

MINUTES

MONTANA SENATE
51st LEGISLATURE - REGULAR SESSION

COMMITTEE ON NATURAL RESOURCES

Call to Order: By THOMAS KEATING, on March 10, 1989,
at 1:00 p.m., in Room 405 of the State Capitol.

ROLL CALL

Members Present: Senators: Chairman Thomas F. Keating,
Larry Tveit, Fred Van Valkenburg, Loren Jenkins,
Darryl Meyer, Lawrence Stimatz, Pete Story,
Bill Yellowtail, Elmer Severson, Cecil Weeding,
Dorothy Eck, and Jerry Noble.

Members Excused: None

Members Absent: None

Staff Present: Bob Thompson and Helen McDonald

Announcements/Discussion: None

HEARING ON HB 274

Presentation and Opening Statement by Sponsor: Joe Quilici,
District #71, Butte, sponsored this bill authorizing
the Department of State Lands (DSL), to investigate and
order appropriate mitigation measures to resolve issues
concerning use of explosives. Over a year ago, the
people in his district presented him with a petition
regarding damage to their homes. When Representative
Quicili got the petition he went to the various homes
that were being damaged and saw fireplace, building
structure, and porch damage. He then contacted the
Montana Resources, Inc. (MRI) Corporation and had a
meeting with them.

Representative Quicili said the company showed
complainants blasting documents and a video tape and
said that the company stated this damage couldn't be
happening from blasting. But whether it's happening
from blasting or not, these homes are being damaged.
Anyone knows that most people have invested 80% of
their assets in their homes and these people are
worried.

Representative Quicili stated that this measure is asking the DSL to come in as a third party and to evaluate the data including data supplied by the mining company. If the readings indicate a problem, DSL can then take remedial action. Everyone in Butte wants to have a valid mining company because that is the town's bread and butter. Representative Quicili summarized by saying this piece of legislation not only will be good for Butte but it will be good for Montana because the third party, which is the DSL, will be able to evaluate the data and make a decision one way or the other.

List of Testifying Proponents and What Group they Represent:

Dennis Sullivan, C.A.S.J.
Caroline Janson, Herself
Esme' LaBrecke, Herself
Joe Ivanich, Butte-Silver Bow
Bernard Harrington, Walkerville
Charley Moody, Butte-Silver Bow
Judy Jacobson, Representative
Donna Hart, 1313 Stewart

List of Testifying Opponents and What Group They Represent:

Gary Langley, Montana Mining Association
Don Jenkins, Golden Sunlight Mine
Ray Tillman, Montana Resources, Inc.

Testimony:

Dennis Sullivan said it is reasonable to expect someone who is having this kind of a problem to have some type of relief.

Caroline Janson lives 2 1/2 blocks from MRI and in the last 15 months there has been a lot of damage to her home. She has pictures that were taken in November and some taken last week. (Exhibit 11) During the summer she noticed damage to her garage. She had her home remodeled and had three new bricks put in the fireplace. She got all of this done and in November, while she was sitting in her front room, there was a terrific blast. She heard a crack, looked up and there was a crack in the fireplace. She has monitored the blasts the last 15 months and has a letter to state the damage that was done to the fireplace. (Exhibit 2) She stated from November 7 until now you can see the damage done to the fireplace alone. She called MRI and didn't get much help from them. She added that her fireplace was constructed in 1952. It was built on a solid

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foundation and under normal conditions the fireplace should last a lifetime.

Esme' LaBrecke said she signed the petition to MRI asking for relief from blasting and invited them to come and look at the damage. She has estimates of the damage done back to January and February. She knows that more or equal amounts of damage have been done to the house since the last estimate. (Exhibit 12)

Joe Ivanich, Silver Bow Council of Commissioners, represents District #4, which includes MRI property and surrounding homes. He said that the bill authorizes investigation of hard rock blasting and is something that is needed. HB 274 recognizes that there is a partnership between the mining company and the community. Both the people and the mining company must be responsible and according to HB 274 neither are negatively affected. A responsible mining company will benefit and so will property owners. HB 274 is needed because home owners can not be expected to be blasting experts. They do not have the experience or the monitoring equipment, such as a seismograph, and cannot be expected to operate such equipment. No one has the authorization to insure that hardrock blasting does not exceed standard levels, no one except the mining company. Today the hardrock mining companies have the expertise. The mining companies have the authorization and the equipment. HB 274 is good for Montana.

Bernard Harrington, mayor of Walkerville, stated his city has not been affected by blasting yet but may be someday. He is here today asking for support for HB 274. He feels this bill will be beneficial both to the citizens and the mining company. The measure provides for an outside expert to study any problems that might result from blasting.

Charley Moody lives about a half mile from the blasting area and has damage to his stucco house. He has spent 40 years of his life as a driller and handler of explosives. He would not say that the mining people are not qualified but argued that this type of work cannot be done without creating damage.

Donna Hart lives one-half mile from MRI and purchases homes to fix and sell. Twelve months ago she purchased a home in this area, but has no hope of bringing it up to code to resell.

Gary Langley said there is a vast difference between protecting the environment and over regulation as

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proposed in HB 274. HB 274 is based on perception. Structure problems in Butte are not being caused by blasting. Representative Quicili, said "whether it's happening from blasting or not, these homes are being damaged." The problem in Butte is not a statewide public concern that requires state legislation and the officials from MRI have made every effort to compromise on a local level. MRI has proposed that a structural engineer who is qualified and agreed on to the complainants come in and evaluate the problem. MRI has pledged to repay damage to any houses decided by the structural engineer to be caused by blasting. That is an agreeable compromise and reasonable people on the local level should be able to agree on how to solve this problem. Mr. Langley concluded that if this bill passes, it will place another requirement statewide on one of the most regulated industries in Montana.

Don Jenkins was impressed with the number of people who came here today concerned for their homes but he thinks this is a local problem and not one that is throughout the state. He is sure that MRI and the residents of Butte can work this thing out together without the assistance of state government.

Mr. Jenkins noted that he is a miner in Whitehall and began operations in 1983. During that time he has had three complaints concerning blasting in Whitehall and these complaints were determined not to be based on the blasting. He stated that DSL will probably have to hire a person at \$30,000 salary a year plus benefits with an education in that field. The state probably cannot get by for less then \$50,000 a year. He doesn't feel this bill is necessary. He added that mining companies are over burdened with regulations.

Ray Tillman passed out a pamphlet on Seismic Effects of Open-Pit Blasting, Butte, Montana, by Lewis L. Oriard, Inc., who has been involved with blasting in Butte since 1953. (Exhibit 5) He said the the company has to blast in order to mine. The folks do have cracks in their houses and in their concrete. The people are going to continue to sense, feel, and hear blasting from the mine operations. It is not the mine company's intention to damage people houses. The company designs the blasts based on federal government research. MRI is confident that what they are doing is right based on the information that the federal government has developed, in addition to monitoring the blasts. He passed out pictures taken of fireplaces. (Exhibit 14) He believes that this bill is unnecessary and added that the DSL already has the authority to come over,

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visit the mine and go through the company's blasting information. After the last hearing, the company let Joe Quilici and Gary Langley know that it would be more than willing to get together and agree on a structural engineer to look at the buildings. If a structural engineer is agreed on, and if, blasting has damaged homes, the company will be willing to pay for those repairs. It's a local problem and needs to be solved locally.

Questions From Committee Members:

Senator Noble asked if an outside expert was hired and decided to do something about it, what happens then?

Representative Quicili said the DSL does not have a seismograph and within the hardrock mining Act it does not have the authorization to go in and get data. Under the bill, if the mining company doesn't live up to the blasting codes, DSL can conduct an inspection. DSL would have the authorization to say "hey, lower your charges." Representative Quicili wants to let a third party and the DSL come in with their own seismograph and get their own data and say "yes or no."

Senator Noble said the committee has heard testimony from Ray Tillman and Gary Langley that MRI is willing to hire a consultant or structural engineer agreeable to both parties to come in and decide what is damaged. Isn't that reasonable?

Representative Quicili wondered how come it took something like having this bill proposed to get this offer.

Senator Noble said in Ray Tillman's testimony the group had two meetings with MRI. Was there an offer to do something at these meetings and what transpired there?

Representative Quicili said the representative from the mining company looked at the homes and nothing happened.

Senator Van Valkenburg wondered if there were some measures that the federal government could employ here, but have not?

Gary Langley answered that the federal government has guidelines for blasting.

Senator Van Valkenburg said that if there are no powers to employ mitigating measures, then what happens when the standards are violated?

Gary Langley doubted if anyone would violate the standards.

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They operate by the book.

Senator Story asked if the homeowners were organized in an association and if MRI put in writing about hiring a structural engineer.

Representative Quicili answered that the homeowners, commissioners, and himself were working to resolve this problem.

Senator Keating wanted to know if this would be a new state program. Is DSL dealing with explosives now?

Gary Amestoy said DSL didn't deal with explosives.

Senator Keating asked if the Fire Marshal's Bureau has any statutory direction for the regulation or monitoring of explosives.

Ray Blehm stated that the state fire marshal rules were based upon nationally recognized standards for safeguarding life and property associated with the manufacturing, transportation, storage, sale and use of explosive materials.

Senator Keating asked if this authority covers areas where there are homes and buildings.

Ray Blehm answered that under the uniform fire code there are sections on explosives that address a variety of topics dealing with explosives. Usually the fire department gets involved more in the lower class of explosives such as fireworks, and display fireworks, etc.

Senator Keating wanted to know if the state fire marshal worked in heavy explosives, such as monitoring blasting companies.

Mr. Blehm answered that the bureau consists of nine FTE's and is responsible for investigating fires, inspecting state buildings and other activities. The National Fire Protection Association (NFPA) codes on the use of explosive materials for blasting provide that when blasting is done in a congested area or in close proximity to a structure, railway, or highway or any other installation that might be affected, special precautions shall be taken to prevent damage and to minimize earth vibrations and air blast effects. Blasting masks and other protective devices shall be used to prevent fragments from being thrown.

Senator Keating replied that the fire marshal's office already has some authority concerning this situation, but it

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seems the office doesn't have the personnel.

Mr. Blehm agreed.

Senator Keating asked if MRI did any seismic monitoring at all.

Mr. Tillman said the company monitors with one seismograph each time it blasted, and sometimes used two seismographs.

Senator Keating asked where the monitoring devices were in proximity to the mine and where this damage is taking place.

Mr. Tillman answered that monitoring is done in people's yards, on their sidewalks or very near to their homes.

Senator Keating asked if the company ever thought of having a third party operate this seismograph.

Mr. Tillman said the blasting is done by a contractor who does the monitoring. A teacher from Montana Tech has done some monitoring.

Mr. Tillman also said that the blasting contractor does the monitoring and the company designs the blasts.

Senator Keating asked if the blasts were designed within the federal standards and if the regulations or codes provide for payment of damages in the event the blasting causes any damage.

Mr. Tillman said the blasts were designed within federal standards. He stated the part of the federal regulations he is familiar with concerns design and the criteria that are used in measuring the blast. He didn't know if there are any mitigating parts in the code.

Senator Keating asked if MRI was the only company doing blasting in Butte.

Mr. Tillman said MRI was the major one, though there is a smaller mine in German Gulch.

Senator Story asked how many homes are in the blasting area.

Representative Quilici said about 600.

Senator Jenkins asked when the company started using the seismograph.

Mr. Tillman said when operations were started in June 1986.

Senator Jenkins asked if they always blasted at certain times of the day.

Mr. Tillman said the blasts usually occur at noon about two times a week. There have been 286 blasts since June.

Senator Jenkins asked if a blast could be set so that shock waves would go one way or another.

Mr. Tillman said it is a part of the blasting design to minimize shock waves.

Senator Noble asked why the rest of the people in Montana should pitch in to solve a local problem.

Representative Quicili answered that this is a Butte problem now but at any given time it could be a problem any place there is mining.

Senator Eck asked if the company was meeting special criteria for blasting that are suggested for a congested area.

Mr. Tillman said that the company has to meet certain federal requirements and the blast is measured by a seismograph.

Senator Eck asked about the role of local fire departments and the fire marshal?

Mr. Blehm said there is a section of state law that deals with municipal ordinances that says cities or towns may adopt technical zoning, electrical, fire and plumbing codes. He said that particular section could be adopted on a local basis.

Senator Keating wondered if the blasts were designed with regard to the density in the area.

Mr. Tillman said they are.

Senator Keating wondered how close the structure are when blasting is done?

Mr. Tillman answered about 2,000 feet (less than one-half mile).

Senator Van Valkenburg asked if this was the same kind of blasting that the Anaconda Company did?

Representative Quicili said he didn't know if MRI was using the same kind of explosives.

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Senator Van Valkenburg wanted to know if there were many problems then?

Representative Quicili said there were some problems but they weren't as prevalent as they are now.

Closing by Sponsor: Representative Quicili closed by saying he would like to have a third party come in to look at this situation. There are no underground tunnels or mines in this area so old diggings can't be blamed for what is happening now. As far as setting up another bureaucracy, all that is requested is to have the DSL hire a structural engineer and buy a seismograph with a budget of \$28,970 over the biennium. It has taken the last year and one-half to finally get some recognition for these people. He said Butte people in the affected area remain pro mining. Representative Quicili then read a letter written to Representative Bob Pavolich. (Exhibit 6)

HEARING ON HB 657

Presentation and Opening Statement by Sponsor:

Representative Lum Owens, District #7, sponsored this bill to revise the laws relating to the control of timber slash and debris worked out between industry and the Department of State Lands (DSL).

List of Testifying Proponents and What Group they Represent:

Gary G. Brown, Dept. of State Lands
Mark Simonich, F. H. Stoltee Land & Lumber
Henry E. Lohr, Mt. State Vol. Firefighters Assn.

List of Testifying Opponents and What Group They Represent:

Al Kington, Self

Testimony:

Gary G. Brown submitted written testimony. (Exhibit 7)

Mark Simonich acted as chairman of a task force for industry and the DSL. The task force wanted to achieve goals through consensus by developing a new standard for hazard reduction which hadn't been in place previously. This standard could be implemented through new rules that will be promulgated next year. The task force wanted to make sure the program was being administered fairly and equitably to all classes of operators and

land owners. There was disagreement between industry and the DSL as to the number of full time employees required. The bill deals with the rate structure and could be applied easily without a great deal of bookkeeping work.

Henry Lohr supported the bill.

Al Kington stated the biggest problem with this bill is funding for additional FTE's, which he didn't think was necessary.

Questions from Committee Members:

Senator Weeding asked if the bill developed by the task force had consensus among a members.

Mark Simonich said there was a great deal of consensus. The industry put together the requirements they wanted and after the bill was drafted, they got together with the department to make sure there was an agreement. The task force consisted of six members from industry, four or five from the department and also people who were not voting members, but specialists.

Senator Eck asked about page 13, line 3-5, "a fee of 60 cents for each 1,000 board feet (log scale) or equivalent must be charged if products other than logs are cut." What products other than logs are cut?

Mark Simonich answered boughs, posting poles and anything other than saw logs that has commercial value.

Senator Van Valkenburg asked if any consideration was given to the air quality problem with slash burn.

Gary Brown said "yes," the smoke management program is a separate program from the fire reduction management law. There is a process to deal with the burning and control of slash.

Representative Owens closed the hearing on HB 657.

DISPOSITION OF HB 657

Discussion: Hearing on HB 657 is closed.

HEARING ON HB 672

Presentation and Opening Statement by Sponsor:

Representative Ben Cohen, District #3, sponsored this bill at the request of the Flathead County Planners.

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This act addresses the exclusion in the solid waste factor that allows persons to dispose of solid waste on their own property. The major concern of the bill is that out-of-state corporations could come in and use Montana as a dumping ground and that individuals should be protected in some way from having this occur adjacent to their land. An amendment was proposed. (Exhibit 8)

List of Testifying Proponents and What Group they Represent:

Chris Kaufman, Montana Environmental Information Center
Kim Wilson, Sierra Club
Jim Leiter, DHES
Sue Winegartner, Montana Solid Waste

List of Testifying Opponents and What Group They Represent:

Lum Owens, Representative
John Fitzpatrick, Pegasus Gold Corporation
Janelle Fallon, Montana Petroleum Association
Jerome Anderson, Shell Oil Company
Ted Doney, Colstrip Energy Ltd. Partnership
John Alke, Montana Dakota Resources
Don Allen, Montana Wood Products
Ken Williams, Entech

Testimony:

Chris Kaufman stated that a municipal landfill serving 5,000 people or a company dumping its own waste on its own land has a potential problem with ground water contamination. She said this is a problem out there that needs to be addressed. She doesn't want Montana to be a solid waste dumping ground for the nation.

Kim Williams said Montana must prevent land fills and disposal sites from being located next to residential areas.

Sue Weingartner supports the bill with the amendment.

Representative Lum Owens is on the House Natural Resources Committee and thinks this bill should be killed because of the amendment.

John F. Fitzpatrick stated the mining industry is generally exempt from the statutes in this particular bill because the majority of their waste is mine waste and that is not included in this statute. His company produces other kinds of waste such as office waste and that is sent to the landfill in Boulder. The mine also

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has wastes like solvents and lubricating greases and some are considered hazardous waste.

Janelle Fallon stated that wastes from oil and gas production are covered by Title 82, MCA which are the oil and gas statutes. The state requires measures to be taken to prevent contamination or damage to surrounding land or underground streams caused by a drilling operation including but not limited to regulating the disposal or injection of water and disposal of oil field waste."

Jerome Anderson opposed this bill. Mr. Anderson stated the environmental community tells the committee that under the present act they fear larger companies will come in and make a large dump out of the state. The present law says that a person owning his own land can dispose of his own waste provided he does not create a nuisance or public health hazard.

Ted Doney represents a small coal mine near Colstrip. The plant is under construction and under current law, a water quality permit is required for the disposal of hazardous waste from a power plant on your own property. The water quality permit was granted in a year and a half. Under current law if a company obtains a water quality permit, a solid waste disposal permit is not needed. Under this law a solid waste permit will also be required. Mr. Doney is asking for an amendment to exclude persons, corporations and partnerships from this bill if they have a water quality permit for the same site.

John Alke said Montana Dakota Utilities' pipeline company is active in the production of natural gas. All of the production is very shallow fresh water drilling. Under current law, that waste can be disposed of and stockpiled on the land if it is done by the landowner. None of that can happen if this bill is passed.

Don Allen said whether land is owned or leased, many small mills would have problems particularly if forest products are covered.

Ken Williams views this bill as an extension of authority for the department. A large number of people will be needed to administer the program.

Questions From Committee Members:

Senator Keating asked if the department would need more staff to monitor all of the areas.

Jim Leiter said the department has one and one-half field people now and can't keep up with what it has to regulate.

Senator Keating asked if there was a fiscal note on this bill?

Jim Leiter said the department has not prepared one.

Senator Noble asked how this measure would affect tire piles?

Jim Leiter said if the tire pile was a disposal, a solid waste site license would be needed.

Closing by Sponsor:

Representative Cohen stated that disposal of wastes is a serious problem that is not going to go away. He stated that maybe the Environmental Quality Council should go out there and examine the scope of the problem. He thought there were a lot of people taking advantage of the exclusion. He said the fact that the solid waste bureau is not funded does not mean that our ground water is not at risk. He would rather have the bill killed than come out with forest products exempted and without recognizing any concerns of the petroleum industry that Mr. Doney brought out. Representative Cohen said the problem is out there and it's a serious one.

Senator Keating asked the department for a fiscal note.

DISPOSITION OF HB 657

Discussion: Hearing on HB 657 is closed.

ADJOURNMENT

Adjournment At: 2:55 p.m.


THOMAS F. KEATING, Chairman

ROLL CALL

NATURAL RESOURCES COMMITTEE

50th LEGISLATIVE SESSION -- 1989

Date 2-10-89

NAME	PRESENT	ABSENT	EXCUSED
Chairman Tom Keating	✓		
Vice-Chairman Larry Tveit	✓		
Senator Fred VanValkenburg	✓		
Senator Loren Jenkins	✓		
Senator Darryl Meyer	✓		
Senator Lawrence Stimatz	✓		
Senator Pete Story	✓		
Senator Bill Yellowtail	✓		
Senator Elmer Severson	✓		
Senator Cecil Weeding	✓		
Senator Dorothy Eck	✓		
Senator Jerry Noble	✓		

Each day attach to minutes.

SENATE NATURAL RESOURCES

EXHIBIT NO. #1

DATE 3-10-59

BILL NO. HB 274

Montana Resources Inc.
600 Shields Avenue
Butte, Mont. 59701

We, the undersigned residents protest the magnitude of the blasting at the Montana Resources open pit in Butte, Silver Bow which shakes our houses and has caused visible structural damage in some instances. We ask that the Montana Resources Mining Company lessen the charges and that they (Montana Resources Inc.) be responsible for present and future damage.

EXHIBIT # 1 INCLUDED 7 PAGES OF SIGNED PETITIONS WHICH ARE HOUSED AT THE HISTORICAL SOCIETY.

BUTTE-SILVER BOW
DEPARTMENT OF PUBLIC WORKS

Courthouse
Butte, Montana 59701
Phone: (406) 723-8262



SENATE NATURAL RESOURCES
EXHIBIT NO. # 2
DATE 3-10-89
BILL NO. HB 274

December 13, 1988

To Whom It May Concern:

Upon the request of Mrs. Caroline Janson, 2617 Silverbow Boulevard, I made an inspection on the afternoon of December 6, 1988. Mrs. Janson said "that recent mine blasting activities had caused extensive damage to the fireplace's brick work".

Background Information:

Mrs. Janson applied and qualified for the Butte-Silver Bow Community Development Housing Rehabilitation Program in the Greeley area. I inspected the residence and prepared a write up and put it out to bid on June 29, 1988 for the rehabilitation of the residence. The work included plumbing, heating and electrical work plus the required carpentry work to accommodate the aforementioned systems as well as minor repair work. Included in the minor repair work was the resetting of the loose bricks of the fireplace's heatalator out flow grill (vertical brick grill above the fireplace opening). To the best of my recollection, at that time one (1) brick could be removed and only 2 or 3 bricks were loose and could be wiggled.

The carpentry work by a contractor was dropped and Mrs. Janson's son took over all carpentry work as a cost saving measure. Mrs. Janson's son was to repair the grill but this work was never done. The major portion of all the contractors' work was completed around the end of September which concluded my regular on-site inspections.

Observations at December 6, 1988 Inspection

The changes that have occurred since I last observed the fireplace are as follows:

- Virtually all bricks of the heatalator grill are now loose
- The lintel over the fireplace opening has shifted and moved out from the vertical face by 1/4 of an inch.

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Ex. #2
3-10-89
H/B 274

- Various cracks exist along the mortar joints which wind up the face of the fireplace vertically.

I.E. cracks located to the left of the fireplace opening and above at the center line.

The aforementioned damage has occurred just recently and was not present at my initial or noticed at my regular inspections. No work was performed by the contractors or by Mrs. Janson's son that would have affected the fireplace. There were no structural modifications done to the residence. The fireplaces brick work is supported by a substantial concrete foundation. Lack of adequate foundation is not the source of the fireplace's failure. There is no sign of subsidence in the concrete foundation.

There are no indications that the cause of the fireplace's failure is because of any work performed on structure or any deficiencies of construction or on site sources.

Sincerely,

Mark Reavis

Mark Reavis
Butte-Silver Bow
House Rehabilitation Architect

Pit blasting bill goes to Senate

A bill to have the state monitor hardrock mine blasting will be discussed Friday at 1 p.m. before the Senate Natural Resources Committee. The panel meets in Room 405 in the Capitol in Helena.

Butte-Silver Bow Commissioner Joe Ivanich said the committee is expected to take testimony from those interested in the measure, sponsored by Rep. Joe Quilici, D-Butte.

~~Mining interests have opposed the bill, saying it is unnecessary and would add state intervention in areas already covered through other laws.~~

But Ivanich, who represents the district near the Continental Pit where people have complained that blasting has damaged their homes, sees it as an improvement.

"It will provide some good balance between mining companies and the people, without causing business problems," he said. "It will provide what the people need, an independent party" to monitor the blasting.

Ivanich said the bill passed the House "basically unamended."

SENATE NATURAL RESOURCES

EXHIBIT NO. #3
3-10-89
BILL NO. HB 274

DEPARTMENT OF STATE LANDS

Ray

SENATE NATURAL RESOURCES

EXHIBIT NO. #4

DATE 3-10-89

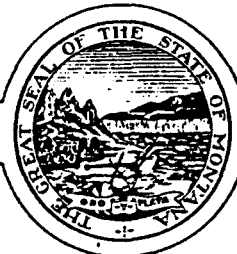
CAPITOL STATION

TED SCHWINDEN, GOVERNOR

STATE OF MONTANA #15274

(406) 444-2074

1625 ELEVENTH AVENUE
HELENA, MONTANA 59620



December 14, 1988

Representative Joseph Quilici
730 South Arizona Street
Butte, Montana 59701

RE: Montana Resources Inc., Blasting Complaints

Dear Representative Quilici:

This letter summarizes the results of the Department of State Lands investigation into the blasting procedures at the Montana Resources Mining Incorporated (MRI) mining operation in Butte.

On the morning of November 29, 1988, Dave Paszkiet of this Department met with you, Butte/Silver Bow Commissioner Joe Ivanich, and Montana Standard Reporter Eric Williams in Butte. The purpose of the meeting was to visit with several concerned citizens who have indicated that their property is being damaged by excessive vibrations being generated by the blasting activities at the MRI mining operation.

The residences of Caroline Janson, Don Greenleaf, Esme' LaBreche and Ann Fisher were visited. The homeowners provided Dave with a summary of the dates and times of the blasts that resulted in their complaints. They also indicated that they had some photographs that they believed documented that the cracks were developing as a result of the vibrations from the blasts. Dave also took some photographs of the cracks.

That afternoon, Dave went to the MRI mine office and met with Steve Walsh and George Burns of MRI, and Kiel Kemp of IRECO. The blasting and seismograph records for November and the severe blasts that had been identified by the homeowners were thoroughly reviewed. All records indicated that none of the standards for ground motion and airblast set forth by the U.S. Bureau of Mines and the Office of Surface Mining Reclamation and Enforcement (OSMRE) had been exceeded. However, there were some seismograph records identifying airblasts above a level that would likely be perceived by the homeowners as causing annoyance and complaints. This level is at 110 dBL (2 Hz high-pass) as identified in the OSMRE "Blasting Guidance Manual." According to this manual, page 115, an airblast may be perceived as follows:

"It is usually perceived as anything from a dull thump to a loud bang. A loud bang is not always a "high" airblast, and converse-

ly, a dull thump may in fact be one. It might even be inaudible! The house may well react, or respond, the structure may creak, the windows may rattle, and, if a person is not expecting it, it may be quite startling. It is most unlikely ever to cause damage."

MRI officials reported that the blasting operation had been aware of the citizens complaints for quite some time and have been experimenting with various blasting techniques to attempt to remedy the concerns outlined by the citizens. They reported that in one specific instance the company received six complaints after shooting over 140 holes in one area of the mine, and then when returning to the same area to blast the next lower bench, after shooting only one-half as many holes, received 12 complaints.

MRI also indicated that they have been aware of the federal standards and regulations for quite some time. They reported that the company has been using and will continue to use these standards and regulations to control its blasting procedures although these standards are not specifically required by law.

In an attempt to determine whether or not they are complying with the standards, MRI is monitoring all its blasts using one or two seismographs. The monitoring is usually done by IRECO, the blasting contractor. In addition, there are other measures that MRI plans to try to attempt to lessen the impact of its blasting operations on the homeowners. These items are described below:

1. Most of the complaints generated by citizens occur when MRI conducts its blasting operations in a zone of alluvium material. MRI has mentioned that this zone appears to generate lower frequency vibrations, which are highly perceived by the home owners. Due to the likelihood of having these lower frequency vibrations in this zone, MRI will experiment in delay sequencing, that is adjusting the time interval of when the individual holes will detonate. This procedure can result in controlling the vibrations.
2. MRI will try to provide a free face (rock face exposed to air) in this zone to relieve some of the confinement. Due to the location of this zone being at the edge of the pit, it has been previously blasted using a V-cut. This V-cut pattern is used to start the mining sequence of the next bench to be mined. MRI will try to start its V-cuts at the other end of the pit as production allows. The material at the other end of the pit is harder crystalline material (quartz monzonite). This harder material generates higher frequency vibrations which appears to result in less complaints when blasted.

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3. MRI is digging unblasted alluvium material when feasible. Sometimes conditions permit the mining of this material without prior blasting. However, this practice is limited by production scheduling and equipment costs.
4. Kiel Kemp of IRECO has been responding to individual complaints when telephoned. Mr. Kemp has been visiting some of the home owners to discuss their concerns. It appears that MRI wishes to continue this practice in the future. This may improve relations between MRI and the citizens.
5. MRI has a video tape available to the public regarding blasting. This tape may alleviate some of the homeowners concerns by educating the general public of safe blasting and design procedures used to control adverse effects. The video tape is for a VHS-VCR and made available upon request through the company.

In the short term, an operating modification that could possibly reduce some of the ground vibration intensity is that MRI will not be blasting the alluvium material after the Spring of 1989 for several years. After that time, this material will not be encountered again until approximately 2,000 feet further north of the present operation. This may substantially reduce the vibration intensity on the neighborhoods in question.

The Department has recently sent a copy of the OSMRE "Blasting Guidance Manual" to MRI as a reference document outlining procedures used to control the adverse effects of blasting on coal mining operations. This manual also includes damage criteria, recordkeeping procedures, methods to conduct pre- and post-blasting surveys and a chapter describing citizen interests. MRI may find this document informative to understand the guidelines used by regulatory authorities in the coal industry for pursuing citizen complaints and evaluating possible damage.

In addition, the Department has suggested to MRI that they may want to conduct surveys of the various residences to document any additional damage to the structures. This documentation should provide the homeowners and MRI with additional information to monitor the future damage to these structures. However, it must be emphasized that this documentation will not provide any information on the cause of the existing damage, only that damage does in fact exist at the time of the survey and the extent of that damage. MRI has indicated that they are considering discussing this issue with their consultants to determine the feasibility and utility of conducting house surveys.

Mr. Joseph Quilici
December 14, 1988
Page 4

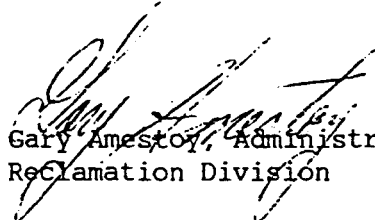
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In closing, the Department is willing to attend another public meeting if requested. Please contact me for future arrangements concerning this matter.

Sincerely,



Gary Amestoy, Administrator
Reclamation Division

DP/ss

c: Don Peoples, Chief Executive (Butte/Silver Bow)
Commissioner Joe Ivanich (Butte/Silver Bow)
Steve Walsh (MRI)
Dave Paszkiet (DSL)

SENATE NATURAL RESOURCES

EXHIBIT NO. # 5

DATE 3-10-89

BILL NO. HB 274

SEISMIC EFFECTS OF OPEN-PIT MINE BLASTING,
BUTTE, MONTANA.

FOR

MONTANA RESOURCES, INC.

BUTTE, MONTANA

BY

LEWIS L. ORIARD, INC.

HUNTINGTON BEACH, CALIFORNIA

DECEMBER 31, 1988

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EXHIBIT # 5
3/10/89

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December 31, 1988

Montana Resources, Inc.
P. O. Box 188
Butte, Montana 59703

Attn: Mr. Frank Gardner

**SEISMIC EFFECTS OF OPEN-PIT MINE BLASTING,
BUTTE, MONTANA.**

Gentlemen:

In accord with your request, I have traveled to Butte, Montana to make a review of your current open-pit blasting operations and to evaluate any potential for damage that these blasting operations might have on residences in the area.

In order to conduct this investigation, I have met with various members of your staff and associates to become familiar with the details of the blasting operations, and have reviewed portions of the blasting logs and seismic data. I have been informed of the blasting complaints which have been received from residents of the area, and have seen photographs of cracks which were thought to be caused by the blasting. I have met with Mr. Peoples, Mr. Quilici and Mr. Ivanich, who have provided me with further observations and comments from the residents of the area. I understand clearly that some people living in the area believe that their houses have been damaged from the blasting operations, and that some have observed the falling of objects in their homes. In addition, I have read a report dated December 14, 1988, from the Montana Department of State Lands, summarizing their investigation of your blasting operations. Further, I have made a repeat inspection of one of the older homes in the area, which I have inspected periodically since the first time in 1979.

I am familiar with Butte mining operations. I have provided technical assistance on blasting techniques and blasting effects in Butte since 1955, at the Berkeley Pit, the Alice Pit, the Gagnon Pit and the Continental Pit. I have inspected many homes in Butte, and have spoken to many of the residents of the area.

I am now prepared to report to you the results of my recent investigation.

THE BLASTING OPERATIONS.

The blasting operations follow a concept similar to those which have been practiced in Butte since the 1960's, and typical of many open-pit bench blasting operations around the United States. Basically, the design is that of a series of vertical holes, loaded with a blasting agent, then detonated in a rapid sequence using blasting caps with a built-in timing system called a "delay". To the average listener a half mile away, this might sound like a single detonation, a sort of continuous but brief rumbling sound. In fact, however, there is a rapid sequence of many separate detonations.

THE USE OF DELAY INTERVALS IN BLASTING DESIGN.

It is very important to understand the concept of the rapid firing sequence of "delays", for the reason that the vibration intensity is determined by the amount of explosive which detonates on any single delay period, not the total amount of explosive in the entire blast. This factor forms the basis for the prediction and control of blasting effects, and is incorporated into many of the specifications, regulations and laws governing the use of explosives. Such rules limit the amount of explosives per delay interval, not the overall size of the blast.

Perhaps one way of illustrating how this concept works is to think of, say 100 people standing along the shore of a pond, each one holding a brick. At a given signal, the first person drops his brick into the water, and very quickly each of the other persons drops his brick in rapid succession. The result is a

series of small water waves starting from each brick. Of course, the results would be quite different if all 100 of the bricks were mortared together into a huge block and the block dropped into the water. We would then get a single, much larger wave.

RECORDINGS OF GROUND VIBRATION AND AIR PRESSURES.

Portable seismographs are being used to record the ground vibrations and air waves generated by the blasting operations. This data can be added to that which has been recorded in Butte since 1955, since the opening of the Berkeley Pit. More than 7000 seismograph records have been obtained for Butte blasting. Thus, the ground response characteristics are well known for the city and the surrounding valley areas.

From this large data base, we can prepare a graph showing how the vibration intensity dies out with distance from the blasting source. Such a graph is shown in Figure 1. We can make a generalized statement to the effect that the vibration dies out to roughly 1/3 of its previous intensity each time we double the distance.

Air waves do not die out quite as fast as ground vibrations, and are affected by weather conditions, but are of less concern to buildings than are the ground vibrations. Filling the upper portion of the blast holes with inert material such as dirt and drill cuttings on top of the blasting agent serves to keep the air waves under control. Just as is true for ground vibrations, it is well known what air pressures are safe and what have potential for causing damage.

SAFE LEVELS FOR BLASTING OPERATIONS.

Safe levels for ground vibrations have been established and verified many, many times over the years, and are defined by regulations in some areas. The first government-sponsored investigations began in the 1920's and 1930's, and produced the first recommendations provided by the federal government to the industry so as to avoid any damage to the public. Such investigations

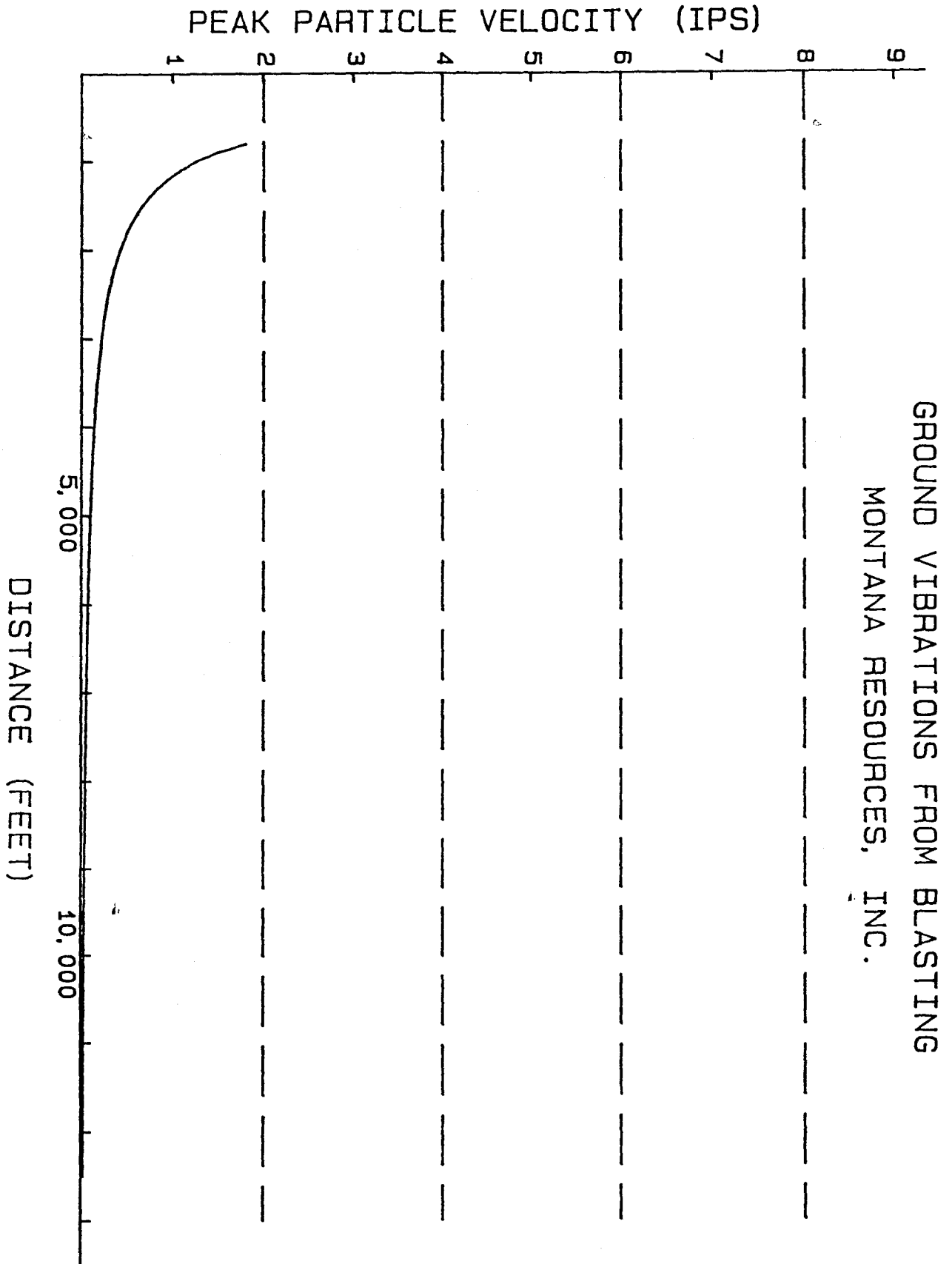


Figure 1

have been repeated and/or continued periodically to the present time. As a result of these investigations, and the regulations which have been adopted in some areas, it has become widely accepted to limit vibrations from open-pit mining to a particle velocity of 1.0 inch per second (this is simply a way of expressing the intensity of the vibration, similar to acceleration or displacement). The most severe restrictions have sometimes limited vibrations to as little as 0.5 inches per second. This value is not considered harmful, but is sometimes recommended to reduce the public perception of the blasting.

Air waves are rarely a matter of concern to buildings, but are responsible for many of the sound effects that are heard by people inside their homes. Therefore, it is customary to limit the allowable pressures from these air waves, in addition to limiting the ground vibration. The pressures from air waves are often called airblast overpressures, where overpressures means the pressure of the air above that of atmospheric pressure, which is always present. It is customary to limit the overpressures to about 0.01 psi for open-pit mining. Many construction specifications permit about 0.03 psi. Occasional cracking of windows can occur at about 0.10 psi and extensive window breakage is expected at about 1.0 psi.

PREDICTION FORMULAS AND GRAPHS.

Because seismic waves follow consistent principles of geophysics, we can prepare curves and formulas to calculate the intensities of events which were not recorded. That is not necessary in the present case, since all of the blasting has been recorded. However, these principles of geophysics also enable us to calculate the vibration intensities at any other location of interest where there was no seismograph at the time of the blast. When a seismograph was used in the area to record known blasting, a study of the seismograph record quickly reveals the ground response characteristics of the area. These do not change, as they are a permanent characteristic of the geology. We can easily determine the intensity and characteristics of vibration

from that blast at other locations in that area.

The effect of distance is illustrated in Figure 1. One can see that the vibration very quickly drops from its high levels near the blast, and then carries on at lower levels for a long distance. That is why people can feel or hear its effects so far away. It is not expected that the average person reading this report will be interested in making calculations, but the appendix contains additional information for those who are interested.

VIBRATION INTENSITIES FROM MRI BLASTING OPERATIONS.

The open-pit covers quite a large area, so that blasting locations may be closer to a given residence on some days, and farther away on other days. Also, all the blasts are not perfectly identical. Consequently, there is variation in the vibrations transmitted to the homes in the area. Typically, the vibration intensities have been in the range of about 0.02 to 0.08 ips (inches per second), most remaining below 0.1 ips. The maximum vibration to date was generated by the blast of November 21, 1988, when a peak of 0.35 ips was reached. This blast was noticed by many people, and was the source of phone calls and complaints, as the vibration was several times stronger than usual for the area.

SUMMARY OF DAMAGE POTENTIAL.

My review of the blasting operations and the recorded measurements of vibration and airblast supports the conclusions expressed by the Montana Department of State Lands, namely that

"All records indicated that none of the standards for ground motion and airblast set forth by the U.S. Bureau of Mines and the Office of Surface Mining Reclamation and Enforcement (OSMRE) had been exceeded".

The blasting effects have been well below those that are capable of causing minor cracking in houses.

The response of the average person will very likely be that it must have been the blasting that caused the damage he is

examining. What else could it have been? Unfortunately, there are very many things it could have been. There are many unseen, silent forces working on all of our houses all of the time.

Also, it is important to understand something about the vibration perceptions of people. In other words, why would the average person be concerned about a vibration that decades of research prove is not strong enough to cause damage to his house? Why would he be so firmly convinced that it must have? It is important to understand this. Therefore, we must not only study houses, but how we perceive and respond to vibration and sound.

BUTTE TEST HOUSES.

Some persons in Butte have been concerned about the damage potential of blasting operations since the beginning of open-pit mining operations in the Continental Pit. As one means of providing information on the subject, a series of "test" houses have been periodically inspected over the years. Some of these were very close to the pit, and were eventually removed as the pit expanded onto that property. None of these were damaged by the blasting operations. Two additional houses are farther away, still in existence. These two were first inspected in 1979, and have been inspected a number of times since then. They have not been damaged, either, by the blasting operations, although they have undergone changes from environmental forces. Some of these changes, of course, are cyclic and seasonal, as is common with some of the environmental forces that cause them.

THE RESPONSE OF HOUSES.

Because of the concerns that people have about their houses when they perceive motion or sounds within them, blasting effects on houses have been studied thoroughly for decades. These serve as the basis for the regulations and recommendations to prevent blast damage. Unfortunately, it is not so easy to prevent damage to houses from all the environmental forces that continually act on them. Some of these act on the superstructure above the ground line, others act from the ground surface downward.

Even after a house is constructed, if we assume that it was properly constructed, it must be properly maintained to slow down its normal aging process and the deterioration that occurs through the invasion of natural destructive agents such as water, wind, chemical decay, mechanical deterioration, loss of elasticity and friction, warping, humidity changes, drying, freezing and thawing, corrosion, erosion, settlement, rust, lichens, algae, topography, expansive soil changes, vegetation incursion, and others. With the passage of sufficient time, and without proper maintenance to counterbalance the effects of these destructive agents, the structure or material can undergo serious deterioration. No building can escape, since environmental forces are present everywhere. As we see from examining old ruins, the result of many of these forces is the breakdown and eventual destruction of the material or building.

Because these environmental forces rarely make any noise, and often (though not always) work slowly, many people are not aware of them, but will be startled and concerned if they feel vibration or hear the rattles and creaks that often accompany vibration.

STUDY OF ENVIRONMENTAL FORCES.

A group of researchers from Texas A & M University conducted a study of some 400 slab-on-grade houses in relation to the effects of factors below the ground surface, with particular emphasis on the clay in soils that so often causes damage. ("System Interaction of Expansive Soils With Light Foundations", Association of Engineering Geologists, 1980). They identified nine independent variables of importance:

1. Antecedent rainfall ratio. (Rainfall before construction).
2. Age of the slab.
3. Lot drainage.
4. Topography.
5. Pre-construction vegetation.
6. Post-construction vegetation.

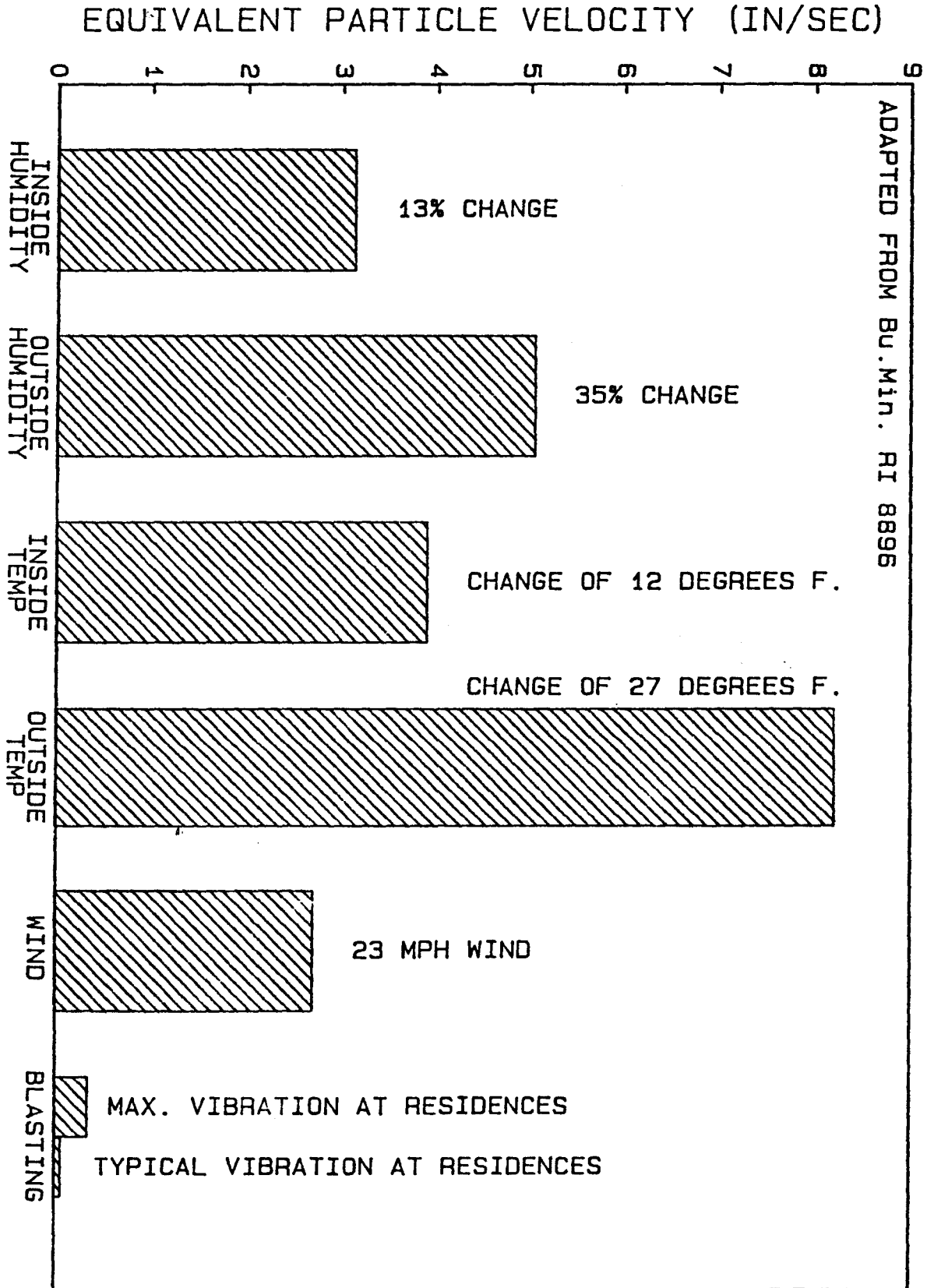
7. Foundation shape measure.
8. Effective plasticity index.
9. Depth of the active zone of expansive soil.

Of course, in Butte, it is important to add at least one other factor to this list, that is freezing and thawing, a very important element in determining the expansion, contraction and settlement of foundations, walks, driveways and patios. Freezing and thawing has caused a great deal of residential damage in Butte.

House construction details have an important effect on how it ages, expands and contracts, where curing and environmental cracks appear, and the like. (This is also true, of course, about the manner of preparing the soils and the foundation supporting the house). Because there are so many differences in materials and design of houses, a single list would not apply to all houses. One older publication provided a listing of 40 reasons related to common construction details showing why houses crack (Architects' Small House Service Bureau of the United States).

Recent studies by the U. S. Bureau of Mines help us make a more direct comparison between vibration effects and those from a few of the more common environmental forces. Bureau researchers carefully instrumented a test house and monitored its response to changes in inside and outside temperature, changes in inside and outside relative humidity, and wind. They also monitored its response to large-scale blasting operations. This information is reported in Bureau of Mines Report of Investigations 8896, "Effects of Repeated Blasting on a Woodframe House". With this data, we can show how much ground vibration would be required to generate the same amount of strain as was generated by certain changes in temperature or humidity or by the wind against the house. This information is presented in Figure 2. Also plotted on Figure 2 is a comparative illustration of the amount of vibration generated by MRI blasting operations. It should be noted

Figure 2



TYPICAL ENVIRONMENTAL STRESSES
AND EQUIVALENT GROUND VIBRATIONS

that the weather conditions in Butte are far more severe than those observed by the Bureau of Mines in their test house. Seasonal changes often include relative humidity changes as great as 80%, changes in temperature of well over 100 degrees, and winds far higher than the 27 MPH tested by the Bureau.

Figure 2 provides a dramatic illustration of how powerful are ordinary environmental forces, as silent and unseen as they are. Unless a person measures the strains in a building, he would probably not be aware of how much it expands and contracts with changes in temperature and humidity. I have measured changes of 1% to 5% in the dimensions of old studs between winter and summer in one test house in Butte, and have measured a 5% volume shrinkage in timbers in one house I occupied a few years ago. These strains cause cracks to appear and grow, and to expand and contract seasonally.

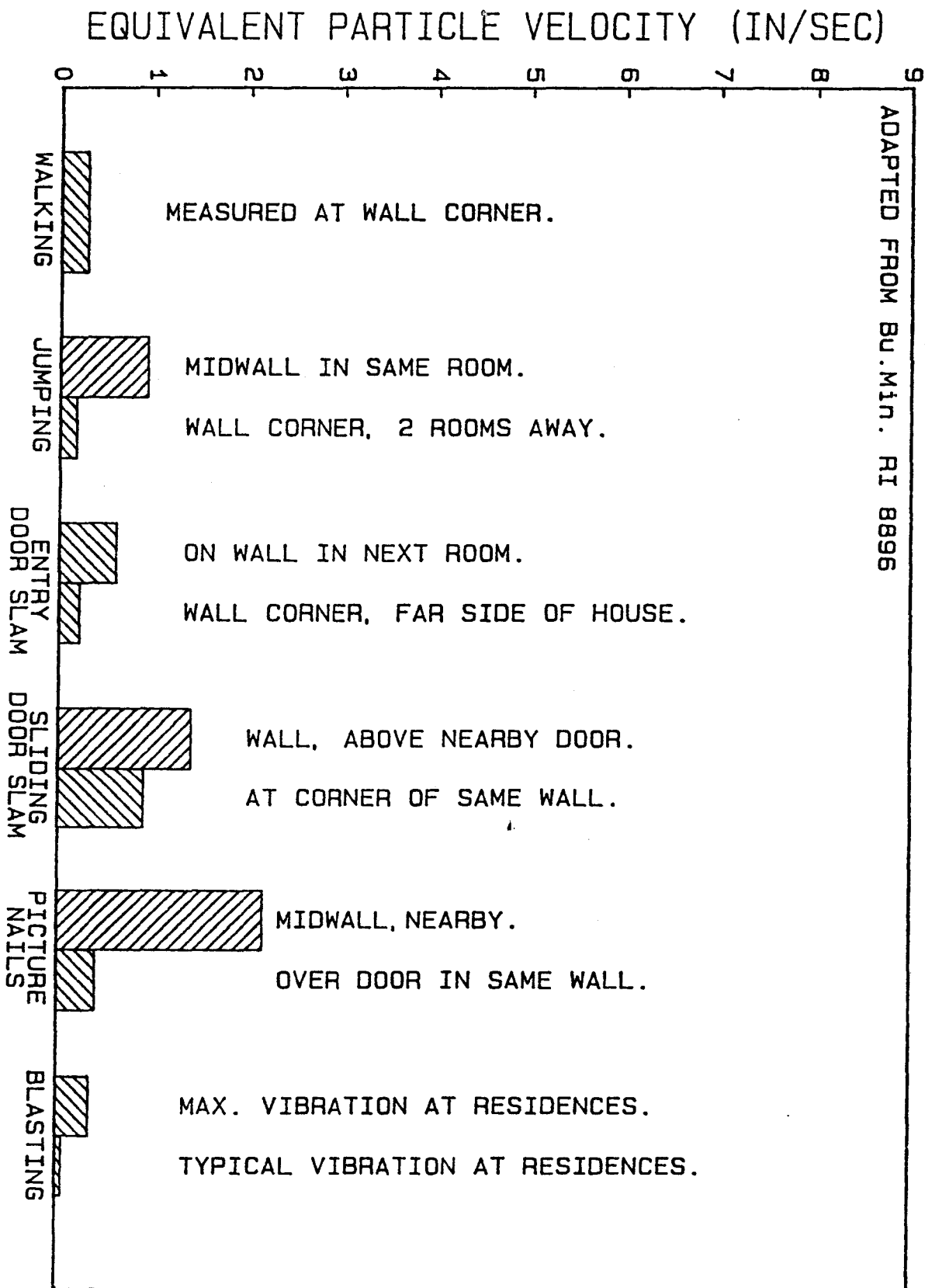
In another comparison, the Bureau of Mines has provided data showing how much vibration was generated during everyday activities by the occupants of houses, such as pounding nails, walking, jumping, slamming doors, and the like. This type of information is presented in Figure 3. Of course, these effects are more localized than environmental forces. For example, slamming the front door might generate an intense vibration nearby, but would die out quickly and not have much effect on the far side of the house. It is not unusual for things to fall off shelves, and pictures to move askew on walls near where doors are opened and closed.

As can be seen from these two graphs, environmental forces are by far the more serious sources of damage.

FALLING OBJECTS.

To the average person, the falling of an object during the passage of an externally generated vibration is very dramatic. Few people are well enough informed on this topic to realize that the occasional falling of objects does not represent sufficient

Figure 3



VIBRATIONS FROM TYPICAL EVERYDAY ACTIVITIES AND EQUIVALENT GROUND VIBRATIONS
 EXHIBIT # 5
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intensity of vibration to cause damage to a house. Of course, if the vibration were sufficiently intense to cause damage to a house, there would be falling objects. The important difference is that most loose objects would be toppled or displaced, not just a few. In the order of sensitivity to vibrations, some animals are the most sensitive, then people are next, then loose objects, and finally buildings. Loose objects are more sensitive than anything that is fastened down or part of a building. When many objects of different sizes and shapes fall, it is reasonable to start looking for the first signs of damage to old plaster. When plaster damage is extensive, we would look to more serious damage, such as cracking of chimneys.

Perhaps the best way to develop some perspective of the relative importance of some of these things is to read the Modified Mercalli intensity scale for earthquakes. There are some differences between the longer duration and greater displacements of earthquakes compared to blasting, but it is valuable to note the order of sensitivity of people, objects, and elements of building damage.

I have taken the Modified Mercalli scale, divided it into three columns and abbreviated it for easier reading. To make it easier to compare the different columns, I am presenting the scale on a separate page. If the reader would like to read further on this topic, he might wish to refer to "Elementary Seismology", by Richter, published by Freeman, 1958.

RESPONSE OF PEOPLE.

No matter how well we understand the behavior of houses to vibrations and environmental forces, we will not fully appreciate situations like the present one until we are personally present in many houses when vibrations occur, where we can analyze our own perceptions and those of many other people.

All of us are very much more sensitive to sounds and vibrations than our houses. We can all easily feel a vibration

ABRIDGED SUMMARY OF MODIFIED MERCALLI SCALE

<u>MM</u>	<u>PEOPLE</u>	<u>OBJECTS</u>	<u>STRUCTURES</u>
I	Not felt.		
II	Felt, persons at rest.		
III	Duration estimated.	Hanging objects swing.	
IV	Jolt.	Objects swing. Windows, doors, dishes rattle. Glasses clink.	Walls and frames may creak.
V	Felt outdoors. Sleepers awakened.	Liquids disturbed. Objects displaced or upset. Doors swing. Shutters, pictures move. Pendulum clocks affected.	
VI	Felt by all. Many frightened and run outside.	Windows, dishes broken. Items off shelves. Pictures off walls, furniture moved, overturned.	Weak plaster and Masonry D cracked.
VII	Difficult to stand.	Furniture broken.	Cracks in masonry D. Weak chimneys broken at roof line. Fall of plaster, loose bricks. Few cracks in masonry C.
VIII			Partial collapse. Damage to B. none to A. Fall of stucco, walls, chimneys. Houses moved on foundations.
IX	General panic.		Masonry D destroyed, C collapsed, serious damage to B. Structures off foundations.
X			General destruction. Large landslides. Soil failures. Rails bent slightly.
XI			Pipelines out of service.
XII			Damage nearly total. Objects thrown.

that is only about 1/100 of that needed to cause a minor crack, and most of us would agree that it could be called a strong vibration at about 1/4 of what might be needed to cause a minor crack in an average house. All of us are predisposed to believe that our houses have about the same sensitivities that we have. If it feels strong to us, we believe intuitively that it must be potentially damaging to the house. During the first few years of my professional practice, it required a considerable amount of factual test data and observation on houses for me to finally understand this. My reactions were the same as any other ordinary person, and it seemed to me that damage must surely accompany vibrations that I perceived as strong. Careful research, and the studying of much information from many sources, finally convinced me that I could not rely on my perceptions. I would have to obtain physical data.

Understanding this point is still not enough. It is equally important to understand thoroughly at least two more very important facts. One is that we are not only very sensitive, but we are not very accurate observers. I have learned that I cannot rely just on my visual observations and recollections alone. Even though I have studied many hundreds of houses, including every house that I have lived in, I know that I cannot tell whether or not there has been any change unless I check carefully the dimensions that I have measured before and carefully written into my records. Even more difficult to understand is how we can think we've actually watched a crack travel across a wall or ceiling, only to discover later that it was sealed over with old paint, or had other clear evidence of age or cause that proved it had no relationship to the recent vibration. I've had that experience myself, and can fully appreciate how puzzling it is. I've also seen that puzzled look on the faces of others when looking at the old seal of paint over a crack, or grass growing in it, or other clear evidence of age, when they thought they had just watched it appear for the first time. The simple fact is that we are just not very accurate visual observers, and must rely on very careful, written notes, sketches and measurements to

know if something is different from the last time we looked.

The other half of that puzzle requires an answer to the question, "If the blasting did not cause the crack, what did, because nothing else has happened here." With the information I've provided above, I hope the reader will begin to appreciate how much silent stress and strain is going on all the time in his house. I've personally lived in houses where certain large, unsightly cracks were a complete frustration in the sense that they could never be permanently patched. They changed dimensions between seasons and ruined my previous patching. This is very common. Also, it is well known that more cracks continue to appear and grow as a house gets older, whether or not it has ever been subjected to vibration. This is part of the aging process. Therefore, our research on buildings must continue through seasonal changes and long-term changes to understand fully what takes place.

If we want to learn whether or not vibration is adding to these effects, we can make inspections before and after, as well as subjecting test houses to continuous vibrations for long periods of time.

REPEATED BLASTING.

Intuition would guide us to expect that repeated blasting over a long period of time would be potentially harmful, even if individual vibrations were not severe. This believe is strongly reinforced by all of the well-known events where metal fatigue has occurred, followed by disasters, wrecks, or injuries.

Again our intuition is wrong, and that is fortunate in this case because it eliminates a source of concern. Testing and observations for many years have clearly shown again and again that materials, beams, houses and other structures can be subjected to a long series of vibrations if they are not strained to more than about 1/2 of the yield strain. Above that, the life of the item is increasingly shortened accordingly to the strain

level. Of course, even just one event beyond yield strain is damaging. At lower levels, the number of vibrations can be increased to where it is no longer of matter of concern. The levels of vibration we are discussing here are very low and could be repeated beyond the life span of these houses. If the reader would like to have more information on this subject, he is encouraged to read Bureau of Mines RI 8896.

CONCLUSIONS.

1. The blasting effects generated by MRI Butte operations are well below accepted standards, and would not be judged to have the capability of causing damage to houses. However, it is possible that there could be the occasional falling of a loose object at the time of the blasting.

Figure 1 illustrates the manner in which the vibrations die out with distance from the open pit.

2. Most of the blasts would be easily perceived by all persons in the vicinity of the pit at the time. Occasional blasts will even be perceived by people at much greater distances, if they happen to be inside a quiet house at the time. It is perfectly normal that many of these people, upon feeling the vibration, and hearing the accompanying sounds in their houses, such as rattling doors and windows, creaking frames, etc., would intuitively conclude that such effects surely must be associated with damage. Fortunately, that is not the case. People are far more sensitive than houses, and begin to worry about damage at levels far below those are actually damaging to buildings.

3. Environmental forces are continuous, very serious forces at work on all houses. They are especially serious in Butte, where seasonal weather changes go through severe extremes. These forces cause damage to all houses in varying degrees, and will continue to work on all houses throughout their lifetimes. Periodic inspections of houses in Butte in the residential area

near the operating pit shows that they undergo seasonal changes between winter and summer, as would be expected, but are not suffering damage from vibration.

4. Although it is expected that the blasting operations will continue for a long time, this factor need not be a matter of concern. At these levels of strain, the houses can tolerate repeated vibration for much longer than their lifetimes.

If you would like to have additional information, or explanation of the items in this report, please contact me at your convenience.

Yours very truly,

LEWIS L. ORIARD, INC.

L. L. Oriard

Lewis L. Oriard

APPENDIX A

CALCULATIONS FOR GROUND VIBRATIONS FROM BLASTING

PREDICTION FORMULA FOR GROUND VIBRATIONS FROM BLASTING.

If we wish to normalize ground vibration data from blasting operations, we can do so by dividing the distance by the charge weight of explosives which detonates at any give instant of time, and plotting that value versus the peak particle velocity of the vibration. This relationship can be expressed mathematically in the following manner:

$$PPV = H (D/W^{0.5})^{-B} k_1, k_2, k_3, \dots$$

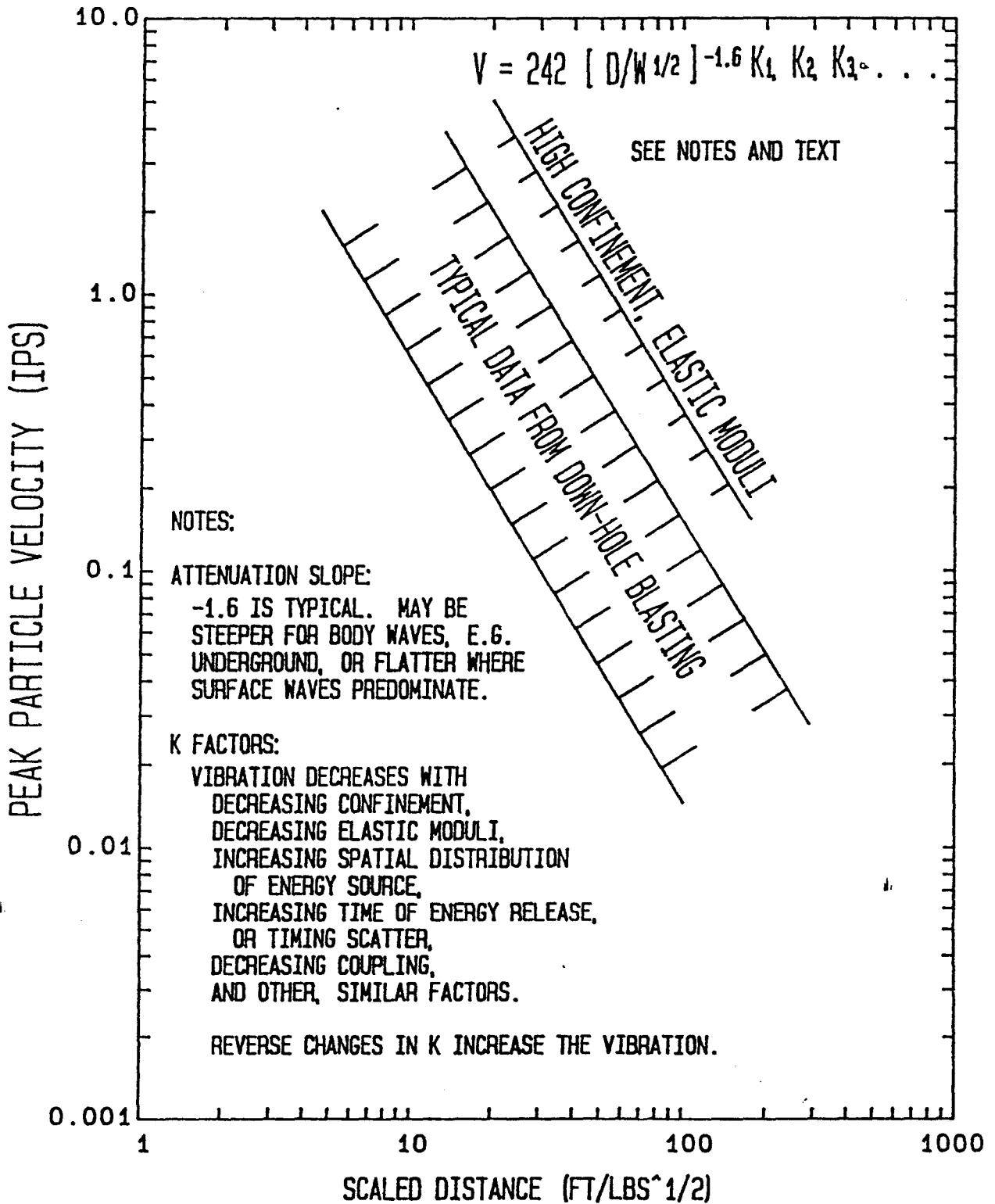
where PPV = the peak particle velocity in inches per second

H = ground response factor, unitless

D = distance, in feet

W = charge weight per delay, in pounds

The k factors express various design-related factors, such as confinement, spatial distribution of charge, timing scatter, time of energy release, coupling, elastic moduli, and the like.



ORIARD CURVES FOR GROUND VIBRATION
TYPICAL DOWN-HOLE BLASTING

APPENDIX B

QUALIFICATIONS OF THE AUTHOR

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GEOTECHNICAL CONSULTING
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Explosives Engineering
Shock and Vibration

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B.S., Civil Engineering, Major in Structural Engineering, Gonzaga University.
Master of Science in Geophysics and Geology, St. Louis University.
Partial completion of Ph.D. in Geophysics, St. Louis University.

AFFILIATIONS

ASCE, ISRM, SME, USCOLD, SSA, SEG, SEE, AEG, UTRC

REGISTRATIONS (STATE OF CALIFORNIA)

Geophysicist - GP 92 (12/19/73)
Geologist - RG 2693 (1/14/71)
Engineering Geologist - EG 788 (1/14/71)

PROFESSIONAL HISTORY

Lewis L. Oriard, Inc., President, 1977 to date.
Woodward-Clyde Consultants, from Associate to Consulting Principal and Partner, 1965-1977.
Independent Consultant, 1951-1965.
Oriard Powder Co. (Explosives), Part Owner and Technical Adviser, 1951-1955.
St. Louis University, administrative and teaching faculty, 1947-1951.

EXPERIENCE

Mr. Oriard has had over 40 years experience in practical problems in all phases of geotechnical consulting, including engineering geology and geophysics, rock mechanics, explosives engineering, structural dynamics and related questions in the general fields of civil construction, mining, and research. He has consulted on more than 1000 projects in some 35 countries. His experiences include rapid transit systems, tunnels, dams, underground powerhouses, open-pit and underground mines, quarrying operations, nuclear power plants, nuclear waste disposal, pipelines, off-shore facilities, highways, canals, airports, other facilities and research projects. Examples of representative assignments would include:

- Service on Consulting Boards or Review Boards.
- Feasibility or pre-bid studies, evaluation of specific site conditions.
- Construction problems, methods, technical assistance during construction.
- Blasting technology, development of special techniques, evaluation of hazards, consultation on products and methods.
- Blasting effects, including shock, ground vibration, airblast overpressures and underwater effects, as applied to residences, slopes and embankments, underground openings, civil structures and facilities, construction materials, marine organisms, people and human activity.
- Study of physical properties of materials (field and laboratory).
- Geological and geophysical exploration.
- Rock mechanics problems, including stability of underground chambers, tunnels, shafts, openings and slopes; reinforcement or support, stabilization and construction techniques.
- Instrumentation.
- Noise and Vibration.
- Tunnel Boring Technology.
- Consultation regarding contracts and specifications.

Mr. Oriard has been an invited lecturer at many universities and conferences, both domestic and foreign, and is the author of many technical papers in his fields of specialization.

EXAMPLES OF PROFESSIONAL ACTIVITIES OF LEWIS L. ORIARD

Mr. Oriard has provided technical assistance to federal agencies, private industry and universities in many countries, including some 22 federal agencies in the U.S. He has served as a technical adviser on over 1000 projects in some 35 countries. He has lectured widely and has served as an adviser on many applied research efforts. Representative examples follow:

Member of advisory panel selected by U.S. National Research Council (Academy of Science and Academy of Engineering) to provide technical assistance to U. S. Navy Civil Engineering Laboratory Research & Development Program involving dynamic stresses in hard rock concerning propellant embedded seafloor anchors.

Invitation from Geomechanics Committee of Society of Mining Engineers to present technical paper at 113th Annual Meeting of AIME, 1984.

Invitation to serve as Technical Adviser to Underground Technology Research Council Committee on Perimeter Control Blasting.

Invitation to serve as a member of the Conference Panel on Perimeter Control Blasting, Society of Explosives Engineers.

Provided technical assistance to the Government of Sri Lanka for complex rock excavation on the world's largest irrigation project. Involved questions pertaining to physical and geological characteristics of the site, blasting technology, concrete structures, specifications and contracts.

Provided technical assistance to the Government of Colombia, South America, for one of the world's largest coal field developments, including port and harbor, highway, railroad, and new city. Involved questions pertaining to geological exploration, physical properties of materials, quarry development and blasting technology, study of the feasibility/design of "coyote" blasting of several million pounds of explosives.

Provided technical assistance to the Government of Canada for large tunneling operation extending from Nova Scotia under the Atlantic Ocean to a large undersea coal field. Involved evaluation of geological setting, estimate of stress fields, feasibility of existing development proposals and final recommendations for tunneling methodology (machine boring and pre-cast lining).

Provided technical assistance for feasibility studies for the largest rock excavation project in the world for civil construction, a regional airport between Hong Kong and Macao.

Provided technical assistance for delicate blasting operations in Kota Kinabalu, Malaysia, involving evaluation of seismic waves and the effects of vibrations on nearby concrete, cinder block and residential structures, as well as the schedule and technology for accomplishing the work.

One of 3 nominees to represent the United States at Australian Conference of the International Society of Rock Mechanics, Panel on Rock Fragmentation and Blasting.

Invited to join a technical delegation to China and present a technical paper on explosives engineering.

Invited by Society of Explosives Engineers to serve as Chairman of a committee of specialists to evaluate the research work done by the U. S. Bureau of Mines regarding the effects of ground vibrations and air overpressures on residences and other small structures.

Invited to teach a short course in explosives engineering at Montana State University, and to teach part of an additional short course in aggregates for the U. S. Forest Service.

(Overall, have lectured or presented technical papers at some 16 universities in the United States, and for universities and professional groups in many foreign countries.)

Invited to participate with Panel For Defining Critical Rock Mechanics Research Requirements, U. S. National Committee for Rock Mechanics, with special emphasis on rock fragmentation and the use of explosives.

Invited to present at an international conference in Canada the State-of-the-Art paper on the effects of ground vibrations on unstable slopes.

Invited to serve on Consultants' Board of Review regarding an underseas tunnel crossing between Labrador and Newfoundland.

Invited to serve on Board of Consultants for the largest underground excavation complex in the world at that time, the Peace Power Development in Canada.

Provided technical assistance on the James Bay Project, Canada, the world's largest hydroelectric development at that time.

Invited to serve on Board of Consultants for the Turimiquiri Project in Venezuela, involving quarry development, two rock fill dams, water control facilities, long rock tunnel, underseas pipeline and public resort area.

Provided technical assistance on the Palabora Project in the Northeast Transvaal, Africa. This operation achieved a world's record for the largest quantity of rock excavation in a single day.

Provided technical assistance on the Rossing Project in Namibia, Africa, the world's largest uranium mining operation.

Provided technical assistance to the Chivor Project in Colombia, South America, involving a number of complex geotechnical questions associated with the construction of the world's highest rockfill dam at that time.

Provided technical assistance to the Government of Venezuela for critical blasting operations on one of the world's largest hydroelectric projects, the Guri Hydro Project. Among other tasks, involved blasting under 70 ft. water at a distance of only 10 ft. from the walls and stoplogs of a \$200 million powerhouse (concrete structure) supplying 50% of the country's electricity.

Invited by the Government of Mexico to serve as Visiting Professor to the National University in Mexico City, to offer a short course in explosives engineering to faculty and professional attendees.

Invited to serve as Visiting Professor to Colegio de Ingenieros Civiles de Mexico, Monterrey, Nuevo Leon, Mexico, to offer a seminar in explosives engineering.

Provided technical assistance to an association of quarry operators and to individual operations in Monterrey, Mexico. Involved development methods, blasting technology, and an evaluation of ground vibrations and air overpressure effects on nearby residential communities.

Provided technical assistance to the Government of Mexico regarding blasting operations on the Laguna Verde Project, Mexico's nuclear power station.

Presented the United States' state-of-the-art in explosives excavation to the Government of Portugal. Also represented were Russia, Sweden and West Germany. Evaluation of feasibility of constructing an ejecta dam at Funcho, Portugal (casting rock across a valley with about 10 million pounds of explosives) and corollary evaluation of associated blast effects on surrounding communities.

Provided technical assistance on the enlargement of the Salto de Villarino hydroelectric facilities in Spain, involving blasting within 20 feet of operating turbines and generators, and within 5 feet of delicate electric control facilities. Similar work was done on the Salto de Castro project.

Provided technical assistance for the Franco-Belga open-pit mine near Bilbao, Spain. Involved such questions as blasting technology, slope stability, and the effects of noise and vibration on a hospital and residential community 900 feet away.

In the same region in Spain, technical assistance was provided for the construction of the Superport at Bilbao.

Provided technical assistance for the construction of railroad tunnels between Oviedo and Leon, Spain. Required blasting parallel tunnels within 10 feet of existing old tunnels in such manner as not to damage the old tunnel linings and electrical facilities 10 feet away.

Provided technical assistance for the delicate blasting operations that were required for the construction of the New World Trade Center in downtown Kowloon, Hong Kong.

Provided technical assistance on the Ord River Project in Australia, involving the largest detonation of chemical explosives that had ever taken place on the Australian continent. Involved prediction of ground motions and the effects that would take place on a variety of man-made and natural items, including a nearby regional fault and a tall intake tower that was in the process of being slip-formed with freshly poured concrete.

Provided technical assistance on the Manapouri Project in New Zealand, involving blasting a solid rock cofferdam, 400 ft. long and 50 ft. high, that came within 3 ft. of the intake structure.

Provided technical assistance on the Tarapoto Project in Peru, involving blasting effects and earthquake effects on high, unstable cut slopes along a highway in the foothills of the Andes.

TECHNICAL ARTICLES AND LECTURES PREPARED BY L. L. ORIARD

"The Scale of Effects in Evaluating Vibration Damage Potential", Prepared for Annual Conference on Explosives and Blasting Techniques, Society of Explosives Engineers, New Orleans, February, 1989.

"Recent Advances in Explosives Engineering", Invited paper for 2nd International Conference on Gold Mining, Vancouver, B.C., November, 1988.

"Resolution of Some Common Problems in Highway Blasting", invited paper for Transportation Research Board Annual Meeting, Washington, DC, January, 1987.

"Close-In Blasting Effects on Structures and Materials", invited paper for ASCE National Meeting, Boston, October, 1986.

"Observed High-Rise Building Response to Construction Blast Vibrations", co-authored with T. L. Richardson and K. P. Akins for presentation at the ASCE National Convention, Detroit, Michigan, October, 1985.

"Seismic Waves Transmitted From Rock to Water: Theory and Experience", invited Paper prepared for 11th Annual Conference on Explosives and Blasting Techniques, San Diego, CA, January, 1985.

"Rock Blasting Techniques and Practices", Short Course prepared for New Mexico Institute of Mining and Technology, in cooperation with their Center for Explosives Technology Research, Socorro, New Mexico, November, 1984.

"Lake Thistle Emergency Drainage Project", co-authored with R. J. Essex and S. T. Freeman for presentation at the 25th U. S. Symposium on Rock Mechanics, Evanston, IL, June, 1984.

"Geomechanics Principles For Complex Blasting," prepared at the request of the Geomechanics Unit Committee, 113th Annual Meeting of Society of Mining Engineers of AIME, Los Angeles, CA, March, 1984.

"Modified Site Response Blasting: The Role of Rock Mechanics in Perimeter Control", prepared at the request of the UTRC Committee on Perimeter Control Blasting, Proceedings, 10th Annual Conference on Explosives and Blasting Technique, Orlando, FL, February, 1984.

"Underwater Explosives Detonations and Structural Responses, Guri Hydro Project, Venezuela", invited paper for Waterpower '83, International Conference on Hydropower, Knoxville, TN, September, 1983.

"Innovations In Technology For Complex Rock Excavations", International Conference on Underground Pumped Hydro and Compressed Air Energy Storage, sponsored by the American Institute of Aeronautics and Astronautics, San Francisco, CA, September, 1982.

"Blasting For Maximum Dragline Productivity: A Case Study", co-authored with representatives of Bauer, Calder & Workman, Inc., Woodward-Clyde Consultants, and Old Ben Coal Company, Indiana Coal Mining Institute, March, 1982.

"Development of New Blast Designs to Improve Dragline Stripping Rates", contributing author and consultant, U. S. Bureau of Mines research contract No. ET-77--CO109124, and Department of Energy Contract No. DOE-AC01-77ET11239, 1977-1982.

"Blasting Effects And Their Control", Invited paper for Section 7 of 'Underground Mining Methods Handbook,' Society of Mining Engineers of AIME, Library of Congress Catalog Card Number 80-70416, 1982.

"Influence Of Blasting On Slope Stability: State Of The Art", invited state-of-the-art paper for the Third International Conference on Stability in Surface Mining, Society of Mining Engineers of AIME, June, 1981, Library of Congress Catalog Card Number 81-70690, 1981.

"Field Tests With Fracture Control Blasting Techniques", invited paper for Rapid Excavation and Tunneling Conference, Society of Mining Engineers of AIME, May, 1981, Library of Congress Catalog Card Number 81-65517, 1981.

"Time Correlations Between Building Cracks And Blasting", Proceeding of the Seventh Conference on Explosives and Blasting Technique, Phoenix, Arizona, January, 1981.

"Drilling, Blasting And Dredging Techniques For Deepening The Panama Canal", invited paper for World Dredging and Marine Construction, Vol 16, No. 6, June, 1980.

"Underground Vibrations From Surface Blasting At Jenny Mine, Kentucky", contributing author and consultant on U. S. Bureau of Mines Contract No. J0275030, 'Criteria for Proximity of Surface Blasting to Underground Mines,' November, 1979.

"Seminar In Explosives Engineering", presented as Visiting Professor to Colegio de Ingenieros Civiles de Mexico, Seccion Monterrey, A. C., Monterrey, Mexico, April 15, 1980.

"TVA's Criteria For Blasting Effects On Concrete", co-authored with J. H. Coulson, American Society of Civil Engineers Specialty Conference on Minimizing Detrimental Construction Vibrations, Portland, Oregon, April, 1980, ASCE Preprint No. 80-175.

"Blast Damage Criteria For A Massive Concrete Structure", co-authored with R. G. Tart and J. H. Plump, American Society of Civil Engineers, Specialty Conference on Minimizing Detrimental Construction Vibrations, Portland, Oregon, April 1980, ASCE Preprint No. 80-175.

"Rockfill Quarry Experience, Ord River, Australia", co-authored with J. L. Jordan, Journal of the Construction Division of the American Society of Civil Engineers, Vol 106, No. C01, March, 1980.

"Short Course in Aggregates And Quarrying", presented at Montana State University for the U. S. Forest Service. Oriard contributions to the short course included quarry blasting and blasting practices, geological considerations and geophysical exploration methods.

"Short Course In Explosives Engineering", as a two-day extension of the above-described short course. Offered at Montana State University, March, 1980.

"Observations On The Performance Of Concrete At High Stress Levels From Blasting", Sixth Annual Conference on Explosives and Blasting Technique, Tampa, Florida, February, 1980.

"Response Of Deep Rock Masses To Vibrations Induced By Nearfield Earthquakes, Blasting or Rock Burst Phenomena", invited presentation, Seismic Design Workshop for Underground Repository, Office of Nuclear Waste Isolation, U. S. Department of Energy, and Rockwell International, Seattle, February, 1980.

"Short-Delay Blasting At Anaconda's Berkeley Open-Pit Mine, Montana", co-authored with Merle Emmert, Society of Mining Engineers of AIME, Preprint No. 80-60, February, 1980.

"The Effect Of Rock Mass Discontinuities On Machine Tunneling: Buckskin

Mountains Tunnel, Arizona", co-authored with S. T. Freeman, invited presentation to the Association of Engineering Geologists, Los Angeles, August, 1979.

"The Atlanta Research Chamber", invited paper for 'Monographs On The State-Of-The-Art Of Tunneling,' prepared for the U. S. Department of Transportation, Office of Technology Development and Deployment, June, 1979.

"Controlled Trench Blasting In Frozen Ground", co-authored with R. G. Tart, prepared for the State-Of-The-Art Conference On Pipelines In Adverse Environments, American Society of Civil Engineers, New Orleans, January, 1979.

"Using Explosives To Excavate Frozen Ground", co-authored with R. G. Tart, prepared for presentation at the joint United States-U.S.S.R. Seminar On Building In Cold Climates And Permafrost, Leningrad, Russia, 1978.

"A Critical Review Of Certain Criteria Used In Explosives Engineering", invited paper, Specialty Conference On Soil Dynamics And Earthquake Engineering, American Society of Civil Engineers, Pasadena, June, 1978.

"Urban Blasting: Problems And Techniques", invited paper, American Society of Civil Engineers Rock Excavation Seminar, New York, October, 1976.

"Physical Properties And Geologic Structures Of Rock Which Determine Its Failure Characteristics Under The Action Of High Explosives", short course presented as Visiting Professor to the National University of Mexico, Mexico City, 1976, repeated, 1978.

"Explosion-Induced Waves In Water, Air, Soil And Rock, And The Response Of Structures And People To These Blasting Effects", short course presented as Visiting Professor to the National University of Mexico, Mexico City, 1976, repeated, 1978.

"Rapid Dam Construction Using The Directed Blasting Method", co-authored with H. M. Ewoldsen and A. Mahmood, invited paper, Second Iranian Congress of Civil Engineering, Pahlavi University, Shiraz, Iran, May, 1976.

"Design Considerations And Stress Analysis For Multiple Underground Openings In Anisotropic Rock", co-authored with B. C. Yen and J. N. Mathur, invited paper, Society of Mining Engineers of AIME, Annual Meeting, Tucson, Arizona, 1975.

"Geophysical Exploration For Deep Underground Structures", co-authored with R. J. Bielefeld, Association of Engineering Geologists, Annual Meeting, Denver, 1974.

"Controlled Blasting", invited paper, Workshop on Tunnel Blasting, jointly sponsored by the Underground Construction Research Council, Society of Mining Engineers of AIME and the University of Maryland, November, 1974.

"Vibration Control", invited paper, Workshop on Tunnel Blasting, jointly sponsored by the Underground Construction Research Council, Society of Mining Engineers of AIME and the University of Maryland, November, 1974.

"Blasting Techniques And Safeguards Used In Enlarging The Underground Powerhouse At Salto De Villarino, Spain", co-authored with H. M. Ewoldsen and J. Y. Perez, invited paper, Rapid Excavation and Tunneling Conference, American Society of Civil Engineers and Society of Mining Engineers of AIME, San Francisco, June, 1974.

"Geotechnical Feasibility Of Underground Reactor Siting", co-authored with H. M. Ewoldsen, Water Resources Conference of the American Society of Civil Engineers, Los Angeles, January, 1974.

"Earthquake Source And Effect Concepts Related To Long-Range Planning Of U. S. Government Facilities Throughout The World", co-authored with R. L. McNeill, invited seminar for representatives of various federal agencies, including State Department, Bureau of Reclamation, Geological Survey, Air Force, Bureau of Standards, Corps of Engineers, and the World Bank, October, 1973.

"Urban Blasting", invited paper, First Annual Conference of the State of Kentucky Bureau of Mines, Division of Explosives and Blasting, Lexington, Kentucky, June, 1973.

"A Guide To Evaluate Damage Potential To Pipelines From Nearby Construction Blasting", a field manual prepared for Alyeska Pipeline Service Co. for the Trans-Alaska Oil Pipeline, 1972.

"Specifications For Controlled Blasting In Civil Engineering Projects", co-authored with A. J. Hendron, Jr., invited paper, Proceedings of the First North American Rapid Excavation and Tunneling Conference, ASCE, SME and other organizations, June, 1972, Library of Congress Catalog Card Number 72-86918, 1972.

"Blasting Effects And Their Control In Open Pit Mining", 'Geotechnical Practice for Stability in Open Pit Mining,' invited paper, Proceedings of the Second International Conference on Stability in Open Pit Mining, Vancouver, Canada, November, 1971, Library of Congress Catalog Card Number 72-86923, 1972.

"Blasting Operations In The Urban Environment", Association of Engineering Geologists Annual Meeting, Washington, D. C., October, 1970. Published in Bulletin of the Association of Engineering Geologists, Vol IX, No. 1, 1972.

"Dynamic Effects On Rock Masses From Blasting Operations", Invited presentation at Slope Stability Seminar, University of Nevada, May, 1970.

"Geophysical Exploration Methods", Invited Cooperating Scientist, Crustal Movement Monitoring, Technical Report No. 26, The Coordinating Committee For East Bay Fault Slippage, Hayward, California, November, 1969.

"A Seismic Method For Evaluating The Apparent Refusal Of Driven Piles", prepared for Woodward-Clyde & Associates, 1967.

"Design Techniques For The Control Of Blasting Effects", prepared for Woodward-Clyde & Associates, 1967.

"Utilization Of Space and Time Distributions To Control Explosion-Generated Ground Vibrations", American Geophysical Union, Washington State University, 1963.

"Magnetic And Electrical Exploration Methods In Engineering And Hydrology", American Geophysical Union, University of Idaho, 1960.

EXPERIENCE OF L. L. ORIARD WITH BUTTE BLASTING OPERATIONS

Mr. Oriard has provided technical assistance on blasting techniques and to control vibrations and airblast for Butte blasting operations since 1955, at the following locations:

- o Berkeley Pit
- o Alice Pit
- o Gagnon Pit
- o Continental Pit

He was present to set up a portable seismograph for the first blast in the new Berkeley Pit in 1955, and later for the Alice Pit, the Gagnon Pit and the Continental Pit. All told, he has taken some 7000 or more seismic tests of Butte blasting operations.

He has inspected many homes in Butte, and has spoken to many residents of the area. He set up a program of periodic inspections of a few houses to serve as demonstrations of cyclic environmental effects and comparisons with blasting effects and human responses, in order to help interested persons better to understand blasting phenomena.

Mr. Oriard has been an invited guest speaker for Montana Professional Engineers and Montana Tech.

OTHER EXPERIENCE IN MONTANA

Mr. Oriard was asked mutually by the State of Montana and Burlington Northern Railroad to set blasting criteria and vibration limits for the highway blasting that took place immediately above the railroad tunnel through Bozeman Pass. Burlington Northern would not permit this work to take place over their tunnel unless Mr. Oriard were to be the specific individual to set the criteria and guide the work.

Mr. Oriard has provided technical assistance to mining projects at the following locations:

- o Near Whitehall
- o Near Bridger
- o Near Hardin

He has also provided technical assistance to a number of highway projects in Montana, including the following:

- o West of Missoula
- o Sout of Helena
- o East of Butte
- o A small project at Great Falls

SENATE NATURAL RESOURCES

EXHIBIT NO. #6

DATE 2-10-89

BILL NO. ~~March 18~~ 1989

274

Hi Pat -

I don't know if you can feel the blasting at your house, but yesterday I was home for lunch and at 12:05 pm there was a blast that really shook our house and Al said there was one at about 12:30 pm. Al said he can feel the blasting almost everyday.

The worst thing this before and then had to move I hope history isn't going to repeat itself. I'm too old to start over again.

Jane Marglok
3645 Cotton

Senate Natural Resources

3/10/89

Gary G. Brown

SENATE NATURAL RESOURCES

EXHIBIT NO. #7

DATE 3-10-89

BILL NO. HB657

STATE FORESTER'S ALTERNATE TESTIMONY

ON '89 SLASH BILL (HB 0657)

DRAFT #3 (Edited 2/15)

I WOULD LIKE TO OFFER MY STRONG SUPPORT FOR HB0657, REVISING THE FIRE HAZARD REDUCTION LAWS.

BACKGROUND

IN RECENT YEARS, THE STATE'S FOREST INDUSTRIES AND LOGGING CONTRACTORS HAVE BECOME INCREASINGLY CONCERNED THAT THE SLASH LAW SHOULD BE ADMINISTERED AS EFFICIENTLY AND EVEN-HANDEDLY AS POSSIBLE. IN PARTICULAR, THEY ASKED ME TO CLARIFY OUR STANDARDS FOR COMPLIANCE WITH THE LAWS AND RULES, SO THAT THEY COULD PLAN AND EXECUTE THEIR OPERATIONS MORE EFFICIENTLY.

IN DECEMBER 1987, I INVITED REPRESENTATIVES OF MONTANA'S FOREST INDUSTRIES, LOGGERS AND PRIVATE LANDOWNERS TO PARTICIPATE IN A TASK FORCE TO IMPROVE THE DEPARTMENT'S SLASH PROGRAM. IN ADDITION TO STANDARDS FOR SLASH WORK, THE REPRESENTATIVES AGREED TO WORK ON RELATED ISSUES INCLUDING DEPARTMENT PROCEDURES, LAW ENFORCEMENT, DSL'S PERSONNEL NEEDS AND FINALLY, FUNDING OF DSL'S PROGRAM. THIS CONSENSUS-BUILDING TASK FORCE FINISHED ITS WORK IN DECEMBER 1988. I AM VERY PLEASED WITH THE RECOMMENDATIONS PRODUCED BY THE SLASH TASK FORCE, SOME OF WHICH ARE REPRESENTED IN THIS BILL.

Ex. #7
3-10-89

KEY PROVISIONS

FROM DSL'S STANDPOINT, THE MOST SIGNIFICANT FEATURES OF THIS BILL ARE THE PROVISIONS FOR A NEW FEE STRUCTURE (SECTION 12), AND THE AUTHORITY TO BOND MILLS (SECTION 8, 76-13-409 MCA, NEW SUBSECTION 4).

THE REVISED FEE STRUCTURE CREATES MORE EQUITY AMONG THOSE WHO DEPEND ON OUR SERVICES TO ACHIEVE COMPLIANCE WITH THE SLASH LAWS. UNDER CURRENT LAW, DSL IS AUTHORIZED TO RETAIN 4% OF THE CONTRACTOR'S PERFORMANCE BOND FOR ADMINISTRATION, INSPECTION AND ENFORCEMENT WORK. AT A BONDING RATE OF \$6 PER THOUSAND BOARD FEET (MBF), THIS PROVIDES ONLY 24 CENTS PER MBF, WHICH GROSSLY UNDER-COMPENSATES DSL FOR THE REAL COSTS OF ADMINISTERING MOST AGREEMENTS. FOR EXAMPLE, A TYPICAL NONINDUSTRIAL AGREEMENT INVOLVING 50 MBF EARNS DSL ONLY \$12, COMPARED TO ACTUAL COSTS OF \$100 OR MORE FOR FIELD WORK, OFFICE WORK AND ACCOUNTING. THIS BILL WOULD ESTABLISH A NEW FEE STRUCTURE TO SUPPORT THE SLASH PROGRAM AT A LEVEL COMMENSURATE WITH SERVICES PROVIDED. FOR AGREEMENTS COVERING INDIVIDUAL OPERATIONS, THERE WOULD BE A FEE OF \$25 TO OPEN THE AGREEMENT PLUS 60 CENTS PER MBF HARVESTED. APPROXIMATELY THREE-QUARTERS OF THE AGREEMENTS WOULD HAVE TOTAL FEES OF \$25 TO \$150. IN A TYPICAL, NONINDUSTRIAL HARVEST OF 50 MBF, THESE FEES WOULD NORMALLY INCREASE THE LOGGING COSTS BY LESS THAN ONE PERCENT. FOR LARGER OPERATIONS, AN ANNUAL LIMIT ON THE VOLUME SUBJECT TO FEES - 500 MBF - WOULD CREATE A CAP ON THE YEARLY COST OF AN AGREEMENT OF \$325.

Ex. # 7
3-10-89

HOLDERS OF MASTER AGREEMENTS - THOSE COVERING MANY OPERATIONS, AND TYPICALLY SUPERVISED BY INDUSTRY FORESTERS - WOULD BE BILLED ANNUALLY FOR 100% OF DSL'S ACTUAL COSTS INCURRED IN THE ADMINISTRATION, INSPECTION AND ENFORCEMENT OF EACH AGREEMENT. THIS SETS INTO LAW CURRENT BILLING PRACTICE FOR THESE MASTER AGREEMENTS, WHICH ARE MORE EFFICIENT FOR BOTH DSL AND THE PRIVATE PARTY CONDUCTING MULTIPLE OPERATIONS.

THE REVISED FEES WOULD BE VERY COMPLEMENTARY FOR DSL'S CURRENT RESOURCE NEEDS. ON FEBRUARY 15, 1989 I TESTIFIED BEFORE THE HOUSE NATURAL RESOURCES APPROPRIATIONS COMMITTEE REQUESTING AUTHORITY FOR 2.81 ADDITIONAL FTES FOR THE SLASH ADMINISTRATION SUBPROGRAM. THIS COMMITTEE APPROVED THIS BUDGET MODIFICATION PENDING PASSAGE OF THIS BILL. THESE RESOURCES ARE NEEDED TO HANDLE A SHARPLY INCREASED WORKLOAD (ABOUT 29%) IN THE NUMBER OF NONINDUSTRIAL PRIVATE HARVESTS, AND TO IMPLEMENT CHANGES IN OUR PROGRAM RECOMMENDED BY THE TASK FORCE (HB0657 DOES NOT, OF ITSELF CAUSE ANY NEW WORKLOAD OR EXPENDITURES). A KEY BENEFIT OF THE REVISED FEES IS THAT THEY ARE EXPECTED TO PROVIDE ALL OF THE INCOME NECESSARY TO SUPPORT THE ADDITIONAL PERSONNEL. THAT IS, NO ADDITIONAL GENERAL FUNDS WOULD BE NEEDED FOR THIS BIENNIUM, NOR IN THE FORESEEABLE FUTURE.

*no new
workload
and expense*

THE OTHER KEY PROVISION OF THIS BILL INVOLVES THE BONDING OF MILLS.
THE AUTHORITY TO BOND MILLS IS NEEDED BY DSL TO REMEDY CERTAIN CASES OF NONCOMPLIANCE BY LOG PURCHASERS. CURRENT LAW OBLIGATES MILLS TO

Ex. #7
3-10-89

DETERMINE THAT A LOG SELLER HAS A SLASH AGREEMENT WITH DSL BEFORE BUYING LOGS, AND TO WITHHOLD MONEYS FROM THE PURCHASE PAYMENT AS A PERFORMANCE BOND FOR SLASH WORK. A MONTHLY REPORT IS REQUIRED TO DSL DETAILING LOG PURCHASES, PLUS A TRANSMITTAL OF ALL MONEYS WITHHELD. UP TO 5% OF MONTANA SAWMILLS MAY NOT BE IN COMPLIANCE WITH THIS LAW AT ANY GIVEN TIME. THIS BILL PROVIDES AUTHORITY FOR DSL TO BOND ^{require a} PURCHASERS OF FOREST PRODUCTS, SO THAT IN CASES WHERE THE PURCHASER DOES NOT TRANSMIT WITHHELD MONEYS TO DSL, DSL HAS A VEHICLE FOR REFUNDING THE BONDS OF CONTRACTORS WHO HAVE ACTED IN GOOD FAITH BY DOING THEIR SLASH WORK. IT IS MY INTENT THAT RULES WILL BE SET FORTH TO ESTABLISH THE CRITERIA DSL WILL USE TO DETERMINE THAT A PURCHASER SHOULD BE BONDED. PURCHASERS WHO HAVE A GOOD RECORD OF COMPLIANCE SHOULD NOT BE PENALIZED BY ^{this} BONDING requirement.

SECONDARY PROVISIONS

THIS BILL CONTAINS SECONDARY MEASURES THAT WILL PROMOTE A FAIR, EVEN-HANDED APPROACH TO ENFORCEMENT OF THE SLASH LAWS. ALL OF THESE REVISIONS ARE BENEFICIAL FOR ADMINISTERING AN EFFICIENT SLASH PROGRAM.

SUMMARY

THIS IS A GOOD BILL. COMBINED WITH THE ADDITIONAL FTE'S JUSTIFIED IN THE GOVERNOR'S BUDGET, THIS BILL WILL ENHANCE THE DEPARTMENT'S ABILITY TO PROVIDE EFFECTIVE SERVICE TO FOREST LANDOWNERS AND OPERATORS, PLUS GUARANTEE THE PUBLIC A CONTINUED, HIGH LEVEL OF COMPLIANCE WITH FIRE

Ex. #7

3-10-89

HAZARD REDUCTION STANDARDS. THE BILL IS FAIR, IT HAS BROAD-BASED
SUPPORT, AND IT DOESN'T ASK THE LEGISLATURE FOR MORE GENERAL FUNDS. I
STRONGLY URGE PASSAGE OF THIS BILL.

Amendments to House Bill No. 672
Third Reading Copy

Requested by Rep. Cohen
For the Senate Committee on Natural Resources

March 9, 1989

1. Title, line 10.

Strike: "OR FOREST PRODUCTS"

2. Page 2, lines 4 and 5.

Strike: "OR" on line 4 through "PRODUCTS" on line 5

3. Page 2, line 11.

Strike: "5"

Insert: "20"

April 10th - 88

Dad called 723-4081 on April 10th to complain about the heat that broke the house on that same day at approx 12:30 PM. He was told to call Rounding Powder Co. 723-3927. He called Rounding Powder Co and was told to call Bert Salery at 723-4081.

Western States Energy

Salery

Cindy Buchelberg

Bert Salery Salery

He called for Bert Salery & he wasn't in. Dad talked to Cindy Buchelberg & relayed a message about his concern about the heat. How ~~the~~ the heat was and the house and his

#9

#8 277

3-10-85

Concern about the gas lines breaking and all the damage that is happening to the house. He took his name and address and said he would give the message to Bert Salery. 2 PM on 4-10-88

Nancy A. Bergman

When Dad talked to someone from Rounding Powder Co. the guy agreed with Dad that it was a hell of a heat.

Exhibit 10

3-10-89

HB 274

1 pg. handwritten

Blasts felt at 2603 Elm

SENATE NATURAL RESOURCES

EXHIBIT NO. 10

Sept 14 - 12:26

~~3-10-89~~
~~HB 274~~

Sept 30 - 2:51

shook house - opened
screen door.
very severe

Oct 3 11:40

extremely severe

Oct 4

Record of Blasts - *approximate time*

EXHIBIT # 11
3/10/89 HB 274

Jan. 7th 1988	approx.	1.10 p.m.	Blast shock house
" 22nd. "	"	12.25 p.m.	severe blast shook house
" 26th. "	"	12.08 p.m.	" " " "
Feb. 12th. "	"	12.09 p.m.	large blast shook house
Feb. 18th. "	"	12.09 p.m.	large blast shook house
Feb. 18th. "	"	12.03 p.m.	severe shock rocked house
Feb. 24th. "	"	12.05 p.m.	blast shook house
March 8th. "	"	1.13 p.m.	blast shook house severely
March 18th. "	"	1.00 p.m.	severe blast shook house
March 25th. "	"	12.00 noon	severe blast shook house
April 7th. "	"	12.05 p.m.	severe blast shook house
May 5th. "	"	2.30 p.m.	severe blast shook house (Neighbour here felt shock)
May 9th. "	"	12.07 p.m.	severe blast rocked house
May 24th. "	"	12.05 p.m.	severe blast
June 1st. "	"	12.06 p.m.	severe blast
June 3rd. "	"	12.12 p.m.	severe blast shook house
June 8th. "	"	12.10 p.m.	severe blast shook house
June 14th. "	"	12.10 p.m.	severe blast
July 1st. "	"	12.10 p.m.	severe blast shook house
July 9th. "	"	12.06 p.m.	severe blast shook house badly
July 14th. "	"	12.04 p.m.	blast shook house for several seconds. Cracked brick on side of house.
July 19th	"	1.06 p.m.	severe blast shook house badly, felt floor shake
July 31st.	"	4.00 p.m.	shook house
August 3rd.	"	minor blast, monitored.	
" 17th.	"	12.05 p.m.	severe blast shook house
" 23rd.	"	12.05 p.m.	blast rocked the house, house creaked
September 8th.	"	12.20 p.m.	severe blast shook house
September 14th	"	12.22 p.m.	severe blast shook house

approximated time of blasting

- 2 -

EXHIBIT # 11
3/10/89 HB 274

September 20th.	12.23 p.m.	blast
" 22nd.	12.15 p.m.	blast shook house
" 28th.	1.15 p.m.	severe blast shook house
October 21st.	12.18 p.m.	severe blast shook house and ground for several seconds.
" 28th.	1.15 p.m.	severe blast shook house
November 4th	2.25 p.m.	severe blast shook house rattled dishes in the cupboard
" 7th	4:50 p.m.	severe blast shook house
" 9th	1:15 p.m.	cracked front of fireplace blast shook house
" 11th	3:55 p.m.	blast shook house (MRI refused to take information no answer at blasting)
" 14th	7:55 p.m.	felt blast
" 15th	2.50 p.m.	blast shook house (rabbit ears really rocked)
21	12:10 PM	real really shook house and could in fireplace got whole minute tremble
22nd	12:20	minute tremble
28th	12:10	minute tremble
December 21st.	12 p.m.	Severe blast shook house rattled dishes it also made the crack in fireplace out 1/2" and more cracks appeared.
6th	12:03	shook house
9th	12:10	real severe shock
13th	12:03	very severe shock - really shook the entire house - more damage to the bricks
15th	12:10	one of the hardest shocks, really shook the house. Very severe
2nd blast	12:20	shook the house really bad.

Dec 21st	12:02 PM	Severe blast - shook house
Dec 23rd	1:15 PM	Severe blast - shook house
Dec 30th		minor blast
Jan 11th	12:00 PM	Very severe blast - really shook house
Jan 17th	12:00 PM	real severe blast - shook house severely.
Jan 27th	12:13 PM	real severe blast - shook house severely.
Febr 1st	12:12 PM	severely shook house
Febr 8th	12:03	minor blast
Febr 10th	12:04	real severe blast - shook house for several seconds
Febr 18th	12:03	real severe blast - shook house and fireplace
Febr 20th	12:06	real severe blast - shook house and fireplace.
Febr 22nd	12:15	real hard blast - shook house several seconds
Febr 24th	12:15	Hard blast
Febr 28th	12:05	shook house
Mar - 3rd	12:23	really shook house & windows
	12:33	really shook house & windows
Mar 7th	12:05	shook house severely
	12:11	shook house severely

Mar 7th EXHIBIT # 11
3/10/89 HB 274

12:05 }
12:05 }
12:20

shook house severely
shook house severely
real severe blast - really
shook house real hard
shook house

Mar - 8th

Mar 4th

2:56

EXHIBIT # 11
3/10/89

EXHIBIT # 11 ALSO CONTAINED 6 PAGES OF PHOTOCOPIES OF ORIGINAL PHOTOGRAPHS.
THEY ARE HOUSED AT THE HISTORICAL SOCIETY.

McLAUGHLIN MASONRY

1824 Wilson Avenue

Butte, Montana 59701

SENATE NATURAL RESOURCES

EXHIBIT NO. 127

DATE 3-11-89

BILL NO. HB 274 1 of 3

La Breche

Date 1-22-89

TO La Breche
2400 Palm St
Butte, MT 59701

PROJECT: concrete brick patio wall

LOCATION: 2400 Palm St - Butte

Gentlemen:

Proposed bid Masonry

Bid Includes: labor & material

Bid Does Not Include: _____

Base Bid: 4990.⁰⁰

Very truly yours,

John McLaughlin

MCLAUGHLIN MASONRY
1824 Wilson Avenue
Butte, Montana 59701

SENATE NATURAL RESOURCES

EXHIBIT NO. 12

DATE 3-11-89

BILL NO. HB 274 1 of 3
LaBucke

Date 1-22-89

TO James LaBucke
2420 Belmont St
Butte, MT 59701

PROJECT: Academy brick patio wall

LOCATION: 2420 Belmont St - Butte

Gentlemen:

Proposed bid Masonry

Bid Includes: Labor & material

Bid Does Not Include: _____

Base Bid: \$990.00

Very truly yours,

John McLaughlin

Record of blasts

La Breche
2020 Elm Bldg, Mt. 59701

EXHIBIT # 12
3/10/89 HB 274

These times are approximate to allow for difference in time pieces

20/3

Jan. 7th. 1988	1.10 p.m.	Blast shook house
" 22nd. "	12.25 p.m.	severe blast shook house
" 26th. "	12.06 p.m.	" " " "
Feb. 12th. "	12.09 p.m.	large blast shook house
" 18th. "	12.03 p.m.	severe shock rocked house
" 24th. "	12.05 p.m.	blast shook house
March 8th. "	1.13 p.m.	blast shook house severely
" 18th. "	1.00 p.m.	severe blast shook house
" 25th. "	12.00 noon	severe blast shook house
April 7th. "	12.05 p.m.	" " " "
May 5th. "	12.30 p.m.	" " " " neighbour felt shock
" 9th. "	12.07 p.m.	severe blast rocked house
" 24th. "	12.05 p.m.	severe blast
June 1st. "	12.06 p.m.	severe blast
" 3rd. "	12.12 p.m.	severe blast shook house
" 8th. "	12.10 p.m.	" " " "
" 14th. "	12.10 p.m.	severe blast
July 1st. "	12.10 p.m.	severe blast shook house
" 9th. "	12.06 p.m.	severe blast shook house badly
" 14th. "	12.04 p.m.	blast shook house for several seconds <u>cracked brick on side of house.</u>
" 19th. "	1.06 p.m.	severe blast shook house badly, floor shook
" 31st. "	4.00 p.m.	shook house
Aug. 3rd. "		minor blast, monitored
" 17th. "	12.05 p.m.	severe blast shook house
" 23rd. "	12.05 p.m.	blast rocked house house creaked
Sept. 8th. "	12.20 p.m.	severe blast shook house
" 14th. "	12.22 p.m.	" " " "
" 16th. "	12.00 p.m.	felt blast
" 20th. "	12.23 p.m.	blast
" 22nd. "	12.15 p.m.	severe blast shook house and ground for several seconds
" 28th. "	1.15 p.m.	severe blast shook house
Oct. 21st. "	12.18 p.m.	severe blast shook house and ground for 7 - 8 seconds
" 28th. "	1.15 p.m.	severe blast shook house
Nov. 4th. "	12.25 p.m.	blast shook house rattled dishes in cupboard
" 7th. "	4.50 p.m.	severe blast shook house
" 9th. "	1.15 p.m.	blast shook house
" " "	7.50 p.m.	" " "
" 11th. "	3.55 p.m.	blast shook house no answer at Blasting Co. M.R.I. refused to take information
" 14th. "	7.55 p.m.	felt blast
" 15th. "	2.50 p.m.	blast shook house, rabbit ears really rocked
" 21st. "	12.15 p.m.	blast rocked house. Stosich & Fournier also
" 22nd. "	12.10 p.m.	minor blast
" 28th. "	12.10 p.m.	" "
Dec. 2nd. "	12.00 p.m.	severe blast, shook house rattled dishes in cupboard
" 6th. "	12.03 p.m.	shook house
" 9th. "	12.10 p.m.	severe blast shook house
" 13th. "	12.03 p.m.	severe blast shook house, slopped water in tub (bathroom)
" 15th. "	12.10 p.m.	blast shook house
" " "	12.20 p.m.	2nd. blast shook house

Dec.	21st.	1988	12.02 p.m.	severe blast shook house
"	23rd	"	1.15 p.m.	" " " "
"	30th.	"		minor blast
Jan.	1st.	1989	12.00 noon	severe blast shook house, rattled dishes in kitchen cupboard
"	15th.	"	7.25 p.m.	blast shook house
"	"	"	9.10 p.m.	blast shook house (could be from concentrator)
"	17th.		12.05 p.m.	severe blast rocked house

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Jan.	27th.	1989	12.13 p.m.	severe sharp blast
Feb.	1st.	"	12.12 p.m.	severe blast really shook house rocked dining room floor
"	8th.	1989	12.10 p.m.	severe blast shook house
"	10th.	"	12.04 p.m.	severe blast shook house for several seconds
"	18th.	"	12.03 p.m.	" " " " " " " "
"	21st.	"	12.10 p.m.	severe blast shook house
"	22nd.	"	12.15 p.m.	severe blast shook house, house shook for several seconds
"	23rd.	"	12.05 p.m.	blast shook house
"	24th.	"	12.15 p.m.	blast shook house
"	27th.	"	6.05 p.m.	blast
"	"	"	6.15 p.m.	severe blast shook house
"	28th.	"	12.05 p.m.	blast felt in house
March	3rd.	"	12.23 p.m.	blast shook house rattled windows
"	"	"	12.33 p.m.	blast shook windows, rocked house
"	7th.	"	12.05 p.m.	severe blast
"	"	"	12.11 p.m.	severe blast
"	8th.	"	12.21 p.m.	severe blast shook house windows rattled
"	9th.	"	2.56 p.m.	blast shook house

EXHIBIT # 13
3/10/89
HB 274

EXHIBIT # 13 CONSISTS OF 2 PAGES OF PHOTOCOPIES OF ORIGINAL PHOTOGRAPHS.
THEY ARE HOUSED AT THE HISTORICAL SOCIETY.

EXHIBIT # 14
3/10/89

EXHIBIT # 14 CONSISTED OF 11 PAGES OF PHOTOCOPIES OF ORIGINAL PHOTOGRAPHS.
THEY ARE HOUSED AT THE HISTORICAL SOCIETY.

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One	
			Support	Oppose
Caroline Janson	Myself	HB274	X	
Danni Sullivan	C.A.S.J.	HB274	X	
Lami Labadie	Myself	HB274	X	
Patricia Bence	myself	HB274	X	
Lyle Nagel	mt. St. Joe. Forest: others pass	HB657	X	
Henry & Zahra	mt. St. Joe. Forest: others pass	HB657	X	
Kelly N (MMA)	BN	HB657		MONITOR
Don Jenkins	Golden Sunlight	HB274		X
Joe & Lucille	Butte Silver Bow	HB274	X	
Velma J. Batten	Butte Silver-Bow		X	
Chadock Shoat	Butte Silver Bow	HB274	X	
A. Facinoni	Butte Silver Bow	"	X	
Mary Jo Ivanich	Butte Silver Bow		X	
Barbara G. Gove	" " "	" "	X	
Bernad Hammett	Walkerville	HD274	X	
Hary G. Brown	DSL	HB-657	X	
Shirley Angatey	DSL	HB274		
Mary Stovich	Butte-Silver Bow	HB274	X	
Toby Stovich	"	"	X	
Peter Petritz	20 Butte S B	"	X	
Mary Petritz	"	"	X	
Cassie Minter				
Jeff Minter				
V. Vign	KNF			
Sherry & Caldwell	Own own Home	HB274	X	
Darlene M. Host	" " "	HB274	X	

DATE 3-10-89 2 of 2

COMMITTEE ON NATURAL RESOURCES

VISITORS' REGISTER

NAME	REPRESENTING	BILL #	Check One	
			Support	Oppose
Judy Jacobson		HB 274	X	
MARK Simonich	F.H. Stoltee hand thumb	H.B. 657	X	
De Kingston	Self			X
Ken Williams	Entech	HB 672		✓
Don All	MWPA	HB 672 HB 657	X	
John Fitzpatrick	Pegasus Gold Helium	HB 672		✓
I. ed J. Doney	Colstrip Energy Ltd. Partnership	HB 672		✓
Jeanne Quigg	Monte Carlo Master			
Jane Neumann	Chlorine Cell	HB 672		✓
ARMY Anderson	West Lake Exp	#672		✓
Janice Fallon	MPA	672		—