Appendix E-7

Studies Used in the 1990 Technical Staff Report

Lake County Air Quality Management District
Asbestos Road Study

LAKE COUNTY AIR QUALITY
MANAGEMENT DISTRICT
— OFFICE AND LABORATORY —
883 Lakeport Blvd.
Lakeport, California 95453
Telephone: 707/263-7000
Burn Info.: 707/263-3121

ROBERT L. REYNOLDS
Air Pollution Control Officer
Noise Control Officer

April 22, 1988

Mr. Eric Johnson
Bureau of Land Management
555 Leslie St.
Ukiah CA 95482

RE: Knoxville Asbestos Sampling 2/22/88

Dear Mr. Johnson:

Please find enclosed a copy of our report regarding the above asbestos sampling. We have provided copies of the laboratory analysis under separate cover and can provide additional copies if necessary.

The District believes that the sampling is representative of exposures likely to be encountered in aggressive recreational activities involving small groups of participants. The sampling was conducted during the first lengthy dry period after the winter season and represents a relatively lower dust potential than would be expected during the drier portions of the year and use impacts causing road dust buildup and thus probably underestimates exposure levels during portions of the year.

Should you require additional information in this regard please give me a call. We will forward the invoicing for our services under separate cover. Your cooperation in this effort has been appreciated.

Sincerely,

Ross L. Kauper

cc: Chron
BLM file

KNOXVILLE ASBESTOS SURVEY

LAKE COUNTY AIR QUALITY MANAGEMENT DISTRICT

APRIL 15, 1988

DESCRIPTION & BACKGROUND

Sampling for asbestos from road generated dust was conducted by District and BLM personnel on February 22, 1988 (Eric Johnson, BLM; John Thompson and Lowell Grant, LCAQMD). This test was performed at BLM's request to gather technical data to be considered as part of a NEPA document considering the area for an Off Road Vehicle (ORV) area. Three sample traverses were made of the area roads in an effort to simulate the exposure level of asbestos to those using the area for recreational purposes.

The exact route chosen for monitoring was determined by BLM personnel, in an effort to generate a representative sample of dust found throughout the entire area.

SAMPLING METHOD

Dust was generated by driving a Ramcharger 4x4 at an average speed of approximately sixteen (16) M.P.H. over the roads shown in attached maps. This speed was determined maximum safe rate of travel over this terrain. Samples were collected on 25mm polycarbonate filters in styrene cassettes, prepared and provided by Science Application International Corp. (SAIC). Sample cassettes were mounted on the right side mirror of a Suburban 4x4. This location was chosen to most closely simulate the respiratory zone of humans in both two and four wheeled vehicles.

The sample vehicle followed the Ramcharger as closely as was safely possible (varying from 15 to 100 feet depending on speed and road condition). Sample volume, corrected to standard pressure and temperature, was supplied to SAIC for the calculation of asbestos concentration results. Copies of the field test report, volume calculations, maps detailing sample routes, and a diagram of the sample train are attached.
Four sample cassettes (one for each sample run plus a field blank) were returned to the SAIC laboratory for transmission electron microscope analysis for asbestos fibers.

Results

The results for the three sample runs, plus the field blank analysis for asbestos and non-asbestos fibers, are presented in Attachment 1 and summarized below.

Sample	Start Time	Sample Volume	Fibers/cc Non-Asbestos	Fibers/cc Asbestos
Knox 1	10:05	180.0 liters	Not Detected	14.800
Knox 2	11:25	181.0 liters	0.0913	10.700
Knox 3	12:55	195.2 liters	Not Detected	17.800
Blank		1.0 liters*	Not Detected	Not Detected

*1.0 liter volume figure assumed by lab for analysis purposes

During the test, temperature varied from 67 to 78 degrees Fahrenheit, with relative humidity ranging from 37% to 30%, winds remained low throughout the test period. Conditions during the sample period were conducive to dust generation, as rain had not been recorded at the adjacent Homestake Mining Company site since January 29, over three weeks prior to this test. Sample material was observed on the inner surface of the sample cassettes, but was not included in fiber count.

The District believes that this series of tests approximates the exposure levels to road users of this area under similar conditions (mildly competitive), while the first series of tests, performed on September 29, 1987, approximates the exposure levels of those camping in the area, but not actively involved in off road activities. The test conditions are considered conservative compared to conditions existent during the summer and fall, when there would be an increase in road use and lower soil moisture contributing to greater potential for dust generation.

Submitted By:

Ross L. Kauper

Attachments: SAIC Analysis Report
Maps of Sample Routes
Field Report of Lowell Grant
Diagram of Sample Train

RLK/LAG

Lake County Air Quality Management District
883 Lakeport Blvd.
Lakeport, California 95453
707-263-7000

-MEMORANDUM-

TO: BLM ASBESTOS FILE

FROM: Lowell Grant

SUBJECT: Sampling activity of 2/22/88

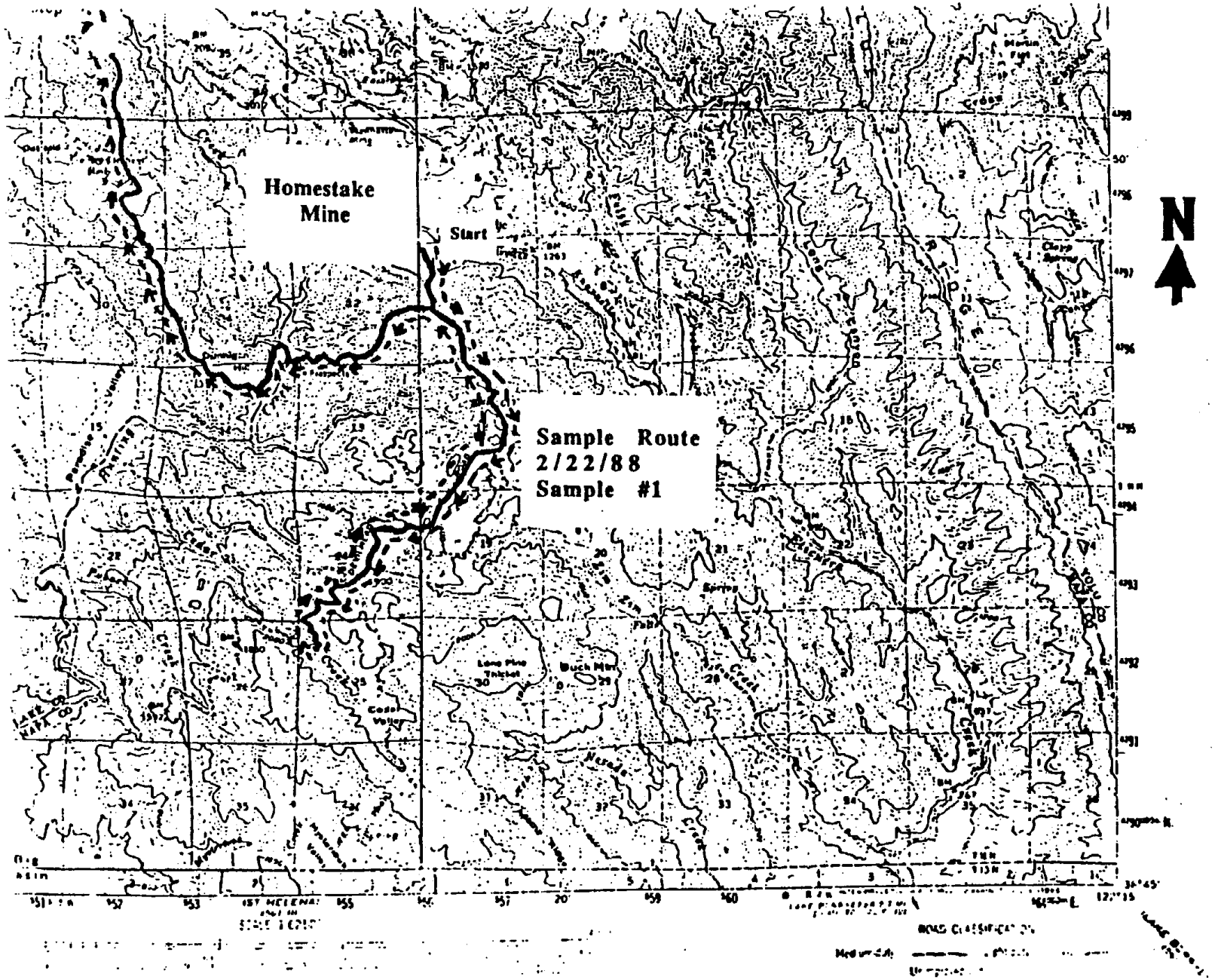
Eric Johnson, BLM, and I arrived at the turn-off for the Red Elephant Mine Rd. at 0930 PST. I then assembled the sample train (see attached diagram), and determined the R.H. to be 37% using a sling psychrometer, winds were calm, temp.=67 F. John Thompson arrived just as this was completed to audit the procedure. A leak check showed a slight leak, which was corrected, video tape of sample train was made. Sampling began at 1005 PST, with Eric Johnson driving a 4wd Ramcharger and the District sample vehicle following as closely as possible.

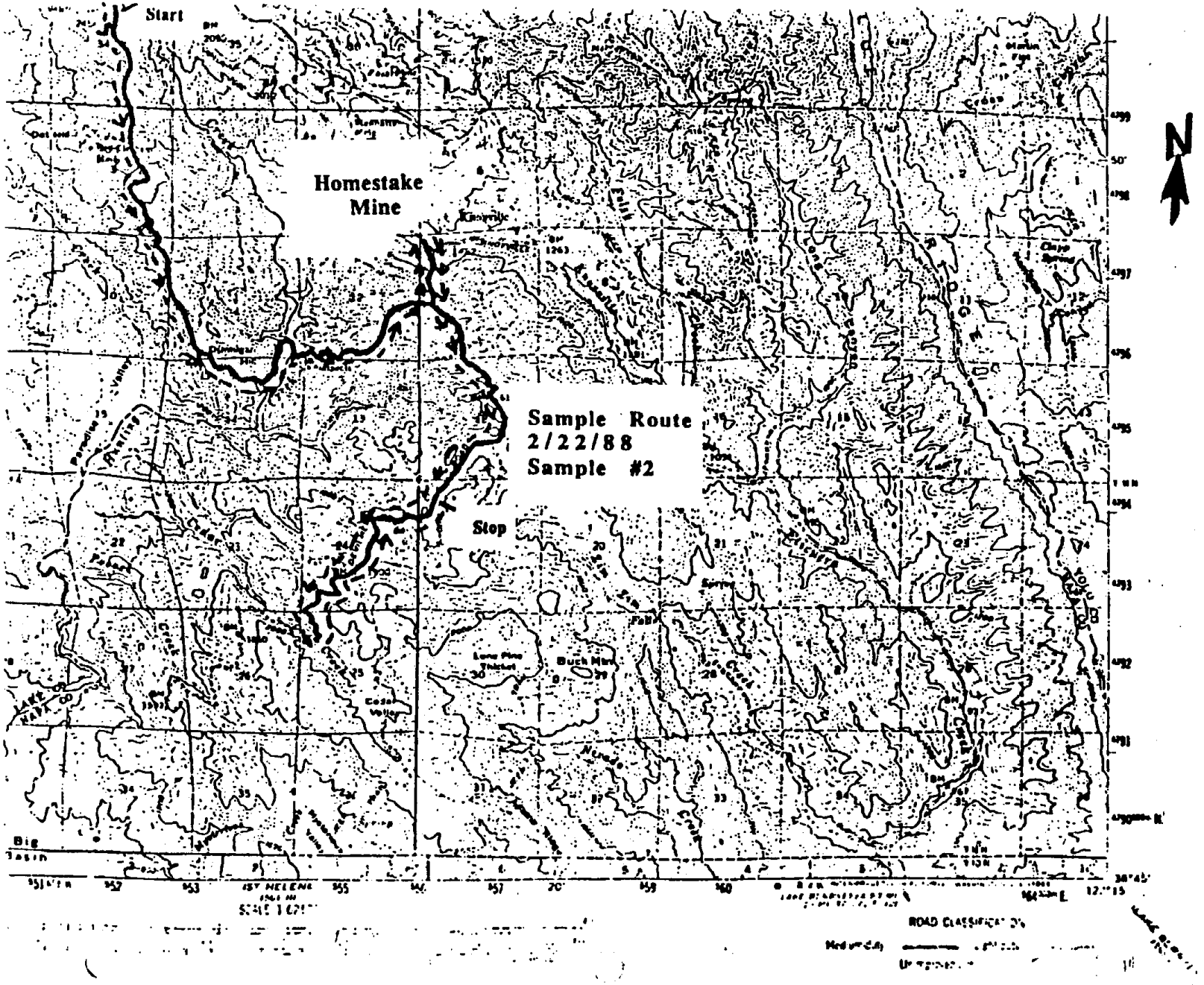
SAMPLE #1
START/ 1005 PST/ Odometer=39065.1/ Rotameter=68/ E.T.=203.4
END/ 1105 PST/ Odometer=39081.9/ Rotameter= 68/ E.T.= 204.4
AVERAGE SAMPLE FLOW= 3.0 LPM

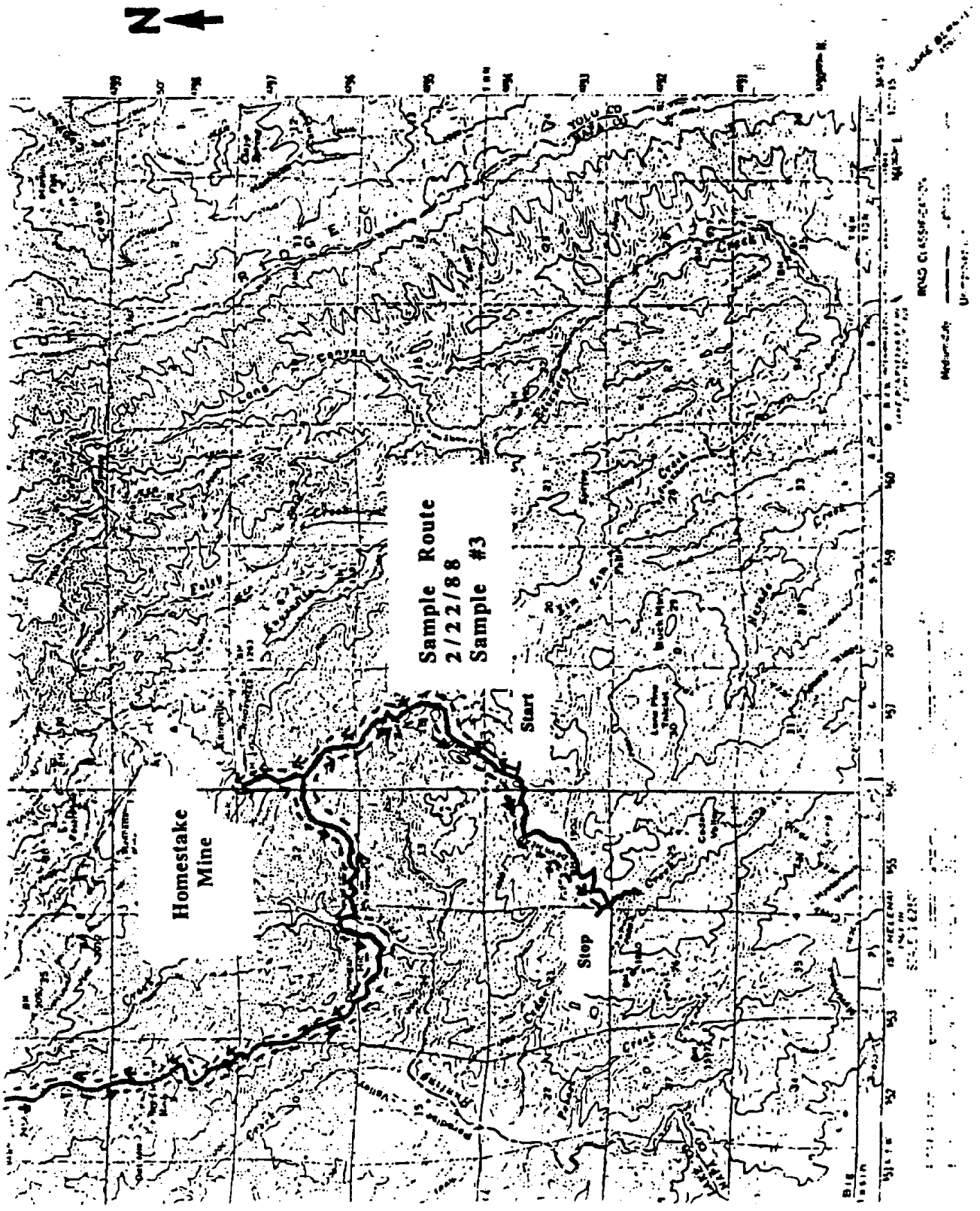
SAMPLE #2
START/ 1125 PST/ Odometer=39081.9/ Rotameter=68/ E.T.=204.5
END/ 1225 PST/ Odometer= 39097.0/ Rotameter= 71/ E.T.= 205.5
AVERAGE SAMPLE FLOW= 3.1 LPM

SAMPLE #3
START/ 1255 PST/ Odometer= 39097.0/ Rotameter=71/ E.T.=205.5
END/ 1355 PST/ Odometer= 39113.4/ Rotameter= 72/ E.T.=206.5
AVERAGE SAMPLE FLOW= 3.2 LPM

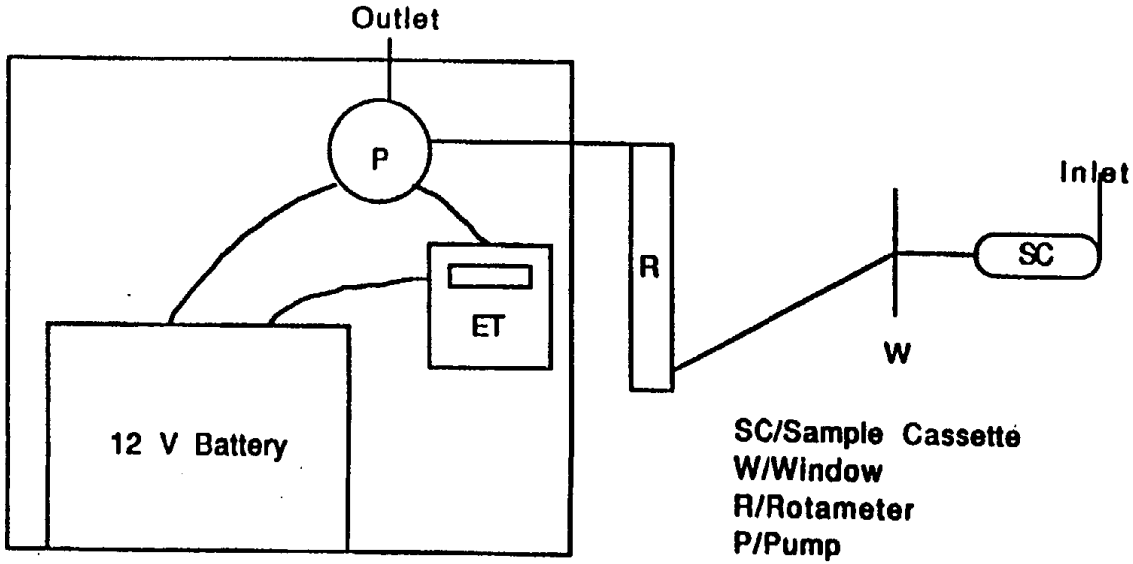
Temp. at end of test was 78 F, R.H. was 30%.


Homestake
Mine
Start
Sample Route
2/22/88
Sample #1
N


Start
Homestake Mine
Sample Route
2/22/88
Sample #2
Stop
N


N
Sample Route
2/22/88
Sample #3
Start
Stop
Homestake
Mine

KNOXVILLE ASBESTOS SAMPLE TRAIN 2/22/88



SC/Sample Cassette
W/Window
R/Rotameter
P/Pump
ET/Elapsed Time Meter
Note: All tubing used 1/4" O.D. Teflon, inlet to sample cassette 4" long

Science Applications International Corporation
An Employee-Owned Company

April 8, 1988

Mr. Ross Kauper
Lake County Air Quality Management District
883 Lakeport Blvd.
Lakeport, CA 95433

Reference: Purchase Order Number 88-011
SAIC Project Number 2-885-05-919-03

Dear Mr. Kauper:

Enclosed please find data reports for four air samples submitted to SAIC for asbestos analysis by transmission electron microscop/specifically, samples labeled Knoxville AB1 through 3 plus a blank.

If you have any questions please don not hesitate to call me at 619/535-7418 and thank you once again for your patience.

Sincerely,

Science Applications International Corporation

Nick P. Rottunda
Section Manager

4224 Campus Point Court, San Diego, California 92121 (619) 535-7462
Other SAIC Offices: Albuquerque, Chicago, Dayton, Denver, Huntsville, La Jolla, Los Angeles, McLean, Oak Ridge, Orlando, San Francisco, Tucson, and Washington, D.C.

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD
LAKEPORT CA 95453

Project Number: 2-885-05-919-03

Price/Sample: $300.00

SAMPLE #: KNOXVILLE 01
SAIC Log #: 88-063-004 Analysis Date: 4/7/88

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 190.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 5

DILUTION FACTOR = 1.0
FIELD AREA = 3295.0 SQ.UM
FIELDS COUNTED AT 5000X = 1

DETECTION LIMIT <5uM = 0.1290 FIBERS/CC
DETECTION LIMIT >5uM = 0.0000 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	115.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE	100.0			
	FIBERS/CC	14.8000	<0.1290	<0.1290	<0.1290
>5.0uM	FIBERS COUNTED	(N.D.)	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	0.0000	0.0000	0.0000	0.0000

TOTAL ASBESTOS FIBERS/CC = 14.8000

TOTAL NON-ASBESTOS FIBERS/CC = (N.D.)

N.D. = Not Detected

ANALYST: A. T. Gothard DATE: 4/7/88

APR 1988

LAKE COUNTY
AIR POLLUTION CONTROL

---- ASBESTOS SCREENING ANALYSIS ----
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD
LAKEPORT CA 95453

Project Number: 2-885-05-919-03

Price/Sample: $300.00

SAMPLE #: KNOXVILLE 02
SAIC Log #: 88-063-005 Analysis Date: 4/7/88

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 181.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 7

DILUTION FACTOR = 1.0
FIELD AREA = 3285.0 SQ.UM
FIELDS COUNTED AT 5000X = 0

DETECTION LIMIT <5uM = 0.0913 FIBERS/CC
DETECTION LIMIT >5uM = 0.0000 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	117.0	(N.D.)	(N.D.)	1.0
	PERCENTAGE	99.2			0.8
	FIBERS/CC	10.7000	<0.0913	<0.0913	0.0913
>5.0uM	FIBERS COUNTED	1.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	0.0000	0.0000	0.0000	0.0000

TOTAL ASBESTOS FIBERS/CC = 10.7000

TOTAL NON-ASBESTOS FIBERS/CC = 0.0913

N.D. = Not Detected

ANALYST: [signature] DATE: 4/7/88

E-7-12

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION 476 Prospect Street La Jolla, CA 92037 (619) 456-7415

RECEIVED
APR 15 1988
LAKE COUNTY
AIR POLLUTION CONTROL

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD
LAKEPORT CA 95453

Project Number: 2-865-05-919-03

Price/Sample: $300.00

SAMPLE #: KNOXVILLE 03
SAIC Log #: 88-063-006 Analysis Date: 4/7/88

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 195.2 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 4

DILUTION FACTOR = 1.0
FIELD AREA = 3285.0 SQ.UM
FIELDS COUNTED AT 5000X = 0

DETECTION LIMIT <5UM = 0.1480 FIBERS/CC
DETECTION LIMIT >5UM = 0.0000 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	120.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE	100.0			
	FIBERS/CC	17.8000	<0.1480	<0.1480	<0.1480
>5.0uM	FIBERS COUNTED	2.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	0.0000	0.0000	0.0000	0.0000

TOTAL ASBESTOS FIBERS/CC = 17.8000

TOTAL NON-ASBESTOS FIBERS/CC = (N.D.)

N.D. = Not Detected

ANALYST: T. F. Hoffman DATE: 4/7/88

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION 476 Prospect Street La Jolla, CA 92037 (619) 454-7416

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
983 LAKEPORT BLVD
LAKEPORT CA 95453

Project Number: 2-865-05-919-03

Price/Sample: $300.00

SAMPLE #: #4 (FIELD BLANK)
SAIC Log #: 88-063-007 Analysis Date: 4/7/88

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 1.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 10

DILUTION FACTOR = 1.0
FIELD AREA = 3285.0 SQ.UM
FIELDS COUNTED AT 5000X = 0

DETECTION LIMIT <5uM = 11.6000 FIBERS/CC
DETECTION LIMIT >5uM = 0.0000 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	(N.D.)	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	<11.6000	<11.6000	<11.6000	<11.6000
>5.0uM	FIBERS COUNTED	(N.D.)	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	0.0000	0.0000	0.0000	0.0000

TOTAL ASBESTOS FIBERS/CC = (N.D.)

TOTAL NON-ASBESTOS FIBERS/CC = (N.D.)

N.D. = Not Detected

ANALYST: A. T. Stewart DATE: 4/7/88

LAKE COUNTY AIR QUALITY
MANAGEMENT DISTRICT
— OFFICE AND LABORATORY —
883 Lakeport Blvd.
Lakeport, California 95453
Telephone: 707/263-7000
Burn Info.: 707/263-3121

ROBERT L. REYNOLDS
Air Pollution Control Officer
Noise Control Officer

November 24, 1987

Mr. Eric Johnson
Bureau of Land Management
555 Leslie St.
Ukiah, Ca. 95482

Dear Mr. Johnson:

RE: Regarding Knoxville Survey; Interim Asbestos Monitoring Report

Please find enclosed the referenced report and several attachments. The report covers the first monitoring effort only. As agreed, we have not attempted to interpret the data but we have provided a more recent document that could assist in such interpretation.

We will attempt to carry out additional sampling per your request if the weather allows. Ross is presently on vacation and will not return until Dec 7, 1987. If you concur, we can get together then to discuss any plans for further testing.

Should you have questions on the report please give me a call.

Sincerely,

Robert L. Reynolds

attachment: Interim Report

KNOXVILLE ASBESTOS SURVEY

LAKE COUNTY AIR QUALITY MANAGEMENT DISTRICT

INTERIM REPORT
November 27, 1987

DESCRIPTION & BACKGROUND

Sampling for asbestos from road generated dust was conducted by District and BLM personnel on September 29, 1987 (Eric Johnson, BLM; Ross Kauper and Lowell Grant, LCAQMD). This was performed at BLM's request to gather technical data to be considered as part of a NEPA document considering the area for an Off Road Vehicle (ORV) area. Three sites identified as AB-1, AB-2 and AB-3 as shown on the attached map (Figure 1) were selected for monitoring of airborne asbestos fiber levels coincident with simulated ORV use near the sites. A Meteorology Research Inc. mechanical weather station was also installed and operated at site AB-2 to record wind speed, direction and temperature during the sampling period.

The exact monitoring locations were selected by BLM personnel after consultation with the District on site, prior to initiating the monitoring. Sites were selected largely on the basis of the observed extent of serpentine rock type outcropping on road cuts. The sites were spaced sufficiently distant and were different in extent of serpentine outcroppings to represent a range of the more general area conditions.

SAMPLING METHOD

The samplers were fabricated by the District, set up and operated at the respective sites to achieve a flow rate of 4.0 liters per minute (standard conditions). The start time and elapsed sample times were recorded to calculate the total sample volume. Volumes were corrected from standard pressure and temperature to the actual field conditions. Science Application International Corp., (SAIC) was supplied with these volumes for the calculation of the asbestos concentration results. The sampling media was prepared by SAIC and provided the District whom was responsible for collection of samples. The inlet to the sample filter casettes was located at an elevation of 5 feet above ground level to simulate the respiratory zone of humans. Copies of the field test report,

volume calculations and photographs of the sampling sites are included in Attachment 1. [redacted]d the procedure utilized. On mutual decision, the location of AB-2 was moved to the opposite side of the roadway after the first hour of sampling to account for the wind shift observed at that location, no other deviations in the program occurred during the sampling.

Sample sites were established so that vehicular traffic generated dust would be upwind and flow into the sampling stations. At sites AB-2 and AB-3 five drive-bys, at 20 miles per hour were made by a Quad Runner ORV (1), 4x4 Pickup Truck (1), GMC 1-ton Van (1) and a 1/2 ton Nissan Pickup (2). At site AB-1 a total of seven (7) vehicle drive-bys at 20 miles per hour were made by a Quad Runner ORV (2), 4x4 Pickup Truck (1), GMC 1-ton Van (2) and a 1/2 ton Nissan Pickup (2). The number of drive-bys is indicated in parenthesis. The sampling apparatus was located at an estimated six (6) feet from the drive-by path.

The 25 mm filter casettes utilized for sample collection were prepared and provided by SAIC and delivered to the District for sample collection in the field. The collected samples and a blank filter were returned to the laboratory for transmission electron microscope analysis. The District deployed one filter in the field during the test period as a control blank. This filter received handling as a regular sample and was also returned to the lab for background analysis.

RESULTS

The hourly averages for the meteorological measurements made at site AB-2 coincident with sample collection are presented below in table I.

TABLE I
Meterological Monitoring (Site AB-2)

Time of Day	Dir- Degrees TN	Wind MPH	Temp F
10:00 (PDT)	20	4	92
11:00 (PDT)	100	3	97
12:00 (PDT)	100	3	99
13:00 (PDT)	90	4	101

The results of the field and blank analysis for total asbestos and non asbestos fibers are presented in Attachment 3 and summarized below in table II.

TABLE II

Sample	Cubic Meters	Total Minutes	Vehicle Drive-bys	Non-asbestos Fibers/cc	Asbestos Fibers/cc
AB-1	0.9227	255	7	0.0416	0.1453
AB-2	0.8923	246	5	0.0197	0.0513
AB-3	0.751345	207	5	Not Detected	0.0632
Blank	0	na	na	Not Detected	Not Detected

Field conditions during the test run were conducive to dust generation, no reportable rain fall had been recorded at the adjacent Homestake Mining Company site during the recent monitoring beginning July 1, 1987. Road conditions were dry. Temperatures were recorded between 90 and 101 degrees Farenheit during the monitoring period. Winds were low and not expected nor observed to generate dust. Conclusions are not offered, but a Dept. of Health Services document dated January1986 and entitled "Health Effects of Asbestos" is attached for the readers consideration.

Submitted By:

Ross L. Kauper

Ross L. Kauper 11/24/87

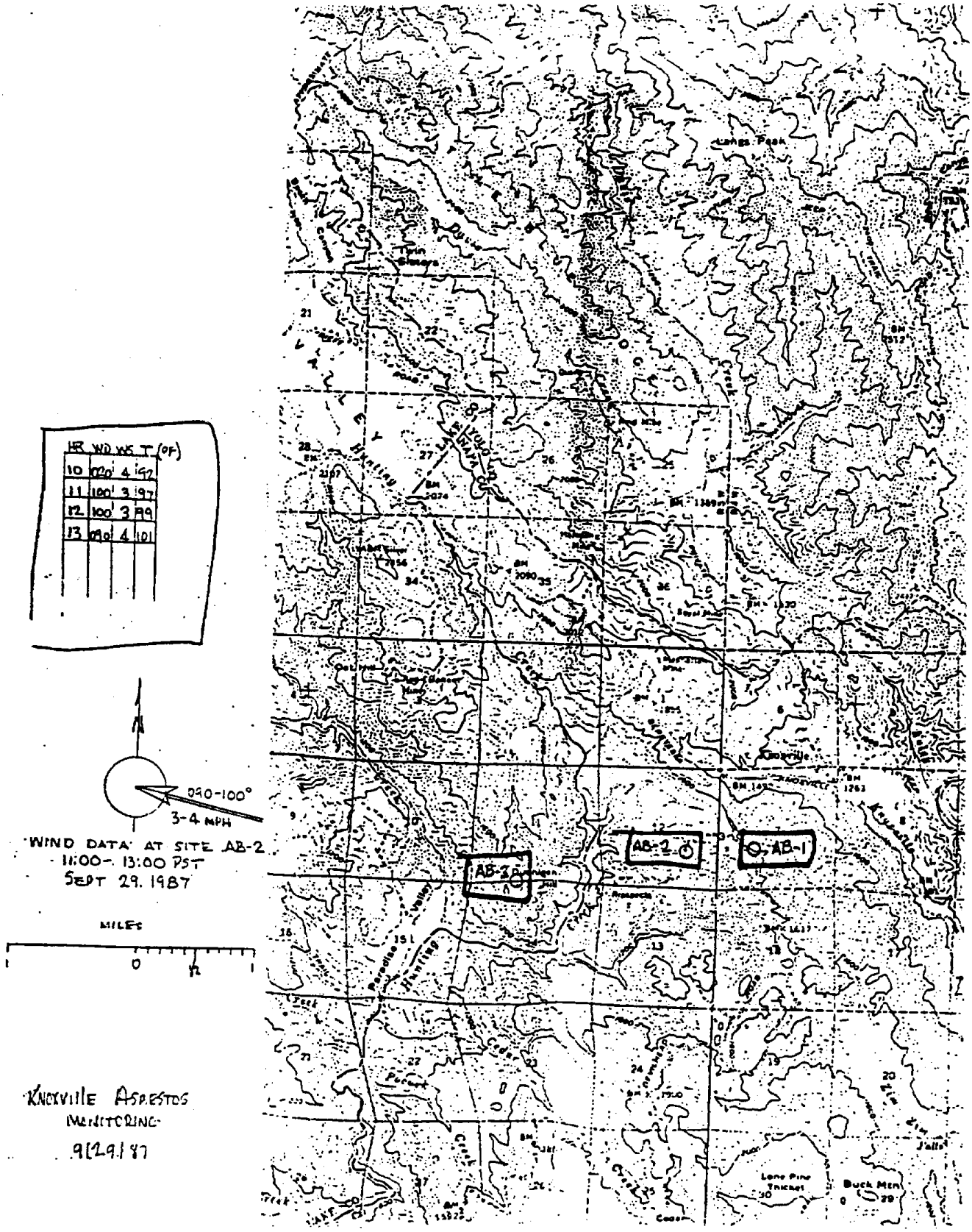
Attachments: 3 Polaroid pictures
Map (figure 1)
3 field test reports
SAIC Analysis Report
DHS document on "Health Effects of Asbestos"

RLK/RLR

KNOXVILLE AB#1 AB-1
9/29/87 0940 PST R. KALMER

KNOXVILLE AB 2 + MET STATION AB-2
9/29/87 1010 PST

KNOXVILLE AB#3 AB-3
1040 PST
9/29/87


HR WD WS T (°F)
10 090 4 92
11 100 3 97
12 100 3 99
13 090 4 101
N
090-100°
3-4 MPH
WIND DATA AT SITE AB-2
11:00- 13:00 PST
SEPT 29. 1987
MILES
0
1
AB-1
AB-2
AB-3
KNOXVILLE ASBESTOS
MONITORING
9/29/87

LAKE COUNTY AIR POLLUTION CONTROL DISTRICT

FIELD TEST REPORT

Date of Test: 9/29/87

Location of Test: Knoxville Site AB-1

Substance Tested: ASBESTOS

Type of Test: 25mm filter - Transmission Electron Microscopy

BP = 28.45
TA = 35°C

Sampling: Time ~~1400 PST~~ 0946 PST ET 194.6 198.85 Rate: START 4.0 LPM END 4.0 LPM

Color - Grade - Range

Range of Concentration

Calculations:
198.85
194.60
(4.25 HR)(60 MIN/HR) = 255 MIN x 4.0 LPM = 1020 Liters / 1000 L/m³ = 1.02 m³ x .9045 TP corr = .922682 m³

T/P corr
28.45/29.92 x 293/(273+35) = (.9508)(.9513) = .9045

Comments: See ATTACHED MAP

Signature
9/30/87
Date

Reviewed By

Date

1-atmosphere & 20°C

LAKE COUNTY AIR POLLUTION CONTROL DISTRICT

FIELD TEST REPORT

Date of Test: 9/29/87

Location of Test: Knoxville Site AB-2

Substance Tested: Asbestos

Type of Test: 25mm Filter, Transmission Electron Microscope

$\Delta P = 28.52$ "Hg

$T_A = 35°C$

Sampling: Time 1012 PST ET 211.6 / 1345 PST 215.7 Rate: START 4.0 LPM / END 4.0 LPM

Color - Grade - Range

Range of Concentration

Calculations: $215.7 - 211.6 = 4.1$ HR

$(4.1 \text{ HR})(60 \frac{\text{MIN}}{\text{HR}}) = 246 \text{ MIN} \times 4.0 \text{ LPM} = 984 \text{ LITERS}$

$\frac{984 \text{ L}}{1000 \text{ L/M}^3} = .984 \text{ M}^3$

$\left(\frac{28.52}{29.92}\right) = .9532 \times \frac{293}{273+35} = .90678$

$.984 \text{ M}^3 \times .90678 = .892276 \text{ M}^3$

Comments:

Ross Kamper — Signature

9/30/87 — Date

Reviewed By

Date

LAKE COUNTY AIR POLLUTION CONTROL DISTRICT

FIELD TEST REPORT

Date of Test: 9/29/87

Location of Test: Knoxville Site AB #3

Substance Tested: Asbestos

Type of Test: 25 mm Filter, Transmission Electron Microscope

P_A = 28.54 mm Hg

T_A = 35°C

Sampling: Time START 1040 PST END 1307 PST Rate: START 4.0 LPM END 4.0 LPM

Color - Grade - Range

Range of Concentration

Calculations: 207 min × 4.04 m = $\frac{828\ l}{1000\ l/m^3}$ = .828 m^3

$\frac{28.54}{29.92}$ = .95377 × $\frac{293}{273+35}$ = .90742 (.828 m^3) = .751345 m^3

Comments:

R. Kemper
Signature

9/30/87
Date

Reviewed By

Date

SAIC
Science Applications International Corporation

13 October 1987

Mr. Ross Kauper
Lake County Air Quality Management District
883 Lakeport Blvd.
Lakeport Ca. 95453

Reference: Purchase order number 88-010
SAIC Project number 2-885-02-638-00

Dear Mr. Kauper,

Enclosed please find data reports for four air samples submitted to SAIC for asbestos analysis by transmission electron microscopy. Specifically, samples AB-1 TEM, AB-2 TEM, AB-3 TEM, AB-4 TEM are included. Invoicing follows under separate cover.

Please do not hesitate to call me at 619/535-7416 if you have any questions.

Sincerely,

Spencer L. Frankel
Microscopy Labratory Manager

Encls.

Division of Applied Environmental Sciences, 476 Prospect Street, La Jolla, California 92037 (619) 456-7462
Other SAIC Offices: Albuquerque, Chicago, Dayton, Denver, Huntsville, Los Angeles, Oak Ridge, Orlando, San Diego, San Francisco, Tucson and Washington, D.C.

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD.
LAKEPORT CA 95453

Project Number: 2-885-02-638-00

Price/Sample: $300.00

SAMPLE #: AB-1
SAIC Log #: 87286001 Analysis Date: 10\7\87

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 923.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 20

DILUTION FACTOR = 1.0
FIELD AREA = 3600.0 SQ.UM
FIELDS COUNTED AT 5000X = 60

DETECTION LIMIT <5uM = 0.0057 FIBERS/CC
DETECTION LIMIT >5uM = 0.0019 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	23.0	1.0	(N.D.)	6.0
	PERCENTAGE	70.4	3.1		18.4
	FIBERS/CC	0.1320	0.0057	<0.0057	0.0343
>5.0uM	FIBERS COUNTED	3.0	1.0	1.0	3.0
	PERCENTAGE	3.1	1.0	1.0	3.1
	FIBERS/CC	0.0057	0.0019	0.0019	0.0057

TOTAL ASBESTOS FIBERS/CC = 0.1453

TOTAL NON-ASBESTOS FIBERS/CC = 0.0419

N.D. = Not Detected

ANALYST: _____ DATE: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION 476 Prospect Street La Jolla, CA 92037 (619) 456-7416

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD.
LAKEPORT CA 95453

Project Number: 2-885-02-638-00

Price/Sample: $300.00

SAMPLE #: AB-2
SAIC Log #: 87286002 Analysis Date: 10\8\87

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 892.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 20

DILUTION FACTOR = 1.0
FIELD AREA = 3600.0 SQ.UM
FIELDS COUNTED AT 5000X = 60

DETECTION LIMIT <5uM = 0.0059 FIBERS/CC
DETECTION LIMIT >5uM = 0.0020 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	7.0	(N.D.)	(N.D.)	2.0
	PERCENTAGE	58.3			16.7
	FIBERS/CC	0.0414	<0.0059	<0.0059	0.0118
>5.0uM	FIBERS COUNTED	5.0	(N.D.)	(N.D.)	4.0
	PERCENTAGE	13.9			11.1
	FIBERS/CC	0.0099	<0.0020	<0.0020	0.0079

TOTAL ASBESTOS FIBERS/CC = 0.0513

TOTAL NON-ASBESTOS FIBERS/CC = 0.0197

N.D. = Not Detected

ANALYST: _____ DATE: _____

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION 476 Prospect Street La Jolla, CA 92037 (619) 456-7416

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD.
LAKEPORT CA 95453

Project Number: 2-885-02-638-00

Price/Sample: $300.00

SAMPLE #: AB-3
SAIC Log #: 87286003 Analysis Date: 10\8\87

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 751.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 20

DILUTION FACTOR = 1.0
FIELD AREA = 3600.0 SQ.UM
FIELDS COUNTED AT 5000X = 60

DETECTION LIMIT <5uM = 0.0070 FIBERS/CC
DETECTION LIMIT >5uM = 0.0023 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	8.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE	88.9			
	FIBERS/CC	0.0562	<0.0070	<0.0070	<0.0070
>5.0uM	FIBERS COUNTED	3.0	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE	11.1			
	FIBERS/CC	0.0070	<0.0023	<0.0023	<0.0023

TOTAL ASBESTOS FIBERS/CC = 0.0632

TOTAL NON-ASBESTOS FIBERS/CC = (N.D.)

N.D. = Not Detected

ANALYST: _____ DATE: _____

--- ASBESTOS SCREENING ANALYSIS ---
(Transmission Electron Microscopy)

Client Information: LAKE COUNTY AQMD
883 LAKEPORT BLVD.
LAKEPORT CA 95453

Project Number: 2-885-02-638-00

Price/Sample: $300.00

SAMPLE #: AB-4
SAIC Log #: 87286004 Analysis Date: 10\8\87

SAMPLE DESCRIPTION: AIR SAMPLE ON 25 mm POLYCARBONATE FILTER IN STYRENE CASSETTE

SAMPLE VOLUME = 1.0 LITERS
FILTER AREA = 3.8 SQ.CM
FIELDS COUNTED AT 10000X = 20

DILUTION FACTOR = 1.0
FIELD AREA = 3600.0 SQ.UM
FIELDS COUNTED AT 5000X = 60

DETECTION LIMIT <5uM = 5.2800 FIBERS/CC
DETECTION LIMIT >5uM = 1.7593 FIBERS/CC

DATA SUMMARY

SIZE	CATAGORY	CHRYSOTILE	AMPHIBOLE	AMBIGUOUS	NON-ASBESTOS
<5.0uM	FIBERS COUNTED	(N.D.)	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	<5.2800	<5.2800	<5.2600	<5.2800
>5.0uM	FIBERS COUNTED	(N.D.)	(N.D.)	(N.D.)	(N.D.)
	PERCENTAGE				
	FIBERS/CC	<1.7593	<1.7593	<1.7593	<1.7593

TOTAL ASBESTOS FIBERS/CC = (N.D.)

TOTAL NON-ASBESTOS FIBERS/CC = (N.D.)

N.D. = Not Detected

ANALYST: _____ DATE: _____

Air Resources Board
Jamestown Mine Road Study

State of California

M E M O R A N D U M

To : Peter Ouchida, Manager
Testing Section

Date : February 22, 1989

Subject : Results of Asbestos Monitoring Conducted Around Jamestown During February 6-8, 1989

From : James McCormack JEM
Monitoring and Laboratory Division
Air Resources Board

During of the week of February 6, 1989, the Air Resources Board (ARB) staff conducted a monitoring program to determine the ambient concentration of asbestos at ten sites within the vicinity of Jamestown in Tuolumne County. The results of the monitoring program are shown in Table I. These results were presented to Jerry Benincasa, Tuoluome County Air Pollution Control Officer, verbally over the phone on February 10 and February 16.

A test protocol describing the sampling equipment, sampling methodologies, and details of the monitoring program is presented in Attachment I. Prior to conducting the monitoring, the staff discussed the protocol at a February 6, 1989, meeting with Jerry Benincasa and representatives from Sonora Mining Corporation and Woods Creek Quarry (attendees of the meeting are shown in Table II). Based on inputs obtained at the meeting, a final test protocol was developed and agreed upon by all parties.

Figure 1 is a map of the sampling area and identifies the locations of each ARB sampling site, ARB meteorological station sites, and Sonora Mining Corporation's (SMC) meteorological station. The monitors were set-up at two sampling sites within the Hurst and SMC properties and one monitor was set up within the Woods Creek Quarry. These sampling sites are identified as #1, #2, #3, #4, and #5 in Figure 1 and correspond to the same sites used in the March 1988 ARB monitoring program. Four sampling sites, #7, #8, #9, and #10 were set up to determine the affects of SMC blasting operations. Sampling site #6 was considered a background sampling site.

Table I

Results of Sampling in the Jamestown Area of Tuolumne County

sample #	Location	sampling dates: start date	start time	end date	end time	ambient concentrations Structures/m^3	minimum& detection limits Structures/m^3
1A	SMC PIT^	2/6/89	1715	2/7/89	1715	ND	<2000
1B	SMC PIT	2/7/89	1720	2/8/89	1717	ND	<2000
2A	SMC PIT^	2/6/89	1735	2/7/89	1735	4000	NA
2B	SMC PIT	2/7/89	1738	2/8/89	1720	6000	NA
3A	WC QUARRY Rd^	2/6/89	1800	2/7/89	1815	5900	NA
3B	WC QUARRY Rd	2/7/89	1816	2/8/89	1630	2100	NA
4A	HURST LAWN^	2/6/89	1815	2/7/89	1839	ND	<1900
4B	HURST LAWN	2/7/89	1840	2/8/89	1620	ND	<2200
5A	HURST HILL ^	2/6/89	1835	2/7/89	1834	15800	NA
5B	HURST HILL	2/7/89	1835	2/8/89	1618	ND	<2200
6A	SMC SITE #35+^	2/6/89	1710	2/7/89	1705	ND	<2100
6B	SMC SITE #35+^	2/7/89	1706	2/8/89	1654	ND	<2100
8	SMC READY LINE^	2/8/89	0929	2/8/89	1024	ND	<51800@
7	SMC READY LINE	2/7/89	1744	2/8/89	1737	ND	<2000
10	SMC STOCKPILE*^	2/8/89	0925	2/8/89	1015	ND	<57000@
9	SMC STOCKPILE*	2/7/89	1755	2/8/89	1742	2000	NA
11	FIELD BLANK	2/8/89	0800	2/8/89	0800	ND	<2000
M1	SMC PIT	2/7/89	1534	2/7/89	1944	6200	NA

& minimum detection limits only reported when no structures are detected
\+ background sampler
* sample of blasting fallout
@ high minimum detection limit due to low sample volume
^ intermittent snow showers afternoon of 2/8/89
ND none detected
NA not applicable

FIGURE 1
Sonora Sampling Area
Containing The Sampling and Meteorological Sites

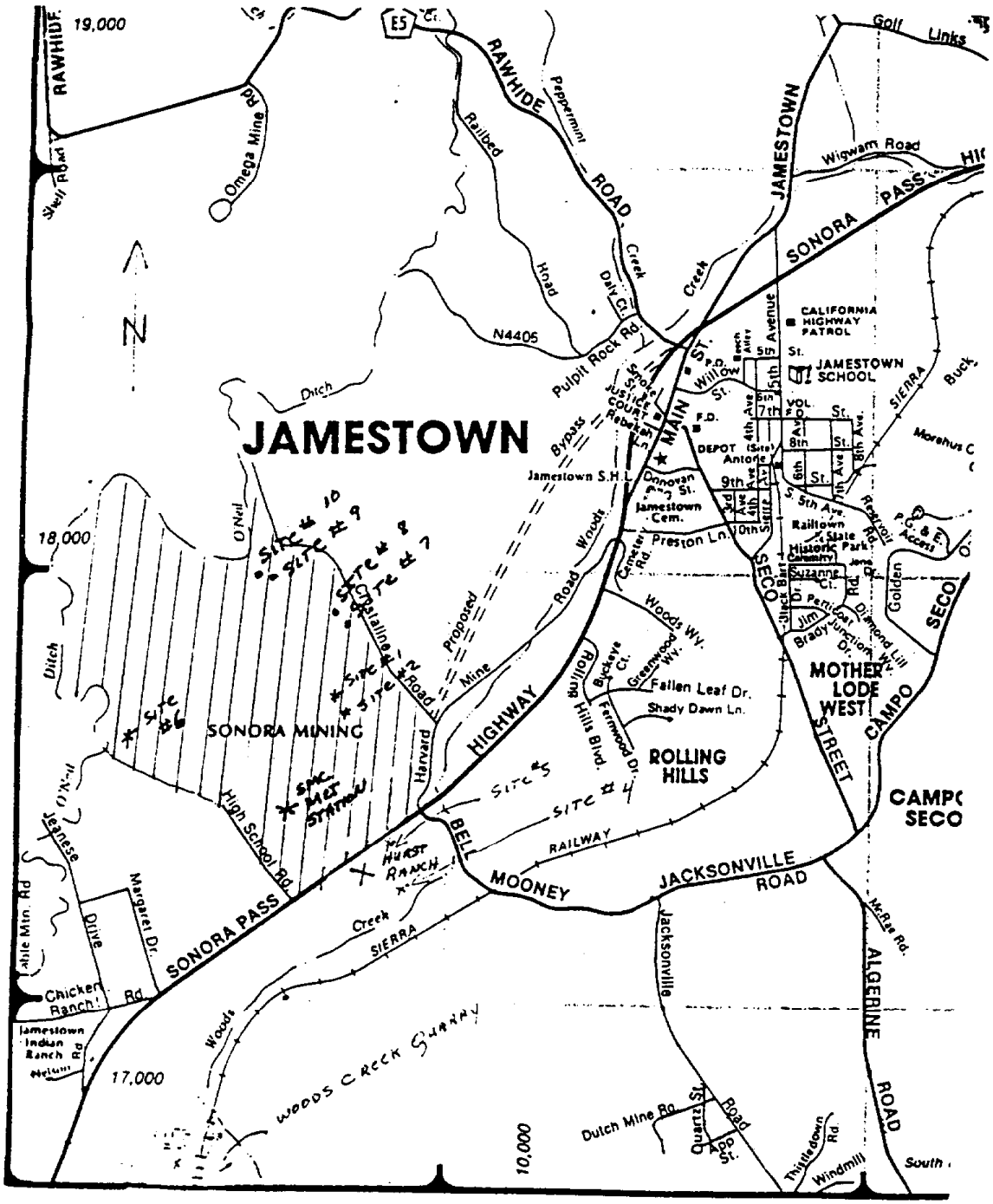


Table II

Attendees of Meeting Reviewing Sampling Protocol

name	affiliation
Jerry Benincasa	Tuolumne County APCD
Mike Waugh	Tuolumne County APCD
George Lew	ARB
Peter Ouchida	ARB
Jeff Lee	ARB
James McCormack	ARB
David Skolasinski	Sonora Mining Corp.
David Lee	Sonora Mining Corp.
John Pradenas	Sonora Mining Corp.
Bud Hatler	Woods Creek Rock Quarry

A total of 18 samples were collected from ten sampling sites over a two consecutive twenty-four period beginning on February 6. One additional sample was taken, over a four hour period, using a "monocot" ambient air samplers at site #2. This type of sampler was used in the 1988 ARB monitoring program. Two consecutive twenty-four samples were collected at a location called background (#6).

In an attempt to determine the asbestos concentration during the blasting at SMC, four samplers were setup at two locations downwind (sites #7, #8, #9, and #10) of the blast area. Sites #7 and #8 were adjacent to each other and northeast of the blast area while sites #9 and #10 were adjacent to each other and due north of the blast area. Samples at sites #7 and #9 were taken over a twenty-four period while samples at sites #8 and #10 were taken during a one hour interval starting before the blast. Due to the wind direction occurring during the blast, samples taken at sites #7 and #8 were not in the "drift" pattern of the blast plume and sites #9 and #10 were marginaly in the blast plume.

The last sample was a field blank. The field blank is a sampling cassette that is uncapped, placed in the monitoring equipment, removed and capped. The field blank is used to determine the effects of handling and contamination.

The wind data from the ARB meteorological stations are summarized in Table III. A snow shower occurred during a four hour period on the afternoon of February 8, 1989. The effect of the snow shower on the asbestos concentration is unknown.

Attachments

TABLE III

Wind Speed and Direction

sampler site	sampler location	wind direction	wind speed mph	time frame
6	SMC Site #35	SE to SW	1.5 - 4	All the Time
5	HURST Ranch Hill	SE	2 - 2.5	9:00am to 4:00pm
		N to NW	2 - 2.5	Rest of Time
1	SMC Pit	SE to SW	1.5 - 4	All the Time

Attachment I

EVALUATION TEST PROCOTOL

(AVAILABLE UPON REQUEST)

United States Environmental Protection Agency
Road Study

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

ENVIRONMENTAL ASBESTOS ROADS STUDY
FIELD WORK REPORT

Lauren Volpini
Emergency Response Section
Field Operations Branch
Toxics and Waste Management Division

MARCH 1988

FINAL

TABLE OF CONTENTS

ACKNOWLEDGMENTS

A special thank you and note of appreciation to my Supervisor, P.T. Brubaker, Chief of the Emergency Response Section (ERS).

At the close of this Study, I am leaving the ERS for a new position - hopefully wiser, certainly older and deeply appreciative for having worked with a man who has given me selfless opportunity to grow and learn over the past 5+ years. His kindness and integrity, his creative non-bureaucratic approach, his fine intellect and his sound advice and guidance have not gone unrecognized by those who count most - his staff.

Lauren Volpini
US EPA Region 9
San Francisco January 1988

I. INTRODUCTION AND BACKGROUND

California's state rock, serpentine, often contains naturally occuring asbestos fibers. This rock has been, and continues to be quarried, crushed and applied as surface aggregate on unpaved roads. Via vehicle travel, asbestos fibers are liberated into the air, potentially exposing vehicle occupants and residents to unsafe levels of asbestos. Over the past few years, EPA Region 9 has carried out three Superfund emergency response actions on such roads - in Garden Valley, CA, in Copperopolis, CA and at the Superfund National Priority List site in Alviso, CA.

Upon better understanding of the potential magnitude of the problem in our Region, we decided to find a method which would more accurately and cost-effectively assess a site's potential asbestos levels and health risks.

We began by developing a "model" designed to estimate ambient air concentrations of asbestos fibers from the concentrations found in bulk road samples. Then, we designed a study to field test the model's validity, involving traffic simulation, air and soil sample collection and meteorological monitoring. At the end of the 1987 dry season during October, we conducted the study at a pre-selected test site in Amador County, CA. After analyzing the the air and soil samples via combinations of polarized light microscopy, phase contrast microscopy/dispersion staining and transmission electron microscopy, we hired an independent laboratory to perform a quality assurance review of the analyses. The data and laboratory reports were further reviewed by a contract quality assurance officer prior to final scrutiny by the Quality Assurance Management Section, EPA Region 9. Because serious quality assurance and quality control measures were integral to all aspects of each Study component, the final data summaries presented in this document are valid for all purposes.

Our efforts were aided by EPA's Office of Air Quality, Planning and Standards in Research Triangle Park, N.C. and Environmental Response Team in Edison, N.J., the National Ocean and Atmospheric Agency's Hazardous Materials Office in Seattle, WA and air quality specialists under our emergency response technical assistance contract.

This Field Study Report discusses the implementation of the US EPA Region 9 Environmental Asbestos Roads Study: Sample Plan (US EPA, November, 1987). Within, you will find an overview of the Study's field work phase with summaries of the sampling methodology and rationale, laboratory services and sample analysis.

A dBase III data management system is now in place, storing all meteorological and sample data. A summary of this data is included in Section VI of this report and contains several graphs and tables which are offered to aquaint the reader with a few apparent

summarizations of the enormous amount of data generated and collected.

To implement the specifics of the Sample Plan, the Study Team collected representative air, soil and meteorological data which now may be used to verify the "Copeland Model" and/or to provide data for application to another model. It is hoped that the model may serve to help estimate potential airborne asbestos fiber concentrations from roads surfaced with asbestos containing serpentinite rock. Because this report is best understood in the context of the Sample Plan, it is recommended that the reader review the Plan prior to the reading this report.

Now that we have the Study data, our next steps are to compare the predicted values of the Copeland Model with the values measured in the Study's sampling effort. This comparison is expected to help us verify or nullify the model. If it is determined that we may use the Copeland Model with confidence, we would then have the basis for a new method to help us quickly and cost effectively determine whether a particular site poses unacceptable public health risks and whether or not a federal response action is warranted. If it is determined that the Copeland Model as expressed has not been verified by the Study, we hope to apply the study data to additional statistical software, to other models, or have it serve as a basis for, or input to, future studies.

The reader's interest in accessing our data base or receiving specific reports is encouraged as are his comments and questions on the Study design and implementation.

A. Field Work Dates and List of Study Team Members

The field work phase of the Study was conducted from Monday, October 12, 1987 through Tuesday, October 20, 1987. The Study Team was comprised of the following members:

Lauren Volpini - Project Manager
Emergency Response Section, US EPA Region 9
Phil Campagna - Technical Advisor
Environmental Response Team (ERT), US EPA, Edison, N.J.
Sella Burchette - Technical Advisor, ERT (formally with Weston)
Debra Simeneck-Beatty - Meteorological Advisor
Hazardous Materials Section, National Oceanic & Atmospheric Agency (NOAA) Seattle, WA.
Renee Cohen - Post field work technical assistance, REAC (Weston - EPA Contractor)

Ecology & Environment, Inc. (EPA Contractors)
- Gary Floyd - Assistant Team Leader, TAT
- Tom Ferrera - Air Quality Technical Advisor (Corporate)
- Don Woody - Technical Assistance, TAT
- Mary Sapp - Technical Assistance, TAT
- Pat Chadwick - Post field work data management
- Cindy Jones - Post field work technical assistance

II. THE STUDY SITE

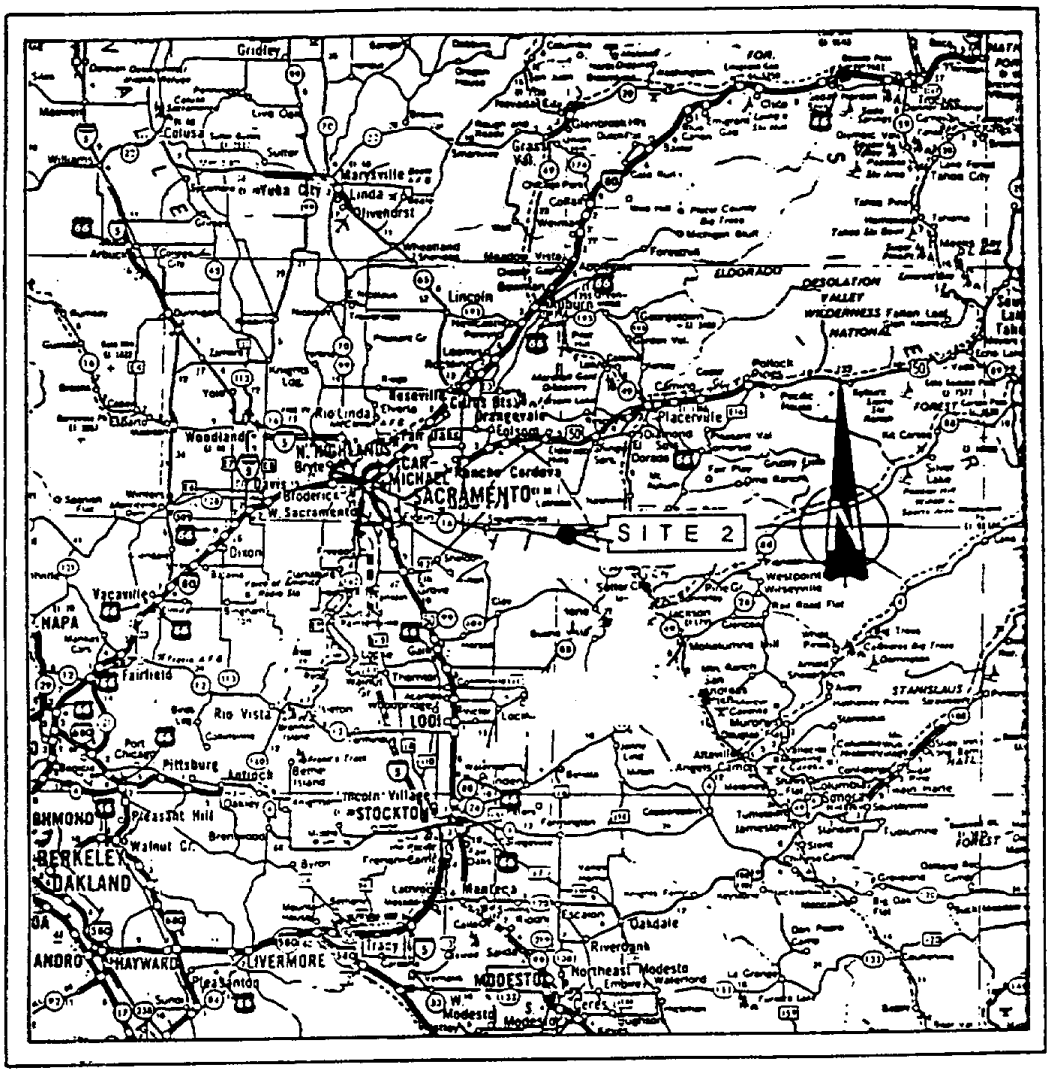
Initially, the field work was going to involve two distinct study sites in the Mother Lode Region of California, with three days of sampling devoted to each site. For a detailed explanation of both test sites and how they were selected, please refer to the Environmental Asbestos Roads Study Sample Plan (US EPA November, 1987).

Site 1 is located in Calaveras County, approximately 2 miles from the County Seat of San Andreas, CA. Site 2 is located in Amador County, approximately 18 miles from the County Seat of Jackson, CA. (see Map 1 Site Location Map). The Study Team decided to begin at Site 2 because of its ideally isolated location and close proximity to water and power. While the field work was in progress at Site 2 however, a few members of the Study Team re-visited Site 1 to reassess its topographical and meteorological characteristics. As a result of this assessment, it was determined that Site 1 would not be as conducive to the Study objectives as the relative merit of remaining at Site 2 and continuing the sampling effort there. This decision was based on Site 1's topographical influences - boulders along the downwind edge of the test road, a steep hill west of the proposed sampling locations, road grade, steep drop off the northeast area of interest - and, meteorological characteristics - winds not generally perpendicular to the test road. Additionally, Site 1 is so clearly visible from the major highway of the area, Highway 49, that to protect the delicate and expensive sampling equipment, overnight security would have been necessary and yet not readily available. To remain at Site 2 and sample for the entire 6 day period was deemed most sensible.

Due to the short planning phase of the Study, some factors were not considered, such as, long term site specific meteorological data, roads with varying grades, varying concentrations of asbestos, nighttime sampling, and various weights and speeds of test vehicles.

A. The Test Area

Upon arrival at the Study Site, the area was closely scrutinized to find the optimum 100' test section. Parameters for optimum conditions included: relatively level road and its immediate surrounds (lateral extent approximately 300'), minimum foliage in the area (i.e., trees and shrubs) and the road oriented such that the predominent wind direction would be perpendicular to the road. 200' of road at either end of the 100' test section was also required as an area where the test car could "coast" as opposed to "braking." This added a buffer zone so that potential asbestos emmissions from brake linings would be less likely to contribute to the airborne asbestos count in the immediate test area and to avoid the potential concentration of particulates and asbestos released from the road surface as a result of the force of "braking". In fact, the only optimum test condition unable to be met was to have a 300' downwind station. Topographically, the



MAP 1

ENVIRONMENTAL ASBESTOS STUDY

SITE LOCATION MAP

MOTHER LODE REGION, CALIFORNIA

test site (necessarily level for the sampling stations), allowed for a maximum downwind station of only 100'. At approximately 100', the vegetation became too dense to locate additional air sampling stations.

Upon selection of the specific 100' test section, a survey was made to correctly orient all pertinent equipment (i.e., air sampling stations, meteorological station, generators, etc.). This began by taking a bearing of the road itself, which would orient all equipment and air sampling points perpendicular to the road. All station locations were surveyed and staked on the ground at pre-determined distances from the road. A "No Braking" area, a "Hot-Line", a Decontamination Area (Decon), the Study Team Command Post and the placement of the outdoor latrines were also designated (refer to Map 2).

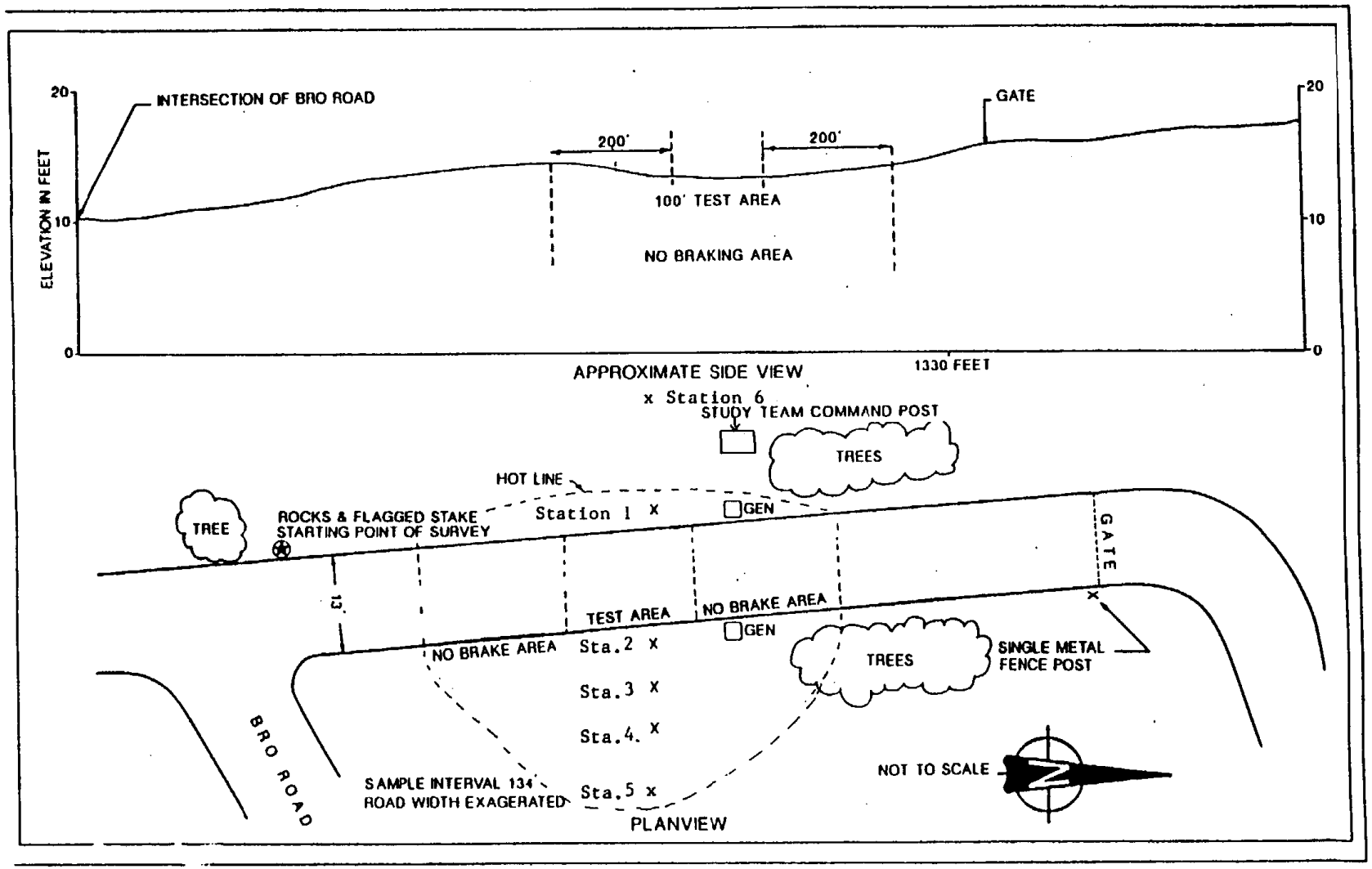
B. Soil Sampling*

Three composite soil samples located in the pre-defined 100' test section were next obtained. Using a 12" x 12" template, an approximately 1/2" deep section of the road, at its 50' midpoint, was collected by using a sterile trowel. This sample was deposited into a clean collection bucket and the process repeated on the same 50' line at either side of the road. These three samples were gently homogenized, inserted to fill one 8 ounce sterile I-Chem jar, sealed, and labeled according to EPA protocol.

The same composite sampling technique was employed to gather samples at either end of the 100 foot test area for a total of 3 composite soil samples. Collectively, these samples would represent a cross section of both the asbestos fiber content and the silt content of the test section. (reference Sample Plan Figure VI-1, pg. 25)

A second type of soil sample was also obtained. At the end of each sampling day, dust from the rear bumper of the test vehicle was collected in a sterile I-Chem jar. These samples may help us to more thoroughly understand potential fiber re-entrainment.

* In order to confirm the presence of asbestos in this road, ten soil samples were previously collected and analyzed (via Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM)) during the Study's site selection phase (September, 1987). For an overview of the soil sampling methodology and sample results obtained, reference Sample Plan Appendix A - Selection of Study Sites.



MAP 2

ENVIRONMENTAL ASBESTOS STUDY
SITE-2 AREA OF INTEREST

C. Air Sampling

After the survey was completed and the soil samples were collected, the air sampling stations were laid out in a straight line, perpendicular to the road and at the midpoint of the test section (50'). Each sampling station (4 downwind and 2 upwind) consisted of several air pumps arranged adjacent to one another in order to perform different sampling functions. The upwind and downwind station locations were set with the pump configurations as described in the Sample Plan's Section V. and as seen in the Plan's Figures V-1 and VI-1 thru 2F.

1. Types and Rationale

8-hour samples

Those pumps which were dedicated to obtaining these full day samples were calibrated at 2.5 liters per minute. This amounts to a total volume of 1200 liters of air per 8 hour sampling day and is well above the 400 liters necessary to provide the minimum analytical detection level as established by EPA methods. This type of sample is designed to give an "overall" daily sample to use as a standard for total airborne constituents.

1- hour samples

Various 1-hour samples were taken to delineate specific conditions throughout the day.

Co-located samples

These side by side or duplicate samples were taken for both 1-hour and 8-hour samples to provide back-up data and to confirm the quality of the Study's data gathering procedures.

5 minute Grab samples

These samples were taken daily at the 10' Station by first exposing the sample filter while the test vehicle travelled the length of the test road and continuing to expose the filter for a total of 5 minutes. Although the minimum detection volume requirements are not met from the grab samples, their results may nontheless provide us information of peak concentrations from the passing of a vehicle.

2. Air Pump Locations

Station 1 - 25' upwind (bearing S85E)

Station 1 consisted of 2 Gillian high volume pumps calibrated to 13 liters per minute. This configuration enabled various types of testing to progress simultaneously (i.e., co-located and one hour samples for PCM and TEM analysis). On alternating days, when eight hour samples were required, two Gillian or Staplex pumps, calibrated to 2.5 liters per minute were placed here and when sample scheduling required, one hour (calibrated to 13 liters/minute) or eight hour (calibrated to 2.5 liters/minute) co-located samples were located at this station.

Station 2 - 10' downwind (bearing N85W)

Station 2 consisted of four Gillian or Staplex high volume pumps, arranged one adjacent to another and perpendicular to the road. Two of these pumps were calibrated to 13 liters per minute and those samples that came from these pumps were designated "Hi Vol" - one dedicated for PCM analysis and one dedicated for TEM analysis. Because we were unsure whether the Hi Vol sample filters would overload at this close downwind station and to better ensure the availability of data from this sampling distance we decided to include 2 additional pumps at this location which were calibrated to 7 liters per minute - one dedicated for PCM analysis and one dedicated for TEM analysis. As explained in Section V, a mid-Study analytical check on these samples allowed us to increase the 7 liter per minute pumps to Hi Vol for the last half of the six day study period.

Five minute grab samples were also taken during even-numbered hours at this station since the pumps used to collect the 7 liter per minute samples during odd-numbered hours were not in use.

Station 3 - 25' downwind (bearing N85W)

Station 3 consisted of two Gillian Hi-Vol pumps calibrated at 13 liters per minute so that one hour dedicated samples for TEM and PCM analysis could be accomodated.

Station 4 - 50' downwind (bearing N85W)

This was the most important station of all since the Copeland Model is based on a fifty foot distance from the line source. Since the model makes its predictions at this distance, each type of air sample and meteorological data were collected here: dedicated filters for both PCM and TEM analysis at one hour and eight hours intervals as well as co-located samples.

The automated meteorological staion was also positioned at Station 4. The station was leveled, oriented and elevated to the breathing zone.

Station 5 - 100' downwind (bearing N85W)

This station was initially expected to be placed 300' down wind in order to measure potentially distant fiber concentrations from the road. Topographic constraints (dense vegetation) dictated setting this station at the 100' mark. Two Gillian pumps calibrated at 2.5 liters per minute were located here to collect 8-hour samples for both TEM and PCM analysis on a daily basis.

Station 6 - 300' upwind (bearing N40W)

Not initially planned for in the Sample Plan and not initiated until the 4th day of the sampling period, this station was established to obtain Study area background values. 8-hour TEM and PCM samples were taken from a single 8-hour Gillian pump calibrated to 2.5 liters per minute.

III. METEOROLOGICAL AND TRAFFIC MONITORING

Meteorological Data

As detailed in the Sample Plan (Sections V.C and VI.H.3), a fully automated Young meteorological station with telemetry equipment, electronically obtained and transmitted data every 30 seconds to a Compaq Plus Personal Computer located in a van at the Study Team Command Post. The PC was equiped with a 20 megabyte hard disk 640 random access memory and a RS232 Serial Port.

For every 30 seconds of the 6 day study period, the meteorological data obtained and currently stored on a dBase III data file are:

Average Wind Speed
Average Wind Direction
Wind Direction Correction Factor
Average Temperature
Instantaneous Wind Speed
Instantaneous Wind Direction
Instantaneous Temperature
Weather staion volts
Validity check summary
Measurement Data
Measurement Date
Measurement Time
Corresponding Sample Number

Traffic Simulation

As detailed in the Sample Plan (Sections V.D) a compact size and weight Test Car was utilized to maintain a 1 vehicle pass per 15 minute interval on the test road. The test car driver accelerated to 30 mph by the time he/she reached the test section of the road, maintained 30 mph over the test section and began to decelerate and brake once past the "no braking" section. While passing the command post, the driver honked the horn to alert the computer operator to indicate the exact time the car was passing. At this moment, a printout of the met data was obtained and the time of the vehicle pass was manually entered onto this printout. In this way we were assured of having an exact reading of the actual meteorological conditions at the precise moment that the test vehicle made a pass and as a backup to possible computer failure.

A reporting log was kept within the test car and filled in by the test car driver. The log required the following information:

Name of Test Driver
Time of Vehicle Pass
Speed of Vehicle
Time of Non-Test Car Vehicle Pass
Type of Non-Test Car Vehicle

The Test Car driver was required to be dressed in Level C (reference Sample Plan Appendix H).

IV. PHOTOGRAPHS

This section will give the reader an idea of the test site and environs as well as the equipment utilized in the Study. Reference the Sample Plan for additional photographs.

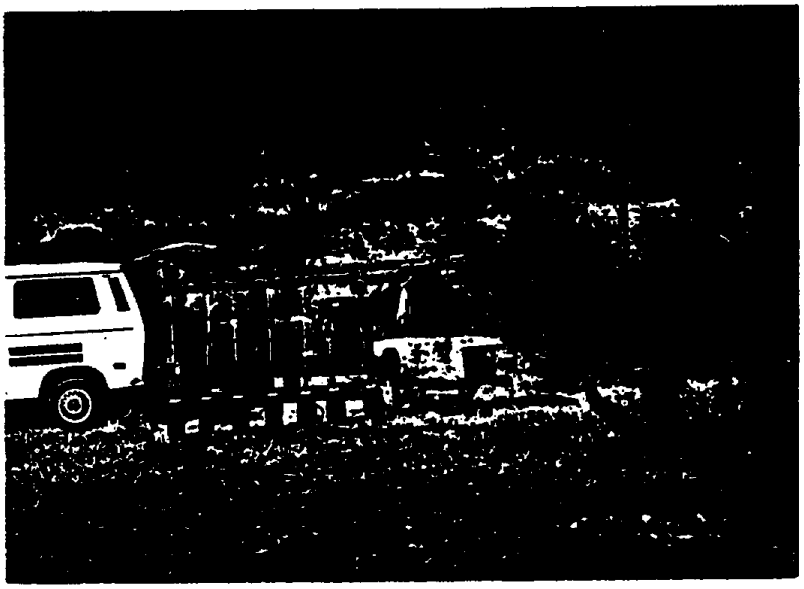
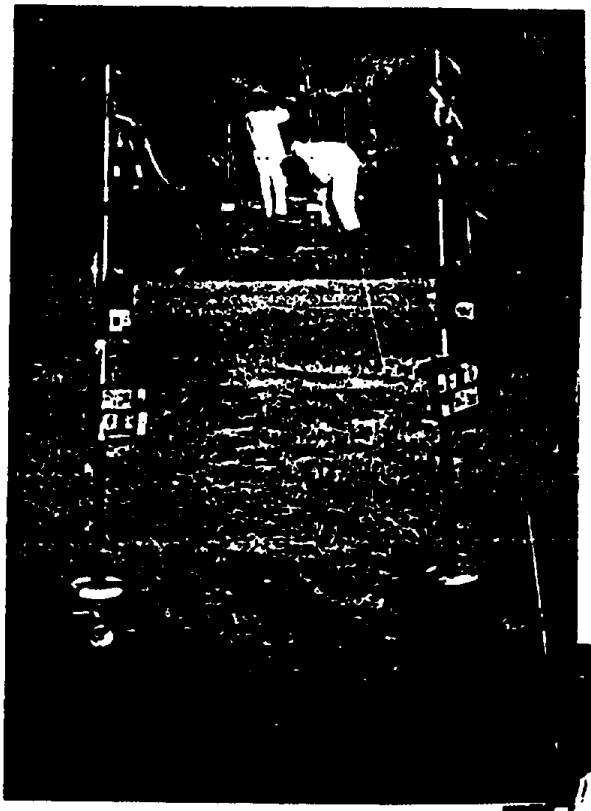
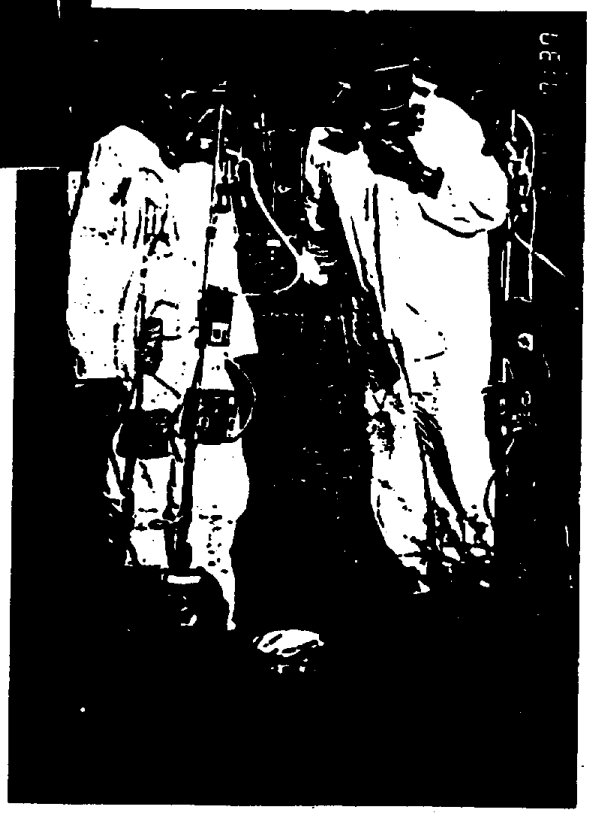


PHOTO A: UPWIND AT THE COMMAND POST, AIR SAMPLING PUMPS BEING ASSEMBLED

PHOTO B: AIR SAMPLING PUMPS ARRANGED IN THE FIELD, LOOKING DOWNWIND ACROSS THE TEST ROAD





PHOTOS: C AND D

CALIBRATING AND
CHANGING AIR
SAMPLE FILTERS

PHOTO E: STATION 4
AND THE METEOROLOGICAL
STATION

PHOTO F: MEASURING
THE HUMIDITY HOURLY

PHOTO G: THE METEOROLOGICAL STATION AT STATION 4 IS HOOKED UP TO THIS COMPUTER IN A VAN AT THE STUDY TEAM COMMAND POST

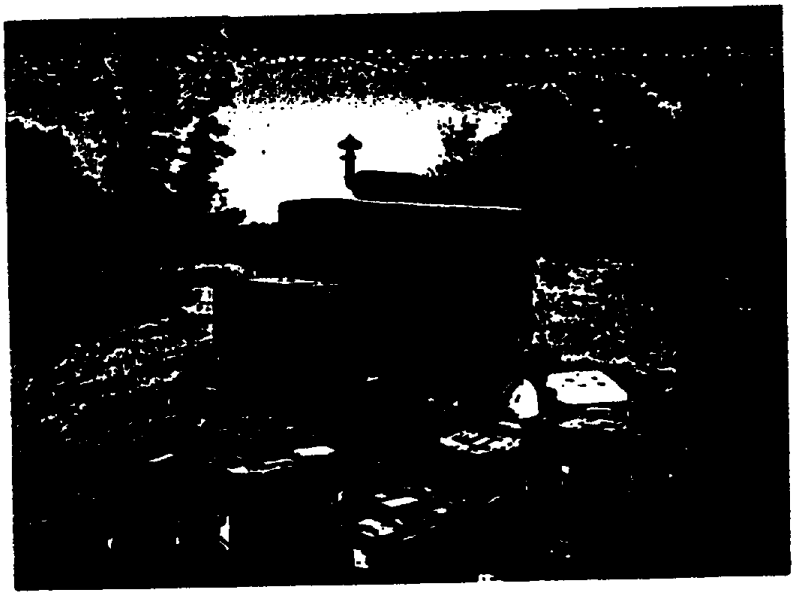


PHOTO H: ONE OF TWO 15K ELECTRICAL GENERATORS WHICH POWERED THE AIR SAMPLING PUMPS, THE METEOROLOGICAL STATION AND THE COMPUTER.

PHOTO K: CONTAMINATED AND DISPOSABLE CLOTHING, USED RESPIRATOR CARTRIDGES AND OTHER SAMPLING EQUIPMENT ARE STORED IN APPROPRIATELY LABELED PLASTIC BAGS UNTIL REMOVED BY A LICENSED ASBESTOS CONTRACTOR

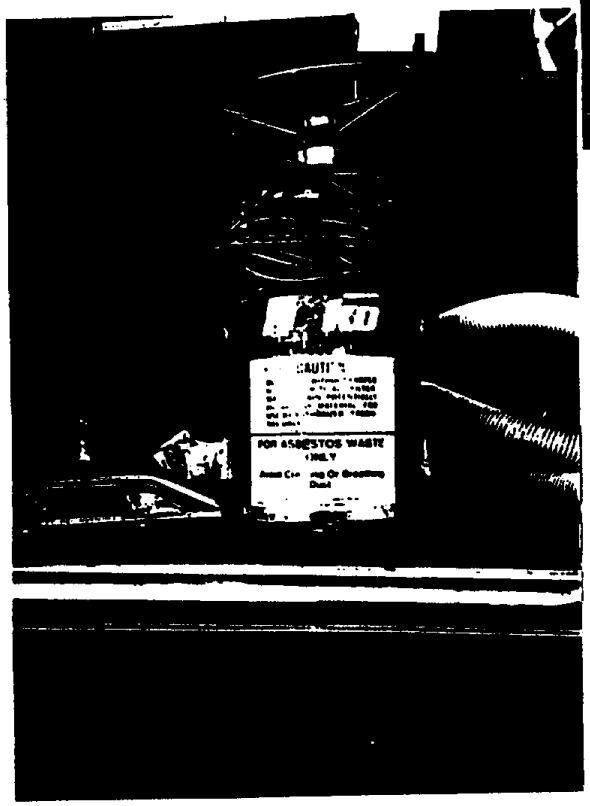


PHOTO L: A HIGH EFFICIENCY PARTICULATE (HEPA) VACUUM WAS SECURED TO THOROUGHLY VACUUM ALL THE VEHICLES USED ON THE STUDY SITE

PHOTO I: THE TEST VEHICLE TRAVELING AT 30 MILES PER HOUR; STATION 2 (10') IS SEEN IN THE FOREGROUND

PHOTO J: THE DUST GENERATED BY THE PASSING VEHICLE WITHIN MOMENTS AFTER IT HAS TRAVELED BEYOND THE TEST SECTION.

V. LABORATORY SERVICES AND ANALYSIS

Mid-Study Sample Analysis

Mid-way through the six day study and after the third day of sampling, we carefully selected samples which were taken when the wind speed and direction most ideally met study criteria and rushed them to two different laboratories for overnight PCM and TEM analysis. The results helped us to determine whether we were appropriately loading the filters so that we would be able to correct the flow rates, distances or number of vehicle passes for the remaining three sampling days. If the filters were found to be appropriately loaded, we also wanted to know if measurable asbestos fibers were found on them. If no fibers were to be found under the best of sampling conditions, the Study Team would have packed up and departed for home.

The mid-study laboratory results, however, indicated that even the Hi-Vol samplers at 13 liters per minute were appropriately loaded and that fibers had been found on all submitted samples. We corrected our study at that point by discontinuing the pumps at Station 2 (which were drawing 7 liters per minute) since the Hi-Vols were adequate.

Laboratory Selection and Services

Finding a laboratory with the desired capabilities, expertise and equipment to handle the Study's approximately 150 PCM samples, 150 TEM samples and several soil samples for both PCM and TEM analysis was given priority attention. Several reputable laboratories were screened for their capabilities, methods, internal QA/QC measures, time frames and costs. After careful consideration by Region 9 and the Environmental Response Team (ERT), final laboratory selection was made by ERTs REAC contractor.

All samples were carefully cushioned and packaged in order to avoid shifting and dislodging of the fibers from the cassette filter material, and upon selection of the laboratory to perform the analytical services, the samples were hand carried to their destination.

Upon completion of the laboratory analysis, the laboratory report and all raw data were submitted to another laboratory which had been selected to perform rigorous validation and quality assurance review.

For a discussion of the analytical methods utilized, reference the Sample Plan and its appendices.

VI. INITIAL DATA MANIPULATIONS AND DISPLAY

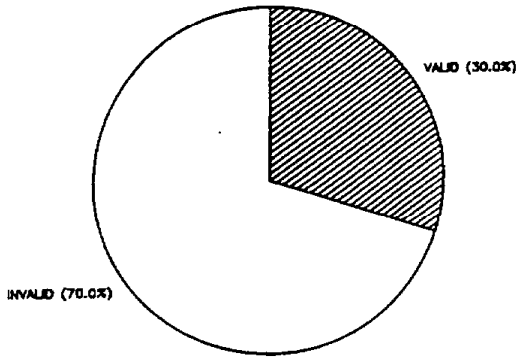
The Quality Assurance Management Section of EPA Region 9 has reviewed all data associated with this Study and has concluded that the final data is valid for all purposes. The data review report is available to interested parties.

The provided selection of graphs and charts were determined to be of the most likely initial interest to the wide spectrum of anticipated readers. They are not intended to be comprehensive nor analytical in scope. They are offered to provide a quick summary, simply displayed and understandable. Because all meteorological and sampling data have now been computerized on dBase III, they may be statistically manipulated and displayed in a wide variety of reports not included in this section, yet easily retrievable. We hope that they stimulate follow-up interest and we encourage your requests for additional data reports or statistical analysis.

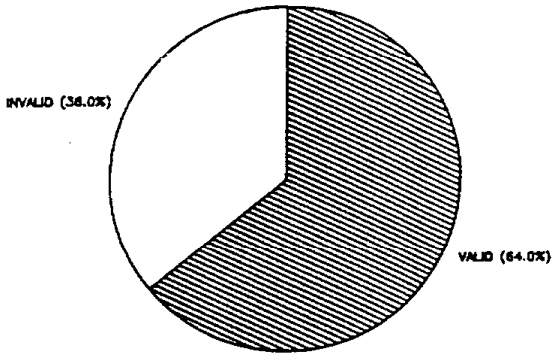
METEOROLOGICAL DATA

Valid = % of the sampling time per day that the wind direction and speed simultaneously met the study criteria.

10/13/87



10/14/87



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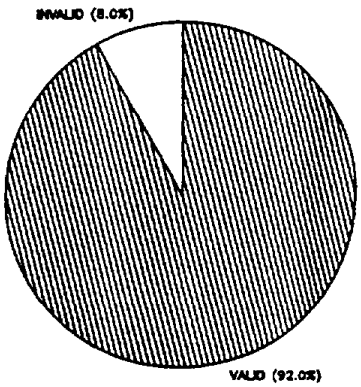
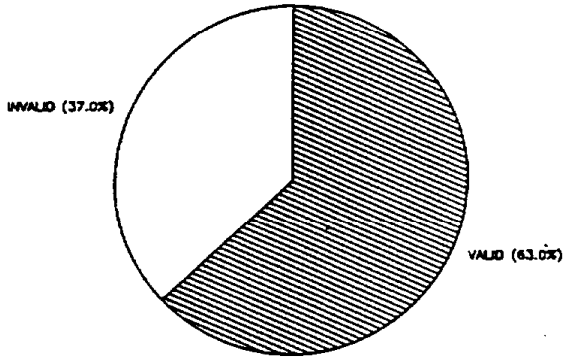
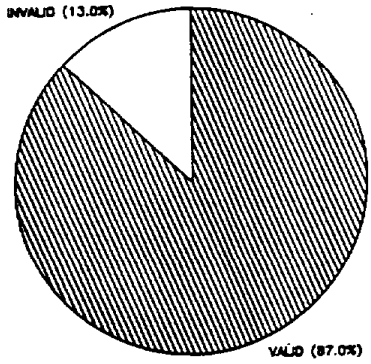


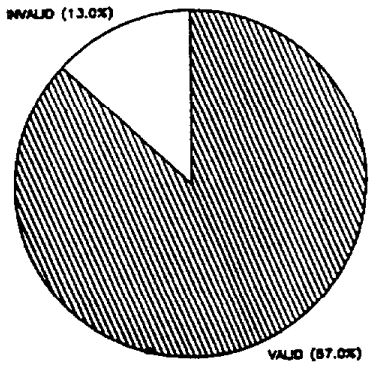
10/17/87



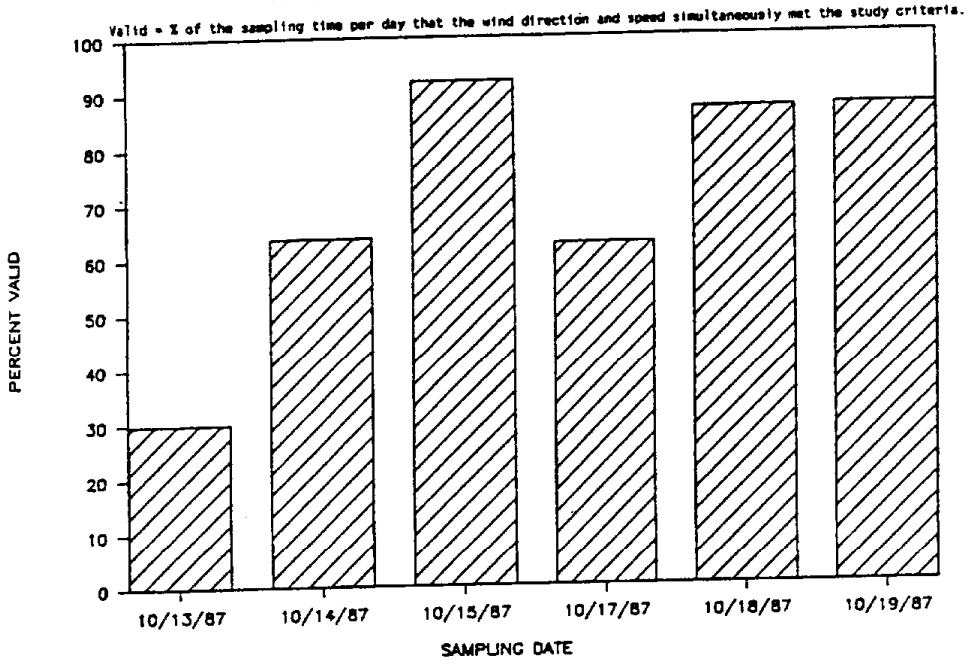
10/18/87



10/19/87

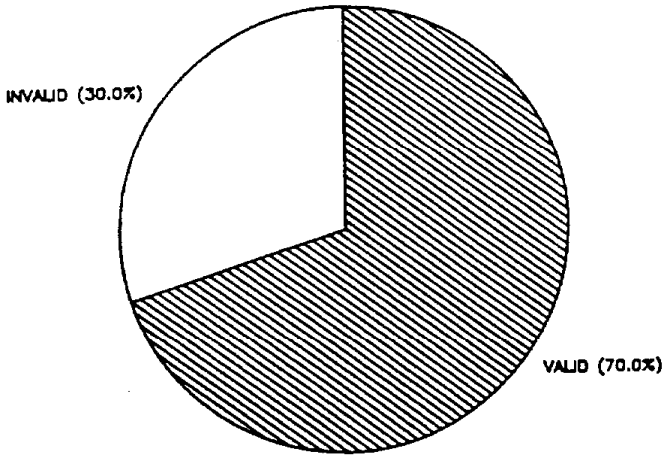


VALID WIND MEASUREMENTS



Note: Study criteria requires that the wind direction be within 45°perpendicular to the road (between 233° - 323°) with a minimum wind speed of 1.1 miles per hour.

METEOROLOGICAL DATA - OVERALL AVERAGE



Environmental Asbestos Study Soil Sample Data

These samples were taken from the road test area and represent the Range and Median of asbestos structure concentrations as determined by Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM) analysis.

	PLM		TEM	
	% Asbestos by Mass		% Asbestos by Mass	
RANGE	Minimum	1	Minimum	0
	Maximum	4	Maximum	7.8
MEDIAN		2		1.8

Total # Samples Analyzed by PLM: 14

Total # Samples Analyzed by TEM: 7

Environmental Asbestos Study Air Sample Data: Range and Median of 1 HOUR samples, by Station, determined by PCM and TEM analysis, over the six (6) day Study.

UPWIND STATION	#Samples Analyzed	PHASE CONTRAST MICROSCOPY and Dispersion Staining		TRANSMISSION ELECTRON MICROSCOPY					
		# Total Structures/cc		# Total Asbestos Structures/cc		# Total Asbestos Structures/cc (PCM equivalent by size)*		# Total Asbestos Structures/cc (PCM equivalent by mass conv.)**		Total Asbestos Mass Concentration ng/cc	
Station 1 25'	31	Med.	0.010	Med.	0.032	Med.	0.019	Med.	1.287	Med.	38.6
		Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.0
		Max.	0.090	Max.	0.451	Max.	0.034	Max.	48.483	Max.	1454.5
DOWNWIND STATIONS											
Station 2 10'	43	Med.	0.210	Med.	1.188	Med.	0.092	Med.	37.590	Med.	1127.7
		Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.0
		Max.	0.900	Max.	8.996	Max.	1.323	Max.	7899.180	Max.	236975.4
Station 3 25'	23	Med.	0.130	Med.	1.089	Med.	0.085	Med.	81.618	Med.	2448.5
		Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.0
		Max.	0.260	Max.	4.306	Max.	0.421	Max.	535.610	Max.	16068.3
Station 4 50'	31	Med.	0.080	Med.	0.831	Med.	0.038	Med.	28.510	Med.	855.3
		Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.0
		Max.	0.230	Max.	1.745	Max.	0.138	Max.	285.263	Max.	8557.9
Station 5 100'	0	Med.	0.000	Med.	0.000	Med.	0.000	Med.	0.000	Med.	0.0
		Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.000	Min.	0.0
		Max.	0.000	Max.	0.000	Max.	0.000	Max.	0.000	Max.	0.0

* Only asbestos structures >5 microns in length and >.25 microns in diameter with a 3:1 aspect ratio are counted.

** The conversion factor applied: 30 ug/m3 = 1 fiber/ml

Environmental Asbestos Study Air Sample Data: Range and Median of 8 HOUR samples, by Station, determined by PCM and TEM analysis, over the six (6) day Study.

		PHASE CONTRAST MICROSCOPY and Dispersion Staining	TRANSMISSION ELECTRON MICROSCOPY			
UPWIND STATIONS	#Samples Analyzed	# Total Structures/cc	# Total Asbestos Structures/cc	# Total Asbestos Structures/cc (PCM equivalent by size)*	# Total Asbestos Structures/cc (PCM equivalent by mass conv.)**	Total Asbestos Mass Concentration ng/cc
Station 1 25'	9	Med. 0.010 Min. 0.000 Max. 0.160	Med. 0.114 Min. 0.016 Max. 1.000	Med. 0.017 Min. 0.012 Max. 0.041	Med. 6.167 Min. 0.120 Max. 37.203	Med. 185.0 Min. 3.6 Max. 1116.1
Station 6 200'	Backgrnd 1	0.005	0.013	0.013	0.017	0.5
DOWNWIND STATIONS						
Station 2 10'	0	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.0 Min. 0.0 Max. 0.0
Station 3 25'	0	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.000 Min. 0.000 Max. 0.000	Med. 0.0 Min. 0.0 Max. 0.0
Station 4 50'	10	Med. 0.090 Min. 0.000 Max. 0.140	Med. 0.374 Min. 0.000 Max. 1.068	Med. 0.023 Min. 0.000 Max. 0.134	Med. 12.988 Min. 0.000 Max. 179.107	Med. 389.6 Min. 0.0 Max. 5373.2
Station 5 100'	6	Med. 0.035 Min. 0.000 Max. 0.110	Med. 0.344 Min. 0.183 Max. 0.811	Med. 0.024 Min. 0.018 Max. 0.031	Med. 10.053 Min. 5.400 Max. 17.860	Med. 301.6 Min. 162.0 Max. 535.8

* Only asbestos structures >5 microns in length and >.25 microns in diameter with a 3:1 aspect ratio are counted.

** The conversion factor applied: 30 ug/m3 = 1 fiber/ml

Air Resources Board
Cothrin Ranch Road Study

State of California

M E M O R A N D U M

To : Don Ames, Chief
Toxic Air Contaminant Control Branch

Date : February 21, 1989

Subject: Results of Laboratory Analysis for Asbestos on Samples Taken During Serpentine Covered Road Study

Thru : George Lew
Peter Ouchida KJ

From : James E. McCormack MAC
Monitoring and Laboratory Division
Air Resources Board

In support of Stationary Source Division's Technical Analysis Section, an unpaved road study was performed on August 27, 1988, to determine asbestos emissions from a serpentine covered road. The study involved sampling upwind and downwind of a section of unpaved road covered with serpentine aggregates while two vehicles drove continuously back and forth at a specific speed.

Sampling was performed in the Sunridge Ranch Subdivision. Sunridge Ranch is located in El Dorado County on Latrobe Road, mid way between Highway 50 and the town of Latrobe. Figure 1 is a map of the Sunridge Ranch and shows the section of road used in this study.

Four Serra-Anderson Model 241 dicbotomus samplers were set up to collect dust on polycarbonate filters for asbestos analysis. One sampler was located 10 feet upwind of the road and the remaining three were located at 25, 50, and 100 feet downwind of the road. A layout drawing of the test section of road and the location of the samplers, and meteorological station relative to the road is shown in Figure 2. Figure 3 shows a schematic of a dichotomus sampler. The dichotomus samplers have two filters: a course cut filter (course) and a fine cut filter (fine). The sampler is designed such that the course filter collects all particulate matter in the sample air stream with an areodynamic diameter between 10 and 3 microns and the fine filter collects all particulate matter in the sampled air stream with an aerodynamic diameter less than 3 microns.

The analysis was performed by an ARB contract laboratory, RJ Lee, located in Berkeley, California. The analytical method for asbestos is based on EPA's AHERA Analytical Procedure. A copy of the procedure is presented in Appendix I. All fibers and bundles of fibers are classified as structures. Each structure is assigned a length and a diameter based on EPA's AHERA Analytical Procedure.

RJ Lee's report on the samples is contained in Appendix II and consists of three tables. Table I (RJ Lee's report) gives the total asbestos structure concentration. Table II (RJ Lee's Report) gives the range of possible concentrations based on a 95% confidence limits for all asbestos structures. 95% confidence intervals are calculated based on a Poisson distribution. Table III (RJ Lee's Report) gives the asbestos structures concentration for structures greater than 5 microns.

The Sunridge Ranch Sampling Parameters are presented in Table I. In test "E" the vehicle speed was 10 mph. The remaining two tests ("F" and "G") were performed at a vehicle speed of 20 mph. The wind speed averaged 5.5 mph and always in the desired direction that placed the samplers in their proper upwind-downwind orientation.

The results of the analytical analysis is presented in Table II. Filters "F-4C-48" AND "G-1C-50" were damaged and not analyzed. The concentration downwind of the road ranged between 4-95 structures per cubic centimeters. The upwind asbestos concentration was always less than three structures per cubic centimeters. No consistent difference in concentration was noted between the sampler at 25 feet and the sampler at 50 feet.

cc: Susan Huscroft
Gary Agid

Figure 1

Plat Map of Sunridge Ranch Subdivision

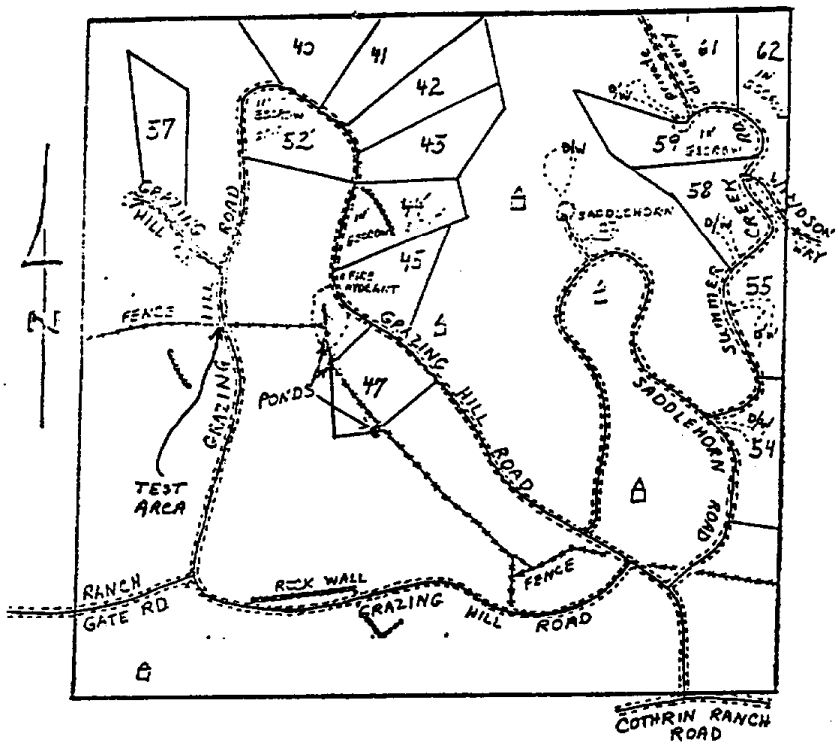


Figure 2

Unpaved Road Test Area

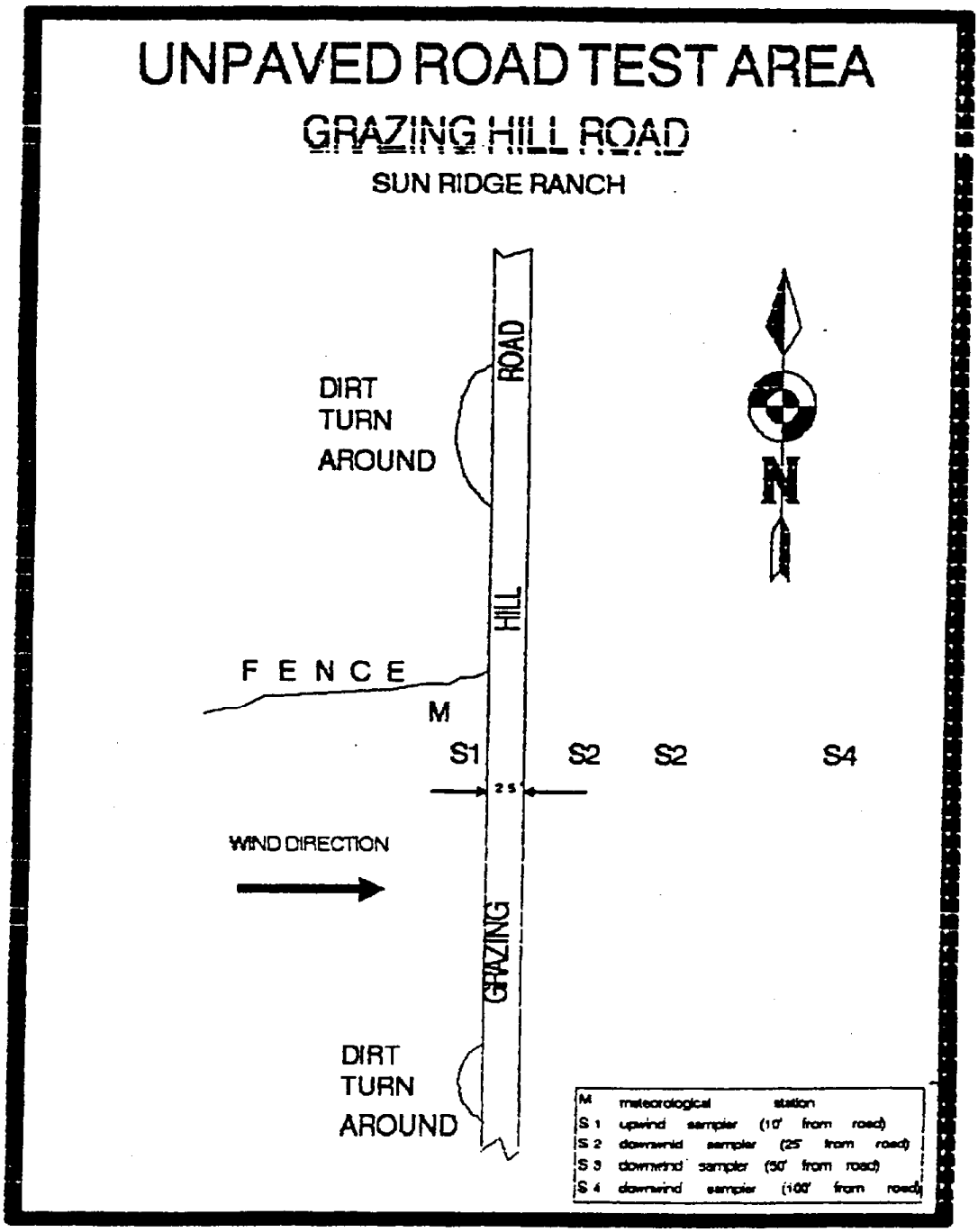


Table 3

Serra-Anderson Dichotomus Sampler

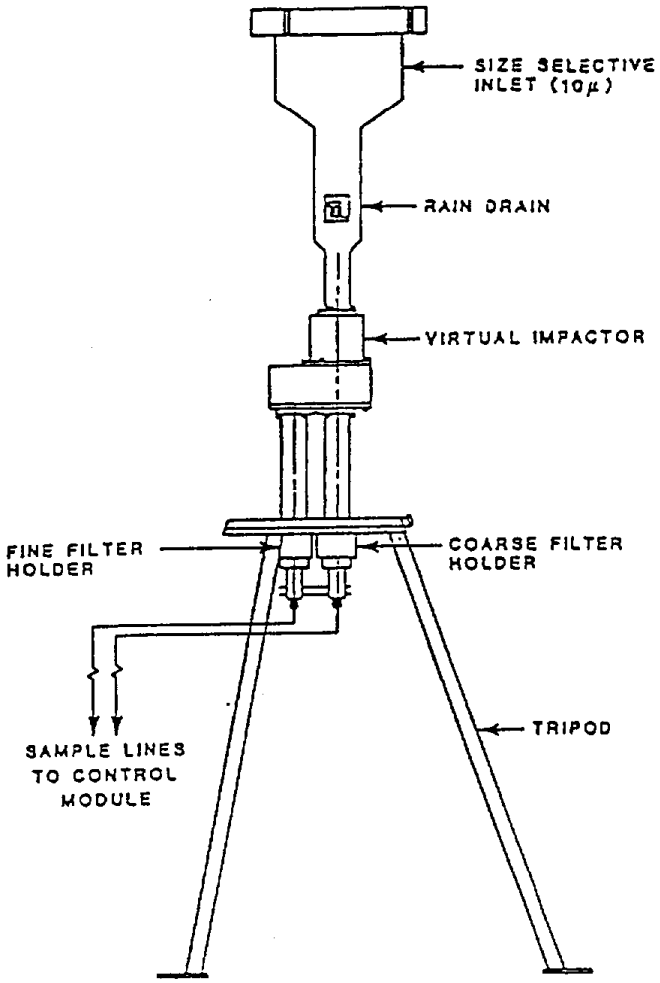


Table I

Sunridge Ranch Sampling Parameters

test number	********** Sampling ********** date	start	end	duration	vehicle speed	vehicle miles traveled car A	car B	wind speed
E	08/27/87	1330	1434	60	10	9.0	9.0*	6
F	08/27/87	1530	1630	60	20	14.4	14.8	5.5
G	08/27/87	1650	1750	60	20	14.4	14.1	5

Notes:

Very little dust at 10 mph.
Dust more than doubled at 20 mph over 10 mph.
One round trip, from turnaround and back to same turnaround, was 600 feet.
* Estimate

TABLE II

SAMPLING PARAMETERS

sample	STRUCTURE COUNTS		CONCENTRATION STRUCTURES/CC	
number	ALL@	≤ 5um+	ALL@	≤ 5um+
E-1F-33	36	0	0.3375	<0.0094
E-1C-34	12	0	1.0106	<0.0842
E-2F-35	42	2	0.7876	0.0375
E-2C-36	32	1	13.474	0.4211
E-3F-37	31	1	0.4844	0.0156
E-3C-38	33	0	13.895	<0.4211
E-4F-39	24	1	0.2250	0.0094
E-4C-40	25	8	4.2106	1.3474
F-1F-41	37	1	3.3755	0.0912
F-1C-42	26	0	0.5282	<0.0203
F-2F-43	30	1	27.369	0.9123
F-2C-44	33	0	0.6704	<0.0203
F-3F-45	23	1	20.983	0.9123
F-3C-46	31	4	3.1487	0.4063
F-4F-47	40	2	18.246	0.9123
F-4C-48*	N/A	N/A	N/A	N/A
G-1F-49	31	0	0.3149	<0.0102
G-1C-50*	N/A	N/A	N/A	N/A
G-2F-51	31	11	3.1487	1.1173
G-2C-52	47	2	21.439	0.9123
G-3F-53	29	2	2.9455	0.2031
G-3C-54	30	0	27.369	<0.9123
G-4F-55	30	3	1.5235	0.1524
G-4C-56	103	4	93.967	3.6492

Note
E-1F-33 E---> Test number
1---> sampler number
F---> filter (fine)
33---> sequence number

* Filters were damaged and not analyzed.
@ Includes all structures independent of length.
\+ Includes only those structures with a measured length greater than 5 microns.

APPENDIX II

RJ Lee Report

RJ LeeGroup

The Materials Characterization Specialists

October 24, 1988

Mr. James E. McCormack
CARB
P.O. Box 2815
Sacramento, Ca 95812

RE: TEM Asbestos Results for Samples as Shown on Tables I thru III
RJL Job No. AAC807956

Dear Mr. McCormack:

Enclosed are the revised results from the scanning transmission electron microscopy (STEM) asbestos analysis of the above referenced samples using proposed EPA Level II analysis.

Table I lists each sample identification number, area analyzed, sample volume, structure counts, analytical sensitivity, and the concentration of asbestos. Table II lists the 95% confidence limits for the analyses, based on the Poisson distribution. Table III lists the asbestos structure concentrations for structures greater than or equal to 5 microns.

These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions and no responsibility or liability is assumed for the manner in which the results are used or interpreted.

If you have any questions, feel free to call me.

Very truly yours,

Kyle Bishop
Division Manager

KMB

Enclosures

Table I

Total Asbestos Structure Concentration
Project AAC807956

Sample #	Client Sample #	Analyzed Area (sq mm)	Sample Volume (liters)	Structure Counts Chrysotile	Structure Counts Amphibole	Analytical Sensitivity (s/sq mm)	Analytical Sensitivity (s/cc)	Concentration (s/sq mm)	Concentration (s/cc)
CT1716	E-1F-33	0.0722	975.0	36	0	13.9	0.0094	498.6	0.3375
CT1717	E-1C-34	0.0722	108.6	12	0	13.9	0.0842	166.2	1.0106
CT1718	E-2F-35	0.0361	975.0	42	0	27.7	0.0188	1163.4	0.7876
CT1719	E-2C-36	0.0144	108.6	32	0	69.3	0.4211	2216.1	1.3474*10^1
CT1720	E-3F-37	0.0433	975.0	31	0	23.1	0.0156	715.6	0.4844
CT1721	E-3C-38	0.0144	108.6	33	0	69.3	0.4211	2285.3	1.3895*10^1
CT1722	E-4F-39	0.0722	975.0	24	0	13.9	0.0094	332.4	0.2250
CT1723	E-4C-40	0.0361	108.6	25	0	27.7	0.1684	692.5	4.2106
CT1724	F-1C-41	0.0722	100.2	37	0	13.9	0.0912	512.5	3.3755
CT1725	F-1F-42	0.0361	900.0	26	0	27.7	0.0203	720.2	0.5282
CT1726	F-2C-43	0.0072	100.2	30	0	138.5	0.9123	4155.1	2.7369*10^1
CT1727	F-2F-44	0.0361	900.0	33	0	27.7	0.0203	914.1	0.6704
CT1728	F-3C-45	0.0072	100.2	23	0	138.5	0.9123	3185.6	2.0983*10^1
CT1729	F-3F-46	0.0072	900.0	31	0	138.5	0.1016	4293.6	3.1487
CT1730	F-4C-47	0.0144	100.2	40	0	69.3	0.4562	2770.1	1.8246*10^1
CT1731	F-4F-48	N/A	Blank	N/A	N/A	N/A	N/A	N/A	N/A
CT1732	G-1F-49	0.0722	900.0	31	0	13.9	0.0102	429.4	0.3149
CT1733	G-1C-50	N/A	Blank	N/A	N/A	N/A	N/A	N/A	N/A
CT1734	G-2F-51	0.0072	900.0	31	0	138.5	0.1016	4293.6	3.1487
CT1735	G-2C-52	0.0144	100.2	47	0	69.3	0.4562	3254.8	2.1439*10^1
CT1736	G-3F-53	0.0072	900.0	29	0	138.5	0.1016	4016.6	2.9455
CT1737	G-3C-54	0.0072	100.2	30	0	138.5	0.9123	4155.1	2.7369*10^1
CT1738	G-4F-55	0.0144	900.0	30	0	69.3	0.0508	2077.6	1.5235
CT1739	G-4C-56	0.0072	100.2	103	0	138.5	0.9123	1.4*10^4	9.3967*10^1

N/A Not Analyzed

Authorized Signature

Date Tuesday, October 25, 1988

RJ Lee Group, Inc.
Berkeley

2424 6th Street
Berkele a 94710

(415) 486-8319
Telefax (415) 486-0927

Table II

95% Confidence Limits (Poisson) For All Asbestos Structures
Project AAC807956

Sample #		Client Sample #	Concentration (s/sq mm)	Concentration (s/cc)	Estimated Ranges of Concentrations (s/sq mm)	Estimated Ranges of Concentrations (s/cc)
CT1716		E-1F-33	498.6	0.3375	346.3 - 692.5	0.2344 - 0.4688
CT1717		E-1C-34	166.2	1.0106	83.1 - 290.9	0.5053 - 1.7685
CT1718		E-2F-35	1163.4	0.7876	831.0 - 1578.9	0.5625 - 1.0688
CT1719		E-2C-36	2216.1	1.3474*10^1	1523.5 - 3116.3	9.2634 - 1.8948*10^1
CT1720		E-3F-37	715.6	0.4844	484.8 - 1015.7	0.3281 - 0.6875
CT1721		E-3C-38	2285.3	1.3895*10^1	1592.8 - 3185.6	9.6844 - 1.9369*10^1
CT1722		E-4F-39	332.4	0.2250	207.8 - 498.6	0.1406 - 0.3375
CT1723		E-4C-40	692.5	4.2106	443.2 - 1024.9	2.6948 - 6.2317
CT1724		F-1C-41	512.5	3.3755	360.1 - 706.4	2.3720 - 4.6527
CT1725		F-1F-42	720.2	0.5282	470.9 - 1052.6	0.3453 - 0.7719
CT1726		F-2C-43	4155.1	2.7369*10^1	2770.1 - 5955.7	1.8246*10^1 - 3.9229*10^1
CT1727		F-2F-44	914.1	0.6704	637.1 - 1274.2	0.4672 - 0.9344
CT1728		F-3C-45	3185.6	2.0983*10^1	2077.6 - 4709.1	1.3685*10^1 - 3.1018*10^1
CT1729		F-3F-46	4293.6	3.1487	2908.6 - 6094.2	2.1330 - 4.4691
CT1730		F-4C-47	2770.1	1.8246*10^1	2008.3 - 3739.6	1.3228*10^1 - 2.4632*10^1
CT1731	†	F-4F-48	N/A	N/A	N/A - N/A	N/A - N/A
CT1732		G-1F-49	429.4	0.3149	290.9 - 609.4	0.2133 - 0.4469
CT1733	†	G-1C-50	N/A	N/A	N/A - N/A	N/A - N/A
CT1734		G-2F-51	4293.6	3.1487	2908.6 - 6094.2	2.1330 - 4.4691
CT1735		G-2C-52	3254.8	2.1439*10^1	2354.6 - 4293.6	1.5509*10^1 - 2.8281*10^1
CT1736		G-3F-53	4016.6	2.9455	2631.6 - 5817.2	1.9298 - 4.2659
CT1737		G-3C-54	4155.1	2.7369*10^1	2770.1 - 5955.7	1.8246*10^1 - 3.9229*10^1
CT1738		G-4F-55	2077.6	1.5235	1385.0 - 2977.8	1.0157 - 2.1837
CT1739		G-4C-56	1.4*10^4	9.3967*10^1	1.1*10^4 - 1.7*10^4	7.5449*10^1 - 1.1248*10^2

† Blank
N/A Not Analyzed

RJ Lee Group, Inc.
Berkeley
2424 6th Street
Berkeley, Ca 94710
(415) 486-8319
Telefax (415) 486-0927

Table III

Asbestos Structure Concentration For Structures ≥ 5 µm
Project AAC807956

Sample #	Client Sample #	Analyzed Area (sq mm)	Sample Volume (liters)	Structure Counts Chrysotile	Structure Counts Amphibole	Analytical Sensitivity (s/sq mm)	Analytical Sensitivity (s/cc)	Concentration (s/sq mm)	Concentration (s/cc)
CT1716	E-1F-33	0.0722	975.0	0	0	13.9	0.0094	<13.9*	<0.0094*
CT1717	E-1C-34	0.0722	108.6	0	0	13.9	0.0842	<13.9*	<0.0842*
CT1718	E-2F-35	0.0361	975.0	2	0	27.7	0.0188	55.4	0.0375
CT1719	E-2C-36	0.0144	108.6	1	0	69.3	0.4211	69.3	0.4211
CT1720	E-3F-37	0.0433	975.0	1	0	23.1	0.0156	23.1	0.0156
CT1721	E-3C-38	0.0144	108.6	0	0	69.3	0.4211	<69.3*	<0.4211*
CT1722	E-4F-39	0.0722	975.0	1	0	13.9	0.0094	13.9	0.0094
CT1723	E-4C-40	0.0361	108.6	8	0	27.7	0.1684	221.6	1.3474
CT1724	F-1C-41	0.0722	100.2	1	0	13.9	0.0912	13.9	0.0912
CT1725	F-1F-42	0.0361	900.0	0	0	27.7	0.0203	<27.7*	<0.0203*
CT1726	F-2C-43	0.0072	100.2	1	0	138.5	0.9123	138.5	0.9123
CT1727	F-2F-44	0.0361	900.0	0	0	27.7	0.0203	<27.7*	<0.0203*
CT1728	F-3C-45	0.0072	100.2	1	0	138.5	0.9123	138.5	0.9123
CT1729	F-3F-46	0.0072	900.0	4	0	138.5	0.1016	554.0	0.4063
CT1730	F-4C-47	0.0144	100.2	2	0	69.3	0.4562	138.5	0.9123
CT1731	F-4F-48	N/A	Blank	N/A	N/A	N/A	N/A	N/A	N/A
CT1732	G-1F-49	0.0722	900.0	0	0	13.9	0.0102	<13.9*	<0.0102*
CT1733	G-1C-50	N/A	Blank	N/A	N/A	N/A	N/A	N/A	N/A
CT1734	G-2F-51	0.0072	900.0	11	0	138.5	0.1016	1523.5	1.1173
CT1735	G-2C-52	0.0144	100.2	2	0	69.3	0.4562	138.5	0.9123
CT1736	G-3F-53	0.0072	900.0	2	0	138.5	0.1016	277.0	0.2031

* Below Analytical Sensitivity
N/A Not Analyzed

RJ Lee Group, Inc.
Berkeley

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Telefax (415) 486-0927

Table III

Asbestos Structure Concentration For Structures ≥ 5 µm
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Sample #	Client Sample #	Analyzed Area (sq mm)	Sample Volume (liters)	Structure Counts Chrysotile	Structure Counts Amphibole	Analytical Sensitivity (s/sq mm)	Analytical Sensitivity (s/cc)	Concentration (s/sq mm)	Concentration (s/cc)
CT1737	G-3C-54	0.0072	100.2	0	0	138.5	0.9123	<138.5*	<0.9123*
CT1738	G-4F-55	0.0144	900.0	3	0	69.3	0.0508	207.8	0.1524
CT1739	G-4C-56	0.0072	100.2	4	0	138.5	0.9123	554.0	3.6492

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* Below Analytical Sensitivity

RJ Lee Group, Inc.
Berkeley

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Telefax (415) 486-0927