EXPOSURE INVESTIGATION

HEALTH CONSULTATION

MESA DE ORO SITE

(a/k/a CENTRAL EUREKA MINE SITE)

SUTTER CREEK, AMADOR COUNTY, CALIFORNIA

CERCLIS NO. CA0000726539

Prepared by

California Department of Health Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Exposure Investigation Summary

Exposure investigation participants were provided with background information, consent forms, a basic questionnaire, and a self-collecting urine kit (see Appendix: Investigation Materials). Urine samples were first morning voids. Hair samples were collected by CDHS staff.

Sixty-six area residents participated in the exposure investigation. Of these residents, none of them were identified as being exposed to high levels of arsenic based on the hair analysis which quantifies exposure over at least a two month time period. Low levels of inorganic arsenic were detected in both urine and hair samples, but these levels are indicative of levels typically found in background populations. No children had elevated levels in either their hair or urine. However, two adults had levels that required further investigation. One adult had an elevated hair arsenic level which was subsequently determined to be caused by external arsenic on the hair (see Appendix: Hair Calculation). The other adult had a urinary arsenic result which showed levels on the high end of unexposed background populations. A subsequent re-test of the second adult, about a month later, indicated exposure had returned to typical levels. Furthermore, this individual's hair arsenic level, which quantifies exposure over a greater amount of time, showed typical levels of arsenic exposure. Future arsenic exposure to the residents living in many of the homes in the site area have either been reduced or eliminated through recent remedial activities. Remediation is planned for completion in the summer of 1996.

Site Background

The United States Environmental Protection Agency (USEPA) has preliminarily defined the site to include the Mesa de Oro Subdivision and approximately seventy other lots in the near vicinity(See Appendix: Map)(2). CDHS conducted a site-specific neighborhood census which revealed that around one hundred sixty people are potentially exposed to elevated levels of arsenic in the soil. The subdivision which began construction in the early 1990s is located on an elevated hill thirty to forty feet high in parts(3). USEPA is currently remediating the site under an emergency removal action because the site may pose a significant threat to the public health or the environment(4-8). The contaminant of concern is potentially bioavailable arsenic which is found in mine tailings left over from the Central Eureka Mine that operated from the 1850s to 1958(3,9). During the mining operation ore containing naturally high levels of arsenic was brought to the surface and deposited in the area after processing. The removal action at the site includes slope stabilization, construction of a retaining wall, and yard excavation(1,5). Remediation activities are planned to end during the Summer 1996.

The California Department of Toxic Substances Control (DTSC) was contacted by an outside source in November of 1992 concerning potential health problems at the Mesa de Oro Site(3). DTSC investigations into the site revealed a 1990 report that indicated high concentrations of arsenic in the mine tailings(10). The report indicated that the arsenic was likely *arsenopyrite*, a relatively insoluble form of arsenic. In addition, the developers were instructed to implement mitigative measures to limit any future potential health threat(10). In June 1993 investigations revealed that mitigative measures were not being implemented and

elevated levels of arsenic were detected(2). A complaint was made to DTSC on March 31, 1994, from construction workers that developed skin sores which prompted further investigation(3). Subsequent tests performed on soil samples indicated high levels of arsenic (average 374 ppm, maximum 1,320 ppm, May 1994 study)(4). United States background soil levels of arsenic range from about 1 to 40 ppm with a mean value of about 5 ppm(12). In addition, the arsenic at the site was shown to be in a small particulate form and having a potential solubility of approximately 25% under certain conditions(11).

In 1994, DTSC brought the Central Eureka Mine Site to the attention of the USEPA. DTSC needed both financial assistance and more technical expertise. In late 1994, USEPA assumed the role of lead agency for the site. Since that time, the USEPA has conducted an extensive soil sampling plan to characterize the extent of contamination and started clean-up at the site.

Pathway Analysis

Completed exposure pathways have been identified at the Central Eureka Mine Site. In order for a pathway to be complete there needs to be five components; an identified source, environmental media, point of exposure, route of exposure, and exposed population. The below table shows three different pathways that are complete at the site.

Source	Environmental Media	Point of Exposure	Route of Exposure	Exposed Population
Mine Tailing Pile	Yard Surface Soil	Contact with surface soil	Ingestion	161 Area Residents
Mine Tailing Pile	Air	Contact with airborne particulates	Inhalation	161 Area Residents
Mine Tailing Pile	Yard Surface Soil	Contact with surface soil	Dermal	161 Area Residents

There are three main exposure pathways of concern at the site (4,5). Inadvertent ingestion of contaminated surface soil at the site is considered to be the most significant route of exposure. The arsenic may become soluble in the gastrointestinal tract, therefore becoming readily bioavailable in the small intestines. Also, inhalation of dust particles containing arsenic may also contribute to a resident's overall exposure. However, the dust that penetrates into the lungs is typically less than 10 μm, and size classification of the mine tailings shows that a majority of the arsenic is above 20 μm in diameter (11). Dermal exposure to arsenic through contact with the soil may also exist, but is limited by the protective barrier that the skin provides. Much of the surface arsenic is associated with iron which is not very soluble in water (11). The lack of mobility (arsenic bound to the soil and

nearly insoluble in water) of the arsenic through the skin reduces its potential for absorption via this pathway.

The amount of exposure to the arsenic at the site is also linked to other factors. Activities where the resident disturbs the contaminated soil would likely increase exposure. On the other hand, if the residents changed their behaviors to limit their exposure to outdoor soil their exposure may be considerably reduced. Moreover, the bioavailability of different forms of arsenic may have an influence on the overall intake of the arsenic. Estimations of arsenic intake made by the DTSC, assuming 100% bioavailability, indicate the potential for both non-cancer adverse health effects and cancer effects at the site (4,5).

DISCUSSION

Hair and Urinary Arsenic Biomarkers

The two most common biologic indicators used to test for arsenic exposure are urinary and hair arsenic levels. The measurement of urinary arsenic levels are by far the most frequently used method, but hair arsenic testing can provide additional information. National Medical Services in Pennsylvania provided the analysis for both the hair and urine arsenic analysis of the samples in the exposure investigation.

The urinary concentration of arsenic detected depends on an individuals dietary, environmental, and occupational exposures. A commonly used method of measuring arsenic exposure is to sum the inorganic arsenic, dimethylarsinic acid (DMA), and monomethylarsonic acid (MMA); this will be referred to as the urinary arsenic concentration or level. The urinary arsenic concentration in those without unusual arsenic exposure is generally in the order of 10-20 μg/l (excluding those who consume seafood shortly prior to test)(13). Those that consume seafood have higher levels of urinary arsenic with most contributed by an increase in DMA(13). The methylated forms (DMA and MMA) of arsenic are considered to be less toxic than the inorganic forms(12). Individuals exposed to arsenic in occupational settings have shown average urinary arsenic levels from low exposure scenarios of 20 μg/l to well over 200 μg/l in high exposure settings. Normal urinary arsenic values (excluding seafood consumption) are considered less than 50 μg/l (14).

The measurement of urinary arsenic levels is most often used to quantify recent exposure, usually within a few days prior to urine collection(13). The analytical method used in this exposure investigation includes the analysis for inorganic arsenic and its metabolites (DMA and MMA) excluding the non-toxic fish arsenic, arsenobetaine and arsenocholine. The urinary arsenic test is also adjusted for creatinine levels to account for variations in water consumption. Creatinine levels for adults are normally around one gram per liter of urine. Typical levels for urinary arsenic levels are considered less than 50 micrograms arsenic per gram creatinine. Levels exceeding this value require further investigation. Another common method to quantify arsenic exposure is to analyze hair.

Inorganic arsenic absorbed into the body is taken up into the keratin rich hair. Therefore, hair arsenic levels can provide quantification of an individual's average arsenic exposure during the growth of the hair tested. A time reference of exposure can be obtained because hair grows approximately one inch every two months. Hair arsenic levels below one microgram of arsenic per gram of hair (1 ppm) is considered typical of background levels in unexposed populations(12). Levels above this reference required further investigation. Seafood consumption is not considered to significantly affect total hair arsenic levels, because the non-toxic forms of fish arsenic (ie. arsenobetaine and arsenocholine) are not absorbed into the hair(15). However, arsenic on the external surface of the hair (non-absorbed arsenic) may increase overall results. Hence, the analytical laboratory washes the hair before quantification of the arsenic levels to reduce the potential for external contamination.

Hair and Urinary Arsenic Results

There was a total of sixty-six participants in the investigation. This accounts for 41% of the total population censused in the month of September (161 people). The participation rate was the highest in children aged seven to twelve years old (63%), and second highest in children less than two years old (60%)(See Appendix: Table 1 - Community Participation). However, the largest number of participants were in the twenty-one to sixty year age category. Out of all the participants, fifty-two people provided urine samples and sixty-five people provided hair samples. The community participation rate provides an overall evaluation of the number of participants, but is not representative of the fraction of those tested who are at the greatest risk for arsenic exposure. Children and those in close contact with the soil containing arsenic were presumed to be at the greatest risk.

No children had levels exceeding the reference levels. However, on the first analysis one adult exceeded the hair arsenic reference (greater than 1 ppm) and another adult exceeded the urine arsenic level (greater than 50 μg/g creatinine). Both of these levels were investigated by re-retesting and home visits.

The adult having the elevated hair arsenic level was retested within about a month. The hair of this adult was not cut between sampling. On the second hair analysis no arsenic was detected. The difference between these two sample values is best explained by external arsenic on the hair. The growth of hair in between sampling would not account for the large difference in hair arsenic levels, 1.4 ppm and none detected at a detection limit of 0.4 ppm (See Appendix: Hair Calculation). Although the laboratory washes the hair, in this case the washing process may not have been adequate to remove all of the external arsenic.

The adult having the initial elevated urinary arsenic level was also retested within about a month. The initial elevated urinary arsenic result was 82 micrograms arsenic per gram creatinine or 45 micrograms arsenic per liter urine. For this adult, when the urinary arsenic level is adjusted by individual creatinine levels the arsenic level exceeds fifty. No arsenic was detected in the second urine sample. The hair arsenic levels for this same individual indicated that on average the adult was exposed to typical or background levels of arsenic.

One contributing factor for this person's initial exceedance of the reference level was due to the low creatinine levels for the individual. Creatinine levels will vary depending on water consumption and kidney function, but the average adult has levels around 1.0 gram creatinine per liter urine. For this person the creatinine level was almost half the average adult value at 0.551 grams creatinine per liter of urine. If another commonly accepted reference level of 50 micrograms of arsenic per liter of urine was used, the individual's levels would not have exceeded the typical range(14). In the second urine sample the arsenic level was below the detection limit and within the typical range found in unexposed populations. The typical hair arsenic result, which measures exposure over months indicates that this adult was not exposed to high levels of environmental arsenic on average during the growth of the tested hair.

In addition to analyzing the data individually, we were able to analyze the data in aggregate using information from questionnaire answers that participants provided. This analysis was limited by the type of questions asked and the exposure data itself. A considerable number of non-detects for both the hair and urinary arsenic levels complicated the analysis. The detection limit is controlled by both laboratory equipment and sample quantity. The detection limit was not a significant factor in looking at the results individually because none of the detection limits were above the reference levels.

Exposure Questionnaire

A questionnaire was provided to participants in the exposure investigation to obtain individual specific information before testing. Questions were asked regarding age, occupation, behavior modification, smoking habits, medication use, and daily activities three days prior to urine collection. The questionnaire data was used to examine how age, behavior, time spent outdoors, and outdoor soil levels might influence the participant's individual exposure to arsenic. Of the sixty-six participants in the investigation, fifty-nine submitted a questionnaire.

Age Group Comparisons

Although all of the age group biological exposure data were statistically similar with a 95% confidence interval, there were some differences in the mean of the various age categories (See Appendix: Graphs 1 & 2 - Age Group). In particular, children aged two to six years old had on average a higher mean level urinary arsenic result. This difference is not considered significant. Children in unexposed communities have slightly higher levels of arsenic than their parents partially due to lower creatinine levels and greater hand to mouth behavior. Also when looking at the hair arsenic levels, children and youths aged between seven and twenty had the higher levels, but these values were still not statistically different than any other age category. Although children are at the greatest risk for exposure to arsenic, none of them had levels exceeding the pre-set screening level.

Behavior Modifications

Participants were asked if they had changed their behaviors to reduce their exposure to dust or outdoor soil. No significant statistical difference in both urinary and hair arsenic levels

were found between those who reported changing their behaviors and those who did not (See Appendix: Graphs 3 & 5 - Behavior Modifications). Surprisingly, around almost forty percent of the participants reported that they did not change their behavior to reduce their exposure to dust or outdoor soil. One factor that could be confounding this analysis is those who were practicing high risk behaviors (ie. gardening, digging, etc.) in the past changed their behaviors. While those who were not in these high risk activities believed that there was no reason to change their activities.

Exposure Over Time

In order to obtain an idea how exposure at the site changed with time an analysis of long hair was conducted. At the time of the sampling, twenty people had hair longer than six inches. Their hair was divided in two samples. Hair longer than six inches was analyzed separately from hair shorter than six inches. Hair grows at about one inch every two months, or six inches in one year. Because most of the fact sheets and advisories mailed and distributed to the community occurred in August and September of 1994 (8), most residents would not have changed their behavior prior to this time. An analysis of hair longer than six inches and hair shorter than six inches indicated no statistically significant difference (See Appendix: Graph 6 - Short and Long Hair). Moreover, the long hair samples, which quantified exposure for over a year, indicated that those participants were not being exposed to levels above what would be found in "unexposed" background populations. And, some hair samples exceeded seventeen inches in length, which quantifies exposure that occurred almost three years prior to the hair collection.

Urinary Arsenic Levels and Time Spent Outdoors

Another method used in the investigation to evaluate exposure was to look at the amount of time a person was more likely exposed to outdoor soil and dust. As part of the questionnaire, a 3-day activity diary was kept by the participants prior to the collection of their urine sample (See Appendix: Graph 7 - Time Spent Outdoors). This activity diary allowed for quantification of the amount of time people spent outdoors in their neighborhood. There was no statistically significant trend apparent for the time that participants spent outside in their yard or neighborhood. The limitations of this particular analysis is the absence of individual specific exposure information, like outdoor activities (ie. gardening, washing car, walking, digging in soil, etc.), and specific yard arsenic concentrations. For instance, if people spend a lot of time in their yard gardening when the soil does not have high levels of arsenic exposure should be low. This problem can be partially addressed by comparing individual urinary arsenic levels with the levels found in their specific yard.

Urinary Arsenic Levels and Soil Arsenic Concentrations

Average soil concentrations in the participant's yards were compared with arsenic levels found in participant's urine (See Appendix: Graph 8 - Soil Arsenic Concentrations). However, there was no correlation between these two variables at all (correlation coefficient = 0.0096). Again, this method of looking at exposure is limited if the participants were not performing a high risk exposure activity during the three days prior to urine collection.

Hair Arsenic Levels and Soil Arsenic Concentrations

Average soil concentrations in the participant's yards were compared with the arsenic levels found in the participant's hair (See Appendix: Graph 9 - Soil Arsenic Concentrations). There was a slight correlation between these two variables, but the correlation is not considered statistically significant (correlation coefficient = 0.28). Also, the hair values indicate that people are not being exposed to high levels of arsenic even though high levels of arsenic exist in their yard. Behavior modifications may explain some of this difference along with individual variations in activities. Also, most people spend a large fraction of their time indoors.

Household Arsenic and Outdoor Soil Arsenic Concentrations

Household dust was obtained from twelve vacuum cleaners in September of 1994 by the DTSC. These dust levels were compared with outdoor soil levels by Dr. Robert Holtzer at the Office of Environmental Health Hazard Assessment. A significant correlation between household dust and outdoor yard soil does exist indicating the potential for indoor residential exposure to arsenic (See Appendix: Graph 10 - Household Dust). Other investigators have also found that indoor dust levels are related to outdoor soil levels(15). Since the discovery of the elevated arsenic levels at the site considerable community education has been conducted through fact sheets, advisories, and community meetings to educate the community in ways to mitigate this potential exposure. Also high efficiency vacuum cleaners have been distributed to the area residents by the USEPA to reduce the potential indoor exposure to arsenic.

Inherent Limitations in Investigation

In the investigation there were some inherent limitations that could only be reduced and not eliminated, especially when applying the results to the entire effected population. First, the sample size of those tested compared to the entire area population. Second, the tests used only quantified exposure over a limited period of time . And third, variation in individual exposure patterns exist. These limitations were greatly reduced by testing significant fractions of the total effected population, testing both hair and urine samples, and by administering a detailed exposure questionnaire.

CONCLUSIONS

The exposure investigation that was conducted at the Central Eureka Mine Site in September 1995 did not indicate that the residents were being exposed to higher than background levels of arsenic from the hair analysis. No children had levels that exceeded our pre-set screening references. However, two adults had levels that required further investigation. For these two individuals re-tests were performed which showed that their arsenic levels were typical of background exposure. In addition, home visits were conducted by a medical doctor and a health assessor to better assess these individual's exposure to arsenic and to address their health concerns. After re-examining the biomarker results and conducting

home visits, the two individuals were considered to be exposed to typical levels of arsenic on average during the time shortly prior to the testing.

Other findings suggest that the Central Eureka Mine Site area residents were not being exposed to high levels of arsenic during the time shortly prior to the exposure investigation. First, behavior modifications did not appear to have a significant influence on the participant's arsenic levels. Secondly, time outdoors and participant's outdoor surface arsenic concentrations did not have a significant influence on urinary or hair arsenic levels. And thirdly, there was no significant difference between hair arsenic levels found in hair grown prior to and after community exposure education in the area. Moreover, none of the long hair arsenic results indicated exposures above the reference level. These levels show for those particular people that on average, prior to around September 1994, they were exposed to levels of arsenic similar to what the background population experiences.

This lower than expected exposure may be explained by low arsenic bioavailability. One study by PTI Environmental Services suggests that the arsenic at the Central Eureka Mine Site is not as bioavailable as first thought. This static *in vitro* study showed the arsenic to be around 14% bioavailable(17). DTSC and USEPA have expressed their objections to this bioavailability study, indicating that the report likely underestimates the bioaccessibility of the arsenic (18,19). The government agencies also questioned the use of a static *in vitro* test to duplicate the complex and dynamic human digestive system. Other research on different mine tailing sites may support the PTI Environmental conclusions (20-23). Nevertheless, caution is correctly exercised in the absence of more substantial site specific evidence. Further research in mine tailing sites seems appropriate, if possible, to better assess the potential human health threat.

Until credible research indicates that exposure to arsenic at the site does not pose a health threat to area residents the CDHS will continue to recommend that people take certain precautions to reduce their potential exposure to arsenic. Regardless of this uncertainty associated with the potential health threat at the Central Eureka Mine Site, exposure to arsenic at the site is being significantly reduced in the residential neighborhood. Final remediation of the neighborhood is now expected to be complete during the Summer of 1996. Many homes have already been remediated by removing elevated levels of surface arsenic in the residential yards. Also stabilization of the slopes of the hill (or mesa) has reduced or eliminated the potential migration of the mine tailings to adjacent lots.

PUBLIC HEALTH RECOMMENDATIONS AND ACTIONS

The Public Health Recommendations and Action Plan (PHRAP) for the site contains a description of actions taken, to be taken, or under consideration by ATSDR and CDHS at and near the site. The purpose of a PHRAP is to ensure that this health consultation not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the

environment. The CDHS and ATSDR will follow-up on this plan to ensure that actions are carried out.

Actions Completed:

1. CDHS implemented a door-to-door census to obtain demographic information of area residents.

2. ATSDR and CDHS conducted an exposure investigation in the area to provide individual exposure information to the community. Both testing of area residents and their dogs was offered free of charge.

3. CDHS informed area resident of the test results.

4. A public availability meeting was also held to present the group results. The meeting provided a forum to answer community questions and to address community concerns.

5. Professional health education has been implemented to educate the health care providers of area residents. CDHS staff organized a community committee to develop the packet. The packet was mailed in mid-April 1996.

Actions Planned:

1. CDHS plans to complete a health consultation evaluating the biological testing of resident's dogs.

Recommendations for Further Action:

1. CDHS should analyze pertinent soil data and other environmental information when it becomes available to better assess the potential health threat to residents living near the site.

2. The form of arsenic and the potential bioavailability of the arsenic in the mine tailings should be further evaluated. Although PTI Environmental Services conducted a static *in vitro* study on the mine tailings, no *in vivo* studies have been performed to this date.

Until remediation is complete we recommend that area residents:

1. avoid direct contact with soil suspected to be contaminated;

2. wash hands before eating;

3. shower/bath after activities that may have exposed you to contaminated soil;

4. keep children away from areas suspected to have contaminated soil and clean/wash toys that have come in contact with soil; and

5. limit your pet's activities around potentially contaminated soil.

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APPENDIX

CENTRAL EUREKA MINE SITE
(a.k.a. Mesa De Oro Site)
Exposure Investigation History

May 11, 1995	-	Community expresses interest in exposure investigation.
June 1, 1995	-	Discussed issues regarding exposure investigations in general. Lee Sanderson from ATSDR was present to talk about his experience at another site.
June 20, 1995	-	Feasibility Report begins - evaluate community concerns and interest. Also examine ATSDR criteria for conducting an exposure investigation.
July 6, 1995	-	CDHS requests ATSDR to assist in exposure investigation.
July 21, 1995	-	ATSDR informs CDHS that request has been approved.
July 25, 1995	-	Design for investigation protocol began.
August 17, 1995	-	Presented information on exposure investigation at a community meeting.
August 25, 1995	-	Sent area residents information letter regarding upcoming census and exposure investigation.
August 31, 1995	-	Attended Gold Country Coalition meeting. Answered questions and informed residents again about investigation and census.
September 6, 1995	-	Performed census in community. Informed area residents about the exposure investigation and answered their questions.
September 9, 1995	-	Revisited community to personally contact residents not available during the first census.
September 14, 1995	-	Exposure investigation sample collection and distribution of kits begins at the Mesa De Oro Club House, 6:30 - 9:00 pm.
September 16, 1995	-	Sample collection at the Sutter Creek Town Hall, 1:00 - 4:00 pm.

September 16, 1995	-	Revisited effected neighborhood to obtain census information and to inform residents of current investigation.
Sept. 19-21, 1995	-	Sample collection at the Mesa De Oro Club House and at residents homes if they were unable to make it to the club house.
Sept. 19-21, 1995	-	Revisited homes of residents that did not participate to ask them if they knew about the service.
October 23, 1995	-	Received final results back from the laboratory.
October 25, 1995	-	Provided results over the phone to participants who chose to be anonymous. They were required to call for results.
October 26, 1995	-	Mailed result letters to participants that chose to be confidential.
November 2, 1995	-	Attended Gold Country Coalition meeting to discuss initial findings and to address community questions.
December 6, 1995	-	Fact sheet mailed to community and all interested parties.
December 14, 1995	-	Presentation to community and all interested parties discussing the findings of the exposure investigation.

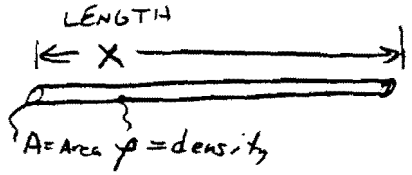
CALCULATION EVALUATING DISCREPANCY IN THE TWO DIFFERENT HAIR VALUES

12/4/95

CONDITIONS:
a). CONCENTRATION OF FIRST HAIR SAMPLE = 1.39 ppm A COLLECTED SEPTEMBER 14, 1995
b). CONCENTRATION OF SECOND HAIR SAMPLE ≤ 0.4 ppm A NONE DETECTED COLLECTED NOVEMBER 2, 1995
c). HAIR SAMPLE WAS COLLECTED FROM THE SAME PERSON AND THEIR HAIR WAS NOT CUT IN BETWEEN SAMPLES.

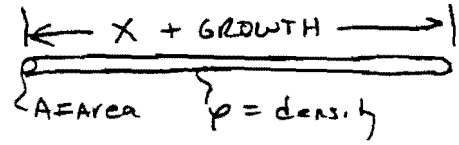
ASSUMPTIONS:
1). EXTERNAL ARSENIC IS REMOVED FROM THE HAIR
2). HAIR GROWS AT ONE INCH EVERY TWO MONTHS (0.5"/30.4 days)
3). HAIR ARSENIC LEVELS DO NOT VARY ON LOCATION OF SAMPLE.
4). THE LENGTH OF THE HAIR TESTED IS UNIFORM
5). THE HAIR HAS A CONSTANT AREA AND DENSIT
6). No exposure to arsenic existed after the first sample was collected.

HAIR₁ SAMPLE #1



Let As_1 = arsenic in hair sample 1

HAIR₂ SAMPLE #2



Let As_2 = arsenic in hair sample 2

$$\text{CONC. HAIR}_1 = \frac{As_1}{X \cdot A \cdot \varphi}$$

$$\text{CONC. HAIR}_2 = \frac{As_2}{(X + \text{GROWTH})\, A \cdot \varphi}$$

$$\text{GROWTH} = 49 \text{ days} \times \frac{0.5"}{30.4 \text{ d}} = 0.80$$

$$1.39 \text{ ppm} = \frac{As_1}{X \cdot A \cdot \varphi} \quad \boxed{\text{EQ 1}}$$

$$\therefore\ 0.4 \text{ ppm} = \frac{As_2}{(X + 0.81)\, A \cdot \varphi}$$

But because we have assumed that no additional arsenic exposure occurred after the first test then $As_1 = As_2$

$$\therefore\ 0.4 \text{ ppm} = \frac{As_1}{(X + 0.81)\, A \cdot \varphi} \quad \boxed{\text{EQ. 2}}$$

2/2

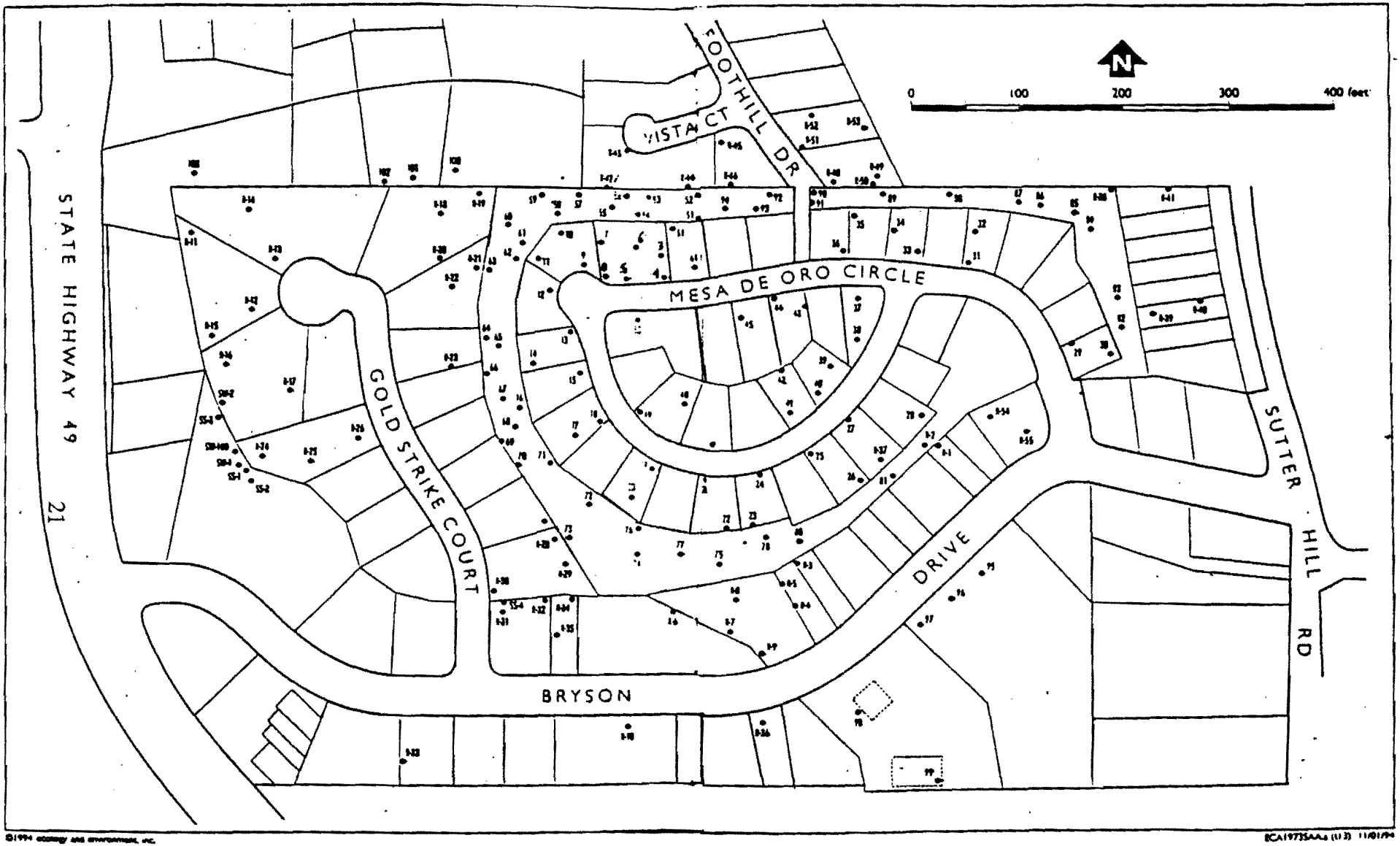
TAKE EQ. 1 AND DIVIDE BY EQ. 2 :

$$\frac{1.39}{0.4} = \frac{\cancel{A_{S_1}}}{X \cdot \cancel{A \cdot \phi}} \times \frac{(X + 0.81)\cancel{A \cdot \phi}}{\cancel{A_{S_1}}}$$

$$3.475 = \frac{X + 0.81}{X} = 1 + \frac{0.81}{X}$$

$$2.475 = \frac{0.81}{X} \quad \therefore \quad X = \frac{0.81''}{2.475} = 0.327$$

THE LENGTH OF THE HAIR TESTED ON SEPTEMBER 14, 1995 WOULD HAD TO HAVE BEEN AROUND ONE THIRD OF AN INCH. ALTHOUGH SHORT HAIR WAS NOT MEASURED THE WOMAN'S HAIR WAS NO SHORTER THAN AN INCH AND A HALF. THEREFORE, THE MOST PROBABLE EXPLANATION FOR THE DIFFERENT HAIR LEVELS IS EXTERNAL ARSENIC.



CENTRAL EUREKA MINE SITE
STREET MAP

(From United States Environmental Protection Agency, Subject: Central Eureka Mine, Sutter Creek, California, November 2, 1994.)

Table 1 - Community Participation

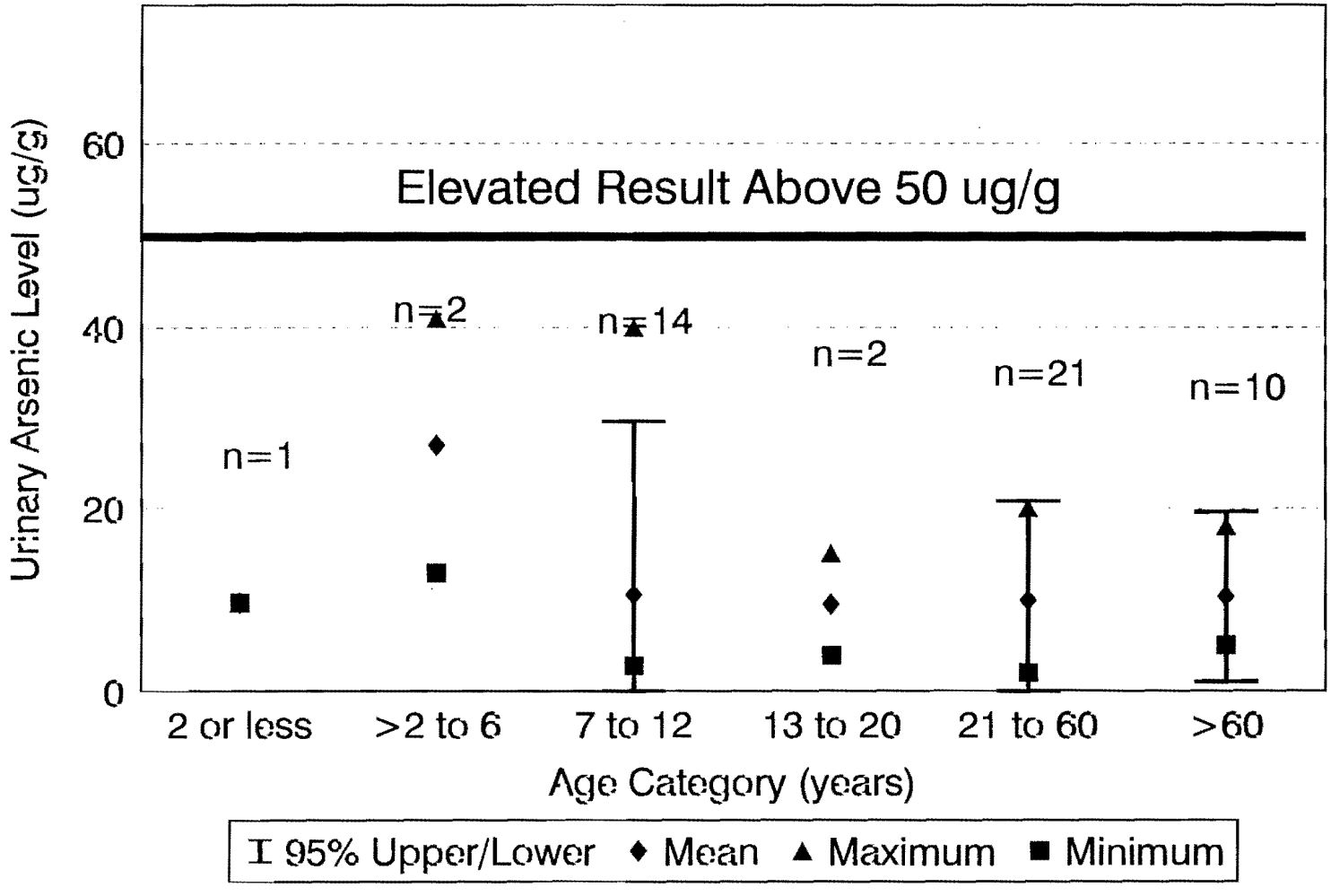
(September 1995 Exposure Investigation, Sutter Creek, CA)

AGE	PARTICIPATION	CENSUS	RATE
2 years or less	3	5	60%
> 2 to 6 years	3	11	27%
7 to 12 years	15	24	63%
13 to 20 years	2	13	15%
21 to 60 years	26	78	33%
> 60 years	15	30	50%
unknown	4	[]	3%

Graph 1- Urinary Arsenic vs. Age Group

(September 1995 Exposure Investigation, Sutter Creek, CA)

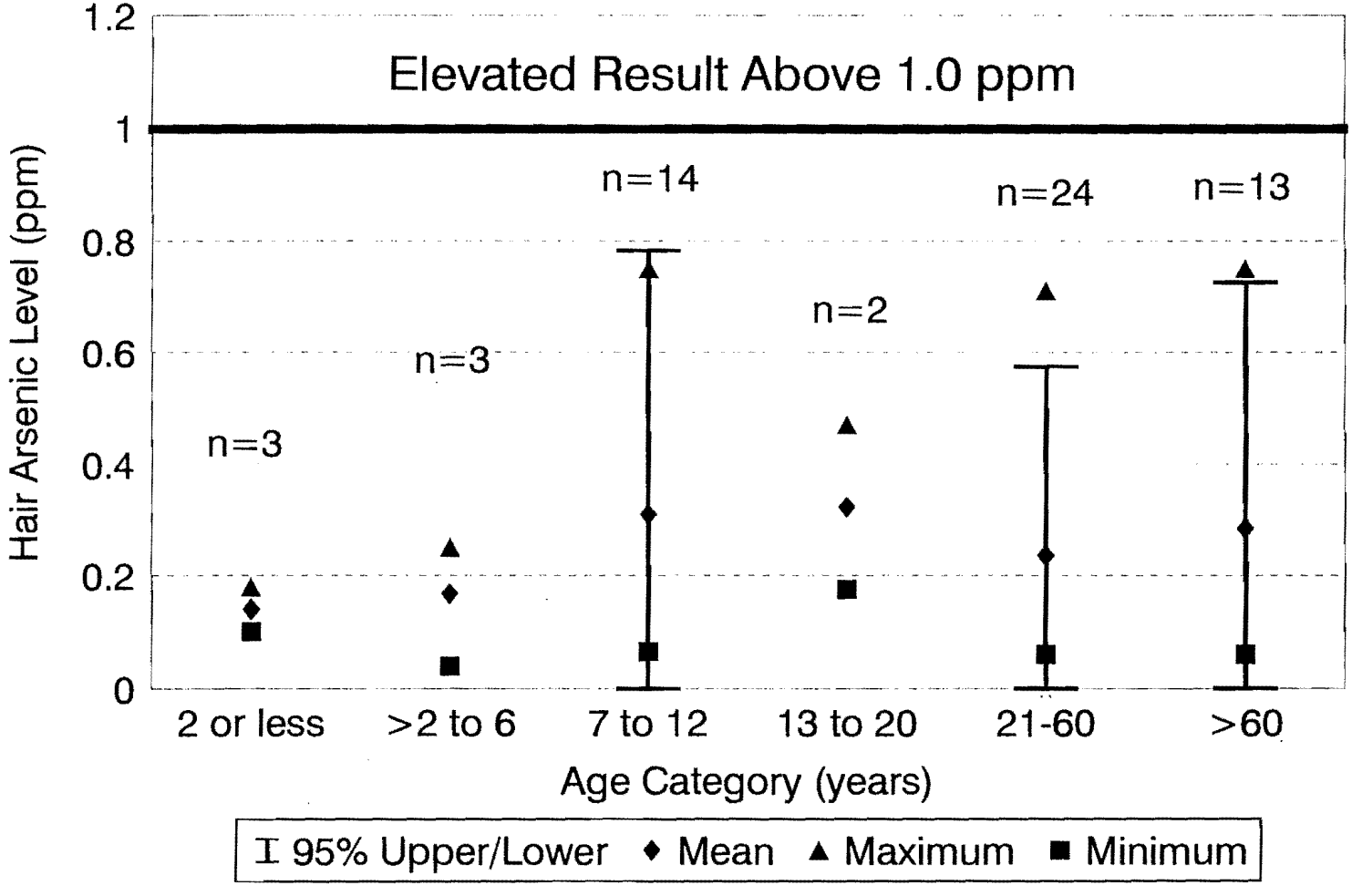
(95% Confidence Interval, Mean, and Range)



Graph 2 -Short Hair Arsenic vs. Age Group

(September 1995 Exposure Investigation, Sutter Creek, CA)

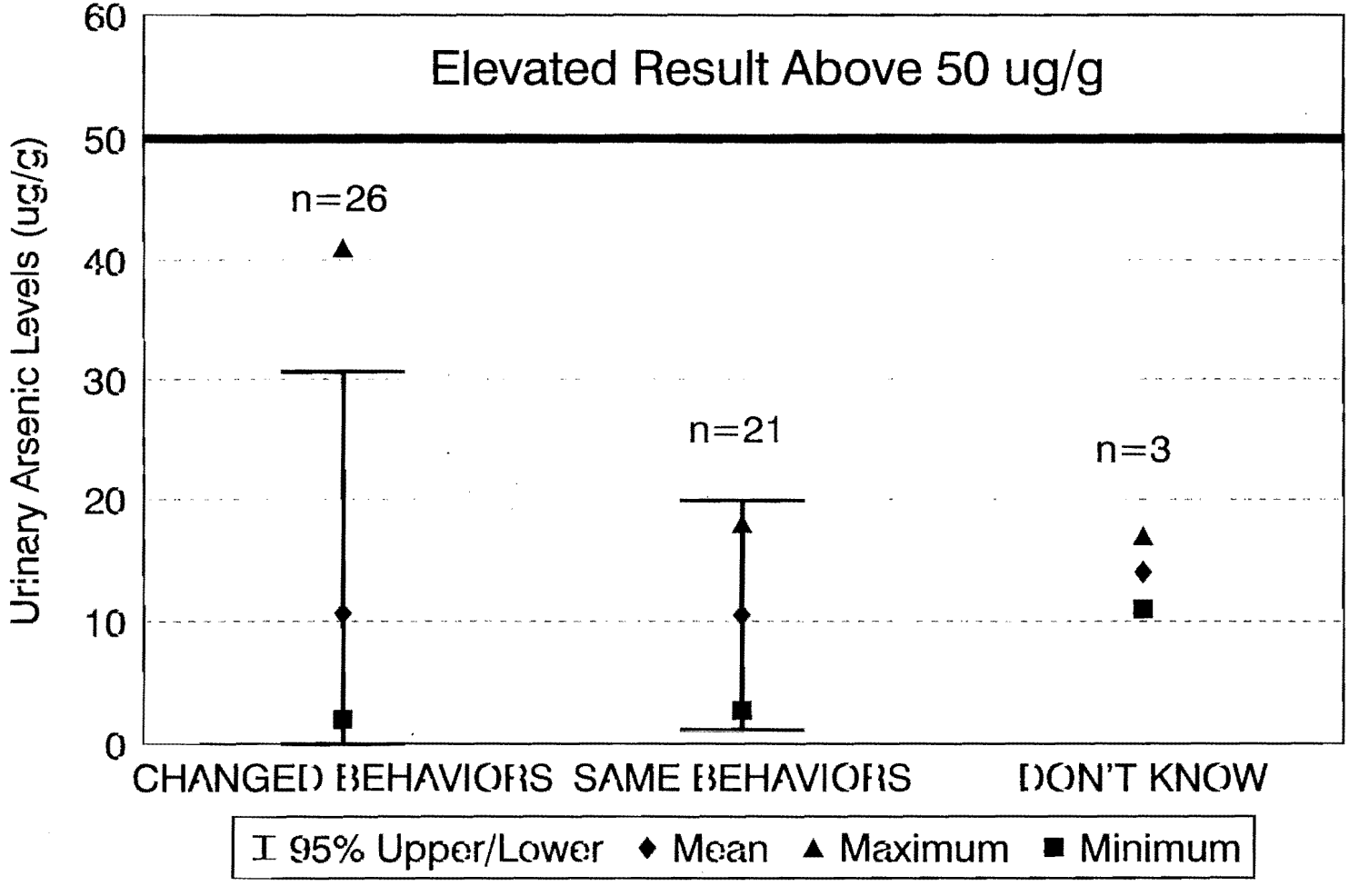
(95% Confidence Interval, Mean, and Range)



Graph 3 - Urinary Arsenic vs. Behavior

(September 1995 Exposure Investigation, Sutter Creek, CA)

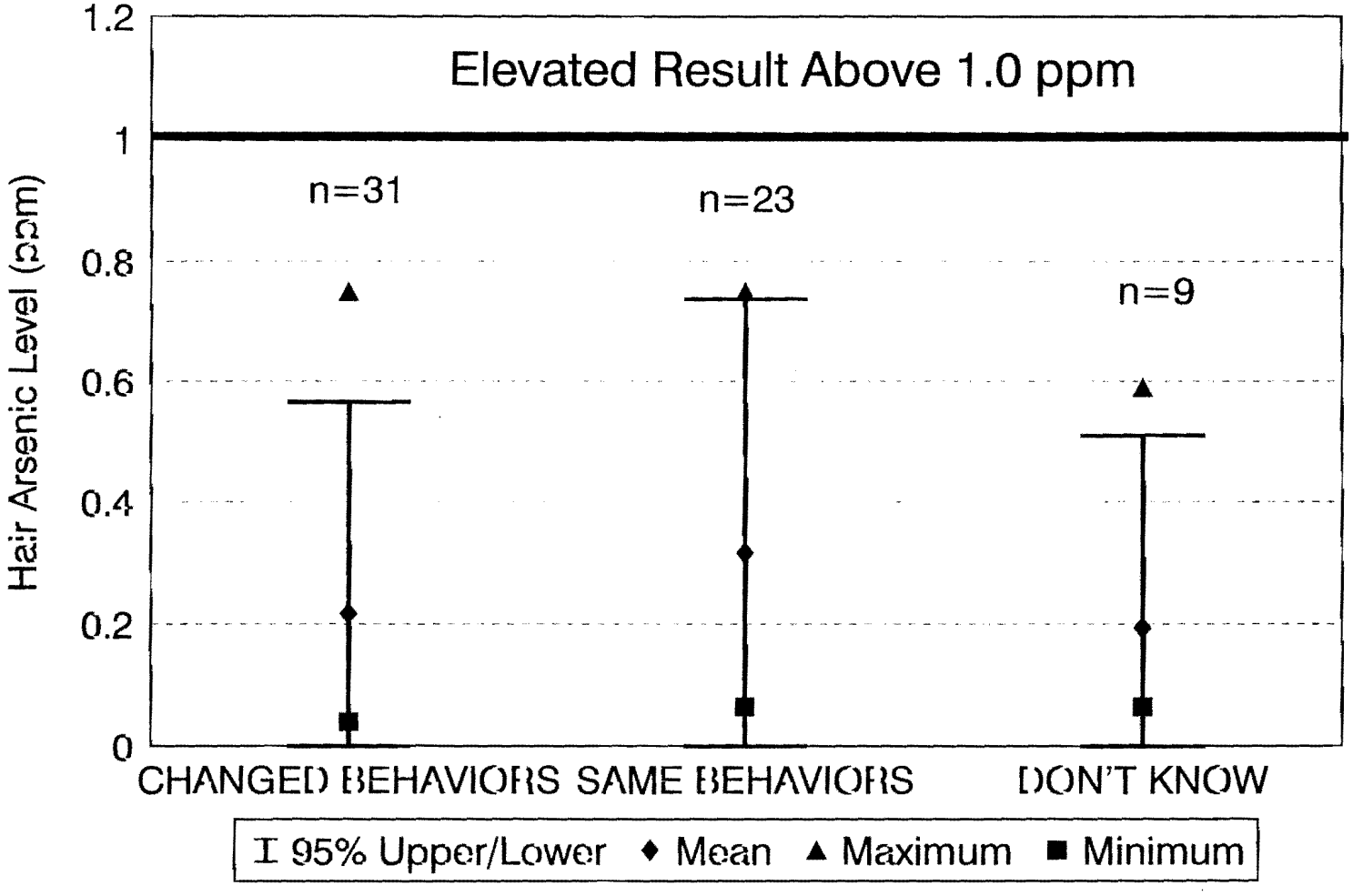
(95% Confidence Interval, Mean, and Range)



Graph 4 - Short Hair Arsenic vs. Behavior

(September 1995 Exposure Investigation, Sutter Creek, CA)

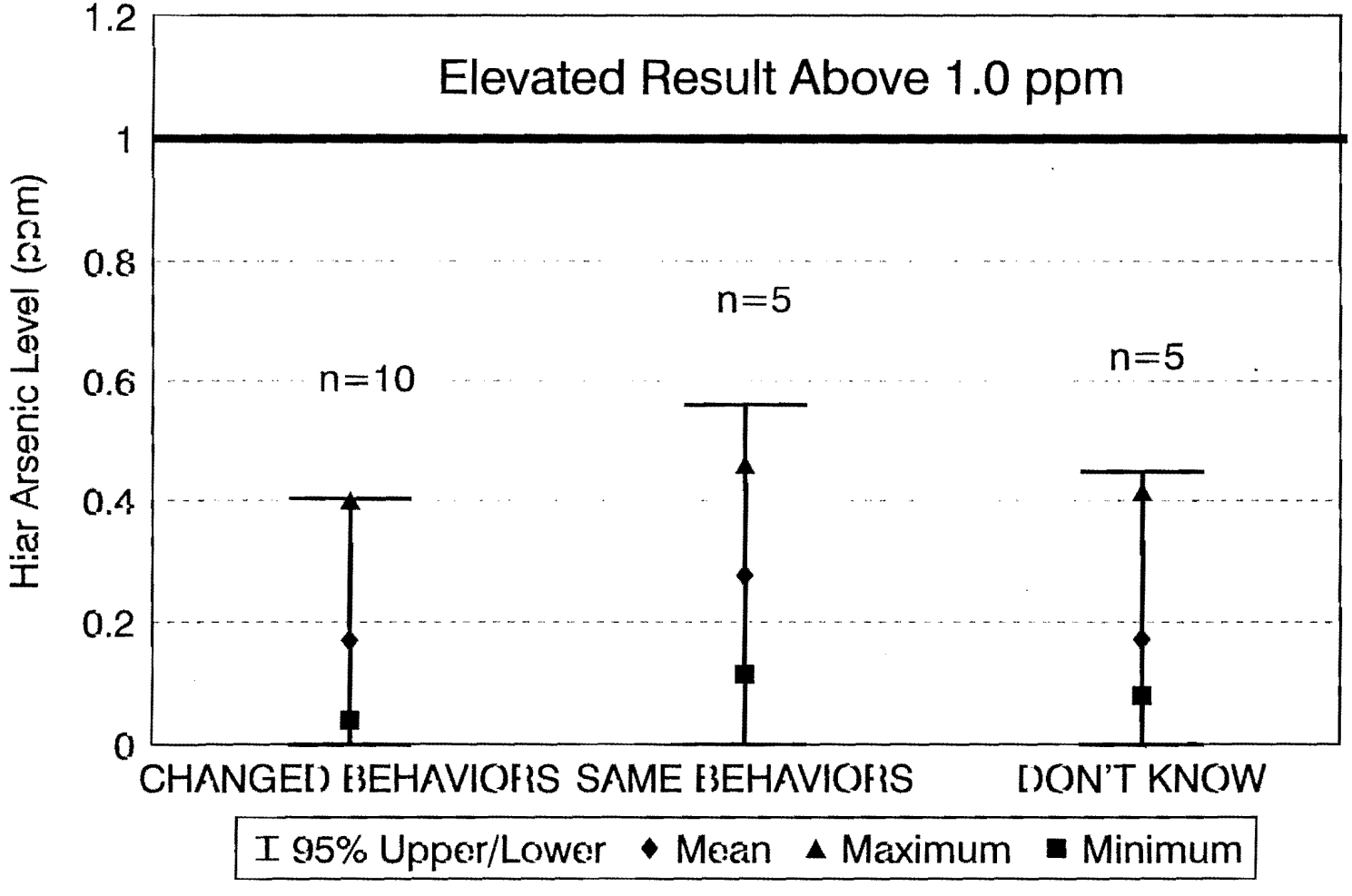
(95% Confidence Interval, Mean, and Range)



Graph 5 - Long Hair Arsenic vs. Behavior

(September 1995 Exposure Investigation, Sutter Creek, CA)

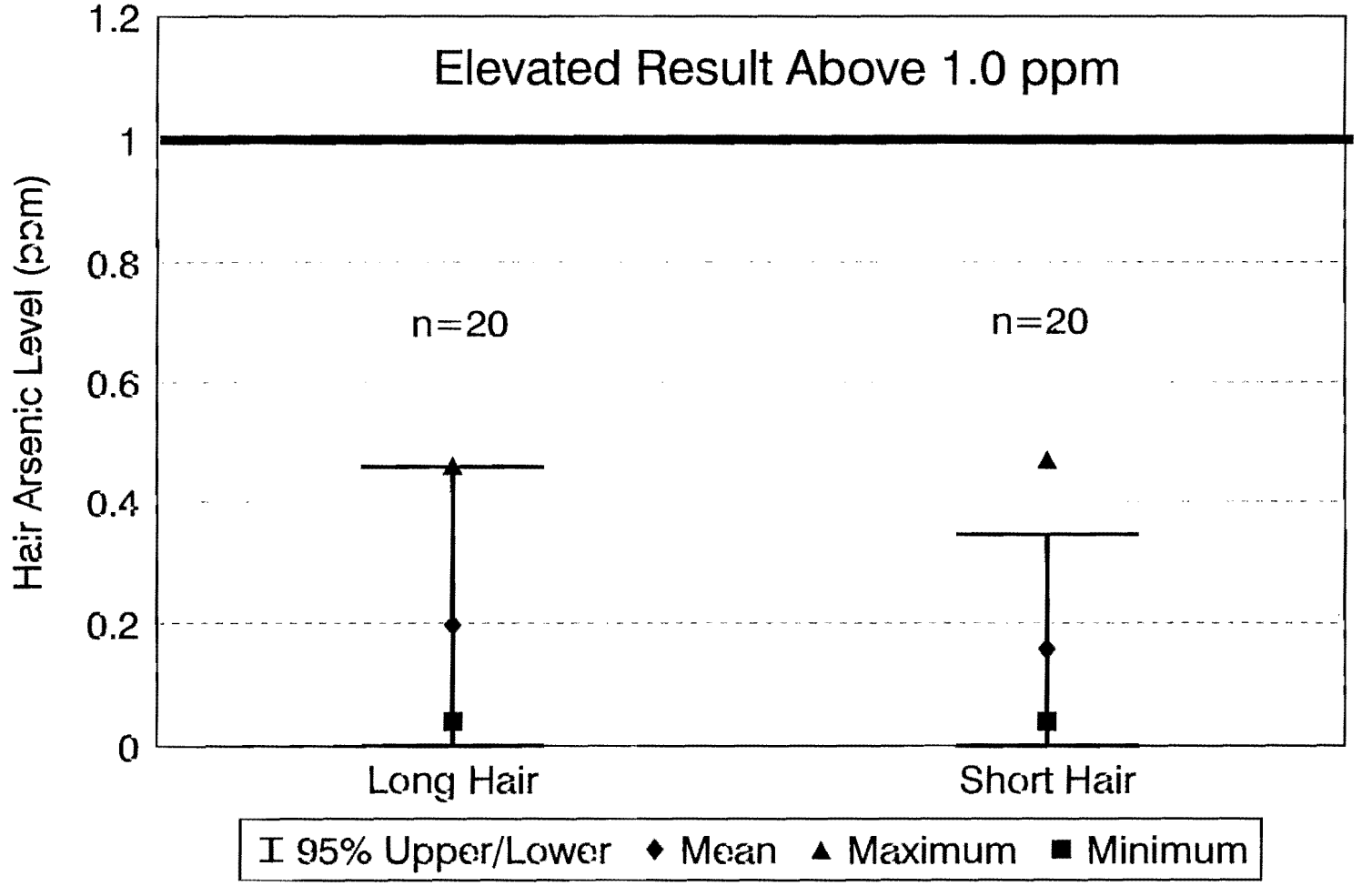
(95% Confidence Interval, Mean, and Range)



Graph 6 -Short Hair and Long Hair Results

(September 1995 Exposure Investigation, Sutter Creek, CA)

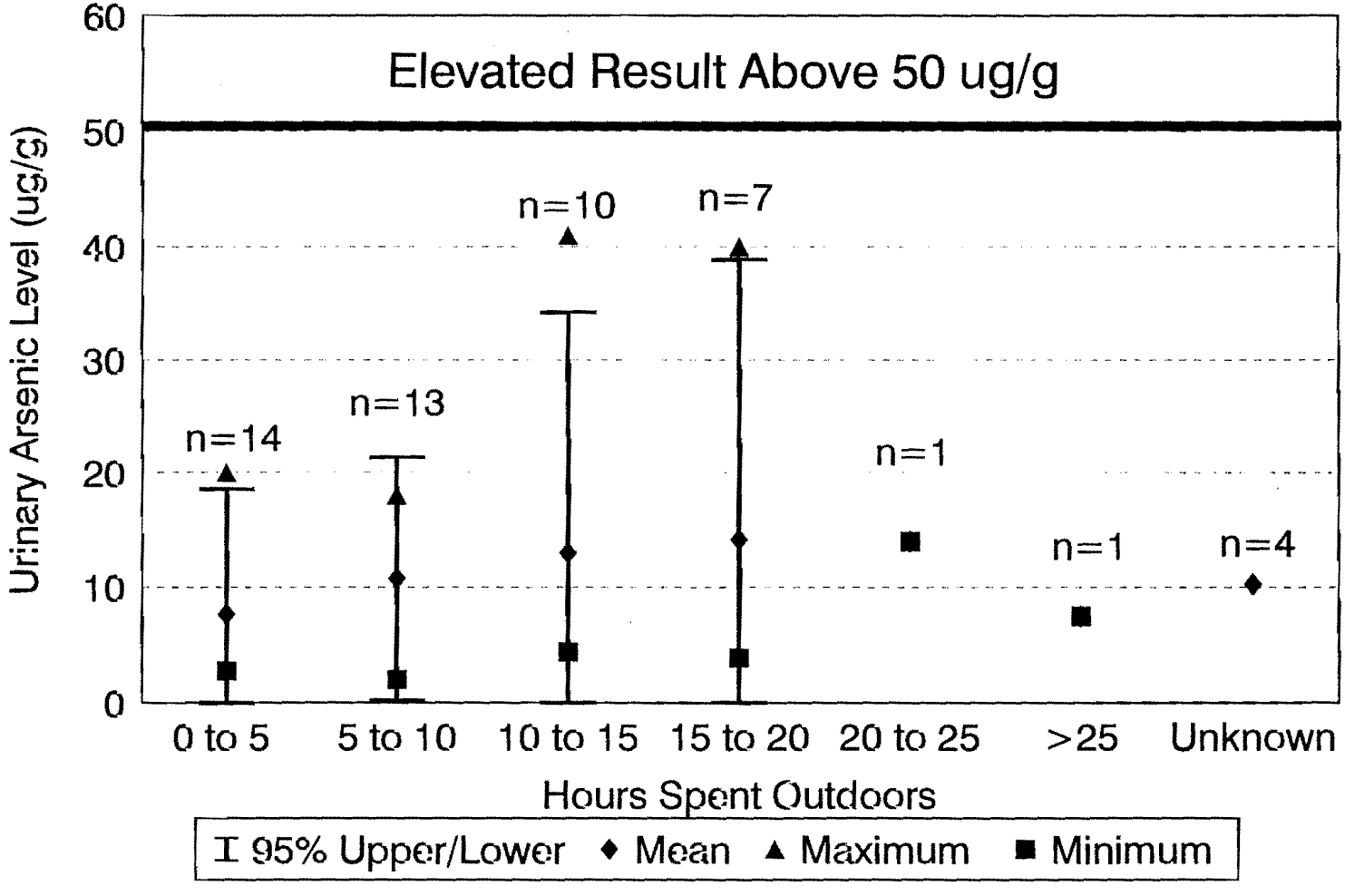
(95% Confidence Interval, Mean, and Range)



Graph 7- Urinary Arsenic vs. Time Outdoors

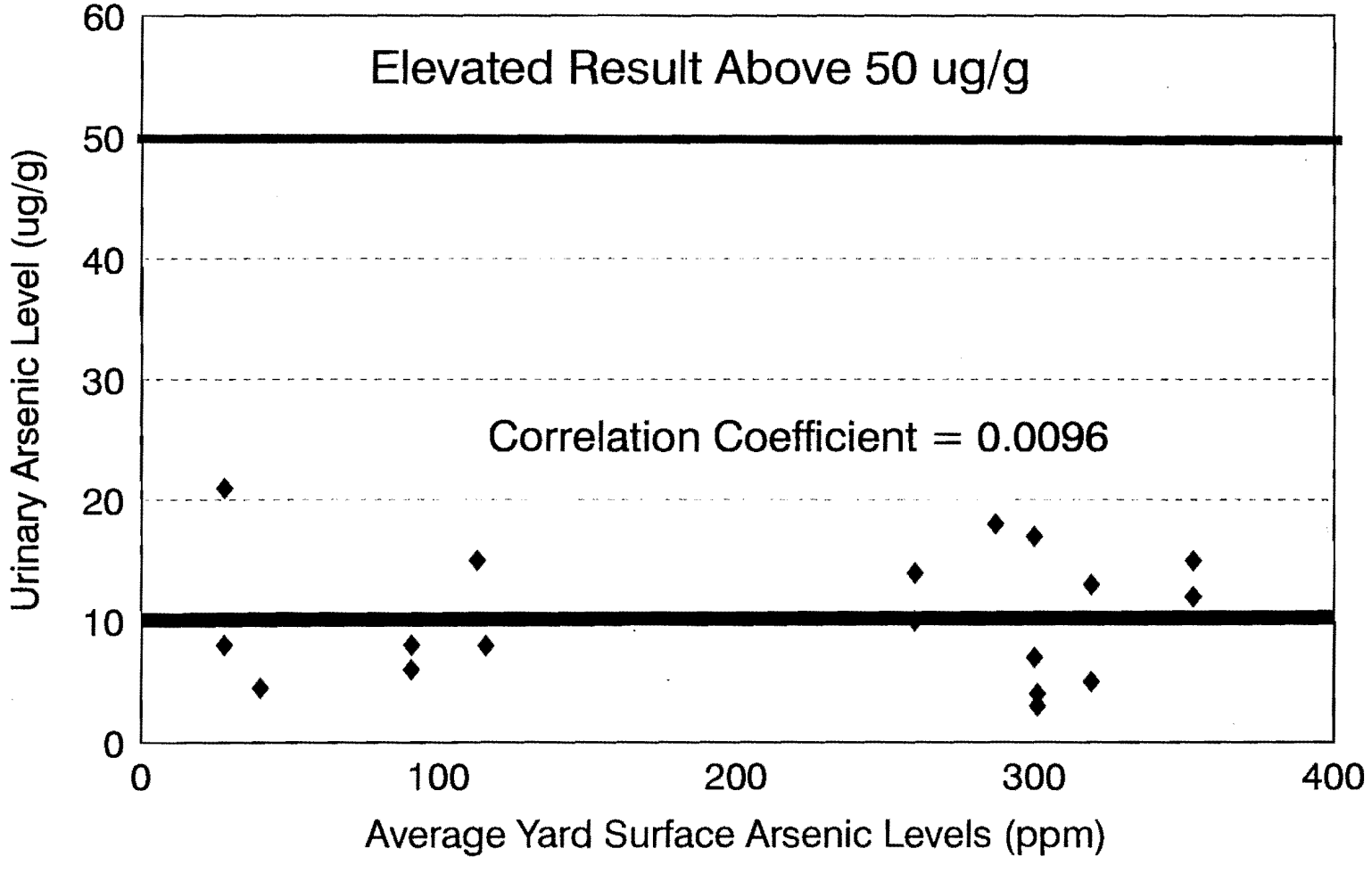
(September 1995 Exposure Investigation, Sutter Creek, CA)

Total Time Outdoors 3-Days Prior to Urine Sample
(95% Confidence Interval, Mean, and Range)



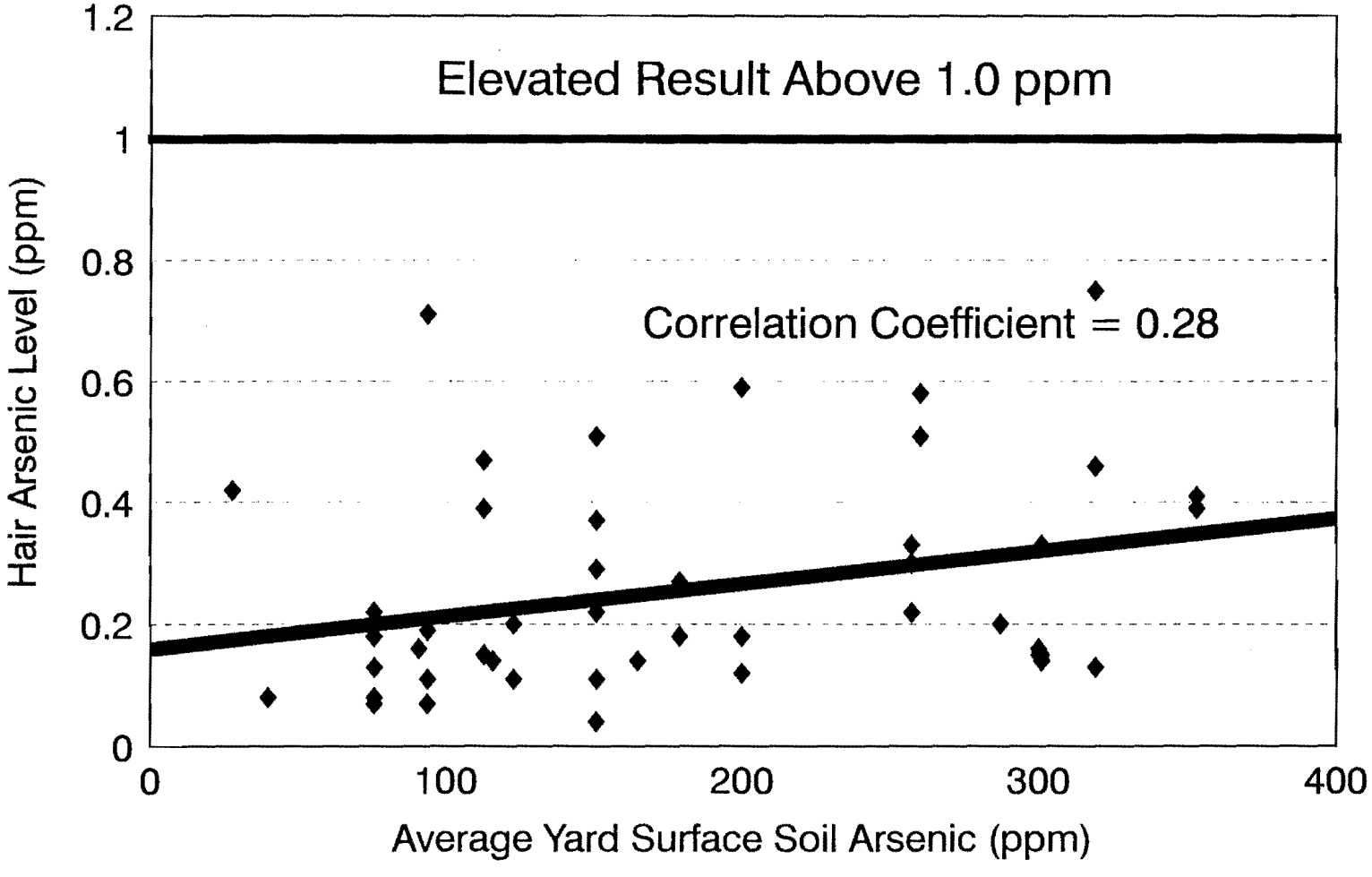
Graph 8 - Urinary Arsenic vs. Surface Soil Arsenic Levels

(September 1995 Exposure Investigation, Sutter Creek, CA)



Graph 9 - Hair Arsenic vs. Surface Soil Levels

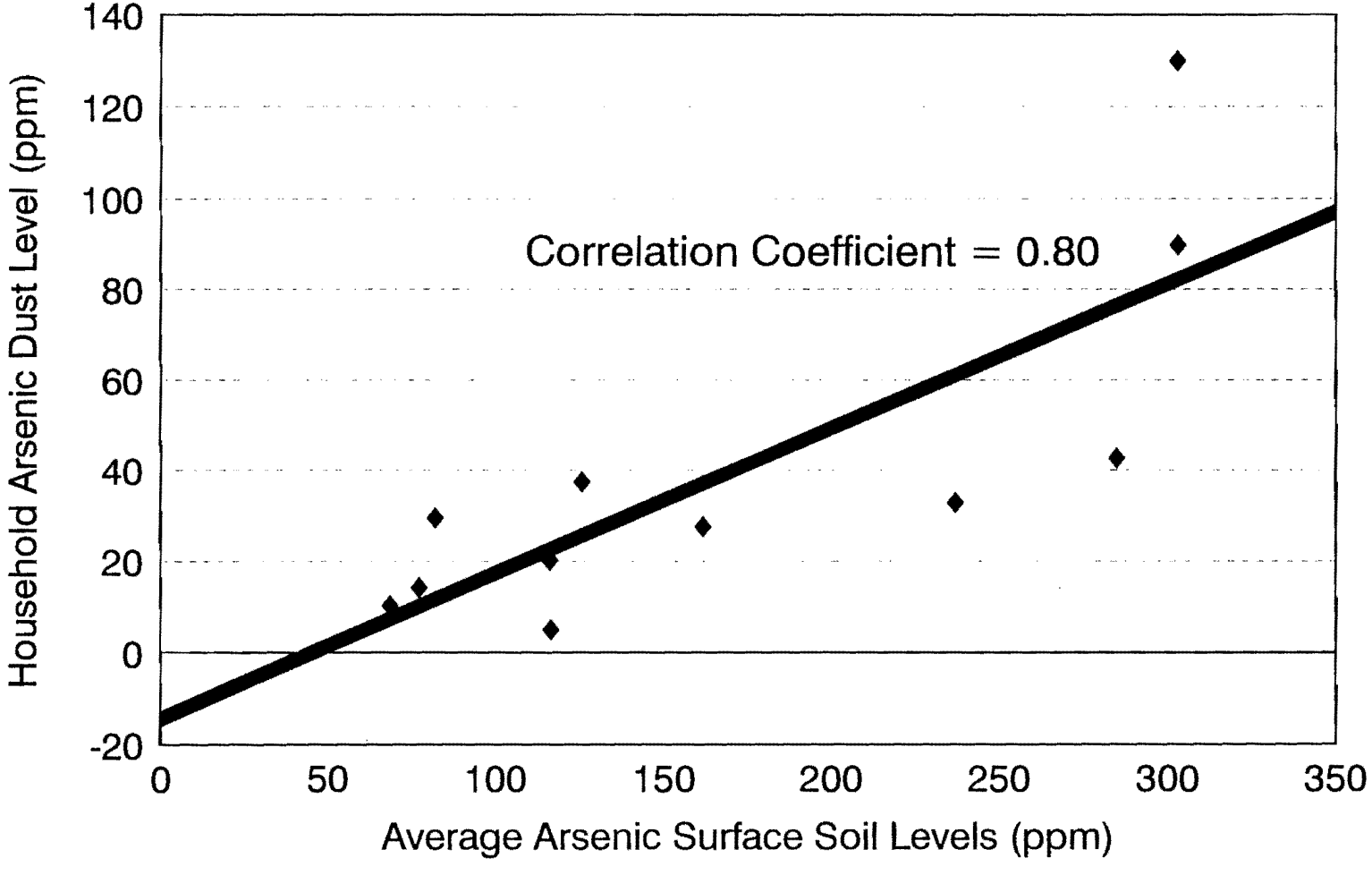
(September 1995 Exposure Investigation, Sutter Creek, CA)



Graph 10 - Comparison of Household Dust with Outdoor Soil

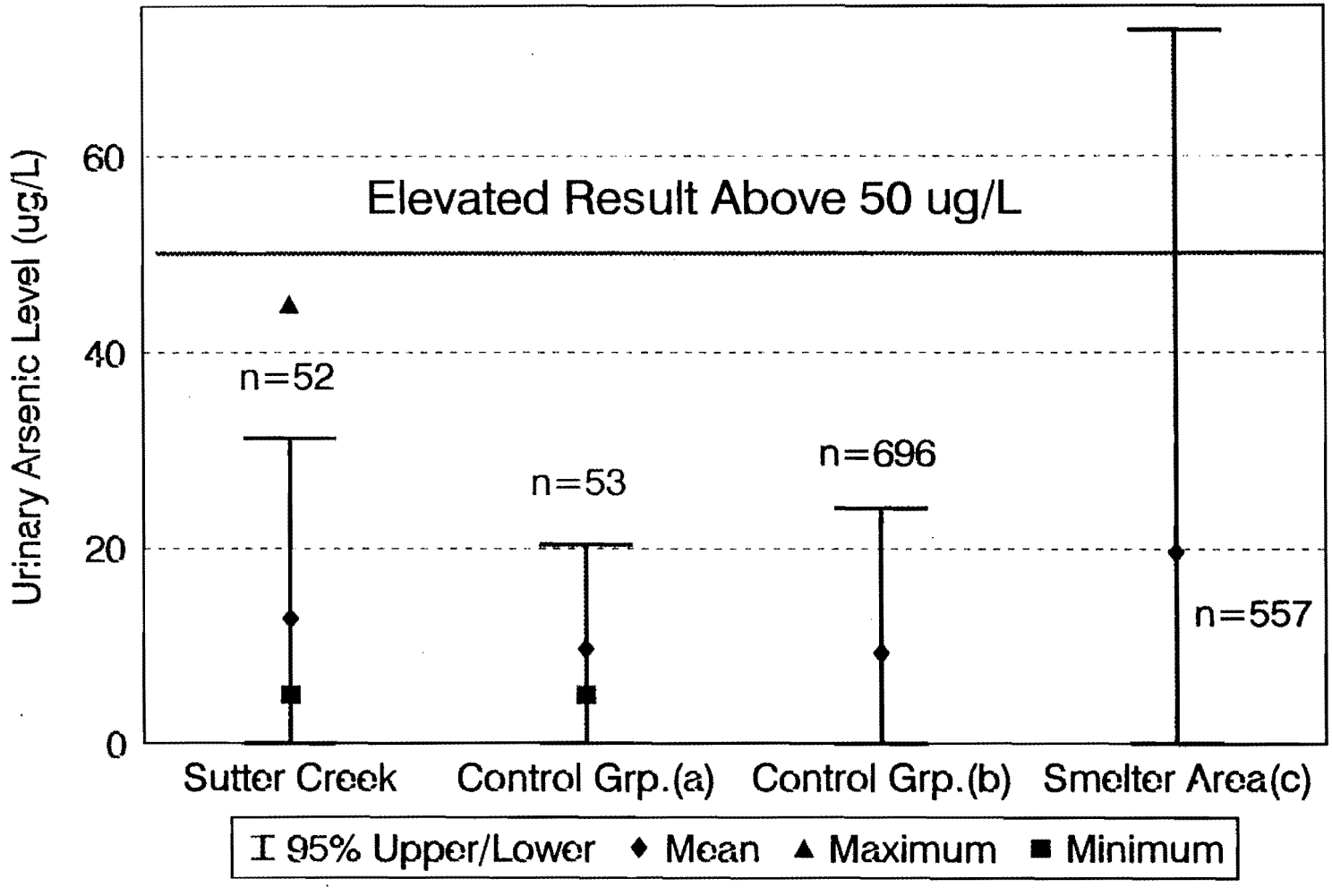
(September 1995, Exposure Investigation, Sutter Creek, CA)

(Arsenic in household vacuum cleaner bags)



Analysis Performed by Dr. Robert Holtzer, OEHHA, October 1994

COMPARISON OF URINARY ARSENIC DATA WITH OTHER COMMUNITIES



(a) Arsenic Level = 6.6ppm, (b) 57.2 ppm, (c) 353 ppm, Environ. Health Perspectives,David Kalman, 1990

EXPOSURE INVESTIGATION MATERIALS

- Letter of Introduction
- Fact Sheet
- Questions and Answers
- Consent Form
- Registration Cards
- Urine Collection Instructions
- Reminder Notice
- Questionnaire
- Sample Result Letter
- Fact Sheet

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY
BERKELEY, CA 94704-1011

(510) 540-3657

August 28, 1995

[redacted]
Sutter Creek, CA 95685

Dear [redacted]

The Environmental Health Investigations Branch of the California Department of Health Services (CDHS) with the assistance of the Agency for Toxic Substances and Disease Registry (ATSDR) will be offering free tests to residents living near the Central Eureka Mine Site to determine possible exposure to arsenic. Residents living on Bryson Drive, Goldstrike Court, Mesa de Oro Circle, and parts of Vista Court and Foothill Drive are included in this exposure investigation. The testing will involve the collection and analysis of urine and hair samples. Urine samples reflect arsenic exposure two to three days prior to testing. Hair analysis detects average exposures that occurred during the growth of the hair. Therefore, depending on the length of your hair, you may be able to determine past as well as recent exposures.

In addition to collecting these samples, we will ask you to complete a short questionnaire assessing daily activities that may be related to arsenic exposure. If your test results are higher than would be normal values, we will review your activity evaluation and suggest possible methods to reduce your exposure. We may also conduct in-home evaluations to try to determine possible sources of exposure.

Testing will take place in mid-September. A community meeting will be held on Thursday, September 14th. A second meeting will also be held on September 16th for those unable to attend the first meeting. At each of these meetings, CDHS staff will discuss the testing procedure and be available to answer questions. Consent forms, collection kits, instructions for obtaining urine samples, and an activity questionnaire will be provided. A sample of hair may also be taken at the meetings, or at your home if you prefer. If you would like to participate and are unable to attend either meeting, we will make alternate arrangements. Your test results will be mailed to you as soon as they are available, in approximately four weeks after testing.

There are some limitations to arsenic testing. Urine analyses will not show arsenic exposure that occurred more than two to three days prior to testing. Analysis of hair is limited in that the results will not detect short-term exposures or exposures that occurred prior to the growth of the hair. Also, the exact time of exposure cannot be determined. None of these tests will pinpoint the source of the arsenic. Other exposures may occur from an individual's occupation, diet, or medication. We will also not be able to tell you if any past, current, or future health problems are caused by your exposure to arsenic.

Health Consultation for Mesa de Oro Site (a/k/a Central Eureka Mine Site)
Sutter Creek, California

BACKGROUND AND STATEMENT OF ISSUE

Statement of Issue

Residents living within the boundaries of the Central Eureka Mine Site in Sutter Creek, California, expressed concern about their current exposure to arsenic. These community concerns were not completely addressed by a previous exposure investigation conducted in September 1994 by the Amador County Health Department and the California Office of Environmental Health Hazard Assessment. Although this investigation provided valuable exposure information to the participants, a July 1995 health consultation reviewing the data indicated that the sample size was relatively small (twenty-nine participants) when compared to the community population(1). Also the previous investigation had a limited questionnaire and tested for urinary arsenic levels which would only quantify very recent exposures. The health consultation further recommended that the California Department of Health Services (CDHS) determine whether an additional investigation would be beneficial in assessing exposure and addressing communities concerns. The Agency for Toxic Substances and Disease Registry (ATSDR) in cooperation with the CDHS took action to follow the recommendation, address health concerns and to meet the needs of the community.

CDHS and ATSDR evaluated the site using ATSDR specific exposure investigation criteria. Concurrently, several levels of community involvement activities were carried out to ascertain the communitiy's interest in another exposure investigation. Staff attended several meetings of the community group, the Gold Country Coalition, to inform the community about the possibility of the exposure investigation and to get feedback from the community. Clear information was provided about the parameters of the investigation and what information could be gained and what questions would not be answered. In addition, a door-to-door census was done at approximately seventy homes to obtain demographic information for the investigation and to inform residents about the testing dates and the procedures that would be followed. In addition, written materials were distributed during the census.

After concluding that the site met the ATSDR criteria and that the community was interested in participating, an exposure investigation was implemented in September 1995 (see Appendix: Timeline). This health consultation will provide an analysis of the recent exposure investigation results, which includes human urine and hair arsenic data, questionnaire information, and site characteristics. Biological testing of dogs in the area was also conducted; the data will be evaluated in a separate health consultation. The dog testing was conducted in conjuction with the human testing to determine whether the dogs were sentinels and vehicles of arsenic exposure.

[redacted]

Your participation in this exposure investigation is voluntary and all your tests results and answers will be strictly confidential. We will not give out or use your name or any other identifying information except to provide you with your test results, to contact you to discuss your activity evaluation, to arrange for an in-home evaluation, or to see if you are interested in participating in any follow-up investigations.

If you are involved in a lawsuit regarding the site, it is possible that a judge may order CDHS to release your information to the lawyers involved. If you don't want this to happen, you can choose to be completely anonymous as well. We will not collect your name, address, or phone number and will assign a unique identification number to your test results. However, this will make it impossible for us to contact you to perform an in-house evaluation in the event that your test results show arsenic levels higher than normal. Moreover, the only way to find out your test results will be for you to contact CDHS and provide your identification number.

In order to allocate adequate resources for this testing, we will be conducting a brief household census to determine how many people live in your area. We will also be available to answer questions that you may have regarding the testing. Members of the CDHS team will be in your community on Wednesday, September 6th, and Saturday, September 9th.

If you have any questions or would like more information, please call toll free at (800) 215-3320.

Sincerely,

Marilyn C. Underwood

Marilyn C. Underwood, Ph.D.
Environmental Health
Investigations Branch

James D. Bodnar

James D. Bodnar, M.S.C.E.
Environmental Health
Investigations Branch

What if my levels are elevated?

If your arsenic levels are elevated, we will suggest possible methods to reduce your exposure. In-home evaluations will be offered to residents with elevated levels.

What if my levels are low?

If your arsenic levels are low, you likely modified your behavior to reduce your exposure to outdoor soil.

Are my results kept private?

Individual results will be kept strictly confidential. Participants can also choose to remain completely anonymous. The anonymous option will make it impossible for CDHS staff to perform follow-up activities, such as an in-home exposure evaluation.

Investigation results will be reported without any identifying information. Results may also be reported in group format (for example; children, youths, and adult age categories).

California Department of Health Services
5900 Hollis Street, Suite E
Emeryville, CA 94608
TELEPHONE: (510) 540-3657

IMPORTANT NOTICE

EXPOSURE INVESTIGATION SOON TO BE CONDUCTED IN YOUR COMMUNITY

BY

California Department of Health Services with the assistance of the Agency for Toxic Substances and Disease Registry

Who?

The California Department of Health Services with the assistance of the Agency for Toxic Substances and Disease Registry will be offering free tests to residents living near the Central Eureka Mine Site to determine possible exposure to arsenic. Residents living on Bryson Drive, Goldstrike Court, Mesa de Oro Circle, and parts of Vista Court and Foothill Drive are included in the investigation.

Why?

Testing of soil and vacuum cleaner bag dust samples from the Mesa de Oro Subdivision and surrounding areas showed elevated concentrations of arsenic. The tests we are offering to residents will better characterize recent individual exposure to arsenic.

What?

The testing will involve the collection and analysis of urine and hair samples. Urine samples reflect arsenic exposure two to three days prior to testing. Hair analysis detects average exposures that occurred over the growth of the hair. In addition to collecting samples, we will ask you to complete a short questionnaire assessing your daily activities that may relate to arsenic exposure.

When?

Testing will take place in mid-September. A meeting will be held on Thursday evening, September 14th, at the Club House on 180 Mesa de Oro Circle. A second meeting will be held on Saturday afternoon, September 16th, at the Sutter Creek City Auditorium for those unable to attend the first meeting. CDHS staff will be available to answer your questions throughout both meetings. The meetings will be divided into sessions to better accommodate the number of participants. We are asking people to attend a session based on the first letter of their last name. Please refer to the time schedules below.

During the sessions we will explain to you the overall investigation and answer your individual questions. We will also collect hair samples and distribute urine collection kits at this time.

You may attend any session if your assigned session is too inconvenient. If you cannot make either meeting but still want to participate, CDHS staff can make alternate arrangements.

• • •

SAMPLE COLLECTION DAYS

Thursday - September 14: 6:30-9:00 p.m.
Club House - 180 Mesa de Oro Circle

6:30 - 9:00 p.m. Question/Answer Time

6:30 - 7:10 p.m. Last Name: A - F

7:10 - 7:50 p.m. Last Name: G - L

7:50 - 8:30 p.m. Last Name: M - S

8:30 - 9:00 p.m. Last Name: T - Z

• • •

Saturday - September 16: 1:00-4:00 p.m.
Sutter Creek Auditorium - Main Street

1:00 - 4:00 p.m. Question/Answer Time

1:00 - 1:45 p.m. Last Name: A - F

1:45 - 2:30 p.m. Last Name: G- L

2:30 - 3:15 p.m. Last Name: M - S

3:15 - 4:00 p.m. Last Name: T - Z

• • •

Pet Biomonitoring

Testing of dogs will be offered. Past exposure investigations suggest that pets may expose humans to outdoor soil. The dog testing will be conducted on Sunday morning at the park on Bryson Drive.

Sunday - September 17
Park - Bryson Drive
8:00-11:00 a.m. Dog Testing By Appointment

☎Schedule your dog's appointment by calling Sandra McNeel, D.V.M. at (510) 540-3657.

❖

For More Information Call:

(510) 540-3657

or

(800) 215-3320

Contact People:

Dr. Marilyn Underwood

and

Mr. James Bodnar

❖

CENTRAL EUREKA MINE SITE
INFORMATION ABOUT ARSENIC EXPOSURE TESTING

1. **Who is conducting these tests?**
   The testing for arsenic exposure is being conducted by the Environmental Health Investigations Branch of the California Department of Health Services (CDHS) with the assistance of the Agency for Toxic Substances and Disease Registry (ATSDR).

2. **Why is CDHS and ATSDR offering these tests?**
   Testing of soil and vacuum cleaner bag dust samples from the Mesa de Oro Subdivision and surrounding areas showed elevated concentrations of arsenic. The elevated environmental levels of arsenic have prompted concern about exposure to residents. These tests will better characterize individual arsenic exposure.

3. **Is there any fee for the testing?**
   No, testing is being offered free of charge to residents of the Mesa de Oro Subdivision and the surrounding areas.

4. **What will the testing involve?**
   A sample of urine and hair will be collected for each resident that would like to participate. In addition, a short questionnaire assessing daily activities that may be related to arsenic exposure will be provided.

5. **What will I learn from the test results?**
   The analysis of urine specimens can detect arsenic exposure within two to three days prior to testing. Analysis of hair samples can detect average exposures that occurred during the growth of the hair. Hair grows about one half inch each month. Therefore, if your hair is six inches long, your test results will reflect average arsenic exposures that happened in the last twelve months. If your test results are elevated, we will suggest possible methods to reduce your exposure. In-home evaluations will also be offered to residents with elevated test results.

6. **What won't I learn from the test results?**
   Urine analysis will not show arsenic exposure that occurred more than two to three days prior to testing. Analysis of hair samples is limited in that the results will not detect short-term exposures or exposures that occurred prior to the growth of the hair. Also, the exact time of exposure cannot be determined. None of these tests will pinpoint the source of the arsenic. Other exposures may occur from an individual's occupation, diet, or medication. We will also not be able to tell you if any past, current, or future health problems are caused by your exposure to arsenic.

7. **Will my name and test results be confidential?**
   Yes, your name, address, phone number, test results, and any other information will be confidential at all times. We will not give out or use your name or any other identifying information except to provide you with your test results, to contact you to discuss your activity evaluation, to arrange for an in-home evaluation, or to see if you are interested in being part of a follow-up study.

   If you are involved in a lawsuit regarding the site, it is possible that a judge may order CDHS to release your information to the lawyers involved. If you don't want this to happen, you can choose to be completely anonymous. We will not collect your name, address, or phone

number and will assign a unique identification number to your test results. However, we will not be able to contact you or to conduct in-home evaluations. The only way for you to find out your test results will be for you to contact CDHS and provide your identification number.

8. **If I want to participate, what do I do?**

There will be a community meeting at the Club House (180 Mesa de Oro Circle) on Thursday, September 14th at 6:30-9:00 pm. A second meeting will also be held at the Sutter Creek City Auditorium (Main Street) Saturday, September 16th at 1:00-4:00 pm for those unable to attend the first meeting. CDHS staff will discuss the testing procedure and be available to answer questions. Consent forms, collection kits, instructions for obtaining urine and stool samples, and a questionnaire will be provided. A sample of hair may also be taken at this meeting, or at your home if you prefer.

If you would like to participate and are unable to attend either meeting, please contact James Bodnar at the number listed below to make alternate arrangements. Your test results will be mailed to you as soon as they are available, in approximately four weeks.

9. **How can I get more information?**

For more information about this investigation, you may call Dr. Marilyn C. Underwood at (510) 540-3657 or (800) 215-3320 or write to her at CDHS, 5900 Hollis Street, Suite E, Emeryville, CA, 94608.

For information about health concerns related to arsenic, please call the Occupational Medical Clinic of the University of California Medical Center at Davis, toll free, at (800)582-4003.

EXPOSURE INVESTIGATION PARTICIPANT CONSENT FORM

I understand that the Environmental Health Investigation Branch of the California Department of Health Services (CDHS) with the assistance of the Agency for Toxic Substances and Disease Registry (ATSDR) is offering free tests to residents living near the Mesa De Oro Subdivision (a/k/a Central Eureka Mine Site) to determine possible exposure to arsenic. I will benefit from participating in the investigation by learning the extent to which I (or my child/ward) have been recently exposed to arsenic.

I will be provided with instructions and collection kits for obtaining urine specimens. These specimens will be picked up by CDHS staff I may drop them off at a collection station. A small sample of hair will be taken either at my home or at the collection station by a membe of the investigation team. The urine samples will help determine whether I have had any recent exposure to arsenic. Analysis of hair samples will indicate average exposure to arsenic during the growth of the hair. I understand that the hair analysis requires a small amour of hair and that every effort will be made to minimize the effect on my appearance. In addition to the testing, I will be asked about daily activities that may be related to arsenic exposure from the site.

My participation in this investigation is voluntary and all my answers and test results are confidential. All forms containing names and addresses will be kept in a locked filing cabinet or locked room. Furthermore, my name, address, and any other identifying information w never be included in any report. However, if I am involved in a lawsuit regarding the site, I understand that CDHS, if ordered by a judge, may have to release my confidential information.

If I do not want this to happen, I can choose to have my results both confidential and completely anonymous. In this case, CDHS staff will assign me a unique identification number. The only way to find out my test results will be to provide my identification number to CDHS staff. My name and address will not be recorded, therefore a specific test result could never be connected to me. The disadvantage of complete anonymity is that CDHS will not be able to contact me or include me in certain follow-up activities, such as in-home counseling that may help me understand the levels of arsenic found in the specimens I provided for analysis.

I _____ ✍, the undersigned agree to the activity questionnaire and:
(Please print name here)

(Please initial only those that you agree to)

___✍ Urine testing ___✍ Hair testing

for:

(Please check those that apply)

___✍ myself ___✍ my child/ward, _____

___✍ my child/ward, _____✍ ___✍ my child/ward, _____

I understand and agree that there is no provision for medical treatment by CDHS or ATSDR based on the test results or in the event of injury from participation. I understand that I can stop my or my child's participation at any time without consequence to anyone. I understand that the results will be evaluated by CDHS and ATSDR staff for possible recommendations on how I can reduce my exposure to arsenic if the test results are elevated. Any medical benefits that I now receive and entitled to will not be affected by this decision.

RISKS	BENEFITS
♦ Collection of hair samples may alter appearance. ♦ A judge may order CDHS to release confidential results if I am involved in a lawsuit related to the site. ♦ Participation will require my time and cooperation in collecting samples.	♦ Personal arsenic exposure information and recommendations will be provided to me free of charge. ♦ Activities that pose the greatest risk to arsenic exposure will be defined (if possible). ♦ Sub-populations with high arsenic exposure levels will be identified (if possible).

The risk and benefits of this procedure have been explained to me. I hereby freely and voluntarily give my signed authorization for the testing and evaluation described above. I choose to remain (PLEASE CHECK ONE ONLY): ☐confidential ☐anonymous.

Signature: _____✍ Date: _____✍

If you have any questions concerning the exposure investigation you may call Dr. Marilyn C. Underwood toll free at (800) 215-3320 or write her at CDHS, 5900 Hollis Street, Suite E, Emeryville, CA 94608.

YOU KEEP THIS PART

ANONYMOUS ID #:

_____

(Please write a number that is familiar to you, for example the last four digits of your social security number. If you forget this number there is no way we can provide you with your results.)

CONTROL NUMBER 550938

NMS-WILLOW GROVE, PA 19090-0437

☎ After 10/25/95 ☎
call Dr. Marilyn Underwood with CDHS at (800) 215-3320 or (510) 540-3657 for your results.

ANONYMOUS EXPOSURE INVESTIGATION KEY

ANONYMOUS ID #:

_____

(Please write the same anonymous identification number that you wrote in the other section. This is the only way we can connect you to your results.)

CONTROL NUMBER 550938

NMS-WILLOW GROVE, PA 19090-0437

DO NOT WRITE IN THIS AREA

CON FRM: ____ HAIR: ____

UR KIT: ____ QUEST: ____

QUE COL: ____ UR COL: ____

011

CONFIDENTIAL EXPOSURE INVESTIGATION KEY

(THIS CARD WILL BE DESTROYED AFTER ANALYSIS OF RESULTS)

PLEASE COMPLETE SEPARATE CARD FOR EACH PERSON

PARTICIPANT'S NAME: _____

STREET ADDRESS: _____

MAILING ADDRESS: _____

_____

PHONE NUMBER: _____

DO NOT WRITE IN THIS SECTION

CONTROL NUMBER 551011

CN FM: ____ UR COLL: ____ SAMPLE ID # —>

HAIR: ____ UR KIT: ____ QUES COL: ____

NMS-WILLOW GROVE, PA 19090-0437

EXPOSURE INVESTIGATION
CALIFORNIA DEPARTMENT OF HEALTH SERVICES

Collection kit should include:

- Labeled, resealable bag.
- Bottle with white plastic cap, labeled URINE COLLECTION CONTAINER.
- DriMop liquid absorbent -- leave in bag.

Use one sample collection kit per person.

COLLECTING URINE SAMPLE

NIGHT BEFORE

The night before sample collection place urine collection bottle near or on toilet. If necessary use a note to remind yourself to take sample. Sample must be from first urination in the morning (**preferably Monday or Tuesday morning**).

TAKING THE SAMPLE

Wash hands thoroughly. Then urinate in the plastic bottle provided with your collection kit. Fill bottle at least 1/4 full, otherwise discard and repeat the next morning. **Replace bottle's cap tightly**.

Place bottle in plastic bag and reseal bag. Mark the date and approximate time the sample was taken on the label affixed to the bag. If more than one person in your family is being tested, label the bag so as not to confuse your samples with others. You do not need to refrigerate the sample.

Monday (9/18) , Tuesday (9/19), or Wednesday (9/20) you may drop the urine sample off at the Club House, 180 Mesa de Oro Circle, during 7:30 am to 6:00 pm. If you would prefer to have your sample picked up at your home, please call our mobile unit at (510) 599-9071 stationed in Sutter Creek until Wednesday night (9/20). Investigation staff personnel, Lee Sanderson and James Bodnar, may also be reached at the Best Western in Jackson at (209) 223-0211 until Wednesday night (9/20). If you need your sample picked up after Wednesday (9/20), please call our Emeryville office at 1-800-215-3320.

PROBLEMS OR QUESTIONS? If you have an urgent question or problem call our mobile unit in Sutter Creek at (510) 599-9071 anytime until Wedneday night (9/20). For general questions you may call Dr. Marilyn Underwood with CDHS at 1-800-215-3320 at our Emeryville office weekdays.

EXPOSURE INVESTIGATION
CALIFORNIA DEPARTMENT OF HEALTH SERVICES

Collection kit should include:

- Labeled, resealable bag.
- Bottle with white plastic cap, labeled URINE COLLECTION CONTAINER.
- DriMop liquid absorbent -- leave in bag.
- Pediatric urine collection bag.

Use one sample collection kit per person.

COLLECTING A URINE SAMPLE FROM A CHILD WHO WEARS DIAPERS

NIGHT BEFORE

Just before bed wash child's genital area with mild soap to remove powder or oils, washing anus last -- make sure genital area is clean and completely dry. The urine collection bag will only stick to clean and dry skin.

Remove paper from adhesive circle on pediatric urine collection bag. For girls, apply adhesive circle first to narrow bridge of skin separating vagina from anus, and continue to attach outward and upward. For boys, insert penis and scrotum into bag, and attach adhesive circle to skin around this area. Avoid wrinkles on the adhesive strip. Do not place opening of bag over the anus; stools will contaminate the urine sample. Place a clean diaper loosely on child.

NEXT MORNING

The next morning open bottle and set nearby. Place child on a secure surface. You may need to hold your child in place during and after removal of the urine bag. Gently remove the bag from your child, hold bag over bottle, snip small hole in bag, and carefully drain urine into bottle. Fill bottle at least 1/4 full. Otherwise, discard and repeat the next morning. **Replace bottle's cap tightly.**

Place bottle in plastic bag and reseal the bag. Mark the date and time the sample was taken on the label affixed to the bag. If more than one person in your family is being tested label the bag so as not to confuse your samples with others. You need not refrigerate the sample.

Monday (9/18), Tuesday (9/19), or Wednesday (9/20) you may drop the urine sample off at the Club House, 180 Mesa de Oro Circle, during 7:30 am to 6:00 pm. If you would prefer to have your sample picked up at your home, please call our mobile unit at (510) 599-9071 stationed in Sutter Creek until Wednesday night (9/20). Investigation staff personnel, Lee Sanderson and James Bodnar, may also be reached at the Best Western in Jackson at (209) 223-0211 until Wednesday night (9/20). If you need your sample picked up after Wednesday (9/20), please call our Emeryville office at 1-800-215-3320.

PROBLEMS OR QUESTIONS? If you have an urgent question or problem call our mobile unit in Sutter Creek at (510) 599-9071 anytime until Wedneday night (9/20). For general questions you may call Dr. Marilyn Underwood with CDHS at 1-800-215-3320 at our Emeryville office weekdays.

REMINDER

PLEASE REFRAIN FROM EATING SEAFOOD (TUNA, SALMON, SHRIMP, MUSSELS, FISH STICKS, ETC.) THREE DAYS PRIOR TO URINE COLLECTION. IF YOU DO HAPPEN TO EAT SEAFOOD COLLECT SAMPLE ANYWAY AND RECORD YOUR SEAFOOD CONSUMPTION IN THE ACTIVITY EVALUATION.

THERE ARE TWO WAYS YOUR URINE SAMPLE BOTTLES MAY BE COLLECTED:

1). DROP OFF URINE SAMPLE AT COLLECTION STATION
CLUB HOUSE - 180 MESA DE ORO CIRCLE.
Monday (Sept. 18), Tuesday (Sept. 19), Wednesday (Sept. 20), 7:30 am - 6:00 pm

OR

2). HAVE YOUR SAMPLE PICKED UP BY INVESTIGATION STAFF.
* Friday (Sept. 15) to Wednesday (Sept. 20) - Schedule a pick-up time by contacting our mobile unit at (510) 599-9071.

* After Thursday (Sept. 21) - Schedule a pick-up time by contacting our staff at our Emeryville office at (800) 215-3320 or (510) 540-3657.

EXPOSURE INVESTIGATION
CENTRAL EUREKA MINE SITE
ACTIVITY QUESTIONNAIRE

SAMPLE ID#

RESPONDENT

1. Are you filling out this form for: ☐ Yourself ☐ A child

BACKGROUND INFORMATION

2. Sex: ☐ Male ☐ Female

3. Age: __ __ years
(If child is less than two years old, please provide the number of months: __ __ months)

4. Do you (or child) currently live on or near Mesa de Oro Circle, Bryson Drive, Goldstrike Court, Foothill Drive, or Vista Court? ☐ Yes ☐ No

5. How long have you (or child) lived in this neighborhood? __ __ years __ __ months.

6. Which of the following best describes the current ground surface of your (or child's) front yard? Please check only one:
☐ grass ☐ dirt ☐ cement ☐ gravel ☐ don't know

7. Which of the following best describes the current ground surface of your (or child's) back yard? Please check only one:
☐ grass ☐ dirt ☐ cement ☐ gravel ☐ don't know

OCCUPATION

8. Some industries involve the production or use of arsenic (for example, copper or lead smelting, wood treatment, semiconductor manufacturing, and pesticide manufacturing and application). During the **last two years** what business have you (or child) been employed in and what was your (or child's) occupation?

Business	Occupation	Start Date	End Date

Questions? - Call the investigation staff in Sutter Creek at our cellular phone number, (510) 599-9071, anytime before September 21 OR call our Emeryville office weekdays at (800) 215-3320.

TOBACCO

9. Tobacco products (cigarettes, cigars, chew, etc.) have small amounts of arsenic in them. Have you (or child) used a tobacco product in the **last two years**? ☐ Yes ☐ No ☐ Don't know

10. Have you (or child) used a tobacco product in the last week? ☐ Yes ☐ No ☐ Don't know

10-1. If yes, what type of tobacco product do you (or child) currently use and how often do you use it?

Type (eg., cigarettes, chew, etc.): _____

How often (eg., one pack a day): _____

BEHAVIOR CHANGES

11. Have you (or child) changed your (or child's) behavior in any way to reduce your exposure to dust or outdoor soil since learning about the arsenic contamination from the Central Eureka Mine Site?

☐ Yes ☐ No ☐ Don't know

11-1. If yes, what specific behaviors have you (or child) changed and when did you approximately start changing this behavior?

Behavior Changed	Approximate Date Started
_____	_____
_____	_____
_____	_____

DAILY ACTIVITY EVALUATION

Instructions: The activity evaluation form will assess your daily activities ***in your home and neighborhood*** prior to the collection of your (or child's) urine sample. For each day, please indicate the total amount of time spent indoors and outdoors in your neighborhood. Activities performed away from your home or neighborhood should **not** be included in the evaluation. The activity evaluation form should be completed for each individual that participates. If you choose not to have your urine sample collected you need not complete this section. A parent or guardian should complete this evaluation for their child or ward.

We recommend that participants refrain from eating seafood (tuna, salmon, shrimp, mussels, fish sticks, etc.) three days prior to collecting urine sample. In the event that you do eat seafood collect your urine sample anyway and record the consumption of seafood in question number twelve of this activity questionnaire.

You should start filling out the activity evaluation form three days prior to the collection of your urine sample (refer to the table below). At the end of each day complete the activity evaluation for that day. For instance, if you plan to collect your urine sample on Monday morning, you should record Friday's activities under DAY 1, Saturday's activities under DAY 2, and Sunday's activities under DAY 3.

DAY YOU PLAN TO COLLECT URINE	DAY 1	DAY 2	DAY 3
Friday morning	Tuesday	Wednesday	Thursday
Saturday morning	Wednesday	Thursday	Friday
Sunday morning	Thursday	Friday	Saturday
Monday morning	**Friday**	**Saturday**	**Sunday**
Tuesday morning	**Saturday**	**Sunday**	**Monday**
Wednesday morning	Sunday	Monday	Tuesday
Thursday morning	Monday	Tuesday	Wednesday

We suggest that you collect your urine sample on Monday or Tuesday morning. This way your urine sample would reflect your weekend exposure when you are more likely to be at home or in your neighborhood. Urinary arsenic levels normally only show arsenic exposure over the last couple of days. So if you plan to spend the weekend away (eg., in Reno or at work) your urinary arsenic levels will not be reflective of your arsenic exposure in your neighborhood. If you happen to forget to take your urine sample on the intended day and need an additional activity evaluation form call our investigation staff at our cellular phone number (510) 599-9071 anytime before September 21 or call our Emeryville office at (800) 215-3320 weekdays.

DAY 1 - ACTIVITY EVALUATION (3 days prior to urine collection) **DATE:** ____ / ____ / ____

Total time spent indoors and outdoors *in your neighborhood*: ___ hours

Outdoor Activities in neighborhood (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)		*Indoor Activities in neighborhood* (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)	
barbecue/picnic	___ hours	eating / food preparation	___ hours
bicycle riding	___ hours	exercising	___ hours
construction/building	___ hours	lounging/watching television	___ hours
exercising/playing sports	___ hours	playing with games/toys	___ hours
gardening/landscaping/yard work	___ hours	playing with /caring for dog or cat	___ hours
lounging	___ hours	reading	___ hours
playing games/toys	___ hours	remodeling/building	___ hours
playing with/caring for dog or cat	___ hours	sleeping	___ hours
walking/jogging	___ hours	vacuuming/cleaning/dusting house	___ hours
washing car	___ hours	other, specify _____	___ hours
other, specify _____	___ hours	other, specify _____	___ hours
Total amount of hours spent outdoors *in your yard or neighborhood*: ____ hours		Total amount of hours spent *inside your home or a nearby neighbor's home*: ____ hours	

Questions? - Call the investigation staff in Sutter Creek at our cellular phone number, (510) 599-9071, anytime before September 21 OR call our Emeryville office weekdays at (800) 215-3320.

DAY 2 - ACTIVITY EVALUATION (2 days prior to urine collection) **DATE:** ____/____/____

Total time spent indoors and outdoors ***in your neighborhood***: ___ hours

Outdoor Activities in neighborhood (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)		***Indoor Activities in neighborhood*** (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)	
barbecue/picnic	___ hours	eating / food preparation	___ hours
bicycle riding	___ hours	exercising	___ hours
construction/building	___ hours	lounging/watching television	___ hours
exercising/playing sports	___ hours	playing with games/toys	___ hours
gardening/landscaping/yard work	___ hours	playing with /caring for dog or cat	___ hours
lounging	___ hours	reading	___ hours
playing games/toys	___ hours	remodeling/building	___ hours
playing with/caring for dog or cat	___ hours	sleeping	___ hours
walking/jogging	___ hours	vacuuming/cleaning/dusting house	___ hours
washing car	___ hours	other, specify _____	___ hours
other, specify _____	___ hours	other, specify _____	___ hours
Total amount of hours spent outdoors ***in your yard or neighborhood***: ____ hours		Total amount of hours spent ***inside your home or a nearby neighbor's home***: ____ hours	

DAY 3 - ACTIVITY EVALUATION (1 day prior to urine collection) **DATE:** ____/____/____

Total time spent indoors and outdoors ***in your neighborhood***: ___ hours

Outdoor Activities in neighborhood (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)		***Indoor Activities in neighborhood*** (write in the number of hours, e.g., 1 hour, 0.5 hour, etc.)	
barbecue/picnic	___ hours	eating / food preparation	___ hours
bicycle riding	___ hours	exercising	___ hours
construction/building	___ hours	lounging/watching television	___ hours
exercising/playing sports	___ hours	playing with games/toys	___ hours
gardening/landscaping/yard work	___ hours	playing with /caring for dog or cat	___ hours
lounging	___ hours	reading	___ hours
playing games/toys	___ hours	remodeling/building	___ hours
playing with/caring for dog or cat	___ hours	sleeping	___ hours
walking/jogging	___ hours	vacuuming/cleaning/dusting house	___ hours
washing car	___ hours	other, specify _____	___ hours
other, specify _____	___ hours	other, specify _____	___ hours
Total amount of hours spent outdoors ***in your yard or neighborhood***: ____ hours		Total amount of hours spent ***inside your home or a nearby neighbor's home***: ____ hours	

Questions? - Call the investigation staff in Sutter Creek at our cellular phone number, (510) 599-9071, anytime before September 21 OR call our Emeryville office weekdays at (800) 215-3320.

12. Did you (or child) consume any seafood (for example, salmon, shrimp, mussels, tuna fish, fish sticks, etc.) during the three days prior to urine collection?
☐ Yes, list below ☐ No ☐ Don't know

	Type of Seafood	Date Consumed
a).	_____	_____
b).	_____	_____
c.)	_____	_____

13. Did you consume fruit or vegetables grown from your garden or a neighbors garden within the last three days? ☐ Yes ☐ No ☐ Don't know

13-1. If yes, about how many times a week, on average, do you eat fruit or vegetables from your own garden or a neighbors garden during the last year?
☐ Less than 1 time a week ☐ 1-3 times a week ☐ 4 or more times a week

14. Did you take any medications or homeopathic remedies three days prior to urine collection?
☐ Yes, describe below ☐ No ☐ Don't know

	Medication/Homeopathic Remedy Name	Date Taken
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____
e.	_____	_____
f.	_____	_____

15. In the past, several household products contained arsenic, such as rat poison, ant poison, and weed killers. During the three days prior to urine collection did you (or child) apply or use rat poison, ant poison, or weedkillers? ☐ Yes, describe below ☐ No ☐ Don't know

a. Product name/use:_____

b. Product name/use:_____

Questions? - Call the investigation staff in Sutter Creek at our cellular phone number, (510) 599-9071, anytime before September 21 OR call our Emeryville office weekdays at (800) 215-3320.

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES
2151 BERKELEY WAY
BERKELEY, CA 94704-1011
(510)540-3657

October 26, 1995

Mr. Sutter Creek Resident
Mesa De Oro Circle
Sutter Creek, CA 95685

Dear Mr. Resident,

Thank you for participating in the arsenic exposure investigation conducted by the California Department of Health Services (CDHS) with the assistance of the Agency for Toxic Substances and Disease Registry. We are glad to inform you that your results and those of your children were all within typical ranges found in the general population.

There are a couple of points that you may want to be aware of when reviewing the results. The general population typically has some arsenic in their urine and hair because food, water, and soil usually contain small amounts of arsenic.

Urinary arsenic analysis measures exposure during the two to three days prior to testing. A typical amount of arsenic found in the urine is usually less than 50 micrograms of arsenic per gram of creatinine(a protein in the urine). Measuring arsenic in relation to individual creatinine levels is a standard method to account for individual variations in water consumption and kidney function. Most of the participants in this exposure investigation had urinary arsenic levels between 10 to 40 micrograms of arsenic per gram of creatinine. Urinary arsenic levels above fifty micrograms of arsenic per gram of creatinine are considered elevated and require further investigation.

Hair arsenic analysis allowed for the measurement of arsenic exposure over a longer period of time, depending on the length of the hair tested. Hair grows around an inch every two months. Therefore, if the hair was two inches long when tested, then approximately four months of past exposure was measured. In cases where the hair was longer than six inches the hair was divided into two samples. These two hair samples were analyzed separately to determine arsenic exposures that occurred within the last year and those that occurred more than a year ago. Typical amounts of arsenic found in hair are less than one microgram of arsenic per gram of hair, or one part per million (ppm). Most participants in this exposure investigation had hair arsenic levels between 0.1 to 0.8 ppm arsenic. Hair arsenic levels exceeding one ppm are considered elevated and require further investigation.

URINARY AND HAIR ARSENIC TEST RESULTS

Name	SHORT TERM EXPOSURE Less than 3 days	LONG TERM EXPOSURE Less than 1 year	LONG TERM EXPOSURE Greater than 1 year
	Urinary Arsenic* (micrograms of arsenic per gram of creatinine)	Short Hair Arsenic (ppm) Less than 6 inches	Long Hair Arsenic (ppm) Greater than 6 inches
Joe	25	0.2	Hair not divided
Jane	22	0.3	0.4
Joe, Jr.	15	None Detected **	Hair not divided
Typical Level	Less than 50	Less than 1	Less than 1

*Urinary arsenic test results report the sum of the inorganic arsenic, monomethlyarsonic acid, and dimethlyarsonic acid.
**"None Detected" means that the level of arsenic was lower than what could be detected. "None detected" does not necessarily mean that no arsenic was present, but does guarantee that the level is within the typical range.

Your results are similar to those found in the general population. However, this does not necessarily mean that there is no potential exposure to arsenic in your neighborhood. The results may be reflecting behavior modifications (e.g., if you have stopped gardening and landscaping your yard). Another possible explanation for the typical levels is that everyday activities are not exposing you to high levels of outdoor soil and dust (e.g., you spend a majority of your time away from home at work or school).

Until remediation is complete in your neighborhood the potential for arsenic exposure may still exist even though the levels shown in the table were typical. We recommend that you should minimize your exposure to outdoor soil and dust (e.g., abstain from eating any vegetablesor fruits grown in your neighborhood, wash hands thoroughly after any direct contact with the soil, and close windows on dusty days).

You may want to tell your physician that you live in an area where the soil has higher than background levels of arsenic. Your physician can consider additional arsenic testing if needed. CDHS will be offering physician health education. We plan to provide you with an information packet describing the site and specific health implications of arsenic exposure that you can give to your physician.

In a few weeks we will be mailing a fact sheet to all the participants. This fact sheet will provide a general summary of all the urine and hair data collected in your neighborhood. Your results will remain completely confidential. Only group data (no personal identifying information) will be presented in the fact sheet. In addition, the fact sheet will announce the date of a community meeting to discuss the exposure investigation results.

In the meantime, if you have any questions please do not hesitate to contact us at (800) 215-3320 or (510) 540-3657.

Sincerely,

Marilyn C. Underwood, Ph.D.
Associate Toxicologist
Environmental Health
Investigation Branch

James D. Bodnar, M.S.C.E.
Environmental Health Scientist
Environmental Health
Investigation Branch

THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL HEALTH INVESTIGATIONS BRANCH

CENTRAL EUREKA MINE SITE

Results of Urine and Hair Tests for Arsenic

DECEMBER 1995

TESTING BACKGROUND

The Environmental Health Investigations Branch of the California Department of Health Services (CDHS) with the assistance of the Agency for Toxic Substances and Disease Registry (ATSDR) offered urine and hair tests to residents in your community in September, 1995 to determine if there was exposure to arsenic. Residents have been concerned about possible exposure to arsenic because elevated levels have been found in soil samples from the Mesa de Oro Subdivision and surrounding areas. Although residents were advised to modify their behavior to reduce possible exposure to arsenic, there was still a concern among many residents about ongoing exposure.

Everyone who requested their individual test results received them in the mail or by telephone. This fact sheet will describe the overall results without identifying individuals or discussing individual results.

CDHS collected urine specimens from 52 residents and hair samples from 65 residents. Laboratory findings for two adults prompted further investigation. Retesting of these two individuals showed typical levels of arsenic exposure. None of the children tested had elevated urine or hair arsenic levels.

We also tested dogs as a potential indicator of exposure levels in the community. Hair, urine, and fecal samples were taken from the majority of the 16 dogs who were tested. Results from the pet exposure investigation will be discussed later in this fact sheet.

URINE TEST RESULTS

Testing urine samples is one of the most common ways to measure the level of arsenic in one's body. The level of arsenic in the urine indicates the exposure that has occurred during the two to three days prior to testing.

■ **Q: What is considered a typical amount of arsenic in the urine sample?**

A: Typical levels of arsenic found in urine in the U. S. general population are less than 50 micrograms of arsenic per gram of creatinine (a protein in the urine). Measuring arsenic in relation to individual creatinine levels is a standard method to account for individual variations in water consumption and kidney function. Urinary arsenic levels above 50 micrograms of arsenic per gram of creatinine are considered elevated and require further investigation.

■ **Q: What were the urine results for the community as a whole?**

A: Ninety-eight percent (98%) of the participants in this exposure investigation had urinary levels below 41 micrograms of arsenic per gram of creatinine.

■ **Q: Were any of the individual urine levels above 50 micrograms of arsenic per gram of creatinine?**

A: One participant had a urinary arsenic level which was above typical levels. This participant was retested and the retest showed that the urinary arsenic level was typical. The hair results for this individual were typical.

HAIR TESTING RESULTS

Testing hair for arsenic indicates exposure over a longer

period of time, depending on the length of the hair tested. Hair grows approximately an inch every two months. Therefore, if the hair was two inches long when tested, approximately four months of exposure was measured. In cases where hair was longer than six inches, it was divided into two samples. These two hair samples were analyzed separately to determine arsenic exposures that occurred within the last year and those that occurred more than a year ago.

■ **Q. What is considered a typical amount of arsenic in hair?**

A: Typical amounts of arsenic in hair are less than one microgram of arsenic per gram of hair which is the same as saying one part per million (ppm). Hair arsenic levels exceeding one ppm are considered elevated and may require further investigation.

■ **Q. What were the hair test results for the community as a whole?**

A: Ninety-eight percent (98%) of the participants in the exposure investigation had hair arsenic levels below 0.8 ppm arsenic.

■ **Q: Were any of the individual hair results above 1 ppm?**

A: One participant had hair results that were above 1 ppm. The individual was retested and the hair did not show the same level. In the second test no arsenic was detected. The most reasonable explanation for the difference is that the hair may not have been completely washed during laboratory processing.

■ **Q. What were the results for people with long hair?**

A: Twenty participants with hair longer than six inches were tested and all of these participants had typical levels of arsenic in their hair. These results provide information about exposure that occurred over a year ago.

Meaning of Test Results

■ **Q. What do the test results show?**

A: The exposure investigation conducted by CDHS provides individual exposure information to those who were tested. The investigation was not a health study and did not evaluate possible health effects. Factors influencing exposure to arsenic such as modification of behavior or bioavailability of the arsenic may have influenced the results of the investigation. The results of the investigation for the community indicate that most people tested have levels of arsenic in their urine and hair that are similar to those found in the general population.

■ **Q. How will my health be affected?**

A: Because this was an exposure investigation and not a health study, we cannot determine whether any health problems you may have are caused by previous or current exposure to arsenic from the site.

Follow-Up

■ **Q. Will there be additional testing?**

A: Because the results indicate that most of the exposure levels to arsenic were typical, DHS will not be retesting the entire community. We have retested the two individuals whose hair or urine samples showed levels of arsenic that were above typical amounts. Although the levels on the retests were not elevated, we will still be conducting home visits to ensure that specific activities in the home minimize exposure to arsenic.

Testing of Dogs

■ **Q. Why did we test dogs?**

A: Urine, hair and fecal samples were collected from dogs to evaluate their exposure to arsenic. Because dogs tend to play outside and have more direct contact with the soil, they may have higher exposures than humans. This may be of concern not only

for the dog's health but because dogs may be a source of exposure for people who comb, pet, and share living space with the dog. Another reason for testing dogs was that they could be considered a potential indicator of exposure levels in their owners. Although estimating exposure of dogs is another way of investigating environmental exposures, it may be difficult to interpret results of samples taken from dogs. In spite of these constraints, it is important to gather more information by collecting samples from pets.

■ **Q What did the tests show?**

A: Urinary arsenic levels found in dogs are usually less than 0.8 ppm. Urinary arsenic levels above 6.0 are considered elevated and require further investigation. None of the dogs had elevated levels of arsenic found in their urine.

Typical amounts of arsenic found in washed hair are less than 0.5 ppm. Hair levels exceeding 1.0 ppm are thought to be elevated and require further investigation. Washed hair samples from two of the dogs tested showed elevated levels of arsenic. These two dogs will be re-tested.

Recommendations

Although the majority of the levels indicate typical exposure, the potential for arsenic exposure still exists and should be taken seriously. Until remediation in your neighborhood is complete, we recommend that you continue to minimize your exposure to outdoor soil and dust.

- Don't eat vegetables or fruits grown in your neighborhood
- Wash hands thoroughly after any direct contact with soil
- Keep windows closed on dusty days

If you have a dog, you can minimize the amount of dust that your dog carries into your home by doing the following:

- Walk your dog on a leash to control his/her access to bare soil
- Brush your dog's coat outside of the home, or, if short-haired, wipe down dog's coat with a wet cloth before entry into the home
- Do not allow your dog to run freely in the neighborhood

Information for Physicians

CDHS plans to work with you to develop an information packet describing the site and specific health implications of arsenic exposure which you can give to your doctor for future reference. You may want to tell your physician that you live in an area where the level of arsenic in the soil is higher than background levels. Your physician can determine if additional arsenic testing is needed in the future should you experience health problems possibly related to arsenic exposure.

Environmental Health Investigations Branch
5900 Hollis St., Suite E
Emeryville, CA 94608

COMMUNITY MEETING

Thursday, December 14, 1995
7:00 P.M.
Club House
180 Mesa De Oro Circle

CERTIFICATION

This Mesa de Oro Exposure Investigation Health Consultation was prepared by the Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Gail D. Godfrey
Technical Project Officer
Superfund Site Assessment Branch (SSAB)
Division of Health Assessment and Consultation (DHAC)
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

Richard E. Gillig
Chief, SPS, SSAB, DHAC, ATSDR