MINUTES OF THE MEETING
NATURAL RESOURCES COMMITTEE
MONTANA STATE SENATE

March 13, 1987

Meeting of the Senate Natural Resources Committee was called to order by Chairman Thomas Keating on March 13, 1987, at 12:30 p.m., in Room 405 of the State Capitol.

ROLL CALL: All members were present.

CONSIDERATION OF HOUSE JOINT RESOLUTION 19: Rep. Miles, District 45, sponsor of HJR 19, introduced the resolution as supporting the annual Governor's Cup Sled Dog Race. She asked the committee to please concur in giving recognition to the annual races.

PROPONENTS: Mark O'Keefe, Race Director, represented the Montana Mountain Mushers and the Helena Citizens Council. Mr. O'Keefe thanked the committee in advance for considering HJR 19. He reported that a race is being planned for 1988, and the planners are currently in negotiations with some film production companies in Colorado and Florida and also are negotiating with major television networks for broadcast rights for the race next year. He reported that the 1987 race went well and about 600 volunteers worked on it. There were three jobs created for the economy of Montana and Mr. O'Keefe said he hoped that number would double in 1988. He offered to answer any questions the committee might have and asked for their concurrence in the resolution.

Dave Siller, Helena, testified that he was last year's race judge and appeared in behalf of Montana Mountain Mushers. Mr. Siller said that the dog sled race is a major sporting event not only in Montana but also in the Pacific Northwest. The Mountain Musher Organization anticipates even more observers in 1988. There were between 4,000 to 6,000 observers in 1987.

OPPONENTS: None.

QUESTIONS (AND/OR DISCUSSION) FROM THE COMMITTEE: None.

CLOSING: Rep. Miles related that the House broke into barking when it was passed.

DISPOSITION OF HOUSE JOINT RESOLUTION 19: Sen. Lynch moved that HJR 19 BE CONCURRED IN. Motion CARRIED unanimously.

CONSIDERATION OF SENATE BILL 397: Sen. McCallum, Senate District 26, introduced SB 397 as an act to provide funding to the Department of Revenue for administration of special revenue accounts for tax checkoff programs.

Sen. McCallum said that the funds would be provided to the Revenue Department to cover the administration of the annual income tax checkoffs. In addition, the Department of Revenue would be allowed to charge each special revenue account $1 per checkoff contribution or $2,000, whichever is greater.

PROPONENTS: Sen. Severson represented the Fish and Game Committee, and he asked for a bill with a standard figure for checkoffs.

QUESTIONS (AND/OR DISCUSSION) FROM THE COMMITTEE: Sen. Halligan and Sen. Severson said they would figure out the charge by Department of Revenue to deal with the mechanics of checkoffs. The bill wasn't posted due to time constraints, so that it could be referred to the House as soon as possible.

CLOSING: Sen. McCallum thanked the committee for hearing a revenue bill in Natural Resources.

DISPOSITION OF SENATE BILL 397: Sen. Severson made a motion that SB 397 DO PASS. Motion CARRIED unanimously.

CONSIDERATION OF HOUSE BILL 534: Rep. Tom Hannah, House District 86, introduced HB 534 which deals with the sulphur dioxide emissions in Billings. Rep. Hannah reported that HB 534 would do the following:

> Increase the SO_2 emission standard in the Yellowstone Valley from Montana's standard to the federal level standard both on the 24-hour and annual basis.

Three refineries, the sugar beet factory, the sulphur processing plant and a coal-fired electric generating plant put the Yellowstone Valley at periodic times in violation of State standards. The Yellowstone Valley, however, is in compliance with federal standards.

Rep. Hannah called the committee's attention to the Statement of Intent that was attached to HB 534 in the House of Representatives, and he cited six points in the Statement of Intent.

Rep. Hannah then submitted information to support his statements. (Exhibit 1) Rep. Hannah stated that companies had already voluntarily found some means to reduce SO_2 emissions. He said that Billings is the only city in the State that has a sulphur dioxide problem. The reason the problem exists is because industries are located there that were built prior to the enactment of plant standards. At present Billings is operating on the federal standards and has never been out of compliance with the federal standards. Rep. Hannah repeated several times that HB 534 is a "status quo" bill because it will not allow the air in Billings to get worse. He said he believes as a result of the passage of HB 534, there will be cleaner air in Billings because industry and State departments are talking towards an agreement that will bring about a reduction in sulphur dioxide that they had never considered before.

PROPONENTS: Dan Farmer, Billings Chamber of Commerce, spoke on behalf of Jim Scott, President of Billings Chamber of Commerce, and Mr. Farmer read Mr. Scott's testimony which stated that the Chamber of Commerce supports HB 534 because the Billings Chamber supports both jobs and clean air. (Exhibit 1) He also stated that when the House heard the bill, 250 Billings residents who favored HB 534 traveled to Helena in buses. Mr. Farmer submitted a list of their names as an exhibit to these minutes. (Exhibit 2) As a private citizen, Mr. Farmer submitted his testimony in support of 534. (Exhibit 3)

Henry Hubble, Manager of Exxon Refinery in Billings, testified in support of HB 534. Mr. Hubble stated that the federal standards proposed in HB 534 are very strict health-based standards, designed to protect the health of the most sensitive members of society with an adequate margin of safety and to protect agriculture, visibility, and aesthetics. He stated that all areas in Billings meet federal air quality standards; in fact, the Air Quality Bureau has estimated that most areas in Billings meet the State's air quality standards and that changing the standards will not degrade State air quality. He submitted an SO_2 Air Quality Measurement Table that showed Billings is in a downward trend due to the voluntary industry efforts. This table (Exhibit 4) which was compiled from State data, shows that average SO_2 measurements in Billings have decreased from 0.027 to 0.021 ppm between 1983 and 1985. Mr. Hubble said he does not believe that the compromise that is now being discussed with the Department of Health would be legal without the passage of HB 534. He urged the committee to concur with HB 534. (Exhibit 5)

Robert Holtsmith, Manager, Billings Refinery, Conoco, Inc., testified that Conoco supports HB 534. Mr. Holtsmith said that since the health of the community is protected by the federal standards, Conoco does not believe that the State standards are necessary or valid. He stated that Conoco is a participant in a joint law suit, filed in 1980, to challenge the State statute. However, the lawsuit has remained dormant while there is an attempt to reach agreement on the issue. Mr. Holtsmith reported that the recent meetings among affected industries, the Air Quality Bureau, and concerned citizens have shown progress. Mr. Holtsmith urged the committee to enact legislation mandating Montana's Air Quality Standards for Sulfur Dioxide Emissions be made identical to the federal National Ambient Air Qaulity Standards. (Exhibit 6)

Louis J. Day, Refinery Manager at the CENEX Refinery in Laurel, testified in support of HB 534. He stated that CENEX had invested $5,7000,000 in a sulfur dioxide reduction program in 1977, and the plant achieved an 80% reduction in the ambient sulfur dioxide concentration in Laurel in 1979. However, there are presently rules before the Board of Health which would require additional emission reductions up to 45% at CENEX Refinery. If implemented, CENEX would be required to commit to an investment which may well exceed $70,000,000. (Exhibit 7)

Carlton D. Grimm, Montana Power Company, said that HB 534 would have the effect of granting existing industry in Billings a permanent variance from the present State ambient standards. He stated that Montana Power has been convinced for years that federal standards were based on extensive studies and hearings; therefore, federal standards are sufficient to protect public health and welfare. In Montana Power's opinion, the stringent State ambient sulphur dioxide standards are not necessary and were based upon an inadequate record. Furthermore, the cost to comply with State standards is exorbitant. Mr. Grimm explained that MPC endorses intermittent control along with adoption of HB 534. Even though there is an agreement being negotiated which would comply with HB 534 Statement of Intent, Mr. Grimm specifically stated that MPC would not sign such an agreement if HB 534 were not passed. (Exhibit 8)

Kenneth L. Williams, Entech/Western Energy Co., Butte, testified in support of HB 534. Mr. Williams stated that Western Energy Company supplies coal from a Rosebud Mine at Colstrip to the J.E. Corette Generating Station in Billings. He stated that the economic impacts would reach into and affect all sections of Montana; therefore, he urged the committee to concur with HB 534. (Exhibit 9)

Dr. Ronald E. Burnam of the Fellow American College of Chest Physicians, who resides in Billings, testified in favor of HB 534. Dr. Burnam stated that SO_2 concentrations of 0.25 ppm--ten times the federal standard--or less did not induce symptomatic bronchoconstriction in exercising asthmatics (short-term exposure). He also reported that studies since 1981 have showed no evidence of adverse effect on lung function at levels of .04 ppm (long-term exposure). Dr. Burnam then questioned the validity of the Montana Air Pollution study that has been quoted in the local media as a reason for more stringent standards. NOTE: Dr. Burnam summarized his remarks and mailed them to Natural Resources Committee on March 16. (Exhibit 10)

Mike Micone, Western Environmental Trade Association, supported previous testimony and he emphasized one point and that was that the Department would probably suggest that HB 534 would not be needed because they are reaching agreements with industry. Mr. Micone stated to the contrary: "HB 534 will provide the basis whereby those agreements can be reached." He said HB 534 deserved the support of the committee.

Gene Pigeon, Montana-Dakota Utilities (MDU), went on record as supporting HB 534--"Clean Air and Jobs." MDU Resources services plants in Billings when ambiet conditions warrent shutting down their fuels and transferring to natural gas. Mr. Pigeon said that MDU recommends that the committee support HB 534.

Time had run out for other proponents to testify, and Jo Brunner who represented the Montana Cattlefeeders submitted written testimony only. (Exhibit 11)

At that point, Sen. Keating asked other proponents to stand, and 13 people stood in support of HB 534.

OPPONENTS: Howard Toole, Board of Health, Missoula, testified against HB 534. He said the conflice on this subject in Billings had let to the proposal of rule-making in regard to the annual and 24 hour standards. He indicated that the Board and the Department are committed; and if the Legislature wanted them to continue to try to work out a consensus approach to the problem, the Board of Health possibly could engage in new rule-making proceedings and re-visit standards with appropriate administrative action. Mr. Toole was concerned that the passage of HB 534 would make negotiation impossible. He stated that if Billings is allowed to be in compliance with the federal standard only, there would be no incentive for further negotiations. Mr. Toole said that the Legislature had given the BHES the authority for policy making in the area of environment, and they were willing to accept that responsibility and would continue to do so. However, Mr. Toole suggested that if HB 534 were passed, the Board of Health ". . . would look at other matters!"

Hal Robbins, Department of Health and Environmental Sciences, testified that he recognized the Legislature's right to control policy, but he objected to HB 534 because it would interfere with the administrative process. The Department of Health and Environmental Sciences had adopted the air quality standards for Montana in the first place, and he believed that the Board should be given an opportunity to implement those standards. Mr. Robbins reported that the standards were adopted only after lengthy public hearings and testimony, and he suggested that the issue was not within the realm of the Legislature. He stated that the duty and implementation should remain the province of an independent board since it had been created specifically for that purpose and has the time necessary to insure a fair implementation. Furthermore, Mr. Robbins stated that sufficient health data exist to conclude that the existing Montana ambient air quality standards are reasonable to protect public health. (Exhibit 12)

Rep. Kelly Addy, House District 94, opposed HB 534. He said that HB 534 is a classic example of what prompted Sen. Mansfield to say when the environmental movement was still in its infancy, "We have to strike a balance." Rep. Addy said that there must be a balance between jobs and environment, and that each consideration is as valid as the other. He stated he objected to the following:

1. Proposal will be a permanent change--there is no sunset in the bill.

2. Bill "tinkers" with the 24-hour standard in which asthmatics would have to pay the penalty.

Rep. Addy said that the people in the Yellowstone Valley should be given a choice of which air quality standards they prefer. Rep. Addy then distributed amendments that were offered by Rep. Harper on the Floor of the House. (Exhibit 13)

Eileen Morris, a resident of Yellowstone County and also a Northern Plains Resource Council representative, testified against HB 534 (Exhibit 14). She distributed two review documents for the committee members to read:

1. Summations from the final Environmental Impact Statement on the Ambient Air Quality Standards Study, dated February 14, 1980 (Exhibit 14-a)

2. EPA's Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982): Assessment of Newly Available Health Effects Information (Exhibit 14-b).

Ms. Morris said that the issue involved is not how much clean air will cost, but who will pay the cost. If Montana industry is not required to control its air pollution, Ms. Morris stated that many in the State would suffer the consequences by ill health. Ms. Morris urged that the Committee not concur with HB 534.

Wendy Anderson, Public Health Association of Montana, testified for Carolyn M. Hamlin, Assistant Professor of Public Health Nursing. Ms. Hamlin's testimony reported that chronic obstructive lung disease is the fifth leading cause of death in Montana. Pneumonia and influenza follow as the sixth leading cause. Both of these death rates exceed the same disease-related death rates in the U.S. Therefore, it seems logical that proposed voluntary standards would be risky. Considering sulfur dioxide as one of the three major sources of air pollution which would result in a decreased quality of life and high medical expenses, Ms. Anderson stated that HB 534 cannot be allowed to pass out of committee. (Exhibit 15)

Claudia Massman Montana Environmental Information Center Action Fund, opposed the passage of HB 534. She said that clean air is a good State policy, and reducing Montana's air quality standards would do little to solve Montana's antibusiness climate, and result only in a loss of clean air. Ms. Massman purported that maintaining clean air would be an economic benefit to Montana because people would be attracted to the State by its largely unspoiled environment. (Exhibit 16)

Rick Berg, rancher from Glen, opposed HB 534 because of the effect it would have on agriculture and tourism. He said that SO_2 has horrible effects on agriculture as stated in a congressional report that he had read. He said that wheat, alfalfa, barley and other plants suffer leaf damage, growth inhibition, and increased mortality from SO_2 levels that are even lower than the national air quality standards.

In regards to tourism, Mr. Berg asked how many people would drive across country to breathe the air that is worse than where they left. He wondered if the tourists would take Montanans at their "word," that there really are mountains somewhere out in the haze. Mr. Berg stated that, even if we disregard all of the aforementioned objections, even if we don't care that Billings' children already have diminished lung capacities, even if we forget that Montana is renowned for its crystal clear air and sky to tourists throughout the world, even if environmental concerns are not the committee's concerns, HB 534 would set a horrible precedent to let the notion go forth that when industry threatens to "take their ball and go home," Montana will throw up her arms and say Go ahead, have your way with me." Mr. Berg concluded by saying, "Let that idea get a foothold in the State, then it's Goodbye, Big Sky!" Mr. Berg asked that HB 534, which amounted to panic legislation in his opinion, not be passed.

Scott L. Fraser, Yellowstone Valley Citizens' Council, submitted written testimony (Exhibit 17). Mr. Fraser urged the committee to abandon HB 534. However, if the committee felt that HB 534 should be passed, Mr. Fraser submitted some amendments. (Exhibit 18)

Don Lees, a resident of Billings, gave testimony that his wife died in the summer of 1985 and he was of the opinion that her death was hastened by dirty air. His wife was asthmatic. Her attacks and dates of hospital admittance correlated with the pollution incidents in Billings. Mr. Lees respectfully asked the committee not to pass HB 534.

Jim Carlson, Missoula City-County Health Department, objected to HB 534 because administrative procedure would be set aside. Mr. Carlson said he was concerned about the industries not following due process. There is a concern of the legality of the standard that was appropriately promulgated and the constitutionality of HB 534. What the bill would do is set a different standard for the Billings area than it does for the rest of the State. Therefore, people's health protection would not be provided for in the Billings area. Mr. Carlson said that the bill would not adequately protect coniferous forests which are the econmic base of Western Montana, and the federal standard does not protect coniferous forests. HB 534 would set a poor precedent in saying that industries who fight rather than cooperate with a set standard may find relief in the legislature. He said that there have been a number of industries in the State who have cooperated and complied with State standards--ASARCO, Colstrip, and Missoula Pulp Mill.

Sen. Keating asked the other opponents to stand, and 12 additional people stood.

Testimony from opponents was submitted to the secretary as follows. Because of time constraints, testimony was written only.

Montana Association of Churches (Exhibit 19)
Audubon with proposed amendment (Exhibit 20)
League of Women Voters (Exhibit 21)
Montana Senior Citizens (Exhibit 22)
Yellowstone Basin Group (Exhibit 23)
Ed Zaidlicz with newspaper article (Exhibit 24)

QUESTIONS (AND/OR DISCUSSION) FROM THE COMMITTEE: Sen. Walker asked if the State air standards were being enforced in Billings. Mr. Toole said that the State air standards had been in litigation for years and there has not been any strict enforcement effort brought by the State. Sen. Walker asked about a comprehensive review study of the standards, and Mr. Toole indicated that he would like to see such a study be undertaken because BHES had deferred twice for lack of good data.

In reply to Sen. Severson's inquiry, Mr. Robbins said he thought maybe 20 states have higher standards than the federal standards, but he wasn't sure.

In the course of the discussion it was reiterated that other areas in the State are complying with State standards and there is a tax reduction for companies that install pollution control equipment. There was concern expressed by some members of the committee about BHES' authority being usurped if HB 534 were passed.

Sen. Halligan asked Mr. Hubble if he would support legislation that would allow tax credits for installation of air pollution devices, and Mr. Hubble said that would make sense to him. It was repeated time and again by representatives of industry that as long as federal standards were being met, the public's health was protected. Board of Health people insisted that others in the State could and did meet State criteria and Billings industries should do likewise.

Sen. Yellowtail referred to the Statement of Intent, and he asked why companies should negotiate. Mr. Hubble said industries have made a public commitment and it's good faith.

Sen. Walker asked Sen. Regan for her comments, and she said that HB 534 disturbs her since BHES and industry are already working on solutions. She said she does not believe that industries would close if they were held to State standards.

CLOSING Sen. Hannah distributed a table showing locations of monitors in the Billings area and a letter to EQC from Mr. Robbins. (Exhibit 25) Rep. Hannah said he feels it's wrong to assume that industry would not leave the State. HB 534 is a good preserver of jobs in his opinion. He said that the question to finally answer is why do we need this bill. Frankly, Rep. Hannah felt that BHES is only negotiating with the companies because of the existence of HB 534. He reported that HB 534 had received 72 votes in the House and concluded his remarks by saying it is important and critical to the economic life of industry in Billings. It can be documented that that there will be clean air, and SO_2 in the Billings area would go down with the passage of HB 534.

There being no more business to come before the Committee, Sen. Keating adjourned the meeting at 2:57 p.m.

Thomas F. Keating

THOMAS F. KEATING, Chairman

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ROLL CALL

NATURAL RESOURCES COMMITTEE

50th LEGISLATIVE SESSION -- 1987 Date 3/13/87

NAME	PRESENT	ABSENT	EXCUSED
Sen. Tom Keating, Chairman	✓		
Sen. Cecil Weeding, Vice Chairman	✓		
Sen. John Anderson	✓		
Sen. Mike Halligan	✓		
Sen. Delwyn Gage	✓		
Sen. Lawrence Stimatz	✓		
Sen. Larry Tveit	✓		
Sen. "J.D." Lynch	✓		
Sen. Sam Hofman	✓		
Sen. William Yellowtail	✓		
Sen. Elmer Severson	✓		
Sen. Mike Walker	✓		

Each day attach to minutes.

DATE March 13, 1987

COMMITTEE ON Natural Resources

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One: Support	Check One: Oppose
Paul F. Berg	Sierra Club	HB534		X
Chris Ebeling	League of Women Voters	HB534		X
KATHY KARP	MONTANA ASSOC. CHURCHES	HB534		X
Ed BARTLETT	MONTANA POWER	H.B.534	X	
Carol Mosher	Mt. Cattle Women Mt. Stockgrowers	HB534	X	
Janet Ellis	MT Audubon	HB534		X
Toni Lee Simmons	Northern Plains Resource Council	HB534		X
Claudia Massman	MEIC	HB534		X
SCOTT FRASER	YELLOWSTONE VALLEY CIT. COUNCIL	HB534		✓
Eileen Morris	Yellowstone Valley Citizens"	HB534		✓
Rick BERG	SELF	HB534		✓
[illegible]	Yellowstone V. C.C.	HB534		✓
JAN Sullivan	SELF	HB534		✓
CARLTON D. GRIMM	Montana Power Company	HB534	X	
Harold W Robbins	MT Dept. of Health	HB534		✓
Joyce Spicher	MT Board of Health	534		X
Jim Carlson	Msla County	534		X
Russ Brown	NPRC	534		X
Edwin Zaidlicz	Health Board-Montana	534		X
Janelle Fallan	Mont Petroleum	534	X	
Bob Holtsmith	Conoco	534	X	
Lou Day	Cenex	534	X	
[illegible]	Cenex	534	X	
Mike Micone	WETA	534	X	
Bob Olsen	CONOCO	534	X	
Ken Williams	Western Energy	534	X	

(Please leave prepared statement with S[...]

DATE March 13, 1987

COMMITTEE ON

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One: Support	Check One: Oppose
Doug Campbell	Montana Senior Citizens Assoc	534		✓
Stacy Steinberg	MT Dept of Health	534		X
Dan Farmer	MDU / CofC	534	X	
GENE PIGEON	MDU RESOURCES GROUP	534	X	
J Brunner	Cattlefeeders	534	X	
David Hall	MT MTN MUSHERS	HJR 19	X	
Mark O'Keefe	Helena Citizens Com	HJR 19	X	
HENRY HIBBLE	Exxon	534	X	
Anne Light	concerned citizen	534		X
" "	"	HJR 19	X	
Tom Tully	NPRC	534		✓
Mike Keen	Citizen	534		✓
LINDA COLLINS	BEAR CREEK COUNCIL GARDINER, MT	534		X
Stuart Doggett	Mt. Chamber of Commerce	534	X	
John Alan	MPC	534	X	
[illegible]	CENEX	534	X	
Ted Robbins	ASARCO, INC	534	X	
Karla Gray	MPC	534	X	
Jan Cool	Exxon	534	X	
Jo Brunner	MONTANA CATTLEFEEDERS	534	X	
Art Wittich	Montana Power	534	X	
Bob Quinn	Mont Pwr Co.	534	✓	
Anne Black	NPRC	534		X
[illegible] Burman MD	Concerned Citizen	534	✓	
[illegible] Olson [illegible]	" "	534	✓	
Thomas A. Nelson	Exxon	534	X	

(Please leave prepared statement with Secretary)

DATE March 13, 1987

COMMITTEE ON

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One: Support	Check One: Oppose
Tim Schey	Exxon Co. U.S.A	534	✓	
Stan Bradshaw	Self	534		✓
B. J. Wood	Am. Assoc. Univ Women	534		✓
Sonny Hanson	SELF - BILLINGS	534	✓	
Steve Wright	Self	534	✓	
Sandy Mesdaniger	self	534		✓
Carolyn Hamblin	Montana Public Health Assn.	534		✓
(by Wendy Atkinson)	NPRC	534		✓
Bill Opitz	DHES	534		✓

(Please leave prepared statement with Secretary)

NAME DAVID STILLER BILL NO. HJR 19

ADDRESS HELENA DATE 3/13

WHOM DO YOU REPRESENT MT MTN MUSHERS

SUPPORT ✓ OPPOSE ______ AMEND ______

PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

Comments:

NAME Mark O'Keefe BILL NO. HJR 19

ADDRESS 719 Holter Helena DATE 3/13

WHOM DO YOU REPRESENT Helena Citizen Council

SUPPORT ✓ OPPOSE ______ AMEND ______

PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

Comments:

SENATE NATURAL RESOURCES
EXHIBIT NO. 1
DATE 3/13/87
BILL NO. HB 534

Exxon reduces emissions

By PAUL J. HOLLEY
Of The Gazette Staff

Operational changes at Exxon USA's Billings refinery have cut sulfur dioxide emissions by 15 percent, company officials said Wednesday.

But, they cautioned that further SO2 reductions to meet state air-quality standards could make the refinery unprofitable.

HUBBLE
process working

The SO2 reduction procedure, in use since Dec. 29, is estimated by Exxon to cost $100,000 a year.

"Our goal is to reach a rapid and equitable solution to the Billings air quality concerns," Henry Hubble, Exxon refinery manager told a news conference.

The method, which Exxon officials said they expect will reduce the refinery's SO2 output by 2,000 tons per year, uses a second stripper unit to remove hydrogen sulfide from waste water created during the refining process.

Instead of emitting SO2 by burning off the hydrogen sulfide, the material is now piped to nearby Montana Sulfur & Chemical Co. for recovery.

Exxon's emissions reduction is welcomed by state regulators, but Hal Robbins, state Air Quality Bureau chief, said the effort won't improve the overall air quality.

"We're not ungrateful. We're pleased that anyone would voluntarily reduce emissions," he said. "The downside is, we're looking for a long-term solution."

The state Board of Health will meet Friday in Helena to discuss ways to reduce SO2 emissions in the Billings area.

Affected industries, including Exxon, two other refineries, a sugar mill, a power plant and Montana Sulfur, have said that they would like to see Montana adopt a less-stringent federal standard for SO2 emissions. The SO2 output of the Yellowstone Valley industries is within the federal standard.

The state standard hasn't been enforced.

Robbins said that the state SO2 emission standard and industry compliance is "all up to negotiation."

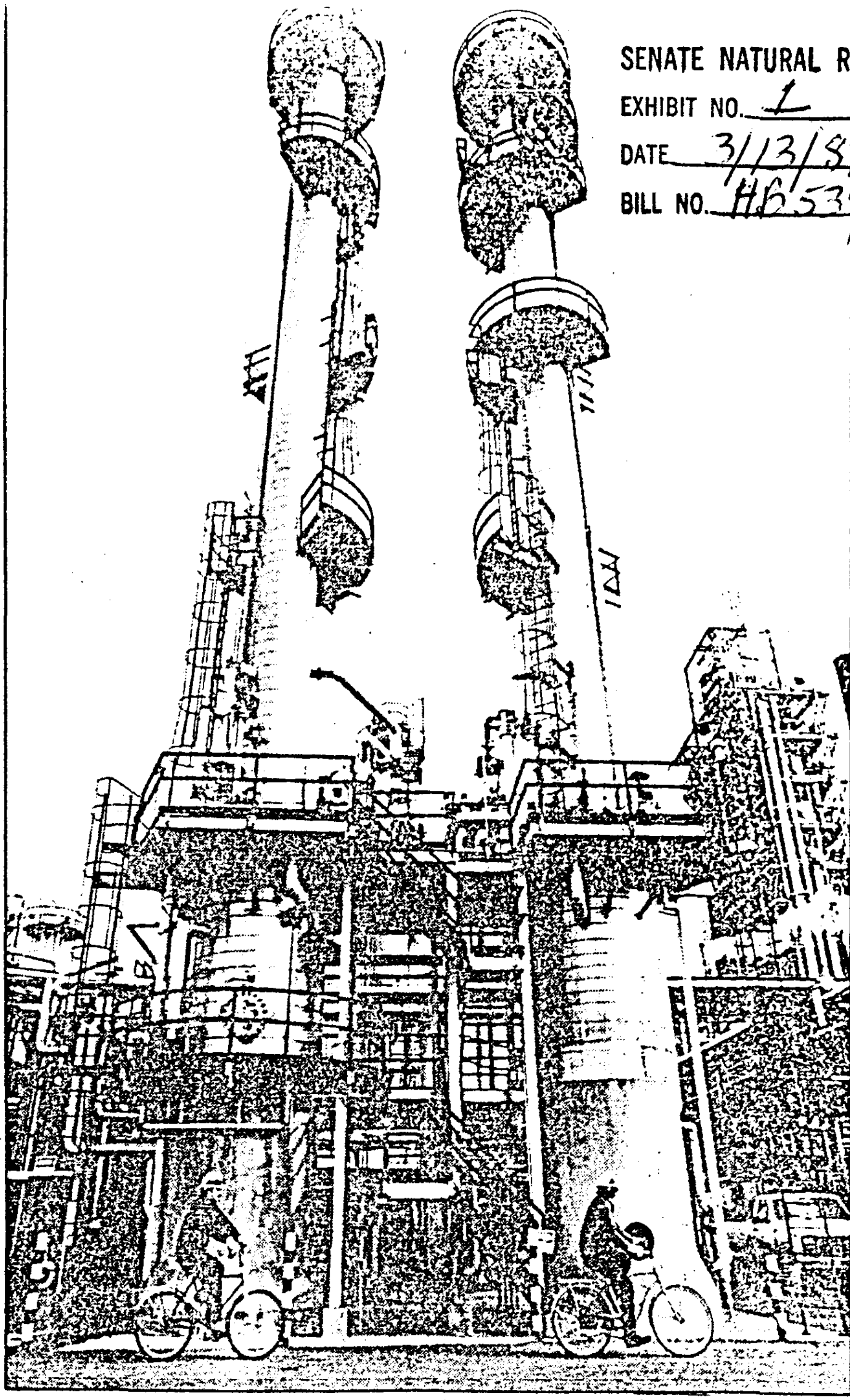
The state wants industries to take steps toward compliance and start monitoring emissions and the surrounding air quality, he said.

Hubble said that it would cost Exxon $8 million to cut its SO2 emissions by another 15 percent and meet the state standard.

"The primary concern is we don't just compete with refineries in Montana, we compete with refineries elsewhere in the country," he said. "If other refineries don't have to comply with the same standards we do, it places us at a significant competitive disadvantage."

Hubble, however, stopped short of predicting the refinery's closure if the state chooses to enforce the SO2 standard.

"I don't want to come off as threatening," he said. "We're going to do what we can to stay in business."



Gazette photo by Larry Mayer

These "stripper" towers are used to reduce sulfur-dioxide emissions at the Billings Exxon refinery.

Bikes save time

Sometimes the simplest methods are the most successful.

Workers at the Billings Exxon refinery use balloon-tired, single-speed bicycles to scurry about the pipework jungle.

Tim Schug, the refinery's environmental affairs coordinator, said the bicycles have proven to be a reliable form of transportation. The refinery keeps several bicycles on hand for on-site use.

SENATE NATURAL RESOURCES
EXHIBIT NO. 1 (p. 2)
DATE 3/13/87
BILL NO. HB 534

LOCKWOOD SCHOOLS

ELEMENTARY AND JUNIOR HIGH SCHOOL
District 26 — Yellowstone County
BILLINGS, MONTANA 59101
1932 U.S. Hwy. 87
Route 2 Phone 252-6022

JOE C. McCRACKEN
SUPERINTENDENT
PHONE 252-6022
CAM CRONK
JUNIOR HIGH PRINCIPAL
PHONE 259-0154
MICHAEL BOWMAN
INTERMEDIATE PRINCIPAL
PHONE 248-3239
DARRELL RUD
PRIMARY SCHOOL PRINCIPAL
PHONE 252-2776

SENATE NATURAL RESOURCES
EXHIBIT NO.
DATE
BILL NO.

June 11, 1986

Rep. Tom Hannah
State Capitol
Capitol Station
Helena, Mt. 59620

Dear Mr. Hannah;

I have attached inforamtion showing what the total Lockwood District tax levies were Fy 86 and the amount that Exxon paid in year 1985-86.

FY 86 LOCKWOOD S.D. #26 TOTAL DISTRICT TAX LEVIED $951,171.92 - (see source A)

FY 86 EXXON'S TOTAL TAXES LEVIED FOR S.D. #26 ..... $495,449.09 - (see source B)

NOTE: EXXON PAID 52% OF LOCKWOOD S.D. #26 TOTAL TAXES IN 1985-86.

I have attached the following source:

A. LOCKWOOD S.D. #26 DISTRICT BUDGET FY'86 FUND REPORT

B. YELLOWSTONE COUNTY TREASURER "DISTRIBUTION WORK SHEET"

NOTE:
DISTRIBUTION WORK SHEET FOR EXXON 1985-86 TAXES:
TOTAL TAXES $2,066,954.89
BREAKDOWN:

Library	$ 26,234.91
Road	110,540.21
S.D. #26 LOCKWOOD	495,449.09
H.S. #2 BILLINGS	353,794.65
COUNTY AND STATE	992,503.85
LOCKWOOD TRANSPORTATION	88,432.18

Attached are copies of Yellowstone County Treasurer "Distribution Work Sheet" for BN and Montana Sulphur and Chemical.

If you need additional inforamtion, call me.

Sincerely,

La Vonne Deeney

La Vonne Deeney
Business Manager/clerk
copy Exxon

SENATE NATURAL RESOURCES
EXHIBIT NO. 1 (p. 3)
DATE 3/13/87
BILL NO. HB534

MPC sees three possible options for our Corette plant, which might meet this emission reduction contained in Alternative 1. They are:

1. Installation of a scrubber. This is a very costly option -- both from the capital cost and annual operating cost standpoint. Costs and limitations of this option are discussed under Alternative 3, the 70 percent reduction case. For both this nominal 30 percent alternative and the 70 percent reduction alternative, the scrubber option is considered unacceptable. Limited space around the existing unit and the need for off-site waste disposal add substantially to the design problems and cost of the flue gas desulfurization retrofit.

2. Permanent reduction of load by approximately 1/3 of the rated capacity of the unit would reduce the SO_2 emissions by the same fraction. The loss in generating capacity would be 60 MW. Loss of this much generation would cost approximately $46 million in annual levelized dollars over an 18-year period to purchase from off-system sources and would not be an acceptable long-term solution.

3. Switch fuels from Colstrip Rosebud seam to a lower sulfur coal. In its analysis of the draft proposed rules, MPC searched for lower sulfur coal and did not locate any viable supply source in the State of Montana that could meet existing boiler requirements and the coal sulfur level necessary to meet the proposed sulfur dioxide emission limitation. However, lower sulfur fuels are currently being mined in Wyoming. The Rosebud seam coal, when burned, generally produces sulfur dioxide emission in the 1.4 to 2.0 lb SO_2/MMBTU range. One specific Wyoming coal we looked at would produce between 0.6 and 1.1 lb SO_2/MMBTU. Depending on how the daily emission rate is computed, even this low sulfur coal

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agricultural and governmental purposes in the Helena valley. The offhand statement in the EIS that "the increased energy demands would be small" is obviously a gross distortion of the truth.

Concerning the possiblility of meeting the proposed standards, the company said:

> ...We, of course, have not had an opportunity to investigate the cost of meeting such stringent requirements since we are only now obtaining the information necessary to assess the costs of meeting the emission limits set by the Board of Health last November. As noted, our present estimates of the costs of meeting those limits and the related OSHA arsenic standard is approximately $130,000,000. We are fearful, however, that the additional costs of lowering SO_2 emissions by the additional 90% ERT says will be necessary to meet the proposed state standards will be so substantial as to destroy the economic viability, not only of the smelter, but of Anaconda's entire Montana copper operation.
>
> ...we suggest that the EIS's consideration of the economic impact of the proposed standards on Anaconda is so faulty that it should be completely revised. We further suggest that a realistic consideration of the economic impact of the proposals on Anaconda, alone, should cause the Bureau to reconsider them and to propose instead the federal ambient air quality standards for SO_2 in view of the failure of the EIS to demonstrate their need to protect human health and vegetation.

In discussing the impact of the proposed standards on the company's position within the mining and smelting industry in general, it said:

> Nonferrous mining and smelting is obviously one of Montana's major industries. The EIS recognizes that Anaconda, alone, employs 5% of Montana's work force in its copper operations. Montana's copper mining and smelter industry must compete with copper mines and smelters operating in other states. Aside from Montana, the bulk of the copper smelting industry in this country is located in the states of Arizona, Utah, Tennessee and Texas. Each of those states has adopted the federal ambient air quality standards for SO_2. Significantly, the EIS fails to make mention of this fact and does not list the standards of any of these states in Table B-I of Appendix B. Obviously, if Montana adopts the proposed ambient air quality standards which are more stringent than those in effect in those states, Montana's copper industry will not merely be placed at a competitive disadvantage; rather, its ability to continue in operation will be placed in jeopardy. This can hardly have the effect of promoting the economic development of Montana, since it could result in the loss of 4,500 Montana jobs.

Labor unions in the Butte-Anaconda area and the Anaconda Chamber of Commerce also voiced concerns over the possible impacts of implementing the might not be an option. Should the coal change become necessary, test burns to prove the alternate fuel's acceptability in the present station would be required. The economic costs to entities other than MPC for switching fuel from a Montana source to Wyoming are as follows and represent those costs accumulated over a 20-year period, which is approximately the remaining economic life of the J. E. Corette plant:

1) The State of Montana would lose approximately $25 million in Coal Severance Taxes;

2) Loss of Gross Proceeds Taxes would be $3.8 million;

3) Loss to the State of Montana of 1/2 of associated Federal Coal Royalties -- $3.8 million;

4) Loss of Resource Indemnity Trust Tax -- $330,000;

5) Loss to a Montana supplier, Western Energy Company, of coal sales in excess of $120 million;

6) Loss to the private sector for support goods and services -- $25 million;

7) Direct employment -- $9.4 million;

8) Indirect employment -- $6.4 million; and

9) Loss of corporate and Individual Income Taxes on direct and indirect employment.

From these figures, one sees the economic impacts of the coal switch are significant to the State of Montana and go beyond the totals of coal taxes, jobs, and direct expenditures. The impacts would reach into and affect all sections of Montana's economy.

PART C—PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY

SUBPART 1

PURPOSES

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SEC. 160. The purposes of this part are as follows:

(1) to protect public health and welfare from any actual or potential adverse effect which in the Administrator's judgment may reasonably be anticipated to occur from air pollution or from exposures to pollutants in other media, which pollutants originate as emissions to the ambient air), notwithstanding attainment and maintenance of all national ambient air quality standards;

(2) to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value;

(3) to insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources;

(4) to assure that emissions from any source in any State will not interfere with any portion of the applicable implementation plan to prevent significant deterioration of air quality for any other State; and

Part 1

General Provisions and Administration

75-2-101. Short title. This chapter shall be known and may be cited as the "Clean Air Act of Montana".

History: En. Sec. 1, Ch. 313, L. 1967; R.C.M. 1947, 69-3904.

75-2-102. Policy and purpose. (1) It is hereby declared to be the public policy of this state and the purpose of this chapter to achieve and maintain such levels of air quality as will protect human health and safety and, to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this state, and facilitate the enjoyment of the natural attractions of this state.

(2) It is also declared that local and regional air pollution control programs are to be supported to the extent practicable as essential instruments for the securing and maintenance of appropriate levels of air quality.

(3) To these ends it is the purpose of this chapter to:

(a) provide for a coordinated statewide program of air pollution prevention, abatement, and control;

(b) provide for an appropriate distribution of responsibilities among the state and local units of government;

(c) facilitate cooperation across jurisdictional lines in dealing with problems of air pollution not confined within single jurisdictions; and

(d) provide a framework within which all values may be balanced in the public interest.

History: En. Sec. 2, Ch. 313, L. 1967; R.C.M. 1947, 69-3905.

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Altimus, Glenn D.
Altimus Distributing

Anderson, Dave
A & H Turf & Specialities

Anderson, Duane S.
Anderson Steel Supply

Andrikopoulous, Basil
Dain Bosworth

Anthony, Doug
Metal Door Products

Astle, Tom
Tom Astle

Badura, Ed
Western Sugar Company

Barthuly, Harry
Harry Barthuly

Bartlett, Bill
Corporate Air

Bernhardt, Mike
Beet Growers Association

Boyer, Bill
Capital Communications

Boyer, Jim
Express Mart

Boyer, Tom
Tom Boyer

Brekke, Dick
Dorsey & Whitney

Brew, Bill
Star Service

Brosovich, Gene
Brosovich Engineers

Buchanan, Gary
Merrill Lynch

Burch, Lynn
FBS Insurance

Burns, Conrad
Yellowstone County

Cartmill's Inc.
Cartmill's Inc.

Cartmill, Joe
Cartmills Inc.

Chiesa, Bill
Yellowstone County

Christianson, Buz
Yellowstone County

Clark, Ed
Industrial Plating & Grinding

Cockrell, Tom J.
Conoco Travel Shoppe

Cooper, Don
Allied Technical Sales

Cumin, Cal
Cumin Associates

Davis, Jim
United Blood Services

DeJarnett, Don
Montana Steel

Dean, Doug
Inland-Northwest Dist.

Demaree, Morris
Bonanza Distributing

Derr, Roger
Hennessey's

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Dimich, Bill
Pepsi Bottling Co.

Duke, Jim
Montana Seals & PACKING

Dutton, Ernie
Metro Realty

Eggebrecht, Mark
Mark Eggebrecht

Eldon, John
Express Services

Eskro, Ray
Familian Northwest

Evans, John
First Interstate Bank

Falstad, Jan
KTVQ-2

Farmer, Dan
Montana Dakota Utilities

Feller, Doug
Doug Feller & Associates

Fenter, W.V.
W.V. Fenter

Flick, Dennis
Dennis Flick

Foote, John E.
Billings Commerce Center

Fox, Fran
Fran Fox

Frank & Wetch Truck Shop
Frank & Wetch Truck Shop

Frank, Warren
Beet Growers Association

Freestone, Tom
Circuit Distributing

Friede, Gordon
Western Sugar Company

Gabel, Leroy
Montana Beet Growers Assoc.

Gabel, Leroy
Gabel Farms

Gauger, Tom
Gaugers RV

Geisinger, Jake
B & B Matl. Handling

Gibson, John
Montana Dakota Utilities

Goan, Richard
Dude Rancher Lodge

Gransbery, Jim
Billings Gazette

Grass, Gene
Gene Grass

Gray, Bruce
Mountain Bell

Grunstead, R.M.
G M Petroleum

Hale, Bob
Oakland & Co.

Hanser, Ralph E.
Hanser's Auto & Wrecker Co.

Harnish, John
Tractor & Equipment

Harpster, Bob
Bob Harpster

Hauck, Scott

Hauptman, John

Havig, Ray
Bairs

Henry's Safety Supply
Henry's Safety Supply

Hortsman, Ann
Ann Hortsman

Jarussi, Gene
Gene Jarussi

Jennings, Ernie
Marion Power Shovel

Johnson, Gregg
Pacific Metal Co.

Johnston, Forrest
Forrest Johnston

Kautz, Dr. Al
Kautz Optimistrist

Kelly, Frank
Standard Batteries

Kiedrowski, Gordy
Bonanza Steak House

Koelzer, Al
Floberg Realtors

Kryser, Thomas C.
Floberg Realtors

Lenhardt, Bob
Bob Lenhardt

Lovely, Doug
Floberg Realtors

MacIntyre, Bruce
Bruce MacIntyre

Madsen, Buford
Madsen Door Service

Henry's Safety Supply
Henry's Safety Supply

Heringer, Charles J.
Herco

Huffield, Mitch
Billings Truck Center

Jenkins, Mae
Yellowstone County

Johannes, John
Walman Optical Co.

Johnston, Dennis
Big Sky Haul Away

KTVQ-2
Photographer

Keifer, Darrell
Montana Brake Eng.

Kennedy, Mark
Bert & Ernies

Knox, Gary
School District #2

Kraft, Jim
Yellowstone County

Kuhlman, Steve
Barry O'Leary Inc.

Louman, Robert A.
Yellowstone Acoustics

Lowe, Bill
Montana Radiator

MacKay, Dwight
Yellowstone County

Maroudas, Tony
Catey Controls

Martin, Albert J.
Empire Heating & Cooling

Matz, Brian
Diebold, Inc.

McKenzie, Jim
Christian Spring Sielbach

McNea, Mel
Summers, McNea & Co., PC

Mellgren, Hank
Northwest Pipe Fittings, Inc.

Mercer, Wallace
Wallace Mercer

Merry, Dan
Yellowstone Hydraulics, Inc.

Metz, Will
Coors Country

Midland Dodge
Midland Dodge

Midland Empire Material
Midland Empire Materials

Miller, Jim
Renn-Vertec

Minckler, Tom
Thomas Minckler Gallery

Mitchell, Jack
MonODak Chemical Inc.

Monson, Ed
Associated Glass Inc.

Mooney Painting Inc.
Mooney Painting Inc.

Mooney, Harold
Mooney Painting Inc.

Morrison, Earl
Agriturf International

Myers, Mike
Cabinet Specialists

Nelstead, Keith
Keith Nelstead

Nile, Kim
Montana Beet Growers Assoc.

Norwest Bank
Norwest Bank

O'Brien, Dave
Mountain Supply Co.

O'Leary, Tim
O-M Equipment Co

Oakland, Gary
Oakland & Co.

Olcott, Harry or Andy
Olcott International, Inc.

Olson, Wallace
Floberg Realty

Palmer, Bill
Palmer Enterprises

Parker, Mark
Mark Parker

Petri, Jim
J & J Machine

Phelps, Hal
J & H Office Equip, Inc.

Pierce, Bill
Pierce Mobile Homes

Pierce, Bob
Western Sugar Company

Pierson, Craig

Pierson, James N.

Pluhar, Helen
Helen Pluhar

Potzman, Dennis
Homestead Business Park

Reed, Arnold M.
Arnold M. Reed

Reinke, Harold
Midland Doge

Rist, Ted
Interstate Diesel Products

Roberts, Dennis
Chem Lawn

Rush, Bob
AC Insudtrial Equipment

Sampson, Steve
Conlin Furniture

Samsal, Dale
D & D Door & Glass

Sanderson, Bob
Sanderson Stewart Gaston

Schafer, Mike
Yellowstone County

Scheels, Chuck
Scheels Inc.

Schuman, George
Ryan Wholesale

Schock, David E.
Travis-Jam, Inc.

Settell, Gary
Mountain Bell

Shima, Gene
Industrial Systems

Slayton, Bob
Normandale Properties Inc.

Slayton, Ron
Hanson-Kelly Const. Inc.

Smart, Butch
Cummin Power Inc.

Smith, Dick
FBS Leasing

Snyder, Ralph
Archie Cochran Motors

Stanaway, Don
A & I Distributors

Stansberry, Meryle
Meryle Stansberry

Steel, Dick
Industrial Plating & Grinding

Stevens, Maralyn
Omega Apparatus

Stewart, Wally
Star Service

Strecker, Bud
Bud Strecker

Strecker, Sherman
Sherman Strecker

Stumvoll, Gene
Landmark of Billings, Inc.

Swanson, Al
Homestead Business Park

Swenson, Craig
First Citizens Bank

Thomas, Frank
American Rent All

Thompson, Rich
Classic Properties

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Tilzey, Fred H.
Empire Lath & Plaster

Tisor, T.J.
Tri State Equip., Inc.

Tonigan, Gardner
Gardner Distributing Co.

Treiber, Richard
Lesman Iron Works, Inc.

Trotman, Roger
Valley Welders Supply Inc.

Urbaska, John
Fasteners Inc.

Van Cao, Dr. T.
Eastern Montana College

Wade, Gene
Dain Bosworth, Inc.

Waggoner, David
Waggoners Trucking

Waggoner, Wayne
Waggoners Trucking

Wagner, Marv
Rimrock Signs

Wahl, Jack
Mountain Bell

Walker, Dan
Mountain Bell

Wallinder, Judy
Farmers Insurance

Walters, Adam
Walters Inc.

Walters, Rich
Walters Inc.

Watson, James
The Insurance Exchange

Weber, John
Weber Machine

Wells, Leland
Leland Wells

Weschenfelder, Lil
Beet Growers Assn.

Whalen, Mike
First Interstate Bank

Whitmore, Dennis
Precision Power Trains

Willard, John
John Willard

Williams, Keith
Keith Williams

Wold, Paul
First Interstate Bank

Wood, Greg
Ford New Holland

Yellowstone County
Yellowstone County

Young, Harvey
Design 3 Engineering

Zent, Phil
Security Federal Savings Bank

Ziegler, Jim
Yellowstone County

Zier, Dick
Yellowstone Electric Co.

Ziller, Lucy
Lucy Ziller

EXHIBIT NO. 3
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Good Afternoon. I Would like to speak in support of House Bill 534.

My name is Dan Farmer. I am a chemical engineer by profession and registered in Montana and Wyoming. I am a past President of the Midland Empire Chapter of the Montana Society of Engineers. My experience is in the design and construction of oil and gas production, transmission, and distribution facilities.

Over the last year, many knowledgeable people in the Billings area have watched this SO_2 Ambient Air Quality issue with great concern. The economic impacts of enforcing the present state standard on the Billings economy could be extremely harmful and long-lasting. I would like to address the issue from an engineering standpoint.

The information presented in support of the present Montana Standard is inadequate to support, with any degree of accuracy, the .02 parts per million standard in two ways.

1) No model has been developed to accurately determine the source and amount of SO_2 emissions and the probable effect of a reduction at any of the six emitting companies. Reliable data is absolutely essential and a precondition to an accurate decision on this issue.

2) No health data has been presented to justify Montana's lower SO_2 level. Federal studies are, by all accounts I can find, considered to be accurate and to have an adequate margin of safety.

Two recent Montana Air Quality Board proposals also need to be addressed:

1) The proposal to limit SO_2 levels on a daily or hourly basis should be left to Federal legislation where staff exists to make a competent decision based upon adequate, reliable research.

2) The proposal to retain the present Montana SO_2 standards, but to allow Yellowstone County emitting businesses to continue operation under Air Quality Board supervision is unacceptable. Business cannot make long-term investments based upon the whim of a board.

In summary, there is not any known health reason to justify Montana's lower SO_2 Ambient Air Standard. If no benefit is shown, how can we justify forcing business to spend millions for SO_2 Scrubbers?

It is my opinion that high business taxes and excessive regulation, such as the present Montana SO_2 Standard, are the major controllable reasons that Montana faces the economic crisis that now exists.

I ask your support of House Bill 534 both because it is an adequate standard and because it will send a positive message to business.

Respectfully submitted,

Dan Farmer

Dan Farmer

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BILLINGS AREA SO_2 SITUATION

Annual, ppm

Federal Standard		Lockwood Park	Coburn Road	Johnson Lane	Billings Average	State Standard
0.030	1983	0.029	0.027	0.024	0.027	0.020
	1984	0.023	0.026	0.018	0.022	
	1985	0.021	0.024	0.018	0.021	

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BILL NO. HB 534

TESTIMONY - HB-534
SENATE NATURAL RESOURCES COMMITTEE
BY HENRY HUBBLE, REFINERY MANAGER
EXXON COMPANY, U.S.A.

March 13, 1987

Mr. Chairman and Members of the Committee:

My name is Henry Hubble. I am the Manager of the Exxon Refinery in Billings, Montana. I appreciate this opportunity to testify in support of HB-534. We are supporting this bill in order to reach a reasonable and equitable solution to the Billings air quality concerns, and because we feel this legislation is a necessary part of the SO_2 compromise we are developing with the Department of Health. From a legal perspective, the compromise can not stand alone or in lieu of modifying the state SO_2 standards.

Specifically, we believe, HB-534 should receive a do pass recommendation for the following reasons:

First, the federal standards proposed in this bill are very strict health-based standards, designed to protect the health of the most sensitive members of society with an adequate margin of safety and to protect agriculture, visibility and aesthetics.

To put this in perspective in setting and testing the 3-hour and 24-hour national standards, the effects on children, the elderly, and asthmatics were studied. Asthmatics were found to be most sensitive. The studies concluded the EPA standards are sufficiently stringent to prevent any response in 99.5 percent of exercising asthmatics who were denied medication and the responses they did find were mild and temporary. These people were far more likely to react to pollen, dust, animal dandruff, etc.

Furthermore, the EPA is in the process of reevaluating the federal standards for sulfur dioxide. The EPA's Clean Air Scientific Advisory Council report submitted on February 19, 1987, recommends that existing federal annual and 24-hour standards not be changed. However, if they are ultimately lowered, they will be lowered for all states, and all refineries we compete with will have to comply with the new standards.

Second, it is helpful to have some perspective on the overall SO_2 situation when evaluating the consequences of allowing existing Billings industries to meet the federal standards. All areas in Billings meet federal air quality standards; in fact, the Air Quality Bureau estimates that most areas in Billings meet the state air quality standards.

Although we know of no plans for construction of new SO_2 emitting industries in Billings or in other areas of the state, in the event this does occur, any new industry would have to meet strict EPA new source performance standards which prevent deterioration of current air quality. We submit that changing the standards will not degrade state air quality.

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Third, and importantly, SO_2 air quality measurements in Billings show a downward trend due to the voluntary industry efforts. This table, which was compiled from state data, shows that average SO_2 measurements in Billings have decreased from 0.027 to 0.021 ppm between 1983 and 1985.

Exxon, in the last decade, has spent over $15M in energy conservation and emissions reduction equipment to improve air quality. I am pleased to report that we recently implemented an operational equipment change which has enabled us to achieve an additional 15 percent reduction in SO_2 emissions. While this operating change results in a substantial $100K addition to our yearly business costs, we were willing to make this reduction voluntarily in a good faith effort to reduce emissions as much as practical.

We have also stated our willingness to make short-term operating changes to enhance air quality during periods of inversion. We believe that in cooperation with other area industries, and the Department of Health, we can and will continue to make improvements in Billings air quality.

However, this leads me to my fourth point. We do not believe the compromise now being discussed with the Department of Health is legal without this bill. In the pending compromise, the Department of Health agreed to not enforce the state standards until the EPA completes its SO_2 standard review. We are concerned that without legislation establishing the federal standard, this agreement would come unraveled at the first challenge.

If the existing state standards are ultimately enforced, our capital costs alone to achieve the additional 15 to 30 percent reduction would be in the $8-20M range. I would expect costs of this magnitude to have a very negative impact on our business. Montana industry needs a long-term commitment to the federal standards.

Taking a longer range view, surplus refining capacity in the Rocky Mountain states has created a highly competitive refining business environment. We are competing with refineries in surrounding states and Canada which will not be required to make similar investments to stay in business. For example, the Utah legislature has passed legislation raising all their environmental standards to the federal level to improve their business climate. We also need to have the cooperation of government in creating a stable regulatory climate so that we can position ourselves to compete both now and in the future.

In conclusion, we are committed to work through the administrative process and are willing to make voluntary reductions, but at the same time, we are asking the Board of Health to consider the negative economic costs associated with achieving the existing state standards. Although we believe genuine progress has been made with the Department of Health with regard to near-term enforcement actions, we want to ensure we achieve a long-lasting solution. We believe that adopting the federal SO_2 standards will allow for the protection of health and air quality and will help Montana industries remain competitive. We ask for your support to accomplish this objective through the passage of this legislation.

Thank you. I will be glad to answer any questions you may have.

HHH/efs

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TESTIMONY OF ROBERT HOLTSMITH
MANAGER, BILLINGS REFINERY, CONOCO INC.

Sulfur Dioxide Air Quality Standards
House Bill 534
State of Montana
March 13, 1987

My name is Robert Holtsmith. I reside at 2750 Gregory Drive North, Billings, Montana. I am Manager of the Conoco Refinery in Billings. The Conoco Refinery has an annual pay roll of $11.5 million and pays in excess of $1.6 million in property tax. We are a major industry in the Yellowstone Valley and have a particular interest in the sulfur dioxide issue.

Conoco applauds the action of the legislature to consider eliminating the more stringent State Ambient Sulfur Dioxide Emission Standards and implement the federal National Ambient Air Quality Standards. We also applaud the efforts of the Air Quality Bureau, the affected industries, and the concerned citizens, to reach a compromise agreement that reduces sulfur dioxide emissions in the Yellowstone Valley. Conoco does not see these as separate efforts, but rather a combined effort to ensure good air quality while minimizing the economic impact in the Billings area. Our specific points are as follows:

- The National Ambient Air Quality Standards were established, after rigorous review, to protect even the most sensitive members of the community. These federal standards were subjected to exhaustive scientific and public review, and to the special scrutiny of an independent national board of leading health scientists known as the Clean Air Scientific Advisory Committee.

- The federal standards are under periodic, legally mandated review. The current review has produced little data to indicate that the 24-hour or the annual average should be made more stringent and has produced more data to indicate that the standards should be left as is or relaxed.

- Since the health of the community is protected by the federal standards, Conoco does not believe that the state standards are necessary or valid. Conoco is a participant in a joint law suit, filed in 1980, to challenge the state statute. This lawsuit has remained dormant while we attempt to reach agreement on the issue.

- The recent meetings among affected industries, Air Quality Bureau, and concerned citizens, have shown progress.

    - Conoco and other industries have indicated a willingness to work with the state.

    - Conoco has said that it would roll back emissions 15% from the 1981-82 base line.

- Conoco will help fund ambient air monitoring stations.

- Conoco will work with other industries to implement a plan to temporarily roll back emissions during periods when meteorological conditions are adverse to good air quality.

- Conoco will supply daily accurate emissions data to the Air Quality Bureau so that intelligent decisions can be made from factual data.

- While Conoco wholeheartedly supports the state on reduction of sulfur dioxide emissions, we disagree with the Air Quality Bureau's basis for such reductions. We cannot concur with a proposed settlement if it is structured to allow violations of state standards with a partial roll back of sulfur emissions, however well intentioned that agreement may be. Alternatively, we cannot concur that the proposed settlement be characterized as compliance or enforcement action. To do so would prejudice the pending challenge to the standards. The only recourse Conoco sees is to change the state standards to the federal standards and proceed with an agreement to roll back emissions in the Yellowstone Valley. Then the basis for emission reductions would be to provide a margin of safety for compliance with the federal standards.

In conclusion, Conoco urges this body to enact legislation mandating Montana's Air Quality Standards for Sulfur Dioxide Emissions be made identical to the federal National Ambient Air Quality Standards. Then the affected industries can implement a plan to decrease emissions in the Yellowstone Valley. The industries can get on with business without the cloud of uncertainty hanging over them and the citizens of the Yellowstone Valley will enjoy cleaner air.

T H A N K   Y O U

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CENEX • Post Office Box 909 • Laurel, Montana • 59044-0909 • Phone (406) 252-9326

Louis J. Day
Refinery Manager
Petroleum Division

I am Louis J. Day, Refinery Manager at the CENEX Refinery in Laurel, Montana.

I wish to thank you for the opportunity to speak to you today and for your concern that has resulted in this hearing.

In accordance with a 1977 stipulation between the Air Quality Bureau and the Billings area industry CENEX invested $5,700,000 in a sulfur dioxide emission reduction program to achieve a 15% reduction in plant sulfur dioxide emissions. This investment program was completed in 1979 and the Air Quality Bureau ambient data showed an 80% drop in the ambient sulfur dioxide concentration in Laurel. The data showed Laurel to be approximately 50% of the present state standards and to have sulfur dioxide levels lower than those measured in 1985 in Alaska and the Virgin Islands.

There are presently rules before the Board of Health which will require additional emission reductions, up to 45%, at our refinery. These rules, if implemented, will require the immediate commitment to an investment which may exceed $70,000,000. The decision to make this investment must be made by CENEX in the face of a company wide loss in 1986 of

$12,000,000 and fiscal uncertainty in 1987. Any additional regulations of this type will affect the economic viability of our operation.

There are negotiations in progress between Billings industry and the Department of Health in an attempt to reach a compromise agreement on the Billings sulfur dioxide question. In these negotiations CENEX has committed to reduce sulfur dioxide emissions for short time periods, one or two days, by 10 to 20% if necessary to comply with the 24 hour standard, participate in funding for ambient monitoring, and provide additional emissions reports. These improvements can be implemented without the major economic impact of the rules now before the Board of Health. However, in order for this agreement to be legally sound the ambient air quality standards must be revised. HB 534 includes the revisions necessary to allow agreement to be reached, thus providing for a sound environment and a sound economy. For these reasons we support HB 534 and encourage you to take favorable action.

Thank you for your consideration of this matter.

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HOUSE BILL 534 - BILLINGS SO_2 STANDARDS

The Montana Power Company (MPC) supports adoption of House Bill 534, which has the effect of granting existing industry in Billings a permanent variance from the present State ambient standards. House Bill 534 would deem these industrial sources of sulfur dioxide in compliance with the present State standards as long as the Federal annual and 24-hour ambient sulfur dioxide standards are not exceeded. The Federal standards are based on extensive studies and hearings and are sufficient to protect public health and welfare. MPC has held this conviction since the State standard was established in 1980 after a hearing by the Board of Health and Environmental Sciences (BHES). In our opinion, the stringent State ambient SO_2 standards are not necessary and are based upon an inadequate record. The cost to comply with them is exorbitant. Further, there is no health and welfare necessity for more stringent standards in the Billings-Laurel area. In a September 1986 EPA staff report, after reviewing current Federal ambient air SO_2 standards, the EPA concluded "the current [Federal] standards provide substantial protection against the effects identified as being associated with 24-hour and annual exposures."

MPC proposes and endorses the adoption of the Federal sulfur dioxide ambient annual and 24-hour standards as expressed by House Bill 534. In conjunction with adoption of House Bill 534, but not in lieu of this legislation, MPC supports voluntary reduction of the emissions from the J.E. Corette Plant for certain identifiable weather episodes that cause 24-hour SO_2 readings above the present State ambient standard. These reductions would be obtained through intermittent control of the plant.

Further, MPC supports the continued use and reporting of data from the J.E. Corette plant (in-stack) continuous emission monitor, and participation in an ambient monitoring program with other industries and with the Department and BHES.

(8)

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The perceived ambient SO_2 problem is not as significant as various groups have alleged. In a three-year period, 32 episodes were recorded exceeding the 24-hour state standard at the four Billings ambient monitoring stations. At the monitoring station closest to the J.E. Corette plant, only four episodes exceeded the State standard when the Corette plant was a 25% or greater contributor.

The perception that a problem exists, however, has led to three proposed rules requiring continuous SO_2 emission reductions for the Billings area industries. These proposed rules show that the BHES intends to enforce strictly the more stringent State standards, regardless of the necessity and economic consequences of enforcement. One of the facilities most affected by the proposed rules is the J.E. Corette coal-fired thermal electric generating plant, which uses low sulfur Rosebud seam coal. Any of these emission reduction proposals would, if adopted, require the installation of a $40 million scrubber or a change to Wyoming coal. Either alternative would lead to increased costs to the people of Montana and the consumers of electric power.

MPC endorses intermittent control, along with adoption of House Bill 534.

This two-pronged solution protects the health of the people of Billings, allows existing industry to continue operations, and provides the certainty which is necessary between the administrative body and industry.

MPC, the other industries, the Department of Health and Environmental Sciences and other interested parties have been attempting to negotiate an agreement which would include the plans

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of the Billings' industries for reduction of sulfur dioxide emissions in Billings. This agreement would comply with the Legislative Statement of Intent. While meaningful progress is being made and agreement is possible, MPC cannot sign such an agreement in the absence of legislation such as House Bill 534.

The Montana Power Company
Carlton D. Grimm

EFB0008by

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Testimony by Kenneth L. Williams
Entech/Western Energy Co., Butte, MT
Senate Natural Resources Committee Hearing
13 March 1987

Mr. Chairman, members of the Committee, for the record my name is Kenneth L. Williams. I appear here today on behalf of Western Energy Company in support of House Bill 534.

Western Energy Company supplies coal from our Rosebud Mine at Colstrip to the J. E. Corette Generating Station in Billings. In 1986, we supplied over 392,840 tons to the Corette Plant. Those 392,840 tons translate into approximately 19 to 20 direct mining jobs at Colstrip.

Western Energy is concerned that the failure to adopt the changes contemplated by House Bill 534 may cause the loss of those coal sales from our Rosebud Mine. A fuel switch to Wyoming coal would have serious economic consequences on Montana by the total loss of coal severance tax revenues, coal gross proceeds taxes, as well as other taxes. The tax loss would be more than $30 million over the remaining life of the plant; however, the human tragedy is greater with the loss of direct and indirect mining jobs that weaken the economic vitality of Montana.

If Montana loses the coal supply for the remaining life of the Corette Plant, impacts of the following magnitude are predictable:

1) The State of Montana would lose approximately $25 million in coal severances taxes;

2) Loss of gross proceeds taxes would be $3.8 million;

9

3) Loss to the State of Montana of 1/2 of the associated Federal coal royalties -- $3.8 million;

4) Loss of Resource Indemnity Trust Taxes -- $330,000;

5) Loss to a Montana supplier, Western Energy Company, of coal sales in excess of $120 million;

6) Loss to the private sector for support goods and services -- $25 million;

7) Direct employment -- $9.4 million;

8) Indirect employment -- $6.4 million; and

9) Loss of corporate and individual income taxes on direct and indirect employment.

From these figures, one sees the economic impacts of the coal switch are significant to the State of Montana and go beyond the totals of coal taxes, jobs, and direct expenditures. The impacts would reach into and affect all sections of Montana's economy.

We urge a "Do Pass" recommendation for HB 534.

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THE RESPIRATORY CENTER

RONALD E. BURNAM, M.D., INC.
THOMAS P. THIGPEN, M.D., P.C.

SENATE NATURAL RESOURCES
EXHIBIT NO. 10 p.1
DATE 3/13/87
BILL NO. SB534

March 16, 1987

Senator Thomas Keating
Montana Senate
Capital Building
Helena, MT 59601

Dear Senator Keating:

I am writing this paper to summarize my viewpoint on the need to roll back the state SO_2 levels in the Billings area to the federal standards.

My position is to support HB 534 and to pass it on to the senate for passage into law.

There are two primary health concerns:

1. Short term - where high levels of pollutant cause acute illness and increased mortality in susceptible pouplations.

   SO_2 concentrations of 0.25 ppm (10 x federal standard) or less did not induce symptomatic bronchoconstriction in exercising asthmatics. (Heavy breathing with exercise increases the lung exposure at any concentration.)

2. Long term - where lower levels of pollutants may contribute to the development of chronic lung diseases or adversely effect lung growth.

   New studies, since 1981 (and most studies before), show no evidence of adverse effect on lung function at levels of .04 ppm.

This data is supported by the review of recent literature done by the EPA and published in the July 1986 review draft of the second addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982).

The Montana Air Pollution study has been often quoted in the local press as a reason for more stringent standards. There are, however, several reasons to question the validity of this report.

1. It has not been published in a reputable, widely read journal where the techniques of study, scientific methods, statistical methods and conclusions could be scrutinized by a large audience of scientists to either verify or refute the study.

2. The most significantly abnormal measure of pulmonary function (FEF 25-75) was new at the time of this study and thought to be a simple,

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inexpensive, easily done test which would detect early lung disease. Since that time the test has been shown to be highly variable in normal individuals, to not reflect early lung disease or small airways disease, which is not a disease state. When this measure is removed, other changes in pulmonary function are less significant.

3. A major determinant of obstructive lung disease is genetic. There was a much higher incidence of "asthma", "bronchitis" and "emphysema" in Billings parents, this confounding variable was not addressed.

4. The effects in lung function were attributed to higher SO_2 levels in Billings as compared to Great Falls yet only one measure of SO_2 in Great Falls was recorded. This was in spring, a time of expected low levels. Therefore, this relationship cannot be supported.

5. The study was for only a short term (one school year) and would be more susceptible to other influences than a study done over five to ten years.

6. Disease caused by specific viruses which can cause community wide, significant decrement in pulmonary function lasting six to twelve weeks was not controlled for, specifically influenza. The only question was concerning illness in the week prior to testing; and no blood testing for evidence of occult infection (i.e. influenza) was done.

Finally, a great deal of statistical manipulation of the pulmonary function data was necessary to achieve significance, and the techniques used may have skewed the data.

In summary, all of the data in the scientific literature to date would indicate that the Federal standards of 0.03 ppm annual and 0.14 ppm 24 hour provide adequate protection for the majority of the most sensitive population with an adequate margin of safety.

I am enclosing exerpts from the July 1986 review draft of the Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982): Assesment of Newly Available Health Effects Information.

Respectfully sumitted,

R E Burnam

Ronald E. Burnam, M.D.
Fellow American College of Chest Physicians

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5.2 SUMMARY OF EPIDEMIOLOGIC FINDINGS ON HEALTH EFFECTS ASSOCIATED WITH EXPOSURE TO AIRBORNE PARTICLES AND SO_x

Newly available reanalyses of data relating mortality in London to short-term (24-h) exposures to PM (measured as smoke) and SO_2 were evaluated and their results compared with earlier findings and conclusions discussed in U.S. EPA (1982a). Varying strengths and weaknesses were evident in relation to the different individual reanalyses evaluated and certain questions remain unresolved concerning most. Regardless of the above considerations, the following conclusions appear warranted based on the earlier criteria review (U.S. EPA, 1982a) and present evaluation of newly available analyses of the London mortality experience: (1) markedly increased mortality occurred, mainly among the elderly and chronically ill, in association with BS and SO_2 concentrations above 1000 $\mu g/m^3$, especially during episodes when such pollutant elevations occurred for several consecutive days; (2) the relative contributions of BS and SO_2 cannot be clearly distinguished from those of each other, nor can the effects of other factors be clearly delineated, although it appears likely that coincident high humidity (fog) was also important (possibly in providing

ow= .4 ppm

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500 μg/m³ = 0.2 ppm

conditions leading to formation of H_2SO_4 or other acidic aerosols); (3) increased risk of mortality is associated with exposure to BS and SO_2 levels in the range of 500 to 1000 μg/m^3, clearly at concentrations in excess of ~700 to 750 μg/m^3; and (4) less certain evidence suggests possible slight increases in the risk of mortality at BS levels below 500 μg/m^3, with no specific threshold levels having yet been demonstrated or ruled out at lower concentrations of BS (e.g., at 150 μg/m^3) nor potential contribution of other plausibly confounding variables having yet been fully evaluated.

150 μg/m³ = 0.06 ppm

In addition to the reanalyses of London mortality data, reanalyses of mortality data from New York City in relation to air pollution reported by Ozkaynak and Spengler (1985) were evaluated. Time-series analyses were carried out on a subset of New York City data included in a prior analysis by Schimmel (1978) which was critiqued during the earlier criteria review (U.S. EPA, 1982a). The reanalyses by Ozkaynak and Spengler (1985) evaluated 14 years (1963-76) of daily measurements of mortality (the sum of heart, other circulatory, respiratory, and cancer mortality), COH, SO_2, and temperature. In summary, the newly available reanalyses of New York City data raise possibilities that, with additional work, further insights may emerge regarding mortality-air pollution relationships in a large U.S. urban area. However, the interim results reported thus far do not now permit definitive determination of their usefulness for defining exposure-effect relationships, given the above-noted types of caveats and limitations.

Similarly, it is presently difficult to accept findings reported in another new study of mortality associated with relatively low levels of SO_2 pollution in Athens, given questions regarding representativeness of the monitoring data and the statistical soundness of using deviations of mortality from an earlier baseline relatively distant in time. Lastly, a newly reported analyses of mortality-air pollution relationships in Pittsburgh (Allegheny County, PA) was evaluated as having utilized inadequate exposure characterization and the results contain sufficient internal inconsistencies, so that the analyses are not useful for delineating mortality relationships with either SO_2 or PM.

Of the newly-reported analyses of short-term PM/SO_x exposure-morbidity relationships discussed in this Addendum, the Dockery et al. (1982) study provides the best-substantiated and most readily interpretable results. Those results, specifically, point toward decrements in lung function occurring in association with acute, short-term increases in PM and SO_2 air pollution. The small, reversible decrements appear to persist for 1-2 wks after episodic exposures to these pollutants across a wide range, with no clear delineation of threshold yet being evident. In some study periods effects may have been due to TSP and SO_2 levels ranging up to 422 and 455 $\mu g/m^3$, respectively. Notably larger decrements in lung function were discernable for a subset of children (responders) than for others. The precise medical significance of the observed decrements per se or any consequent long-term sequalae remain to be determined. The nature and magnitude of lung function decrements found by Dockery et al. (1982), it should be noted, are also consistent with: observations of Stebbings and Fogelman (1979) of gradual recovery in lung function of children during seven days following a high PM episode in Pittsburgh, PA (max 1-hr TSP estimated at 700 $\mu g/m^3$); and a report by Saric et al. (1981) of 5 percent average declines in $FEV_{1.0}$ being associated with high SO_2 days (89-235 $\mu g/m^3$).

In regard to evaluation of long-term exposure effects, the 1982 U.S. EPA criteria document (1982a) noted that certain large-scale "macroepidemiological" (or "ecologic" studies as termed by some) have attracted attention on the basis of reported demonstrations of associations between mortality and various indices of air pollution, e.g., PM or SO_x levels. U.S. EPA (1982a) also noted that various criticisms of then-available ecologic studies made it impossible to ascertain which findings may be more valid than others. Thus, although many of the studies qualitatively suggested positive associations between mortality and chronic exposure to certain air pollutants in the United States, many key issues remained unresolved concerning reported associations and whether they were causal or not.

Since preparation of the earlier Criteria Document (U.S. EPA, 1982a) additional ecological analyses have been reported regarding efforts to assess relationships between mortality and long-term exposure to particulate matter and other air pollutants. For example, Lipfert (1984) conducted a series of cross-sectional multiple regression analyses of 1969 and 1970 mortality rates for up to 112 U.S. SMSA's, using the same basic data set as Lave and Seskin (1978) for 1969 and taking into account various demographic, environmental and lifestyle variables (e.g., socioeconomic status and smoking). Also, the Lipfert (1984) reanalysis included several additional independent variables: diet; drinking water variables; use of residential heating fuels; migration; and SMSA growth. New dependent variables included age-specific mortality rates with their accompanying sex-specific age variables. Both linear and several nonlinear (e.g., quadratic or linear splines testing for possible threshold model specifications) were evaluated.

It became quite evident from the results obtained that the air pollution regression results for the U.S. data sets analyzed by Lipfert (1984) are extremely sensitive to variations in the inclusion/exclusion of specific observations (for central city versus SMSA's or different subsets of locations) or additional explanatory variables beyond those used in the earlier Lave and Seskin analyses. The results are also highly dependent upon the particular model specifications used, i.e. air pollution coefficients vary in strength of association with total or age-/sex-specific mortality depending upon the form of the specification and the range of explanatory variables included in the analyses. Lipfert's overall conclusion was that the sulfate regression coefficients are not credible and, since sulfate and TSP interact with each other in these regressions, caution is warranted for TSP coefficients as well.

Ozkaynak and Spengler (1985) have also newly described results from ongoing attempts to improve upon previous analyses of mortality and morbidity effects of air pollution in the United States. Ozkaynak and Spengler (1985) present principal findings from a cross-sectional analysis of the 1980 U.S. vital statistics and available air pollution data bases for sulfates, and fine, inhalable and total suspended particles. In these analyses, using multiple regression methods, the association between various particle measures and 1980 total mortality were estimated for 98 and 38 SMSA subsets by incorporating recent information on particle size relationships and a set of socioeconomic variables to control for potential confounding. Issues of model misspecification and spatial autocorrelation of the residuals were also investigated.

The Ozkaynak and Spengler (1985) results for 1980 U.S. mortality provide an interesting overall contrast to the findings of Lipfert (1984) for 1969-70 U.S. mortality data. Whereas Lipfert found TSP coefficients to be most consistently statistically significant (although varying widely depending upon model specifications, explanatory variables included, etc.), Ozkaynak and Spengler found particle mass measures including coarse particles (TSP, IP) often to be non-significant predictors of total mortality. Also, whereas Lipfert found the sulfate coefficients to be even more unstable than the TSP associations with mortality (and questioned the credibility of the sulfate coefficients), Ozkaynak and Spengler found that particle exposure measures

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related to the respirable or toxic fraction of the aerosols (e.g., FP or sulfates) to be most consistently and significantly associated with annual cross-sectional mortality rates. It might be tempting to hypothesize that changes in air quality or other factors from the earlier data sets (for 1969-70) analyzed by Lipfert (1984) to the later data (for 1980) analyzed by Ozkaynak and Spengler (1985, 1986) may at least partly explain their contrasting results, but there is at present no basis by which to determine if this is the case or which set of findings may or may not most accurately characterize associations between mortality and chronic PM or SO_x exposures in the United States. Thus conclusions stated in U.S EPA (1982a) concerning ecologic analyses still largely apply here in regard to mortality PM/SO_x relationships.

The present Addendum also evaluated a growing body of new literature on morbidity effects associated with chronic exposures to airborne particles and sulfur oxides. In summary, of the numerous new studies published on morbidity effects associated with long-term exposures to PM or SO_x, only a few may provide potentially useful results by which to derive quantitative conclusions concerning exposure-effect relationships for the subject pollutants. A study by Ware et al. (1986), for example, provides evidence of respiratory symptoms in children being associated with particulate matter exposures in contemporary U.S. cities without evident threshold across a range of TSP levels of ~25 to 150 $\mu g/m^3$. The increase in symptoms appears to occur without concomitant decrements in lung function among the same children. The medical significance the observed increased in symptoms unaccompanied by decrements in lung of function remains to be fully evaluated but is of likely health concern. Caution is warranted, however, in using these findings for risk assessment purposes in view of the lack of significant associations for the same variables when assessed from data within individual cities included in the Ware et al. (1985) study.

Other new American studies provide evidence for: (1) increased respiratory symptoms among young adults in association with annual-average SO_2 levels of ~115 $\mu g/m^3$ (Chapman et al., 1983); and (2) increased prevalence of cough in children (but not lung function changes) being associated with intermittent exposures to mean peak 3-hr SO_2 levels of ~1.0 ppm or annual average SO_2 levels of ~103 $\mu g/m^3$ (Dodge et al., 1985).

Results from one European study (PAARC, 1982a,b) also suggest the likelihood of lower respiratory disease symptoms and decrements in lung function in adults (both male and female) being associated with annual average SO_2 levels ranging without evident threshold from about 25 to 130 $\mu g/m^3$. In addition that study suggests that upper respiratory disease and lung function decrements in children may also be associated with annual-average SO_2 levels across the above range. Further analyses would probably be necessary to determine whether or not any thresholds for the health effects reported by PAARC (1982a,b) exist within the stated range of annual-average SO_2 values.

5.3 SUMMARY OF CONTROLLED HUMAN EXPOSURE STUDIES OF SULFUR DIOXIDE HEALTH EFFECTS

The new studies clearly demonstrate that asthmatics are much more sensitive to SO_2 as a group. Nevertheless, it is clear that there is a broad range of sensitivity to SO_2 among asthmatics exposed under similar conditions. Recent studies also confirm that normal healthy subjects, even with moderate to heavy exercise, do not experience effects on pulmonary function due to SO_2 exposure in the range of 0 to 2 ppm. The minor exception may be the annoyance of the unpleasant smell or taste associated with SO_2. The suggestion that asthmatics are about an order of magnitude more sensitive than normals is thus confirmed.

There is no longer any question that normally breathing asthmatics performing moderate to heavy exercise will experience SO_2-induced bronchoconstriction when breathing SO_2 for at least 5 min at concentrations less than 1 ppm. Durations beyond 10 min do not appear to cause substantial worsening of the effect. The lowest concentration at which bronchoconstriction is clearly worsened by SO_2 breathing depends on a variety of factors.

Exposure to less than 0.25 ppm has not evoked group mean changes in responses. Although some individuals may appear to respond to SO_2 concentrations less than 0.25 ppm, the frequency of these responses is not demonstrably greater than with clean air. Thus individual responses cannot be relied upon for response estimates, even in the most reactive segment of the population.

In the SO_2 concentration range from 0.2 to 0.3 ppm, six chamber exposure studies were performed with asthmatics performing moderate to heavy exercise. The evidence that SO_2-induced bronchoconstriction occurred at this concentration with natural breathing under a range of ambient conditions was equivocal. Only with oral mouthpiece breathing of dry air (an unusual breathing mode under exceptional ambient conditions) were small effects observed on a test of questionable quantitative relevance for criteria development purposes. These findings are in accord with the observation that the most reactive subject in the Horstman et al. (1986) study had a $PCSO_2$ (SO_2 concentration required to double SRaw) of 0.28 ppm.

Several observations of significant group mean changes in SRaw have recently been reported for asthmatics exposed to 0.4 to 0.6 ppm SO_2. Most if not all studies, using moderate to heavy exercise levels (>40 to 50 L/min), found evidence of bronchoconstriction at 0.5 ppm. At a lower exercise rate, other studies (e.g., Schachter et al., 1984) did not produce clear evidence of SO_2-induced bronchoconstriction at 0.5 ppm SO_2. Exposures which included higher ventilations, mouthpiece breathing, and inspired air with a low water content resulted in the greatest responses. Mean responses ranged from 45 percent (Roger et al., 1985) to 280 percent (Bethel et al., 1983b) increase in SRaw. At concentrations in the range of 0.6 to 1.0 ppm, marked increases in SRaw are observed following exposure. Recovery is generally complete within approximately 1 h although the recovery period may be longer for subjects with the most severe responses.

It is now evident that for SO_2-induced bronchoconstriction to occur in asthmatics at concentrations less than 0.75 ppm, the exposure must be accompanied by hyperpnea. Ventilations in the range of 40 to 60 L/min have been most successful; such ventilations are beyond the usual oronasal ventilatory switchpoint.

There is no longer any question that oral breathing (especially via mouthpiece) causes exacerbation of SO_2-induced bronchoconstriction. New studies reinforce the concept that the mode of breathing is an important determinant of the intensity of SO_2-induced bronchoconstriction in the following order: oral > oronasal > nasal.

A second exacerbating factor strongly implicated in recent reports is the breathing of dry and/or cold air with SO_2. It has been suggested that the reduced water content and not cold, per se, could be responsible for much of this effect. Airway drying may contribute to the SO_2 effect by decreasing the efficacy of SO_2 scrubbing by the surface liquid of the oral and nasal airway. Drying of airways peripheral to the laryngopharynx may result in decreased surface liquid volume to buffer the effects of SO_2.

The new studies do not provide sufficient additional information to establish whether the intensity of the SO_2-induced bronchoconstriction depends upon the severity of the disease. Across a broad clinical range from "normal" to moderate asthmatic there is clearly a relationship between the presence of asthma and sensitivity to SO_2. Within the asthmatic population, the relationship of SO_2 sensitivity to the qualitative clinical severity of asthma has not been studied systematically. Ethical considerations (i.e., continuation of appropriate medical treatment) prevent the unmedicated exposure of the "severe" asthmatic because of his dependence upon drugs for control of his asthma. True determination of sensitivity requires that the interference with SO_2 response caused by such medication be removed. Because of these mutually exclusive requirements, it is unlikely that the true SO_2 sensitivity of severe asthmatics will be determined. Nevertheless, more severe asthmatics should be studied. Alternative methods to those used with mild asthmatics, not critically dependant on regular medication, will be required. The studies to date have only addressed the "mild to moderate" asthmatic.

Consecutive SO_2 exposures (repeated within 30 min or less) result in a diminished response compared with the initial exposure. It is apparent that this refractory period lasts at least 30 min but that normal reactivity returns within 5 h. The mechanisms and time course of this effect are not clearly established but refractoriness does not appear to be related to an overall decrease in bronchomotor responsiveness.

From the review of studies included in this addendum, it is clear that the magnitude of response (typically bronchoconstriction) induced by any given SO_2 concentration was variable among individual asthmatics. Exposures to SO_2 concentrations of 0.25 ppm or less, which did not induce significant group mean increases in airway resistance also did not cause symptomatic bronchoconstriction in individual asthmatics. On the other hand, exposures to 0.40 ppm SO_2 or greater (combined with moderate to heavy exercise) which induced significant group mean increases in airway resistance,also caused substantial bronchoconstriction in some invididual asthmatics. This bronchoconstriction was associated with wheezing and the perception of respiratory distress. In several instances it was necessary to discontinue the exposure and provide medication. The significance of these observations is that some SO_2-sensitive asthmatics are at risk of experiencing clinically significant (i.e., symptomatic) bronchoconstriction requiring termination of activity and/or medical intervention when exposed to SO_2 concentrations of 0.40 ppm or greater when this exposure is accompanied by at least moderate activity.

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WITNESS STATEMENT

NAME ~~Jo Brunner~~ BILL NO. HB534

ADDRESS 2015½ 9th Avenue DATE 3/13/87

WHOM DO YOU REPRESENT? ~~Montana Cattlefeeders~~

SUPPORT X OPPOSE ______ AMEND ______

PLEASE LEAVE PREPARED STATEMENT WITH SECRETARY.

Comments:

Mr. Chairman, members of the committee, various testimony will be given or has been given on every aspect of this situaiton.

The Cattlefeeders support the criteria established in the federal Standards of air quality, as sufficient to protect the citizens of Montana.

After the first hearing on HB534, I was asked just what an agriculture associated organization was doing, coming in on a bill such as this and the inferrence was that it was no concern of ours.

It not only is a concern of agriculture, environmental wise, but for other reasons.

We protest the additional costs to the entities involved in this instance, knowing full well that if they are able to survive these costs to their operations, they will be passed on to the consumer.

Agriculture and agriculture related industries cannot stand that additional burden. Our economic situation is at a point where even the most minute additions to our operating ependitures could deal the death blow.

We talk about a healthy climate in our state for an inducement to new businesses, yet we continue to penalize our existing industries with additional burdens, and as in this instance a burden without justification.

Federal standards are adequate, we do not need further hindrances for the businesses involved, nor the additonal costs that will be passed on to our agriculture businesses.

Thank you. We ask that you do pass HB534

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House Bill 534

Testimony by

Montana Department of Health and Environmental Sciences

Before

1987 Montana Legislative Session

Senate Committee
Natural Resources

March 13, 1987

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BILL NO. HB 534

The Montana Department of Health and Environmental Sciences (department) appreciates the opportunity to present testimony regarding House Bill 534 introduced by Representative Hannah. The department has carefully reviewed the bill and is presenting this testimony as an opponent to its adoption.

The bill proposes to change Montana's ambient air quality standards for sulfur dioxide from their current value to those adopted by the Environmental Protection Agency (EPA). The change is only applicable, however, to sources which exceeded the current Montana standard in 1985. It is our understanding that the only facilities which exceeded the standards in 1985 were the Billings-area industries (Cenex, Conoco, Exxon, Montana Power, Montana Sulphur and Chemical Co., and Western Sugar). The table below provides a chart of the existing and proposed sulfur dioxide standards. The department opposes this action because an administrative process already exists for this problem and a prudent review of the health effects data supports the existing standards.

Ambient Air Quality Standards
Sulfur Dioxide
Comparisons

	Montana Standards	EPA Standards	Proposed by HB 534
1 - Hour	0.50 *	None	No Change
3 - Hour	None	0.50 **	No Change
24 - Hour	0.10 **	0.14 **	0.14 **
Annual	0.02	0.03	0.03

Units are in parts per million (ppm)

* not to be exceeded more than 18 times per year

** not to be exceeded more than 1 time per year

The remainder of this testimony will be divided into sections which are designed to discuss various aspects of the bill.

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HEALTH EFFECTS - GENERAL

Few air pollutants have received as much attention in regard to their health effects as sulfur dioxide. Despite these intense investigations, the decision on the appropriate standard remains the subject of debate and interpretation. It would be easy to provide the committee with several hundred pages of discussion on the results of these many studies. In the interest of time, however, it would be better to provide only a very brief summary of the effects of sulfur dioxide on human health.

In order to give the committee an appreciation for the amount of data that rightfully should be reviewed before making a decision that will impact Montana's residents, we have provided four tables attached to the back of this testimony. These tables provide a summary of the studies that have been conducted relating to sulfur dioxide and their outcome. We ask that you at least quickly review these tables in order to gain an appreciation for the complexity of the problem.

In most air pollution investigations, two types of studies are usually conducted: clinical and epidemiological. Clinical studies are usually short term studies of the effects of sulfur dioxide on specific human or animal subjects. Results from these clinical investigations provide the core of information necessary to adopt short term standards such as the 1-hour and 24-hour values. Epidemiological studies are investigations into a large population of people and how they have reacted to various air pollution levels over time. Epidemiological investigations provide most of the evidence in support of long term standards such as the annual standard.

Most of the epidemiological evidence has been gathered in larger cities. London and New York are often used in these investigations. Effects have been observed at annual concentrations as low as .03 ppm, especially when accompanied by other pollutants, but most studies have focused on areas with annual concentrations in the range of .04 to .07 ppm. These health studies generally show increased mortality rates from respiratory diseases or an increased prevalence of respiratory diseases and respiratory ailments such as coughing.

In regard to the 24-hour averaging period, studies in the United States and Europe have indicated that health effects do occur at concentrations as low as .08 to .11 ppm when accompanied by moderate to high levels of particulates. The health studies which are applicable to this averaging period show a decrease in lung functions, especially among children, and worsening health among sensitive individuals such as asthmatics and atopics (allergy related ailments).

In the past few years a large amount of data has been collected in regard to very short term exposures (5 minutes to 6 hours). Most of these clinical studies were conducted by exposing certain individuals to varying amounts of sulfur dioxide. Many of these studies indicate a significant increase in airway resistance among exercising asthmatics during 5 to 10 minute exposures varying from 0.20 to 0.40 ppm. A similar response was noted for resting asthmatics at a concentration of approximately 0.75 ppm. This research indicates that the current federal 3-hour and Montana 1-hour standards are probably not protecting the health of asthmatics.

It is important to keep in mind that all of the studies reviewed by the department during the adoption of the ambient air quality standards only identify a range of concentrations where health effects are likely to occur. That range is generally accepted to lie somewhere between .03 and .06 ppm (annual average); and .08 and .20 ppm (24-hour average). In light of these uncertainties, the department recommended that the Board of Health and Environmental Sciences (board) choose a level in the lower range of the above values or with some margin of safety: 0.02 for the annual average and 0.10 for the 24-hour average. Dr. Mike Morgan, Public School of Health at the University of Washington, summarized this position in his testimony to the board when he stated:

> "From the summaries of chronic morbidity, described as increased prevalence of chronic respiratory symptoms, increased work absences, decreased ventilatory function and increased incidence of lower respiratory infections, is expected when sulfur dioxide exceeds 100 to 120 micrograms per cubic meter (.04 to .05 ppm), annual average when accompanied by a like amount of particulate matter. Acute morbidity, described as increased minor respiratory illness, increased asthma attacks and worsening of chronic obstructive lung disease, is expected when sulfur dioxide exceeds 200 to 250 micrograms per cubic meter (.08 to .10 ppm), twenty four hour average and accompanied by like concentrations of particulate matter. Since the proposed standards for the State of Montana for the corresponding time periods are 52 and 260 micrograms per cubic meter respectively, there is no or little margin of safety. Thus, based upon the two reviews cited, which reflect a consensus of scientific opinion, the proposed standards are not overly stringent in meeting the goal of protecting human health" (emphasis added)

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HEALTH STUDIES - BILLINGS

It is of interest to note that at least one major health study has been conducted in the Billings area. The study was part of a statewide effort to determine if air pollution levels found in Montana have an impact upon the health of its populace. The study was funded by the 1977 and 1979 legislatures and involved the assistance of numerous organizations and doctors.

The study was entitled the "Montana Air Pollution Study" (MAPS) and was administered by the department. Numerous local organizations gave much of their time to provide a quality product. In addition, the department sought the advice of national experts to insure its success. Many Montana doctors were also consulted including several pulmonary physiologists. The project officer for the health effects portion of the study was Dr. Kit Johnson.

MAPS included many investigations into health effects, air monitoring, meteorology, computer modeling, etc. What are of interest in this matter are the results of lung testing (pulmonary function) of school children in the Billings and Lockwood area. During the school year ending in June 1979, 171 children from Lockwood and 139 children from parochial schools in Billings were tested. Following parental permission, pulmonary function readings were taken for these children during the fall, winter and spring. The testing applied only to children in the third, fourth and fifth grades. This age group was chosen since a high degree of cooperation can be obtained and because they are too young to have begun heavy smoking.

In order to determine if there was an air pollution effect on the children, the results of these tests were compared to children of the same age group in Great Falls. Great Falls was chosen as a comparison city since it has a large data base and has the least amount of air pollution among the MAPS cities (Missoula, Anaconda, Butte, Billings, Colstrip, and Hardin).

The results of the lung tests are displayed in the following table. Although the data is fairly technical, one can summarize the readings by noting that in 6 of the 18 comparisons, the children of Great Falls performed better than their counterparts in Billings. The MAPS investigators conducted lengthy follow-up analyses to determine if variables other than air pollution might account for this difference. These other variables included education, smoking in the home, disease exposure, home heating sources, etc. The MAPS researchers concluded that the difference between Great Falls and the other communities was attributable to air pollution, not the other factors.

What is of particular interest in this study is that children in one community of Montana had poorer lung abilities than children in another community due to air pollution. The report concluded that air pollution was indeed having an impact upon Montana's population.

The department concludes, therefore, that a decision by the legislature to continue with the status quo for Billings may not serve the best interest of all of its residents.

Comparison of Lung Testing

% Difference Between Lung Tests of Various Communities
Great Falls as a Reference

	Fall			Winter			Spring		
	FVC	FEV1	FEF	FVC	FEV1	FEF	FVC	FEV1	FEF
FEMALES									
Anaconda	-4.1%	-5.1%	-7.6%	-2.0%	-3.4%	-7.6%	-3.0%	-4.2%	-10.4%
Billings	0.6	0.1	0.7	-2.0	-2.8	-4.2	-1.5	-2.4	-4.0
Butte	-0.8	-0.8	-1.1	-0.8	-1.6	-5.2	0.7	0.1	-3.3
Missoula	2.1	2.0	1.1	-1.3	-1.5	-1.1	-1.5	-2.2	-4.3
MALES									
Anaconda	-0.2	-1.4	-6.5	0.6	-1.1	-6.1	0.5	-1.3	-7.7
Billings	7.4	1.8	2.6	-2.4	-3.0	-4.6	-2.5	-3.5	-3.7
Butte	-2.0	-1.7	-5.0	-0.4	-2.0	-7.6	-0.4	-2.0	-6.3
Missoula	-1.0	-0.8	-4.7	-0.2	-0.9	-2.6	-2.8	-4.3	-9.3

FVC = Forced Vital Capacity (The total amount of air breathed out)
FEV1 = Forced Expiratory Volume (The amount of air breathed out in one second)
FEF = Forced Expiratory Flow rate (The amount of air exhaled during the middle half of the test. This parameter measures the speed at which air can be expelled.)

TIMELY AND APPROPRIATE ACTION

The department believes that the adoption of this bill is neither timely nor appropriate. The bill proposes to amend the ambient standards in the middle of an ongoing administrative process. It is appropriate that the board of health and environmental sciences (board), the body that adopted the air quality standards in the first place, be given an opportunity to implement those standards in a fair manner.

The adoption of an air quality standard is, as you might suspect, a very lengthy and complicated process. The standards are not adopted by simply reviewing the available clinical and epidemiological evidence. Other considerations must be addressed. These include:

a. What is the level of apparent health response?

b. What is the accuracy of the monitoring data for each of the studies (especially important in epidemiological data)?

c. What population needs protection? Do you want to protect only "healthy" individuals or "sensitive" individuals (those with respiratory problems such as asthma, bronchitis , etc.)? If you want to protect sensitive individuals, then what portion of this population do you wish to protect?

d. What are the possible unknown effects due to the uncertainties in study design? (A failure to not find an effect at one concentration does not conclude that no effect exists.)

e. What is the significance of the health responses?

f. Based upon the uncertainties noted above, sensitivity of the population and significance of the health response, what margin of safety should be applied to protect the targeted population?

The board has undertaken a significant effort to look at these questions. The standards were adopted only after lengthy public hearings and testimony. In fact, this action by the board took more time and effort than any other air quality matter discussed previously by the board.

The department respectfully submits that the Legislature simply does not have the time to make this same evaluation. This duty and its implementation should remain the province of an independent board since it has been created specifically for this purpose and has the time necessary to insure a fair implementation.

CONCLUSION

The department is convinced that it is appropriate to continue to have the board be the body which adopts and implements ambient air quality standards. They are the only body that can spend the necessary time to study and implement appropriate standards.

Sufficient health data exists to conclude that the existing Montana ambient air quality standards are reasonable to protect the public health. We are of the opinion that the recent health data being reviewed by EPA indicates the need for a 24-hour standard of .10 and further indicates a more stringent 1-hour standard is probably necessary.

In view of the ongoing administrative process and the health data presented, the department recommends this bill receive a "do not pass" recommendation.

The department stands ready to respond to questions or comments.

Thank you for your time and patience.

COMMITTEE OF THE WHOLE AMENDMENT

2-13-87
DATE
15:15
TIME

MR. CHAIRMAN: I MOVE TO AMEND HB 534

2nd reading copy (yellow) as follows:
Color

SENATE NATURAL RESOURCES
EXHIBIT NO. 13 (p.1)
DATE 3/13/87
BILL NO. HB 534

1) Title, line 20.
Following: "STANDARDS"
Insert: ", SUBJECT TO APPROVAL BY THE COUNTY GOVERNING BODY"

2) Title, line 22.
Following: "SOURCES;"
Insert: "AMENDING SECTION 75-2-301;"

3) Page 2, line 19.
Following: "YEAR"
Insert: "and if the county governing body has adopted the federal standard pursuant to [section 3]"

4) Page 2, line 25.
Following: "MILLION"
Insert: "and if the county governing body has adopted the federal standard pursuant to [section 3]"

5) Page 3.
Following: line 16
Insert: "NEW SECTION. Section 3. (1) Notwithstanding the provisions of 75-2-301, the governing body of a county may adopt, through the procedures of 7-5-103 through 7-5-107, an ordinance providing for adoption of the federal annual average and 24-hour average standards for ambient air quality for sulfur dioxide. The governing body may repeal the ordinance at any time by use of the same procedures. (2) The board and department shall enforce, under the provisions of this chapter and rules adopted under it, an ordinance adopting federal sulfur dioxide standards under subsection (1).

ADOPT

REJECT

continued

NEW SECTION. Section 4. Section 75-2-301, MCA, is amended to read:

75-2-301. Local air pollution control programs. (1) Except as provided in [section 1], a A municipality or county may establish a local air pollution control program on being petitioned by 15% of the qualified electors in its jurisdiction and, if the program is consistent with this chapter and is approved by the board after a public hearing conducted under 75-2-111, may thereafter administer in its jurisdiction the air pollution control program which:

(a) provides by ordinance or local law for requirements compatible with, more stringent, or more extensive than those imposed by 75-2-203, 75-2-212, and 75-2-402 and rules issued under these sections;

(b) provides for the enforcement of these requirements by appropriate administrative and judicial process; and

(c) provides for administrative organization, staff, financial, and other resources necessary to effectively and efficiently carry out its program.

(2) If the board finds that the location, character, or extent of particular concentrations of population, air contaminant sources, or geographic, topographic, or meteorological considerations or any combination of these are such as to make impracticable the maintenance of appropriate levels of air quality without an areawide air pollution control program, the board may determine the boundaries within which the program is necessary and require it as the only acceptable alternative to direct state administration.

(3) If the board has reason to believe that an air pollution control program in force under this section is inadequate to prevent and control air pollution in the jurisdiction to which the program relates or that the program is being administered in a manner inconsistent with this chapter, the board shall, on notice, conduct a hearing on the matter.

(4) If, after the hearing, the board determines that the program is inadequate to prevent and control air pollution in the jurisdiction to which it relates or that it is not accomplishing the purposes of this chapter, it shall require that necessary corrective measures be taken within a reasonable time, not to exceed 60 days.

(5) If the jurisdiction fails to take these measures within the time required, the department shall administer within such jurisdiction all of the provisions of this chapter. The department's control program supersedes all municipal or county air pollution laws, rules, ordinances, and requirements in the affected jurisdiction. The cost of the program shall be a charge on the municipality or county.

continued

Attach 3

(6) If the board finds that the control of a particular air contaminant source because of its complexity or magnitude is beyond the reasonable capability of the local jurisdiction or may be more efficiently and economically performed at the state level, it may direct the department to assume and retain control over that air contaminant source. No charge may be assessed against the jurisdiction therefor. Findings made under this subsection may be either on the basis of the nature of the sources involved or on the basis of their relationship to the size of the communities in which they are located.

(7) A jurisdiction in which the department administers its air pollution control program under subsection (5) of this section may, with the approval of the board, establish or resume an air pollution control program which meets the requirements of subsection (1) of this section.

(8) A municipality or county may administer all or part of its air pollution control program in cooperation with one or more municipalities or counties of this state or of other states."

Renumber: subsequent sections

6) Page 3.
Following: line 24
Insert: "NEW SECTION. Section 7. Codification instruction. [Section 3] is intended to be codified as an integral part of Title 75, chapter 2, part 3, and the provisions of Title 75, chapter 2, part 3, apply to [section 3]."

Renumber: subsequent section

SENATE NATURAL RESOURCES
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2131515S.CW

Rep. Harper

NORTHERN PLAINS RESOURCE COUNCIL

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SENATE NATURAL RESOURCES
EXHIBIT NO. 14
DATE 3/13/87
BILL NO. HB 534

Testimony in opposition to HB 534
3/13/87

Mr Chairman, members of the committee, for the record, my name is Eileen Morris. My family and I have lived in Yellowstone County most of our lives. I am past president of the Yellowstone Valley Citizens Council, and a member of the Northern Plains Resource Council. It is on their behalf that I am testifying and submitting information for your consideration.

Mr. Chairman, this committee has already passed out bills dealing with Montana's Major Facility Siting Act, and the Montana Environmental Policy Act. While the impact of your actions on these bills may not be felt or observed for several years, if you pass HB 534, the impact on human health will be immediate!

I'd like to pass out for your consideration and review documents and summations of reports prepared on the S02 standards and their impacts: Gentlemen, it took two years of complex hearings before the State arrived at the present S02 standard. We ask you to read and analyze these documents. Upon doing so, you will have a better understanding of what is being asked of you.

Mr. Chairman, <u>the issue involved is not how much clean air will cost</u>, but <u>who will pay the cost</u>. If Montana industry is not required to control its air pollution, then others in the State will suffer the health, vegetative and property damage caused by air pollution.

Thank you for the opportunity to comment.

Eileen Morris

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

AIR QUALITY BUREAU
Cogswell Building
(406) 449-3454

A. C. Knight, M.D., F.C.C.P.
Director

SENATE NATURAL RESOURCES
EXHIBIT NO. 14 c. (cover)
DATE 3/13/87
BILL NO. HB 534

February 14, 1980

TO: INTERESTED PERSONS

This is summations from the final Environmental Impact Statement on the Montana Ambient Air Quality Standards Study. Copies of this impact statement are being sent to persons who filed comments on the draft environmental impact statement as well as to all the major libraries in the state.

Issuance of this final Environmental Impact Statement commences the process of rulemaking by the Board of Health and Environmental Sciences under the Montana Administrative Prodecure Act. A description of the upcoming rulemaking process is provided in the Preface of this document.

Persons desiring information about the library availability of the impact statement or wishing to obtain a copy of the impact statement may contact the Department of Health and Environmental Sciences, Air Quality Bureau, in Helena, at 406-449-3454.

The Department wishes to thank all those persons who contributed their interest and information to the EIS process.

Sincerely,

Michael D. Roach, Chief
Air Quality Bureau

SENATE NATURAL RESOURCES
EXHIBIT NO. 14a (p.1)
DATE 3/13/87
BILL NO. HB534

I. SUMMARY

In the fall of 1977 the Montana Department of Health and Environmental Sciences (DHES) was considering enforcement action against some Montana industries for violations of the administrative regulation on Ambient Air Quality Standards (ARM 16-2.14(1)-S14140). This rule had been on the books more than ten years and had been regarded during that time as an enforceable regulation. During the research in preparation for the enforcement action, however, it was discovered that there was some doubt whether the Board of Health and Environmental Sciences had adopted the standards with the intent that they be enforceable.

When advised of the uncertain status of the Montana Ambient Air Quality Standards, the Board indicated it wanted the state to have enforceable standards. It was decided that before such standards were adopted anew, there should be a thorough review to determine whether the old standards were still appropriate or whether scientific research completed since their adoption indicated different standards were needed.

The process followed by the Department in determining the proposed standards may be summarized as follows:

1. <u>Compilation and Assessment of Scientific and Factual Information</u>

The Department first reviewed the scientific literature on the health effects of pollutants found in Montana. Information was also assembled regarding the various pollution sources within the state.

2. <u>Determination of Which Pollutants to Regulate</u>

The Department selected for regulation those pollutants currently

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occurring in significant levels in the state and for which there was scientific evidence to derive a meaningful standard. These include sulfur dioxide, total suspended particulate, settleable particulate, lead, carbon monoxide, fluorides, nitrogen dioxide, photochemical oxidants, hydrogen sulfide and visibility. Several portions of the current ambient rule were recommended for deletion. These included the ambient standards for beryllium, acid mist, and suspended sulfate, and the calcium borate and sulfate plate methods of sampling.

The data were judged insufficient to support standards for arsenic, cadmium, polycyclic organic matter, beryllium, respirable particles, suspended sulfate, and sulfuric acid mist. Therefore, no standards were proposed for these. The Department decided to continue reviewing new research results as they become available, with the commitment to recommend additional standards when appropriate.

3. Determining the Level of Apparent Health Response

The Department relied on scientific information to establish for each pollutant a level which apparently was sufficient to produce a detectable health response in the most sensitive persons.

4. Once the level of apparent health response was established, the Department assessed the risk associated with effects of the pollutant. Several considerations were weighed to determine what level of risk was acceptable without jeopardizing public health. This determination indicated the stringency necessary to compensate for uncertainties as to what exposures were safe.

5. Considerations Above and Beyond Health to Determine Final Standard to be Proposed

Once the health standard was determined, the Department reviewed the scientific evidence to determine whether the pollutant would have effects upon the state's economic and social welfare at concentrations more dilute than the level required to protect health. Where such effects were likely to occur, they were weighed against the other specific welfare interests specified in the Montana Clean Air Act to determine whether a standard to protect more than human health was "practicable." If the anticipated impacts were not offset or outweighed by the other concerns, then the standard was modified to prevent anticipated welfare effects.

Following completion of this process, a draft EIS was compiled and issued on January 3, 1979. The standards recommended in the draft EIS and the final EIS are shown in Table 1. Table 1 also shows the relationship of these proposed standards to existing state and federal standards.

The draft noted that there are in Montana approximately 50 "major sources" of air pollution, with a "major source" defined as a source emitting at least 100 tons of pollution per year. The draft was concerned primarily with the 13 sources that could potentially be affected by an ambient standard. These are: The Anaconda Aluminum plant at Columbia Falls, the Hoerner Waldorf pulp and paper mill in Missoula, the Anaconda Copper Smelter at Anaconda, the Stauffer Chemical Company phosphate plant at Ramsay, the Berkeley Pit copper mine in Butte, the ASARCO lead smelter in East Helena, the Cenex, Conoco and Exxon refineries in the Billings-Laurel area, the Montana Sulfur and Chemical Company plant in Billings, the Corette coal-fired generator in Billings, and the coal fired generators in Colstrip and Sidney. Figure 1 shows the sites of major pollution sources in Montana, and their relationship to existing and proposed Prevention of Significant Deterioration (PSD) Class I areas.

The most recent emission estimates from major sources are shown in Table 2. Ambient air pollution levels in the vicinity of these sources are shown in Table 3.

TABLE I . PROPOSED AND EXISTING AMBIENT AIR REGULATIONS

Pollutant	Federal Standard	Existing Montana Ambient Air Rule	Montana Ambient Standard Proposed in Draft EIS	Montana Ambient Standard Proposed in Final EIS
Sulfur Dioxide	0.03 ppm annual average 0.14 ppm 24-hour average not to be exceeded more than once a year 0.5 ppm 3-hour average not to be exceeded more than once a year	0.02 ppm maximum annual average 0.10 ppm 24-hr average not to be exceeded over 1% of the days in any 3-month period -- 0.25 ppm 1-hr average not to be exceeded for more than one hour in any 4 consecutive days	0.02 ppm annual average 0.10 ppm 24-hour average not to be exceeded more than once a year 0.40 ppm hourly average not to be exceeded more than once a year	0.02 ppm annual average 0.10 ppm 24-hour average not to be exceeded more than once a year -- 0.5 ppm 1-hr average not to be exceeded more than once a year
Total Suspended Particulate	75 micrograms per cubic meter, geometric annual average 260 ug/m^3, 24-hr average not to be exceeded more than once a year	75 ug/m^3 annual geometric mean 200 ug/m^3 not to be exceeded more than 1% of the days a year	75 ug/m^3 annual average 200 ug/m^3 24-hr average not to be exceeded more than once a year	75 ug/m^3 annual average 200 ug/m^3 24-hr average not to be exceeded more than once a year
Carbon Monoxide	35 ppm, 1-hr average not to be exceeded more than once a year 9 ppm, 8-hr average not to be exceeded more than once a year	-- --	9 ppm 8-hr average not to be exceeded more than once a year 17 ppm hourly average, not to be exceeded more than once a year	9 ppm 8-hr average not to be exceeded more than once a year 23 ppm hourly average, not to be exceeded more than once a year
Photochemical Oxidants (Ozone)	0.12 ppm hourly average not to be exceeded on more than one day a year	--	0.10 ppm hourly average, not to be exceeded more than once a year	0.10 hourly average, not to be exceeded more than once a year
Nitrogen Dioxide	0.05 ppm annual average --	-- --	0.05 ppm annual average 0.17 ppm hourly average, not to be exceeded more than once a year	0.05 annual average 0.30 ppm, hourly average, not to be exceeded more than once a year
Hydrogen Sulfide	--	0.03 ppm ½-hour average, not to be exceeded more than twice in any 5 consecutive days 0.05 ppm ½-hour average, not to be exceeded over twice a year	0.10 ppm hourly average, not to be exceeded more than once a year	0.05 ppm hourly average, not to be exceeded
Lead	1.5 ug/m^3, calendar quarter average	5.0 ug/m^3, 30-day average	1.5 ug/m^3 calendar quarter average	1.5 ug/m^3, 3-month average
Fluoride	--	1.0 ppb, 24-hr average, total fluoride (as HF) 0.3 micrograms per square centimeter per 28 days (gaseous)	1.0 ppb 24-hr average 0.30 ppb 30-day average 0.13 ppb growing season average	1.0 ppb 24-hr average, gaseous fluoride 0.3 ppb 30-day average
Foliar Fluoride	--	35 ppm, dry weight basis	30 ug/g, dry weight basis	35 ug/g in forage, annual average, no monthly average to exceed 50 ug/g
Settled Particulate (Dustfall)	--	15 tons/sq mile/month, 3 month average in residential areas 30 tons/sq mile/month 3 month average in heavy industrial areas	10 gm/m^2 30 day average	10 gm/m^2, 30-day average
Visibility	--	--	Particle scattering coefficient of 2×10^{-5} per meter annual average	Particle scattering coefficient of 3×10^{-5} per meter annual average
Reactive Sulfur (sulfation)	--	0.25 milligrams sulfur trioxide/100 sq. centimeter/day, maximum annual average 0.50 milligrams sulfur trioxide/100 sq. centimeters/day, max. for any 1-month period	--	
Suspended Sulfate	--	4 ug/m^3 of air, max. allowable annual avg. 12 ug/m^3 of air, not to be exceeded more than 1% of the time	--	--
Sulfuric Acid Mist	--	4 ug/m^3 of air, max. allowable annual average 12 ug/m^3 of air, not to be exceeded more than 1% of time 30 ug/m^3 of air, hourly average, not to be exceeded over 1% of the time	--	--
Beryllium	--	0.01 ug/m^3, 30-day average	--	--
Arsenic	--	--	--	Deferred for further study
Cadmium	--	--	--	Deferred for further study

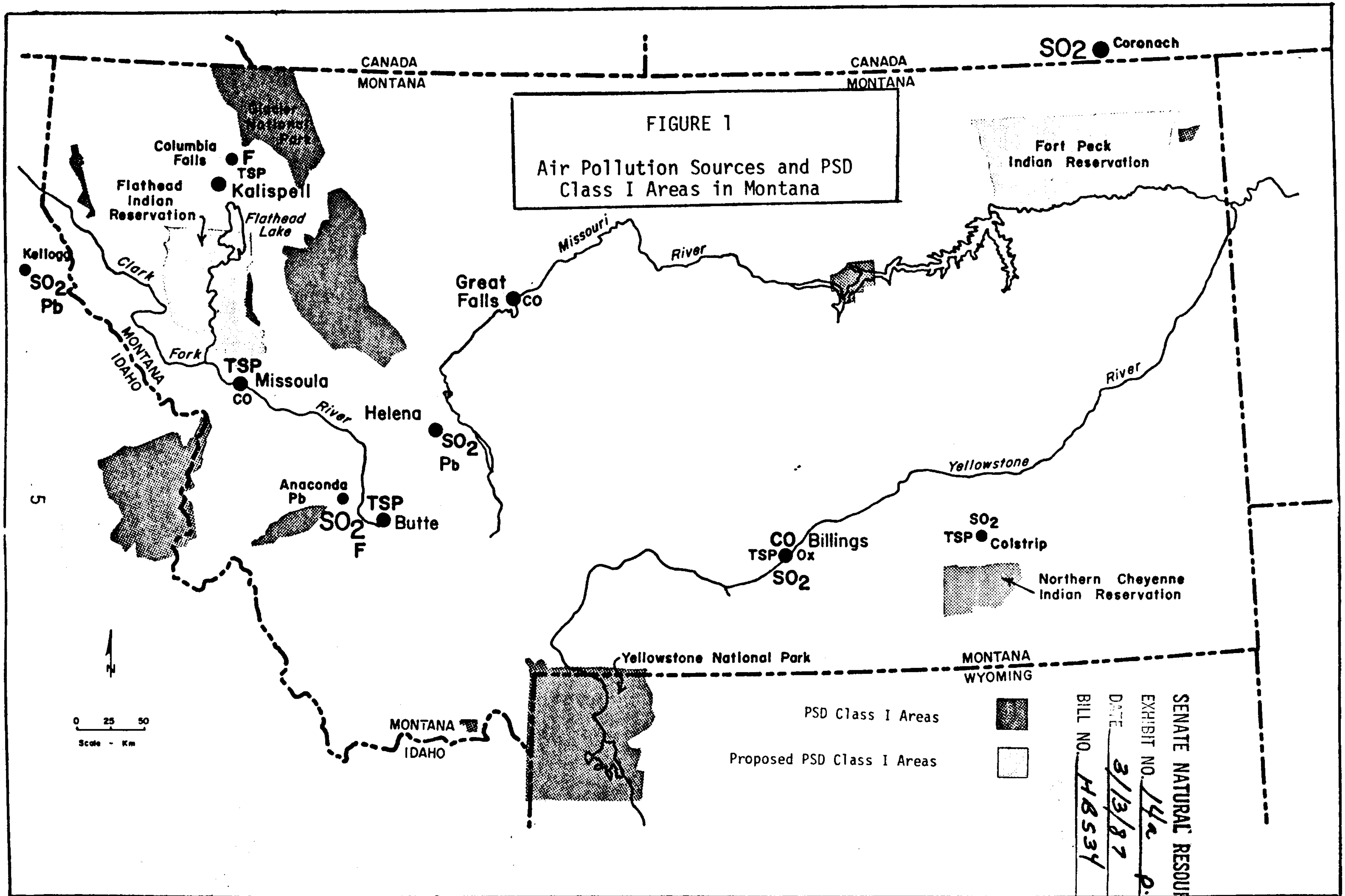

FIGURE 1

Air Pollution Sources and PSD Class I Areas in Montana

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TABLE 2

ESTIMATED EMISSIONS FROM POINT SOURCES
OF AIR POLLUTION AND PRESENT DEGREE OF CONTROL

SOURCE	SULFUR DIOXIDE t/yr	%	PARTICULATE t/yr	%	LEAD t/yr	%	FLUORIDE t/yr	%	NITROGEN OXIDES t/yr	%	HYDROCARBONS t/yr	%
Anaconda Aluminum	2,200	0	1440	77			455	90				
Anaconda Copper	281,750	34	4780	95	179	95						
Berkeley Pit	207	unk	4023	33								
ASARCO Lead	14,000	76	418	96	48	95						
CENEX Refinery	10,380	unk	398	unk					540	unk	1317	unk
Conoco Refinery	3,198	unk	263	unk					1,194	unk	1991	unk
Exxon Refinery	9,800	unk	735	unk					1,401	unk	4177	unk
Hoerner Waldorf Paper	365	unk	760	98					1,008	unk	115	unk
Montana-Dakota Utilities, Sidney	2,372	15	430	98								
Mont. Power Co. (Colstrip 1 & 2)	5,326	75	618	99					7,000	unk		
Mont. Power Co. (Corette)	9,986	10	1124	97					6,757	unk	94	unk
Montana Sulphur	1,530	97							4	unk		
Stauffer Chemical	208	unk	99	96			35*	90				

unk=unknown or unmeasurable

Source: Gelhaus, et al., 1978; Constant et al., 1977

*Anticipated emissions based on emission control projection.

TABLE 3

SUMMARY OF SELECTED AMBIENT AIR QUALITY DATA (1978)

Pollutant and Averaging Time	Missoula	Anaconda	East Helena	Great Falls	Billings	Colstrip
Sulfur Dioxide	Lions Park	Lincoln School	East Stack	--	Central Park	--
Max. 1-hr. (ppm)	0.05	1.21	0.48		0.195	
Max. 24-hr. (ppm)	0.02	0.37	0.10		0.091	
Annual Average (ppm)	0.00	0.02	0.004		0.010	
	(10 months)	(7 months)	(11 months)		(7 months)	
Particulates	Courthouse Roof	Highway Junction	Microwave	Fire Station	City Hall	BN
Max. 24-hr. (ug/m^3)	389.7	155.0	101.0	125.0	175.0	138.0
Annual Geom. Mean	64.0	26.9	23.4	55.4	64.8	13.0
	(12 months)	(12 months)	(12 months)	(12 months)	(11 months)	(4 months)
Settled Particulate (gm/m^2) monthly mean	--	--	--	Fire Station	--	--
				4.52		
				(9 months)		
Visibility	Lions Park	---	---	---	---	---
Annual Avg. (miles)	17					
	(12 months)					
Carbon Monoxide	Mal. Junction	---	---	10th Ave. S.	27th & Mont.	--
Max. 1-hr. (ppm)	28.0			15.1	15.9	
Max. 8-hr. (ppm)	15.0			11.5	8.4	
	(5 months)			(10 months)	(6 months)	
Ozone	Lions Park	*	---	---	27th & Mont.	*
Max. 1-hr. (ppm)	0.078				0.120	
	(12 months)				(7 months)	
Nitrogen Dioxide	Lions Park	Lincoln School	---	---	Central Park	---
Max. 1-hr. (ppm)	0.098	0.050			0.075	
Annual Arith. Mean	0.016	0.006			0.012	
	(10 months)	(3 months)			(4 months)	
Total Hydrocarbons	Lions Park	---	---	---	27th & Mont.	---
Max. 1-hr. (ppm)	8.13				11.40	
	(11 months)				(5 months)	

*=no data

---=less than 3 months data

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AIR QUALITY TRENDS IN MONTANA

Billings

The sulfur dioxide levels in Billings have remained generally the same over the past three years with an annual average of about .003 ppm in residential and traffic areas. The sulfur dioxide levels near the Cenex refinery in Laurel seem to have decreased from 1976 to 1978. The 1979 data, although incomplete, appear to be about the same as the 1978 data. No clear trends emerge from the total suspended particulate data. The data from 1975 through 1978 appear relatively constant at most sites. The 1979 data analyzed so far may be a little higher.

The ozone and carbon monoxide data from Billings follow the same general trend as total suspended particulate. These pollutants were monitored at different locations throughout the past four years, making an analysis of the trend difficult.

It would appear that the readings from the Billings stations have not changed significantly, with a few exceptions, over the past four years. The emissions from industrial sources of pollution have generally remained constant, while the population base has been increasing. A slight increase in the total suspended particulate number for 1979 may be due to a combination of meteorological conditions and population expansion.

Anaconda

The air monitoring work done in the Anaconda area has generally been limited to sulfur dioxide and total suspended particulate. In general, the sulfur dioxide readings have been increasing since 1975 from about .014 (annual average) to .056 in 1978. The data are not complete enough for 1979 to yield a valid annual average. The change shown is unusual since the

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Anaconda Company has significantly reduced its emissions ince 1975. The reason for the increasing readings is due to the decreased bouyancy of the emissions as they are released into the atmosphere. This decreased disperssion has been caused by the installation of controls required by the State. Although the concentration of sulfur dioxide in the main stack plume is less than in the past, the plume is more inclined to reach the ground sooner. The total suspended particulate readings for the area have remained relatively unchanged since 1976 (approximately 40 ug/m^3) annual average. The 1978 values were lower than all other years for unknown reasons. It appears that 1979 was a typical year for total suspended particulate in Anaconda.

Butte

Butte has been monitored for total suspended particulate for many years. The readings have decreased from 1976 through 1978. However, the readings increased by about 10 percent in the first 10 months of 1979. Nitrogen dioxide, ozone, sulfur dioxide, and carbon monoxide have all been measured in Butte for the past year. Although the data is preliminary at this point, it appears that nitrogen dioxide, carbon monoxide, and ozone may be present, but not in sufficient quantities to exceed the proposed standards. The data on sulfur dioxide are too preliminary to define the concentrations present.

Columbia Falls

The Columbia Falls area has had a relatively constant level of total suspended particulat over the past four years. The data show levels in excess of the proposed standard. The area has already been determined to be in violation of federal standards. It is suspected that road traffic and conditions are the major cause of these readings. A sampler located near the Anaconda Aluminum Reduction Works show much lower readings than the sampler in town.

Great Falls

Great Falls has been the subject for monitoring of carbon monoxide and total suspended particulate. The total suspended particulate readings in the downtown area of Great Falls decreased from 74 ug/m^3 (annual average) in 1976 to about 56 ug/m^3 in 1978. The 1979 data, however, show an increase to 77 ug/m^3. The cause of this change is unknown. A carbon monoxide monitor on 10th Avenue South has been in operation for about two years. The data from this site show about 14 violations of the federal eight-hour standard for carbon monoxide.

Missoula

Total suspended particulate measurements have been taken in Missoula for many years. Since 1976 the readings have generally remained constant. However, inclusion of 1979 data, may show a downward trend. The 1976 average reading was 86 ug/m^3 while the 1979 average of data thus far analyzed was approximately 79 ug/m^3. There have been a number of emission controls initiated at various facilities in Missoula since 1976. Population gains and/or meteorological conditions may have offset some of these controls.

East Helena

The East Helena area has been studied for sulfur dioxide, total suspended particulate and lead. The sulfur dioxide levels have generally decreased starting in 1978. The reason for the decrease is believe to be the emission control systems implemented about the same time. The annual geometric mean for the past four years is 77 ug/m^3, except 1977 when the mean was 64 ug/m^3. This indicates violations of the 75 ug/m^3 national and proposed state standards.

The cause of the lower 1977 reading is unknown. Lead also has been measured at this site for the last two years. The data show exceedance of the proposed state and existing federal lead standard.

AIR POLLUTION IN MONTANA

The draft EIS pointed out that there is reason for concern about the extent and seriousness of air pollution in Montana. Although there are relatively few sources of industrial pollution, the areas affected generally are the population centers of the state. Furthermore, the measured levels of several pollutants are higher than those which have been scientifically established to cause health effects in humans. The pollutants reaching these excessive levels in Montana are sulfur dioxide, particulates, lead, carbon monoxide, nitrogen dioxide and ozone. There are no completed studies to show whether these effects are occurring in Montana, but there is no reason to believe that people in Montana would be more or less endangered by a given pollutant level than residents of other areas. It was said in the draft EIS that hydrogen sulfide was a threat to health at levels found in Montana, but further review of the data led to the recommendation of a standard based on welfare effects.

Besides human health effects, many of the pollutants found in Montana can affect plants and animals, m terials, and other elements important to human "welfare." Two pollutants, hydrogen fluoride and hydrogen sulfide, affect plants and animals at levels more dilute than those necessary to threaten human health, so the standards recommended to the Board in the final EIS are based exclusively on these "welfare effects." The recommended standards for each pollutant are expected to protect both human health and the environment. Mobile and area sources, such as automobiles, strip mines, and

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dusty roads, also can be significant emission sources, but emissions from these are not generally as significant as those from industrial point sources.

The issuance of the draft EIS was followed by a massive outpouring of comments from industry and other concerned groups and individuals. In response to these comments, there was much reanalysis of data, review of a few research results not previously reviewed, and other efforts to clarify and update the findings and conclusions of the draft. As a result, there were some changes made in the recommended standards. These changes are apparent in Table I.

The proposal in the draft EIS to make the standards directly enforceable generated a considerable volume of comments, all of which were reviewed and evaluated in determining the Departments final recommendation on an enforcement stance.

The following are the principal enforcement recommendations of the Department's final proposal:

- Change the ambient air quality standards from their current form to expressly enforceable standards (no change from draft EIS);
- Adopt the standards without limitation of enforcement measures (no change from draft EIS);
- Limit the definition of "ambient air" to include only areas where the general public has access (change from the draft EIS).

A major need pointed out in the comments on the draft EIS regarded the need for an analysis of the alternatives available to the Department. The Final EIS states the Department's position that there are no legal alternatives to the standards recommended to protect health, in view of the Clean Air Act's requirement that health be protected, and the scientific evidence and analysis indicating that the standards recommended are necessary to fulfill that requirement.

There also were many comments to the effect that alternative modes of enforcement should have been analyzed in the draft EIS. The final EIS discusses the limitations of these suggested alternatives, and points out why they are not available for adoption.

Many comments asserted that draft EIS did not contain adequate information regarding the impacts of the Department's proposal. The discussion of impacts in the draft was concerned primarily with the effects of various levels of pollution on human health and welfare. These findings are organized and supplemented in the final EIS with an analysis of the probable impacts of the Department's proposal.

ANTICIPATED IMPACTS OF THE DEPARTMENT'S PROPOSAL

The impacts of the proposed ambient air quality standards would occur in two broad areas: (1) a reduction in the effects of air pollution upon humans and the natural environment, and (2) economic and environmental costs necessary to achieve the air quality standards.

There are two fundamental constraints upon the Department's ability to predict the exact impacts of its proposed ambient rule. The first is the important role played by the existing regulatory background. Particularly with respect to new sources, current regulatory programs would largely determine the abatement requirements which would be applied to pollution sources.

Secondly, as noted previously, it is difficult to quantify the impacts of the proposed standards either as cost (additional control of emissions) or benefits (reduced effects on humans, plants, animals and the environment.)

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For this reason, the discussion on anticipated impacts is largely cast in qualitative terms rather than quantitative.

It can be said, for example, that standards based upon health considerations would reduce the potential for human health effects. Lower potential for disease, fewer sick days, and the reduced potential for interference with normal human activities may be expected to increase the productivity of the state's people.

Farming and ranching, wood products and recreation, which account for more than one-half of the state's economic activity, all depend upon clean air. The proposed standard could contribute to preserving the productivity of these sectors.

Furthermore, much of the state's residential growth can be attributed to the natural amenities available in Montana, including its unpolluted air. The proposed standards, particularly those for the urban pollutants, visibility, and settled particulate should preserve these amenities and Montana's attractiveness as a place to live.

In an attempt to quantify the economic aspects of air pollution in Montana, the Department contracted the production of a study (Otis et al. , 1979) to define the situation. This study estimates the change in death rates that could be anticipated in Helena, Anaconda, and Billings if sulfur dioxide emissions were reduced to meet the existing federal and state ambient air quality standards. Using two procedures for calculating the health effects and two values for the reduction in risk to life and health, estimates of social economic benefit were obtained for moving from present ambient levels to the federal standard ($1 million to $4 million per year) and moving from present ambient levels to the proposed state standard ($1 million to $7 million per year). Estimates for the loss of agricultural crops and ornamental plants in four

Montana counties were calculated. The crops included alfalfa, wheat, and timber. The estimated economic benefits were approximately $800 thousand per year for meeting the federal standard and approximately $1 million per year if the state standard were met. The reduction in damage to materials, primarily galvanized zinc surfaces and paints, was estimated to be approximately $100 thousand per year for meeting either state or federal standards. Finally, estimates were made for the loss of visibility from particulate matter derived from sulfur dioxide in the Billings area. Depending on the choice of assumptions regarding who "owns" clean air, the annual value of improved visibility is calculated to be between $100 thousand and $1 million for achieving the federal standard and $200 thousand to $2 million for achieving the state standard.

The costs of reducing emissions to meet the federal and state standards were estimated for the seven largest sources of sulfur dioxide in Montana. At Anaconda Copper a $21 million acid plant already scheduled for installation to meet federal standards is expected to reduce emissions sufficiently to achieve both the federal and state standards. The CENEX petroleum refinery in Billings already is planning to spend about $5 million to meet the federal standards. An additional $1 million might have to be spent to meet the state standard. The controls needed by Montana Power's Corette plant to meet the state standard could cost between $7 million and $11 million, depending on the engineering difficulty. The Exxon refinery might have to spend about $9 million on controls to meet the state standard. No additional control is likely to be required at either the Corette power plant or the Exxon refinery to meet the federal standards. The Conoco refinery does not appear to require any additional controls to meet either standard. Montana Sulfur already had agreed to install a new stack for less than $1 million that may permit the plant to meet both standards. The ASARCO lead smelter in East Helena recently installed control equipment that may enable it to meet both standards. Approximately $40 million was spent on the control program.

When control costs are compared to the estimated benefits of control, it is found that for both the high and low estimates, the additional costs of moving from the federal to the more stringent state standard is roughly equal to the additional benefits. This is the best measure of economic efficiency and it suggests that the proposed state standard is economically optimal for Montana.

The final EIS also discusses the economic aspects of the proposed fluoride standards in relation to the state's two major sources of fluoride emissions, the Anaconda Aluminum plant and the Stauffer Chemical phosphorus plant. Estimates are reported for damage from fluorides in the Columbia Falls and Ramsay areas. Both facilities are completing installation of new control equipment. The control programs at both plants are expected to achieve the proposed fluoride standards. In both instances the analysis indicates that the present control programs are economically justified but further indicate that new control programs would not be economically justified on the basis of currently available economic and engineering information.

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III. POLICY CONSIDERATIONS IN DEVELOPMENT OF AMBIENT AIR QUALITY STANDARDS

INTRODUCTION

The purpose of this chapter is to outline and clarify the policy considerations underlying the development of the Department's proposals.

The chapter is divided into three sections. The first section summarizes the statutory directives contained in the Montana Clean Air Act. The second outlines and discusses the Department's methodology for determining the standards. The third section clarifies how the Department chose among alternative ambient air quality standards.

Montana Clean Air Act

Section 75-202 of the Montana Clean Air Act (MCAA) provides:

> Board to set ambient air quality standards. The board shall establish ambient air quality standards for the state.

Section 75-2-102 of the MCAA provides:

> Policy and Purpose. (1) It is hereby declared to be the public policy of this state and the purpose of this chapter to achieve and maintain such levels of air quality as will protect human health and safety and, to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this state, and facilitate the enjoyment of the natural attractions of this state.
>
> (2) It is also declared that local and regional air pollution control programs are to be supported to the extent practicable as essential instruments for the securing and maintenance of appropriate levels of air quality.
>
> (3) To these ends it is the purpose of this chapter to: (a) provide for a coordinated statewide program of air pollution prevention, abatement, and control;
>
> (b) provide for an appropriate distribution of responsibilities among the state and local units of government;

(c) facilitate cooperation across jurisdictional lines in dealing with problems of air pollution not confined within single jurisdictions; and

(d) provide a framework within which all values may be balanced in the public interest.

In preparing its recommendations the Department has necessarily referred to Section 75-2102 which sets out the policy and purpose of the Montana Clean Air Act. That section requires the Board to engage in a two-step process in the establishment of air quality standards in Montana.

The Board must first determine what levels of air quality are necessary to protect human health. The Board must establish air quality standards to achieve at least that level of air quality.

Once the level needed to protect human health is determined, the Board must decide whether other social, environmental, or economic needs of Montana call for air quality beyond that necessary to protect human health. The Board accomplishes this second step by weighing the four specific "welfare" factors set out in section 75-2-102. If the Board's weighing of these factors indicates a need for air quality beyond that required to protect human health, then more stringent ambient air standards may be established to achieve such air quality levels. If the Board concludes that the advantages to be gained by better air quality are outweighed by considerations pertaining to the other objectives then it may leave the standard at the level required to protect human health. Direct economic comparisons among these factors is not possible. Section 75-2-102 contemplates that, once human health is protected, the Board has broad discretion to balance these objectives and establish standards which will serve the state as a whole.

A standard established to protect human health includes a margin of safety to account for uncertainties and hazards which research may not yet have identified or resolved. The margin of safety for any given pollutant is determined by the acceptability of the risk associated with the pollutant. A standard established to protect a welfare interest such as wildlife or vegetation is not specifically designed to include such a margin of safety. The level of air quality needed to protect welfare interests is based upon effects which are either known or may reasonably be anticipated.

Policy Considerations

The Montana Clean Air Act requires establishment of ambient air quality standards sufficient to protect human health and welfare. The standards cannot be derived solely by reference to available scientific information. The process of setting such standards demands that some judgments be made and applied to the available information. For example, if health is to be protected, is it only healthy persons who should be protected? Conversely, must every aspect of health be protected from every possible effect of air pollution?

As a foundation for the standards, the Department gathered and analyzed information concerning the sources, concentrations and effects of pollutants. The information was assessed in accordance with the policies which the Department is carrying out. Therefore, the final form of the rule derives from the application of a policy framework to scientific findings.

Several policy choices were made by the Department and incorporated into the proposed rule. They may be stated generally as follows:

Protected population: Health standards are established to protect not only healthy persons but also the most sensitive or vulnerable segments of the population.

Health Related Response - The Department concluded that a response is of regulatory concern if it results in or contributes to a reduction in one's present or future capacity to engage in normal activities. The Department's determinations of whether a response is health-related were made on a case-by-case basis.

Level of Apparent Health Response - For some pollutants there is no apparent health effects threshold below which exposure may automatically be deemed safe. Therefore rather than use the term threshold, the Department has used the term "level of apparent health response" to indicate the pollutant level at which health related responses begin to be observed. This level of apparent health response dictated the minimum standards for each pollutant.

Margin of Safety - There are uncertainties concerning the full range of health effects caused by air pollutants. To account for these uncertainties the Department generally has proposed a standard more stringent than the level of apparent health response. The margin of safety is based upon a case-by-case evalution of the uncertainties and risks associated with a given pollutant.

Enforceability:- The ambient air quality standards are recommended to be legally enforceable limitations which may be enforced by the measures provided in the Montana Clean Air Act.

Ambient Air - The Department has determined that the ambient air standards are to be enforceable in areas to which the general public has access. The standards are not enforceable inside the property lines of pollution sources.

Discussion of these policy considerations is incorporated into the discussion on Determination of Ambient Air Quality Standards.

Determination of Ambient Air Quality Standards: Summary

The process followed by the Department in determining the proposed standards may be summarized as follows:

1. Compilation and Assessment of Scientific and Factual Information. The Department first reviewed the available health effects literature on pollutants of concern in Montana. It focused upon studies indicating effects of concentrations at or near the federal standards. Information was also assembled regarding the various pollution sources within the state.

2. Determination of Which Pollutants to Regulate. The Department selected for regulation those pollutants currently occurring in significant levels in the state and for which there was scientific evidence to derive a meaningful standard.

3. Determining the Level of Apparent Health Response. The Department relied on scientific information to establish for each pollutant a level which apparently was sufficient to produce a detectable health response to whichever segment of the public was most vulnerable.

4. Margin of Safety. Once the level of apparent health response was established, the Department assessed the risk associated with unknown effects of the pollutant. Several factors were weighed to determine what level of risk was acceptable to assure protection of public health. In accordance with that estimate, the standard was made more stringent than the level of apparent health response.

5. Considerations Above and Beyond Health to Determine Final Standard to be Proposed. Once the health standard was determined, the Department reviewed the scientific evidence to determine whether the pollutant would have effects upon the state's economic and social welfare at concentrations lower than the level required to protect health. Where such effects were likely to occur,

they were weighed against the other specific welfare interests specified in section 75-2-102 of the Montana Clean Air Act to determine whether a standard to protect more than human health was "practicable." If the anticipated impacts were not offset or outweighed by the other concerns, then the standard was modified to prevent anticipated welfare effects.

DETERMINATION OF AMBIENT AIR QUALITY STANDARDS: DISCUSSION

Compilation and Assessment of Data

1. Use of Data - The initial task of the Department was to gather scientific information concerning air pollutants of concern in Montana. In order to gain an overview, the Department conducted a computerized scan of literature on the effects of air pollutants on the public health and welfare. Much of this literature was cited and discussed in the EIS.

While it did consult the general body of scientific data, the Department chose to focus its attention upon studies indicating effects at or near the federal standards. The proposing of state standards less stringent than the federal standards would have been a largely academic exercise.

Throughout the process of reviewing scientific data, the Department preferred to consult original scientific papers and generally avoided reliance upon reviews which summarize and critique several different studies in a particular area of research. Reference to original articles allowed the Department to examine the actual experiments conducted and thereby to assess the degree of reliability of the scientific conclusions. There also was a preference for studies appearing in scientific journals since they are more widely available and generally will be better known by other researchers in the field. Some reports by government agencies also receive wide distribution and were utilized where appropriate.

In certain cases, reports published by panels of scientists have drawn conclusions based upon a review of existing literature. Some researchers suggest that these reports embody the scientific consensus regarding any given pollutant. The Department seriously considered the findings of such panels but did not automatically defer to their conclusions.

A scientific consensus depends in part upon common assumptions governing the interpretation of data. Not all researchers approach scientific data with the same assumptions. For example, some researchers may contend that there is a safe effects threshold for every pollutant or that reversible effects have no biological significance. Other reseachers may proceed under different assumptions. Therefore some scientific disagreement and uncertainty is inevitable concerning important factors in the setting of standards.

2. Types of Studies - Three types of experiments are used to define the impacts of air pollutants on human health: animal studies, clinical studies, and epidemiological studies.

Animal studies are valuable for determining the effects of pollutants on laboratory animals under controlled conditions in experiments that would be too hazardous with human subjects. Animal experiments allow the use of high pollutant concentrations and examination of affected tissues. They make possible the repetition of experiments and the determination of relationships between given pollution levels and the effects observed. Although the findings of these studies are not directly applicable to humans, there is a general understanding that responses found in experimental animals may be paralleled in humans.

Clinical health studies are used for more direct determination of air pollution responses in humans. The advantage of this method is that precise levels of pollutant can be administered under consistent study conditions. Because the experiments usually use volunteers, often college students, it is difficult to experiment with long-term or repeated exposures. There is little doubt these studies understate the effects on the general population, given the better than average health of college students.

The epidemiological studies evaluate health responses under ambient conditions common to the human environment. Testing for low level effects in humans often is possible only through statistical survey in cities alike except for their pollution levels. These studies relate pollution levels to illness and death rates. Epidemiological studies are especially useful in identifying a sensitive group or detecting an unusual type of illness or cause of death that might be associated with pollution.

Each of the three types of studies has its own benefits and disadvantages. A good epidemiological study is probably the most desirable, since it most closely reflects the everyday world. However, it is extremely difficult to produce clear results, because of the large number of uncontrolled variables inherent in any such study. One approach is to rely on epidemiological results only if they report effects consistent with clinical and animal studies.

Some researchers use only clinical studies. Such studies are the most easily controlled, but are, necessarily, the most artificial, and application of the results to the everyday world often involves data interpretations and inferences that may be subject to dispute.

Animal studies often explore the physiological mechanisms by which pollutant exposures produce effects, but may reveal little about the exposure levels at which human health is affected.

Rather than weighing any one type of study, the Department chose to look for composite sets of results: epidemiologic studies backed up by clinical and animal studies. The greater the degree of consistency and convergence among these three approaches, the more reliable the conclusions.

Protected Population

The objective in establishing health-based ambient air quality standards is to estimate the concentrations of various pollutants in the air to which all groups within the general population can be exposed without an unacceptable risk to health. Susceptibility to ambient air pollution often varies significantly from one person to another. Similarly, different segments of the population with preexisting limitations or health conditions may exhibit more dramatic responses to air pollution than other healthy groups. The question arises as to which of such groups should be afforded protection from health effects.

Congress has specified that the responsibility of the federal government under the Federal Clean Air Act is to protect the most sensitive segment of the population which is regularly exposed to ambient air. The only limitation is that such segments be large enough to be statistically definable.

The Department has determined that it has an equal responsibility to protect the health of Montana's citizens. Therefore standards are designed to protect those persons who are most sensitive or vulnerable to air pollutants. For example, persons with asthma or other respiratory disorders, children, pregnant women and other statistically significant groups, will be afforded protection under the proposed standards. The exact identity of the sensitive populations will vary by pollutant.

Determination of Which Pollutants to Regulate

Once the scientific literature was compiled and reviewed, the initial decision which had to be made was whether a standard should be proposed for a particular pollutant.

There are numerous air pollutants presently found within the state. The Department's review gave particular consideration to the pollutants regulated in the existing ambient standards rule. Standards for four pollutants (beryllium, suspended sulfate, sulfuric acid mist, and total reactive sulfur) were removed and do not appear in the rule proposed by the Department. While standards for these pollutants may again be considered in the future, they are not included in the present proposal for the reasons stated in Appendix F of the draft EIS and on p. 102, Chapter III of this final EIS.

The process of selecting pollutants for regulation is not accomplished by applying a general rule to all pollutants. Certain criteria must be applied on a case-by-case basis. The first consideration is whether the pollutant occurs in sufficient concentrations to warrant the adoption of an ambient air quality standard. In the case of beryllium, for example, there currently are no significant sources in the state nor are any proposed.

Another consideration is the extent of knowledge regarding the effects of a pollutant. The Department proposed a standard only for those pollutants for which there was sufficiency of reliable scientific information. There must be enough reliable scientific information to suggest what concentrations may cause identified effects and what levels are safe. For example, current scientific information on suspended sulfate, sulfuric acid mist, cadmium, polyclic organic matter and arsenic does not provide an adequate basis for specific standards. Intensifying research may allow the adoption of standards for these pollutants in the near future.

Furthermore, the scientific information must be sufficiently precise to allow accurate measurement of pollutant concentrations and enforcement of standards. It is only with such information that a standard may be confidently derived.

A standard for sulfuric acid mist would be impractical because of the difficulty of operating ambient measuring devices accurately under field condition. A standard for total reactive sulfur was not proposed because of

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ambiguities associated with the sulfation plate measurement ~~method. Scientific~~ research has associated suspended sulfate with health effects but does not yet allow the formulation of an accurate and workable regulation. The Department also reviewed the current evidence on respirable particulates but deferred proposing a standard until more information is available.

Health Related Response

Although the Montana Clean Air Act requires that ambient air quality standards be established to protect human health from the effects of air pollution, not all effects of air pollution necessarily endanger human health. Therefore, in preparing to propose air quality standards, the Department examined the range of pollutant effects and emphasized those believed to be significant to human health.

There is no universal agreement about what constitutes a health related response. Exposure of the human organism to varying concentrations of air pollutants results in a spectrum of responses which may be summarized as follows:

- Substantial and significant effects, such as death or incapacitating disease;
- Clinically observable illness or disability, such as an elevated temperature, a persistent cough, or nausea;
- Subclinical effects or predisposition such as a change in the mucal clearance rate, change in lung function (e.g. mid maximal expiration flow rate), or a change in blood protein composition;
- Body burden and subjective responses, such as an accumulation of heavy metals in the body or psychological responses.

A reasoned judgement was necessary in determining the initial point where health related effects begin to occur on the continuum of physiological response. Also required was a decision concerning the kinds of responses to pollution which could be discounted in establishing the level of apparent health response.

Some physiological responses to air pollution are undramatic but may be biologically significant. For example, chronic exposure to low levels of pollution may go undetected but may have significant effects on health over the long term. On the other hand, effects such as eye irritation may at times be dramatic but are temporary and reversible and therefore may have only minimal biological significance if they occur infrequently.

There are differences of opinion concerning which effects should be discounted in establishing air quality standards to protect human health. It may be stated generally that the higher the levels of pollution, the more medical researchers will agree that a response may be expected and the more medical researchers will agree that the response has biological significance.

One school of thought as to which effects are "adverse" is reflected in the standard used by the World Health Organization. That organization's concept of a health effect includes the "well-being" of the exposed human population. This is a broad perspective which includes subjective considerations such as whether a person feels better or worse on a given day.

Other researchers follow a narrower course. For example, some argue that any effects which were reversible should be discounted in establishing a health standard. According to this view, for example, a chest cold is a temporary and fully reversible respiratory infection and therefore should not be of regulatory concern.

Between these two positions is an approach which adequately protects public health and also allows the Department to discount effects too subtle to be considered "adverse." The principal factor in determining if an effect is health related is whether it contributes to a reduction in the ability to engage in normal activities. Use of this approach is intended to prevent all but minimal interference with bodily functions upon which physical activity and mental ability depend. For example, a chest cold constitutes a significant interference with the normal condition of the body. A reduction in mucal clearance rate is likely to increase the susceptability of a person to chest colds. Therefore, a measured reduction in mucal clearance rate should be considered an adverse health effect.

Similarly, a subtle change in the formation of blood proteins may not have any immediately observable effect on behavior. However, if prolonged, such interference could leave the body in an anemic state which could significantly reduce the ability to engage in normal activities. Conversely, an effect of minimal biological significance such as eye irritation occurring at sufficient intensity over a short period may create such discomfort that it interferes with normal activities.

The Department has determined that reactions to odor and other subjective responses should be considered nuisance effects rather than health effects.

Level of Apparent Health Response

In the past, health based standards rested primarily on the belief that there were safe pollutant thresholds below which no adverse health effects would be expected even after a lifetime of exposure. Control of emissions to achieve this safe threshold was considered adequate to protect public health.

More recently, increasingly sophisticated scientific research has found definite health responses for many pollutants at concentrations which previously were thought to be below the threshold. This recognition of effects at lower levels suggests that even the lowest levels of these pollutants may affect the human body.

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~~In light~~ of this, the Department has not attempted to establish definite thresholds as the basis for its health-related standards. Rather, the Department reviewed the scientific evidence to establish the range of concentrations at which definite health responses have been observed. The Department has used the term "level of apparent health response" to indicate this range.

Margin of Safety

The Need for a Margin of Safety

The level of apparent health response indicates the pollution concentration at which health related responses have been reliably detected. Setting an ambient air quality standard at that level would limit the public exposure to those effects. However, it does not follow that the public health would be adequately protected at that level.

There are a number of uncertainties associated with the protection afforded at the level of apparent health response. It is because of these uncertainties that the level of apparent health response may not be relied on to determine the standard ultimately needed to protect health. A margin of safety is required to take into account these uncertainties which may be summarized as follows:

Inherent Uncertainty in Scientific Data - Some degree of uncertainty is inevitable in probing new areas of scientific research. The true significance of scientific results may not be known until further research dispels, affirms, or clarifies initial findings.

Undetected Effects - Failure to detect effects at low concentrations is not proof that such effects do not exist. Expanded health effects research along with new investigative methods have and may further disclose adverse health effects at levels lower than those currently believed to produce such effects.

Variable Susceptibility - Susceptibility to air pollution varies from one person to another. Certain segments of the population are sensitive to one or more particular air pollutants. There is no certainty that experiments to date have accounted for the full range of susceptibility to each pollutant. Since much of the experimentation is performed on healthy, young males, the vulnerability of less healthy segments of the population is often unknown. Further research may reveal sensitivities which are as yet unsuspected.

Synergistic Effects - Some pollutants appear to exhibit enhanced effects in the presence of other pollutants. In such cases, the total effect may be greater than the sum of the effects of the individual pollutants. Substantial uncertainty still exists regarding this phenomenon, even for pollutants currently believed to be associated with it. Nor has synergism been demonstrated for every pollutant.

Scientific research regarding pollutant interactions is intensifying. Until such effects are well understood, allowances must be made for the uncertain role they play in environmental health.

Uncertainty in Predicting Actual Exposure - The extent to which the human population will actually be exposed to air pollutants may only be estimated. An individual's exposure to air pollution will depend partly on where he lives and on the amount of time he spends indoors where pollutant levels are typically somewhat lower. For example, some people tend to remain indoors during winter when outdoor air pollution levels generally increase. Indoor pollutant levels themselves may vary substantially depending, for example, on exposure to gas heating or cooking stoves. Other persons may frequently exercise outdoors in urban areas, thus increasing their exposure.

Meteorological variations occurring on an hourly or daily basis may allow periodic excursions beyond pollutant levels known to produce adverse health effects. These excursions may occur even though longer averaging time ambient standards set at known health effect levels are not exceeded.

Similarly, air pollution monitors cannot be said to measure precisely the actual human exposure to air pollutants. Although monitor locations are selected to reflect typical ambient concentrations, actual pollutant levels at a given place may vary significantly due to variances in air movement, source emissions, and other influences. Therefore, it is inevitable that a monitor at times will either overstate or understate actual human exposure in the vicinity.

The essential objective of ambient air quality standards is to minimize the exposure of the public to harmful air quality conditions. Since many factors combine to determine the level of actual exposure, it may be either more or less intense than anticipated. By making some allowance for the uncertainty in predicting actual exposure, the potential for abnormally high exposures is taken into account.

In light of these qualifications, the level of apparent health response should not serve as the sole determinant of an ambient air quality standard. The uncertainties associated with both the health effects of a pollutant and the exposures to it must be assessed, and allowances made for them in the final standard. In this way the final standard includes a margin of safety to insure protection of human health.

The Derivation of a Margin of Safety

The specific margin of safety recommended for each pollutant is based upon a reasoned judgement regarding the acceptable level of risk for that pollutant. It is not derived by applying any general rule to all pllutants. Rather, certain common considerations are weighed to assess the degree of protection needed.

The following are indicators of the margin of safety required for each pollutant:

Seriousness of Potential Harm - If existing scientific evidence has associated the pollutant with severe effects such as incapacity or irreversible reduction in lung function, then a wide margin of safety may be necessary. If, on the other hand, only less serious effects have been observed, then less protection is needed and a narrow margin of safety may be acceptable.

Degree of Uncertainty in the Data - In general, the greater the uncertainty the wider a margin of safety is needed. If there is a substantial body of relable scientific information which has largely foreclosed the possibility of effects at lower levels than the level of apparent health response, then a narrow margin of safety may be acceptable. If evidence is inconclusive or if studies suggest effects at lower levels, then a wide margin of safety may be indicated.

Degree of Exposure Across the Population - When experiments indicate the adverse effects of a given pollutant exposure are seen only in vulnerable segments of the population, such as persons with emphysema, it is likely that healthier people are not subject to the same immediate risks. Although such experiments say little about the long-term ability of healthy persons to tolerate given pollutant concentrations, such results may alleviate the need for a substantial margin of safety. On the other hand, if the harmful effects of the pollutant are observed in healthy young persons, then a substantial margin of safety may be necessary to protect less healthy people.

Likelihood of Occurrence - If there are significant emissions of a pollutant within the state, there is a likelihood that frequent low level concentrations will occur. Frequent exposures of the population to low level concentrations increases the risk that potentially harmful effects will be experienced. In such cases, a wide margin of safety may be indicated. If a pollutant is not present in significant amounts within the state, then public exposure will be less frequent and a smaller margin of safety may be acceptable.

Similar considerations apply to conditions caused by pollutant combinations or synergisms. Occasionally, harmful effects may be anticipated when mixtures of two or more pollutants are present in sufficient concentrations. If the conditions giving rise to the risk are not likely to occur, then a narrow margin of safety may be acceptable. If these conditions are likely to be frequent, then a wide margin of safety may be required.

All the indicators mentioned above must be considered together in the assessment of the risk associated with a pollutant. In the case of a given pollutant, for example, one or two factors may suggest the need for a wide margin of safety while in other cases all factors may indicate a wide margin. These factors are the primary indicators of the appropriate margin of safety. They form the basis for the Department's judgment regarding the levels of acceptable risk for each pollutant.

Considerations of Welfare and Practicability upon the Department's Proposal

Once the level of apparent health response has been determined and the appropriate margin of safety applied to it, there remains the final step in selecting the standard to be recommended. A determination must be made as to whether the social and economic needs of the state require air quality better than that needed to protect human health.

As noted previously, the Montana Clean Air Act requires the Board to establish standards which will not only protect human health but also will, to the greatest degree practicable, foster four goals which embody the social and economic welfare of the state. These welfare goals were previously set out in the discussion on the Montana Clean Air Act (p. 145). They refer generally to the quality of life available to the citizens of the state, including the beneficial use of the state's resources and the availability of employment. They also include the preservation of the state's natural attractions and productivity.

A balance must be struck among the four objectives. Such a balance may be determined only after careful consideration of the needs of the state. For example, use of an area by a polluting activity may foster economic growth and employment but may render the area undesirable for other uses such as agriculture,

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residential growth, or recreation. Although section 75-2-102 does not specifically require that each factor must be given equal weight, it clearly obliges the Board to consider the advancement of each objective before adopting a standard.

The Department's recommendations are intended to advance all of these objectives. No single consideration has been accorded paramount importance. It was necessary for the Department to first determine the level of air quality necessary to protect human health. Then the Department examined the scientific research to see whether welfare interests such as vegetation, property, social growth or natural attractions would be affected at lower pollutant concentrations. If such effects were noted, then an attempt was made to determine the advantages to the state of achieving air quality sufficient to eliminate them. These advantages were then weighed against the disadvantages which achievement of such air quality would impose upon attainment of the other objectives set out in Section 75-2-102. If the estimated advantages of better air quality were outweighed by the likely interference with other objectives, then the standard was not made more stringent than necessary to protect human health.

The determination of practicability under Section 75-2-102, is of necessity, largely a qualitative balancing of welfare objectives. It is difficult at best to quantify such things as social comfort and convenience, enjoyment of natural attractions, and socioeconomic development. Certain components of these broad categories, such as crop and timber losses or industrial control costs do, however, lend themselves to varying degrees of estimation. Where available, such information was used by the Department to assess the advisability of proposing standards more stringent than those necessary to protect health.

The Department used all reasonably available and reliable information in striking a balance among welfare objectives. In some cases, scientific evidence suggests that air quality better than that needed to protect human health would protect the state's various ecosystems from the potential effects of air pollution. While this is undoubtedly true in a general sense, there is not sufficient reliable scientific evidence to allow assessment of these advantages with any degree of accuracy.

For similar reasons, long-term projections concerning matters such as the rate of energy development in the state or the future economic consequences of air quality regulation upon industry and employment were avoided since such projections involve substantial speculation.

For six pollutants (sulfur dioxide, particulate matter, carbon monoxide, nitrogen dioxide, photochemical oxidants, and lead) the standards now proposed by the Department were indicated by human health considerations. Given the limitations of current scientific knowledge on the environmental effects of air pollution, there is very little basis for determining the respective advantages and disadvantages of standards below those necessary to protect human health. However a review of scientific evidence indicates that in every case the standards proposed to protect human health with a margin of safety will also to a great extent prevent known or anticipated effects upon the state's welfare interests. Therefore, none of the standards for these six pollutants was made more stringent on the basis of welfare considerations.

As to the four remaining pollutants (hydrogen sulfide, settled particulate, fluorides and visibility impairment) the standards now proposed by the Department were indicated by welfare considerations rather than health considerations. In the case of hydrogen sulfide, fluorides and settled particulate, effects on human health are observed only at concentrations above those levels associated with welfare effects. Visibility impairment is not directly related to human health. Therefore, standards for these four pollutants were determined by the balancing of welfare objectives.

While the Department used economic information, it did not engage in discrete cost-benefit analyses for standards based upon considerations of practicability. Precise cost and benefit information is difficult to obtain. Moreover, the Montana Clean Air Act does not require that a welfare-based ambient air quality standard be justified by a dollar for dollar cost-benefit analysis. In its recommendations the Department sought to advance the best interests of the state as a whole, as expressed in the four objectives established by the Legislature.

ALTERNATIVE AMBIENT AIR QUALITY STANDARDS

As noted earlier, the ambient standards rule proposed by the Department is based upon the application of a policy framework to scientific and technical information. This policy framework is derived from the Montana Clean Air Act. Pertinent aspects of this process have been reviewed and discussed in the draft EIS and elsewhere in this final EIS.

The scientific and technical information gathered and assessed by the Department serves as the foundation for the proposed ambient standards rule. In general, such information is made up of scientific findings, which by themselves do not constitute an ambient standards rule. Policy considerations must be applied to these findings in forging a rule which will carry out the mandates of the Montana Clean Air Act. Policy decisions generally do have alternatives.

The fact that the proposed rule has resulted from the application of policy to a process of information review makes it difficult to discuss alternatives which would apply to a site-specific project such as a bridge or highway

Alternatives in ambient air standards rulemaking fall among a wide range of policy choices.

The Department has previously identified and discussed a number of individual policy areas inherent in establishing the proposed rule. Each of these policy areas itself has alternatives. For example, the Montana Clean Air Act requires that standards be established which will protect human health. A decision must be made regarding which responses of the human body to air pollution signify some threat to health. Judgements as to what constitutes a health response could range from "only severe and irreversible effects" to "any detectable biological effect." The determination of what is a tolerable pollutant concentration thus has a major role in the setting of an air quality standard. Similarly, a decision as to whether reactions to odor or other subjective responses should be considered a health response could importantly affect what levels of pollutants would be acceptable.

An analysis of the proposed rule reveals that these selections, among alternatives within each of these policy areas, led to the final determination of standards. Different standards flow from different choices among policy components. Elsewhere in the final EIS the Department has clarified the reasoning behind its choices in these basic policy areas. A consideration of the alternatives to the Department's choices is implicit in such discussions.

In a theoretical sense, there are no alternatives to the Department's proposed standards. The Montana Clean Air Act requires the establishment of standards which will protect health and welfare. The Act calls upon the Board to decide what concentrations of pollutants are acceptable within the state. Once the policy decisions are made, the process of reviewing information leads to a decision as to what standard is appropriate. This principle is perhaps best illustrated in the assessment of risks which leads to a margin of safety included in a standard. After all considerations are weighed, the

Department can make only one judgement as to what level of risk is tolerable and only one judgement as to what margin of safety is appropriate. Such judgements implicitly consider and reject all other alternatives.

In this sense, the Department could recommend the no-action alternative (i.e., recommend the standards in the existing ambient rule) only if the application of its policy decisions to scientific and technical information indicated that the standards in the current ambient rule would carry out the mandate of the Montana Clean Air Act better than any other standards. For example, the current rule includes a standard for suspended sulfates. Even though sulfates have been suspected of causing health and welfare effects, the Department decided to establish standards only where there is sufficient reliable scientific information to allow formulation of a standard. Such information regarding sulfates is not yet available. Therefore no standards for sulfates have been proposed at this time and, at least for this pollutant, the no-action alternative has implicitly been rejected.

Similar reasoning applies to the alternative of recommending adoption of the national ambient air quality standards. In some cases, the Department recommended adoption of standards identical to existing national standards. In other cases, the Department's evaluation indicated the advisability of standards somewhat more stringent than national standards. In a few instances the Department proposed standards for pollutants which have no national standards.

Recommending adoption of the national ambient standards in their entirety without an independent evaluation by the Department would not fulfill the responsibility imposed upon the Department by the Montana Clean Air Act. This is especially true since there is an important element of judgement inherent in establishing standards which will protect human health.

In actuality, the individual national ambient standards were considered as alternatives in the Department's evaluation of possible standards. As noted above, specific national standards were in some cases selected as the proper alternative. In such cases, however, the recommended state standard coincided with the federal standard purely because the state policy as applied to the relevant scientific information independently indicated the same number set forth in the federal standard. There was no effort to justify the federal standard as such.

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V. ANTICIPATED IMPACTS OF THE DEPARTMENT'S PROPOSAL

INTRODUCTION

The impacts of the proposed ambient air quality standards would occur in two broad categories: (1) a reduction in the effects of air pollution upon humans and the natural environment, and (2) economic and environmental costs resulting from efforts to achieve the air quality standards.

There are two fundamental constraints upon the Department's ability to predict the exact impacts of its proposed ambient rule. The first is the important role played by the existing regulatory background. Particularly with respect to new sources, current pollution control programs may largely determine the abatement requirements to be applied to pollution sources.

Secondly, it is difficult to quantify the impacts of the proposed standards either as costs (additional control of emissions) or benefits (reduced effects on humans, plants, animals and the environment). For this reason, the discussion on anticipated impacts is largely cast in qualitative rather than quantitative terms.

IMPACTS WITHIN EXISTING REGULATORY BACKGROUND

Any discussion of the impacts of the proposed standards must take into account the existing regulatory background within which the proposed ambient rules must operate. The impacts of the proposed rulescan be estimated only after reference to the principal elements of existing regulations:

- Existing Ambient Air Quality Standards
- Montana air quality regulations

- New Source Performance Standard (NSPS)
- Nonattainment provisions applying to areas in violation of federal air quality standards
- Prevention of Significant Deterioration (PSD)

Each of these elements merits some discussion.

Existing Ambient Air Quality Standards

There are two sets of ambient air quality regulations which already apply to pollution sources in Montana. These are the National Ambient Air Quality Standards (NAAQS) and the Montana rule on ambient air quality standards found in the Administrative Rules of Montana.

National Ambient Air Quality Standards (NAAQS). The National Ambient Air Quality standards were established by Congress in 1970. These standards apply across the nation. Currently there are standards for six pollutants with others to be set for different pollutants in the near future. There are "primary" standards designed to protect public health and "secondary" standards designed to protect public welfare.

Each of the states has been required to submit to the EPA a State Implementation Plan (SIP) to achieve and maintain the national ambient standards and to implement other federal air quality requirements. The Montana air quality regulations governing allowable emissions constitute the major component of the SIP. Since 1970, EPA has obliged the states to revise their state plans to reflect changing federal requirements, particularly those contained in the 1977 Federal Clean Air Act Amendments. The 1977 Amendments required in part that the state plans be revised to assure that the national primary ambient air quality standards (NAAQS) are achieved in every state by the new deadline of December 31, 1982. The Montana Board of Health submitted its latest revised plan to the EPA in April of 1979 and should soon have final approval for the plan.

Currently over one-half of the states have either formally adopted or use the national standards as their own state ambient air standards. Therefore, if adopted, the standards proposed by the Department would be among the more stringent state standards in effect.

The federal standards must be achieved nationally and therefore in Montana within a short time. Consequently, where the proposed state standards and the national standards are the same or nearly the same, there should be little or no impact on sources.* In such cases, achieving the national standard sources would also achieve the state standard. Table 1 indicates which proposed state standards are essentially the same as existing federal standards.

As Table 1 also reveals, some of the proposed Montana standards are somewhat more stringent than existing national standards. While these differences are numerically small, it does not necessarily follow that the impact of the proposed rule will also be small. Sometimes a slightly stricter standard can mean the difference between the onset of a health or welfare effect and the avoidance of those effects. In cases where the proposed standards are more stringent than the federal standards, some effects which may occur at concentrations allowed by the federal standard would be prevented by the proposed state standard. Some effects are possible at pollutant levels more dilute than the proposed standards.

By the same token, costs of controlling emissions are not always constant. At times the costs of controlling the last 20 percent of emissions can equal the costs of controlling the first 80 percent.

Therefore, only a slight tightening of an ambient standard can have a substantial cost impact, particularly for a facility that has reached the limit

*The Montana Clean Air Act contemplates a more comprehensive enforcement approach than that followed by the federal EPA.

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of its installed control capacities in attempting to attain the national standards. Certain sources may incur expense in moving from federal compliance to compliance with the proposed standards. However, most sources in the state are expected to comply with the proposed standards with their current pollution control programs.

Montana Ambient Air Quality Standards. The Montana Clean Air Act specifically requires the Board to establish ambient air quality standards for the state. The Montana rule currently governing ambient air quality is one of the Department's regulations found in the Administrative Rules of Montana.

Pollution sources in the state have been subject to this rule since its adoption in 1967. Some of the air quality requirements in the rule have not been achieved although many sources in the state have initiated emission control programs to meet them. As noted earlier, it currently is unclear whether these ambient standards were intended to be enforceable standards or merely guidelines.

It is difficult to estimate the impacts of the proposed standards in light of the existing ambient rule. As Table 1 indicates, some of the proposed standards are different than those in the existing ambient rule. In cases where the proposed standards are the same or similar to the standards in the current rule, the proposals may be expected to have less of an impact than if they were being newly introduced into the state. Since adoption of the rule in 1967, sources in the state have been on notice that the Board has specified maximum permissible concentrations for the state. It is only recently that questions concerning their precise enforcement status have arisen.

On the other hand, the adoption of a rule establishing the proposed ambient standards and eliminating any reference to goals and guidelines would remove the

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ambiguity surrounding the enforcement status of the existing rule. In that sense, the proposed rule would constitute a tightening of air quality regulations in the state, even though many of the proposed ambient requirements were adopted in 1967. For some existing facilities there may be increased compliance costs when the ambient limitations in the current rule are adopted as standards.

On the other hand, adoption of the proposed rule should result in a greater reduction in health and welfare effects than provided by either the national standard or the current state rule. It is obvious that proposed state standards more stringent than existing standards would provide more reduction in pollutant impacts than less stringent standards. However, increased protection would be provided even in the proposed standards that are the same as the federal standards or the current state rule, because of the more effective administrative and judicial enforcement features.

Montana Air Quality Regulations

The Montana air quality regulations forbid the operation of most significant air pollution sources in the state without an air quality permit. Permits for new or newly altered sources are granted only in cases where the source will install best available control technology (BACT). Therefore, for every new or altered source requiring a permit, the Department determines the maximum degree of pollution control which is achievable, taking into account energy demands, environmental and economic costs.

The regulations also include several emission standards for specific pollutants such as sulfur oxides, particulates, and fluorides. These regulations apply to both new and existing sources. In some cases, a particular emission standard may already require controls sufficient to allow compliance with the proposed ambient standards. In such cases, the proposed standards would not be likely to have a significant impact.

In other cases, emission standards may not be stringent enough to provide compliance with the proposed standards. In these cases, the proposed standards could have an impact on an existing source by expanding the source's responsibility to include achieving and maintaining necessary ambient air quality in the area.

Emission standards should correspond at least generally to ambient air quality standards. The Department will ensure this relationship through a gradual review of the state's emission standards for comparison with the ambient standards.

New Source Performance Standards (NSPS)

One aspect of regulation affecting industrial development is the new source performance standards program now incorporated into the Montana Air Quality Regulations as Section 16-2.14(1)-S14082 (Standards of Performance for New Stationary Sources). The regulation imposes minimum emission controls upon 28 categories of new or modified industrial sources.

The performance standards require new plants to use the best system of emission reduction which the federal Environmental Protection Agency has determined has been adequately demonstrated. Performance standards are scheduled to be issued in the next few years for most significant industrial categories.

Since the new source performance standards are applied nationwide, a given type of source would be required to attain the specified level of control no matter where it was built. Such a program would largely offset the economic advantages of being located in a state with ambient air quality standards less stringent than in other states.

In some cases it is likely that the proposed ambient standards could require more stringent controls than necessitated by new source performance standards.

However, in many cases current Montana law other than air quality requirements could require new sources to install controls beyond those required by new source performance standards. For example, the existing emission standards and the permit requirement for best available control technology may in some cases already require a level of emission control beyond the minimum design control set out in the new source performance standards. In such cases, the proposed ambient standards are not likely to impose further controls. Actual control requirements and the application of specific regulations which require them will be determined on a case-by-case basis.

Nonattainment

Another provision of the federal Clean Air Act Amendments of 1977 dealt with areas not in compliance with the national ambient air quality standards.

By the original deadline for achievement of the national ambient air standards (July 1, 1975) more than one-half of the nation's air control regions were still experiencing monitored violations. EPA then required the states to identify all areas which had not yet attained either the federal primary or secondary standards. The areas currently designated nonattainment in Montana are:

Table 5 Nonattainment Areas in Montana

	Carbon Monoxide (CO)	Total Suspended Particulate (TSP)	Sulfur Dioxide (SO_2)
Anaconda area			X
Billings Area	X	X	
Butte Area		X	
Columbia Falls		X	
Colstrip Area		X	
E. Helena Area		X	X
Great Falls Area		X	
Laurel Area			X
Missoula	X	X	

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Subsequently, the EPA required the states to revise their state implementation plans to achieve reasonable further progress each year in such areas and to allow new growth in such areas only if stringent conditions were met. Therefore, existing sources in nonattainment areas must reduce their emissions to achieve reasonable further progress and, by the end of 1982, actual compliance with national standards. In addition, new sources proposed for location in nonattainment areas must attain a very high degree of control, known as "the lowest achievable emission rate" and must offset their projected emissions by obtaining emission reductions from sources already in the area (the so-called emissions offset). Those reductions must exceed the amount of emissions to be produced by the new source. Montana regulations currently impose such conditions.

The impact of the proposed ambient standards in nonattainment areas is subject to a number of variables. Generally speaking, emissions in such areas already are subject to further reduction. Therefore, to the extent that these reductions are prompted by nonattainment requirements, the proposed ambient standards will have little or no effect. In a few cases, controls beyond those being undertaken for compliance with a national standard may be necessary for compliance with a proposed Montana ambient standard. The proposed ambient standard thus may cause some impacts that otherwise would not occur.

<u>Prevention of Significant Deterioration (PSD)</u>

While the objective of the nonattainment provisions is to attain the national ambient standards, the fundamental purpose of the PSD requirements is to prevent the degradation of air already cleaner than required by the national standards.

The PSD regulations have been incorporated as part of the recently revised Montana implementation plan. They establish a system whereby areas of the state with air quality better than national ambient standards remain at such relatively clean levels, unless state or local decisions change their status.

Three land classifications are defined: In Class I areas, only minimal pollution increments will be allowed over baseline levels; in Class II areas somewhat higher increments, consistent with moderate growth and development will be permitted; in Class III areas pollution levels may increase up to current national ambient standards. Initially, the entire state was designated Class II except for special areas such as wilderness and national parks, which Congress designated mandatory Class I. Also, the Northern Cheyenne Indian Reservation in eastern Montana has been redesignated as a Class I PSD area. Except for mandatory Class I areas, there are established procedures for redesignation of an area from one class to another.

The current regulations apply to twenty-eight (28) categories of "major" new or modified sources. A source is "major" if it has the potential to emit (after the application of control equipment) 100 tons per year of any pollutant regulated under the federal Clean Air Act.* New or modified sources not within the twenty-eight (28) categories are covered if they have the potential to emit (after the application of control equipment) two hundred-fifty (250) tons per year of any such pollutant.*

The PSD regulations currently apply to only two pollutants, sulfur dioxide and particulate matter. At present, the Environmental Protection Agency is developing PSD regulations for all pollutants for which there are national ambient air quality standards.

The basic principle of the PSD regulations is simple. A major new source or major modification may not be constructed unless the owner first obtains a

*Proposed modification to Federal PSD regulations in response to recent U.S. Court of Appeals decision in Alabama Power Co. vs. Costle.

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permit requiring the source to apply best available control technology (BACT) and to meet other requirements. One of these requirements is that the new source will not exceed the increments allowed over the pollution baseline level. The allowable increases over the baseline are as follows:

MONTANA RULE ON PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

Allowed Increase Above Baseline Levels

	Fed. Std.	Proposed Mont. Standard	Class I Allowable Increment	Class II Allowable Increment	Class III Allowable Increment
Particulate					
24-hour (ug/m^3)	260	200	10	37	75
Annual	75	75	5	19	37
Sulfur Dioxide					
1-hr (ppm)	--	0.50	--	--	--
3-hr (ppm)	0.50	--	0.01	0.20	0.27
24-hr (ppm)	0.14	0.10	0.002	0.035	0.07
Annual (ppm)	0.03	0.02	0.0008	0.0008	0.01[illegible]

The allowable increments are defined in terms of increases in pollution levels over the "baseline concentration." The baseline concentration reflects pollution levels existing in an area at the time the first application for a PSD permit is filed in that area by a major source.*

For large areas of the state, the PSD rule in effect establishes ambient sulfur dioxide and particulate standards more stringent than those proposed by the Department. For example, in a Class II area with sulfur dioxide concentrations near zero, the ambient standard under the PSD rule would be near 0.035 ppm 24-hour average, rather than the Department's proposed 0.10 24-hour average. Therefore, with the PSD rule in its current form, the Department's proposed standards for sulfur dioxide and particulate matter would have a negligible impact in large areas of the state. For example, the PSD rule rather than

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*Proposed modification to Federal PSD regulations in response to recent U. S. Court of Appeals decision in Alabama Power Co. vs. Costle.

the proposed standards would largely determine the levels of sulfur dioxide and particulate that would be allowed in the ambient air surrounding future coal development facilities.

Nevertheless, the PSD rule could be weakened in the future to the extent that the Montana ambient standards might be required to ensure the maintenance of acceptable air quality in the area now controlled by the PSD rule. For the moment, the proposed standards ensure acceptable air quality for the entire state.

OTHER IMPACTS

Economic and Environmental Costs and Benefits of the Proposed Standards

Introduction The Department took two measures in order to assess as completely as possible the economic and environmental impacts of its proposals. First, it gathered and reviewed all the information pertinent to possible costs and benefits of its proposed ambient rule. This information included emission data, ambient air quality data, reports on current control programs, and the like. Secondly, the Department awarded a research grant to faculty at the University of Montana (Otis, et al.) to perform an economic analysis based largely upon the information provided by the Department.

The study by Otis et al., "Some Economic Aspects of Air Pollution in Montana," is the principal reference used by the Department in making its assessments. The Department combined its own findings with the conclusions reached in Otis, et al. to identify the major areas of concern and to estimate the major costs and benefits of its proposal.

Summary The benefits of the proposed standards are the reductions of air pollution effects upon human health and welfare, while their costs are the

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expenditures necessary to control emissions to comply with them.

The number of unknowns and variables relating to costs and benefits limited the depth of the Department's analysis. Sufficient information to even make estimates was available for only two pollutants, sulfur dioxide and fluoride.

Overall, the Department estimates that the benefits of achieving the proposed sulfur dioxide standards are roughly equal to the benefits to be gained. The Department also concludes that the state's two major fluoride sources would not need further controls to meet the proposed fluoride standards.

<u>Sulfur Dioxide</u> The Otis, <u>et al</u>. study estimated the costs and benefits likely to result from one of the proposed sulfur dioxide standards. The study concluded that the control benefits of moving from the federal 0.03 annual standard to the state's proposed 0.02 parts per million standard were of approximately the same magnitude as the expected costs.

<u>Benefits</u>. The estimated benefits were based upon anticipated reductions in sulfur dioxide effects on human health (sickness and death), vegetation, materials, and visibility.

The study calculated the economic value of reducing the risk of sickness and death for three Montana cities. If sulfur dioxide emissions were reduced to achieve the federal standard (0.03 ppm), the estimated economic value of reduced risk of health effects on residents of Billings, Anaconda and Helena would range from $1 million to $4 million per year. If sulfur dioxide emissions were reduced from their present levels to achieve the proposed Montana standard (0.02 ppm), the reduction in risk of sickness and death would have an estimated economic value ranging from $1 million to $7 million.

Sulfur dioxide can damage crops (such as alfalfa and wheat), timber, and ornamental plants (such as private and public gardens, and roadside trees).

Otis et al. estimated economic losses to these types of vegetation for four Montana counties, Silver Bow, Deer Lodge, Yellowstone and Lewis and Clark. Estimated reductions in the economic damage to crops, timber, and ornamentals were $1 million per year for meeting the federal standard and approximately $1.2 million per year for achieving the state standard.

Damage to materials, such as paint and metals, was estimated to be reduced by approximately $100,000 per year if either state or federal standards were met. Annual average benefits of improving visibility (from reductions in particulate derived from sulfur dioxide) ranged from $100,000 to $1 million for achieving the federal standard and from $200,000 to $2 million for achieving the state standard. The estimated benefits of meeting the state standard include the estimated benefits of meeting the federal standard. Therefore, the total benefits of achieving the federal standard range from $2 million to $6 million per year. The benefits of moving current ambient levels into compliance with the proposed state annual standard range from $3 million to $10 million per year.

Costs The Otis et al. study also estimated the costs associated with meeting the federal and state annual standards. Costs were approximated for the seven largest sources of sulfur dioxide in the state. The analyses relied heavily on control cost estimates provided by the industrial sources.

The Anaconda Copper smelter is the state's largest source of sulfur dioxide emissions. The Environmental Protection Agency has determined that 86 percent control of process input sulfur is necessary for the smelter to meet the federal 24-hour primary standard. The construction of a second large sulfuric acid plant at the smelter at a capital cost of $21 million should result in compliance with both the annual and 24-hour average federal standards and also the proposed Montana annual standard. Assuming relative stability in the price of sulfuric acid, the Company's cost for marketing sulfuric acid should not exceed $1 million per year.

In East Helena, the ASARCO lead smelter recently has undergone the installation of a new sulfuric acid plant at a cost of $40 million, and the company plans to raise the height of its blast furnace stack. These modifications are predicted to reduce sulfur dioxide emissions sufficiently to allow the plant to meet both the federal and state annual standards. If additional control were necessary to comply with these standards, the additional modification required for air pollution control could cost approximately $2 million.

In the Billings area, the CENEX petroleum refinery is the major source of sulfur dioxide emissions. The company already has agreed to construct two new stacks and initiate several modifications in its process equipment to achieve the federal annual standard for sulfur dioxide. These modifications will cost approximately $5 million. Meeting the proposed Montana annual standard could require an additional $1 million expenditure.

The Exxon petroleum refinery in Billings could require additional controls to meet the Montana standard. Costs for these added controls could reach approximately $9 million although substantially less expensive control measures may be available. The controls needed by Montana Power Company's J. E. Corette 180 MW power plant to meet the Montana standard could costs between $7 million and $11 million, depending on the engineering difficulty. It appears that both the Corette power plant and the Exxon refinery could comply with the federal standard with their present controls.

Other sources of sulfur dioxide in Billings are the Conoco petroleum refinery and the Montana Sulfur and Chemical Company. It appears likely that the Conoco refinery would not require any further controls to meet either the federal or the state standards. Montana Sulfur already has agreed to spend approximately $700,000 to raise its exhaust stack, which should allow the plant to meet both the federal and the state standard.

In overall terms, the costs to all sources of achieving the federal standard range from $4.2 million to $8.5 million per year. The costs of achieving the Montana standard range from $5.6 million to $14.4 million per year.

Conclusion According to Otis, et al., the best measure of the net economic efficiency of achieving the state standard is the difference in benefits and costs of moving from the federal to the state standard. The study estimates that the annual benefits of moving from the federal to the state standard would be between $900,000 and $3.8 million. The annual costs of meeting the state standard would be between $1.4 million and $5.9 million. Since the increases in benefits and costs are of comparable magnitude, the Department's recommendation of 0.02 ppm is the standard most likely to provide the best balance between social costs and social benefits.

It is unclear whether the Otis, et al. estimate of the relationship between costs and benefits of the annual standard also would hold true for the proposed 24-hour and 1-hour standards. It appears that any increases in costs necessary for sources to comply with either the 24-hour or 1-hour standard would be offset by health and welfare benefits of comparable value. However, substantially more information would be needed before such estimates could be stated conclusively.

Fluoride

The Anaconda Aluminum Reduction Plant. Located at Columbia Falls, the Anaconda Aluminum Company's aluminum reduction plant is the largest source of fluoride emissions in the state. The Otis et al. study

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reports that from 1968 to 1977 the plant's fluoride emissions caused an estimated loss of 27 million board feet of timber with an approximate economic [illegible]s of $1,640,000. Furthermore, the study reports that approximately 77,000 acre of Glacier National Park have been subjected to elevated levels of fluoride.

Since 1974 the Company has operated under a variance from the state's emission standards for fluorides. During this time it implemented controls for its fluoride emissions. The Company presently is completing a major chang-over of its production process at a cost of approximately $30 million. The new control process is designed to recover approximately 8,000 tons of aluminu fluoride annually producing an annual savings of $4.2 million to the Company.

The current control program is expected to reduce fluoride emissions from the plant from 2500 pounds per day to approximately 850 pounds per day. A further reduction to 400 pounds per day could be achieved but the additional capital cost of such a system might exceed $25 million with no significant resource recovery expected. It is unlikely that the environmental benefits that would result from these additional controls could justify their costs.

Otis et al. projects that the current control program would end violatio of the existing 24-hour ambient rule for fluoride. A Department review of emissions data and related ambient air quality readings in the vicinity of the plant indicates that the current control program at the facility would allow compliance with the proposed 24-hour ambient standard for fluorides. Also, o the basis of its emissions review, the Department expects that the control program would achieve compliance with the proposed 30-day standard and the proposed forage standard. Therefore the fluoride standards proposed by the Department are not expected to impose costs beyond those already committed for the current control program.

VI. CONCLUSIONS

This chapter contains a distillation of the Department's review of the scientific data, along with the rationale that went into determining the appropriate standards for each pollutant.

SULFUR DIOXIDE

The Department reviewed the literature on the effects of sulfur dioxide on the public health and welfare. The principal features of that literature were described in the draft Environmental Impact Statement at pp. 49-112.

General Findings

Human Health

Sulfur dioxide and its oxidation products have been associated with adverse human health effects and adverse effects on vegetation. Sulfur oxides may irritate the throat and lungs and exacerbate existing respiratory disease. The growth and yield of timber, wheat, oats and other agricultural crops important to Montana is reduced by exposure to sulfur oxides.

Studies of the effects of sulfur dioxide on people have been of two distinctly different types. One group of studies exposed subjects to sulfur dioxide in the laboratory for relatively short periods of time usually a few minutes to a few hours. Another group of studies attempted to analyse the results of exposure under natural conditions by comparing the effects on individuals from several communities with differing pollution levels or by following the reactions of individuals within one community over a period of time. These community studies most often are based on measurements of the twenty-four-hour average or annual average concentrations of sulfur dioxide. A definite response to sulfur dioxide exposures has been observed in healthy young subjects after short-term exposures to concentrations of 0.75 to 3.0 ppm. Sensitive measures detected changes of lung function following exposure to 3 ppm of sulfur dioxide for less than 5 minutes (Kreisman et al. 1976), to 1 ppm for 15 minutes (Snell and Luchsinger 1969), and to 0.75 ppm for 90 minutes when subjects were exercising (Bates and Hauzucha 1973). A few subjects among a group of fifteen reported discomfort and demonstrated a reduced mucous flow rate during an exposure to 1 ppm of sulfur dioxide over 1 to 6 hours (Andersen et al. 1974). Mucous flow is believed to be an important part of the body's defense against infection.

Exposures to mixtures of sulfur dioxide, particulates, and other pollutants found in the ambient air have been associated with aggravation of illness and an increase in death rates. In a review of several studies, Lawther (1963) concluded that an increase in the number of illness-related deaths had been observed when the daily average sulfur dioxide concentration was above 0.25 ppm and suspended particulate was in excess of 750 ug/m^3. In a separate series of studies, Lawther et al. (1970) analysed health records of elderly bronchitis patients. From these data he concluded that the minimum daily pollution level that would result in aggravation of the patients' condition was 0.19 ppm of sulfur dioxide and about 250 ug/m^3 BS* of particulate. However, in a follow up study a few years later he again observed health effects associated with sulfur oxides and particulates, even though the pollution levels were much lower. Similarly, a study of asthma patients observed a relationship between the frequency of asthma attacks and concentrations of sulfur oxides and particulates, without any distinct threshold (Cohen et al., 1972).

Studies of the long-term health effects of air pollution observed an increased death rate and increased respiratory diseases in more polluted areas. Douglas and Waller (1966) noted an increased incidence of bronchitis and colds in the chest among school children in areas with sulfur dioxide concentrations greater than 0.05 ppm annual average and suspended particulate levels greater than 132 ug/m^3 BS. An increase in the death rate was reported by Wicken and

* BS refers to particulate measurement by the British Smoke method; see pp 53-54 of the draft EIS.

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Buck (1964) when annual average sulfur dioxide levels were at 0.04 ppm and suspended particulate at 160 ug/m^3 BS.

Kerrebijn et al. (1975) found an increased incidence of cough and chronic lung disease among children in an area with an annual average concentration of 0.06 ppm of sulfur dioxide and an annual average particulate matter concentration of less than 40 ug/m^3 BS.

<u>Vegetation</u>

Vegetation damage from sulfur dioxide has been recorded in Montana in the past (Scheffer and Hedgecock, 1955). The levels causing this damage are not accurately known. It may be assumed, however, that the concentrations of sulfur dioxide which caused past vegetation damage were higher than are presently occurring in the state.

Scientific studies have determined a range of adverse effects that occur in vegetation from sulfur dioxide either alone or in combination with other pollutants. Table III.A-III on pp. 79-83 of the draft EIS gives results from a number of these studies. The information depicted in Table III.A-III indicates several important facts: 1) that sulfur dioxide in combination with other pollutants can cause synergistic type vegetation damage 2) that environmental conditions of moisture and nutrition can alter plant response to sulfur dioxide 3) that sulfur dioxide levels of 0.02 to 0.5 ppm for one hour can cause measureabl[illegible] alterations in normal plant functions (it is not clear if such alterations are irreversibly detrimental) 4) that sulfur dioxide average concentrations between 0.5 and 0.1 ppm for four to 24 hours when combined with other pollutants cause an increase in leaf destruction 5) that annual sulfur dioxide levels below 0.0[illegible] ppm are associated with the elimination of certain lower plant forms and possible growth loss in non native forest species.

Sulfur dioxide enters into a number of chemical reactions in the atmosphere. The result of several of these reactions is the production of acids which may fall to earth as acidic rain, snow, or other forms of precipitation. Acid precipitation has been noted by scientists throughout the world to be increasing with increased utilization of fossil fuels for electrical power generation and industrial development (Shriner et al. 1977).

Acid precipitation has been shown to cause increased acidity in many lakes and in forest soils with concomittant losses in fish populations and forest yields (Dochinger and Selinga, 1976). The extent of potential and actual acid precipitation in Montana is not known.

Other Welfare Effects

Sulfur dioxide can cause significant damage to materials especally when sufficent humidity is present. Materials particularly suseptible to sulfur dioxide and its derivatives are paint, building stone, and both galvanized and untreated iron and steel. (Salmon, 1970).

Measurement of Sulfur Dioxide

Sulfur dioxide is routinely measured by the pararnosaniline method described in the draft EIS. This measuring technique has been prescribed by the EPA for the measurement of sulfur dioxide to determine compliance with the federal standards. It is accurate and reliable within the expected range of ambient concentrations.

Automated methods for the measurement of sulfur dioxide have been developed. The Air Quality Bureau is presently using certain of these techniques approved by the EPA as equivalent to the pararosaniline method, such as the Philips coulometric and the Thermal Electron pulsed fluoresence instruments. These methods are accurate and reliable within the expected range of ambinet concentrations.

Selection of Ambient Air Quality Standard

Susceptible Populations

Several studies observed that about 10 percent of their subjects were especially sensitive to sulfur dioxide. In a study of the occurrance and development of chronic bronchitis, Fletcher et al. (1976) found that 13 percent of their sample was especially susceptible to the development of chronic obstructive lung disease.

It is not known if the persons who were particularly susceptible to lung disease represented the same portion of the population as the 10 percent who have been found to be sensitive to sulfur dioxide. Quite apart from these individuals, children and persons with existing respiratory conditions also are considered to be particularly vulnerable to sulfur dioxide. The National Center for Health Statistics (1973) reports that in the western U.S. approximately three percent of the population experience continuing asthma, one percent had emphysema, and three percent were chronic bronchitis patients. Among those over 65 years, approximately four percent had asthma, three percent emphysema and four percent chronic bronchitis. Persons with chronic bronchitis who are over 55 years have been found to be more vulnerable to sulfur oxides pollution than younger chronic bronchitis patients (Carnow et al. 1969).

Level of Apparent Health Response

Based on the studies cited above, the Department identified 0.75 to 1.0 ppm of sulfur dioxide for one hour as likely to be associated with the response of decreased lung function measurements in sensitive but otherwise healthy population; 0.19 to 0.25 ppm of sulfur dioxide for twenty-four hours as likely to be associated with decreased physical capacity for exercise, and with death among persons with advanced heart and lung disease; and 0.04 ppm to 0.05 ppm of sulfur dioxide annual average with an increased incidence of respiratory disease among general populations, especially children.

Uncertainty and Risk

The primary effects on human health associated with exposure to sulfur dioxide (a decrease in lung function, an increased incidence of respiratory disease among children, a decline in the health of individuals with chronic obstructive lung conditions to and including death, and an increase in the number of asthma attacks among persons with asthma) present a risk to the health of a vulnerable population group in the community and may result in permanent damage.

The changes in lung function observed in brief, sporadic exposures to sulfur dioxide concentrations of 0.75 to 3.0 ppm appear to be entirely reversible in otherwise healthy individuals with exposure to clean air. In laboratory experiments repeated or continued exposure to such concentrations often results in an acclimatization such that the effects tend to diminish (Frank et al. 1962). This is thought to be due to an adaptation of the nervous reflex responsible for the effect.

Lung function gradually declines with age in all people. An individual who smokes or who has an obstructive lung condition will lose lung function at a faster than normal rate. Some diseases can result in a substantial decline in lung function, even among young people. There is no specific loss that marks the onset of chronic obstructive lung disease for each individual, but rather a gradual increase in poor health and limitation of activities due to shortness of breath is observed. Thus an additional loss in lung function from air pollution will simply increase the degree of disability at any age and lung capacity. Persons with already impaired lung function, such as an individual with chronic obstructive lung disease, could find their meager reserves of lung capacity severely eroded by even a small additional loss of lung function Under such circumstances a person might complain that they are not able to get enough breath for almost any exertion, even such a simple act as feeding themselves. In many instances this also will place a strain on th heart.

An increased incidence of respiratory disease among children can ha long-term as well as immediate adverse effects. Burrows et al. (1977) and others have observed that children with a history of respiratory disease are much more likely to develop chronic obstructive lung conditions when they are grown. As adults, these individuals also were reported as having a lower average lung function than individuals without a history of childhood respirat disease.

An increased incidence of asthma symptons and asthma attacks increases the financial and health cost imposed by each such incident and increases the risk that an especially severe attack may be experienced. Such a severe attack can result in hospitalization and long-term or permanent health damage.

Substantial uncertaintly exists in the identification of a minimum conc-tration below which such human health effects do not occur. Laboratory studies of short-term exposures to moderate concentrations have relied almost entirely on healthy subjects, although some of these otherwise healthy subjects have proven to be sensitive to sulfur dioxide. Many of the studies of community health response have focused directly on the more sensitive segments of the population. This reduces the uncertainty in developing standards from these studies. However, several epidemiological studies of general populations have observed a relationship between reported health effects and sulfur dioxide and particulate pollution that increases from the lowest to the highest pollution levels without any apparent threshold. Some studies report a lower limit of exposure simply because their control group also is experiencing an exposure to sulfur dioxide. Other studies report an apparent threshold which may be due more to the size and composition of their sample than to any property of the pollutant.

Long-term studies of air pollution effects are difficult to interpret. Although a pollution level can be measured and associated with a group of individuals who are being observed, the effects may be partly due to exposures in past years that may have been higher either because the pollution has been reduced in the interim or the family has moved to a less polluted area. On the other hand, pollution levels may have been increasing as the economy and production have increased or the family may have moved to a more polluted area.

Synergistic Effects

Many epidemiological studies have been made in cities where both sulfur dioxide and particulate concentrations are high. It is not possible to say if the effects observed are greater from the sum of the effects from each pollutant separately. Although the effects are observed in situations with and without particulate matter present, it is not known if the effects are significantly increased by the presence of particulate matter.

Attempts to demonstrate the synergistic effect with laboratory animals have involved tests at high concentrations of sulfur dioxide and particulates (Asmundson et al., 1973). Amdur (1978) reported a synergistic response between sulfur dioxide and copper sulfate particles at moderate concentrations but has not observed synergism for other sulfate particulates. The mechanism of the synergistic effect in studies such as this is not known nor is it clear that a synergistic effect exists at low concentrations. In developing the standards, the Department's utilization of studies measuring both sulfur dioxide and particulate matter will assure that synergistic effects, if any, will be taken into account.

A few laboratory studies have observed synergistic effects between oxidants and sulfur dioxide, especially in the presence of low concentrations of particulate matter (Hazucha and Bates, 1975 and Bell et al., 1977). Other studies (Bedi et al., 1979) have not observed the synergism at the same concentrations

Since ozone levels of the magnitude utilized in these experiments have never been observed in Montana and even moderate concentrations occur only infrequently these synergistic effects were not taken into account developing the Department's recommendations. If they had been an element of consideration, the recommendations might have been revised toward a more stringent standard.

Recommended Standard - One Hour

The response observed from brief exposures to 0.75 to 1.0 ppm of sulfur dioxide is of minimal health significance in healthy populations. However, substantial uncertainty remains in identifying the concentration that will not adversely affect the health of individuals with currently impaired heart and lung function since experimental subjects typically have been healthy, young individuals. Therefore, to protect the health of vulnerable individuals and to protect the general public from five- to fifteen-minute exposures in the range of 0.75 to 1.0 ppm, the Department recommends an ambient air quality standard for sulfur dioxide of 0.5 ppm, averaged over one hour, not to be exceeded more than once a year.

The current Montana one-hour standard is 0.25 ppm, not to be exceeded more than once in any four consecutive days. The federal secondary standard is 0.5 ppm, averaged over three hours, not to be exceeded more than once a year. Although an exact equivalence cannot be stated, the present state standard might permit a one-hour exposure between 1 and 2 ppm, not to be exceeded more than once a year, at many locations in the state. Similarly, achievement of the federal standard can be estimated to permit a one-hour average exposure of between 0.6 and 0.8 ppm, not to be exceeded more than once a year, at most monitoring locations in the state. Although the one hour standard of 0.5 ppm could be expected to permit only one twenty-minute period to exceed 0.8 ppm during the year, a three-hour standard could be expected to permit between two and five twenty-minute periods to exceed 0.8 ppm during a one year period at most monitoring locations in the state.

Twenty-four Hour Standard

The health responses observed in community studies from twenty-four-hour exposures to 0.19 to 0.25 ppm of sulfur dioxide often were most apparent when contemporaneous particulate matter concentrations were greater than 250 ug/m^3 BS.* However, in several studies described here and in the draft EIS, health responses were observed at significantly lower sulfur dioxide and particulate matter concentrations with no apparent threshold. At the lower concentrations the responses become less dramatic and more difficult to identify with statistical precision but are nevertheless observed. There is not convincing evidence that the presence of particulate is necessary to observe the effect at low concentrations. Therefore the Department concedes a substantial degree of uncertainty in the identification of a concentration that will clearly protect the public health and safety, and recommends an ambient air quality standard of 0.10 ppm averaged over twenty-four hours, not to be exceeded more than once a year.

The current Montana twenty-four hour rule is 0.10 ppm, not to be exceeded more than one day in any three month period. This is expected to be functionally equivalent to the proposed standard, since violations of air quality standards often occur only during a single season at most monitoring locations. The current Federal regulations require the State to achieve a standard of not more than 0.14 ppm, not to be exceeded more than once a year.

An averaging time of twenty-four hours is consistent with the time periods reported in the community epidemiological studies cited above and is consistent with the averaging time of the federal standards. An exceedance level of once per year, which is essentially a prohibition on concentrations above that amount, has been selected to be consistent with the other air qualtiy standards being recommended by the Department.

*BS refers to particulate measurement by the British Smoke method; see pp. 53-54 of the draft EIS.

Annual Standard

Studies of the long term effects of sulfur dioxide exposure have associated the observed health response with annual average concentrations of 0.04 to 0.05 ppm. In many of these studies, particulate matter concentrations are high where sulfur dioxide levels are high, and low where sulfur dioxide levels are low. Thus in these studies, the relative importance of the two pollutants cannot be clearly separated. Nor is it known if there is a synergistic relationship between sulfur dioxide and particulate matter at low concentrations. A few studies have observed similar health responses at similar or slightly higher concentrations of sulfur dioxide where annual average concentrations of particulate matter were very low. Because of the uncertainty involved in identifying the long term concentrations of sulfur dioxide that will not adversely affect health, the Department recommends an annual average standard of 0.02 ppm.

The current Montana annual average rule is 0.02 ppm. The current federal primary standard is 0.03 ppm annual average.

Consideration of Welfare Effects

The Department's review and analysis of current scientific evidence indicates that the standards proposed to protect human health should largely protect the state's commercially important plants from the known or anticipated effects of sulfur dioxide. Some potential exists for some sensitive species to be affected at concentrations allowed by the proposed standards. It is anticipated the effects of sulfur dioxide on materials, property, and other welfare interests would be prevented by the proposed standards.

The current evidence pertaining to the welfare benefits from more stringent sulfur dioxide standards than that needed to protect human health is inconclusive and leaves the Department without a sufficient basis to ascertain the extent and significance of harm at concentrations below those proposed. Until further

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research clarifies these uncertainties, the Department has determined the proposed standards to adequatly protect welfare interests and therefore does not recommend standards beyond that needed to protect human health.

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Second Addendum to Air Quality Criteria for Particulate Matter and Sulfur Oxides (1982):

Assessment of Newly Available Health Effects Information

Review Draft (Do Not Cite or Quote)

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NOTICE

This document is a preliminary draft. It has not been formally released by EPA and should not at this stage be construed to represent Agency policy. It is being circulated for comment on its technical accuracy and policy implications.

NOTE: Chapters I and V only

CHAPTER 1. INTRODUCTION

The United States Clean Air Act and its 1977 Amendments mandate that the U.S. Environmental Protection Agency (U.S. EPA) periodically review criteria for National Ambient Air Quality Standards (NAAQS) and revise such standards as appropriate. The most recent periodic review of the scientific bases underlying the NAAQS for particulate matter (PM) and sulfur oxides (SO_x) culminated in the 1982 publication of the EPA document Air Quality Criteria for Particulate Matter and Sulfur Oxides (U.S. EPA, 1982a), an associated PM staff paper (U.S. EPA, 1982b) which examined the implications of the revised criteria for the review of the PM NAAQS, an addendum to the criteria document addressing further information on health effects (U.S. EPA, 1982c), and another staff paper relating the revised scientific criteria to the review of the SO_x NAAQS (U.S. EPA 1982d). Based on the criteria document, addendum and staff papers, revised 24-hr and annual-average standards for PM have been proposed (Federal Register, 1984a) and public comments on the proposed revisions have been received both in written form and orally at public hearings (Federal Register, 1984b). Consideration of possible revision of the sulfur oxides NAAQS is still under way.

Since preparation of the above criteria document, addendum, and staff papers (U.S. EPA, 1982a, b, c, d), numerous new scientific studies or analyses have become available that may have bearing on the development of criteria for PM or SO_x and thus may notably impact proposed revisions of those standards now under consideration by EPA. In December 1985 the Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board met to discuss the PM proposal and possible implications of the newly available information. CASAC recommended that a second addendum to the 1982 Criteria Document (U.S. EPA, 1982a) be prepared to evaluate new studies and their implications for derivation of health-related criteria for the PM NAAQS. In the process of responding to CASAC's recommendations, the Agency also determined that it would be useful to examine studies that have emerged since 1982 on the health effects of sulfur oxides.

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Accordingly, the present addendum (1) summarizes key findings from the 1982 EPA criteria document and first addendum (U.S. EPA, 1982a,c) as they pertain to derivation of health-related criteria, and (2) provides an updated assessment of newly available information of potential importance for derivation of health criteria for both the PM and SO_x standards, with major emphasis on evaluation of human health studies published since 1981. Certain background information of crucial importance for understanding the assessed health effects findings is also summarized. This includes information on physical and chemical properties of PM, sulfur oxides, and associated aerosols (including acid aerosols) and ambient monitoring techniques. However, new studies on associations between acid aerosols and health effects are being evaluated in a separate issue paper.

1.1 PHYSICAL AND CHEMICAL PROPERTIES OF AIRBORNE PARTICULATE MATTER AND AMBIENT AIR MEASUREMENT METHODS

As noted in the 1982 EPA criteria document (U.S. EPA, 1982a), airborne particles exist in many sizes and compositions that vary widely with changing source contributions and meteorological conditions. However, airborne particle mass tends to cluster in two principal size groups: coarse particles, generally larger than 2 to 3 micrometers (μm) in diameter; and fine particles, generally smaller than 2 to 3 μm in diameter. The dividing line between the coarse and the fine sizes is frequently given as 2.5 μm, but the distinction according to chemical composition is neither sharp nor fixed; it can depend on the contributing sources, on meteorology, and on the age of the aerosol.

Fine particle volume (or mass) distributions often exhibit two modes. Particles in the nuclei mode (which includes particles from 0.005 to 0.05 μm in diameter) form near sources by condensation of vapors produced by high temperature processes such as fossil-fuel combustion. Accumulation-mode particles (i.e., those 0.05-2.0 μm in diameter) form principally by coagulation or growth through vapor condensation of short-lived particles in the nuclei mode. Typically, 80 percent or more of the atmospheric sulfate mass occurs in the accumulation-mode. Particles in the accumulation mode normally do not grow into the coarse mode. Coarse particles include re-entrained surface dust, salt spray, and particles formed by mechanical processes such as crushing and grinding.

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Primary particles are directly discharged from manmade or natural sources. Secondary particles form by atmospheric chemical and physical reactions, and most of the reactants involved are emitted as gaseous pollutants. In the air, particle growth and chemical transformation occur through gas-particle and particle-particle interactions. Gas-particle interactions include condensation of low-vapor-pressure molecules, such as sulfuric acid (H_2SO_4) and organic compounds, principally on fine particles. The only particle-particle interaction important in atmospheric processes is coagulation among fine particles.

As shown in Figure 1, fine atmospheric particles mainly include sulfates, carbonaceous material, ammonium, lead, and nitrate. Coarse particles consist mainly of oxides of silicon, aluminum, calcium, and iron, as well as calcium carbonate, sea salt, and material such as tire particles and vegetation-related particles (e.g., pollen, spores). The distributions of fine and coarse particles overlap; some chemical species found mainly in one mode may also be found in the other.

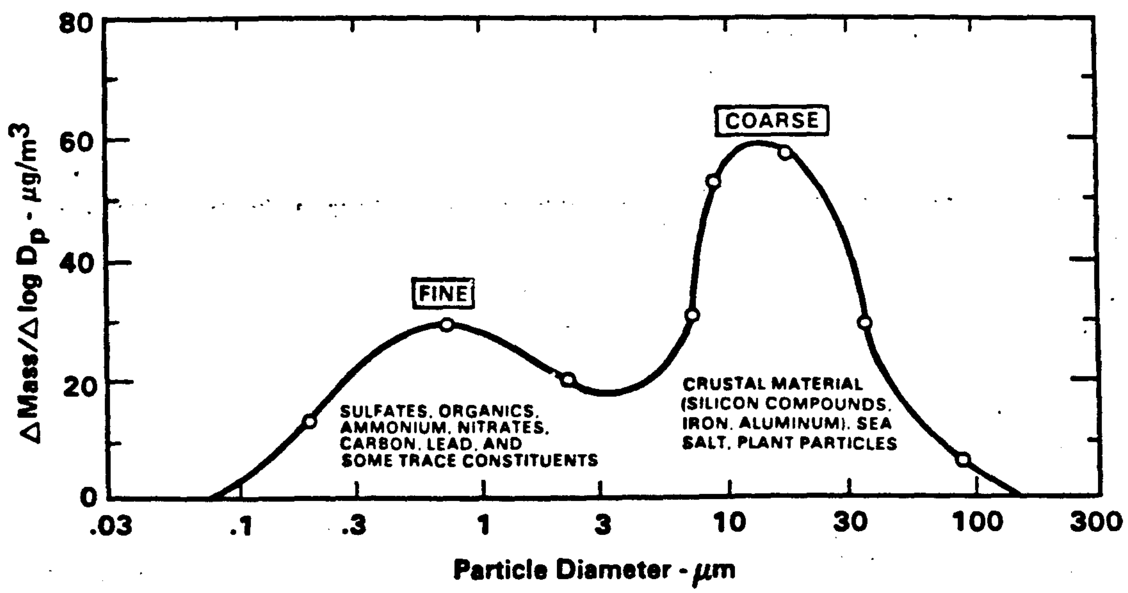

Figure 1. Representative example of typical bimodal mass distribution (measured by impactors) and chemical composition in an urban aerosol. Although some overlap exists, note substantial differences in chemical composition of fine versus coarse modes. Chemical species of each mode are listed in approximate order of relative mass contribution. Note that the ordinate is linear and not logarithmic.

Source: Modified from Whitby (1975) and NAS (1977).

The carbonaceous component of fine particles contains both elemental carbon (graphite and soot) and nonvolatile organic carbon (hydrocarbons in combustion exhaust and secondary organics formed by photochemistry). In many urban and nonurban areas, these species are the most abundant fine particles, after sulfates. Secondary organic particles form by oxidation of primary organics by a cycle that involves ozone and nitrogen oxides. Atmospheric reactions of nitrogen oxides yield nitric acid vapor (HNO_3) that may accumulate as nitrate particles in the fine or coarse modes. Most atmospheric sulfates and nitrates are water-soluble and tend to absorb moisture. Hygroscopic growth of sulfate-containing particles markedly affects their size, reactivity, and other physical properties which influence their biological and physical effects.

The relative proportions of particles of different chemical composition and size ranges can vary greatly in ambient air, depending upon emission sources from which they originate and interactions with meteorological conditions, e.g., relative humidity (RH) and temperature. Particles from combustion of fossil fuels or high-temperature processes, e.g., metal smelting, tend to fall in the fine (<2.5 μm) or small coarse mode (<10 μm MMD) range; those from crushing or grinding processes, e.g., mining operations, tend to be mainly in the coarse mode (>2.5 μm), with a substantial fraction in excess of 10 μm.

Another important distinction concerning airborne particles is the broad characterization that can result from different methods commonly used for routine monitoring purposes. The most commonly used methods for collection and measurement of airborne particles were described in U.S. EPA (1982a). As noted there, differences in measurements obtained from various instruments and methods used to measure PM levels have important implications for derivation of quantitative dose-response relationships from epidemiologic studies and for establishing air quality criteria and standards. It is generally not practicable to discriminate on the basis of either particle size or chemical composition when assessing particulate matter data from routine monitoring networks. Characteristics of the collected samples are dependent on the types of sources in the vicinity, weather conditions and sampling procedures. Difficulties that result and limitations of measurements were also discussed in detail in the 1982 EPA criteria document (U.S. EPA, 1982a).

When considering measurements of airborne particles it is essential to specify the method used and to recognize that results obtained with one method and under a given set of conditions are not necessarily applicable to other situations. For example, attempts have been made to relate findings based on smoke measurements (that relate mainly to dark-colored characteristics of particles from incomplete combustion of coal or other hydrocarbon fuels) to situations involving total suspended particulate matter (TSP) or size-specific fractions thereof (measured directly in terms of weight). Because the former (smoke) methods were used in many early epidemiological studies and the latter are now more often used for monitoring purposes in many countries, conversion from one type of measurement to the other would be desirable, but for reasons noted below, there can be no generally applicable conversion factor. Comparative evaluation of the two methods has been undertaken at numerous sites (Ball and Hume, 1977; Commins and Waller, 1967: Lee et al., 1972), but the results emphasize that they measure different qualities of the particulate matter and cannot be directly compared with one another (U.S. EPA, 1982a).

Sampling airborne particles is a complex task because of the wide spectrum of particle sizes and shapes. Separating particles by aerodynamic size provides a simplification by disregarding variations in particle shape and relying on particle settling velocity. The aerodynamic diameter of a particle is not a direct measurement of its size but is the equivalent diameter of a spherical particle of specific gravity which would settle at the same rate as the measured particles. Samplers can be designed to collect particles within sharply defined ranges of aerodynamic diameters or to simulate the deposition pattern of particles in the human respiratory system, which exhibits a more gradual transition from acceptance to exclusion of particles. High-volume (hi-vol) samplers, dichotomous samplers, cascade impactors, and cyclone samplers are the most common devices with specifically designed collection characteristics. These samplers rely on inertial impaction techniques for separating particles by aerodynamic size, filtration techniques for collecting the particles and gravimetric measurements for determining mass concentrations. Mass concentrations can also be estimated using methods that measure an integral property of particles such as optical reflectance, and empirical relationships between mass concentrations and the integral measurement can be used to predict mass concentration, if a valid physical model relating to the measurements exists and empirical data verify the model predictions.

The hi-vol sampler collects particles on a glass-fiber filter by drawing air through the filter at a flow rate of ~1.5 m^3/min, and is used to measure total suspended particulate matter (TSP). The hi-vol sampler has cutpoints of ≈25 μm at a wind speed of 24 kph and 45 μm at 2 kph. Although sampling effectiveness is wind-speed sensitive, no more than a 10 percent day-to-day variability occurs for the same ambient concentration for typical conditions. The hi-vol is one of the most reproducible particle samplers in use, with a typical coefficient of variation of 3 to 5. One major problem associated with the glass-fiber filter used on the hi-vol is formation of artifact mass caused by the presence of acid gases in the air (e.g., artifactual formation of sulfates from SO_2), which can add 6 to 7 $\mu g/m^3$ to a 24-h sample. The hi-vol has been the sampler most widely used in the U.S. for routine monitoring and has yielded TSP mass estimates used in many American epidemiological studies.

Hi-vol samplers with size-selective inlets (SSI) have recently been developed which collect and measure particles $\leq$10 μm or $\leq$15 μm. Except for the inlet, these samplers are identical in design and operation to the TSP hi-vol. Versions are now being used in epidemiologic health effects studies, and several models are being evaluated for possible routine monitoring use.

The dichotomous sampler is a low-volume gravimetric measurement device which collects fine ($\leq$2.5 μm) and coarse ($\geq$2.5 μm to $\leq$10 or 15 μm) ambient particle fractions. The sampler uses Teflon® filters which minimize artifact mass formation. The earlier inlets used with this sampler were very wind-speed dependent, but newer versions are much improved. Because of low sampling flow rate, the sampler collects submilligram quantities of particles and requires microbalance analyses, but is capable of reproducibility of $\pm$10 percent or better. The method, however, has only begun to be employed on any major scale to generate size-selective data on PM mass assessed in relation to health effects evaluated in epidemiological studies.

Cyclone inlets with cutpoints around 2 μm have long been used to separate the fine particle fraction, can be used with samplers designed to cover a range of sampling flow rates and are available in a variety of physical sizes. Applications of cyclone inlets are found in 10- and 15-μm cutpoint inlets for both dichotomous and hi-vol samplers. Samplers with cyclone inlets could be expected to have coefficients of variations similar to those of the dichotomous or SSI hi-vol samplers, and until recently have also found only limited use in epidemiological studies of PM health effects.

Cascade impactors have been used to obtain mass distribution by particle size. Because care must be exercised to prevent errors (e.g., those due to particle bounce between stages), these samplers are normally not used as routine monitors. A study by Miller and DeKoning (1974) comparing cascade impactors with hi-vol samplers showed inconsistencies in mass collections by the impactors.

Samplers that derive mass concentrations by analytical techniques other than direct weight have been used extensively. One of the earliest was the British smokeshade (BS) sampler, which measures the reflectance of particles collected on a filter and uses empirical relationships to estimate mass concentrations. These relationships are more sensitive to carbon concentrations than mass (Bailey and Clayton, 1980) and hence are very difficult to interpret as either total or size-selective PM mass present in the atmosphere. The BS method and its standard variations typically collect PM with an ≅4.5 μm D_{50} cutpoint under field conditions, with some particles ranging from 7 to 9 μm at times being collected (McFarland et al., 1982). Thus, even if larger particles are present in the atmosphere, the BS method collects mainly fine-mode and small coarse-mode particles. The BS method neither directly measures mass nor determines chemical composition of collected PM. Rather, it measures light absorption of particles indicated by reflectance from a stain formed by particles collected on filter paper. Reflectance of light from the stain depends both on density of the stain, or amount of PM collected, and optical propert of collected PM. Smoke particles composed of elemental carbon in incomplete fossil-fuel combustion products typically make the greatest contribution to darkness of the stain, especially in urban areas. Thus, the amount of elemental carbon, but not organic carbon, in the stain tends to be most highly correlated with BS reflectance readings. Other nonblack, noncarbon particles also have optical properties which can affect the reflectance readings, but usually with negligible contribution to optical absorption.

Because the relative proportions of atmospheric carbon and noncarbon PM can vary greatly from site to site or from one time to another at the same site, the same absolute BS reflectance reading can be associated with very different amounts (or mass) of collected particles or even with very differen amounts of carbon. Site-specific calibrations of reflectance readings agains actual mass measurements from collocated gravimetric monitoring devices are therefore mandatory in order to obtain credible estimates of atmospheric concentrations of particulate matter based on the BS method. A single calibration curve relating mass or atmospheric concentration (in μg/m^3) of particula

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matter to BS reflectance readings obtained at a given site may serve as a basis for crude estimates of the levels of PM (mainly particles <10 μm) at that site over time, so long as the chemical composition and relative proportions of elemental carbon and noncarbon PM do not change. However, the actual mass or smoke concentration at a given site may differ markedly from values calculated from a given reflectance reading on either of the two most widely used standard curves (the British and OECD standard smoke curves). Thus, much care must be taken in interpreting the meaning of any BS value reported in terms of μg/m^3, and such "nominal" expressions of airborne particle concentrations are not meaningful unless related to direct determinations of mass by gravimetric measurements carried out at the same geographical location and close in time to the BS readings.

The AISI light transmittance method is similar in approach to the BS technique, collects particles with a D_{50} cutpoint ≅5.0 μm aerodynamic diameter, uses an air intake similar to that of the BS method, and has been used for routine monitoring in some American cities. Particles are collected on a filter-paper tape periodically advanced to allow accumulation of another stain, opacity of the stain is determined by transmittance of light through the deposited material and tape, and results are expressed in terms of optical density or coefficient of haze (CoH) units per 1000 linear feet of air sampled (rather than mass units). Readings of COH units are more responsive to non-carbon particles than are BS measurements, but again, the AISI method does not directly measure mass or determine chemical composition of collected particles. Attempts to relate COH to μg/m^3 also require site-specific calibration of COH readings against mass measurements determined by a collocated gravimetric device, but the accuracy of such mass estimates are subject to question.

Since the hi-vol method collects particles much larger than those collected by BS or AISI methods, intercomparisons of PM measurements by the BS or AISI methods to equivalent TSP units, or vice versa, are very limited. For example, as shown by several studies, no consistent relationship exists between BS and TSP measurements taken at various sites or at the same site during various seasons. One exception is the relationship observed between BS and TSP during severe London air pollution episodes when low wind-speed conditions caused settling out of larger coarse-mode particles. Because fine-mode particl predominated, TSP and BS levels (in excess of ~500 μg/m^3) tended to converge, as expected if mainly fine-mode particles were present.

Many analytical techniques are available to determine chemical properties of particles collected on a suitable substrate. Most of the techniques, such as those for elemental sulfur, have been shown to be more precise than the analyses for gravimetric mass concentration. Methods are available that provide reliable analyses for sulfates, nitrates, organic fractions, and elemental composition (e.g., sulfur, lead, silicon), but not all analyses can be used for all particle samples because of factors such as incompatible substrates or inadequate sample size. Results can be misinterpreted when samples have not been appropriately segregated by particle size and when artifact mass is formed on the substrate rather than collected in particulate form, e.g., positive artifacts likely in nitrate and sulfate determinations (as noted below).

1.2 PHYSICAL/CHEMICAL PROPERTIES OF SULFUR OXIDES AND THEIR TRANSFORMATION PRODUCTS AND AMBIENT MEASUREMENT METHODS

The only sulfur oxide that occurs at significant concentrations in the atmosphere is sulfur dioxide, one of the four known gas-phase sulfur oxides (sulfur monoxide, sulfur dioxide, sulfur trioxide, and disulfur monoxide). As discussed in U.S. EPA (1982a), sulfur dioxide is a colorless gas detectable by taste at levels of 1000 to 3000 $\mu g/m^3$ (0.35-1.05 ppm). Above 10,000 $\mu g/m^3$ (3.5 ppm), it has a pungent irritating odor.

As also discussed in U.S. EPA (1982a), SO_2 is mainly removed from the atmosphere by gaseous, aqueous, and surface oxidation to form acidic sulfates. Gas-phase oxidation of SO_2 by the hydroxyl (OH) radical is well understood; not so well understood, however, is oxidation of SO_2 by hydroperoxyl (HO_2) and methyl peroxyl (CH_3O_2) radicals. The ready solubility of SO_2 in water is due mainly to formation of bisulfite (HSO_3^-) and sulfite (SO_3^{2-}) ions, which are easily oxidized to form acidic sulfates by reacting with catalytic metal ions and dissolved oxidants. Sulfur dioxide reacts on the surface of a variety of airborne solid particles, such as ferric oxide, lead dioxide, aluminum oxide, salt, and charcoal.

Sulfur trioxide (SO_3), which can be emitted into the air directly or result from reactions mentioned earlier, is a highly reactive gas. In the presence of moisture in the air, it is rapidly hydrated to form sulfuric acid. In the air, then, it is sulfuric acid in the form of an aerosol that is found rather than SO_3, and it is generally associated with other pollutants in droplets or solid particles of widely varying sizes. The acid is strongly hygroscopic, and droplets containing it readily take up further moisture from the air until they are in equilibrium with their surroundings. If any ammonia is present, it reacts with sulfuric acid to form various ammonium sulfates, which continue to exist as an aerosol (in droplet or crystalline form, depending on the relative humidity).

The sulfuric acid may also react further with other compounds in the air to produce other sulfates. Some sulfates reach the air directly from combustion or industrial sources, and near oceans, sulfates exist in aerosols generated from ocean spray. As discussed in U.S. EPA (1982a), sulfate particles fall mainly in the fine-mode (<2.5 μm) size range. These particles, in the presence of moisture in air, combine with water to form coarse-mode aerosols (i.e., >2.5 μm).

Many sulfur compounds are present in the complex mixture of urban air pollutants. Some are naturally occurring and some are manmade. Total biogenic sulfur emissions in the United States have been estimated to be in the range of 5 to 6 million metric tons annually. Additional contributions from coastal and oceanic sources may also be significant. Anthropogenic (manmade) sources are estimated to emit about 26 to 27 million metric tons of SO_x (mostly SO_2) annually in the United States. Most manmade sulfur oxide emissions are from stationary point sources; over 90 percent of these are SO_2 and the rest are sulfates.

Once SO_2 is emitted into the lower atmosphere, maintenance of a tolerable environment depends on the ability of wind and turbulence to disperse the pollutants. Factors affecting the dispersion of SO_2 from combustion sources include (1) temperature and efflux velocity of the gases, (2) stack height, (3) topography and the proximity of other buildings, and (4) meteorology. Some of the SO_2 emitted into the air is removed unchanged onto various surfaces, including soil, water, grass and vegetation. The remaining SO_2 is transformed into sulfuric acid or other sulfates by various processes in the presence of moisture, and these transformation products are then removed by dry deposition processes or by precipitation. The relative proportion of SO_2 and its transformation products resulting from atmospheric processes varies with increasing distance from emission sources and residence time (age) in the atmosphere. With long-range transport (over hundreds or thousands of kilometers), extensive transformation of SO_2 to sulfates occurs, with dry deposition of acidic sulfates or their wet depositon in rain or snow contributing to acidic precipitation processes.

The most commonly used collection and measurement methods for sulfur oxides were described in the 1982 EPA criteria document (U.S. EPA, 1982a). A clear understanding of the underlying bases and limitations of particular methods is essential for adequate interpretation of epidemiological studies discussed later. If SO_2 were the only contaminant in air, all measurement methods for that gas would give comparable results, indicating the true concentration of SO_2. In typical urban environments, however, other pollutants are always present and although sampling procedures can be arranged to minimize interference from particulate matter by first filtering the air, errors still arise due to other gases and vapors. Thus, variations in specificity and accuracy of methods must be taken into account in comparing results from various studies.

Methods for measurement of SO_2 include (1) manual methods, which involve collection of the sample over a specified time period and subsequent analysis by a variety of analytical techniques, and (2) automated methods, in which sample collection and analysis are performed continuously and automatically. In the most commonly used manual methods, the analyses of the collected samples are based on colorimetric, titrimetric, turbidimetric, gravimetric, x-ray fluorescent, chemiluminescent, and ion exchange chromatographic measurement principles.

The most widely used manual method for determination of atmospheric SO_2 is the West-Gaeke pararosaniline method. An improved version of this colorimetric method, adopted in 1971 as the U.S. EPA reference method, can measure ambient SO_2 at levels as low as 25 $\mu g/m^3$ (0.01 ppm) with 30 min to 24 hr sampling time. The method has acceptable specificity for SO_2, if properly implemented; however, samples collected in tetrachloromercurate(II) can undergo temperature-dependent decay leading to the underestimation of ambient SO_2 concentrations. A variation of the method uses a buffered formaldehyde solution for sample collection, reducing the temperature-dependent decay problem. Certain American epidemiological studies employed the West-Gaeke or other variations of the pararosaniline method.

A titrimetric (acidometric) method, whereby SO_2 is collected in dilute hydrogen peroxide and the resultant H_2SO_4 is titrated with standard alkali, is

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the standard method mainly used in Great Britain and by the Organization for Economic Cooperation and Development (OECD). The method requires long sampling times (24 h), is subject to interference from atmospheric acids and bases, and can be affected by errors due to evaporation of reagent during sampling, titration errors, and alkaline contamination of glassware. It has been used to provide aerometric SO_2 estimates reported in many British and European epidemiological studies.

Some other methods use alkali-impregnated filter papers for collection of SO_2 and subsequent analysis as sulfite or sulfate. Most involve extraction prior to analysis; but nondispersive x-ray fluorescence allows direct measurement of SO_2 collected on sodium carbonate-impregnated membrane filters. These methods have not been widely used for routine air monitoring or epidemiological studies.

Two of the most sensitive methods for measuring SO_2 are based on chemiluminescence and ion exchange chromatography. With the former, SO_2 is absorbed in a tetrachloromercurate solution and then oxidized with potassium permanganate; oxidation of the absorbed SO_2 is accompanied by chemiluminescence detected by a photomultiplier tube. With the latter, ion exchange chromatography can be used to determine ambient levels of SO_2 absorbed into dilute hydrogen peroxide and oxidized to sulfate, or SO_2 absorbed into a buffered formaldehyde reagent. These methods have not yet been widely employed for routine monitoring uses.

Sulfation methods, based on reaction of airborne sulfur compounds with lead dioxide paste to form lead sulfate, have been used both in the United States and Europe to estimate ambient SO_2 concentrations over extended time periods. However, data obtained by sulfation methods are affected by many physical and chemical variables and other interferences (such as wind speed, temperature, and humidity); and they are not specific for SO_2, since sulfation rates are also affected by other airborne sulfur compounds (e.g., as sulfates). Thus, although sulfation rates (mg SO_3/100 cm^2/day) have been converted to rough estimates of SO_2 levels (in ppm), these cannot be accepted as accurate measurements of atmospheric SO_2 levels. This is notable here because lead dioxide gauges provided estimates of SO_2 data used in some pre-1960s British epidemiological studies and also in some American epidemiologic studies.

Automated methods for measuring ambient SO_2 levels have been widely used for air monitoring. Some early continuous SO_2 analyzers, based on conductivity and coulometry, were subject to interference by many ambient air substances. More recent commercially available analyzers using these measurement principles exhibit improved specificity for SO_2 through incorporation of sophisticated chemical and physical scrubbers.

Continuous SO_2 analyzers that use flame photometric detection (FPD), fluorescence, or second-derivative spectrometry are now commercially available. The FPD method involves measurement of the band emission of excited SO_2 molecules formed from sulfur species in a hydrogen-rich flame and can exhibit high sensitivity and fast response, but must be used with selective scrubbers or coupled with gas chromatographs to achieve high specificity. Fluorescence analyzers detect characteristic fluorescence of the SO_2 molecule when irradiated by UV light, have acceptable sensitivity and response times, are insensitive to sample flow rate, and require no support gases. However, they can be affected by interference due to water vapor (quenching effects) and certain aromatic hydrocarbons and must employ ways to minimize such effects. Second-derivative spectrometry can provide highly specific measurement of SO_2 in the air, with continuous analyzers based on this principle being insensitive to sample flow rate and requiring no support gases. U.S. EPA has designated continuous analyzers based on many of the above principles (conductivity, coulometry, flame photometry, fluorescence, and second-derivative spectrometry) as equivalent methods for measurement of atmospheric SO_2.

Two main methods have been used to measure total water-soluble sulfates collected on filters along with other suspended particulate matter. With the turbidimetric method, samples are collected on sulfate-free glass fiber or other efficient filters, the sulfate is extracted and precipitated with barium chloride, and the turbidity of the suspension is measured spectrophotometrically. Samples are normally collected over 24-h periods by hi-vol sampler. However, no distinction can be made between sulfates and sulfuric acid present in the air and collected on the filters; and some material present as acid in the air may be converted to neutral sulfate on the filter during sampling. With the methylthymol blue method, samples are collected as in the turbidimetric method and the extract is reacted with barium chloride, but the barium remaining in solution is then reacted with methylthymol blue and the sulfate determined colorimetrically by measurement of uncomplexed methylthymol blue. This modification allows the procedure to be automated, but the same limitations as noted for the turbidimetric method apply, including lack of distinction between sulfates and sulfuric acid.

As for sulfuric acid, no fully satisfactory method exists for its measurement in the presence of other pollutants in the air, but some procedures exist for examining acidic properties of suspended particles or acid aerosols in general. Almost all of the strong acid content of ambient aerosols consists of sulfuric acid (H_2SO_4) and its partial atmospheric neutralization product, ammonium bisulfate (NH_4HSO_4); however, ammonium sulfate [$(NH_4)_2SO_4$], the final neutralization product, is only weakly acidic. Nitric acid (HNO_3) and hydrochloric acid (HCl) are other strong acids found in the ambient air (mainly as vapors or, when incorporated into fog droplets, as constituents of acid aerosols). Ambient air acidic aerosol concentrations can be expressed in terms of μmols H^+/m^3 or as H_2SO_4 equivalent in $\mu g/m^3$ (at 98 μg/μmol). Unfortunately, no systematic surveys of average acid aerosol concentrations in United States airsheds were available at the time the 1982 EPA criteria document (1982a) was prepared, nor is such systematic survey information available for more current acidic aerosol levels. However, Lioy and Lippmann (1985) have recently summarized some of the highest levels reported for recent years in North America, including levels in the range of 20 to 30 $\mu g/m^3$ H_2SO_4 (1 hr mean). This is in contrast to the highest level (680 $\mu g/m^3$ H_2SO_4 1 hr mean) recorded in the United Kingdom in London in 1962 and even higher levels almost certainly present during earlier London air pollution episodes.

1.3 KEY AREAS ADDRESSED IN EMERGING NEW HEALTH EFFECTS DATA

Important new health effects information has emerged in three main areas since preparation of the 1982 EPA criteria document and addendum: (1) new data which permit more definitive characterization of respiratory tract deposition patterns for inhaled particles of various size ranges, e.g., fine-mode (<2.5 μm) vs. larger coarse mode particles (>2.5 μm, <10 μm, <15 μm, etc.); (2) new reanalyses of certain key British epidemiology studies, which used BS methods for measuring PM levels, and additional new epidemiologic studies, employing other non-gravimetric or gravimetric PM measurement methods, that assess health effects associated with exposures to PM and SO_x in contemporary urban airsheds of the 1970s and 1980s; and (3) new controlled human exposure studies which

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more precisely define exposure-response relationships for pulmonary function decrements and respiratory symptoms due to acute SO_2 exposure.

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CHAPTER 5. EXECUTIVE SUMMARY

In general, studies published in the scientific literature since 1981-82 support many of the conclusions reached in the earlier criteria review (U.S. EPA, 1982a,c). Some of the key findings emerging from the present evaluation of the newly available information on health effects associated with exposure to PM and SO_x are summarized here.

5.1 RESPIRATORY TRACT DEPOSITION AND FATE

Studies published since preparation of the earlier criteria document (U.S. EPA, 1982a) and the previous addendum (U.S. EPA, 1982c) support the conclusions reached at that time and provide clarification of several issues. In light of previously available data, new literature was reviewed with a focus towards (1) the thoracic deposition and clearance of large particles, (2) assessment of deposition during oronasal breathing, (3) deposition in possibly susceptible subpopulations, such as children, and (4) information that would relate the data to refinement or interpretation of ancillary issues, such as inter- and intrasubject variability in deposition, deposition of monodisperse versus polydisperse aerosols, etc.

The thoracic deposition of particles ≥10 μm D_{ae} and their distribution in the TB and P regions has been studied by a number of investigators (Svartengren, 1986; Heyder, 1986; Emmett et al., 1982). Depending upon the breathing regimen used, TB deposition ranged from 0.14 to 0.36 for 10-μm D_{ae} particles, while the range for 12-μm D_{ae} particles was 0.09 to 0.27. For particles 16.4 μm D_{ae}, a maximally deep inhalation pattern resulted in TB deposition of 0.12. While the magnitude of deposition in various regions depends heavily upon minute ventilation, there is, in general, a gradual decline in thoracic deposition for large particle sizes, and there can be significant deposition of particles greater than 10 μm D_{ae}, particularly for individuals who habitually breathe through their mouth. Thus, the deposition experiments wherein subjects inhale through a mouthpiece are relevant to examining the potential of particles to penetrate to the lower respiratory tract and pose a potentially increased risk. Increased risk may be due to increased localized dose or to the exceedingly long half-times for clearance of larger particles (Gerrity et al., 1983).

Although experimental data are not currently available for deposition of particles in the lungs of children, some trends are evident from the modeling results of Phalen et al. (1985). Phalen and co-workers made morphometric measurements in replica lung casts of people aged 11 days to 21 years and modeled deposition during inspiration as a function of activity level. They found that, in general, increasing age is associated with decreasing particulate deposition efficiency. However, very high flow rates and large particulate sizes do not exhibit consistent age-dependent differences. Since minute ventilation at a given state of activity is approximately linearly related to body mass, children receive a higher TB dose of particles than do adults and would appear to be at a greater risk, other factors (i.e., mucociliary clearance, particulate losses in the head, tissue sensitivity, etc.) being equal.

5.2 SUMMARY OF EPIDEMIOLOGIC FINDINGS ON HEALTH EFFECTS ASSOCIATED WITH EXPOSURE TO AIRBORNE PARTICLES AND SO_x

Newly available reanalyses of data relating mortality in London to short-term (24-h) exposures to PM (measured as smoke) and SO_2 were evaluated and their results compared with earlier findings and conclusions discussed in U.S. EPA (1982a). Varying strengths and weaknesses were evident in relation to the different individual reanalyses evaluated and certain questions remain unresolved concerning most. Regardless of the above considerations, the following conclusions appear warranted based on the earlier criteria review (U.S. EPA, 1982a) and present evaluation of newly available analyses of the London mortality experience: (1) markedly increased mortality occurred, mainly among the elderly and chronically ill, in association with BS and SO_2 concentrations above 1000 μg/m^3, especially during episodes when such pollutant elevations occurred for several consecutive days; (2) the relative contributions of BS and SO_2 cannot be clearly distinguished from those of each other, nor can the effects of other factors be clearly delineated, although it appears likely that coincident high humidity (fog) was also important (possibly in providing conditions leading to formation of H_2SO_4 or other acidic aerosols); (3) increased risk of mortality is associated with exposure to BS and SO_2 levels in the range of 500 to 1000 μg/m^3, clearly at concentrations in excess of ~700 to 750 μg/m^3; and (4) less certain evidence suggests possible slight increases in the risk of mortality at BS levels below 500 μg/m^3, with no specific threshold levels having yet been demonstrated or ruled out at lower concentrations of BS (e.g., at 150 μg/m^3) nor potential contribution of other plausibly confounding variables having yet been fully evaluated.

In addition to the reanalyses of London mortality data, reanalyses of mortality data from New York City in relation to air pollution reported by Ozkaynak and Spengler (1985) were evaluated. Time-series analyses were carried out on a subset of New York City data included in a prior analysis by Schimmel (1978) which was critiqued during the earlier criteria review (U.S. EPA, 1982a). The reanalyses by Ozkaynak and Spengler (1985) evaluated 14 years (1963-76) of daily measurements of mortality (the sum of heart, other circulatory, respiratory, and cancer mortality), COH, SO_2, and temperature. In summary, the newly available reanalyses of New York City data raise possibilities that, with additional work, further insights may emerge regarding mortality-air pollution relationships in a large U.S. urban area. However, the interim results reported thus far do not now permit definitive determination of their usefulness for defining exposure-effect relationships, given the above-noted types of caveats and limitations.

Similarly, it is presently difficult to accept findings reported in another new study of mortality associated with relatively low levels of SO_2 pollution in Athens, given questions regarding representativeness of the monitoring data and the statistical soundness of using deviations of mortality from an earlier baseline relatively distant in time. Lastly, a newly reported analyses of mortality-air pollution relationships in Pittsburgh (Allegheny County, PA) was evaluated as having utilized inadequate exposure characterization and the results contain sufficient internal inconsistencies, so that the analyses are not useful for delineating mortality relationships with either SO_2 or PM.

Of the newly-reported analyses of short-term PM/SO_x exposure-morbidity relationships discussed in this Addendum, the Dockery et al. (1982) study provides the best-substantiated and most readily interpretable results. Those results, specifically, point toward decrements in lung function occurring in

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association with acute, short-term increases in PM and SO_2 air pollution. The small, reversible decrements appear to persist for 1-2 wks after episodic exposures to these pollutants across a wide range, with no clear delineation of threshold yet being evident. In some study periods effects may have been due to TSP and SO_2 levels ranging up to 422 and 455 $\mu g/m^3$, respectively. Notably larger decrements in lung function were discernable for a subset of children (responders) than for others. The precise medical significance of the observed decrements *per se* or any consequent long-term sequalae remain to be determined. The nature and magnitude of lung function decrements found by Dockery et al. (1982), it should be noted, are also consistent with: observations of Stebbings and Fogelman (1979) of gradual recovery in lung function of children during seven days following a high PM episode in Pittsburgh, PA (max 1-hr TSP estimated at 700 $\mu g/m^3$); and a report by Saric et al. (1981) of 5 percent average declines in $FEV_{1.0}$ being associated with high SO_2 days (89-235 $\mu g/m^3$).

In regard to evaluation of long-term exposure effects, the 1982 U.S. EPA criteria document (1982a) noted that certain large-scale "macroepidemiological" (or "ecologic" studies as termed by some) have attracted attention on the basis of reported demonstrations of associations between mortality and various indices of air pollution, e.g., PM or SO_x levels. U.S. EPA (1982a) also noted that various criticisms of then-available ecologic studies made it impossible to ascertain which findings may be more valid than others. Thus, although many of the studies qualitatively suggested positive associations between mortality and chronic exposure to certain air pollutants in the United States, many key issues remained unresolved concerning reported associations and whether they were causal or not.

Since preparation of the earlier Criteria Document (U.S. EPA, 1982a), additional ecological analyses have been reported regarding efforts to assess relationships between mortality and long-term exposure to particulate matter and other air pollutants. For example, Lipfert (1984) conducted a series of cross-sectional multiple regression analyses of 1969 and 1970 mortality rates for up to 112 U.S. SMSA's, using the same basic data set as Lave and Seskin (1978) for 1969 and taking into account various demographic, environmental and lifestyle variables (e.g., socioeconomic status and smoking). Also, the Lipfert (1984) reanalysis included several additional independent variables: diet; drinking water variables; use of residential heating fuels; migration; and SMSA growth. New dependent variables included age-specific mortality rates with their accompanying sex-specific age variables. Both linear and several nonlinear (e.g., quadratic or linear splines testing for possible threshold model specifications) were evaluated.

It became quite evident from the results obtained that the air pollution regression results for the U.S. data sets analyzed by Lipfert (1984) are extremely sensitive to variations in the inclusion/exclusion of specific observations (for central city versus SMSA's or different subsets of locations) or additional explanatory variables beyond those used in the earlier Lave and Seskin analyses. The results are also highly dependent upon the particular model specifications used, i.e. air pollution coefficients vary in strength of association with total or age-/sex-specific mortality depending upon the form of the specification and the range of explanatory variables included in the analyses. Lipfert's overall conclusion was that the sulfate regression coefficients are not credible and, since sulfate and TSP interact with each other in these regressions, caution is warranted for TSP coefficients as well.

Ozkaynak and Spengler (1985) have also newly described results from ongoing attempts to improve upon previous analyses of mortality and morbidity effects of air pollution in the United States. Ozkaynak and Spengler (1985) present principal findings from a cross-sectional analysis of the 1980 U.S. vital statistics and available air pollution data bases for sulfates, and fine, inhalable and total suspended particles. In these analyses, using multiple regression methods, the association between various particle measures and 1980 total mortality were estimated for 98 and 38 SMSA subsets by incorporating recent information on particle size relationships and a set of socioeconomic variables to control for potential confounding. Issues of model misspecification and spatial autocorrelation of the residuals were also investigated.

The Ozkaynak and Spengler (1985) results for 1980 U.S. mortality provide an interesting overall contrast to the findings of Lipfert (1984) for 1969-70 U.S. mortality data. Whereas Lipfert found TSP coefficients to be most consistently statistically significant (although varying widely depending upon model specifications, explanatory variables included, etc.), Ozkaynak and Spengler found particle mass measures including coarse particles (TSP, IP) often to be non-significant predictors of total mortality. Also, whereas Lipfert found the sulfate coefficients to be even more unstable than the TSP associations with mortality (and questioned the credibility of the sulfate coefficients), Ozkaynak and Spengler found that particle exposure measures related to the respirable or toxic fraction of the aerosols (e.g., FP or sulfates) to be most consistently and significantly associated with annual cross-sectional mortality rates. It might be tempting to hypothesize that changes in air quality or other factors from the earlier data sets (for 1969-70) analyzed by Lipfert (1984) to the later data (for 1980) analyzed by Ozkaynak and Spengler (1985, 1986) may at least partly explain their contrasting results, but there is at present no basis by which to determine if this is the case or which set of findings may or may not most accurately characterize associations between mortality and chronic PM or SO_x exposures in the United States. Thus conclusions stated in U.S EPA (1982a) concerning ecologic analyses still largely apply here in regard to mortality PM/SO_x relationships.

The present Addendum also evaluated a growing body of new literature on morbidity effects associated with chronic exposures to airborne particles and sulfur oxides. In summary, of the numerous new studies published on morbidity effects associated with long-term exposures to PM or SO_x, only a few may provide potentially useful results by which to derive quantitative conclusions concerning exposure-effect relationships for the subject pollutants. A study by Ware et al. (1986), for example, provides evidence of respiratory symptoms in children being associated with particulate matter exposures in contemporary U.S. cities without evident threshold across a range of TSP levels of ~25 to 150 μg/m^3. The increase in symptoms appears to occur without concomitant decrements in lung function among the same children. The medical significance the observed increased in symptoms unaccompanied by decrements in lung of function remains to be fully evaluated but is of likely health concern. Caution is warranted, however, in using these findings for risk assessment purposes in view of the lack of significant associations for the same variables when assessed from data within individual cities included in the Ware et al. (1985) study.

Other new American studies provide evidence for: (1) increased respiratory symptoms among young adults in association with annual-average SO_2 levels of ~115 μg/m^3 (Chapman et al., 1983); and (2) increased prevalence of cough in children (but not lung function changes) being associated with intermittent exposures to mean peak 3-hr SO_2 levels of ~1.0 ppm or annual average SO_2 levels of ~103 μg/m^3 (Dodge et al., 1985).

Results from one European study (PAARC, 1982a,b) also suggest the likelihood of lower respiratory disease symptoms and decrements in lung function in

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adults (both male and female) being associated with annual average SO_2 levels ranging without evident threshold from about 25 to 130 $\mu g/m^3$. In addition that study suggests that upper respiratory disease and lung function decrements in children may also be associated with annual-average SO_2 levels across the above range. Further analyses would probably be necessary to determine whether or not any thresholds for the health effects reported by PAARC (1982a,b) exist within the stated range of annual-average SO_2 values.

5.3 SUMMARY OF CONTROLLED HUMAN EXPOSURE STUDIES OF SULFUR DIOXIDE HEALTH EFFECTS

The new studies clearly demonstrate that asthmatics are much more sensitive to SO_2 as a group. Nevertheless, it is clear that there is a broad range of sensitivity to SO_2 among asthmatics exposed under similar conditions. Recent studies also confirm that normal healthy subjects, even with moderate to heavy exercise, do not experience effects on pulmonary function due to SO_2 exposure in the range of 0 to 2 ppm. The minor exception may be the annoyance of the unpleasant smell or taste associated with SO_2. The suggestion that asthmatics are about an order of magnitude more sensitive than normals is thus confirmed.

There is no longer any question that normally breathing asthmatics performing moderate to heavy exercise will experience SO_2-induced bronchoconstriction when breathing SO_2 for at least 5 min at concentrations less than 1 ppm. Durations beyond 10 min do not appear to cause substantial worsening of the effect. The lowest concentration at which bronchoconstriction is clearly worsened by SO_2 breathing depends on a variety of factors.

Exposure to less than 0.25 ppm has not evoked group mean changes in responses. Although some individuals may appear to respond to SO_2 concentrations less than 0.25 ppm, the frequency of these responses is not demonstrably greater than with clean air. Thus individual responses cannot be relied upon for response estimates, even in the most reactive segment of the population.

In the SO_2 concentration range from 0.2 to 0.3 ppm, six chamber exposure studies were performed with asthmatics performing moderate to heavy exercise. The evidence that SO_2-induced bronchoconstriction occurred at this concentration with natural breathing under a range of ambient conditions was equivocal. Only with oral mouthpiece breathing of dry air (an unusual breathing mode under exceptional ambient conditions) were small effects observed on a test of questionable quantitative relevance for criteria development purposes. These findings are in accord with the observation that the most reactive subject in the Horstman et al. (1986) study had a $PCSO_2$ (SO_2 concentration required to double SRaw) of 0.28 ppm.

Several observations of significant group mean changes in SRaw have recently been reported for asthmatics exposed to 0.4 to 0.6 ppm SO_2. Most not all studies, using moderate to heavy exercise levels (>40 to 50 L/min), found evidence of bronchoconstriction at 0.5 ppm. At a lower exercise rate other studies (e.g., Schachter et al., 1984) did not produce clear evidence of SO_2-induced bronchoconstriction at 0.5 ppm SO_2. Exposures which included higher ventilations, mouthpiece breathing, and inspired air with a low water content resulted in the greatest responses. Mean responses ranged from 45 percent (Roger et al., 1985) to 280 percent (Bethel et al., 1983b) increase in SRaw. At concentrations in the range of 0.6 to 1.0 ppm, marked increases in SRaw are observed following exposure. Recovery is generally complete within approximately 1 h although the recovery period may be longer for subjects with the most severe responses.

It is now evident that for SO_2-induced bronchoconstriction to occur in asthmatics at concentrations less than 0.75 ppm, the exposure must be accompanied by hyperpnea. Ventilations in the range of 40 to 60 L/min have been most successful; such ventilations are beyond the usual oronasal ventilatory switchpoint.

There is no longer any question that oral breathing (especially via mouthpiece) causes exacerbation of SO_2-induced bronchoconstriction. New studies reinforce the concept that the mode of breathing is an important determinant of the intensity of SO_2-induced bronchoconstriction in the following order: oral > oronasal > nasal.

A second exacerbating factor strongly implicated in recent reports is the breathing of dry and/or cold air with SO_2. It has been suggested that the reduced water content and not cold, per se, could be responsible for much of this effect. Airway drying may contribute to the SO_2 effect by decreasing the efficacy of SO_2 scrubbing by the surface liquid of the oral and nasal airway. Drying of airways peripheral to the laryngopharynx may result in decreased surface liquid volume to buffer the effects of SO_2.

The new studies do not provide sufficient additional information to establish whether the intensity of the SO_2-induced bronchoconstriction depends upon the severity of the disease. Across a broad clinical range from "normal" to moderate asthmatic there is clearly a relationship between the presence of asthma and sensitivity to SO_2. Within the asthmatic population, the relationship of SO_2 sensitivity to the qualitative clinical severity of asthma has not been studied systematically. Ethical considerations (i.e., continuation of appropriate medical treatment) prevent the unmedicated exposure of the "severe" asthmatic because of his dependence upon drugs for control of his asthma. True determination of sensitivity requires that the interference with SO_2 response caused by such medication be removed. Because of these mutually exclusive requirements, it is unlikely that the true SO_2 sensitivity of severe asthmatics will be determined. Nevertheless, more severe asthmatics should be studied. Alternative methods to those used with mild asthmatics, not critically dependant on regular medication, will be required. The studies to date have only addressed the "mild to moderate" asthmatic.

Consecutive SO_2 exposures (repeated within 30 min or less) result in a diminished response compared with the initial exposure. It is apparent that this refractory period lasts at least 30 min but that normal reactivity returns within 5 h. The mechanisms and time course of this effect are not clearly established but refractoriness does not appear to be related to an overall decrease in bronchomotor responsiveness.

From the review of studies included in this addendum, it is clear that the magnitude of response (typically bronchoconstriction) induced by any given SO_2 concentration was variable among individual asthmatics. Exposures to SO_2 concentrations of 0.25 ppm or less, which did not induce significant group mean increases in airway resistance also did not cause symptomatic bronchoconstriction in individual asthmatics. On the other hand, exposures to 0.40 ppm SO_2 or greater (combined with moderate to heavy exercise) which induced significant group mean increases in airway resistance,also caused substantial bronchoconstriction in some invididual asthmatics. This bronchoconstriction was associated with wheezing and the perception of respiratory distress. In several instances it was necessary to discontinue the exposure and provide medication. The significance of these observations is that some SO_2-sensitive asthmatics are at risk of experiencing clinically significant (i.e., symptomatic) bronchoconstriction requiring termination of activity and/or medical

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intervention when exposed to SO_2 concentrations of 0.40 ppm or greater when this exposure is accompanied by at least moderate activity.

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SENATE NATURAL RESOURCES
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BILL NO. HB 534

ROOM 405-a

TO: Secretary Natural Resource Committee
(Sponsor/Chairperson/Your Legislator/Committee)

FROM: C. Hamlin President M.P.H.A.
(Individual Sender/ Group)

REGARDING: HB 534 - Ambient air Standards
(Bill Number/ Issue / Budget Item)

DATE: 3/13/87
(Date Sent to Legislature)

DATE TO BE SUBMITTED TO

LEGISLATURE: 3/13/87

RECEIVER: PLEASE DELIVER THIS

ASAP!
(As Soon As Possible/ Next Morning)

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montana public health association

Since 1918

March 11, 1987

Senator Keating and Members of the Natural Resource Committee:

Chronic obstructive lung disease is the fifth leading cause of death in Montana. Pneumonia and influenza follow as the sixth leading cause. Both of these death rates exceed the same disease-related death rates in the United States. It therefore seems logical that the proposed voluntary standards would be risky at best.

The scientific literature discusses the inherent problems in sulfur dioxide measurement including the expense of accurate control measures. M.P.H.A. appreciates the local industry's attempt to deal with this. However, in view of the known devastating health effects, the issue remains an important public health problem. It is not a battle between "environmental freaks" and industry. The end point of any environment is the health of our citizens.

Changes in decreased ability to breathe respond both consistently and progressively upon exposure to sulfur dioxide. In a February 10, 1987, conversation with Dr. John Bateman, of the E.P.A.'s ambient air standards, it was acknowledged that new data is being gathered linking rapid or transient increases with SO_2 with acute and sometimes fatal attacks of asthma, bronchitis and COPD. This data is tentatively to be utilized in establishing new 3 hour, 24 hour and annual standards for emissions at regional, neighborhood and proximate stations. Does this committee wish to act prematurely and without substantive data other than cost to industry?

Considering sulfur dioxide as one of the three major sources of air pollution which result in a decreased quality of life and high medical expenses, we cannot allow HB 534 to pass out of committee and lead to disability and early death of our most important resources, our citizens.

Thank you.

Carolyn M. Hamlin

Carolyn M. Hamlin,
Assistant Professor Public Health Nursing
MPHA President
1206 Reece Drive
Billings, MT 59105

CMH/jp

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The Montana Environmental Information Center Action Fund

• P.O. Box 1184, Helena, Montana 59624 • (406) [illegible]2520

SENATE NATURAL RESOURCES
EXHIBIT NO. 16
DATE 3/13/87
BILL NO. HB 534

March 13, 1987
Senate Natural Resources Committee
Re: HB 534

Mr. Chairman, members of the committee, my name is Claudia Massman. I represent the members of the Environmental Information Center. We oppose HB 534.

Clean air is good state policy. Proponents of HB 534 argue that Montana's air quality standards send a signal to industry that Montana has an "anti-business attitude". On the contrary, the state's air quality standards reflect the past concerns and demands by the people of this state to protect their health and environment. A Recent poll indicates that this attitude has not changed and that the people believe that good business and clean air are not mutually exclusive.

Reducing Montana's air quality standards will do little to solve Montana's anti-business climate and will only result in a loss of our clean air. Economic good health depends on a complex series of events and is best addressed through state and local measures. It is simplistic to think that a reduction of air quality standards will attract new industry to our state, particularly in the manner that HB 534 addresses the problem. HB 534 merely legalizes the status quo. New industries cannot move to a city such as Billings, because the addition of its emissions would violate the total allowable concentration of sulfer dioxide in the area. Therefore, existing industries maintain a monopoly on the pollution credits in an air shed. New industries cannot compete because they cannot reduce their emissions to zero. Maintaining Montana's current standards will force the existing industries to make room for new ones, which is a positive message to industry.

Industries have threatened to shut down if forced to comply with the state's air quality standards. As yet no jobs have been lost due to existing air quality standards, and jobs have been created due to pollution control requirements. The state should not give in to these threats and consider instead the health and welfare of its citizens. Passage of HB 534 will not ensure the state that these industries will stay. Passage of HB 534 will only protect the profits of existing industries, because they will no

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longer need to reduce their emissions to be in compliance with air quality standards.

Maintaining clean air is an economic benefit to Montana. People are attracted to the state for its scenic vistas and largely unspoiled environment. Last year at least 750 million dollars was spent by visitors to the state. They came to enjoy the quality of life offered by a state that protects its environement through legislation. Eliminating those protections is unsound for the future economy of the state.

Although industry is complaining about the cost of coming into compliance with the state's high air quality standards, these standards have been in existence for twenty years. It is ironic that while these industries complain about hard economic times, this legislature is currently deciding what to do with 14.4 million in oil-overcharge funds that Exxon has been forced to repay to the state. During years of incredibly good economic times, industry simply did not reinvest profits to control their emissions. Now they complain about the high cost of compliance.
Furthermore, people are willing to pay the cost of clean air. Industry can pass the cost of compliance on to the consumer and still remain competitive.

This committee should not assume that the people have changed their mind about clean air due to the complaints of a few companies. This committee should vote "do not pass" on HB 534.

YELLOWSTONE VALLEY CITIZENS COUNCIL
419 Stapleton Building
Billings, Montana 59101

March 13, 1987

TO: Senate Natural Resources Committee

RE: House Bill 534

The proponents of HB 534 have said a great deal about "good faith" offers to reduce sulfur dioxide above Billings. It would be instructive to look at those offers on two points: are they credible and, if so, what would they really accomplish? The industries in question have not exactly established a good track record with the Department of Health. One could reasonably conclude, in fact, that the industries have flagrantly disregarded the state air quality standards ever since those standards were adopted. Even now as they talk of compromise and concessions, with the exception of Exxon's 15% reduction gesture, industry has not been forthcoming with commitments. Failure to put their signatures on their good intentions can only call into question the sincerity of their "good faith" position.

Analyzing the Dept. of Health sponsored "agreement" reveals only three provisions which could conceivable reduce SO2 levels: Exxon would agree to continue their 15% reduction, Conoco would implement a similar reduction, and all the industries would adopt temporary reductions four to five "inversion days" each year. That's it ... two of the six industries implement or continue modest SO2 reductions and the industries as a whole agree to develop some as yet vague system of response to the half-dozen long term inversions each year. I guess we can just hold our breath during the almost daily several-hour inversions.

Don't yield to the illusion that this bill would significantly improve the air quality in Billings. At best, it would sanction the status quo. The issue, then, is whether the federally accepted level of ambient SO2 is adequate for Billings. In effect, do we deserve the same level of protection afforded the rest of the state?

I would like to remind you that the federal standard was adopted 17 years ago! And, in fact, is now under review in Congress in light of recent health and environmental evidence. Federal acceptance is no guarantee of safety. How many substances were in approved use 10 to 15 years ago but have since been found to be unacceptable, even dangerous? Asbestos? DDT? Dioxin? Formaldehyde? ... The list goes on. Will sulfur dioxide be listed five years hence?

I must include in my testimony mention of public sentiment. One year ago I presented to the Board of Health the signatures of over 600 concerned people in Billings requesting the timely enforcement of the air quality standards as applied everywhere else in the state. Prior to last November's election, Rep. Addy informally polled his Billings' constituents on this issue. As he reported, 70% of the respondents believed that "we can maintain our air quality standards and attract new businesses". Further, 76% thought that "we can maintain our air quality standards and keep existing jobs"!

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There has been a noticeable absence of letters to the editor of the Billings Gazette supporting this legislation. In contrast, frequent are the comments of readers angry and frustrated over the indifference of the business community toward their health. Apparently the general public doesn't share the proponents enthusiasm to sacrifice their air quality.

Recently the Billings' City Council considered a position statement supporting the application of the federal air quality standards. Discussion revealed serious reservations on the part of the council members. The final motion specifically removed reference to any support for the federal standards, but did support a negotiated settlement of the air quality issue. The motion carried nine to one.

Yellowstone Valley Citizens Council does not want or expect any industries to close due to air quality requirements. If the state standard is kept and if the administrative process is allowed to work through the Board of Health, we are optimistic that an equitable solution is possible. H. B. 534 is not equitable and I urge you to abandon it.

S L Fraser
Scott L Fraser

YVCC Chair

PROPOSED AMENDMENT TO HOUSE BILL 534

SENATE NATURAL RESOURCES
EXHIBIT NO. 18
DATE 3/13/87
BILL NO. HB 534

1. Title, line 22.
   Strike: "AND"

2. Title, line 23.
   Following: "DATE"
   Insert: " ; AND PROVIDING A TERMINATION DATE"

3. Page 3, line 25.
   Following: "DATE"
   Insert: "AND TERMINATION DATE"

4. Page 4, line 1.
   Following: "APPROVAL"
   Insert: " , AND TERMINATES JULY 1, 1989"

Montana Association of Churches

MONTANA RELIGIOUS LEGISLATIVE COALITION • P.O. Box 745 • Helena, MT 59624

SENATE NATURAL RESOURCES
EXHIBIT NO. 19
DATE 3/13/87
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March 13, 1987

WORKING TOGETHER:

American Baptist Churches of the Northwest

American Lutheran Church Rocky Mountain District

Christian Church (Disciples of Christ) in Montana

Episcopal Church Diocese of Montana

Lutheran Church in America Pacific Northwest Synod

Roman Catholic Diocese of Great Falls-Billings

Roman Catholic Diocese of Helena

United Church of Christ MT-N.WY Conference

United Methodist Church Yellowstone Conference

Presbyterian Church (U.S.A.) Glacier Presbytery

Presbyterian Church (U.S.A.) Yellowstone Presbytery

MISTER CHAIRMAN AND MEMBERS OF THE SENATE NATURAL RESOURCES COMMITTEE:

I am Kathy Karp and I am speaking on behalf of the Montana Association of Churches.

The Montana Association of Churches supports the protection of the environment through air standards that adequately protect Montanans from air pollution.

The effects of air pollution fall disproportionately on children, the elderly and those already in poor health for other reasons. The primary purpose of air pollution control is the protection of human health.

We support the Montana Constitution's guarantee that "all persons have a right to a clean and healthful environment." (Declaration of Rights, Article 2; Montana Constitution)

When these standards were adopted, the primary concern was one of health; the Montana Association of Churches hopes that when you make your decision on HB534, health will remain your primary concern.

NOT VERBATIM

Montana

Audubon Legislative Fund

SENATE NATURAL RESOURCES
EXHIBIT NO. 20
DATE 3/13/87
BILL NO. HB534

Testimony on HB 534
Senate Natural Resource Committee
March 13, 1987

Mr. Chairman and Members of the Committee,

My name is Janet Ellis and I'm here today representing the Montana Audubon Legislative Fund. The Audubon Fund is composed of 2500 members of the National Audubon Society located throughout the state.

The Audubon Fund opposes HB 534. We believed in the process that initially established Montana's air quality standards. That process involved an extensive review of scientific evidence and an active public hearing process. HB 534 sidesteps that process and doesn't even allow citizens in the affected community of Billings to have a adequate voice in the new rules that will affect them.

We believe HB 534 does not affect just Billings. It is a precedent setting piece of legislation that has the potential to affect other environmental standards set through the public hearing process. Perhaps the citizens of Billings are ready to sacrifice their health and environmental quality for potentail economic hardships. If legislators feel this is true, they wouldn't fight a local option review of standards.

Sulfur dioxide has been shown to affect human health, plants used in agriculture, plants used by livestock, trees, and the acidity of our soils. It is a serious air pollutant. The standards set under HB 534 could affect the standards set throughout Montana. We would hence like to ask this committee to accept at least one ammendment on this bill (attached). Because of the potential far reaching affects of HB 534, we feel that any study done under this legislation should have the best chance possible for being adequately funded. We would ask that if you are going to pass HB 534, you at least consider our amendment.

Thank you.

Montana

Audubon Legislative Fund

Amendment to HB 534

Page 3, line 16
Following: "SOURCES"
Strike: "WITHIN THE AREA OF STUDY"

This amendment will allow a more adequate study to be undertaken by allowing monies from all interested parties to help fund this research. The research could have far reaching affects on Montana's clean air standards and should hence have every opportunity to receive adequate funds.

montana
LWV

SENATE NATURAL RESOURCES
EXHIBIT NO. 21
DATE 3/13/87
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Chris Ebeling - President of the League of Women Voters of Montana

The League of Women Voters position on Natural Resources: "Promote an environment beneficial to life through the protection and wise management of natural resources..........Pollution of these resources should be controlled in order to preserve the physical, chemical and biological integrity of ecosystems and to protect public health." More specifically on air quality, "The League of Women Voters supports regulation and reduction of pollution from stationary sources" and we are working at the national level through our lobbying effort to reduce sulpher dioxide emissions by 50% within a ten year period.

Based on these statements of position, the League of Women Voters of Montana opposes HB 534. By citing the federal standard, this bill discourages industry from doing what they have already agreed to do; that is, to voluntarily reduce SO_2 emissions below current levels. This bill, in essence says, business as usual.

The League of Women Voters also mandates through position that we "promote public understanding and participation in decision-making as essential elements of responsible and responsive management of our natural resources". The Board of Health sets standards after years of public input and balances public health vs. cost. The League of Women Voters believes HB 534 is a piece of reactionary legislation to a very specific and local problem that takes the perogative to set standards away from the Board without adequate public input.

not verba[tim]

Montana Senior Citizens Assn., Inc.

WITH AFFILIATED CHAPTERS THROUGHOUT THE STATE

P.O. BOX 423 - HELENA, MONTANA 59624

(406) 443-5341

Tēstimony in Opposition to
House Bill 534 3-13-87

Mr. Chairman and Members of the Committee,

My name is Doug Campbell and I'm testifying on behalf of the MOntana Senior Citizens Association in oppostion to House Bill 534.

Mr. Chairman, Montana's Air Quality Standards were selected to protect all segments of Montanas population, including those most likely to be adversely impacted by air pollution such as the elderly, the asthmatics and the young.

Many of our members have lived in Yellowstone County all their lives and have made valuable economic contributions to the County and the State.

Mr. Chairman, clean air is a valuable resource in Montana. If industry wants to use that resource by emitting pollution into the air, then industry should pay the cost. Controlling air pollution is a cost of doing business. Air Quality and human health should not be sacrificed due to corporate threats. Thank You

Doug Campbell

NOT VERBAL

COMMENTS ON H.B. 534

BEFORE THE SENATE NATURAL RESOURCE COMMITTEE

HELENA, MONTANA MARCH 13, 1987

by: PAUL F. BERG

SENATE NATURAL RESOURCES
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Mr. Chairman and members of the committee. I am Paul F. Berg, Conservation Chairman, Yellowstone Basin Group, Sierra Club, representing 370 conservationists in the Billings area.

The American people have a basic right to clean air.

That right is just as important as our freedom of speech.

An average of 107 * tons of SO_2 is discharged into our Billings air each day from the smokestacks of local industry.

The Federal SO_2 standard of .03 ppm is causing serious human health problems, especially to our children.

SO_2 contributes to acid rain which damages agricultural crops, forest trees, and aquatic life downwind for many miles.

The sponsors of H.B. 534 attempt to assure us that the Federal standards are good enough because the industry will voluntarily reduce SO_2 emissions to something below that level.

During my 26 years as a professional biologist with the U. S. Department of the Interior, I negotiated with many officials responsible for the construction and operation of fossil-fueled and nuclear power plants nationwide.

None of these people volunteered any environmental protection controls of any kind. They had to be forced to comply with the environmental laws.

Many of these officials tried to force us to accept their interpretations of the laws in an attempt to dilute the meaning and intent of the laws.

Where in the history of Montana do you find evidence that industry has voluntarily taken positive steps to protect human health or our environment from degradation?

Consider what Anaconda Copper did to public health and the environment in the Butte-Anaconda area -- and what that cost the people of Montana.

Consider what tobacco is doing to public health -- and what that costs the people of our nation. <u>That</u> industry also can produce expert witnesses who swear that their by-products will not harm human health.

The industry in Billings will not be a good neighbor until it seriously addresses its emissions of SO_2.

No one has the right to pollute our air.

Pollution abatement technology is available.

Abatement costs would be cheaper in the long-run than the costs to human health and environmental damage from SO_2.

NOT 3.2 ...

The price of progress -- or continuance of the industry -- does not have to be pollution.

The industry believes that it has the economic and political power to force dirty air upon us.

We ask that you consider the advice of Chief Justice Turnage contained in his Judiciary Address to the 49th Legislature, and I quote: "...force must give way to reason and power to justice."

We think that the above reasons justify a NO vote on H.B. 534.

We appreciate the opportunity to comment.

Paul F Berg

Paul F. Berg, Conservation Chairman,
Yellowstone Basin Group, SIERRA CLUB
3708 Harry Cooper Place
Billings, Montana 59106

Phone: 656-2015

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EXHIBIT NO.________
DATE________
BILL NO.________

* from Hal Robbins' February 4, 1987 testimony.

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DATE 3/13/87
BILL NO. HB 534

SO_2 SENATE HEARING 1:00 PM, MARCH 13, 1987

MR. CHAIRMAN, LADIES AND GENTLEMEN:

I AM ED ZAIDLICZ - RESIDENT AND TAXPAYER OF BILLINGS AND YELLOWSTONE COUNTY. AS A MEMBER OF THE MONTANA HEALTH BOARD INVOLVED WITH THE SO_2 ISSUE FOR SEVEN YEARS, I'M HERE TO EXPRESS STRONG OPPOSITION TO HB 534.

MY REVIEW OF THE DEPT. OF HEALTH AND THE HEALTH BOARD RECORDS SHOWS THAT HB 534:

-- IS SHORT SIGHTED
-- IS ILL ADVISED
-- IS IMPROPERLY TIMED DUE TO:
   a) HARRIED, OVERLOADED, CRISES DOCKET
   b) THE PUBLIC IS OVERSENSITIVE DUE TO ECONOMIC DOWNTURN.
-- DISCREDITS AND NULLIFIES THE MONTANA ADMINISTRATIVE PROCESS THAT OUR PUBLIC HAS GROWN TO TRUST.
-- CONFUSES ISSUES AND WILL POLARIZE THE GENERAL PUBLIC'S PERCEPTION.

MORE SPECIFICALLY, IT CREATES THE PERCEPTION:

-- THAT THE SO_2 ISSUE IS ONE OF JOBS AND TAX BASE VERSUS IRRESPONSIBLE, CAPRICIOUS BUREAUCRATIC REGULATIONS.
-- AND THAT THE FEDERAL STANDARD (SO_2 DOES HAVE ADEQUATE HEALTH RISK FACTORS FOR BILLINGS - YELLOWSTONE COUNTY
-- AND THAT THE POLLUTION PROBLEM CAN ONLY BE SOLVED UNDER THE LENIENT FEDERAL STANDARD AND THROUGH INDUSTRY'S VOLUNTEER EFFORT.

INSTEAD, HEALTH BOARD RECORDS SHOW:

1. THE FEDERAL STANDARD IS NOT APPROPRIATE FOR THE BILLINGS GEOLOGICAL CLEFT AND HEAVY CLUSTER OF SO_2 EMITTING INDUSTRIES.
2. THE STATE STANDARD ADOPTED IN 1979 DOES PROVIDE THE NECESSARY HEALTH RISK FACTOR.
3. MAJOR INDUSTRY COMPLEXES -- REFINERIES, ET AL -- ACROSS AMERICA ARE OPERATING AT OR BELOW (MORE STRICT) THE MONTANA STATE STANDARD. WHY?
4. 1981 STATE STUDY -- MONTANA AIR POLLUTION STUDY (PLUS OTHER STUDIES) -- INDICATE SO_2 CONCENTRATIONS SIMILAR TO WHAT'S FOUND IN BILLINGS AND YELLOWSTONE COUNTY (SUPPOSEDLY WITHIN FEDERAL STANDARDS) IMPAIR CHILDREN'S LUNG FUNCTIONS.
5. THERE ARE NO CONTINUOUS EMISSION MONITORS (CEM'S) IN YELLOWSTONE COUNTY EXCEPT ON MPC'S STACK.
6. RECENT YELLOWSTONE COUNTY SULPHATION STUDY -- OVER FOUR MONTHS, COMPLETED JANUARY, 1987 -- DOCUMENT WORSENING PROBLEM OVER 1985.

YELLOWSTONE COUNTY OVERALL	+ 16 1/2% WORSE - 26 SITES
LOCKWOOD	+ 39% WORSE
LAUREL	+ 30% WORSE - 10 SITES (WORST ONE 49%)

7. EPA REPORT - NATIONWIDE SO_2 REPORT OF 70 MAJOR CITIES -- BILLINGS FALLS BETWEEN NEW YORK CITY AND PITTSBURGH. PITTSBURGH IS 70TH - ONLY 9/1000 of 1 PPM SEPARATE BILLINGS FROM PITTSBURGH

NOT VERBAL

SENATE NATURAL RESOURCES
EXHIBIT NO. 24 p.2
DATE 3/13/87
BILL NO. HB534

PITTSBURGH IS IMPROVING - BILLINGS IS NOT. WE ARE NOW THE PITTSBURGH OF THE WEST.

8. BUSINESS CLIMATE WILL BE JEOPARDIZED
- TOURISM - MONTANA FUTURE ECONOMIC HOPE WILL BE ADVERSELY IMPACTED. SEE "DENVER BROWN CLOUD."
- BILLINGS/YELLOWSTONE COUNTY AIR SHED SATURATED FOR SO_2. NO NEW INDUSTRY STARTS CAN BE PERMITTED OR NO EXPANSION OR MODIFICATION OF EXISTING PLANTS

9. THE CARROT OF VOLUNTARY POLLUTION REDUCTION IF FEDERAL STANDARD IS ENACTED IS QUESTIONABLE.
- MONTANA HISTORIC TRACK RECORD SAYS OTHERWISE
- MONTANA HEALTH BOARD IN MARCH, 1986, AFTER 7+ YEARS, CONCLUDED IT'S FUTILE TO WAIT FOR SELF POLICING AND VOLUNTEER REDUCTION OF SO_2
  (WHY WOULD ANY PLANT IMPROVE ITS EMISSIONS IF A COMPETITOR BENEFITS BY ASSUMING AN UNFAIR SHARE OF THE CLEAN AIR BALLOON?)

LEGISLATORS HAVE TWO CHOICES.
YOU SHOULD:

1. -- REJECT HB 534 - RETAIN MONTANA STATE STANDARD. DON'T DISCREDIT AND NULLIFY MANY YEARS OF HARD PROFESSIONAL EFFORT.
-- AFFIRM/SUPPORT ADMINISTRATIVE PROCESS. WE NOW HAVE COMMITTED, COMPETENT DEPT. OF HEALTH PROFESSIONALS, + KNOWLEDGEABLE CITIZENS HEALTH BOARD + FULL PUBLIC INVOLVEMENT IN ALL DECISIONS.
-- A LONG-TERM EQUITABLE SOLUTION CAN ONLY BE FORGED THROUGH <u>TOUGH, HARD NOSED BUT HONEST NEGOTIATIONS</u> WORKING <u>FROM</u> THE <u>CURRENT (1979) MONTANA STANDARDS, NOT FROM FEDERAL STANDARDS</u>. IF THE FEDERAL STANDARD IS ENACTED, WHAT FURTHER INCENTIVE TO INDUSTRY TO IMPROVE EMISSIONS?
-- CONTINUAL PUBLIC INVOLVEMENT AND MONITORING IS ESSENTIAL. THIS ISSUE IS GREATER THAN BILLINGS, ITS 6 PLANTS AND BILLINGS CHAMBER OF COMMERCE.
-- SAME RULES SHOULD APPLY TO ALL MONTANA - EXCEPT WHERE UNDENIABLE EVIDENCE WARRANTS SPECIAL CONSIDERATION.

<u>OR</u>:

2. -- IF YOU ARE SATISFIED THAT YOU HAVE <u>ALL</u> DATA AND ADEQUATE TIME TO ANALYZE AND THEN YOU FIND THE ADMINISTRATIVE PROCESS IS FAULTED, WHERE YOU CAN'T TRUST HEALTH DEPT. PROFESSIONALS OR THE MONTANA HEALTH BOARD TO MAKE PROPER DECISION IN THE BEST INTEREST OF EVERYONE --
-- THEN ROLL BACK TO FEDERAL STANDARD, <u>BUT</u> SINCE HEALTH RISK MARGIN IS INADEQUATE, PLEASE IMPOSE THE <u>FULL IMPLEMENTATION OF ALL REQUIRED STANDARDS</u>.

A) THERE CAN BE NO GRANDFATHERING - NO SIDE AGREEMENTS - NO SPECIAL ARRANGEMENTS.

THE STANDARDS ARE:

1 HR CEILING	- .5 ppm	CAN'T EXCEED 18 x / YEAR
3 HR CEILING	- .5 ppm	CAN'T EXCEED 1 x / YEAR
24 HR CEILING	- .14 EPA ppm	CAN'T EXCEED 1 X / YEAR
ANNUAL	- .30 EPA ppm	CAN'T EXCEED 1 X / YEAR

ALL 4 ABOVE TIME STANDARDS MUST RUN CONCURRENTLY - ANY ONE IS LIMITING - VIOLATIONS MUST BE CITED.

B) CEM'S MUST BE INSTALLED ON EVERY UNIT EMITTING 250 TONS SO_2 / YEAR - "REASONABLY ACCURATE" INDUSTRY ESTIMATES ARE UNACCEPTABLE.

C) INSTALL 4 AMBIENT AIR GROUND CONTROLS - CORRECTLY LOCATED (WHY SHOULD TAXPAYERS PAY FOR ANY OF THESE?)

D) REQUIRE STATE AND COUNTY POLLUTION ADMINISTRATION AND CONTINUAL MONITORING ON ALL (1-HOUR TO ANNUAL) STANDARDS.

CITE ALL VIOLATIONS!

-- ANYTHING LESS WILL GENERATE MORE POLARIZATION AND CYNICAL DISTRUST OF LEGISLATIVE ACTION AND PROLONG CURRENT AGONY.

-- WHAT HAS BEEN GLOSSED OVER - ALL 6 OPERATIONS ARE NOT EQUAL. SOME HAVE DONE A CREDITABLE JOB OF EMISSION CONTROL. THE PUBLIC HAS A RIGHT TO AND MUST KNOW - WHO IS PRODUCING HOW MUCH SO_2 OVER WHAT AREA AND WHEN IS IT DONE?

-- THEN PERHAPS WE CAN STOP THIS INTERMINABLE WAFFLING, LEGAL POSTURING, ESOTERIC PONTIFICATION OF FAULTY GAUSSIAN MODELS WHILE THE KIDS AND ELDERLY FOLKS IN LOCKWOOD ARE BREATHING CHEMICAL ADDITIVES INSTEAD OF CLEAN AIR. THIS AIR POLLUTION ABATEMENT CHARADE CANNOT CONTINUE.

I'D BE PLEASED TO ANSWER QUESTIONS OR SUPPLY ADDITIONAL DATA.

THANK YOU.

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EXHIBIT NO. 24 p. 3
DATE 3/13/87
BILL NO. HB 534

SENATE NATURAL RESOURCES
EXHIBIT NO. 24 p.1
DATE 3/13/87
BILL NO. HB 534

OPINION

The Billings Gazette is dedicated to the continued growth of Billings and Montana while recognizing that our unique quality of life must be maintained and preserved.

Wayne E. Schile: Publisher
Richard J. Wesnick: Editor
Carl E. Rexroad: Managing Editor
Gary Svee: Opinion Editor

THE BILLINGS GAZETTE FEB. 1, 1987

Haste makes waste on S02 standards

Don't rush to adopt federal levels

Guest columnist

Ed Zaidlicz

As a member of the Montana Health Board, I am appalled at the unseemly haste shown by Mr. Hannah and the Billings Chamber of Commerce to thwart the administrative process under way to improve the most precious resource we need for life — breathable air. I speak to our on-going problem of S02 pollution in Billings-Yellowstone County.

For six years, the board has patiently waited for the professional staff of the Department of Health and Environmental Science and the six contributing companies to reach some reasonable and equitable solution to the growing problem.

In March 1986 we recognized that the expectation of self-policing on the part of all S02 generating industry was futile.

I must rise to the defense of the Air Quality Bureau's interminable effort to bring about some progress. Based on the record and my exposure to them, they are professionally competent and fully committed to serving the public under state and federal law. If they can be criticized for anything, it's for chasing rabbits that were bred faster than they could be captured.

Now at the peak of our public deliberations to reduce this complex issue to a simple face-off of jobs versus "capricious bureaucratic standards" may prove a serious mistake. To simply "legalize" the status quo by discarding the state standard and relying on the lenient federal ignores a host of sur-facing [illegible]. The [illegible] effect [illegible] liber[illegible] S02 pollution is not understood or measurable state-wide.

What we are sure of are several troublesome facts. By EPA evaluations covering 70 major cities over four years, Billings has received national recognition of having the dirtiest (S02) pollution of any city but Pittsburg. We are now the Pittsburgh of the West. The trend for Pittsburg is improving. Unless we take concise action, we shortly will be the Pittsburgh of America.

Further study of controlled and monitored industrial areas like the Bay Area of California and Puget Sound in Washington proves that they are operating about and well below our state standards for S02. How and why is this?

Ostensibly Hannah's efforts to relax our S02 standard by relying on th[illegible] [fe]deral is to safeguard jobs and the tax base [illegible] ensuring adequate [illegible] [hea]lth saf[illegible]

Considerable concern exists that those objectives can be reached. Personally I am troubled by the apparent short-sightedness of this approach.

Our recent economic downturn has stimulated many creditable and creative efforts at the local and state levels to improve our economic opportunities for new business, for existing operations and to fully capitalize on the generally recognized potential of fully exploiting tourism. To lock in the current air quality into a "status quo" posture would prove hard to rationalize in light of those efforts.

To admit to having air dirtier than Denver's, Chicago's and Detroit's hardly encourages foreign visitor interest. Additionally, our air shed for S02 is now saturated even by the lenient federal standard. What price do we pay there for limiting new business, for expansion or modification of the more efficient plants now in operation ? Are we penalizing the more efficient operations and freezing possible improvement of our tax base?

Many, I am one of them, have strong reservations as to whether we in fact are not violating the federal standard. A verifiable, unquestionable process of documenting violations of either the state or federal standards on the annual and 24-hour basis doesn't exist! Only MPC has an emission monitor in operation.

While I applaud the recent efforts to reduce S02 emission at the six plants, I frankly am cynical about this "breakthrough" and the fortuitous timing.

Our board has been keenly sensitive to the impacts our decisions have on Montana citizens, both healthwise and economically. If our exhaustive deliberations and decisions are not to be trusted and the results prejudged before finalization, I respectfully suggest the Legislature discard the citizen board concept. It becomes a futile waste of time.

Personally, I encourage our concerned public and our legislators to allow the aadministrative process to continue to completion and not be stampeded into an ill-advised, irreversible action. Veiled threats of plant closures should not interfere with [illegible] [pub]lic's r[illegible] [car]efully [illegible] [an]d and [illegible]

DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

AIR QUALITY BUREAU

TED SCHWINDEN, GOVERNOR COGSWELL BUILDIN

STATE OF MONTANA

(406) 444-3454 HELENA, MONTANA 5962

SENATE NATURAL RESOURCES
EXHIBIT NO. 25
DATE 3/13/87
BILL NO. HB 534

September 19, 1986

Hugh Zackheim
Environmental Quality Council
Capitol Station
Helena, MT 59620

Dear Hugh:

This letter serves as a response to your inquiries of Sept. 17 regarding alternative sulfur dioxide control measures for the Billings/Laurel area.

If one assumes the Montana annual ambient sulfur dioxide (SO_2) standard is changed to the federal standard of 0.03 parts per million (ppm), the department believes that emission standards would still be necessary to achieve compliance with the Montana 24-hour ambient standard of 0.10 ppm. The reason for this lies in a review of the existing data. Data collected over the past 5 years indicates compliance with the annual standard (0.03), but continuing non-compliance with the 24-hour standard (0.10). It is clear, therefore, that changing the annual standard to 0.03 will not solve the non-compliance problems with the Montana 24-hour standard.

Your second question requests information about what emission reductions would be necessary to achieve compliance with the 24-hour standard. The department has reviewed the data from 1981 through 1985 to determine the source contributions of the six industries. We have made the following general conclusions:

1. The peak 24-hour concentrations range from .15 to .22 ppm. These larger peak values seem to be tied to malfunctions at the Conoco refinery. These malfunction problems must be solved if attainment of the standards is expected.

2. If the malfunction problems are solved, the estimated range of peak 24-hour concentration is between .12 and .15 ppm. Compliance with this standard must be achieved from reductions among several industries. The department took the approach that the annual source apportionment for the 24-hour violations were the same as the annual. This is based upon our review of the 24-hour violations over the past five years.

The data submitted in the department's discussion paper discusses compliance with the 24-hour standard under the assumption of 2. above. We believe, therefore, that the proposed alternatives would also be appropriate for the 24-hour standard. There may, however, be other mechanisms to obtain compliance with the short-term standard that we have not considered. The methods of compliance would need further study by ourselves and the industries involved prior to any definitive statement.

We hope this provides you with the information you requested. The information presented in the Sept. 11 discussion paper is a good first cut for the reductions necessary to attain compliance with the 24-hour ambient air quality standard.

Sincerely,

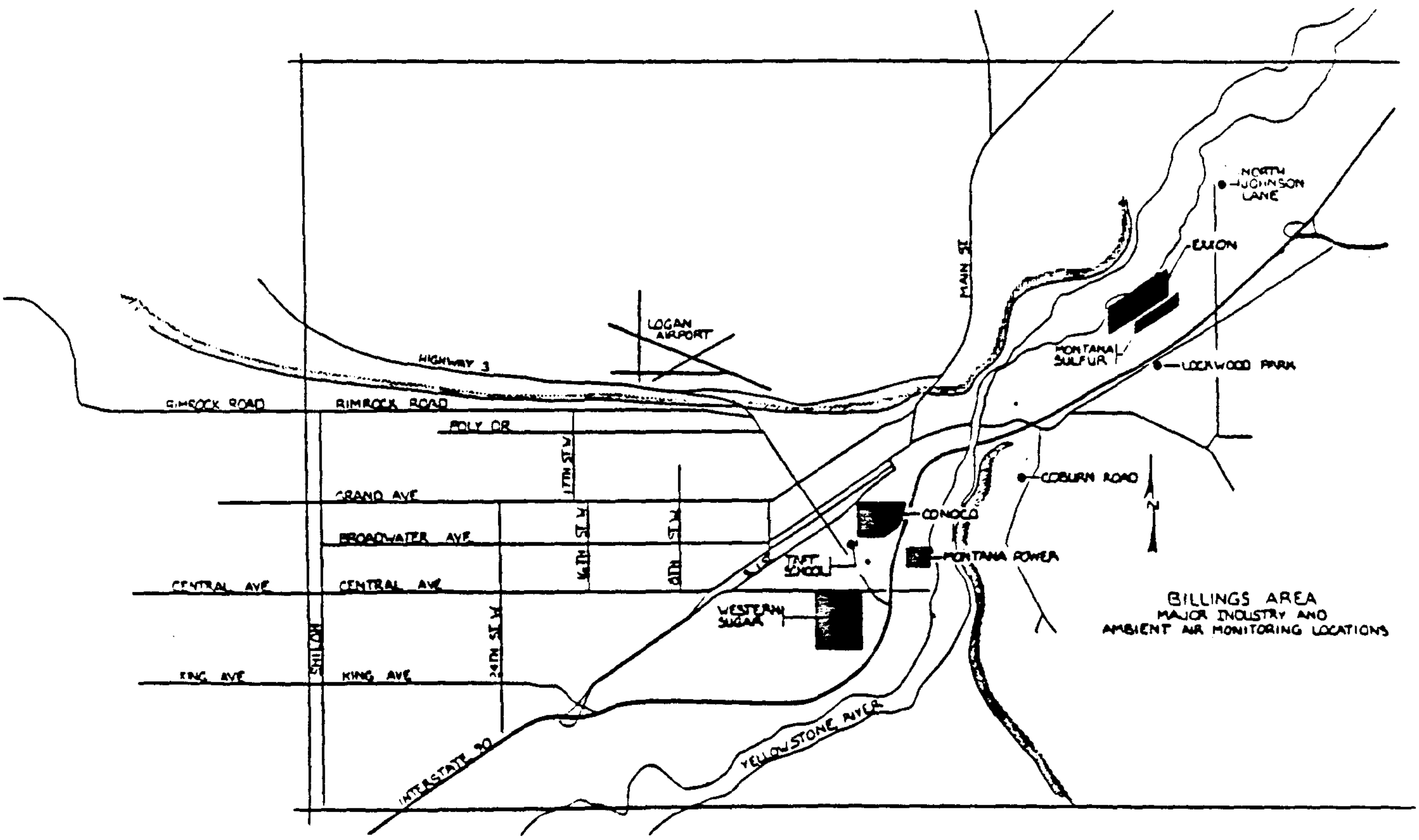
Harold W. Robbins
Chief

BILLINGS REFINERY

BILLING AREA SO_2 SITUATION

Annual, ppm

• Federal Standard		Lockwood Park	Coburn Road	Johnson Lane	State Standard
0.030	1982	0.023	0.026	0.020	0.020
	1983	0.029	0.027	0.024	
	1984	0.023	0.026	0.018	



STANDING COMMITTEE REPORT

MARCH 13 19 87

MR. PRESIDENT

We, your committee on NATURAL RESOURCES

having had under consideration SENATE BILL No. 397

THIRD reading copy (BLUE)
color

AN ACT TO PROVIDE FUNDING TO THE DEPARTMENT OF REVENUE FOR ADMINISTRATION OF SPECIAL REVENUE ACCOUNTS FOR TAX CHECKOFF PROGRAMS

MC CALLUM

Respectfully report as follows: That SENATE BILL No. 397

DO PASS

DO NOT PASS

SENATOR THOMAS F. KEATING, Chairman.

STANDING COMMITTEE REPORT

MARCH 13 19 87

MR. PRESIDENT

We, your committee on NATURAL RESOURCES

having had under consideration HOUSE JOINT RESOLUTION No. 19

THIRD reading copy (BLUE)
color

SUPPORTS GOVERNOR'S CUP SLED DOG RACE

MILES (MAZUREK)

Respectfully report as follows: That HOUSE JOINT RESOLUTION No. 19

BE CONCURRED IN

~~DO PASS~~

~~DO NOT PASS~~

SENATOR THOMAS F. KEATING, Chairman.