

IMPROVE Steering Committee Meeting Summary
7/22/99 Draft by Marc Pitchford, Chair

Overview: The steering committee met at the Desert Research Institute in Reno, NV on June 10 & 11, 1999. A copy of the agenda and meeting participants is attached. Major topics of discussion were the ongoing expansion of the IMPROVE network with the addition of about 80 new aerosol monitoring sites, and the creation of Associate Membership as a means for interested government organizations to gain access and influence with the IMPROVE Program. The expansion is proceeding on schedule, with most of the new sites identified. Most of the IMPROVE "protocol sites" that are in or near class I areas have been found to be suitable for the new IMPROVE sites.

The Steering Committee unanimously approved a new category of steering committee membership designated Associate Membership. The purpose of Associate Membership is to foster additional IMPROVE-comparable visibility monitoring that will aid in understanding class I area visibility, without upsetting the balance of organizational interests obtained by the steering committee participants. To be an Associate Member a government organization must operate at least one monitoring site following IMPROVE protocols and share that data. Associate Members have the same access to IMPROVE services as full members and have an equal voice in deciding technical issues. The Steering Committee unanimously voted to accept the State of Arizona as the first Associate Member.

The following summarizes the meeting discussions and resolutions in greater detail and is presented in the order of occurrence in the meeting as shown in the agenda. Time was set aside from 7:00pm to 9:00pm on the first evening for visibility-related technical presentations and discussions. This was not anticipated in the agenda but is also briefly reported on below.

Summary:

Participant Highlights Some of the highlights from the visibility-related news by the meeting participants include the following. A brief discussion of the implications of the court ruling on PM and O₃ for the regional haze rule indicated that there should be only minor impacts, if any. The anticipated relationship of IMPROVE and the national speciation network was discussed, including a commitment by both programs to work together to ensure data comparability. WESTAR indicated that they were having a PM, speciation, and regional haze workshop the following week. The WMO (World Meteorological Organization) has been in contact with Bill Malm concerning appropriate monitoring approaches for global aerosol monitoring. Bill recommended a nephelometer network as a practical way to obtain consistent data worldwide (aerosol sampling and analysis would likely entail laboratory consistency issues). MIRAMA has initiated a program to display scenic photographs showing current visibility conditions at certain sites on a web page. This seems to be part of a growing trend to provide the public with visibility information that they can easily understand.

Network Expansion Update UCD distributed a status report on the network expansion efforts (attached) and provided an overview presentation at the meeting. The site selection process is going well with most locations having a good candidate site already identified. One of the next

steps is to complete the site documentation as required by the siting criteria document. Samplers will be setup at sites over a period of several months from late summer through late fall. There was some discussion concerning the naming convention for the additional sites. UCD will circulate proposed names to the steering committee prior to final adoption of names and abbreviations. The list of sites in the status report includes some site changes for UT and AZ that were requested by the two states. The steering committee unanimously approved these changes.

California Siting Proposal At the previous IMPROVE Steering Committee meeting (12/98), the State of California requested additional time to consider and coordinate with other organizations concerning the plan for monitoring locations for their state. In late April they sent IMPROVE a plan that called for 17 monitoring sites to cover their 29 class I areas, whereas the original IMPROVE allocation based on a simple distance and elevation criteria was for 14 monitoring sites (California plan is attached).

The impact of the California plan is that the total number of IMPROVE sites would be 110 instead of the planned 108 (one site was unallocated in the original IMPROVE plan). The support provided by EPA was originally planned to deploy and analyzed samples for the smaller number of sites. However there have been a number of startup cost savings primarily having to do with a slower deployment of the expanded network than originally planned. These savings would allow the deployment of the two additional sites, but not the long-term operational costs unless EPA increased their support somewhat in successive years.

The steering committee voted to accept the California siting plan with the understanding that IMPROVE would seek the required additional support for long-term operations of 110 sites. If the operational support cannot be found, then the steering committee would have to adjust the number of sites downward, but would have the benefit of a year or more of data to help identify the most redundant of the monitoring sites to be discontinued.

Siting Problems and Problem Sites Three class I areas were identified as having challenging problems for siting new IMPROVE aerosol monitoring. They are Tuxedni and Simeonof in Alaska and Breton Island in the Gulf of Mexico off of Louisiana. State of Alaska representatives indicated their concerns for finding a representative location that would meet our siting criteria for the two wilderness areas in their state. Alaska representatives also had concerns for the current site near the visitor center at Denali National Park, thinking that it is not representative of the park overall. A site survey trip to each of the Alaska class I areas was arranged for June involving FWS, EPA, and NPS steering committee members and State of Alaska staff to resolve all of the issues if possible.

The candidate site proposed by the FWS for Breton Island was destroyed by a Gulf hurricane last season and is not expected to be rebuilt. The Gulf Islands National Seashore (NPS) is now being considered as a candidate, though its distance from Breton Island (about 80km) is not ideal.

As in previous discussions of locating new sites, the steering committee discussed the question of where sites should be located for class I areas in complex terrain with a wide range of

elevation. With at most only one monitoring site per class I area, some of the steering committee feel that we should have some technically-supported preference concerning whether it is better to monitor at a high elevation where regional sources may be dominate or at a low elevation where there may be a greater chance for local impacts to dominate. Some suggested that we should ensure that we have both high and low sites in all complex terrain regions of the country. In most cases there are not many candidate sites that meet the practical aspects of the siting criteria (i.e. power, access, and security) so the question of a policy for siting monitors high or low may be mute. Since most candidate sites have been tentatively identified, it was decided that we should examine the elevation of those sites compared to the range of elevations for the class I areas to see whether the sites tend to be biased towards the high or low end or are distributed throughout the elevation range. This will be done and distributed prior to the next meeting.

Proposal to Establish Associate Membership The STAPPA/ALAPCO representative prepared and distributed a motion prior to the meeting that would establish a new form of IMPROVE Steering Committee Membership call Associate Membership. The steering committee discussed and made minor changes to the motion then voted unanimously to approve it (amended motion attached). The primary purpose of the Associate Membership is to promote additional IMPROVE protocol monitoring at locations representative of visibility protected class I areas by expanding the access of qualified government organizations to the IMPROVE steering committee and its technical resources. Associate members are given an equal voice in all technical discussions and decisions.

The State of Arizona requested associate membership status on the steering committee based upon their visibility monitoring program at class I areas (request letter and monitoring plan is attached). After a brief discussion, the steering committee unanimously approved their request making them the first Associate Member.

IMPROVE Accountability and Administrative Support This topic was initiated at the previous meeting in Portland (12/98) but not fully explored. The recently passed regional haze rule indicates that IMPROVE data will be the basis for tracking visibility trends for most class I areas. The IMPROVE Network expansion to meet the regional haze data needs required a significantly larger budget then in the past. These changes make the IMPROVE network more important to air quality issues and we must therefore expect to be held more publicly accountable for IMPROVE activities.

Accountability activities that were discussed include publication of an annual budget, perhaps distributed on a web-page or to the organizations involved and announced as available by request in the IMPROVE Newsletter. This could be done at about the level of detail of a balance sheet in a corporate prospectus (one to four page). NPS is the financially accountable federal agency that handles all of the transfers of funds and contracts for IMPROVE and so is the logical organization to draft a summary budget. They offered to prepare a draft budget prior to the next meeting and distribute it to the steering committee. Somewhere in this summary there needs to be a place to display the funds and in-kind resources supplied by the other organizations. NPS can draft the summary budget page without these data, but will need to have input from the other organizations prior to completing it.

Another aspect of accountability that was discussed is the need for a summary inventory. This would include documentation of the number of various types of monitoring equipment, analysis systems, computers, shelters, supplies, etc. that were purchased explicitly for IMPROVE with IMPROVE resources. The inventory should also indicate the current status for all inventoried equipment (e.g. 33 IMPROVE particle samplers, 30 in-use, 2 spares, 1 out of service). The inventory could be periodically updated (e.g. monthly) for our internal use and published annually. The steering committee chair offered to layout a draft format for the inventory for approval prior to having the contractors supply the summary information needed for it.

Monitoring and analysis quality assurance is an important activity for IMPROVE which is documented in various operations and laboratory protocols, but is not organized and summarized in a document using the formats that are required by EPA of states and others collecting air quality data used to support air quality regulations. A Quality Assurance Program Plan (QAPP) is the standard form of documentation required by EPA. All seemed to agree that the IMPROVE network needs to prepare a QAPP. Rich Fisher and Tom Moore offered to explore the level of effort to do this using a contractor with experience preparing QAPPs for state programs. They will report prior to the next meeting on their progress.

The steering committee also briefly discussed the desirability of having administrative support to help organize meetings and conference calls, summarize them, and keep track of the commitments made during these meetings. The chair will explore the possible mechanisms and their projected costs to provide feedback to the steering committee prior to the next meeting.

Technical Presentations An optional technical session was held during the evening of June 10th during which a number of aerosol and visibility-related presentations were made and discussed. Only a brief description and the name of the presenter will be identified here. Ken Stroud presented preliminary data from a California field intercomparison test of particle speciation samplers. Hans Moosmuller showed his current and soon-to-be completed optical instrumentation that will for the first time allow light extinction coefficient closure experiments to be made with point measurements. He has a photo-acoustic absorption measurement, a prototype for a ring-down folded path extinction cell, and a prototype integrating sphere nephelometer. The first two will be used at Big Bend National Park during the BRAVO study. Bill Malm made a presentation concerning the composition of the coarse particles at Grand Canyon NP that indicates that about half of the mass is organic carbon. He also presented preliminary information concerning absorption closure measurements at Grand Canyon. Rich Poirot presented results of aerosol composition data assessment that he and others have been conducting on IMPROVE data from eastern sites. He showed the similarities and differences in findings from a number of analysis methods and from the same methods applied with relatively minor changes in input data or treatment of below detection limit records. He showed the ability of these methods to identify the impacts of Independence Day (July 4th) fireworks among other things. Lowell Ashbaugh discussed plans to compare the nitrate measurements by IMPROVE with those by the Dry Deposition Network.

Sampler Availability for Protocol and Other Sites Based upon discussions at several of the earlier steering committee meetings, UCD has plans to build by December enough of the new version of the IMPROVE samplers for all of the new IMPROVE sites as well as replacing all of the protocol site samplers with new samplers. Other samplers would be built early in 2000. The UCD plan however, did not take into account that some of the protocol sites might upgrade from only a channel A to a full IMPROVE sampler or that the steering committee would include sites that are not presently being serviced by the UCD Air Quality Group as protocol sites that we would offer to upgrade. These would include two sites in AZ funded by the state and the Tahoe Regional Planning Agency site at South Lake Tahoe. The samplers built for the BRAVO Study that ends in November should be able to makeup for these unanticipated sampler needs and be replaced by sampler production in early 2000.

EPA has been soliciting interests by states that would like to have non-urban monitoring using IMPROVE samplers that would be operated using the IMPROVE protocols. State would pay for the sampler and compositional analysis. Funding would be handled by having EPA set aside a portion of the state grant resources for next fiscal year that would be transferred to NPS to supplement the current particle-sampling contract to pay for the equipment and analysis services. EPA estimates that about 12 such non-urban state funded protocol sites might result from this solicitation.

During the discussion of samplers for protocol sites, the steering committee discussed competing uses for IMPROVE resources. Among the various uses of resources identified were the following: the commitment made earlier in the meeting to deploy the two additional sites in California; upgrading the protocol sites; adding camera systems to new sites for view monitoring; studies of possible unintended changes in the data associated with switching to the upgraded samplers; contractor support to prepare a QAPP; and monitoring at other remote areas. The view was expressed that having access to IMPROVE-comparable data from remote-area protocol sites that are funded by other organizations represented a major value to IMPROVE that justified the cost of contributing an upgraded sampler.

The group identified a number of characteristics of monitoring sites that could be used to weigh their relative importance to the goals of IMPROVE. These relate to the nature of the monitoring location and the characteristics of the monitoring. In priority order of importance sites can be classified by the following location related attributes: representative of class I areas; in transport corridors for class I areas; to assess visibility in non-class I areas that are remote (e.g. class II areas) or urban; or for establishing background or transport for other PM_{2.5} issues. Some sites could serve multiple purposes. Monitoring can be classified by the following attributes: number of parameters monitored (e.g. channel A particle sampling is lower priority than full IMPROVE particle, optical and view monitoring); anticipated duration of monitoring (higher priority for long-term monitoring); nearness to other monitoring sites (sites that fill a big gap are more important than those near existing sites); and degree to which the monitoring follows the IMPROVE protocol. When choices are required about which protocol sites to support with IMPROVE resources, as in the case of providing free upgraded samplers to allow them to operate on the same sampling schedule, the characteristics described above should be considered.

The steering committee established two subcommittees to further explore some of the issues raised in this agenda item. Marc Pitchford, Rich Poirot, and Bob Eldred will draft a definition of protocol site for use by IMPROVE. Sandra Silva, Mark Scruggs, Bill Malm, and Scott Archer will review the need for and draft a plan for view monitoring at the new IMPROVE sites. Both subcommittees will report at the next meeting.

Status of Revised IMPROVE Particle Samplers UCD indicated that the first production run of the new samplers were being deployed in the BRAVO Study next month (July) where they would received extensive field testing. [BRAVO Study funds paid for the production of sampler; IMPROVE did not loan them.] The next production run should be completed by end of summer and addition production continuing through the fall. Deployment will begin as soon as samplers are available and continue to December. UCD will prepare a deployment schedule to be distributed to the steering committee prior to the next meeting.

Definition of an IMPROVE Particle Sampler Lowell Ashbaugh made a presentation on the nature of IMPROVE particle sampling and analysis. He covered various aspects of siting, analysis, standard operating procedures, quality control and validation, and the sampler. The essential components of the sampler that he identified are the rain shield inlet, aluminum down tube including the HNO₃ denuder on channel B, the tee connection and the size-selective cyclone. These components are identical between the original and revised IMPROVE sampler. He also indicated the necessary performance requirements including the 50% cutpoint at 2.5µm aerodynamic diameter, ability to operate unattended for a week with samples as often as every third day, and separate sample collection on various substrates.

While this was a useful presentation it did not contain the level of detail that would be required for someone to independently build an IMPROVE sampler. Currently building an identical sampler is the only way that is guaranteed to produce one that all would agree is equivalent to an IMPROVE sampler. No decision was made concerning whether a sufficiently detailed list of design and performance specifications should be developed to provide an unambiguous definition of an IMPROVE particles sampler that could allow any variations from the current detailed design. While useful for some who may wish to design and build some variation on the current design but still be able to call it an IMPROVE sampler, such a definition could create future problems for IMPROVE if we wish to change monitoring methods as the state-of-the-art improves. No doubt the issue will be raised again

Network Updates and Quality Assurance Very brief updates on the optical and aerosol networks were presented. The routine information such as site location and data recovery statistics are available in the IMPROVE Quarterly Newsletter. The network has been running well.

The quality assurance discussion agenda item was cut short by the clock and the agreement that most of the issues were discussed on the previous day as part of the Accountability topic.

**IMPROVE Steering Committee Meeting Agenda
June 10 & 11 at the Desert Research Institute, Maxey Conference Room
Maxey Science Center, 7010 Dandini Blvd., Reno NV**

Thursday June 10

10:00am	Welcome, introductions & agenda review	Marc Pitchford
10:15am	Visibility-related news from participants	
	NESCAUM	Rich Poirot
	WESTAR	Bob Leben
	MIRAMA	Charlie Pietarinen
	STAPPA/ALAPCO	Dan Ely
	NPS	Mark Scruggs
	FWS	Sandra Silva
	FS	Rich Fisher
	EPA	Neil Frank
	BLM	Scott Archer
	Other as available	
11:00am	Update on network expansion	Bob Eldred
11:30am	State of CA siting proposal review & decision	Marc Pitchford
12:00pm	Lunch	
1:00pm	Siting problems & problem sites	Marc Pitchford
1:30pm	Proposal to establish Associate Membership on the Steering Committee	Dan Ely
3:30pm	Break	
3:45pm	IMPROVE accountability (e.g. publication of annual budgets, inventories, current status of Q.A. audits, protocols, etc.)	Mark Scruggs
4:30pm	Administrative support to the Steering Committee	Mark Scruggs
5:00pm	Adjourn for the day (could go to 6:00pm if needed)	

Friday June 11

8:00am	Sampler availability for protocol & other sites (Develop an IMPROVE policy)	Marc Pitchford
8:30am	Status of production & testing of the revised samplers	Lowell Ashbaugh
9:00am	Draft specification to define IMPROVE sampler	Lowell Ashbaugh
9:30am	Network updates	
	Optical & continuous	John Molenaar
	Aerosol	Lowell Ashbaugh
10:15am	Quality assurance documentation requirements (Quality Assurance Program Plans)	Neil Frank
11:00am	Adjourn	

6/10 to 6/11/99 IMPROVE Steering Committee Meeting Participants

Marc Pitchford	NOAA
Scott Archer	USDI - BLM
Tom Moore	AZ – DEQ
Scott Copeland	USFS – CIRA
Bob Eldred	UC Davis
Lowell Ashbaugh	UC Davis
William Malm	NPS
Sandra Silva	US FWS
Jerry Guase	USFS – Reg.5
Steve Body	EPA Reg. 10
Bob Lebens	WESTAR
John Molenaar	ARS
Charles Pietarinen	MARAMA
Bob Bachman	USFS
Neil Frank	EPA - OAQPS
Hans Moosmuller	DRI
Dan Ely	STAPPA - ALAPCO
Rich Poirot	VT – NESCAUM
Mike George	AZ – DEQ
Rich Fisher	USFS
Lincoln Sherman	ARS
Mike Eissenberg	NPS
Ken Stroud	CA – ARB

Status of Site Selection
Bob Eldred, UC Davis June 10, 1999

Current IMPROVE Sites: All will remain.

Current Protocol Sites: All current Protocol sites at mandatory Class I areas (except Indian Gardens) will be incorporated into IMPROVE. Three sites will probably relocate. Four former Protocol sites will also be incorporated (Voyageurs, Isle Royale, Joshua Tree, Hawaii Volcanoes). For many existing IMPROVE and Protocol sites we will need to work on revising the current shelters or installing new shelters.

New Sites: Candidate sites have been identified for all except a few clusters. In most cases the states have either been actively involved or at least somewhat aware of the choices.

The next steps are to take site pictures and fill out the evaluation forms. These will then be shared with the interested parties and a decision will be made on the best site. The decision may be that the potential sites are not acceptable, but I do not anticipate many cases of this. In a few cases, it will be necessary to obtain permits. We will work with each site to establish power and put in an appropriate shelter. We should plan to complete this by the end of summer.

In fall we will install the samplers at the sites and instruct the local operators on the weekly sample change procedures. Sampling at the new sites will begin immediately. We are planning on shifting to the one-day-in-three sequence in early December.

Changes in Clusters

Utah. In the original configuration, Zion was represented by Bryce Canyon, and Arches was a separate site. Utah has asked to have Arches represented by Canyonlands and Zion be a separate site. The NPS agrees that this is a desirable change.

Arizona. Move Galiuro Wilderness from Saguaro cluster to Chiricahua cluster. Most of Saguaro NP is in the same basin as Tucson, while Galiuro is separated by a mountain range. The current Protocol site monitors the influence of Tucson on the sections of Saguaro within this basin. It is important to continue this. Galiuro is not represented by the Saguaro site. However, it is less than 100 km from the Chiricahua IMPROVE site, and should be reasonably represented by it. (Practical note: the state of Arizona and the FLM's were not able to find a site satisfying the elevation criterion as long as Galiuro and Saguaro were in the same cluster.)

Minor shifts after final configuration: We may want to shift a few wilderness areas from one cluster to another after the final locations are determined. For example, with the current proposed sites we could move Teton Wilderness from North Absoraka to Yellowstone because of both distance and the same side of continental divide (change proposed by FS).

California. The following table uses the April 1999 cluster proposal by the California Air Resources Board, except Kalmiopsis OR and Redwood CA are separate clusters. To accommodate their proposed plan, the number of IMPROVE sites must be increased from 108 to 110.

Status of Each Cluster

1	Acadia	ME	IMPROVE: no change
2	Moosehorn, Roosevelt Campobello	ME	Protocol: no change (MOOS)
3	Lye Brook	VT	IMPROVE: no change
4	Great Gulf, Presidential Range-Dry River	NH	Protocol: no change (GRGU)
5	Brigantine	NJ	IMPROVE: no change
6	Shenandoah	VA	IMPROVE: no change
7	James River Face	VA	Protocol: relocate a few miles (development)
8	Dolly Sods, Otter Creek	WV	IMPROVE: no change (DOSO)
9	Mammoth Cave	KY	IMPROVE: no change
10	Great Smoky Mtns, Joyce Kilmer-Slickrock	TN, NC	IMPROVE: no change (GRSM)
11	Shining Rock	NC	IMPROVE: no change
13	Linville Gorge	NC	good site
14	Swanquarter	NC	four good potential sites found, state involved
15	Cape Romain	SC	IMPROVE: no change
12	Cohutta	GA	good site at overlook; potential vandalism
16	Okefenokee, Wolf Island	GA	IMPROVE: no change (OKEF)
17	St Marks	FL	two potential sites found
18	Chassahowitzka	FL	Protocol: no change
19	Everglades	FL	Protocol: no change
20	Breton	LA	difficult time-looking at Gulf Island NS, MS
21	Sipsey	AL	IMPROVE: no change
22	Seney	MI	good site already approved by state
23	Boundary Waters Canoe	MN	IMPROVE: no change
24	Voyageurs	MN	former Protocol: site moved 22 miles
25	Isle Royale	MI	Isle Royale not accessible all year, looking at mainland sites in MI and MN
26	Mingo	MO	good site near shop buildings
28	Hercules-Glades	MO	3 acceptable potential sites found-state involved.
27	Upper Buffalo	AR	IMPROVE: no change
29	Caney Creek	AR	good site , okayed by state
30	Wichita Mountains	OK	good site near HQ, okayed by state
31	Big Bend	TX	IMPROVE: no change
32	Guadalupe Mountains, Carlsbad Caverns	TX, NM	Protocol: no change (GUMO)
33	Bandelier	NM	Protocol: no change
34	San Pedro Parks	NM	good site at camera site east of Cuba
35	Wheeler Peak, Pecos	NM	one of several potential sites in Taos ski area.
36	Salt Creek	NM	good site just south of wilderness
37	White Mountain	NM	good site at top of ski lift
38	Bosque del Apache	NM	several potential sites available
42	Gila	NM	Protocol: no change
39	Chiricahua NM, Chiricahua W, Galiuro	AZ	IMPROVE: no change (CHIR)
40	Saguaro	AZ	Protocol: no change
41	Petrified Forest	AZ	Protocol: no change
43	Mount Baldy	AZ	good site selected, state approval
44	Superstition	AZ	IMPROVE: no change (TONT)

45	Sierra Ancha	AZ	good site selected, state approval
46	Pine Mountain, Mazatzal	AZ	good site between areas, state approval
47	Sycamore Canyon	AZ	good candidate site, state approval
48	Grand Canyon	AZ	IMPROVE: no change
49	Bryce Canyon	UT	IMPROVE: no change
50	Canyonlands, Arches	UT	IMPROVE: no change (CANY)
51	Zion NP	UT	two candidate sites (high and low)
52	Capitol Reef	UT	good candidate site
53	Great Sand Dunes	CO	Protocol: no change
54	Mesa Verde	CO	IMPROVE: no change
55	Weminuche, La Garita, Black Canyon of the Gunnison	CO	IMPROVE: no change (WEMI)
56	Maroon Bells, West Elk, Eagles Nest, Flat Tops	CO	Protocol: no change (WHRI)
57	Rocky Mountain, Rawah	CO	IMPROVE: no change (ROMO)
58	Mount Zirkel	CO	Protocol: no change
59	Badlands	SD	Protocol: no change
60	Wind Cave	SD	good candidate site
61	Theodore Roosevelt	ND	good site in air quality compound with state
62	Lostwood	ND	good location at PM10 site
65	Bridger, Fitzpatrick	WY	IMPROVE: no change (BRID)
67	North Absoraka, Washakie, Teton W	WY	good site at Dead Indian summit
66	Yellowstone, Grand Teton Red Rock Lakes	WY MT	Protocol: no change (YELL)
63	Medicine Lake	MT	good site at met station
64	UL Bend	MT	site 50 km west of wilderness on FWS land
72	Glacier	MT	IMPROVE: no change
73	Bob Marshall, Mission Mountains	MT	potential site found, state approval
74	Gates of the Mountains, Scapegoat	MT	potential site found near Gates
75	Cabinet Mountains	MT	potential site found, state approval
71	Anaconda-Pintler, Selway-Bitterroot	MT, ID	Protocol: no change (SULA)
69	Craters of the Moon	ID	Protocol: no change
70	Sawtooth	ID	Protocol: no change
77	Hells Canyon	ID	good site, except for possible permit delay
68	Jarbidge	NV	IMPROVE: no change
78	Mount Rainier	WA	IMPROVE: no change
79	Goat Rocks , Mt Adams	WA	White Pass ski area, state approval
80	Alpine Lakes	WA	Protocol: no change
81	North Cascades, Glacier Peak	WA	above Ross Lake dam (North Cascades)
82	Pasayten	WA	possibly at resort south of wilderness
83	Olympic	WA	two potential sites, neither perfect.
76	Eagle Cap, Strawberry Mountain	OR	good site found, state approval
84	Three Sisters, Mt Jefferson, Mt Washington	OR	Protocol: no change (THSI)
85	Mount Hood	OR	potential site found
86	Crater Lake, Diamond Peak, Mountain Lakes, Gearhart Mtn	OR	IMPROVE: no change (CRLA)

89	Kalmiopsis	OR	Agness, NW of area
87	Lava Beds, South Warner	CA	probably near Lava Beds HQ
90	Lassen Volcanic, Thousand Lakes, Caribou	CA	Protocol: no change (LAVO)
88	Redwood	CA	Protocol: no change
104	Marble Mountain, Yolla Bolly Middle Eel	CA	sites between two tentatively identified
91	Point Reyes	CA	Protocol: no change
92	Pinnacles, Ventana	CA	Protocol: no change (PINN)
95	Desolation, Mokelumne	CA	represented by current site at Bliss State Park
96	Yosemite, Emigrant	CA	IMPROVE: no change (YOSE)
97	Hoover, John Muir	CA	sites on east slope tentatively identified
110	Kaiser, Ansel Adams	CA	sites near Kaiser tentatively identified
98	Sequoia, Kings Canyon, John Muir	CA	Protocol: may move to higher elevation
109	Dome Land	CA	Protocol: relocate a few miles (power)
94	San Rafael	CA	sites tentatively identified
93	San Gabriel, Cucamonga	CA	site between two tentatively identified
99	San Gorgonio, San Jacinto	CA	IMPROVE: no change (SAGO)
100	Agua Tibia	CA	sites tentatively identified
101	Joshua Tree	CA	Former Protocol: probably no change
102	Denali	AK	IMPROVE: no change
103	Tuxedni	AK	possible site at oil company facility
105	Simeonof	AK	possible site near small settlement to west
106	Virgin Islands	VI	Protocol: no change
107	Hawaii Volcanoes	HI	Former Protocol: probably same location
108	Haleakala	HI	Protocol: no change

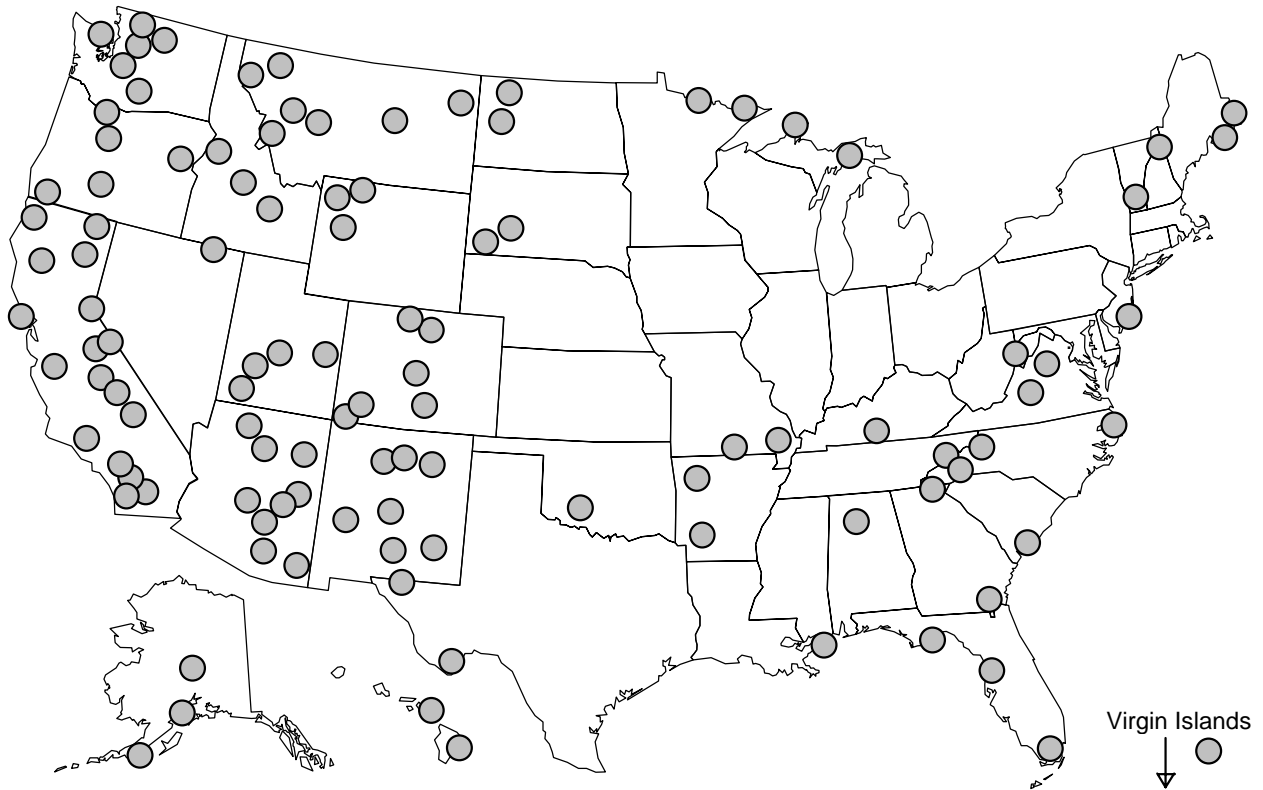
Site Selection Issue: Possible Relocation at Sequoia National Park because of Elevation

We are currently sampling at an elevation of 1800 feet, in a wilderness area that ranges from 1500 feet to 14,500 feet. The current site represents the maximum impact of San Joaquin Valley aerosol on the wilderness, not the major part of the wilderness noted for vistas. There is an alternative site at 7,400 feet with good drainage from higher elevations. Should we move the site? Advantages of current location: We would maintain the historic record. (If we moved, would the NPS retain the current site as an associated site?). We will monitor the maximum impact. Disadvantages of current location: We are not monitoring the upper elevation region where visibility is most important. We cannot represent any other wilderness areas because their minimum elevation is above the current site elevation. Thus we would have to retain the Dome Land and Kaiser site indefinitely.

Shelters.

We are planning on installing well-ventilated shelters at all sites. These shelters will be generally 6ft by 8 ft by 8 ft high. In regions of mild winters, the shelters might be open with perhaps only a back wall and a roof. The local FLM may participate in the exterior design in order to fit the environment. We currently have shelters at sites at high elevation and in the north. Some currently have AC; this will not be permitted in the future. There are two advantages: (1) in extreme weather conditions (wind, rain, snow, blizzards) the samples and the operators are protected during the weekly sample change. Without shelters, the recovery rate will undoubtedly drop. (2) Many FLM contacts want shelters to protect against vandalism. We

have never had vandalism with outdoor samplers in the past, but the situation may be different in many new sites. The disadvantages of shelters: (1) A shelter is more visible than an outdoor stand. (2) The temperature of the air stream at the cyclone in a shelter may be slightly further from ambient than with an outdoor sampler.



[April 1999 State of California Proposal for IMPROVE Monitoring in California]

Introduction

On March 18, 1999 the California Air Resources Board (CARB) circulated for comment a proposal to expand in California the federal visibility air quality monitoring network, called IMPROVE. Developed by CARB and USDA Forest Service-Region 5, the March 18 proposal was a variant of an August 31, 1998 “clusters proposal” developed by the national IMPROVE steering committee. To optimize limited resources, the IMPROVE program proposed that new monitoring sites be located to represent “clusters” of federal Class I wilderness areas and parks.

The March 18 proposal was transmitted by CARB via post and electronic mail to local California air districts, federal land managers (FLMs), UC Davis, and other interested parties. Comments were received during the March 18-April 9 review period from Shasta County AQMD, Lava Beds National Monument, USDA Forest Service Region 5, UC Davis, CARB staff, the Monterey Bay Unified APCD, the San Joaquin Valley Unified APCD and others. Comments included suggestions for site locations, augmentation of instrumentation, and cluster assignments of Class I areas.

Comment Summary

For northern California, commentators recommended that Redwood National Park (NP) be paired with the Kalmiopsis Wilderness, and the Marble Mountain Wilderness with the Yolla Bolly Middle Eel Wilderness.

For the central coast, CARB, UC Davis and Monterey Bay Unified APCD have noted that the Ventana Wilderness and Pinnacles National Monument (NM) represent different air quality regimes. The Ventana Wilderness is dominated by marine air and episodic local emissions such as forest fire. By contrast, Pinnacles NM is located in the San Benito Valley, which is impacted by air masses from the south San Francisco Bay as well as the San Joaquin Valley. Monterey Bay Unified APCD recommended that the Ventana Wilderness receive its own IMPROVE site, and not be paired with the Pinnacles NM. Alternatively, CARB staff believe that the current IMPROVE “protocol” site at Pinnacles NM can serve as a surrogate for the Ventana Wilderness, because, of the two areas, Pinnacles NM is more likely to exhibit a greater degree of visibility impairment resulting from regional haze.

Refinements to Sierra Nevada clusters were also proposed. CARB, USDA Forest Service Region 5 and UC Davis recommended that the IMPROVE “protocol” site at Sequoia NP be relocated to a more suitable upper elevation (>7000 ft.). Relocation of the Sequoia NP site would permit better resolution of upper elevation conditions and help resolve coverage for west and east sides of the range.

CARB and the San Joaquin Valley Unified APCD expressed concerns about air pollutant impacts on the northern Mojave Desert. Both agencies recommended that monitoring continue to provide coverage for the Dome Land Wilderness and the adjoining Walker Pass, at a site with more reliable power.

Clusters proposed for southern California were well received. A commentator in southern California also recommended that a PM2.5 FRM operate in parallel with a southern California IMPROVE site, together with meteorological instrumentation.

CARB staff also recommended enhancements (continuous PM2.5 and meteorological measurements) to two IMPROVE sites, to meet background siting needs related to the PM2.5 program. CARB plans to use the Point Reyes National Seashore IMPROVE “protocol” and the proposed San Rafael Wilderness sites, for measuring background PM2.5 concentrations in northern and southern California, respectively. Background concentrations are defined by the PM2.5 program as concentrations that would be observed in the absence of directly emitted anthropogenic PM, and secondary PM formed from anthropogenic precursor emissions. Data on background PM2.5 concentrations help to inform the development of control plans, for areas expected to exceed PM2.5 standards.

Cluster I.D.

Redwood National Park - Kalmiopsis

An IMPROVE “protocol” site is located at Redwood NP. The site is located at an elevation of 760 ft, above the minimum elevation for Kalmiopsis. Although located 30 km from the coast, the Kalmiopsis Wilderness (Siskiyou National Forest, Oregon) has a marine regime very similar to Redwood NP, and is therefore paired with the Redwood NP to represent conditions for the far north coast of California. Assigning the Kalmiopsis Wilderness to Redwood NP also conforms to the 100 km distance criteria between Class I areas. A cluster involving the Kalmiopsis will need to be discussed with the Oregon Department of Environmental Quality and the USDA Forest Service Region 6.

Min/Max Elevations (ft): 0 -3117 (Redwood NP); 217-5092 (Kalmiopsis)

Marble Mountain - Yolla Bolly

This cluster represents upper elevation interior Coast Range conditions for the Marble Mountain Wilderness (Klamath National Forest, a.k.a. Klamath NF) and the Yolla Bolly Middle Eel Wilderness (located between the Six Rivers NF and the Mendocino NF). The two wilderness areas are approximately 60 km from the coast and approximately 167 km from each other.

Shasta County AQMD suggested a potential site at Shasta Bally Mountain (elevation 6209 ft), located in the Whiskeytown Unit of the Whiskeytown-Shasta-Trinity National Recreation Area. The site is approximately 120 km from Marble Mt. and 66 km from Sugar Loaf Mt. (Yolla Bolly). Other potential sites may exist within the Hayfork Ranger District (Shasta-Trinity NF).

Min/Max Elevations (ft): 741-7895 (Marble Mt.); 2284-7713 (Yolla Bolly)

Lava Beds - South Warner

Located within the Modoc NF, this cluster represents plateau conditions in northeast California, covering the Lava Beds National Monument (Lava Beds NM) and the South Warner Wilderness. Siskiyou County APCD operates a PM10 air monitoring site at Lava Beds NM. Air monitoring staff at Lava Beds NM also expressed interest in receiving an IMPROVE site. Schonchin Butte (Lava Beds NM) and Eagle Peak (South Warner) are separated by approximately 122 km.

Suitable sites may exist between the two areas, at Happy Camp Mountain, Manzanita Mountain, or Likely Mountain.

Min/Max Elevations (ft): 4000-5400 (Lava Beds); 4587-9437 (South Warner)

Lassen -Thousand Lakes - Caribou

This cluster is covered by an IMPROVE “protocol” site located at Lassen Volcanic National Park and represents conditions both at the park and at the Thousand Lakes and Caribou Wilderness areas within the Lassen NF.

Min/Max Elevations (ft): n.a.-10457 (Lassen); 5353-8090 (Thousand Lakes); 6035-7678 (Caribou).

Point Reyes

This cluster also represents background coastal conditions for northern California, but within the known reach of pollutant transport from the San Francisco Bay Area. An IMPROVE “protocol” site is located at Point Reyes National Seashore.

Min/Max Elevations (ft): 0-1409

Pinnacles - Ventana

This cluster represents two slightly different regimes: marine central coast (Ventana Wilderness, within the Los Padres NF) and inland upper elevation between the Salinas and San Joaquin Valleys (Pinnacles National Monument). An IMPROVE “protocol” site located at Pinnacles NM, is operated by the National Park Service. Nitrate monitoring data from the Pinnacles site indicate occasional episodes of urban influence from the southern San Francisco Bay (100 km to the north). By contrast, the Ventana Wilderness is dominated by marine air. Urban influence on the Ventana may occur during episodes when flows out of the San Francisco Bay are recirculated south and east into the Monterey Bay.

Min/Max Elevations (ft): 800-3304 (Pinnacles); 540-5627 (Ventana).

D.L. Bliss - Desolation - Mokelumne

This cluster represents conditions in the northern Sierra in and around the Lake Tahoe Basin, the Desolation and Mokelumne Wilderness areas. An IMPROVE “protocol” site (elevation 6700 ft) is located at D.L. Bliss State Park.

Min/Max Elevations (ft): 6229-7200 (D.L. Bliss); 5938-9415 (Desolation); 3754-9720 (Mokelumne).

Kaiser - Ansel Adams

This cluster represents high central Sierra elevations.

Min/Max Elevations (ft): 6660-9730 (Kaiser); 3200-12350 (Ansel Adams).

Emigrant - Yosemite

This cluster represents mid-to-upper elevation western slopes of the central Sierra Nevada mountain range, which are influenced by air masses originating from the San Francisco Bay Area and the San Joaquin Valley and transported up west-facing watersheds and river canyons. An IMPROVE site (elevation 5300 ft) is located at Yosemite National Park.

Min/Max Elevations (ft): 4593-10964 (Emigrant); 2000-13000 (Yosemite)

Hoover - “North” John Muir

This cluster represents upper elevation *east* slopes of the Sierra Nevada, to account for eastward transport over the range. A monitoring site located near the east side of the Sonora Pass could represent conditions at the Hoover and the northern portion of the John Muir wilderness areas. Other suitable sites may exist near Virginia Lakes, Conway Summit, or the June Mountain Ski Area.

Min/Max Elevations (ft): 7640-12446 (Hoover); 4873-13880 (John Muir).

Kings Canyon - Sequoia - “South” John Muir

This cluster represents west-facing upper elevations of the southern Sierra, which are impacted by air mass transport from the San Joaquin Valley. An IMPROVE “protocol” site operates near the Ash Mountain entrance to Sequoia National Park. This site is within the Middle Fork of the Kaweah River canyon. To better represent upper elevation conditions outside of river canyons, a monitoring site may be located near Moro Rock (above Giant Forest Village), or Olancho Peak. Min/Max Elevations (ft): 1500-14494 (Sequoia); 1500-14494 (Kings Canyon); 4873-13880 (John Muir).

Dome Land

This cluster represents upper elevations of the southern Sierra, which are influenced by air mass transport from the southern San Joaquin Valley, through the Walker Pass and into the northern Mojave Desert. The summer seasonal IMPROVE site (elevation 2942 ft) between Onyx and Walker Pass has experienced frequent power outages (33% of sampling days). While IMPROVE monitoring data suggest little significant difference between Sequoia NP and Dome Land sulfate and nitrate concentrations, San Joaquin Valley Unified APCD and CARB staff believe it is important to monitor this area. The Dome Land Wilderness is in the Sequoia NF and on Bureau of Land Management holdings. The current IMPROVE protocol site should be moved to a site with more reliable power. Suitable alternatives may exist at a former CARB research site near the town of Canebrake, or at the Walker Pass campground.

Min/Max Elevations (ft): 2670-9224.

San Rafael

This cluster is the first of a series of clusters for southern California. The San Rafael Wilderness is located within the southern portion of the Los Padres NF and represents upper elevation background conditions east of the Santa Maria Valley and north of the Santa Barbara Channel. The Bates Ridge fire lookout station on Sierra Madre Road may be a suitable monitoring site.

Min/Max Elevations (ft): 1109-6311.

San Gabriel - Cucamonga

This cluster represents the San Gabriel and Cucamonga Wilderness areas within the Angeles NF, directly adjacent to the Los Angeles air basin. Numerous air quality studies have been conducted in the vicinities of Cogswell Reservoir, the San Dimas Experimental Forest and Mount Baldy. A suitable site may exist at “the Notch” ski lift area (7600 ft) on Mount Baldy. The Cucamonga is generally higher in elevation and a little further downwind from urban sources than the San Gabriel.

Min/Max Elevations (ft): 1593-7675 (San Gabriel); 4285-8583 (Cucamonga).

San Gorgonio - San Jacinto

Located east of the Los Angeles basin within the San Bernardino NF, the San Gorgonio and San Jacinto Wilderness areas are influenced by flow regimes into and out of the LA airshed. An IMPROVE site is located at the San Gorgonio Wilderness. An air quality research site, operated by the Forest Service - Pacific Southwest Research Station, is also located at Barton Flats. Min/Max Elevations (ft): 3116-10911 (San Gorgonio); 1348-8922 (San Jacinto Wilderness. Note that the actual San Jacinto summit, elevation 10804 ft, is located within the Mount San Jacinto State Park.).

Joshua Tree

Joshua Tree National Park represents high desert conditions further east of the LA basin. Min/Max Elevations (ft): 1200-5814.

Agua Tibia

The Agua Tibia Wilderness is located in a middle portion of the Cleveland NF near the astronomical observatory at Mount Palomar, mid-way between Los Angeles and San Diego. The Agua Tibia mountains are one of several southern California coastal mountain ranges, which include the Santa Ana, Santa Rosa and Laguna mountain ranges. Min/Max Elevations (ft): 1615-4763.

IMPROVE Steering Committee Associate Member Motion (as modified and approved by the Steering Committee 6/10/99)

Background & Purpose: Membership on the IMPROVE Steering Committee currently consists of representatives of 10 organizations, including four organizations of state air quality organizations (STAPPA/ALAPCO, NESCAUM, WESTAR, & MARAMA), four federal land management agencies (FWS, FS, NPS, & BLM) and the federal environmental regulatory and science agencies (EPA & NOAA). Thus composed, the Steering Committee is able to balance the various interests of the organizations they represent to provide direction and oversight to the operation of the IMPROVE monitoring program in a way that serves the overall interests of the nation. This proposal would not affect the composition or oversight role of the Steering Committee.

From its inception the IMPROVE Steering Committee has recognized the limitations of its monitoring resources and therefore the benefits of promoting high quality and consistent visibility monitoring in and near federally protected Class I areas by other organizations. Monitoring programs that use the same instruments, operational protocols and analysis laboratories generate the most IMPROVE-consistent data. Monitoring at so-called protocol sites, which are those not having IMPROVE Steering Committee oversight but are otherwise consistent with IMPROVE approaches, have been conducted by some of the IMPROVE participant organizations. Non-IMPROVE organizations that have attempted to operate in this way have found it frustrating because of inadequate access to technical information and resources and insufficient interaction with the IMPROVE technical decision-making process.

In addition to the operations of routine monitoring sites, IMPROVE participant organizations have occasionally conducted extensive short-term studies that built upon the IMPROVE network by providing additional monitoring (e.g. additional instrumentation, greater frequency of monitoring, additional monitoring locations). These studies have been done at the expense of the sponsoring organization (i.e., no cost to the IMPROVE budget) but access to IMPROVE sites and support infrastructure represents a substantial savings and enhancement to the study sponsors. Similar access to the IMPROVE system by non-IMPROVE organizations is difficult to arrange.

To further promote the expanded collection of high quality IMPROVE-comparable data by organizations that are not directly represented on the IMPROVE Steering Committee, it is proposed that a new category of representation to the IMPROVE Steering Committee be created.

Proposal: Associate Membership on the IMPROVE Steering Committee would be offered to any governmental organization (federal, state, tribal, or local) that makes a substantial resource commitment to visibility monitoring in or near federal Class I areas and agrees to employ IMPROVE monitoring protocols and to share their data in a timely manner. Associate Members would have an equal voice with Steering Committee members in all technical decisions (e.g., monitoring methods, protocols, quality assurance, data availability, etc.) Their voting privileges would not extend to matters of overall direction or oversight of the IMPROVE program including resource allocation decisions or the composition of the IMPROVE Steering

Committee. Associate Members would have the same access to the IMPROVE monitoring system as other IMPROVE participant organizations.

More specifically, to be considered for Associate Membership an organization must meet the following requirements:

- 1) One (1) or more Class I areas within the candidate government agencies' jurisdiction.
- 2) Currently operate (or a firm commitment to operate within 12-months) at least one (1) technically-supportable field visibility monitoring site which collect aerosol and/or optical data following IMPROVE monitoring protocols that the candidate agency specifies as representative of a Class I area(s), and agrees to share this data in a timely way.
- 3) Documentation (i.e., the monitoring plan, any field/lab QAPPs, any SIP references, et cetera) for the visibility monitoring program described above shall be provided to the IMPROVE Steering Committee as part of the candidate agency's membership application.
- 4) A letter requesting Associate Membership on the IMPROVE Steering Committee from the candidate agency's management shall be provided to the Committee for approval, including the documentation above, and specifying an understanding of an associate member agency's responsibilities and rights as detailed below.

Associate IMPROVE Steering Committee Members have specific responsibilities and rights as indicated below:

- 1) The management of the associate member's agency commits to the continued operation of the visibility monitoring program of the associate member agency.
- 2) Associate member agencies agree to provide ongoing active participation in, and appropriate programmatic support of, the programs and activities of the IMPROVE Steering Committee.
- 3) Associate membership resides in that member's agency, not in an individual person, and the person participating in IMPROVE Steering Committee's programs and activities is expected to vary from time to time.
- 4) Associate member agencies acknowledge a potential financial responsibility belonging to the associate member agency for technical activities proposed by the associate member agency (i.e., lab analysis intercomparisons, field method testing/development, data analyses, etc.) which the associate member agency asks that the IMPROVE Steering Committee conduct or coordinate.
- 5) Associate members shall be eligible to vote on technical issues before the Steering Committee, but are not eligible to vote on membership issues.
- 6) Associate members shall have the same access as Steering Committee Members to class I area-representative visibility monitoring-related services provided through contracts or inter-agency agreements which support the programs and activities of the IMPROVE Steering

Committee. Access to these services shall be the responsibility of the appropriate contract officer of the member agency of the IMPROVE Steering Committee. The unit cost of these services for associate member agencies shall be the same as for regular IMPROVE Steering Committee member agencies.

[letter to IMPROVE from State of AZ]

June 8, 1999

Dr. Marc Pitchford, Chairman
IMPROVE Steering Committee
c/o NOAA/EPA
P.O. Box 19040
Las Vegas, NV 89132

Dear Dr. Pitchford:

The purpose of this letter is to formally apply, on behalf of ADEQ, for associate membership status on the IMPROVE (Interagency Monitoring of PROtected Visual Environments) Steering Committee. Attached is the June 1, 1999 Arizona Class I Area Visibility Monitoring Plan update, describing our monitoring approach, listing cooperating agencies and institutions, and detailing specific present and future instrument installations.

ADEQ has 12 Class I Areas within our jurisdiction, and has had a technically sound field visibility monitoring program in our major metropolitan areas since 1993, and in several of our Class I Areas since 1996. ADEQ Class I monitoring sites collect aerosol and/or optical data representative of either an individual Class I Area, and/or a cluster of similar, nearby Class I Areas. These sites are operated using IMPROVE Steering Committee criteria for both equipment, field operations, and data processing/analyses. Further, ADEQ understands the responsibilities and rights of IMPROVE Steering Committee associate membership status.

On behalf of ADEQ management, I am committed to the continued operation of the visibility monitoring program as we have outlined in the attachment. ADEQ looks forward to actively participating in the programs and activities of the IMPROVE Steering Committee. ADEQ understands that associate membership status resides in that member's agency, not in an individual person, and that the person participating in IMPROVE Steering Committee's programs and activities is expected to vary from time to time. Initially, I am designating Tom Moore as the representative.

ADEQ understands that associate members' voting rights, to the degree that a technical operations committee needs to vote, shall be limited to technical operations issues before the Steering Committee. In addition, associate members shall have access to all visibility monitoring-related services provided through contracts or inter-agency agreements which support the programs and activities of the IMPROVE Steering Committee; access to these services shall be the responsibility of the appropriate contract officer of the regular member agency of the IMPROVE Steering Committee. The unit cost of these services for associate

member agencies shall be the same as for regular IMPROVE Steering Committee member agencies.

In closing, thank you for ensuring that the IMPROVE Steering Committee takes action on this membership application by Arizona DEQ. Mike George and Tom Moore of my staff will attend the June 10-11, 1999 Committee meeting to present this letter of application and monitoring plan. Please call me or Ira Domsky, Deputy Division Director at 602-207-2308, if there is a need to discuss these matters further.

Sincerely,

Nancy C. Wrona, Director
Air Quality Division

cc: IMPROVE Steering Committee Members
John Kennedy, EPA Region IX

Class I Area Visibility Monitoring Plan for Arizona
Arizona DEQ - June 1, 1999 Update

The intent of this monitoring plan is to continue to characterize all Class I Areas as completely as possible using ambient visibility measurements within constraints of an Area's size, terrain, or logistics. That will not always mean having exactly one monitoring site for each Class I Area. It may mean one site or a group of sites representing several Class I Areas, or multiple locations for a single Class I Area. As with criteria pollutants like PM_{2.5} or PM₁₀, characterization of upwind conditions is also needed for understanding visibility conditions in Arizona's Class I Areas. There are other influences on decision making aside from those having to do with the representativeness issues described above. These are more institutional in nature, such as the federal IMPROVE (Interagency Monitoring of PROtected Visual Environments) monitoring program, the IMPROVE program planning and operations process, integration of the Arizona Class I Area visibility monitoring plan with PM_{2.5} requirements, and limitations on available personnel and budget resources. Implementation of the initial draft of this monitoring plan was begun in Spring 1996.

The present plan with regard to Class I Area visibility monitoring in Arizona is as follows:

Grand Canyon National Park

Maintain existing aerosol and optical monitoring locations on the South Rim and in the Canyon as IMPROVE program sites, with National Park Service staff continuing to function as the operator of the sites.

Petrified Forest National Park

Maintain existing aerosol and optical monitoring locations in the Park as IMPROVE program sites, with National Park Service staff continuing to function as the sites' operator.

Mount Baldy Wilderness

ADEQ has recommended that the IMPROVE program install an aerosol sampler at the **Greer Water Treatment Plant** (immediately northeast of Mount Baldy). The U.S. Forest Service and ADEQ have identified the sampling site as meeting all the criteria set forth by the IMPROVE program. The Forest Service will make all the necessary arrangements to prepare the site, and ADEQ will proceed with installing a nephelometer and meteorological equipment at the Plant while the IMPROVE contractor completes installation of the new aerosol sampler. The aerosol sampler will be part of the IMPROVE Program, with Forest Service staff to function as the site operator.

Sycamore Canyon Wilderness

ADEQ presently has a cooperative agreement in place with the Boy Scouts of America at their **Camp Raymond**, located at the north end of the wilderness area. The U.S. Forest Service and ADEQ have identified the sampling site

as meeting all the criteria set forth by the IMPROVE Program. ADEQ has a nephelometer and meteorology equipment already operating at the site and is preparing the site for installation of the new aerosol sampler by the IMPROVE contractor. The aerosol sampler will be part of the IMPROVE program, with Forest Service staff to function as the operator of the site.

Mazatzal Wilderness &
Pine Mountain Wilderness

These Class I Areas are quite close to each other and are roughly in the same airshed. Given the complex terrain and emissions transport patterns, a northern location and a southern location in the Verde River drainage have been selected. **Ike's Backbone** will represent both Class I Areas to the north in a cluster with respect to elevation and distance. ADEQ will install a nephelometer and meteorology equipment at this new site and is also preparing the site for installation of the new aerosol sampler by the IMPROVE contractor. The aerosol sampler will be part of the IMPROVE program, with Forest Service staff to function as the operator of the site. In addition, ADEQ presently has a nephelometer and meteorology equipment at the **Humboldt Mountain** location just south of the Class I Areas and just north of the Phoenix metropolitan area, in order to more completely characterize the south side of both Class I Areas.

Sierra Ancha Wilderness

There is presently a solar-powered nephelometer and meteorology monitoring site at **McFadden Peak**, 21 km north of the wilderness boundary. This site will be re-deployed to the U.S. Forest Service **Pleasant Valley Ranger Station** situated 17.5 km north of the wilderness boundary. The Forest Service will make all the necessary arrangements in preparing the site, for installation of the new aerosol sampler by the IMPROVE contractor. At the same time, ADEQ will proceed with relocation of the existing instrumentation (nephelometer and meteorological) to the Ranger Station site. The aerosol sampler will be part of the IMPROVE program, with Forest Service staff to function as the operator of the site.

Superstition Wilderness

Previous monitoring efforts near the Superstition Wilderness have been reasonably unproductive because of security problems. The existing IMPROVE program aerosol sampler site at **Tonto National Monument** should continue operation, as part of the IMPROVE program, with

National Park Service staff continuing to function as the site operator. ADEQ will proceed with a parallel installation of a nephelometer and meteorological instrumentation at the Monument site. ADEQ has also committed to installing a second site at the **Queen Valley Water Tank** in order to more completely characterize the Class I Area from the west and south, as a state Class I visibility monitoring location. The Water Tank site will consist initially of only a new IMPROVE aerosol sampler, jointly operated by the Pinal County Air Quality Control District and ADEQ. Both monitoring locations serve as Phoenix metropolitan area transport sites for PM_{2.5}.

Saguaro National Park

Since the Saguaro National Park Class I Area is split into two pieces with a major metropolitan area (Tucson) in between, it remains a high priority for multiple visibility monitoring sites. Since 1997, Pima County DEQ, the National Park Service, and ADEQ have operated a nephelometer, meteorological equipment, and an IMPROVE aerosol sampler at a site in the **West Unit**. This site is on the west side of the Tucson Mountains, and thus can provide insight as to conditions upwind (background) of Tucson. In addition, analysis of data from that location seems to show a clear indication of periodic plumes from the city. It should then continue to serve as both near-field background and Class I site. The West Unit site will soon be relocated near to its present location, but will continue with the equipment listed above, with the same joint operations arrangement, after installation of a new replacement IMPROVE aerosol sampler to belong to ADEQ, by the IMPROVE contractor.

With regard to the East Unit, Pima County DEQ, the National Park Service, ADEQ, and the IMPROVE program have agreed to reinstate Class I visibility monitoring at the East Unit, located at the eastern edge of the metropolitan area. That location could then serve as a dual purpose site, to characterize both transport and Class I conditions. The new IMPROVE aerosol sampler at the **East Unit** will be part of the IMPROVE program, with National Park Service staff functioning as the operator of the site. ADEQ will proceed with a parallel installation of a nephelometer and meteorological instrumentation at this East Unit site, to be jointly operated in a manner similar to the West Unit site.

Chiricahua Monument Wilderness,
Galiuro Wilderness &
Chiricahua Wilderness

The IMPROVE program currently operates visibility monitoring sites in Chiricahua National Monument, and ADEQ recommends that existing aerosol and optical monitoring locations in that Monument be maintained as IMPROVE program sites, with National Park Service staff continuing to function as the operator of the sites. ADEQ presently operates a nephelometer and meteorology sensors both at **Muleshoe Ranch**, which is just south of Galiuro Wilderness, as well as at **Rucker Canyon** just west of the Chiricahua Wilderness boundary (immediately south of the Monument). These three Class I Areas are roughly in the same airshed, and given the terrain and emissions transport patterns, considering these Areas as a cluster seems feasible. Preliminary data analyses seem to show some similarity. Monitoring by ADEQ will continue at the latter two sites.

As to the characterization of background, a dichotomous PM₁₀ sampler (dichot) is presently operated at Hillside, Arizona, which has been determined to be generally representative of long-range upwind conditions from Phoenix. This should then also mean that it will be reasonably good for that same purpose for Superstition Wilderness, Mazatzal Wilderness, Pine Mountain Wilderness, and Sierra Ancha Wilderness Class I Areas. When the opportunity presents itself, the dichot sampler will be replaced by a new IMPROVE aerosol sampler. A dichot is also operated at Organ Pipe Cactus National Monument, which is southwest of Tucson. It is used to characterize southern Arizona background, which implies that data from there should represent background for at least Saguaro National Park and Galiuro Wilderness and perhaps Chiricahua National Monument Wilderness and Chiricahua Wilderness, as well. As above, when the opportunity presents itself, the dichot sampler will be replaced by a new IMPROVE aerosol sampler. The larger remaining question for background characterization is relative to Colorado Plateau Class I Areas, Grand Canyon National Park, Petrified Forest National Park, Mount Baldy Wilderness, and Sycamore Canyon Wilderness. If the Meadview site that is suggested to augment South Rim activities were installed and operated, then it could also provide background data for the four Class I Areas listed above.

In summary, beginning in 1999, the following sites should be operated with some combination of IMPROVE protocol aerosol and optical measurements, as a combined effort led by ADEQ and the IMPROVE program, as a part of the long-term visibility monitoring plan for Arizona:

Grand Canyon National Park - Hance (South Rim)
Grand Canyon National Park - Indian Gardens (In-Canyon)

Petrified Forest National Park
Chiricahua National Monument
Mount Baldy Wilderness - Greer Water Treatment Plant
Sycamore Canyon - Camp Raymond
Saguaro National Park - 1 each in the East and West Units
Sierra Ancha Wilderness - Pleasant Valley Ranger Station
Superstition Wilderness - Tonto National Monument and Queen Valley Water Tank
Mazatzal and Pine Mountain Wildernesses - Ike's Backbone

In addition, the following sites will be operated by ADEQ, initially with dichot samplers only, and later with new IMPROVE aerosol samplers only, for the present time:

- Hillside
Organ Pipe Cactus National Monument

Finally, the following will have nephelometer and meteorology only, for the present time:

Muleshoe Ranch
Rucker Canyon
Humboldt Mountain

For more information, please contact either:

Tom Moore, 602-207-2353, moore.tom@ev.state.az.us
Mike George, 602-207-2274, george.mike@ev.state.az.us