ADEQ 2021 Regional Haze State Implementation Plan Source Screening Methodology

The Clean Air Act (CAA) and the EPA Regional Haze rule (RHR) require States to submit periodic state implementation plans (SIP) to demonstrate the State's approach for making progress toward achieving their visibility improvement goals in federal Class I areas. The RHR requires States to establish visibility improvement goals that provide for ''reasonable progress'' toward achieving natural visibility conditions called reasonable progress goals (RPGs). In establishing the RPGs, States are required to consider the four statutory reasonable progress factors.[1] To achieve these RPG's, States are additionally required to develop a long term strategy (LTS) that must "include emission limits, schedules of compliance and other measures as may be necessary to make reasonable progress'' and "identify all anthropogenic sources of visibility impairment considered by the State in developing its long-term strategy".[2, 3]

In order to meet these requirements ADEQ has developed a source screening methodology to clarify the criteria the State will utilize to determine the point sources and nonpoint source categories that will be evaluated for emission control measures (i.e. four factor analyses) for the second planning period. The methodology presented is a variation of the recommended Western Regional Air Partnership (WRAP) source screening methodology.[4]

This document presents:

1. ADEQ's determination of which pollutant species to consider.
2. ADEQ's methodology for determining what point sources to consider, the methodology for excluding effectively controlled processes, and the results of this analysis.
3. ADEQ's methodology for determining which nonpoint source categories to consider and the results of that analysis.

Based on the methodologies presented in this document, ADEQ has identified 11 permitted sources (Table 1) and six nonpoint source sectors (Table 2) to evaluate for controls utilizing the four factor analysis.

[1] 40 CFR 51.308(d)(1)(i)(A)
[2] 82 FR 3078, 3084 (January 10, 2017)
[3] 40 CFR 51.308(d)(3)
[4] WRAP. WRAP Reasonable Progress Source Identification and Analysis Protocol for Second 10-year Regional Haze State Implementation Plans. February 27, 2019.

Table 1: Arizona permitted sources that will undergo the four factor analysis based on source screening results

Facility	Q (tpy)	d (km)	Q/D	Nearest CIA
Tucson Electric Power Co - Springerville	17,697	50	352	Mount Baldy WA
Freeport-McMoran - Morenci	2,768	54	52	Gila WA
ASARCO LLC - Mission Complex	1,254	42	30	Saguaro WA
Freeport-McMoran - Sierrita Mine	869	42	21	Saguaro WA
El Paso Natural Gas – Williams Compressor Station	786	19	40	Sycamore Canyon WA
Tucson Electric Power Co - Irvington	545	16	34	Saguaro WA
Drake Cement LLC	375	22	17	Sycamore Canyon WA
ASARCO LLC - Ray Operations	371	26	14	Superstition WA
El Paso Natural Gas – Willcox Compressor Station	321	27	12	Chiricahua WA
CalPortland - Rillito Cement Plant (APCC)	246	8	30	Saguaro WA
Phoenix Cement - Clarkdale	140	10	14	Sycamore Canyon WA

Sources controlled in Regional Haze round 1 are highlighted in brown.
Additional changes to these values may occur based on source feedback on ADEQ's effective control identifications.

Table 2: Six Arizona nonpoint source sectors identified for four factor analysis, with a Q >13,500 tons/year (tpy).

SCC	NO_x	PM_{10}	SO_2	Q	Sector
2285002006	18,045	541	11	18,597	Mobile - Locomotives
2294000000	0	14,501	0	14,501	Dust - Paved Road Dust
2296000000	0	107,924	0	107,924	Dust - Unpaved Road Dust
2311020000	0	15,536	0	15,536	Dust – Industrial/Commercial/Institutional Construction Dust
2325000000	0	44,753	0	44,753	Industrial Processes - Mining
2701220000	13,912	0	0	13,912	Biogenics - Vegetation and Soil

Significantly Contributing PM species

EPA final guidance states that:

"When selecting sources for analysis of control measures, a state may focus on the PM species that dominate visibility impairment at the Class I areas affected by emissions from the state and then select only sources with emissions of those dominant pollutants and their precursors. Also, it may be reasonable for a state to not consider measures for control of the remaining pollutants from sources that have been selected on the basis of their emissions of the dominant pollutants. IMPROVE data and a 2018 EPA technical guidance document on tracking visibility progress can be used directly to develop light extinction budgets (i.e., pie charts showing the light extinction contribution from each ambient PM species) for single days and average budgets for the 20 percent most anthropogenically impaired days.

These budgets reveal the relative importance of each PM species to total light extinction. As such, they may be used by a state to focus its SIP development work on the pollutants that matter most."[5]

ADEQ evaluated the anthropogenic light extinction for particulate species on the 20% most impaired days at Class I areas within the State of Arizona. Based on this evaluation, the following percentage breakdowns of total light extinction (Table 3) and anthropogenic extinction (Table 4) were calculated for each of the species on the 20% most impaired days in Arizona Class I areas.[6]

When examining total light extinction, it is necessary for ADEQ to include the ammonium sulfate (sulfate), ammonium nitrate (nitrate), organic mass carbon (OMC), and coarse mass (CM) impacts in order to address 80% of the impact at the monitor. However, when only the anthropogenic portion of the impact is considered (Table 4), including only the sulfate, nitrate, and coarse mass impacts gives an average impact of 80% amongst the Arizona class I areas. Petrified Forest National Park (PEFO) has the lowest impact from these three species. Even examining PEFO specifically, the impact from these three species account for >72% of the impact at the monitor (Table 5).

Table 3: 2013-2017 Most Impaired Days particulate matter species relative total impact (% total average light extinction).[7]

Site	Sulfate	Nitrate	OMC	LAC	Soil	CM
BALD1	46.6%	5.1%	24.9%	6.3%	4.5%	12.4%
CHIR1	49.1%	4.9%	16.1%	4.9%	4.2%	20.4%
GRCA2	43.9%	8.8%	21.5%	6.3%	6.5%	12.3%
IKBA1	37.2%	12.0%	20.7%	6.5%	4.8%	17.9%
PEFO1	36.7%	7.7%	22.3%	10.4%	4.8%	17.7%
SAGU1	36.3%	10.3%	16.8%	6.8%	6.0%	22.9%
SIAN1[a]						
SYCA1[a]						
TONT1	38.2%	8.4%	19.6%	6.2%	5.6%	21.2%

[a] Values cannot be calculated for these sites for 2013-2017 due to incomplete data.

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

[6] Total light extinction refers to the extinction impact at the monitor on the most impaired days from both natural and anthropogenic sources. Anthropogenic light extinction excludes the extinction impact of natural sources on the most impaired days, as estimated using EPA's most impaired day calculation methodology in their December 20, 2018 guidance document (*Technical Guidance on Tracking Visibility Progress for the Second Implementation Period of the Regional Haze Program*).

[7] In this document visibility impairing particulate species are referred to by the following terms: ammonium sulfate (sulfate), ammonium nitrate (nitrate), organic mass carbon (OMC), light absorbing carbon (LAC), fine soil (Soil), and coarse mass (CM)

Table 4: 2013-2017 Most Impaired Days particulate matter species relative anthropogenic impact (% total average light extinction).[8]

Site	Sulfate	Nitrate	OMC	LAC	Soil	CM
BALD1	78.7%	2.6%	9.3%	7.8%	1.6%	0.0%
CHIR1	71.4%	3.1%	3.7%	5.2%	2.2%	14.4%
GRCA2	80.5%	6.2%	2.3%	7.5%	3.4%	0.0%
IKBA1	56.7%	12.3%	11.8%	8.1%	3.0%	8.2%
PEFO1	58.0%	5.6%	9.6%	15.2%	2.9%	8.7%
SAGU1	48.4%	10.7%	8.9%	7.7%	5.2%	19.1%
SIAN1[a]						
SYCA1[a]						
TONT1	52.9%	7.9%	12.4%	7.4%	4.1%	15.3%

[a] Values cannot be calculated for these sites for 2013-2017 due to incomplete data.

Table 5: Cumulative visibility impact of Sulfate, Nitrate, and Coarse Mass at Arizona Class I Areas (% of anthropogenic visibility impairment based on 2013-2017 most impaired day average extinction)

Site	Sulfate + Nitrate + CM (% total extinction)
BALD1	81.3%
CHIR1	88.8%
GRCA2	86.7%
IKBA1	77.2%
PEFO1	72.3%
SAGU1	78.2%
TONT1	76.1%
Site Average	80.1%

Further examination of the emissions that control OMC visibility impairment additionally provide evidence that this species may not be necessary for consideration in this round of planning. For the purposes of this analysis, OMC impacts are assumed to be a product of VOC emissions. Examining EPA's 2014 National Emission Inventory (NEI) indicates that 2.1 million tons of VOC were emitted in 2014 in the State of Arizona. Those emissions can be separated by major sector into the categorizations listed in Table 6. Given that wildfire emissions cannot be controlled by the State and prescribed fire emissions are already subject to Arizona's smoke management program[9], ADEQ does not feel that fire emissions can be further controlled in this round. Additionally, onroad emissions are primarily controlled through federal government mobile source engine controls and will not be analyzed in this round of regional haze planning. While point source represent a sector for which ADEQ can control VOC emissions, these emissions only comprise 0.2% of the total VOC emissions in the State and are, therefore, unlikely to have

[8] ibid

[9] Arizona Administrative Code. Title 18, Chapter 2, Article 15. https://apps.azsos.gov/public_services/Title_18/18-02.pdf

a significant impact on OMC visibility impacts. Finally, biogenic and anthropogenic nonpoint emissions comprise >90% of the total statewide VOC emissions in 2014; however, of the 1.934 million tons emitted in 2014, natural biogenic sources released 1.851 million tons or 96% of the total nonpoint VOC. The remaining anthropogenic nonpoint VOC emissions comprise only 3.9% of the total VOC statewide inventory.

Table 6: 2014 Arizona VOC emissions by major sector

Sector	VOC Emissions (tons)	Fraction of total emissions (%)
Nonpoint (biogenic)	1,850,671	86.5%
Nonpoint (anthropogenic)	83,281	3.9%
Onroad	55,882	2.6%
Point	5,307	0.2%
Fires	145,090	6.8%
Total	2,140,231	100.0%

Given the results presented in the Table 6 and the limited controllable VOC emissions discussed in the previous paragraph, ADEQ determined that sulfate, nitrate, and coarse mass are the three species which should be evaluated for source controls during this planning period in order to maximize the benefit of controls.

While, organic carbon mass (OMC) and light absorbing carbon (LAC) also exceed 10% of the light extinction impact for at least one of the Class I areas, ADEQ is not proposing to include these species for evaluation in this round of Regional Haze planning for the reasons specified previously[10], as well as:

1. Sulfate, nitrate, and coarse mass account for 72% - 89% of anthropogenic light extinction in Arizona Class I areas.
2. OMC and LAC species are generally dominated by fire or natural emissions and ADEQ intends to partially address the impacts of prescribed wildland fires through the Uniform Rate of Progress adjustment.
3. For non-fire related OMC and LAC, ADEQ expects that a control strategy targeting sulfate, nitrate, and coarse mass emissions will additionally provide some ancillary reductions to organic carbon and light absorbing carbon emissions.
4. ADEQ will commit to reevaluating the impact from OMC and LAC in future planning periods and include these species in future control analyses, as needed.

Point Source Screening Methodology

The following steps outline ADEQ's methodology for source screening of point sources. The methodology generally follows the Q/d approach recommended by the WRAP. However, ADEQ includes additional steps in order to account for facilities that have installed or will install, prior to the end of the

[10] In addition, WRAP outlines additional reasons States should not targeting OCM and LAC emissions in the document: *Draft WRAP Reasonable Progress Source Identification and Analysis Protocol for Second 10-year Regional Haze State Implementation Plans*.

second planning period, effective controls. Determination of effective controls and their treatment are discussed in a subsequent chapter of this document (see page 7).

1. Gather all 2014 major permitted source emissions data within the State of Arizona.
    a. Data requests were forwarded to Maricopa, Pinal, and Pima Counties for any permitted source information they may not have previously shared with ADEQ and/or EPA.
    b. Generally EPA's NEI dataset was the preferred data source, except where data were missing or incorrect data was identified. In these cases, locally provided data was substituted.
2. Sum facility-wide PM_{10} primary, nitrogen oxide, and sulfur dioxide annual emissions (tons/yr) to calculate "Q".[11, 12]
3. Isolate those sources with a Q value greater than 10.
4. Utilize GIS to plot the location of each point source and the boundary of all Class I areas within Arizona and surrounding States.
5. Calculate the distance from each source to the nearest Class I area boundary in kilometers to calculate "d".
6. Calculate "Q/d" and isolate those sources with a Q/d value greater than 10.
7. Evaluate 2018 operational and emissions data and determine which processes have had an effective control installed within the last five years.[13]
8. Defer effectively controlled processes from further consideration in this round of planning and calculation of Q (including all NO_x, SO_2, and PM_{10} emissions). Effectively controlled processes will be reevaluated in future rounds of Regional Haze planning.
9. Recalculate Q utilizing the remaining processes and 2018 data.
10. Recalculate Q/d utilizing the 2018 Q value and isolate those sources with a Q/d greater than 10.

Figure 1 presents a flowchart of ADEQ's source screening process for this round of Regional Haze. Utilizing the major source screening approach outlined above, the sources who will need to undergo a four factor analysis are listed in Table 1.

[11] WRAP's current suggested approach also calls for the inclusion of SO_4; however, ADEQ believes that the addition of SO_4 would result in double counting since the NEI currently includes SO_4 as a subset of $PM_{2.5}$ and thus PM_{10}. Therefore, SO_4 was not included in our calculations.

[12] WRAP further suggests the exclusion of fugitive PM_{10} emissions; however, ADEQ has chosen to include fugitive emissions. ADEQ considers these emissions of equal importance to stack emissions in visibility degradation.

[13] ADEQ will confirm its effective control determinations with impacted facilities. Please note that some results may change as ADEQ receives feedback on these determinations from facilities.

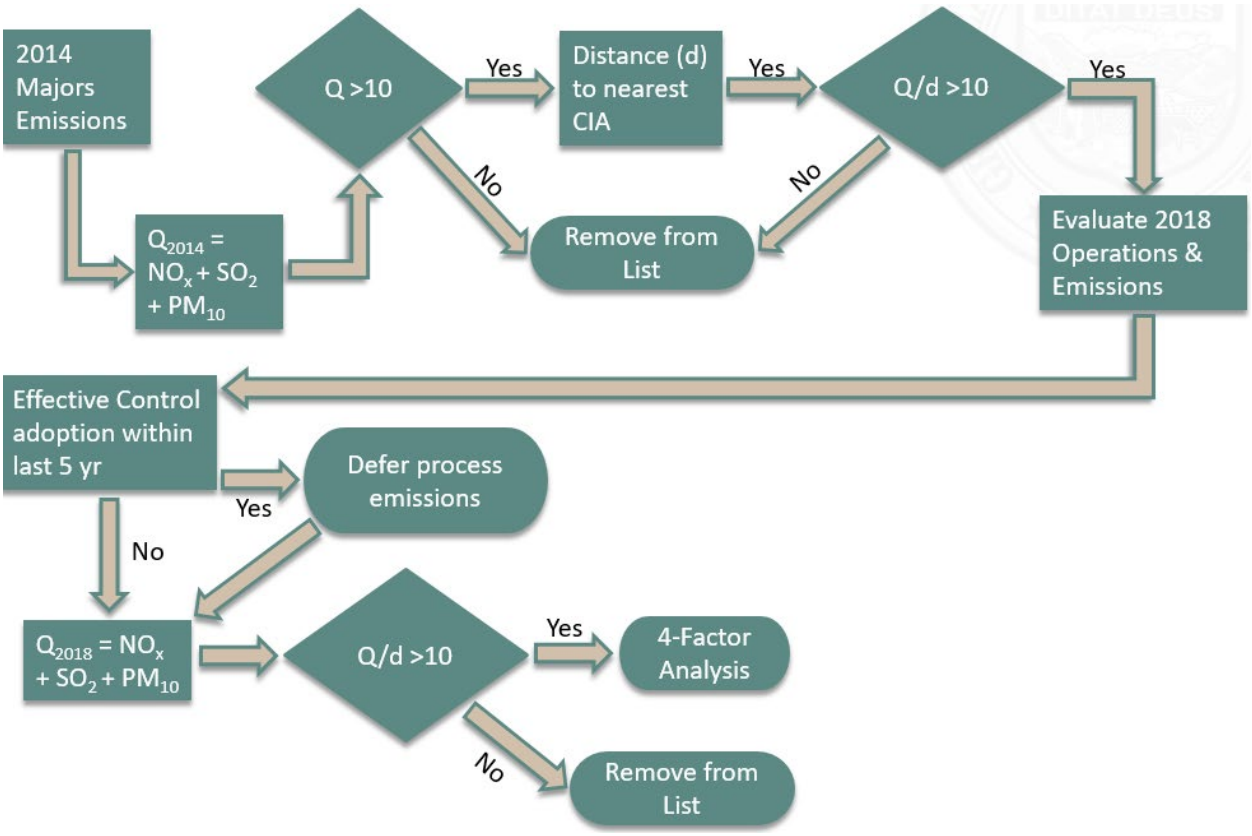

Figure 1: ADEQ Regional Haze point source screening flowchart

ADEQ Methodology for Effective Control Determinations

The Regional Haze rule requires the State of Arizona to develop an LTS that must "include enforceable emission limitations, compliance schedules, and other measures as necessary to achieve the reasonable progress goals established by states having mandatory Class I Federal areas".[14] In establishing a screening methodology to identify which emission sources to analyze for possible emission control measures, the State is not obligated to evaluate all sources and may reasonably select a set of sources to consider. The RHR does not identify specific emission sources or source categories that a state must consider, rather the rule requires SIPs to include "a description of the criteria it used to determine which sources or groups of sources it evaluated and how the four factors were taken into consideration in selecting the measures for inclusion in its long-term strategy".[15]

In alignment with the requirements of the RHR, the Arizona Department of Environmental Quality (ADEQ) has performed source screening to determine the point sources and nonpoint source categories

[14] *supra* note 3
[15] 40 CFR 51.308(f)(2)(i)

the State is selecting to evaluate during the second planning period. The point source screening approach utilized by ADEQ is presented earlier in this document (Figure 1).

A key step in ADEQ's source screening process is the isolation and removal of emissions from processes that have had effective controls installed in the last five years. In light of the significant analytical work that ADEQ has already conducted to evaluate some of the screened sources and taking into account the recent large expenditures by source owners to reduce emissions through various CAA programs, ADEQ agrees with the assertion in EPA's final Regional Haze guidance that "there will be only a low likelihood of a significant technological advancement that could provide further reasonable emission reductions having been made in the intervening period".[16]

While EPA has provided a series of examples on what may constitute an effectively controlled source, EPA has not provided a formal definition for effective controls. Furthermore, EPA has not provided a clear understanding as to whether the definition of "source" in the context of effective controls refers to a unit, process, release point, or facility. As such, ADEQ is clarifying in this document the criteria the State plans to utilize to defer consideration of effectively controlled processes to the next implementation period.

Facility Identification

As evidenced by the source screening process flow chart (Figure 1), ADEQ did not perform effective control determinations for all sources. ADEQ only considered sources that met the following criteria:

1. 2014 facility-wide Q (i.e. sum of NO_x, SO_2, and PM-10 emissions) > 10
2. 2014 Q/d > 10

Based on these two criteria, the following sources were evaluated for having installed effective controls within the last five years:

Source
Arizona Electric Power Cooperative - Apache Generating Station
Arizona Public Service - Cholla Power Plant
ASARCO LLC - Hayden Smelter
ASARCO LLC - Mission Complex
ASARCO LLC - Ray Operations
CalPortland - Rillito Cement Plant (APCC)
Lhoist NA – Nelson Plant
Salt River Power - Coronado Generating Plant
Drake Cement LLC
El Paso Natural Gas - Willcox Compressor Station
El Paso Natural Gas - Williams Compressor Station
Freeport-McMoran - Miami Smelter

[16] *supra* note 5

Source
Freeport-McMoran - Morenci Inc.
Freeport-McMoran - Sierrita Inc.
Phoenix Cement - Clarkdale
Tucson Electric Power Co - Irvington
Tucson Electric Power Co - Springerville

Effective Control Determination

A number of the sources listed above have undergone recent facility upgrades to address air pollution control through one or multiple air quality programs. As previously discussed, ADEQ considers it unlikely that a full four factor analysis on these effectively controlled sources would identify additional reasonable controls. ADEQ developed the following criteria for determination of what constitutes an effective control:

1. The control was installed within the last five years of this analysis (i.e. in or since 2014) or will be installed prior to 2028
2. The control was installed to meet the requirements of one of following programs:
    a. Prevention of Significant Deterioration (PSD) or is otherwise considered a BACT-level control
    b. Round 1 Regional Haze Best Available Retrofit Technology (BART) including BART alternatives, BART reconsiderations, or better-than-BART determinations
    c. Round 1 Regional Haze Reasonable Progress
    d. Other SIP actions to achieve NAAQS compliance
3. Process emissions must be controlled through routing those emissions through a newly constructed or recently upgraded pollution control device or taking emission limits that would otherwise equate to the installation of a pollution control device.

ADEQ further determined that the application of the effective control screening should be applied at the process level as opposed to applying the exclusion at the facility-wide level. While the air quality program actions that lead to an effective control technology installation do reduce facility-wide emissions, they are generally applied at the unit or process level, which may leave additional uncontrolled facility processes open to reasonable progress evaluations.

Application of Effective Control Determinations for Source Screening & Four Factor Analysis

In applying its effective control determinations to the source screening process and the four factor analysis, ADEQ plans to:

1. Exclude all NOx, SO_2, and PM_{10} annual emissions from the facility-wide calculation of Q for the process to which an effective control was installed.
2. Exclude the process that installed an effective control from consideration of a four factor analysis during this implementation period. These processes will be deferred from control

consideration in this round of Regional Haze planning and will be considered in subsequent rounds of planning, as appropriate.

Finally, ADEQ intends to further limit the number of processes considered for the four factor analysis to only those processes that make up the top 80% of emissions at the source. The intent of this limitation is to further target reported emission processes that significantly contribute to facility-wide emissions.

Nonpoint Source Screening Methodology

During and following ADEQ's October 2, 2018 Regional Haze 2021 planning stakeholder kickoff meeting, ADEQ received feedback from stakeholders asking that we consider sources that were not previously controlled in the last round of planning. Given that the last round of controls focused on major permitted sources, ADEQ determined that it was appropriate to also examine nonpoint sources that contribute to visibility impacting emissions. As such ADEQ employed the following approach when screening area sources for the four factor analysis:

1. Gather 2014 EPA NEIv2 county-level nonpoint datasets for the State of Arizona.
2. Isolate source classification code (SCC) annual emissions (tons/yr) for PM_{10} primary, nitrogen oxide, and sulfur dioxide.
3. Remove PM_{10}-PRI emissions from consideration for those counties that are not located within 50 km of a Class I area since PM_{10} does not generally experience high transport distances.
4. Sum the remaining SCC-specific PM_{10} primary, nitrogen oxide, and sulfur dioxide annual emissions to calculate "Q".
5. Sort all SCCs from highest to lowest "Q".
6. Determine the "Q"-threshold which achieved inclusion of the SCCs with the largest "Q's" until >80% of total "Q" emissions across all SCCs are accounted for (i.e. "Q" >13,500 tpy includes 6 sectors which account for 81.6% of the total statewide nonpoint "Q").
7. Isolate those sources with a "Q" value greater than 13,500 tpy.

Based on the approach outlined above, the area source sectors that would be screened into a four factor analysis are presented in Table 2. This methodology lead to the identification of six nonpoint source sectors ADEQ should consider for four factor analysis (Table 2).

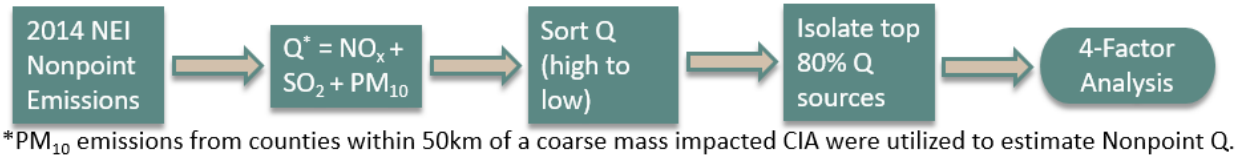

Figure 2: ADEQ Regional Haze nonpoint source screening flowchart