered, as well as, to ensure that enough controls are implemented during the second period to continue achieving reasonable progress at Jarbidge WA and other out-of-state CIAs.

As a result of the four-factor analyses, NDEP has determined the following control measures, listed in Table 5-5, as necessary to make reasonable progress during the second implementation period. Further discussion of the facilities, units, controls, and characterizations of the four statutory factors is provided in the following sections.

TABLE 5-5

CONTROL MEASURES NECESSARY TO MAKE REASONABLE PROGRESS

Facility	Unit	Control	Controlled Pollutant	Existing/New	Compliance Deadline
North Valmy Generating Station	Unit 1	Baghouse and Air Atomized Ignitors	PM_{10}	Existing	Upon SIP approval
		LNB+OFA	NO_x	Existing	Upon SIP approval
		Permanent Closure	-	New	December 31, 2028
	Unit 2	Baghouse and Air Atomized Ignitors	PM_{10}	Existing	Upon SIP approval
		Spray Dryer with Lime Slurry	SO_2	Existing	Upon SIP approval
		LNB+OFA	NO_x	Existing	Upon SIP approval
		Permanent Closure	-	New	December 31, 2028
Tracy Generating Station	Unit 5	Dry Low NO_x Combustor	NO_x	Existing	Upon SIP approval
	Unit 6	Dry Low NO_x Combustor	NO_x	Existing	Upon SIP approval
	Unit 7	Steam Injection	NO_x	Existing	Upon SIP approval
		Permanent Closure	-	New	December 31, 2031
	Unit 32	Dry Low NO_x Combustor and SCR	NO_x	Existing	Upon SIP approval

	Unit 33	Dry Low NO_x Combustor and SCR	NO_x	Existing	Upon SIP approval
Apex Plant	Kiln 1	LNB	NO_x	New	No later than two years after SIP approval
		SNCR	NO_x	New	
	Kiln 3	LNB	NO_x	Existing	
		SNCR	NO_x	New	
	Kiln 4	LNB	NO_x	Existing	
		SNCR	NO_x	New	
Pilot Peak Plant	Kiln 1	LNB	NO_x	Existing	240 days
	Kiln 2	LNB	NO_x	Existing	240 days
	Kiln 3	LNB	NO_x	Existing	240 days

5.4 SUMMARY OF FOUR-FACTOR CONTROL ANALYSES

A full control determination was completed for North Valmy and Tracy Generating Stations, Lhoist Apex and Graymont Pilot Peak lime production plants, and Nevada Cement Fernley cement production plant. A Reasonable Progress Determination was conducted for the TS Power Plant to evaluate potential controls. Emission limitations for reasonable progress were established on a case-by-case basis taking into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source or unit, and the remaining useful life of the unit.

The control measures identified by Nevada as necessary to achieve reasonable progress will be installed and operating by a compliance deadline established through the consideration of the "time needed for compliance" statutory factor. Compliance schedules are determined on a case-by-case basis dependent on the type of control, planned outages at the facility, vendor availability, and other factors.

Facilities identified by Nevada's source screening procedure conducted their four-factor analyses internally, while coordinating with NDEP. In some cases, NDEP's review of the submitted four-factor analyses resulted in revisions to the original draft or requests were sent from NDEP to the facility to provide additional information. If the analysis and proposed control technologies were acceptable, NDEP relied on the submitted four-factor analyses to determine which controls are necessary to achieve reasonable progress. Where facility reasonable progress determinations were not accepted, the state made its own determinations using the facility reports as a foundation.

Each four-factor analysis established baseline emissions representative of actual emissions using acid rain data or actual annual emissions reported by each facility. Typically, sources used an annual average baseline comprised of emissions reported to NDEP during the 2016 through 2018 reporting years. All technically feasible controls that were considered for each unit at each facility assume achievable control efficiencies that were confirmed by NDEP. If a control was determined necessary to achieve reasonable progress, the assumed control efficiency was used to derive a new emission limit specific to the controlled pollutant on a case-by-case basis, along with corresponding averaging periods, and monitoring, record keeping, and reporting requirements.

A comparison of the baseline and post-control annual emissions resulting from the outcomes of the four-factor analyses and WRAP emissions inventories are presented for each facility below. The WRAP 2028 On-The-Books (2028OTBa2) emission inventory utilized 2014 NEIv2 emissions, with some adjustments made by states and on-the-books controls set to operate by the end of the period in 2028. Since the 2028OTBa2 modeling output does not include all new controls proposed in this SIP, new RPGs reflecting final reductions achieved through reasonable progress controls are derived in the next chapter.

5.5 NORTH VALMY GENERATING STATION FOUR-FACTOR OVERVIEW

For the purpose of determining whether controls at North Valmy Generating Station are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP’s “Reasonable Progress Control Determination” for North Valmy found in Appendix B.6.a. North Valmy’s air quality operating permit is incorporated by reference into this SIP in Appendix A.6.

Note, that NV Energy submitted a four-factor analysis, and subsequent response letters to requests for additional information, for North Valmy and Tracy Generating Stations within the same files. Therefore, NDEP’s “Reasonable Progress Control Determination” for North Valmy Generating Station is found in Appendix B.6, but references documents located in Appendix B.5 (sub-appendix for Tracy Generating Station). Table 5-6 outlines the files referenced in making reasonable progress determinations for North Valmy Generating Station, and where they can be found in Appendix B.

TABLE 5-6

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR VALMY

Full Document Title	Shortened Document Title	Date	Appendix Location
North Valmy Generating Station Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Determination*	May 2022	B.6.a
Regional Haze Reasonable Further Progress Four Factor Analysis	*NVE Analysis*	March 13, 2020	B.5.b
RE: Response to Request for Additional Information	*Response Letter 1*	July 8, 2020	B.5.c
RE: Response to a Second Follow-up Request for Additional Information	*Response Letter 2*	January 15, 2021	B.5.d
RE: Response to a Third Follow-up Request for Additional Information	*Response Letter 3*	April 16, 2021	B.5.e
RE: Response to a Fourth Follow-up Request for Additional Information	*Response Letter 4*	May 7, 2021	B.5.f
RE: Response to a Fifth Follow-up Request for Additional Information (Valmy specific)	*Response Letter 5.1*	August 27, 2021	B.5.g
RE: Response to a Fifth Follow-up Request for Additional Information (Tracy specific)	*Response Letter 5.2*	October 11, 2021	B.5.h
RE: Response to a Sixth Follow-up Request for Additional Information	*Response Letter 6*	April 29, 2022	B.5.i
RE: Response to a Seventh Follow-up Request for Additional Information	*Response Letter 7*	May 27, 2022	B.5.j
RE: NV Energy Response to an Eighth Follow-Up Request for Additional Information	*Response Letter 8*	August 5, 2022	B.5.k
Class I Air Quality Operating Permit	Permit		A.6

5.5.1 Baseline Emissions

For the purpose of NV Energy's four-factor analysis for the North Valmy Generating Station, baseline emissions were dervied from the annual average of emissions observed from 2016 through 2018. Table 5-7 shows the baseline emissions assumed for SO_2, NO_x, and PM_{10} emissions at Unit 1 and 2.

TABLE 5-7

VALMY FOUR-FACTOR ANALYSIS BASELINE EMISSIONS

	SO_2	NO_x	PM
Baseline Emission Rates for Unit 1			
2016	1,848 ton/yr	797 ton/yr	22.01 ton/yr
2017	1,232 ton/yr	587 ton/yr	16.27 ton/yr
2018	2,357 ton/yr	1,027 ton/yr	27.76 ton/yr
2016-2018 Annual Average	**1,812 ton/yr 0.760 lb/MMBtu**	**804 ton/yr 0.337 lb/MMBtu**	**22.01 ton/yr 0.0092 lb/MMBtu**
Baseline Emission Rates for Unit 2			
2016	431 ton/yr	839 ton/yr	54.84 ton/yr
2017	356 ton/yr	674 ton/yr	20.97 ton/yr
2018	716 ton/yr	1,493 ton/yr	37.19 ton/yr
2016-2018 Annual Average	**501 ton/yr 0.158 lb/MMBtu**	**1,002 ton/yr 0.317 lb/MMBtu**	**37.67 ton/yr 0.0119 lb/MMBtu**

5.5.2 Identification of Technically Feasible Controls

For Unit 1 at the North Valmy Generating Station, NV Energy identified SCR and SNCR as technically feasible control measures in controlling NO_x emissions, and identified FGD and DSI using Milled Trona as technically feasible control measures in controlling SO_2 emissions. Additional PM_{10} control measures were not evaluated as Unit 1 already implements baghouses and air atomized ignitors to control particulate emissions, representing an existing effective control.

For Unit 2 at the North Valmy Generating Station, NV Energy identified SCR and SNCR as technically feasible control measures in controlling NO_x emissions, and identified upgrades to an existing lime slurry-based spray dryer as a technically feasible control measure in controlling SO_2 emissions. Additional PM_{10} control measures were not evaluated as Unit 2 already implements baghouses and air atomized ignitors to control particulate emissions, representing an existing effective control.

5.5.3 Characterization of Cost of Compliance

All potential new control measures outlined below assume a capital recovery factor of 0.2936, based on a 4-year equipment life (assuming controls go live beginning of 2025 and plant closes at the end of 2028) and an interest rate of 6.75%. A summary of the cost-effectiveness values for each technically feasible control technology considered at North Valmy Generating Station is provided in Table 5-8.

Utilizing the Control Cost Manual spreadsheet in evaluating SNCR as a potential control measure at both Valmy units, a cost-effectiveness value of $16,195/ton and $14,131/ton is estimated for Unit 1 and 2, respectively. Cost calculations assume a retrofit factor of 1. A total annual cost of implementing SNCR on Unit 1 is estimated at $3.2M and is projected to reduce

NO_x emissions by 200 tons per year. For Unit 2, the cost of implementing SNCR is estimated at $3.5M and is projected to reduce NO_x emissions by 250 tons per year.

Utilizing the Control Cost Manual spreadsheet in evaluating SCR as a potential control measure at both Valmy units, a cost-effectiveness value of $57,583/ton and $54,178/ton is estimated for Unit 1 and 2, respectively. Cost calculations assume a retrofit factor of 1.3 due to necessary modifications to the auxiliary power system, space constraints, new ductwork, and new steel and reinforcements. A total annual cost of implementing SCR on Unit 1 is estimated at $39M and is projected to reduce NO_x emissions by 681 tons per year. For Unit 2, the cost of implementing SCR is estimated at $45.5M and is projected to reduce NO_x emissions by 841 tons per year.

TABLE 5-8

VALMY FOUR-FACTOR ANALYSIS COST-EFFECTIVENESS SUMMARY

Control	**Unit**	**Baseline Emissions**	**Tons Reduced**	**Total Annualized Costs**	**Cost – Effectiveness**
SNCR	1	804 tpy NO_x	200 tpy NO_x	$3,235,852	$16,195 /ton
	2	1,002 tpy NO_x	250 tpy NO_x	$3,527,944	$14,100 /ton
SCR	1	804 tpy NO_x	681 tpy NO_x	$39.19 Million	$57,583 /ton
	2	1,002 tpy NO_x	841 tpy NO_x	$45.56 Million	$54,178 /ton
DSI w/ Milled Trona	1	1,812 tpy SO_2	1,338 tpy SO_2	$15.26 Million	$11,409 /ton
Limestone-Based FGD	1	1,812 tpy SO_2	1,751 tpy SO_2	$76.51 Million	$43,704 /ton
Lime-based FGD	1	1,812 tpy SO_2	1,751 tpy SO_2	$73.77 Million	$42,315 /ton
FGD Upgrade	2	2,278 tpy SO_2	365 tpy SO_2	$17.00 Million	$46,500 /ton

In evaluating the cost of compliance of replacing the existing DSI system using hydrated lime (designed to control HCl emissions) with a Trona-based Dry Sorbent Injection (Trona DSI) on Valmy Unit 1, the total annual cost of replacing the existing DSI system with a Trona-based DSI system is estimated at $15.26 million. This system is estimated to reduce annual SO2 emissions by 1,338 tons, or $11,409 per ton reduced.

The total annual cost of implementing a limestone-based flue gas desulfurization system is \$76.51 million, based on an estimated capital cost of \$247.8M. This system is estimated to reduce annual SO_2 emissions by 1,751 tons, or \$43,704 per ton reduced. The total annual cost of implementing a limestone-based flue gas desulfurization system is \$73.77 million, based on an estimated cost of \$238.2M. This system is estimated to reduce annual SO2 emissions by 1,751 tons, or \$42,135 per ton reduced.

5.5.4 Characterization of Time Necessary for Compliance

For NO_x controls, it is estimated that a minimum of 35 months would be needed to implement SNCR at both Valmy units. A minimum of six years is estimated to be needed to retrofit both Valmy units to implement SCR controls.

For SO_2 controls, it is estimated that a minimum of 34 months would d be needed to implement a DSI system using Milled Trona at Valmy Unit 1. Both FGD systems (limestone-based and lime-based) would require approximately six to eight years. At Valmy Unit 2, upgrading the existing FGD system by replacing the spray nozzles would require a minimum of 46 months before reaching compliance.

5.5.5 Characterization of Energy and Non-Air Quality Environmental Impacts

Both SCR and SNCR have the potential for ammonia slip if too much reagent is emitted unreacted. SCR will increase the parasitic load of the station and cause backpressure in the exhaust flow path.

All potential SO_2 controls would produce solid waste that would trigger EPA's CCR disposal rules. NVE estimates water losses over 61,000 gallons per day via evaporative losses that will occur when the hot boiler flue gas contacts the FGD reagent slurry. Electricity use would also increase in order to operate the system. All of these factors have been accounted for in the cost analysis. DSI systems have the potential to emit a yellow/brownish plume due to excess NO_x. Activated carbon injection is included in the cost analysis to mitigate this.

5.5.6 Characterization of Remaining Useful Life of the Source

As stated above, NVE has committed to shutting down and permanently ceasing operations at both units at North Valmy by December 31, 2028. This is reflected in annualized capital costs for SNCR and SCR.

Although NVE estimates various compliance schedules for each considered control ranging from 34 months up to eight years, NVE has conservatively estimated that all considered controls could be implemented by the end of 2024 when calculating the cost of compliance for both controls. Assuming all controls go on-line at the beginning of 2025 and both units permanently close at the end of 2028, a remaining useful life of 4 years is estimated.

5.5.7 Decisions on what Control Measures are Necessary to Make Reasonable Progress

Based on the four statutory factors, NDEP concludes that no new control measures evaluated for the North Valmy Generating Station are necessary to make reasonable progress.

NDEP is relying on a federally enforceable and permanent closure date of December 31, 2028 for both units (used to reduce the remaining useful life of each unit and inflate cost-effectiveness values for all new control measures considered in the four-factor analysis) as necessary to achieve reasonable progress. During the time both units are in operation prior to closure, NDEP is also relying on the continued use of existing controls at Unit 1 (baghouse to control PM_{10} emissions and Low NO_x burners and over fired air to control NO_x emissions) and Unit 2 (baghouse to control PM_{10} emissions, Low NO_x burners and over fired air to control NO_x emissions, and spray dryer using a lime slurry to control SO_2 emissions) to make reasonable progress.

NDEP is submitting the following controls, emission limits, and associated requirements, for approval into the SIP as measures necessary to make reasonable progress during second implementation period of Nevada's Regional Haze SIP (Table 5-9). These emission limits and associated requirements, listed in the source's air quality operating permit, are incorporated into the SIP by reference. The North Valmy Generating Station's permit, Permit No. AP4911-0457.03, can be found in Appendix A.6 of Nevada's second Regional Haze SIP.

TABLE 5-9

NORTH VALMY PERMIT CONDITIONS INCORPORATED BY REFERENCE

North Valmy Generating Station, Permit No. AP4911-0457.03		
	Citation	Permit Condition
Unit 1 (System 01 – Unit #1 Boiler)		
NO_x	VI.A.1.a.(3)	Multi-stage combustion to control nitrogen oxides emissions through the use of Low NO_x Burners and Over Fired Air.
	VI.A.2.e	The discharge of NOx (nitrogen oxides) to the atmosphere will not exceed **0.70** pound per million Btu, based on a 3-hour rolling average.
PM_{10}	VI.A.1.a.(1)-(2)	(1) Baghouse to control particulate matter emissions. (2) Air atomized ignitors to control particulate matter and opacity during startup and for flame stabilization
	VI.A.2.b	The discharge of PM (total particulate matter) to the atmosphere will not exceed **0.10** pound per million Btu.
	VI.A.4.a.1-3 VI.A.4.a.14	Compliance/Performance Testing
	VI.A.4.b.3 VI.A.4.b.7 VI.A.4.b.10	Monitoring
	VI.A.4.d.4-5 VI.A.4.d.7	Recordkeeping
	VI.A.4.e	Reporting
Unit 2 (System 02 – Unit #2 Boiler)		
NO_x	VI.B.1.a.(4)	Multi-stage combustion to control nitrogen oxides emissions through the use of Low NO_x Burners and Over Fired Air.
	VI.B.2.e	(1) 210 ng/J (**0.50 lb/million Btu**) heat input derived from combustion of Sub-bituminous coal; (2) 260 ng/J (**0.60 lb/million Btu**) heat input derived from the combustion of Bituminous coal;

		(3) 65 percent reduction of potential combustion concentration when combusting solid fuel
SO_2	VI.B.1.a.(2)	Spray dryer using a lime slurry with a rated **70%** minimum sulfur dioxide removal efficiency.
	VI.B.2.i	(1) 520 ng/J (**1.20 lb/million Btu**) heat input and 10 percent of the potential combustion concentration (90 percent reduction), or (2) 30 percent of the potential combustion concentration (70 percent reduction), when emissions are less than 260 ng/J (**0.60 lb/million Btu**) heat input.
PM_{10}	VI.B.1.a.(1) VI.B.1.a.(3)	(1) Baghouse to control particulate matter emissions. (3) Air atomized ignitors to control particulates and opacity during startup and for flame stabilization
	VI.B.2.b	(1) 13 ng/J (**0.03 lb/million Btu**) heat input derived from the combustion of solid, liquid, or gaseous fuel; (2) 1 percent of the potential combustion concentration (99 percent reduction) when combusting solid fuel; (3) and 30 percent of potential combustion concentration (70 percent reduction) when combusting liquid fuel.
	VI.B.4.a.1-3 VI.B.4.a.14	Compliance/Performance Testing
	VI.B.4.b.3-4 VI.B.4.b.7 VI.B.4.b.9-10	Monitoring
	VI.B.4.d.4-7	Recordkeeping
	VI.B.4.e	Reporting
All Units Monitoring, Recordkeeping, and Reporting Requirements		
Section V.A - V.G		General Monitoring, Recordkeeping, and Reporting Requirements
Closure Date		
Section XI.C		As part of Nevada's Regional Haze State Implementation Plan's (SIP) Long-Term Strategy to achieve reasonable progress, the Permittee shall shutdown and permanently cease operation of **System 01 (S2.001)** and **System 02 (S2.002)** no later than December 31, 2028.

5.5.8 Discussion of North Valmy Generating Station Four-Factor Outcome

NV Energy has committed to cease operations and shutdown both electrical generating units at North Valmy Generating Station by December 31, 2028. With this closure date, no additional controls on either unit are cost-effective or necessary to achieve reasonable progress.

NV Energy's four-factor analysis relies on an emissions baseline derived from the annual average of emissions reported in 2016 through 2018. The emission reductions resulting from closure of both units are shown below in Table 5-10. By the end of 2028, or the end of the second implementation period, 1,746 tons per year of NO_x reductions, 2,313 tons per year SO_2 reductions, and 60 tons per year of PM_{10} reductions are expected from the closure of both Valmy units, amounting to a total of 4,119 tons per year reductions of visibility impairing pollutants.

WRAP emissions inventories underestimated the final reductions expected to be achieved at North Valmy Generating Station. Emissions reported by the Valmy Generating Station in 2016 were used to forecast Valmy's emissions in the 2028OTBa2 modeling emission inventory, or 2028 baseline before the implementation of potential controls. Beyond the 2028OTBa2 model, Valmy will reduce NO_x emissions by an additional 1,583 tpy and SO_2 emissions by an additional

2,281 tpy by the end of the second implementation period. New reasonable progress goals for 2028 are derived in Chapter 6 to account for these additional reductions.

TABLE 5-10

VALMY MODELING VS. FINAL EMISSION REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		Four-Factor Analysis		
	2028OTBa2 Emissions		**Baseline Emissions**	**Emissions after Controls**	**Emission Reductions**
Unit 1					
NOx	785		796	0	796
SO2	1,850		1,812	0	1812
PM10	22		22	0	22
Unit 2					
NOx	798		950	0	950
SO2	431		501	0	501
PM10	55		38	0	38
Total NOx	1,583		1746	0	1746
Total SO2	2,281		2313	0	2313
Total PM10	77		60	0	60

Note: Negative values reflect annual emissions increases.

5.6 TRACY GENERATING STATION FOUR-FACTOR OVERVIEW

For the purpose of determining whether controls at the Tracy Generating Station are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP's "Reasonable Progress Control Determination" for Tracy found in Appendix B.5.a. Tracy's air quality operating permit is incorporated by reference into this SIP in Appendix A.5. Table 5-11 outlines the files referenced in making reasonable progress determinations for the Tracy Generating Station, and where they can be found in Appendix B.

TABLE 5-11

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR TRACY

Full Document Title	Shortened Document Title (used in this document)	Date	Appendix Location
Tracy Generating Station Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Determination*	May 2022	B.5.a
Regional Haze Reasonable Further Progress Four Factor Analysis	*NVE Analysis*	March 13, 2020	B.5.b
RE: Response to Request for Additional Information	*Response Letter 1*	July 8, 2020	B.5.c
RE: Response to a Second Follow-up Request for Additional Information	*Response Letter 2*	January 15, 2021	B.5.d
RE: Response to a Third Follow-up Request for Additional Information	*Response Letter 3*	April 16, 2021	B.5.e
RE: Response to a Fourth Follow-up Request for Additional Information	*Response Letter 4*	May 7, 2021	B.5.f
RE: Response to a Fifth Follow-up Request for Additional Information (Valmy specific)	*Response Letter 5.1*	August 27, 2021	B.5.g
RE: Response to a Fifth Follow-up Request for Additional Information (Tracy specific)	*Response Letter 5.2*	October 11, 2021	B.5.h
RE: Response to a Sixth Follow-up Request for Additional Information	*Response Letter 6*	April 29, 2022	B.5.i
RE: Response to a Seventh Follow-up Request for Additional Information	*Response Letter 7*	May 27, 2022	B.5.j
RE: NV Energy Response to an Eighth Follow-Up Request for Additional Information	*Response Letter 8*	August 5, 2022	B.5.k
Class I Air Quality Operating Permit	Permit		A.5

All major emission units currently in operation at the Tracy Generating Station that were considered in the facility's four-factor analysis are summarized in Table 5-12.

TABLE 5-12

LIST OF UNITS AT TRACY

NDEP Unit ID	NVE Unit ID	Description (and Nominal Rating)
Unit 3	Unit 3	Steam Boiler (MG) 113 MW
Unit 5	Clark Mountain 3	GE EA Combustion Turbine, Simple Cycle NG-fired 83.5 MW (Distillate for emergency only)
Unit 6	Clark Mountain 4	GE 7EA Combustion Turbine, Simple Cycle NG-fired 83.5 MW (Distillate for emergency only)
Unit 7	Piñon Pine 4	GE 6FA NG Combined Cycle Combustion Turbine 107 MW (+23 MW Duct Burners)
Unit 32	Unit 8	GE 7F NG Combined Cycle Combustion Turbine 254 MW with 660 mmbtu/hr duct burners
Unit 33	Unit 9	GE 7F NG Combined Cycle Combustion Turbine 254 MW with 660 mmbtu/hr duct burners

Not all units at the Tracy Generating Station were required to be considered for potential new control measures. This was due to either low utilization, low emissions, or existing effective controls. Units 5 and 6 were screened out from further consideration of potential new control measures based on low utilization and low emissions. Units 32 and 33 were screened out from further consideration of potential new control measures based on existing effective controls and low emissions. Baseline emissions for Units 5, 6, 32, and 33 are provided in the following section.

Units 5 and 6 currently use Dry Low NO_x combustors to control NO_x emissions, and units 32 and 33 currently use Dry Low NO_x combustors and SCR to control NO_x emissions. NDEP considers the continued use of these existing controls as necessary to achieve reasonable progress.

Units 3 and 7 were evaluated for potential new control measures for NO_x emissions considering the four statutory factors. Potential new control measures for SO_2 and PM_{10} were not considered for any units at the Tracy Generating Station, as all units burn natural gas, resulting in low annual emissions for SO_2 and PM_{10}.

To comply with BART during the first round of Regional Haze in Nevada, Unit 3 discontinued the occasional use of distillate fuel and was retrofitted with the best available Low-NO_x Burners. NDEP does not consider these control measures to reduce NO_x, SO_2, and PM_{10} emissions as necessary to achieve reasonable progress as they are already incorporated into Nevada's Regional Haze SIP to satisfy BART.

Currently, the Unit 7 turbine uses steam injection to partially quench the heat of combustion to control NO_x emissions to approximately 41 ppm at 15% O_2 (2016-2018 average). NDEP considers the continued use of this control measure to control NO_x emissions as necessary to achieve reasonable progress.

5.6.1 Baseline Emissions

In NV Energy's initial four-factor analysis (*NVE Analysis* found in Appendix B.5.b) baseline emissions were derived from the annual average of emissions from 2016 through 2018. NDEP is relying on the 2016 through 2018 baseline emissions in evaluating Units 5, 6, 32, and 33, as annual emissions in 2018 were the most recent emissions data available at the time these units were screened out from a four-factor requirement. Table 5-13 outlines the baseline emission for units 5, 6, 32, and 33.

TABLE 5-13

TRACY FOUR-FACTOR ANALYSIS BASELINE EMISSIONS FOR
UNITS 5, 6, 32, AND 33

Unit ID	Average NO_x Emissions (tpy)	Average SO_2 Emissions (tpy)	Average PM_{10} Emissions (tpy)
Unit 5	12.0	0.3	1.0
Unit 6	10.6	0.2	0.8
Unit 32	38.5	4.0	24.3
Unit 33	37.5	4.0	23.8

For the purpose of NV Energy's four-factor analysis for the Tracy Generating Station, baseline emissions were adjusted to reflect the annual average of emissions observed from 2016 through 2020. Emissions data for 2019 and 2020 were incorporated into the baseline emissions for Units 3 and 7 as they became available and were included in later Response Letters submitted by NV Energy. Tables 5-14 and 5-15 show the baseline emissions assumed for SO_2, NO_x, and PM_{10} emissions at Units 3 and 7.

TABLE 5-14

TRACY FOUR-FACTOR ANALYSIS BASELINE EMISSIONS FOR UNIT 3

	Unit 3 Emissions (tpy)				
Year	**2016**	**2017**	**2018**	**2019**	**2020**
Total Annual NO_x	77	61	114	230	210
2016-2018 Average	84				
2016-2020 Average	138				

TABLE 5-15

TRACY FOUR-FACTOR ANALYSIS BASELINE EMISSIONS FOR UNIT 7

	Unit 7 Emissions (tpy)				
Year	**2016**	**2017**	**2018**	**2019**	**2020**
Total Annual NO_x	190	182	269	315	293
2016-2018 Average	213				
2016-2020 Average	250				

5.6.2 Identification of Technically Feasible Controls

As described in NDEP's Reasonable Progress Determination for the Tracy Generating Station (*NDEP Tracy Determination)*, Units 5, 6, 32, and 33 were screened out from further consideration of additional control measures, since these units all have existing effective controls and low annual emissions, indicating that a four-factor analysis would not result in any cost-effective additional controls that would be necessary to achieve reasonable progress for the second implementation period.

For Unit 3 at the Tracy Generating Station, NV Energy identified SCR and SCNR as technically feasible control measures in controlling NO_x emissions.

For Unit 7 at the Tracy Generating Station, NV Energy identified SCR and Dry Low NO_x Combustors as technically feasible control measures in controlling NO_x emissions.

Since all units at the Tracy Generating Station are natural gas fired, potential additional SO_2 and PM_{10} control measures were not evaluated as the use of natural gas is considered as an existing effective control in controlling SO_2 and PM_{10} emissions. As seen in the above table for baseline emissions, SO_2 and PM_{10} emissions at all units are low, and would likely not result in a cost-effective add-on control for SO_2 and PM_{10} emissions that would be necessary to achieve reasonable progress if a four-factor analysis were conducted.

5.6.3 Characterization of Cost of Compliance

As shown in Table 5-16, all potential control measures evaluated for Units 3 and 7 yield a cost-effectiveness value above NDEP's threshold of $10,000 per ton of NO_x reduced. Cost information used to determine the total annualized costs of each control that NDEP is relying on can be found in the *NDEP Tracy Determination* and other supporting documentation found in Appendix B.5.

TABLE 5-16

TRACY FOUR-FACTOR ANALYSIS COST-EFFECTIVENESS SUMMARY

Control	Unit	Baseline Emissions	Tons Reduced	Total Annualized Costs	Cost – Effectiveness
Dry Low NO_x Combustor	7	250 tpy NO_x	157 tpy NO_x	$2,724,697	$17,355 /ton
SNCR	3	138 tpy NO_x	35 tpy NO_x	$474,641	$13,561 /ton
SCR	7	250 tpy NO_x	225 tpy NO_x	$2,259,408	$10,064 /ton
	3	138 tpy NO_x	124 tpy NO_x	$1,387,040	$11,186 /ton

5.6.4 Characterization of Time Necessary for Compliance

For controls considered for Unit 3, an estimated two to three years would be needed to fully implement SCR or SNCR. For Unit 7, 47 months would be needed to fully implement SCR and two years for implementation of Dry Low NO_x combustors. These timeframes include design, permitting, procurement, installation, startup, and schedules that support regional electrical needs during each unit's outage.

5.6.5 Characterization of Energy and Non-Air Quality Environmental Impacts

Both SNCR and SCR have the potential to produce "ammonia slip." Installation of SCR in the exhaust flow path of the boiler causes a backpressure which must be offset by increased electrical demand. This increased energy use is reflected in the economic analysis as one of the operating costs for SCR. An annual electricity cost of $48,551 in 2019 dollars is estimated in Appendix B of the "Tracy Generating Station Four Factor Analysis" within the *NVE Analysis*.

For the installation of a Dry Low NO_x Combustor, NVE states in the *NVE Analysis* that this control would have a negative impact on the plant's water balance and result in a wastewater stream that would require treatment or disposal. A DLN conversion would also decrease the electrical generation of the turbine because of the decreased mass flow. This would add an annual cost of $870,000 in energy purchases.

5.6.6 Characterization of Remaining Useful Life of the Source

There is currently no federally enforceable closure date of Unit 3 that would restrict the remaining useful life of the unit when considering annualized capital costs. Because of this, NDEP is relying on the recommended life of SNCR and SCR listed in the EPA Control Cost Manual of 20 years and 30 years, respectively.

NDEP is relying on a service life of at most only 6 years before permanent shutdown of the unit for SCR implementation. NDEP is relying on a 9-year life for a Dry Low NO_x Combustor on Unit 7 given that the control go online by the end of 2022 and the unit permanently ceases operation at the end of 2031.

5.6.7 Decisions on what Control Measures are Necessary to Make Reasonable Progress

Based on the four statutory factors, NDEP concludes that no new control measures evaluated for the Tracy Generating Station are necessary to make reasonable progress.

NDEP is relying on a federally enforceable and permanent closure date of December 31, 2031 for Unit 7 (used to reduce the remaining useful life of the unit and inflate cost-effectiveness values for all new control measures considered for Unit 7 in the four-factor analysis) as necessary to achieve reasonable progress. During the time Unit 7 remains in operation prior to closure, NDEP is also relying on the continued use of existing controls (steam injection to control NO_x emissions) to make reasonable progress.

As stated above, NDEP is relying on the continued use of existing NO_x controls at Units 3, 5, 6, 32, and 33 to make reasonable progress.

NDEP is submitting the following controls, emission limits, and associated requirements, for approval into the SIP as measures necessary to make reasonable progress during second implementation period of Nevada's Regional Haze SIP (Table 5-17). These emission limits and associated requirements, listed in the source's air quality operating permit, are incorporated into the SIP by reference. The Tracy Generating Station's permit, Permit No. AP4911-0194.04, can be found in Appendix A.5 of Nevada's second Regional Haze SIP.

TABLE 5-17

TRACY PERMIT CONDITIONS INCORPORATED BY REFERENCE

Tracy Generating Station, Permit No. AP4911-0194.04		
	Citation	Permit Condition
Unit 5 (System 05A – Clark Mountain Combustion Turbine #3)		
NO_x	IV.B.1.a	Emissions from **S2.006** shall be controlled by **Dry Low NO_X Burners** while combusting natural gas only. Emissions from **S2.006** shall be controlled with **Water Injection** while combusting No. 2 Distillate Fuel Oil under "Emergency" conditions defined in **B.2.c.** of this section. Note, these are not add-on controls.
	IV.B.3.f	The discharge of **NO_X** (oxides of nitrogen) to the atmosphere shall not exceed: (1) **9** parts per million by volume (ppmv) at 15 percent oxygen and on a dry basis, based on a 24-hour rolling period; (2) **42.0 pounds** per hour, based on a 720-hour rolling period; (3) **122.64** tons per year, based on a 12-month rolling period.
Unit 6 (System 06A – Clark Mountain Combustion Turbine #4)		
NO_x	IV.D.1.a	Emissions from **S2.007** shall be controlled by **Dry Low NO_X Burners** while combusting Pipeline Natural Gas only. Emissions from **S2.006** shall be controlled with **Water Injection** while combusting No. 2 Distillate Fuel Oil under "Emergency" conditions defied in **D.2.c.** of this section. Note, these are not add-on controls.
	IV.D.3.f	The discharge of **NO_X** (oxides of nitrogen) to the atmosphere shall not exceed: (1) **9** parts per million by volume (ppmv) at 15 percent oxygen and on a dry basis, based on a 24-hour rolling period; (2) **42.0 pounds** per hour, based on a 720-hour rolling period; (3) **122.64** tons per year, based on a 12-month rolling period.
Unit 7 (System 07C – Tracy Unit #4 Piñon Pine Combustion Turbine)		
NO_x	IV.F.1	a. Emissions from **S2.009** shall be controlled by a **Steam Injection** for control of NO_X. b. Emissions from **S2.009.1** shall be controlled by **Dry Low NO_X Burners**. Note, these are not add-on controls.
	IV.F.3.f	The discharge of **NO_X** (oxides of nitrogen) to the atmosphere shall not exceed **141.0 pounds** per hour, nor more than **533.1 tons** per 12-month rolling period.
Unit 32 (System 32 – Combined Cycle Combustion Turbine Circuit No. 8)		
NO_x	IV.L.1.a	NO_X emissions from **S2.064 and S2.065** shall be controlled by a **Selective Catalytic Reduction (SCR)**. The SCR shall utilize Ammonia Injection into the SCR at a volume specified by the manufacturer.
	IV.L.3.g	The discharge of **NO_X** to the atmosphere shall not exceed **2.0** parts per million by volume (ppmv) at 15 percent oxygen on a dry basis, based on a 3-hour rolling period.
Unit 33 (System 33 – Combined Cycle Combustion Turbine Circuit No. 9)		
NO_x	IV.M.1.a	NO_X emissions from **S2.066 and S2.067** shall be controlled by a **Selective Catalytic Reduction (SCR)**. The SCR shall utilize Ammonia Injection into the SCR at a

		volume specified by the manufacturer.
	IV.M.3.g	The discharge of **NO_X** to the atmosphere shall not exceed **2.00** parts per million (ppmv) by volume at 15 percent oxygen and on a dry basis, per 3-hour rolling period.
All Units – Monitoring, Recordkeeping, Reporting		
	V.A & V.C	Oxides of Nitrogen (NO_x) Continuous Emissions Monitoring System (CEMS) Conditions
Closure Date		
VIII.A.		As part of Nevada's Regional Haze State Implementation Plan's (SIP) Long-Term Strategy to achieve reasonable progress, the Permittee shall shutdown and permanently cease operation of **System 07C (S2.009, S2.009.1)** no later than December 31, 2031.

5.6.8 Discussion of Tracy Generating Station Four-Factor Outcome

Upon conclusion of the initial four-factor analysis and after discussions with NDEP, NV Energy has since committed to NDEP to cease operations at Unit 7 Piñon Pine by December 31, 2031. This new closure date lowered the remaining useful life of the unit from 30 years to approximately 6 years, inflating the cost effectiveness value to $10,064/ton for SCR and $17,355/ton for Dry Low NO_x combustors. NDEP does not consider controls above $10,000/ton as cost-effective for the second implementation period of the Regional Haze Rule. Reductions from the closure of this unit will not be observed during the second implementation period, ending in 2028, but will be observed in Nevada's third implementation period of the Regional Haze Rule. Because of this, expected reductions cannot be quantified or assumed in Nevada's reasonable progress goals for the second implementation period.

In the 2028OTBa2 emission inventory, facility emissions for Tracy are taken from annual emissions reported in 2018. By the end of the second implementation period in 2028, final reductions achieved from the unit's closure will not be observed yet. To reflect this, NDEP expects no emission reductions at the Tracy Generating Station as a result of this round's four-factor analyses by the end of the planning period. An emissions summary is outlined in Table 5-15.

Although there is a slight difference in NO_x emissions between 2028OTBa2 and the Emissions After Controls inventories, as shown in Table 5-18, this is a result of different baseline emissions used and not because of reductions achieved from add-on controls considered in the four-factor analysis. Because of this, there will be no adjustments made to the reasonable progress goals provided by the WRAP to reflect additional reductions at Tracy.

TABLE 5-18

TRACY MODELING VS. FINAL EMISSIONS REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		Four-Factor Analysis		
	2028OTBa2 Emissions		**Baseline Emissions**	**Emissions after Controls**	**Emission Reductions**
Unit 3 Steam Boiler					
NOx	114		84	84	0
SO2	1		1	1	0
PM10	2		2	2	0
Unit 4 Clark Mountain 3					
NOx	22		12	12	0
SO2	1		1	1	0
PM10	1		1	1	0
Unit 5 Clark Mountain 4					
NOx	20		11	11	0
SO2	1		1	1	0
PM10	1		1	1	0
Unit 6 Pinon Pine 4					
NOx	267		250	250	0
SO2	1		1	1	0
PM10	7		7	7	0
Unit 8					
NOx	40		39	39	0
SO2	4		4	4	0
PM10	24		24	24	0
Unit 9					
NOx	40		38	38	0
SO2	4		4	4	0
PM10	24		24	24	0
Total NOx	503		434	434	0
Total SO2	12		12	12	0
Total PM10	59		59	59	0

Aside from the closure of the Piñon Pine unit by December 31, 2031, Nevada is also relying on existing controls, listed in Table 5-19, that effectively control visibility impairing pollutants. The continued use of these existing controls will be included in Nevada's Long Term Strategy for the second implementation period, along with the current corresponding NO_x emission limits for each unit listed in the facility's current operating permit. These listed controls target NO_x emissions as the Tracy facility primarily burns pipeline natural gas.

TABLE 5-19

TRACY EXISTING CONTROLS FOR NO_x

Permit ID	NVE ID	Description and Nominal Rating	Current Control	Permitted NO_x Emission Limit
System 3	3	Steam Boiler (NG) 113 MW	Low-NO_x Burner	0.19 lb/MMBtu based on a 12-month rolling average
System 5	Clark Mountain 3	GE EA Combustion Turbine, Simple Cycle NG-fired 83.5 MW (Distillate for emergency only)	Dry Low NO_x combustors w/ NG (water injection if distillate)	9 ppmv based on a 24-hour rolling average
				42 lb/hr based on a 720-hour rolling average
				122.64 tpy based on a 12-month rolling average
System 6	Clark Mountain 4	GE 7EA Combustion Turbine, Simple Cycle NG-fired 83.5 MW (Distillate for emergency only)	Dry Low NO_x combustors w/ NG (water injection if distillate)	9 ppmv based on a 24-hour rolling average
				42 lb/hr based on a 720-hour rolling average
				122.64 tpy based on a 12-month rolling average
System 7	Piñon Pine 4	GE 6FA NG Combined Cycle Combustion Turbine 107 MW (+23 MW Duct Burners)	steam injection	141.0 lb/hr, nor more than 533.10 tpy based on a 12 month rolling average
System 32	Unit 8	GE 7F NG Combined Cycle Combustion Turbine 254 MW with 660 mmbtu/hr duct burners	Low NO_x combustors, SCR, & Ox. catalyst	87.6 tons per year
				2 ppmv based on a 3-hour average
System 33	Unit 9	GE 7F NG Combined Cycle Combustion Turbine 254 MW with 660 mmbtu/hr duct burners	Low NO_x combustors, SCR, & Ox. catalyst	87.6 tons per year
				2 ppmv based on a 3-hour average

5.7 APEX PLANT FOUR-FACTOR OVERVIEW

For the purpose of determining whether controls at the Apex Plant are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP's "Reasonable Progress Control Determination" for the Apex Plant found in Appendix B.1.a. The Apex Plant's air quality operating permit is incorporated by reference into this SIP in Appendix A.1. Table 5-20 outlines the files referenced in making reasonable progress determinations for the Apex Plant, and where they can be found in Appendix B.

TABLE 5-20

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR APEX PLANT

Full Document Title	Shortened Document Title (used in this document)	Date	Appendix Location
Apex Plant Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Determination*	March 2022	B.1.a
Regional Haze Second Planning Period Four-Factor Analysis	*LNA Analysis*	March 24, 2021	B.1.b
RE: RHR Apex Plant Update	*LNA Email*	September 13, 2021	B.1.c
RE: Lhoist North America of Arizona, Inc. - Apex Plant Comments on Draft 2021 Regional Haze Four Factor Review and Initial Control Determination	*LNA Comments*	October 13, 2021	B.1.d
Class I Air Quality Operating Permit	Permit		A.1

5.7.1 Baseline Emissions

The Apex Plant is a lime production facility that operates four horizontal rotary preheater lime kilns. Baseline emissions assumed for each kiln for the purpose of conducting a four-factor analysis are provided in Table 5-21. The baseline emissions are derived from the annual average of emissions reported from 2016 to 2018.

TABLE 5-21

APEX PLANT FOUR-FACTOR ANALYSIS BASELINE EMISSIONS

Process Level	SO_2 Emissions (tpy)	NO_x Emissions (tpy)	PM_{10} Emissions (tpy)
Kiln 1	107.30	304	18.46
Kiln 2	5.32	19	1.12
Kiln 3	14.42	154	15.81
Kiln 4	8.21	687	23.04
Facility-Wide (Total)	135	1,164	58.43

5.7.2 Identification of Technically Feasible Control Measures

For all kilns at the Apex Plant, Lhoist North America identified LNB and SNCR as technically feasible control measures in controlling NO_x emissions. LNB is only considered for Kilns 1 and 2, as Kilns 3 and 4 already implement the control. SNCR is evaluated for all four kilns.

For Kilns 2 and 4 at the Apex Plant, Lhoist North America identified a fuel switch to use of natural gas only as a technically feasible control measure in controlling SO2 emissions. This was not considered for Kilns 1 and 3 since these kilns are intended to produce dolomitic lime, which cannot be produced using 100% natural gas. Kilns 2 and 4 are intended to produce HiCal lime, which can be produced using 100% natural gas.

Additional PM_{10} controls are not evaluated for the Apex Plant kilns, as PM_{10} emissions at all four kilns are already controlled by baghouses that meet the definition of best available control technology (BACT). Low annual baseline PM_{10} emissions confirm that all four kilns are effectively controlled by the existing baghouses.

5.7.3 Characterization of Cost of Compliance

Table 5-22 summarizes how the cost of compliance was characterized for each control measure considered in the facility's four-factor analysis using baseline emissions, assumed control efficiencies, total tons reduced, total annualized costs, and cost-effectiveness values (annual dollars per ton of pollutant reduced).

Cost-effectiveness values for the implementation of LNB and SNCR are focused on achievable NO_x reductions based on the baseline NO_x emissions and assumed control efficiency of each control. A 10% NO_x reduction is assumed for the implementation of LNBs. A 20% NO_x reduction at Kilns 1, 2, and 3, and a 50% NO_x reduction at Kiln 4, are assumed for the implementation of SNCR. The control efficiency of SNCR differs between Kiln 4 and the rest of the Apex Plant kilns due to differences in age and configuration (discussed further in Lhoist's four-factor analysis).

Although switching to 100% natural gas at Kilns 2 and 4 have the potential to reduce SO_2 and PM_{10} emissions, increased use of natural gas increases NO_x emissions. To ensure the change in all visibility impairing pollutants are considered, baseline emissions and tons reduced are calculated from the sum of NO_x, SO_2, and PM_{10} emissions. The assumed control efficiency is only applied to SO_2 emissions. For Kiln 4's case, the increase in NO_x emissions surpasses the reduced SO_2 and PM_{10} emissions, resulting in an overall increase in emissions (negative tons reduced value) that produces a negative cost-effectiveness value (marked N/A in table).

TABLE 5-22

APEX PLANT FOUR-FACTOR ANALYSIS COST-EFFECTIVENESS SUMMARY

Control	Kiln	Baseline Emissions (tpy)	Assumed Control Efficiency	Tons Reduced (tpy)	Total Annualized Costs	Cost – Effectiveness
LNB	1	304 tpy NO_x	10%	30.35 tpy NO_x	$25,792	$850 /ton
	2	19 tpy NO_x	10%	1.91 tpy NO_x	$25,792	$13,494 /ton
SNCR	1	304 tpy NO_x	20%	60.70 tpy NO_x	$164,394	$2,708 /ton
	2	19 tpy NO_x	20%	3.82 tpy NO_x	$144,681	$37,847 /ton
	3	154 tpy NO_x	20%	30.84 tpy NO_x	$154,044	$4,995 /ton
	4	687 tpy NO_x	50%	343.34 tpy NO_x	$262,344	$764 /ton
Fuel Switch to 100% NG	2	23.66 tpy NO_x, SO_2, and PM_{10}	99.92%	1.02 tpy NO_x, SO_2, and PM_{10}	$8,708,565	$8,666,204 /ton
	4	724.46 tpy NO_x, SO_2, and PM_{10}	99.62%	-147.92 tpy NO_x, SO_2, and PM_{10}.	$1,589,821	N/A

5.7.4 Characterization of Time Necessary for Compliance

Lhoist North America indicates that the time necessary for compliance of LNB and SNCR across all kilns would require two years, while a fuel-switch to 100% natural gas could be implemented at Kilns 2 and 4 by 2028, or approximately six years.

5.7.5 Characterization of Energy and Non-Air Quality Environmental Impacts

An expected decrease in efficiency throughout the facility as significant energy and water use is increased to support the SNCR technology is represented as additional power costs in the evaluation of cost of compliance. An additional annual power cost of $16,272 per kiln is estimated based on LNA's previous experience in implementing SNCR on Lhoist's Nelson facility. It is also acknowledged that the use of SNCR, and urea as a reagent, may introduce ammonia slip to the kilns. This is not accounted for in the cost calculations.

No energy and non-air quality impacts were identified when considering the implementation of Low-NO_x Burners or a fuel switch to 100% natural gas.

5.7.6 Characterization of Remaining Useful Life of the Source

Currently, there is no federally enforceable closure date for the Apex Plant. Because of this, the typical life of LNB and SNCR specified in the USEPA Control Cost Manual of 20 years is assumed. A 20-year life is also assumed for switching to 100% natural gas.

5.7.7 Decisions on what Control Measures are Necessary to Make Reasonable Progress

Based on the four statutory factors, NDEP considers the implementation of LNBs at Kiln 1, and implementation of SNCR at Kilns 1, 3, and 4 as necessary to achieve reasonable progress during the second implementation period of Nevada's Regional Haze SIP. As previously stated, LNBs have recently been installed on Kilns 3 and 4 that have not yet been incorporated into the Apex Plant's current air quality operating permit. NDEP considers the continued use of LNB on Kiln 3 and 4 as necessary to make reasonable progress as well. New NO_x emission limits (and other requirements) that reflect the use LNB and SNCR at Kilns 1, 3, and 4, are derived in the *NDEP Reasonable Progress Determination* for the Apex Plant, found in Appendix B.1.a. These new limits, and other associated requirements, were revised into the Apex Plant's air quality operating permit.

The following requirements are established in the Apex Plant's Authority to Construct Permit issued and enforced by the Clark County Department of Environment and Sustainability as enforceable permit conditions (Table 5-23). The referenced permit conditions below are incorporated by reference into Nevada's Regional Haze SIP Long-Term Strategy for the second implementation period as a source-specific SIP revision for approval. Pages with referenced conditions in the Apex Plant's Authority to Construct permit that NDEP is relying on to achieve reasonable progress for the second implementation period can be found in Appendix A.1.

TABLE 5-23

APEX PLANT ATC PERMIT CONDITIONS INCORPORATED BY REFERENCE

Apex Plant, Authority to Construct Permit for a Major Part 70 Source, Source ID: 3, Clark County DES		
	Citation	Permit Condition
Control Requirements (Facility-Wide)		
NO_x	2.2.1	The control requirements and the NO_X emission reductions proposed in the ATC are permanent and shall not be removed, changed, revised, or modified without the approval of the Nevada Division of Environmental Protection and EPA upon becoming effective.
	2.2.2	Effective no later than two years after the EPA's approval of the controls determination associated with the SIP, the permittee shall install and maintain **low-NO_X burners (LNB) on Kilns 1, 3 and 4** in order to achieve a reduction of **NO_X emissions** (EU: K102, K302, and K402).
	2.2.3	Effective no later than two years after the EPA's approval of the controls determination associated with the SIP, the permittee shall install, operate, and maintain **selective non-catalytic reduction (SNCR) on Kilns 1, 3, and 4 (EUs: K102, K302, and K402) to achieve reduction of NO_X emissions**
Emission Limits (Facility-Wide)		
NO_x	3.2.1	Effective no later than two years after the EPA's approval of the controls determination associated with the SIP, the permittee shall **limit total NO_X emissions from all operating kilns to 3.75 tons per day based on a consecutive 30-day average** (EUs: K102, K202, K302, and K402).
	3.2.2	Effective no later than two years after the EPA's approval of the controls determination associated with the SIP, the permittee **shall limit the combined total NO_X emissions from all operating kilns to 3.59 lb/tlp based on a consecutive 12-month average** (EUs: K102, K202, K302, and K402)
Monitoring, Recordkeeping, and Reporting Requirements		
NO_x	4.1	Monitoring
	4.3.6 4.3.7	Recordkeeping
	4.4.7 4.4.8	Reporting and Notifications

5.7.8 Discussion of Apex Plant Four-Factor Outcome

For Kilns 1, 3, and 4, Low-NO_x Burners and Selective Non-Catalytic Reduction for NO_x control are necessary to achieve reasonable progress. Low NO_x Burners control fuel and air mixing at each burner to reduce peak flame temperature and reduce NO_x formation. Selective Non-Catalytic Reduction injects a reagent, typically urea or anhydrous gaseous ammonia, into the flue gas stream of a system to scrub NO_x emissions.

In the WRAP emission inventories, 2028OTBa2 used reported facility emissions from 2014 to forecast 2028 baseline emissions. Final reductions achieved from the four-factor analysis are greater than what was assumed in the WRAP emission inventories. A comparison of the

2028OTBa2 and final reductions resulting from reasonable progress controls is shown in Table 5-24.

Nevada expects additional NO_x reductions as a result of the four-factor analysis beyond what was assumed in the 2028OTBa2 modeling. The Apex Plant will reduce NO_x emissions by an additional 493 tpy by the end of the second implementation period. New reasonable progress goals for 2028 are derived in Chapter 6 to account for these additional reductions.

TABLE 5-24

APEX MODELING VS. FINAL EMISSIONS REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		**Four-Factor Analysis**		
	2028OTBa2 Emissions		**Baseline Emissions**	**Emissions after Controls**	**Emission Reductions**
Kiln 1					
NOx	294		304	219	85
SO2	107		107	107	0
PM10	2		19	19	0
Kiln 2					
NOx	137		19	19	0
SO2	9		5	5	0
PM10	1		1	1	0
Kiln 3					
NOx	274		154	124	30
SO2	16		18	18	0
PM10	4		16	16	0
Kiln 4					
NOx	647		687	309	378
SO2	18		8	8	0
PM10	1		23	23	0
Total NOx	1,352		1,164	671	493
Total SO2	150		138	138	0
Total PM10	8		59	59	0

5.8 PILOT PEAK PLANT REASONABLE PROGRESS OVERVIEW

For the purpose of determining whether controls at the Pilot Peak Plant are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP's "Reasonable Progress Control Determination" for the Pilot Peak Plant found in Appendix B.2.a. Pilot Peak's air quality operating permit is incorporated by reference into this SIP in Appendix A.2. Table 5-25 outlines the files referenced in making reasonable progress determinations for the Pilot Peak Plant, and where they can be found in Appendix B.

TABLE 5-25

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR PILOT PEAK

Full Document Title	Shortened Document Title (used in this document)	Date	Appendix Location
Pilot Peak Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Determination*	May 2022	B.2.a
Reasonable Progress Four-Factor Analysis	*GW Analysis*	October 2020	B.2.b
RE: Graymont Pilot Peak Response to Federal Land Managers Comments on Four-Factor Analysis for Regional Haze	*Response Letter 1*	November 13, 2020	B.2.c
RE: Pilot Peak Response to NDEP Request for Additional Information Graymont Western US, Inc.	*Response Letter 2*	April 16, 2021	B.2.d
RE: Graymont Pilot Peak Response to the Initial Control Determination Letter	*Response Letter 3*	October 15, 2021	B.2.e
Class I Air Quality Operating Permit	Permit		A.2

5.8.1 Removing the Pilot Peak Plant from Consideration of Potential New Control Measures

NDEP relied on the Q/d method for source selection by quantifying total facility-wide NO_x, SO_2, and PM_{10} emissions, represented as "Q", reported in the 2014 NEIv2. The Q value was then divided by the distance, in kilometers, between the facility and the nearest Class I area (CIA), represented as "d". The nearest CIA to the Pilot Peak Plant is Jarbidge Wilderness Area at 131 kilometers away. NDEP elected to set a Q/d threshold of 5. As displayed in Table 5-26, using 2014 NEIv2 emissions, the Pilot Peak Plant yielded a Q/d value of 5.15, effectively screening the facility into a four-factor analysis requirement for the second round of Regional Haze in Nevada.

TABLE 5-26

ORIGINAL Q/D DERIVATION FOR PILOT PEAK

NO_x Emissions (tpy)	SO_2 Emissions (tpy)	PM_{10} Emissions (tpy)	Total Q (NO_x+SO_2 +PM_{10}) [tpy]	Distance from Nearest CIA (Jarbidge WA) [km]	Q/d
523	23	127	673	131	**5.15**

These emissions were pulled from the 2014 NEIv2, based on NO_x emission rates presented in Table 5-27, however, in *Response Letter 2*, Graymont indicated that the emissions reported in the 2014 NEIv2, particularly the NO_x emissions, did not agree with what was submitted by Graymont for Pilot Peak's 2014 Annual Emission Inventory (AEI). Graymont's AEI for Pilot Peak in 2014 resulted in a Total Q of 604 tons per year (tpy), rather than 673, resulting in a Q/d of 4.61 (see Table 5-28). The change in resulting Total Q is primarily due to different NO_x emission rates used to calculate total NO_x emissions. Table 5-29 shows Graymont's calculated NO_x emissions for 2014 to be compared to Table 5-27 that outlines NO_x emissions reported into the 2014 NEIv2.

As seen in Table 5-27, the 2014 NEIv2 emissions calculated NO_x emissions for the Pilot Peak Plant kilns in 2014 using a NO_x emission rate in pound per hour, multiplied by the annual hours of operation for each kiln. This produced facility-wide NO_x emissions at 523 tons per year, resulting in a Q/d of 5.15. Alternatively, as seen in Table 5-29, Graymont calculated NO_x emissions for the Pilot Peak kilns in 2014 using a NO_x emission rate in pounds of NO_x per ton of lime produced, multiplied by the annual lime production rate for each kiln in tons per year. This produced facility-wide NO_x emissions at 459 tons per year, resulting in a Q/d of 4.61.

TABLE 5-27

NDEP-CALCULATED NO_x EMISSIONS FOR PILOT PEAK IN 2014

Unit	NO_x Emission Rate (lb/hr)	Hours of Operation (hr/yr)	NO_x Emissions (tpy)
Kiln 1	47.5	7033	167
Kiln 2	40.1	7033	141
Kiln 3	60.2	7153	215
		Total NO_x Emissions	**523**

TABLE 5-28

UPDATED Q/D DERIVATION FOR PILOT PEAK

NO_x Emissions (tpy)	SO_2 Emissions (tpy)	PM_{10} Emissions (tpy)	Total Q (NO_x+SO_2 +PM_{10}) [tpy]	Distance from Nearest CIA (Jarbidge WA) [km]	Q/d
459	23	122	604	131	**4.61**

TABLE 5-29

GRAYMONT-CALCULATED 2014 NO_x EMISSIONS FOR UPDATED Q/D

Unit	NO_x Emission Rate (lb NO_x/ton lime)	Lime Production Rate (tons/yr)	NO_x Emissions (tpy)
Kiln 1	2.102	125,313	131.69
Kiln 2	1.302	199,362	129.78
Kiln 3	1.374	287,132	197.32
		Total NO_x Emissions	**459**

NDEP has reviewed the reporting requirements for NO_x emissions in the Pilot Peak Plant's air quality operating permit and confirms that the permitted procedure is to calculate NO_x emissions for each kiln using NO_x emission rates in pounds of NO_x per ton of lime produced, and annual lime production rates in tons per year. Because of this, Graymont no longer places above the set Q/d threshold of 5 and, therefore, is formally screened out of a four-factor analysis requirement and is not considered further for potential new control measures.

A comparison to other reporting years, and their resulting Q/d values, were conducted for years 2015 through 2020. As shown in Table 5-30, the following four operating years (2015-2018) also yield Q/d values below 5, while 2019 and 2020 yield a Q/d value above 5.

TABLE 5-30

Q/D COMPARISON AMONG OPERATING YEARS AT PILOT PEAK

	Facility Emissions (tpy)						
Pollutant	**2014***	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
NO_x	459	406	451	395	418	562	700
SO_2	23	25	15	15	18	19	18
PM_{10}	122	66	75	70	68	77	80
Total	**604**	**497**	**541**	**480**	**504**	**658**	**798**
Q/d	**4.61**	**3.79**	**4.13**	**3.66**	**3.85**	**5.02**	**6.09**

*Updated 2014 emissions submitted in Graymont's AEI

Although emissions reported in 2019 and 2020 yield Q/d values above 5, NDEP does not find that it is reasonable to screen the source back into a four-factor analysis requirement for consideration of potential new measures for the following reasons:

1. Arbitrary Action – NDEP is reluctant to hold the Pilot Peak Plant to a different reporting year than other sources for source selection, as this can be seen as an arbitrary action. All other sources in the state of Nevada were considered for source selection using 2014 emissions, Pilot Peak would be the sole facility that was held to a different reporting year.
2. Emission Inventories – the WRAP states uniformly agreed to conduct source selection through the Q/d analysis using emissions from the NEI so emissions for all Western States could be easily accessed and reviewed by the Western Regional Air Partnership (WRAP) States and members. WRAP agreed to rely on the 2014 NEIv2 for source selection. This was done so that the Representative Baseline emission inventory (based on years 2014-2018) used in the SIP would agree with emissions used for source selection. At the time source selection was conducted, in August of 2019, 2017 and 2020 NEI were not yet available. Even if NDEP elected to rely on 2017 NEI emissions for source selection when it was released, Graymont would have had a Q/d of 3.66. The 2020 NEI is still not yet available.
3. Overall Q/d - considering Q/d values for 2014 through 2020, five of the seven years, or clear majority, show a Q/d value below NDEP's set threshold. The average Q/d across all seven years is 4.45, also falling below the threshold of 5.

Graymont did not provide updated 2014 emissions, subsequently screening them out of the four-factor requirement, until after they had already provided source information for a four-factor analysis (*GW Analysis*). Graymont has volunteered to include all information submitted for a four-factor analysis to demonstrate their efforts in remaining compliant with the requirements of the Regional Haze Rule, but do not intend for the submitted information to be used to consider new potential control measures for the second implementation period of the Regional Haze Rule in Nevada.

Although no new measures were formally considered to achieve reasonable progress at the Pilot Peak kilns, NDEP still evaluated whether any existing measures at the facility were necessary to achieve reasonable progress, outlined in the following sections.

5.8.2 Decisions on What Control Measures are Necessary to Make Reasonable Progress

NDEP evaluated whether existing SO_2, PM_{10}, and NO_x control measures at the Pilot Peak are necessary to make reasonable progress in NDEP's "Reasonable Progress Control Determination" for the Pilot Peak Plant found in Appendix B.2.a.

In this document, a robust weight-of-evidence demonstration is provided for existing SO_2 and PM_{10} control measures at the Pilot Peak Plant to determine that these controls are not necessary to make reasonable progress. Historical and projected emission rates for PM_{10} and SO_2 remain low and consistent, making it reasonable to assume that the source will continue to implement its existing measures and will not increase its emission rate.

For the control of NO_x emissions, Graymont Western has implemented LNBs at all three of the Pilot Peak kilns in recent years. NDEP identifies the continued use of existing LNBs at all three kilns as necessary to make reasonable progress. The determination of the new NOx limits, and other associated requirements, that reflect the use of Low-NO_x Burners at all Pilot Peak kilns is provided in NDEP's "Reasonable Progress Control Determination" for Pilot Peak.

The following requirements are established in the Pilot Peak Plant's air quality operating permit (Permit No. AP3274-1329.03) as enforceable permit conditions (Table 5-31). The referenced permit conditions below are incorporated by reference into Nevada's Regional Haze SIP Long-Term Strategy for the second implementation period as a source-specific SIP revision for approval. Pages with referenced conditions in the Pilot Peak Plant's current air quality permit that NDEP is relying on to achieve reasonable progress for the second implementation period can be found in Appendix A.2.

TABLE 5-31

PILOT PEAK PLANT PERMIT CONDITIONS INCORPORATED BY REFERENCE

Pilot Peak Plant, Permit No. AP3274-1329.03		
	Citation	Permit Condition
Kiln 1 (System 10 – Kiln #1 Circuit)		
NO_x	IV.I.1.a	Emissions from **S2.031 through S2.033** shall be controlled by a baghouse (D-85) and **Low-NOx Burners.**
	IV.I.3.b	The Permittee, within 240 days upon issuance of this operating permit, shall not discharge into the atmosphere from **the exhaust stack of baghouse (D-85)** the following pollutants in excess of the following specified limits: (1) Nevada Regional Haze SIP Limit – The discharge of **NOx** to the atmosphere shall not exceed 101.4 pounds per hour, based on a 30-day rolling average period.
	V.B-C	**NOx (CEMS) Requirements for System 10** (S2.031, S2.032, and S2.033), **System 13** (S2.036, S2.037, S2.038), and **System 17** (S2.042, S2.043, S2.044)
	IV.I.4.q IV.I.4.u	Specific Monitoring, Recordkeeping, and Reporting Requirements
Kiln 2 (System 13 – Kiln #2 Circuit)		
NO_x	IV.L.1.a	Emissions from **S2.036 through S2.038** shall be controlled by a baghouse (D-285) and **Low-NOx Burners.**
	IV.L.3.b	The Permittee, within 240 days upon issuance of this operating permit, shall not discharge into the atmosphere from **the exhaust stack of baghouse (D-285)** the following pollutants in excess of the following specified limits: (1) Nevada Regional Haze SIP Limit – The discharge of **NOx** to the atmosphere shall not exceed 107.4 pounds per hour, based on a 30-day rolling average period.
	V.B-C	**NOx (CEMS) Requirements for System 10** (S2.031, S2.032, and S2.033), **System 13** (S2.036, S2.037, S2.038), and **System 17** (S2.042, S2.043, S2.044)
	IV.L.4.q IV.L.4.u	Specific Monitoring, Recordkeeping, and Reporting Requirements
Kiln 3 (System 17 – Kiln #3 Circuit)		
NO_x	IV.Q.1.a	Emissions from **S2.042 through S2.044** shall be controlled by a baghouse (D-385) and **Low-NOx Burners.**
	IV.Q.3.b	The Permittee, within 240 days upon issuance of this operating permit, shall not discharge into the atmosphere from **the exhaust stack of baghouse (D-385)** the following pollutants in excess of the following specified limits: (1) Nevada Regional Haze SIP Limit – The discharge of **NOx** to the atmosphere

		shall not exceed 143.7 pounds per hour, based on a 30-day rolling average period.
	V.B-C	**NOx (CEMS) Requirements for System 10** (S2.031, S2.032, and S2.033), **System 13** (S2.036, S2.037, S2.038), and **System 17** (S2.042, S2.043, S2.044)
	IV.Q.4.q IV.Q.4.u	Specific Monitoring, Recordkeeping, and Reporting Requirements

5.4.4 Discussion of Pilot Peak Plant Four-Factor Outcome

Although NO_x emission limits will be reduced within the source's air quality operating permit, these levels have already been achieved in practice over the past several years, and beyond the scope of the second implementation period of the Regional Haze Rule for Nevada. Because of this, there are no expected emission reductions within the WRAP emission inventories, or as a result of the final four-factor analysis. An emissions summary is provided in Table 5-32.

Although there is a slight difference in emissions between 2028OTBa2 and the Emissions After Controls inventories, this is a result of different baseline emissions used and not because of reductions achieved from add-on controls considered in the four-factor analysis. Because of this, there will be no adjustments made to the reasonable progress goals provided by the WRAP to reflect additional reductions at the Pilot Peak Plant.

TABLE 5-32

PILOT PEAK MODELING VS. FINAL EMISSIONS REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		Four-Factor Analysis		
	2028OTBa2 Emissions		**Baseline Emissions**	**Emissions after Controls**	**Emission Reductions**
Kiln 1					
NOx	167		135	135	0
SO2	3		1	1	0
PM10	18		17	17	0
Kiln 2					
NOx	141		173	173	0
SO2	6		1	1	0
PM10	31		25	25	0
Kiln 3					
NOx	215		207	207	0
SO2	14		4	4	0
PM10	5		51	51	0
Total NOx	523		515	515	0
Total SO2	23		6	6	0
Total PM10	54		93	93	0

5.9 FERNLEY PLANT FOUR FACTOR ANALYSIS

For the purpose of determining whether controls at the Fernley Plant are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP's "Reasonable Progress Control Determination" for the Fernley Plant found in Appendix B.4.a. Table 5-33 outlines the files referenced in making reasonable progress determinations for the Pilot Peak Plant, and where they can be found in Appendix B.

TABLE 5-33

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR FERNLEY

Full Document Title	Shortened Document Title (used in this document)	Date	Appendix Location
Fernley Plant Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Control Determination*	March 2022	B.4.a
Regional Haze – Four Factor Analysis	*NCC Analysis*	October 2020	B.4.b
RE: Regional Haze Four Factor Analysis SO_2 Response to NDEP Comments	*Response Letter 1*	November 3, 2020	B.4.c
RE: Regional Haze Four Factor Analysis SO_2 Response to NDEP Comments	*Response Letter 2*	January 7, 2021	B.4.d
Regional Haze Email	*NCC Email*	September 20, 2019	B.4.e

Nevada Cement Company's (NCC) Fernley Plant is a Portland cement manufacturing plant located in Fernley, Nevada, consisting of two coal-fired and/or natural gas-fired long-dry process kilns. Portland cement produced by NCC is a cementitious, crystalline compound composed primarily of calcium, aluminum, and iron silicates. Both kilns are rated at 30.55 tons per hour of clinker, translating to about 267,500 tons per year clinker for each kiln, or 535,000 tons per year plantwide.

Both kilns at the Fernley Plant currently operate baghouses for the control of particulate matter. NDEP considers the existing baghouses for both kilns as existing effective controls, therefore, additional PM_{10} control measures were not considered for the Fernley Plant kilns. However, NDEP considers the continued use of the existing baghouses at both kilns as necessary to achieve reasonable progress.

When considering existing and potential new SO_2 and NO_x control measures, it is important to note that the Fernley Plant is currently bound to the requirements of a USEPA Consent Decree to control NO_x and SO_2 emissions, which can be found via the following links:

United States of America v. Nevada Cement Company, Civil Action No. 3:17-cv-00302-MMD-WGC

https://www.justice.gov/enrd/consent-decree/file/1089586/download

https://www.justice.gov/enrd/consent-decree/file/1089596/download

To control SO_2 emissions, the Consent Decree requires that both kilns at the Fernley Plant emit no more than 1.1 pound of SO_2 per ton of clinker. The facility relies on inherent scrubbing of SO_2 emissions within the cement kilns and has since installed a Dry Sorbent Injection system to assist in achieving the relevant emission limits for both kilns. The Consent Decree ultimately requires that the 1.1 pound of SO_2 per ton of clinker emission rate be incorporated into the facility's Title V operating permit.

To control NO_x emissions, the facility is required to install Selective Non-Catalytic Reduction (SNCR), followed by Low-NO_x Burners. Currently, the facility has installed SNCR on both kilns and is in the demonstration period. As stated in Appendix A of the Consent Decree, after the demonstration period, the source is to submit a demonstration report for each kiln's SNCR performance. A final 30-day rolling average emission limit for NO_x for both kilns is then derived from the findings of the demonstration report. Once approved by EPA, or an alternative 30-day rolling average emission limit is provided by EPA, the new NO_x limit associated with the SNCR systems for both kilns is permanently incorporated into the Fernley Plant's NDEP air quality operating permit. The same procedure is required for the implementation of Low-NO_x Burners for each kiln.

NDEP does not consider the installation and continued use of SNCR and Low-NO_x Burners at both Fernley Plant kilns as necessary to achieve reasonable progress, as NDEP is incapable of determining emissions limits, associated requirements, and compliance schedules for the NO_x controls in a manner that would satisfy the applicable SIP requirements.

The Consent Decree also required the installation and continued use of Continuous Emission Monitoring Systems (CEMS) for both kilns to measure and monitor SO_2 and NO_x emissions. The facility has since implemented CEMS for both kilns successfully and relies on CEMS for SO_2 and NO_x emissions reporting.

NDEP is relying on the referenced Consent Decree to screen the facility out of further consideration of potential new control measures, as the outcome of the Consent Decree will inherently make both kilns BACT for NO_x, SO_2, and PM_{10} emissions. Once NCC has developed and finalized all associated limits to the consent decree controls, it is required that these new limits be incorporated into the facility's Title V permit, making the controls federally enforceable and permanent.

NDEP concludes that the consent decree controls for NO_x and SO_2 are not necessary to achieve reasonable progress as these new consent decree controls, and associated limits, will become federally enforceable and permanent through the source's Title V operating permit, as required by the USEPA Consent Decree, regardless of whether they are included in Nevada's Long-Term Strategy for the second implementation period of Regional Haze as necessary to achieve reasonable progress. Furthermore, anticipated reductions from the implementation of NO_x controls and achievement of new SO_2 limits required by the consent decree were not included in the 2028 RPGs developed in Chapter 6 for Jarbidge WA.

Although the Fernley Plant was not required to conduct a four-factor analysis for potential new control measures, the facility was asked to evaluate the continuous use of the facility's existing DSI system, as opposed to occasional use, considering the four statutory factors to achieve additional SO_2 emission reductions.

5.9.1 Baseline Emissions

The SO_2 emissions baseline used in the considering continuous operation of the existing DSI system is summarized in Table 5-34. These baseline emissions represent available SO_2 emissions that could be reduced after DSI has already been used to meet the SO_2 emission limit requirements listed in the consent decree.

TABLE 5-34

FERNLEY FOUR-FACTOR ANALYSIS BASELINE SO_2 EMISSIONS

Kiln	Baseline SO_2 Emissions (tpy)
1	114.6
2	106.8

5.9.2 Characterization of Cost of Compliance

Cost-effectiveness values for operating the existing DSI system at full capacity, provided in Table 5-35, are focused on achievable SO_2 reductions based on the baseline SO_2 emissions and assumed control efficiency of the control. A 30% SO_2 reduction is assumed, resulting in a cost-effectiveness value of $30,066 per ton of SO_2 reduced for Kiln 1 and $30,140 per ton of SO_2 reduced for Kiln 2.

TABLE 5-35

FERNLEY FOUR-FACTOR ANALYSIS COST-EFFECTIVENESS SUMMARY

Control	Kiln	Baseline SO_2 Emissions (tpy)	Assumed Control Efficiency	Tons SO_2 Reduced (tpy)	Total Annualized Cost	Cost-Effectiveness
Continuous use of DSI	1	114.6	30%	34.4	$1,034,274	$30,066 /ton
	2	106.8	30%	32.0	$964,491	$30,140 /ton

5.9.3 Characterization of Time Necessary for Compliance

Approximately 4 months is required to procure, build, install, and shakedown the new equipment for proper engineering.

5.9.4 Characterization of Energy and Non-Air Quality Environmental Impacts
In determining energy and non-air quality environmental impacts, NDEP is relying on NCC's statement provided in Section 5.6 of the NCC Analysis that states:

"The use of DSI full time (8,760 hr/yr) will have an energy penalty in terms of electricity needed to operate the larger blower (50 hp). The electricity requirement for the DSI system is approximately 39kW per hour (343,889 kW/yr) which equates to $19,051 per year... Kiln 1 and Kiln 2 are currently equipped with an as needed DSI system for SO_2 control. The lime reagent used in a DSI system reacts with SO_2 in the flue gas to form calcium sulfate and calcium sulfite solids. The solids are captured in the existing fabric filter particulate control systems and either returned to the systems for reuse or removed from the systems as nonhazardous solid waste. Collateral environmental impacts associated with the DSI system include increased solid waste generation. Additionally, the operation of the DSI storage vessel's baghouse will emit an additional 0.2 tpy of PM (lime emissions)."

The additional electricity cost outlined above is included in the source's analysis for the cost of compliance. Although the control would require additional electricity to operate at full capacity, NDEP does not find this to be sufficient to warrant a no control determination. The calcium sulfate and calcium sulfite solids are either recycled back into the system or properly disposed of. This does not pose a threat to the surrounding non-air environment. Although there is a 0.2 tpy increase in PM emissions as a result of this control, adding this increase to the total reductions achieved by the control would not be impactful in the analysis.

5.9.5 Characterization of Remaining Useful Life of the Source
The cost analysis assumes a 20-year life for the DSI system on both kilns when calculating the annualized capital costs of the upgraded DSI system.

5.9.6 Decisions on what Control Measures are Necessary to Make Reasonable Progress
Considering the four statutory factors outlined above, NDEP does not consider the upgrade of the existing DSI system to operate at full capacity for both kilns as necessary to achieve reasonable progress. No other potential new control measures are considered for the Fernley Plant.

As stated above, NDEP does not consider the anticipated NO_x and SO_2 emission reductions resulting from the ongoing USEPA consent decree as necessary to achieve reasonable progress during the second implementation period.

NDEP also does not consider the existing baghouses used to achieve current PM_{10} emission limits listed in the facility's air quality operating permit as necessary to achieve reasonable progress. NDEP is relying on consistent historical emissions and referencing PM_{10} emissions limits (Table 5-36) listed in the Fernley Plant's permit, Permit No. AP3241-0387.02. A robust demonstration with supporting documentation is included in the source's Control Determination in Appendix B.

TABLE 5-36

FERNLEY PLANT PERMIT LIMITS FOR PM_{10}

Kiln	Pollutant	Limit (lb/hr)	Limit (tpy)
1	PM_{10}	14.83	64.96
2	PM_{10}	14.83	64.96

5.9.7 Discussion of Fernley Plant Four-Factor Outcome

Although there is a slight difference in emissions between 2028OTBa2 and the Emissions After Controls inventories, as shown in Table 5-37, this is a result of different baseline emissions used and not because of reductions achieved from add-on controls considered in the four-factor analysis. Both 2028OTBa2 and the Emissions After Controls inventories use the same emission factors, however, 2028OTBa2 assumed actual operating hours reported in 2014 and Emissions After Controls assumed 8760 operating hours. Because of this, there will be no adjustments made to the reasonable progress goals provided by the WRAP to reflect additional reductions at the Fernley Plant.

TABLE 5-37

FERNLEY MODELING VS. FINAL EMISSIONS REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		Four-Factor Analysis		
	2028OTBa2 Emissions		Baseline Emissions	Emissions after Controls	Emission Reductions
Kiln 1					
NOx	544		1307	1307	0
SO2	62		167	167	0
PM10	58		125	125	0
Kiln 2					
NOx	554		1261	1261	0
SO2	64		167	167	0
PM10	57		125	125	0
Total NOx	1,098		2568	2568	0
Total SO2	126		334	334	0
Total PM10	115		250	250	0

5.10 TS POWER PLANT REASONABLE PROGRESS ANALYSIS

For the purpose of determining whether controls at the TS Power Plant are necessary to make reasonable progress during the second implementation period, NDEP is relying on NDEP's "Reasonable Progress Control Determination" for the TS Power Plant found in Appendix B.3.a. Table 5-38 outlines the files referenced in making reasonable progress determinations for the TS Power Plant, and where they can be found in Appendix B.

TABLE 5-38

LOCATION OF FOUR-FACTOR ANALYSIS DOCUMENTS FOR TS POWER

Full Document Title	Shortened Document Title (used in this document)	Date	Appendix Location
TS Power Plant Reasonable Progress Control Determination (NDEP)	*NDEP Reasonable Progress Control Determination*	March 2022	B.3.a
Reasonable Progress Analysis	*NNEI Analysis*	December 10, 2019	B.3.b

TS Power, built in 2008, was also removed from the four-factor requirement as the facility has state of the art Best Available Control Technology (BACT) that was included in the original design. It was confirmed that a four-factor analysis would not result in any cost-effective additional controls in the facility's Reasonable Progress Report submitted to NDEP (located in Appendix B.3.b) during the second implementation of the Regional Haze Rule. The TS Power Plant has one pulverized coal, dry bottom boiler with a gross capacity of 220 MW. Table 5-39 lists the existing controls that reduce visibility impairing pollutants at the facility, along with the corresponding BACT emission limits that can be found in the facility's air quality operating permit (Permit No. AP4911-2502).

Note that there are two BACT emission limits for SO_2, depending on the sulfur content of the coal burned. As seen in the below table, an SO_2 emission limit of 0.065 pounds per million british thermal units and minimum SO_2 control efficiency of 91% is enforced when the unit burns coal with a sulfur content less than 0.45%. When the unit is combusting coal with a sulfur content equal to or greater than 0.45%, the emission limit is raised to 0.09 pounds per million british thermal units, however, the increase in emissions is offset by an increased minimum SO_2 control efficiency of 95%.

TABLE 5-39

TS POWER PLANT BACT CONTROLS AND EMISSION LIMITS

Pollutant	Control	BACT Emission Limit (lb/MMBtu)
NO_x	Low-NO_x Burners Over Fired Air Selective Catalytic Reduction	0.067
SO_2	Lime Spray Dryer While combusting coal with a sulfur content equal to or greater than 0.45%	0.09 (95% minimum SO_2 removal efficiency required)
	Lime Spray Dryer While combusting coal with a sulfur content less than 0.45%	0.065 (91% minimum SO_2 removal efficiency required)
PM_{10}	Pulse Jet Fabric Filter Dust Collector	0.176

As stated above, the TS Power Plant has been determined as already operating BACT (best available control technology) controls for NO_x, SO_2, and PM_{10} emissions. In NDEP's "Reasonable Progress Control Determination" for TS Power, a robust weight-of-evidence demonstration is provided for existing NO_x, SO_2, and PM_{10} control measures at the TS Power Plant to determine that these controls are not necessary to make reasonable progress. Historical and projected emission rates for NO_x, SO_2, and PM_{10} remain low and consistent, making it reasonable to assume that the source will continue to implement its existing measures and will not increase its emission rates.

5.4.7 Cumulative Emissions Reductions

Significant emission reductions are expected to achieve reasonable progress for the second implementation period of Nevada's Regional Haze SIP. Emission reductions for all facilities conducting a four-factor analysis were estimated by both WRAP and NDEP. WRAP estimates were developed for modeling inventories, with 2028OTBa2 data using updated 2014 emissions. In NDEP's four-factor analyses calculations, baseline emissions were typically derived from more recent reporting years (e.g. average annual emissions from 2016 to 2018) and controlled emissions derived from the assumed control efficiency of any control that is cost-effective and necessary to achieve reasonable progress.

Emission reductions calculated from NDEP's four-factor analyses are more accurate than what was estimated for WRAP modeling, and provide a better image of achieved emission reductions as a result of Nevada's efforts during the second implementation period. WRAP modeling inventories used less recent emissions data for the baseline and only estimates of controlled emissions. Table 5-40 compares the total emission reductions between baseline and controlled emissions for WRAP modeling and NDEP's four-factor analyses. Total emissions across the four-factor sources were estimated at 7,964 tpy in WRAP 2028OTBa2 modeling, while NDEP's four-factor data indicates total emissions across four-factor sources at 5,139 tpy. This translates to a difference of nearly 3,000 tpy.

Figure 5-1 compares NDEP's calculation of baseline and controlled emissions among the sources in Nevada considered for reasonable progress controls. SO_2 emissions show a total reduction of 2,313 tons per year, NO_x emissions show a total reduction of 2,239 tons per year, and PM_{10} emissions show a total reduction of 60 tons per year. Referring to more current and accurate baseline emissions used in the four-factor analyses, Nevada expects a total reduction in primary visibility impairing pollutants (SO_2, NO_x, and PM_{10}) of 4,612 tons per year as a result of the four-factor analyses conducted to achieve reasonable progress for the second round.

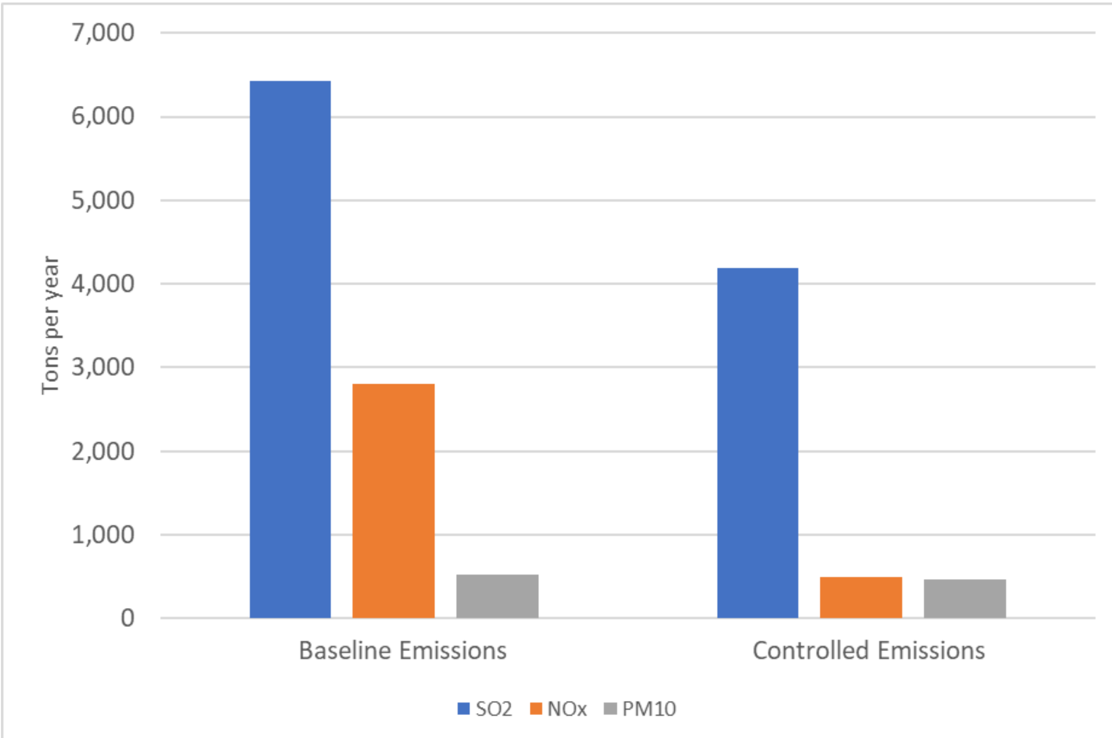
TABLE 5-40

TOTAL MODELING VS. FINAL EMISSIONS REDUCTIONS
DURING SECOND ROUND IN TONS PER YEAR

	WRAP Modeling		Four-Factor Analysis		
	2028OTBa2 Emissions		Baseline Emissions	Emissions after Controls	Emission Reductions
Valmy					
NOx	1583		1746	0	1746
SO2	2,281		2,313	0	2313
PM10	77		60	0	60
Tracy					
NOx	503		434	434	0
SO2	11.5		12	12	0
PM10	59		59	59	0
Apex					
NOx	1,352		1164	671	493
SO2	150		138	138	0
PM10	8		59	59	0
Pilot Peak					
NOx	523		515	515	0
SO2	23		6	6	0
PM10	54		93	93	0
Fernley					
NOx	1,098		2568	2568	0
SO2	126		334	334	0
PM10	115		250	250	0
Total					
NOx	5,059		6427	4188	2239
SO2	2,592		2803	490	2313
PM10	313		521	461	60
Grand Total	7,964		9,751	5,139	**4,612**

FIGURE 5-1

BASELINE AND CONTROLLED EMISSIONS COMPARISON FOR REASONABLE PROGRESS DURING THE SECOND IMPLEMENTATION PERIOD



5.11 ENVIRONMENTAL JUSTICE IMPACT ANALYSIS OF FOUR-FACTOR SOURCES

The Regional Haze Rule requires that states consider non-air quality environmental impacts as one of the four statutory factors when evaluating potential additional controls. Consideration of Environmental Justice (EJ) and the impact control decisions may have on potentially vulnerable communities falls within this category. NDEP has modeled its EJ analysis after the EJ analysis found in Oregon's Regional Haze Plan Support Document[1]. In NDEP's Regional Haze EJ analysis, communities within a 3-mile and 10-mile radius of each source identified by NDEP's Q/d source screening method were examined for any patterns of disproportionate burden of environmental pollution on vulnerable communities using the 2020 version of EPA's EJSCREEN tool.

This version of EJSCREEN uses the 2014-2018 five-year American Community Survey data for demographic indicators:

- People of Color Population (%)
- Low Income Population (%)
- Linguistically Isolated Population (%)
- Population With Less Than High School Education (%)
- Population Under 5 Years of Age (%)
- Population Over 64 Years of Age (%)

These indicators are standard demographic indicators commonly used by EPA and other state agencies when considering Environmental Justice impacts. Each indicator is represented in percentage of the total recorded population within the designated radius around each facility.

For each facility, NDEP tallied a “1” if the value of that indicator was above the statewide average, or a “0” if the value was below the statewide average. Figures 5-2 and 5-3 below show the number of indicators for which the community within a facility was above the statewide average, achieving a maximum of 6 and minimum of 0. If a census block was only partially contained within the radius of the facility, then the value for that census block group was scaled to the proportion of the block group within the circle. An outline of the demographic indicator values recorded within the radius of each facility is included in the Tables 5-41 and 5-42 below and compared to the statewide average. Indicators that are above the statewide average are highlighted and represent a tally of “1.” An “N/A” value indicates a census population of 0 in that facility’s radius. A facility with a vulnerability score of 4 or more would indicate a significant impact on vulnerable communities and would require further consideration in deciding what controls at the facility may be necessary for reasonable progress in Nevada’s second implementation period of the Regional Haze Rule.

FIGURE 5-2

NUMBER OF SOCIOECONOMIC INDICATORS FOR COMMUNITIES
<u>WITHIN 3 MILES OF A FOUR-FACTOR FACILITY</u>

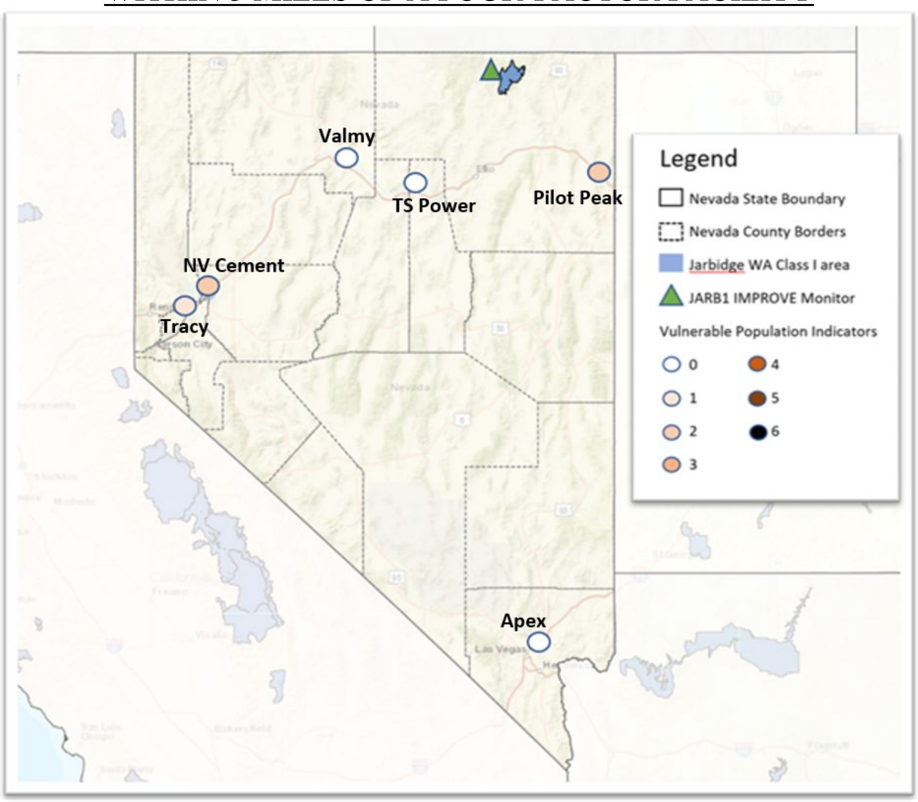


TABLE 5-41

DEMOGRAPHIC INDICATORS FOR EACH FACILITY
COMPARED TO STATEWIDE AVERAGES USING A 3-MILE RADIUS

Demographic Indicator	North Valmy GS	Tracy GS	TS Power Plant	Statewide Ave.
Population Count	0	16	2	3,100,00
People of Color	N/A	14%	20%	50%
Low Income	N/A	16%	7%	34%
Linguistically Isolated	N/A	0%	0%	6%
< High School Education	N/A	4%	8%	14%
< 5 Years of Age	N/A	2%	5%	6%
> 64 Years of Age	N/A	39%	12%	15%
Demographic Indicator	Fernley Plant	Apex Plant	Pilot Peak Plant	Statewide Ave.
Population Count	12,316	0	2	3,100,00
People of Color	32%	N/A	44%	50%
Low Income	33%	N/A	51%	34%
Linguistically Isolated	0%	N/A	0%	6%
< High School Education	13%	N/A	25%	14%
< 5 Years of Age	7%	N/A	4%	6%
> 64 Years of Age	17%	N/A	11%	15%

FIGURE 5-3

NUMBER OF SOCIOECONOMIC INDICATORS FOR COMMUNITIES
WITHIN 10 MILES OF A FOUR-FACTOR FACILITY

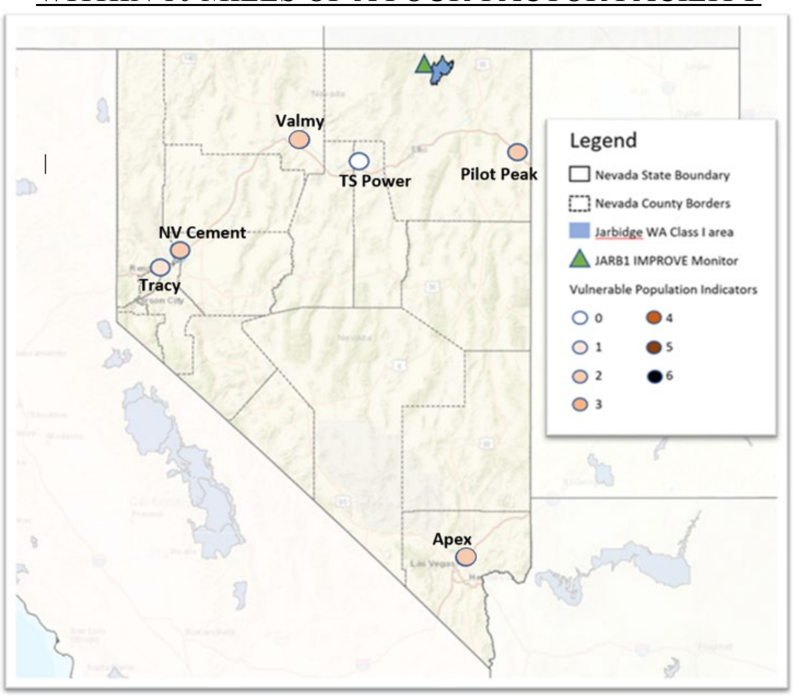


TABLE 5-42

DEMOGRAPHIC INDICATORS FOR EACH FACILITY
COMPARED TO STATEWIDE AVERAGES USING A 10-MILE RADIUS

Demographic Indicator	North Valmy GS	Tracy GS	TS Power Plant	Statewide Ave.
Population Count	83	30,047	21	3,100,00
People of Color	35%	26%	20%	50%
Low Income	44%	13%	7%	34%
Linguistically Isolated	4%	2%	0%	6%
< High School Education	27%	5%	8%	14%
< 5 Years of Age	4%	5%	5%	6%
> 64 Years of Age	12%	20%	12%	15%
Demographic Indicator	Fernley Plant	Apex Plant	Pilot Peak Plant	Statewide Ave.
Population Count	20,956	78	11	3,100,00
People of Color	28%	57%	44%	50%
Low Income	29%	35%	51%	34%
Linguistically Isolated	1%	5%	0%	6%
< High School Education	11%	3%	25%	14%
< 5 Years of Age	7%	0%	4%	6%
> 64 Years of Age	17%	0%	11%	15%

The six facilities that underwent the four-factor review are generally located in sparsely populated rural areas. Among the six sources, only the Nevada Cement Fernley Plant has a significantly large population within a 3-mile radius. Two sources, North Valmy and TS Power, have no population. The Lhoist Apex facility located just outside the Las Vegas metropolitan area, has very few residents living nearby. Similarly, the Tracy plant near the Reno/Sparks area is situated where there are few residents. Of the four sources that have a reported population, a maximum of two indicators were recorded above the statewide average.

When evaluating the same facilities at a 10-mile radius, the conclusion remains relatively the same, with a few changes. North Valmy Generating Station and the Apex Plant now have a population value with corresponding EJSCREEN Tool data. With this, both North Valmy and Apex Plant show two indicators that are above the statewide average. Fernley Plant's population nearly doubles with the larger radius; however, the two indicators of concern remain the same. Tracy Generating Station's population increased by nearly 30,000 people and demonstrates the benefit of evaluating larger distances around facilities, however, the sole indicator of concern remains the same. Of all six sources, it remains true that a maximum of two indicators were recorded above the statewide average for each source.

In considering the communities within a 3-mile and 10-mile radius of Nevada's Regional Haze sources, NDEP concludes that there is no significant impact on vulnerable communities that would further provide evidence that a control currently not being considered as "necessary for reasonable progress" should be installed.

5.12 REFERENCES

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Six – Reasonable Progress for the Jarbidge Wilderness Area

6.1 INTRODUCTION

The Regional Haze Rule (RHR) requires states to establish reasonable progress goals for each Class I area within the state (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions by 2064 (40 CFR 51.308(f)(3)(i)). The reasonable progress goals must provide for improvement in visibility for the most-impaired days as compared to the baseline visibility condition and ensure no degradation in visibility for the clearest days as compared to the baseline visibility condition. The planning period for the second regional haze SIP is 2018 through 2028, with a progress report that NDEP is committed to submit by January 31, 2025.

Chapter Two identifies the uniform rate of progress (URP) for Nevada's only Class I area, the Jarbidge Wilderness Area (Jarbidge WA). Nevada compared baseline visibility conditions to natural visibility conditions to determine the uniform rate of visibility improvement (in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064, as shown in Figure 2-6.

Visibility modeling was used to determine the expected 2028 visibility improvements for the Jarbidge WA resulting from existing federal and state regulations, including presumptive sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emission limits from on-the-books/on-the-way controls. Visibility modeling indicates that implementation of existing rules and controls, as captured by the projected 2028OTBa2 emissions inventory, provides for an improvement in visibility better than the URP for the Jarbidge WA on the most-impaired days over the period of the SIP and identifies no degradation in visibility for the clearest days over the same period.

The modeled 2028 extinction of 7.76 dv represents the foundation of Nevada's reasonable progress goal (RPG). Nevada's long-term strategy, primarily consisted of controls determined as necessary to make reasonable progress in Chapter Five, to achieve this RPG is detailed in Chapter Seven. Given the significant emissions reductions anticipated from Nevada's control requirements and the implementation of other Clean Air Act (CAA) programs during this planning period, implementation of these programs represents reasonable progress in Nevada for the second regional haze planning period. The resulting 2028 modeled visibility improvement does not assume the same reductions as the final outcomes of the four-factor analysis, as described in the previous chapter. Section 6.8 discusses how Nevada derived RPGs based on the modeled 2028 visibility of 7.76 dv with adjustments made by correcting the final expected emission reductions.

6.2 STEPS FOR DEVELOPING REASONABLE PROGRESS GOALS

The steps in USEPA's guidance for developing a RPG are listed below.

1. Ambient data analysis
2. Determination of Affected Class I Areas in Other States
3. Selection of sources for analysis
4. Characterization of factors for emission control measures
5. Decisions on what control measures are necessary to make reasonable progress

6. Regional scale modeling of the LTS to set the RPGs for 2028
7. Progress, degradation, and URP glidepath checks
8. Additional requirements for SIPs

6.3 STEP ONE - AMBIENT DATA ANALYSIS

The first key step is to identify the 20 percent most anthropogenically impaired days and the 20 percent clearest days and determine baseline, current, and natural visibility conditions for each Class I area within the state (40 CFR 51.308(f)(1)). This requirement is addressed in Chapter Two and are summarized in Figures 2-4 and 2-5.

6.4 STEP TWO - DETERMINATION OF AFFECTED CLASS I AREAS IN OTHER STATES

The second key step is to determine which Class I area(s) in other states may be affected by the state's own emissions (40 CFR 51.308 (f)(2)). This requirement is addressed in Chapter Four and determined that the following Class I areas in neighboring states are affected the most by emissions originating in Nevada:

- Grand Canyon, AZ (GRCA2)
- Ike's Backbone, AZ (IKBA1)
- Desolation Wilderness, CA (BLIS1)
- Craters of the Moon, ID (CRMO1)
- Hells Canyon, OR (HECA1)
- Zion Canyon, UT (ZICA1)

6.5 STEP THREE - SELECTION OF SOURCES FOR ANALYSIS

The third key step is to select the emission sources for which an analysis of emission control measures will be completed in the second implementation period and explain the bases for these selections. This requirement is addressed in Chapter Five, where the following sources were selected to conduct a four-factor analysis to determine additional controls that are necessary to achieve reasonable progress:

- North Valmy Generating Station, NV Energy
- Apex Plant, Lhoist North America
- Fernley Plant, Nevada Cement Company
- Tracy Generating Station, NV Energy
- Pilot Peak Plant, Graymont Western

6.6 STEP FOUR - CHARACTERIZATION OF FACTORS FOR EMISSION CONTROL MEASURES

The fourth key step is to identify potential emission control measures for the selected sources and develop data on the four statutory factors. This requirement is addressed in Chapter Five.

6.7 STEP FIVE - DECISIONS ON WHAT CONTROL MEASURES ARE NECESSARY TO MAKE REASONABLE PROGRESS

The fifth key step is to consider the four statutory factors, the five required factors listed in section 51.308(f)(2)(iv), and decide on emission controls for the incorporation into the LTS. For each control considered at each selected source, the four statutory factors are characterized and considered in Chapter Five. The five required factors listed in 51.308(f)(2)(iv) are addressed in Chapter Seven. Emission controls that are incorporated into the LTS as necessary to achieve reasonable progress are summarized in Table 5-5. For each control measure needed to make reasonable progress, associated emission limits, monitoring, recordkeeping, and reporting requirements, and compliance schedules that Nevada is relying on are also outlined in Chapter 5.

6.8 STEP SIX - REGIONAL SCALE MODELING OF THE LTS TO SET THE RPGS FOR 2028

The sixth key step is to determine the visibility conditions in 2028 that will result from implementation of the LTS and other enforceable measures to set the RPGs for 2028.

40 CFR 51.308(f)(3)(i) requires that states establish reasonable progress goals (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the applicable implementation period as a result of those enforceable emission limits. Typically, 2028OTBa2 modeling projections for 2028 provided by the WRAP would be established as RPGs, however, the emission reductions assumed in the 2028OTBa2 modeling do not exactly match emission reductions that are expected as a result of the finalized four-factor analyses, as discussed in the previous chapter.

To provide RPGs that more accurately reflect the anticipated visibility conditions in 2028 due to the implementation of reasonable progress controls, Nevada has adopted a post-modeling RPG adjustment approach used by USEPA for Arizona and Hawaii Federal Implementation Plans (FIP) during the first implementation period. This approach is based on the scaling of visibility extinction components in proportion to emission changes. To determine the new RPG for the 20 percent most impaired days at Jarbidge Wilderness Area, Nevada scaled the modeled visibility extinction components for sulfate and nitrate from point sources in Nevada, determined by WRAP's CAMx and photochemical modeling with source apportionment, in proportion to the additional emission reductions in SO_2 and NO_x beyond what was assumed in the WRAP's 2028OTBa2 visibility projections.

As described in Chapter Five, additional emission reductions are expected at Lhoist North America's Apex Plant and NV Energy's North Valmy Generating Station due to reasonable progress controls for the second implementation period. Also discussed in Chapter Five, an increase in emissions at the Nevada Cement Company's Fernley Plant due to under-reported baseline emissions are included in the development of Jarbidge WA's RPGs to provide the most accurate projection of visibility in 2028 possible.

The method of adjusting WRAP CAMx modeling outputs to reflect Nevada's Long-Term Strategy into the calculation of Jarbidge WA's RPGs for the second round are as follows:

1. Determine 2028 WRAP CAMx PSAT results for Nevada source sectors for sulfate and nitrate light extinction, as well as total light extinction at Jarbidge WA.
2. Scale modeled sulfate and nitrate light extinction values for source sectors that will experience emission reductions due to reasonable progress controls (EGU and Non-EGU)

by the ratios of 2028 WRAP CAMx emissions minus expected reductions (or plus expected increases), divided by 2028 WRAP CAMx emissions (Table 6-1).

3. Total light extinction at Jarbidge WA from 2028 WRAP CAMx model is adjusted to reflect the scaled contributions from EGU and Non-EGU sulfate and nitrate extinctions.
4. Total light extinction is converted to deciviews and scaled by a factor to be more comparable to the most impaired days *average of deciviews calculated from daily extinction values* (Table 6-2).

Spreadsheet calculations of Jarbidge WA's RPGs are included in Appendix H.

TABLE 6-1

NITRATE AND SULFATE SCALING FACTORS
FOR 2028 RPG CALCULATION

Source Sector	Pollutant	2028 WRAP CAMx Emissions (tpy)	Change in Emissions (tpy)	Scaling Factor
EGU	NO_x	3,869	-1,746	0.549
	SO_2	2,556	-2,313	0.095
Non-EGU	NO_x	8,129	970	1.119
	SO_2	1,321	206	1.156

TABLE 6-2

JARBIDGE WA SCALE CORRECTION VALUES FOR AVERAGE DECIVIEWS

JARB1 Modeled Extinction (Mm-1)	
Most Impaired Days	0.978
Clearest Days	0.995

The baseline 2028 visibility conditions (2028OTBa2) are projected at 7.764 dv during the most impaired days and 1.724 dv during the clearest days. Applying the above referenced scaling method to these model outputs calculate RPGs for Jarbidge WA at 7.757 dv during the most impaired days and 1.720 dv during the clearest days. Visibility improvement is small, and lost in rounding (still 7.76 dv for most impaired days and 1.72 dv for clearest days), as emission increases from the Fernley Plant off-set emission reductions from the North Valmy Generating Station and Apex Plant. A comparison of the two visibility projections for Jarbidge WA in 2028 are provided in Table 6-3.

TABLE 6-3

2028 VISIBILITY VS PROPOSED RPGs FOR JARBIDGE WA

	2028OTBa2 (dv)	RPG (dv)	Rounded (dv)
Most Impaired Days	7.764	7.757	7.76
Clearest Days	1.724	1.720	1.72

6.9 STEP SEVEN - PROGRESS, DEGRADATION, AND URP GLIDEPATH CHECKS

The seventh key step requires the following:

- Demonstrate that there will be an improvement on the 20 percent most anthropogenically impaired days in 2028 at Jarbidge WA, compared to 2000-2004 conditions (40 CFR 51.308(f)(3)).
- Demonstrate that there will be no degradation on the 20 percent clearest days in 2028 at Jarbidge WA, compared to 2000-2004 conditions (40 CFR 51.308(f)(3)).
- Determine the URP that would achieve natural conditions at the in-state Class I area in 2064. The URP may be adjusted for international anthropogenic impacts and certain wildland prescribed fires (40 CFR 51.308(f)(1)).
- Compare the 2028 RPG for the 20 percent most anthropogenically impaired days to the 2028 point on the URP glidepath for the in-state Class I area and out-of-state Class I areas affected by emissions originating in Nevada (40 CFR 51.308(f)(3)(ii)).

6.9.1 Determining the Uniform Rate of Progress

Pursuant to 40 CFR 51.308(f)(1)(vi)(A), Chapter Two, section 2.6, of this SIP outlines the URP needed to attain natural visibility conditions for the Jarbidge WA. Nevada compared the baseline visibility conditions to natural visibility conditions to identify the uniform rate of visibility improvement that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064.

The final URP or glidepath for Jarbidge WA during the second implementation of the Regional Haze Rule is shown in Figure 6-1, reproduced from Chapter Two, which includes an adjustment made to account for visibility impacts from prescribed fire and international emissions. 40 CFR 51.308(f)(1)(vi)(B) allows states to propose an adjustment to the URP for a Class I area to account for impacts from anthropogenic sources outside the United States and/or impacts from wildland prescribed fire with the objective to establish, restore, and/or maintain sustainable and resilient wildland ecosystems. In establishing reasonable progress goals and tracking visibility improvement, Nevada will rely on the adjusted glidepath, as this provides a more accurate tracking system of what visibility improvement, and emissions, are controllable under state and federal jurisdiction.

An unadjusted glidepath for Jarbidge WA that does not account for international and prescribed fire impacts assumes a natural visibility goal of 5.2 dv by 2064. Using data from 2028 source apportionment modeling outlined in Chapter Four, states are able to determine what visibility impairment in deciviews is contributed by international emissions (2.0 dv) and prescribed fire emissions (0.2 dv), and add these visibility impairments to the natural conditions visibility in 2064. This creates a glidepath that only requires visibility impairment achievable under the scope of state and federal regulatory authority. As shown in Figure 6-2, adding 2.0 dv for international impacts increases the 2064 conditions from 5.2 dv (solid red line) to 7.2 dv (dashed yellow line). Adding an additional 0.2 dv for prescribed fire impacts results in a final 2064 natural visibility conditions of 7.4 dv, or 7.39 dv (dashed blue line) as referenced throughout this SIP.

For the final glidepath, baseline conditions for the 20 percent most impaired days are shown by the upper short dark blue line on Figure 6-1, while natural visibility conditions for the most impaired days are shown by the long orange horizontal line. The baseline visibility conditions for the 20 percent clearest days are shown by the short lower light blue line. The diamonds represent the annual average visibility conditions for each of the baseline years for the most impaired and clearest days. The URP or glidepath is shown by the green sloping line interrupted by triangles identifying the URP in five-year increments. In order to achieve natural conditions (7.39 deciviews) by 2064, the 2028 URP value for the Jarbidge WA is 8.20 deciviews.

FIGURE 6-1

UNIFORM RATE OF PROGRESS GLIDEPATH

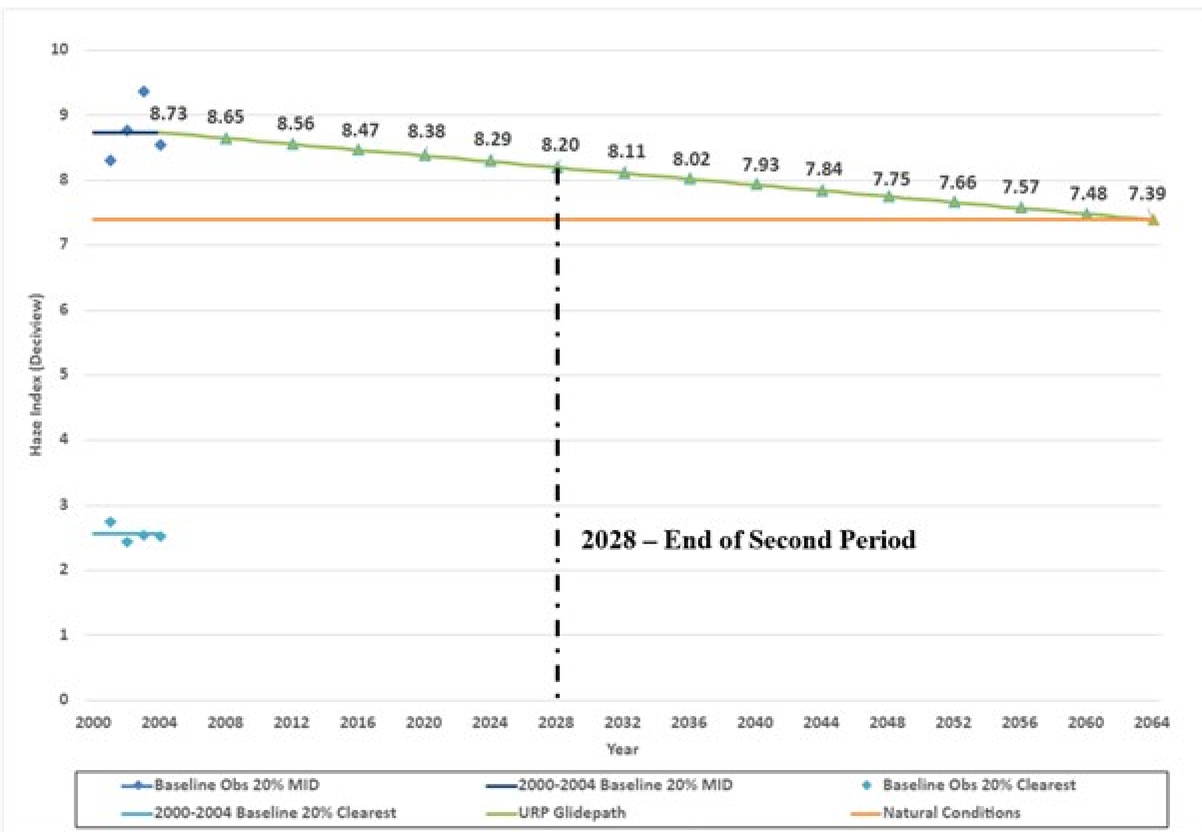
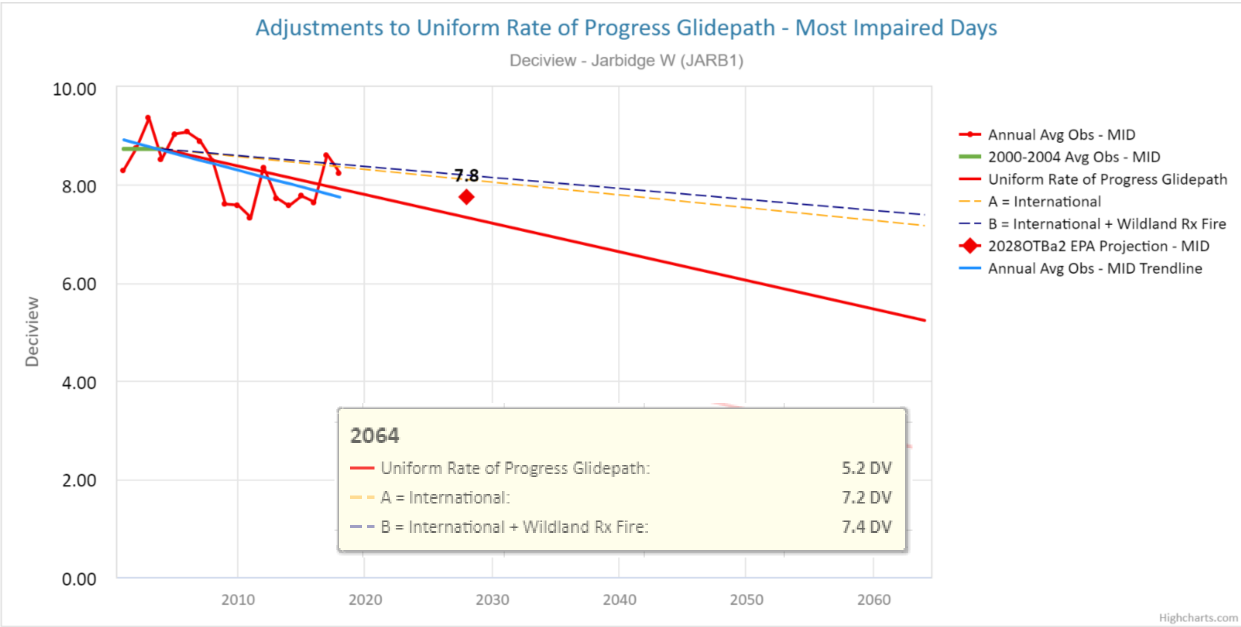


FIGURE 6-2

UNIFORM RATE OF PROGRESS GLIDEPATH ADJUSTMENT OPTIONS

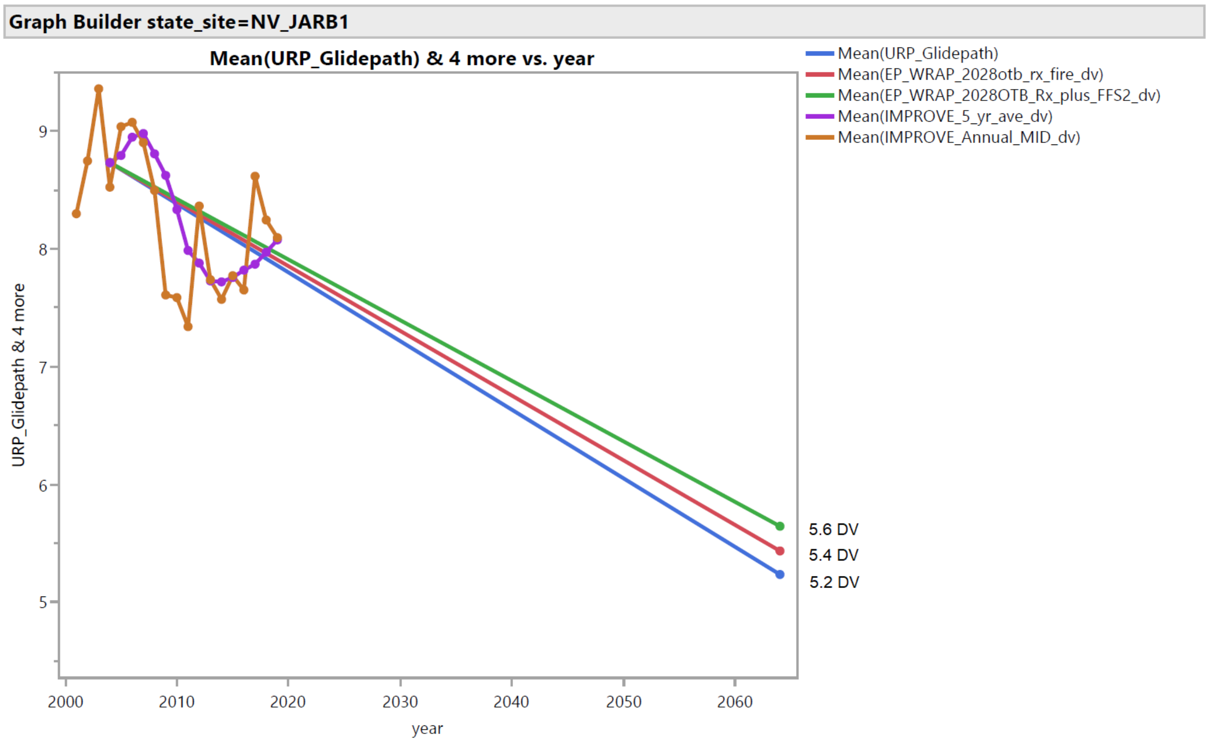


6.9.2 Consideration of USFS Glidepath Adjustment for Increased Prescribed Fire
Wildfires in Nevada have been increasing in size and severity as a result of drier climate conditions. Prescribed fire is an effective management tool utilized by land managers that can help reduce fire risk and mitigate severity and other impacts of wildfires in the future. The United States Forest Service (USFS) proposed an additional adjustment to the 2064 natural conditions, and glideslope path, to account for the expected increase in prescribed fire emissions to further combat the size and severity of future wildfires in their formal FLM consultation comments (see Appendix C).

NDEP has chosen to adjust the 2064 natural conditions and glideslope for Jarbidge Wilderness Area to account for international and prescribed fire emissions, provided by the WRAP. In this adjustment, prescribed fire is held constant and does not account for an increase of emissions. This 0.2 dv adjustment is shown as the red line in Figure 6-3, and does not include the additional 2.0 dv adjustment made for international emissions. USFS has proposed a glidepath adjustment of 0.2 dv (see Figure 6-3) that goes beyond the glidepath already adjusted for prescribed fire, as shown by the green line in Figure 6-3. If added with international impacts (2.0 dv), the final 2064 natural visibility conditions would be 7.6 dv, as opposed to 7.4 dv.

FIGURE 6-3

USFS INCREASED PRESCRIBED FIRE IMPACTS URP ADJUSTMENT



After careful consideration, the NDEP has elected not to make the additional 0.2 dv USFS proposed adjustment to the glideslope for the second implementation period of Nevada's Regional Haze SIP. Although an increase in prescribed fire burning is indicated in strategies and plans listed in Nevada's Shared Stewardship agreement, NDEP has elected to rely on a more conservative Uniform Rate of Progress that doesn't assume increases in prescribed fire into natural conditions at Jarbidge WA to prevent excess "flattening" of the URP glidepath. Whether or not an additional 0.2 deciview increase is made to the natural conditions metric to account for increases in prescribed fire burning, the calculated RPGs for Jarbidge WA in 2028 still remain below the URP point for 2028. NDEP recognizes the important role of prescribed fire emissions in Regional Haze and will reconsider quantifying the increased prescribed fire visibility impacts in future planning periods.

6.9.3 URP Glidepath Check for Jarbidge WA

The URP glidepath, along with 2028 RPGs, at Jarbidge WA during the second implementation period is provided in Figure 6-4 and summarized in Table 6-4. As stated above, the 2028 RPG for Jarbidge WA during the 20 percent most impaired days is 7.76 deciviews. The below figure confirms that a visibility improvement during the 20 percent most impaired days is anticipated in 2028 (7.76 deciviews) compared to the 2000-2004 baseline conditions (8.73 deciviews). It is also confirmed that the anticipated visibility projection during the 20 percent clearest days in 2028 (1.71 deciviews) does not degrade beyond the visibility conditions during the 20 percent clearest days observed from the 2000-2004 baseline condition (2.56 deciviews).

The glidepath assumes natural visibility conditions of 7.39 deciviews, including adjustments to account for international and prescribed fire impacts. In order to achieve natural conditions by 2064, visibility projections during the 20 percent most impaired days must be 8.20 deciviews or below by 2028. NDEP's 2028 RPG for the 20 percent most impaired days of 7.76 deciviews confirms that visibility at Jarbidge WA is on track to achieve natural conditions by 2064.

FIGURE 6-4

JARBIDGE WA FINAL URP GLIDEPATH WITH
2028 REASONABLE PROGRESS GOALS

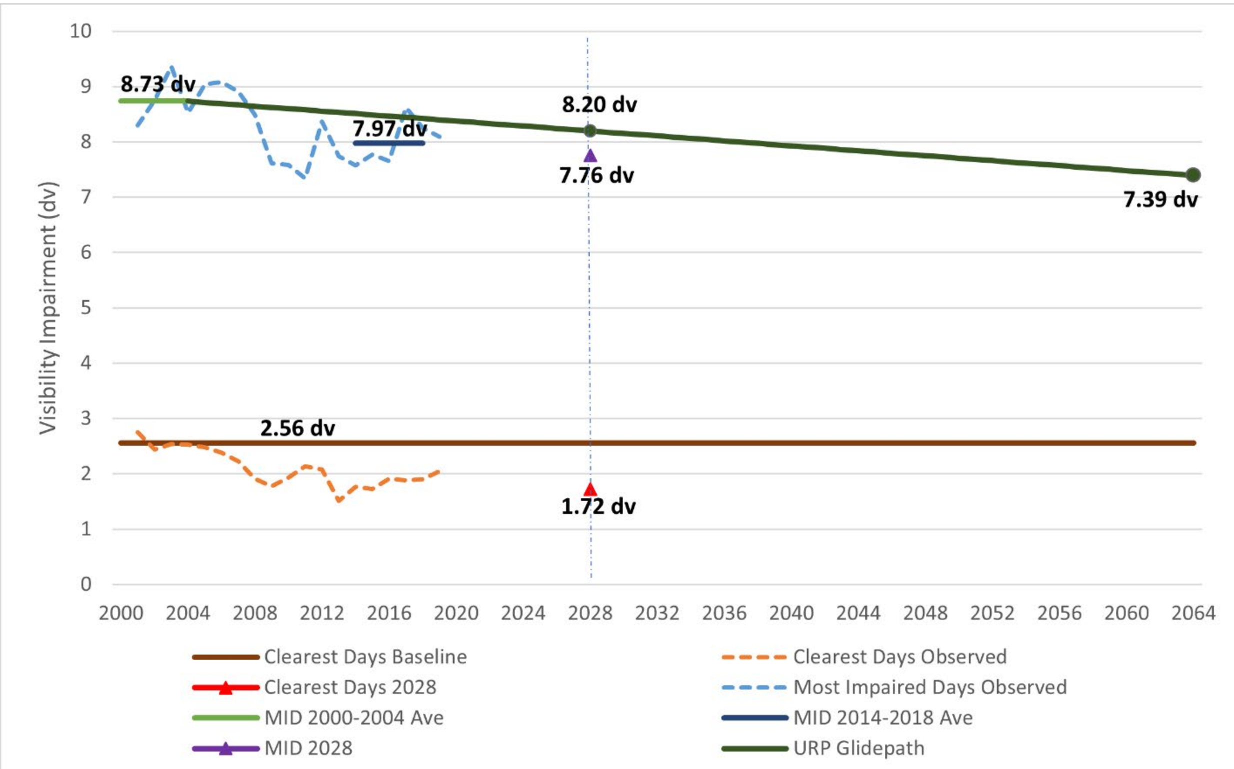


TABLE 6-4

SUMMARY OF PREDICTED PROGRESS TOWARD 2028 UNIFORM RATE OF
PROGRESS AT JARB1 (DECIVIEWS)

Class I Area	20% Most Impaired Days				20% Clearest Days		
	Most Impaired Days Baseline	2028 Adjusted URP	Baseline 2028 Visibility	2028 RPG	Clearest Days Baseline	2028 RPG	RPG Less Than Baseline?
Jarbidge WA	8.730	8.200	7.764	7.757	2.564	1.720	Yes

6.9.4 URP Glidepath Check for Out-of-State Class I Areas

NDEP has completed URP Glidepath checks for out-of-state Class I areas identified as being affected by emissions originating in Nevada and confirmed that projected visibility in 2028 (2028OTBa2) for the 20 percent most impaired days fall below the glidepath. NDEP assumes 2028 visibility projections using the EPA default method and assumes an adjusted glidepath slope that accounts for international and prescribed fire emissions. As seen in Figures 6-5 through 6-10, all evaluated, out-of-state CIAs (by associated IMPROVE monitor) estimate baseline 2028 visibility conditions (red diamond) that fall below the adjusted glidepath slope (dashed, yellow line). Because of this, no further additional controls in Nevada are required to achieve reasonable progress in any CIA.

FIGURE 6-5

2028 URP GLIDEPATH CHECK FOR GRCA2 IMPROVE MONITOR

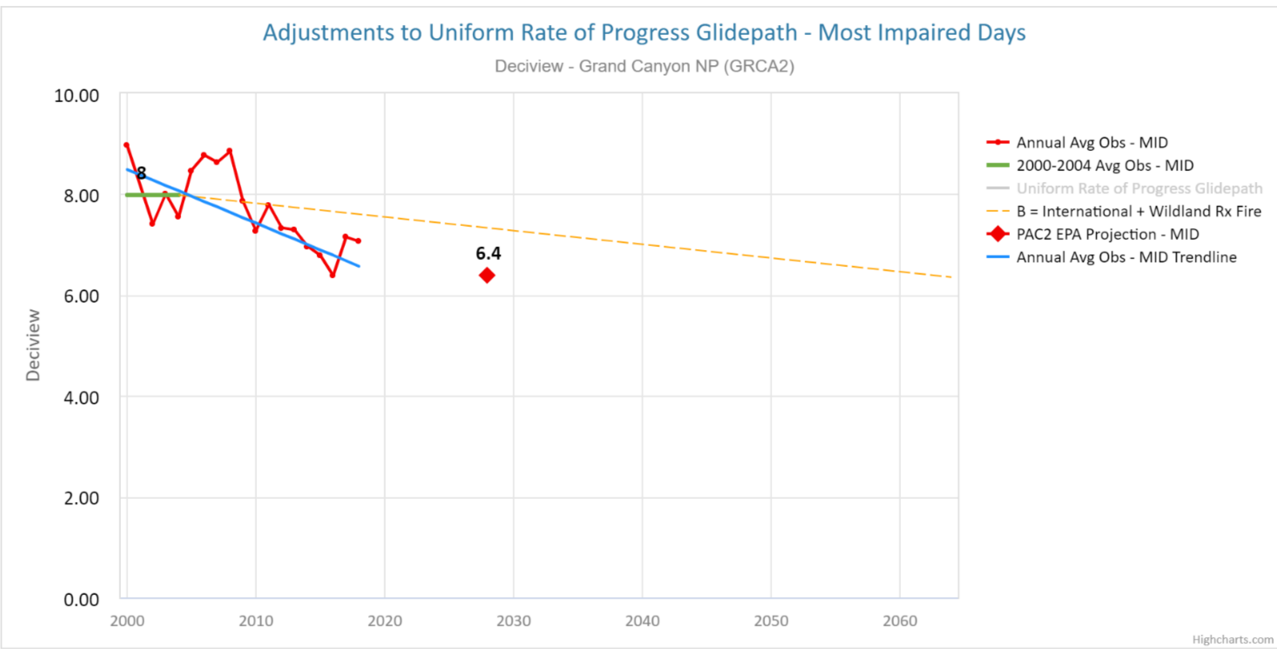


FIGURE 6-6

2028 URP GLIDEPATH CHECK FOR IKBA1 IMPROVE MONITOR

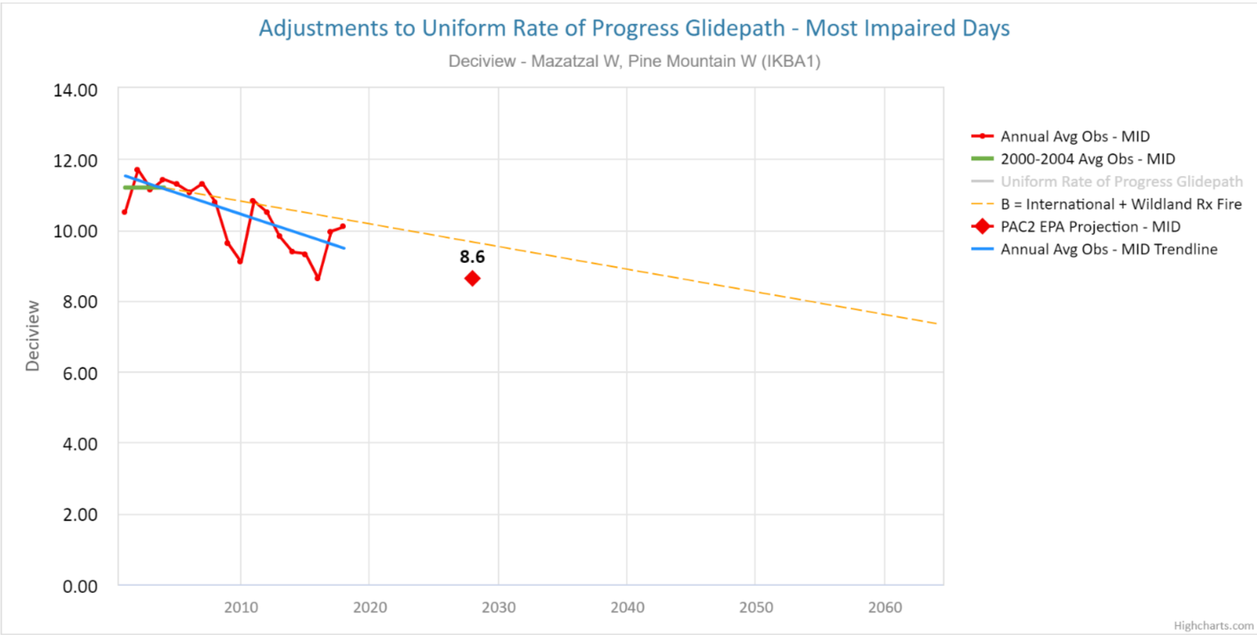


FIGURE 6-7

2028 URP GLIDEPATH CHECK FOR BLIS1 IMPROVE MONITOR

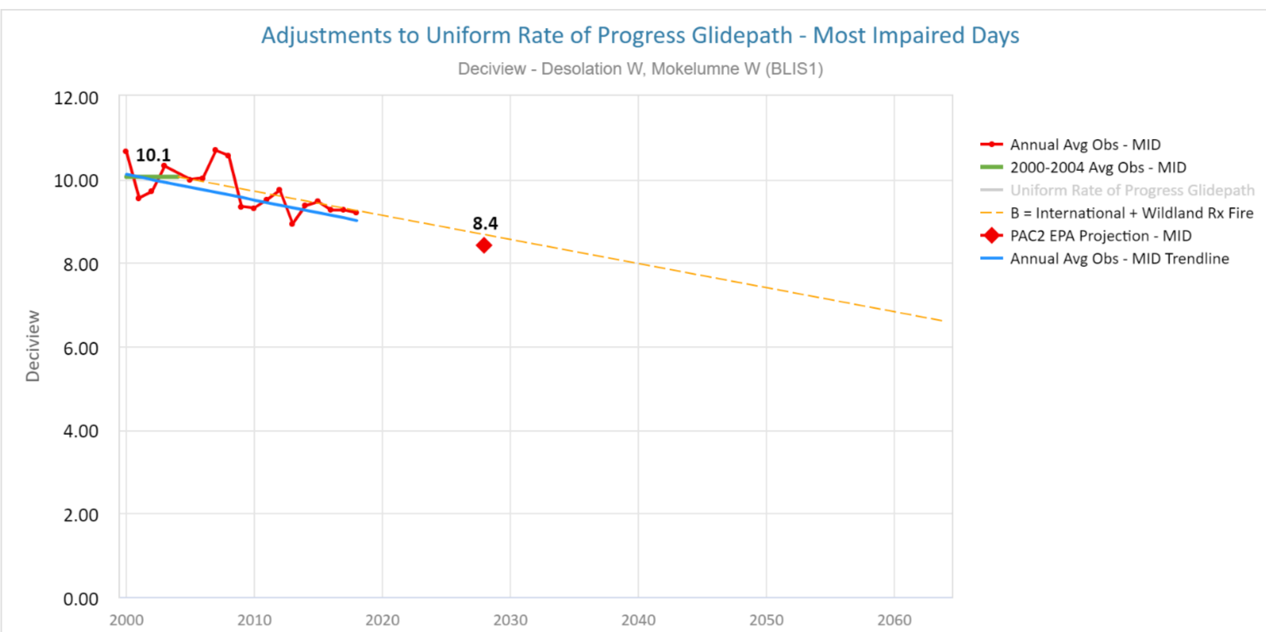


FIGURE 6-8

2028 URP GLIDEPATH CHECK FOR CRMO1 IMPROVE MONITOR

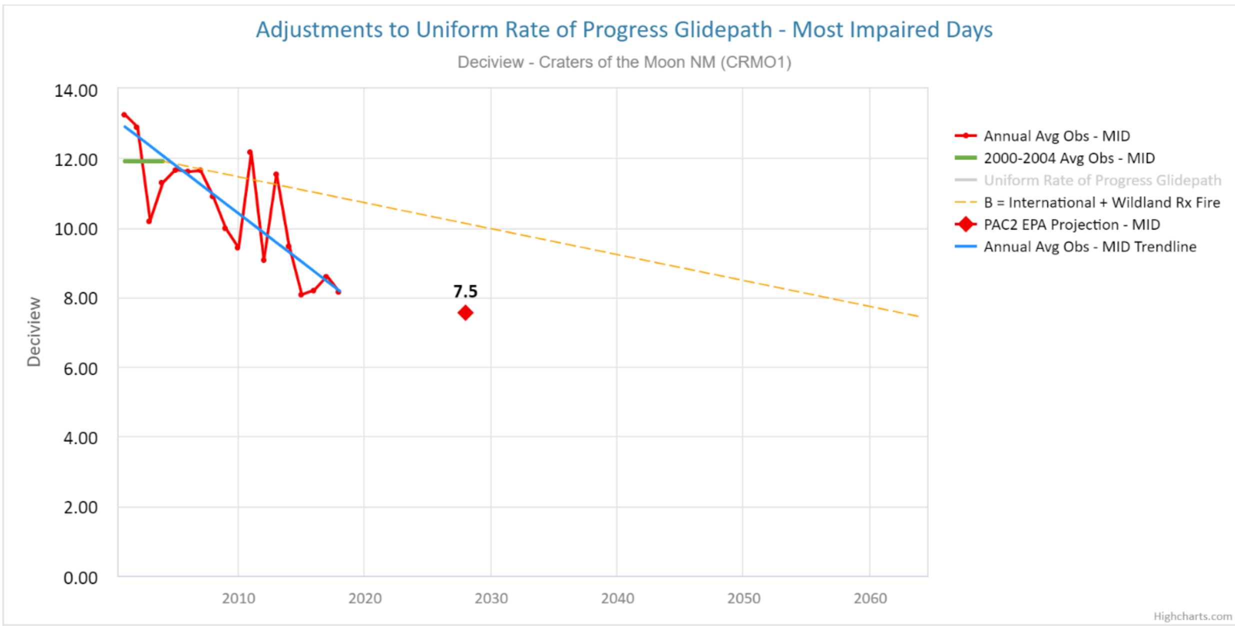


FIGURE 6-9

2028 URP GLIDEPATH CHECK FOR HECA1 IMPROVE MONITOR

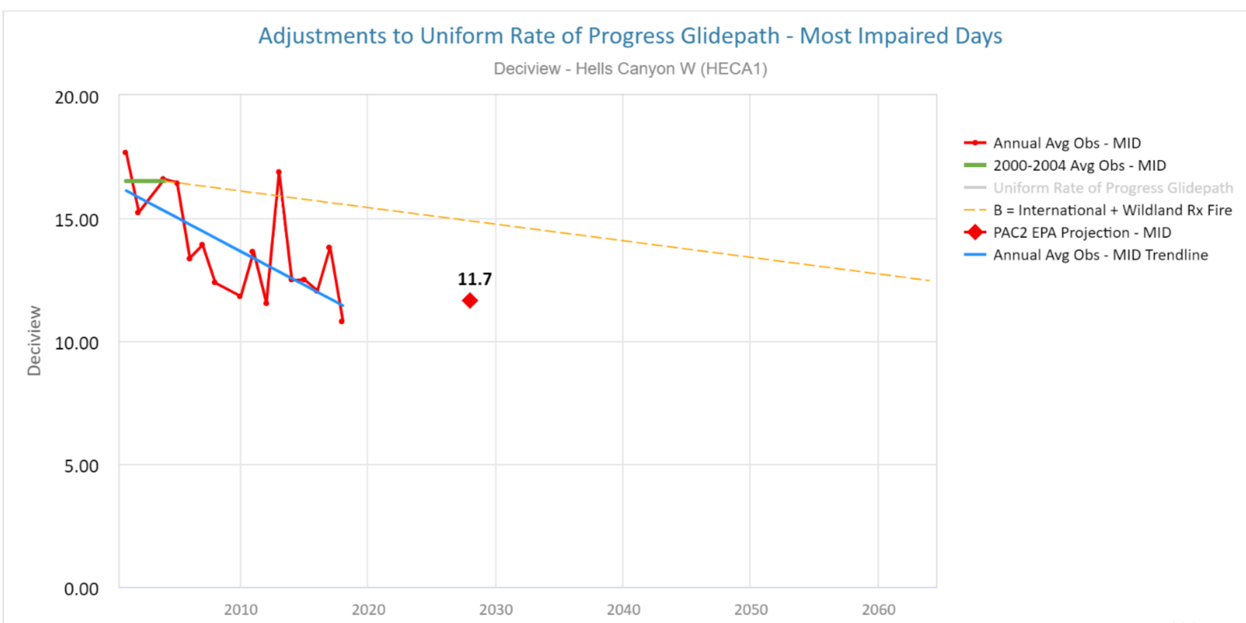
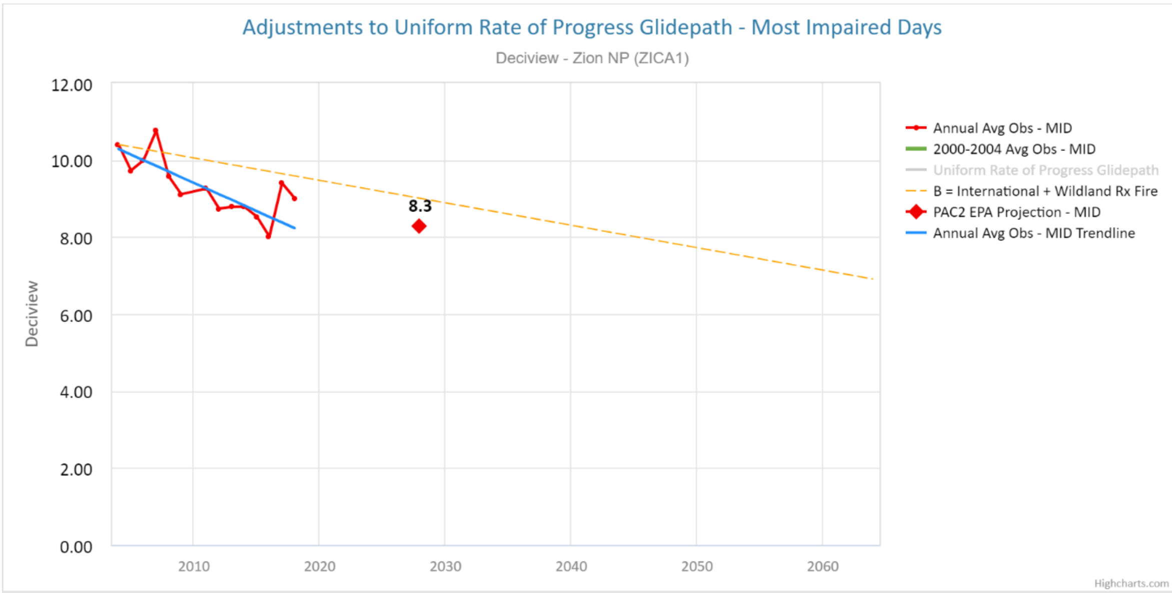


FIGURE 6-10

2028 URP GLIDEPATH CHECK FOR ZICA1 IMPROVE MONITOR



6.10 STEP EIGHT – ADDITIONAL SIP REQUIREMENTS

The eighth key step is to provide additional information necessary to ensure that other requirements of the Regional Haze Rule are met (40 CFR 51.308(f)(4), (5), and (6).

6.10.1 Reasonably Attributable Visibility Impairment (RAVI)

The FLMs for the Jarbidge Wilderness Area have not identified any reasonably attributable visibility impairment from sources in Nevada. The FLMs for the CIAs that Nevada's emissions impact in other states have not identified any reasonably attributable visibility impairment caused by Nevada sources. For these reasons, NDEP does not have reasonably attributable visibility impairment to address to satisfy the requirements of 40 CFR 51.308(f)(4).

6.10.2 Progress Report

The 2017 Regional Haze Rule requires periodic reports that describe a state's progress toward reasonable progress goals. A state must submit progress reports every five years after submitting its first Regional Haze Plan [40 CFR Section 51.308(g)]. NDEP submitted the most recent 5-year Progress Report and Update to EPA in November 2014, which presented data analysis for the period 2008 through 2012 and 2018 Reasonable Progress Goals.

As this Round 2 Regional Haze Plan is a comprehensive revision to satisfy the requirements of 40 CFR Section 51.308(f), this section serves to fulfill the required 5-year progress report [40 CFR 51.308(f)(5)]. The Regional Haze Rule allows the plan revision to serve also as a progress report, as long as the plan revision addresses the requirements of 40 CFR 51.308 (g)(1) through (5). The USEPA Guidance Document for the second implementation period recommends that "the 2021 SIP cover a period approximately from the first full year that was not actually incorporated in the previous progress report through a year that is as close as possible to the submission date of the 2021 SIP. For Nevada, that is 2014 through 2018.

Three of the required elements of a 5-year progress report are covered in other sections of this Round 2 Regional haze plan. The remaining two required elements of a 5-year progress report are described in the following sections.

Table 6-5 shows baseline monitored conditions (2000-2004), 2018 Reasonable Progress Goals, current visibility (2014 – 2018), and estimated natural conditions in 2064 for the 20 percent most impaired days and clearest days at Jarbidge Wilderness Area.

TABLE 6-5

CURRENT VISIBILITY AND 2018 RPG COMPARISON

20% Most Impaired Days (dv)					**20% Clearest Days (dv)**		
2000-2004 Baseline Visibility	**2008-2012 Progress Report**	**2018 Reasonable Progress Goal**	**2014-2018 Current Visibility**	**2064 Natural Conditions**	**2000-2004 Baseline Visibility**	**2008-2012 Progress Report**	**2014-2018 Current Visibility**
12.1	12.0	11.05	7.97	7.39	2.6	1.9	1.84

6.10.2.1 Status of Implementation of Control Measures

40 CFR 51.308(g)(1) requires five-year progress reports to contain "a description of the status of implementation of all measures included in the implementation plan for achieving reasonable progress goals for mandatory Class I Federal areas both within and outside the State."

In Nevada's first Regional Haze SIP, submitted in 2009, NDEP determined that four sources, comprising 10 units, were subject to Best Achievable Retrofit Technology: NV Energy's generating stations at Tracy (units 1, 2 and 3), Fort Churchill (units 1 and 2) and Reid Gardner (units 1, 2 and 3); and Southern California Edison's (SCE) Mohave Generating Station (units 1 and 2). The 2009 Regional Haze SIP required that all BART control measures would be installed and operating by January 1, 2015. In 2012, USEPA promulgated a Federal Implementation Plan (FIP) that adjusted the BART emission limits determined for Reid Gardner Generating Station and granted an extension to the compliance deadline.

In the 2014 5-year Progress Report, NDEP reported that the Mohave Generating Station opted not to begin operations again, after ceasing operations in 2005. The facility was fully decommissioned and demolished and the operating permit for the facility was officially cancelled in April 2010. The progress report also referenced plans to fully shutdown and decommission all units at Reid Gardner Generating Station. As of February 2014, baghouses had already been installed at Reid Gardner and the use of fuel oil had been eliminated at Fort Churchill Generating Station. The progress report also stated that NV Energy had received approval from the Public Utilities Commission (PUC) of Nevada to retire the Tracy units 1 and

2, and was granted approval to implement alternative equivalent control technology for BART and supplemental control technology for Unit 3 at Tracy and Units 1 and 2 at Fort Churchill.

At Reid Gardner Generating Station, units 1 through 3 were shutdown in 2014, followed by Unit 4 which was shutdown in March 2017. The demolition of the plant was completed in 2019. On October 19, 2015, the NDEP requested EPA rescind the FIP promulgated for BART at Reid Gardner on the basis that units 1, 2, and 3 were all shut down.

For all Tracy units, BART for SO_2 was use of Pipeline Natural Gas and/or low-sulfur NO.2 fuel oil with an emission limit of 0.05 lb/MMBtu. For Tracy units 1 and 2, BART was determined to be the implementation of a Low-NO_x Burner and Flue Gas Recirculation (LNB/FGR) combustion system upgrade forecast to achieve approximately 30% reduction in NO_x. Instead, NV Energy retired these units on December 31, 2014, and subsequently removed them from the Title V operating permit. To comply with BART, Unit 3 discontinued the occasional use of distillate fuel and was retrofitted with the best available Low-NO_x Burners before the compliance deadline. This source was selected to conduct a four-factor analysis for reasonable progress during the second implementation period.

For Fort Churchill units 1 and 2, BART for SO_2 and PM_{10} was determined to be use of Pipeline Natural Gas and/or low-sulfur No. 2 fuel oil with an emission limit of 0.05lb/MMBtu for SO_2 and 0.03 lb/MMBtu for PM_{10}. The use of fuel oil has since been permanently suspended at the facility.

6.10.2.2 Emission Reductions Achieved by SIP Measures

The Regional Haze Rule requires 5-year progress reports to contain, “a summary of the emissions reductions achieved throughout the State through implementation of the measures described in paragraph (g)(1).” [40 CFR.308 (g)(2)]. For the purpose of the 5-year progress report within this Regional Haze SIP for the second implementation period, a comparison between emissions reported in 2008 and 2018 for all four BART sources is provided in Table 6-6. These years were selected to evaluate total, facility-wide reductions between the beginning and end of the initial planning period. All sources, especially Reid Gardner, show significant emission reductions, except for Mohave. Note that, Mohave had ceased operations in 2005, and BART determinations were only applicable if the source began operations again, however, the facility officially closed its operating permit in 2010.

TABLE 6-6

ROUND 1 EMISSION REDUCTIONS AT BART FACILITIES

Pollutant	Reid Gardner		Mohave		Tracy		Fort Churchill	
	2008	2018	2008	2018	2008	2018	2008	2018
NO_x	5,559	0	0	0	1,169	511	1,609	366
SO_2	941	0	0	0	3	11	3	2
PM_{10}	1,482	0	0	0	40	73	68	20
Total	7,982	0	0	0	1,212	595	1,680	388
Reductions	**7,982 tpy**		**0 tpy**		**617 tpy**		**1,292 tpy**	

6.10.2.3 Other Progress Report Requirements

Regional Haze Rule requirements outline in 40 CFR 51.308(g)(3)-(5) are provided in other chapters of this SIP. Table 6-7 lists these requirements and where in the SIP these topics are discussed.

TABLE 6-7

OTHER PROGRESS REPORT REQUIRMENTS

CFR Citation	Progress Report Element	Round 2 SIP Chapter
40 CFR 51.308 (g)(3)	"For each mandatory Class I Federal area within the State, the State must assess the following visibility conditions and changes, with values for most impaired, least impaired and/or clearest days as applicable expressed in terms of 5-year averages of these annual values" for the period since the most recent progress report."	Chapter 2
40 CFR 51.308 (g)(4)	"An analysis tracking the change over the period since the period addressed in the most recent plan required under paragraph (f) of this section in emissions of pollutants contributing to visibility impairment from all sources and activities within the State."	Chapter 3
40 CFR 51.308 (g)(5)	"An assessment of any significant changes in anthropogenic emissions within or outside the State that have occurred since the period addressed in the most recent plan…"	Chapter 4

6.10.3 Monitoring Strategy and Other Implementation Requirements

Nevada's monitoring strategy pursuant to the requirements of 40 CFR 51.308(f)(6) is provided in Chapter Eight.

6.11 REFERENCES

U.S. EPA 2003. Guidance for Tracking Progress under the Regional Haze Rule. EPA-454/B-03-004. September 2003.

U.S. EPA 2013. General Principles for 5-year Regional Haze Progress Reports. April 2013.

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2019. Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. September 2019.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Seven -- Long-Term Strategy for Nevada

7.10.3 Uncertainty

7.11 REFERENCES

7.1 LONG-TERM STRATEGY OVERVIEW

The Long-Term Strategy is the compilation of enforceable emissions limitations, compliance schedules, and other measures determined as necessary to achieve the reasonable progress and is the means through which the state ensures that its 2028 reasonable progress goals (RPGs) will be met (40 CRF 51.308(f)(2)). In determining which new control measures are necessary to achieve reasonable progress, Nevada considered the four statutory factors. When the conclusion of a source's four-factor analysis was that no new control measures were needed make reasonable progress, NDEP considered whether the continued use of existing controls at the source were needed to make reasonable progress. Chapter Five outlines NDEP's steps in determining which new and existing control measures are necessary to make reasonable progress at Jarbidge WA. Anticipated emissions reductions from new control measures were used to develop the 2028 RPGs for Jarbidge WA, outlined in Chapter Six. All new and existing control measures identified in Chapter Five, along with enforceable emissions limitations, compliance schedules, and other requirements needed to ensure the controls are practically enforceable, are incorporated by reference into Nevada's Long-Term Strategy for the second implementation period of the Regional Haze Rule.

The Long-Term Strategy must have the capability of addressing existing and future impairment situations as they face the state. Generally, Nevada considers that its permitting program meets this requirement for existing major stationary facilities, as well as preventing future impairment from proposed major stationary sources or major modifications to existing facilities. The New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs are key components of Nevada's regional haze plan, as these programs inherently aid in preventing future visibility impairment by mitigating impacts from new sources. The state maintains that its existing regulations, including the Best Available Retrofit Technology (BART) regulations adopted for the initial implementation period, along with the strategies and activities outlined below, assist in achieving natural visibility conditions at Jarbidge WA, and other out-of-state CIAs.

This chapter discusses Nevada's Long-Term Strategy to restore natural visibility conditions at the Jarbidge Wilderness Area (Jarbidge WA) by 2064 and its relationship to the 2028 RPG for the Jarbidge WA.

7.2 FOUR-FACTOR REASONABLE PROGRESS CONTROLS

The installation of new control measures, and continued use of existing control measures, that are deemed necessary to achieve reasonable progress are an integral part of the Long-Term Strategy and RPGs of Nevada's second regional haze SIP. Chapter Five describes the four-factor process, identifies Nevada's five sources that conducted a four-factor analysis and presents the requirements for those facilities. Each source that has evaluated new control measures that are considered necessary to achieve reasonable progress is required to install and operate said controls as expeditiously as practicable. In addition, each source subject to reasonable progress controls is required to establish procedures to ensure the control equipment is properly operated and maintained. Any existing controls that are needed to make reasonable progress are required to permanently operate said controls, as long as the associated unit remains in operation, upon SIP approval.

Five Nevada facilities conducted a four-factor analysis: NV Energy's generating stations at Tracy and North Valmy; Lhoist North America's Apex Plant, Graymont's Pilot Peak Plant, and Nevada Cement Company's Fernley Plant. Chapter Five outlines the new and existing control measures that are needed to make reasonable progress during the second implementation period (see Table 5-5) and lists the associated emission limits, compliance schedules, and other requirements relied upon to ensure the controls are practically enforceable. Permit conditions associated with the emission limits and requirements needed for each control that is necessary to make reasonable progress are incorporated and adopted by reference into this SIP's Long-Term Strategy for approval, and can be found in Chapter 5 and Appendix A.

Significant emissions reductions will be achieved through the installation of new control measures . Table 7-1 summarizes the expected emissions reductions resulting from the installation of reasonable progress control technologies.

TABLE 7-1

ANNUAL EMISSIONS REDUCTIONS IN TONS RESULTING
FROM IMPLEMENTATION OF REASONABLE PROGRESS IN NEVADA

NO_x	SO_2	PM_{10}	Total
2,239	2,313	60	4,612

7.3 PERMIT REVISION PROCEDURE

For the second planning period, NDEP has revised the air quality operating permits of the facilities under its jurisdiction when new emission limits, and associated requirements, are needed. The permit revisions include the emissions limitations, associated monitoring, recordkeeping, and reporting requirements, and compliance schedules that are required as part of Nevada's Long-Term Strategy. Inclusion of these revisions in the operating permits for Title V stationary sources will make those measures both permanent and federally enforceable upon SIP approval. Nevada has a combined Title V and New Source Review permit program, which meets EPA's requirement that emissions limitations and compliance schedules apply to both.

Operating permits were amended using the authority outlined in NAC 445B.315. This provision authorizes NDEP to revise, revoke and reissue, reopen and revise, or terminate an air quality operating permit for cause. NAC 445B.425 further provides the authority for the NDEP Administrator to reopen and revise an operating permit if it is determined that the operating permit, as written, does not ensure compliance with all applicable requirements. In this case the applicable requirement that provides the justification to revise a permit is the need to implement the control measures outlined in the State's Long-Term Strategy that are intended to achieve the Reasonable Progress Goals stated in the Regional Haze State Implementation Plan.

The operating permit revisions that were undertaken followed the process stated in NAC 445B.3395 for Class I operating permits. This process entails informing the permit holder of NDEP's intent to open and revise the existing operating permit with the required elements (facility closure date or emissions limitations based on the use of existing emission controls) derived from the 4-factor analysis included in this Regional Haze SIP. NDEP's intent to revise the permit and the proposed conditions of the revision does not trigger a public review requirement as the proposed Regional Haze controls do not relax emission limits or other associated requirements. The permit revision becomes effective once the revision is signed and issued by NDEP. The operating permit for a Class I (Title V) facility is federally enforceable because NDEP has delegated authority to implement a federal Title V air permitting program. NDEP's Class I permitting program meets EPA equivalency requirements for Title V programs and is included in Nevada's State Implementation Plan.

One facility that underwent the four-factor analysis is in Clark County, Nevada. The Lhoist Apex facility north of Las Vegas falls under the jurisdiction of the Clark County Department of Environment and Sustainability (CCDES). In consultation with NDEP and EPA, CCDES developed an approach to establish enforceable emissions limitations and compliance schedules for the installation of required controls at Lhoist Apex that involved two parts. The CCDES lacked the authority to open an existing operating permit and make revisions or amendments without a written request from the permit holder to initiate such an action. Lhoist North America requested in a recent Authority-to-Construct (ATC) permit application to permanently include applicable Regional Haze requirements including plant-wide applicability limits, monitoring, recordkeeping, and reporting requirements, as specified in the source's ATC permit in Appendix A.

CCDES is in the process of amending their county regulations to allow operating permits in Clark County to be revised to implement the State's Regional Haze Rule Long-Term Strategy. When completed, CCDES will have the authority to revise air quality operating permits to include provisions for the installation of reasonable progress controls, including enforceable emissions limitations, averaging periods, and all other associated requirements needed to make the controls practically enforceable.

Reasonable progress controls identified in the four-factor analyses as necessary to achieve reasonable progress are described in Chapter Five. Each identified control technology has specific emissions limitations and schedules of compliance unique to each unit.

7.4 ENFORCEABILITY OF EMISSION LIMITS

Major emission sources are issued Class I air quality operating permits in the State of Nevada. These legally-enforceable documents are designed to improve compliance with applicable air quality regulations by clarifying in the permit conditions what facilities must do to control air pollution. Air quality operating permits are required by Title V of the Clean Air Act and are issued by NDEP in all counties except Clark and Washoe, which have their own respective permitting programs.

The enforcement of emissions limits and compliance schedules will be through the mechanism the State uses to enforce Class I (Title V) operating permits. The authority for NDEP to issue and enforce air quality operating permits is provided in statute by NRS 445B.210, 445B300, and 445B.450. Regulations that contain the enforcement procedures are found in NAC 445B.275, 445B.277, 445B.281, and 445B.283. The rules state that failure to comply with any requirement of Nevada air quality regulations, any applicable requirement, or any condition of an operating permit constitutes a violation. The regulations provide for the leveeing of administrative fines for violations.

Federal enforceability of emissions limits and compliance schedules hinges on the connection between NDEP's issuance of air quality operating permits and the oversight authorities EPA retains over that program. NDEP's Class I operating permit program was developed to comply with EPA's Title V Operating Permit Program and is codified in regulation in the applicable sections of NAC 445B. The NAC 445B Class I regulations are listed in the applicable State implementation plan for the State of Nevada in 40 CFR § 52.1470. NDEP has primary responsibility for running the Title V permitting program, having been granted delegated authority from the EPA. Regional Offices of the EPA have oversight responsibilities over state Title V programs, including the review and comment on draft state permits, and review of monitoring or other reports required by the permit.

Should the State fail to enforce any Class I permit conditions, including the regional haze control measures, the associated emissions limitations, the compliance schedule including a facility closure date that factored into the 4-factor analysis, or any associated monitoring, reporting, or recordkeeping requirements, EPA will also have authority to federally enforce those permit conditions on a Nevada Class I permit.

CCDES will enforce the emissions limits and compliance schedules in the Lhoist Apex facility permit. Enforceability of the CCDES permit revisions follows Clark County regulatory authority in Clark County Air Quality Regulations Section 12.3.7: Source Obligation, which includes enforcement and compliance provisions for major sources in nonattainment areas.

7.5 EMISSION REDUCTIONS DUE TO ONGOING AIR POLLUTION CONTROL PROGRAMS

The following air pollution control programs are discussed as evidence of ongoing air pollution control programs. These air pollution control programs are not necessary to achieve reasonable progress but are anticipated to support long-term preservation of visibility in Nevada.

7.5.1 State Regulations from the Nevada Administrative Code (NAC)

Nevada has state emission control programs and rules that focus on the protection of visibility. In addition, Nevada has state emission control programs and rules that were not specifically written to address visibility impairment but still work to improve and protect visibility in CIAs by controlling the emissions of pollutants that cause or contribute to visibility impairment. Both programs that specifically address visibility impairment and programs not specific to visibility impairment that still improve visibility are detailed below.

7.5.1.1 NAC 445B.22017: Visible Emissions: Maximum Opacity; Determination and Monitoring of Opacity

These provisions restrict the degree of opacity that can be discharged into the ambient air from both new and existing installations. The restriction of opacity, or visible emissions, has a direct impact on visibility.

7.5.1.2 NAC 445B.2203: Emissions of Particulate Matter: Fuel-Burning Equipment

This provision restricts the amount of allowable PM_{10} emissions resulting from the combustion of fuel in fuel-burning equipment. PM_{10} is a primary visibility impairing pollutant.

7.5.1.3 NAC 445B.22033: Emissions of Particulate Matter: Sources Not Otherwise Limited

This provision restricts the amount of allowable PM_{10} emissions resulting from stationary sources that would otherwise not be included in other particulate matter restrictions. PM_{10} is a primary visibility impairing pollutant.

7.5.1.4 NAC 445B.22037: Emissions of Particulate Matter: Fugitive Dust

This provision restricts the amount of PM_{10} emissions from fugitive dust sources and prohibits any person from causing or permitting construction, repair, demolition, or use of unpaved or untreated areas without first putting into effect an ongoing program using the best practical methods to prevent particulate matter from becoming airborne. This provision also requires an operating permit for surface area disturbance for any projects that disturb or cover 5 or more acres of land. PM_{10} is a primary visibility impairing pollutant and fugitive dust is a significant source category of PM_{10} emissions.

7.5.1.5 NAC 445B.22047: Sulfur Emissions: Fuel-Burning Equipment

This provision restricts the emission of compounds of sulfur caused by the combustion of fuel in fuel-burning equipment. Sulfur dioxide and other sulfur oxides can react with other compounds in the atmosphere to form fine particles that impair visibility.

7.5.1.6 NAC 445B.2205: Sulfur Emissions: Other Processes which Emit Sulfur

This provision restricts the emission of compounds of sulfur where the sulfur originates in the material being processed, excluding hydrogen sulfide and sulfur from all solid, liquid or gaseous fuel. Sulfur dioxide and other sulfur oxides can react with other compounds in the atmosphere to form fine particles that impair visibility.

7.5.1.7 NAC 445B.22067: Open Burning

This regulation establishes the authority for Nevada's Smoke Management Program and open burn permitting requirements. It helps to maintain air quality by regulating prescribed fire operations and restricting the types of material that may be burned in Nevada. Open burning directly impacts visibility nearby and emits pollutant species that react in the atmosphere and impair visibility in downstream Class I areas.

7.5.1.8 NAC 445B.22093 Organic Solvents and Other Volatile Compounds

This provision restricts solvents or other volatile compounds from being released into the ambient air causing or contributing to air pollution. Volatile compounds can react with other compounds in the atmosphere to form visibility impairing particles.

7.5.1.9 NAC 445B.22096 Control Measures Constituting BART; Limitations on Emissions

This provisions, as a result of BART determinations of the first implementation of the Regional Haze Rule for Nevada, provides an enforceable measure for controls required to reduce emissions and improve visibility. Sources that are still in operation are still bound to these requirements and associated visibility improvement.

7.5.1.10 NAC 445B.22097: State Standards of Quality for Ambient Air

NAC 445B.22097 lists the minimum state standards of quality for ambient air. National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a regulated air pollutant. This includes the preservation of visibility.

7.5.1.11 NAC 445B.308, 3405, 346: Required Contents of Class I and II Operating Permits

Nevada operates a permitting program that evaluates new construction projects for their impact on air quality. Once a permit to construct is issued, a facility may be built. Once construction is completed, a facility inspection is performed to ensure construction was in line with the permit to construct and then an appropriate permit to operate is issued. Non-Title V sources receive an issued minor source permit to operate. Title V sources must apply for a Title V permit within a year of completed construction and initial operation. The primary goal of the permitting program is to maintain compliance with both federal and state regulations. Although the primary goal of the permitting program is not to protect visibility, maintaining compliance with federal and state regulations inherently helps to protect visibility.

7.5.1.12 NAC 445B.576: Vehicles Powered by Gasoline or Diesel Fuel: Restrictions on Visible Emissions and on Idling of Diesel Engines

This provision restricts visible emissions from vehicles powered by gasoline and diesel fuel. This directly protects visibility in Nevada.

7.5.1.13 NAC 445B. 577: Devices used on Stationary Rails: Restrictions on Visible Emissions

This provision restricts visible emissions from devices used on stationary rails. This directly protects visibility in Nevada.

7.5.1.14 NAC 445B.596: Standards of Emissions

This provision sets standards for exhaust emissions from each motor vehicle powered by gasoline with a model year of 1968 to 1995. The provision restricts the amount of allowable carbon monoxide emissions from each vehicle. Carbon monoxide can react with other compounds in the atmosphere to form visibility impairing particles.

7.5.1.15 NAC 445B.7665: Standards of Opacity; Citation for Violation; Equipment for Measurement

This provision sets standards of smoke opacity from heavy-duty motor vehicles powered by:

(a) A 1991 or newer model-year engine may cause or permit the discharge into the atmosphere of engine exhaust from the vehicle which is of an opacity greater than 40 percent.

(b) A 1977 to 1990 model-year engine may cause or permit the discharge into the atmosphere of engine exhaust from the vehicle which is of an opacity greater than 55 percent.
(c) A 1970 to 1976 model-year engine may cause or permit the discharge into the atmosphere of engine exhaust from the vehicle which is of an opacity greater than 70 percent.
The restriction of smoke opacity directly benefits visibility in Nevada.

7.5.1.16 NAC 445B.221: Adoption by Reference and Applicability of Certain Provisions of Federal Law and Regulations

Nevada routinely adopts by reference certain provisions of federal law and regulations that are directly applicable to industries and emission-forming processes that exist in the State. These provisions largely fall under 40 CFR Part 60 - Standards of Performance for New Stationary Sources, 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants, and 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories. Though not specifically intended to reduce regional haze, these provisions do reduce emissions of haze-forming pollutants. Standards that have been adopted by reference that are more applicable to the goals of the Regional Haze Rule are outlined in sections 7.5.2.7 and 7.5.2.8.

7.5.2 Federal Regulations

The EPA has several existing emission control programs and rules that do not specifically address visibility impairment. However, the programs control the emission of pollutants that cause or contribute to visibility impairment in Nevada. Therefore, these programs have an impact on Nevada's CIAs. These programs are described in the following sections.

7.5.2.1 Acid Rain Program (ARP)

In addition to being the two primary emissions contributing to visibility impairment in Nevada, SO_2 and NO_x are the two primary precursors of acid rain. The Acid Raid Program (ARP)[1] was established under Title IV of the 1990 Clean Air Act Amendments and requires significant reductions in SO_2 and NO_x emissions from the power sector.137 The ARP was released in two phases, with Phase I beginning in 1995 and Phase II beginning in 2000. The ARP set a goal of reducing annual SO_2 emissions by 10 million tons below 1980 levels. The ARP also set a goal of a two-million-ton reduction in NO_x emissions below 1980 levels by the year 2000. Although the ARP is not solely focused on SO_2 and NO_x reductions within Nevada, SO_2 and NO_x reductions throughout the United States also benefit visibility within Nevada CIAs, since air is not contained within state boundaries.

7.5.2.2 Tier 3 Motor Vehicle Emission and Fuel Standards

Tier 3 vehicle standards were established in 2014.[2] The action established more stringent vehicle emissions standards and reduced the sulfur content of gasoline beginning in 2017. Under the Tier 3 program, federal gasoline cannot contain more than 10 ppm of sulfur on an annual average basis after January 1, 2017. The vehicle standards reduced both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. The tailpipe standards include different phase-in schedules ranging between

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[1] https://www.epa.gov/acidrain/acid-rain-program
[2] https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-control-air-pollution-motor-vehicles-tier-3

model years 2017 and 2025, depending on vehicle class. It is expected that the Tier 3 vehicle standards will result in a 60–80% reduction of NO_x, VOC, CO, $PM_{2.5}$, and air toxics throughout the country. As such, Nevada's CIAs will experience less visibility impairment when newer vehicles are operating within or near the CIAs. 2028 emissions projections from non-road and on-road engines were generated using the Motor Vehicle Emission Simulator (MOVES) look-up tables generated by EPA, starting from the 2016v1 platform.[3]

7.5.2.3 Tier 4 Emission Standards for Nonroad Diesel Engines

The EPA finalized Tier 4 emission standards for nonroad diesel engines and sulfur reductions in nonroad diesel fuel in 2004. The new emission standards took effect for new engines beginning in 2008 and were fully phased in by the end of 2015. The rule set standards reducing NO_x and PM emissions by more than 90 percent from nonroad diesel equipment and reduced sulfur emissions from nonroad diesel fuel by more than 99 percent. A reduction on NO_x, PM, and sulfur emissions from nonroad diesel engines benefits visibility across the United States.

7.5.2.4 Emission Standards for New Nonroad Engines

The EPA adopted new standards for NO_x, CO, and hydrocarbons emissions from previously unregulated nonroad large industrial spark-ignition engines and recreational vehicles in 2002. The new standards also include requirements for diesel marine engines. The rule was fully phased in by 2012. It is estimated that the rule resulted in a 72 percent reduction in hydrocarbon emissions, an 80 percent reduction in NO_x emissions, and a 56 percent reduction in CO emissions. These reductions benefit visibility across the United States.

7.5.2.5 Heavy Duty Highway Engine and Vehicle Standards

The EPA set a PM emissions standard for new heavy-duty engines of 0.01 grams per brake-horsepowerhour (g/bhp-hr), to take full effect for diesel engines in the 2007 model year. The rule also includes standards for NO_x and non-methane hydrocarbons (NMHC) of 0.20 g/bhp-hr and 0.14 g/bhp-hr, respectively. This NOx and NMHC standards were phased in together between 2007 and 2010 for diesel engines.[4] Sulfur in diesel fuel was lowered to enable modern pollution control technology to be effective on trucks and buses. The EPA required a 97 percent reduction in the sulfur content of highway diesel fuel from its previous level of 500 parts per million (low sulfur diesel) to 15 parts per million (ultralow sulfur diesel).[5]

The EPA announced plans for the Cleaner Trucks Initiative (CTI) on November 13, 2018. The purpose of the CTI is to update standards for NO_x emissions from highway heavy-duty vehicles and engines. An advanced notice of proposed rulemaking was posted to the Federal Register on January 21, 2020, requesting comments on the CTI.[6] Comments on the proposed rule were due by February 20, 2020. No further updates have been released, but a reduction in NO_x emissions from highway heavy-duty vehicles and engines would improve visibility across the United States.

[3] https://views.cira.colostate.edu/docs/wrap/mseipp/WRAP_MSEI_Summary_Memo_13Mar2020.pdf
[4] https://www.federalregister.gov/d/01-2/p-284
[5] https://www.federalregister.gov/d/01-2/p-279
[6] https://www.federalregister.gov/d/2020-00542/p-3

7.5.2.6 Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone (NO_x SIP Call)

The EPA finalized the NO_x SIP Call in October 1998. Since NO_x is a major precursor to ozone, the NO_x SIP Call focuses on NO_x reductions. The NO_x SIP Call was designed to mitigate significant transport on NO_x. Phase I of the NO_x SIP Call applies to EGUs and large non-EGUs, including industrial boilers and turbines, and cement kilns in the eastern United States. The NO_x SIP Call is expected to reduce NO_x emissions by 90%. When winds are from the easterly direction, Nevada's CIA will likely experience an improvement in visibility.

7.5.2.7 National Emission Standards for Industrial, Commercial, and Institutional Boilers and Process Heaters (40 CFR 63, Subpart DDDDD)

The EPA issued final rules to substantially reduce emissions of toxic air pollutants from industrial, commercial, and institutional boilers and process heaters (40 CFR 63, Subpart DDDDD) in 2004. The rule reduced emissions of several toxic air pollutants including hydrogen chloride, manganese, lead, arsenic, and mercury. Regulations within the rule also reduced emissions of SO_2 and PM. The rule has been updated several times, with the most recent update being finalized in 2015. The District of Columbia Circuit remanded several of the emission standards to the EPA in 2016 and 2018. The EPA proposed amendments to the rule in 2020 to update the issues identified when the rule was remanded.

7.5.2.8 National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units (40 CFR 63, Subpart UUUUU)

The EPA issued final rules to substantially reduce emissions of toxic air pollutants from coal- and oil-fired EGUs in 2012, known as the Mercury and Air Toxics Standards (MATS). The MATS reduces emissions of HAPs, including mercury, from the electric power industry. As a co-benefit, the emissions of certain $PM_{2.5}$ precursors such as SO_2 also declined.[7] The rule has been updated several times, with the most recent update being finalized in 2020.[8]

7.5.2.9 Various Other Maximum Achievable Control Technology (MACT) Standards

Various MACT standards have been promulgated by the EPA that will limit or reduce various visibility impairing pollutants, including PM, NO_x, SO_2, and VOC which were not discussed above.

7.5.3 Consent Decree Agreements

Nevada is relying on one ongoing Consent Decree issued by the USEPA to forego evaluating potential new add-on control measures at the Nevada Cement Company's Fernley Plant during the second implementation period. This Consent Decree requires NO_X and SO_2 controls at both kilns, however, these controls are not fully implemented, and emission limits have yet to be finalized. Because of this, NDEP is unable to conduct an accurate four-factor analysis or incorporate any expected reductions from the Consent Decree into its long-term strategy. It should be noted that a four-factor analysis evaluating the upgrades of existing controls at the

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7 https://www.epa.gov/sites/production/files/2020-09/documents/matsriafinal.pdf
8 https://www.epa.gov/mats/regulatory-actions-final-mercury-and-air-toxics-standards-mats-power-plants

Fernley Plant was still conducted and concluded that those measures would not be cost-effective, nor necessary to achieve reasonable progress. Section 5.9 further explains the conditions of the consent decree. (Civil Action Number 3:17-cv-00302-MMD-WGC)

7.5.4 Voluntary and State Regulatory Emission Reduction Programs Directed at Mobile Source Emissions and Other Air Pollution Control Measures

Listed are several programs that are either voluntary grant-funded efforts or state regulatory measures intended to reduce mobile source emissions. Also listed are other measures, both in-state and out-of-state, that assist in reducing visible emissions.

7.5.4.1 Volkswagen Environmental Mitigation Trust

On October 25, 2016, a Partial Settlement and Consent Decree was finalized between the United States Department of Justice and the Volkswagen Corporation (VW) regarding the installation and use of emissions testing defeat devices in over 500,000 VW vehicles sold and operated in the United States beginning in 2009. These devices violated the federal Clean Air Act and increased air emissions of the pollutant nitrogen oxide (NO_x).

An environmental mitigation trust (trust) has been established as part of the consent decree to provide funds to the states to mitigate the negative air quality impacts of the violations. Nevada's total share of the trust is $24.8 million. The trust establishes a process for states to receive the funds and develop environmental mitigation plans. The trust also identified the mitigation projects that are eligible for funding.

Nevada has utilized its share of the trust to fund grants for clean air projects through the Diesel Emission Mitigation Fund, partnering with the Governor's Office of Energy to support the Nevada Electric Highway, and to provide support for the Nevada Clean Diesel Program by matching our annual EPA program award. Projects funded by this grant program are intended to reduce NO_x, but often also result in reductions of other visibility impairing pollutants. More information and future updates on Nevada's funding for the trust can be found at https://ndep.nv.gov/air/vw-settlement.

7.5.4.2 EPA's Diesel Emissions Reduction Act (DERA)

The EPA allocates funds within the DERA program to individual states each year to help fund the voluntary retrofit or replacement of older diesel-powered vehicles that produce higher emissions with new replacement technology or vehicles that have lower or zero emissions. The amount of funds varies yearly, and the program provides up to 25% of the cost of the replacement vehicle. The DERA program began in 2008.

Emission reductions were largest at the start of the DERA program when diesel vehicles with no or limited emission controls were being retrofitted with emission control technology. More recently, the program has evolved to a vehicle replacement program. In 2019, sixteen vehicles were funded for replacement, with an additional five replacements funded in 2020. In 2021 more projects are planned, including several school bus projects that will acquire zero emission replacement school buses. Each successive year of funding results in further emission reductions in part a result of more stringent national vehicle emission standards and availability of more advanced technology. The program continues to provide NO_x and PM2.5 reductions with each funding cycle.

7.5.4.3 Clean Cars NV

Using the Clean Air Act Section 177 provisions, Nevada joined several other states in adopting California's Advanced Clean Cars Program that combines the control of smog-causing (criteria) pollutants and greenhouse gas (GHG) emissions into a single coordinated package of regulations. The Low-Emission Vehicle (LEV) regulation that reduces criteria and GHG emissions, combined with a technology forcing regulation that facilitates zero-emission vehicle (ZEV) purchases, together will result in further criteria and GHG emission reductions.

Under the state authorities of NRS 445B.210 and NRS 445B.760, the State Environmental Commission (SEC) on September 1, 2021, adopted the LEV and ZEV standards into the Nevada Administrative Code (NAC). With final approved granted by the Nevada Legislative Commission on October 22, 2021, the Clean Cars Nevada program as detailed in NAC 445B will commence with regulation of model year 2025 vehicles beginning in calendar year 2024. As new model year vehicles enter the statewide fleet of vehicles each successive year, the LEV and ZEV programs will result in an incremental but measurable reduction of visibility causing pollutants from the mobile sector.

7.5.4.4 Nevada Nonattainment

As of 2021, Nevada shas several areas that are in nonattainment with the NAAQS or were previously in nonattainment but have been redesignated as attainment. These areas have SIPs in place that are effective in Washoe and Clark Counties, for the cities of Reno and Las Vegas, respectively as detailed below. In NDEP's jurisdiction, there were only two nonattainment areas that have now been redesignated. The Central Steptoe Valley was out of attainment for SO_2 because of emissions from a copper smelter but was redesignated attainment in 2002. Secondly, the Nevada side of the Lake Tahoe Basin (Hydrographic Area 90) was out of attainment for carbon monoxide but was redesignated effective 2004. Table 7-2 shows the designation status for Nevada's nonattainment areas.

TABLE 7-2

NONATTAINMENT AREA
REDESIGNATION STATUS AS OF OCTOBER 2021

Planning Area	Nonattainment Date	Redesignations
Carbon Monoxide		
Lake Tahoe Basin (HA90)	3/3/78	USEPA approved 12/15/03; effective 2/13/04
Las Vegas Valley (HA212)	3/3/78 and 11/15/90	USEPA approved 0909/27/10
Truckee Meadows (Reno) (HA87)	3/3/78 and 11/15/90	USEPA approved 7/3/08
Ozone		
Washoe County	1/6/92 (1 hr) 1/16/01 (1 hr)	6/15/05 1 hr NAAQS revoked; Maintenance plan approved 1/18/08; effective 3/18/08
Clark County: 1997 std.: Portions of Clark County 2008 std: Clark County 2015 std.: Las Vegas Valley (HA212)	9/13/2004 (8 hr) for 1997 std. n/a: attainment for 2008 std. 8/03/2018 (8 hr) for 2015 std.	USEPA approved 2/7/2013 for 1997 std. USEPA approved 07/20/2012 for 2008 std.
PM_{10}		
Las Vegas Valley (HA212)	11/15/90	USEPA approved 11/05/14
Pahrump Valley[1] (HA162)	does not apply	MOU Sept 2003
Truckee Meadows (Reno) (HA87)	11/15/90	USEPA approved 1/07/16
SO_2		
Central Steptoe Valley (HA179M)	3/3/78	USEPA approved 4/12/02; effective 6/11/02

7.5.4.5 Clark County

Clark County has PM_{10} and carbon monoxide (CO) SIPs. The Las Vegas Valley was in nonattainment of air quality standards for PM_{10} airborne particulate matter and CO. Fugitive dust and many sources of PM_{10} contributed to this problem. Adoption and enforcement of stringent fugitive dust rules resulted in successful reduction of PM_{10} and in 2014 the Las Vegas Valley was redesignated to attainment. The Las Vegas Valley was redesignated to attainment for CO in 2010 due to the implementation several control programs and there have been no recorded exceedances of the CO NAAQS since 1998. CO control strategies required to maintain compliance with the CO NAAQS include mobile source control measures including state and federal programs, woodstove and fireplace regulations. Ozone has been a concern in Clark

County for several years and the 2018 Marginal nonattainment designation for the 2015 ozone 8-hr standard has spurred officials to take action. The Clark County Department of Environment and Sustainability has been enrolled in USEPA's Ozone Advance Program since 2013. Clark County has been engaged with SIP planning requirements for the Las Vegas Valley nonattainment area with respect to the major New Source Review (NSR) preconstruction permitting requirement, the emissions inventory and emissions statement requirements, and other planning provisions required by the CAA for newly designated nonattainment areas.

7.5.4.6 Washoe County

Washoe County, specifically, the Truckee Meadows Hydrographic Area HA 87, has SIPs for ozone, CO and PM_{10}. Control measures focus on nonroad and on-road vehicles ,mobile source control measures including state and federal programs, residential wood burning and dust control measures.

7.6 MITIGATION OF CONSTRUCTION IMPACTS

Nevada manages the release of fugitive dust from construction related activities through the implementation of regulations set forth in the Nevada Administrative Code (NAC).

NAC 445B.22037 requires fugitive dust to be controlled (regardless of the size or amount of acreage disturbed), and requires an ongoing program, using best practical methods, to prevent particulate matter from becoming airborne. All activities which have the potential to adversely affect the local air quality must implement all appropriate measures to limit controllable emissions. Appropriate measures for dust control may consist of a phased approach to acreage disturbance rather than disturbing the entire area all at once; using wet suppression through such application methods as water trucks or water sprays systems to control wind blown dust; the application of soil binding agents or chemical surfactant to roadways and areas of disturbed soil; as well as the use of wind-break or wind-limiting fencing designed to limit wind erosion of soils.

Furthermore, no person may disturb or cover 5 acres or more of land or its topsoil until he has obtained an operating permit for surface area disturbance to clear, excavate or level the land or to deposit any foreign material to fill or cover the land. In addition to requiring a permit for all disturbances greater than 5 acres, a dust control plan must be submitted for all disturbances greater than 20 acres. The approval of the dust control plan does not limit the permit holder's need to control fugitive dust from the disturbance and its related activities, nor from putting into effect an ongoing program for using the best practical methods of dust control.

In addition to the requirements detailed above, there are guidelines for the Pahrump Valley (HA 162) in southern Nevada. In this area, a dust control plan is required for any disturbance greater than 5 acres. Washoe and Clark counties have their own respective air quality departments and, therefore, are responsible for managing their particular fugitive dust programs.

It is important to note the requirements above do not apply to agricultural activities occurring on agricultural land and mining exploration projects pursuant to Nevada Revised Statute 519A.180.

7.7 SOURCE RETIREMENT AND REPLACEMENT SCHEDULES

The construction of new sources, which will ensure the early or scheduled retirement of older, less well-controlled sources, can greatly aid progress toward the national visibility goal over the long term. Nevada's continued implementation of NSR and PSD requirements with FLM involvement for Class I area impact review will protect the clearest days from further degradation and will assure that no Class I areas experience degradation from expansion or growth of a single new source or large-scale regional development of stationary sources.

As stated in Chapter Five, NDEP is relying on the closure of three units as part of its Long-Term Strategy. Both Unit 1 and 2 at the North Valmy Generating Station will have a federally enforceable closure date of December 31, 2028. The Piñon Pine unit at the Tracy Generating Station will have a federally enforceable closure date of December 31, 2031.

7.8 SMOKE MANAGEMENT PROGRAM

In Nevada, preventing and managing emissions from smoke are achieved through implementation of two separate elements of the air quality program. Open burning is controlled through a comprehensive set of open burning regulations. Prescribed fires used specifically for land management purposes are controlled through implementation of the Nevada Smoke Management Program.

Open burning regulations are found in NAC 445B.22067. The regulations apply to federal, state, and private lands equally and prohibit open burning of combustible refuse, waste, garbage, oil or open burning for any salvage operation. Exemptions are granted for open burning conducted for the purposes of weed abatement, conservation, disease control, game or forest management and fire training. Burning for agricultural purposes is exempt, as is the burning of yard waste and untreated wood at single-family residences. Small fires used for cooking, recreation, education, or ceremonial purposes are also exempt.

The Nevada Smoke Management Program was developed to coordinate and facilitate the statewide management of prescribed outdoor burning. This program is designed to meet the requirements of Nevada's air quality statutes listed in Nevada Revised Statutes (NRS) 445B.100 through 445B.845, inclusive, and the requirements of the USEPA Interim Air Quality Policy on Wildland and Prescribed Fires (EPA OAQPS, April 23, 1998). It supports the visibility protection goals for Federal class I areas in Section 169A of the CAA. The program does not, however, supersede the authority of local governments to regulate and control smoke and air pollution under NRS 244.361 and NRS 268.410 or the authority of the state forester to regulate controlled fires under NRS 527.122 through 527.128.

The Nevada Smoke Management Program is administered by NDEP and compliance is achieved through a Memorandum of Understanding (MOU) between the various state and federal agencies that conduct prescribed burning, including the U.S. Bureau of Land Management, the U.S. Forest Service, the U.S. National Park Service, the U.S. Fish and Wildlife Service and Nevada state land management agencies. The MOU lists the objectives as well as both the mutual and individual responsibilities of the signatory parties. The MOU was last renewed in 2011. Land managers recognize the importance of the Nevada Smoke Management Program and provide fiscal support for its continuation through various financial assistance agreements.

The *Smoke Management Plan* (https://ndep.nv.gov/uploads/air-pollutants-docs/smp-2013-final.pdf) is a collaborative document, written by the signers of the MOU, and is the guiding document of the program. It details the applicability of the program and responsibilities of affected parties. It provides information on open burn authorization requirements for those land managers using prescribed fire and wildland fires for land management purposes. It also includes information on air quality monitoring at prescribed fires, burner qualifications and emission reduction methods.

The *Smoke Management Plan* applies to all areas of Nevada except Clark County, Washoe County and Bureau of Indian Affairs trust lands, which have their own open burn policies, regulations and permit requirements. Applications for open burn permits are processed by NDEP. Applicants must estimate the prescribed fire's PM_{10} emissions. For larger fires, additional information is needed, and stricter requirements are imposed. For fires emitting greater than 1 ton but less than 10 tons PM_{10} and located greater than 15 miles from a Class I area, a smoke sensitive area or a nonattainment area, the application must include an estimate of emissions from a model predicting the impact of smoke on smoke-sensitive receptors. For prescribed fire projects emitting greater than 25 tons, or more than 10 tons if the burn area is within 15 miles of a Class I area, a smoke sensitive area or a nonattainment area, the application must also include a smoke management plan that lists smoke minimization methods to be used and the model or calculations used to make emission estimates. The plan must have a list of safety and contingency measures, identification of smoke sensitive areas that may potentially be affected, a list of air regulators to be notified and air monitoring to be conducted.

Permit conditions intended to mitigate smoke impacts apply to open burn permits issued by NDEP. These include: permits will be invalid during declared air pollution emergencies and alerts in affected areas; pre-ignition notification and approval is required; best smoke management and emission reduction techniques shall be practiced; and permits are issued with provisions related to supervision, inspection and availability of the permit. Additional restrictions and requirements apply where wildland fires are used to achieve land management objectives including a burn plan, applicable maps, a list of conditions under which burning will be suppressed and a stipulation requiring daily fire evaluation. Burn managers are expected to assess meteorological conditions, obtain a burn day forecast and not proceed to ignition unless conditions are favorable. All personnel conducting prescribed burns must meet burner qualifications.

Agencies conducting prescribed fires in excess of 10 tons of PM_{10} annually are required to supply NDEP with an annual fire activity report. This report provides a summary of fire activities including a listing of: permit number, acreage burned, fuel type, emissions estimates and emission factors used. In the time since the first regional haze planning period, NDEP has reassessed its fire emission data collection procedures and future data needs. The Smoke Management Program recently launched an interactive web map that displays the location of active permits for prescribed burns and current active prescribed burns. As permit applications and burn notifications are received, the map is updated on a daily basis. This tool assists land managers in making informed decisions on the location and timing of prescribed fire operations to better limit smoke impacts.

NDEP's website includes additional information on the Nevada Smoke Management Program and can be found at https://ndep.nv.gov/air/air-pollutants/smoke-management. An online open burn permit application, an instruction sheet, links to applicable statutes and regulations and contact information are provided.

7.9 ANTICIPATED VISIBILITY IMPROVEMENT

This chapter summarized the significant federal, state, and local control programs that are being implemented between the baseline period and 2028. These control programs focus primarily on mobile (both on- and off-road) emissions sources and to a lesser degree area and stationary source emissions. Emissions projections based on implementation of all the described programs have been incorporated into the preliminary reasonable progress emissions inventory.

The 2028OTBa2 inventory included emission reductions due to known controls (i.e., implementation of existing federal and state regulations), existing SIP control measures and other relevant regulations that have gone into effect since 2014 or will go into effect before the end of 2028. Additional emission reductions achieved through reasonable progress controls were quantified and used to determine the Reasonable Progress Goals, using 2028OTBa2 as a foundation.

As discussed in Chapter Six, the final 2028 visibility projection for Jarbidge WA during the 20 percent most impaired days is 7.76 dv. The difference between the second implementation period's baseline (7.97 dv) and reasonable progress goal (7.76 dv), or anticipated visibility improvement, is 0.21 dv.

7.10 LONG-TERM STRATEGY ADDITIONAL CONSIDERATIONS

Projected 2028 visibility conditions at the Jarbidge WA (7.76 dv) are better than the glidepath value (8.20 dv) for 2028 toward achieving natural visibility conditions by 2064. For this reason and other factors discussed in Chapter Six and below, Nevada's long-term strategy will be limited to those pollution control programs described in Chapter Six and below (i.e., the "on the way" and "on the books" controls included in the 2028OTBa2 emission inventory in Chapters Three and Six and the reductions realized from the implementation of reasonable progress controls) that result in the RPG calculated in Chapter Six. The various sources of visibility impairment and potential controls discussed in the following sections are intended to provide an assessment of other source sectors that may reasonably contribute to visibility impairment at Jarbidge WA, and are not considered necessary for reasonable progress.

7.10.1 Anthropogenic Sources of Visibility Impairment

Table 7-3 identifies the relative contribution of each visibility impairing pollutant from anthropogenic and natural emission sources. These data suggest SO_2 and NO_x are the dominant anthropogenic emissions of primary particulate matter from Nevada sources. Natural sources include emissions from the biogenic, natural fire and windblown dust source categories. *Emissions from natural sources represent nearly three-quarters of all emissions originating from* *within Nevada's borders.* Natural sources are uncontrollable and have little potential for effective control of visibility impairing emissions.

Table 7-4 identifies the relative contribution to visibility impairment by pollutant for the baseline and 2028 scenarios, along with the change in emissions from the baseline period to 2028. This includes the net change in SO_2 and NO_x emissions as a result of reductions achieved through reasonable progress controls, and additions from the Fernley Plant due to corrections made to previously reported emissions. Table 7-5 identifies the largest source categories for each pollutant and the change in emissions from the baseline to 2028 by source category. The pollutants are ordered by their relative contribution to the baseline most impaired days visibility impairment.

TABLE 7-3

SUMMARY OF NEVADA ANTHROPOGENIC AND NATURAL EMISSIONS

	2014		**2028**	
Pollutant	Anthropogenic Sources	Natural Sources	Anthropogenic Sources	Natural Sources
SO_2	94%	6%	92%	8%
NO_x	53%	47%	34%	66%
VOC	6%	94%	5%	95%
PM_{10}	86%	14%	86%	14%
NH_3	93%	7%	93%	7%
$PM_{2.5}$	71%	29%	70%	30%
Total emissions:	33%	67%	27%	73%

TABLE 7-4

NEVADA'S EXTINCTION CONTRIBUTION AND EMISSIONS BY SPECIES

Annual Average Baseline (2014-2018) Extinction Contribution			Emissions (tpy)			
	Most Impaired Days	Clearest Days		2014-2018	2028	Percent Reduction
SO_4	29.3%	42.9%	SO_2	10,916	6,151	44%
OMC	29.3%	21.1%	VOC	1,138,559	1,123,892	1%
CM	21.6%	12.7%	PM_{10}	158,808	159,303	0%
SOIL	8.5%	4.1%	$PM_{2.5}$	37,379	36,052	4%
EC	5.7%	6.1%	CO	676,860	565,491	16%
NO_3	5.2%	10.7%	NO_x	154,498	109,557	29%
SEASALT	0.3%	2.3%	NH_3	20,336	20,209	1%

Examination of Table 7-5 shows the largest source categories for three of the visibility impairing pollutants, nitrogen oxides (NO_x), volatile organic compounds (VOC), and carbon monoxide (CO), are natural emissions resulting from lightning NO_x and biogenic sources. Fine and coarse particulate matter ($PM_{2.5}$ and PM_{10}) have natural emissions resulting from wildfire and windblown dust as the second largest category. The largest source categories for sulfur dioxide (SO_2), $PM_{2.5}$, PM_{10}, and ammonia (NH_3), are anthropogenic emissions resulting from nonpoint, EGU point, Nonroad mobile, fugitive dust, and agriculture. Emission reductions in the point source sector was the approach of the second implementation period in achieving reasonable progress, as shown in EGU Point reductions in SO_2 emissions of 64 percent. Because of this, all other anthropogenic sources show little to no change. Pollutants with 0 percent change in emission inventories indicate that source sector was held constant.

TABLE 7-5

NEVADA EMISSIONS SOURCE CONTRIBUTIONS BY SPECIES

	Largest 2028 Source Category	Percent of 2028 Inventory	2014 to 2028 Change for Category	Second Largest 2028 Source Category	Percent of 2028 Inventory	2014 to 2028 Change for Category
SO_2	Nonpoint	45%	0%	EGU Point	24%	-64%
NO_x	Lightning NO_x	53%	0%	Biogenic	11%	0%
VOC	Biogenic	93%	0%	Nonpoint	2%	0%
CO	Biogenic	42%	0%	Nonroad Mobile	23%	6%
$PM_{2.5}$	Fugitive Dust	50%	2%	Wildfire	23%	0%
PM_{10}	Fugitive Dust	79%	-7%	Windblown Dust	7%	0%
NH_3	Agriculture	84%	0%	Wildfire	7%	0%

7.10.1.1 Major and Minor Stationary Sources

Nevada's evaluation of the monitoring, emissions and modeling data suggests that point source emissions of SO_x and NO_x are the most likely candidates for additional control, although these emissions are not the most significant contributors to visibility impairment at the Jarbidge WA. Baseline and 2028 emissions of SO_x from within Nevada are dominated by anthropogenic sources, as shown on Table 7-5. Although OMC (formed from Primary organic aerosol (POA) and Volatile organic compound (VOC) emissions), EC, PMC and PMF are significant contributors to visibility impairment, their emissions are dominated source categories outside of point sources. Nevada's SO_x emissions have a greater contribution to visibility impairment at JARB1 than NO_x (see Figures 2-4 and 2-5), although Nevada's NO_x emissions are ten times greater than SO_x emissions.

The 2017 NEI lists 19 point sources with NO_x emissions greater than 100 tpy and 8 point sources with SO_2 emissions greater than 100 tpy. The 19 NO_x point sources include all five Nevada sources asked to conduct a four-factor analysis. The 8 SO_2 point sources include two facilities asked to conduct a four-factor analysis, and includes the only source, North Valmy Generating Station, that is the only source that will be required to reduce SO_2 emissions as a result of the four-factor analysis.

A discussion of the four-factor process in Nevada can be found in Chapter Five where links to reports documenting the four-factor analyses are provided. NO_x and SO_2 emission reductions are expected at North Valmy Generating Station, Tracy Generating Station, and Lhoist Apex Plant as a result of reasonable progress controls determined as necessary to achieve reasonable progress in each facility's four-factor determination. Nevada is relying on NO_x and SO_2 emission limits for both kilns at the Nevada Cement Company's Fernley Plant outlined in an ongoing USEPA Consent Decree, as explained in Section 7.5.3 to satisfy the requirements of the Regional Haze Rule.

Many of Nevada's point sources with SO_2 or NO_x emissions greater than 100 tpy are well controlled through existing air quality operating permit obligations or will be well controlled through the four-factor process. In addition, several of the federal pollution control programs described in this chapter address emission from point sources (i.e., Maximum Achievable Control Technology standards). The SO_2 point source inventory for 2028 represents a 64 percent reduction in EGUs from the baseline inventory, and the 2028 NO_x point source inventory represents a 19 percent reduction in EGUs from the baseline when proposed reasonable progress controls are included. These significant reductions demonstrate reasonable progress from point sources in Nevada.

7.10.1.2 Mobile Sources

Nevada has achieved significant reductions in SO_x and NO_x emissions from mobile sources through the implementation of federal, state, and local emissions control programs. Implementation of the federal programs will result in a 31 percent reduction in mobile source NO_x emissions and a 54 percent reduction in mobile source SO_x emissions from the baseline to

2028. These significant reductions demonstrate reasonable progress from mobile sources, both on-road and off-road, in Nevada.

On-road and off-road mobile sources contribute approximately 17 percent of the total statewide 2028 NO_x emissions inventory. Many of the federal pollution control programs identified in this chapter focus on reducing NO_x emissions from mobile sources, both on-road and off-road. In addition, Washoe and Clark Counties have implemented mobile source emissions reduction programs (e.g., motor vehicle emissions testing, idle reduction, bicycle and pedestrian advocacy, and low-income vehicle repair assistance programs) to address non-attainment areas, as discussed in Chapter Six (see 6.5.2.3) and this chapter (see 7.5.4.1). The emissions reductions related to the implementation of these local programs has not been factored into the 2028OTBa2 emissions projections or modeling.

7.10.1.3 Area Sources

Any Nevada County within 50 km of a CIA (in or out of state) was analyzed for Area Sources. Coarse Mass extinction at each CIA using a 2013-2017 averaging period on Most Impaired Days was measured to determine if the CIA is significantly impacted by fugitive dust (PM_{10} emissions). NDEP selected a threshold of 10% Coarse Mass of total extinction in determining significance. Among the CIAs, all fell below this threshold, with the highest being Jarbidge WA at 5% Coarse Mass extinction. Although this is below the threshold, NDEP reviewed the top source sectors contributing to area/nonpoint emissions from the 2014 NEI. All other CIAs were no longer explored.

The top contributing sources, in descending order of contribution, were:

1. Fugitive Dust from Mining and Quarrying
2. Fugitive Dust from Unpaved Road
3. Fugitive Dust from Agriculture Tilling
4. Mobile – Locomotive

NDEP reviewed all federal and state regulations that currently target these source sectors and plan to include these in the SIP. Potential state regulations from other states were also considered, however, the Nevada Administrative Code already requires the use of "best practical methods" in any given activity to prevent particulate matter from becoming airborne. As of now, there are no direct restrictions on agricultural operations and preventing fugitive dust. For Regional Haze Rule purposes, the potential state regulations considered would lack enforceability and an avenue for quantifying any expected reductions.

Of the four evaluated, Mining and Quarrying is the only sector that falls under NDEP's regulatory authority. These types of sources are required to obtain an air quality permit from NDEP, and must include a thorough dust control plan that prevents any sources of fugitive dust along with their application. This dust control plan is reviewed and approved before the source is given a permit.

Coarse Mass extinction at Jarbidge WA did not reach the set threshold to warrant controls in these sectors, but this information will serve helpful in future implementation periods as the need for area source controls become more imperative for reasonable progress. Further details on Nevada's area source analysis for the second implementation period is included in Appendix F.

7.10.1.4 International Emissions

Emissions from outside the modeling domain, as well as those from Canada and Mexico contribute substantially to visibility impairment at the Jarbidge WA and other Class I areas across the WRAP. These emissions are beyond the control by federal, state or local regulatory agencies in the United States. At the Jarbidge WA, international emissions of SO_x and NO_x contribute 51 percent and 30 percent of the 2028 SO_4 and NO_3 visibility impairment at JARB1, respectively.

7.10.2 Additional Emissions Control Programs

Nevada has numerous existing emission control programs to improve and protect visibility in Class I areas. Generally, Nevada considers its NSR and PSD programs meet the long-term strategy requirements for preventing future visibility impairment from proposed major stationary sources or major modifications to existing facilities. In addition to Nevada's permitting program, Nevada also has emission control requirements for motor vehicles in Clark and Washoe Counties and residential burning in Washoe Country, as well as PM_{10} nonattainment/maintenance area requirements, dust suppression for construction areas and unpaved roads, and renewable energy requirements.

The state believes that its existing regulations along with the activities outlined below together provide for reasonable progress toward the national visibility goal. Nevada's continued implementation of NSR requirements with FLM involvement for Class I area impact review will protect the least impaired days from further degradation and will assure that no Class I areas experience degradation from expansion or growth of a single new source or large-scale regional development of stationary sources.

7.10.2.1 State and Local Mobile Source Programs

Nevada's two major metropolitan areas, Clark County (Las Vegas) and Washoe County (Reno), have inspection and maintenance programs per the Clean Air Act requirements for areas that were not attaining the national ambient air quality standards for carbon monoxide (CO). Washoe County has a basic program while Clark County has a low enhanced program. Both reduce CO and VOC emissions from motor vehicles.

Washoe County has Stage I and Stage II gasoline vapor recovery regulations. Clark County currently has only Stage I gasoline vapor recovery regulations. These systems control VOC vapor releases during the refilling of underground gasoline storage tanks and the refueling of motor vehicles. The Stage II system controls the release of VOC, benzene and toxics emitted from gasoline.

As mentioned in Chapter 7.5.4.3, Nevada has approved the Clean Cars NV program to adopt low emission and zero emission standards for new light duty vehicles using the same provisions as in

California's Advanced Clean Cars Program. Beginning with model year 2025, the program is expected to result in modest but compounding emissions reductions as each new model year's vehicles enter the statewide fleet. Nevada anticipates additional reductions in NO_x, SO_2, and PM_{10} emissions, during the second implementation period, as a result of these new standards. These anticipated reductions, however, cannot be accurately quantified at this time.

7.10.2.2 Nevada's Renewable Portfolio Standard

With large-scale geothermal development in Nevada dating back to the mid-1980's and use of hydroelectric energy since the early part of the last century, Nevada's electric utilities have pioneered the use of renewable energy. In cooperation with the utilities, Nevada was one of the first to adopt a RPS in 1997, which is now among the most aggressive in the United States. Nevada's RPS has set the bar high in terms of its percent of renewable energy, timetable and solar quota, requiring that not less than 50 percent of the total electricity sold in 2030 and thereafter be renewable. Power producers have responded by working with renewable energy companies to bring many new renewable projects into operation. As a result, Nevada now leads the nation in both geothermal and solar power per capita.

In 2007, two of the world's largest solar projects began operation in southern Nevada, the 64 MW Nevada Solar One concentrating solar power plant and the 14 MW Solar Star photovoltaic facility at Nellis AFB. Geothermal energy is a renewable resource particularly abundant in Nevada. With three new geothermal plants completed in the past year, and a total of 26 projects under contract, Nevada's main utility, NV Energy, is on the way to doubling the geothermal portion of its renewable energy portfolio by 2012 to a total of nearly 500 MW. These efforts to meet the RPS will replace some of the need for fossil fuel fired EGUs in Nevada.

The effects of Nevada's Renewable Portfolio Standard (RPS) on EGU source retirement and replacement schedules are not well understood. The RPS sets the percentage of electricity sold each year by providers of electric service to Nevada customers that must come from renewable energy (biomass, geothermal energy, solar energy, waterpower, and wind) or energy efficiency measures. The percentage of renewable energy required by the RPS will increase at the following scheduled rate until it reaches 50% in 2030:

24% in 2021;
29% in 2022 and 2023;
34% in 2024 through 2026;
42% in 2027 through 2029;
50% in 2030 and each year thereafter.

To meet the requirements, the Nevada RPS is likely to be a factor in planned fossil-generation EGU retirements in the coming years made by the State's primary electrical provider, NV Energy. The planned EGU retirements outlined in Chapter Six are part of the long-term strategy. Additional planned retirements may help shape the long-term strategy for the next regional haze planning period.

7.10.3 Uncertainty

Nevada's reasonable progress demonstration and development of a long-term strategy have identified numerous factors affecting the implementation of our long-term strategy and resulting reasonable progress. These factors have important but unknown impacts to all elements of the plan to reduce or contain emissions contributing to regional haze. The most significant factor is the uncertainty of the projected 2028 emission inventories, which may not reflect actual 2028 emissions for Nevada sources. Some of the factors affecting Nevada's reasonable progress are related to projected emissions inventories and the uncertainties associated with growth projections and the implications of future regulatory actions.

Nevada acknowledges the many difficulties associated with the projection of area and mobile source emissions, but remains confident the inventories represent the best available data at the time they were developed. However, Nevada also acknowledges there is associated uncertainty with the area source projections, which may over-predict future emissions in light of the current economic times.

Repair and replacement schedules for large point sources of NO_x and SO_2 are difficult for the regulatory community to anticipate. It is also difficult to predict the potential permit revisions for other large sources in response to growth of any particular industry sector. Repair and replacement of current facilities will continue to drive permit revisions at their own pace, but will likely reduce emissions as new technology is incorporated into the facilities.

Another level of uncertainty in the growth projections relates to regulatory uncertainty. The consequences of future regulatory actions are not well known at this time. The Clean Air Mercury Rule was recently vacated by the courts. Whether USEPA will reissue this regulation or what form it will take is not known at this time. The other area of regulatory uncertainty is how USEPA will regulate greenhouse gas emissions and what ancillary benefits to visibility will be realized.

7.11 REFERENCES

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

U.S. EPA 2019. Availability of Modeling Data and Associated Technical Support Document for the EPA's Updated 2028 Visibility Air Quality Modeling. September 2019.

U.S. EPA 2021. Clarifications Regarding Regional Haze State Implementation Plans for the Second Implementation Period. July 2021.

Chapter Eight - Monitoring Strategy

8.1 INTRODUCTION

The Regional Haze Rule (RHR) at 40 CFR 51.308(f)(6) requires states to submit a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I areas within the state. The regional haze monitoring strategy must also coordinate with the monitoring strategy required in 40 CFR 51.305 for reasonably attributable visibility impairment, as well as provide for a variety of other requirements designed to evaluate reasonable progress toward meeting national visibility goals.

8.2 NEVADA'S REGIONAL HAZE VISIBILITY IMPAIRMENT MONITORING STRATEGY

Visibility conditions are presently measured by the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network. In the mid-1980's, the IMPROVE network was established to measure visibility impairment in mandatory Class I areas throughout the United States. The monitoring sites are operated and maintained through a formal cooperative relationship between the USEPA and Federal Land Managers (FLM) agencies, which include: the National Park Service, the U.S. Fish and Wildlife Service, the Bureau of Land Management, and the U.S. Forest Service.

The objectives of the IMPROVE program are:

1. To determine current visibility and aerosol conditions in mandatory Class I areas;
2. To identify chemical species and emission sources responsible for existing human-made visibility impairment;
3. To document long-term trends for assessing progress towards the national visibility goals; and
4. With the enactment of the regional haze program, to provide regional haze monitoring representing all visibility in mandatory Class I areas, where practical.

Given that the IMPROVE monitoring data from 2000 through 2004 serves as the baseline for the regional haze program, the future regional haze monitoring strategy must necessarily be based on, or directly comparable to the IMPROVE program. The IMPROVE measurements provide the only long-term record available for tracking visibility improvement or degradation. The data collected at these sites are used by a variety of professionals in industry and at regulatory agencies to better understand and protect the visual air quality resources in mandatory Class I areas. The IMPROVE network documents the visual air quality in wilderness areas and national parks throughout the United States.

Nevada's regional haze monitoring strategy relies on information generated through the IMPROVE network for the Jarbidge Wilderness Area (Jarbidge WA). It is expected that the IMPROVE program will:

1. Maintain a stable configuration of the individual monitors and sampling sites, and stability in network operations for the purpose of continuity in tracking reasonable progress trends;
2. Assure sufficient data capture at each site for all visibility-impairing species;
3. Comply with the USEPA quality control and assurance requirements; and

4. Prepare and disseminate periodic reports on IMPROVE operations.

8.3 COORDINATION WITH §51.305 MONITORING STRATEGY REQUIREMENT

Nevada is subject to a federal visibility protection plan (visibility FIP) as opposed to having an approved visibility protection SIP. Nevada's visibility FIP is found at 40 CFR 52.1488. The visibility monitoring strategy provisions of 40 CFR 52.28 are incorporated into Nevada's visibility FIP, except for that portion applicable to the Clark County Department of Environment and Sustainability (formerly known as the Clark County Department of Air Quality and Environmental Management). Federal regulation requires the USEPA in cooperation with the appropriate FLM to monitor visibility within each visibility protection area in the state. Accordingly, the FLMs operate the IMPROVE program which addresses visibility monitoring at the Jarbidge WA, as well as visibility protection areas outside the state, and establishes background visibility for the purposes of the regional haze requirements.
Nevada's regional haze monitoring strategy will coordinate with the Nevada visibility FIP by continuing to utilize the data collected by the IMPROVE program and will promote reasonable progress toward the national visibility goal.

8.4 ASSOCIATED REGIONAL HAZE MONITORING STRATEGY REQUIREMENTS

Other associated monitoring strategy components, as required by 40 CFR 51.308(f)(6)(i-vi) for Nevada's SIP commitment, are presented below. The RHR requirement is shown below in italics, followed by Nevada's response.

The implementation plan must also provide for the following:

(i) The establishment of any additional monitoring sites or equipment needed to assess whether reasonable progress goals to address regional haze for all mandatory Class I Federal areas within the State are being achieved.

Sufficient funding for a complete and representative monitoring network within the IMPROVE program is supported by the USEPA. The IMPROVE site representing Nevada's Class I area at the Jarbidge WA is considered to be sufficiently representative to support a determination of reasonable progress for the Jarbidge WA.

(ii) Procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I areas both within and outside the State.

Visibility monitoring data is presently processed and maintained through the coordination of the IMPROVE program. Nevada expects the IMPROVE program monitoring operation and data collection to continue, with the fundamental assumption that network data collection operations will not change, or if changed, will remain directly comparable to those operated by the IMPROVE program during the 2014 through 2018 RHR baseline period.

Generally, the Western Regional Air Partnership (WRAP) has analyzed, deduced and provided information on relative contributions to visibility impairment. Nevada has and will continue to use data reported by the IMPROVE program as input into the regional technical support analysis tool found at the Visibility Information Exchange Web System (VIEWS) and WRAP's Technical Support System (TSS), as well as other analysis tools and efforts sponsored by the WRAP. The state will continue to participate in the regional analysis activities of the WRAP to collectively assess and verify the progress toward reasonable progress goals, as the RHR is implemented. If the technical support service that the WRAP has provided for this SIP is not available in the future, Nevada is uncertain how it would fulfill this requirement. Nevada does not have the resources to replace the functions that the WRAP has provided in support of the first planning period for the RH SIP.

Evaluation activities, using the technical support provided by the WRAP as long as possible, will occur no less than every five years in association with 5-year progress reports and 10-year SIP revisions.

(iii) For a State with no mandatory Class I Federal areas, procedures by which monitoring data and other information are used in determining the contribution of emissions from within the State to regional haze visibility impairment at mandatory Class I Federal areas in other States.

Because Nevada has a mandatory Class I Federal area (Jarbidge WA), this requirement is addressed in paragraph (ii) above.

(iv) The implementation plan must provide for the reporting of all visibility monitoring data to the Administrator at least annually for each mandatory Class I Federal area in the State. To the extent possible, the State should report visibility monitoring data electronically.

Visibility monitoring data is available to the public, states and the USEPA in an electronic format at the following websites: IMPROVE (http://vista.cira.colostate.edu/improve/) and VIEWS (https://views.cira.colostate.edu/iwdw/). Nevada will depend on the continued routine timely reporting of monitoring data by these programs.

(v) A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Federal area. The inventory must include emissions for a baseline year, emissions for the most recent year for which data are available, and estimates of future projected emissions. The State must also include a commitment to update the inventory periodically.

With the support of the WRAP, Nevada has prepared a statewide inventory of emissions that can reasonably be expected to cause or contribute to visibility impairment in mandatory Class I areas. Chapter Three of this SIP summarizes the emissions by pollutant and source category. Nevada commits to updating its statewide emissions inventory periodically. The inventory updates will be used for state tracking of emission changes, determining trends and providing input into the WRAP's evaluation of whether reasonable progress goals are being achieved, as well as other regional analyses.

Nevada will depend upon and participate in additional periodic collective emissions inventory efforts by the WRAP. If the technical support service that the WRAP has provided for this SIP is not available in the future, Nevada is uncertain how it would fulfill the requirement for estimates of future projected emissions.

(vi) Other elements, including reporting, recordkeeping, and other measures, necessary to assess and report on visibility.

Nevada will track data related to those sources for which the state has regulatory authority, and will depend on the IMPROVE program and WRAP-sponsored collection and analysis efforts and data support systems to assess and report on visibility.

8.5 OVERVIEW OF IMPROVE SITE AT THE JARBIDGE WILDERNESS AREA

The Jarbidge WA, described in Chapter One, is the only mandatory Class I area requiring visibility monitoring within Nevada. The IMPROVE monitoring site for the Jarbidge WA is located in the Humboldt National Forest in northeastern Nevada, approximately one kilometer north of the city of Jarbidge in the Jarbidge River drainage. The monitoring site has been maintained and operated by the U.S. Forest Service since 1986. As indicated previously, monitoring data may be obtained from the VIEWS and IMPROVE websites, as well as the WRAP TSS website.

8.6 COMMITMENT TO FUTURE MONITORING

Nevada is committed to continue using the IMPROVE monitoring data. If economic challenges are faced by the IMPROVE monitoring program, Nevada commits to working with federal agencies as a team to try to resolve the situation. Also, the state commits to continue developing updated emission inventory data to allow for tracking emission increases or decreases as related to regional haze, as funding and resources allow. Nevada updates its point source emission inventory for major sources every year as required by USEPA. In addition, Nevada updates its entire emission inventory every three years (all point sources, area sources and mobile sources) as required by USEPA for the National Emission Inventory. Information collected will be made available on a periodic basis. As part of the periodic RH SIP revision discussed in Chapter 9, Nevada will re-evaluate the adequacy of the existing monitoring strategy.

8.7 REFERENCES

U.S. EPA 2018. Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program. EPA-454/R-18-010. December 2018.

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.

Chapter Nine - Coordination, Future Commitments, and Other Requirements

9.1 COORDINATION AND CONSULTATION FOR PLAN DEVELOPMENT

The Western Regional Air Partnership (WRAP) represents a collaboration of western states, tribal governments, federal agencies, and industry representatives. The WRAP was formed in 1997 as the successor to the Grand Canyon Visibility Transport Commission. The WRAP's primary focus is to develop and implement the technical and policy tools needed by western states and tribes to comply with the Regional Haze Rule (RHR). The WRAP is administered jointly by the Western Governors' Association and the National Tribal Environmental Council. WRAP activities are conducted by a network of committees and forums composed of WRAP members and stakeholders who represent a wide range of viewpoints. An initial long-term strategic plan was completed by the WRAP in 2003. Through the WRAP, states, tribes, USEPA and Federal Land Managers (FLMs), working with non-governmental organizations, including industry and environmental organizations, developed and implemented numerous air quality policies that have improved the environment in the western United States.

The initial strategic plan7: (1) identified major products and milestones; (2) served as an instrument of coordination; (3) provided the direction and transparency needed to foster stakeholder participation and consensus-based decision-making, which are key features of the WRAP process, and (4) provided guidance to the WRAP forums and committees. In March 2008 the 2008-2012 WRAP strategic plan was adopted by the WRAP Board. The 2008-2012 strategic plan (http://wrapair.org/WRAP/documents/WRAP_2008-12_Strategic_Plan3_08final.pdf) addresses implementation of the regional haze (RH) SIPs and a one-atmosphere analysis in the west for the next five years. The 2008-2012 strategic plan also addresses refinement and development of analysis tools for evaluation of ongoing and future control programs for air quality planning focusing on:

1. Ongoing implementation of the regional haze program;
2. Technical and policy support related to other regional air quality issues, such as ozone and particulate matter National Ambient Air Quality Standards, mercury and nitrogen deposition impact on ecosystems, regionally-appropriate emissions management strategies; and
3. Technical and policy support on issues related to climate change and energy.

For the second implementation period of the Regional Haze Rule, the WRAP states developed the WRAP Communication Framework for Regional Haze Planning document.[1] The purpose of this document is to provide a general framework for efficient and effective coordination among WRAP partners, including the western states and their local air agencies, federal agencies (EPA and FLMs), and tribes throughout the Regional Haze planning process and lays out a basic strategy to help WRAP partners navigate through the requirements, policies, and recommendations associated with consultation and coordination. This Framework focuses on a collaborative process and is intended to provide guidance.

Through participation in the WRAP, a significant portion of the consultation process with FLMs, tribes and other states has been met. In the WRAP process, stakeholders participated in various

[1] http://wrapair2.org/pdf/WESTAR-WRAP_Communication_Framework_Aug28_2019approved%20by%20RHPWG%20consensusSept3rd.pdf

forums and workgroups to help develop a coordinated emissions inventory and analysis of the impacts that sources have on regional haze in the West. Coordination and evaluation of monitoring data and modeling processes were also overseen by WRAP participants. Nevada has been an active participant in the WRAP since its inception and in the forums, workgroups and committees that were formed to address many elements of this SIP. Nevada relies on the WRAP Strategic Plan and Communication Framework for Regional Haze Planning document to help meet the State's RHR coordination and consultation obligations.

The WRAP consultation process is provided on the WRAP web site (http://wrapair2.org/RHPWG.aspx). The purpose of this webpage, and subcommittee webpages within it, is to gather a consolidated list of each forum, committee and workgroup, its purpose, membership, significant work products and meetings in one place. Although not inclusive of all the meetings and conference calls held by the WRAP, these webpages demonstrate the extent of consultation among the WRAP partners and stakeholders since its inception.

9.1.1 Past Coordination and Consultation with FLMs

40 CFR 51.308(i) of the RHR requires coordination between states and the FLMs. Nevada has provided agency contacts to the FLMs as required in 40 CFR 51.308(i)(1).

During development of this SIP, the FLMs were consulted in accordance with the provisions of section 51.308(i)(2). Numerous opportunities were provided by the WRAP for FLMs to participate in the development of technical documents developed by the WRAP. This included the opportunity to review and comment on these analyses, reports and policies. Nevada provided additional opportunities for coordination and consultation with FLMs as the SIP was developed through tele-meetings and stakeholder outreach. The FLM consultation process included the opportunity to discuss their assessment of visibility impairment at the Jarbidge Wilderness Area (Jarbidge WA), and to provide recommendations on reasonable progress goals and the development and implementation of visibility control strategies.

9.1.1.1 Formal FLM Consultation

A draft version of this SIP was submitted to the FLMs (National Parks Service, U.S. Fish and Wildlife Service, U.S. Forest Service, and the Bureau of Land Management) on November 29, 2021 for a 60-day review and comment period. Comments were received from the National Parks Service and U.S. Forest Service on February 15, 2022. The U.S. Fish and Wildlife Service and Bureau of Land Management did not submit any comments as a result of the formal consultation period and expressed support for the contents of the draft SIP. As required by CAA 169A(d), a summary of conclusions and recommendations of the FLMs are provided below as part of the SIP submission made available for public comment, along with a summary of how NDEP has addressed all comments and requests submitted by the FLMs, as required by 40 CFR 51.308(i)(3).

The National Park Service provided their own technical review of implementing DSI at North Valmy Generating Station's Unit 1 to control SO_2 emissions for the time remaining prior to the unit's closure by December 31, 2028, and estimated that DSI could reduce SO_2 emissions from Unit 1 by 800 to 1,500 tons per year for less than $5,500 per ton of SO_2 reduced. It was also indicated that SO_2 scrubber upgrades on Unit 2 at North Valmy could likely improve the control efficiency from around 80% to 95% or greater in a cost-effective manner. The National Park

Service requested that NDEP consider their analysis for DSI on North Valmy's Generating Station and conduct a four-factor analysis for Unit 2 scrubber upgrades.

NDEP is relying on NV Energy's *Response Letter 6* and *Response Letter 7* to NPS's formal comments that can be found in Appendix B.5.i and B.5.j, respectively. In these response letters, NV Energy provides further discussion and documentation that confirms that the original cost figures provided for the implementation of Dry Sorbent Injection using Milled Trona (from a previous Sargent & Lundy study) as an SO_2 control on Unit 1 represents the most accurate and source-specific cost data for North Valmy Unit 1. NV Energy also determines that the cost-effectiveness value for Dry Sorbent Injection provided by NPS of $5,500 per ton reduced is underestimated and does not accurately reflect the retrofit costs of Dry Sorbent Injection at North Valmy Unit 1. *Response Letter 7* further explains why a lime-based Dry Sorbent Injection for additional SO_2 reductions is not technically feasible at North Valmy Unit 1.

A new four-factor analysis is conducted for North Valmy Unit 2 scrubber upgrades that considers the replacement of the existing multi-nozzle atomizer system with a single nozzle design to increase SO2 reductions. The cost to implement such upgrade is estimated at $46,500/ton, which is well beyond NDEP's threshold of $10,000/ton.

In response to the formal FLM consultation, the U.S. Forest Service requested that NDEP reconsider making an additional adjustment to Jarbidge WA's glidepath to account for increased prescribed fire projections. NDEP has addressed this request in Chapter 6 and elected not to make additional adjustments to Jarbidge WA's glidepath to account for increased presribed fire projections. This will prevent an "over-flattening" of the glidepath and ensure that Nevada is aiming to achieve the most visibility improvement in future implementation periods.

NDEP's final response to comments received during the formal FLM consultation is provided in Appendix C.

9.1.2 Past Collaboration with Tribes

Nevada worked closely with the Nevada Division of Environmental Protection's tribal liaison to share the Draft Regional Haze SIP for the second implementation period with tribal representatives during the formal FLM consultation period and public comment period.

During the FLM's formal 60-day consultation period, a draft version of the SIP was provided to Nevada's tribes for review, with comments welcome. NDEP provided a presentation at a Nevada Tribal Environmental Managers meeting on January 26, 2022, to outline the major topics of the draft SIP out for formal FLM consultation. No comments were received from tribes regarding the draft SIP.

9.1.3 Past Consultation with other States

Pursuant to 40 CFR 51.308(f)(2)(ii), Nevada consulted with other WRAP states in development of this SIP. Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington and Wyoming agreed to work together to address regional haze in the western continental United States. The majority of state consultation in the development of the RH SIPs was conducted through the Regional Haze Planning Work Group (RHPWG) of the WRAP. Nevada participated in the RHPWG, which took the products of the WRAP technical analysis and consultation process discussed above and developed a process for establishing reasonable progress goals in the western Class I areas. This consultation process ensures that states are aware of each other's reasonable progress goals and long-term strategies.

Aside from WRAP participation, Nevada engaged in direct state-to-state consultations with neighboring states and other states that are anticipated to impact visibility at Jarbidge, including: Arizona, California, Idaho, Oregon, Utah, Washington, and Wyoming. Nevada addressed the state consultation requirements of the rule and concluded that there are no disagreements between Nevada and any neighboring state. Nevada is not relying on certain reductions in another state to achieve reasonable progress at an in-state Class I area, and no neighboring states are relying on emission reductions in Nevada to achieve reasonable progress in out-of-state Class I areas. Confirmation of state-to-state consultations is provided in Appendix E.

Nevada has reviewed and analyzed contributions from other states that reasonably may cause or contribute to visibility impairment in the Jarbidge WA. As discussed in Chapter Three, emission sources beyond the control of Nevada, other states or the FLMs include: emissions from outside the WRAP modeling domain; emissions from Canada and Mexico; emissions from wildfires, windblown dust and biogenic emissions; and emissions from offshore shipping. Nevertheless, Nevada anticipates that the long-term strategies adopted by other states in their SIPs and approved by USEPA will include emission reductions from a variety of sources that will reduce visibility impairment in the Jarbidge WA.

9.2 FUTURE COORDINATION AND CONSULTATION COMMITMENTS

Nevada will continue to coordinate and consult with parties as summarized below.

9.2.1 Future FLM Coordination and Consultation

The RHR requires states to submit periodic SIP revisions and progress reports evaluating progress toward the reasonable progress goal for each Class I area. As required by 40 CFR 51.308(i)(4), Nevada will continue to coordinate and consult with the FLMs during the development of these future progress reports and plan revisions. The progress reports are to occur at five-year intervals, with the first report due five years from submittal of the initial RH SIP. Plan revisions are due every ten years, with the exception of the second SIP revision and subsequent progress report. The consultation process will provide on-going and timely opportunities to address the status of the control programs identified in this SIP, the development of future assessments of sources and impacts, and the development of additional control programs.

Nevada will provide the FLMs an opportunity to review and comment on future SIP revisions and the 5-year progress reports. The consultation will be coordinated with the designated visibility protection program coordinators for the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, and the U.S. Forest Service. At a minimum, Nevada will meet with the FLMs on an annual basis through the WRAP, as long as the WRAP continues to provide this forum. All SIP revisions will include a description of how the state consulted with and addressed any comments provided by the FLMs.

Nevada has, and will continue to, coordinate and consult with the following FLM agencies in developing any Regional Haze SIP revisions and/or 5-year progress reports: National Park Service, United States Forest Service, Fish and Wildlife Service, and Bureau of Land Management.

9.2.2 Future Tribal Coordination and Consultation

Nevada will continue to remain in contact, via the WRAP, with participating tribes to keep track of possible future impacts from tribes to visibility at the Jarbidge WA and to provide opportunity for consultation regarding any tribal Class I area that Nevada's emissions may reasonably be anticipated to impact.

9.2.3 Future Inter-state Coordination and Consultation

In accordance with 40 CFR 51.308(f)(2)(ii)(A) through (f)(2(ii)(C), Nevada commits to continue consultation with Arizona, California , Idaho, Oregon and Utah, and any other state which may reasonably be anticipated to cause or contribute to visibility impairment at the Jarbidge WA. Nevada will also continue consultation with any state for which Nevada's emissions may reasonably be anticipated to cause or contribute to visibility impairment in those states' federal Class I areas.

Nevada is not relying on any neighboring state's emissions reductions to achieve reasonable progress at its CIA, Jarbidge WA, and no neighboring states are relying on emission reductions in Nevada to achieve reasonable progress in their state CIAs. At the time this SIP is submitted, there are no disagreements between Nevada and any neighboring state with respect to RHR commitments.

With regard to the established or updated goal for reasonable progress, should disagreement arise between another state or group of states and Nevada, the State will describe the actions taken to resolve the disagreement in future RH SIP revisions for USEPA's consideration. With regard to assessing or updating long-term strategies, Nevada commits to coordinate its emission management strategies with affected states and will continue to include in its future RH SIP revisions all measures necessary to obtain its share of emissions reductions for meeting other states' reasonable progress goals.

9.2.4 Future Regional Planning Coordination and Consultation

Nevada commits to continued participation in the WRAP, to the extent appropriate, and to coordinating future plan revisions with other WRAP member states in addressing regional haze. This involvement in the WRAP will contribute significantly to Nevada's inter-state and FLM coordination for future SIP revisions and progress reports.

9.3 COMMITMENT TO PROGRESS REPORTS

40 CFR 51.308(g) requires states to submit a progress report to USEPA every 5 years evaluating progress towards the reasonable progress goal(s). The second progress report is due by January 31, 2025, with subsequent progress reports due by July 31, 2033, and every 10 years thereafter.

Progress reports must be in the form of an implementation plan revision that complies with USEPA's public hearing and plan submittal requirements (40 CFR 51.102-103). At a minimum, the progress reports must contain the elements in paragraphs 51.308(g)(1-8) for each Class I area.

In accordance with the requirements listed in section 51.308(g) of the RHR, Nevada commits to submitting a report on reasonable progress to USEPA every five years following the second submittal of the progress report. The reasonable progress report will evaluate progress made towards the reasonable progress goal for the Jarbidge WA and in each mandatory Class I area located outside Nevada, which may be affected by emissions from Nevada. Nevada's mid-term review will address each of the required elements listed above, including a reassessment of the uncertainty in the data. The state will also evaluate the monitoring strategy adequacy in assessing reasonable progress goals.

9.4 DETERMINATION OF CURRENT PLAN ADEQUACY

40 CFR 51.308(h) requires a state to make a determination of the adequacy of the current implementation plan as part of its five-year progress report. Based on the findings of the five-year progress report, the state must take one or more of the actions summarized below at the same time the state submits its five-year progress report.

1. If the state finds that no substantive SIP revisions are required to meet established visibility goals, the state shall provide a negative declaration that no implementation plan revision is needed.
2. If the state finds that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from sources in another state that participated in a regional planning process, the state shall notify USEPA and the other contributing state(s). The plan deficiency shall be addressed through a regional planning process to develop additional strategies through the planning efforts described in the progress report(s).
3. If the state finds that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from another country, the state shall notify USEPA and provide the available supporting information.
4. If the state finds that the implementation plan is or may be inadequate to ensure reasonable progress due to emissions from within the state, the state shall revise its implementation plan to address the plan's deficiencies within one year.

Nevada commits, in accordance with 40 CFR 51.308(h), to make an adequacy determination of the current SIP at the same time its five-year progress report is due and to comply with the requirements of 51.308(g). If Nevada determines that the current implementation plan is or may be inadequate due to emissions from within the state itself, Nevada will develop additional strategies to address the plan deficiencies and revise the SIP within one year from the date that the progress report is due. If, on the other hand, Nevada determines that the plan is or may be inadequate due to emissions from other states, Nevada will address the deficiency through a regional planning process.

9.5 COMMITMENT TO FUTURE SIP REVISIONS

In addition to a SIP revision made for plan inadequacy, 40 CFR 51.308(f) requires a state to revise and submit a comprehensive regional haze implementation plan revision to USEPA by July 31, 2021 for the second implementation period, July 31, 2028 for the third implementation period, and every ten years thereafter. Future SIP revisions must evaluate and reassess all of the elements required under 40 CFR 51.308(d) and specifically address the items listed in 51.308(f)(1-3). The plan revision must take into account improvements in monitoring data collection and analysis, control technologies and other relevant factors. Nevada's commitments to comply with RHR requirements for future plans follow.

By July 31, 2028 and every 10 years thereafter, Nevada commits to completing and submitting a comprehensive RH SIP revision to USEPA, evaluating and reassessing all of the elements required under 40 CFR 51.308(d). In evaluating and reassessing the elements, Nevada commits to:

1. Determining current visibility (most recent five-year period preceding the required date of the SIP submittal for which data is available) conditions for the most impaired and least impaired days and determine the actual progress made towards natural conditions.
2. Determining the effectiveness of the long-term strategy for achieving the reasonable progress goals for the prior SIP period as well as include enforceable emission limitations and compliance schedules.
3. Affirming or revising the current reasonable progress goals based on assessment of new or updated information, improved technologies, and on-going legislation. If the reasonable progress goal is found to be insufficient to attain natural conditions by 2064, Nevada will look at additional or new control measures that may be adopted considering compliance cost, compliance time, the energy and non-air quality environmental impacts of compliance and the remaining useful life of the affected source(s).

9.6 CONSIDERATION OF CAA 110(L)

Per CAA section 110(l), SIP revisions are subject to reasonable notice and public hearing prior to adoption and submittal by states to the EPA. Additionally, CAA section 110(l) prohibits the EPA from approving any SIP revision that would interfere with any applicable requirement concerning attainment and reasonable further progress, or any other applicable requirement of the CAA.

NDEP has satisfied the first requirement by holding a reasonable notice and 30-day Public Comment period for the draft Regional Haze SIP Revision prior to submittal to EPA. Documentation of NDEP's Public Notice period for the Regional Haze SIP revision is provided in Appendix D. Furthermore, NDEP confirms that the contents of this SIP revision do not weaken or relax any pre-existing requirements of the CAA, and instead, strengthens the requirements through emission reductions achieved from the implementation of new control measures.

9.7 REFERENCES

U.S. EPA 2019. Guidance on Regional Haze State Implementation Plans for the Second Implementation Period. EPA-457/B-19-003. August 2019.