

1 **DRAFT Protocol:**

2
3 **Determining Long-Term Strategies and**
4 **Reasonable Progress Goals for WRAP Class I Areas**

5
6 *April 13, 2007*

7
8 *This document captures comments on and changes since the January 31, 2007 version. The*
9 *comments have been inserted where the draft language might be revised. Comments are identified*
10 *numerically and by commenter's initials. Proposed revisions to the document have been inserted to*
11 *address as many comments as possible. Several issues are identified at the end from the comments*
12 *that were not fully addressed in the proposed revisions, and will require further discussion. There*
13 *are three appendices that were not part of the January 31 draft Protocol. Appendix A includes*
14 *itemized comments received to date. The italicized comments are those that are inserted into the*
15 *draft protocol Appendix B is an EPA-FLM list of issues in haze planning, and Appendix C contains*
16 *links to 2 case studies using the evolving protocol for determining reasonable progress goals and*
17 *long-term strategies for Class I areas in the WRAP region.*

18
19 **Background**

20
21 The Clean Air Act (CAA) requires states to make reasonable progress towards meeting the national
22 visibility goal, which is to prevent any future and remedy any existing impairment in mandatory
23 Class I Federal areas resulting from man-made air pollution. The measures needed to make
24 reasonable progress must be included in the SIP and must include BART for certain stationary
25 sources and a long-term strategy.

26
27 The CAA also requires the EPA to provide guidelines to the states on implementing the visibility-
28 protection requirements. To date, EPA has issued the following guidelines:

- 29
30
- Guidelines for estimating natural conditions.
 - Guidelines for establishing a baseline and tracking progress.
 - Guidelines for implementing BART.
 - Draft guidelines on how to use modeled and monitored data to estimate whether a control strategy will result in meeting a reasonable progress goal.
- 34
35

36 No additional guidelines are expected from the EPA, including any guidelines for selecting Long-
37 Term Strategies, establishing Reasonable Progress Goals, or determining what constitutes
38 reasonable progress. The basic approach, however, is described in the EPA's Regional Haze Rule
39 (RHR), first promulgated in July 1999. Under this approach, for each Class I area, the state
40 determines baseline (average) visibility conditions on the least impaired and most impaired [days in](#)
41 [the deciview haziness index, representing total visibility impairment for RHR planning purposes.](#)
42 [The scale of this index, expressed in deciview \(dv\) units, is linear with respect to perceived visual](#)
43 [changes over its entire range, analogous to the decibel scale for sound. The total visibility](#)
44 [impairment used to derive the dv values for RHR planning is the sum of light extinction resulting](#)
45 [from measured or modeled mass concentrations of sulfate, nitrate, organic carbon, elemental](#)
46 [carbon, fine soil, coarse material, and sea salt.](#)

47

1 For the first SIPs, due at the end of 2007, covering the planning period to 2018, the period for
2 establishing base-line conditions is 2000-2004. The SIP, for each Class I area within the state, must
3 establish two Reasonable Progress Goal(s) (RPGs) for: 1) the 20% least impaired days which
4 ensures no visibility degradation and; 2) A RPG for the 20% most impaired days which ensures
5 improvement through the 10-year planning period, leading to a SIP check in 2013, and a SIP
6 revision by 2018. These two sets of RPGs must be expressed in deciviews projected at each Class I
7 area monitoring site and they must each be based on consideration of the following (emphasis
8 added):

- 9
- 10 • Costs of compliance;
- 11 • Time necessary for compliance;
- 12 • Energy and non-air quality environmental impacts of compliance; and
- 13 • Remaining useful life of any potentially affected sources.
- 14

15 These factors are commonly referred to as the “Statutory Factors,” found in the CAA.

- 16
- 17 • [How the above factors were taken into consideration in selecting the RPG is the reasonable](#)
18 [progress demonstration finding documented in the SIP.](#)
- 19

20 The EPA guidelines for implementing BART contain details on how to evaluate and consider the
21 “statutory factors” for BART. No guidelines, however, exist or are anticipated from the EPA which
22 address how they should be considered for the visibility improvement goals suggested in setting
23 RPG deciview values.

24

25 For each Class I area within the state, states must analyze and determine the rate of progress needed
26 to attain natural visibility by the year 2064. This is called the Uniform Rate of Progress (URP) also
27 reported in deciviews. In establishing the RPG values, states must consider the URP, and emission
28 reduction measures needed to achieve it for the planning period. (Emphasis added) As defined in
29 the requirements of the RHR, the quantity of deciview changes and visibility improvement over any
30 period of time is the sum of controllable anthropogenic emissions reductions as those emissions
31 changes affect the flux of measured mass of visibility-impairing species at each Class I area, on the
32 20% most and least impaired days, measured as total visibility impairment by the IMPROVE
33 sampling network. The change in these individual species (sulfate, nitrate, organic carbon,
34 elemental carbon, fine soil, and coarse material) over time are not likely to be constantly decreasing,
35 are likely to be variable, and to some degree, non-linear - so generally a downward trend in a
36 species’ emissions leads to reductions in measured mass. This result has been well-documented for
37 SO₂ emissions in general, and for NO_x emissions in high nitrate environments; the linearity of the
38 relationship between the declines in the other measured species as the associated emissions decline
39 are not as well known.

40

41 In cases where the RPG results in less improvement in 2018 than the URP, the state must use the
42 statutory factors above, to demonstrate why the URP is unreasonable, and that the lesser RPG is
43 reasonable. In addition, the state must assess the number of years it would take to reach natural
44 conditions if visibility improvement continues at the rate of progress selected as reasonable.

45

46 Besides establishing RPGs for in-state Class I areas, the SIP must also contain Long-Term
47 Strategies (LTS) for Class I areas within the state, and for Class I areas outside the state which may

1 be affected by emissions within the state. These LTSs must identify all anthropogenic sources
2 considered, and should include major/minor stationary, mobile and area sources indicates states
3 should include, and includes all reasonable control measures, including BART that will achieve in
4 state and out-of-state RPGs. The following “long-term strategy factors” must be considered in
5 developing a state’s long-term strategy (emphasis added):
6

- 7 • Existing emission reduction programs, including Reasonably Attributable Visibility
8 Impairment
- 9 • Emission mitigation from construction activities
- 10 • Compliance schedules to achieve reasonable progress goals
- 11 • Source retirement and replacement schedules
- 12 • Smoke management for forestry and agricultural management purposes
- 13 • Enforceability of emissions limits
- 14 • Anticipated net effect on visibility from projected changes in emissions over the period
15 addressed by the long-term strategy

16
17 The requirement that *dv* RPG be compared with a pre-determined *dv* URP might suggest that the *dv*
18 URP is meant as a bright-line benchmark of “reasonableness” and states should first select RPGs
19 based on the URP considering the statutory factors, then test visibility improvements from a
20 succession of candidate control measures, including BART against the URP. Such a process carried
21 to extreme implies repetitive analyses with each additional control measure until the URP is
22 achieved, or no further control measures are possible.
23

24
25 The WRAP has produced extensive analytical results from air quality monitoring, emissions
26 inventories and air quality modeling. These data strongly suggest that causes of regional haze in the
27 west are due significantly to emissions from a wide variety of anthropogenic and natural sources,
28 some of which are controllable, some of which are natural, or originate outside the jurisdiction of
29 any state and the federal government and are uncontrollable. Analyses to date also consistently
30 show that across Class I areas in the west, visibility projections in 2018 will improve, but not at
31 rates consistent with the 2064 URPs.
32

33 Purpose of This Document

34

35 This document offers a procedure the WRAP states and tribes may use to select Reasonable
36 Progress Goals and establish Long-Term Strategies in compliance with federal requirements. A
37 written procedure is particularly useful at this time given the lack of guidance described above, the
38 preference for consistency within the WRAP region, and the abundance of analytical results being
39 produced by the WRAP. This document does not address other RHR requirements such as
40 monitoring strategies and BART determinations. These are addressed as EPA guidance and
41 elsewhere.
42

43 **RPGs As an Outcome of Regional Planning**

44

45 As written, the RHR may provide the reader with the impression that the stepwise process of
46 establishing RPGs for the 20% least impaired days and the 20% most impaired days is: (1) a
47 visibility goal is selected according to the URP; (2) the goal is evaluated for reasonableness given

1 the four statutory factors; and (3) emission control measures are subsequently identified to achieve
2 the goal. This process, however, is neither practical, nor required. It is not practical because there
3 is no way of knowing a priori whether a goal is reasonable without first examining appropriate
4 emission control measures. In other words, the costs and other statutory factors pertain to control
5 measures, not the goal per se. A goal initially based on the URP could likely be unreasonable
6 because the control measures necessary to achieve the goal would likely be unreasonably stringent
7 or unreasonably lax in light of the costs, etc. Consequently, a new goal would have to be selected
8 and the necessary control measures reevaluated. Such an iterative process would be costly, time
9 consuming, and impractical for the WRAP states, especially considering the large number of Class I
10 areas, the two goals for the 20% least and most visibility impaired days which must be established
11 for each, and the diverse range of emission sources which significantly contribute to haze in the
12 West.

13
14 Nor is the above process required. The statutory factors and URP must be considered in
15 establishing the RPGs. However, the RHR does not prescribe a process, only the minimal elements
16 which must be considered in the process and ultimately reflected within the RPGs. The flexibility
17 afforded to states and tribes in this regard is in fact bolstered by the lack of EPA guidance and the
18 results of the judicial review the RHR has received. The RHR also requires the SIP to describe *how*
19 the statutory factors and URP were considered. This ensures that the process, however devised by
20 the state, is made clear to EPA and the public.

21
22 A more sensible approach to establish RPGs – described further later in this document – would first
23 look at the progress expected for each species from existing and likely controls (e.g., emission
24 reductions of each species from air pollution control programs other than RH, and BART); then
25 identify anthropogenic sources of species significantly contributing to haze along with candidate,
26 control measures, if any, that are realistic. Statutory factors would then be applied and considered as
27 appropriate, to arrive at a final determination of reasonable. A second evaluation of progress would
28 be made, and this would be that species' contribution to RPG. Comparison of

29
30 Non-BART stationary sources are an obvious category to include for consideration in establishing
31 RPGs. The statutory factors can be applied most readily here. The WRAP is developing a list of
32 candidate non-BART large stationary point sources using criteria of source strength and proximity
33 to Class I areas.

34
35 These reasonable controls, plus BART, plus the other existing and future control measures, and
36 possibly other factors such as the contribution of the source and the data quality would be included
37 in the Long-Term Strategy. The last required long-term strategy factor, that is the visibility effect of
38 these control measures (plus BART) would be estimated with WRAP technical resources and
39 equate to Reasonable Progress Goals. Because the control measures (including BART) would be
40 evaluated and selected based on consideration of the statutory factors, the resulting air quality
41 improvements / RPGs would inherently be based on such factors as well, as required by the RHR.

42 43 **Comparison of RPG with URP**

44
45 The URP would be considered in the process as a means of prioritizing the evaluation of potential
46 control measures. Most western Class I areas are affected by a diverse range of haze sources.
47 Where the expected rate of progress is poor relative to the URP, a greater amount of effort could be
48 expended to evaluate control measures, and vice versa. This use of the URP as a prioritization tool

1 is appropriate for states given the number of potential sources (and control measures), and the fact
2 that states are developing the first in a series of regional haze SIP over the next 50 years.

3
4 The RHR also requires consideration of the control measures needed to achieve the URP,
5 supposedly regardless of the RPG selected [see Section 308(d)(1)(i)(B)]. However, if a RPG has
6 been determined as described above, (that is RPG is the result of those control measures deemed
7 reasonable, considering the statutory factors) it is not necessary to explicitly consider the measures
8 needed to achieve the URP. If the URP is more stringent than the RPG, then by definition the
9 measures needed to achieve it would be unreasonable. This, essentially, would satisfy the
10 consideration requirement of this section of the rule.

11
12 In sum, Reasonable Progress Goals for the 20% least and most visibility impaired days would be the
13 outcome of a process to determine *reasonable* control measures. The process would take into
14 consideration the causes of haze, the data quality, the statutory factors, the uniform rate of progress,
15 and the resources available to implement controls in these first SIPs.

16 17 **Long-Term Strategies**

18
19 The RHR requires SIPs to include Long-Term Strategies that address regional haze through
20 enforceable emission limitations, compliance schedules and other measures designed to achieve the
21 Reasonable Progress Goals for Class I areas within the state as well as RPGs for Class I areas
22 outside the state that have visibility impacts from in-state sources. States with out-of-state impacts,
23 and those with sources that impact out-of-state Class I areas must consult with each other (through
24 the regional process) to ensure that each states' proportionate share of emission reduction
25 obligations are included for each affected Class I area. In addition, Long-Term Strategies must
26 include documentation of technical analyses of monitoring, emissions, and modeling to achieve
27 proportionate shares of emission reductions. These consultation and technical support requirements
28 are met for all WRAP participants through the WRAP process through regular meetings and the
29 Technical Support System.

30
31 In general, Long-Term Strategies for each Class I area should be developed along with RPGs,
32 except that LTS must also address RPGs in other states where there are multi-state impacts. As a
33 minimum, consideration must be given to the 7 LTS factors above. LTS control measures should
34 include everything in the RPGs, (which includes the statutory factors) plus BART, plus fire and
35 construction dust controls **and other measures adopted or projected to meet other air program**
36 **requirements**. Such other requirements include NAAQS, Acid Rain, NSR and others.

37 38 **Limitations of the Deciview Glidepaths**

39
40 The RHR requires that RPGs and the URP be expressed in terms of deciviews. The *dv* is a
41 convenient and conceptually simple metric. A one *dv* change in haziness is a small but noticeable
42 change in haziness under most circumstances when viewing scenes in Class I areas. It corresponds
43 to human perception in a linear, one for one manner. Thus, a 3 *dv* change in a highly impaired
44 environment would be perceived as roughly the same degree of change as a 3 *dv* change in a
45 relatively clear environment.

46
47 While the *dv* is useful for comparing haziness across sites and for measuring net visibility changes
48 over time, its use in the URP and for setting RPGs at a given site must be made with caution. This

1 is especially true in the West, where visibility conditions are relatively good, and the URP (i.e.,
2 slope of the glidepath) relatively flat. This makes the slope of the glidepath more sensitive to the
3 baseline conditions and the assumed natural conditions. A given error or bias in these “ends” of the
4 glidepath will have relatively larger impacts on the URP in areas where the URP has a smaller
5 slope, such as those in the West.

6
7 Baseline conditions, (one end of the glidepath) are averaged over five years (2000-04) to mitigate
8 the effects of extreme events or individual years. However, the conditions causing haze during this
9 period may be extreme relative to the many other 5-year periods occurring between 2000 and 2064,
10 at least at some sites. Perhaps more importantly, 24 of the 77 IMPROVE sites representing air
11 quality at Class I areas have no more than 3 years of data, making their URPs more sensitive to
12 extreme events or years. The baseline air quality for this 5-year period is also affected by large
13 wildfire events, off-shore and trans-oceanic emissions as well as other natural and anthropogenic
14 sources outside the WRAP region. Over the past few years, WRAP analyses have determined that
15 these sources are not only significant, but often dominant. This situation creates substantially
16 increased degrees of complexity and uncertainties not generally found in other RPO areas. Basing
17 the URP on net measurements of haze, without distinguishing between controllable WRAP and
18 other, uncontrollable and non-WRAP sources illustrates the limitations of this uniform glide-path
19 approach.

20
21 Natural conditions in 2064 (the other end of the glidepath) are clearly speculative and based on
22 limited data thought to be representative of natural conditions in the continental U.S. Furthermore,
23 the natural visibility goal enumerated in the RHR and related guidance documents represents the
24 EPA’s implementation of the CAA’s goal to remedy any existing impairment from man-made air
25 pollution. In American Corn Growers v EPA, The Court of Appeals clearly upheld the EPA’s
26 implementation, but also recognized “the natural visibility goal is not a mandate, it is a goal. As
27 EPA has explained, this goal serves as the foundation for analytical tools to be used by the states to
28 set reasonable progress goals.”

32 **Reasons for Taking a Pollutant-By-Pollutant Approach**

33
34 Notwithstanding the above illustrations of limitations of a *dv* URP glidepath to show progress from
35 all visibility impairing pollutants, use of a glidepath is enhanced when applied on a pollutant-by-
36 pollutant basis. Regional haze, of course, is caused predominantly by particulate matter (PM), is
37 generally characterized in ambient monitoring and air quality modeling techniques as either
38 ammonium sulfate (SO₄), ammonium nitrate (NO₃), elemental carbon (EC), organic carbon (OC),
39 fine soil (FS, or Soil), or coarse mass (CM). Each of these PM species come from a variety of
40 emission sources, none of them behave independently from one another in the atmosphere, and they
41 tend to agglomerate into mixed particles. Despite the overlap they share in emission sources and
42 atmospheric processes, there is nonetheless quite a bit to distinguish these PM species from one
43 another. Specifically, these species differ in their:

- 45 • Contribution to visibility impairment.
- 46 • Spatial and seasonal patterns.
- 47 • Most significant emission source categories.

- Contribution from natural and international sources.
- Emissions data quality.
- Levels of scientific understanding and air quality model performance.

Consequently, there is variation in the types of data and tools (or in the quality and applicability of the data and tools) available for assessing each species, how much each contributes to visibility impairment, and what their future emissions and ambient air quality projections are likely to be. Figure 1 provides a very abbreviated but clear illustration of some of the differences among the PM species.

Figure 1. Summary of variation in data quality and analysis tools for regional haze planning

	SO ₂	NO _x	OC	CM
Emission Sources	Almost entirely anthro. <i>Mostly point sources.</i>	Mostly anthro. <i>Mix of combustion sources.</i>	Diverse. <i>Mix of anthro, fire, and biogenic VOCs.</i>	Diverse. <i>Very difficult to partition w/ dust into nat/anthro.</i>
Emissions Data Quality	Very good overall. <i>Activity data less good for area sources.</i>	Good. <i>Activity data less good, some coding concerns w/ smaller point, area, and O&G sources.</i>	Fair. <i>Good activity data & conf. in PM_{2.5} emissions, but uncertain spec. of PM_{2.5} & bio. VOCs.</i>	Poor, except for some locales. <i>Categorically complete but accuracy very uncertain.</i>
Emission Projections	Very good. <i>Uncertain about area sources.</i>	Good. <i>Uncertain about offshore and O&G.</i>	Fair. <i>What to expect from fire?</i>	Fair. <i>What to expect from w/ dust?</i>
Atmospheric Science Quality	Very good. <i>Meteorology probably largest uncertainty.</i>	Fair. <i>Chemistry more complex, but meteorology too.</i>	Fair. <i>Most complex, least understood, but model perf. OK.</i>	Fair. <i>No major chemistry, but model resolution, met. insufficient.</i>
WRAP Tools	Emission Inv. CMAQ Proj. PSAT Apport.	Emission Inv. CMAQ Proj. PSAT Apport.	Emission Inv. CMAQ Proj. PMF, WEP.	Emission Inv. Causes of Dust. WEP.

Because of the many differences among the species – especially among emission sources, data sources, and appropriate analytical tools – it makes sense analyze them separately for the purposes of determining long-term strategies and RPGs. This includes the use of species-specific glidepaths. Whereas a deciview glidepath can be strongly affected by baseline conditions, extreme events, and natural sources, individual species glidepaths are not each affected by these issues. Natural sources such as wildfire, for instance, contribute heavily to OC concentrations and the *dv* glidepath, but much less so to glidepaths for SO₄ and NO₃. In this way, species glidepaths isolate some of the problems inherent in a *dv* glidepath and allow the most appropriate data sets and tools to be applied

1 to their respective pollutants. Moreover, the effort devoted to identifying and implementing
2 controls for each species can be guided in part by the specie's performance against its URP.

4 **A Process for Determining RPGs and Long-Term Strategies**

6 Below is a suggested process for determining long-term strategies and RPGs:

8 **For a single site and PM species ...**

- 10 1. Estimate the progress expected in 2018 from known emission reductions and increases
11 including any BART controls for the PM species, on the most-impaired visibility days.
- 12 2. Identify emissions for planning:
 - 13 i. Establish natural sources and related emissions
 - 14 ii. Establish sources not under state control and related emissions
 - 15 iii. Establish sources already reasonably controlled
- 16 3. Identify non-BART sources or other anthropogenic source categories that emit the PM
17 species that could be considered **realistically** for additional control measures in a Long-
18 Term Strategy beyond those included in Step 1, above. (Universe of Sources)
 - 19 • Include uncontrolled stationary, minor, area, mobile, Rx fire, AG, construction
- 20 4. Compare the expected progress from Step 1 above, to the *dv*URP for the PM species.
 - 21 i. If the comparison is good, identify any of the sources identified in Step 2, above which may
22 be uncontrolled for the PM species. (For four statutory factor analysis in Step 4 below, as
23 appropriate)
 - 24 ii. If the comparison is poor, check the progress for the PM species from reductions expected
25 from WRAP anthropogenic sources.
 - 26 a) If this progress is good, identify any other sources which may be uncontrolled.
27 (May be same uncontrolled sources identified earlier in Step 3, above)
 - 28 b) If this progress is poor, identify any additional sources which may be
29 uncontrolled or undercontrolled. Use the URP comparisons to select most
30 important sources for four statutory factor analysis.
- 31 5. For any sources identified in Step 3i and 3ii a) and b), above, select **realistic** control
32 measures,
- 33 6. Evaluate selected control measures considering the four statutory factors and the long-term
34 strategy factors listed in 308(d)(3)(v)(A)-(G).(Steve Body #1 comment)
- 35 7. Make determination of reasonable control measure (or not). Adopt outright outright, or
36 adopt timetable for adoption, or further evaluation as part of Long-Term Strategy (Steve
37 Body #3 and Colleen McKaughan #1 comments)
- 38 8. Recalculate the 2018 species concentration.
- 39 9. Repeat the process above for each species.(Colleen McKaughan #3 and Steve Body #4
40 comments)
- 41 10. Determine the cumulative progress in deciviews.
- 42 11. Adopt this expected progress as the RPG for the most impaired days.
- 43 12. If the causes of haze on the least-impaired days are not expected to differ substantially from
44 the causes on the most-impaired days, repeat steps 7-10 for the least-impaired days. (Steve
45 Body #5 comment)
- 46 13. If the causes of haze are expected to differ substantially, repeat steps 1-10 for the least-
47 impaired days. (Steve Body #6 comment)

1 14. If either RPG is less than the URP, state how long it would take to reach natural conditions
2 under the chosen rate of progress and explain that the URP is not a RPG because all
3 currently reasonable strategies have investigated to the extent possible and cite any ways in
4 which the URP may insufficiently account for non-US contributions, natural contributions,
5 large uncertainties in the dust inventory, etc. (Colleen McKaughan #4 comment)

6
7 See Appendix D for Process Flow diagram (to be added, once the outline above is clarified)

8
9
10
11 **Issue: Limiting number of non- BART and those already regulated under other air programs –**

12
13 “All sources...” should be read as “Important sources”. “Realistically,” “Realistic,” need some
14 criteria as a basis for selection, first of the sources selected consideration in LTS, second of which
15 control measures should be evaluated considering the statutory factors.

16
17 “Important sources”, as referenced above, could be identified and qualitatively ranked based on
18 some or all of the following:

- 19
20 • Size, proximity to Class I area, current/potential degree of control, feasibility of control, cost
21 effectiveness, etc.
22 ○ If point sources important, identify ~10 facilities
23 ○ If area sources important, identify 3-5 categories
24 • Identification of important sources should not be limited by state boundaries.

25
26 Additional screening criteria could be used to pare the universe of sources:

- 27 • If a source was subject to NSR/PSD **and** installed BACT, it should not be considered;
28 • If a source is uncontrolled when it was constructed, but BACT would be required today, it
29 may be considered;
30 • If a source is uncontrolled when it was constructed, but there is no authority to re-open the
31 permit to meet regional haze requirements, it should not be considered, but may be
32 evaluated for future plan revisions.

33
34
35 **Issue: Limiting extent of feasible control measures for evaluation to a manageable number –**

36
37 This issue will apply to virtually all Class I areas in the west. At its extreme, one could include shut-
38 down of sources or activities. While this level of control may be realistic for some sources (e.g.
39 open burning) it is not a viable consideration for most sources of visibility-impairing pollutants.
40 “All feasible...” needs some boundaries if this issue is to be addressed successfully.

41
42 One way to establish the extreme boundary would be to compare current control technologies with
43 existing BACT/BACM

44
45 “Realistic,” “Realistically” should include potential for any regulatory activity in time for this
46 planning cycle, or need to evaluate for later plan reviews.

1 **Issue: Parameters used in “consideration” of statutory and long-term strategy factors –**

2
3 Once the non-BART sources and candidate control measures are identified, the question is how
4 exhaustive should the effort be to adequately consider each of the factors. States may use their
5 individual criteria and judgments in determining how far to go. Should there be some attempt at
6 consistency of application of factors? This apparently will be a big concern of EPA and FLMs. . .

7
8 **Other Issues:...**

1 **Appendix A - Comments Received on the 1/31/07 Document**

2
3 This appendix captures comments received on the January 31, 2007 draft document. Comments are
4 attributed to the sender, and have been numbered for cross-reference to edits in the main document
5 above. Comments on future drafts of this document will be added to retain a record of the
6 consultation on determining reasonable progress and long-term strategies for regional haze plans in
7 the WRAP region.

8
9 **EPA R9 (sent by Colleen McKaughan):**

10
11 1) *The process steps for the long term strategy do not appear to meet the requirements for*
12 *reasonable progress.*

13
14 *Specifically, the bold portion of step #4 does not meet the requirements.*

15
16 4. *Either adopt these strategies, **commit to adopting them post 2007, or commit to***
17 ***evaluating them further.***

18
19 *Those controls that are found to be reasonable should be adopted. The commitment might*
20 *be acceptable if it has a thorough explanation of why they could not be adopted on time and*
21 *when they would be adopted to assure their implementation prior to the end of the first*
22 *planning period in 2018.*

23
24 2) *The paper should be explicit that species-specific glide paths are a useful adjunct to, not a*
25 *replacement for, the deciduous glide path required under the Regional Haze Rule. Also,*
26 *while paper states that species-specific glide paths will help in "identifying and*
27 *implementing controls for each species", EPA would prefer that there also be an explicit*
28 *statement that they should not be used as excuse to avoid applying the four-factor analysis*
29 *required in setting Reasonable Progress Goals.*

30
31 3) *Text of the 11 steps in "A Process for Determining Long-Term Strategies and RPGs" on*
32 *page 5 should be reworded so it is clear exactly which steps are to be repeated; also, a flow*
33 *chart should accompany it to aid in this clarification. Overall, the concept paper needs to*
34 *be clearer on to what extent setting RPGs would be a one-time process as opposed to an*
35 *iterative one (under which the pool of sources examined would be expanded as needed).*

36
37 4) *Modeling to date shows that expected emission reductions will fall far short of the Uniform*
38 *Rate of Progress (URP); therefore potentially "reasonable" controls would have to be*
39 *applied to all sources, without the need for the repeated steps in the goal-setting process.*
40 *The paper should be clearer on what is envisaged as the universe of sources to be examined.*
41 *Also it should be clear on the extent to which geographic area (e.g. area of influence),*
42 *source category contribution, or individual source contributions to haze would determine*
43 *that universe and/or serve as a guide in prioritizing source examination.*

44
45 -----

1 **Scott Bohning:**

2
3 Overall, I think the approach described in the 1/31/07 concept paper is sound, addressing both the
4 requirements of the Regional Haze Rule (RHR) and also practical issues arising in determining
5 Reasonable Progress (RP) for the WRAP.

6
7 In particular, the idea that controls are driven by an analysis of what is reasonable for significantly
8 contributing sources to achieve, as opposed to being driven by ultimate visibility goals or the
9 Uniform Rate of Progress (URP), is a good basis for setting RP visibility goals for the plans. It
10 avoids having to set RP visibility goals before performing any source control analyses; and
11 conversely it also avoids having to analyze controls for the entire universe of sources before setting
12 RP visibility goals.

13
14 Several points remain unclear to me, however. Some of these might be cleared up if there were a
15 flow chart in addition to the 11-step process text description on pages 5-6, and additional specificity
16 within that text.

- 17
18 1) *Important SOURCES may need to be distinguished from important source CATEGORIES.*
19 *The cumulative effect of insignificant sources of a given type may be significant, and it may*
20 *be possible to apply "reasonable" controls to sources that are individually not significant.*
21 *It is not clear to me whether the described process address such sources, nor to what extent*
22 *RHR requires that; i.e., need to distinguish between reasonable controls on ALL sources*
23 *(since default URP not being met) vs. limit consideration to controls to some subset of*
24 *sources (what subset?)*
25
26 2) *The degree to which the process is one-time as opposed to iterative (or with a finite number*
27 *of iterations) should be clarified. Page 2 mentions how an iterative process (selecting a*
28 *goal, identifying controls, checking impact against the goal, and resetting goal...) would be*
29 *costly and time-consuming. However, steps # 9 and #10 specify repeating earlier steps (e.g.*
30 *#3, under which source identification follows comparison against expected progress); this*
31 *seems to imply an iterative process.*
32
33 3) *It seems to me that comparison of progress to URP needs to be repeated for each Class I*
34 *area, for each species, and for the worst days and best days. But identification of "any*
35 *important sources" and of control measures ideally would need to be done only once, if*
36 *done thoroughly and carefully. Or perhaps it would be needed just a finite number of times,*
37 *with iterations after the first including more careful analyses, or increased control costs, or*
38 *an expansion of the set of sources considered (e.g. look at a larger area or smaller size*
39 *threshold, assuming one needs to look only at a subset of full universe of sources).*
40
41 4) *In step #6, it's not clear exactly which steps "above" need to be repeated for each species,*
42 *and #6 seems to partially duplicate step #1.*
43
44 5) *Step #9 says to repeat steps 5-8; that would include #6, which says to repeat preceding*
45 *steps. Thus, it is not clear how this differs from step #10, which says to repeat steps 1-8.*
46
47 6) *Steps #9 and #10, require some repetition of previous steps, depending on whether the*
48 *causes of least-impaired days are "expected" to be different than those of the most impaired.*

1 *What would this expectation be based on (e.g. some specific source attribution results)?*
2 *Perhaps this consideration should be folded in to #2, i.e. fully assess causes under both*
3 *conditions, before step #3 evaluation of progress and source controls.*
4

- 5 7) *Appropriately, page 3 mentions anthropogenic sources outside the WRAP region as a*
6 *limitation of the decidew glide path. I think a few more sentences could be added to this,*
7 *e.g. about the large unreduced fire and coarse matter components, and comparison to other*
8 *RPOs' situation, as illustrations of the limitation of uniform application of decidew glide*
9 *path approach. This does not need to be a complete account of these issues, but additional*
10 *material would be in line with the sentiment at the February 6 meeting discussion, on the*
11 *need to further planners' understanding of the effect of boundary conditions, etc. on WRAP's*
12 *visibility progress.*
13

14 -----
15
16 **Steve Body:**

17
18 Overall Comments:

- 19
20 1) Both EPA Region 10 and States do not want to waste resources on analysis that do not result
21 in effective emission reductions and improvement in visibility - does a double negative
22 make it a positive statement?
23
24 2) At the same time the SIP will need to meet federal requirements. *When presenting the "rule*
25 *requirements", the paper should plagiarize the exact language of the rule rather than a*
26 *summary or other re-wording. This would minimize misinterpretation due to nuances*
27 *implied from use of different words. Also, words that connote a judgment on the value of a*
28 *requirement should be avoided.*
29
30 3) *In the Background section there is a good discussion of RPGs..., but it seems short on*
31 *talking about LTS, and how development of both the RPG and LTS are an integrated, or*
32 *simultaneous process. This discussion could be expanded.*
33
34 4) *In general, the writing could be "tightened up" to provide clarity. As written, some of the*
35 *words used are not clear or specific, e.g., in the section Limitations of the Deciview*
36 *Glidepath, 3rd paragraph, the word "WRAP sites" is used... Should it be more accurately be*
37 *called "IMPROVE sites"?*
38

39 Questions: (I think the questions below 'hit' on Region 10's major issue with the paper)

- 40
41 5) *How can the SIP meet the requirements of 308(d)(1)(i)(B) in establishing the RPGs,*
42 *especially the requirement for states to consider emission reduction measures needed to*
43 *achieve URP, when:*
44
45 *a.) There are so many unanswered technical questions regarding natural sources of fire and*
46 *other emission sources, international transport, and other sources outside the state's*
47 *jurisdiction thus putting into question the 'real' URP line and;*

1 *b.) it may be extremely resource intensive to identify the emission reduction measures*
2 *needed to achieve the URP in the time period covered by the Plan?*

3
4 7) *What strategy or process should a state use to identify "all" reasonable control measures*
5 *regardless of whether these measures achieve URP?*

6
7 8) *Is there a cut-off for a pollutant impact for which a state can ignore looking at reasonable*
8 *control measures?*

9
10 -----
11
12 **Keith Rose:**

13
14 1) *The argument for diminishing the importance of the deciview glide path, as the most*
15 *important measure of progress, has some merit. However, this glide path still remains the*
16 *best metric for determining the rate of progress for attaining natural conditions in 2064, and*
17 *should be the primary measure for determining if adequate progress is being achieved in*
18 *each Class I area for each planning period. As more monitoring data are collected, more*
19 *accurate emission inventories are compiled, and more refined air quality modeling*
20 *performed, we will continue to revise the glide path and make adjustments to the visibility*
21 *improvement goals accordingly.*

22
23 2) *I think the pollutant-by-pollutant approach has merit, as it identifies the species that are*
24 *anthropogenic and are responsible for the majority of visibility impairment in each Class I*
25 *area. The States can use this approach to focus their resources to address those species that*
26 *are responsible most of the visibility impairment and are controllable.*

27
28 3) *The process for determining long-term strategies is a good example of a process States*
29 *could use to identify reasonable control strategies to achieve the URP. However, Step 3,*
30 *"Determine any other long-term strategies", should be comprehensive and include an*
31 *evaluation of all feasible long-term strategies, not just those which may be reasonable. It is*
32 *not until after all feasible strategies have been identified that the four statutory factors are*
33 *applied to determine which are reasonable.*

Appendix B – EPA-FLM List of Issues in WRAP Haze Planning

This appendix displays a list of issues and questions developed by EPA western regions and FLMs. This appendix is included as a reference, and page and paragraph pointers to edits and language changes in the main document were not included.

Draft list of information collection and analysis areas WRAP might focus on to support SIP development during early 2007 Developed By Western EPA Regions and FLMs

Last Updated 2/5/07

Area of Influence and Groupings of Class I areas - A lot of information has been produced by the WRAP forums and workgroups to identify sources and causes of visibility impairment and to project future conditions at Class I areas. The volume of technical information generated regarding the causes of visibility impairment and projected future emissions makes it difficult to develop an overall understanding at the state and neighboring state level of the key atmospheric components that need to be addressed in the SIP for each Class I area. The ability to focus on areas where impairment concerns are similar is critical for success in western SIPs, given the large number of Class I areas which must be addressed. There is also the likelihood that emissions strategies for reasonable progress are likely to overlap Class I areas and perhaps several groups of Class I areas. The key to understanding and being able to address visibility concerns at each Class I area would be the development of a grouping system. This system could identify Class I areas where concerns about visibility impairment are potentially similar or overlapping and emission strategies for reasonable progress are likely to overlap.

Matrix of Crossover Impact - In relation to the groupings of Class I areas, an assessment for both the 20% best and 20% worst days that indicates the key pollutants and sources between the groupings of Class I areas would be helpful. This assessment would also provide a justification for the groupings. For SIP purposes, the grouping matrix would be of primary interest and used to drive and facilitate the consultation processes between States and the development of long-term strategies. The focus here should be on sulfur oxides and nitrogen oxides, but to the extent that wild land fire or dust dominate the extinction budgets for a Class I area, those pollutants and sources should be identified where feasible.

- How can the TSS be used to assess groups of class I areas which share commons source impacts on the worst visibility days?
- We understand that due to significant impacts from foreign and natural sources many the WRAP States are analyzing reasonable progress by looking at individual PM2.5 species. How can the TSS be used to analyze the areas / sources which influence by species, specifically for the sources of sulfate and nitrate which are more directly tied to emissions strategies that may be included in the SIP?

- 1 ▪ Can the TSS be used to build on the information that DRI assessment of the IMPROVE
2 monitoring data which looked for similar species impacts at the monitors by adding to that the
3 results of the Regional Modeling Center PSAT results, particularly for nitrogen and sulfur?
4

5 **Base Case Projections for 2018** - The projections for 2018 need to be reviewed and analyzed for
6 each grouping of Class I areas and associated areas of influence. In these projections, WRAP is
7 including control measures already on the books and control measures considered to be on the way
8 to being implemented. An analysis of the base case projections will enable states and stakeholders
9 to better understand the effects of regional reductions and localized emissions changes for specific
10 Class I areas. This analysis would include what emission reductions were included in the
11 projections and what emission reductions still need to occur to achieve reasonable progress. The
12 modeling that WRAP has planned for the spring of 2007 will incorporate the planned BART control
13 measures, which will be key in looking at the 2018 projections. We encourage WRAP to focus on
14 completing this work, though we understand this is dependent on most of the states completing their
15 BART determinations.
16

17 **New Sources and Emissions “Growth”** - While many parts of the WRAP region are expected to
18 see general reductions in industrial and mobile source emissions, some areas may see increases.
19 This is particularly true for rural areas where new energy extraction activities are rapidly increasing.
20 It is important that new source emissions are addressed as part of the overall SIP Long Term
21 Strategy to assure some improvement is made in visibility at all Class I areas. This would build on
22 the policy of “steady and continuous” progress expressed in the GCVTC report and concepts in the
23 RHR.
24

- 25 ▪ Can the TSS call out the state-by-state identification of the anticipated new sources and
26 emissions between 2002 and 2018? It would be useful to compare that information with the
27 projected emissions from existing sources based on magnitude and geographic location.
28

29 **What’s Left to Control** - Since we currently assume most WRAP areas will not meet the Uniform
30 Rate of Progress (URP) with BART or other expected control measures from reductions on the
31 books or on the way, the emissions inventories should be analyzed to provide information on
32 contributing sources that are not being addressed by these scenarios. As mentioned above, we are
33 aware that BART source controls will be factored into the list of OTW controls, but there are
34 potentially large stationary and area sources that are exempt from BART that could be reassessed
35 under the Long Term Strategy and should be listed as part of the emission’s inventory of “what’s
36 left”.
37

- 38 ▪ Can the TSS process the emissions inventories to provide a ‘what’s left’ emissions summary,
39 state by state? For example, for each 2018 EI WRAP could generate a state-by-state table that
40 shows emissions reductions from 2002 by category and pollutant, and how much of the
41 remaining 2018 emissions were from sources not effected by emissions reduction strategies.
42
- 43 ▪ It would also be beneficial to the States if WRAP could identify all large (>100 tpy) stationary
44 sources (in addition to the BART sources already identified) within 200-300 km of each Class I
45 area that have the potential to contribute to visibility impairment. The States could then target
46 those sources for control analyses in developing their long-term control strategy.
47

Appendix C - Case Studies

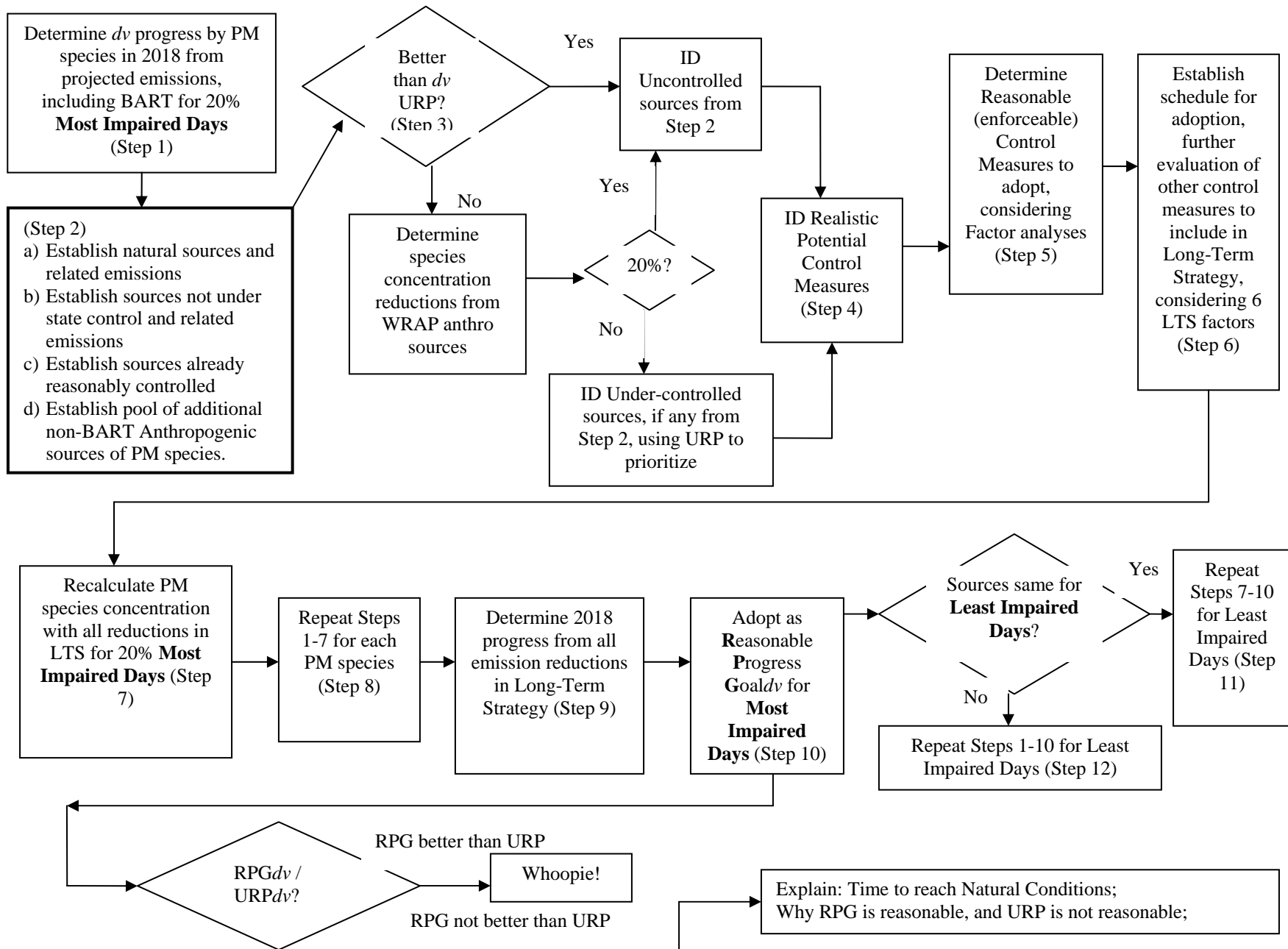
The WRAP staff has presented 2 case studies to date:

- Starkey (STAR1) IMPROVE monitoring site in eastern Oregon, which is assigned to represent the Eagle Cap and Strawberry Mountain Class I areas, see: http://www.wrapair.org/forums/iwg/meetings/061206m/STAR_Example.pdf; and
- Saguaro East (SAGU1) and Saguaro West (SAWE1) monitoring sites bracketing the Tucson, AZ metropolitan area, these sites are assigned to represent the separate Class I area wilderness portions in the East and West Units of the Saguaro National Park, see: <http://wrapair.org/forums/iwg/documents/SaguaroReasonableProgress.pdf>.

Additional case studies are in preparation by individual states for the April 17-19, 2007 Implementation WG meeting, and links to those will be added in future versions of this protocol.

Appendix D – Process Flowchart for Reasonable Progress Protocol

1
2
3

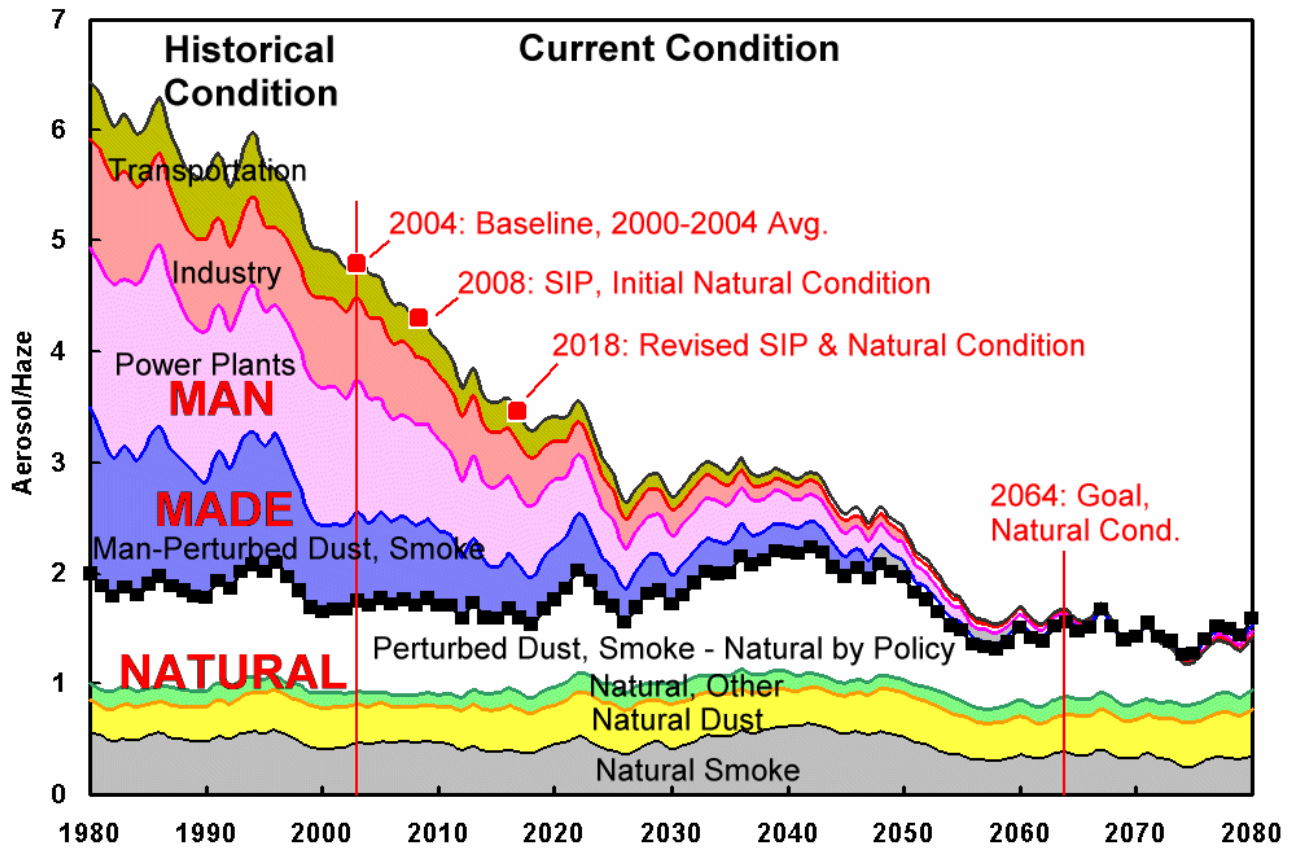


1 **Appendix E – Discussion of the Uniform Rate of Progress**
 2 **Glide Path Concept in WRAP Region Haze Planning Applications**

3
 4 **Limitations of Linear Glidepaths as Benchmarks for Reasonable Progress**

5
 6 The anticipated net effect on visibility of emissions reductions between the 2000-04 baseline period
 7 and the first planning milestone of 2018 is an analysis that must consider individual species light
 8 extinction changes that sum to total visibility impairment, which can then be converted to
 9 deciviews. The assessment of linear declines in emissions resulting in linear improvements in
 10 visibility by exclusively using the deciview metric is inappropriate in the WRAP region, see figure
 11 following.

12
 13 Figure E-1. Conceptual example of emissions changes affecting a typical WRAP region Class I
 14 area over the Regional Haze Rule planning horizon. (Husar, R. 2004)



16
 17
 18 Analyses by WRAP Forums and Workgroups indicate that many emissions source categories have
 19 shown and will likely continue to show large interannual variations, especially fire and dust,
 20 whether those emissions are defined as natural or anthropogenic, and also whether they are
 21 reasonably controllable. The RPGs and long-term strategies for Class I areas in the WRAP region
 22 must account for:
 23

- 1 • An estimate of both 2000-04 baseline and 2018 natural emissions, and exclude them from
2 further control analysis;
- 3 • The fact that natural emissions and their impacts on projections of the specific year of 2018
4 visibility conditions cannot reasonably be estimated as different in 2018 than they were in the
5 2000-04 baseline period; and
- 6 • Policy definitions of what is both “natural” and “reasonably controllable” in the first 10-year
7 RHR planning period.

8
9 Although the *dv* URP glidepath described in the RHR must be considered in establishing the RPG
10 and long-term strategies, it has limitations in substantially accounting for the variety and actual
11 variations in causes of regional haze and uncertainties in projecting natural conditions in the west
12 suggest a limited role in this regard. There are, however, as described above, advantages to using a
13 *dv* URP glidepath to prioritize the evaluation and adoption of potential emission control measures.
14 The *dv* glidepath presumably also relates to what the public perceives, and remains a means to
15 measure overall progress toward natural conditions through each planning period.
16 The point here is not that the *dv* URP glidepath is inadequate or unreasonable, but that long-term
17 strategies and RPGs should not be driven strongly by the glidepath. For one, the 2000-04 baseline
18 is subject to long-term cycles, incomplete data, extreme events (especially where data are
19 incomplete), and larger-than-anticipated natural, uncontrollable and non-WRAP anthropogenic
20 sources. Second, natural conditions, although useful in the process for setting RPGs, are not
21 mandates and are highly uncertain. Thus, if over weighted, the *dv* URP could set over- or under-
22 ambitious expectations for reasonable progress.
23