

DRAFT v.2 for REVIEW

**WESTAR
Regional Haze 2021 SIP Plan Update**



JUNE 2017, v.1

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WESTAR Regional Haze 2021 SIP Update Plan

Introduction

The WESTAR States have developed this plan to guide their work for the Regional Haze State Implementation Plans (RH SIPs) due on July 31, 2021. This update identifies the regional and technical work elements that will be needed for these RH SIPs, how these elements fit together, and estimates the time needed to complete each task.

In 2013, WESTAR States identified and recommended to U.S. EPA potential changes to the Regional Haze Rule (RHR) and supporting guidance.¹ After discussions with other Regional Planning Organizations (RPOs), the Federal Land Managers (FLMs), and interested tribal representatives, U.S. EPA proposed rule revisions and new guidance for public comment in 2016. On January 10, 2017, U.S. EPA published final RHR revisions in the Federal Register. U.S. EPA plans to publish final guidance for the RH SIP preparation based on the rule revisions, but not likely in 2017.

WESTAR states have prepared this 2021 Update to guide the member states in the preparation of a Regional Haze SIP for the second planning period, now due in July 2021. It helps identify the tasks where input is needed from all the states for regional modeling and it structures a timeline so that shared and independent tasks can be completed in a timely fashion.

The rule promulgated in January of 2017 is subject to requests for rule review and requests for rule reconsideration to which U.S. EPA is responding. Since the rule has not been stayed, WESTAR states are proceeding as though the RH SIP submission date is July 2021. In the absence of guidance, this WESTAR Regional Haze 2021 SIP Update Plan serves as a working guide for western states. Should U.S. EPA make substantive changes to the rule or guidance, this SIP Update Plan may need to be modified. In the absence of certain rule and guidance changes, this SIP Update Plan identifies areas where the states will need to make reasoned assumptions or interpretations. Also, to date, no resources have been identified by U.S. EPA to assist states in conducting the work needed for 2021 RH SIPs. Hence, this Update assumes in-kind and extramural funding sources will be leveraged to accomplish the work identified herein.

Since the RHR requires a comprehensive plan review every 10 years, much of the work for the 2021 plan will be similar to the work required for the initial RH SIPs. States have the benefit of having been through the process once before, thereby having a better understanding of the requirements and work needed. An interim Progress Report is embedded in the RH SIP revision due in 2021 and will address whether or not states met their 2018 RPGs and why.

Throughout this SIP update plan, the sections of the regional haze rule most relevant to each task are cited. The RHR drives the work that needs to be done either explicitly, by requiring specific analyses (such as determining current visibility conditions), or implicitly, by requiring

¹ WESTAR Regional Haze Workgroup "Five Core Issues"

states to make planning decisions (such as identifying control measures to improve visibility). In order to make sound planning decisions, the states must complete a regional analysis, which requires the use of certain methods, inputs, timelines, and resources.

Regional Haze Program Requirements

The requirements for the Regional Haze Program are codified at 40 CFR 51.308. Appendix A of this SIP Update Plan shows the text of the RHR as revised and briefly identifies the associated work the states need to undertake for the requirements.

Basic Regional Haze SIP Requirements

Section 51.308 (d) includes the basic elements of all RH SIPs:

- Determining current visibility conditions and comparing to natural conditions;
- Developing long-term strategies to reduce emissions that contribute to visibility impairment; after conducting a four-factor analysis of anthropogenic sources with potential impacts;
- Establishing 2028 RPGs for the end of the implementation period; and
- Submitting a monitoring strategy.

Regional Haze SIP Revision Requirements

Section 51.308(f) requires that states revise and submit regional haze plans for the second planning and implementation period to U.S. EPA by July 31, 2021. In addition to re-evaluating all elements required in section 51.308 (d) of the RHR, the states must:

- Assess baseline, natural, and current visibility conditions for the most impaired and least impaired days;
- Address actual progress made towards natural conditions or the most impaired and for the clearest days during the previous implementation period ending 2018;
- Determine the effectiveness of the long-term strategy for achieving Reasonable Progress Goals (RPGs) over the prior implementation period ending 2018 (which were calculated for Worst Days); and
- Affirm or revise the uniform rate of progress according to procedures in paragraph (d).

While meeting the requirements of sections 51.308(d) and (f), the states must consult with other states having Class I Areas that may be impacted by anthropogenic emissions from their state and consult with the Federal Land Managers on the effectiveness of the long-term strategy and setting the RPGs for the Class I Areas in the respective states. The required elements and schedule of this coordination are found at section 51.308 (i). States must also include a Progress Report containing the elements described at section 51.308 (g) and determine the adequacy of their existing implementation plan, explained at section 51.308(h).

Work Products Overview

Exhibit 1 outlines the tasks to develop the regional haze SIPs and shows how they fit together. Exhibits 2a and 2b are summary timelines. Exhibit 3 briefly describes regional work products.

Timeline

This plan update identifies an initial description and timeline for the substantial work that is needed over the next three-four years to complete the 2021 SIP. The timing to complete the plans by July 2021 depends on a reliable sequence of technical and planning work at the regional level and by individual states. In addition to these efforts, the states must provide time for consultation with the Federal Land Managers (FLMs) and for a public comment period, as well as the state adoption process. This all points to the need for states to start the 2021 SIP development process in early 2017. Exhibits 2a and 2b are summary timelines for developing these SIPs, showing overlapping tasks. A more detailed timeline is available in Appendix B. The SIP adoption process varies from state to state. Colorado, with the requirement for their RH SIP to be approved by the state's legislature, has the lengthiest process among the WESTAR States. In order to meet the July 2021 submission deadline, the Colorado SIP needs to have completed the FLM review and public review by the summer of 2017, prior to the State Legislature adoption beginning the Fall of 2021. That means all technical work for the final control scenarios must be complete before the final regional modeling to determine the final RPGs in the Spring of 2020.

Input Tasks required for RH SIPs

The activities listed in Exhibit 3 show how various elements required for the regional haze planning process and RH SIP development might be achieved. As needed, states will work together to develop protocols for interpreting the rule requirements. These might include methods for determining Most Impaired Days, protocols for revising Natural Conditions, consensus for projecting wildfire smoke and dust events for modeling future years, opportunities to involve Federal Land Managers early in the planning process, contracting for special studies, source category control options, and other needs that may arise during SIP development.

Need for Shared Database

For the initial regional haze SIP, states worked together to develop a standardized database storage system called the WRAP-TSS (Western Regional Air Partnership Technical Support System) for storing emission data, monitoring data, and modeling results in a common format, made publically accessible. For this second RH SIP, states anticipate using a similar system. It is essential to have the complete historic monitoring data data record for planning purposes and for RH SIP preparation. <http://vista.cira.colostate.edu/tss/Results/HazePlanning.aspx>

Exhibit 1 – Regional Haze SIP Development Flowchart

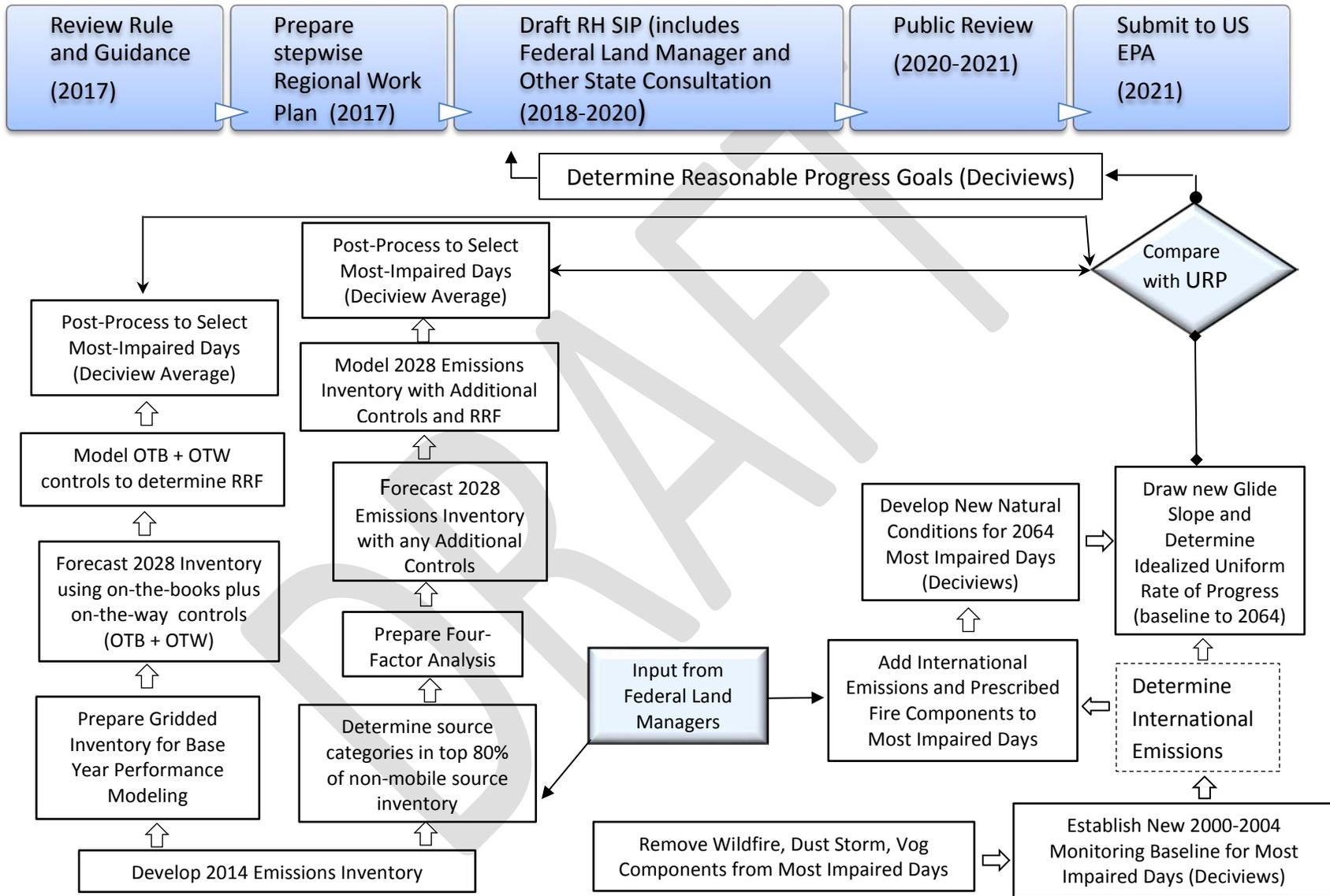


Exhibit 2a – SIP Preparation Task Timeline by Quarter (for States adopting plans in 2021)



Exhibit 2b – Regional Haze SIP Process Timeline through to Submittal Deadline

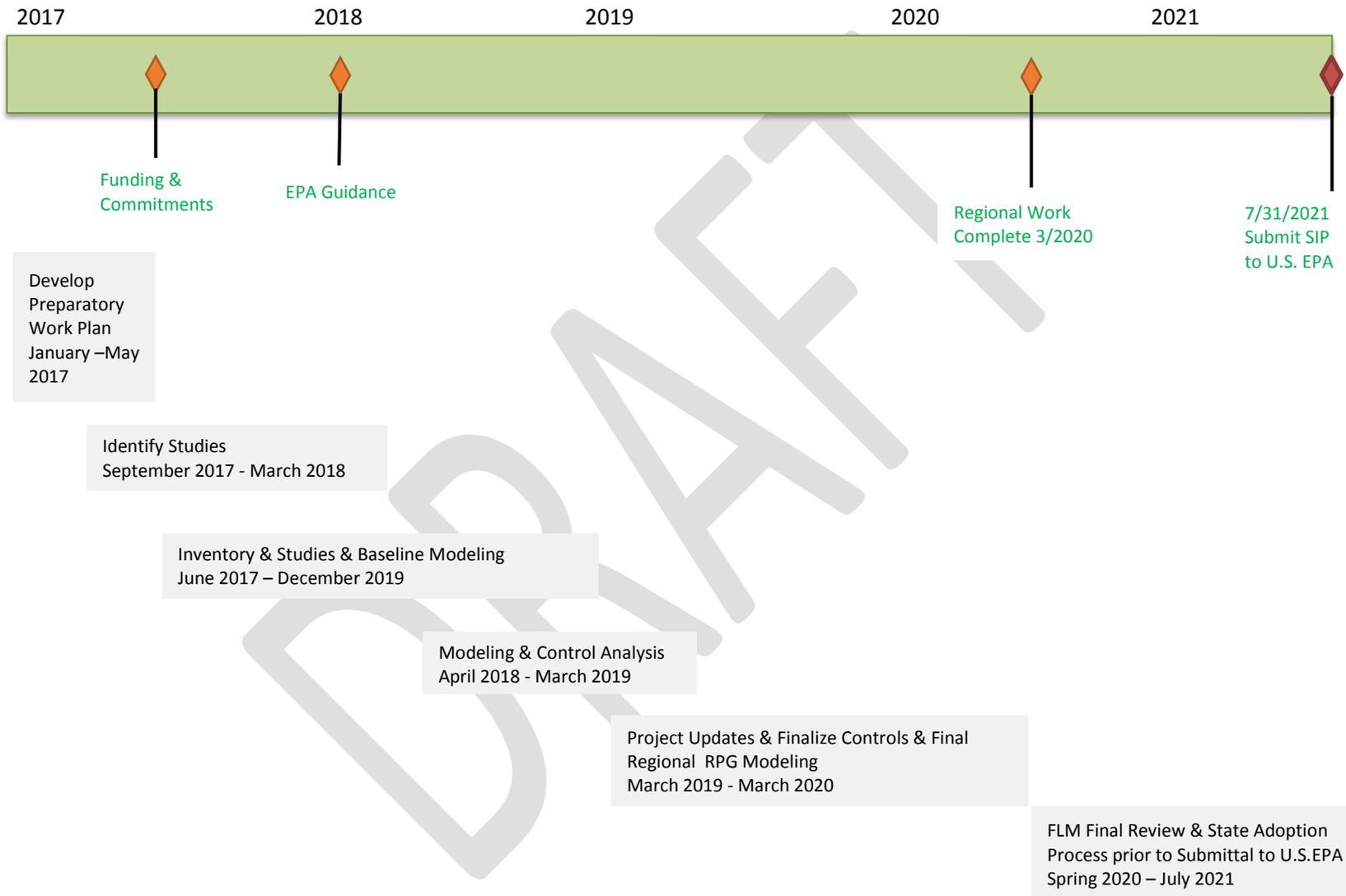


Exhibit 3 – Regional Task Analysis

Regional Activity	Timeframe	Comments
IMPROVE Monitoring Data Analysis *	Original Rule format available through 2014 on WRAP-TSS 2016 available on FED unformatted	Need new formats for Impaired days Need technology upgrade to support WRAP-TSS with historic and future data Will need monitoring data through 2017 (or 2018?) to complete Progress Report for first planning period
Emission inventory *	2014 Base Year start Summer 2017 Wildfire Emissions & Gridding for 2014	Is the 2014 NEI finalized? 2017 inventory useful for supporting Progress Report, (same as used for NEI submissions in 2018) Collective western states' involvement critical to timely development of 2028 control scenarios
Meteorological modeling **	Work underway now, complete by Spring, 2014	Can we use 2011 data for 2028; will we need 2014 meteorology to check performance?
Reconstruct Baseline * or **	Determine Most Impaired Days Create New Baseline (Fall 2017- Spring 2018)	Use Baseline Source Apportionment as International Emissions Contribution in Future?
Emissions Forecasting * or**	2028 OTB-OTW projection, start by December 2017 Spring 2018 through Spring 2020	Lags emission inventory work by 3-4 months Base Year is 2014 EPRI - International emissions for what years? (Baseline? 2014? 2018? 2028?) 2028 OTW + OTB ready in Spring 2018

		4-factor Control Scenarios for finished by Spring 2019
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Exhibit 3 – Regional Task Analysis (continued)

Regional Activity	Timeframe	Comments
AQ modeling base case & source apportionment **	2014 base case for model performance Will source apportionment be done?	Use existing WestJump AQMS 2008 base year source apportionment results to assist initial work on RH planning? New 2011 base year source apportionment – work will start Spring 2014 (was this ever done?)
Regional Modeling for.(OTW+OTB) * or**	Start as soon as 2014 Emissions inventory analyzed (begin January 2018) Need 2028 Projections by mid 2018	Could develop Control Measure Clearinghouse of Best Practices for subsequent 4-factor analysis?
Reconstruct 2064 Natural Conditions * or **	Develop Methodology in 2017 or 2018 Propose new Natural Conditions in 2019 to Construct new Glide Slope and URP	Use Baseline Source Apportionment for Future International Emissions Contribution? Federal Land managers Develop Prescribed Burning Contribution for 2064 (Hold present levels constant?)
2028 Scenarios modeling & Source Apportionment **	2028 scenarios: Start modeling January 2019, finish Spring 2020	Results from 2028 “What If” control scenarios needed no later than Summer, 2019 Will we be able to do any Source Apportionment?
Confirmation of RFPs *	Spring 2020	Compare with New Glide Path and URP and confirm all reasonable efforts have been made
Final consultations with other states and Federal	Can begin in Summer of 2020	Colorado will need to accelerate their development of New Glide Slope to finish before Spring of 2020

Land Managers and Public Review *		
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* State In-Kind work

** Need Outside Contractor

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IMPROVE Monitoring Data Analysis

Analyzing monitoring data is required to meet several sections of the regional haze rule. For all future implementation, plan revisions define:

- Baseline, natural, and current visibility conditions for the most impaired and clearest days, and actual progress made towards natural conditions since the baseline period and during the previous implementation period. (section 51.308(f)(1))
- The number of deciviews by which current conditions, exceed natural visibility conditions for the Most Impaired and Clearest days. (section 51.308(f)(1)(v))
- The uniform rate of progress from baseline visibility conditions (2000-2004) to natural visibility conditions by the end of 2064 (section 51.308(f)(1)(vi))
- The effectiveness of the long-term strategy for achieving reasonable progress goals over the prior implementation period(s). (51.308(f)(2))

The monitoring data analysis required for the SIP revisions is similar to the analysis supporting the five-year progress reports. As such, states will use a similar approach for this requirement.

As part of this effort, states will continue to rely upon the WRAP TSS to store and display the data and trends. <http://vista.cira.colostate.edu/tss/Results/HazePlanning.aspx> The raw data is accessible from the FED site <http://views.cira.colostate.edu/fed/DataWizard/Default.aspx>, but it must be formatted before trend comparisons can be made with the historic record on the WRAP-TSS site. One exercise for the western states will be to decide how the monitoring data should be presented on a commonly available website, once it has been formatted to be used in planning and trend analysis.

The 1999 RHR specifies that, “The period for calculating current visibility conditions is the most recent five-year period preceding the required date of the implementation plan submittal for which data are available.” In the April 2013 “General Principles for the 5-Year Regional Haze Progress Reports for the Initial Regional Haze State Implementation Plans,” U.S. EPA states that states should “consider a chart of the rolling average.” In the January 2017 RHR revision, section 51.308(g)(3) provides that “the period for calculating current visibility conditions is the most recent 5-year period preceding the required date of the progress report for which data are available as of a date 6 months preceding the required date of the progress report.” That translates to what is available as of January 31, 2021.

Because it takes 15-18 months before IMPROVE data is available, 2018 will be the last full year of monitoring data evaluated for the SIPs, and the most recent five-year period will be 2014 through 2018. Data for 2018 should be available by mid-2020 at the latest. Among other things, the states will use the rolling five-year average for the Worst Days from 2014-2018 to compare with the Worst Days RPG modeled for 2018 from the initial RH SIP. This Progress

Report will use Worst Days rather than remodel RPGs for the first planning period using Most Impaired Days. This Progress Report requirement can be embedded in the RH SIP due in 2021.

Exhibit 4 is an excerpt from the full project timeline in Appendix B and highlights the timeline for completing the analysis of current visibility and recent trends, including the review periods prior to submission to the U.S. EPA.

Exhibit 4 – Timeline to Evaluate Current Visibility and Trends for Progress Report

Task	Time	Start	Finish
Last year of monitoring data collected, QA/QCed, and posted	15 months	January 2018	Spring 2020
Data formatted, and trends analyzed (build structure and add data to format as it becomes available) (start by reconstructing the baseline period 2000-2004) (includes reconstructing Natural Conditions assigned to 2064)	ongoing	Summer 2016	Summer 2020
Data available to other states (centrally posted or compiled in contracted report)	ongoing	Summer 2017	Summer 2020
Determine if 2018 visibility goal met (explain any interfering, uncontrollable circumstances)	3 months	Spring 2020	Summer 2020
FLM Coordination and Comment Process (formal draft review and comment , prior to public review)	120 days	As early as Summer 2019	As late as winter 2020-2021
Public Review Process (RH SIP for public review includes response to FLM comments)	usually 90 days	After FLM review	Ideally in June 2021

Regional Modeling Overview: Purposes, Inputs, and Analysis

Regional modeling assists the states in addressing a number of requirements in the Regional Haze Rule. The regional modeling process includes several substantial input tasks: emission inventory development, emissions forecasting, meteorological modeling, and baseline modeling, all done prior to the regional modeling of control scenarios occurs to determine reasonable progress goals. Regional modeling affirms that all the states’ long-term strategies, developed from a four-factor analysis of potential controls, is sufficient to improve visibility on the Most Impaired Days, as a result of reducing anthropogenic emissions.

As discussed below, the preparatory work that goes into regional modeling is extensive. For planning purposes, spatially-allocated emissions inputs are associated with year-specific meteorology and modelled to show their impact at Class I Areas. Forecasted emissions inventories are used to model future scenarios. For states to evaluate the effects of potential strategies in 2028, multiple future scenarios will need to be developed and modeled, prior to setting the RPGs for 2028.

Modeling occurs at different stages in SIP preparation, as the inputs are developed sequentially and in an iterative fashion. Baseline modelling is completed once the base year inventory and meteorology is confirmed. Then future year and control scenario modeling becomes an iterative exercise with the results informing the determination of the reasonable progress goal. In other words, a balance must be struck between the control scenario selected and the visibility improvement achieved.

One of the final requirements of the RHR is to compare the RPG with the Glide Slope defining the Uniform Rate of Progress. The rule does not require the RPG to be on the Glide Path or to achieve a specific Uniform Rate of Progress, but it does require states to demonstrate that every reasonable control has been included, after a four-factor analysis, irrespective of where an RPG is in relation to the respective Glide Path and Natural Conditions.

The Glide Path is merely a guide that should reflect continuous improvement in visibility towards achieving Natural Conditions on the Most Impaired Days in 2064. The 2017 RHR revision recognizes that the Glide Path may need adjustments due to the impacts of natural and international emissions that may not have been accounted for sufficiently in the default values for Natural Conditions utilized in the first planning period. Some of the results from regional modeling and from emissions inventory calculations can be employed to reconstruct more realistic Glide Paths (and their slopes or Uniform Rate of Progress), using refinements in the baseline and more informed assumptions for the Natural Conditions endpoint. For this SIP revision, additional steps must be taken to adjust the Glide Path for future planning.

Issues and tasks associated with Emissions Inventory, Modeling, the Long-Term Strategy and Four-Factor analyses, and the Natural Conditions progress metric are discussed in detail below. Note that some of the tasks can be conducted separately and some rely on the results of others. Some of the processes are iterative. All culminate in setting the Reasonable Progress Goals for 2028 and demonstrating that visibility is improving due to reductions in anthropogenic emissions.

Emissions Inventories

Emission inventories serve both as inputs to regional modeling and as assessment tools. RH SIP Requirements relying on emission inventories include:

- The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy. The State should consider evaluating major and minor stationary sources, or groups of sources, mobile sources, and area sources. (section 51.308(f)(2)(i))
- A statewide inventory of emissions of pollutants that are reasonably anticipated to cause or contribute to visibility impairment in any mandatory Class I Area. The inventory must include 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. (section 51.308(f)(6)(v))
- As part of the embedded Progress Report, a summary of the emissions reductions achieved throughout the State through implementation of the measures included in the first implementation plan for achieving reasonable progress goals for Class I Areas both within and outside the State. (section 51.308(g)(2))

Analysis for the initial RH Sips was based on the 2002 emission inventory and projections. For the initial Progress Report, many WESTAR States used the 2008 inventory, leveraging work done for the WestJumpAQMS study. The 2021 SIPs will likely be based on the 2014 National Emissions Inventory (NEI), projected to 2028. In preparation for control strategy analyses, the 2014 NEI data will be evaluated to identify non-anthropogenic and anthropogenic emission sources. Anthropogenic sources will be further evaluated to identify sources that fall under state control. Emission sources under state control may be subject to four-factor analysis.

Inventory projections to 2028 will provide the basis for developing states' long-term strategies. The Control Scenario(s) will reflect the emission reductions resulting from the Long Term Strategy of states and provide the basis for establishing Reasonable Progress Goals. To accomplish this work, at least four inventories may be needed:

- 2014 Base Year Inventory – NEI inventory with regional adjustments, as needed, to affirm model performance; *(there is a possibility that a 2016 inventory will be used as the base year to take advantage of a 2016 modeling platform to be developed nationally for modeling attainment of the 2015 ozone standard)*
- 2018 Projected Inventory – 2014 inventory projected to 2018 and adjusted to reflect emission changes that are planned but not implemented until after 2014 (e.g., BART controls that will be installed between 2014 and 2018) so that States will be able to complete the Progress Report, embedded in the SIP that demonstrates how well the state met their 2018 Reasonable Progress Goals;
- 2028 Projected Inventory – the 2014 inventory projected and adjusted to account for emission changes on-the-books, (e.g. permit conditions and shutdowns) and phased

reductions on-the-way from known control measures applied to growth categories (e.g. mobile fleet changes, and performance standards applied to growth categories); and

- 2028 Control Scenario(s) – Modifications to the 2028 inventory developed based on forecasts to test the regional effects of potential state control strategies, and to establish Reasonable Progress Goals for 2028.

As of June 2017, the WESTAR States anticipated having the two essential 2014 and 2028 on-the-books and on-the-way (OTB and OTW) emission inventories completed by the end of 2017. The 2028 Control Scenarios should be completed by the end of 2018, to allow sufficient time to do the subsequent modeling to identify Reasonable Progress Goals. The 2018 inventory is not used for modeling; it is necessary only as a requirement of the embedded Progress Report, to affirm that promised reductions occurred, and as backup or weight of evidence for the improvements seen at the monitors when evaluating the visibility improvements against the 2018 RPGs. It is possible that individual states may choose to rely on what they prepare for the 2017 NEI submission, since WESTAR –WRAP may not be funded to prepare the detailed inventory and regional analysis many states used for their initial Progress Report.

Emission Inventory Sector Methods

For this interstate planning effort, consistent and comparable emission inventories are important. Interstate coordination on emission inventory preparation and adjustments will improve the accuracy of these emission sectors. Consistency among state inventories will also ensure fair and reasonable apportionment for Class I Areas affected by emissions from outside the state.

Some sectors will require additional refinements or considerations. For example, because wildland fire emissions vary greatly from year to year, and are not predictable, states will need to agree on an estimation method. Input from the Federal Land Managers (FLMs) is critical at this point because States and the FLMs have worked to improve recordkeeping on acres burned and emissions generated, from wildfires and from prescribed burns. Other refinements may be specific to individual states or a few states, such as emissions from the oil and gas industry in some states. Methods specific to individual sectors must be developed early on so that they can be consistently applied throughout the process.

Emission Inventory Projection Methods

Some emission categories have well-accepted projection methods; mobile sources and electric generation fall into this group. Some source categories are more challenging to project, including wildland fire, and oil and gas development. The WESTAR States will work together to develop mutually acceptable projection methods for each emissions inventory category. The earlier the states can agree on projection methods for these sources, the simpler and quicker emissions can be developed for modeling.

For some source categories, an option is to use the same emissions for multiple years. This approach was used in the past for fire emissions, both wildfires and prescribed fires. For other categories, such as oil and gas, states may need to develop their own projections based on expected activity in the individual state.

As emission inventory tools and methods improve over time, the states must reconcile differences in methods when comparing emissions from year to year to determine progress. For example, at the time of the first SIPs, MOBILE6.2 provided on-road emission estimates, but now MOVES has replaced the older tool. While some reconciliation might be needed for the 2018 forecast, the 2014 NEI and the 2028 forecasts both use MOVES. California uses its own projection methods for mobile sources but can supply a compatible mobile inventory to the regional modeling effort. In WESTAR states, the methods for calculating emissions from wildfire and prescribed burning should be agreed upon with the Federal Land Managers.

Additional Emission Inventory Studies

To prepare the first Regional Haze SIP, the WRAP led the development of a number of special studies, such as developing data sets or tools for gathering data (e.g., FETS) for the first time. Additional emissions studies may not occur for the second planning period, depending on the availability of funding and priorities. Some of the studies were emission inventories for specific sectors, which may need additional scrutiny to adequately support the 2021 SIP development.

Topics potentially warranting additional study or inventory development or refinement for the 2021 SIP include:

- Oil and gas sector
- Canada, Mexico (anthropogenic and natural from neighboring countries)
- Natural marine emissions
- Offshore shipping emissions (after implementation of international agreements)
- Global (e.g. Asian and European sources affecting Arctic circle, Hawaii, and lower 48 states)
- Dust Storms (e.g. episodic events)
- Wildfires (e.g. average to use for 2028 projection)
- Ammonia (agricultural, industrial, mobile)
- Prescribed fire future estimates for 2064
- Lightning NOx.

Long Term Strategies for Visibility Improvement

The long-term strategy addresses visibility impairment for each mandatory Class I Area within the State and for each mandatory Class I Area located outside the State that may be affected by emissions from the State. The long-term strategy and the interim RPGs must provide for an improvement in visibility for the Most Impaired Days since the baseline period, and ensure no degradation in visibility for the Clearest Days since the baseline period. States must establish

RPGs in each RH SIP that indicate the visibility conditions projected to be achieved by the end of the implementation period as a result of the State's long-term strategy.

Long Term Strategy

The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the RPGs established by States having Class I Areas. The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy. The State should consider major and minor stationary sources, area sources, and mobile sources.

Preliminary guidance suggests that states focus on stationary and area sources, in particular those categories which comprise the top 80% of their inventory. Western states will also analyze their mobile source inventories for planned and anticipated reductions. For some haze precursor species, mobile source emissions inventories are larger in comparison with stationary and area source inventories. Reductions in emissions from federal controls will also benefit visibility. Some states have the ability to regulate mobile sources, fleets, or indirect sources (e.g. parking lots) with mandatory and voluntary programs. As discussed later, states should be able to indicate which sources are within their statutory control and which are not, in the process of evaluating long-term strategies.

Four-Factor Analysis

In establishing its long-term strategy, each state must evaluate and determine the emission reduction measures available, given their respective statutory authorities, to make reasonable progress by considering:

- (1) the costs of compliance,
- (2) the time necessary for compliance,
- (3) the energy and non-air quality environmental impacts of compliance, and
- (4) the remaining useful life of any potentially affected anthropogenic source of visibility impairment.

These four considerations are commonly referred to as the "four-factor analysis" and include a demonstration showing how these factors were taken into consideration in selecting the reasonable progress goal. (section 51.308(f)(2)(i).

The four-factor analysis is complex and time consuming. For the initial SIP, most western states focused their four-factor analysis on sources requiring best available retrofit technology (BART). For the 2021 SIP, the RHR does not provide direction for identifying which sources or source categories on which to focus the four-factor analysis. This void means that states must first identify which sources or source categories warrant four-factor analysis and then complete the analysis. This process is sometimes referred to as the reasonable progress analysis.

The western states plan to identify sources or source categories for potential four-factor analysis using simple screening methods as a surrogate for visibility impairment, such as relative contributions to total haze precursor emissions, or Q/d (emissions quantity divided by distance to the nearest affected Class I Area) comparisons. By setting thresholds for these screening analyses, the sources or source categories most likely to affect visibility at Class I Areas on the Most Impaired Days can be identified, and those not likely to affect visibility on those days will not receive additional time-consuming analysis.

The western states will also remove sources already controlled under either BART during the first planning period or other best available control requirements from the pool of those possibly receiving additional scrutiny, *unless* it is clear that available technology or other four-factor conditions have changed during the ensuing years. Although sources may be affecting visibility, if little more can be done or technology is not available to further control the emissions within the 2028 implementation period, further analysis at this time is not an efficient use of resources. WESTAR states sometimes refer to these anthropogenic sources as technologically “uncontrollable” for the current planning period.

The State must consider the following additional factors in developing its long-term strategy:

- (A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;
- (B) Measures to mitigate the impacts of construction activities;
- (C) Source retirement and replacement schedules;
- (D) Basic smoke management practices for prescribed fire used for agricultural and wildland vegetation management purposes and smoke management programs; and
- (E) The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy. (section 51.308(f)(2)(iv).)

As of this writing, U.S. EPA provided draft guidance for public review for which the comment period has closed. In the absence of a prescribed method for analyzing sources and their potential impact on visibility, the WESTAR states can examine their current inventory, growth scenarios, and future on-the-way and on-the-books control measures for potential emissions reductions. In the absence of a federal mandate for additional control stringency, some states are limited by their legislatures to federal control levels. WESTAR states sometimes refer to the anthropogenic sources, in-state and out-of-state, for which they have no legal authority to control, as jurisdictional “uncontrollables” for the current planning period. States with waivers from U.S. EPA for additional control of mobile sources, may evaluate additional mobile source control options.

Potential Effect of Emissions Reductions on Visibility

Essential to any evaluation of controls is the ability to demonstrate how the identified sources or source categories are affecting Class I Area visibility. This aids in quantifying or measuring reductions in anthropogenic haze, if new controls were applied. This exercise requires modeling. There are major technical and resource issues that states will face in conducting such evaluations, and limited assistance is expected from regional planning organizations in the future. States need a strong technical basis to demonstrate change in visibility impairment for selecting control measures, if any, which are necessary for a source or source category, to make a determination or defense of reasonable progress toward natural visibility conditions.

One question often raised with the four-factor analysis regards the potential effect of the proposed emission reductions on overall visibility: Will implementing the proposed controls improve visibility at the Class I Areas the source affects? Or, alternately considered, how much emission reduction is needed to make a visibility improvement? The states expect to be challenged when requiring emission controls that have little noticeable effect on visibility; they must focus on controls that have demonstrable effects by improving visibility on the Most Impaired Days.

Reasonable Progress Authority

All states will need to ensure that they have sufficient authority to implement strategies selected for inclusion in their Regional Haze SIP. During the development of the initial Regional Haze SIPs, a number of states had to adopt additional rules that would allow them to implement the strategies required under BART. For this second planning period SIP, if strategies are selected because they help the state improve visibility to meet reasonable progress, the state may need to adopt rules allowing them to use reasonable progress as criteria for implementing controls. Stated another way, some states will only be able to use existing authorities delegated or mandated by federal programs to reduce criteria pollutants, toxic emissions, or to meet greenhouse gas reduction commitments. Developing a model rule for reductions of precursors to anthropogenic haze at Class I Areas may help states that need additional statutory authority, provided that a reasonable progress benefit is achieved.

Reasonable progress goals will be established for each mandatory Federal Class I Area in the WRAP based on regional photochemical grid modeling of the 2028 Control Strategy emission inventory. The 2028 control strategy inventory incorporates emissions reductions resulting from the control measures identified in all the WESTAR states' long-term strategies. The WRAP will work with the WESTAR states to develop a framework for identification and evaluation of Long Term Strategies. In the absence of specific guidance from U.S. EPA, this framework will guide identification of sources and source sectors for further consideration under the four statutory factors.

Reasonable Progress Goal (RPG) and the Uniform Rate of Progress (URP)

States with Class I Areas must establish RPGs (expressed in deciviews) that reflect the visibility conditions that are projected to be achieved by the end of the implementation period as a result of enforceable emission limitations, compliance schedules, and other measures necessary for their long-term strategy. The RPGs must provide for an improvement in visibility for the Most Impaired Days over the period of the implementation plan and ensure no degradation in visibility for the Clearest Days over the same period. Regional modeling provides the information needed to set these goals.

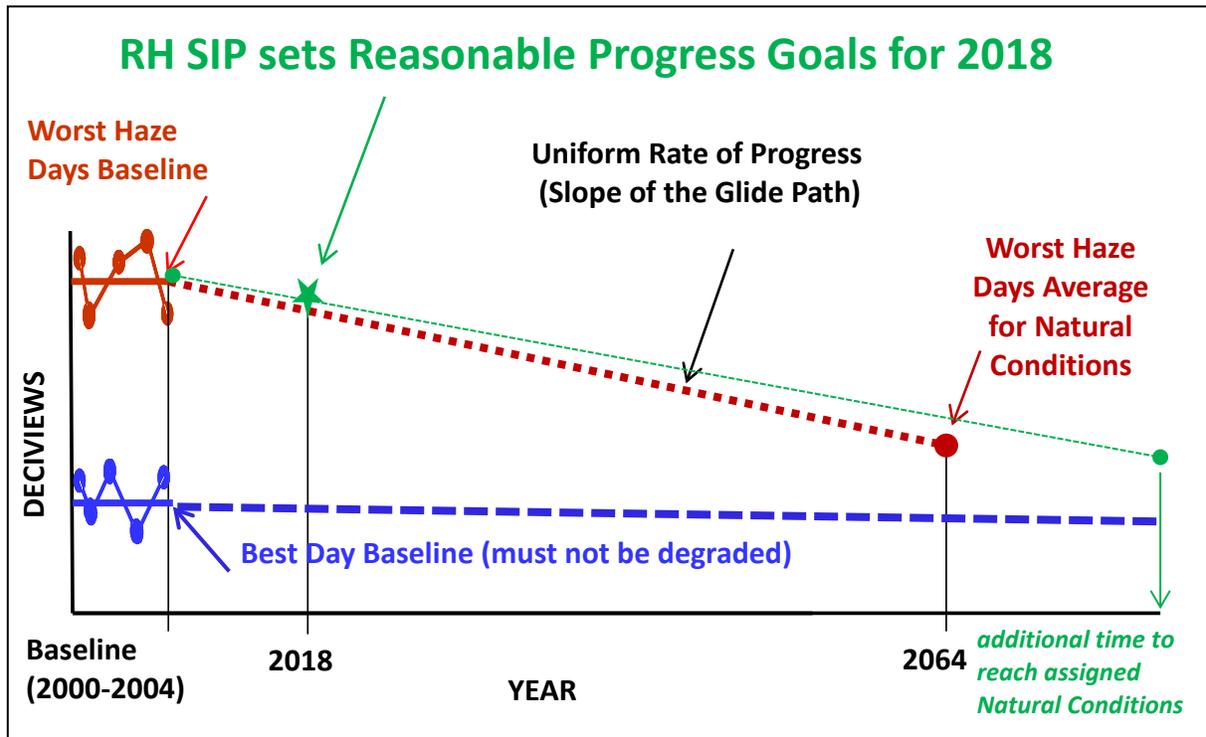
In developing each RPG, a State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Area. States must assure that they have included all measures needed to achieve their apportionment of emission reductions for visibility impairment in other states, when setting their RPGs. Regional modeling helps with the accounting, and is the basis for determining potential impacts. In any situation in which the State cannot agree with another such State or group of States that a goal provides for reasonable progress, the State must describe in its submittal the actions taken to resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will consider this information in determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions.

Uniform Rate of Progress

States must analyze and determine the rate of progress needed to attain natural visibility conditions by the year 2064. To calculate this Uniform Rate of Progress (URP), the State must compare baseline visibility conditions (2000-2004 average) on the Most Impaired Days to natural visibility conditions in the Class I Area (assigned to 2064) and determine the uniform rate of visibility improvement (expressed as deciviews per year) that needs to be maintained during each implementation period, in order to attain "natural visibility conditions" by 2064. In the initial guidance for the 1999 RHR, the URP was also known as the slope of the Glide Path from Baseline to Natural Conditions for the Worst Haze Days. The revised RHR uses the Most Impaired Days in the baseline to focus on reducing anthropogenic impairment, which may also be present in 2064.

In the initial RH SIP, if a State established an RPG for the Worst (Haze) Days that provided a slower rate of improvement in visibility than the URP, the State demonstrated, based on the four-factor analysis, that there were no additional emission reduction measures for anthropogenic sources or groups of sources in the State that would be reasonable to include in the implementation period. As part of its implementation plan, the State provided to the public for review an assessment of the number of years it would take to attain natural conditions if visibility improvement continued at the rate of progress selected by the State as reasonable for the implementation period. Under the metric for the 1999 RHR, modeling of the long term strategies indicated that no RPGs could meet the pace ascribed to the Uniform Rate of Progress, for any WESTAR state Class I Area, despite all the planned emissions reductions.

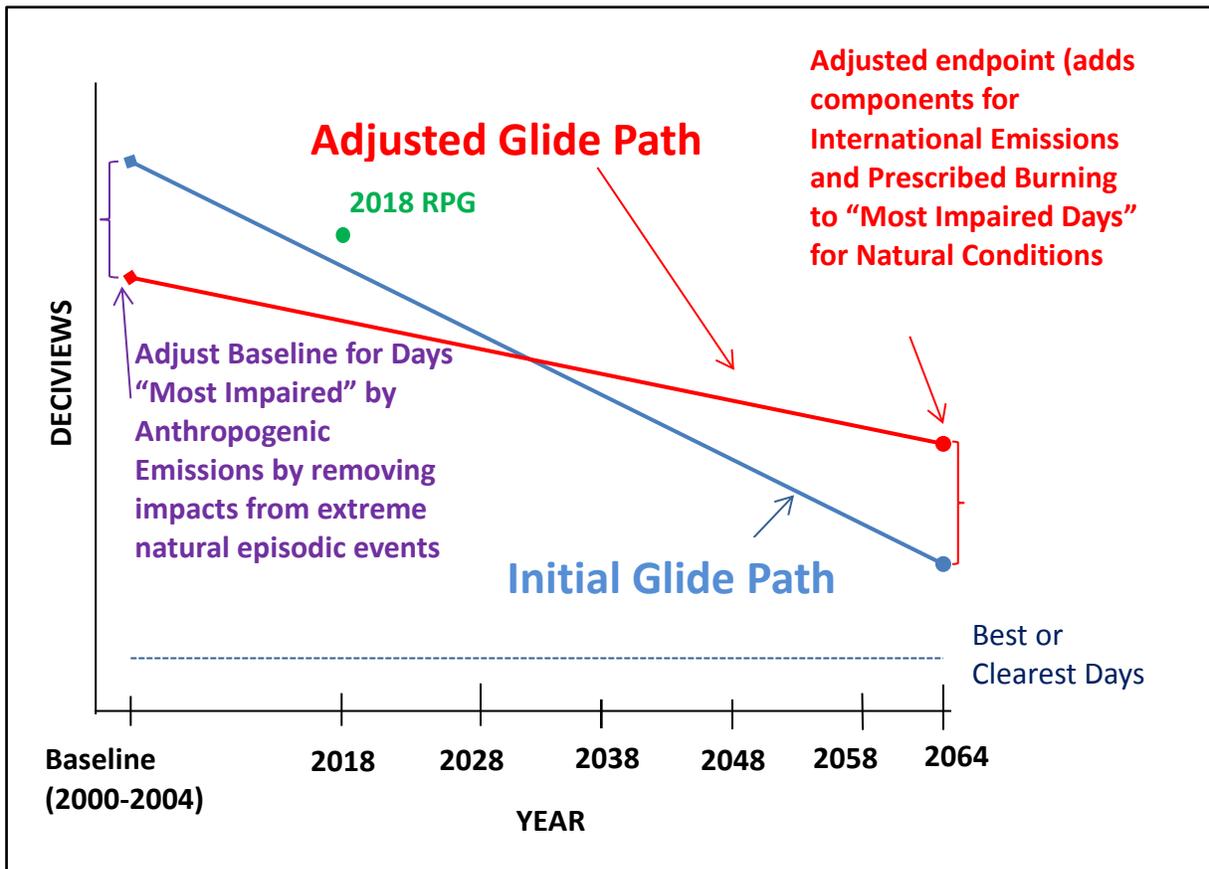
Exhibit 6. Initial Metric for Reasonable Progress



The 2017 RHR revision recognizes that the initial metric for measuring progress in reducing visibility throughout the western United States was skewed by the contributions from natural sources of haze precursors. **Natural** emissions from wildfires, dust storms, and volcanic gases and ash make considerable contributions to the days with the worst haze. Modeling, satellite data, and chemical analysis indicated that international emissions also contributed to haze. Whether these were natural or anthropogenic, it was not possible for individual states to control emissions from international sources. Federal Land Managers and others conducted prescribed burns for resource benefits and to restore natural ecosystem conditions, whose anthropogenic emissions also contributed to haze at Class 1 Areas.

The 2017 RHR allows states to make adjustments to the Glide Path to account for these natural and uncontrollable emissions. In addition, an adjustment can be made to the Glide Path for the impacts of prescribed burning meant to restore Natural Conditions to fire-dependent ecosystems. Since the goal of the program is to reduce anthropogenic impacts that impair visibility, states can now show progress on days Most Impaired by anthropogenic emissions, as illustrated in Exhibit 7.

Exhibit 7. Conceptual Glide Path for Visibility Protection Planning using a New Metric



These adjustments change the Glide Path’s slope, the idealized Uniform Rate of Progress. The adjustments, in concept, help states focus on the days most impaired by anthropogenic emissions. The impacts of these naturally-occurring, extreme, episodic events (“e3”) such as wildfires, dust storms, and volcanic emissions are removed from the averaging so that they will not skew the measure of progress. The new metric is used to show the progress improving visibility resulting from reductions in controllable anthropogenic emissions. Even under Natural Conditions, assigned as a goal to 2064, the most impaired days will always have some contributions from anthropogenic sources that cannot be controlled.

For a better understanding of what causes anthropogenic vs. natural haze at Class 1 Areas, source apportionment and back trajectory modeling can be used to help determine the causes of haze at a particular location. International emissions, both natural and anthropogenic, impact various Class 1 Areas, as demonstrated by source apportionment modeling in the initial planning period. This information and additional modeling of more current scenarios may be used to help determine (quantify) the international contribution. Each state will also have to make some adjustments using statistics, and local knowledge, to identify and quantify days impacted by extreme episodic events from natural sources. By working with Federal Land Managers, each state can determine an adjustment for future prescribed burning. In the

absence of guidance, WESTAR states will develop protocols for arriving at the adjustment values, allowed in the revised RHR.

Relationship between the RPG and the Glide Path

In determining whether the State's 2028 goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will evaluate the demonstrations developed by the State. The RPGs established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan to achieve the RPG adopted by the State.

For each Class I Area located within the State, the State must establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the Most (anthropogenically) Impaired days over the period of the implementation plan and ensure no degradation in visibility for the Clearest Days over the same period (section 51.308(d)(1)). In plain English, the Most Impaired Days must have improved visibility since the prior planning period and the Clearest Days (least hazy, 20% lowest deciview days) cannot have diminished visibility.

The State may not adopt an RPG that represents less visibility improvement than is expected to result from implementation of other requirements of the CAA during the applicable planning period (section 51.308(d)(1)(vi)).

Section 51.308(f)(3) explains that if a State established an RPG for the prior period which provided a slower rate of progress than that needed to attain natural conditions by the year 2064, the State must evaluate and determine the reasonableness, based on the factors in paragraph (d)(1)(i)(A) of this section, of additional measures that could be adopted to achieve the degree of visibility improvement projected by the analysis contained in the first implementation plan described in paragraph (d)(1)(i)(B) of this section. Since the metric for determining the reasonable progress goal has changed between the first and the second planning period, WESTAR states will use the 2014-2018 Worst (Haze) Days average in deciviews to compare with the 2018 RPGs. All 2028 RPGs set for the second planning period will relate to the Most (Anthropogenically) Impaired Days, compared to the URP for the adjusted Glide Path.

Meteorological and Emissions Modeling

Meteorological and emission modeling will prepare the inputs for regional modeling. In order to complete these tasks, states must analyze the effects of current and future emissions to determine their effects on visibility at Class I Areas. To complement the 2014 base year emissions inventory, 2014 meteorological data will be used for all the regional modeling analyses. For most of the WESTAR States, this analysis will be done through regional modeling for thirteen states with shared boundaries, which do not include Alaska and Hawaii.

Additional Studies

The scope of analysis to support the 2021 revision is still being developed but it is anticipated it may include the following:

- identify international influence (i.e., upwind boundary concentrations impacting the state, both currently and for 2028 forecasts);
- quantify pollutant specific impacts from international transport;
- determine how international influence varies over time and develop temporal profiles;
- assess meteorological conditions associated with temporal variations; and
- assess the role of atmospheric chemistry on the observed pollutants.

An investigation of source-specific pollutant and temporal profiles is a likely approach but it will be a challenge to distinguish sources that emit similar pollutants. For example, marine vessels and large commercial sources can both contribute to ammonium sulfate. Similarly, it will be difficult to differentiate international versus domestic marine vessel emissions that contribute to reduced visibility in coastal Class I Areas.

Alaska Analysis

For the first regional haze SIP, Alaska was not included in the regional modeling domain. Instead, back trajectory and weighted emission potential analysis (WEP) provided insight into the sources of haze affecting Alaska's Class I Areas. Similar analysis may be conducted for the 2021 regional haze SIP. Alaska's Department of Conservation (DEC) continues to develop and update the Rural Inventory. DEC staff are also working to update and compare the Alaska specific marine and aviation inventories with the NEI inventories to determine what additional analysis will be needed for the 2021 SIP. As a result of the recent update to the Regional Haze Rule (January 2017) Alaska will be developing the selection of the 20% most impaired days to reflect anthropogenic emissions, as scientifically valid data becomes available. Alaska may need to complete additional analysis similar to other states.

Hawaii Analysis

Like Alaska, Hawaii is not included in the Western state regional modeling domain. Nonetheless, Hawaii will need to complete the required analyses of the emissions inventory, monitoring data, and reasonable controls of anthropogenic impact on visibility at Hawaii's Class I Areas in order to set interim goals for 2028 in a Regional Haze SIP for the upcoming planning period. Hawaii also needs to determine the contributions of natural volcanic emissions to haze. The State may also need assistance to determine the impacts of prescribed fires and international emissions on visibility.

Embedded Progress Report

Per section 51.308(f)(1) the Progress Report must include calculations of baseline, current, and natural visibility conditions; and progress to date compared with the uniform rate of progress. Additionally, the state must indicate the differences between current visibility condition and natural visibility conditions, expressed as the number of deciviews by which the current visibility condition exceeds the natural visibility condition, for the Most Impaired and for the Clearest Days.

Monitoring data to determine the deciview average for the Worst (Haze) Days for the five-year period ending 2018 (i.e. 2014-2018) should be available during the preparation of the RH SIP revision due in 2021. This average deciview value should be compared with the 2018 RPGs, which were calculated for Worst (Haze) Days. States could also report on the implementation of the long-term strategy and emissions reductions of the first planning period. Depending on the interference of uncontrollable emissions from extreme episodic events, natural, or international sources, an assessment of progress in achieving the 2018 RPG will be informative, but does not require adjustments to the past Long Term Strategy. The Long Term Strategy of the SIP revision due in 2021 will address any adjustments to the uniform rate of progress. The comparisons in the embedded Progress Report involve analysis of monitoring data, anthropogenic emissions inventories, and implementation of planned reductions only. Modeling is not needed for Progress Report assessments.

Other Issues Affecting Direction of Regional Haze Work

In 2013, after completing their initial Regional Haze SIPs, the fifteen western states comprising WESTAR identified specific areas for revising the RH rule, or where additional guidance was needed. These are referred to as the five “core issues” and reflected the considerable differences in visibility impacts from anthropogenic and natural emissions sources in the western part of the United States. Several of these issues were addressed in the 2017 RHR revisions that applies to developing SIPs for the second 10-year planning period. Others might also be addressed in guidance, but these issues form the basis for the approaches that western states might employ in preparation of their RH SIPs and Progress Reports.

The Five “Core Issues”

A workgroup of regional haze coordinators from WESTAR states developed specific recommendations to address five “core issues” associated with the 1999 RHR. They focused mostly on potential rule changes, and the need for further guidance. Representatives from the Regional Haze Workgroup presented these core issues to U.S. EPA in August 2013, at their Office of Air Quality Planning and Standards headquarters in North Carolina. Subsequent discussions involving other Regional Planning Organizations and the Federal Land Managers resulted in rule revisions opened to public review. Some of WESTAR’s Five Core Issues, described below, were addressed in the January 10, 2017 RHR update.

1. 5-Year Progress Reports

Based on comments from WESTAR, WRAP and others, the 2017 RHR update eliminated the requirement for 5-year progress reports to be SIP revisions. This change is particularly important for states that require a legislative review process for SIPs. A 30 day public comment period is still required for 5-Year Progress Reports prior to submittal to U.S. EPA.

2. Achieving Natural Conditions and Reasonable Progress

This core issue addresses the primary goal of the regional haze rule – to achieve natural conditions – and the concerns states have about how achievable this goal is, the dilemma it poses for states in terms of “controllable vs. uncontrollable” sources and eliminating all anthropogenic contribution to haze by 2064. This issue was partially addressed by U.S. EPA, in the 2017 RHR update, where the 20 percent “worst days” metric was changed to the 20 percent “most impaired days”. The “most impaired days” metric intends to remove days heavily influenced by uncontrollable sources, such as wind-blown dust and wildfire smoke. Until states see the post-processing of baseline and projected IMPROVE data taking into account the new metric, it remains unclear what affect this change may have on states’ ability to achieve reasonable progress and natural conditions. Adjusting the baseline and the options for adjusting Natural Conditions for 2064 also address the western states’ concerns.

3. Developing Effective Long-Term Strategies after BART to Achieve Reasonable Progress

This core issue focuses on “post-BART” implementation, and the concerns states have about the lack of clear and consistent criteria or guidelines in the regional haze rule for developing effective ongoing, long-term strategies to reduce visibility impairment from anthropogenic sources and achieve Natural Conditions by 2064.

4. Integrate Planning

This core issue deals with the need for a multi-pollutant focus and better integration of NAAQS into the regional haze SIP planning process, as NAAQS-related controls are a major source of emission reductions and provide significant visibility benefits, yet their SIP preparation schedule is often out of sync with regional haze SIPs. This issue was largely addressed for the second implementation period in the 2017 RHR update by extending the SIP deadline from 2018 to 2021.

5. Class I Area Visitation as a Consideration

This core issue focuses on whether visitation should play a role in developing regional haze strategies. Based on the July 2016 draft guidance, visitation of a Class 1 Area should not be considered when developing regional haze SIPs. It is assumed that the final guidance will not change regarding visitation.

Of the above core issues, numbers 2 and 3 are the most relevant to the work that states need to conduct in preparing their 2021 SIPs, while others are options for rule changes that are less

essential for 2021. For example, under core issue 2, revisiting the goal of achieving natural conditions, or recalculating the 2064 estimate of natural conditions, are key elements of this core issue, but are not as essential as the need to focus on “controllable” sources. Equally important under core issue 3 is the need for clear and consistent criteria or guidance for developing long-term strategies that are “post-BART.” This information would include the requirements for conducting the “four-factor analysis,” which due to the lack of final guidance, makes it necessary for states to develop the criteria on their own. The need to have a means for relating the proposed controls of the long-term strategy to improvements in visibility are critical.

Controllability of Emissions

(this section needs to be rewritten to explain additional considerations, such as...)

- ❖ Recurrence of natural events, routine and extreme episodes
- ❖ Explaining Residual Veneer of Uncontrollable Sources or Emissions
- ❖ Future Expectations and Unknowns in Forecasting

The 1999 RHR assumed that a dominant set of anthropogenic sources impair visibility and can be reduced through control measures. There are areas in the western U.S. where this assumption does not hold true, because natural emissions can cause the haziest days. The 2017 RHR revisions address this reality by changing the metric for assessing progress in improving visibility by reducing anthropogenic emissions.

Two factors determine whether an emissions source is controllable: the location of the emission source and whether the emissions are naturally-occurring or are anthropogenic. For emissions to be controllable by a state, they must originate from sources in the state and be caused by human activity. Exhibit 8 shows the four possible combinations of location and source type – only one is controllable.

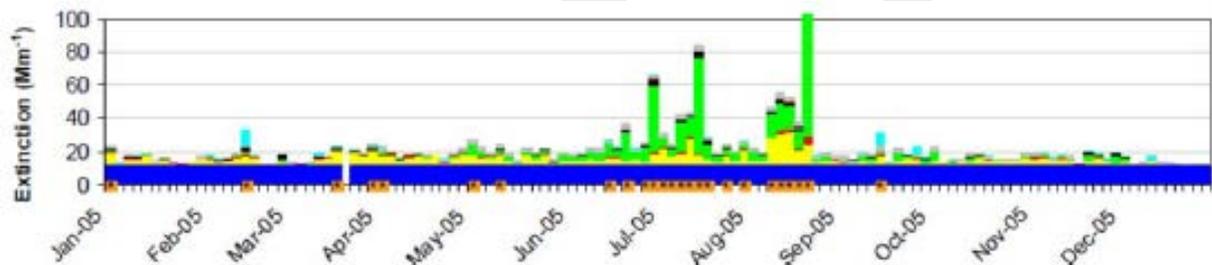
Exhibit 8 – Emissions Controllability

	Originate in United States	Originate Outside US
Anthropogenic	Controllable	Not controllable by states
Not controllable	Not Controllable	Not controllable

Because of uncontrollable sources, the trend in visibility impairment does not necessarily track with the trend in the states’ controllable emissions. Monitoring results indicate the overall pollution levels and visibility impairment. However, separating out the contributions of sources a state can control from the contribution of sources the states cannot control is challenging at best. The states will look at inventories and other information about sources to determine visibility trends from controllable sources. Past and future modeling exercise may be used to attribute visibility impairment to controllable sources.

Wildland fire emissions have the added challenge of varying greatly from year to year. However, states have mechanisms such as FETS, to track wildland fire emissions. Wildfire emissions at times dwarf the controllable emissions, particularly on worst days. Fire emissions are also difficult to forecast, although needed to determine future reasonable progress goals. Trapper Creek, in 2005, demonstrates the potential magnitude of the effects from wildfire emissions. Organic mass carbon is strongly correlated with wildland fires. In Exhibit 9, extinction from organic mass carbon is identified in green. In 2005, the worst days are heavily dominated by wildland fires in July and August. U.S. EPA attempted to address this issue in the 2017 RHR update by changing the metric to focus on anthropogenic impairment. The final 2017 RHR update requires the use of the “most impaired days” and does not allow for states choosing between the “most impaired” or “worst” days, which was listed in the proposed rule for purposes of soliciting comment on the two options.

Exhibit 9 – Light Extinction at Trapper Creek, Alaska



The proposed guidance suggested selecting out all days above the historic 95th percentile for OC+EC, and substituting the long-term mean for those two species’ light extinction on those days, before ranking from highest to lowest deciview. This statistical approach is meant to remove the skewing, without losing the anthropogenic contribution. Western states will be evaluating this suggested guidance to see if it works for western states where wildfires occur every year but can be of different magnitude. In similar respect, e3 for Fine Soil and Coarse Mass due to dust storms would be evaluated.

Anthropogenic emissions from other regions, including Asia, Canada, and Mexico are also likely affecting visibility in the western states. These emissions also vary from year to year, being comprised of natural sources (e.g. wildfires) and anthropogenic sources (e.g. offshore shipping; power generation from fossil fuel combustion) influenced by swings in the global economy. These are also hard to quantify.

When uncontrollable emissions overwhelm controllable emissions, they readily disguise trends in visibility impairment caused by sources the states can regulate. Given the overwhelming nature of wildland fire emissions, it is possible that, although the state may go to great lengths to reduce controllable emissions, visibility may not improve substantially. The effects of international emissions are less clear. Emerging technologies and advancements in modeling

may shed more light on how international emissions are affecting visibility in the west and should be utilized in future regional haze planning.

The western states intend to focus their analytical and planning efforts on controllable emissions, i.e., anthropogenic emissions within state boundaries that have technically and economically feasible emission controls.

At this time, it is unclear how the changing climate may affect the states' ability to meet regional haze goals. Potentially, hotter drier summers could cause more and more severe wildfires. Likewise, extended dry periods could affect dust events. Without a clear understanding of how the climate may be changing, the western states will continue to use base year meteorology for regional modeling of future years.

Reasonably Attributable Visibility Impairment

Reasonably Attributable Visibility Impairment regulatory provisions (section 51.302) are somewhat different in the recently promulgated changes to the Regional Haze rule. Originally promulgated in 1980, the reasonably attributable impairment provisions were very difficult to implement, in large part due to the lack of accepted techniques to characterize the impairment²

As has always been the case, the regulation prescribes a process by which the Federal Land Manager (FLM) identifies a visibility problem to state(s) with an expectation that the state will control emissions from the identified source(s) resulting in an improvement in visibility. Impairment must be associated with a Class I Area and notice must be provided to states in which both the source or sources of impairment are located, as well as the impaired Class I Area(s) are located.

Prior to formally certifying impairment, the Federal Land Manager is obligated to provide the state in which the source(s) are located "an opportunity to consult on the basis of the planned certification."

Once the FLM certifies impairment, providing notice to both the state(s) where the source(s) of concern are located, the state in which the source(s) are located is obligated to revise its regional haze implementation plan within three years of the certification. However, the state is not required to revise its reasonable progress goals in response to a certification by the FLM.

The four source-specific factors to be assessed as part of the long-term strategy for regional haze development process must also be considered by a state when examining the source(s) identified by the FLM. These include the: cost of compliance; time necessary for compliance;

² RA BART and RA BART-like Case Studies. WESTAR Council. June, 2001.

energy and non-air quality environmental impacts; and the remaining useful life of the facility (section 51.308(f)(2)).

Finally, a state may be compelled by U.S. EPA or an FLM to adopt a monitoring strategy specific to reasonably attributable visibility impairment “by visual observation or other appropriate monitoring technique” (section 51.305) in addition to the monitoring strategy for regional haze.

Coordination, Consultation, and Public Outreach

(this section needs to be drafted!)

Resources for Regional Work

(this section will be updated to reflect recent funding)

Completing the tasks required for RH SIP development in the western region requires resources. Funding has yet to be identified for the critical tasks that require regional cooperation and coordination. Emission inventories, monitoring data analysis, control measure analysis and long-term strategy development, all feed into regional modeling to determine the reasonable progress goals. Assembling and storing current and forecasted inventory information, monitoring data, and modeling output in a shared and accessible database is critical. Regional modeling is the culminating task supporting SIP development, because final regional modeling of the state-selected control strategies determines the reasonable progress goals.

Some of the emissions inventory, monitoring data analysis, and control strategy development can be performed by each state as in-kind work, contributing the regional modeling inputs. Not all states have the same resources or capability to do some of the emissions forecasting needed for regional modeling input. Part of the cooperative work will be to set up agreed-upon protocols for the RH SIP requirements that feed into the regional modeling. Some of the adjustments to the baseline and Natural Conditions require modeling to determine the appropriate values expressed in deciviews. State staff will support analysis efforts by providing data and reviewing work. However, regional work, contracted through the WRAP will require additional funding.

Regional work and resources needs are outlined in the WRAP work plan.

Appendix A – Regional Haze Rule (1999 version, update with 2017 revision and include side-by-side comparison)

Rule Text	Summary	Regional Work Needed
(d) What are the core requirements for the implementation plan for regional haze? [SIP]		
51.308(d) The State must address regional haze in each mandatory Class I Federal area located within the State and in each mandatory Class I Federal area located outside the State which may be affected by emissions from within the State. To meet the core requirements for regional haze for these areas, the State must submit an implementation plan containing the following plan elements and supporting documentation for all required analyses:	States will submit SIPs	–
51.308(d) Reasonable progress goals. For each mandatory Class I Federal area located within the State, the State must establish goals (expressed in deciviews) that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least impaired days over the same period.	State will establish new RP goals based on current monitoring data, emissions estimates, control strategies, and other information.	Regional modeling
51.308(d) In establishing a reasonable progress goal for any mandatory Class I Federal area within the State, the State must: (A) Consider the costs of compliance, the time necessary for compliance, the energy and non-air quality environmental impacts of compliance, and the remaining useful life of any potentially affected sources, and include a demonstration showing how these factors were taken into consideration in selecting the goal.	Use 4-factor analysis to determine reduction measures.	Four- factor analysis

51.308(d) (1)(i)(B)	Analyze and determine the rate of progress needed to attain natural visibility conditions by the year 2064. To calculate this rate of progress, the State must compare baseline visibility conditions to natural visibility conditions in the mandatory Federal Class I area and determine the uniform rate of visibility improvement (measured in deciviews) that would need to be maintained during each implementation period in order to attain natural visibility conditions by 2064. In establishing the reasonable progress goal, the State must consider the uniform rate of improvement in visibility and the emission reduction measures needed to achieve it for the period covered by the implementation plan.	Depending on the expected emission reductions, states may revise the date natural conditions are expected to be achieved.	Regional modeling, rate of progress determination.
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Rule Text	Summary	Regional Work Needed	
51.308(d) (1)(ii)	For the period of the implementation plan, if the State establishes a reasonable progress goal that provides for a slower rate of improvement in visibility than the rate that would be needed to attain natural conditions by 2064, the State must demonstrate, based on the factors in paragraph (d)(1)(i)(A) of this section, that the rate of progress for the implementation plan to attain natural conditions by 2064 is not reasonable; and that the progress goal adopted by the State is reasonable. The State must provide to the public for review as part of its implementation plan an assessment of the number of years it would take to attain natural conditions if visibility improvement continues at the rate of progress selected by the State as reasonable.	States will revise RP goal based on emission reductions available for this implementation period. If the expected date to achieve natural conditions is later than 2064, states must demonstrate unreasonableness of meeting natural conditions in 2064	Four-factor analysis
51.308(d) (1)(iii)	In determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions, the Administrator will evaluate the demonstrations developed by the State pursuant to paragraphs (d)(1)(i) and (d)(1)(ii) of this section.	No state action.	No state action.
51.308(d) (1)(iv)	In developing each reasonable progress goal, the State must consult with those States which may reasonably be anticipated to cause or contribute to visibility impairment in the mandatory Class I Federal area. In any situation in which the State cannot agree with another such State or group of States that a goal provides for reasonable progress, the State must describe in its submittal the actions taken to	Must consult.	State consultation process.

resolve the disagreement. In reviewing the State's implementation plan submittal, the Administrator will take this information into account in determining whether the State's goal for visibility improvement provides for reasonable progress towards natural visibility conditions.

51.308(d) (1)(v)	The reasonable progress goals established by the State are not directly enforceable but will be considered by the Administrator in evaluating the adequacy of the measures in the implementation plan to achieve the progress goal adopted by the State.	Reasonable progress goals are not enforceable.	No state action
51.308(d) (1)(vi)	The State may not adopt a reasonable progress goal that represents less visibility improvement than is expected to result from implementation of other requirements of the CAA during the applicable planning period.	Reasonable progress goal must be at least as much as is expected from other CAA requirements.	Regional analysis of 'on the books' emission reductions from other CAA requirements to determine 'base case' visibility.

Rule Text	Summary	Regional Work Needed
51.308(d) (2)(i) <i>Calculations of baseline and natural visibility conditions.</i> For each mandatory Class I Federal area located within the State, the State must determine the following visibility conditions (expressed in deciviews): (i) Baseline visibility conditions for the most impaired and least impaired days. The period for establishing baseline visibility conditions is 2000 to 2004. Baseline visibility conditions must be calculated, using available monitoring data, by establishing the average degree of visibility impairment for the most and least impaired days for each calendar year from 2000 to 2004. The baseline visibility conditions are the average of these annual values. For mandatory Class I Federal areas without onsite monitoring data for 2000-2004, the State must establish baseline values	Completed as part of the initial SIP. Same values will be used unless the visibility formula is modified.	No state action at this time.

	using the most representative available monitoring data for 2000-2004, in consultation with the Administrator or his or her designee;		
51.308(d) (2)(ii)	For an implementation plan that is submitted by 2003, the period for establishing baseline visibility conditions for the period of the first long-term strategy is the most recent 5-year period for which visibility monitoring data are available for the mandatory Class I Federal areas addressed by the plan. For mandatory Class I Federal areas without onsite monitoring data, the State must establish baseline values using the most representative available monitoring data, in consultation with the Administrator or his or her designee;	Not applicable beyond initial SIP.	No state action
51.308(d) (2)(iii)	Natural visibility conditions for the most impaired and least impaired days. Natural visibility conditions must be calculated by estimating the degree of visibility impairment existing under natural conditions for the most impaired and least impaired days, based on available monitoring information and appropriate data analysis techniques; and	Completed as part of the first haze SIP. Same values will be used unless the natural conditions calculations are revised.	No state action at this time.
51.308(d) (2)(iv)(A)	For the first implementation plan addressing the requirements of paragraphs (d) and (e) of this section, the number of deciviews by which baseline conditions exceed natural visibility conditions for the most impaired and least impaired days; or	Not applicable beyond initial SIP.	No state action
51.308(d) (2)(iv)(B)	For all future implementation plan revisions, the number of deciviews by which current conditions, as calculated under paragraph (f)(1) of this section, exceed natural visibility conditions for the most impaired and least impaired days.	Calculate difference between current conditions and natural conditions.	IMPROVE monitoring data analysis

Rule Text	Summary	Regional Work Needed
51.308(d)(3) Long-term strategy for regional haze. Each State listed in §51.300(b)(3) must submit a long-term strategy that addresses regional haze visibility impairment for each mandatory Class I Federal area within the State and for each mandatory Class I Federal area located outside the State which may be affected by emissions from the State. The long-term strategy must include enforceable emissions limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals established by States having mandatory Class I Federal areas. In establishing its long-term strategy for regional haze, the State must meet the following requirements;	States must submit a long-term strategy	–
51.308(d)(3)(i) Where the State has emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area located in another State or States, the State must consult with the other State(s) in order to develop coordinated emission management strategies. The State must consult with any other State having emissions that are reasonably anticipated to contribute to visibility impairment in any mandatory Class I Federal area within the State.	States must consult.	State consultation process
51.308(d)(3)(ii) Where other States cause or contribute to impairment in a mandatory Class I Federal area, the State must demonstrate that it has included in its implementation plan all measures necessary to obtain its share of the emission reductions needed to meet the progress goal for the area. If the State has participated in a regional planning process, the State must ensure it has included all measures needed to achieve its apportionment of emission reduction obligations agreed upon through that process.	States must demonstrate its plan includes all measures necessary to obtain emission reduction goals for the areas it affects.	Regional analysis and source apportionment
51.308(d)(3)(iii) The State must document the technical basis, including modeling, monitoring and emissions information, on which the State is relying to determine its apportionment of emission reduction obligations necessary for achieving reasonable progress in each mandatory Class I Federal area it affects. The State may meet this requirement by relying on technical analyses developed by the regional planning organization and	States must document technical analysis.	Regional analysis documentation

approved by all State participants. The State must identify the baseline emissions inventory on which its strategies are based. The baseline emissions inventory year is presumed to be the most recent year of the consolidate periodic emissions inventory.

The 2011 emissions inventory will be the baseline for this implementation period.

51.308(d) (3)(iv)	The State must identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy. The State should consider major and minor stationary sources, mobile sources, and area sources.	Focus on controllable anthropogenic sources	Emission inventories, four-factor analysis
Rule Text	Summary	Regional Work Needed	
51.308(d) (3)(v)(A)	The State must consider, at a minimum, the following factors in developing its long-term strategy: (A) Emission reductions due to ongoing air pollution control programs, including measures to address reasonably attributable visibility impairment;	-	-
51.308(d) (3)(v)(B)	Measures to mitigate the impacts of construction activities;	-	-
51.308(d) (3)(v)(C)	Emissions limitations and schedules for compliance to achieve the reasonable progress goal	-	-
51.308(d) (3)(v)(D)	Source retirement and replacement schedules;	-	-

1.308(d) (3)(v)(E)	Smoke management techniques for agricultural and forestry management purposes including plans as currently exist within the State for these purposes;	-	-
51.308(d) (3)(v)(F)	Enforceability of emissions limitations and control measures; and	-	-
51.308(d) (3)(v)(G)	The anticipated net effect on visibility due to projected changes in point, area, and mobile source emissions over the period addressed by the long-term strategy.	-	Regional modeling
51.308(d) (4)	<p><i>Monitoring strategy and other implementation plan requirements.</i></p> <p>The State must submit with the implementation plan a monitoring strategy for measuring, characterizing, and reporting of regional haze visibility impairment that is representative of all mandatory Class I Federal areas within the State.</p> <p>This monitoring strategy must be coordinated with the monitoring strategy required in §51.305 for reasonably attributable visibility impairment. [RAVI]</p> <p>Compliance with this requirement may be met through participation in the Interagency Monitoring of Protected Visual Environments network. [IMPROVE]</p>	States must submit a monitoring plan.	-
51.308(d) (4)(i)	<p>The implementation plan must also provide for the following:</p> <p>(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.</p>	Monitoring considerations may need to include provisions for reduced IMPROVE budget.	-

Rule Text	Summary	Regional Work Needed
51.308(d)(4)(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 Federal areas both within and outside the State.	States must describe how monitoring data and other information are used to determine contributions to impairment at Class I sites.	Document source apportionment and regional modeling.
51.308(d)(4)(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.	<i>Not applicable to western states.</i>	<i>Not applicable to western states</i>
51.308(d)(4)(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.	Done through IMPROVE network	–
51.308(d)(4)(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.	Baseline inventory was completed as part of initial SIP. The 2011 EI will be used as the foundation for the analysis for this SIP revision, with projections to 2018 and 2028.	Emissions inventories
(f) Requirements for comprehensive periodic revisions of implementation plans for regional haze [PROGRESS REPORT]		
51.308(f) Each State identified in § 51.300(b)(3) must revise and submit its regional haze implementation plan revision to EPA by July 31, 2018 and every ten years thereafter. In each plan revision, the State must evaluate and reassess all of the elements required in paragraph (d) of this section, taking into account improvements in monitoring data	States will submit revised SIPs by July 31, 2018.	–

collection and analysis techniques, control technologies, and other relevant factors. In evaluating and reassessing these elements, the State must address the following:

51.308(f) (1)	Current visibility conditions for the most impaired and least impaired days, and actual progress made towards natural conditions during the previous implementation period. The period for calculating current visibility conditions is the most recent five year period preceding the required date of the implementation plan submittal for which data are available. Current visibility conditions must be calculated based on the annual average level of visibility impairment for the most and least impaired days for each of these five years. Current visibility conditions are the average of these annual values.	Analysis similar to what was done for the progress reports. Monitoring data for visibility calculations is expected to be available through 2014.	IMPROVE monitoring data analysis
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	Rule Text	Summary	Regional Work Needed
51.308(f) (2)	The effectiveness of the long-term strategy for achieving reasonable progress goals over the prior implementation period(s); and	The effectiveness of the longterm strategy over the prior period will be addressed through the analysis of the monitoring data, emissions data, and other relevant information.	IMPROVE monitoring data analysis and emission inventories for comparison.
51.308(f) (3)	Affirmation of, or revision to, the reasonable progress goal in accordance with the procedures set forth in paragraph (d)(1) of this section. If the State established a reasonable progress goal for the prior period which provided a slower rate of progress than that needed to attain natural conditions by the year 2064, the State must evaluate and determine the reasonableness, based on the factors in paragraph (d)(1)(i)(A) of this section, of additional measures that could be adopted to achieve the degree of visibility improvement projected by the analysis contained in the first implementation plan described in paragraph (d)(1)(i)(B) of this section.	See paragraph (d) section above.	Regional modeling and four-factor analysis

(i) What are the requirements for State and Federal Land Manager coordination?

51.308(i) (1)(i) and (ii)	By November 29, 1999, the State must identify in writing to the Federal Land Managers the title of the official to which the Federal Land Manager of any mandatory Class I Federal area can submit any recommendations on the implementation of this subpart including, but not limited to: (i) Identification of impairment of visibility in any mandatory Class I Federal area(s); and (ii) Identification of elements for inclusion in the visibility monitoring strategy required by § 51.305 and this section.	Not applicable	No state action required.
51.308(i) (2)(i) and (ii)	The State must provide the Federal Land Manager with an opportunity for consultation, in person and at least 60 days prior to holding any public hearing on an implementation plan (or plan revision) for regional haze required by this subpart. This consultation must include the opportunity for the affected Federal Land Managers to discuss their: (i) Assessment of impairment of visibility in any mandatory Class I Federal area; and (ii) Recommendations on the development of the reasonable progress goal and on the development and implementation of strategies to address visibility impairment.	FLM consultation	FLM coordination with regional analysis
Rule Text	Summary	Regional Work Needed	
51.308(i) (3)	In developing any implementation plan (or plan revision), the State must include a description of how it addressed any comments provided by the Federal Land Managers.	–	–
51.308(i) (4)	The plan (or plan revision) must provide procedures for continuing consultation between the State and Federal Land Manager on the implementation of the visibility protection program required by this subpart, including development and review of implementation plan revisions and 5-year progress reports, and on the implementation	–	–

of other programs having the potential to contribute to impairment of visibility in mandatory Class I Federal areas.

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