# Draft Final Report

VOLUME II: DETAILED STATISTICAL RESULTS

# COMPREHENSIVE ABATEMENT PERFORMANCE STUDY

To

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# COMPREHENSIVE ABATEMENT PERFORMANCE STUDY
# VOLUME II: DETAILED STATISTICAL RESULTS


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**ABSTRACT**

In 1989 the U.S. Department of Housing and Urban Development (HUD) initiated the Lead-Based Paint Abatement Demonstration Study in seven urban areas across the U.S. The objectives of this study were to assess the cost, worker hazards, and short-term efficacy of various lead-based paint abatement methods. Among other conclusions, the FHA portion of this study estimated that abatement costs for a single-family dwelling could range from $2000 to $12,000.

One question which was not answered by the HUD Abatement Demonstration was that of the long-term efficacy of the abatement methods. Therefore, in 1990 the U.S. Environmental Protection Agency (EPA) initiated the Comprehensive Abatement Performance (CAP) Study to address this question. The CAP Study was a follow up to HUD Abatement Demonstration activities performed in Denver, Colorado. There were three primary objectives of the CAP Study: (1) characterize lead levels in household dust and exterior soil at abated houses and control houses, (2) assess the long-term efficacy of two primary abatement methods, and (3) investigate relationships between lead levels measured in different media and sampling locations. To address these objectives the CAP Study collected approximately 30 dust and soil samples at each of 53 HUD Demonstration houses in Denver, approximately two years after the abatements had been completed. These samples were analyzed for their lead content, and these lead measurements were then used in a detailed statistical analysis addressing the three study questions.

This report presents the conclusions from the CAP Study. There were four primary findings which can be summarized as follows: (1) Lead levels at abated houses were typically higher than those at control houses which had always been relatively free of lead-based paint contamination. Lead levels were also higher in abated rooms than in control rooms of the same houses. Therefore, the HUD Demonstration abatement methods

appear to have been unable to reduce lead levels at abated houses to the same levels found at houses which never had a lead-based paint problem. (2) However, the HUD Demonstration abatement procedures were, in many cases, able to reduce lead levels at abated houses to below HUD interim abatement guidelines at 200 $\mu g/ft^2$ for floors, 500 $\mu g/ft^2$ for window stools, and 800 $\mu g/ft^2$ for window channels. (3) Lead Levels were typically higher in houses abated by encapsulation/enclosure methods than in houses abated by removal methods. These results may suggest that encapsulation/enclosure methods are less effective than removal methods, although houses in the HUD Demonstration Study which were abated by encapsulation/enclosure methods typically had greater amounts of lead-based paint requiring abatement than in houses abated by removal methods. (4) The accuracy of environmental lead determinations can be seriously affected by the sampling and analysis protocols used, and by variations in lead levels among similar housing environments and among different sampling locations within a single housing environment. Therefore, assessments of abatement performance and potential lead hazards must be carefully designed to control for these complicating sampling variations.

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## 1.0 INTRODUCTION AND SUMMARY

This report presents detailed results from the statistical analysis of data collected during the Comprehensive Abatement Performance (CAP) Study. The objectives and design of this study are well documented in previous reports (Battelle and MRI, 1992a,b). In addition, the conclusions from the study are summarized in a companion document to this report (Battelle and MRI, 1993). For completeness, the CAP Study objectives, design, and results are also summarized in this introductory section.

### 1.1 STUDY OBJECTIVES

The CAP Study is a U.S. Environmental Protection Agency (EPA) project designed to follow up on the FHA Lead-Based Paint Abatement Demonstration Study conducted by the U.S. Department of Housing and Urban Development (HUD). The HUD Abatement Demonstration is an ongoing research program in ten cities which is assessing the costs and short-term efficacy of alternative methods of lead-based paint abatement. A variety of abatement methods are currently being tested in approximately 120 multi-family public housing units in three cities -- Omaha, Cambridge, and Albany -- and similar methods have already been tested in 172 single-family housing units in the FHA inventory in seven metropolitan areas -- Baltimore, Birmingham, Denver, Indianapolis, Seattle, Tacoma, and Washington (HUD, 1991). The FHA demonstration evaluated two classes of abatement methods, encapsulation and enclosure methods, versus removal methods. The study found that the cost of encapsulation and enclosure abatements ranged from about $2000 to $8000 per housing unit, while the cost of removal abatements ranged from about $2000 to $12,000 per housing unit (HUD, 1990).

Whereas the HUD Demonstration was intended to focus on short-term cost-effectiveness of abatement methods, the CAP Study provides important information about the longer-term effectiveness of these same methods. Although clearance testing of lead levels in dust was done immediately after abatement in the

HUD Demonstration, the longer-term performance of the abatement methods after these houses have been reoccupied is not known. The CAP Study was therefore necessary to preclude spending large sums of money abating lead-based paint using methods that may prove in the long term to be ineffective at maintaining low lead levels in household dust.

High levels of lead in household dust pose serious health risks to occupants regardless of the source. Therefore the CAP Study also collected important information as to how household dust may become contaminated with lead from other household locations. It is possible that even those houses in which the lead-based paint hazard has been removed can become recontaminated after the house is reoccupied. Either prior to abatement or during the abatement process itself, lead-contaminated dust may have been deposited in the ventilation system or other parts of the house which, when reoccupied by new residents, could spread contaminated dust throughout the house. Also, activity patterns of the occupants may re-introduce lead from contaminated exterior soils.

Therefore, to help address these concerns, the specific objectives of the CAP Study were as follows:

1. Characterize levels of lead in household dust and exterior soil for HUD Demonstration and control homes.

2. Compare abatement methods or combination of methods relative to performance. Assess whether there are differences in performance.

3. Investigate the relationship between lead in household dust and lead from other sources, in particular, exterior soil and air ducts.

These objectives were intended to address at least three important concerns presented in the HUD Comprehensive and Workable Plan (HUD, 1990): the durability of various abatement methods over time, the importance of adequate dust control during

the abatement process, and the possible recontamination of housing units from a variety of locations, such as exterior soil and air ducts.

The HUD Demonstration intended to eliminate the lead-based paint hazard from housing environments either by containing the lead-based paint with encapsulation or enclosure methods, or by eliminating the lead-based paint with removal methods. Encapsulation and enclosure methods attempt to chemically bond or mechanically affix durable materials over painted surfaces, while removal methods attempt to either scrape or chemically strip lead-based paint from painted surfaces, or to completely remove and replace painted components (e.g., windows, doors, baseboards).

There are two primary performance concerns with these abatement methods. First, conducting the abatement methods themselves might generate large amounts of leaded dust that could significantly contaminate the housing environment. And second, the performance of the abatement measures might degrade over several months or years following abatement, allowing the lead hazard to be reintroduced to the housing environment. Encapsulation and enclosure methods do not attempt to remove lead-based paint from housing surfaces and therefore may have a lesser potential to contaminate the housing environment during the actual abatement process. However, these two types of abatement may be more susceptible to degradation over time. In contrast, removal methods do attempt to remove lead-based paint from housing surfaces and therefore may have a greater potential to contaminate the housing environment during abatement. This contamination might be seen shortly after abatement, or its effects might be seen more gradually over time.

The approach in the CAP Study was to collect environmental samples several months after abatement both inside and outside housing units abated by HUD, and at the same time at control houses known to be relatively free of lead-based paint, and measure the concentration of lead in these samples. The

performance of the abatement methods was assessed by comparing the lead concentrations at abated houses with those at control houses. Sampling at control houses provided a measure of the amount of lead introduced to the housing environment from sources other than lead-based paint abatement. If the environmental lead concentrations at abated houses were found to be significantly higher than those at control houses, this was taken as an indication that abatement failed to completely eliminate the lead hazard because lead was introduced to these environments either immediately through inadequate dust control during abatement, or more gradually through recontamination over time.

## 1.2 STUDY DESIGN

In 1989 and 1990 HUD conducted abatement demonstrations in 172 single-family dwellings from the inventory of FHA repossessed houses in seven urban areas. Three of these houses had only pilot abatements performed, while the other 169 were completely abated. The distribution by city of these 169 houses is presented in Table 1-1. The specific units for abatement were selected by first identifying older housing likely to contain lead-based paint and then testing painted surfaces for lead using portable x-ray fluorescence (XRF). Units included in the Demonstration were those found to have a large number of structural components covered by paint with a high concentration of lead. When surveying houses for lead-based paint, HUD considered all painted surfaces both on the interior and exterior of the house.

The HUD Demonstration originally considered six different abatement methods: encapsulation, enclosure, and four removal methods (i.e., chemical stripping, abrasive stripping, heat-gun stripping, and complete removal or replacement of painted components). Because of the diversity of housing components containing lead-based paint, it was generally true that no single abatement method could be used uniformly throughout a given housing unit. One important consideration in the CAP Study was the appropriate way in which to summarize and classify the

**Table 1-1. Number of Houses Abated in the HUD Demonstration**

| City | Interior Abatement Category* | | Exterior Abatement Only | | TOTAL |
|---|---|---|---|---|---|
| | Encap/Enclos | Removal | Encap/Enclos | Removal | |
| Baltimore | 11 | 9 | -- | -- | 20 |
| Birmingham | 8 | 12 | 2 | 1 | 23 |
| Denver | 33 | 18 | 5 | 1 | 57 |
| Indianapolis | 17 | 10 | 3 | 4 | 34 |
| Seattle/Tacoma | 12 | 10 | 1 | 3 | 26 |
| Washington | 6 | 3 | -- | -- | 9 |
| TOTAL | 87 | 62 | 11 | 9 | 169 |

*Each house is classified according to the abatement category accounting for the largest square footage of interior abatement.

abatement activities conducted at each house. Detailed information was collected by HUD which lists each type of interior and exterior structural component abated in the Demonstration, along with the linear or square footage abated and the abatement method used. For the CAP Study, each house was primarily classified according to the abatement category (i.e., encapsulation/enclosure versus removal methods) accounting for the largest square footage of interior abatement. However, at many HUD Demonstration houses, a great deal of exterior abatement was also performed, and another objective of the CAP Study was to assess the performance of this exterior abatement. Therefore, the data interpretation also considered which specific methods were used on both the interior and exterior of the house.

Initial plans for the CAP Study included selection of housing units from all seven urban areas in the FHA portion of the HUD Demonstration. However, after conducting a pilot sampling and analysis program (Battelle and MRI, 1991), and subsequently developing a cost estimate for the CAP Study, it was decided that the CAP Study would only be conducted in Denver, where 57 of the 169 abated units are located (Table 1-1). Because the number of abated houses in Denver was limited, all reoccupied houses were included for recruitment in the CAP Study. Results from a preliminary statistical power analysis indicated that approximately 40 abated houses would be sufficient to detect meaningful differences between the dust lead levels in abated and control houses. Given the initial set of 57 abated houses in Denver, 70% of these units had to be successfully recruited into the study.

In order to use the levels of lead measured in dust and soil samples at abated houses as a measure of the performance of abatement at those houses, it must be demonstrated that the lead found is not associated with other environmental sources. Therefore, in addition to abated houses, dust and soil samples were collected from control houses that were previously tested by XRF in the HUD Demonstration and found to be relatively free of

lead-based paint both inside and outside the house. The objective in measuring lead levels at control houses was to determine whether lead levels observed at abated houses were in fact greater than those found at houses having very few components covered with lead-based paint (and therefore affected by only non-paint sources of lead).

In the FHA portion of the HUD Demonstration, a total of 304 houses of similar age and construction were tested by XRF for lead-based paint, and 172 were abated. Of those houses not abated, 37 houses were found to be free of structural components covered with lead-based paint (Table 1-2). When performing the XRF tests, HUD took three replicate XRF readings at each sampling location and based their decisions at each location on the average of those three readings. When interpreting the results, HUD considered an average reading greater than 1.0 $mg/cm^2$ to be a positive indication that lead-based paint was covering the tested component. While only a single round of XRF testing was performed at unabated houses, in some cases a second round of XRF and/or AAS testing was performed at abated houses to confirm inconclusive XRF results.

Control houses for the CAP Study were recruited from the set of unabated houses in Denver tested by XRF in the HUD Demonstration. For the purposes of identifying control houses, the detailed XRF results supplied by HUD were used under the assumption that they provide an accurate and current assessment of these houses. Results from a statistical power analysis indicated that approximately 20 control houses were required to detect two-fold multiplicative differences between the dust lead levels in abated and control houses. Using a criterion that equally weights (1) the percentage of housing components testing positive by XRF for lead-based paint, and (2) the average XRF testing result, the 20 unabated houses (out of 40) in Denver with the lowest XRF results were prioritized and selected as control houses for the CAP Study.

**Table 1-2. Number of Unabated Houses Tested by XRF in the HUD Demonstration**

| City | Number of LBP Components* | | | | |
|---|---|---|---|---|---|
| | 0 | 1-2 | 3-9 | 10 or more | TOTAL |
| Baltimore | 1 | 6 | 3 | 10 | 20 |
| Birmingham | 4 | 5 | -- | 5 | 14 |
| Denver | 13 | 10 | 14 | 3 | 40 |
| Indianapolis | 5 | 9 | 5 | -- | 19 |
| Seattle/Tacoma | 10 | 3 | 2 | 5 | 20 |
| Washington | 4 | 2 | 4 | 9 | 19 |
| TOTAL | 37 | 35 | 28 | 32 | 132 |

*Number of structural components for which XRF testing identified the presence of lead-based paint.

During the CAP Study a variety of environmental samples were collected along with questionnaire and field inspection information to help assess the performance of abatement methods used in the HUD Demonstration. The environmental samples that were collected are summarized in Table 1-3. All samples were chemically analyzed to measure the amount of lead present. The results for vacuum dust samples are presented on both a concentration basis (i.e., micrograms of lead per gram of dust, $\mu g/g$) and a loading basis (i.e., micrograms of lead per unit area sampled, $\mu g/ft^2$). The results for wipe dust samples are presented only on a loading basis, and the results for soil core samples are presented only on a concentration basis.

The environmental sampling planned for the study, included both regular samples (vacuum dust and soil cores) and field quality control samples (wipe versus vacuum dust, blanks, and side-by-side samples) intended to assess sampling variability and potential sample contamination. The role of each type of sample listed in Table 1-3 for meeting these objectives is as follows:

- Vacuum dust from floor perimeter and window stools -- Provides primary measure of performance for interior abatement;
- Vacuum dust from window channels -- Provides measure of performance for interior abatement, possible measure of performance for exterior abatement, and possible transport of exterior soil from outside to inside the house;
- Air ducts -- Provides measure of source contribution to interior dust lead levels;
- Interior and exterior entryway floor -- Provides measure of possible transport of exterior soil from outside to inside the house;
- Soil cores -- Provides primary measure of performance of exterior abatement, and measure of possible transport of exterior soil lead into the house.

**Table 1-3. Summary of Environmental Sampling Planned for the Cap Study**

| Sample Type | Number of Samples Planned | | |
|---|---|---|---|
| | For 18 Control Units | For 22 Abated Units[a] | For 13 Abated Units[b] |
| **Regular Samples** | | | |
| 1. Vacuum dust | | | |
| a. Perimeter floor | 2 | 2 | 3 |
| b. Window channel | 2 | 2 | 3 |
| c. Window stool | 2 | 2 | 3 |
| d. Air ducts | 2 | 2 | 3 |
| e. Int. entryway floor | 2 | 2 | 2 |
| f. Ext. entryway concrete | 2 | 2 | 2 |
| 2. Soil cores | | | |
| a. Near foundation | 2 | 2 | 2 |
| b. Property boundary | 2 | 2 | 2 |
| c. Entryway | 2 | 2 | 2 |
| **Quality Control Samples** | | | |
| 3. Wipe vs. vacuum | | | |
| a. Floor wipe dust | 0 | 2 | 2 |
| b. Floor vacuum dust | 0 | 2 | 2 |
| 4. Blanks | | | |
| a. Vacuum dust field blank | 1 | 1 | 1 |
| b. Vacuum dust trip blank | 1 | 1 | 1 |
| c. Soil core field blank | 1 | 1 | 1 |
| d. Wipe dust field blank | 0 | 1 | 1 |
| 5. Side-by-side samples | | | |
| a. Vacuum dust floor | 1 | 1 | 1 |
| b. Soil cores | 1 | 1 | 1 |
| Total samples | 23 | 28 | 32 |

(a) 22 units where sampling was conducted in two rooms.
(b) 13 units where sampling was conducted in three rooms.

- Wipe versus vacuum dust from floors -- Provides consistency check against earlier results from HUD Demonstration and other studies;

- Blanks -- Provides assessment of potential sample contamination and uncertainty in sample weighing; and

- Side-by-side samples -- Provides assessment of sampling variability.

## 1.3 SUMMARY OF CONCLUSIONS

The detailed results of the CAP Study are discussed in Sections 2 through 9 of this report. This section presents an overall summary of the most important conclusions. These conclusions are listed below according to the study objective to which they pertain.

The first objective of the CAP Study was to characterize lead levels in household dust and exterior soil for HUD Demonstration and control houses. The lead levels found in the CAP Study are summarized in Section 2, as well as in the following points:

- Geometric mean dust lead loadings varied from a low of 11 $\mu g/ft^2$ for floor wipe samples to a high of 2516 $\mu g/ft^2$ for window channel vacuum samples.

- Individual dust lead loadings varied greatly. Minimum lead loadings for all sample types were typically only a few $\mu g/ft^2$. Maximum lead loadings were lowest for floor wipe samples (334 $\mu g/ft^2$) and highest for window channel vacuum samples (244,581 $\mu g/ft^2$).

- Geometric mean lead concentrations varied from a low of 125 $\mu g/g$ for boundary soil samples to a high of 1439 $\mu g/g$ for window channel vacuum samples.

- Individual lead concentrations also varied greatly. Minimum lead concentrations for most sample types were typically on the order of 10 $\mu g/g$. Maximum lead concentrations were lowest for

boundary and entryway soil samples (on the order of 1000 μg/g) and highest for window stool and window channel vacuum samples (on the order of 50,000 μg/g).

The second objective of the CAP Study was to compare the performance of different abatement methods used in the HUD Demonstration Study. Abatement performance is discussed in Section 4, and can be summarized with the following points:

- Lead levels were often found to be higher in abated houses than in control houses. The most significant differences in dust lead loadings were found for air duct vacuum samples (4.7 times higher in abated houses than control houses), exterior entryway vacuum samples (2.2 times higher), and floor vacuum samples (1.8 times higher). The most significant differences in lead concentrations were found for air duct vacuum samples (2.1 times higher).

- For every sample type where lead levels were higher in abated houses than in control houses, the lead levels were also higher in houses abated by encapsulation/enclosure methods than in houses abated by removal methods. The most significant differences in dust lead loadings were found for window stool vacuum samples (4.6 times higher in encapsulation/enclosure houses than removal houses), air duct vacuum samples (4.0 times higher), and floor vacuum samples (1.9 times higher). The most significant differences in lead concentrations were found for window stool vacuum samples (2.7 times higher) and air duct vacuum samples (2.0 times higher). When interpreting these results it should be noted that encapsulation/enclosure houses typically had larger amounts of abatement performed than removal houses. Therefore, the differences in lead levels noted above may be largely a result of the more severe initial conditions in encapsulation/enclosure houses, that is, the greater amount of abatement required in encapsulation/enclosure houses.

- Lead levels were often lower in control rooms of abated houses (i.e., rooms that did not require abatement) than in abated rooms of these same

houses, although the differences observed were only of marginal significance. The most significant differences in dust lead loadings were found for window channel vacuum samples (0.53 times lower in control rooms than abated rooms), window stool vacuum samples (0.56 times lower), and floor vacuum samples (0.57 times lower). The most significant differences in lead concentrations were found for window stool vacuum samples (0.65 times lower) and window channel vacuum samples (0.66 times lower).

- A number of secondary abatement factors were found to be important for differentiating lead levels in some particular sample types. For example, both lead loadings and lead concentrations in window stool samples differed significantly depending on the phase of the HUD Demonstration Study during which abatement was performed. Other factors considered were the amount of interior and exterior abatement performed, the specific abatement methods used, the abatement contractor, the time period between HUD Demonstration clearance testing and CAP Study sampling, and the HUD Demonstration XRF readings.

- A number of non-abatement factors were also found to be important for differentiating lead levels in some sample types. For example, lead loadings in floor vacuum samples differed significantly depending on the substrate type. Other non-abatement factors considered were the frequency with which surfaces were typically cleaned, the resident's occupation and activities, the age and location of the housing unit, the number of children living at home, and the number of months the current residents had been living at the house.

- Soil lead concentrations were 18 percent higher at abated houses than at control houses, but this difference was not found to be significant. However, foundation soil lead concentrations were found to be significantly higher than entryway and boundary soil lead concentrations, although this finding was shared by both abated and control houses. Interestingly, foundation soil lead concentrations were significantly lower at houses where more than an average amount of exterior abatement was performed. Houses where twice as much exterior abatement was performed had 35% lower foundation soil lead concentrations. In

addition, there was a strong positive correlation found between foundation soil lead concentrations and exterior XRF readings made during the HUD Demonstration.

The third objective of the CAP Study was to investigate the relationship between lead levels in different media (i.e., dust and soil) and different sampling locations (e.g., floors, window channels, foundation soil). Correlations among observed lead levels are discussed in Section 5, and can be summarized with the following points:

- At the house level, significant correlations in dust lead loadings were found for two pairs of sample types. The most significant correlations were found between lead loadings in window channels and window stools (correlation coefficient of 0.64), and in air ducts and exterior entryways (0.41).
- Significant correlations in lead concentrations at the house level were found for three pairs of sample types. Significant correlations were found between lead concentrations in window channels and window stools (0.44), in entryway soil and boundary soil (0.53), and in entryway soil and foundation soil (0.37).
- At the room level, significant correlations in dust lead loadings was found for window channel and window stool samples (0.33). In addition, marginally significant correlation in lead loadings was observed for window stool and floor vacuum samples (0.15).
- Significant correlations in lead concentrations at the room level were found for three pairs of sample types. Significant correlations were observed between lead concentrations in air duct and window stool samples (0.43), in interior and exterior entryway samples (0.37), and in window channel and window stool samples (0.32).

A final objective of the CAP Study, which was not originally stated at the study design stage but which evolved during the course of the study, was to compare the performance of two dust sampling protocols: cyclone vacuum sampling and wipe sampling. The results of this comparison are discussed in Section 6, and can be summarized as follows:

- For comparative tests where side-by-side samples of dust were collected from various substrates, lead loadings measured by cyclone vacuum sampling were 42% higher than those measured by wipe samples. This difference was not found to be significant.

- The performance of these two sampling protocols was found to be different for different substrates. On linoleum surfaces cyclone vacuum lead loadings were found to be equivalent to wipe lead loadings. Cyclone lead loadings were higher than wipe lead loadings on wood surfaces (4.2 times higher) and concrete surface (12.2 times higher). On tile surfaces cyclone lead loadings were 0.69 times lower than wipe lead loadings.

## 2.0 DESCRIPTIVE STATISTICS

As is noted in the previous chapter, ten types of samples were collected at each housing unit in this study. Vacuum dust samples were collected from air ducts, entryways, floors, window stools, and window channels within each unit. For purposes of comparison, wipe dust samples were also collected from floors. Core soil samples were obtained at the boundary of the property, the foundation of the unit, and an entryway to the unit. In the analyses that follow, abbreviations are employed in identifying these various sample types. The abbreviations we selected are displayed in Table 2-1.

### 2.1 DUST COLLECTED

When interpreting results of a field study which included vacuum dust samples in a residential setting, information about the amount of dust collected is important. The detection limit for dust lead concentration is a direct function of the amount of dust collected. In Table 2-2, descriptive statistics are reported by sample type for the amount of dust collected (mg) by the vacuum sampling method. The statistics presented are the number of samples, geometric mean, logarithmic standard deviation, minimum, and maximum. The amount of dust by sample type is illustrated graphically in Figure 2-1. In this figure, box and whisker plots are displayed for the logarithm of dust collected by sample type.

Box and whisker plots illustrate the center, scatter, and skewness of a dataset. The lower and upper quartiles of the data are represented by the bottom and top of the box, respectively. The distance embodied by the box is termed the interquartile range, the range from the 25th to 75th percentile. The bar within the box portrays the median of the data. The lower and upper tails of the distribution of the amount of dust are represented by the whiskers extending from the bottom and top of the box. Extreme data points are classified as either minor

**Table 2-1. Symbols Used to Denote Sample Types in Tables and Figures**

| Sample Type | Symbol | Description |
|---|---|---|
| Air Duct Dust | ARD | Vacuum dust samples collected from an air duct within the unit |
| Window Channel Dust | WCH | Vacuum dust samples collected from a window channel within the unit |
| Window Stool Dust | WST | Vacuum dust samples collected from a window stool within the unit |
| Floor Dust | FLW | Wipe dust samples collected from a floor within the unit |
| | FLR | Vacuum dust samples collected from a floor within the unit |
| Entryway Dust (Interior) | EWI | Vacuum dust samples collected from inside an entryway to the unit |
| Entryway Dust (Exterior) | EWO | Vacuum dust samples collected from outside an entryway to the unit |
| Soil | EWY | Core soil samples collected adjacent to an entryway to the unit |
| | FDN | Core soil samples collected at the foundation of the unit |
| | BDY | Core soil samples collected at the boundary of the property |

**Table 2-2. Descriptive Statistics for Amounts of Dust Collected (mg) and Area Sampled ($ft^2$) by Sample Type**

| STATTYPE | Air Duct (Vacuum) | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Wipe) | Floor (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) |
|---|---|---|---|---|---|---|---|
| **Amount of Dust (mg)** | | | | | | | |
| Number of Samples | 109 | 98 | 113 | 0 | 238 | 100 | 97 |
| Arithmetic Mean | 355.42 | 1324.36 | 174.11 | . | 572.12 | 2880.35 | 3081.30 |
| Geometric Mean | 95.49 | 617.08 | 89.22 | . | 180.81 | 1112.18 | 1583.29 |
| LN Standard Deviation | 1.68 | 1.43 | 1.18 | . | 1.65 | 1.66 | 1.30 |
| Minimum | 2.20 | 0.50 | 2.30 | . | 40.60 | 8.50 | 40.60 |
| Maximum | 4215.10 | 13285.80 | 2299.40 | . | 14426.00 | 20857.40 | 22170.30 |
| **Area Sampled ($ft^2$)** | | | | | | | |
| Number of Samples | 109 | 98 | 113 | 67 | 238 | 100 | 97 |
| Arithmetic Mean | 0.43 | 0.52 | 0.90 | 1.00 | 1.00 | 1.00 | 0.98 |
| Standard Deviation | 0.26 | 0.41 | 0.63 | 0.01 | 0.03 | 0.03 | 0.07 |
| Minimum | 0.03 | 0.05 | 0.11 | 0.96 | 0.96 | 0.67 | 0.50 |
| Maximum | 1.44 | 1.83 | 4.73 | 1.00 | 1.40 | 1.00 | 1.00 |

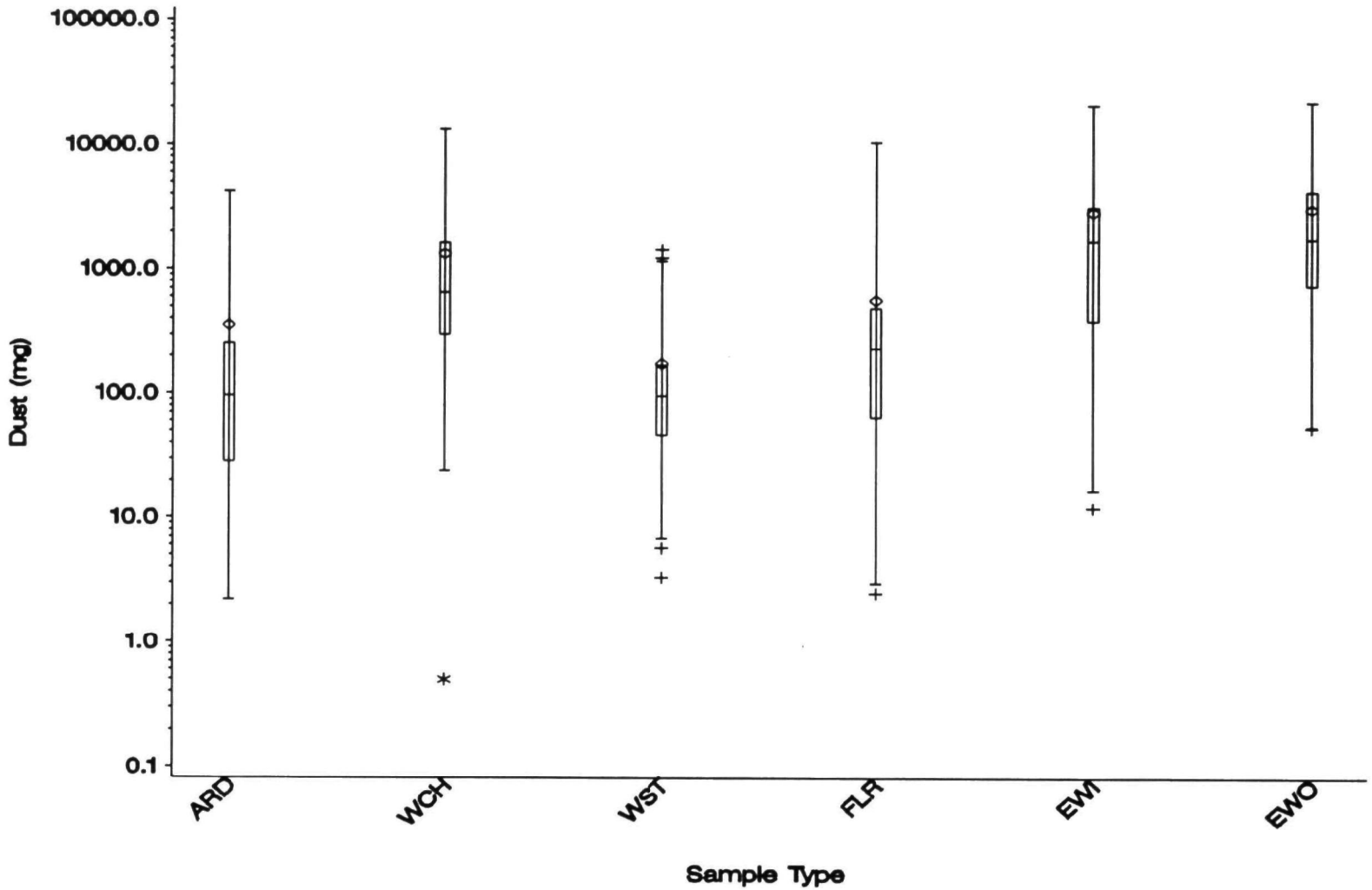


Figure 2-1. Amount of dust collected (mg) by sample type.

(pluses) or extreme (stars) outliers based on their distance from the quartiles relative to the interquartile range. The arithmetic mean amount of dust is displayed as a diamond.

The amount of dust collected by the vacuum sampler was seldom less than 10 mg (the amount targeted by the laboratory chemists in the study plans), and never exceeded 25 grams (25000 mg). The geometric mean amount of dust for each sample type was at least 90 mg. Problems in collecting air duct samples resulted in their surprisingly small amount of dust. The large amount of dust collected from window channels is due to a very high dust loading which compensates for the very small area available for sampling (less than for window stool samples).

## 2.2 AREA SAMPLED

The square footage sampled when collecting vacuum and wipe dust samples is useful for interpreting the resulting lead loadings and concentrations. In Table 2-2, descriptive statistics are reported by sample type for the area sampled ($ft^2$) by both the vacuum and wipe sampling methods. The number of samples, arithmetic mean, standard deviation, minimum and maximum are reported. These results are illustrated in Figure 2-2 via the box and whisker plots of area sampled for each sample type.

With only a few exceptions, one square foot of dust was sampled when the entryway-interior, entryway-exterior, floor (vacuum), and floor (wipe) measures were collected. The area sampled during the collection of air duct, window stool and window channel measures, however, varied considerably. In the case of window stools, as little as 0.1 $ft^2$ to nearly as much as 5 $ft^2$ were sampled. Since the sampling protocol called for collecting dust from the entire window stool or channel, the variation is mostly a function of differences in the construction of the units. For example, a window stool in unit 44 was 47 inches long and 14.5 inches wide, while a window stool in unit 95 was 63.5" x 7.9". The average area sampled for air duct and window channel measures was approximately 0.4 $ft^2$ while an

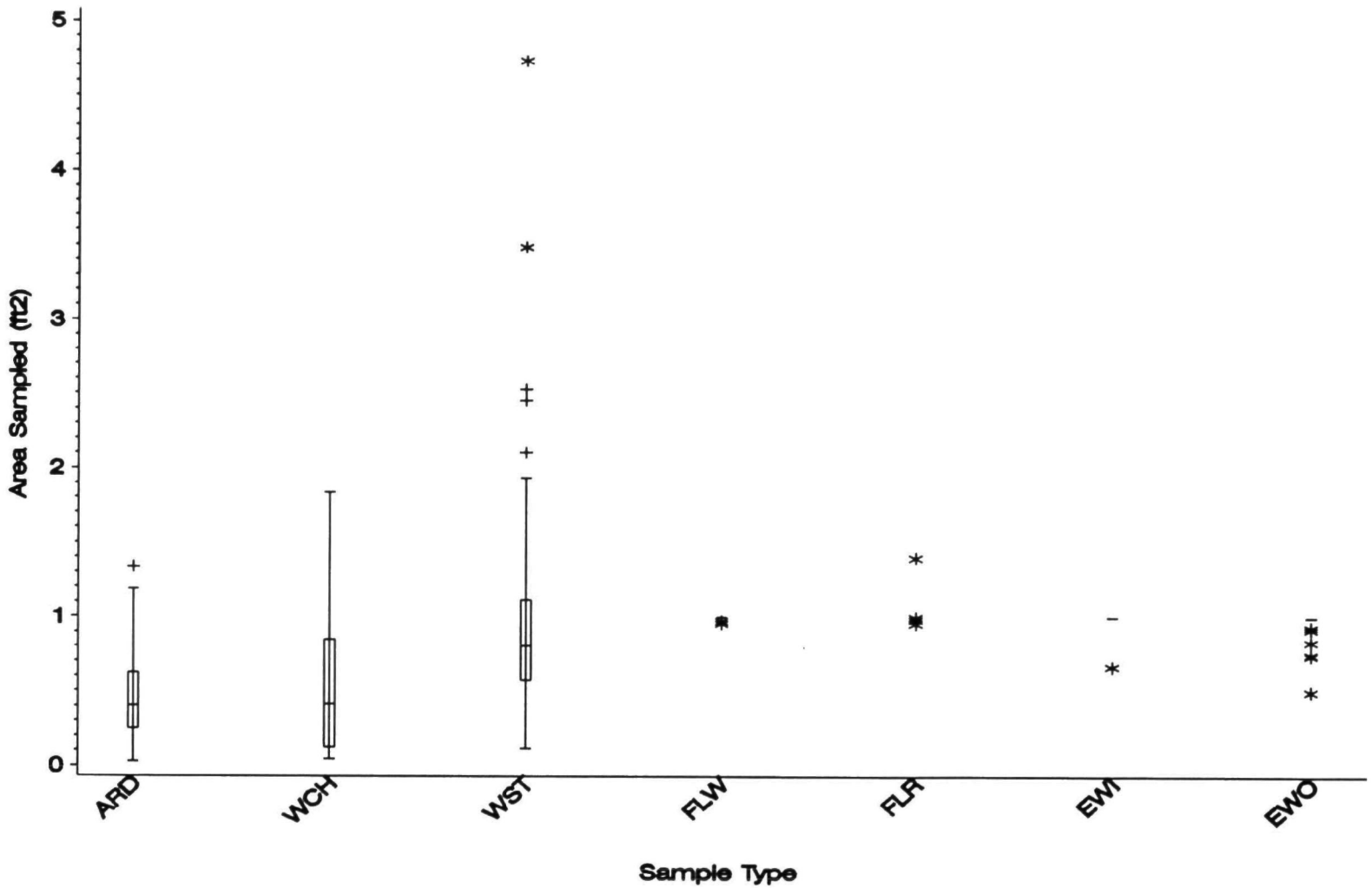


Figure 2-2. Area sampled ($ft^2$) by sample type.

average of approximately 0.9 $ft^2$ was sampled for window stool measures.

## 2.3 LEAD LOADING, LEAD CONCENTRATION, AND DUST LOADING

Three types of measurements were collected for the dust and soil samples. They are:

> Lead Loading: Amount of lead ($\mu g$) in household dust per square foot ($ft^2$) of surface area sampled.
>
> Lead Concentration: Amount of lead ($\mu g$) per gram (g) of household dust sampled or amount of lead ($\mu g$) per gram (g) of soil sampled.
>
> Dust Loading: Amount of household dust (mg) per square foot ($ft^2$) of surface area sampled.

Vacuum dust samples produce all three measurements. Wipe dust samples produce only lead loading measurements since the amount of dust collected cannot be determined. For soil samples, only lead concentration may be determined because only a point, not a surface, is sampled.

Descriptive statistics for all units combined are presented by sample type in Table 2-3 for all three measurement types. The descriptive statistics reported include the number of samples collected, geometric mean, arithmetic mean, logarithmic standard deviation, minimum and maximum. Figure 2-3 displays box and whisker plots for lead loading across all units plotted versus sample type. Comparable plots for lead concentration and dust loading are presented in Figures 2-4 and 2-5, respectively.

Log-transformed responses (lead loadings, lead concentrations, and dust loadings) were used in all of the statistical analyses. Using log-transformed environmental lead measures is common and supported in the literature. Reeves et al (1982) found that the normal distribution was statistically rejected for each of the environmental measures they studied (lead in paint, soil, and house dust). Further, the data were found to be closer in form to the lognormal distribution than

**Table 2-3. Descriptive Statistics for Lead Loading ($\mu g/ft^2$), Lead Concentration ($\mu g/g$), and Dust Loading ($mg/ft^2$) by Sample Type**

| Measurement | Statistic | Air Duct (Vacuum) | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Wipe) | Floor (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) | Entryway (Soil) | Foundation (Soil) | Boundary (Soil) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lead Loading ($\mu g/ft^2$) | Number of Samples | 109 | 98 | 113 | 67 | 238 | 100 | 97 | 0 | 0 | 0 |
| | Geometric Mean | 120.36 | 2515.59 | 74.43 | 11.24 | 27.15 | 208.00 | 384.17 | . | . | . |
| | Arithmetic Mean | 1530.60 | 13637.20 | 584.62 | 22.68 | 244.22 | 774.18 | 1234.56 | . | . | . |
| | LN Standard Deviation | 2.29 | 2.24 | 2.12 | 1.05 | 2.03 | 1.99 | 1.74 | . | . | . |
| | Minimum | 1.85 | 19.12 | 0.86 | 2.72 | 0.34 | 1.23 | 3.97 | . | . | . |
| | Maximum | 40863.60 | 244581.21 | 16710.45 | 333.56 | 11641.25 | 7349.00 | 14021.00 | . | . | . |
| Lead Concentration ($\mu g/g$) | Number of Samples | 109 | 98 | 113 | 0 | 238 | 100 | 97 | 109 | 118 | 120 |
| | Geometric Mean | 427.19 | 1438.61 | 622.94 | . | 150.31 | 186.25 | 237.48 | 148.77 | 185.75 | 125.46 |
| | Arithmetic Mean | 664.07 | 4920.84 | 2168.84 | . | 395.92 | 344.97 | 542.39 | 222.92 | 299.52 | 161.62 |
| | LN Standard Deviation | 0.91 | 1.69 | 1.55 | . | 1.14 | 1.01 | 1.06 | 0.95 | 0.96 | 0.70 |
| | Minimum | 58.48 | 72.90 | 10.15 | . | 1.71 | 9.24 | 8.84 | 4.55 | 8.51 | 21.35 |
| | Maximum | 5644.54 | 45229.26 | 48271.93 | . | 13567.76 | 5332.00 | 16335.45 | 1068.07 | 3351.12 | 1072.76 |
| Dust Loading ($mg/ft^2$) | Number of Samples | 109 | 98 | 113 | 0 | 238 | 100 | 97 | 0 | 0 | 0 |
| | Geometric Mean | 281.75 | 1748.63 | 119.48 | . | 180.60 | 1116.70 | 1617.67 | . | . | . |
| | Arithmetic Mean | 3554.57 | 4386.95 | 244.15 | . | 572.17 | 2891.59 | 3143.55 | . | . | . |
| | LN Standard Deviation | 2.00 | 1.46 | 1.18 | . | 1.65 | 1.66 | 1.30 | . | . | . |
| | Minimum | 5.01 | 4.80 | 4.63 | . | 0.43 | 8.50 | 40.60 | . | . | . |
| | Maximum | 128646.00 | 46328.75 | 2824.00 | . | 14426.00 | 20857.40 | 22170.30 | . | . | . |

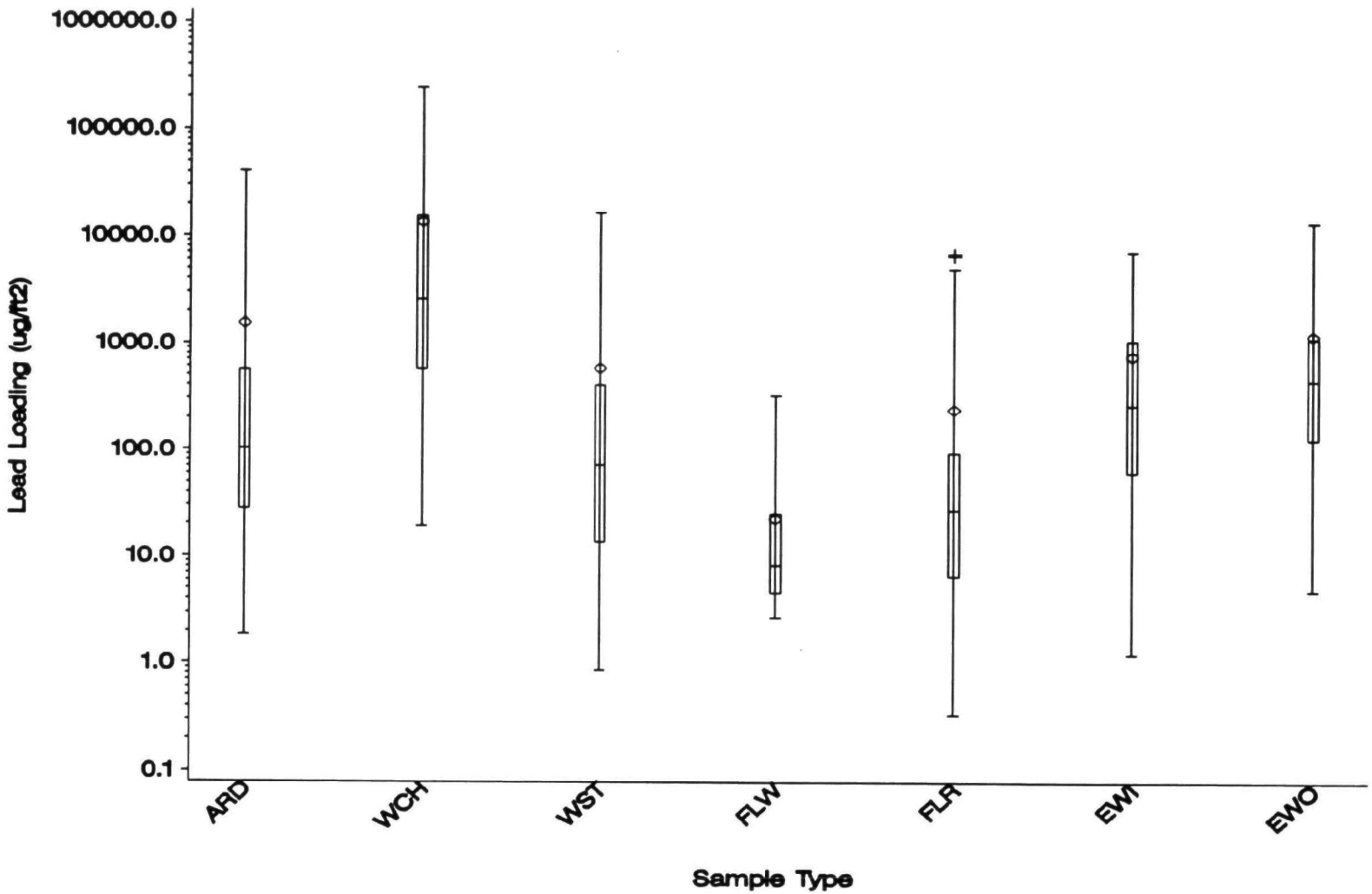


Figure 2-3. Lead loading ($\mu g/ft^2$) by sample type.

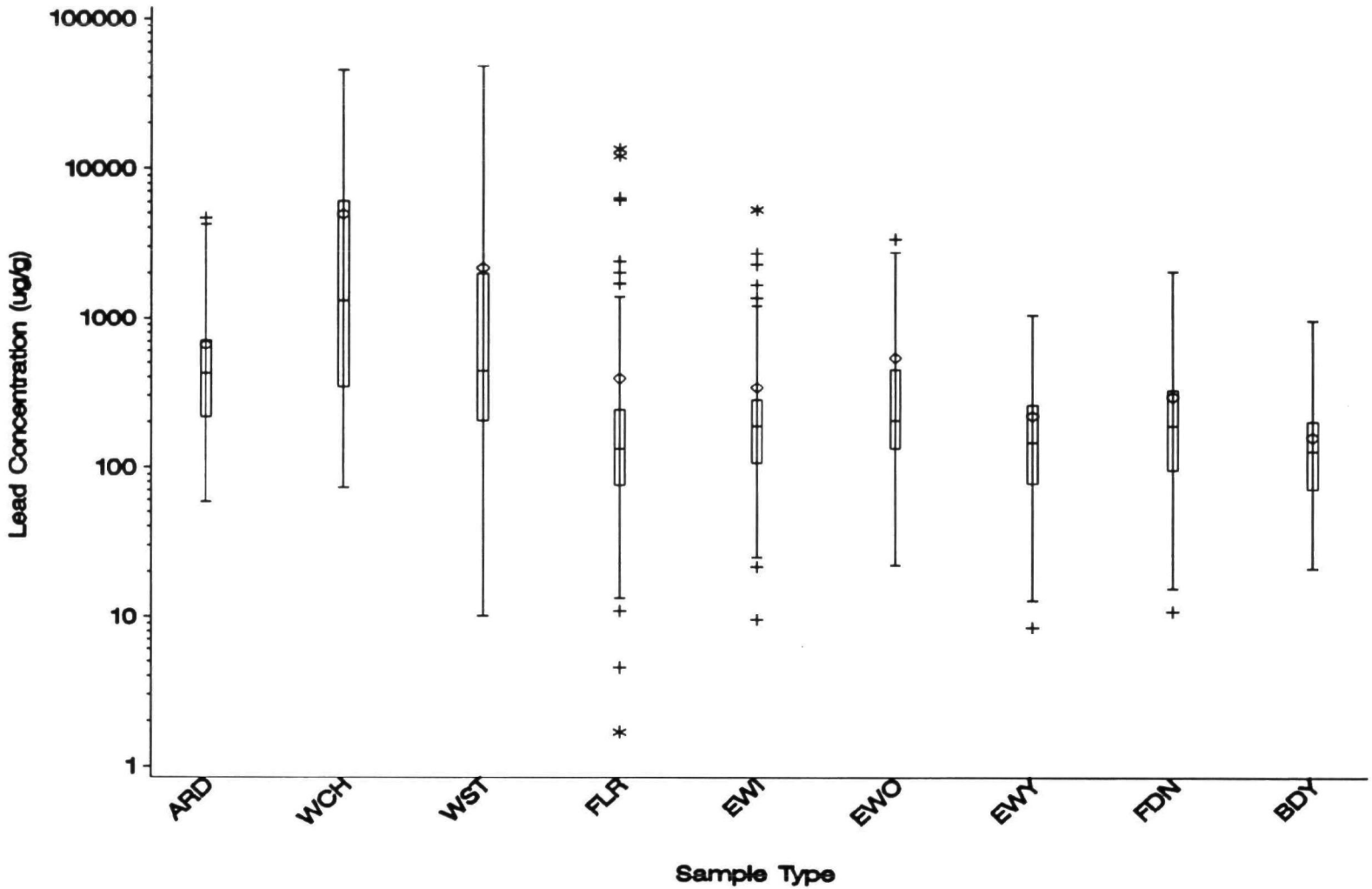


Figure 2-4. Lead concentration (μg/g) by sample type.

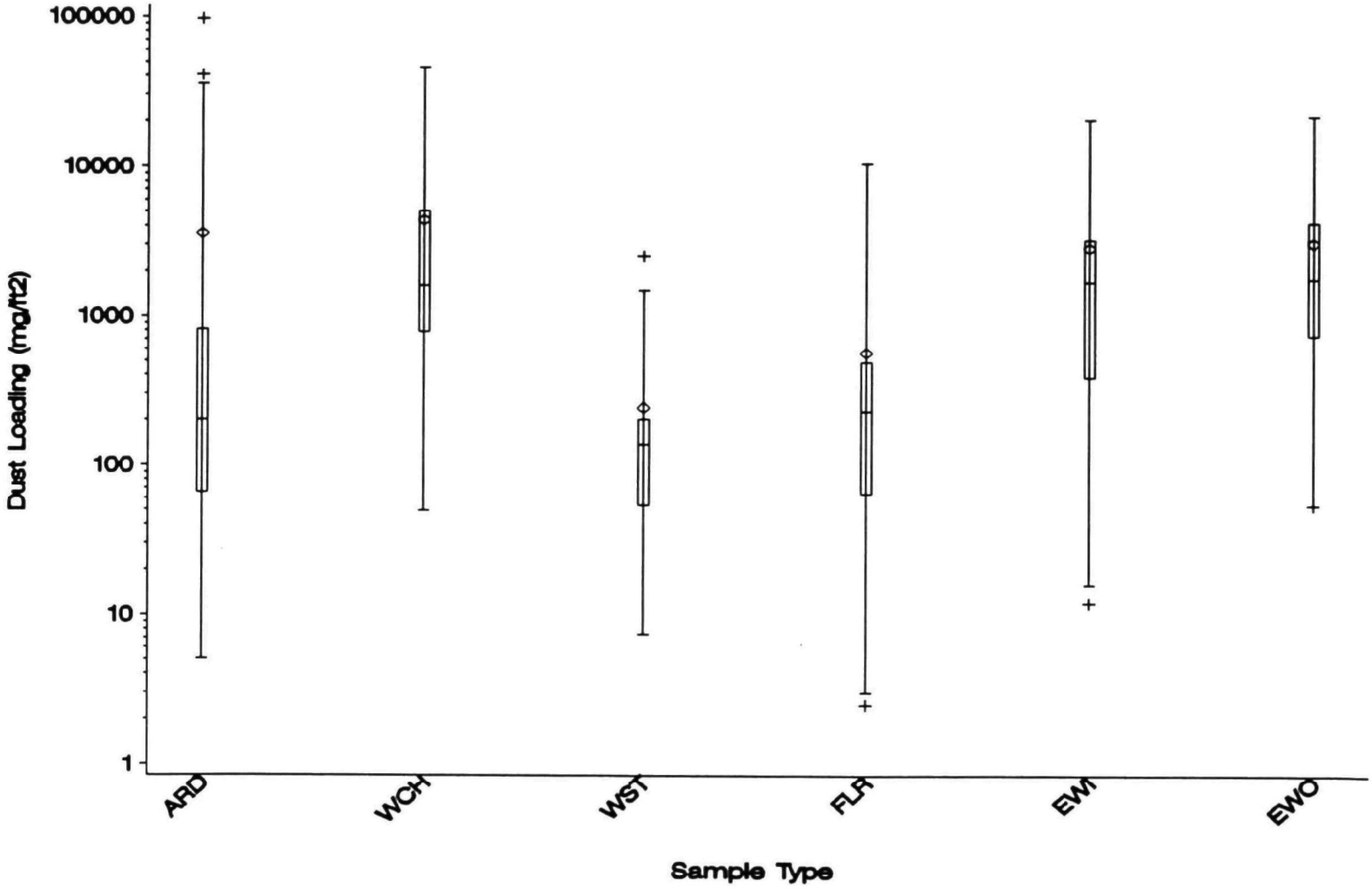


Figure 2-5. Dust loading (mg/ft$^2$) by sample type.

the normal distribution. The data obtained in this study illustrate another important reason for using log-transformed data - the responses range over four to five orders of magnitude. In addition, the geometric means are often much closer to the medians than the arithmetic means (illustrated in Figures 2-3, 2-4 and 2-5). This is evidence that the distributions are more symmetric on a log scale than a linear scale.

The geometric mean and logarithmic standard deviation are natural summary parameters for lognormally distributed data. The geometric mean is calculated by taking the natural logarithm of the data values, calculating their arithmetic mean, and exponentiating (taking the antilog). The logarithmic standard deviation, in turn, is determined by taking the natural logarithm of the original data values and then calculating their standard deviation.

The correlations among lead loadings, lead concentrations, and dust loadings were assessed for the six types of vacuum dust samples collected. Table 2-4 displays these estimated correlations for each type of sample. These estimates are based on the log-transformed data. For all six sample types the estimated correlations between lead loadings and lead concentrations, and lead loadings and dust loadings were significantly different from zero. In contrast, the estimated correlations between lead concentrations and dust loadings were not significantly different from zero for any of the sample types. The estimated correlations between lead and dust loadings were higher than those between lead loadings and lead concentrations, except for window stool and channel samples. When the samples are pooled across sample types all the average correlations are significantly different from zero. The average estimated correlation among lead concentrations and dust loadings (0.12), however, is smaller than those among lead and dust loadings (0.82), and lead loadings and lead concentrations (0.67).

**Table 2-4. Correlations of Lead Loading Versus Lead Concentration for Dust Samples**

| Sample Type | Number of Samples | Estimated Correlation | | |
|---|---|---|---|---|
| | | Pb Load vs Pb Conc | Pb Load vs Dust Load | Pb Conc vs Dust Load |
| Air Ducts | 109 | 0.50* | 0.92* | 0.12 |
| Window Channel | 98 | 0.76* | 0.66* | 0.002 |
| Window Stool | 113 | 0.84* | 0.70* | 0.19 |
| Floor | 238 | 0.58* | 0.83* | 0.02 |
| Entryway Interior | 100 | 0.56* | 0.86* | 0.05 |
| Entryway Exterior | 97 | 0.66* | 0.79* | 0.07 |
| Across Sample Types | 755 | 0.67* | 0.82* | 0.12* |

* Significant at the 0.01 level.

## 2.4 DESCRIPTIVE PLOTS

Figures 2-6a and 2-6b present the geometric mean lead loading, lead concentration, and dust loading results by sample type for control units and abated units, respectively. These plots facilitate assessment of the three types of measurements and their relationship across sample and unit types. With a single exception (entryway outside dust loading in abated units), the highest loadings and concentrations were obtained from window channel samples. Similar geometric mean lead concentrations were measured for the three soil sample types, though foundation samples from abated units were highest.

The environmental efficacy of the abatement procedures may be roughly assessed by examining Figures 2-7, 2-8, and 2-9. In Figure 2-7, the geometric mean lead loading for control, predominantly encapsulated/enclosed, and predominantly removal units are displayed by sample type. Figures 2-8 and 2-9 present similar bar charts for lead concentration and dust loading, respectively. For all sample types, the predominantly

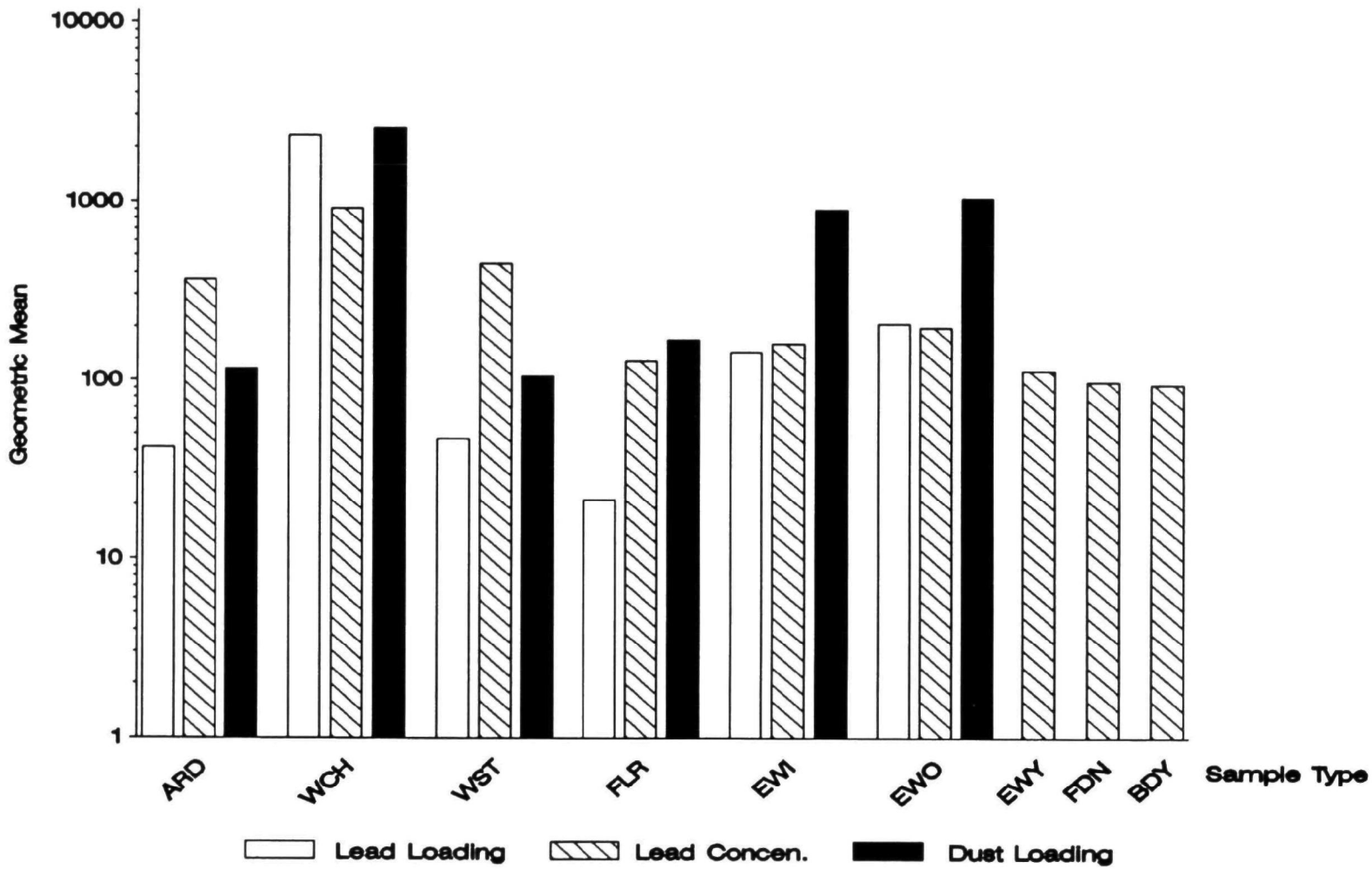


Figure 2-6a. Geometric mean lead loading ($\mu g/ft^2$), lead concentration ($\mu g/g$), and dust loading ($mg/ft^2$) by sample type (control units).

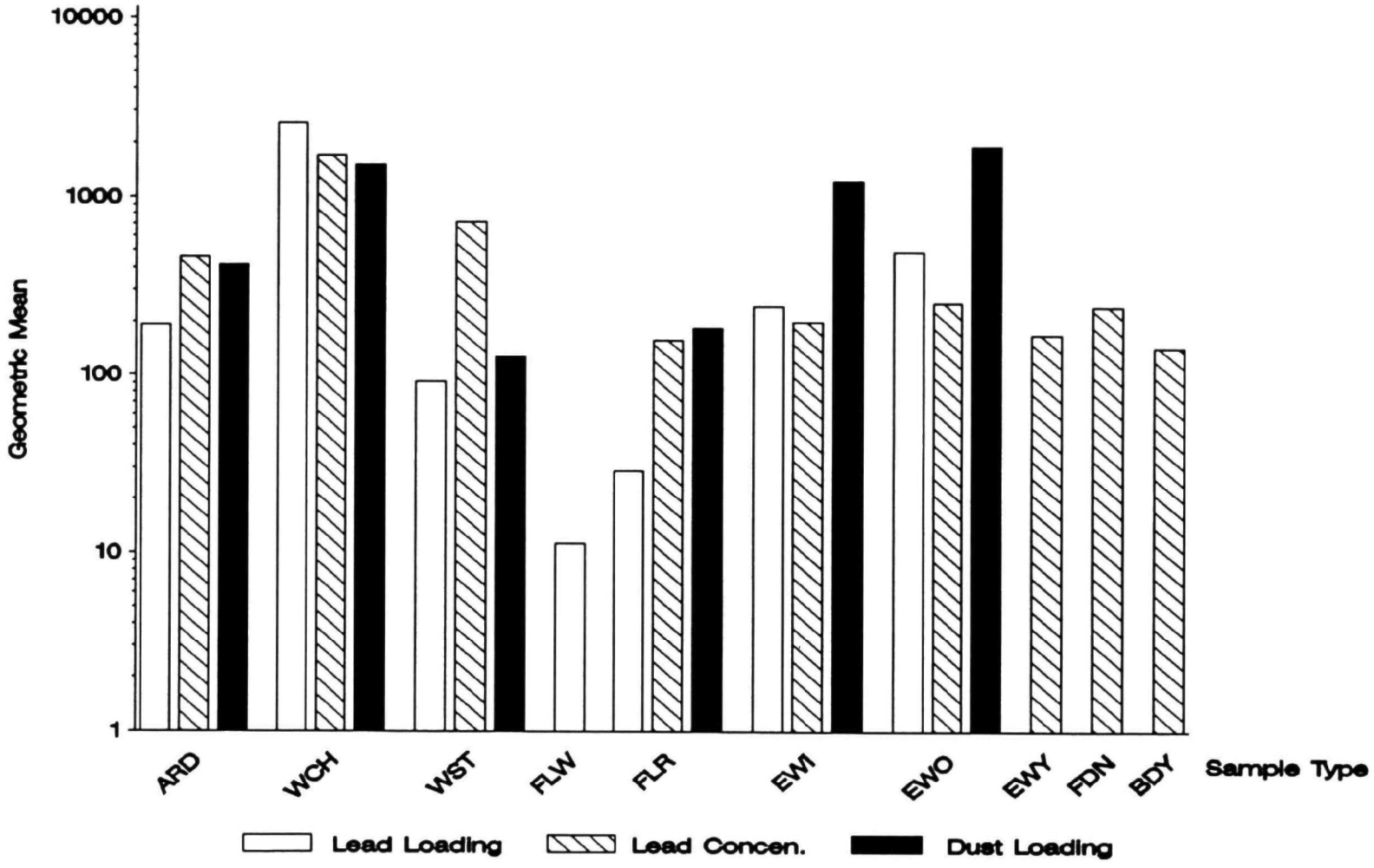


Figure 2-6b. Geometric mean lead loading ($\mu g/ft^2$), lead concentration ($\mu g/g$), and dust loading ($mg/ft^2$) by sample type (abated units).

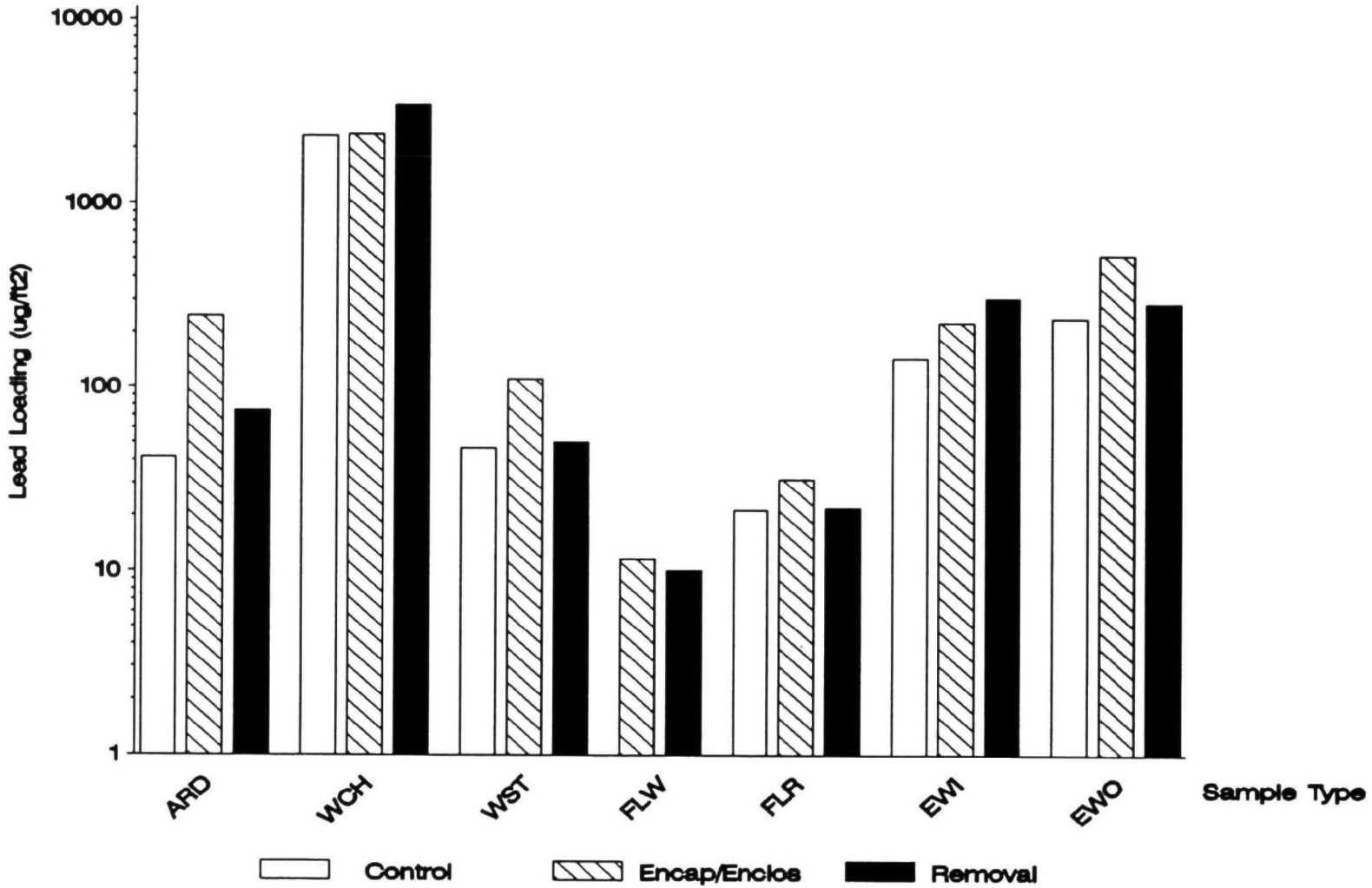


Figure 2-7. Lead loading ($\mu g/ft^2$) by sample type and method of abatement.

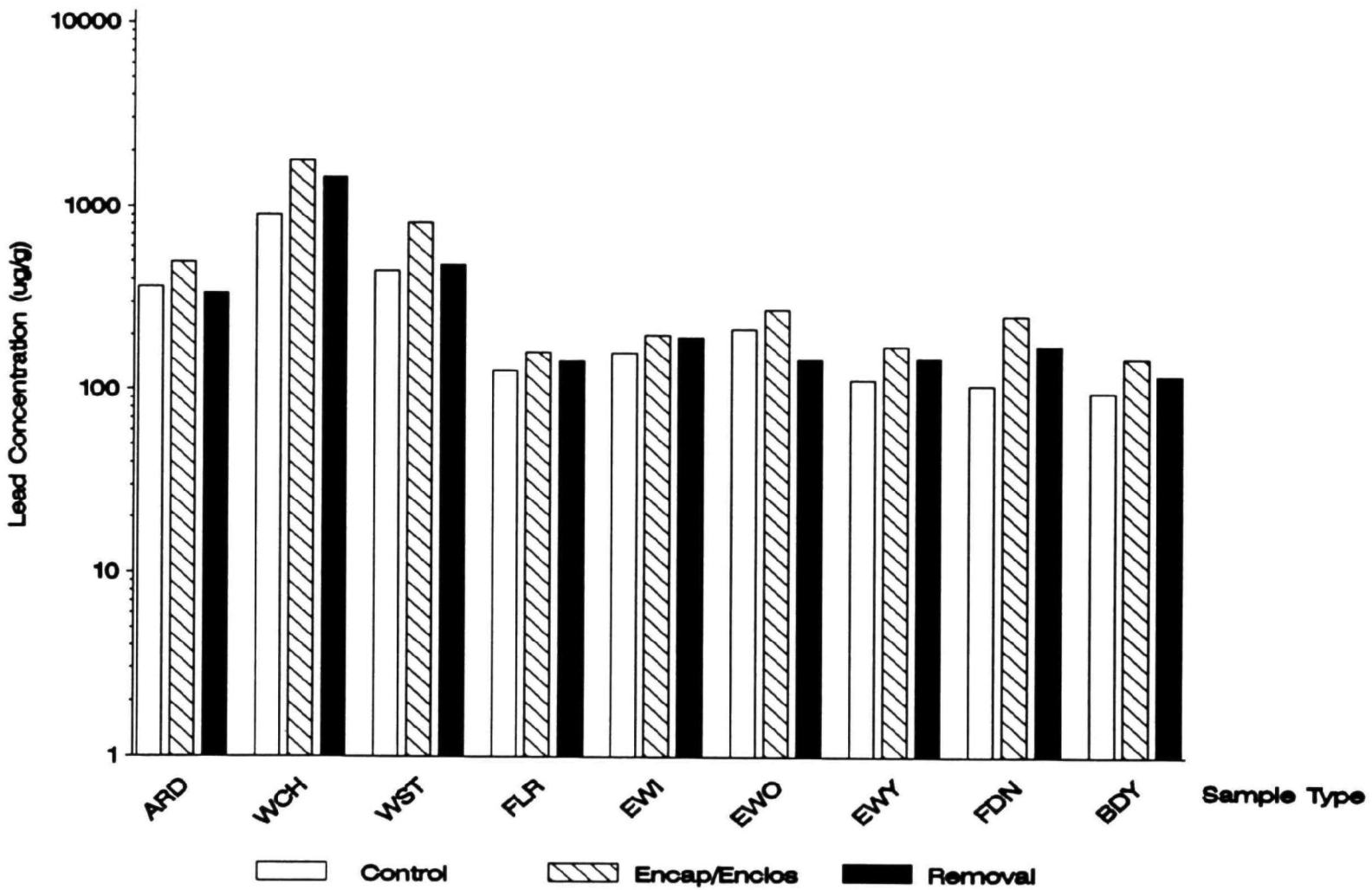


Figure 2-8. Lead concentration (μg/g) by sample type and method of abatement.

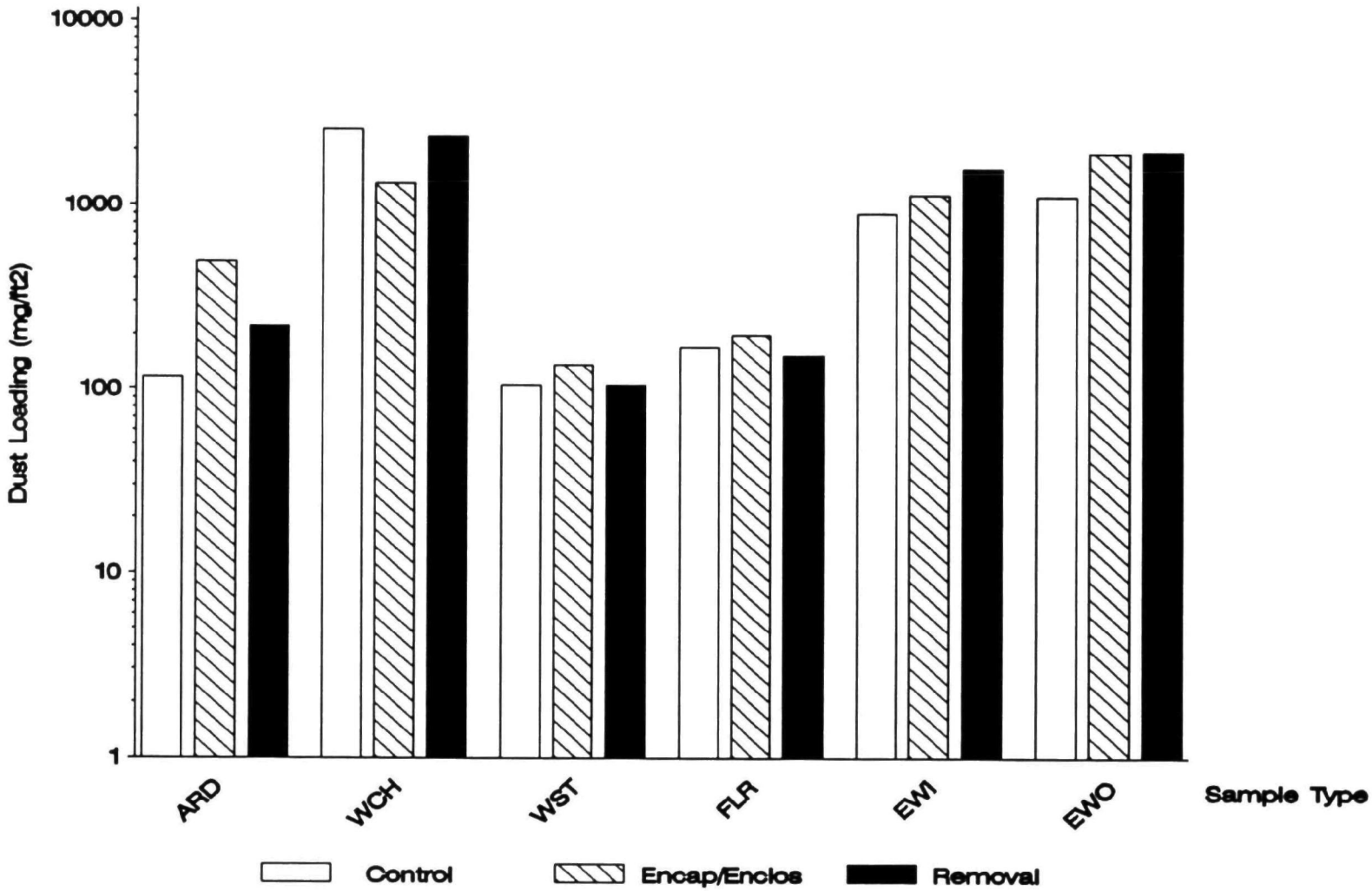


Figure 2-9. Dust loading ($\mu g/ft^2$) by sample type and method of abatement.

encapsulated/enclosed units exhibited the highest geometric mean lead concentrations. The geometric mean lead concentration for predominantly removal units are usually higher than for control units, with the exception of air ducts and entryway exterior samples. This pattern is not duplicated in either the lead or dust loading results. The results for control units, however, were usually lowest. A striking exception is evident for window channel samples. The geometric mean lead and dust loading results for window channels are higher for control units than for predominantly encapsulated/enclosed units.

## 2.5 ESTIMATED LEVEL OF DETECTION AND LEVEL OF QUANTIFICATION

In order to assess the validity of the lead concentration and lead loading results reported, it is appropriate to discuss the sensitivity of the laboratory procedures employed. This assessment may be performed by considering two parameters of sensitivity, the estimated level of detection (ELOD) and the level of quantification (LOQ). Both parameters are stated in terms of the instrument response concentration, which is the amount of lead (μg) per dilution volume (mL) in instrument samples. The ELOD is a practical upper bound on the estimated concentration (μg/mL) that would result from the analysis of samples which contain no lead. The LOQ, in turn, is the smallest concentration which will consistently produce estimated concentrations that are within 30% of the true concentration.

Table 2-5 contains the ELODs for the 24 instrument batches performed in analyzing the regular field samples. Three percent (35 out of 1169) of the regular samples had instrument response concentrations below the ELOD for their instrument batch. These samples are detailed in Table A-3 of the Appendix.

The LOQ was determined from information outlined in the memorandum, "Potential Instrumental Measurement Error for Lead Analysis," dated September 21, 1992. This memo, portions of which are excerpted in Table 2-6, documented the instrumental

measurement error for a series of known lead concentrations ranging from (0.02 to 0.50 μg/mL). The results suggested an LOQ of 0.208 μg/mL.

Approximately 19% (226 out of 1169) of the regular field samples had instrument response concentrations below the LOQ. To examine the potential impact of how these samples are handled in the statistical analysis, two sets of statistical analyses were performed. In the first set of analyses, we set the instrument response concentrations of those samples below their ELOD equal to their ELOD. No modifications were made to samples with concentrations above their ELOD but below the LOQ. In the second set of analyses, we set the instrument response concentrations of all samples below the LOQ equal to the LOQ. We fit the mixed model described in Section 4 separately to each set of data. Since the second set of analyses agree appreciably with the first, only the results of the first set of analyses are presented in this report. The only notable disagreement between the two sets of analyses was that the difference in lead concentrations in air ducts between abated and control homes was not as great by the second analysis.

**Table 2-5. Estimated Level of Detection by Instrument Batch**

| Instrument Batch | ELOD µg/mL | Instrument Batch | ELOD µg/mL |
|---|---|---|---|
| E04272A | 0.0298 | E06122A | 0.0370 |
| E04292A | 0.0138 | E06152A | 0.0254 |
| E05042A | 0.0383 | E06242A | 0.0263 |
| E05072B | 0.0324 | E06262A | 0.0655 |
| E05122B | 0.0308 | E06292A | 0.0527 |
| E05132A | 0.0255 | E07142A | 0.0300 |
| E05192A | 0.0293 | E07212A | 0.0593 |
| E05262A | 0.0461 | E07242A | 0.0354 |
| E05272A | 0.0634 | E07302A | 0.0514 |
| E06022A | 0.0400 | E08032A | 0.0272 |
| E06042A | 0.0465 | E08062A | 0.0349 |
| E06112A | 0.0553 | E08242A | 0.0240 |

**Table 2-6. Potential Instrumental Measurement Error: Calculated Results**

| Lead Concentration (µg/mL) | Average Response (µg/mL) | n-1 Standard Deviation | % Relative Standard Deviation |
|---|---|---|---|
| 0.02 | 0.03303 | 0.01682 | 50.91% |
| 0.03 | 0.04253 | 0.01893 | 44.50% |
| 0.05 | 0.06625 | 0.02012 | 30.36% |
| 0.07 | 0.08816 | 0.01891 | 21.45% |
| 0.10 | 0.11709 | 0.02000 | 17.08% |
| 0.30 | 0.31963 | 0.02643 | 8.27% |
| 0.50 | 0.52871 | 0.02155 | 4.08% |

## 3.0 STATISTICAL MODELS

In this section we present the statistical models that were fitted to the lead loading, lead concentration, and dust loading data. We also discuss centering and scaling of design variables which were used to produce easily interpretable model parameters. The stepwise regression and mixed model procedures used to arrive at final models are defined and model parameters are related to specific hypotheses of interest.

### 3.1 MIXED RANDOM AND FIXED EFFECTS MODEL

In this section we describe the statistical models that were fitted to the observed lead loadings, lead concentrations, and dust loadings. These models are the basis for the statistical analyses described in Sections 4 and 5.

The following model contains all of the design factors considered in the study, random effects for housing unit-to-unit and room-to-room variation, and additional explanatory variables or covariates. This model was fitted separately to the data for air duct, interior entryway, window channel, and window stool dust samples.

$$\begin{aligned}\ln(C_{ij}) = {} & \ln(\alpha) + U_i + R_{ij} + \ln(\beta_{PI})PI_i + \ln(\beta_{PID})PID_i \\ & + \ln(\beta_{SI})SI_i + \ln(\beta_{SID})SI_i\, PID_i + \ln(\beta_{POD})POD_i \\ & + \ln(\beta_{SO})SO_i + \ln(\beta_{SOD})SO_i\, POD_i + \ln(\beta_{PR})PR_{ij} \\ & + \ln(\beta_{PRD})PRD_{ij} + \ln(\beta_{SR})SR_{ij} + \ln(\beta_{SRD})SR_{ij}PRD_{ij} \\ & + \ln(\underset{\sim}{\gamma})\underset{\sim}{X}\end{aligned}$$

for

$$i = 1, 2, \ldots, \# \text{ units}$$
$$j = 1, 2 \text{ rooms}$$

where

$C_{ij}$ = measured lead concentration, lead loading, or dust loading in the jth room in the ith unit,

$\alpha$ = overall geometric average lead concentration in control units for nominal values of covariates,

$U_i$ = random effect for the ith unit; assumed to follow a normal distribution with mean zero and standard deviation $\sigma_U$,

$R_{ij}$ = random effect for the jth room in the ith unit; assumed to follow a normal distribution with mean zero and standard deviation $\sigma_R$,

$\beta_{PI}$ = fixed multiplicative effect associated with a unit that has undergone abatement; $\beta_{PR}$ is similarly defined for room-level abatement,

$PI_i$ = 1 if abatement was performed in the ith unit and zero otherwise; $PR_{ij}$ is similarly defined for room-level abatement,

$\beta_{PID}$ = fixed multiplicative effect of interior abatement by E/E methods rather than removal methods; $\beta_{POD}$ and $\beta_{PRD}$ are similarly defined for outside abatement and room-level abatement,

$PID_i$ = the percentage of interior abatement that was performed by E/E methods; $POD_i$ and $PRD_{ij}$ are similarly defined for exterior abatement and room-level abatement,

$\beta_{SI}$ = multiplicative effect of increasing the log-square footage of abatement; $\beta_{SO}$ and $\beta_{SR}$ are similarly defined for outside abatement and room-level abatement,

$SI_i$ = log-square footage of interior abatement in the ith unit or $\ln(1+SFI_i)$ where $SFI_i$ is the square footage of interior abatement in the ith unit; $SO_i$ and $SR_{ij}$ are similarly defined for outside abatement and room-level abatement,

$\beta_{SID}$ = ratio of the multiplicative effect of increasing the log-square footage of interior abatement by E/E methods to the multiplicative effect of the same increase in the log-square footage of interior abatement by removal methods; $\beta_{SOD}$ and $\beta_{SRD}$ are similarly defined for outside abatement and room-level abatement.,

$\underset{\sim}{X}$ = vector of additional covariates, and

$\underset{\sim}{\gamma}$ = vector of multiplicative effects associated with increases in the corresponding covariates in the vector X.

The unit-level random effect terms for the different sample types within a unit are assumed to be correlated. Similarly, the room-level random effect terms for the different sample types within a room are assumed to be correlated.

In the case of floor dust vacuum samples, an additional within-room random error term was added to the model,

$\epsilon_{ijk}$ = random effect for the kth sample in the jth room of the ith unit.

Floor dust wipe samples were taken from only one location in each of the abated houses. Therefore, no room level effects were included in the model, nor can differences between abated and control houses be estimated. The following model was used for these samples:

$$\begin{aligned}\ln(C_{ij}) = {} & \ln(\alpha) + U_i + R_{ij} + \ln(\beta_{PID})PID_i \\ & + \ln(\beta_{SI})SI_i + \ln(\beta_{SID})SI_i\ PID_i + \ln(\beta_{POD})POD_i \\ & + \ln(\beta_{SO})SO_i + \ln(\beta_{SOD})SO_i\ POD_i \\ & + \ln(\underset{\sim}{\gamma})\underset{\sim}{X}.\end{aligned}$$

The model fitted to the data for exterior entryway dust samples is

$$\begin{aligned}\ln(C_{ij}) = {} & \ln(\alpha) + U_i + S_{ij} + \ln(\beta_{PI})PI_i + \ln(\beta_{POD})POD_i \\ & + \ln(\beta_{SO})SO_i + \ln(\beta_{SOD})SO_i\ POD_i + \ln(\underset{\sim}{\gamma})\underset{\sim}{X}\end{aligned}$$

where

$C_{ij}$ = measured lead concentration at ith unit,

$S_{ij}$ = random effect for the jth side of ith unit; assumed to follow a normal distribution with mean zero and standard deviation $\sigma_S$,

and all other terms are defined as above. The side-level random effect terms for the three different sample types within a side of a unit are assumed to be correlated.

For foundation soil, boundary soil, and entryway soil, an additional within-side of house component of variation is added to this model:

$E_{ijk}$ = random effect for the kth sample on the jth side of ith unit; assumed to follow a normal distribution with mean zero and standard deviation $\sigma_E$,

The additional explanatory variables (covariates) that were considered for inclusion in the model are listed in Appendix B. The variables considered included questionnaire responses, field inspection variables, and measurements taken during the HUD Demonstration. Explanatory variables that were found to be significant for at least one of the sample types are listed by category in the second column of Table 3-1. Nominal values of these covariates and the sample types for which the covariates are significant are listed in the third and fourth columns.

In the model, the $\alpha$ term represents the geometric average lead level that can be expected in houses where no abatement was necessary and none was performed (control houses) for nominal values of the covariates included in the model. The random effect term for units ($U_i$) allows each housing unit to have its own average lead level. The random effect terms for rooms ($R_{ij}$), entryways ($E_{ij}$), and sides ($S_{ij}$) allow each room, entryway, or side within the unit to have its own average lead level.

The terms $PI_i$ and $PID_i$ and the corresponding coefficients, $\beta_{PI}$ and $\beta_{PID}$, allow estimation of the effect of

## Table 3-1. Explanatory Variables that are Significant for at Least One Sample Type

| Explanatory Variable Category | Explanatory Variable | Nominal Value | Sample Types for Which Explanatory Variable is Significant |
|---|---|---|---|
| Abatement | Abatement contractor | | ARD, FLW |
| | Months between clearance and sampling | 24 | WST |
| | Phase of HUD Demonstration (of three) in which residence was abated | | WST |
| | HUD XRF or AAS measure of lead loading | C:0.38 ($mg/cm^2$)<br>A:1.10 ($mg/cm^2$) | FDN |
| | Specific removal method used on the interior<br>- chemical stripping<br>- remove and replace<br>- heat gun<br>- removal | <br>30%<br>15%<br>15%<br>40% | WCH |
| Substrate | Substrate type | Carpet<br>Carpet<br>Wood | FLR<br>EWI<br>WCH |
| | Substrate condition | Good | ARD, WCH |
| Cleanliness | Frequency of wet mopping uncarpeted floors | 12 | ARD |
| | Frequency of window sill dusting | 1 | ARD |
| | Frequency of vacuuming uncarpeted floors | 0 | EWI |
| Occupation | Wearing home work clothes from an occupation with potential lead contamination | 0 | |
| | Resident employed in welding occupation | 0 | FDN, FLR |
| | Resident employed in paint removal occupation | 0 | BDY |
| Activities | Frequency of removing paint at home | 0 | EWI, FDN |
| | Frequency of pipe or electrical component soldering | 0 | BDY |
| Age/ location of house | Proximity to supposed lead smelter | > 3 mi | EWY |
| | Year house was built | 1932 | BDY |
| Other resident factors | Number of children (between ages of 7 and 17) | 0 | EWI |
| | Months at residence | 12 | FDN |
| | Ownership of home | Owner | FLW, FDN |
| Sampling deviations | Air duct samples taken from cover of air duct | No | ARD |
| | Window channel samples taken with small nozzle | No | WCH |

abatement and a distinction of effects between methods. $\beta_{PI}$ characterizes the abatement effect without distinguishing between E/E methods and removal methods. $\beta_{PID}$ characterizes the difference in the interior abatement effects for E/E methods versus removal methods. Outside abatement and room-level abatement effects are handled similarly in the model.

The term $SI_i$ and the corresponding coefficients, $\beta_{SI}$ and $\beta_{SID}$, allow the effect of the amount of interior abatement, on a per log-square foot abated basis, to be estimated by the model. $\beta_{SI}$ characterizes the interior abatement effect per log-square foot abated without distinguishing between E/E methods and removal methods. $\beta_{SID}$ characterizes the difference in the interior abatement effects per log-square foot abated for E/E methods versus removal methods. Exterior abatement and room-level abatement effects are handled similarly in the model.

## 3.2 CENTERING AND SCALING OF COVARIATES

Several covariates included in the models were centered and scaled so that the model parameters would have more meaningful interpretations. In order to determine the appropriate centering and scaling parameters, three classes of abated units were identified: (1) predominantly E/E, (2) predominantly removal, and (3) abated. The third class is the combination of the first and second classes. If the percentage of abatement performed by E/E methods is more than 50%, then an abated unit is classified as predominantly E/E. Otherwise, it is classified as predominantly removal. Each unit is classified separately for interior and exterior abatement.

For each of the three classes of abated units two quantities were determined:

- Typical percentage abated by E/E methods, and
- Typical square footage abated.

These values are reported in Table 3-2 for interior, exterior, and room-level abatement. The typical percentage abated by E/E methods was determined by taking an average across all units in the class.

A correlation was observed between total square feet abated in a house and the method used to perform the abatement. Typically, significantly more square feet were abated when E/E methods were used than when removal methods were used. This occurred both indoors and outdoors. Therefore, the typical square footage abated was treated as a function and allowed to vary with the percentage abated by E/E methods. To accomplish this, a simple linear regression of log-square feet abated versus percent abated by E/E methods was fit to the data for all abated units. Figure 3-1 displays the regression relationship for interior abatement. Similar regression relationships were developed for exterior and room level abatement.

The typical square footage abated values reported in Table 3-2 are taken from the regression relationship for the typical percentage abated by E/E methods. Taking interior abatement for example, a predominantly E/E unit with 93% E/E abatement is predicted to have 282 total square feet of interior abatement. Similarly, a predominantly removal unit with 4% E/E abatement is predicted to have only 61 total square feet of interior abatement. Finally, an abated unit with 67% E/E abatement is predicted to have 180 total square feet of interior abatement. The typical square footage abated values in Table 3-2 for exterior and room level abatement were determined in a similar fashion.

The values in Table 3-2 were used to center and scale corresponding model covariates as indicated in Table 3-3. Control unit values were never centered. For abated units, PID, POD, and PRD values were centered by subtracting off the typical percent abated by E/E methods for an "abated" unit. These values were then scaled by dividing the centered variable by the difference between the typical percent abated by E/E methods for

**Table 3-2. Average Percent Abated by E/E Methods, by Abatement Method Classification for Interior, Exterior and Room Level Abatement**

| Level | Typical % Abated by E/E Methods | | | Typical Square Footage Abated | | |
|---|---|---|---|---|---|---|
| | E/E | Removal | Abated | E/E | Removal | Abated |
| Interior | 93 | 4 | 67 | 282 | 61 | 180 |
| Exterior | 92 | 27 | 78 | 628 | 260 | 519 |
| Room | 96 | 3 | 69 | 70 | 36 | 58 |

**Table 3-3. Centering and Scaling Parameters for Model Covariates**

| Covariates | Value Subtracted | | Value Divided By |
|---|---|---|---|
| | Control | Abated | |
| PID | 0 | 67% | 89% |
| POD | 0 | 78% | 65% |
| PRD | 0 | 69% | 93% |
| SI | 0 | ln(57)+0.0172*(E/E%) | ln(2) |
| SO | 0 | ln(180)+0.0136*(E/E%) | ln(2) |
| SR | 0 | ln(35)+0.0072*(E/E%) | ln(2) |
| PR | 0 | 1 | -1 |

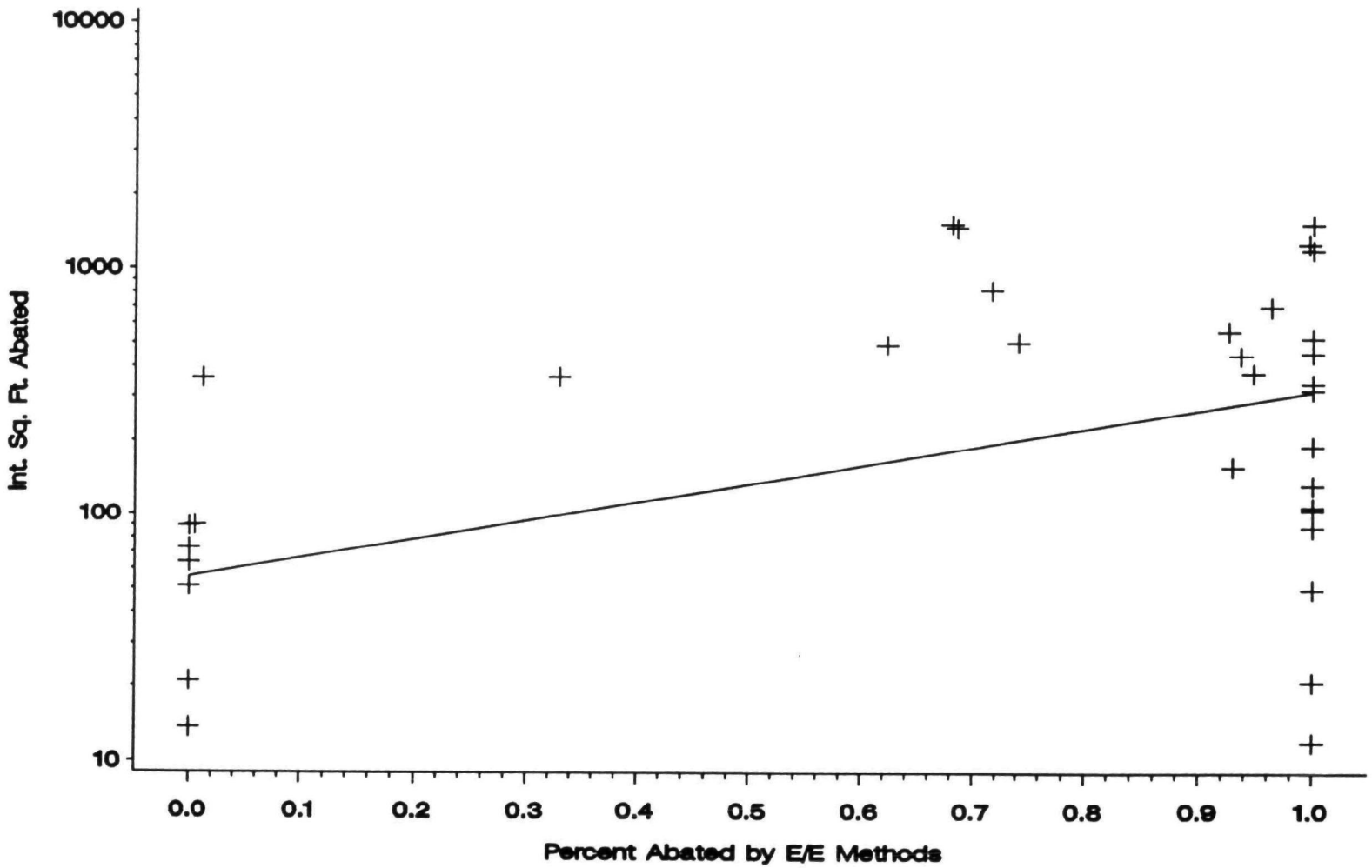


Figure 3-1. Total square feet abated indoors vs. percent encapsulated/enclosed indoors (for abated houses).

a typical "E/E" unit minus a typical "removal" unit. SI, SO, and SR values were centered by subtracting off the logarithm of the predicted square footage abated based on the regressions versus E/E percentage discussed above. These values were then scaled by dividing by ln(2). Finally for abated units, PR was centered by subtracting one (making abated rooms the default for abated units). This value was then scaled by dividing by -1.

The result of the data transformations detailed in Table 3-3 is that the primary factors in the statistical models can be interpreted as indicated in Table 3-4. These interpretations are consistent with the hypotheses we wish to test, as will be discussed in Section 3.4.

The other explanatory factors previously described were also centered and scaled where appropriate. Centering was accomplished by subtracting off the nominal value reported in Table 3-1. These nominal levels are reported again in Section 4 in each table where estimates are given, along with the scaling factor used. The selection of nominal values is also discussed in more detail in Section 4.

## 3.3 MODEL SELECTION

The procedure used to select models to fit to the data was developed in concert with the study objectives. Specific terms corresponding to the primary design factors were included in the model to test the hypotheses presented in Section 4.5 of the Detailed Design Document (Battelle and MRI, 1992a).

Every model used in this study included the following primary design factors:

- A term to distinguish between control units and abated units (PI), and
- A term to distinguish between abatement methods (PID for interior samples, POD for exterior samples).

**Table 3-4. Parameter Interpretation After Centering and Scaling**

| Parameter | Interpretation |
|---|---|
| $\beta_{PI}$ | Ratio of the expected lead level in a typical abated room in a typical abated unit[a] to the expected lead level in a control unit |
| $\beta_{PO}$ | Ratio of the expected soil lead level for a typical abated unit[a] to the expected soil lead level for a control unit |
| $\beta_{PR}$ | Ratio of the expected lead level in a control room in a typical abated unit[a] to the expected lead level in a typical abated room in the same abated unit |
| $\beta_{PID}$ | Ratio of the expected lead level in a typical abated room in a typical E/E unit[a] to the expected lead level in a typical abated room in a typical removal unit |
| $\beta_{POD}$ | Ratio of expected soil lead level for typical E/E unit[a] to expected soil lead level for typical removal unit |
| $\beta_{PRD}$ | Ratio of the expected lead level in a typical E/E room in an abated unit to the expected lead level in a typical removal room in the same abated unit |
| $\beta_{SI}$ | Multiplicative effect of doubling the square footage of interior abatement in a typical abated unit[b] |
| $\beta_{SO}$ | Multiplicative effect of doubling the square footage of exterior abatement in a typical abated unit[b] |
| $\beta_{SR}$ | Multiplicative effect of doubling the square footage of room-level abatement in a typical abated room[b] while holding the square footage and mix of unit level abatement constant |
| $\beta_{SID}$ | Ratio of the multiplicative effect of doubling the square footage of interior abatement in a typical E/E unit[b] to the multiplicative effect of doubling the square footage of interior abatement in a typical removal unit[b] |
| $\beta_{SOD}$ | Ratio of the multiplicative effect of doubling the square footage of exterior abatement in a typical E/E unit[b] to the multiplicative effect of doubling the square footage of exterior abatement in a typical E/E unit[b] |
| $\beta_{SRD}$ | Ratio of the multiplicative effect of doubling the square footage of room-level abatement in a typical E/E room[b] to the multiplicative effect of doubling the square footage of room-level abatement in a typical removal room[b] while holding the square footage and mix of unit level abatement constant |

(a) Typical with respect to both E/E% and square footage abated as indicated in Table 3-2.

(b) Typical with respect to E/E% as indicated in Table 3-2 but with varying square footage abated.

Models for interior dust measurements also contained:

- A term to distinguish between control rooms and abated rooms in abated units (PR).

In addition to the three primary design factors, many additional factors (questionnaire data, field observations) were included to estimate other effects which may affect lead levels. The additional factors included in each model were selected using a phased stepwise regression approach.

### 3.3.1 Phase 1: Abatement Effects (Stepwise Regression)

First, stepwise regression was used to select additional abatement design factors which were significant above and beyond the effects of the three primary design factors described above. The additional abatement factors included square-footage abated by room, as well as a breakdown of square-footage by abatement method.

In the stepwise regression, factors were retained only if they were significant at the 5 percent level. Any factor found to be significantly associated with either lead concentration or lead loading was automatically forced to be retained in the model for the next selection phase.

### 3.3.2 Phase 2: Non-Abatement Factors (Stepwise Regression)

In a second phase of factor selection, all remaining factors, including questionnaire and visual observation data, HUD Demonstration Data, and other practical measures (see Table 3-1), were considered as candidate factors in addition to the design factors discussed above. Stepwise regression was used again to select significant factors. Any factors found to be significant at the 5 percent level were retained for the next selection phase.

Appendix B presents a list of all the nonabatement factors considered for inclusion in the models. To avoid confounding, a preliminary correlation analysis was performed to screen any factors which were strongly correlated with others. For example, for 15 of the 16 homes in which a resident wore work clothes home from their occupation, their clothes were also washed at home. Therefore, only the former was included as a candidate factor in the stepwise regression. Specifically, if any factor was more than 80 percent correlated with another, one of the factors was excluded from the models. The factor with the most complete data was used in fitting the models.

### 3.3.3 Phase 3: Mixed Model Screening (Backward Elimination)

Phase 1 and Phase 2 identified a subset of factors with some association with lead levels. However, due to software limitations, the stepwise regressions were based on fixed effect models whereas it is proper to use a mixed model with random effects in the factor selection process described above. Therefore a mixed model was fit with random unit and random room/side of house effects where appropriate. Any factors not found to be significant by the mixed model analysis at the 10% level were removed from the model (aside from the three design factors described at the beginning of Section 3.3). This process was repeated, refitting the model each time and removing one factor at a time, until all factors remaining were observed as significant covariates for either lead loading or lead concentration.

The final models varied by sample type. Appendix C displays the selected factors and their estimated effects by sample type and response (lead concentration, dust loading, lead loading). This table is explained in more detail in Section 4. In particular, all wipe samples were taken on floors in only one room of each of abated unit. Therefore, although for 4 of the 34 houses where these were taken a control room was selected, any room-to-room differences in lead loadings are confounded by

house-to-house variation. Therefore, room-level abatement effects were not estimated from the data collected by wipe sampling. In particular, differences between control rooms and abated rooms and substrate effects were ignored for wipe samples. By the same reasoning, we did not distinguish between substrates since samples in each house were taken side-by-side.

### 3.4 HYPOTHESIS TESTS

As stated in the Detailed Design Document (Battelle and MRI, 1992a), data were collected to test the following hypotheses:

$H_{01}$: Average lead levels in a typical abated room in a typical abated unit are equivalent to average lead levels in a control unit.

$H_{02}$: Average lead levels in a typical abated room in a typical E/E unit are equivalent to average lead levels in a typical abated room in a typical removal unit.

$H_{03}$: Average lead levels in a typical abated room in a typical abated unit are equivalent to average lead levels in a control room in a typical abated unit.

$H_{04}$: Unit to unit differences above and beyond those explained by the models are uncorrelated.

Hypothesis $H_{01}$ is equivalent to the hypothesis that $\beta_{PI}=0$, hypothesis $H_{02}$ is equivalent to the hypothesis that $\beta_{PID}=0$, and hypothesis $H_{03}$ is equivalent to the hypothesis that $\beta_{PR}=0$. Thus, the model parameters align perfectly with the hypotheses to be tested. Hypothesis $H_{04}$ will be tested via extensive correlation analyses in Section 5.

## 4.0 MODELING RESULTS

### 4.1 MODELING RESULTS SUMMARY

For most of the components sampled, lead levels were found to be higher in abated units than in control units. The most notable differences were observed for air ducts, floors, and exterior entryway (dust) samples. For each of these components, the differences in lead loadings were statistically significant. For floors and exterior entryways, this difference was marginal. In air ducts lead concentrations were significantly higher as well.

Differences were also observed in houses abated by the different methods. In every case where lead levels were higher in abated houses than in control houses, levels were also higher in houses abated by E/E methods than in those abated by removal methods. The most notable of these differences were observed in air ducts, on window stools, and on floors. For air ducts and window stools there were statistically significant differences in both lead loadings and lead concentrations. On floors the difference was marginally significant for loadings.

In all cases except interior entryway samples, lead levels were lower in the control rooms of abated units than in the abated rooms of abated units. In no case was the difference statistically significant.

There were some exceptions to the above generalizations. Lead loadings and lead concentration in window channels, and lead concentrations in dust at interior entryways of abated houses were slightly lower than in the control house samples. Lead loadings for window channels and lead concentrations for interior entryways were also slightly lower in E/E houses than in removal houses. In none of these cases was the result statistically significant.

One cautionary note should be mentioned concerning the interpretation of the differences observed in houses abated by the different methods. Due to abatement cost, most of the units which had very large amounts of abatement performed were abated

by E/E methods. This means that the lead problem was often greater in the houses selected for abatement by E/E methods. In other words, the results presented here indicating that lead levels were higher after abatement by E/E methods may simply be an artifact of the more severe initial condition in these houses.

There were some other factors which were found to be significantly correlated with differences in levels. Some of these were associated with house-to-house differences. These include:

- Specific abatement method used
- Abatement contractor
- HUD Demonstration abatement phase (early, intermediate, or late)
- Year the house was built
- Time since the house was cleared
- Questionnaire answers
  - occupations of residents
  - ages of occupants
  - measures of cleanliness
  - activities of occupants
  - ownership
- Proximity to a lead smelter.

Some factors were associated with differences at the sample level. These include:

- Substrate type and condition
- XRF measures taken prior to abatement
- Sampling deviations.

## 4.2 DETAILED MODELING RESULTS

### 4.2.1 Analysis of Abatement and Random Effects

This section presents estimated effects of the various abatement factors considered in the study on lead loading, lead concentration, and dust loading for each sample type collected. These estimates are to be interpreted as having been corrected for other practical effects found to be significant (e.g., ownership, XRF measurements, cleanliness, substrate, etc.). Also described in this section is uncontrolled and unexplained random variation from unit to unit, room to room (or side to side), and within room/side for each sample type.

#### Effects of Primary Abatement Factors

Table 4-1 displays estimates of the effects of the primary abatement factors on lead loadings. The first column provides the number of samples included in the model for each sample type. In many cases these numbers are lower than the total number of samples because of missing values of significant covariates. For instance, in some cases, the housing unit resident interviewed did not know the answers to some of the questionnaire items (e.g., ownership. cleanliness measures, etc.). The number of missing values were fewer than 20 for most sample types. However, for foundation soil samples, 30 observations were excluded. The HUD Demonstration XRF measures were found to be a significant factor and there were several observations in the CAP Study for which there was no corresponding XRF measure available from the HUD Demonstration.

Table 4-2 displays the estimated effects of the primary abatement factors for lead concentrations. Table 4-3 provides the corresponding results for dust loadings.

The second column in these tables contains the estimated geometric mean in units which were not abated. The estimate is to be interpreted as the average lead loading in control houses when the covariates included in the model are fixed at the nominal levels described in Table 4-4. The log

**Table 4-1. Estimates[1] of Effects of Primary Abatement Factors on Lead Loading; Controlling for Significant Covariates**

| Sample Type | No. of Samples/ Denominator Degrees of Freedom | Geometric Mean in Control Units After Controlling for Effects of Significant Factors | Ratio of Levels in Abated Rooms of Abated Units to those in Control Units | Ratio of Levels in E/E Units to those in R/R Units | Ratio of Levels in Control Rooms of Abated Units to those in Abated Rooms of Abated Units | Standard Deviation Estimates | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Unit-to-Unit Log Standard Deviation | Room-to-Room Log Standard Deviation | Residual Log Standard Deviation |
| Air Duct (Vacuum) | 86<br>(35) | 76<br>(0.52) | 4.70<br>(0.61)<br>.02 | 3.99<br>(0.68)<br>.05 | 0.73<br>(0.39)<br>.43 | 1.52<br>(0.86)<br>.00 | 1.18 | |
| Window Channel (Vacuum) | 86<br>(33) | 3909<br>(0.73) | 0.73<br>(0.78)<br>.68 | 0.60<br>(0.89)<br>.57 | 0.53<br>(0.53)<br>.23 | 1.09<br>(0.87)<br>.12 | 1.66 | |
| Window Stool (Vacuum) | 111<br>(59) | 37.9<br>(0.38) | 1.95<br>(0.49)<br>.18 | 4.64<br>(0.62)<br>.02 | 0.56<br>(0.42)<br>.18 | 0.90<br>(0.74)<br>.15 | 1.76 | |
| Floor (Wipe) | 65<br>(32) | ~~18.7~~<br>~~(0.21)~~ | -- | 1.48<br>(0.38)<br>.31 | -- | 0.73<br>(0.45)<br>.01 | 0.56 | |
| Floor (Vacuum) | 233<br>(105) | 35.3<br>(0.30) | 1.83<br>(0.34)<br>.08 | 1.87<br>(0.36)<br>.08 | 0.57<br>(0.33)<br>.10 | 0.00<br>-<br>- | 1.27<br>(0.53)<br>.00 | 0.94 |
| Entryway (Interior Vacuum) | 90<br>(34) | 531<br>(0.35) | 1.05<br>(0.38)<br>.90 | 1.15<br>(0.44)<br>.75 | 1.63<br>(0.41)<br>.24 | 0.00<br>-<br>- | 1.48 | |
| Entryway (Exterior Vacuum) | 97<br>(46) | 220<br>(0.37) | 2.24<br>(0.44)<br>.07 | 1.06<br>(0.50)<br>.91 | -- | 0.91<br>(0.69)<br>.08 | 1.47 | |

[1] Top value is multiplicative estimate, middle value is logarithmic standard error of estimate, and bottom value is observed significance level.

**Table 4-2. Estimates[1] of Effects of Primary Abatement Factors on Lead Concentration; Controlling for Significant Covariates**

| Sample Type | No. of Samples/ Denominator Degrees of Freedom | Geometric Mean in Control Units After Controlling for Effects of Significant Factors | Ratio of Levels in Abated Rooms of Abated Units to those in Control Units | Ratio of Levels in E/E Units to those in R/R Units | Ratio of Levels in Control Rooms of Abated Units to those in Abated Rooms of Abated Units | Standard Deviation Estimates | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Unit-to-Unit Log Standard Deviation | Room-to-Room Log Standard Deviation | Residual Log Standard Deviation |
| Air Duct (Vacuum) | 86<br>(35) | 332<br>(0.19) | 1.59<br>(0.23)<br>.05 | 2.01<br>(0.24)<br>.01 | 0.79<br>(0.23)<br>.30 | 0.00<br>(.)<br>. | 0.79 | |
| Window Channel (Vacuum) | 83<br>(29) | 1572<br>(0.52) | 0.81<br>(0.55)<br>.71 | 1.86<br>(0.63)<br>.34 | 0.66<br>(0.36)<br>.25 | 0.84<br>(0.62)<br>.06 | 1.12 | |
| Window Stool (Vacuum) | 111<br>(59) | 413<br>(0.29) | 1.70<br>(0.37)<br>.16 | 2.71<br>(0.48)<br>.04 | 0.65<br>(0.31)<br>.16 | 0.74<br>(0.56)<br>.08 | 1.29 | |
| Floor (Vacuum) | 233<br>(105) | 122<br>(0.19) | 1.07<br>(0.22)<br>.76 | 1.20<br>(0.23)<br>.42 | 0.84<br>(0.22)<br>.44 | 0.00<br>-<br>- | 0.73<br>(0.35)<br>.00 | 0.77 |
| Entryway (Interior Vacuum) | 90<br>(34) | 182<br>(0.24) | 0.85<br>(0.27)<br>.56 | 0.95<br>(0.31)<br>.88 | 1.28<br>(0.26)<br>.34 | 0.49<br>(0.41)<br>.15 | 0.84 | |
| Entryway (Exterior Vacuum) | 97<br>(46) | 184<br>(0.22) | 1.19<br>(0.26)<br>.51 | 1.00<br>(0.29)<br>.99 | - | 0.52<br>(0.41)<br>.10 | 0.89 | |
| Entryway (Soil) | 109<br>(12) | 111<br>(0.18) | 1.18<br>(0.22)<br>.46 | 1.18<br>(0.24)<br>.52 | - | 0.37<br>(0.35)<br>.27 | 0.71<br>(0.38)<br>.00 | 0.40 |
| Foundation (Soil) | 88<br>(14) | 290<br>(.19) | 1.17<br>.21<br>.46 | 0.72<br>(0.33)<br>.34 | - | .21<br>.24<br>.44 | .44<br>.26<br>.00 | 0.27 |
| Boundary (Soil) | 120<br>(20) | 109<br>(0.14) | 1.18<br>(0.17)<br>.35 | 1.27<br>(0.18)<br>.21 | - | 0.38<br>(0.25)<br>.01 | 0.44<br>(0.22)<br>.00 | 0.21 |

[1] Top value is multiplicative estimate, middle value is logarithmic standard error of estimate, and bottom value is observed significance level.

**Table 4-3. Estimates[1] of Effects of Primary Abatement Factors on Dust Loading; Controlling for Significant Covariates**

| Sample Type | No. of Samples/ Denominator Degrees of Freedom | Geometric Mean in Control Units After Controlling for Effects of Significant Factors | Ratio of Levels in Abated Rooms of Abated Units to those in Control Units | Ratio of Levels in E/E Units to those in R/R Units | Ratio of Levels in Control Rooms of Abated Units to those in Abated Rooms of Abated Units | Standard Deviation Estimates | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Unit-to-Unit Log Standard Deviation | Room-to-Room Log Standard Deviation | Residual Log Standard Deviation |
| Air Duct (Vacuum) | 86<br>(35) | 202<br>(.48) | 3.11<br>(.57)<br>.05 | 1.80<br>(0.63)<br>.36 | 0.91<br>(0.34)<br>.78 | 1.45<br>(0.79)<br>.00 | 1.00 | |
| Window Channel (Vacuum) | 86<br>(33) | 2451<br>(0.51) | 0.90<br>(0.54)<br>.84 | 0.33<br>(0.61)<br>.08 | 0.80<br>(0.37)<br>.56 | 0.72<br>(0.69)<br>.28 | 1.18 | |
| Window Stool (Vacuum) | 111<br>(59) | 92<br>(0.22) | 1.16<br>(0.28)<br>.60 | 1.72<br>(0.36)<br>.14 | 0.86<br>(0.26)<br>.55 | 0.43<br>(0.43)<br>.31 | 1.08 | |
| Floor (Vacuum) | 233<br>(105) | 348<br>(0.26) | 1.69<br>(0.29)<br>.08 | 1.52<br>(0.32)<br>.19 | 0.67<br>(0.25)<br>.12 | 0.49<br>(0.44)<br>.22 | 0.84<br>(0.45)<br>.00 | 0.86 |
| Entryway (Interior Vacuum) | 90<br>(34) | 3053<br>(0.25) | 1.19<br>(0.28)<br>.54 | 1.24<br>(0.31)<br>.49 | 1.31<br>(0.29)<br>.36 | 0.00<br>-<br>- | 1.06 | |
| Entryway (Exterior Vacuum) | 97<br>(46) | 1151<br>(0.25) | 1.95<br>(0.30)<br>.03 | 1.05<br>(0.33)<br>.88 | . | 0.40<br>(0.50)<br>.52 | 1.19 | |

[1] Top value is multiplicative estimate, middle value is logarithmic standard error of estimate, and bottom value is observed significance level.

## Table 4-4. Multiplicative Effects of Secondary Abatement Factors

| Factor | Sample Type | Nominal | Deviation | Multiplicative Effect | | |
|---|---|---|---|---|---|---|
| | | | | Lead Loading | Lead Concentration | Dust Loading |
| Total Interior Square Feet Abated | Floor (Vacuum) | 282 for Typical E/E<br>61 for Typical Removal | Double square feet abated | 1.03<br>- | 1.14*<br>- | 0.91<br>- |
| | Window Channel | 282 for Typical E/E<br>61 for Typical Removal | Double square feet abated | 1.34<br>- | 1.31*<br>- | 1.02<br>- |
| Total Exterior Square Feet Abated | Window Channel | 628 for Typical E/E<br>260 for Typical Removal | Double square feet abated | 0.49*<br>- | 0.59*<br>- | 0.83<br>- |
| | Foundation | 628 for Typical E/E<br>260 for Typical Removal | Double square feet abated | NA<br>NA | 0.65*<br>- | NA<br>NA |
| Percent Exterior Abatement by E/E Methods | Floor (Wipe) | Typical Abated | (Effect equals ratio of typical E/E to typical removal) | 0.44* | NA | NA |
| Interior Removal Method<br>· Chemical Stripping<br>· Removal/Replace<br>· Heat Gun<br>· Removal | Window Channel | <br>30%<br>15%<br>15%<br>40% | <br>+10%<br>+10%<br>+10%<br>+10% | <br>0.90<br>1.00<br>1.06<br>1.06 | *<br>1.05<br>1.03<br>1.33<br>0.70 | <br>0.85<br>0.97<br>0.79<br>1.52 |
| Abatement Contractor<br>· A (3 units)<br>· B (15 units)<br>· C (13 units)<br>· D (4 units) | Air Ducts | NA | NA | <br>0.55<br>1.01<br>0.78<br>3.35 | *<br>2.34<br>0.77<br>0.91<br>1.81 | <br>0.24<br>1.36<br>0.83<br>1.87 |
| | Floor (Wipe) | NA | NA | *<br>4.70<br>0.68<br>1.58<br>0.12 | NA | NA |
| Phase<br>· 1 (13 units)<br>· 2 (13 units)<br>· 3 (9 units) | Window Stool | NA | NA | *<br>12.43<br>1.04<br>0.33 | *<br>6.73<br>1.09<br>0.44 | <br>1.84<br>0.97<br>0.77 |
| Months between clearance and sampling | Window Stool | 24 | 1 month | *<br>0.62 | *<br>0.67 | 0.93 |
| Last XRF measure at sample location during HUD demonstration (log) | Foundation | -0.964 for control<br>0.094 for abated | | NA | 1.28* | NA |

* Significant at the 10% level.

standard error of these estimates appears in parentheses below each estimate.

Figure 4-1 displays estimated geometric means in control units by sample type for lead loading, lead concentration and dust loading. Some interesting points to note regarding these geometric means are as follows:

- The highest lead loadings were observed in the window channels, and the lowest were observed on floors.
- Floor dust loadings and interior entryway dust loadings were higher than those in the air ducts.
- Foundation soil lead concentration appears to be much higher than boundary or entryway concentrations in these houses.
- Similar relationships exist among the three measures for interior and exterior entryway dust, with higher levels indoors.

One thing to keep in mind when observing dust levels on floors (and interior entryways) is that substrate was an important differentiating factor. The geometric means are based on samples taken from carpet, because it was the most frequent substrate sampled, but carpet had much higher levels of dust than any of the other substrates. Therefore, geometric mean lead loadings appear higher than if substrate was not controlled.

The third column in Tables 4-1, 4-2, and 4-3 displays the estimated ratio of levels in abated rooms of abated houses to levels in control houses. The fourth column contains the estimated impact of abatement method, which should be interpreted as the ratio of levels in typical E/E units to levels in typical removal units (see Section 3.2). The fifth column in these tables gives an estimate of the ratio of levels in control rooms of abated houses to levels in abated rooms of abated houses. The log standard error and significance level of these estimates

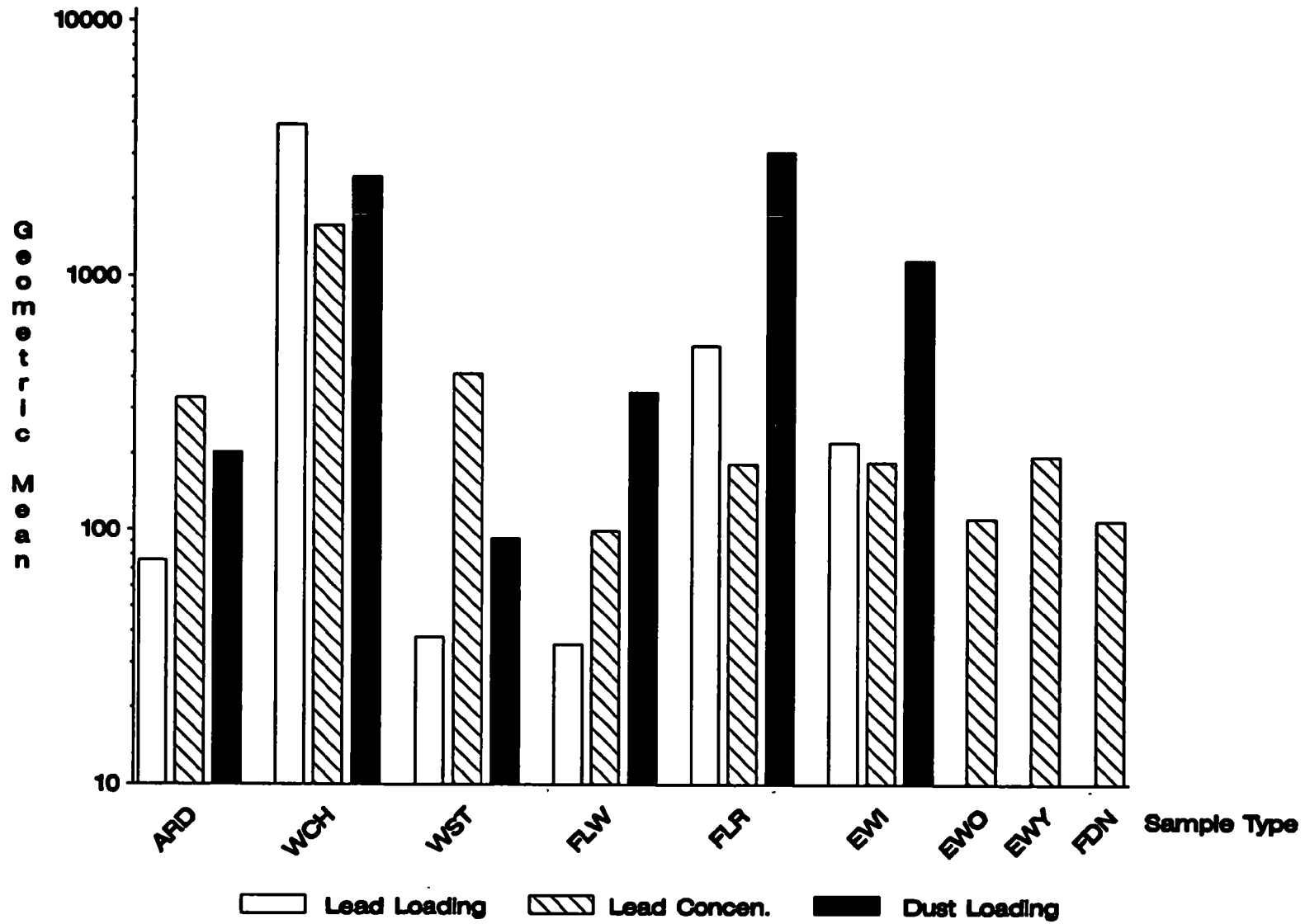


Figure 4-1. Geometric mean lead loading ($\mu g/ft^2$), lead concentration ($\mu g/g$), and dust loading ($mg/ft^2$) in control units after controlling for effects of significant factors.

appear beneath each estimate. The latter represents the observed significance of a test that the ratio equals 1.

The following are the significant results for the estimated effects of primary abatement factors:

- Air Ducts -- Lead loadings, lead concentrations, and dust loadings were higher in abated units than in control units. Lead loadings and lead concentrations were higher in E/E units than removal units.

- Window Channels -- Dust loadings were lower in abated units.

- Window Stools -- Lead loadings and lead concentrations were higher in E/E units than in removal units.

- Floors (Vacuum) -- Lead loadings and dust loadings were higher in abated units than in control units (marginally). Lead loadings were higher in E/E units than in removal units (marginally). Lead loadings were lower in control rooms of abated units than in abated rooms (marginally).

- Exterior Entryway -- Lead loadings and dust loadings were higher in abated units than in control units. (For lead loadings, the difference was marginal.)

The estimates from columns 3, 4, and 5 of Tables 4-1, 4-2, and 4-3 are displayed graphically in Figures 4-2, 4-3, and 4-4 for lead loading, lead concentration, and dust loading, respectively. Reference lines are provided on these plots at a level of one. A bar which rises above the reference line for the 'Abatement' factor indicates that for this sample type levels were higher in abated houses than in control houses. A bar which rises above the reference line for the 'Method (E/R)' factor indicates that the levels in E/E units were higher than those in removal units. If the 'Ctrl Room' effect is greater than one, then levels in unabated rooms of abated houses were higher than in abated rooms.

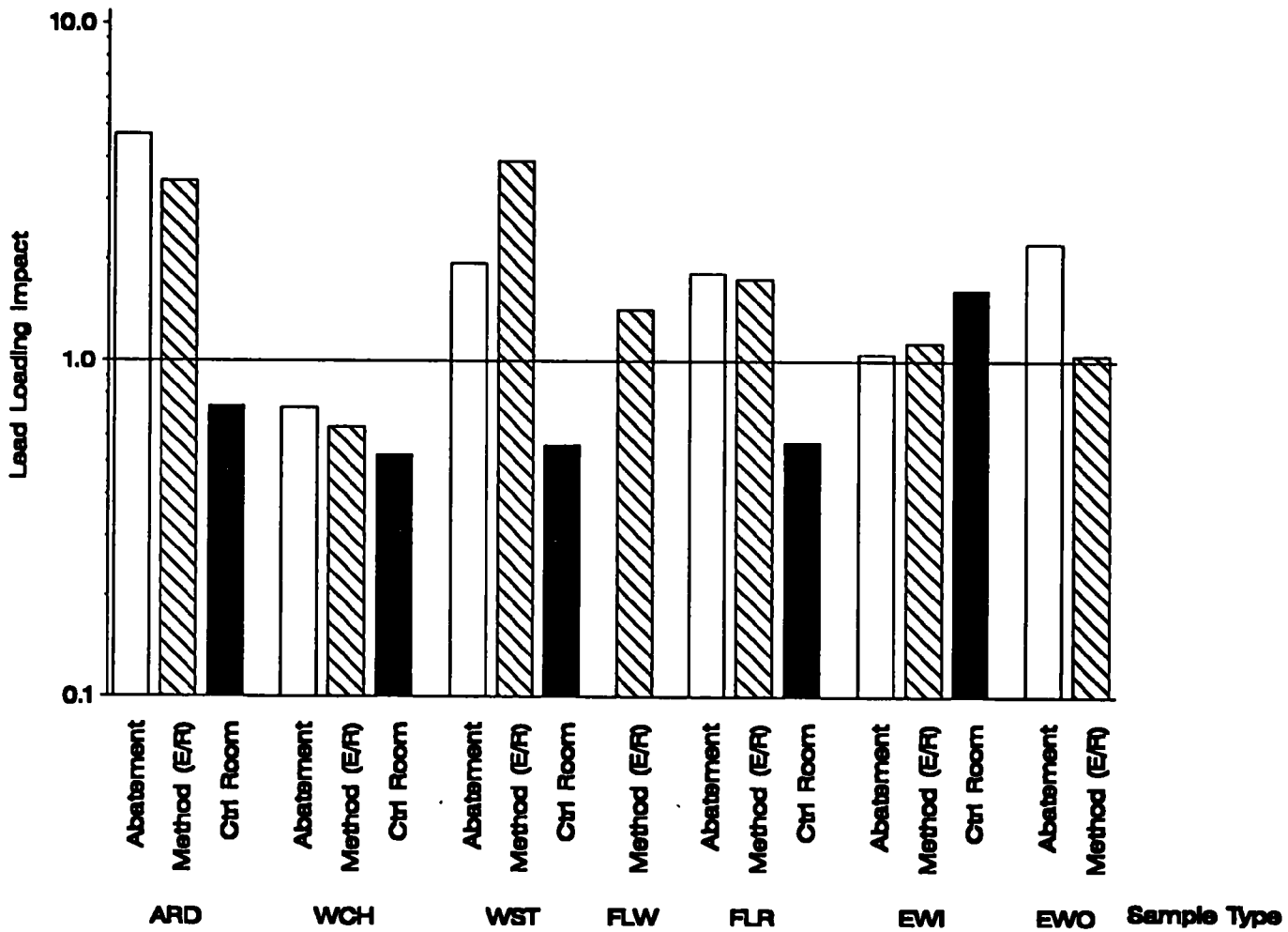


Figure 4-2. Estimated multiplicative effects of abatement from mixed model ANOVA: Lead loading ($\mu g/ft^2$).

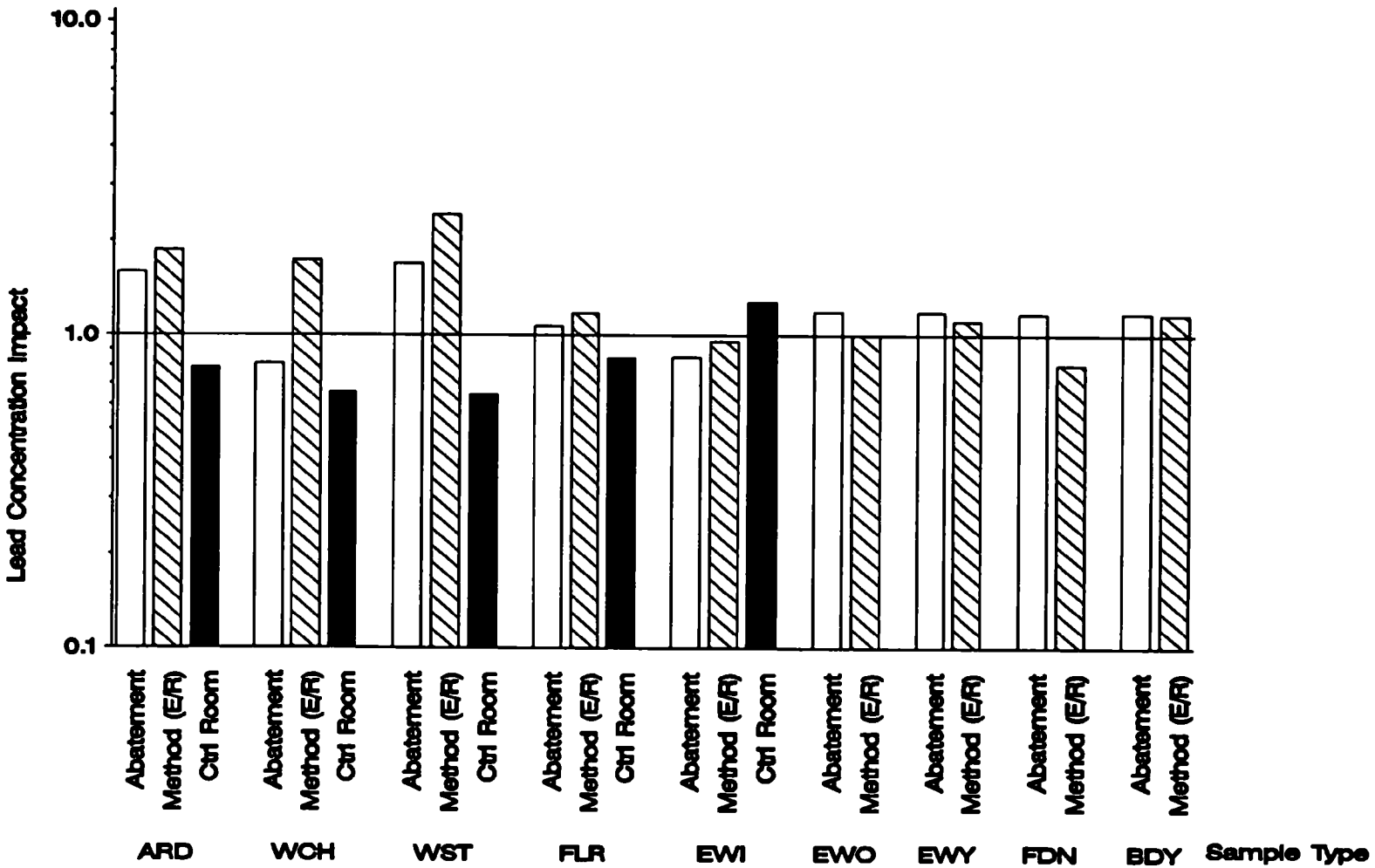


Figure 4-3. Estimated multiplicative effects of abatement from mixed model ANOVA: lead concentration (μg/g).

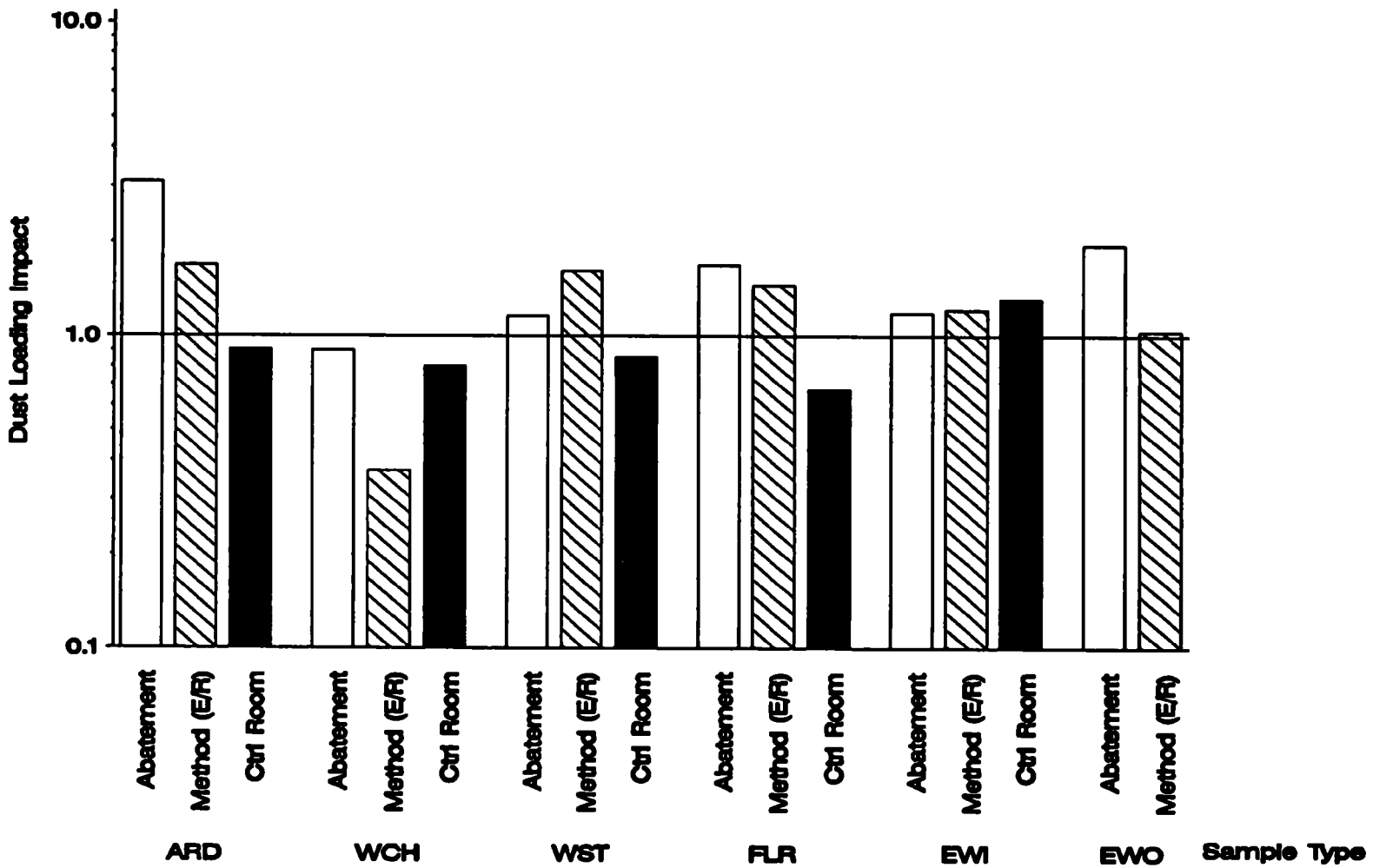


Figure 4-4. Estimated multiplicative effects of abatement from mixed model ANOVA: dust loading (mg/ft$^2$).

The most significant difference between abated and control houses was observed in the air ducts for lead loadings and lead concentrations. Perhaps more striking in these figures is the frequency with which the 'Method (E/R)' bar rises above the reference line. As mentioned above, this indication that E/E houses have higher lead levels than removal houses could simply be a reflection of a more serious initial lead problem in the E/E houses.

Similarly, the figures portray lower levels in the control rooms of abated houses than in abated rooms of the same houses. This indicates that abatement performed in the rooms that needed it did not reduce lead levels to the baseline levels found in control rooms that did not require abatement.

Analysis of Random Effects

The last three columns of Tables 4-1 through 4-3 provide estimates of the unit-level, room/side-level, and residual error-level variance components. Only in the case of vacuum floor samples and soil samples were the room/side of house-level variance components estimable. The values presented are given as standard deviations of the log-transformed responses. Except in the case of residual standard deviation, each estimate is followed by its standard error estimate and a test of significance that the log standard deviation equals zero. Figures 4-5, 4-6, and 4-7 display the estimates of these variance components. The variances are summed and stacked in these plots providing an estimate of overall uncontrolled variance in the measures. Interesting points to note regarding the variance estimates are the following:

- There is much more variation from sample to sample on the window channel and window stool measurements than floor measurements.
- In air ducts, although there is large unit-to-unit variation in lead loading, it is negligible for lead concentration.

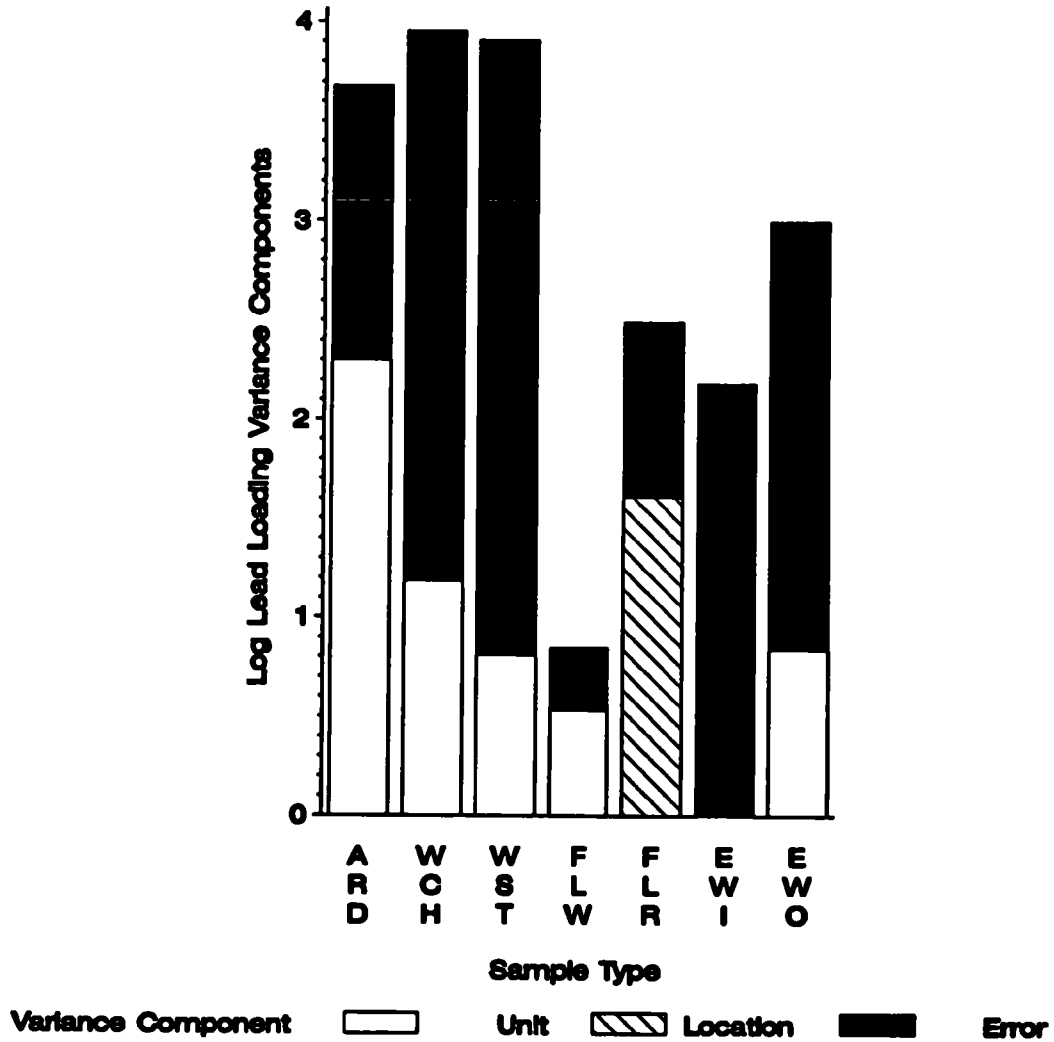


Figure 4-5. Variance component estimates from mixed model ANOVA: lead loading ($\mu g/ft^2$).

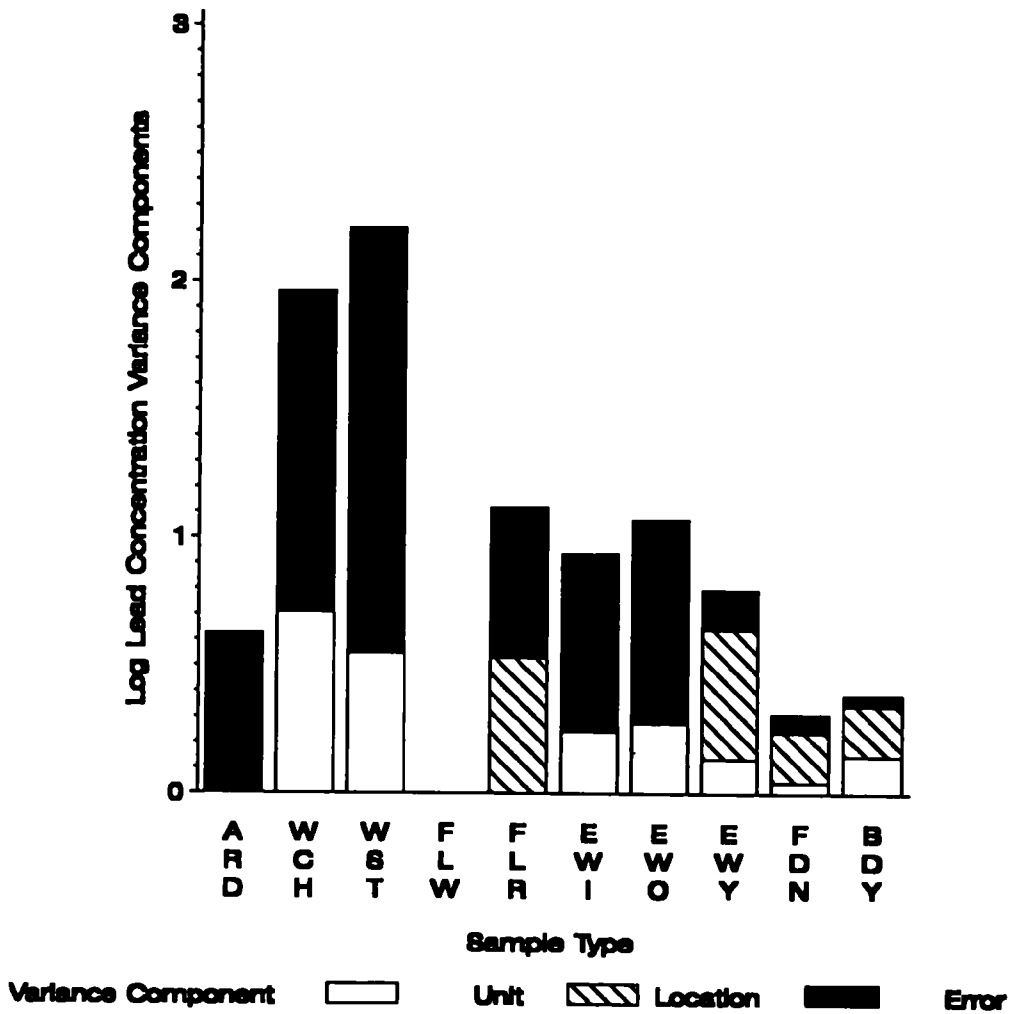


Figure 4-6. Variance component estimates from mixed model ANOVA: lead concentration (μg/g).

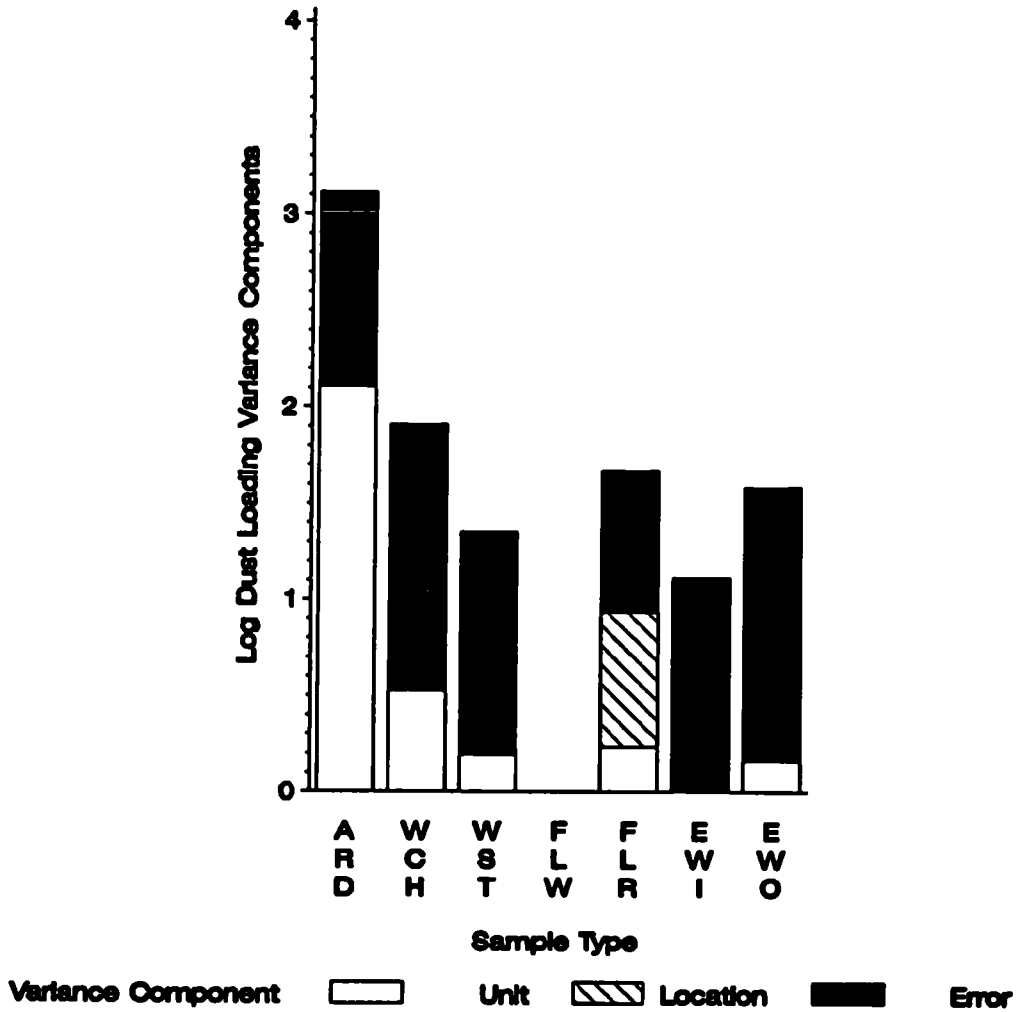


Figure 4-7. Variance component estimates from mixed model ANOVA: dust loading (mg/ft$^2$).

- Among soil samples, uncontrolled (error) variation was smallest for foundation samples, largest for entryways.

One of the considerations in interpreting these variance components is that different models were fit to each sample type. Therefore, for some sample types, more factors are controlled. For example, more factors were controlled in the case of foundation soil samples than any of the other soil samples; in particular, this was the only sample type for which XRF measures from the HUD Demonstration were included.

Effects of Secondary Abatement Factors

Table 4-4 displays estimates of the effects of secondary abatement factors found to be significantly associated with lead levels for at least one of the sample types. Some important items to note regarding the effects of these secondary abatement factors are:

- Units with large amounts of interior abatement were associated with higher lead concentrations and loadings on floors and window channels.

- Units with large amounts of exterior abatement were found to have lower lead loadings and concentrations in window channels, and lower lead concentrations in foundation soil samples.

- Lead concentrations in window channels were impacted by the specific removal method used (chemical stripping, removal and replacement, heat gun stripping, or other removal).

- Different contractors used to perform the abatements in the HUD Demonstration were found to significantly effect the lead levels in air ducts and wipe floor samples.

- Houses abated during the Demonstration were abated in three different phases according to the magnitude of the abatement required; units with the most severe lead problems were abated first. Abatement phase was found to be significant in

distinguishing between lead levels in window stool samples.

- The length of time since clearance testing during the HUD Demonstration was found to be significant, with lower lead levels found at houses cleared more than 24 months before CAPS sampling.

- The average of the (log) XRF or AAS measures taken during the HUD Demonstration was found to be significant, with higher lead concentrations found at houses with higher XRF/AAS readings.

The second column of Table 4-4 displays the sample types for which each of these factors was significant. This is followed by a description of the nominal level of the factor. The geometric means displayed in Table 4-1 through 4-3 should be interpreted as though levels of these factors were fixed at the nominal levels. The fourth column of Table 4-4 describes the deviation from nominal with which the multiplicative effects in the last three columns are associated. An asterisk is placed in the multiplicative effect box for each response where the association was significant at the 10 percent level.

For example, the estimated geometric mean lead concentration on window channels in control units (Table 4-2) was 1572. The time between clearance and CAPS sampling, and the specific removal method used were found to be significant. Nominally, time since clearance was 24 months. To obtain an estimate of the level for a control house which was cleared by XRF 27 months before sampling - holding all other factors constant - multiply the geometric mean from Table 4-2 by the estimated effect (0.67) of this factor 3 times. That is

$$1572 * (0.67)^3 = 473.$$

To evaluate the effect of deviating from the nominal levels of abatement by specific removal methods, each of the deviations needs to be accounted for. For example, the multiplicative

adjustment to lead concentration necessary to describe levels in an abated unit in which 50 percent of the removal was done with a heat gun and 50 percent was done by chemical stripping, would be $(1.05)^2\ (1.03)^{-1.5}\ (1.33)^{-1.5}\ (0.70)^1 = 0.48$. The factors in this equation come from Table 4-4, and relate to the interior removal abatement method (e.g., factor 1.05 for chemical stripping), as well as the percentage of each method used as it deviates from the nominal level (e.g., the exponent for factor 1.05 represents two "deviations" from the nominal percentage of 30%).

By the method of variable screening, every factor represented in this table is significant for either lead loading or lead concentration. It is interesting to note that every one of these factors had a significant association with lead concentration.

Appendix C contains the detailed model fitting results listed by sample type and response ('CONC' = lead concentration, 'DUST' = dust loading, 'LOAD' = lead loading). Each factor included in the final model is listed under 'Parameter'. This is followed by the degrees of freedom for estimating the error term to which the effect was compared (except in the row displaying the number of observations). This is followed by the column containing the multiplicative effect of the factor (simply the geometric mean for the intercept). The logarithm of this effect appears in the next column (except in the case of the lines for variance components). The log standard error is then presented, followed by the significance of the result. Standard deviation estimates for variance components' ('STUDYID' = house, 'LOCATION (STUDYID)' = room or side, 'Standard Reviation Estimate') appear in the 'Estimate' column.

### 4.2.2 Analyses of Abatement and Random Effects by Sample Type

The previous section summarized modeling results across all sample types collected. This section breaks down these modeling results into more detailed discussions for each sample type separately.

#### 4.2.2.1 Dust Samples

This subsection presents modeling results for all locations at which dust samples were collected.

**Air Ducts.** There were significantly higher levels of lead in air ducts of abated houses than in control houses, and levels were significantly higher in houses abated by the E/E methods than by the removal methods. Lead loadings were 5 times higher and lead concentrations were 60 percent higher in abated homes. Lead loadings in typical E/E units were approximately 4 times higher than in typical removal units. Concentrations were only about twice as high. Control rooms in the abated houses did not have lead levels significantly different than those in abated rooms of the same houses.

Unit-to-unit variation was highest in air ducts for lead loadings and dust loadings. However, unit-to-unit variation in air duct lead concentration was negligible. This indicates that for air ducts, most house-to-house variation in air duct lead loading is due to the differences in dust levels in these houses.

**Window Channels.** There was no significant difference in lead levels observed in the window channels of abated and control houses. Nor were there differences between levels in units abated by different methods.

However, total square feet abated - both interior and exterior - was a significant covariate. Doubling exterior square feet abated was associated with a reduction of lead loadings by half, and lead concentrations by 40 percent. Doubling interior square feet abated was associated with a 31 percent increase in lead concentration.

Units abated by E/E methods typically had much more abatement performed than the units abated primarily by removal methods. The estimates provided are adjusted for this potential confounding factor. The baseline square footage abated in a typical removal house is 61 square feet; the baseline in a typical E/E house is 282 square feet. These numbers are based on a regression of (log) square feet abated on the percent abated by E/E methods.

There were marginally significant differences in lead concentration associated with use of the specific removal methods on the interior. Of the four different methods, heat gun use was associated with the highest concentrations. Pure removal was associated with the lowest concentrations.

Window channels and window stools were associated with the greatest total variation in lead levels. The differences were particularly notable for lead concentrations. On window channels there was large house-to-house variation in lead levels. It was statistically significant for lead concentrations.

**Window Stools.** Although lead loadings were about twice as high on window stools of abated units, there was no significant difference in lead loadings or concentrations observed between abated and control houses. Lead loadings were 4.6 times as high on window stools in the average E/E house than in the average removal house. Lead concentrations were about 2.7 times as high in these houses. Each of these results was significant. There were no significant differences in dust loadings between these houses, so it appears that the differences in lead levels are primarily related to lead concentration. Although lead levels were lower in control rooms of abated houses (almost 50% lower for lead loadings), the differences were not statistically significant.

As mentioned above, variation in window stool measures is very high compared to other sample types. Thus, it is even more notable that the differences between houses abated by the different methods are statistically significant.

**Floor (Wipe).** Method was the only abatement effect which was estimated for floor lead loadings from wipe samples. This was not a significant factor.

House-to-house variation was significant for this sample type, but it was moderate in magnitude. The estimated residual log standard deviation was smallest for this sample type, but this requires some explanation. By design, the floor wipe samples were taken to compare with the floor vacuum samples (see Section 6). Two side-by-side samples were taken per abated house. Thus, the residual log standard deviation is really a measure of side-by-side sample variability. This is in contrast with the other dust sample types for which the two samples per house were often taken from different rooms.

**Floor (Vacuum Samples).** About twice as many floor (vacuum) samples were taken than any other sample type in the study. For lead loadings, there were marginally significant differences in each of the following relationships:

- Levels were twice as high in abated units as in control units ($p = .08$),
- Levels were twice as high in units abated by E/E methods as in units abated by removal methods ($p = .08$), and
- Levels were almost twice as high in abated rooms of abated units as in control rooms of abated units ($p = .10$).

Similar but less extreme differences were seen in the dust loadings. Any differences in lead concentration were not significant. Thus, differences in lead loadings seem mainly due to differences in dust present on floors.

However, there was a significant relationship between the total square feet abated indoors and lead concentration. Houses where large amounts of abatement were performed were associated with higher levels. Doubling square feet abated indoors was associated with about 30% higher concentrations.

There were negligible house-to-house differences in both lead loadings and lead concentrations. Although not significant, there were differences present in dust loadings. There were significant room-to-room differences within houses for all three measures. It is interesting to note that in Figure 4-3, the room-to-room variance component alone for vacuum floor samples is greater than the estimated total variance for the corresponding wipe samples. Another practical note is that the residual log standard deviation estimate (the within-room component) is larger than that for wipe floor samples. In some cases, repeated samples taken within the same room were taken from different locations within the room. Thus, this standard deviation includes side-to-side within-room variation, whereas, the floor wipe residual standard deviation does not. Section 6 compares the results of these two samples types in detail.

**Interior Entryway.** There was no significant difference observed in lead levels among the three categories of homes. Nor was there a significant control room effect in abated homes.

Perhaps the most interesting thing to note about these samples is the corrected geometric mean lead loading. The estimated lead loading for interior entryways is 15 times higher than that for regular floor (vacuum) samples. This difference is due to only a 50% difference in lead concentration, but a 10 fold difference in dust loading. As mentioned earlier, the baseline substrate to which these estimates pertain is carpet. Carpet retains much more dust than other substrates, and since people tend to brush off dirt from their shoes at the entryways of homes, this may be the cause of the difference.

There was significant house-to-house variation in lead concentration, but not in lead loading or dust loading. Residual log standard deviation was relatively large for lead loading.

**Exterior Entryway (Dust).** There were marginally significant differences in lead loading ($p = .07$) in the dust outside the entryways sampled. These differences were due to significantly higher dust levels at the abated units ($p = .03$),

not to higher concentrations of lead in this dust. There was no difference observed in levels abated by different methods.

House-to-house variation in lead loading at exterior entryways was marginally significant. This was due to variations in lead concentration (which were also marginally significant), not to dust loading variations. Residual log standard deviation was very large for lead loading (as for the interior entryways).

#### 4.2.2.2 Soil Samples

Lead concentrations were highest in the soil near foundations, followed by entryway soil and boundary soil (which had similar levels). Concentrations were about 18 percent higher in abated houses than in control houses for each of these sample types, but in no case was this difference significant. There was significant side-to-side variation for each of the measures. Side-by-side variation was largest at the entryways, smallest at the boundaries.

Although abatement was not a significant factor distinguishing between lead concentration, several other factors were significantly associated with lead concentration. These are discussed in the next two subsections.

**Entryway (Soil).** There was no significant difference observed between soil concentrations at the entryways of abated and control units, and there was no difference observed between units abated by different methods on the exterior.

There was no significant house-to-house difference in entryway soil lead concentrations, but there were significant differences between levels observed at different entryways to the same houses.

**Boundary Soil.** There was no difference observed between soil concentrations at the boundaries of abated and control units, nor were there differences observed between levels at houses abated by different methods.

There was significant random house-to-house variation, and significant side-to-side within-house variation.

**Foundation Soil.** There was no significant difference found between lead concentrations in abated units and control units. Also, differences observed between levels in houses abated by different methods were not significant. Lead concentrations were significantly lower in the foundation soil of houses with more than average abatement performed on the exterior. Houses where twice as much abatement was performed outside were found to have 35% lower lead concentrations.

House-to-house differences were not significant, but side-to-side variation was significant. There was a strong correlation between the foundation soil lead concentrations observed in the CAP Study and the XRF/AAS measures taken during the HUD Demonstration. This relationship is displayed in Figure 4-8. In this figure, lines of best fit are drawn separately for control and abated houses. Although lead concentrations are higher on average in abated houses than in control houses, there is evidently a similar relationship in both groups of houses.

### 4.2.3 Analysis of Non-Abatement Factors

Table 4-5 displays the effects of non-abatement factors found to be significantly associated with lead levels. These included substrate, questionnaire responses, proximity of the house to a lead smelter, age of the house, etc. The format of the table is exactly the same as Table 4-4 with an initial column added to distinguish between classes of related factors. These classes include substrate, cleanliness, occupation, activities, age/location of home, ownership, and sampling deviations.

None of these factors was found to be significant for more than three sample types. For every sample type, lead loading or lead concentration was observed to be significantly associated with at least one of these factors.

The substrate from which samples were collected was a significant factor for window channels and floors. This is displayed in Figure 4-9 for floors with a box and whisker plot. (The same format is used in this plot as was used in Section 2

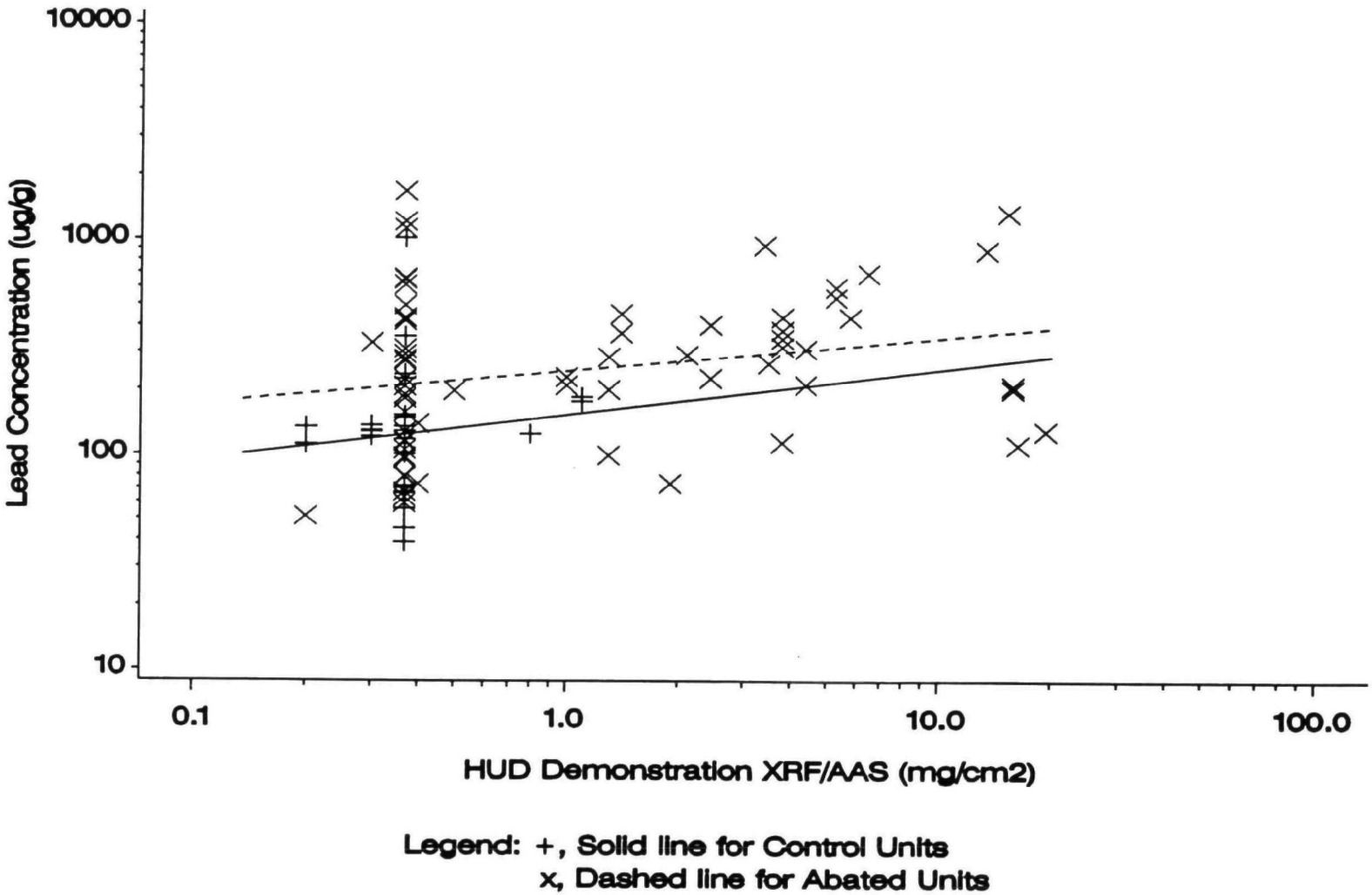


Figure 4-8. Foundation soil lead concentration vs. HUD Demonstration XRF/AAS levels.

## Table 4-5. Multiplicative Effects of Non-Abatement Factors

| Type of Expanatory Variable | Factor | Sample Type | Nominal | Deviation | Multiplicative Effect | | |
|---|---|---|---|---|---|---|---|
| | | | | | Lead Loading | Lead Concentration | Dust Loading |
| Substrate | Substrate Type | Window Channel | Wood (44)** | | * | | * |
| | | | | Concrete (1) | 0.15 | 0.58 | 0.28 |
| | | | | Metal (33) | 0.37 | 0.41 | 0.94 |
| | | | | Plastic (5) | 0.03 | 0.23 | 0.13 |
| | | Floor (Vacuum) | Carpet (84) | | * | * | * |
| | | | | Concrete (4) | 13.76 | 3.56 | 4.24 |
| | | | | Linoleum (85) | 0.14 | 1.06 | 0.14 |
| | | | | Tile (20) | 0.12 | 1.15 | 0.11 |
| | | | | Wood (40) | 1.45 | 2.70 | 0.57 |
| | | Entryway (Interior) | Carpet (47) | | * | | * |
| | | | | Linoleum (26) | 0.15 | 0.94 | 0.15 |
| | | | | Plastic (2) | 0.01 | 0.76 | 0.01 |
| | | | | Tile (7) | 0.03 | 1.08 | 0.03 |
| | | | | Wood (8) | 0.35 | 1.34 | 0.27 |
| | Substrate Condition | Air Duct | Good (82) | | * | * | * |
| | | | | Damaged (1) | 41 | 1.5 | 28 |
| | | | | Peeling (3) | 28 | 6.7 | 2.5 |
| | | Window Channel | Good (48) | | | * | |
| | | | | Chalking (2) | 2.84 | 4.07 | 0.71 |
| | | | | Peeling (33) | 2.25 | 2.35 | 0.95 |
| Cleanliness | Frequency of wet mopping uncarpeted floors | Air Duct | 12 | 6 | 0.97 | 0.98* | 0.98 |
| | Frequency of window sill dusting | Air Duct | 1 | 1 | 0.99 | 1.03* | 0.96 |
| | Frequency of vacuuming uncarpeted floors | Floor (Vacuum) | 12 | 6 | 1.02 | 1.03* | 0.99 |
| | | Entryway (Interior) | 12 | 6 | 1.06* | 1.06* | 0.99 |
| | | Entryway (Exterior) | 12 | 6 | 1.00 | 1.05* | 0.96* |

* Significant at the 10% level.
** Numbers in parentheses following substrate types and substrate conditions represent the number of substrates of this type or this condition for this sample type.

## Table 4-5. (Continued)

| Type of Expanatory Variable | Factor | Sample Type | Nominal | Deviation | Multiplicative Effect | | |
|---|---|---|---|---|---|---|---|
| | | | | | Lead Loading | Lead Concentration | Dust Loading |
| Occupation | Wearing home work clothes from an occupation with potential lead contamination | Window Stool | No | Yes | 3.04* | 1.53 | 1.96* |
| | Resident employed in welding occupation | Floor (Vacuum) | No | Yes | 1.49 | 1.26* | 1.19 |
| | | Foundation | No | Yes | NA | 1.13* | NA |
| | Resident employed in paint removal occupation | Boundary | No | Yes | NA | 0.45* | NA |
| Activities | Frequency of removing paint at home | Entryway (Interior) | 0 | 1 | 1.06 | 1.10* | 0.97 |
| | | Foundation | 0 | 1 | NA | 0.84* | NA |
| | Frequency of pipe or electrical component soldering | Boundary | 0 | 1 | NA | 1.46* | NA |
| Age/Location of Unit | Proximity to supposed lead smelter | Entryway (Soil) | > 3 miles | 1 mile closer** | NA | 1.37* | NA |
| | Year house was built | Foundation | 1932 | 10 years | NA | 0.73* | NA |
| | | Boundary | 1932 | 10 years | NA | 0.84* | NA |
| Other Resident Factors | Number of children (7-17) | Entryway (Interior) | 0 | 1 child | 0.64* | 0.81* | 0.78* |
| | Ownership of home | Foundation | Owner | Renter | NA | 0.34* | NA |
| | Number of months at residence | Foundation | 18 | 1 month | NA | 0.94* | NA |
| Sampling Deviations | Substrate Location | Air Duct | Inside Air Duct (48)*** | Cover of Air Duct (38)*** | 0.18* | 0.78 | 0.26* |
| | Sampling Device | Window Channel | Large Nozzle (60) | Small nozzle (26) | 2.61 | 1.18 | 2.26* |

* Significant at the 10% level.
** See discussion in Section 4.2.4.
*** Number in parentheses following sampling deviation levels represents the number of samples collected in this manner.

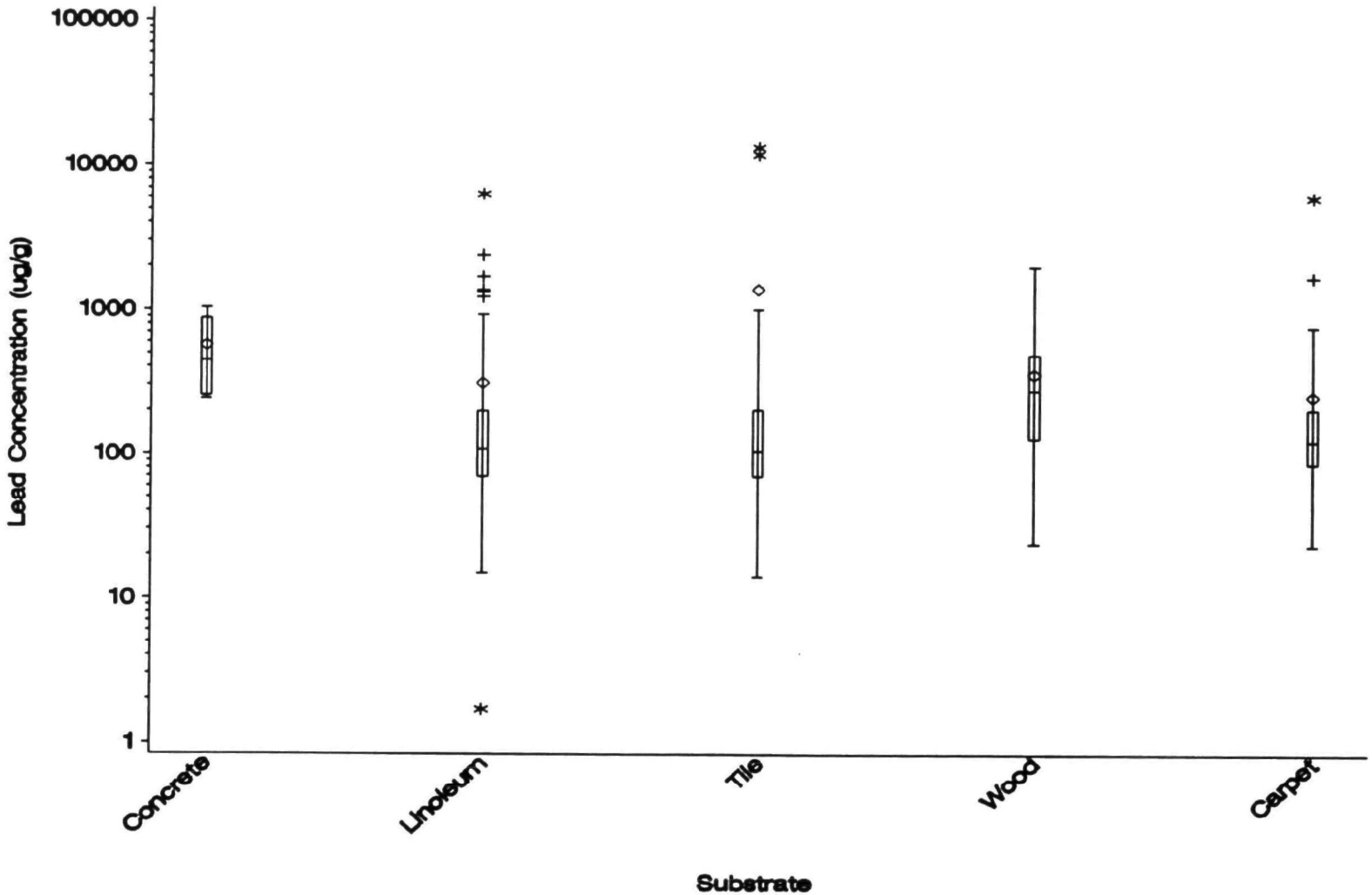


Figure 4-9. Floor dust lead concentration vs. substrate.

plots.) The corrected geometric means presented in Tables 4-1 through 4-3 are to be interpreted as the mean of the nominal substrate. Table 4-4 presents the nominal substrate and the ratio of levels observed for other substrates relative to those for the nominal substrate. Nominal substrates were chosen because they were sampled most frequently in the study.

In general, on the floors (including interior entryways), carpet had higher dust loadings than any of the other sample types. (There were only four samples taken on concrete, but dust loading there was higher.) Lead concentrations were typically highest on wood for all of the sample types where substrate was found to be significant. Lead loadings were higher on wood than on carpet for regular floor samples, but the opposite was true at the entryways. This is because the ratios of lead concentration and dust loading on wood to those on carpet for regular floor samples are both twice as high as for entryways.

The condition of the substrate was also significant, with damaged, peeling, and chalking substrates noted for higher lead concentrations. Sampling deviations were also significant factors. On some air ducts, the cover was not removable and so a sample was taken from the cover. These samples had one quarter of the dust loading and lower lead concentrations as compared with regular samples taken from inside the air ducts. For some window stool and some window channel samples a small nozzle was used on the end of the vacuum sampler. Lead concentrations and dust loadings were greater for these samples than for those collected with the large nozzle. Older homes had significantly higher soil lead concentrations than newer homes. Lead concentrations were significantly higher at the foundations and boundaries of older homes. This is demonstrated for boundary soil in Figure 4-10.

Other significant factors were less intuitive. For instance, the frequency of removing paint at home was associated with houses with higher lead concentrations at the interior entryways, and lower lead concentrations in soil near the

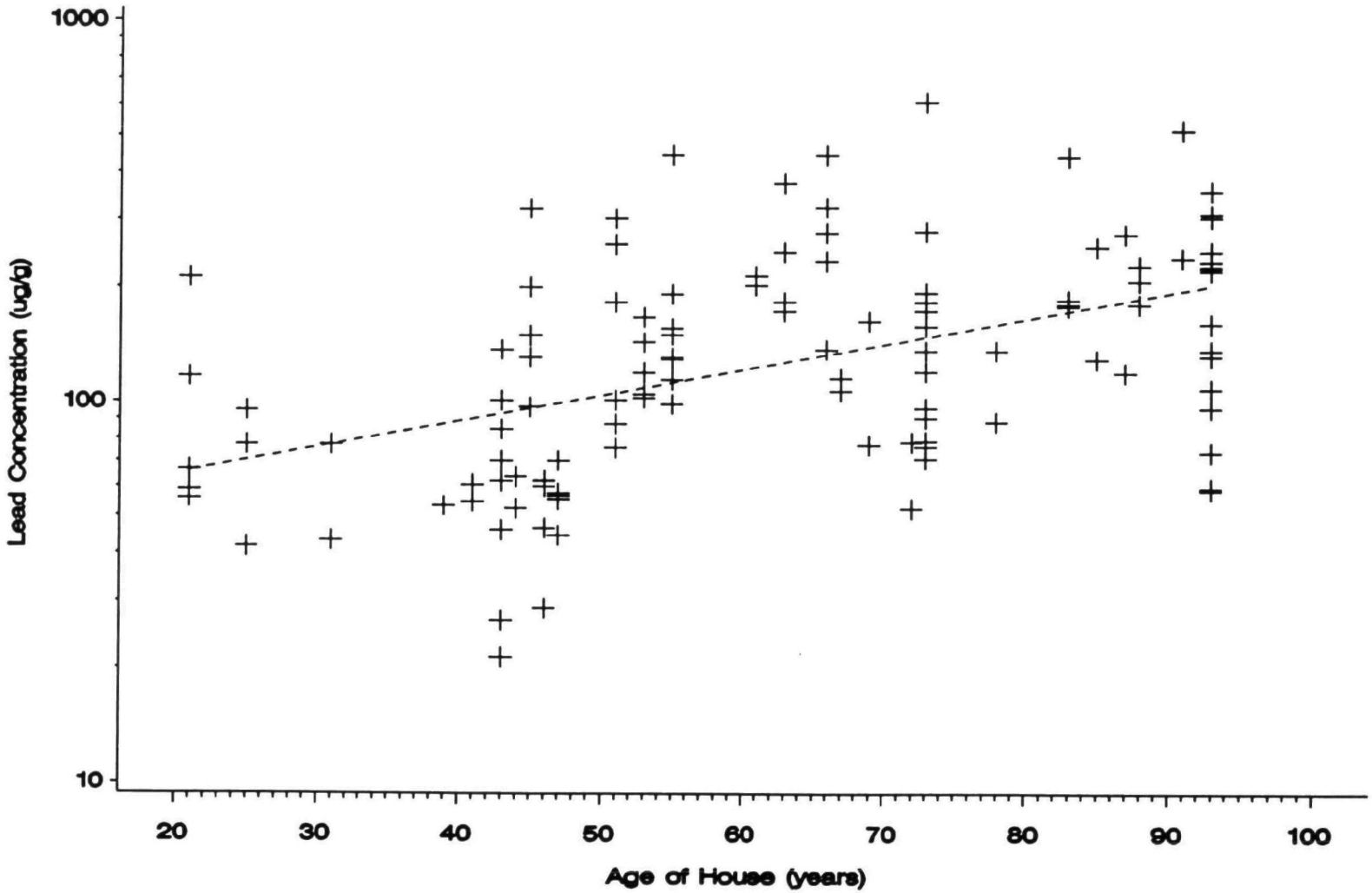


Figure 4-10. Boundary soil lead concentration vs. age of house.

foundations. Houses where pipes or electronic parts were soldered had substantially higher lead concentrations.

There were two houses in which the resident interviewed stated that the uncarpeted floors were vacuumed every day. In these houses, lead concentrations were particularly high, and dust loadings were particularly low for interior entryway, exterior entryway, and regular floor samples (these relationships are portrayed in Figures 4-11 and 4-12). Whereas, the frequency of vacuuming uncarpeted floors was found to be very significantly associated with lead concentrations and dust loadings for the houses in the study, when the two houses discussed above were excluded, the factor was not observed as significant. Except for a marginal relationship with lead concentration for interior entryway samples, this factor was not at all significant. However, for the analyses, data from these two houses are included.

Finally, it is interesting to note that these non-abatement factors were primarily significant for lead concentrations (as were the abatement factors) - as opposed to lead loadings. This excludes substrate type, sampling deviations, and an indicator of whether a resident wears work clothes home from an occupation which involves potential lead contamination.

### 4.2.4 Non-Abatement Effects by Sample Type

#### 4.2.4.1 Dust Samples

**Air Ducts.** One hundred nine (109) air duct samples were taken. Two of the 109 air duct samples were taken from baseboard-type heating elements and two others were taken from cold-air returns. There were differences between results on these and other types of samples. To avoid making unsubstantiated conclusions about the impact of these deviations and to simplify interpretation, these four samples were deleted from the analyses. Due to common difficulties in removing covers from air ducts, 46 of the 109 samples were taken from the

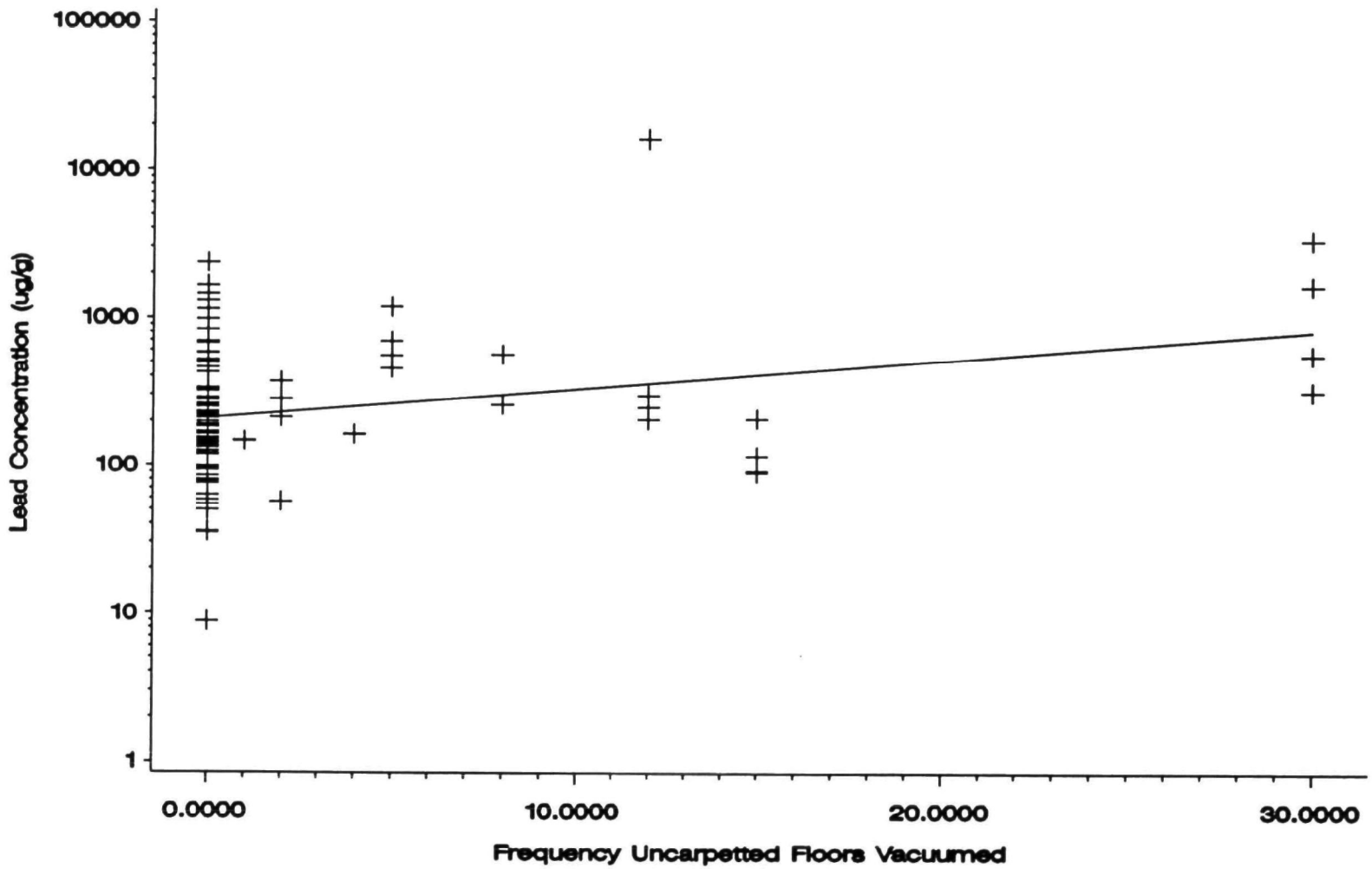


Figure 4-11 Exterior entryway dust lead concentration vs. frequency of vacuuming uncarpeted floors.

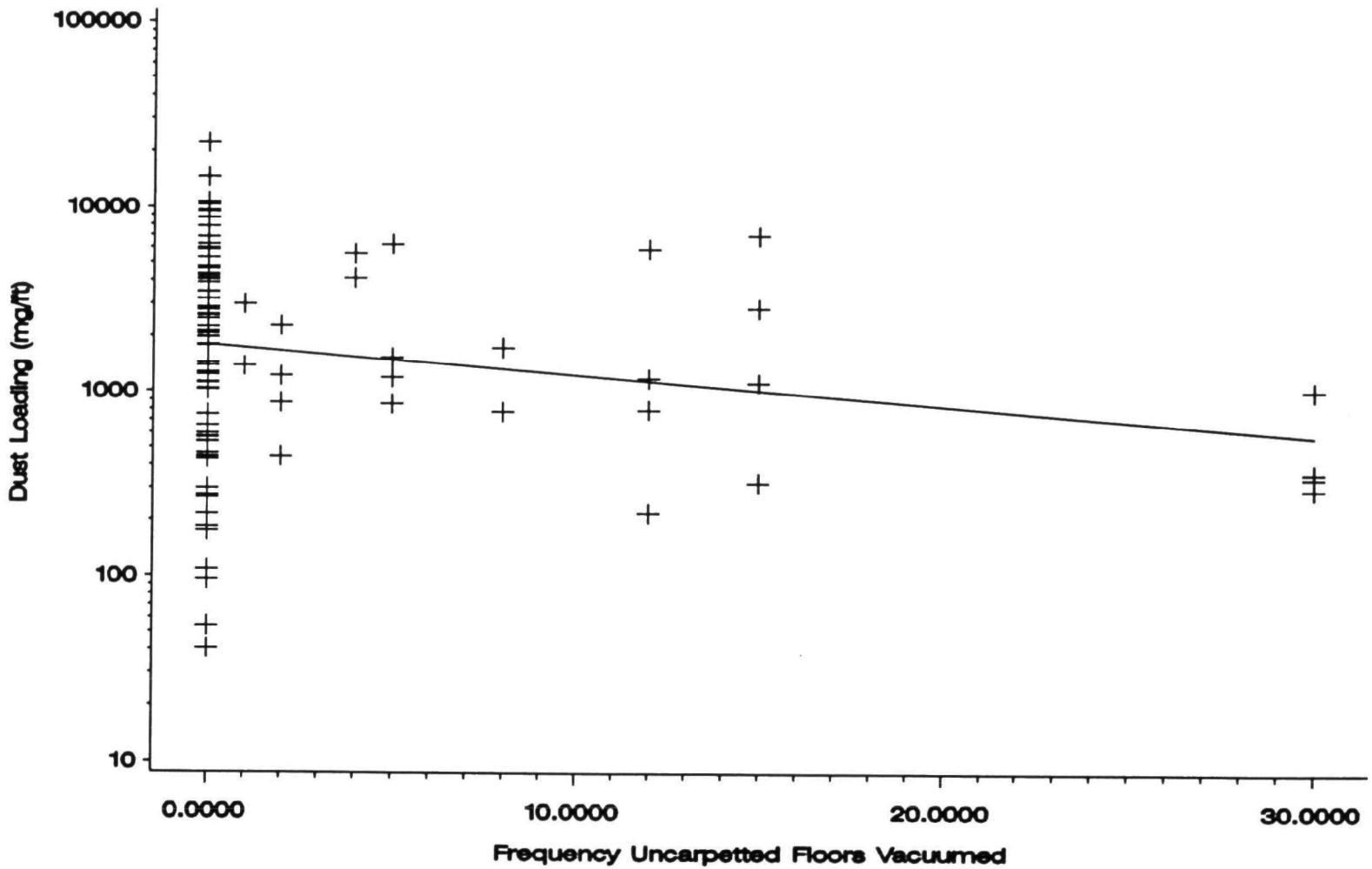


Figure 4-12. Exterior entryway dust loading vs. frequency of vacuuming uncarpeted floors.

exterior fins or grates covering the air ducts. The remaining 59 samples were taken from inside the air ducts. This had a significant impact on the results. The substrate condition was also observed to have a significant effect. Table 4-5 presents estimates of these effects.

Lead loadings were substantially lower in samples taken from the exterior grates. This was mainly due to significantly lower dust loadings, but concentrations were also slightly lower (though not significantly lower). One air duct was damaged and three air ducts had peeling substrates. Lead levels were significantly higher on the damaged and peeling substrates.

There were significant differences in lead concentrations among houses abated by different contractors. Four contractors (denoted A, B, C, and D) were employed to abate the units in this study. There was as much as a three-fold difference in concentrations in houses abated by different contractors. The differences are presented in Table 4-5 as ratios to levels in control houses. For the two contractors (B and C) which abated most of houses, lead loadings and lead concentrations were very similar.

Lead concentrations were significantly lower in houses where there was frequent wet-mopping of uncarpeted floors ($p = 0.4$). In houses where the window stools were frequently dusted, there were higher concentrations in the air ducts.

**Window Channels.** Substrate and condition of substrate were important factors associated with lead levels in window channels. Thirty-six (36) of the channels were made of metal; 44 were made of wood. Differences in lead loadings on these were significant. For concentrations, the differences were not significant. Lead loadings were 38% lower on metal than on wood. Conditions of these substrates were primarily either good or peeling. These differences were shown to have an association with lead concentrations. On peeling surfaces, concentrations were 2.36 times as high as on channels which were intact.

Twenty-seven (27) percent of the window channel samples were taken with the small nozzle attached to the vacuum. Lead loadings were estimated to be 2.6 times higher in these samples, but this was not estimated to be a significant effect due to the large variation.

**Window Stools.** The two most significant practical effects associated with window stool levels were related to abatement and clearance times. The houses abated in the HUD Demonstration in Denver were abated in three different phases according to the magnitude of abatement required. The worst units were abated first. Table 4-4 indicates higher lead levels were found in homes abated earlier. Table 4-4 presents these estimated effects for lead loadings, lead concentrations, and dust loadings.

There was also a significant relationship between lead levels and the number of months between clearance and CAPS sampling for the unit. Longer times since clearance were associated with lower lead levels.

Finally, higher lead loadings were observed in houses where a resident wears work clothes home from an occupation with potential lead exposure. This was not due to higher concentrations of lead in these houses, but there were higher dust loadings found.

**Interior Entryway.** The most influential variable for lead loading appeared to be substrate, with highest loadings observed in samples taken from carpets. Most of the samples were taken on carpet and linoleum with smaller numbers taken on tile and wood floors. Lead loadings were about six times higher on carpet than on linoleum; three times higher on carpet than on wood; and about 30 times higher on carpet than on tile. This difference is attributed to greater levels of dust retained by the carpet, since there were not significant differences in concentrations among these substrates.

There were significantly higher lead loadings in homes where there was frequent vacuuming of uncarpeted floors. Higher

concentrations were observed in houses where paint removal was recently done. Lower loadings and concentrations were observed in houses where there were more children between the ages of 7 and 17.

**Exterior Entryway (Dust).** Aside from abatement, only frequency of vacuuming uncarpeted floors was found to be significantly related to levels of lead in the dust outside the entryways to these homes. Lead concentrations were found to be higher in houses where vacuuming of uncarpeted floors was more frequent. Dust levels were lower in these houses. These two relationships combined to yield no association between the factor and lead loading.

**Floor (Wipe).** Rented homes had lead loadings on floors 62 percent lower than those in owner-occupied homes.

**Floor (Vacuum).** Perhaps the most significant factor associated with floor lead levels was substrate. Most of the samples were taken on carpet (84), linoleum (85), tile (20), and wood (40). Of these, dust loading was, by far, greatest on carpets. Lead concentrations were similar on carpet, linoleum, and tile, but on wood they were almost three times as large. This contributed to the highest lead loadings (excluding four samples taken on concrete) on wood. They were about 50 percent higher on wood than on carpet - much lower on linoleum and tile.

In houses where uncarpeted floors were vacuumed frequently, there were significantly higher lead concentrations. Dust loadings were slightly lower in these houses, so lead loadings were not significantly higher. Homes in which a resident was employed in welding had lead concentrations four times as large as homes which did not. In those same houses, dust loadings were more than twice as high, contributing to lead loadings more than 10 times as great.

#### 4.2.4.2 Soil Samples

**Entryway Soil.** The only non-abatement factor found to be significantly associated with entryway soil lead levels was a

crude measure of proximity to an establishment described as a lead smelter. Houses were classified as being either less than 1 mile away, 1 to 2 miles away, 2 to 3 miles away, or greater than 3 miles away from the smelter. The geometric mean in Table 4-2 is to be interpreted as being representative of houses more than four miles from the smelter. Figure 4-13 displays lead concentrations versus these classifications. Viewing this measure as roughly continuous, lead concentrations were estimated to increase by 37 percent with each mile closer to the smelter.

**Foundation Soil.** Several factors were very significantly associated with lead concentrations in foundation soil. Age of the house, ownership, and length of residence were all very significant factors. Older houses had much higher levels. A ten-year difference in age was associated with a difference of 27 percent in lead concentrations near the foundation. However, lead levels were lower in houses where the residents have lived longer since abatement. About a 6 percent drop per month was estimated. Controlling for the other factors, lead concentrations around homes rented by their residents were 34 percent of those in homes owned by their residents. Another factor found to be significantly associated with lower lead concentrations was recent paint removal at the house. Lead concentrations were twice as high around houses where a resident was employed in a welding occupation.

**Boundary Soil.** Lead concentrations in boundary soil were significantly associated with the age of the house. The average age of houses in the study was about 60 years at the time of sampling. An increment in age of 10 years was associated with an increment in lead concentration of about 22 percent. From Figure 4-10, we see that log concentrations increased fairly linearly with age of house. Three homes were observed in which a resident was employed in an occupation involving paint removal. In these houses, lead concentration was significantly ($p = .04$) lower (55 percent lower). Table 4-4 indicates there was also a significant association found between lead concentration in

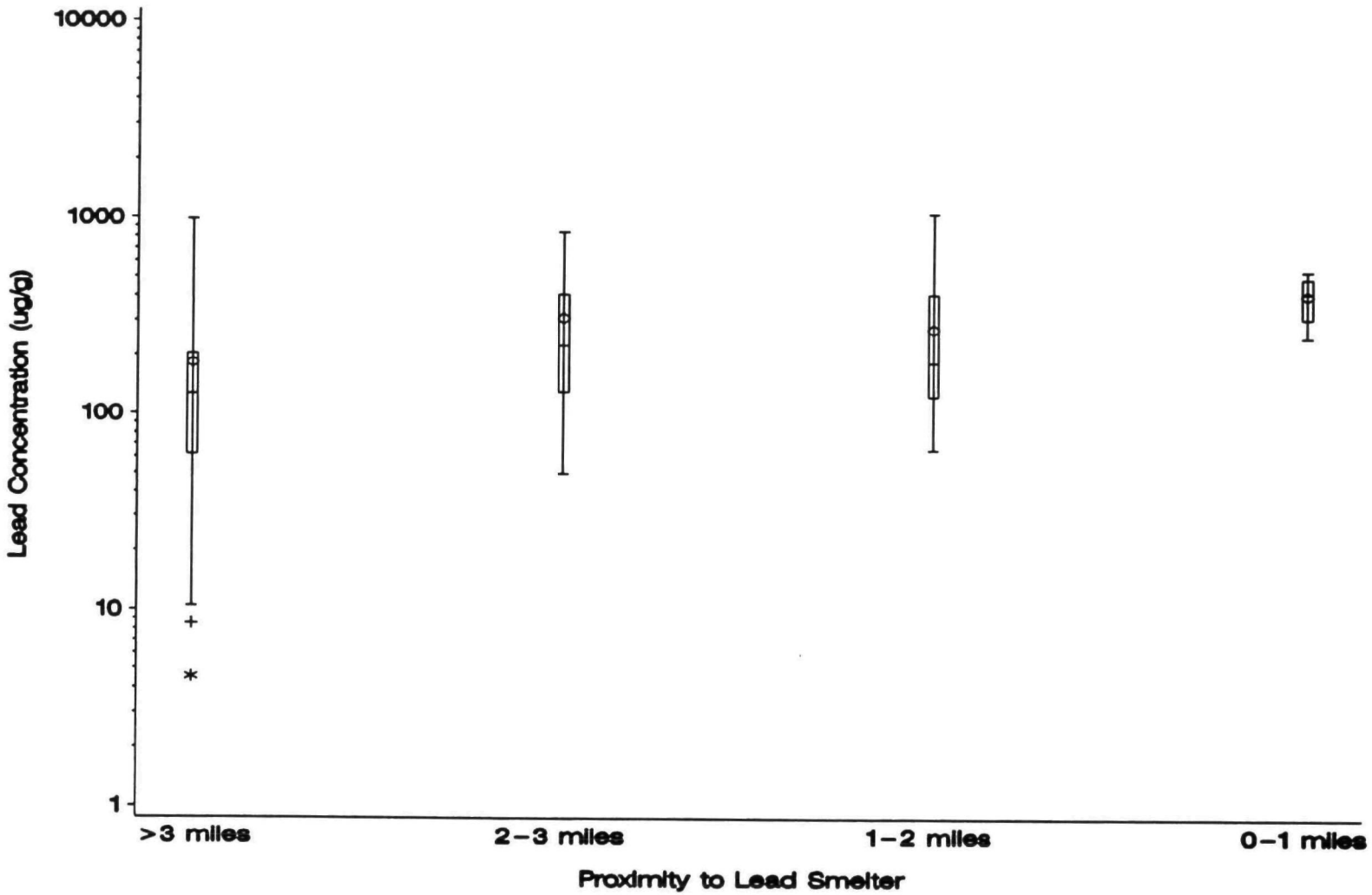


Figure 4-13. Entryway lead concentrations vs. proximity to lead smelter.

boundary soil and the frequency with which pipes or electronic parts were soldered in the last 6 months. Levels were significantly higher in such houses (p=0.02).

## 5.0 CORRELATIONS

Section 4 summarized the relationship between lead levels and various abatement, sampling and other factors by sample type. Here we discuss correlations of lead levels between the various sample types after correction for the estimated effects of the factors discussed in Section 4. Thus, these correlations should be interpreted as relationships between different sample types above and beyond that which are explained by things like abatement, age of house, cleanliness measures, and other factors included in the models.

This analysis involves examining correlation matrices and scatterplot matrices. The primary data used to examine these relationships are the estimated random unit (house) effects and the estimated random location-within-house effects. Both of these random effects are estimated after controlling for the estimated fixed effects in the model for each sample type.

### 5.1 UNIT-TO-UNIT CORRELATIONS

The correlation matrix of random unit-to-unit differences in lead loading is presented in Table 5-1. To locate a correlation of interest, locate the row corresponding to the first sample type and the column corresponding to the second sample type. Correlation information for the two sample types is presented in the corresponding box. Within each box, three values are presented:

- **Top value:** Correlation coefficient between the logarithms of the geometric unit means,
- **Middle value:** Degrees of freedom used in calculating the correlation coefficient, and
- **Bottom value:** Observed significance level of the test of the hypothesis of no correlation (correlation coefficient equal to zero).

**Table 5-1. Correlations* Among Sample Types for Unit-Level Random Effects: Lead Loading**

| | | Vacuum | | | | |
|---|---|---|---|---|---|---|
| | | Air Duct | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Wipe) | Entryway Exterior (Vacuum) |
| Vacuum | Air Duct | | .178<br>33<br>.31 | .052<br>36<br>.76 | .323<br>22<br>.12 | .409<br>36<br>.01 |
| | Window Channel (Vacuum) | | | .641<br>37<br>.00 | .110<br>23<br>.60 | .169<br>37<br>.30 |
| | Window Stool (Vacuum) | | | | .075<br>25<br>.71 | .081<br>42<br>.60 |
| | Floor (Wipe) | | | | | .333<br>29<br>.07 |
| | Entryway Exterior (Vacuum) | | | | | |

* Top number is estimated correlation; middle number is degrees of freedom; and bottom number is significance level.

Only the upper right-hand half of the matrix, above the shaded diagonal, is filled in since the lower left-hand half of the matrix would contain redundant information.

When controlling for the fixed effects, degrees of freedom for the estimation of correlation are specified to estimate the fixed effects. This was accounted for in the significance levels and the degrees of freedom displayed in the correlation tables.

The following method was used to calculate degrees of freedom for estimating the unit-level correlation of two sample types, A and B:

1. Let $m_{A,B}$ denote the number of houses from which samples of both types were taken, and

2. Let $f_i$ denote the number of unit-level fixed effects in the model fit for sample type i (i=A,B).

3. $df_{A,B} = m_{A,B} - \max(f_A, f_B) - 2$.

In most cases we had at least 30 degrees of freedom. Estimates of correlations with floor wipe samples had fewer degrees of freedom because the samples were only taken in the abated houses.

Some sample types are not represented in the unit-level correlation analysis. This is because in some cases the restricted maximum likelihood (REML) estimates of the random unit-to-unit differences were negligible after controlling for the fixed effects. This happened in the case of interior entryway lead loadings and floor lead loadings and concentrations.

The lead loading random unit effect estimates are presented graphically in Figure 5-1. This figure is a scatterplot matrix, or a collection of bivariate plots organized into matrix form. As with the correlation matrix, to locate a

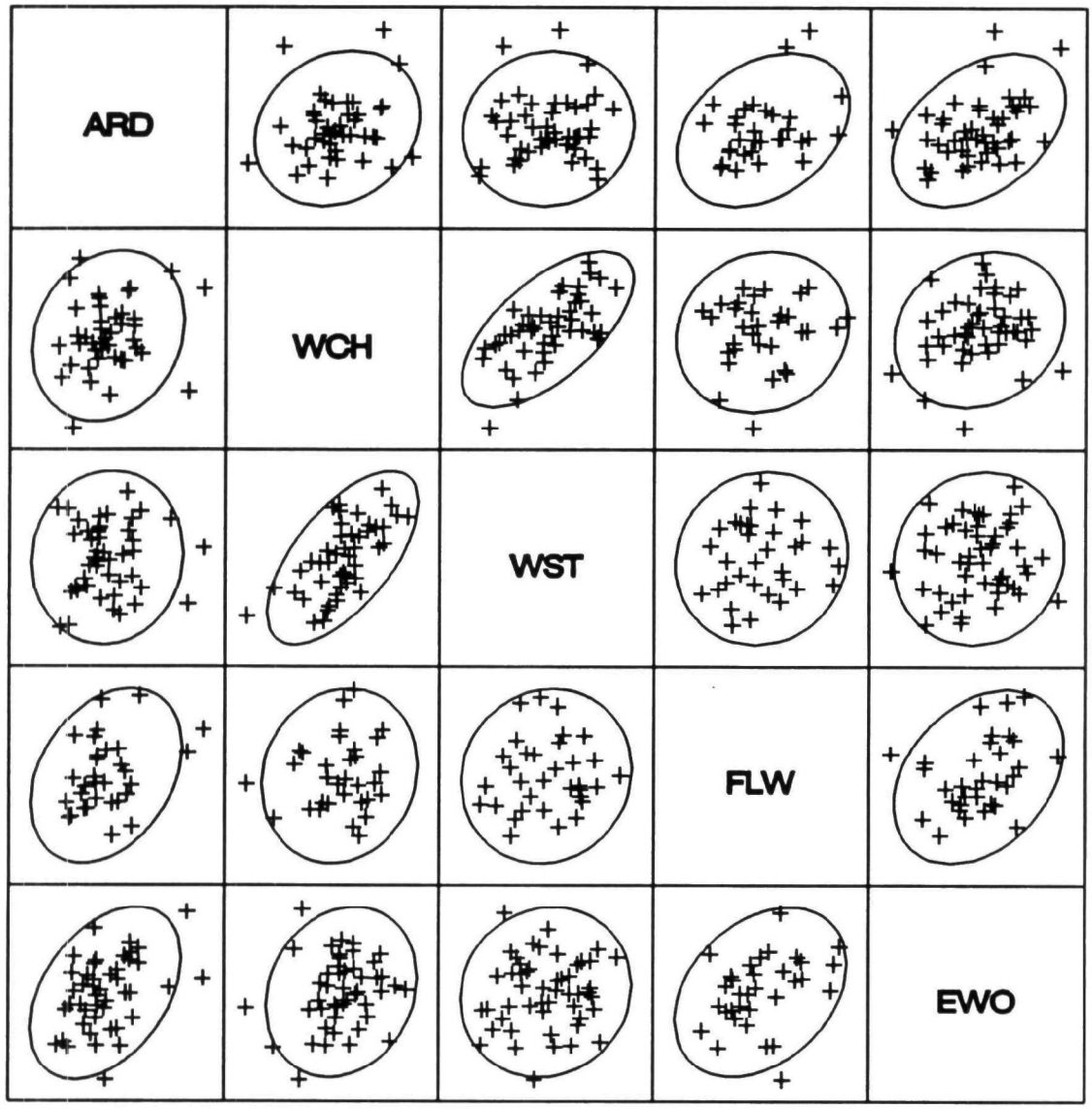


Figure 5-1. Scatterplot matrix of unit-level random effects for different sample types: lead loading ($\mu g/ft^2$).

plot of interest, identify the row associated with one sample type and the column associated with the other sample type. The plot is presented in the corresponding box. Within each box, the horizontal axis represents increasing values of the column variable on a logarithmic scale. Similarly, the vertical axis represents increasing values of the row variable on a logarithmic scale. The abbreviations employed on the diagonal to identify the different sample types are defined in Table 2-1.

The ellipse plotted in each box of Figure 5-1 is the ellipse that contains 95% of the probability associated with the estimated bivariate normal distribution for the plotted data. The narrower the ellipse, the stronger the correlation between the two sample types. If the ellipse is oriented from the lower left-hand corner of the box to the upper right-hand corner of the box, the sample types are positively correlated. If, on the other hand, the ellipse is oriented from the upper left-hand corner of the box to the lower right-hand corner of the box, the sample types are negatively correlated.

Table 5-2 contains unit-to-unit correlation estimates for lead concentrations; Table 5-3 provides the same for dust loading. Figure 5-2 is the analog to Figure 5-1 for lead concentrations; Figure 5-3 provides the same information about dust loadings.

There were several indications of a positive unit-level correlation between different sample types. No significant negative correlations were observed. Thus, unexplained (not accounted for by the models) differences between lead and dust levels in different houses appear to be similar for certain pairs of sample types.

The strongest correlation in lead loadings was observed between window channels and window stools. The estimated correlation was 0.64 with 37 degrees of freedom. This was highly significant.

Examining Figures 5-2 and 5-3 reveals that this relationship is due to positive correlations in both lead

Table 5-2. Correlations* Among Sample Types for Unit-Level Random Effects: Lead Concentration

| | | Vacuum | | | | Soil | | |
|---|---|---|---|---|---|---|---|---|
| | | Window Channel (Vacuum) | Window Stool (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) | Entryway (Soil) | Foundation (Soil) | Boundary (Soil) |
| Vacuum | Window Channel (Vacuum) | | .444<br>37<br>.00 | .208<br>38<br>.20 | .264<br>37<br>.10 | .276<br>38<br>.08 | .158<br>24<br>.44 | .135<br>38<br>.41 |
| | Window Stool (Vacuum) | | | .099<br>42<br>.52 | -.006<br>42<br>.97 | .245<br>43<br>.11 | .199<br>28<br>.29 | .266<br>43<br>.077 |
| | Entryway Interior (Vacuum) | | | | .253<br>43<br>.09 | .255<br>44<br>.09 | .114<br>28<br>.55 | .121<br>44<br>.42 |
| | Entryway Exterior (Vacuum) | | | | | .238<br>46<br>.10 | .213<br>28<br>.259 | -.148<br>44<br>.327 |
| Soil | Entryway (Soil) | | | | | | .367<br>29<br>.04 | .531<br>45<br>.00 |
| | Foundation (Soil) | | | | | | | .034<br>29<br>.86 |
| | Boundary (Soil) | | | | | | | |

* Top number is estimated correlation; middle number is degrees of freedom; and bottom number is significance level.

**Table 5-3. Correlations* Among Sample Types for Unit-Level Random Effects: Dust Loading**

| | | Vacuum | | | | |
|---|---|---|---|---|---|---|
| | | Air Duct | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Vacuum) | Entryway Exterior (Vacuum) |
| Vacuum | Air Duct | | -.297<br>33<br>.08 | .009<br>36<br>.96 | .134<br>37<br>.42 | .328<br>36<br>.04 |
| | Window Channel (Vacuum) | | | .388<br>37<br>.01 | .097<br>38<br>.55 | .013<br>37<br>.94 |
| | Window Stool (Vacuum) | | | | .278<br>43<br>.06 | .111<br>42<br>.47 |
| | Floor (Vacuum) | | | | | .333<br>44<br>.02 |
| | Entryway Exterior (Vacuum) | | | | | |

* Top number is estimated correlation; middle number is degree of freedom; and bottom number is significance level.

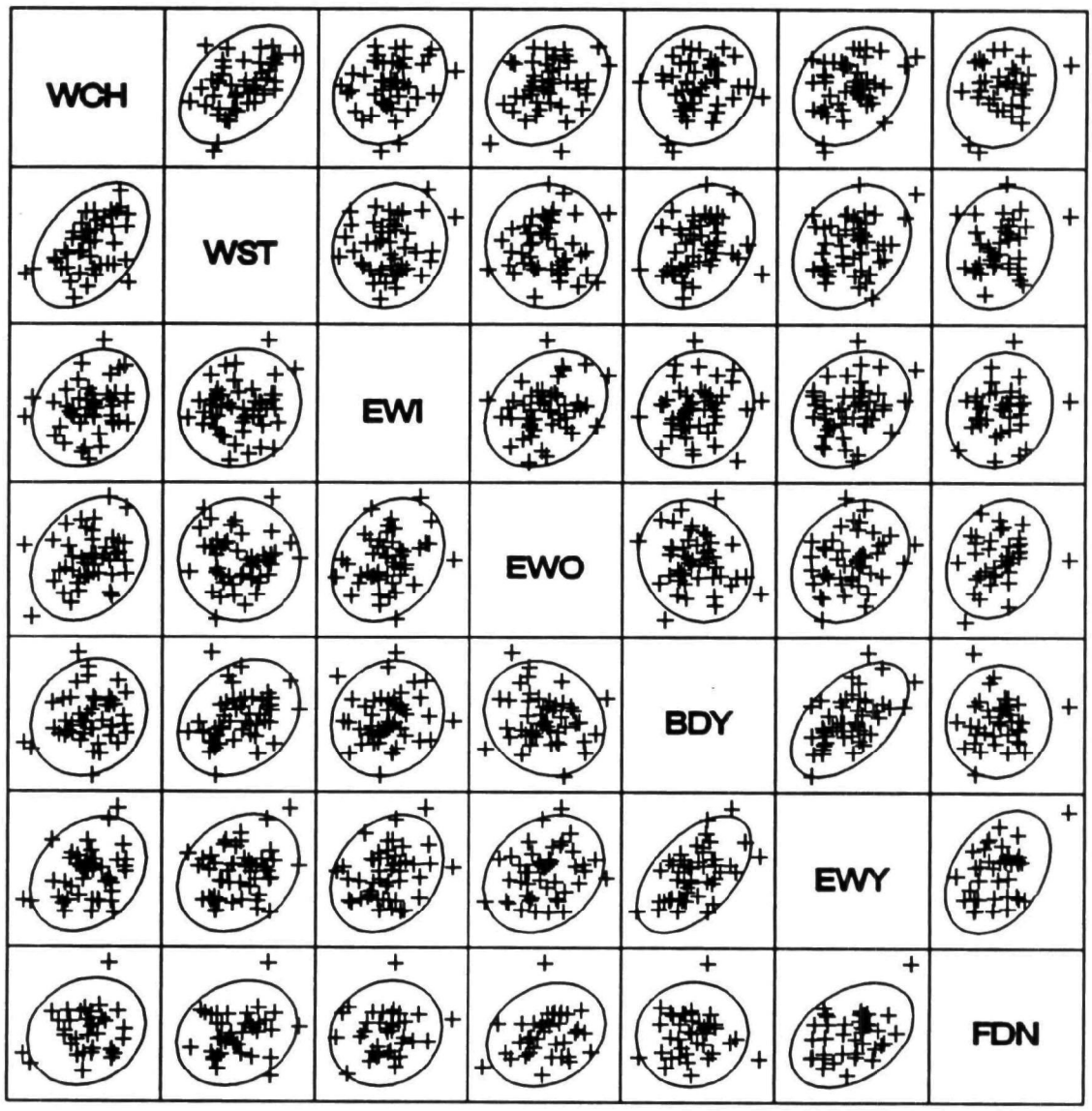


Figure 5-2. Scatterplot matrix of unit-level random effects for different sample types: lead concentration (μg/g).

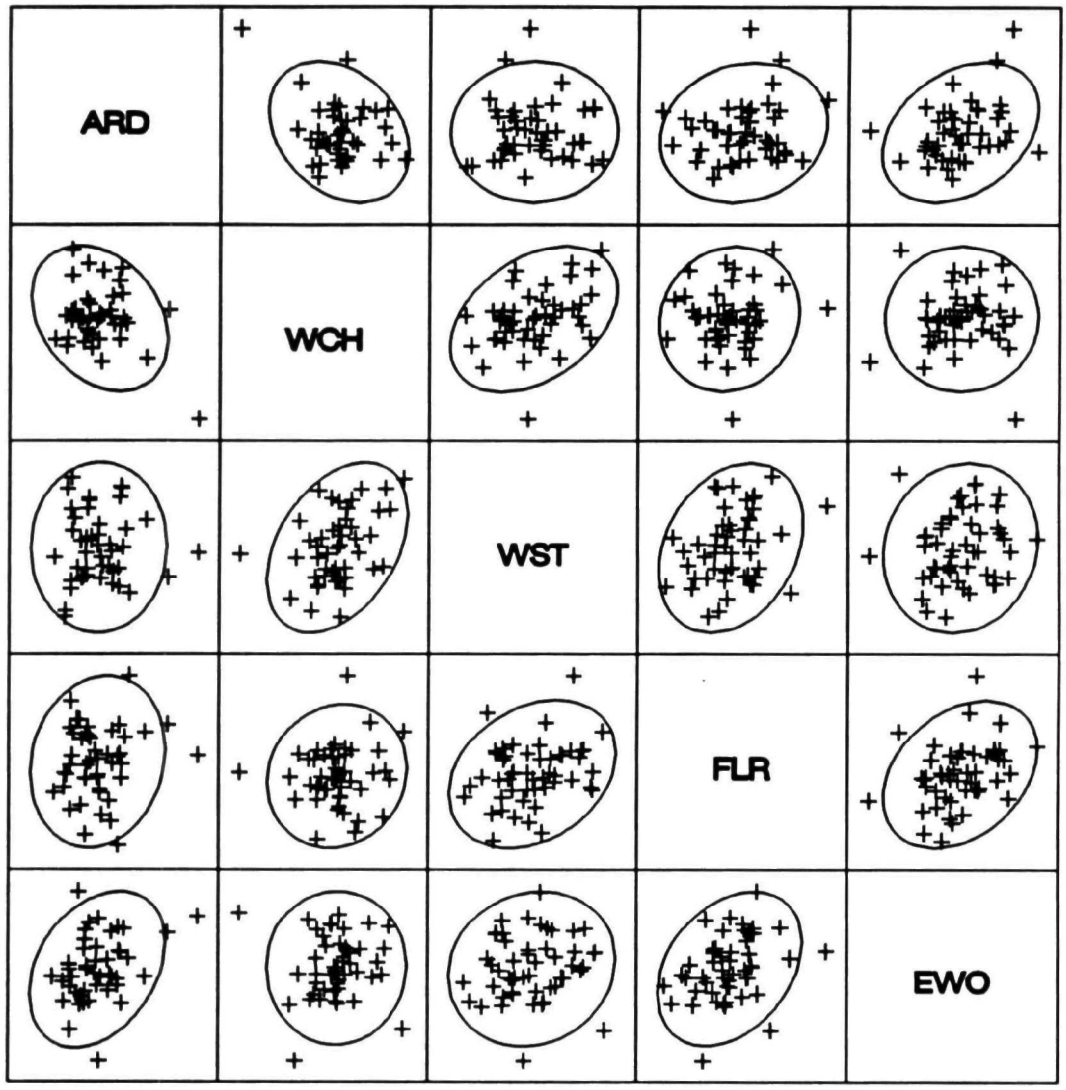


**Figure 5-3. Scatterplot matrix of unit-level random effects for different sample types: dust loadings (μg/g).**

concentrations and dust loading. The other significant correlation observed for lead loadings was that between air duct and exterior entryway lead loadings.

The unit-to-unit variation in air duct lead concentrations was negligible (refer to Table 4-2). However, there was significant correlation observed in dust loadings for these two sample types. That is, at houses where much dust was found at the exterior entryways, there was also much dust found in the air ducts.

There were also significant correlations observed in soil lead concentrations at different property locations. Entryway soil lead concentrations were significantly correlated with both boundary concentrations (53%, $p < .005$) and foundation concentrations (37%, $p = .04$). The correlation between boundary and foundation lead concentrations was not significant.

Although unit-to-unit variation in lead loading and lead concentration was negligible in vacuum floor samples, dust loading was not. There was significant correlation observed between dust loading on interior floors and exterior entryways (33%, $p = .02$). There was also a marginal correlation observed between dust loading on floors and window stools (28%, $p = .06$).

## 5.2 ROOM-TO-ROOM CORRELATIONS

Whereas the previous section discussed house-to-house variations in lead and dust levels, this section discusses within-unit correlations among sample types. Thus, the purpose of this analysis is to determine if there is significant co-variation in lead levels as one moves from room to room or side to side at a house.

For interior dust samples (except floor samples), there was typically only one sample taken per room. For these sample types, it was impossible to estimate random room effects apart from within-room variation. Residuals from the fit of the full model were used in the correlation calculations.

For floor and soil samples, the model included a room/side level random effect term for each room/side sampled. Therefore for these sample types, residuals from the full model were added to the estimates of the room/side levels random effect. There were many rooms/sides where more than one vacuum floor sample was taken. In these cases, (for purposes of correlation estimation) the residual estimates were averaged.

We used the following method to calculate degrees of freedom for estimating the within-unit correlation of two sample types, A and B:

1. Let $h_{A,B}$ denote the number of houses from which samples of both types were taken, and

2. Let $l_{A,B}$ denote the number of locations from which both sample types were taken, and

3. Let $f_i^r$ denote the number of room-level fixed effects in the model fit for sample type (i=A,B).

4. $df_{A,B} = l_{A,B} - h_{A,B} - \max(f_A^r, f_B^r) - 2$.

Estimates of correlations with floor wipe samples had fewer degrees of freedom because the samples were only taken in the abated houses. Therefore the correlations presented in this section are really those of room-to-room plus within-room variation among the different dust sample types.

Table 5-4 presents these correlations for lead loading; Table 5-5 presents the correlations for lead concentrations; and Table 5-6 presents the correlations for dust loading. The format used in these tables is the same as that of Tables 5-1, 5-2, and 5-3. Figure 5-4 displays scatterplot matrices of room-level differences in lead loadings; Figures 5-5 and 5-6 provide the same for lead concentrations and dust loadings.

All significant room-level correlations were positive. The strongest correlations were observed between window stools and window channels. The estimated correlation between room-to-room variations in lead loading was 33% (p=.00), for lead

**Table 5-4. Correlations* Among Sample Types for Room-Level Random Effects: Lead Loading**

| | | Air Duct | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Wipe) | Floor (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) |
|---|---|---|---|---|---|---|---|---|
| Vacuum | Air Duct | | .052<br>~~45~~ 8<br>.73 .97 | .174<br>~~70~~ 23<br>.14 .41 | missing<br>-.128<br>~~7~~<br>.74 | .044<br>80 27<br>.69 .82 | missing<br>.068<br>~~9~~<br>.92 | . |
| | Window Channel (Vacuum) | | | .327<br>~~92~~ 24<br>.00 .10 | missing<br>.200<br>~~27~~<br>.30 | .086<br>98 24<br>.39 .68 | missing<br>.323<br>~~10~~<br>.31 | missing<br>.086<br>~~9~~<br>.91 |
| | Window Stool (Vacuum) | | | | missing<br>.221<br>~~37~~<br>.18 | .150<br>134 48<br>.08 .30 | missing<br>-.082<br>~~20~~<br>.82 | -.033<br>~~14~~ 2<br>.90 .97 |
| | Floor (Wipe) | | | | | missing<br>.172<br>~~62~~<br>.17 | missing<br>.091<br>~~8~~<br>.85 | missing<br>.299<br>~~2~~<br>.70 |
| Soil | Floor (Vacuum) | | | | | | missing<br>.181<br>~~29~~<br>.33 | missing<br>.315<br>~~20~~<br>.15 |
| | Entryway Interior (Vacuum) | | | | | | | .139<br>77 30<br>.22 .45 |
| | Entryway Exterior (Vacuum) | | | | | | | |

* Top number is estimated correlation; middle number is degrees of freedom; and bottom number is significance level.

**Table 5-5. Correlations* Among Sample Types for Room-Level Random Effects: Lead Concentration**

| | | Vacuum | | | | Soil | | |
|---|---|---|---|---|---|---|---|---|
| | | Air Duct | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) | Entryway (Soil) |
| Vacuum | Air Duct | | .084<br>46<br>.57 | .434<br>71<br>.00 | .100<br>81<br>.37 | .029<br>4<br>.96 | . | . |
| | Window Channel (Vacuum) | | | .324<br>93<br>.00 | .103<br>99<br>.31 | -.057<br>11<br>.85 | .214<br>3<br>.73 | .176<br>4<br>.74 |
| | Window Stool (Vacuum) | | | | -.011<br>135<br>.90 | .098<br>21<br>.66 | -.062<br>15<br>.81 | .330<br>17<br>.17 |
| | Floor (Vacuum) | | | | | .236<br>30<br>.19 | .142<br>21<br>.52 | .156<br>22<br>.47 |
| Soil | Entryway Interior (Vacuum) | | | | | | .374<br>78<br>.00 | -.031<br>87<br>.77 |
| | Entryway Exterior (Vacuum) | | | | | | | -.074<br>84<br>.50 |
| | Entryway (Soil) | | | | | | | |

* Top number is estimated correlation; middle number is degrees of freedom; and bottom number is significance level.

**Table 5-6. Correlations* Among Sample Types for Unit-Level Random Effects: Dust Loading**

| | | Vacuum | | | | Soil | |
|---|---|---|---|---|---|---|---|
| | | Air Duct | Window Channel (Vacuum) | Window Stool (Vacuum) | Floor (Vacuum) | Entryway Interior (Vacuum) | Entryway Exterior (Vacuum) |
| Vacuum | Air Duct | | .244<br>45<br>.10 | -.133<br>70<br>.27 | .114<br>80<br>.31 | .347<br>3<br>.57 | . |
| | Window Channel (Vacuum) | | | .207<br>92<br>.05 | -.055<br>98<br>.59 | .284<br>10<br>.37 | .087<br>2<br>.91 |
| | Window Stool (Vacuum) | | | | .236<br>134<br>.01 | -.029<br>20<br>.90 | .145<br>14<br>.59 |
| | Floor (Vacuum) | | | | | .259<br>29<br>.16 | .376<br>20<br>.08 |
| Soil | Entryway Interior (Vacuum) | | | | | | .035<br>77<br>.76 |
| | Entryway Exterior (Vacuum) | | | | | | |

* Top number is estimated correlation; middle number is degrees of freedom; and bottom number is significance level.

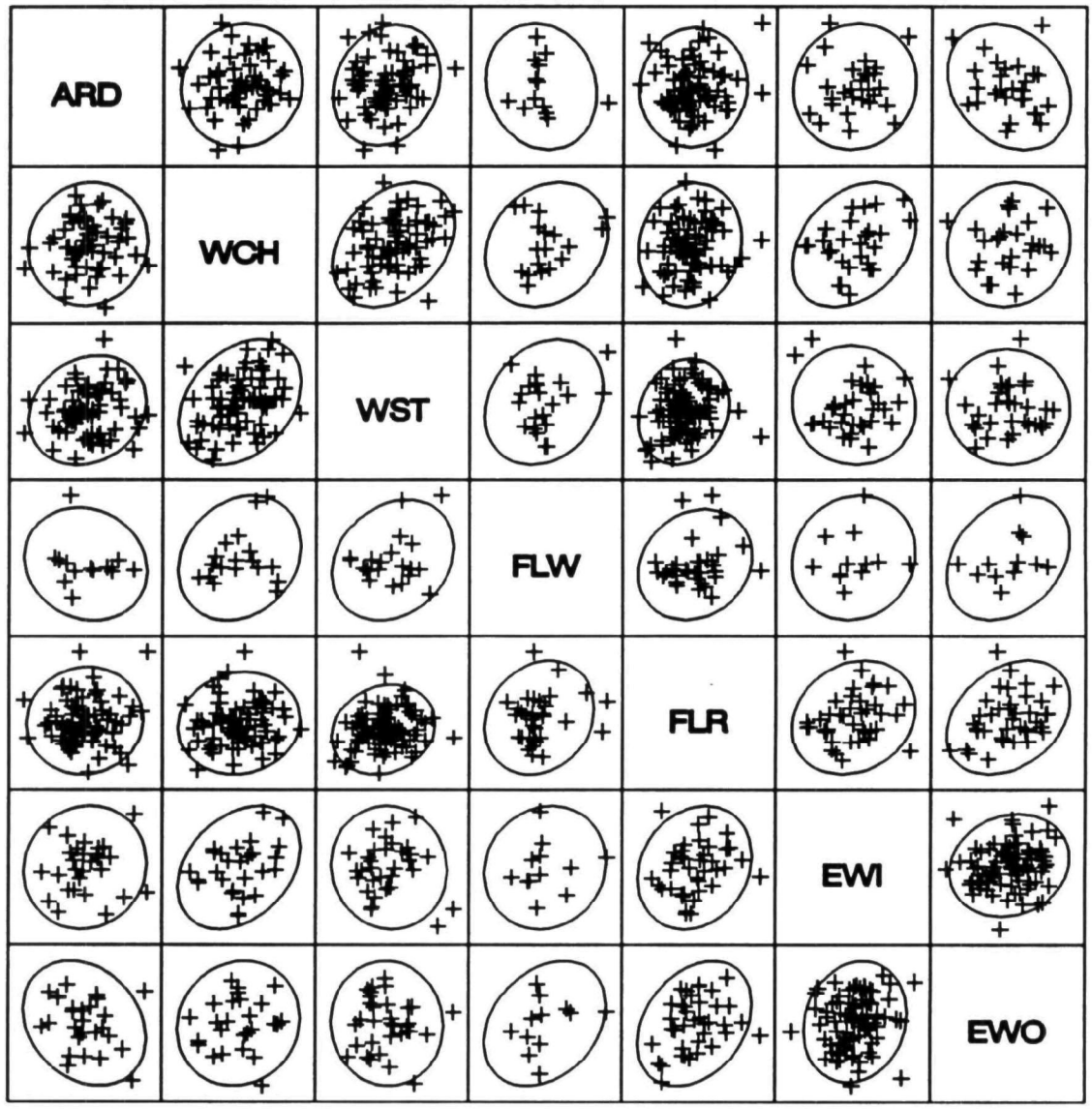


Figure 5-4. Scatterplot matrix of room-level random effects for different sample types: lead loading ($\mu g/ft^2$).

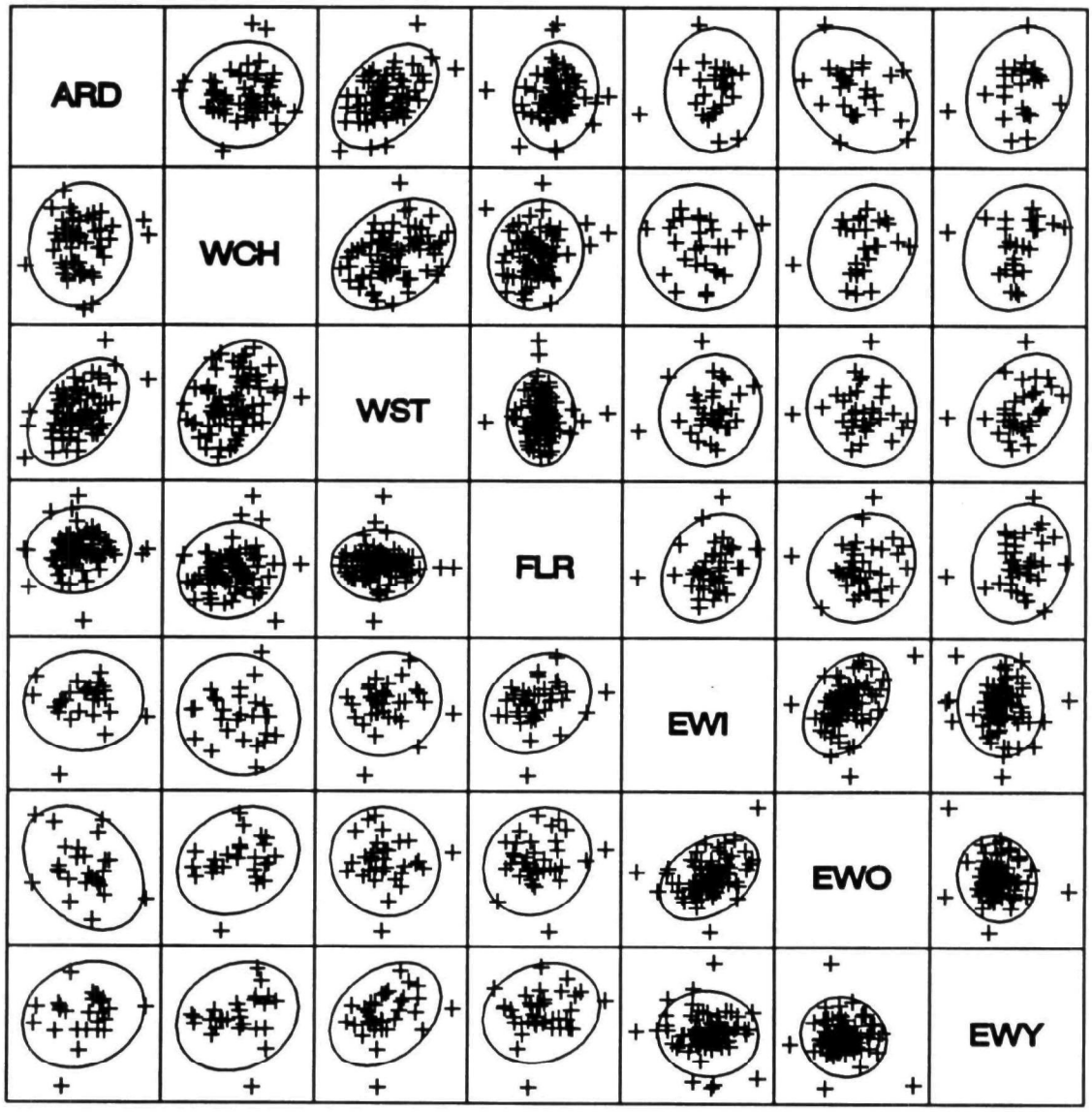


Figure 5-5. Scatterplot matrix of room-level random effects for different sample types: lead concentration (μg/g).

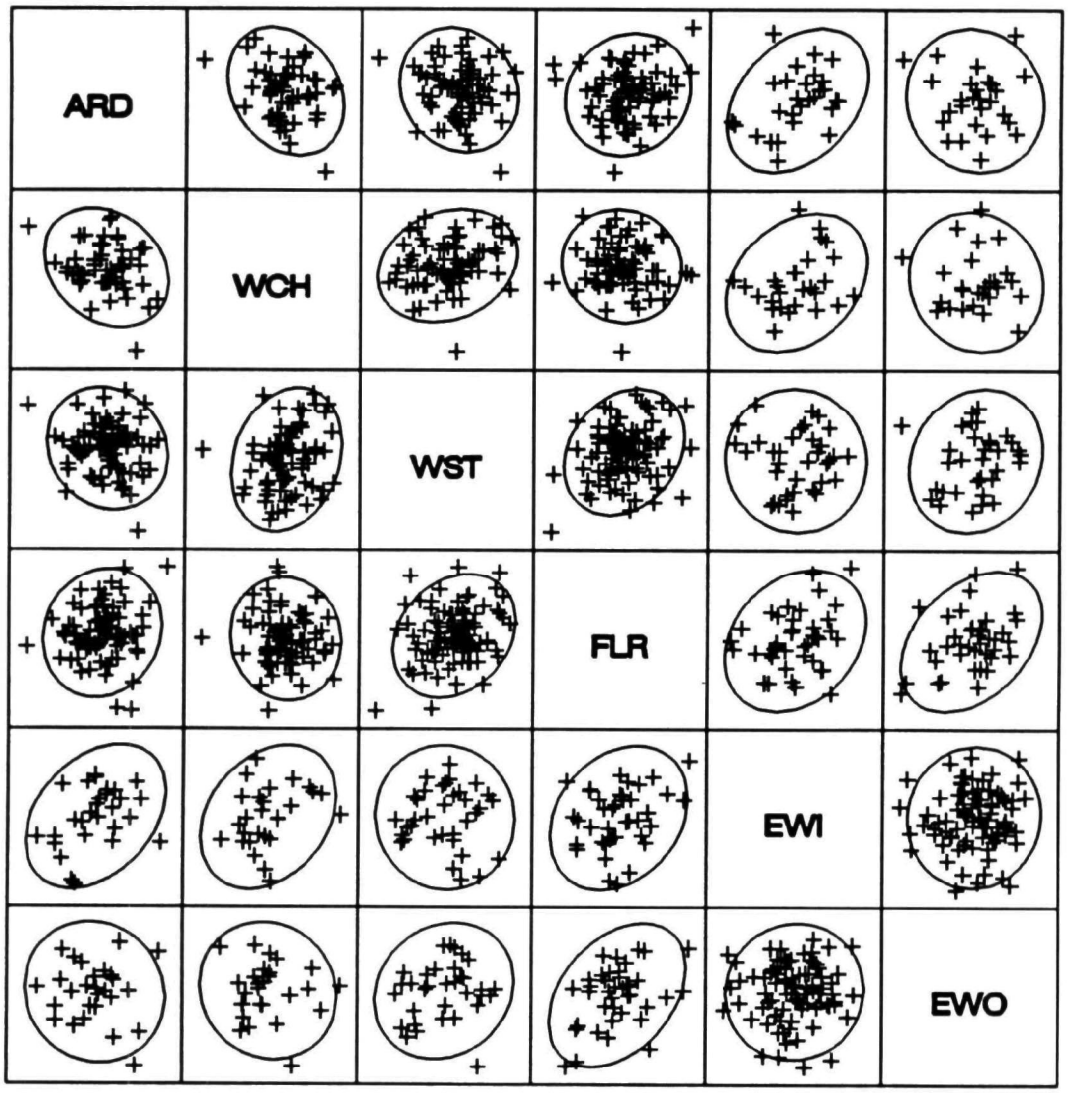


**Figure 5-6. Scatterplot matrix of room-level random effects for different sample types: dust loadings (μg/g).**

concentration it was 32% (p=.00), and for dust loading it was 21% (p=.05). Each of these results was statistically significant. There was marginal correlation observed between the lead loadings for window stools and floor (vacuum) samples (15%, p = .08).

The correlation between air duct and window stool lead concentrations was highly significant (43%, p=.00), but the corresponding estimated correlation in dust loading was negative (-13%, p=.27), negating any correlation in lead loading.

The only other significant room-to-room correlation in lead concentration was between interior and exterior entryway dust samples (37%, p=.00). These were not at all correlated with lead concentrations in entryway soil samples, despite the fact that these estimates are based on many degrees of freedom.

Floor dust loadings were significantly correlated with interior entryway dust loadings (24%, p=.01), but no association was found for lead levels.

## 6.0 WIPE VERSUS VACUUM COMPARISON

The two major HUD programs investigating levels of lead in household dust utilized different sampling methods. In the Demonstration Study, dust was wipe sampled. In the National Survey, dust was vacuum sampled. As part of the CAP Study, several side-by-side dust samples were taken by the wipe and vacuum sampling methods.

To investigate the relationship between lead loading determinations made by the two methods, four side-by-side samples were taken from a selected room in each abated unit. Two of the samples were taken by the vacuum method and two by the wipe method. Samples were collected in 34 of the 35 abated houses sampled. In one house (589), all floors were carpeted so no wipe/vacuum comparison samples were taken. Of the 34 houses sampled, one of the comparison samples in unit 585 was lost during analysis. This also happened to be the only unit in which the wipe/vacuum comparison samples were taken from a concrete floor. The three observed loadings were substantially higher than corresponding measures in all the other houses. The analysis was performed both with and without the data from this house. Since the results are only slightly different when this unit is excluded, it is included in the results provided.

The geometric means of the paired floor lead loadings are listed in Table 6-1 and plotted in Figure 6-1. In the figure, lead loadings from vacuum samples are plotted versus lead loadings from wipe samples. A solid reference line which represents complete agreement between the two sampling methods is also plotted along with the best fit regression line. A statistical analysis was performed to quantify this relationship. This is discussed in Section 6.1. Samples taken on different substrates (linoleum, wood, concrete, or tile) are distinguished by different plotting symbols in Figure 6-1. Since the relationships between vacuum and wipe responses were different for each substrate, the analysis was also performed adjusting for substrate. This analysis is discussed in Section 6.2.

**Table 6-1. Vacuum versus Wipe Comparison Data: Room Geometric Mean Floor Lead Loadings (ug/ft$^2$)**

| Substrate | Unit | Location | Vacuum Loading | Wipe Loading |
|---|---|---|---|---|
| Concrete | 585 | LDY | 4075.33 | 333.56 |
| Linoleum | 502 | KIT | 6.07 | 3.96 |
| | 517 | HAL | 3.89 | 3.84 |
| | 525 | KIT | 2.84 | 3.56 |
| | 532 | BAT | 38.93 | 10.41 |
| | 537 | BAT | 0.85 | 18.07 |
| | 540 | KIT | 5.63 | 6.85 |
| | 543 | KIT | 26.77 | 7.34 |
| | 554 | KIT | 34.81 | 5.82 |
| | 569 | KIT | 51.23 | 4.00 |
| | 570 | KIT | 1.03 | 5.18 |
| | 571 | KIT | 980.96 | 21.10 |
| | 574 | KIT | 11.83 | 7.37 |
| | 577 | BAT | 1.03 | 4.83 |
| | 578 | BSM | 4.57 | 5.57 |
| | 580 | KIT | 21.35 | 23.31 |
| | 581 | KIT | 3.47 | 39.70 |
| | 586 | HAL | 87.02 | 52.69 |
| | 587 | KIT | 2.17 | 7.30 |
| | 590 | KIT | 1.55 | 6.94 |
| Tile | 548 | BA2 | 1.14 | 2.86 |
| | 563 | KIT | 3.19 | 13.37 |
| | 572* | KIT | 552.54 | 69.37 |
| | 579 | KIT | 2.06 | 3.64 |
| | 588 | KIT | 5.24 | 13.05 |
| Wood | 510 | BD2 | 48.26 | 26.91 |
| | 511 | KIT | 195.17 | 14.76 |
| | 512 | KIT | 27.06 | 26.92 |
| | 515 | LDY | 206.14 | 4.24 |
| | 528 | LVG | 10.53 | 10.56 |
| | 544 | LVG | 104.66 | 6.26 |
| | 562 | DIN | 175.91 | 24.71 |
| | 566 | KIT | 11.24 | 26.61 |
| | 584 | DIN | 183.66 | 28.97 |

* An outlier analysis of the vacuum-wipe ratios revealed this ratio as significantly different. It was excluded in the estimation of multiplicative biases by substrate.

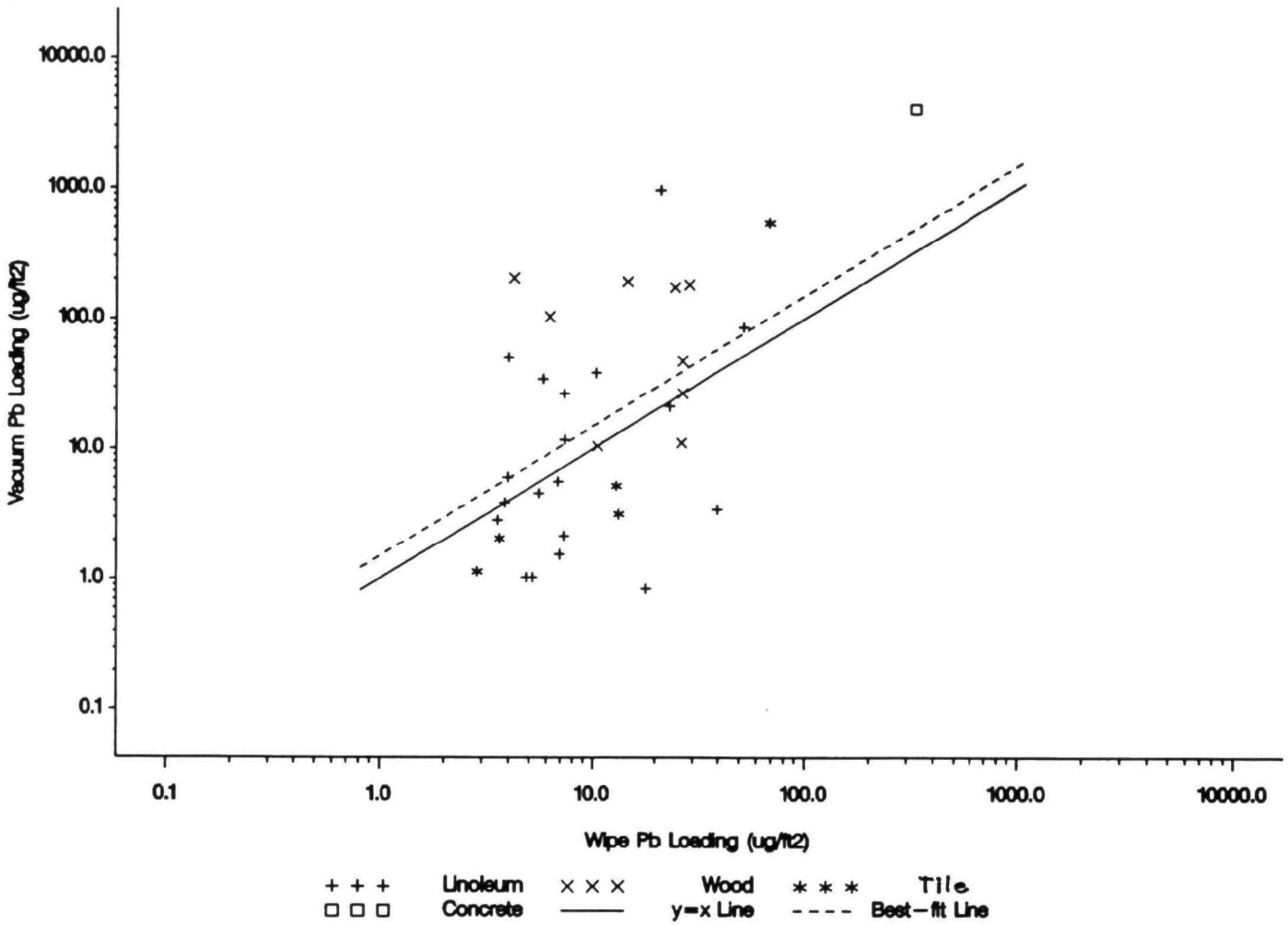


Figure 6-1. Vacuum versus wipe comparison: geometric means of side-by-side floor lead loading ($\mu g/ft^2$) measures. (Estimate of vacuum/wipe ratio is 1.42; confidence interval is (0.78, 2.60).)

The effect of room type on the wipe/vacuum relationship was also investigated. Categories such as wet versus dry and eating versus non-eating were considered. No significant differences were observed.

## 6.1 ALL SUBSTRATES COMBINED

It is assumed that the relationship between vacuum and wipe measures is log-linear:

$$\log(V) = \log(\alpha) + \beta \log(W) \tag{1}$$

where V and W represent the true expected loadings by the vacuum and wipe methods. Restating the model in terms of the untransformed loadings we have

$$V = \alpha W^{\beta}. \tag{2}$$

If $\beta$ is not equal to one, the multiplicative bias between the two sampling methods changes with the magnitude of the measurements. However, if $\beta$=1, there is a fixed multiplicative bias ($\alpha$) between the sampling methods which does not change with the magnitude of the measurements. Also, for $\beta$=1, the model of Equations (1) and (2) simplifies to the assumption that the ratio W/V follows a lognormal distribution with geometric mean $\alpha$.

Since the vacuum and wipe determinations are both measured with error, a simple linear regression for (1) is inappropriate. An errors-in-variables approach was used. Specifically, we do not observe V and W in (1), but rather we have V* and W* where

$$\log(V^*) = \log(V) + \log(\epsilon), \text{ and}$$
$$\log(W^*) = \log(W) + \log(\delta),$$

with $\epsilon$, $\delta$ independent, and lognormally distributed. We also assume that W is lognormally distributed. Using simple linear regression produces biased estimates of $\alpha$ and $\beta$. However, formulas to correct for these biases are well known, and were used in the results that follow.

The first step was to test the hypothesis of a fixed multiplicative bias ($H_o$:$\beta$=1). The estimate of $\beta$ was 1.40 with a standard error of 0.37. Since the hypothesis could not be rejected at any reasonable significance level (p=0.29), the model was then refitted with the $\beta$ parameter set to one. The estimate of the multiplicative bias ($\alpha$) of vacuum over wipe measurements is 1.42 with a 95% confidence interval of (0.78, 2.60). This result implies that, on the average, vacuum lead loadings are 1.42 times larger than matching wipe lead loadings on floors.

The precision of the vacuum and wipe measurements is also a relevant quantity. On average, side-by-side vacuum measures were significantly more variable than wipe measures. The estimated log standard deviation for vacuum samples was 0.95 with a 95 percent confidence interval of (0.77, 1.25) whereas for wipe samples it was 0.55 with a 95 percent confidence interval of (0.45, 0.73).

## 6.2 ADJUSTING FOR SUBSTRATE EFFECTS

The above approach was used to investigate the vacuum/wipe relationship separately for each of the substrate categories sampled. For each of the substrates, the hypothesis of a fixed multiplicative bias ($\beta$=1) could not be rejected at any reasonable level. There was only one set of side-by-side comparison samples taken on concrete, so this hypothesis was not tested for concrete. We only remind the reader that the highest lead loadings observed for wipe/vacuum comparison samples occurred on concrete by both methods. The estimated biases vary according to substrate. There appears to be a relationship between the smoothness of the substrate and these biases. Table 6-2 displays the estimated multiplicative bias for each substrate

along with confidence bounds. The ratio observed on wood was significantly different from the ratios observed on both linoleum and tile. The bias appears to increase with coarseness of the substrate. If the wipe method fails to extract dust particles embedded in recesses on the substrate surface then this relationship would be expected.

**Table 6-2. Vacuum/Wipe Multiplicative Bias Estimates**

| Substrate | Observations | Estimated Vacuum/Wipe Multiplicative Bias | Lower Confidence Bound | Upper Confidence Bound |
|---|---|---|---|---|
| Tile | 4 | 0.69 | 0.15 | 3.06 |
| Linoleum | 19 | 1.01 | 0.47 | 2.17 |
| Wood | 9 | 4.15 | 1.36 | 12.65 |
| Concrete | 1 | 12.22 | 0.43 | 344.87 |

## 7.0 COMPARISONS WITH OTHER STUDIES

The environmental sampling results of the CAP Study may be compared to those from other studies. In particular, comparisons to the earlier CAP Pilot Study, the HUD Abatement Demonstration Project, and other studies assessing the efficacy of an abatement procedure seem most applicable. Chapter 7.1 compares the results from the pilot and full CAP studies. A comparison to the HUD Demonstration results is presented in Chapter 7.2. Finally, CAP results are compared to the results of other abatement efficacy studies.

### 7.1 COMPARISON OF CAP STUDY DATA AND CAP PILOT STUDY DATA

The CAP Pilot Study investigated field, laboratory, and statistical analysis procedures planned for the CAP Study. As such, it employed comparable sampling techniques and locations. A complete discussion on the Pilot Study is available in another report (Battelle and MRI, 1991).

Of the six residential units surveyed in the Pilot Study, five were revisited in the CAP Study. Figure 7-1 displays the differences for those five units between the CAP Pilot and full CAP studies in geometric mean lead loading results, by sample type. Similar plots for lead concentration and dust loading are portrayed in Figures 7-2 and 7-3, respectively. Each line segment in the figures represents the change in lead loading for a particular unit and sample type. For example, the floor lead loading results were higher in the full Study than in the Pilot for all units except Unit 51. In the figure, this is evidenced by the appropriate line segments rising from left to right.

As the figures suggest, there is no single pattern of change across the various sample types. For example, a particular unit may have higher air duct lead loadings in the CAP Study, but lower window channel lead loadings. The floor and entryway interior changes are the most similar unit to unit, especially for the lead loading and dust loading results.

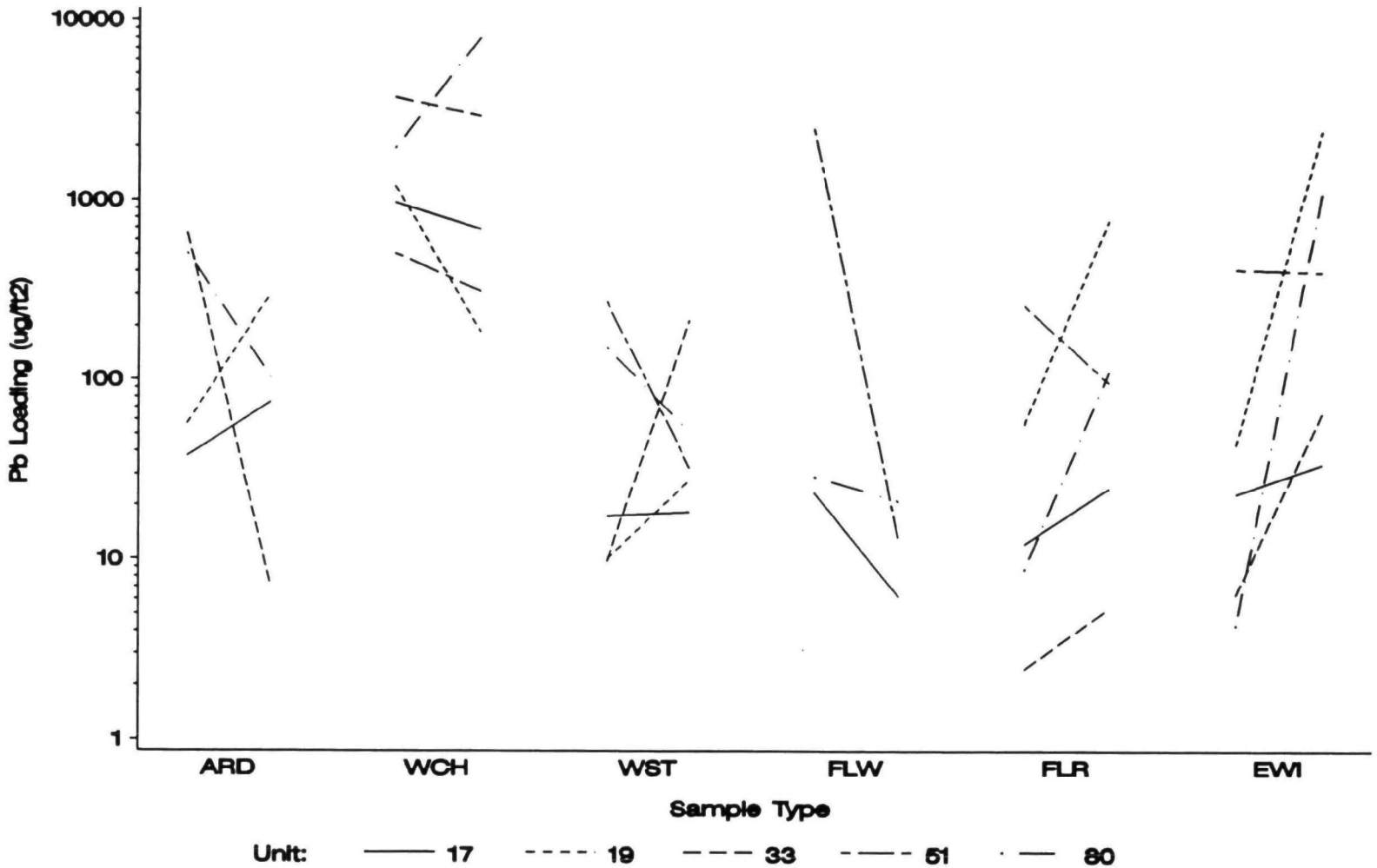


Figure 7-1. Comparison of CAP Pilot and CAP Study results: unit geometric mean lead loading ($\mu g/ft^2$) by sample type.

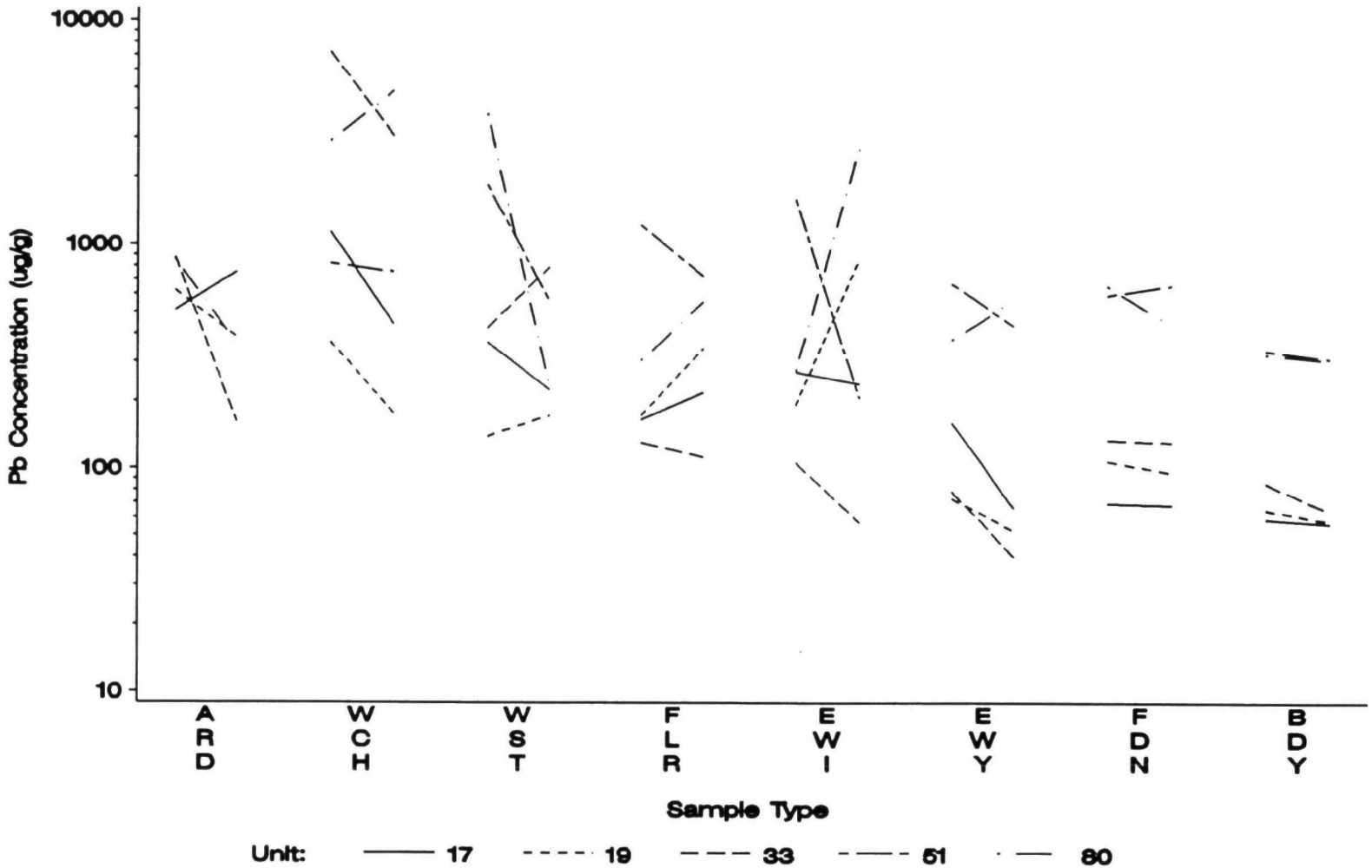


Figure 7-2. Comparison of CAP Pilot and CAP Study results: unit geometric mean lead concentration (μg/g) by sample type.

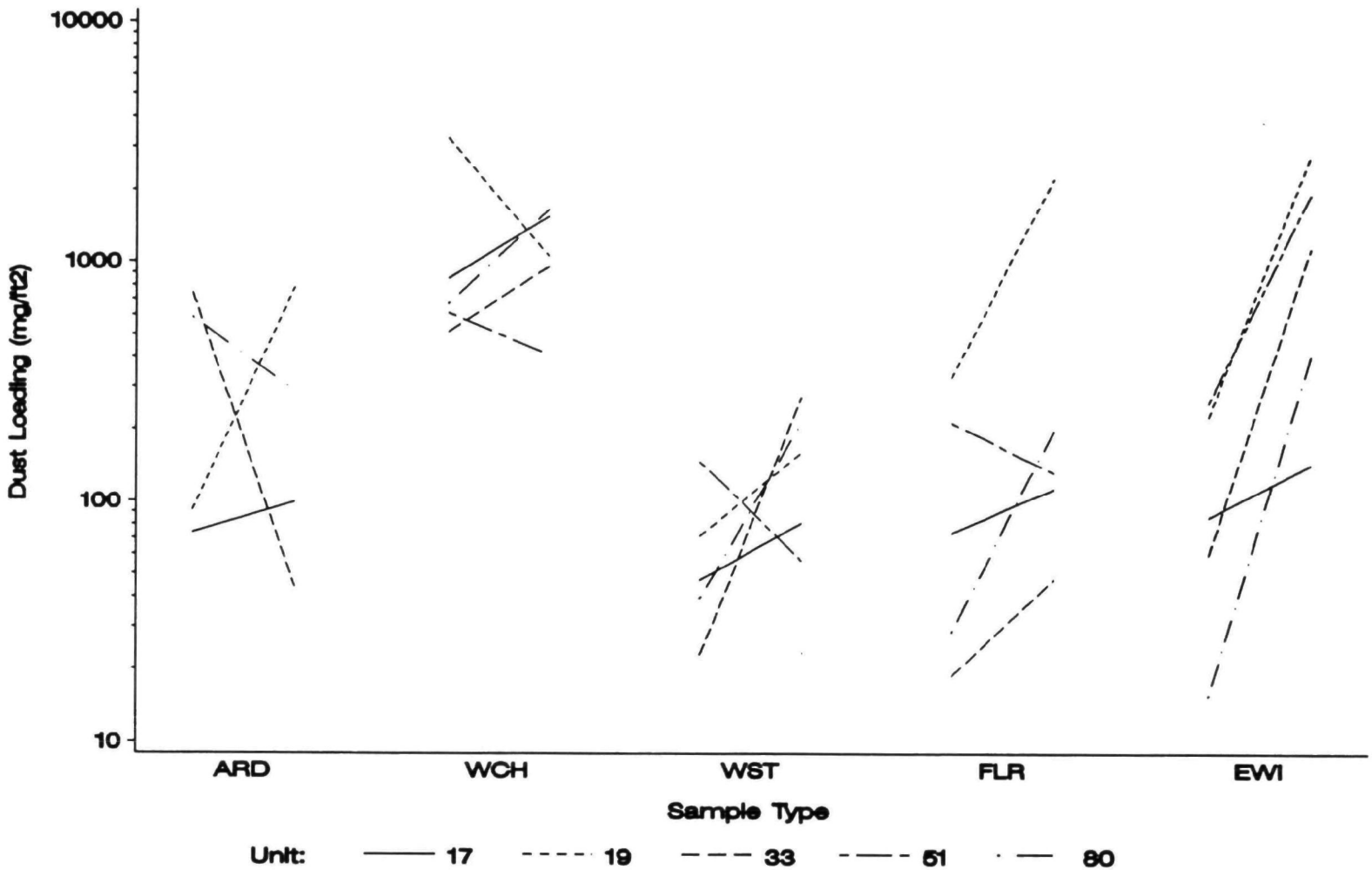


Figure 7-3. Comparison of CAP Pilot Study and CAP Study results: unit geometric mean dust loading (mg/ft$^2$) by sample type.

The window channel and stool results, in turn, were the least consistent. Not surprisingly, the soil lead concentration measurements did not change significantly in the time between the two studies. Despite the greater efficiency of the dust sampler in the CAP Study, the dust loading unit geometric means did not all increase. In fact, the dust loading results for Unit 51 were usually lower in the CAP Study than the Pilot Study. Only the air ducts had on average a decrease in dust loadings. The greatest geometric mean increase in dust loading, 9.5 times, occurred for floor samples. Since the CAP Study only collected wipe samples from abated units, only three units had two sets of wipe samples. The lead loading results in those units decreased.

It is noted above that a more efficient dust vacuum sampler was utilized in the CAP Study. When revisiting the Pilot units in the CAP Study, an attempt was made to collect dust samples from the same room and component. Figure 7-4 presents a comparison of the dust loading results from these two studies. The dust loading results for the Pilot Study are plotted versus those for the CAP Study. The different sample types are indicated by individual plotting symbols. The cloud of points and its location are somewhat surprising. Given the greater efficiency of the sampler used in the CAP Study, one might have expected the CAP Study dust loadings to be consistently higher. Evidently, other factors such as time, occupancy, and sample-to-sample variation overwhelm any obvious difference in sampling efficiency.

## 7.2 COMPARISON OF CAP STUDY DATA AND HUD ABATEMENT DEMONSTRATION DATA

The HUD Abatement Demonstration project included the collection of detailed environmental data at all units, both abated and control. Each unit underwent extensive XRF/AAS testing to assess the amount of lead-based paint. Units found to contain lead-based paint had additional environmental samples

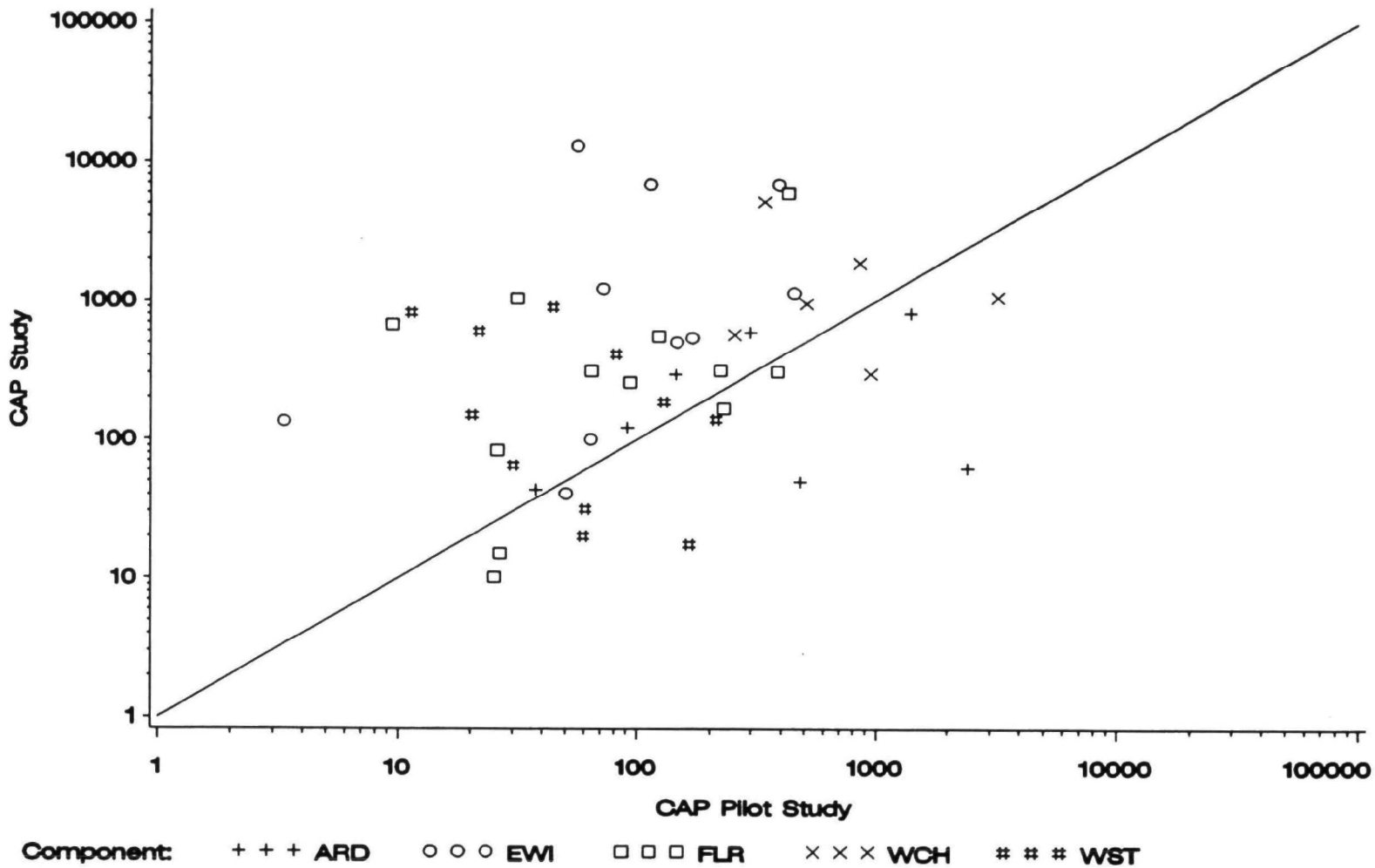


Figure 7-4. Comparison of CAP Pilot Study and CAP Study results: component geometric mean dust loadings (mg/ft$^2$) by sample type.

collected. Those samples were from individual components within a room and soil core samples (both before and after the abatement) collected on all four sides of the unit. The HUD Demonstration dust and post-abatement soil samples were collected between November 1989 and July 1990. The pre-abatement soil samples were collected between August and December 1989. The CAP Study results, in turn, were obtained in March and April 1992. Though a seasonal effort may be influencing the comparisons that follow, it cannot be separated from other differences between the projects such as sampling protocols.

Figure 7-5 contrasts the CAP Study floor dust lead loading ($\mu g/ft^2$) results to those from the HUD Demonstration. For the CAP Study, geometric mean dust lead loadings are calculated for all floor dust vacuum and wipe samples collected within a room and unit. Since the dust samples collected in the HUD Demonstration project were part of the clearance procedures, only the final floor dust wipe sample collected in a room was retained. Figures 7-6 and 7-7 present similar comparisons for window stools and window channels, respectively. Recall that in the CAP Study, dust wipe samples were collected only on the floors of abated units. As is evidenced in the figures, there appears to be little agreement between the CAP Study results and those from the HUD Demonstration. The higher dust lead loadings from the CAP Study, most apparent for the window channel samples, may be due to increased lead concentration in the dust or the greater efficiency of the vacuum sampler employed.

For purposes of comparison, a geometric mean XRF/AAS result ($mg/ft^2$) was calculated by room and unit from the extensive HUD Demonstration XRF/AAS measurements within the room. Figure 7-8 compares the CAP Study floor dust lead loading results (both wipe and vacuum) and the HUD Demonstration dust wipe lead loadings to these room geometric mean XRF/AAS results. Similar comparisons are portrayed for window stools (Figure 7-9) and window channels (Figure 7-10). The resulting clouds of points suggest little or no correlation between dust lead loading and

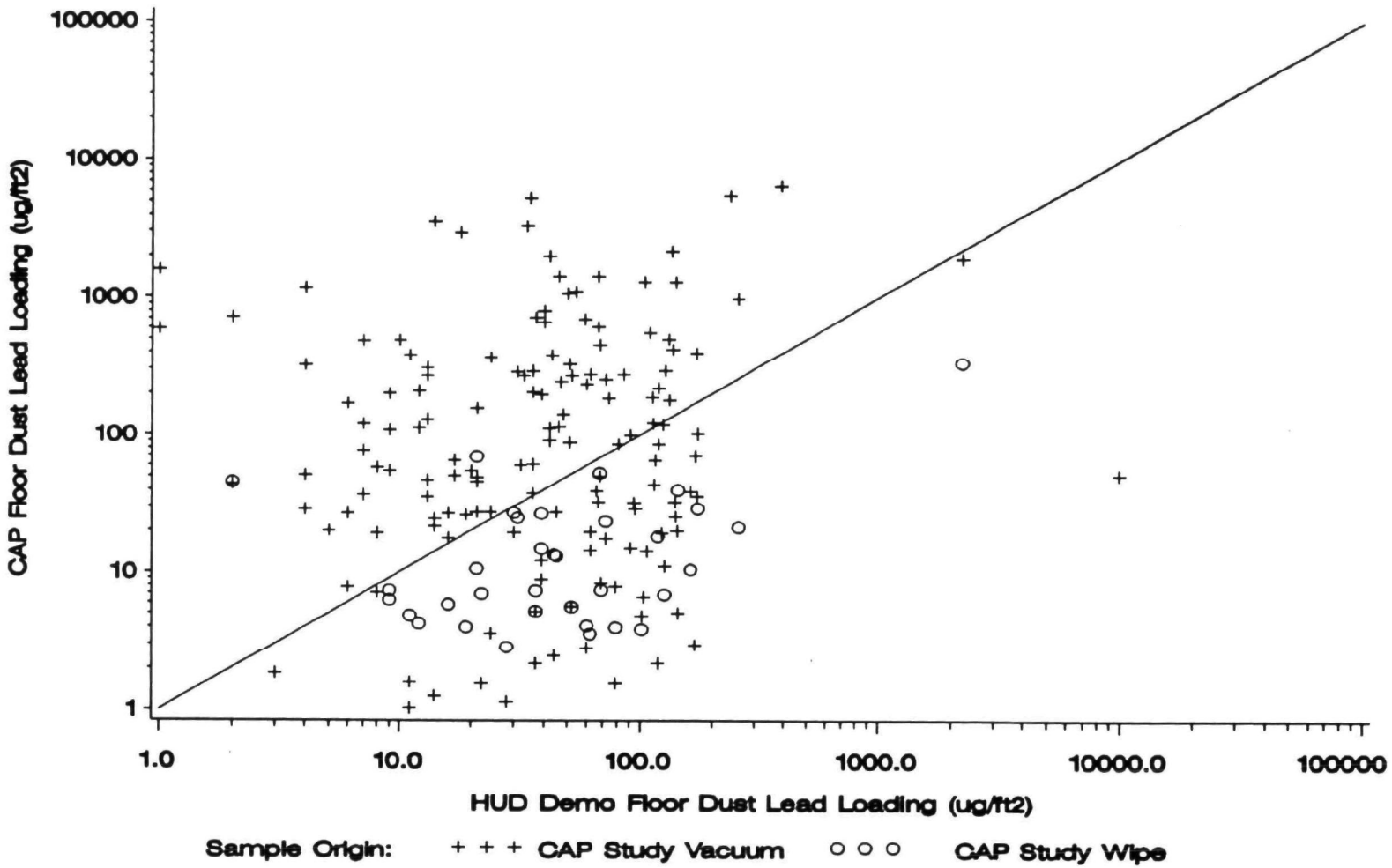


Figure 7-5. CAP vacuum and CAP wipe vs HUD Demonstration wipe results: geometric mean floor lead loading by room.

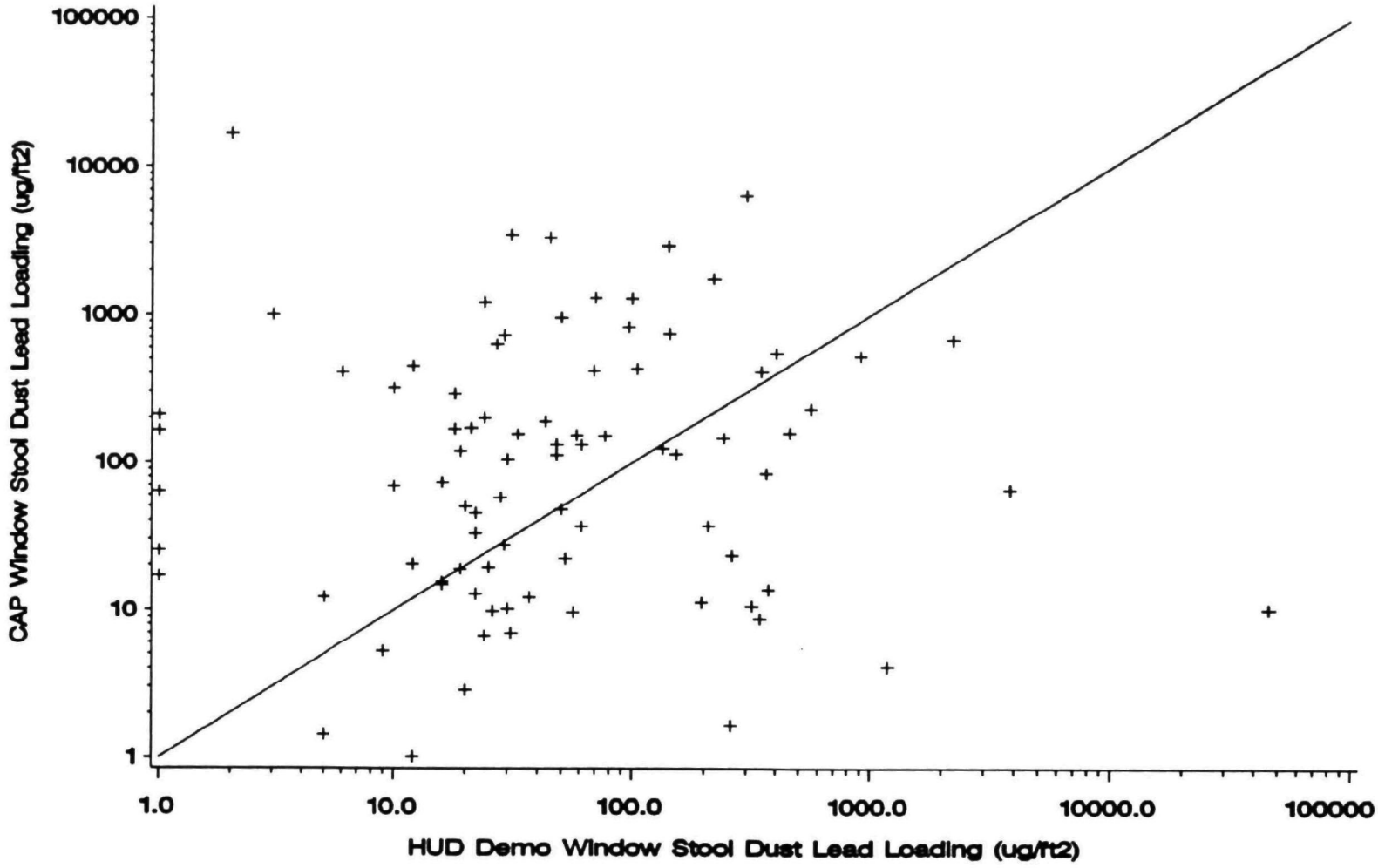


Figure 7-6. CAP vacuum versus HUD Demonstration wipe results: geometric mean window stool lead loadings by room.

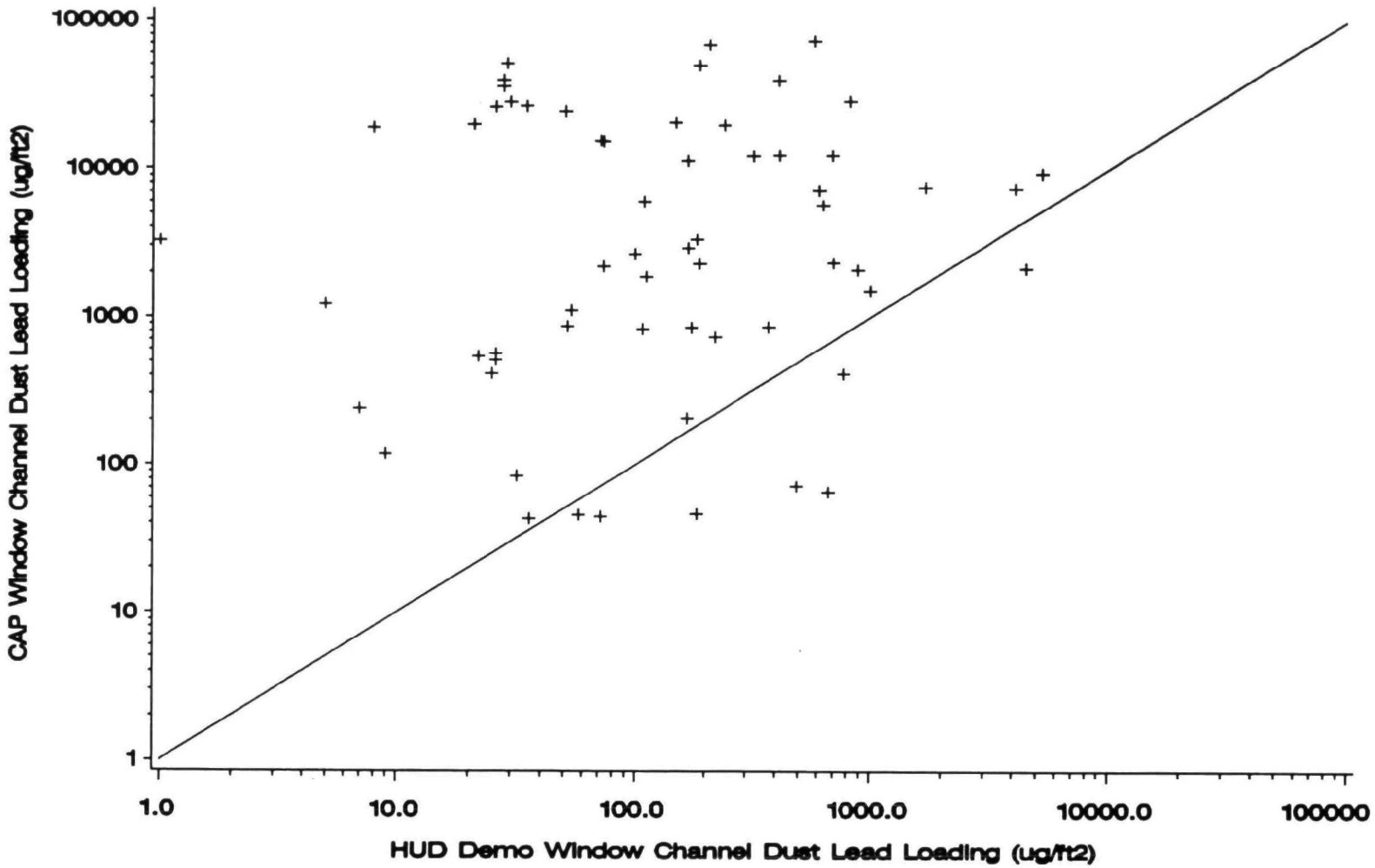


Figure 7-7. CAP vacuum versus HUD Demonstration wipe results: geometric mean window channel lead loading by room.

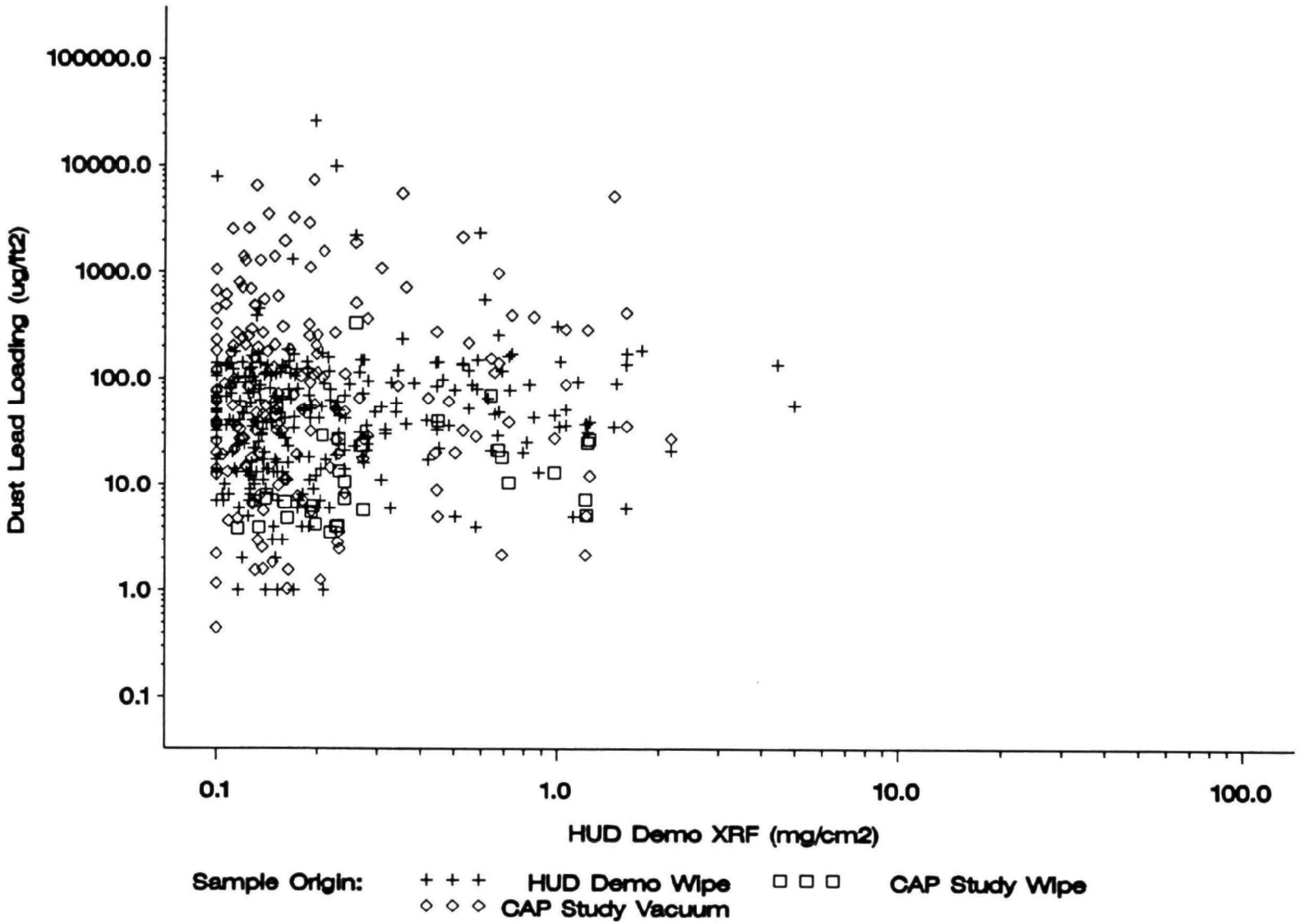


Figure 7-8. CAP wipe, vacuum, and HUD Demonstration wipe versus HUD Demonstration XRF/AAS results: geometric mean floor lead loading ($\mu g/ft^2$) by room.

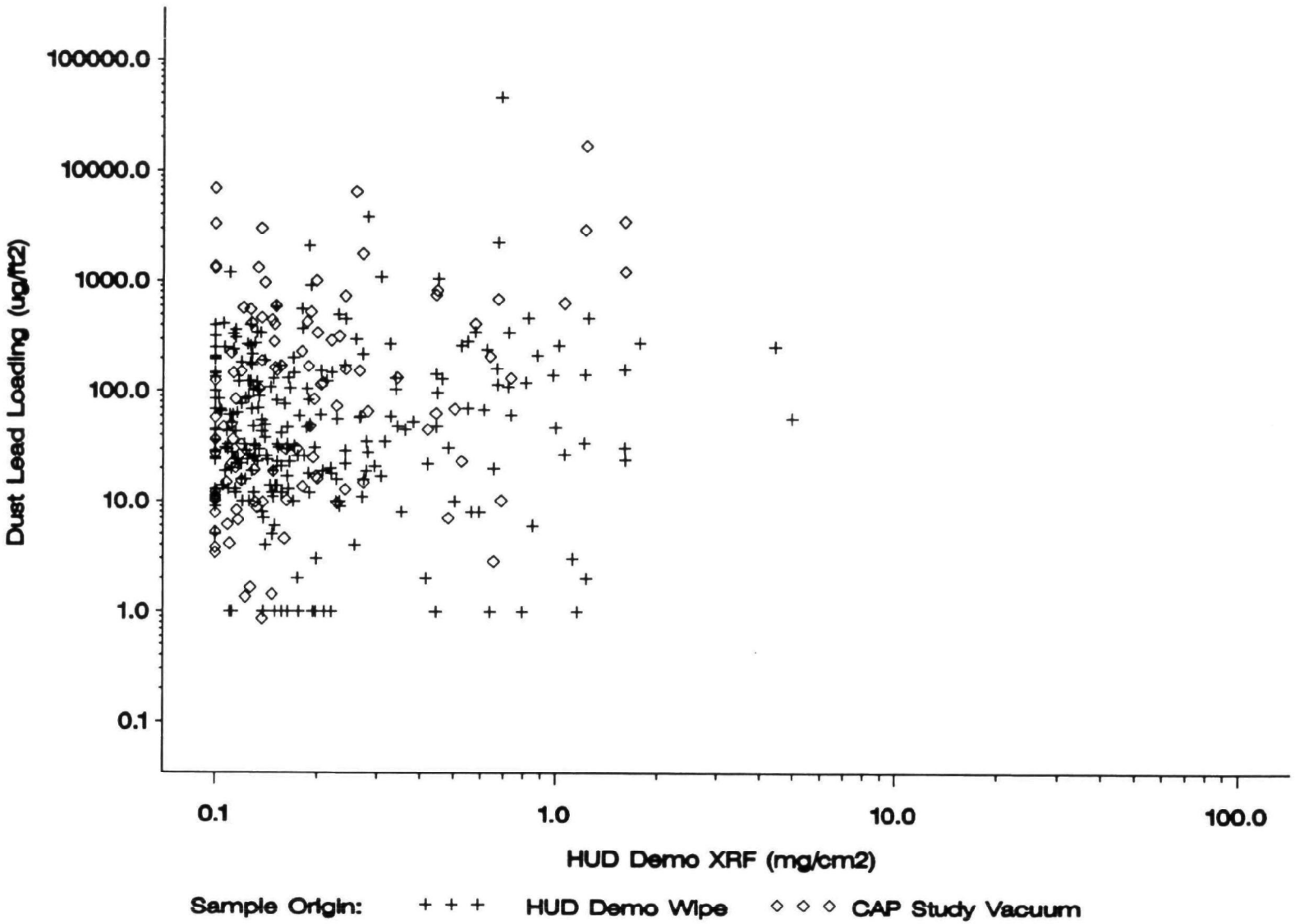


Figure 7-9. CAP vacuum and HUD Demostration wipe versus HUD Demostration XRF/AAS results: geometric mean window stool lead loading ($\mu g/ft^2$) by room.

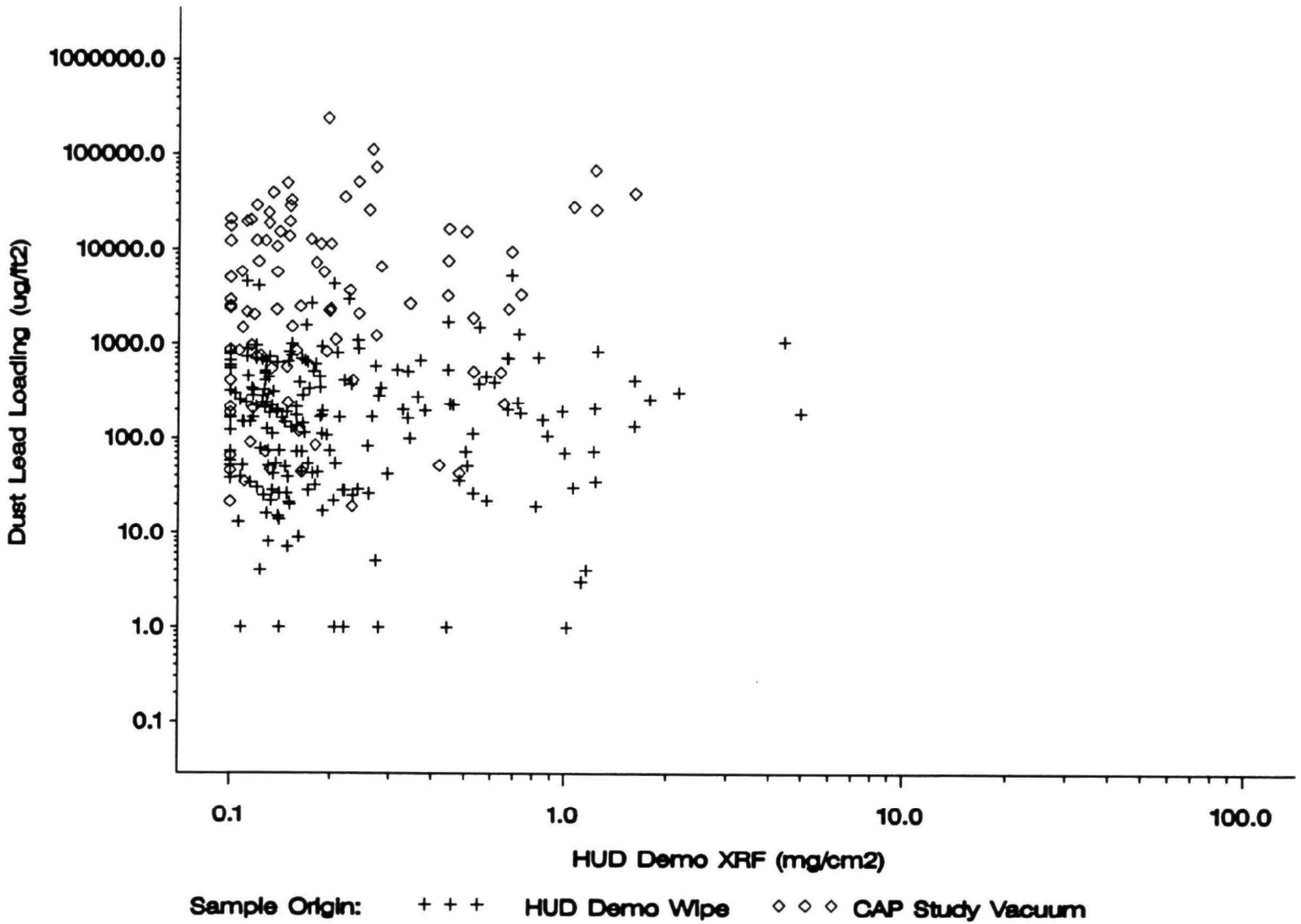


Figure 7-10. CAP vacuum and HUD Demonstration wipe versus HUD Demonstration XRF/AAS results: geometric mean window channel Loading ($\mu g/ft^2$) by room.

the XRF/AAS results for both the HUD Demonstration and the CAP Study projects. The scatter is somewhat more pronounced at lower paint-lead loadings. Higher dust lead loadings are at times evident for the CAP dust vacuum samples and again particularly so for the window channel results.

Figure 7-11 compares the HUD Demonstration and CAP studies relative to soil lead concentrations (μg/g), collected on the same side of the unit. The pre-abatement soil samples are also included as a basis of comparison. The HUD Demonstration pre- and post-abatement results appear positively correlated. The CAP soil lead concentrations, in contrast, exhibit a high degree of scatter. The six measurements in the lower right quadrant of the figure are from three units (16, 78, and 95) with low concentrations in the CAP Study and high post-abatement soil lead levels in the HUD Demonstration. There is some suggestion of a positive association between the levels of the CAP and HUD Demonstration when these six measurements are ignored.

In Figure 7-12, soil lead concentrations (μg/g) are plotted versus the HUD Demonstration XRF/AAS loadings (mg/ft$^2$), measured for the adjacent exterior wall. The CAP soil samples and the HUD Demonstration soil results, both pre- and post-abatement, do not appear to exhibit any trend with increasing paint-lead loading.

## 7.3 COMPARISON OF DUST LEAD LOADINGS BETWEEN THE CAP STUDY AND OTHER STUDIES

It is worthwhile to contrast the CAP Study dust lead loading results with those from other comparable studies, including the HUD Demonstration Study. Though considerable differences exist in the sampling frames, collection procedures, and instrumental analyses used in each study, the respective lead loading results may still provide insight on the range of environmental lead levels which exist in U.S. housing. The following four field studies were examined:

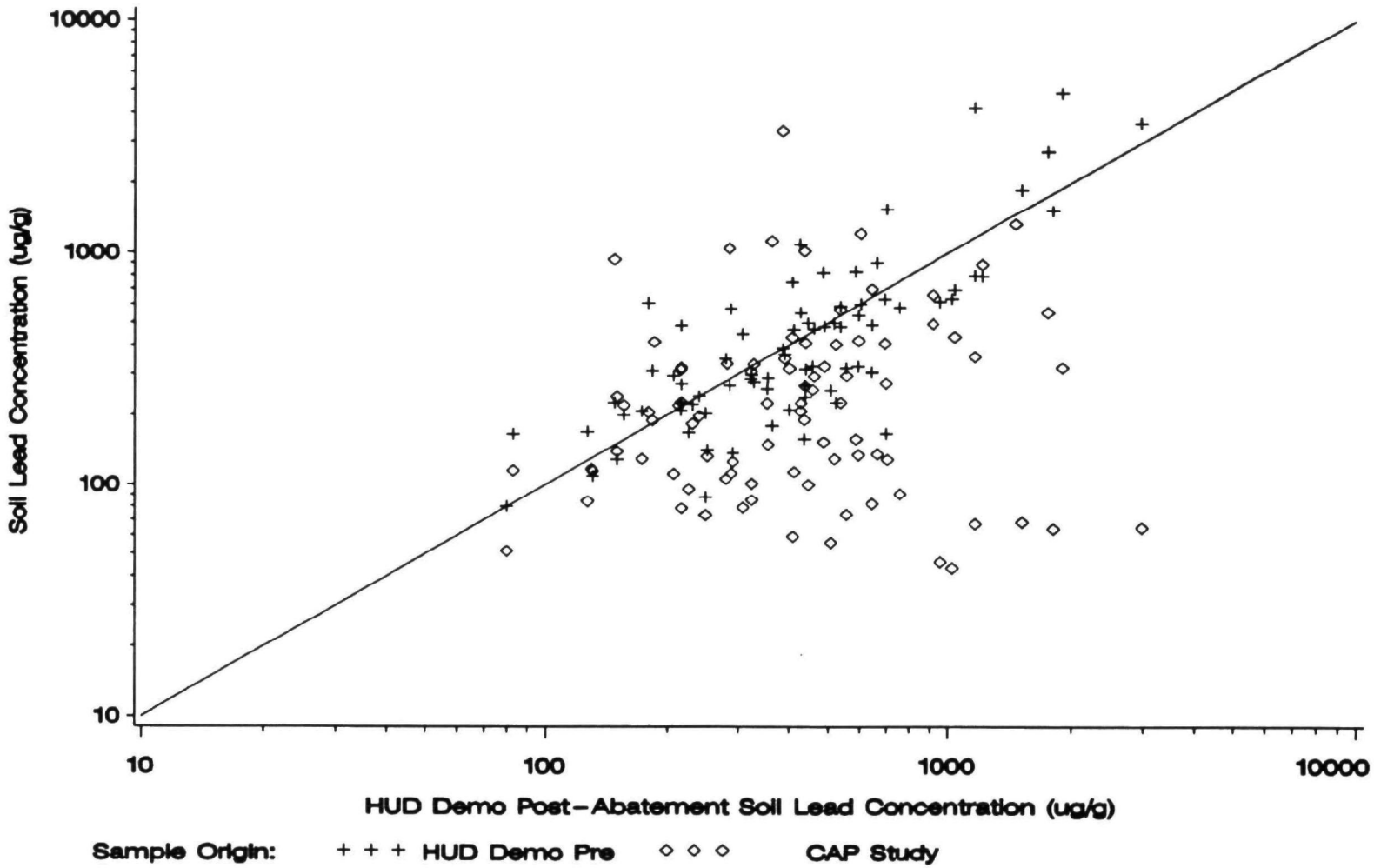


Figure 7-11. CAP versus HUD Demonstration results: geometric mean foundation soil lead concentration (μg/g) by side of unit.

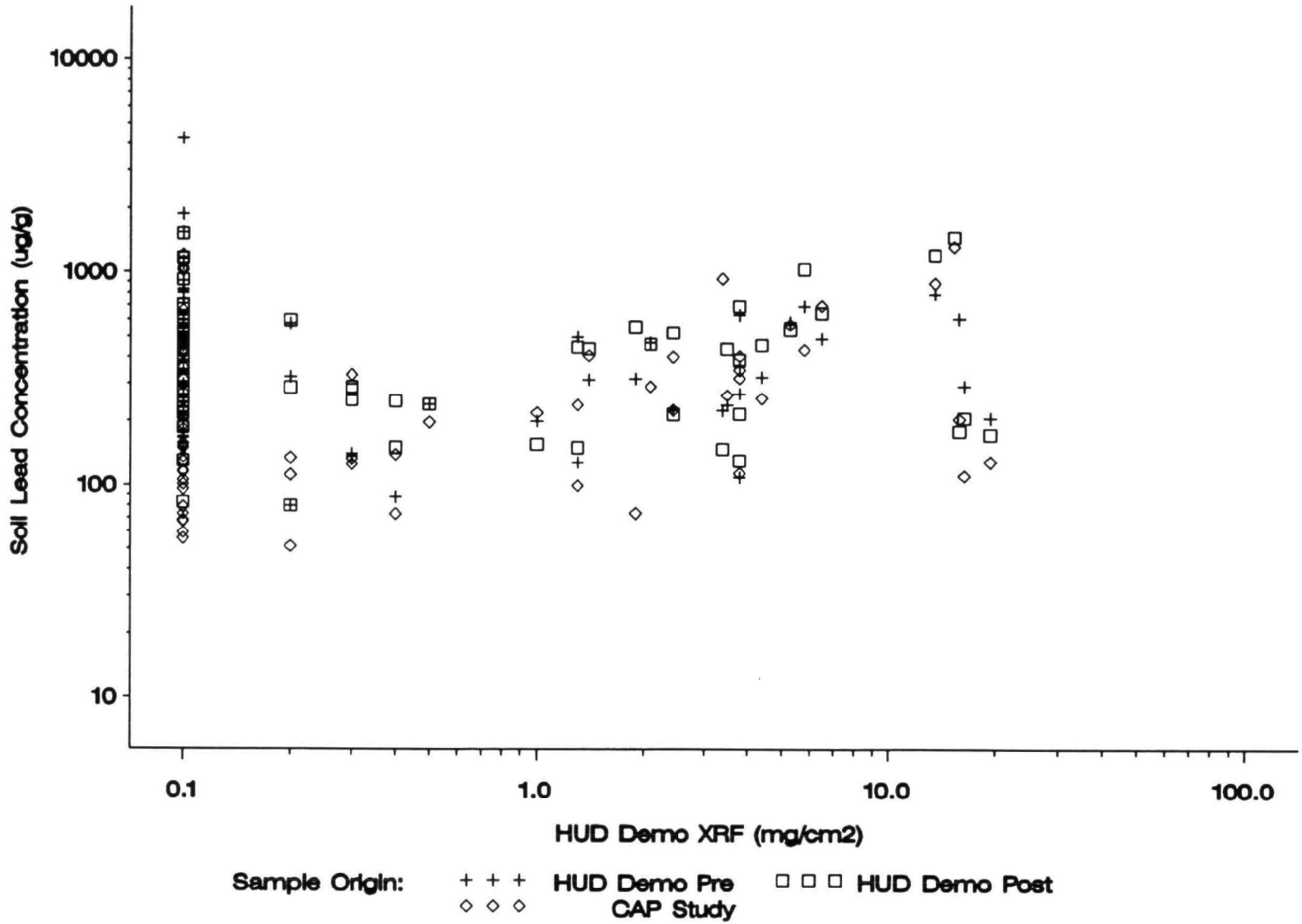


Figure 7-12. CAP soil concentration (μg/g) and HUD Demonstration soil concentration (μg/g) versus HUD Demonstration XRF/AAS results: geometric mean by side of unit.

- HUD Abatement Demonstration Study,
- HUD National Survey of Lead-Based Paint,
- Traditional versus Modified Practices Study, and
- Experimental Abatement Practices Pilot Study.

The dust lead loading results for these studies were either calculated from available datasets or extracted from reported results in the scientific literature.

The comparison produced two primary results. First, the floor and window stool lead loading levels measured in the CAP Study were lower than those in the other studies. Second, the CAP Study window channel lead loadings were higher than the clearance levels measured in the HUD Demonstration and the post-abatement levels collected in the Experimental Practices Pilot.

Table 7-1 compares the CAP Study floor dust lead loading results for control and abated units to those measured in the four studies listed above. For each study, the number of samples, log standard deviation, geometric mean, and 10th, 25th, 75th, and 90th percentiles are presented. Only the number of samples and geometric means were available for two of the studies reported in the literature. Tables 7-2 and 7-3 provide similar comparisons for window stool and window channel dust lead loadings, respectively.

The HUD Demonstration intended to eliminate the lead-based paint hazard from housing environments either by containing the lead-based paint with encapsulation or enclosure methods, or by eliminating the lead-based paint with removal methods (HUD, 1991). Because of the diversity of housing components containing lead-based paint, it was generally true that no single abatement method could be used uniformly throughout a given housing unit. The housing units selected for complete abatement included 169 single-family dwellings from the inventory of FHA repossessed houses in seven urban areas. The clearance (immediately post-

**Table 7-1. Descriptive Statistics for Floor Dust Lead Loadings ($\mu g/ft^2$) by Abatement Efficacy Field Study**

| Study | | Unit Type | Sample Size | Log St.Dev. | P10 | P25 | Geom. Mean | P75 | P90 |
|---|---|---|---|---|---|---|---|---|---|
| CAPS | Full | Control | 51 | 2.12 | 1.09 | 5.71 | 21.38 | 64.99 | 289.23 |
| | | Abated | 187 | 2.00 | 1.69 | 6.73 | 28.97 | 104.34 | 408.58 |
| HUD Demo | | | 1026 | 1.53 | 9.31 | 23.55 | 66.01 | 185.06 | 467.99 |
| National Survey | | High XRF | 234 | 1.82 | 0.23 | 0.70 | 2.40 | 8.23 | 24.90 |
| | | Low XRF | 304 | 1.61 | 0.08 | 0.22 | 0.64 | 1.91 | 5.08 |
| Kennedy-Kreiger[1] | Pre-Abate. | Traditional | 280 | na | na | na | 250.84 | na | na |
| | | Modified | 82 | na | na | na | 288.00 | na | na |
| | Post | Traditional | 271 | na | na | na | 1440.00 | na | na |
| | | Modified | 50 | na | na | na | 650.32 | na | na |
| | Post (6 months) | Traditional | 234 | na | na | na | 315.87 | na | na |
| | | Modified | 57 | na | na | na | 315.87 | na | na |
| Kennedy-Kreiger[2] | Pre-Abate. | | 70 | na | na | na | 520.26 | na | na |
| | Post | | 70 | na | na | na | 130.06 | na | na |
| | Post (6 m) | | 63 | na | na | na | 55.74 | na | na |

[1] Farfel and Chisolm (1990).

[2] Farfel and Chisolm (1991).

**Table 7-2. Descriptive Statistics for Window Stool Dust Lead Loadings ($\mu g/ft^2$) by Abatement Efficacy Field Study**

| Study | | Unit Type | Sample Size | Log St.Dev. | P10 | P25 | Geom. Mean | P75 | P90 |
|---|---|---|---|---|---|---|---|---|---|
| CAPS Full | | Control | 35 | 1.93 | 3.79 | 9.85 | 46.90 | 224.68 | 571.47 |
| | | Abated | 78 | 2.18 | 7.02 | 15.43 | 91.57 | 467.23 | 1315.08 |
| HUD Demo | | | 783 | 1.79 | 9.03 | 26.70 | 89.06 | 297.09 | 878.56 |
| National Survey | | High XRF | 123 | 2.64 | 0.29 | 1.42 | 8.40 | 49.70 | 246.22 |
| | | Low XRF | 126 | 2.13 | 0.10 | 0.37 | 1.57 | 6.59 | 24.06 |
| Kennedy-Kreiger[1] | Pre-Abate. | Traditional | 280 | na | na | na | 1337.80 | na | na |
| | | Modified | 82 | na | na | na | 1802.32 | na | na |
| | Post | Traditional | 271 | na | na | na | 3595.35 | na | na |
| | | Modified | 50 | na | na | na | 603.87 | na | na |
| | Post (6 months) | Traditional | 234 | na | na | na | 1542.19 | na | na |
| | | Modified | 57 | na | na | na | 1635.09 | na | na |
| Kennedy-Kreiger[2] | Pre | | 70 | na | na | na | 4607.99 | na | na |
| | Post | | 70 | na | na | na | 325.16 | na | na |
| | Post (6 m) | | 63 | na | na | na | 408.77 | na | na |

[1] Farfel and Chisolm (1990).

[2] Farfel and Chisolm (1991).

**Table 7-3. Descriptive Statistics for Window Channel Dust Lead Loadings ($\mu g/ft^2$) by Abatement Efficacy Field Study**

| Study | | Unit Type | Sample Size | Log St.Dev. | P10 | P25 | Geom. Mean | P75 | P90 |
|---|---|---|---|---|---|---|---|---|---|
| CAPS Full | | Control | 27 | 2.02 | 84.16 | 738.00 | 2330.21 | 12427.41 | 20517.84 |
| | | Abated | 71 | 2.33 | 51.74 | 510.51 | 2589.90 | 18883.56 | 39308.26 |
| HUD Demo | | | 756 | 1.93 | 42.90 | 138.10 | 506.21 | 1855.57 | 5973.47 |
| National Survey | | High XRF | 56 | 2.28 | 11.91 | 47.40 | 220.00 | 1021.11 | 4065.07 |
| | | Low XRF | 38 | 2.46 | 0.73 | 3.27 | 17.18 | 90.35 | 402.41 |
| Kennedy-Kreiger[1] | Pre-Abate. | Traditional | 280 | na | na | na | 15496.22 | na | na |
| | | Modified | 82 | na | na | na | 18274.03 | na | na |
| | Post | Traditional | 271 | na | na | na | 14353.52 | na | na |
| | | Modified | 50 | na | na | na | 8082.56 | na | na |
| | Post (6 months) | Traditional | 234 | na | na | na | 12467.59 | na | na |
| | | Modified | 57 | na | na | na | 24879.43 | na | na |
| Kennedy-Kreiger[2] | Pre-Abate. | | 70 | na | na | na | 29422.39 | na | na |
| | Post | | 70 | na | na | na | 938.32 | na | na |
| | Post (6 m) | | 63 | na | na | na | 1003.35 | na | na |

[1] Farfel and Chisolm (1990).

[2] Farfel and Chisolm (1991).

abatement) dust wipe lead loading results from these units were considered in this instance. The geometric mean floor and window stool lead loading levels measured in the HUD Demonstration were higher than those collected in the CAP Study. In contrast, the geometric mean window channel lead loading results were lower in the HUD Demonstration than the CAP Study. There are a variety of possible explanations, including long-term recontamination of the dust by the external soil lead which was unabated.

The HUD National Survey was conducted to examine on a national basis the relationships among soil, dust, and paint lead levels (HUD, 1990). No abatement procedures were performed. In seeking to represent the pre-1980 housing stock in the U.S., a total of 381 housing units were sampled: 284 privately-owned residences and 97 public housing units. The dust vacuum lead loading results from a subset, 182 units, of the privately-owned residences sampled were examined in Tables 7-1, 7-2, and 7-3. The units were partitioned into two groups: the high XRF group having units with at least one interior and exterior XRF result exceeding 1.0 $mg/cm^2$, and the low XRF group having units with all interior and exterior XRF readings less than or equal to 1.0 $mg/cm^2$. There were 102 units in the high XRF group and 80 units in the low XRF group. The unusually low lead loadings measured in the National Survey may be misleading, due in part to the sampling apparatus employed. The so called "blue nozzle" vacuum sampler used in the National Survey has subsequently been determined to be approximately 5 times less efficient than the wipe and vacuum sampling techniques employed in the CAP Study (MRI, 1991).

The Traditional versus Modified Practices Study was performed by Kennedy Institute (Farfel and Chisolm, 1990). Serial dust wipe lead loading measurements were collected from 71 dwellings in Baltimore, Maryland. Samples were collected before, immediately after, and six months after abatement of lead-based paint within the dwellings. Local abatement requirements addressed deteriorated paint on surfaces up to four feet from the

floor and all paint on easily accessible "biting" surfaces where lead content of the paint was greater than 0.7 $mg/cm^2$ by XRF or 0.5 percent by weight. Traditional practices involved only cursory clean-up following the abatement, and allowed a variety of abatement methods to be used. The modified practices called for more substantial efforts to clean the dwelling following abatement, and excluded the use of open-flame burning and sanding techniques. Most of the study dwellings were low-income row houses constructed before 1940. The geometric mean floor, window stool, and window channel dust lead loadings in the CAP Study were at least an order of magnitude lower than the geometric mean post-abatement values for both the traditional and modified practices procedures. The incomplete nature of the traditional and modified abatement procedures may explain the resulting high dust lead loadings. Window channels, for example, were not abated as part of these procedures.

The Experimental Practices Pilot Study was also performed by Kennedy Institute (Farfel and Chisolm, 1991). The experimental practices are described as abatement procedures which included, (1) treatment of lead-painted surfaces above and below 4 ft from the floor; (2) sealing and covering of wooden floors; (3) procedures for containment of dust during abatement; and (4) a final cleanup using a high-efficiency particle air (HEPA) vacuum. Dust wipe lead loading samples were collected in six two-story, six-room low income row houses constructed in the 1920's. Measurements were taken before, immediately following, and six months after the abatement procedures occurred. The CAP Study geometric mean lead loading levels measured on floors and window stools were lower than those measured following the experimental abatement procedures. Interestingly, the geometric mean window channel lead loadings were higher in the CAP Study than the Experimental Practices Pilot. The CAP Study samples were collected more than six months post-abatement, so perhaps recontamination occurs over longer periods of time.

## 8.0 OUTLIER ANALYSIS

In this section, the outlier analysis is discussed. First, we provide the general approach to the analysis, and then we provide details on how the data were grouped, the outlier analysis procedure used, and how the outliers found were handled in our statistical analysis. Data from Unit 08 (which were excluded from the full statistical analysis) were included in this outlier analysis.

### 8.1 APPROACH

Formal statistical outlier tests were performed on the field sample data and the laboratory QC sample data. Data were placed into groups of comparable values, and a maximum absolute studentized residual procedure was used to identify potential outliers. When a potential outlier was identified, that value was excluded from the group, and the outlier test was performed again. This procedure was repeated until no additional outliers were detected. After all potential outliers were identified, a list of these samples was sent to the laboratory for rechecking. The following sections further explain this procedure.

### 8.2 DATA GROUPS

Samples collected from inside the houses were grouped according to the predominant interior abatement method, sample medium (cassette or wipe) and component (air duct, floor, window channel, field blank, trip blank, etc.). Soil samples and exterior entryway cassette samples were grouped according to the predominant exterior abatement method. In addition, interior floor samples were split into two groups, those taken from carpeted floors and those taken from uncarpeted floors. Separate outlier analyses were then performed for each group on the natural logarithm of lead loading values, the natural logarithm of lead concentration values, sample concentration values (field blanks only) and net weight values (trip blanks only).

Normally, soil samples were collected along the foundation of each house. In one case, however, pavement along the foundation required the use of a vacuum cassette to collect two dust samples rather than the usual two soil samples. Additional outlier tests were performed (1) grouping these two samples with foundation soil samples and (2) grouping these two samples with exterior entryway cassette samples.

Laboratory QC values were grouped according to type of sample and sample medium. Outlier analyses were than performed on the natural logarithms of the appropriate measurement for each type of sample (spike recovery for spiked samples, amount of lead for method blanks, calibration blanks, and unspiked samples, percent recovery for interference check samples, calibration standards, calibration verification samples and blind reference material samples, and range of spike recovery for duplicate spiked samples).

## 8.3 THE OUTLIER TEST

The SAS procedure GLM (SAS PC, ver. 6.04) was used to compute the studentized residual for each data value in a group by fitting a "constant" model (i.e., mean value plus error term) to the log-transformed data in each group. The absolute values of the studentized residuals were then compared to the upper .10/n quantile of a t distribution with n-2 degrees of freedom, where n is the number of data values in the group. If the maximum absolute studentized residual was greater than or equal to the .10/n quantile, the corresponding data value was flagged as a potential outlier. The outlier test was then repeated, excluding additional potential outliers, until no more outliers were detected. Table 8-1 lists the field sample outliers found as a result of this test. Table 8-2 lists the laboratory QC outliers.

Often, the minimum and/or maximum data values in a group were flagged as outliers by the test described above. If the minimum and maximum values in a group were not flagged, they

## Table 8-1. CAP Study Outliers - Field Samples

Lead Loading Outliers

| Instrument Batch | Sample Preparation Batch | MRI ID | Sample Medium | Study ID/ Sample ID | Location | Component | Lead Loading (ug/ft$^2$) |
|---|---|---|---|---|---|---|---|
| E04292A | WIO | 902924 | Dust-Vacuum | 28/01 | Kitchen | Floor | < 0.34 |
| E05072B | WIR | 903347 | Dust-Vacuum | 96/02 | Hall | Floor | 2365.43 |
| E05072B | WJB | 903556 | Dust-Vacuum | 19/01 | Living Room | Floor | 1102.35 |
| E05132A | WJC | 903116 | Dust-Vacuum | 96/01 | Hall | Floor | 11641.25 |
| E06022A | WJG | 902546 | Dust-Vacuum | 45/07 | Kitchen | Floor | 1765.38 |
| E07272A | WIZ | 903392 | Dust-Vacuum | 19/02 | Living Room | Floor | 6745.20 |
| E07272A | WIZ | 903769 | Dust-Vacuum | 21/25 | Laundry Room | Floor | 7046.70 |
| E08032A | WKF | 905079 | Dust-Wipe | 21/26 | Laundry Room | Floor | 333.56 |
| E08032A | WKG | 905143 | Dust-Wipe | 57/27 | Bathroom #2 | Floor | < 2.72 |

Lead Concentration Outliers

| Instrument Batch | Sample Preparation Batch | MRI ID | Sample Medium | Study ID/ Sample ID | Location | Component | Lead Concentration (ug/g) |
|---|---|---|---|---|---|---|---|
| E04272A | WIL | 902564 | Dust-Vacuum | 17/13 | Front | Outside Entryway | 8.84 |
| E04292A | WIL | 902761 | Dust-Vacuum | 94/12 | Hall | Inside Entryway | 21.67 |
| E04292A | WIO | 903673 | Dust-Vacuum | 46/05 | Bathroom | Air Duct | 4623 43 |
| E05072B | WIR | 902605 | Dust-Vacuum | 79/12 | Kitchen | Inside Entryway | 2723.16 |
| E05072B | WIR | 903347 | Dust-Vacuum | 96/02 | Hall | Floor | 1724 32 |
| E05072B | WJD | 902142 | Dust-Vacuum | 49/02 | Kitchen | Floor | < 4.56 |
| E05072B | WJD | 903487 | Dust-Vacuum | 60/01 | Bedroom #1 | Floor | < 11.00 |
| E05122B | WJE | 902126 | Dust-Vacuum | 79/14 | Back | Outside Entryway | 16335.45 |
| E05122B | WJF | 902220 | Dust-Vacuum | 51/02 | Bathroom | Floor | 13567.76 |
| E05132A | WJC | 903116 | Dust-Vacuum | 96/01 | Hall | Floor | 6217.62 |
| E05192A | WIQ | 904271 | Soil | 81/17 | Back | Foundation | 3351.12 |
| E05262A | WIT | 904054 | Soil | 79/16 | Back | Entryway | < 4.55 |
| E06022A | WJG | 902546 | Dust-Vacuum | 45/07 | Kitchen | Floor | 6398 60 |
| E06042A | WJP | 902380 | Dust-Vacuum | 68/10 | Dining Room | Air Duct | 5644.54 |
| E06112A | WIW | 904433 | Soil | 51/18 | Back | Foundation | < 5.49[1] |
| E06122A | WJR | 903291 | Dust-Vacuum | 72/11 | Hall | Inside Entryway | 9 65 |
| E06152A | WJV | 903089 | Dust-Vacuum | 68/12 | Kitchen | Inside Entryway | 1200.39 |
| E06292A | WKB | 902955 | Dust-Vacuum | 80/11 | Living Room | Inside Entryway | 5332 00 |
| E06292A | WKB | 903020 | Dust-Vacuum | 03/04 | Bathroom | Window Stool | 48271 93 |
| E06292A | WKB | 903163 | Dust-Vacuum | 31/07 | Bathroom #2 | Floor | 1.71 |
| E07212A | WJG | 902953 | Dust-Vacuum | 51/01 | Bathroom | Floor | 12186 30 |
| E07212A | WJR | 902169 | Dust-Vacuum | 19/12 | Kitchen | Inside Entryway | 2293.62 |
| E08242A | WJA | 904397 | Soil | 53/19 | Left | Boundary | 1074.24[2] |
| E08242A | WJX | 902275 | Dust-Vacuum | 10/12 | Kitchen | Inside Entryway | 9.24 |

## Table 8-1. CAP Study Outliers - Field Samples (Contd)

"Amount of Lead" Outliers

| Instrument Batch | Sample Preparation Batch | MRI ID | Sample Medium | Study ID/ Sample ID | Location | Component | Amount of Lead (ug/sample) |
|---|---|---|---|---|---|---|---|
| E04292A | WIO | 902825 | Dust-Vacuum | 18/06 | Kitchen | Field Blank | < 0.344 |
| E05272A | WIV | 904161 | Soil | 70/22 | Front | Field Blank | 35.638 |
| E06112A | WIW | 904333 | Soil | 50/22 | Right | Field Blank | 271.625[3] |
| E06152A | WJU | 903654 | Dust-Vacuum | 07/06 | Living Room | Field Blank | 2.682 |
| E08032A | WKG | 905133 | Dust-Wipe | 94/28 | Kitchen | Field Blank | 35.445 |
| E08242A | WIT | 904183 | Soil | 99/22 | Front | Field Blank | < 1.197 |

Net Weight (Trip Blank) Outliers

| Instrument Batch | MRI ID | Sample Medium | Study ID/ Sample ID | Location | Component | Sample Weight (g) |
|---|---|---|---|---|---|---|
| TRIPBLNK | 902217 | Dust-Vacuum | 19/23 | Bedroom #1 | Trip Blank | -0.0052 |
| TRIPBLNK | 902516 | Dust-Vacuum | 90/23 | In Van | Trip Blank | 0.0051 |
| TRIPBLNK | 902964 | Dust-Vacuum | 40/23 | Living Room | Trip Blank | 0.0002 |
| TRIPBLNK | 903144 | Dust-Vacuum | 07/23 | Living Room | Trip Blank | 0.0007 |
| TRIPBLNK | 903146 | Dust-Vacuum | 65/23 | Living Room | Trip Blank | 0.0009 |
| TRIPBLNK | 903722 | Dust-Vacuum | 55/23 | Living Room | Trip Blank | 0.0015 |

[1]Value subsequently corrected to 271.625 $\mu g/g$ - no longer an outlier.
[2]Value subsequently corrected to 1072.76 $\mu g/g$ - still an outlier.
[3]Value subsequently corrected to <5.49 - no longer an outlier.

## Table 8-2. CAP Study Outliers - Laboratory QC Samples

Spike Recovery Outliers

| Instrument Batch | Sample Preparation Batch | Sample ID | Run Number | Sample Type Flag | Spike % Recovery |
|---|---|---|---|---|---|
| E04272A | WIL | 903695 | 102 | 2 | 128.5 |
| E04272A | WIL | 903701 | 104 | 3 | 134.0 |
| E05042A | WIR | 903551 | 31 | 2 | 104.1 |
| E05042A | WIR | 903555 | 33 | 3 | 104.0 |
| E05072B | WJB | 903604 | 34 | 2 | 101.5 |
| E05072B | WJB | 903597 | 42 | 3 | 101.5 |
| E05072B | WJD | 903584 | 116 | 2 | 97.8 |
| E05072B | WJD | 903753 | 118 | 3 | 97.9 |
| E05122B | WJE | 903454 | 110 | 2 | 101.2 |
| E05122B | WJE | 903484 | 112 | 3 | 101.2 |
| E05192A | WIP | 904266SPD | 33 | 3 | 130.9 |
| E05272A | WJO | 903360 | 115 | 2 | 98.5 |
| E05272A | WJO | 903628 | 116 | 3 | 98.4 |
| E06042A | WJP | 903320 | 29 | 2 | 100.6 |
| E06042A | WJP | 903321 | 30 | 3 | 100.3 |
| E07142A | WKF | 905240 | 45 | 2 | 99.2 |
| E07212A | WJC | 903546 | 234 | 3 | 113.7 |
| E07272A | WKJ | 903303 | 148 | 2 | 108.5 |
| E07272A | WKJ | 903079 | 149 | 3 | 109.0 |

Method Blank Outliers

| Instrument Batch | Sample Preparation Batch | Sample ID | Run Number | Sample Type Flag | Amount of Lead (µg/sample) |
|---|---|---|---|---|---|
| E07272A | WIZ | MB1 | 38 | 4 | <4.0202 |
| E07272A | WIZ | MB2 | 39 | 4 | <4.0202 |
| E07272A | WKJ | MB1 | 116 | 4 | 4.0380 |
| E07272A | WKJ | MB2 | 142 | 4 | 20.6810 |

## Table 8-2. CAP Study Outliers - Laboratory QC Samples (Contd)

### Reference Material Recovery Outliers

| Instrument Batch | Sample Preparation Batch | Sample ID | Run Number | Sample Type Flag | Reference Material % Recovery |
|---|---|---|---|---|---|
| E06292A | WIX | 904326 | 181 | 5 | 114.8 |
| E07302A | WKJ | 902699 | 156 | 5 | 34.4 |
| E08212A | WKJ | 902699 | 28 | 5 | 22.9 |
| E08212A | WIZ | 902731 | 29 | 5 | 27.0 |

### Continuing Calibration Blank Outliers

| Instrument Batch | Sample Preparation Batch | Sample ID | Run Number | Sample Type Flag | Amount of Lead (μg/ml) |
|---|---|---|---|---|---|
| E05152A | WIK | CCB | 44 | 9 | 0.0130 |
| E05152A | WIK | CCB | 93 | 9 | 0.0111 |
| E08182A | REF | CCB | 55 | 9 | 0.0004 |

were nevertheless included in Tables 8-1 and 8-2 as being potential outliers. Of the 838 lead loading values reported, nine (1%) are listed as potential outliers. This includes 7 out of 770 cassette samples and 2 out of 68 wipe samples. Of the 1124 lead concentrations reported, 24 (2%) are listed as potential outliers. This includes 20 out of 770 cassette samples and 4 out of 354 soil samples. Of the 139 field blanks, six (4%) are listed as potential outliers, and of the 53 trip blanks, six (11%) are listed as potential outliers.

## 8.4 RESOLUTION OF OUTLIER QUESTIONS

Tables 8-1 and 8-2 were sent to the laboratory for review. This review resulted in corrections to three of the identified field sample outliers (as indicated in footnotes to Table 8-1) and two other values which had not been identified as outliers. No errors were found in the reporting of the laboratory QC sample data.

## 9.0 STATISTICAL ANALYSIS OF QUALITY CONTROL DATA

To assure that the sampling and analytical protocols employed in the CAP Study were producing data of sufficient quality, a number of different quality control (QC) samples were included in the study design. The intended purpose of each QC sample varied, but each sample type belonged to one of three categories:

1. Field QC-Samples, originating in the field, intended to assess the quality of the sample collection procedures;

2. Sample Preparation QC-Samples, originating in the sample preparation laboratory, which examine the preparation of field samples for analysis, and;

3. Instrumental Analysis QC-Samples, produced in the instrument analysis laboratory, that evaluate the quantitative analysis of the samples.

These individual categories reflect distinct goals of the QC analysis, and separate steps in the collection and analysis of a sample. From a statistical analysis perspective, however, the QC samples may be partitioned somewhat differently. This partitioning reflects the nature of the parameter considered when assessing a particular QC measure. Specifically, the QC samples are partitioned analytically into three groups: (1) blank samples, (2) recovery samples, and (3) duplicate samples. Table 9-1 below is helpful in considering these two approaches to categorizing the QC results. Each type of QC sample employed in the CAP Study is identified within a particular cell of the table. For example, spiked samples were analyzed as recovery samples, but their results address the quality of the sample preparation procedures. A total of ten QC measures were employed. Detailed results of the statistical analyses performed on these QC measures are reported in the sections that follow. To facilitate understanding of the analytical results, our report sections are organized by analysis category. Within each

**Table 9-1. QC Sample Categorization Matrix**

| | Field QC | Sample Preparation QC | Instrument Analysis QC |
|---|---|---|---|
| Blank Samples | • trip blanks<br>• field blanks | • method blanks | • calibration blanks |
| Recovery Samples | | • spikes<br>• blind reference materials | • interferant check standards<br>• calibration verifications |
| Duplicate Samples | • side-by-sides | • spiked duplicates | |

category, however, the implications of the results to each procedure step are discussed.

As an overall summary, the following conclusions may be drawn regarding the QC samples:

1. Analysis of the blank samples suggests little if any procedural contamination. The majority of blanks were measured to have lead content below the instrumental level of detection.

2. Despite some procedural problems in their creation and analysis, the results for the recovery samples indicate very good method performance.

3. Spiked duplicate samples created in the laboratory exhibited very good agreement. Side-by-side field samples, on the other hand, suggest significant variability in field sampling. Greater inherent variation was seen in dust samples than in soil samples.

4. There is no significant evidence of a time-based trend in any of the QC samples.

## 9.1 BLANK SAMPLES

Blank samples are expected, by the nature of their collection or preparation, to contain no lead or only a very small amount of lead. In the CAP Study, four types of blank samples were analyzed: trip blanks, field blanks, method blanks, and calibration blanks. The parameter of interest was the amount

of lead (μg) measured for the sample (lead content). In the case of trip and field blanks, the net weight (g) of the sample was also examined. Evidence of a significant amount of lead in a blank sample would suggest a bias in the results for the regular field samples. As was the case for the regular field data, the lead content of the blanks was assumed to follow a lognormal distribution. The amounts, therefore, were log-transformed during their analysis.

### 9.1.1 Field Quality Control

Trip blanks are vacuum dust cassettes that are weighed in the gravimetric laboratory before and after being transported to the field. They are similar to field blanks, except they are not exposed to the field environment. Trip blanks provide information on the sample weight variability resulting from gravimetric laboratory activities in the absence of field handling. Used in combination with the field blank net weight data, they provide a means of determining the weight error contribution from the gravimetric laboratory should the net weight data from the field blanks show an unusual result. Accordingly, no lead analysis was performed on trip blanks. One trip blank was generated for each housing unit sampled by selecting, at random, one vacuum dust cassette from all unused vacuum dust cassettes transported to the field.

Descriptive statistics for the net weights measured for both trip and field blanks from the CAP Pilot and CAP Studies are presented in Table 9-2. The number of samples, arithmetic mean, standard deviation, minimum and maximum net weights are presented. Net weight data from trip blanks indicate that gravimetric laboratory processing resulted in a net mean weight gain of 3.5 mg. This gain is about twice as large as that observed during execution of the pilot study (net mean weight gain of 1.8 mg). The weight difference between the CAP Study and CAP Pilot Study can be attributed, in part, to protocol changes made in gravimetric processing. The clearance criterion for the

**Table 9-2. Net Weight Results for Trip and Field Blanks**

| Statistic | CAP Pilot Study | | CAP Study | |
|---|---|---|---|---|
| | Trip Blanks | Field Blanks | Trip Blanks | Field Blanks |
| Number of Samples | 54 | 9 | 51* | 52 |
| Net Weight Mean (mg) | 1.8 | 2.4 | 3.5 | 0.4 |
| Net Weight Standard Deviation (mg) | 0.3 | 0.5 | 1.2 | 3.0 |
| Minimum Net Weight (mg) | 1.1 | 1.4 | 0.2 | -6.3 |
| Maximum Net Weight (mg) | 2.6 | 3.0 | 5.1 | 5.2 |

* Excluding one sample identified as an outlier.

determination of cassette stability was increased from ± 1 mg to ± 2 mg. This change was made to reduce the excessive equilibration time required during the pilot study. It was anticipated that the resulting losses in accuracy at low sample weights would be offset by the increased collection efficiency of the sampling system used for dust sample collection. Indeed, the summary in Table 2-2 of the amount of dust collected suggests that the lack of sufficient sample was not usually a problem. The mean weights of the collected dust were sufficiently large to override the mean weight gain resulting from gravimetric laboratory processing.

Field blanks are identical to regular field samples, except that no sample is actually collected. Field blanks provide information on the extent of lead contamination experienced by field samples resulting from a combination of laboratory processing and field handling. In addition, field blanks for cassettes provide information on the sample weight variability resulting from the combination of gravimetric

laboratory activities and field handling. Field blanks for vacuum dust, wipe dust (abated houses only), and core soil were collected for each housing unit.

Field blanks, as opposed to trip blanks, better represent the handling experienced by field samples. Any adjustments to weight data, if required, are best based on field blank net weight data. As shown in Table 2-2, the mean weights of collected dust for field samples are considerably larger than the net mean weight of 0.4 mg measured for the field blanks as shown in Table 9-2. No adjustments were made, therefore, to field sample weights of vacuum dust cassettes for the calculation of lead concentration (μg/g) values.

Mean net weights between the trip and field blanks for the CAP Pilot (1.8 mg compared to 2.4 mg) were relatively close as indicated in Table 9-2. Mean net weights between the trip and field blanks for the CAP Study, however, differ more considerably (3.5 mg compared to 0.4 mg). The CAP Study data imply that field handling produces weight reduction of the vacuum dust cassettes. The change between the CAP Pilot and CAP Study data is suspected to be related to a combination of two factors: the protocol changes made in gravimetric processing (discussed earlier), and the humidity at the sampling site.

Handling of field blanks exposes the cassettes to the atmosphere at the field site. The procedure of collecting field blanks included the following steps: remove the cassette from the sealed plastic bags, open the cassette casing, insert it into the cyclone sampler, remove it from the sampler, close the cassette casing, and replace the cassette into the sealed plastic bags used for transport. Trip blanks were not removed from their sealed plastic bags in the field. The collection site was in an area known for low humidity (Denver has a dry climate). When opened in a low humidity environment, field blanks would be expected to lose water (and weight) absorbed during equilibration in the gravimetric laboratory. It is suspected that the change in gravimetric clearance criterion did not permit sufficient

equilibration in the gravimetric laboratory to allow the cassettes to gain back all the weight lost during their exposure to the low humidity field environment. This would account for the observed net weight difference between the field and trip blanks. Gravimetric records were reviewed for data to support this supposition. However, no weights were recorded for the first 72 hours after vacuum dust cassettes were placed into the gravimetric laboratory (standard equilibration) and there exist no field humidity data. There are insufficient data available, as a result, to either discount or support the protocol change and humidity effect explanation.

Field blank samples also were measured for lead content. A summary of the field blank lead content results (and in fact, of all the QC results) is presented in Table 9-3. The descriptive statistics reported include the number of samples, number above the instrumental detection limit (IDL), minimum and maximum. When possible, the geometric mean and logarithmic standard deviation for the amount of lead per sample are presented. A 95% upper confidence bound on the 95th percentile for lead content is also provided. For the sake of simplicity, this bound will be referred to as the estimated 95% tolerance bound. These calculations were possible only when a sufficient number of results were above the IDL.

If all results were above the IDL, calculation of the geometric mean and logarithmic standard deviation was routine, and the estimated 95% tolerance bound was determined using an exact procedure for lognormal distributions. In cases where a portion of the results were below the IDL, statistical procedures which recognize these data as censored values were used to estimate the geometric mean and logarithmic standard deviation. A lognormal model was fitted to the data and its parameters estimated. The SAS procedure LIFEREG was utilized in obtaining these estimates. LIFEREG maximizes the log-likelihood function via a ridge stabilized Newton-Raphson algorithm, thereby providing maximum likelihood estimates of the log mean and log

## Table 9-3. Results of Quality Control Measures Analyses

| Quality Control Measure | | Parameter Considered | # of Samples[1] | Minimum | Maximum | Geometric Mean | Log Standard Deviation | Lower 95% Tolerance Bound | Upper 95% Tolerance Bound |
|---|---|---|---|---|---|---|---|---|---|
| Field Blanks | Vacuum | Amount | 52 (6) | 0.344 | 2.682 | 0.228 | 1.059 | | 2.006 |
| | Wipe | | 34 (1) | 2.723 | 35.445 | na | na | | na |
| | Soil | | 51 (4) | 1.198 | 35.638 | 0.067 | 2.387 | | 9.162 |
| Method Blanks | Vacuum | Amount | 48 (13) | 0.468 | 20.681 | 0.414 | 1.135 | | 4.369 |
| | Wipe | | 6 (1) | 2.723 | 3.975 | na | na | | na |
| | Soil | | 22 (1) | 1.276 | 3.297 | na | na | | na |
| Calibration Blanks | | Amount | 431 (33) | 0.0004 | 0.068 | 0.007 | 0.956 | | 0.041 |
| Blind References | I | % Recovery | 75 | 0.344 | 1.749 | 1.061 | 0.206 | 0.706 | 1.594 |
| | II | | 37 | 0.229 | 1.131 | 0.881 | 0.316 | 0.396 | 1.957 |
| ICS | | % Recovery | 144 | 0.997 | 1.211[2] | 1.060 | 0.035 | 0.993 | 1.131 |
| Calibration Verifications | | % Recovery | 274 | 0.962 | 1.058 | 1.014 | 0.016 | 0.986 | 1.043 |
| Spikes | Vacuum | % Recovery | 96 | 0.930 | 1.428 | 1.030 | 0.068 | 0.904 | 1.174 |
| | Wipe | | 12 | 0.862 | 1.000 | 0.926 | 0.044 | 0.820 | 1.044 |
| | Soil | | 44 | 0.733 | 1.309 | 0.981 | 0.098 | 0.799 | 1.205 |
| Spiked Duplicates | Vacuum | Ratio | 48 | 1.000 | 1.094 | 1.031 | 0.039 | | 1.068 |
| | Wipe | | 6 | 1.001 | 1.151 | 1.063 | 0.080 | | 1.238 |
| | Soil | | 22 | 1.001 | 1.308 | 1.081 | 0.109 | | 1.227 |
| Side-by-Sides | Vacuum | Ratio ($\mu g/ft^2$) | 52 | 1.027 | 40.381 | 2.334 | 1.110 | | 6.403 |
| | Vacuum | Ratio ($\mu g/g$) | 52 | 1.022 | 81.101 | 2.071 | 1.129 | | 6.605 |
| | Soil | | 51 | 1.004 | 4.569 | 1.296 | 0.399 | | 1.951 |

Censored Analysis

[1] The number of samples measured above the instrumental detection limit (IDL) is enclosed in parentheses.

[2] This value represents an extra ICS analyzed in the middle of an analysis run from an instrument analysis batch containing no field samples. This batch contained only re-runs of SRM 1646 under the conditions described in Section 9.2.1. The next highest ICS, 1.182, was also measured in the same analysis batch.

na - The statistic could not be calculated due to the large number of censored samples.

standard deviation. Further, an approximate procedure was used to calculate the estimated 95% tolerance bound. The "approximate" nature of this statistical procedure was in employing the 'censor' estimates for log mean and log standard deviation in calculating a traditional 95% tolerance bound. Since this procedure did not include an adjustment to the bounds reflecting censored data, the estimated tolerance bound is approximate.

The data for field blank samples are illustrated in Figure 9-1. The amount of lead (μg) found in each blank sample is plotted by sample type. Different plotting symbols are used to indicate whether the result was above the IDL or below, in which case the detection limit is plotted. In those instances where an estimated tolerance could be calculated, the estimated 95% tolerance bound is illustrated in the figure by a bar which has the bound as its upper value.

Most of the field blanks generated for each sample type were below the IDL: more than 88% of the vacuum dust samples were, as well as more than 97% of the wipe dust samples, and more than 92% of the soil samples. No field blank result exceeded five times the average IDL measured during the analysis activities (0.037 μg of lead per mL). Geometric means for all three sample types are less than this IDL mean. These data suggest that no lead contamination occurred during field sample activities.

### 9.1.2 Sample Prep Quality Control

Method blanks are blank samples generated in the laboratory during sample preparation activities. They are processed in a manner identical to field samples except that no sample material or sample medium is present in the container used for sample digestion. Method blanks provide information on the potential lead contamination experienced by field samples resulting solely from laboratory processing. Method blanks were

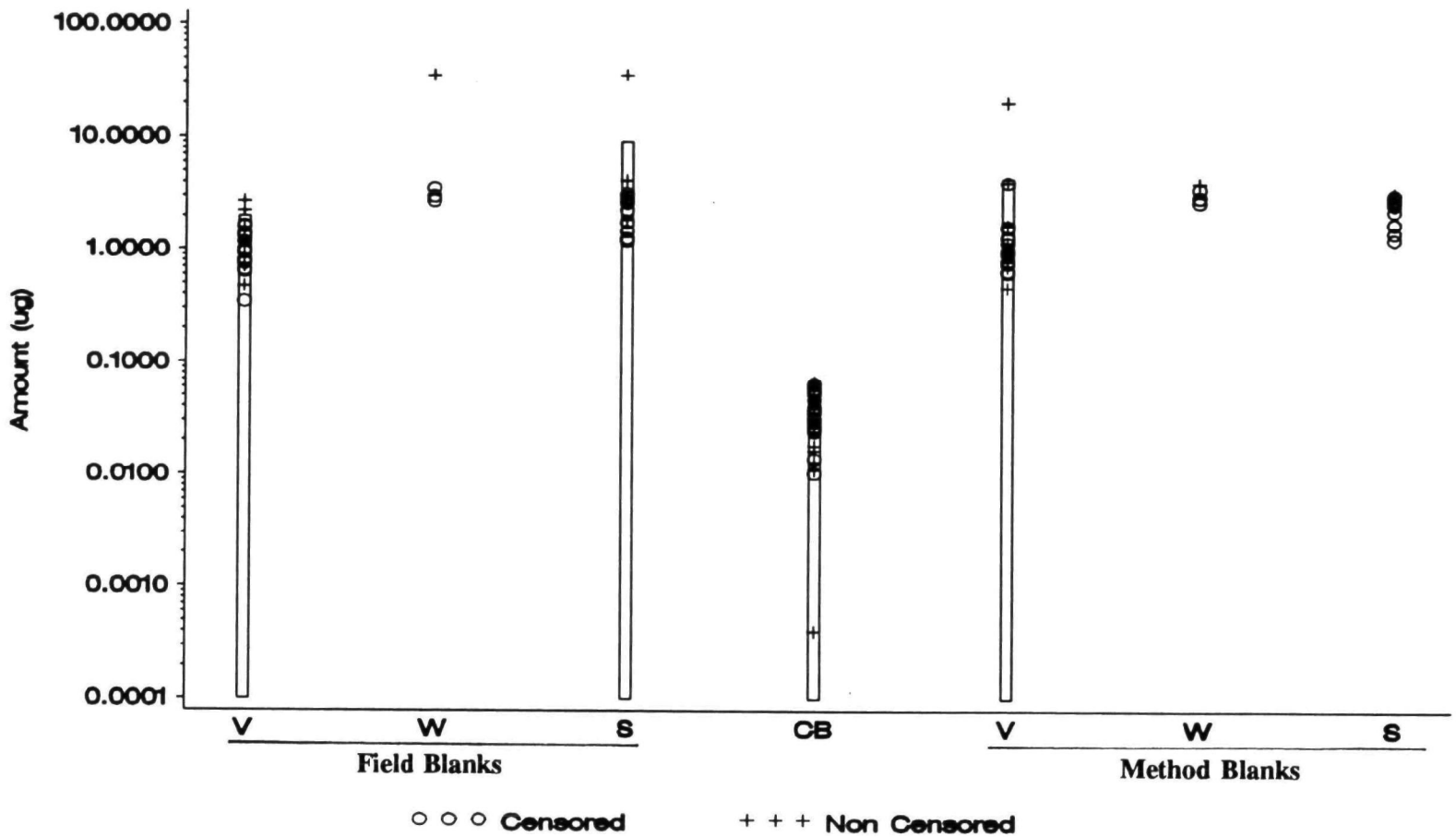


Figure 9-1. Individual measurements and tolerance bounds for $\mu$g lead/sample in blank samples.

generated at a frequency of two samples per batch of approximately 40 field samples.

A summary of the method blank results is presented in Table 9-3 and presented graphically in Figure 9-1. These results were obtained using the same procedures outlined for field blanks. All method blank data met the data quality objective of lead levels less than 10 times the IDL. Most of the method blanks generated for each sample type were below the IDL: 72% of the vacuum dust samples, 83% of the wipe dust samples, and 95% of the soil samples. In fact, a geometric mean, log standard deviation, and approximate 95% tolerance bound could only be calculated for the vacuum cassettes. Only one method blank result exceeded five times the average IDL measured during the analysis activities (0.037 µg of lead per mL). This method blank was one of two in a sample preparation batch which contained only high sample weight vacuum dust samples (minimum field sample weight of 4 grams each). This method blank, with a measured lead level near six times the instrumental detection limit, was insignificant with respect to the lead levels within the batch. The other method blank in this high sample weight batch was less than the IDL. These data indicate no lead contamination occurred during laboratory processing of field samples.

### 9.1.3 Instrumental Analysis Quality Control

Calibration blanks were analyzed along with field samples to assure adequate instrument performance during lead determinations. They are useful in assessing any changes in instrument performance which may affect the estimated lead concentrations reported for regular field samples. Descriptive statistics summarizing the results for calibration blanks are presented in Table 9-3. The individual results and their approximate 95% tolerance bound are portrayed in Figure 9-1. As with the field blank results, the geometric mean, log standard deviation, and approximate 95% tolerance bound are adjusted to reflect the censored nature of many of the results. Greater than

92% of the calibration blanks, which included both initial and continuing calibration blanks, were below the IDL. The maximum lead concentration measured for any calibration blank was less than two times the average IDL for all instrumental analysis runs (0.037 µg of lead per mL). Their geometric mean was well below the average IDL. These results suggest that the field sample results appear to be free from any significant bias caused by carryover.

## 9.2 RECOVERY SAMPLES

Recovery samples are expected to contain a known amount of lead or to have had a known amount of lead added (spiked). Four types of recovery samples were incorporated into the design of the CAP Study: blind reference material samples, spiked samples, calibration verification samples, and interferant check standards (ICS). The parameter of interest was the ratio of the amount of lead measured for the sample (lead content) to the known amount of lead in the sample. This ratio should be approximately one, and when multiplied by 100 is commonly referred to as the percent recovery. Percent recovery values over 100% indicate a measured value exceeding the known amount of lead in the sample and values under 100% indicate a measured value below the known amount. Spiked soil samples were slightly different in that the spike was added to a sample already containing a measured amount of lead. The percent recovery value is assumed to follow a lognormal distribution. If the geometric mean of the lognormal distribution is 100%, this is an indication that lead is over-recovered half the time and under-recovered half the time.

### 9.2.1 Sample Preparation Quality Control

Spiked samples were blank samples (or regular field soil samples) fortified with known levels of lead prior to sample preparation activities, and were processed in a manner identical

to field samples. They provided lead recovery information for use as an assessment of the accuracy and precision of field sample data through sample preparation and analysis activities. Spiked samples were generated at a frequency of four (two spikes and two spiked duplicates) per batch of approximately 40 field samples.

As is noted earlier, spiked soil samples were prepared and analyzed somewhat differently compared to vacuum and wipe dust spikes. Whereas spiked cassette and wipe samples involved spiking a known amount of lead into a blank, spiked soil samples were created by spiking a regular soil sample with a known amount of lead. For cassette and wipe spikes, the ratio of measured amount to known spiking amount was considered (percent recovery). Since a soil spike sample already contained some lead, a different calculation of percent recovery was required. Specifically, the spiked soil percent recovery was determined as,

$$\frac{\left[\begin{matrix}\textit{measured } \mu g \textit{ lead} \\ \textit{for spiked sample}\end{matrix}\right] - \left[\begin{matrix}\textit{measured } \mu g \textit{ lead} \\ \textit{for unspiked sample}\end{matrix}\right]}{\mu g \textit{ lead for spike}} * 100 .$$

Use of QC sample data as an assessment of the accuracy and precision achieved for field samples is partially dependent on the chemical constituent matching (matrix matching) between the QC sample and field sample. This is because data generated from a given analytical processing scheme are generally matrix sensitive. In the case of soil samples, the matrix matching was very good, because unspiked and spiked samples were generated from splits of homogenized soil samples from field sample locations. Spiked sample data for soils, therefore, were expected to closely mimic that of the field samples. Blank cassettes and wipes, however, were used for the generation of the unspiked and spiked samples for dust. Dust field samples (vacuum and wipe) could not be split in a homogeneous manner. As a result, the spiked sample QC data for dust samples may be less

useful than the spiked sample QC data generated for soils. Still, the spiked sample QC data do provide an adequate measure of the degree of successful execution of the analytical methodology. The methodology (sample preparation and analysis) is procedurally very similar to methods commonly used and verified successfully for many different types of environmental samples. The spiked sample QC data for dust samples generated during this project are still useful in estimating of precision and accuracy for field samples.

A summary of the spiked sample results is presented in Table 9-3. Descriptive statistics presented include the number of samples, minimum, maximum, geometric mean, and log standard deviation. In addition, an estimated central 90% tolerance interval was calculated using an exact procedure for lognormal data. This interval was derived from a 95% upper confidence bound on the 95th percentile and a 95% lower confidence bound on the 5th percentile. Performance-Control charts showing individual spiked sample recovery data are shown for each sample type in Figures D-1, D-2, and D-3 of Appendix D.

The data for all recovery samples, including the spiked samples, are illustrated in Figure 9-2. The individual percent recovery results for each type of recovery sample are plotted. The estimated central 90% tolerance interval is presented in the figure by a bar extending from the lower confidence bound on the 5th percentile to the upper confidence bound on the 95th percentile.

Spiked sample recoveries for all but four data points met the data quality objectives of accuracy of ±30% from the true spiked value. Three of these four points were the result of a spiking error (samples were spiked 10 times less than planned). This error produced measurements approaching both the IDL and background lead levels detected in blank cassettes used in the generation of the spiked samples. Accurate determination of spike recoveries under such conditions is difficult and is not

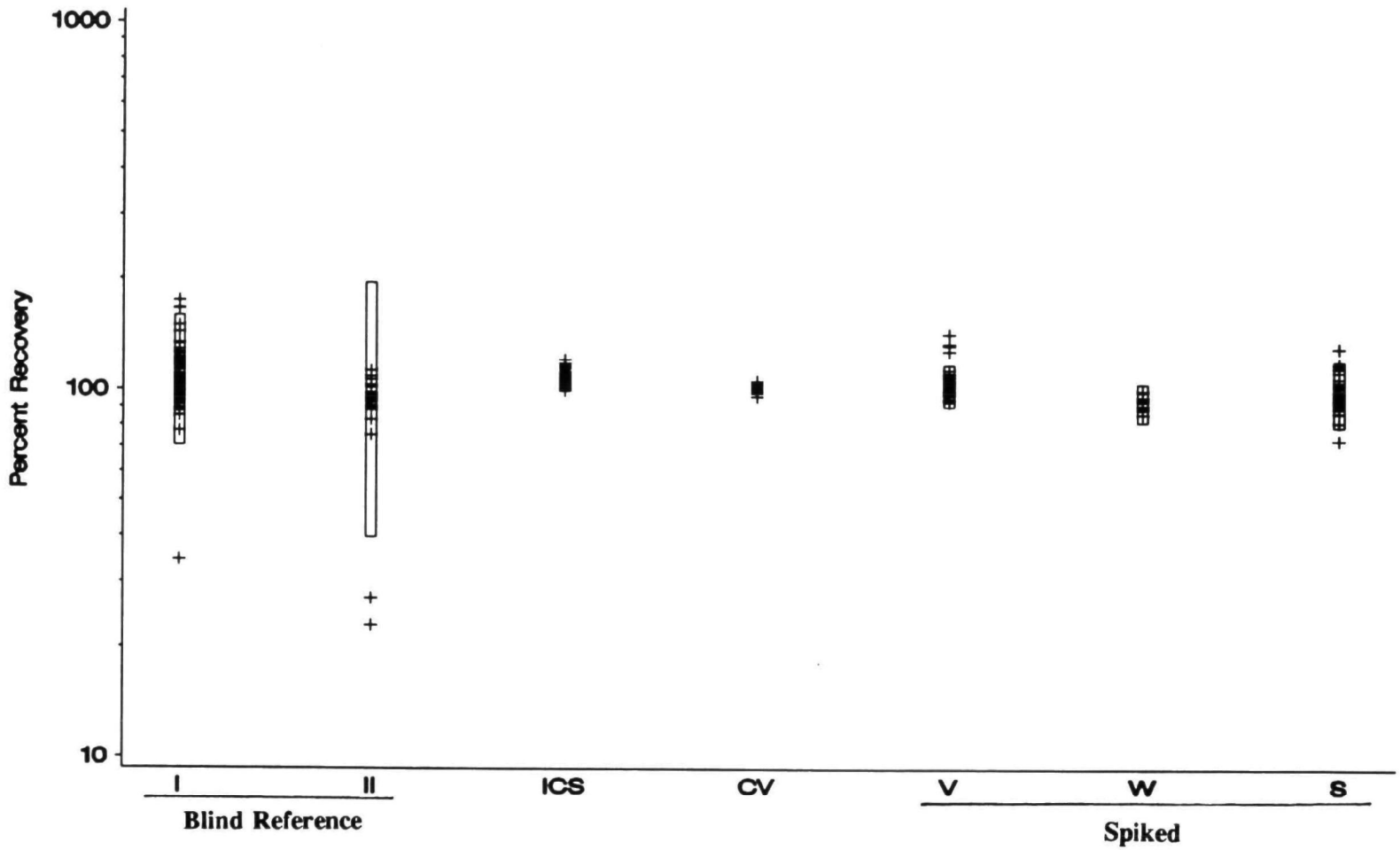


Figure 9-2. Individual measurements and tolerance bounds for percent recovery in recovery samples.

anticipated to be reflective of performance related to field samples. The other data point (soil sample) was only slightly outside the data quality objectives (130.9%). Geometric means for all three sample types are within ±10% of the true spiked amount. The estimated tolerance intervals for all three media contain 100% or complete recovery. These data infer that accuracy for field samples was good and well within data quality objectives.

Blind reference material samples were generated by placing known quantities of NIST standard certified reference materials (SRMs) into blank samples and inserting them into the sample batches in a blind manner prior to sample preparation activities. These reference materials were processed by the laboratory in the same way as the field samples. Their results provide lead recovery information that can be used as an assessment of accuracy of field sample data as determined by sample preparation and analysis activities. The blind nature of the insertion into the sample processing stream helped provide QC data unbiased by laboratory activities. Blind reference materials were generated at a frequency of two (one each of two different materials) per batch of approximately 40 field samples.

As was discussed for the spiked QC samples earlier, matrix matching is an important determinant of the usefulness of QC samples in assessing the accuracy achieved for regular field samples. In general, reference materials are included in an analysis scheme to help provide higher confidence in the accuracy of field sample data than can be obtained using only spiked samples. Unfortunately when this study initiated, no suitable dust or soil SRMs were available. Two SRMs were chosen as the best readily available approximations to matrix matching the field samples (matching with respect to general matrix components and anticipated lead levels). These were NIST SRM No. 2704 Buffalo River Sediment and NIST SRM No. 1646 Estuarine Sediment. Given the limitations of the matrix match, some caution is appropriate in extending the accuracy results of these reference

materials. These data, combined with the spiked results, still do provide reasonable confidence that analytical methodologies were carried out as planned.

Performance-Control charts, showing the percent recovery of lead from the two blind reference materials, are shown for each sample type in Figures D-4, D-5, and D-6. Blind reference material recoveries for NIST SRM No. 2704 met the data quality objectives for accuracy of ±30% from the true spiked value. Recoveries for NIST SRM No. 1646, however, were sporadic. Eight of 37 data points were outside data quality objectives. Investigation into these recovery problems suggested they were related to corrections for spectral interferences during instrumental analysis measurements. SRM No. 1646 has a low lead concentration (28.2 μg/g) combined with high levels of other metals such as iron. The iron-to-lead ratio is over 1000 to 1. In order to correct for potential iron interferences, the analyst conducting the instrumental measurement efforts must perform serial dilution of all digests to get iron levels within the calibration range of the ICP instrument. For field samples, extra dilutions were rarely needed (indicating limits in the ability of SRM No. 1646 to mimic field sample matrices). For the blind SRM No. 1646 reference materials, extra dilution was always required. This extra dilution pushed the measurable lead level down to within a few multiples of the instrumental detection limit where measurement variance increases relative to higher lead level digests. (A detailed discussion of the affect of decreasing lead levels and measurement variance is presented in Volume III under laboratory experiences.) The result of the extra dilutions were the sporadically poor recoveries seen for SRM No. 1646.

The dilution theory for explaining sporadic recoveries for SRM No. 1646 was verified by reanalyzing the original digests using the ICP-AES reconfigured to extend the linear range of the instrument for detecting iron. The extra dilution requirement was avoided. The results of the measurements are plotted as the

DF=1 data points in the Performance-Control charts shown. Using the reconfigured instrument, all but two blind reference material recoveries for NIST SRM No. 1646 met the data quality objectives of accuracy of ±30% from the true spiked value. The remaining two points were associated with extra high weight sample batches that required a sample preparation protocol change. The change resulted in a four fold increase in final digestion volume. The increase, in turn, reduced lead levels beyond that which could be made-up by elimination of any extra dilution volumes.

Blind reference material results, shown in Table 9-3 (identified as group I), reflect summarized data from the originally analyzed SRM No. 1646. The results of the reanalysis of SRM No. 1646 at no extra dilution volumes (data points plotted in the figures as DF=1) are identified as group II. These results are illustrated in Figure 9-2. Both geometric means were within ±12% of the NIST certified value. The estimated central 90% tolerance intervals both contain 100% recovery. Even with the matrix match limitations for these SRMs, these data infer that accuracy for field samples was good and well within data quality objectives.

### 9.2.2 Instrumental Analysis Quality Control

Calibration verification samples were analyzed along with field samples during instrumental measurement activities to verify calibration standard levels and monitor drift of instrument response. A summary of lead results for calibration verification samples is shown in Table 9-3 and Figure 9-2. These statistics are calculated using the same procedures described for spiked samples. All calibration verification results met design specifications. In addition, the estimated central 90% tolerance interval is narrow and contains 100%. It seems reasonable to conclude that the field samples results are free from any significant bias caused by instrumental drift.

Interference check standards (ICS) were used to verify accurate analyte response in the presence of possible spectral

interferences from other analytes present in the sample. A summary of lead results for ICS is available in Table 9-3 and Figure 9-2. As with the calibration verifications, the estimated central 90% tolerance interval is remarkably narrow and contains 100%. There is no evidence of any significant bias in the regular field sample results caused by commonly encountered interferences.

## 9.3 DUPLICATE SAMPLES

Duplicate samples are expected to be have similar lead content either because they were collected side-by-side in the field or because they were created to be comparable in the laboratory. In both cases, such samples are analyzed one after the other in the same analytical batch. The analytical result of interest for each pair of duplicate samples was the ratio of the larger measured lead result to the smaller measured lead result. This ratio has a minimum value of one. The log of this ratio was assumed to follow the absolute value of a normal distribution with mean zero and standard deviation $\sigma$. In the CAP Study, two types of duplicate samples were examined: side-by-side samples collected in the field, and spiked duplicate samples created in the sample preparation laboratory.

### 9.3.1 Field Quality Control

Side-by-sides were included to determine variability due to the sample collection process; however, this source of variability will also be confounded with short-scale variations attributable to nearby sampling locations within a room. Side-by-sides were collected for dust vacuum and soil core samples, but not for wipe samples. A pair of dust and soil duplicates were collected at each housing unit surveyed.

Table 9-3 reports descriptive statistics for the side-by-side samples. The statistics presented are the number of samples collected, minimum ratio, maximum ratio, geometric mean ratio, and log standard deviation. An estimated 95% tolerance

bound was also calculated, using an exact procedure for the distribution assumed for the log transformed ratio.

The side-by-side results are illustrated in Figure 9-3. The ratio for each pair of samples is plotted by sample type. The estimated 95% tolerance bound is portrayed in the figure by a bar extending from a value of one up to the tolerance bound.

The soil side-by-sides exhibit better agreement than the vacuum dust pairs. Their geometric mean was approximately 40% smaller than that for the paired dust vacuum lead concentrations. The inherent variability between field samples, however, is evident in these results. Despite being collected side-by-side, a number of the pairs were measured to have distinct lead contents. This disparity is reflected in the higher ratios and relatively large estimated tolerance bounds.

### 9.3.2 Sample Preparation Quality Control

Spiked duplicate samples originate in the sample preparation laboratory and are developed with identical lead content. Each pair is derived from two identical spiked samples. The spiked sample results are presented in section 9.2.1 where a more detailed presentation of their development is available. Spiked duplicates were generated at a frequency of two pair (two spikes and two spiked duplicates) per batch of approximately 40 field samples.

A summary of the spiked duplicate sample results is presented in Table 9-3. This summary is portrayed graphically in Figure 9-3. The descriptive statistics are the same as those developed for the field side-by-side samples. Performance-Control charts showing the range of spiked sample and spiked sample duplicate pairs are shown for each sample type in Figures D-7, D-8, and D-9.

The range of spiked duplicate percent recoveries were tighter for dust samples than for soil samples. This is not surprising given the sampling protocol. Recall that spiked blanks were employed for dusts (cassettes and wipes could not be

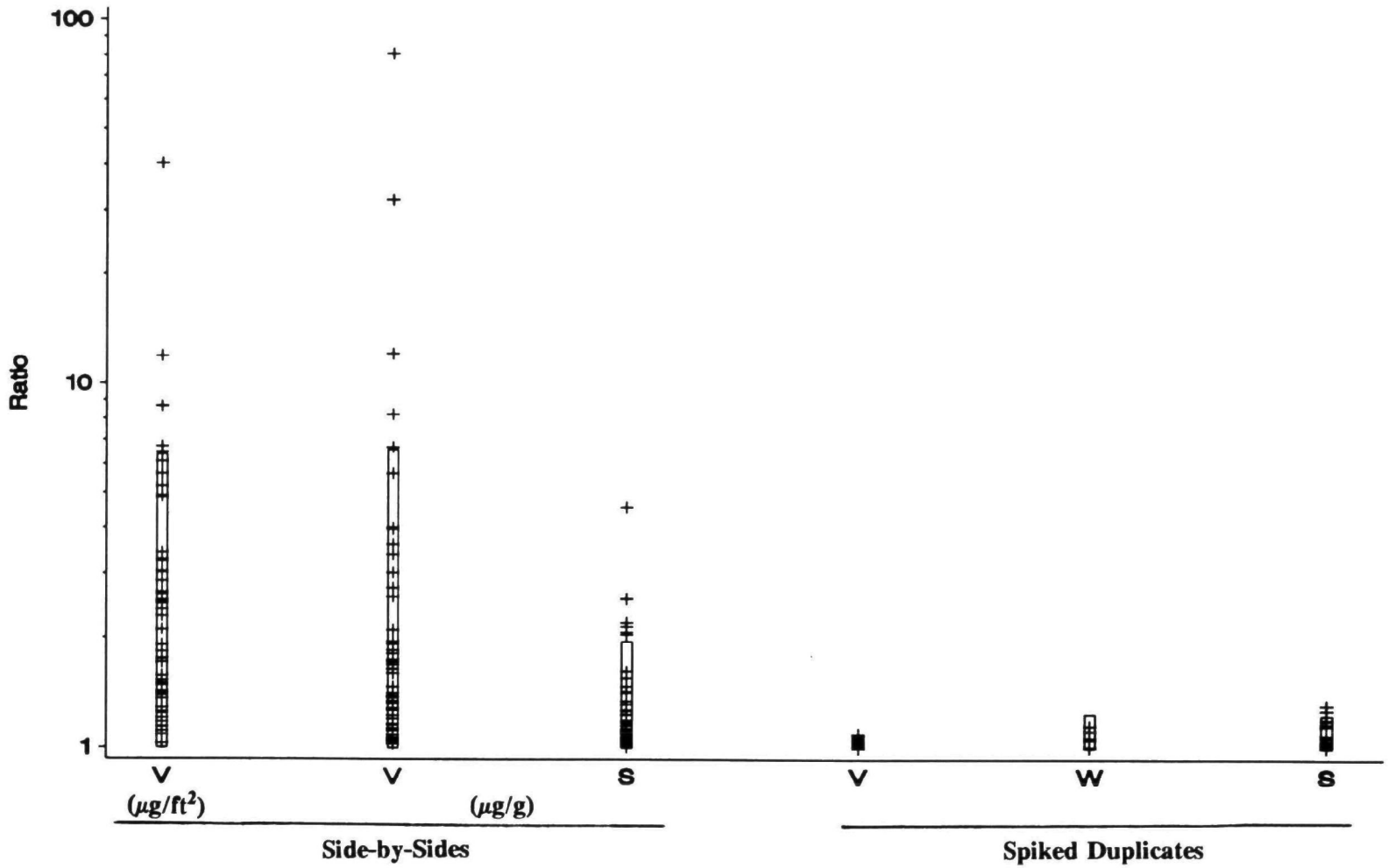


Figure 9-3. Individual measurements and tolerance bounds for the ratio of duplicate samples.

split homogeneously) and regular field sample splits were utilized for soils (see section 9.2.1). The slightly wider range observed for dust wipes compared to vacuum dust may be a result of an increased variability in the native lead background commonly observed in baby wipes. The ranges observed for soils imply that the 0.5 gram nominal sample weight used for sample preparation may not be sufficient to overcome some heterogeneity apparently still present in the dried, sieved, and homogenized soil samples used for analysis. Still, the geometric means are close to one and the estimated 95% tolerance bounds are not unreasonably large. The results do suggest good agreement between the spiked duplicate samples.

## 9.4 TIME TREND ANALYSES

The extensive samples collected in the CAP Study required laboratory analyses which spanned several months. One natural question, therefore, was whether any trend across time was apparent in the samples. Specifically, is there a time-based bias in the sampling results? The QC samples, expected to demonstrate consistent sampling results, are ideal for this examination.

The individual results for each of the QC measures outlined above were plotted using a common frame of reference. Each QC sample was plotted according to the instrument analysis batch it was included in, and its run number within that batch. The instrument batches were ordered based on the time they were processed. For each QC sample type, the appropriate parameter was displayed for the individual results. The measured amount of lead (μg), for example, was displayed for the 52 vacuum dust field blank results.

An examination of these plots suggested no evidence of time trends, excepting the soil field and method blank results. The plots are available in Volume III. Recall that more than 92% of the soil field blank results were censored, as were 83% of the soil method blanks. In the results, censored samples are set

equal to the instrumental detection limit. Furthermore, these blanks were all analyzed using the same dilution factor (50 mL). Their apparent time trends were determined, therefore, to be a function of the IDLs for the instrument batches containing the soil samples. Figure 9-4 presents the available IDL results for each instrument batch. Those batches which included soil samples are identified as circles. Note that they do exhibit an apparent quadratic trend across time. The IDLs considered as a whole, in contrast, show no evidence of a trend. To assess the significance of the apparent trend in the soil IDLs, quadratic equations were fit to all the IDLs and only to those including soil samples. The two resulting fits were not significantly different ($p=0.13$). Given the apparent randomness exhibited by the IDLs, there is no evidence of a time trend in the soil field or method blank results.

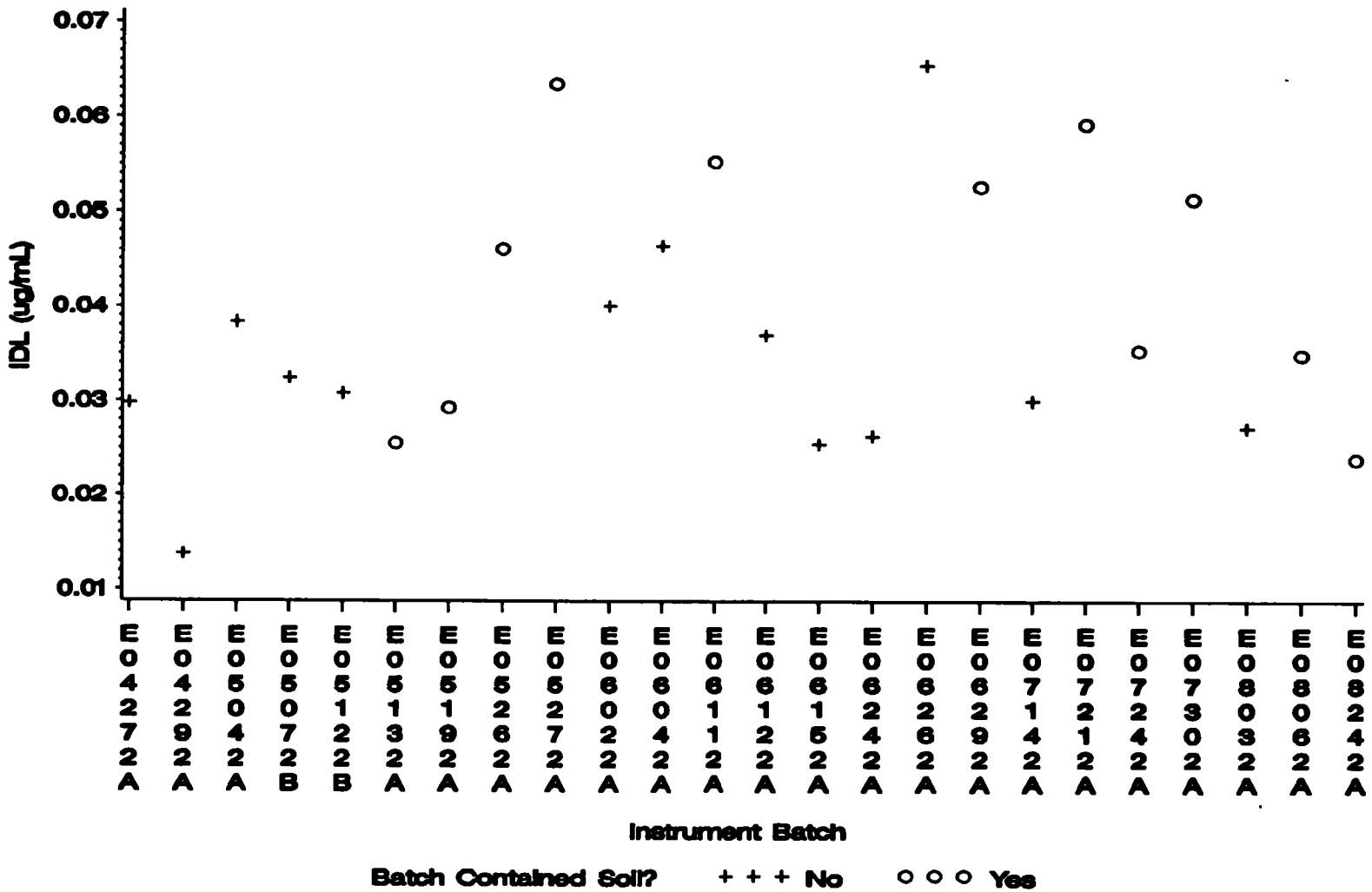


Figure 9-4. Time trend analyses in instrumental detection level by instrument batch.

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# APPENDIX A

# CONDENSED DATA LISTING

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 03 | 20 | BAC | 1 | BDY | Soil | Regular | 04/03/92 | 129.80 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 04/03/92 | 111.99 | . | . | |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 04/03/92 | 74.82 | 4.49 | 60.04 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 04/03/92 | 32.73 | 5.88 | 179.60 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/03/92 | 269.71 | 7.36 | 27.30 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 04/03/92 | 48271.93 | 417.07 | 8.64 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/03/92 | 208.07 | 1425.80 | 6852.40 | |
| | 16 | FRO | 5 | EWY | Soil | Regular | 04/03/92 | 160.89 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 04/03/92 | . | . | . | < |
| | 11 | KIT | 6 | EWI | Dust - Vacuum | Regular | 04/03/92 | 55.57 | 272.99 | 4912.70 | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 04/03/92 | 341.73 | 33.24 | 97.27 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 04/03/92 | 206.53 | 182.70 | 884.60 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/03/92 | 346.43 | . | . | < |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 04/03/92 | 763.49 | 125.22 | 164.01 | |
| 07 | 20 | BAC | 1 | BDY | Soil | Regular | 03/31/92 | 63.74 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/31/92 | 577.42 | 125.01 | 216.50 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/31/92 | 55.92 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/31/92 | 63.23 | . | . | |
| | 21 | BAC | 3 | FDN | Soil | Field Side-by-Side | 03/31/92 | 97.80 | . | . | |
| | 10 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 140.37 | 51.34 | 365.76 | |
| | 07 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 149.45 | 37.71 | 252.30 | |
| | 08 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 168.61 | 50.50 | 299.52 | |
| | 09 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 196.05 | 12.19 | 62.18 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/31/92 | 198.42 | 521.20 | 2626.70 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/31/92 | 76.58 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/31/92 | . | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/31/92 | 75.53 | 231.03 | 3058.80 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/31/92 | 50.75 | 14.82 | 292.10 | < |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/31/92 | 187.38 | 48.36 | 258.10 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/31/92 | . | 7.27 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/31/92 | . | 7.41 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/31/92 | . | . | . | < |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/31/92 | 52.53 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/31/92 | 105.83 | . | . | |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 768.11 | 36.99 | 48.16 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/31/92 | 176.59 | 509.90 | 2887.50 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 99.93 | 22.20 | 222.20 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/31/92 | 72.79 | 20.02 | 275.00 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/31/92 | 893.83 | . | . | |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 120.29 | 42.78 | 355.63 | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 168.80 | 7.02 | 41.60 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 09 | 20 | BAC | 1 | BDY | Soil | Regular | 03/19/92 | 215.01 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/19/92 | 116.23 | 130.94 | 1126.56 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/19/92 | 348.68 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/19/92 | 278.89 | . | . | |
| | 21 | BAC | 3 | FDN | Soil | Field Side-by-Side | 03/19/92 | 615.88 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/19/92 | . | . | . | < |
| | | BAT | | | | | . | . | . | . | |
| | | BD2 | | | | | . | . | . | . | |
| | | BD3 | | | | | . | . | . | . | |
| | | BD4 | | | | | . | . | . | . | |
| | 10 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/19/92 | 570.35 | 1406.92 | 2466.76 | |
| | 07 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/19/92 | 108.53 | 31.64 | 291.50 | |
| | 06 | DIN | N/A | N/A | Dust - Vacuum | Field Blank | 03/19/92 | 572.29 | . | . | < |
| | 08 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/19/92 | 2107.39 | 5759.58 | 2733.04 | |
| | 09 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/19/92 | 494.76 | 48.01 | 97.03 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/19/92 | 90.48 | 29.38 | 324.70 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/19/92 | 127.82 | . | . | |
| | 12 | GAM | 5 | EWI | Dust - Vacuum | Regular | 03/19/92 | 76.90 | 83.53 | 1086.20 | |
| | | HAL | | | | | . | . | . | . | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/19/92 | 618.05 | 76.41 | 123.62 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/19/92 | 83.43 | 1.21 | 14.50 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/19/92 | 74.83 | 3.00 | 40.10 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/19/92 | 184.16 | 1.75 | 9.50 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/19/92 | 174.33 | 5.82 | 33.40 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/19/92 | . | 22.16 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/19/92 | . | 8.07 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/19/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/19/92 | 471.60 | 413.27 | 876.31 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/19/92 | 203.29 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/19/92 | 495.58 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/19/92 | 175.99 | 90.95 | 516.80 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 20 | BAC | 1 | BDY | Soil | Regular | 03/26/92 | 226.15 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/26/92 | 275.54 | 1066.25 | 3869.70 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/26/92 | 393.71 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/26/92 | 331.75 | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | 05 | BD2 | 3' | ARD | Dust - Vacuum | Regular | 03/26/92 | 442.42 | 73.06 | 165.14 | |
| | 01 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 126.36 | 56.65 | 448.30 | |
| | 02 | BD2 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/26/92 | 121.85 | 45.78 | 375.70 | |
| | 03 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 03/26/92 | 386.85 | 3681.30 | 9516.00 | |
| | 04 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 231.32 | 73.34 | 317.06 | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/26/92 | 250.52 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 03/26/92 | 222.47 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/26/92 | 181.71 | 1933.10 | 10638.30 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/26/92 | 461.89 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/26/92 | 434.17 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/26/92 | . | . | . | < |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 03/26/92 | 229.14 | 642.65 | 2804.60 | |
| | 32 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 108.44 | 14.03 | 129.42 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/26/92 | 9.24 | 25.50 | 2758.80 | |
| | 29 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 27.56 | 1.31 | 47.70 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/26/92 | 191.95 | 5.11 | 26.60 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/26/92 | 84.19 | 27.41 | 325.60 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/26/92 | . | 4.16 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/26/92 | . | 13.05 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/26/92 | . | . | . | < |
| | 31 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 122.32 | 12.86 | 105.11 | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 1775.20 | 982.57 | 553.50 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 98.04 | 35.52 | 362.30 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/26/92 | 253.40 | . | . | < |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 6029.25 | 1223.81 | 202.98 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/25/92 | 260.47 | 270.00 | 1036.60 | |
| | 21 | BAC | | EWY | Soil | Field Side-by-Side | 03/25/92 | 106.18 | . | . | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/25/92 | 106.59 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | | BD2 | | | | | . | . | . | . | |
| | 05 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 1640.09 | 661.29 | 403.20 | |
| | 01 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 625.56 | 65.56 | 104.80 | |
| | 02 | DIN | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/25/92 | 207.17 | 48.21 | 232.70 | |
| | 24 | DIN | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/25/92 | 2027.74 | 340.86 | 168.10 | |
| | 25 | DIN | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/25/92 | 429.51 | 98.96 | 230.40 | |
| | 26 | DIN | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/25/92 | . | 47.94 | . | |
| | 27 | DIN | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/25/92 | . | 17.51 | . | |
| | 28 | DIN | N/A | N/A | Dust - Wipe | Field Blank | 03/25/92 | . | . | . | < |
| | 03 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 804.04 | 1115.39 | 1387.23 | |
| | 04 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 754.99 | 119.21 | 157.90 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/25/92 | 108.46 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/25/92 | 1653.27 | 4596.25 | 2780.10 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/25/92 | 116.04 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/25/92 | 117.03 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/25/92 | . | . | . | < |
| | | KIT | | | | | . | . | . | . | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/25/92 | 392.62 | 178.84 | 455.50 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/25/92 | 96.76 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/25/92 | 138.90 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 1019.72 | 872.71 | 855.83 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/25/92 | 1690.93 | 137.98 | 81.60 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 638.45 | 26.11 | 40.90 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/25/92 | 834.29 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 735.25 | 21067.64 | 28653.82 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 147.27 | 10.68 | 72.54 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 05 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 177.92 | 158.98 | 893.54 | |
| | 01 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 203.24 | 79.16 | 389.50 | |
| | 02 | BD2 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/31/92 | 151.76 | 27.61 | 181.90 | |
| | 03 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 147.08 | 46.40 | 315.47 | |
| | 04 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 181.67 | 9.85 | 54.22 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/31/92 | 162.33 | 688.15 | 4239.10 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/31/92 | 171.63 | . | . | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/31/92 | 63.22 | 19.07 | 301.60 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/31/92 | 89.07 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/31/92 | 152.51 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 141.41 | 35.10 | 248.23 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/31/92 | 98.79 | 14.33 | 145.10 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 66.39 | 21.83 | 328.80 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/31/92 | 227.18 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 221.08 | 72.00 | 325.66 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 10.15 | 1.65 | 162.72 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/31/92 | 137.27 | . | . | |
| | 14 | RGT | 5 | EWO | Dust - Vacuum | Regular | 03/31/92 | 97.69 | 3.97 | 40.60 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 03/31/92 | 180.72 | . | . | |
| | 21 | RGT | 5 | EWY | Soil | Field Side-by-Side | 03/31/92 | 237.06 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/31/92 | 135.38 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/31/92 | . | . | . | < |
| 16 | 05 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 04/06/92 | 454.74 | 7.37 | 16.20 | < |
| | 01 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 04/06/92 | 102.50 | 15.12 | 147.50 | |
| | 02 | BD2 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/06/92 | 216.43 | 49.00 | 226.40 | |
| | 03 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 04/06/92 | 5330.04 | 7481.60 | 1403.67 | |
| | 04 | BD2 | 2 | WST | Dust - Vacuum | Regular | 04/06/92 | 4170.78 | 571.47 | 137.02 | |
| | 10 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 04/06/92 | 130.96 | 7.60 | 58.06 | < |
| | 07 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 04/06/92 | 86.16 | 21.39 | 248.20 | |
| | 06 | BD3 | N/A | N/A | Dust - Vacuum | Field Blank | 04/06/92 | 263.53 | . | . | < |
| | 09 | BD3 | 2 | WST | Dust - Vacuum | Regular | 04/06/92 | 778.07 | 146.42 | 188.18 | |
| | 12 | DIN | 5 | EWI | Dust - Vacuum | Regular | 04/06/92 | 157.01 | 1414.36 | 9008.30 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 04/06/92 | 183.64 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/06/92 | 143.76 | 457.25 | 3180.70 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/06/92 | 129.49 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 04/06/92 | 64.19 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 04/06/92 | . | . | . | < |
| | 20 | LFT | 1 | BDY | Soil | Regular | 04/06/92 | 101.38 | . | . | |
| | 21 | LFT | 1 | BDY | Soil | Field Side-by-Side | 04/06/92 | 87.86 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 04/06/92 | 64.71 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/06/92 | 138.23 | 250.98 | 1815.60 | |
| | 14 | RGT | 5 | EWO | Dust - Vacuum | Regular | 04/06/92 | 316.23 | 352.78 | 1115.60 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 04/06/92 | 215.83 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 20 | BAC | 1 | BDY | Soil | Regular | 03/17/92 | 62.15 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/17/92 | 131.80 | 74.54 | 565.50 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/17/92 | 62.03 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/17/92 | 59.36 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/17/92 | . | . | . | < |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/17/92 | 1067.92 | 46.13 | 43.20 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/17/92 | 577.69 | 321.14 | 555.90 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/17/92 | 410.47 | 168.63 | 410.82 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/17/92 | 8.84 | 46.91 | 5305.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/17/92 | 71.29 | . | . | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/17/92 | 464.37 | 135.83 | 292.50 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/17/92 | 239.86 | 9.79 | 40.80 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/17/92 | 38.07 | 0.49 | 12.80 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/17/92 | 73.04 | 1.29 | 17.60 | < |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/17/92 | 1351.31 | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/17/92 | 303.96 | 567.89 | 1868.27 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/17/92 | 71.49 | 1.43 | 20.00 | |
| | 21 | LFT | | BDY | Soil | Field Side-by-Side | 03/17/92 | 62.36 | . | . | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/17/92 | 46.58 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/17/92 | 79.34 | . | . | |
| | 32 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/17/92 | 870.45 | 67.25 | 77.26 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/17/92 | 237.94 | 119.87 | 503.80 | |
| | 29 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/17/92 | 589.07 | 104.38 | 177.20 | |
| | 24 | LVG | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/17/92 | 156.08 | 58.65 | 375.80 | |
| | 25 | LVG | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/17/92 | 740.27 | 186.77 | 252.30 | |
| | 26 | LVG | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/17/92 | . | 4.61 | . | |
| | 27 | LVG | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/17/92 | . | 8.49 | . | |
| | 28 | LVG | N/A | N/A | Dust - Wipe | Field Blank | 03/17/92 | . | . | . | < |
| | 30 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/17/92 | 649.19 | 831.02 | 1280.09 | |
| | 31 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/17/92 | 385.66 | 25.11 | 65.12 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 20 | BAC | 1 | BDY | Soil | Regular | 03/13/92 | 101.01 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/13/92 | 146.75 | 438.97 | 2991.20 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/13/92 | 79.42 | . | . | |
| | 21 | BAC | 5 | EWY | Soil | Field Side-by-Side | 03/13/92 | 86.93 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/13/92 | 84.38 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/13/92 | . | . | . | < |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/13/92 | 1552.50 | 1436.46 | 925.26 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/13/92 | 94.43 | 50.50 | 534.80 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/13/92 | 9540.68 | 19792.59 | 2074.55 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/13/92 | 1991.10 | 406.69 | 204.26 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/13/92 | 145.89 | 201.58 | 1381.70 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/13/92 | 59.58 | . | . | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/13/92 | 1988.82 | 329.07 | 165.46 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/13/92 | 266.13 | 82.13 | 308.60 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/13/92 | 104.83 | 11.86 | 113.10 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/13/92 | 121.56 | 11.55 | 95.00 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/13/92 | 100.67 | 16.61 | 165.00 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/13/92 | 432.56 | 72.97 | 168.70 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/13/92 | . | 4.15 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/13/92 | . | 8.15 | . | |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/13/92 | -491.83 | . | . | < |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/13/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/13/92 | 799.14 | 1229.73 | 1538.81 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/13/92 | 403.44 | 14.89 | 36.90 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/13/92 | 62.03 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/13/92 | 189.45 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/13/92 | 67.87 | 1415.50 | 20857.40 | |
| 19 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/10/92 | 566.74 | 988.85 | 1744.80 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/10/92 | 99.65 | . | . | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/10/92 | 316.17 | 38.45 | 121.60 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/10/92 | 197.42 | 61.71 | 312.60 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/10/92 | 176.30 | 186.71 | 1059.02 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/10/92 | 109.00 | 3.40 | 31.20 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/10/92 | 77.48 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/10/92 | 259.01 | 202.65 | 782.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/10/92 | 38.00 | . | . | |
| | 21 | FRO | 6 | EWY | Soil | Field Side-by-Side | 03/10/92 | 38.29 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/10/92 | 39.05 | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/10/92 | 2293.62 | 2611.75 | 1138.70 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/10/92 | 43.22 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/10/92 | 237.06 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/10/92 | . | . | . | < |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/10/92 | 475.66 | 2384.72 | 5013.50 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/10/92 | 327.54 | 2259.57 | 6898.60 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/10/92 | 444.55 | 1102.35 | 2479.70 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/10/92 | 467.57 | 6745.20 | 14426.00 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/10/92 | -300.29 | . | . | < |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/10/92 | 272.15 | 224.68 | 825.60 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | 19 | BAC | 2 | BDY | Soil | Regular | 03/18/92 | 119.61 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/18/92 | 251.32 | 1165.25 | 4636.50 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/18/92 | 130.00 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/18/92 | 272.29 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/18/92 | . | . | . | < |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 172.15 | 60.82 | 353.30 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/18/92 | 282.75 | 161.96 | 572.80 | |
| | 06 | BAT | N/A | N/A | Dust - Vacuum | Field Blank | 03/18/92 | -810.78 | . | . | < |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 190.11 | 36.61 | 192.55 | |
| | 32 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 1905.20 | 181.07 | 95.04 | |
| | 29 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 263.00 | 121.09 | 460.40 | |
| | 30 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 25342.38 | 12281.48 | 484.62 | |
| | 31 | BD3 | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 6824.51 | 1299.66 | 190.44 | |
| | | EXT | | | | | . | . | . | . | |
| | 20 | FRO | 1 | BDY | Soil | Regular | 03/18/92 | 276.93 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/18/92 | 1143.43 | 2588.15 | 2263.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/18/92 | 641.01 | . | . | |
| | 21 | FRO | 6 | EWY | Soil | Field Side-by-Side | 03/18/92 | 413.57 | . | . | |
| | 18 | FRO | 3 | FDN | Soil | Regular | 03/18/92 | 190.37 | . | . | |
| | 12 | GAM | 5 | EWI | Dust - Vacuum | Regular | 03/18/92 | 199.70 | 497.33 | 2490.40 | |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 03/18/92 | 281.43 | 230.71 | 819.80 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 360.86 | 740.78 | 2052.80 | |
| | 07 | LDY | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 238.66 | 420.25 | 1760.90 | |
| | 24 | LDY | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/18/92 | . | . | . | |
| | 25 | LDY | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/18/92 | 1033.44 | 7046.70 | 6818.70 | |
| | 33 | LDY | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/18/92 | 734.95 | 2356.89 | 3206.85 | |
| | 26 | LDY | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/18/92 | . | 333.56 | . | |
| | 27 | LDY | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/18/92 | . | . | . | |
| | 28 | LDY | N/A | N/A | Dust - Wipe | Field Blank | 03/18/92 | . | . | . | < |
| | 08 | LDY | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 2456.61 | 26137.63 | 10639.72 | |
| | 09 | LDY | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 6197.57 | 6494.53 | 1047.92 | |
| | | POR | | | | | . | . | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/28/92 | 89.89 | 16.26 | 180.90 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/28/92 | 64.95 | 24.29 | 373.90 | |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/28/92 | 412.95 | 5028.69 | 12177.46 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/28/92 | 235.93 | 36.36 | 154.13 | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/28/92 | 228.91 | 15.14 | 66.15 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/28/92 | 118.54 | 33.10 | 279.20 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/28/92 | 436.34 | 2033.28 | 4659.84 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/28/92 | 164.52 | 26.41 | 160.54 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/28/92 | 53.39 | . | . | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/28/92 | 56.97 | . | . | |
| | 21 | FRO | 6 | EWY | Soil | Field Side-by-Side | 03/28/92 | 116.24 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/28/92 | 59.99 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/28/92 | . | . | . | < |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/28/92 | 83.47 | 72.16 | 864.50 | |
| | 13 | LFT | 6 | EWO | Dust - Vacuum | Regular | 03/28/92 | 58.41 | 115.88 | 1983.90 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/28/92 | 77.14 | 175.10 | 2269.90 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/28/92 | 3091.50 | . | . | |
| 24 | | BD2 | | | | | . | . | . | . | |
| | 05 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 04/03/92 | 574.46 | 218.25 | 379.93 | |
| | 01 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 04/03/92 | 100.86 | 36.90 | 365.80 | |
| | 02 | BD3 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/03/92 | 73.61 | 33.97 | 461.50 | |
| | 03 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 04/03/92 | 172.02 | 413.73 | 2405.12 | |
| | 04 | BD3 | 2 | WST | Dust - Vacuum | Regular | 04/03/92 | 66.33 | 5.22 | 78.75 | |
| | 10 | DIN | 3 | ARD | Dust - Vacuum | Regular | 04/03/92 | 339.00 | 259.11 | 764.34 | |
| | 12 | DIN | 5 | EWI | Dust - Vacuum | Regular | 04/03/92 | 219.48 | 1059.40 | 4826.90 | |
| | 06 | DIN | N/A | N/A | Dust - Vacuum | Field Blank | 04/03/92 | 219.41 | . | . | < |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 04/03/92 | 151.01 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 04/03/92 | 157.18 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/03/92 | 459.18 | 907.75 | 1976.90 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/03/92 | 89.11 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 04/03/92 | 95.63 | . | . | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/03/92 | 81.52 | 25.25 | 309.80 | |
| | 24 | LDY | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/03/92 | 361.17 | 262.83 | 727.70 | |
| | 25 | LDY | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/03/92 | 177.94 | 161.67 | 908.60 | |
| | 26 | LDY | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/03/92 | . | 5.07 | . | |
| | 27 | LDY | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/03/92 | . | 3.54 | . | < |
| | 28 | LDY | N/A | N/A | Dust - Wipe | Field Blank | 04/03/92 | . | . | . | < |
| | 08 | LDY | 2 | WCH | Dust - Vacuum | Regular | 04/03/92 | 209.97 | 2239.25 | 10664.61 | |
| | 09 | LDY | 2 | WST | Dust - Vacuum | Regular | 04/03/92 | 41.04 | 16.94 | 412.83 | |
| | 14 | LFT | 5 | EWO | Dust - Vacuum | Regular | 04/03/92 | 211.57 | 4690.50 | 22170.30 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/03/92 | 175.05 | 482.93 | 2758.80 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | 20 | BAC | 1 | BDY | Soil | Regular | 03/31/92 | 60.83 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/31/92 | 519.22 | 1034.49 | 1992.40 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/31/92 | 124.26 | . | . | |
| | 21 | BAC | 5 | EWY | Soil | Field Side-by-Side | 03/31/92 | 117.49 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/31/92 | 156.93 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/31/92 | . | . | . | < |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 264.26 | 3.20 | 12.13 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 210.19 | 21.90 | 104.20 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/31/92 | 158.92 | 18.20 | 114.50 | |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 9306.87 | 15567.63 | 1672.70 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 1372.86 | 69.36 | 50.52 | |
| | 32 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 94.49 | 6.18 | 65.37 | |
| | 29 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 36.36 | 54.96 | 1511.40 | |
| | 30 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 17291.82 | 19735.20 | 1141.30 | |
| | 31 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 1648.67 | 50.16 | 30.42 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/31/92 | 54.61 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/31/92 | 141.19 | 84.15 | 596.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/31/92 | 340.88 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/31/92 | 128.17 | . | . | |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/31/92 | 130.13 | 5.60 | 43.05 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/31/92 | 131.99 | 149.83 | 1135.10 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/31/92 | 71.82 | 35.01 | 487.50 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/31/92 | 22.88 | 2.47 | 108.00 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/31/92 | 25.57 | 3.27 | 128.00 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/31/92 | . | 3.49 | . | < |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/31/92 | . | 3.63 | . | |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/31/92 | 274.26 | . | . | < |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/31/92 | . | . | . | < |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/31/92 | 9101.28 | 35787.70 | 3932.16 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/31/92 | 1657.85 | 291.87 | 176.05 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/31/92 | 93.35 | 306.40 | 3282.40 | |
| 26 | | | | | | | . | . | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | | KIT | | | | | . | . | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | 10 | BA2 | 3 | ARD | Dust - Vacuum | Regular | 03/24/92 | 281.26 | 26.04 | 92.58 | |
| | 07 | BA2 | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 99.03 | 9.77 | 98.70 | |
| | 05 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/24/92 | 211.52 | 8.60 | 40.64 | |
| | 01 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 149.77 | 319.70 | 2134.60 | |
| | 02 | BD1 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/24/92 | 125.06 | 224.56 | 1795.60 | |
| | 06 | BD1 | N/A | N/A | Dust - Vacuum | Field Blank | 03/24/92 | 495.59 | . | . | < |
| | 03 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 442.87 | 20517.83 | 46328.75 | |
| | 04 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 384.68 | 84.70 | 220.18 | |
| | 12 | DIN | 5 | EWI | Dust - Vacuum | Regular | 03/24/92 | 183.24 | 378.98 | 2068.20 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/24/92 | 219.37 | 11.85 | 54.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/24/92 | 181.74 | . | . | |
| | 21 | FRO | 6 | EWY | Soil | Field Side-by-Side | 03/24/92 | 180.89 | . | . | |
| | 08 | GAM | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 961.17 | 17639.13 | 18351.71 | |
| | 09 | GAM | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 1136.78 | 1367.46 | 1202.92 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/24/92 | 129.80 | . | . | |
| | 14 | LFT | 5 | EWO | Dust - Vacuum | Regular | 03/24/92 | 117.43 | 88.27 | 751.70 | |
| | 16 | LFT | 5 | EWY | Soil | Regular | 03/24/92 | 127.23 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/24/92 | 148.89 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/24/92 | 345.74 | 487.25 | 1409.30 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/24/92 | 256.67 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/24/92 | 1015.56 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/24/92 | . | . | . | |
| 28 | 19 | BAC | 2 | BDY | Soil | Regular | 03/18/92 | 44.64 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/18/92 | 282.36 | 246.93 | 874.50 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/18/92 | 61.12 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/18/92 | 72.20 | . | . | |
| | 10 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 675.43 | 128.63 | 190.44 | |
| | 07 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 196.13 | 5.71 | 29.10 | |
| | 09 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 243.54 | 9.82 | 40.32 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/18/92 | 56.88 | 25.42 | 447.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/18/92 | 50.44 | . | . | |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 03/18/92 | 93.11 | 104.35 | 1120.70 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 437.07 | 98.91 | 226.30 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 41.99 | 0.34 | 8.20 | < |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/18/92 | 1351.31 | 0.58 | 0.43 | < |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/18/92 | -292.14 | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 1325.94 | 2521.44 | 1901.62 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 121.97 | 3.79 | 31.06 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/18/92 | 98.70 | 207.31 | 2100.40 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/18/92 | 55.22 | . | . | |
| | 21 | RGT | 1 | BDY | Soil | Field Side-by-Side | 03/18/92 | 57.74 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/18/92 | 125.04 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/18/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 10 | BA2 | 3 | ARD | Dust - Vacuum | Regular | 04/04/92 | 516.49 | 3686.76 | 7138.13 | |
| | 07 | BA2 | 1 | FLR | Dust - Vacuum | Regular | 04/04/92 | 1.71 | 2.21 | 1287.20 | |
| | 06 | BA2 | N/A | N/A | Dust - Vacuum | Field Blank | 04/04/92 | 182.84 | . | . | < |
| | 09 | BA2 | 2 | WST | Dust - Vacuum | Regular | 04/04/92 | 442.48 | 7.82 | 17.68 | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/04/92 | 696.04 | 4368.40 | 6276.10 | |
| | 16 | BAC EXT | 5 | EWY | Soil | Regular | 04/04/92 | 154.23 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/04/92 | . | . | . | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/04/92 | 555.00 | 478.08 | 861.40 | |
| | 21 | FRO | 6 | EWY | Soil | Field Side-by-Side | 04/04/92 | 979.62 | . | . | |
| | 01 | HAL | 1 | FLR | Dust - Vacuum | Regular | 04/04/92 | 773.37 | . | . | |
| | 02 | HAL | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/04/92 | 105.64 | 11.23 | 106.30 | |
| | 24 | HAL | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/04/92 | 181.41 | 72.93 | 402.00 | |
| | 25 | HAL | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/04/92 | 75.75 | 127.98 | 1689.50 | |
| | 26 | HAL | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/04/92 | 123.01 | 59.17 | 481.00 | |
| | 27 | HAL | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/04/92 | . | 31.59 | . | |
| | 28 | HAL | N/A | N/A | Dust - Wipe | Field Blank | 04/04/92 | . | 87.90 | . | |
| | 12 | HL2 | 5 | EWI | Dust - Vacuum | Regular | 04/04/92 | . | . | . | < |
| | 19 | LFT | 2 | BDY | Soil | Regular | 04/04/92 | 350.96 | 512.86 | 1461.30 | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 04/04/92 | 174.22 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/04/92 | 404.17 | . | . | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 04/04/92 | 67.45 | 7.76 | 115.00 | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 04/04/92 | 184.33 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 04/04/92 | 226.49 | . | . | |
| | | | | | | | | . | . | . | < |
| 33 | 20 | FRO | 1 | BDY | Soil | Regular | 03/09/92 | 52.44 | . | . | |
| | 21 | FRO | | EWY | Soil | Field Side-by-Side | 03/09/92 | 39.02 | . | . | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/09/92 | 8.54 | . | . | |
| | 18 | FRO | 3 | FDN | Soil | Regular | 03/09/92 | 134.24 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/09/92 | . | . | . | < |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/09/92 | 136.13 | 4.25 | 31.20 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/09/92 | 158.21 | 1.28 | 8.10 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/09/92 | 148.44 | 1.89 | 12.70 | |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/09/92 | -245.69 | . | . | < |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/09/92 | 25.55 | 2.56 | 100.30 | |
| | 04 | LDY | 2 | WST | Dust - Vacuum | Regular | 03/09/92 | 3339.94 | 3007.05 | 900.33 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/09/92 | 78.72 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/09/92 | 128.98 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/09/92 | 191.20 | 11.90 | 62.24 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/09/92 | 128.56 | 1665.96 | 12959.00 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/09/92 | 61.42 | 63.70 | 1037.10 | |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/09/92 | 3067.23 | 2929.08 | 954.96 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/09/92 | 340.90 | 45.07 | 132.21 | |
| | 24 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/09/92 | 439.10 | 74.85 | 170.46 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 03/09/92 | 193.32 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/09/92 | 161.29 | 15.45 | 95.80 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/09/92 | 183.67 | . | . | |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/09/92 | 712.39 | 12011.20 | 16860.40 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/09/92 | 349.90 | 25.37 | 72.50 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/09/92 | 200.88 | 8.42 | 41.90 | |
| | 29 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/09/92 | 62.65 | 3.27 | 52.20 | |
| | 06 | BAT | N/A | N/A | Dust - Vacuum | Field Blank | 03/09/92 | -769.52 | . | . | < |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/09/92 | 5156.14 | 7620.12 | 1477.87 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/09/92 | 5442.72 | 750.79 | 137.94 | |
| | | BD1 | | | | | . | . | . | . | |
| | 10 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 03/09/92 | 395.41 | 221.75 | 560.80 | |
| | 07 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 03/09/92 | 110.54 | 34.39 | 311.10 | |
| | 08 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 03/09/92 | 1573.52 | 90.16 | 57.30 | |
| | 09 | BD3 | 2 | WST | Dust - Vacuum | Regular | 03/09/92 | 207.37 | 20.37 | 98.24 | |
| | | DIN | | | | | . | . | . | . | |
| | - | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/09/92 | 184.46 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/09/92 | 62.98 | 18.94 | 300.80 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/09/92 | 545.76 | . | . | |
| | 21 | FRO | | FDN | Soil | Field Side-by-Side | 03/09/92 | 454.29 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/09/92 | 370.01 | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/09/92 | 123.45 | 14.10 | 114.20 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/09/92 | 106.41 | 5.59 | 52.50 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/09/92 | 505.51 | 22.60 | 44.70 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/09/92 | . | 27.77 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/09/92 | . | 25.49 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/09/92 | . | . | . | < |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/09/92 | 614.74 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/09/92 | 73.85 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/09/92 | . | . | . | < |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/09/92 | 371.98 | 715.50 | 1923.50 | |
| | | PAN | | | | | . | . | . | . | |
| | | POR | | | | | . | . | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 19 | BAC | 2 | BDY | Soil | Regular | 03/10/92 | 163.85 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/10/92 | 119.06 | 151.55 | 1272.90 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/10/92 | 66.62 | . | . | |
| | 21 | BAC | 5 | EWY | Soil | Field Side-by-Side | 03/10/92 | 71.09 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/10/92 | 114.29 | . | . | |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/10/92 | 1588.70 | 1176.93 | 740.81 | |
| | 24 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/10/92 | 209.59 | 1.66 | 7.90 | |
| | 25 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/10/92 | 152.26 | 0.64 | 4.20 | |
| | 26 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/10/92 | . | 3.54 | . | < |
| | 27 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/10/92 | . | 6.60 | . | |
| | 28 | BAT | N/A | N/A | Dust - Wipe | Field Blank | 03/10/92 | . | . | . | < |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/10/92 | 255.06 | 44.25 | 173.49 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/10/92 | 2208.04 | 10.23 | 4.63 | |
| | 10 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 03/10/92 | 113.73 | 1.90 | 16.70 | |
| | 07 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/10/92 | 206.92 | 128.41 | 620.60 | |
| | 06 | BD2 | N/A | N/A | Dust - Vacuum | Field Blank | 03/10/92 | 871.43 | . | . | < |
| | 08 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 03/10/92 | 235.73 | 239.30 | 1015.13 | |
| | 09 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/10/92 | 160.31 | 18.86 | 117.66 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/10/92 | 230.47 | 411.53 | 1785.60 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/10/92 | 148.50 | . | . | |
| | 01 | HAL | 1 | FLR | Dust - Vacuum | Regular | 03/10/92 | 119.78 | 230.55 | 1924.70 | |
| | 02 | HAL | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/10/92 | 125.19 | 577.51 | 4613.10 | |
| | | HL2 | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/10/92 | 84.83 | 3.58 | 42.20 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/10/92 | 200.96 | 2920.20 | 14531.10 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/10/92 | 77.33 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/10/92 | 129.05 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/10/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/30/92 | 1668.88 | 615.57 | 368.85 | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/30/92 | 1334.51 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/30/92 | 676.37 | 65.40 | 96.69 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/30/92 | 242.69 | 118.12 | 486.70 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/30/92 | 11398.99 | 11413.91 | 1001.31 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/30/92 | 3037.50 | 430.03 | 141.57 | |
| | 05 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 03/30/92 | 929.47 | 13213.87 | 14216.53 | |
| | 01 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 03/30/92 | 363.88 | 479.93 | 1318.90 | |
| | 02 | BD3 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/30/92 | 222.72 | 323.25 | 1451.40 | |
| | 06 | BD3 | N/A | N/A | Dust - Vacuum | Field Blank | 03/30/92 | -893.45 | . | . | < |
| | 03 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 03/30/92 | 3622.45 | 3342.36 | 922.68 | |
| | 04 | BD3 | 2 | WST | Dust - Vacuum | Regular | 03/30/92 | 2379.10 | 131.96 | 55.47 | |
| | | BD4 | | | | | . | . | . | . | |
| | 32 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/30/92 | 600.27 | 102.54 | 170.83 | |
| | 29 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/30/92 | 2398.76 | 43.42 | 18.10 | |
| | 30 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/30/92 | 6066.85 | 15336.58 | 2527.93 | |
| | 31 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/30/92 | 1653.03 | 966.96 | 584.96 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/30/92 | 179.22 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 03/30/92 | 186.61 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/30/92 | 320.32 | 111.31 | 347.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/30/92 | 147.30 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/30/92 | 182.74 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/30/92 | . | . | . | < |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 03/30/92 | 235.42 | 1982.30 | 8420.20 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/30/92 | 127.94 | 3.24 | 25.30 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/30/92 | 60.40 | 1.45 | 24.00 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/30/92 | . | 6.59 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/30/92 | . | 8.08 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/30/92 | . | . | . | < |
| | | LVG | | | | | . | . | . | . | |
| | 12 | PO2 | 5 | EWI | Dust - Vacuum | Regular | 03/30/92 | 477.49 | 450.70 | 943.90 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/16/92 | 834.07 | 2911.75 | 3491.00 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/16/92 | 104.21 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | BD2 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/16/92 | 137.13 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 03/16/92 | 96.75 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/16/92 | 133.06 | 275.23 | 2068.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/16/92 | 132.78 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/16/92 | 1211.55 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/16/92 | . | . | . | < |
| | 10 | GAM | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 202.46 | 39.77 | 196.45 | |
| | 07 | GAM | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 95.78 | 14.34 | 149.70 | |
| | 08 | GAM | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 72.90 | 759.14 | 10413.80 | |
| | 09 | GAM | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | 69.56 | 1.35 | 19.38 | < |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 03/16/92 | 95.05 | 6.66 | 70.10 | |
| | 01 | HAL | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 199.06 | 14.63 | 73.50 | < |
| | 02 | HAL | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/16/92 | 58.63 | 1.69 | 28.90 | |
| | 24 | HAL | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 39.25 | 3.37 | 85.90 | |
| | 25 | HAL | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 16.67 | 4.48 | 268.60 | |
| | 26 | HAL | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 4.17 | . | |
| | 27 | HAL | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 3.54 | . | < |
| | 06 | HAL | N/A | N/A | Dust - Vacuum | Field Blank | 03/16/92 | 172.14 | . | . | < |
| | 28 | HAL | N/A | N/A | Dust - Wipe | Field Blank | 03/16/92 | . | . | . | < |
| | 03 | HAL | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 298.51 | 969.02 | 3246.17 | |
| | 04 | HAL | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | 97.07 | 8.25 | 85.00 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 118.71 | 187.10 | 1576.13 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/16/92 | 256.45 | 796.70 | 3106.60 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/16/92 | 120.23 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/16/92 | 113.41 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/19/92 | 247.32 | 110.23 | 445.70 | |
| | 05 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 03/19/92 | 292.32 | 19.95 | 68.25 | |
| | 01 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/19/92 | 55.13 | 29.51 | 535.30 | |
| | 02 | BD2 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/19/92 | 107.73 | 12.88 | 119.60 | |
| | 04 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/19/92 | 703.50 | 104.97 | 149.22 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/19/92 | 131.35 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/19/92 | 49.51 | 200.08 | 4041.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/19/92 | 72.91 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/19/92 | 55.80 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/19/92 | . | . | . | < |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/19/92 | 475.26 | 88.35 | 185.89 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/19/92 | 167.61 | 32.95 | 196.60 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/19/92 | 6398.60 | 1765.38 | 275.90 | |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/19/92 | 7044.19 | 12427.41 | 1764.21 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/19/92 | 617.04 | 151.21 | 245.06 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/19/92 | 51.74 | 14.90 | 288.00 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/19/92 | -1594.76 | . | . | < |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/19/92 | 200.54 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/19/92 | 121.47 | . | . | |
| | 21 | RGT | 3 | FDN | Soil | Field Side-by-Side | 03/19/92 | 129.79 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/24/92 | 983.74 | 1107.40 | 1125.70 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/24/92 | 296.50 | . | . | |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/24/92 | 4623.43 | 555.87 | 120.23 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 67.73 | 10.24 | 151.20 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/24/92 | 95.30 | 2.99 | 31.40 | |
| | 24 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/24/92 | 109.85 | 0.89 | 8.10 | |
| | 25 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/24/92 | 75.77 | 0.81 | 10.70 | < |
| | 26 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/24/92 | . | 7.20 | . | |
| | 27 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/24/92 | . | 45.37 | . | |
| | 28 | BAT | N/A | N/A | Dust - Wipe | Field Blank | 03/24/92 | . | . | . | < |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 5385.66 | 9458.11 | 1756.17 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 218.97 | 10.22 | 46.69 | |
| | | BD1 | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/24/92 | 161.57 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 03/24/92 | 228.79 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/24/92 | 580.03 | 2672.25 | 4607.10 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/24/92 | 66.47 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/24/92 | 318.96 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/24/92 | 550.75 | 553.78 | 1005.50 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/24/92 | 59.79 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/24/92 | 555.49 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/24/92 | 205.24 | 33.77 | 164.52 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/24/92 | 702.58 | 1256.35 | 1788.20 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 487.79 | 31.37 | 64.30 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/24/92 | -214.24 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 2842.09 | 859.69 | 302.49 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 108.38 | 1.01 | 9.36 | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/24/92 | . | . | . | < |
| 49 | 21 | FRO | | BDY | Soil | Field Side-by-Side | 03/17/92 | 104.94 | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/17/92 | 102.62 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/17/92 | 166.78 | 30.84 | 184.90 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/17/92 | 549.80 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/17/92 | 185.28 | . | . | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/17/92 | 368.54 | 1.85 | 5.01 | < |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/17/92 | 173.94 | 2.09 | 12.00 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/17/92 | 369.82 | 0.92 | 2.50 | < |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/17/92 | 4.56 | 0.81 | 177.80 | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/17/92 | 841.47 | 2402.05 | 2854.59 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/17/92 | 68.45 | 10.25 | 149.76 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/17/92 | 119.77 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/17/92 | 177.51 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/17/92 | . | . | . | < |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/17/92 | 1807.51 | 108.12 | 59.82 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/17/92 | 144.18 | 1.23 | 8.50 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/17/92 | 77.11 | 16.85 | 218.50 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/17/92 | -768.10 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/17/92 | 278.90 | 1486.47 | 5329.75 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/17/92 | 296.58 | 6.13 | 20.67 | |
| | 14 | RGT | 5 | EWO | Dust - Vacuum | Regular | 03/17/92 | 286.03 | 516.75 | 1806.60 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 03/17/92 | 252.78 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | | BA2 | | | | | . | . | . | . | |
| | 19 | BAC | 2 | BDY | Soil | Regular | 03/27/92 | 60.03 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/27/92 | 151.82 | 899.50 | 5924.70 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/27/92 | 79.35 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/27/92 | 200.32 | . | . | |
| | 21 | BAC | 4 | FDN | Soil | Field Side-by-Side | 03/27/92 | 285.35 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | . | BD2 | | | | | . | . | . | . | |
| | 01 | BSM | 1 | FLR | Dust - Vacuum | Regular | 03/27/92 | 106.55 | 23.74 | 222.80 | |
| | 02 | BSM | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/27/92 | 38.85 | 1.99 | 51.10 | |
| | 24 | BSM | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/27/92 | 57.00 | 7.05 | 123.60 | |
| | 25 | BSM | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/27/92 | 84.07 | 2.96 | 35.20 | |
| | 26 | BSM | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/27/92 | . | 3.54 | . | < |
| | 27 | BSM | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/27/92 | . | 8.76 | . | |
| | 06 | BSM | N/A | N/A | Dust - Vacuum | Field Blank | 03/27/92 | 153.08 | . | . | < |
| | 28 | BSM | N/A | N/A | Dust - Wipe | Field Blank | 03/27/92 | . | . | . | < |
| | 04 | BSM | 2 | WST | Dust - Vacuum | Regular | 03/27/92 | 2058.54 | 525.10 | 255.09 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/27/92 | 75.27 | 20.10 | 267.10 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/27/92 | 50.14 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 03/27/92 | 138.42 | 111.58 | 806.10 | |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/27/92 | 182.55 | 4.26 | 23.36 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/27/92 | 47.18 | 1.26 | 26.70 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/27/92 | 807.44 | 114.13 | 141.35 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/27/92 | 127.62 | 269.55 | 2112.10 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/27/92 | 28.72 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/27/92 | 192.16 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/27/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | BA2 | | | | | . | . | . | . | |
| | 20 | BAC | 1 | BDY | Soil | Regular | 03/25/92 | 307.18 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/25/92 | 229.30 | 791.90 | 3453.50 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/25/92 | 281.53 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/25/92 | 539.69 | . | . | |
| | 21 | BAC | 3 | FDN | Soil | Field Side-by-Side | 03/25/92 | 602.57 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/25/92 | . | . | . | < |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 425.61 | 85.34 | 200.52 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 12186.30 | 1592.75 | 130.70 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/25/92 | 13567.76 | 2903.50 | 214.00 | |
| | 06 | BAT | N/A | N/A | Dust - Vacuum | Field Blank | 03/25/92 | 1321.58 | . | . | < |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 3299.35 | 1881.82 | 570.36 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 1345.05 | 23.44 | 17.43 | |
| | | BD1 | | | | | . | . | . | . | |
| | | BD2 | | | | | . | . | . | . | |
| | 10 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 644.33 | 59.95 | 93.05 | |
| | 07 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 212.59 | 65.27 | 307.00 | |
| | 08 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 173.80 | 51.74 | 297.70 | |
| | 09 | BD3 | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 243.14 | 45.08 | 185.39 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/25/92 | 313.32 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/25/92 | 672.24 | 6494.60 | 9661.20 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/25/92 | 680.31 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/25/92 | 892.07 | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | | HL2 | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/25/92 | 107.29 | 738.35 | 6882.00 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/25/92 | 68.38 | 1.96 | 28.70 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/25/92 | 85.16 | 14.02 | 164.60 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/25/92 | . | 12.86 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/25/92 | . | 13.24 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/25/92 | . | . | . | < |
| | | LDY | | | | | . | . | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/25/92 | 401.86 | 217.65 | 541.60 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | 20 | BAC | 1 | BDY | Soil | Regular | 03/25/92 | 131.30 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/24/92 | 77.88 | 13.60 | 174.60 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/25/92 | 137.32 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/25/92 | 128.59 | . | . | |
| | 21 | BAC | 3 | FDN | Soil | Field Side-by-Side | 03/25/92 | 137.04 | . | . | |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 358.59 | 13.54 | 37.76 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 78.23 | 2.30 | 29.40 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/25/92 | 42.38 | 1.09 | 25.80 | |
| | 06 | BAT | N/A | N/A | Dust - Vacuum | Field Blank | 03/25/92 | 556.19 | . | . | < |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 656.25 | 5733.31 | 8736.47 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 50.63 | 0.86 | 16.90 | < |
| | 10 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 03/25/92 | 130.68 | 3.53 | 27.04 | |
| | 07 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 03/25/92 | 164.24 | 26.74 | 162.80 | |
| | 08 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 03/25/92 | 360.86 | 207.27 | 574.37 | |
| | 09 | BD3 | 2 | WST | Dust - Vacuum | Regular | 03/25/92 | 290.39 | 6.72 | 23.13 | < |
| | 12 | FAM | 5 | EWI | Dust - Vacuum | Regular | 03/25/92 | 217.01 | 301.43 | 1389.00 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/25/92 | 54.42 | 60.40 | 1109.80 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/25/92 | 242.06 | . | . | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/25/92 | 1072.76 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/25/92 | 100.91 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/25/92 | . | . | . | < |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/25/92 | 96.89 | 36.55 | 377.20 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/11/92 | 368.59 | 449.35 | 1219.10 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/11/92 | 53.50 | . | . | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/11/92 | 180.87 | 608.04 | 3361.75 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/11/92 | 321.71 | 24.39 | 75.80 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/11/92 | 2781.74 | 6038.22 | 2170.67 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/11/92 | 1071.56 | 200.71 | 187.31 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/11/92 | 281.75 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/11/92 | 212.40 | 486.03 | 2288.20 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/11/92 | 45.70 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/11/92 | 265.78 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 03/11/92 | 321.99 | 45.40 | 141.00 | |
| | | KIT | | | | | . | . | . | . | |
| | | LDY | | | | | . | . | . | . | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/11/92 | 174.50 | . | . | |
| | 21 | LFT | 1 | BDY | Soil | Field Side-by-Side | 03/11/92 | 194.68 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/11/92 | . | . | . | < |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/11/92 | 1021.74 | 3059.10 | 2994.00 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/11/92 | 196.34 | 42.14 | 214.60 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/11/92 | 965.96 | 302.93 | 313.60 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/11/92 | 372.07 | 193.55 | 520.20 | |
| | 24 | LVG | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/11/92 | 392.40 | 8.16 | 20.80 | |
| | 25 | LVG | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/11/92 | 251.47 | 13.58 | 54.00 | |
| | 26 | LVG | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/11/92 | . | 8.37 | . | |
| | 27 | LVG | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/11/92 | . | 13.33 | . | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/11/92 | -154.82 | . | . | |
| | 28 | LVG | N/A | N/A | Dust - Wipe | Field Blank | 03/11/92 | . | . | . | < |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/11/92 | 9585.86 | 51335.38 | 5355.32 | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/11/92 | 12798.85 | 732.01 | 57.19 | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/11/92 | 208.07 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 57 | 24 | BA2 | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 38.81 | 0.96 | 24.70 | < |
| | 25 | BA2 | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 44.79 | 1.36 | 30.30 | |
| | 26 | BA2 | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 3.00 | . | < |
| | 27 | BA2 | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 2.72 | . | < |
| | 28 | BA2 | N/A | N/A | Dust - Wipe | Field Blank | 03/23/92 | . | . | . | < |
| | 20 | BAC | 1 | BDY | Soil | Regular | 03/23/92 | 55.49 | . | . | |
| | 21 | BAC | 1 | BDY | Soil | Field Side-by-Side | 03/23/92 | 56.90 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/23/92 | 35.03 | 16.29 | 465.07 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/23/92 | 42.85 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/23/92 | 73.34 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/23/92 | . | . | . | < |
| | 10 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/23/92 | 487.64 | 369.83 | 758.40 | |
| | 07 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 1136.51 | 12.39 | 10.90 | |
| | 08 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 252.36 | 21.47 | 85.09 | |
| | 09 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 317.53 | 12.22 | 38.49 | |
| | 05 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/23/92 | 198.28 | 780.17 | 3934.70 | |
| | 01 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 37.34 | 34.40 | 921.20 | |
| | 02 | BD1 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/23/92 | 35.42 | 30.19 | 852.20 | |
| | 06 | BD1 | N/A | N/A | Dust - Vacuum | Field Blank | 03/23/92 | -183.22 | . | . | < |
| | 03 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 1302.19 | 854.87 | 656.49 | |
| | 04 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 827.06 | 171.44 | 207.29 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/23/92 | 125.24 | 667.35 | 5328.60 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/23/92 | 63.88 | . | . | |
| | 12 | GAM | 5 | EWI | Dust - Vacuum | Regular | 03/23/92 | 189.08 | 78.17 | 413.40 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/23/92 | 70.21 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/23/92 | 51.35 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/23/92 | 211.52 | 690.48 | 3264.40 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 21 | BAC | | BDY | Soil | Field Side-by-Side | 03/15/92 | 322.87 | . | . | |
| | 20 | BAC | 1 | BDY | Soil | Regular | 03/15/92 | 150.19 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/15/92 | 208.90 | 1477.20 | 7071.20 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/15/92 | 109.32 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/15/92 | 114.80 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 03/15/92 | . | . | . | < |
| | 05 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/15/92 | 58.48 | 31.71 | 542.29 | |
| | 01 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/15/92 | 11.00 | 4.05 | 368.60 | < |
| | 02 | BD1 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/15/92 | 44.15 | 12.32 | 279.10 | |
| | 03 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/15/92 | 635.15 | 7244.55 | 11406.00 | |
| | 04 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/15/92 | 324.21 | 13.71 | 42.27 | |
| | | BD2 | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/15/92 | 92.67 | 266.38 | 2874.60 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/15/92 | 124.57 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/15/92 | 65.70 | 5.31 | 80.80 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/15/92 | 131.67 | 1.38 | 10.50 | < |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/15/92 | 81.95 | 3.08 | 37.60 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/15/92 | . | 3.54 | . | < |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/15/92 | . | 4.71 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/15/92 | . | . | . | < |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/15/92 | 97.18 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/15/92 | 937.98 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/15/92 | 384.85 | 1248.96 | 3245.28 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/15/92 | 163.83 | 90.11 | 550.00 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/15/92 | 155.93 | 15.70 | 100.70 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/15/92 | -236.25 | . | . | |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/15/92 | 121.87 | 215.53 | 1768.52 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/15/92 | 599.61 | 27.45 | 45.78 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 61 | 19 | BAC | 2 | BDY | Soil | Regular | 04/01/92 | 361.24 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/01/92 | 226.21 | 325.73 | 1439.90 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/01/92 | 297.93 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 04/01/92 | 420.62 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 04/01/92 | . | . | . | < |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 438.89 | 146.10 | 332.89 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 145.43 | 49.59 | 341.00 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/01/92 | 128.92 | 86.41 | 670.20 | |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 17053.46 | 112917.92 | 6621.41 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 1055.32 | 153.50 | 145.46 | |
| | | EXT | | | | | . | . | . | . | |
| | 20 | FRO | 1 | BDY | Soil | Regular | 04/01/92 | 137.57 | . | . | |
| | 21 | FRO | 1 | BDY | Soil | Field Side-by-Side | 04/01/92 | 132.39 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/01/92 | 188.49 | 772.32 | 4097.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/01/92 | 183.32 | . | . | |
| | 18 | FRO | 3 | FDN | Soil | Regular | 04/01/92 | 312.00 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 04/01/92 | 128.24 | 1289.00 | 10051.30 | |
| | 32 | KIT | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 1178.23 | 468.60 | 397.71 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 04/01/92 | 243.68 | 1153.00 | 4731.60 | |
| | 29 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 69.61 | 151.57 | 2177.40 | |
| | 30 | KIT | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 19169.39 | 39308.39 | 2050.58 | |
| | 31 | KIT | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 7649.41 | 3481.40 | 455.12 | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 290.13 | 22.56 | 77.76 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 139.85 | 156.76 | 1120.90 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/01/92 | -2903.72 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 4849.87 | 24453.52 | 5042.10 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 605.82 | 112.37 | 185.48 | |
| 65 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/27/92 | 85.00 | 816.70 | 9607.70 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/27/92 | 205.76 | . | . | |
| | 05 | BD4 | 3 | ARD | Dust - Vacuum | Regular | 03/27/92 | 709.18 | 27.63 | 38.96 | |
| | 01 | BD4 | 1 | FLR | Dust - Vacuum | Regular | 03/27/92 | 170.21 | 64.99 | 381.80 | |
| | 02 | BD4 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/27/92 | 249.36 | 123.76 | 496.30 | |
| | 06 | BD4 | N/A | N/A | Dust - Vacuum | Field Blank | 03/27/92 | 372.06 | . | . | < |
| | 03 | BD4 | 2 | WCH | Dust - Vacuum | Regular | 03/27/92 | 1190.49 | 855.25 | 718.40 | |
| | 04 | BD4 | 2 | WST | Dust - Vacuum | Regular | 03/27/92 | 346.48 | 47.62 | 137.44 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/27/92 | 229.22 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/27/92 | 691.82 | 7127.30 | 10302.20 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/27/92 | 262.09 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/27/92 | 225.26 | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/27/92 | 240.18 | 69.97 | 291.30 | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/27/92 | 269.40 | 4.04 | 15.01 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/27/92 | 430.33 | 1149.45 | 2671.10 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/27/92 | 842.02 | 441.39 | 524.20 | |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/27/92 | 586.83 | 738.00 | 1257.60 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/27/92 | 376.21 | 32.82 | 87.25 | |
| | 21 | RGT | | BDY | Soil | Field Side-by-Side | 03/27/92 | 208.86 | . | . | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/27/92 | 181.96 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/27/92 | 356.71 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/27/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 68 | 19 | BAC | 2 | BDY | Soil | Regular | 03/30/92 | 66.56 | . | . | |
| | 21 | BAC | 2 | BDY | Soil | Field Side-by-Side | 03/30/92 | 58.92 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/30/92 | 515.91 | 275.19 | 533.40 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/30/92 | 631.73 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/30/92 | 8.51 | . | . | |
| | 10 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/30/92 | 5644.54 | 4652.72 | 824.29 | |
| | 07 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/30/92 | 115.60 | 31.96 | 276.50 | |
| | 06 | DIN | N/A | N/A | Dust - Vacuum | Field Blank | 03/30/92 | -1935.81 | . | . | < |
| | 08 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/30/92 | 10116.70 | 33021.38 | 3264.05 | |
| | 09 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/30/92 | 5062.83 | 597.57 | 118.03 | |
| | 20 | FRO | 1 | BDY | Soil | Regular | 03/30/92 | 212.58 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/30/92 | 190.49 | 234.63 | 1231.70 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/30/92 | 655.14 | . | . | |
| | 18 | FRO | 3 | FDN | Soil | Regular | 03/30/92 | 648.06 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/30/92 | . | . | . | < |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/30/92 | 254.25 | 161.27 | 634.28 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/30/92 | 1200.39 | 1190.43 | 991.70 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/30/92 | 245.28 | 79.55 | 324.30 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/30/92 | 200.66 | 1.97 | 9.80 | |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/30/92 | 14271.12 | 244581.21 | 17138.19 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/30/92 | 3234.31 | 84.83 | 26.23 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/30/92 | 237.05 | 1108.40 | 4675.90 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 69 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/01/92 | 169.95 | 73.64 | 433.30 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/01/92 | 133.53 | . | . | |
| | 32 | BAT | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 709.30 | 148.74 | 209.70 | |
| | | BD1 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 04/01/92 | 137.61 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/01/92 | 334.09 | 717.66 | 2148.10 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/01/92 | 205.84 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 04/01/92 | 306.72 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 04/01/92 | . | . | . | < |
| | 29 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 47.03 | 6.73 | 143.10 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 153.56 | 94.96 | 618.40 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 105.29 | 27.64 | 262.50 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 3.54 | . | < |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 4.51 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 04/01/92 | . | . | . | < |
| | 31 | KIT | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 419.69 | 9.67 | 23.04 | |
| | 05 | LDY | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 106.61 | 35.64 | 334.33 | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 04/01/92 | 192.03 | 1010.65 | 5263.10 | |
| | 01 | LDY | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 248.24 | 47.24 | 190.30 | |
| | 02 | LDY | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/01/92 | 62.59 | 31.03 | 495.80 | |
| | 03 | LDY | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 209.83 | 232.06 | 1105.92 | |
| | 04 | LDY | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 92.03 | 2.86 | 31.12 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 04/01/92 | 84.92 | . | . | |
| | 21 | LFT | | FDN | Soil | Field Side-by-Side | 04/01/92 | 401.90 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 04/01/92 | 248.50 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 1012.70 | 283.02 | 279.47 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/01/92 | 142.71 | 57.20 | 400.80 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 88.60 | 26.63 | 300.50 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/01/92 | 1659.27 | . | . | < |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 27058.49 | 6883.68 | 254.40 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 20 | BAC | 1 | BDY | Soil | Regular | 04/01/92 | 182.04 | . | . | |
| | 21 | BAC | | FDN | Soil | Field Side-by-Side | 04/01/92 | 380.03 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 04/01/92 | 437.66 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | 10 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 550.54 | 48.18 | 87.52 | |
| | 07 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 106.40 | 28.46 | 267.50 | |
| | 09 | BD2 | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 4733.33 | 413.26 | 87.31 | |
| | | DIN | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 04/01/92 | 444.76 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/01/92 | 324.49 | 2036.80 | 6277.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/01/92 | 265.20 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 04/01/92 | 99.70 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 04/01/92 | . | . | . | |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 04/01/92 | 1124.68 | 88.06 | 78.30 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 848.19 | 559.26 | 659.36 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 04/01/92 | 852.90 | 1807.90 | 2119.70 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 94.43 | 1.16 | 12.30 | < |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/01/92 | 150.21 | 1.61 | 10.70 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 74.89 | 0.69 | 9.20 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 514.58 | 1.54 | 3.00 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 5.60 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 4.80 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 04/01/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 10407.95 | 68986.67 | 6628.27 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 5276.03 | 2934.53 | 556.20 | |
| | 14 | LFT | 5 | EWO | Dust - Vacuum | Regular | 04/01/92 | 153.30 | 16.65 | 108.60 | |
| | 16 | LFT | 5 | EWY | Soil | Regular | 04/01/92 | 358.19 | . | . | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/01/92 | 260.19 | . | . | |
| | | PAN | | | | | . | . | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 71 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/23/92 | 164.06 | 678.10 | 4133.20 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/23/92 | 345.99 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/23/92 | 1370.52 | 15703.01 | 11457.73 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 143.47 | 139.42 | 971.80 | |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 7714.68 | 2335.39 | 302.72 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 6078.61 | 686.94 | 113.01 | |
| | | BD2 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/23/92 | 326.19 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/23/92 | 161.95 | 910.07 | 5619.60 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/23/92 | 92.94 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/23/92 | 78.99 | . | . | |
| | 21 | FRO | 4 | FDN | Soil | Field Side-by-Side | 03/23/92 | 92.28 | . | . | |
| | | GAM | | | | | . | . | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 58.30 | 6.50 | 111.50 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/23/92 | 390.70 | 31.61 | 80.90 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 109.38 | 7.18 | 65.60 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 158.21 | 63.51 | 401.43 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 35.29 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 15.40 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/23/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 18311.15 | 73338.35 | 4005.12 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 13469.26 | 1760.65 | 130.72 | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/23/92 | 370.39 | 1094.63 | 2955.30 | |
| | 32 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/23/92 | 400.72 | 1689.80 | 4216.93 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/23/92 | 250.55 | 1285.80 | 5132.00 | |
| | 29 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 156.67 | 66.13 | 422.10 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/23/92 | -769.52 | . | . | < |
| | 30 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 2649.43 | 12387.93 | 4675.70 | |
| | 31 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 1990.75 | 553.83 | 278.20 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/23/92 | 138.02 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/23/92 | 218.86 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/23/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 72 | 10 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/14/92 | 379.81 | 1004.87 | 2645.73 | |
| | 07 | BAT | 1 | FLR | Dust - Vacuum | Regular | 03/14/92 | 225.80 | 119.41 | 528.80 | |
| | 06 | BAT | N/A | N/A | Dust - Vacuum | Field Blank | 03/14/92 | 506.74 | . | . | < |
| | 08 | BAT | 2 | WCH | Dust - Vacuum | Regular | 03/14/92 | 143.21 | 45.66 | 318.85 | |
| | 09 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/14/92 | 1310.53 | 3319.39 | 2532.86 | |
| | 05 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/14/92 | 1098.45 | 6101.28 | 5554.44 | |
| | 01 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/14/92 | 594.85 | 261.68 | 439.90 | |
| | 02 | BD1 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/14/92 | 322.67 | 109.22 | 338.50 | |
| | 03 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/14/92 | 1622.06 | 2214.40 | 1365.18 | |
| | 04 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/14/92 | 1054.74 | 1007.37 | 955.10 | |
| | | BD3 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/14/92 | 447.77 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/14/92 | 92.73 | 441.99 | 4766.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/14/92 | 156.76 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/14/92 | 319.40 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/14/92 | . | . | . | < |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 03/14/92 | 9.65 | 27.20 | 2820.20 | |
| | 32 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/14/92 | 257.78 | 1229.31 | 4768.92 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/14/92 | 19.46 | 1.70 | 87.30 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/14/92 | 78.19 | 1.41 | 18.00 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/14/92 | . | 6.23 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/14/92 | . | 7.74 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/14/92 | . | . | . | < |
| | 29 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/14/92 | 200.45 | 58.01 | 289.40 | |
| | 31 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/14/92 | 9421.10 | 49932.75 | 5300.10 | |
| | 30 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/14/92 | 2903.62 | 445.13 | 153.30 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/14/92 | 192.92 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/14/92 | 310.60 | . | . | |
| | 21 | RGT | 3 | FDN | Soil | Field Side-by-Side | 03/14/92 | 211.16 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 74 | 19 | BAC | 2 | BDY | Soil | Regular | 04/02/92 | 144.24 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/02/92 | 186.61 | 1094.70 | 5866.10 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/02/92 | 637.89 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 04/02/92 | 1678.61 | . | . | |
| | 21 | BAC | 4 | FDN | Soil | Field Side-by-Side | 04/02/92 | 654.01 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | 05 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 509.22 | 48.38 | 95.00 | |
| | 01 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 115.10 | 24.78 | 215.30 | |
| | 02 | BD2 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/02/92 | 132.71 | 62.93 | 474.20 | |
| | 24 | BD2 | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 313.32 | 57.09 | 182.20 | |
| | 25 | BD2 | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 104.09 | 40.80 | 392.00 | |
| | 26 | BD2 | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 15.30 | . | |
| | 27 | BD2 | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 10.39 | . | |
| | 27 | BD2 | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 122.63 | . | |
| | 06 | BD2 | N/A | N/A | Dust - Vacuum | Field Blank | 04/02/92 | 16370.53 | . | . | < |
| | 28 | BD2 | N/A | N/A | Dust - Wipe | Field Blank | 04/02/92 | . | . | . | < |
| | 03 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 30077.53 | 28664.44 | 953.02 | |
| | 04 | BD2 | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 679.25 | 164.48 | 242.15 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/02/92 | 228.52 | 2353.80 | 10300.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/02/92 | 555.52 | . | . | |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 467.33 | 74.11 | 158.59 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 328.05 | 592.63 | 1806.50 | |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 3474.09 | 1519.71 | 437.44 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 3135.61 | 155.21 | 49.50 | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 04/02/92 | 196.74 | 251.65 | 1279.10 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/02/92 | 233.37 | 1585.00 | 6791.90 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 04/02/92 | 167.86 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 04/02/92 | 1125.26 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 04/02/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 77 | 20 | BAC | 1 | BDY | Soil | Regular | 03/24/92 | 71.27 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/24/92 | 94.76 | 235.77 | 2488.10 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/24/92 | 107.98 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/24/92 | 201.14 | . | . | |
| | 21 | BAC | 3 | FDN | Soil | Field Side-by-Side | 03/24/92 | 208.84 | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/24/92 | 151.17 | 1426.84 | 9438.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/24/92 | 203.70 | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/24/92 | 91.59 | 38.49 | 420.20 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 76.63 | 13.86 | 180.90 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/24/92 | 83.29 | 9.83 | 118.00 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/24/92 | 42.48 | 2.33 | 54.90 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/24/92 | 89.23 | 13.61 | 152.50 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/24/92 | . | 4.03 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/24/92 | . | 11.65 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/24/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 149.80 | 118.33 | 789.94 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 193.30 | 4.58 | 23.69 | < |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/24/92 | 91.09 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/24/92 | 111.33 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/24/92 | . | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/24/92 | 464.35 | 5.89 | 12.68 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/24/92 | 207.22 | 744.73 | 3593.80 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/24/92 | 190.76 | 97.40 | 510.60 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/24/92 | -1762.11 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/24/92 | 1945.34 | 2303.87 | 1184.30 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/24/92 | 1782.75 | 467.23 | 262.08 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 20 | FRO | 1 | BDY | Soil | Regular | 03/26/92 | 46.01 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/26/92 | 98.96 | 868.01 | 8771.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/26/92 | 37.69 | . | . | |
| | 21 | FRO | | FDN | Soil | Field Side-by-Side | 03/26/92 | 70.36 | . | . | |
| | 18 | FRO | 3 | FDN | Soil | Regular | 03/26/92 | 66.29 | . | . | |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 1321.97 | 359.49 | 271.94 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 66.41 | 19.11 | 287.80 | |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/26/92 | 314.55 | 12877.92 | 40941.36 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 209.93 | 30.13 | 143.54 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/26/92 | 70.35 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/26/92 | 67.26 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/26/92 | . | . | . | < |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 217.78 | 5.43 | 24.92 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/26/92 | 69.82 | 235.28 | 3369.75 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 44.16 | 33.09 | 749.40 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/26/92 | 56.54 | 57.94 | 1024.70 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/26/92 | 143.09 | . | . | < |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/26/92 | 160.25 | 867.96 | 5416.20 | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 98.67 | 11.31 | 114.62 | |
| 79 | 20 | BAC | 1 | BDY | Soil | Regular | 03/11/92 | 55.88 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/11/92 | 16335.45 | 3608.50 | 220.90 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/11/92 | 4.55 | . | . | < |
| | 18 | BAC | 3 | FDN | Soil | Regular | 03/11/92 | 11.00 | . | . | |
| | 05 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/11/92 | 1476.59 | 3059.73 | 2072.16 | |
| | 01 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/11/92 | 217.68 | 225.95 | 1038.00 | |
| | 02 | BD1 | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/11/92 | 125.31 | 289.23 | 2308.10 | |
| | 06 | BD1 | N/A | N/A | Dust - Vacuum | Field Blank | 03/11/92 | 386.09 | . | . | < |
| | 03 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/11/92 | 6852.68 | 2357.76 | 344.06 | |
| | 04 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/11/92 | 1849.83 | 341.85 | 184.80 | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/11/92 | 300.02 | 355.91 | 1186.30 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/11/92 | 514.93 | . | . | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/11/92 | 2723.16 | 7349.00 | 2698.70 | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/11/92 | 116.40 | . | . | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/11/92 | 1398.66 | 2650.52 | 1895.04 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/11/92 | 318.28 | 2381.40 | 7482.00 | |
| | 21 | LVG | 6 | EWY | Soil | Field Side-by-Side | 03/11/92 | 459.07 | . | . | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/11/92 | 134.28 | 18.32 | 136.40 | |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/11/92 | 10323.76 | 13867.20 | 1343.23 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/11/92 | 1586.51 | 283.29 | 178.56 | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/11/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 20 | BAC | 1 | BDY | Soil | Regular | 04/02/92 | 377.27 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/02/92 | 569.03 | 170.37 | 299.40 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/02/92 | 1068.07 | . | . | |
| | 21 | BAC | 5 | EWY | Soil | Field Side-by-Side | 04/02/92 | 416.89 | . | . | |
| | 18 | BAC | 3 | FDN | Soil | Regular | 04/02/92 | 293.89 | . | . | |
| | 22 | BAC | N/A | N/A | Soil | Field Blank | 04/02/92 | . | . | . | < |
| | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 207.83 | 123.04 | 592.00 | |
| | 01 | BAT | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 816.65 | 33.97 | 41.60 | |
| | 02 | BAT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/02/92 | 144.04 | 24.24 | 168.30 | |
| | 03 | BAT | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 4872.21 | 6552.82 | 1344.94 | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 472.75 | 65.66 | 138.90 | |
| | 29 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 443.88 | 27.21 | 61.30 | |
| | 30 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 45229.26 | 29102.05 | 643.43 | |
| | 31 | BD1 | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 133.62 | 15.43 | 115.45 | |
| | | BD2 | | | | | . | . | . | . | |
| | 10 | BD3 | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 595.59 | 29.48 | 49.50 | |
| | 07 | BD3 | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 275.17 | 85.63 | 311.20 | |
| | 06 | BD3 | N/A | N/A | Dust - Vacuum | Field Blank | 04/02/92 | 442.45 | . | . | < |
| | 08 | BD3 | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 513.36 | 2666.68 | 5194.59 | |
| | 09 | BD3 | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 219.70 | 132.84 | 604.64 | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/02/92 | 3395.09 | 3495.25 | 1029.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/02/92 | 417.62 | . | . | |
| | 32 | KIT | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 373.86 | 304.48 | 814.40 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 1707.55 | 1884.45 | 1103.60 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 1241.52 | 510.64 | 411.30 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 24.84 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 17.92 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 04/02/92 | . | . | . | < |
| | 19 | LFT | 2 | BDY | Soil | Regular | 04/02/92 | 248.46 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 04/02/92 | 659.74 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/02/92 | 5332.00 | 6512.50 | 1221.40 | |
| | 12 | PAN | 5 | EWI | Dust - Vacuum | Regular | 04/02/92 | 1380.58 | 186.24 | 134.90 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 81 | 19 | BAC | 2 | BDY | Soil | Regular | 03/23/92 | 447.05 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/23/92 | 250.23 | 1498.36 | 5987.89 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/23/92 | 852.78 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/23/92 | 3351.12 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | 10 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/23/92 | 153.26 | 9.02 | 58.88 | |
| | 07 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 88.17 | 45.62 | 517.40 | |
| | 06 | BD1 | N/A | N/A | Dust - Vacuum | Field Blank | 03/23/92 | -146.75 | . | . | < |
| | 08 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 3975.77 | 10809.87 | 2718.93 | |
| | 09 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 2378.37 | 189.90 | 79.84 | |
| | | BD4 | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/23/92 | 206.84 | 165.60 | 800.60 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/23/92 | 177.61 | . | . | |
| | | HAL | | | | | . | . | . | . | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/23/92 | 424.39 | 6.66 | 15.70 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/23/92 | 566.41 | 7.82 | 13.80 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 168.14 | 3.08 | 18.30 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/23/92 | 172.72 | 3.92 | 22.70 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 26.22 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/23/92 | . | 60.12 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/23/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/23/92 | 12816.04 | 16534.40 | 1290.13 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/23/92 | 2444.70 | 830.87 | 339.86 | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/23/92 | 363.85 | 5501.00 | 15118.90 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/23/92 | 235.15 | . | . | |
| | 21 | LFT | 1 | BDY | Soil | Field Side-by-Side | 03/23/92 | 278.95 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/23/92 | 329.85 | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/23/92 | 225.05 | 1298.00 | 5767.70 | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 03/23/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 84 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/02/92 | 1188.48 | 1420.95 | 1195.60 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/02/92 | 151.36 | . | . | |
| | 10 | BAT | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | 505.95 | 24.00 | 47.44 | |
| | 07 | BAT | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 134.09 | 14.15 | 105.50 | |
| | 08 | BAT | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 88.36 | 65.89 | 745.69 | |
| | 09 | BAT | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 140.02 | 36.89 | 263.49 | |
| | 12 | DIN EXT | 5 | EWI | Dust - Vacuum | Regular | 04/02/92 | 494.04 | 1162.13 | 2352.30 | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 04/02/92 | 259.93 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 04/02/92 | 304.16 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/02/92 | 454.65 | 698.53 | 1536.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/02/92 | 184.92 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 04/02/92 | 436.67 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 04/02/92 | . | . | . | < |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 126.87 | 169.33 | 1334.60 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/02/92 | 195.40 | 224.95 | 1151.20 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 8.45 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/02/92 | . | 25.78 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 04/02/92 | . | . | . | < |
| | 05 | LDY LVG | 3 | ARD | Dust - Vacuum | Regular | 04/02/92 | . | . | . | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/02/92 | 252.38 | 179.96 | 713.05 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 04/02/92 | 125.03 | 4.33 | 34.60 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/02/92 | 609.36 | 458.85 | 753.00 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/02/92 | 769.94 | 684.55 | 889.10 | |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 04/02/92 | 797.77 | . | . | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 04/02/92 | 438.77 | 2092.64 | 4769.32 | < |
| | 20 | RGT | 1 | BDY | Soil | Regular | 04/02/92 | 132.31 | 158.48 | 1197.79 | < |
| | 18 | RGT | 3 | FDN | Soil | Regular | 04/02/92 | 75.99 | . | . | |
| | | | | | | | | 698.17 | . | . | |
| 88 | 19 | FRO | 2 | BDY | Soil | Regular | 03/26/92 | 26.72 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/26/92 | 495.94 | 3908.20 | 7880.40 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/26/92 | 19.70 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/26/92 | 117.86 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/26/92 | . | . | . | < |
| | 10 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 437.87 | 1122.84 | 2564.35 | |
| | 11 | KIT | 6 | EWI | Dust - Vacuum | Regular | 03/26/92 | 118.51 | 23.48 | 198.10 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 36.97 | 5.24 | 141.60 | |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/26/92 | 2107.94 | 2491.59 | 1182.00 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 216.19 | 29.92 | 138.41 | |
| | 21 | LFT | | FDN | Soil | Field Side-by-Side | 03/26/92 | 42.30 | . | . | |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/26/92 | 323.63 | 89.05 | 275.15 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/26/92 | 38.40 | 18.22 | 474.40 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/26/92 | 37.57 | 9.52 | 253.30 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/26/92 | 268.91 | . | . | < |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/26/92 | 346.36 | 5807.92 | 16768.23 | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/26/92 | 98.21 | 14.90 | 151.68 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/26/92 | 21.35 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/26/92 | 45.39 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | | BAT | | | | | . | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | 32 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 247.05 | 397.09 | 1607.31 | |
| | 29 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 117.11 | 274.60 | 2344.80 | |
| | 30 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 459.77 | 3254.40 | 7078.25 | |
| | 31 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | 408.98 | 63.24 | 154.63 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/16/92 | 58.96 | . | . | |
| | 21 | FRO | 2 | BDY | Soil | Field Side-by-Side | 03/16/92 | 74.12 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/16/92 | 1460.46 | 6316.50 | 4325.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/16/92 | 427.58 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/16/92 | 348.80 | . | . | |
| | 11 | HAL | 6 | EWI | Dust - Vacuum | Regular | 03/16/92 | 287.46 | 1304.50 | 4538.00 | |
| | 07 | HAL | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 220.85 | 337.93 | 1530.10 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 885.97 | 478.00 | 539.52 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/16/92 | 142.02 | 25.45 | 179.20 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 230.55 | 193.53 | 839.40 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/16/92 | 388.52 | 58.98 | 151.80 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 134.89 | 680.95 | 5048.20 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 154.17 | 448.34 | 2908.00 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 75.75 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 63.52 | . | |
| | 06 | KIT | N/A | N/A | Dust - Vacuum | Field Blank | 03/16/92 | -334.57 | . | . | < |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/16/92 | . | . | . | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 189.85 | 501.73 | 2642.78 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | 205.62 | 209.31 | 1017.94 | |
| | | LDY | | | | | . | . | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/16/92 | . | . | . | < |
| | | LVG | | | | | . | . | . | . | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/16/92 | 235.58 | . | . | |
| | 14 | RGT | 5 | EWO | Dust - Vacuum | Regular | 03/16/92 | 426.07 | 1222.89 | 2870.16 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 03/16/92 | 188.22 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/16/92 | 292.00 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 19 | BAC | 2 | BDY | Soil | Regular | 04/01/92 | 98.88 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 04/01/92 | 1303.25 | 3381.40 | 2594.60 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 04/01/92 | 59.31 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 04/01/92 | 67.18 | . | . | |
| | 21 | BAC | 4 | FDN | Soil | Field Side-by-Side | 04/01/92 | 79.97 | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 04/01/92 | 135.94 | 188.42 | 1386.00 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 04/01/92 | 126.25 | . | . | |
| | 10 | HAL | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 86.53 | 31.71 | 366.48 | |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 04/01/92 | 149.74 | 611.54 | 4083.90 | |
| | 07 | KIT | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 74.71 | 12.90 | 172.70 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 202.26 | 3.84 | 19.00 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 04/01/92 | 92.71 | 9.61 | 103.70 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 5.24 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 04/01/92 | . | 3.00 | . | < |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 04/01/92 | . | . | . | < |
| | 08 | KIT | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 4067.58 | 39410.37 | 9688.89 | |
| | 09 | KIT | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 2218.35 | 1315.08 | 592.82 | |
| | 05 | LVG | 3 | ARD | Dust - Vacuum | Regular | 04/01/92 | 1456.63 | 28.93 | 19.86 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 04/01/92 | 107.97 | 177.62 | 1645.00 | |
| | 01 | LVG | 1 | FLR | Dust - Vacuum | Regular | 04/01/92 | 64.76 | 16.59 | 256.20 | |
| | 02 | LVG | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 04/01/92 | 74.74 | 11.17 | 149.40 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 04/01/92 | 548.52 | . | . | < |
| | 03 | LVG | 2 | WCH | Dust - Vacuum | Regular | 04/01/92 | 8785.71 | 18883.56 | 2149.35 | |
| | 04 | LVG | 2 | WST | Dust - Vacuum | Regular | 04/01/92 | 248.07 | 19.40 | 78.20 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 04/01/92 | 114.64 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 04/01/92 | 223.86 | . | . | |
| | 22 | RGT | N/A | N/A | Soil | Field Blank | 04/01/92 | . | . | . | < |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 94 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/18/92 | 509.91 | 7408.40 | 14528.90 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/18/92 | 216.69 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | 32 | BD1 | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 317.64 | 40863.60 | 128646.00 | |
| | 29 | BD1 | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 308.08 | 85.62 | 277.90 | |
| | 30 | BD1 | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 344.51 | 34.90 | 101.31 | |
| | 31 | BD1 | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 35.79 | 4.10 | 114.67 | < |
| | | BD2 | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/18/92 | 115.82 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/18/92 | 2348.06 | 14021.00 | 5971.30 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/18/92 | 188.12 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/18/92 | 224.53 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/18/92 | . | . | . | < |
| | 12 | HAL | 5 | EWI | Dust - Vacuum | Regular | 03/18/92 | 21.67 | 19.91 | 918.70 | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 327.26 | 31953.60 | 97639.20 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 24.12 | 5.31 | 220.20 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/18/92 | 96.74 | 35.64 | 368.40 | |
| | 24 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/18/92 | 31.53 | 38.61 | 1224.50 | |
| | 25 | KIT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/18/92 | 144.27 | 18.96 | 131.40 | |
| | 26 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/18/92 | . | 28.61 | . | |
| | 27 | KIT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/18/92 | . | 25.33 | . | |
| | 28 | KIT | N/A | N/A | Dust - Wipe | Field Blank | 03/18/92 | . | . | . | |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 3984.00 | 19.12 | 4.80 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 1781.19 | 318.50 | 178.81 | |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/18/92 | 84.97 | 3471.30 | 40852.80 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/18/92 | 282.24 | 836.45 | 2963.60 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/18/92 | 182.08 | 49.67 | 272.80 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/18/92 | 563.87 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/18/92 | 1301.04 | 2158.85 | 1659.32 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/18/92 | 416.25 | 22.21 | 53.35 | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/18/92 | 107.11 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/18/92 | 339.90 | . | . | |
| | 21 | RGT | 3 | FDN | Soil | Field Side-by-Side | 03/18/92 | 307.04 | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | 19 | BAC | 2 | BDY | Soil | Regular | 03/12/92 | 77.29 | . | . | |
| | 21 | BAC | 2 | BDY | Soil | Field Side-by-Side | 03/12/92 | 95.12 | . | . | |
| | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/12/92 | 79.81 | 22.13 | 277.30 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/12/92 | 47.37 | . | . | |
| | 17 | BAC | 4 | FDN | Soil | Regular | 03/12/92 | 43.50 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/12/92 | 145.64 | 83.44 | 572.90 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/12/92 | 83.05 | . | . | |
| | 05 | KIT | 3 | ARD | Dust - Vacuum | Regular | 03/12/92 | 201.88 | 2.68 | 13.27 | |
| | 12 | KIT | 5 | EWI | Dust - Vacuum | Regular | 03/12/92 | 26.17 | 5.33 | 203.60 | |
| | 01 | KIT | 1 | FLR | Dust - Vacuum | Regular | 03/12/92 | 854.14 | 5.21 | 6.10 | |
| | 02 | KIT | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/12/92 | 70.58 | 0.92 | 13.10 | < |
| | 03 | KIT | 2 | WCH | Dust - Vacuum | Regular | 03/12/92 | 591.53 | 544.67 | 920.78 | |
| | 04 | KIT | 2 | WST | Dust - Vacuum | Regular | 03/12/92 | 342.78 | 8.77 | 25.57 | |
| | 20 | LFT | 1 | BDY | Soil | Regular | 03/12/92 | 41.66 | . | . | |
| | 18 | LFT | 3 | FDN | Soil | Regular | 03/12/92 | 46.17 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/12/92 | . | . | . | < |
| | 10 | LVG | 3 | ARD | Dust - Vacuum | Regular | 03/12/92 | 263.90 | 5.51 | 20.87 | |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/12/92 | 132.56 | 314.95 | 2375.90 | |
| | 07 | LVG | 1 | FLR | Dust - Vacuum | Regular | 03/12/92 | 35.82 | 8.16 | 227.90 | |
| | 06 | LVG | N/A | N/A | Dust - Vacuum | Field Blank | 03/12/92 | 435.72 | . | . | < |
| | 08 | LVG | 2 | WCH | Dust - Vacuum | Regular | 03/12/92 | 139.15 | 84.16 | 604.80 | |
| | 09 | LVG | 2 | WST | Dust - Vacuum | Regular | 03/12/92 | 3114.95 | 231.23 | 74.23 | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 96 | 05 | BAT | 3 | ARD | Dust - Vacuum | Regular | 03/13/92 | 331.57 | 57.37 | 173.02 | |
| | 24 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/13/92 | 167.13 | 3.71 | 22.20 | |
| | 25 | BAT | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/13/92 | 1387.82 | 408.58 | 294.41 | |
| | 26 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/13/92 | . | 7.22 | . | |
| | 27 | BAT | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/13/92 | . | 15.02 | . | |
| | 04 | BAT | 2 | WST | Dust - Vacuum | Regular | 03/13/92 | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | 10 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 03/13/92 | 434.03 | 190.57 | 439.07 | |
| | 07 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/13/92 | 385.32 | 290.23 | 753.20 | |
| | 33 | BD2 | | WCH | Dust - Vacuum | Regular | 03/13/92 | 31595.17 | 46843.00 | 1482.60 | |
| | 08 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 03/13/92 | 28337.07 | 17061.75 | 602.10 | |
| | 09 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/13/92 | 2923.75 | 636.87 | 217.83 | |
| | | BSM | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/13/92 | 151.85 | 155.27 | 1022.50 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/13/92 | 54.23 | . | . | |
| | 01 | HAL | 1 | FLR | Dust - Vacuum | Regular | 03/13/92 | 6217.62 | 11641.25 | 1872.30 | |
| | 02 | HAL | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/13/92 | 1724.32 | 2365.43 | 1371.80 | |
| | 06 | HAL | N/A | N/A | Dust - Vacuum | Field Blank | 03/13/92 | -122.15 | . | . | < |
| | 28 | HAL | N/A | N/A | Dust - Wipe | Field Blank | 03/13/92 | . | . | . | < |
| | | KIT | | | | | . | . | . | . | |
| | 21 | LFT | | BDY | Soil | Field Side-by-Side | 03/13/92 | 76.66 | . | . | |
| | 19 | LFT | 2 | BDY | Soil | Regular | 03/13/92 | 159.24 | . | . | |
| | 17 | LFT | 4 | FDN | Soil | Regular | 03/13/92 | 91.00 | . | . | |
| | 22 | LFT | N/A | N/A | Soil | Field Blank | 03/13/92 | . | . | . | < |
| | 11 | LVG | 6 | EWI | Dust - Vacuum | Regular | 03/13/92 | 214.43 | 3522.60 | 16428.10 | |
| | 32 | PO2 | 3 | ARD | Dust - Vacuum | Regular | 03/13/92 | 217.21 | 8.90 | 40.96 | |
| | 12 | PO2 | 5 | EWI | Dust - Vacuum | Regular | 03/13/92 | 124.48 | 265.34 | 2131.50 | |
| | 29 | PO2 | 1 | FLR | Dust - Vacuum | Regular | 03/13/92 | 92.58 | 48.54 | 524.30 | |
| | 30 | PO2 | 2 | WCH | Dust - Vacuum | Regular | 03/13/92 | 828.73 | 11449.67 | 13815.96 | |
| | 31 | PO2 | 2 | WST | Dust - Vacuum | Regular | 03/13/92 | 162.17 | 16.16 | 99.68 | |
| | | POR | | | | | . | . | . | . | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/13/92 | 79.09 | . | . | |
| | 14 | RGT | 5 | EWO | Dust - Vacuum | Regular | 03/13/92 | 35.65 | 23.40 | 656.30 | |
| | 16 | RGT | 5 | EWY | Soil | Regular | 03/13/92 | 190.28 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/13/92 | 82.44 | . | . | |
| 97 | | | | | | | . | . | . | . | |
| | | EXT | | | | | . | . | . | . | |

| Unit ID | Sample ID | Room or Yard Location | General Sample Location | Component | Sample Medium | Sample Type | Date Collected | Lead Concentration (ug/g) | Lead Loading (ug/ft2) | Dust Loading (ug/ft2) | Below Detection |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 99 | 14 | BAC | 5 | EWO | Dust - Vacuum | Regular | 03/16/92 | 163.59 | 203.13 | 1241.70 | |
| | 16 | BAC | 5 | EWY | Soil | Regular | 03/16/92 | 148.14 | . | . | |
| | | BAT | | | | | . | . | . | . | |
| | | BD1 | | | | | . | . | . | . | |
| | 10 | BD2 | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 2988.51 | 412.87 | 138.15 | |
| | 07 | BD2 | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 140.87 | 32.25 | 228.90 | |
| | 08 | BD2 | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 422.53 | 510.51 | 1208.23 | |
| | 09 | BD2 | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | . | . | . | |
| | | BD3 | | | | | . | . | . | . | |
| | | BSM | | | | | . | . | . | . | |
| | 05 | DIN | 3 | ARD | Dust - Vacuum | Regular | 03/16/92 | 1645.10 | 214.28 | 130.25 | |
| | 01 | DIN | 1 | FLR | Dust - Vacuum | Regular | 03/16/92 | 347.13 | 204.53 | 589.20 | |
| | 02 | DIN | 1 | FLR | Dust - Vacuum | Field Side-by-Side | 03/16/92 | 627.17 | 1071.78 | 1708.90 | |
| | 24 | DIN | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 54.08 | 485.09 | 8969.80 | |
| | 25 | DIN | 4 | FLR | Dust - Vacuum | Vacuum Wipe Comparison | 03/16/92 | 94.50 | 63.79 | 675.00 | < |
| | 26 | DIN | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 31.76 | . | |
| | 27 | DIN | 4 | FLR | Dust - Wipe | Vacuum Wipe Comparison | 03/16/92 | . | 19.22 | . | |
| | 06 | DIN | N/A | N/A | Dust - Vacuum | Field Blank | 03/16/92 | -207.89 | . | . | < |
| | 28 | DIN | N/A | N/A | Dust - Wipe | Field Blank | 03/16/92 | . | . | . | < |
| | 03 | DIN | 2 | WCH | Dust - Vacuum | Regular | 03/16/92 | 3061.29 | 26435.50 | 8635.40 | |
| | 04 | DIN | 2 | WST | Dust - Vacuum | Regular | 03/16/92 | 5917.30 | 16710.45 | 2824.00 | |
| | | EXT | | | | | . | . | . | . | |
| | 19 | FRO | 2 | BDY | Soil | Regular | 03/16/92 | 521.38 | . | . | |
| | 13 | FRO | 6 | EWO | Dust - Vacuum | Regular | 03/16/92 | 197.55 | 848.52 | 4295.20 | |
| | 15 | FRO | 6 | EWY | Soil | Regular | 03/16/92 | 212.56 | . | . | |
| | 17 | FRO | 4 | FDN | Soil | Regular | 03/16/92 | 197.97 | . | . | |
| | 22 | FRO | N/A | N/A | Soil | Field Blank | 03/16/92 | . | . | . | < |
| | 11 | HAL | 6' | EWI | Dust - Vacuum | Regular | 03/16/92 | 310.23 | 3260.60 | 10510.30 | |
| | | KIT | | | | | . | . | . | . | |
| | 12 | LDY | 5 | EWI | Dust - Vacuum | Regular | 03/16/92 | 194.44 | 379.04 | 1949.40 | |
| | | LVG | | | | | . | . | . | . | |
| | 20 | RGT | 1 | BDY | Soil | Regular | 03/16/92 | 240.05 | . | . | |
| | 18 | RGT | 3 | FDN | Soil | Regular | 03/16/92 | 210.37 | . | . | |
| | 21 | RGT | 3 | FDN | Soil | Field Side-by-Side | 03/16/92 | 229.23 | . | . | |

# APPENDIX B

## ADDITIONAL EXPLANATORY VARIABLES CONSIDERED FOR INCLUSION IN THE STATISTICAL MODELS

# APPENDIX B

Factors considered for inclusion in the models.

**Abatement**

Proportion of interior abated by encapsulation, as opposed to enclosure

Proportion of exterior abated by encapsulation, as opposed to enclosure

Proportion of room abated by encapsulation, as opposed to enclosure

Proportion of interior abated by each of four specific removal methods

Proportion of exterior abated by each of four specific removal methods

Proportion of room abated by each of four specific removal methods

Phase of abatement

Abatement contractor

Mean of Log XRF measures obtained at location during HUD Demonstration

**Remodeling**

During six months prior to sampling
During sampling
Number of residents over 18 years
Number of residents between 7 and 17 years of age
Number of residents under age 7
Number of pets
Number of months at residence
Indicator of ownership

**Occupation**

Paint removal
Building demolition
Home remodeling
Welding
Plumbing
Sand blasting
Auto body repair
Salvage
Chemical plant
Glass work
Lead smelter
Oil refinery

Indicator of work clothes worn home
Indicator of work clothes washed at home

**Activities (at home)**

Car or bicycle painting
Paint removal
Soldering pipes or electronic parts
Soldering jewelry
Use of artists' paint
Car maintenance

**Cleanliness**

Frequency of vacuuming carpets
Frequency of vacuuming uncarpeted floors
Frequency of sweeping uncarpeted floors
Frequency of wet mopping uncarpeted floors
Frequency of furniture dusting
Frequency of window stool dusting
Frequency of window stool dusting
Frequency of pets scratching the carpet or furniture
Frequency of pets chewing the carpet or furniture

**Sampling Deviations**

Small nozzle used instead of large nozzle
Sample collected from outside of air duct instead of inside
Substrate type
Substrate condition
Proximity of house to lead smelter
Age of house

# APPENDIX C

## CONCISE LISTING OF STATISTICAL MODELING RESULTS BY COMPONENT AND MEASUREMENT TYPE

## Mixed Model Results by Sample Type

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| ARD | CONC | INTERCEPT | 35.00 | 331.91 | 5.80 | 0.19 | .0000 |
| | | Observations | 86.00 | . | . | . | . |
| | | STUDYID | . | . | . | . | . |
| | | Standard Deviation Estimate | . | 2.21 | 0.79 | . | . |
| | | Avg Abatement Effect | 35.00 | 1.59 | 0.46 | 0.23 | .0488 |
| | | PID | 35.00 | 2.01 | 0.70 | 0.24 | .0057 |
| | | PR | 35.00 | 0.79 | -0.24 | 0.23 | .3012 |
| | | Condition Effect | 35.00 | . | . | . | .0022 |
| | | Condition: Damaged | 35.00 | 1.52 | 0.42 | 0.83 | .6139 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 35.00 | 6.71 | 1.90 | 0.50 | .0005 |
| | | Contractor Effect | 35.00 | . | . | . | .0155 |
| | | Contractor: A | 35.00 | 2.34 | 0.85 | 0.35 | .0220 |
| | | Contractor: B | 35.00 | 0.77 | -0.26 | 0.13 | .0537 |
| | | Contractor: C | 35.00 | 0.91 | -0.10 | 0.15 | .5024 |
| | | Contractor: D | 35.00 | 1.81 | 0.59 | 0.28 | .0407 |
| | | DUSTSILL | 35.00 | 1.03 | 0.03 | 0.01 | .0602 |
| | | EXTAIRDT | 35.00 | 0.78 | -0.24 | 0.19 | .1992 |
| | | WMOPUNCP | 35.00 | 0.98 | -0.02 | 0.01 | .0394 |
| ARD | DUST | INTERCEPT | 35.00 | 202.46 | 5.31 | 0.48 | .0000 |
| | | Observations | 86.00 | . | . | . | . |
| | | STUDYID | . | . | 1.45 | 0.79 | .0008 |
| | | Standard Deviation Estimate | . | 2.73 | 1.00 | . | . |
| | | Avg Abatement Effect | 35.00 | 3.11 | 1.14 | 0.57 | .0530 |
| | | PID | 35.00 | 1.80 | 0.59 | 0.63 | .3557 |
| | | PR | 35.00 | 0.91 | -0.10 | 0.34 | .7768 |
| | | Condition Effect | 35.00 | . | . | . | .0460 |
| | | Condition: Damaged | 35.00 | 28.44 | 3.35 | 1.34 | .0176 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 35.00 | 2.54 | 0.93 | 1.07 | .3911 |
| | | Contractor Effect | 35.00 | . | . | . | .3559 |
| | | Contractor: A | 35.00 | 0.24 | -1.44 | 0.96 | .1411 |
| | | Contractor: B | 35.00 | 1.36 | 0.31 | 0.36 | .3961 |
| | | Contractor: C | 35.00 | 0.83 | -0.19 | 0.40 | .6350 |
| | | Contractor: D | 35.00 | 1.87 | 0.63 | 0.79 | .4324 |
| | | DUSTSILL | 35.00 | 0.96 | -0.04 | 0.04 | .3625 |
| | | EXTAIRDT | 35.00 | 0.26 | -1.35 | 0.33 | .0003 |
| | | WMOPUNCP | 35.00 | 0.98 | -0.02 | 0.02 | .4566 |
| ARD | LOAD | INTERCEPT | 35.00 | 75.81 | 4.33 | 0.52 | .0000 |
| | | Observations | 86.00 | . | . | . | . |
| | | STUDYID | . | . | 1.52 | 0.86 | .0019 |
| | | Standard Deviation Estimate | . | 3.24 | 1.18 | . | . |
| | | Avg Abatement Effect | 35.00 | 4.70 | 1.55 | 0.61 | .0165 |
| | | PID | 35.00 | 3.99 | 1.38 | 0.68 | .0490 |
| | | PR | 35.00 | 0.73 | -0.31 | 0.39 | .4318 |
| | | Condition Effect | 35.00 | . | . | . | .0047 |
| | | Condition: Damaged | 35.00 | 40.56 | 3.70 | 1.55 | .0224 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 35.00 | 27.77 | 3.32 | 1.21 | .0092 |
| | | Contractor Effect | 35.00 | . | . | . | .5036 |
| | | Contractor: A | 35.00 | 0.55 | -0.61 | 1.03 | .5609 |
| | | Contractor: B | 35.00 | 1.01 | 0.01 | 0.38 | .9736 |
| | | Contractor: C | 35.00 | 0.78 | -0.25 | 0.43 | .5689 |
| | | Contractor: D | 35.00 | 3.35 | 1.21 | 0.84 | .1617 |
| | | DUSTSILL | 35.00 | 0.99 | -0.01 | 0.04 | .7761 |
| | | EXTAIRDT | 35.00 | 0.18 | -1.74 | 0.38 | .0001 |
| | | WMOPUNCP | 35.00 | 0.97 | -0.03 | 0.02 | .1869 |

## Mixed Model Results by Sample Type (Contd)

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| BDY | CONC | INTERCEPT | 20.00 | 108.62 | 4.69 | 0.14 | .0000 |
| | | LOCATION(STUDYID) | . | . | 0.44 | 0.22 | .0001 |
| | | Observations | 120.00 | . | . | . | . |
| | | STUDYID | . | . | 0.38 | 0.25 | .0146 |
| | | Standard Deviation Estimate | . | 1.23 | 0.21 | . | . |
| | | Avg Abatement Effect | 20.00 | 1.18 | 0.16 | 0.17 | .3469 |
| | | POD | 20.00 | 1.27 | 0.24 | 0.18 | .2118 |
| | | HUDYRBLT | 20.00 | 0.84 | -0.18 | 0.04 | .0002 |
| | | PNTREMJB | 20.00 | 0.45 | -0.81 | 0.36 | .0376 |
| | | SLDRPIPE | 20.00 | 1.46 | 0.38 | 0.15 | .0199 |
| EWI | CONC | INTERCEPT | 34.00 | 181.71 | 5.20 | 0.24 | .0000 |
| | | Observations | 90.00 | . | . | . | . |
| | | STUDYID | . | . | 0.49 | 0.41 | .1537 |
| | | Standard Deviation Estimate | . | 2.31 | 0.84 | . | . |
| | | Avg Abatement Effect | 34.00 | 0.85 | -0.16 | 0.27 | .5612 |
| | | PID | 34.00 | 0.95 | -0.05 | 0.31 | .8764 |
| | | PR | 34.00 | 1.28 | 0.25 | 0.26 | .3410 |
| | | NUM7TO17 | 34.00 | 0.81 | -0.21 | 0.11 | .0602 |
| | | REMPAINT | 34.00 | 1.10 | 0.10 | 0.05 | .0675 |
| | | Substrate Effect | 34.00 | . | . | . | .9001 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Linoleum | 34.00 | 0.94 | -0.06 | 0.23 | .7838 |
| | | Substrate: Plastic | 34.00 | 0.76 | -0.27 | 0.69 | .6927 |
| | | Substrate: Tile | 34.00 | 1.08 | 0.07 | 0.41 | .8579 |
| | | Substrate: Wood | 34.00 | 1.34 | 0.29 | 0.37 | .4377 |
| | | VACMUNCP | 34.00 | 1.06 | 0.06 | 0.02 | .0013 |
| EWI | DUST | INTERCEPT | 34.00 | 3052.85 | 8.02 | 0.25 | .0000 |
| | | Observations | 90.00 | . | . | . | . |
| | | STUDYID | . | . | . | . | . |
| | | Standard Deviation Estimate | . | 2.88 | 1.06 | . | . |
| | | Avg Abatement Effect | 34.00 | 1.19 | 0.17 | 0.28 | .5385 |
| | | PID | 34.00 | 1.24 | 0.22 | 0.31 | .4921 |
| | | PR | 34.00 | 1.31 | 0.27 | 0.29 | .3642 |
| | | NUM7TO17 | 34.00 | 0.78 | -0.24 | 0.11 | .0304 |
| | | REMPAINT | 34.00 | 0.97 | -0.03 | 0.05 | .5224 |
| | | Substrate Effect | 34.00 | . | . | . | .0000 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Linoleum | 34.00 | 0.15 | -1.90 | 0.27 | .0000 |
| | | Substrate: Plastic | 34.00 | 0.01 | -5.05 | 0.77 | .0000 |
| | | Substrate: Tile | 34.00 | 0.03 | -3.65 | 0.45 | .0000 |
| | | Substrate: Wood | 34.00 | 0.27 | -1.33 | 0.42 | .0030 |
| | | VACMUNCP | 34.00 | 0.99 | -0.01 | 0.02 | .7614 |
| EWI | LOAD | INTERCEPT | 34.00 | 531.48 | 6.28 | 0.35 | .0000 |
| | | Observations | 90.00 | . | . | . | . |
| | | STUDYID | . | . | . | . | . |
| | | Standard Deviation Estimate | . | 4.38 | 1.48 | . | . |
| | | Avg Abatement Effect | 34.00 | 1.05 | 0.05 | 0.38 | .9021 |
| | | PID | 34.00 | 1.15 | 0.14 | 0.44 | .7537 |
| | | PR | 34.00 | 1.63 | 0.49 | 0.41 | .2439 |
| | | NUM7TO17 | 34.00 | 0.64 | -0.45 | 0.15 | .0052 |
| | | REMPAINT | 34.00 | 1.06 | 0.06 | 0.07 | .3840 |
| | | Substrate Effect | 34.00 | . | . | . | .0000 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Linoleum | 34.00 | 0.15 | -1.87 | 0.38 | .0000 |
| | | Substrate: Plastic | 34.00 | 0.01 | -5.18 | 1.08 | .0000 |
| | | Substrate: Tile | 34.00 | 0.03 | -3.53 | 0.62 | .0000 |
| | | Substrate: Wood | 34.00 | 0.35 | -1.06 | 0.58 | .0766 |
| | | VACMUNCP | 34.00 | 1.06 | 0.06 | 0.02 | .0230 |

## Mixed Model Results by Sample Type (Contd)

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| EWO | CONC | INTERCEPT | 46.00 | 183.84 | 5.21 | 0.22 | .0000 |
| | | Observations | 97.00 | . | . | . | . |
| | | STUDYID | . | . | 0.52 | 0.41 | .0969 |
| | | Standard Deviation Estimate | . | 2.44 | 0.89 | . | . |
| | | Avg Abatement Effect | 46.00 | 1.19 | 0.17 | 0.26 | .5090 |
| | | POD | 46.00 | 1.00 | 0.00 | 0.29 | .9943 |
| | | VACMUNCP | 46.00 | 1.05 | 0.04 | 0.02 | .0142 |
| EWO | DUST | INTERCEPT | 46.00 | 1151.37 | 7.05 | 0.25 | .0000 |
| | | Observations | 97.00 | . | . | . | . |
| | | STUDYID | . | . | 0.40 | 0.50 | .5230 |
| | | Standard Deviation Estimate | . | 3.30 | 1.19 | . | . |
| | | Avg Abatement Effect | 46.00 | 1.95 | 0.67 | 0.30 | .0291 |
| | | POD | 46.00 | 1.05 | 0.05 | 0.33 | .8760 |
| | | VACMUNCP | 46.00 | 0.96 | -0.04 | 0.02 | .0317 |
| EWO | LOAD | INTERCEPT | 46.00 | 219.99 | 5.39 | 0.37 | .0000 |
| | | Observations | 97.00 | . | . | . | . |
| | | STUDYID | . | . | 0.91 | 0.69 | .0762 |
| | | Standard Deviation Estimate | . | 4.35 | 1.47 | . | . |
| EWO | LOAD | Avg Abatement Effect | 46.00 | 2.24 | 0.81 | 0.44 | .0710 |
| | | POD | 46.00 | 1.06 | 0.06 | 0.50 | .9072 |
| | | VACMUNCP | 46.00 | 1.00 | 0.00 | 0.03 | .9967 |
| EWY | CONC | INTERCEPT | 12.00 | 110.66 | 4.71 | 0.18 | .0000 |
| | | LOCATION(STUDYID) | . | . | 0.71 | 0.38 | .0005 |
| | | Observations | 109.00 | . | . | . | . |
| | | STUDYID | . | . | 0.37 | 0.35 | .2666 |
| | | Standard Deviation Estimate | . | 1.49 | 0.40 | . | . |
| | | Avg Abatement Effect | 12.00 | 1.18 | 0.17 | 0.22 | .4578 |
| | | POD | 12.00 | 1.18 | 0.16 | 0.24 | .5175 |
| | | PROXIMTY | 12.00 | 1.37 | 0.31 | 0.11 | .0169 |
| FDN | CONC | INTERCEPT | 14.00 | 194.49 | 5.27 | 0.15 | .0000 |
| | | LOCATION(STUDYID) | . | . | 0.44 | 0.26 | .0034 |
| | | Observations | 88.00 | . | . | . | . |
| | | STUDYID | . | . | 0.21 | 0.24 | .4375 |
| | | Standard Deviation Estimate | . | 1.31 | 0.27 | . | . |
| | | Avg Abatement Effect | 14.00 | 1.17 | 0.16 | 0.21 | .4584 |
| | | POD | 14.00 | 0.72 | -0.33 | 0.33 | .3350 |
| | | SO | 14.00 | 0.65 | -0.43 | 0.12 | .0029 |
| | | HUDYRBLT | 14.00 | 0.73 | -0.31 | 0.05 | .0000 |
| | | LOG_XRF | 14.00 | 1.28 | 0.24 | 0.09 | .0146 |
| | | NOWNER | 14.00 | 0.34 | -1.09 | 0.18 | .0000 |
| | | NUMMONTH | 14.00 | 0.94 | -0.07 | 0.02 | .0014 |
| | | REMPAINT | 14.00 | 0.84 | -0.18 | 0.03 | .0002 |
| | | WELDJB | 14.00 | 2.09 | 0.74 | 0.36 | .0619 |
| FLR | CONC | INTERCEPT | 105.00 | 99.15 | 4.60 | 0.19 | .0000 |
| | | LOCATION(STUDYID) | . | . | 0.73 | 0.35 | .0000 |
| | | Observations | 233.00 | . | . | . | . |
| | | STUDYID | . | . | 0.00 | . | . |
| | | Standard Deviation Estimate | . | 2.16 | 0.77 | . | . |
| | | Avg Abatement Effect | 105.00 | 1.07 | 0.07 | 0.22 | .7614 |
| | | PID | 105.00 | 1.20 | 0.18 | 0.23 | .4218 |
| | | PR | 105.00 | 0.84 | -0.17 | 0.22 | .4375 |
| | | SI | 105.00 | 1.14 | 0.13 | 0.06 | .0311 |
| | | Substrate Effect | 105.00 | . | . | . | .0024 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Concrete | 105.00 | 3.56 | 1.27 | 0.69 | .0687 |
| | | Substrate: Linoleum | 105.00 | 1.06 | 0.06 | 0.20 | .7818 |
| | | Substrate: Tile | 105.00 | 1.15 | 0.14 | 0.35 | .6898 |
| | | Substrate: Wood | 105.00 | 2.70 | 0.99 | 0.27 | .0003 |
| | | VACMUNCP | 105.00 | 1.03 | 0.03 | 0.01 | .0070 |
| | | WELDJB | 105.00 | 3.94 | 1.37 | 0.38 | .0005 |

## Mixed Model Results by Sample Type (Contd)

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| FLR | DUST | INTERCEPT | 105.00 | 348.05 | 5.85 | 0.26 | .0000 |
| | | LOCATION(STUDYID) | . | . | 0.84 | 0.45 | .0005 |
| | | Observations | 233.00 | . | . | . | . |
| | | STUDYID | . | . | 0.49 | 0.44 | .2224 |
| | | Standard Deviation Estimate | . | 2.36 | 0.86 | . | . |
| | | Avg Abatement Effect | 105.00 | 1.69 | 0.52 | 0.29 | .0786 |
| | | PID | 105.00 | 1.52 | 0.42 | 0.32 | .1891 |
| | | PR | 105.00 | 0.67 | -0.40 | 0.25 | .1169 |
| | | SI | 105.00 | 0.91 | -0.10 | 0.08 | .2325 |
| | | Substrate Effect | 105.00 | . | . | . | .0000 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Concrete | 105.00 | 4.24 | 1.45 | 0.90 | .1110 |
| | | Substrate: Linoleum | 105.00 | 0.14 | -1.98 | 0.24 | .0000 |
| | | Substrate: Tile | 105.00 | 0.11 | -2.24 | 0.43 | .0000 |
| | | Substrate: Wood | 105.00 | 0.57 | -0.55 | 0.34 | .1107 |
| | | VACMUNCP | 105.00 | 0.99 | -0.01 | 0.02 | .5604 |
| | | WELDJB | 105.00 | 2.86 | 1.05 | 0.53 | .0507 |
| FLR | LOAD | INTERCEPT | 105.00 | 35.25 | 3.56 | 0.30 | .0000 |
| | | LOCATION(STUDYID) | . | . | 1.27 | 0.53 | .0000 |
| | | Observations | 233.00 | . | . | . | . |
| | | STUDYID | . | . | . | . | . |
| | | Standard Deviation Estimate | . | 2.56 | 0.94 | . | . |
| | | Avg Abatement Effect | 105.00 | 1.83 | 0.60 | 0.34 | .0826 |
| | | PID | 105.00 | 1.87 | 0.63 | 0.36 | .0811 |
| FLR | LOAD | PR | 105.00 | 0.57 | -0.56 | 0.33 | .0971 |
| | | SI | 105.00 | 1.03 | 0.03 | 0.09 | .7426 |
| | | Substrate Effect | 105.00 | . | . | . | .0000 |
| | | Substrate: Carpet | . | 1.00 | 0.00 | . | . |
| | | Substrate: Concrete | 105.00 | 13.76 | 2.62 | 1.08 | .0169 |
| | | Substrate: Linoleum | 105.00 | 0.14 | -1.93 | 0.32 | .0000 |
| | | Substrate: Tile | 105.00 | 0.12 | -2.10 | 0.55 | .0002 |
| | | Substrate: Wood | 105.00 | 1.45 | 0.37 | 0.41 | .3694 |
| | | VACMUNCP | 105.00 | 1.02 | 0.02 | 0.02 | .2495 |
| | | WELDJB | 105.00 | 10.92 | 2.39 | 0.58 | .0001 |
| FLW | LOAD | Observations | 65.00 | . | . | . | . |
| | | STUDYID | . | . | 0.73 | 0.45 | .0080 |
| | | Standard Deviation Estimate | . | 1.76 | 0.56 | . | . |
| | | PID | 32.00 | 1.48 | 0.39 | 0.38 | .3083 |
| | | POD | 32.00 | 0.44 | -0.82 | 0.38 | .0381 |
| | | Contractor Effect | 32.00 | . | . | . | .0012 |
| | | Contractor: A | 32.00 | 4.70 | 1.55 | 0.51 | .0048 |
| | | Contractor: B | 32.00 | 0.68 | -0.38 | 0.19 | .0546 |
| | | Contractor: C | 32.00 | 1.58 | 0.46 | 0.19 | .0250 |
| | | Contractor: D | 32.00 | 0.12 | -2.11 | 0.45 | .0001 |
| | | Intercept | 32.00 | 18.21 | 2.90 | 0.21 | .0000 |
| | | NOWNER | 32.00 | 0.38 | -0.97 | 0.34 | .0074 |
| WCH | CONC | INTERCEPT | 29.00 | 1571.83 | 7.36 | 0.52 | .0000 |
| | | Observations | 83.00 | . | . | . | . |
| | | STUDYID | . | . | 0.84 | 0.62 | .0648 |
| | | Standard Deviation Estimate | . | 3.07 | 1.12 | . | . |
| | | Avg Abatement Effect | 29.00 | 0.81 | -0.21 | 0.55 | .7065 |
| | | PID | 29.00 | 1.86 | 0.62 | 0.63 | .3383 |
| | | PR | 29.00 | 0.66 | -0.42 | 0.36 | .2508 |
| | | SI | 29.00 | 1.31 | 0.27 | 0.15 | .0778 |
| | | SO | 29.00 | 0.59 | -0.53 | 0.18 | .0076 |
| | | Condition Effect | 29.00 | . | . | . | .0865 |

## Mixed Model Results by Sample Type (Contd)

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| WCH | CONC | Condition: Chalking | 29.00 | 4.07 | 1.40 | 0.99 | .1674 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 29.00 | 2.35 | 0.86 | 0.39 | .0364 |
| | | Int Removal Effect | 29.00 | . | . | . | .0763 |
| | | Int Removal: Chem Strip | 29.00 | 1.05 | 0.05 | 0.13 | .7082 |
| | | Int Removal: Heat Gun | 29.00 | 1.33 | 0.28 | 0.17 | .0967 |
| | | Int Removal: Rem/Repl | 29.00 | 1.03 | 0.03 | 0.16 | .8735 |
| | | NOZZLDEV | 29.00 | 1.18 | 0.17 | 0.45 | .7082 |
| | | Substrate Effect | 29.00 | . | . | . | .1729 |
| | | Substrate: Concrete | 29.00 | 0.58 | -0.55 | 1.42 | .7038 |
| | | Substrate: Metal | 29.00 | 0.41 | -0.90 | 0.49 | .0737 |
| | | Substrate: Plastic | 29.00 | 0.23 | -1.49 | 0.81 | .0779 |
| | | Substrate: Wood | . | 1.00 | 0.00 | . | . |
| WCH | DUST | INTERCEPT | 29.00 | 2450.92 | 7.80 | 0.51 | .0000 |
| | | Observations | 83.00 | . | . | . | . |
| | | STUDYID | . | . | 0.72 | 0.69 | .2789 |
| | | Standard Deviation Estimate | . | 3.25 | 1.18 | . | . |
| | | Avg Abatement Effect | 29.00 | 0.90 | -0.11 | 0.54 | .8463 |
| | | PID | 29.00 | 0.33 | -1.12 | 0.61 | .0796 |
| | | PR | 29.00 | 0.80 | -0.22 | 0.37 | .5576 |
| | | SI | 29.00 | 1.02 | 0.02 | 0.14 | .8921 |
| | | SO | 29.00 | 0.83 | -0.18 | 0.18 | .3120 |
| | | Condition Effect | 29.00 | . | . | . | .9436 |
| | | Condition: Chalking | 29.00 | 0.71 | -0.34 | 1.01 | .7372 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 29.00 | 0.95 | -0.06 | 0.39 | .8877 |
| | | Int Removal Effect | 29.00 | . | . | . | .1733 |
| | | Int Removal: Chem Strip | 29.00 | 0.85 | -0.16 | 0.12 | .2092 |
| | | Int Removal: Heat Gun | 29.00 | 0.79 | -0.23 | 0.16 | .1612 |
| | | Int Removal: Rem/Repl | 29.00 | 0.97 | -0.03 | 0.15 | .8335 |
| | | NOZZLDEV | 29.00 | 2.26 | 0.81 | 0.45 | .0831 |
| | | Substrate Effect | 29.00 | . | . | . | .0802 |
| | | Substrate: Concrete | 29.00 | 0.28 | -1.28 | 1.46 | .3889 |
| | | Substrate: Metal | 29.00 | 0.94 | -0.06 | 0.48 | .8927 |
| | | Substrate: Plastic | 29.00 | 0.13 | -2.03 | 0.80 | .0163 |
| | | Substrate: Wood | . | 1.00 | 0.00 | . | . |
| WCH | LOAD | INTERCEPT | 29.00 | 3908.71 | 8.27 | 0.73 | .0000 |
| | | Observations | 83.00 | . | . | . | . |
| | | STUDYID | . | . | 1.09 | 0.87 | .1200 |
| | | Standard Deviation Estimate | . | 5.28 | 1.66 | . | . |
| | | Avg Abatement Effect | 29.00 | 0.73 | -0.32 | 0.78 | .6822 |
| | | PID | 29.00 | 0.60 | -0.51 | 0.89 | .5706 |
| | | PR | 29.00 | 0.53 | -0.64 | 0.53 | .2313 |
| | | SI | 29.00 | 1.34 | 0.29 | 0.21 | .1669 |
| | | SO | 29.00 | 0.49 | -0.71 | 0.26 | .0097 |
| | | Condition Effect | 29.00 | . | . | . | .3460 |
| | | Condition: Chalking | 29.00 | 2.84 | 1.04 | 1.44 | .4741 |
| | | Condition: Good | . | 1.00 | 0.00 | . | . |
| | | Condition: Peeling | 29.00 | 2.25 | 0.81 | 0.56 | .1554 |
| | | Int Removal Effect | 29.00 | . | . | . | .5073 |
| | | Int Removal: Chem Strip | 29.00 | 0.90 | -0.11 | 0.18 | .5517 |
| | | Int Removal: Heat Gun | 29.00 | 1.06 | 0.05 | 0.23 | .8147 |
| | | Int Removal: Rem/Repl | 29.00 | 1.00 | 0.00 | 0.22 | .9825 |
| | | NOZZLDEV | 29.00 | 2.61 | 0.96 | 0.65 | .1496 |
| | | Substrate Effect | 29.00 | . | . | . | .0294 |
| | | Substrate: Concrete | 29.00 | 0.15 | -1.87 | 2.08 | .3748 |
| | | Substrate: Metal | 29.00 | 0.37 | -0.98 | 0.69 | .1620 |
| | | Substrate: Plastic | 29.00 | 0.03 | -3.54 | 1.15 | .0044 |
| | | Substrate: Wood | . | 1.00 | 0.00 | . | . |

## Mixed Model Results by Sample Type (Contd)

| Sample Type | Response | Parameter | Denominator for Degrees of Freedom | Multiplicative Effect | Estimate | Std Error | Observed Significance Level |
|---|---|---|---|---|---|---|---|
| WST | CONC | INTERCEPT | 59.00 | 412.54 | 6.02 | 0.29 | .0000 |
| | | Observations | 111.00 | . | . | . | . |
| | | STUDYID | . | . | 0.74 | 0.56 | .0828 |
| | | Standard Deviation Estimate | . | 3.63 | 1.29 | . | . |
| | | Avg Abatement Effect | 59.00 | 1.70 | 0.53 | 0.37 | .1599 |
| | | PID | 59.00 | 2.71 | 1.00 | 0.48 | .0415 |
| | | PR | 59.00 | 0.65 | -0.44 | 0.31 | .1633 |
| | | NWHOME | 59.00 | 1.53 | 0.43 | 0.38 | .2676 |
| | | PHASE 1 | 59.00 | 6.73 | 1.91 | 0.59 | .0020 |
| | | PHASE 2 | 59.00 | 1.09 | 0.08 | 0.50 | .8716 |
| | | PHASE 3 | 59.00 | 0.44 | -0.82 | 0.62 | .1952 |
| | | PHASE Effect | 59.00 | . | . | . | .0132 |
| | | SINCE_CL | 59.00 | 0.67 | -0.40 | 0.18 | .0256 |
| WST | DUST | INTERCEPT | 59.00 | 92.29 | 4.52 | 0.22 | .0000 |
| | | Observations | 111.00 | . | . | . | . |
| | | STUDYID | . | . | 0.43 | 0.43 | .3117 |
| | | Standard Deviation Estimate | . | 2.94 | 1.08 | . | . |
| | | Avg Abatement Effect | 59.00 | 1.16 | 0.15 | 0.28 | .6005 |
| | | PID | 59.00 | 1.72 | 0.54 | 0.36 | .1350 |
| | | PR | 59.00 | 0.86 | -0.15 | 0.26 | .5547 |
| | | NWHOME | 59.00 | 1.96 | 0.67 | 0.28 | .0210 |
| | | PHASE 1 | 59.00 | 1.84 | 0.61 | 0.44 | .1701 |
| | | PHASE 2 | 59.00 | 0.97 | -0.03 | 0.38 | .9360 |
| | | PHASE 3 | 59.00 | 0.77 | -0.26 | 0.46 | .5708 |
| | | PHASE Effect | 59.00 | . | . | . | .4198 |
| | | SINCE_CL | 59.00 | 0.93 | -0.08 | 0.13 | .5682 |
| WST | LOAD | INTERCEPT | 59.00 | 37.93 | 3.64 | 0.38 | .0000 |
| | | Observations | 111.00 | . | . | . | . |
| | | STUDYID | . | . | 0.90 | 0.74 | .1456 |
| | | Standard Deviation Estimate | . | 5.82 | 1.76 | . | . |
| | | Avg Abatement Effect | 59.00 | 1.95 | 0.67 | 0.49 | .1750 |
| | | PID | 59.00 | 4.64 | 1.53 | 0.62 | .0170 |
| | | PR | 59.00 | 0.56 | -0.58 | 0.42 | .1759 |
| | | NWHOME | 59.00 | 3.04 | 1.11 | 0.50 | .0300 |
| | | PHASE 1 | 59.00 | 12.43 | 2.52 | 0.77 | .0018 |
| | | PHASE 2 | 59.00 | 1.04 | 0.04 | 0.66 | .9536 |
| | | PHASE 3 | 59.00 | 0.33 | -1.09 | 0.81 | .1840 |
| | | PHASE Effect | 59.00 | . | . | . | .0115 |
| | | SINCE_CL | 59.00 | 0.62 | -0.48 | 0.23 | .0411 |

# APPENDIX D

## LABORATORY CONTROL CHARTS FOR QUALITY CONTROL SAMPLES

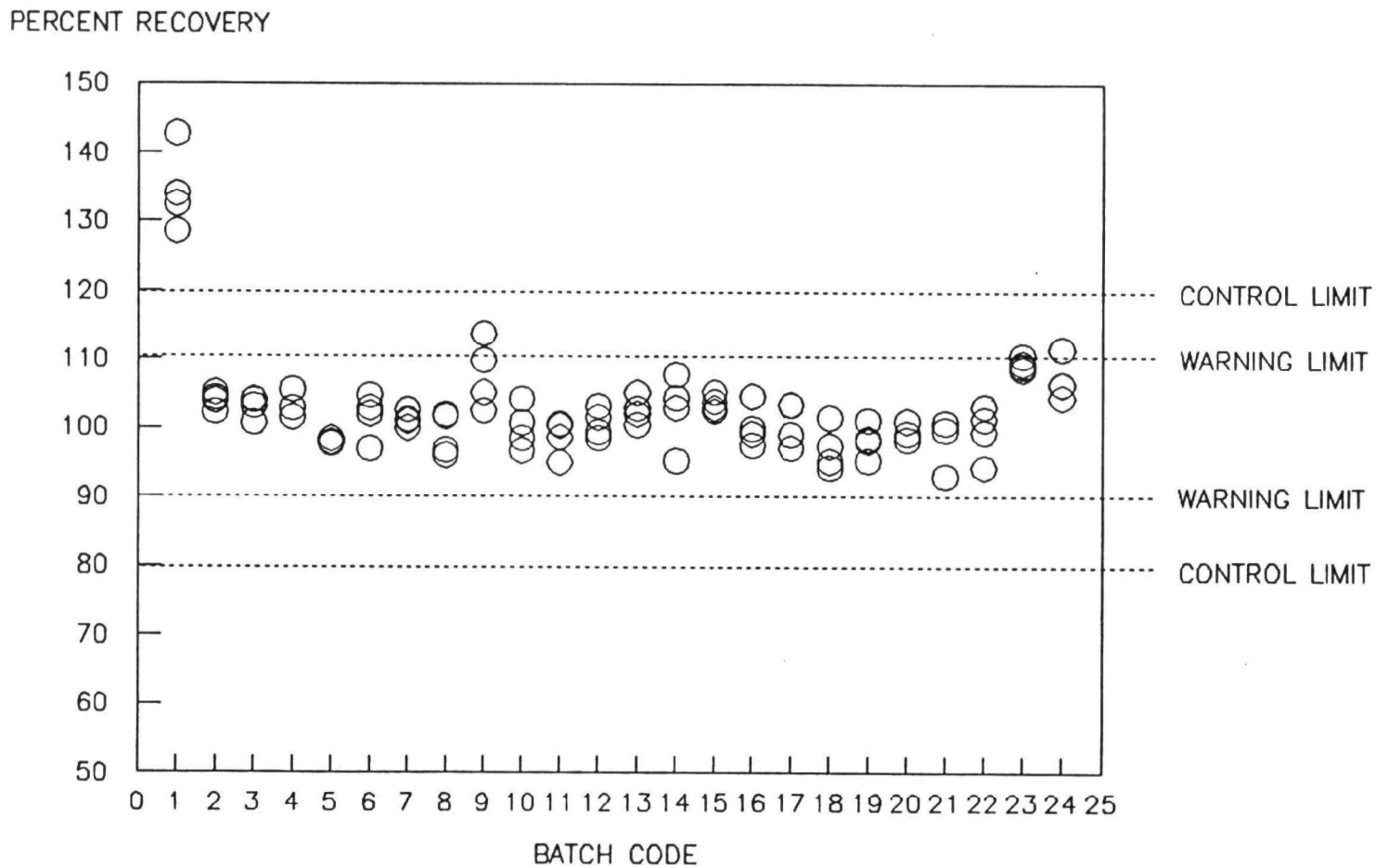


**Figure D-1. Performance - control chart of individual spiked sample recovery data, vacuum cassette samples.**

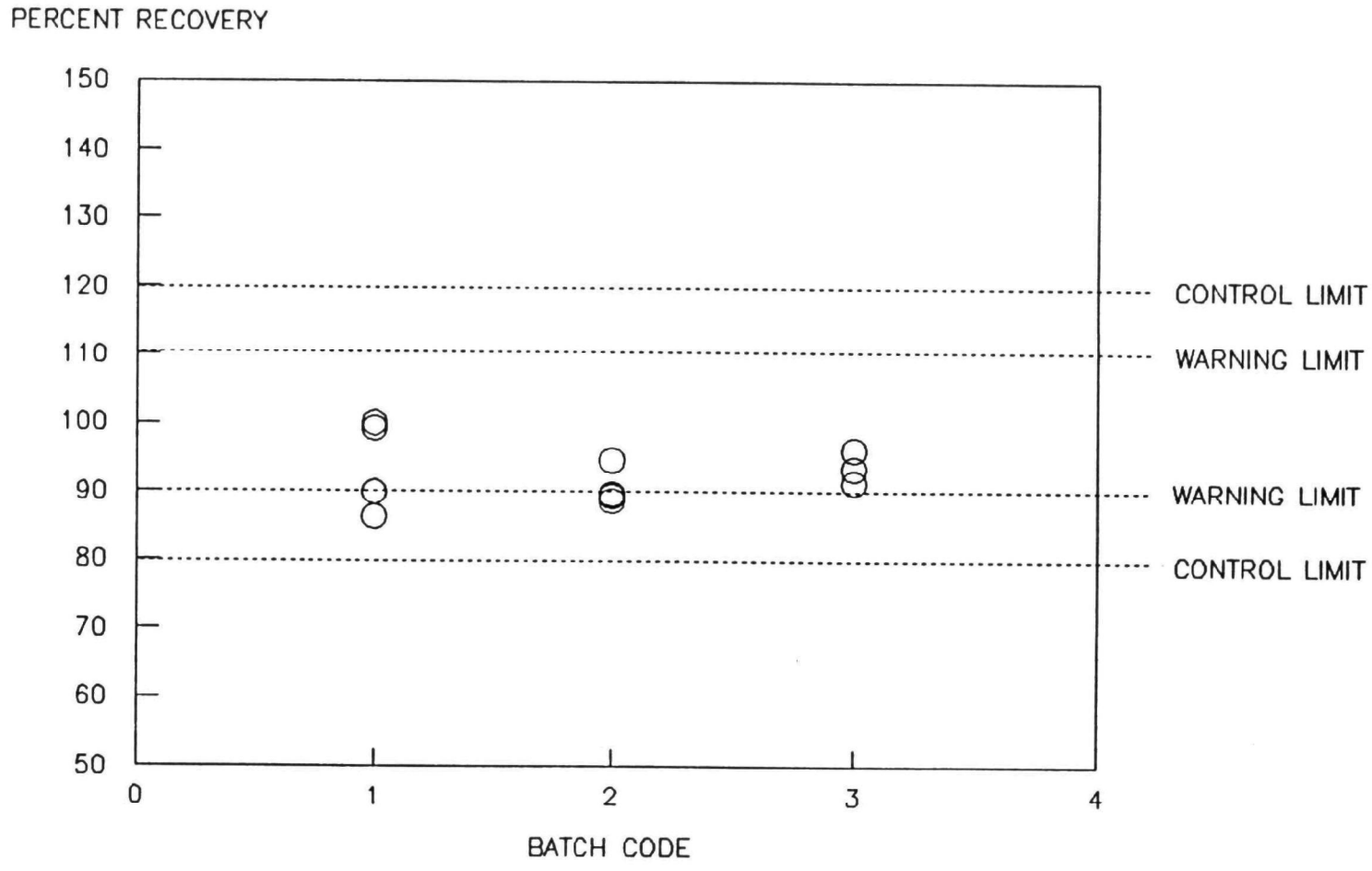


**Figure D-2. Performance - control chart of individual spiked sample recovery data, wipe samples.**

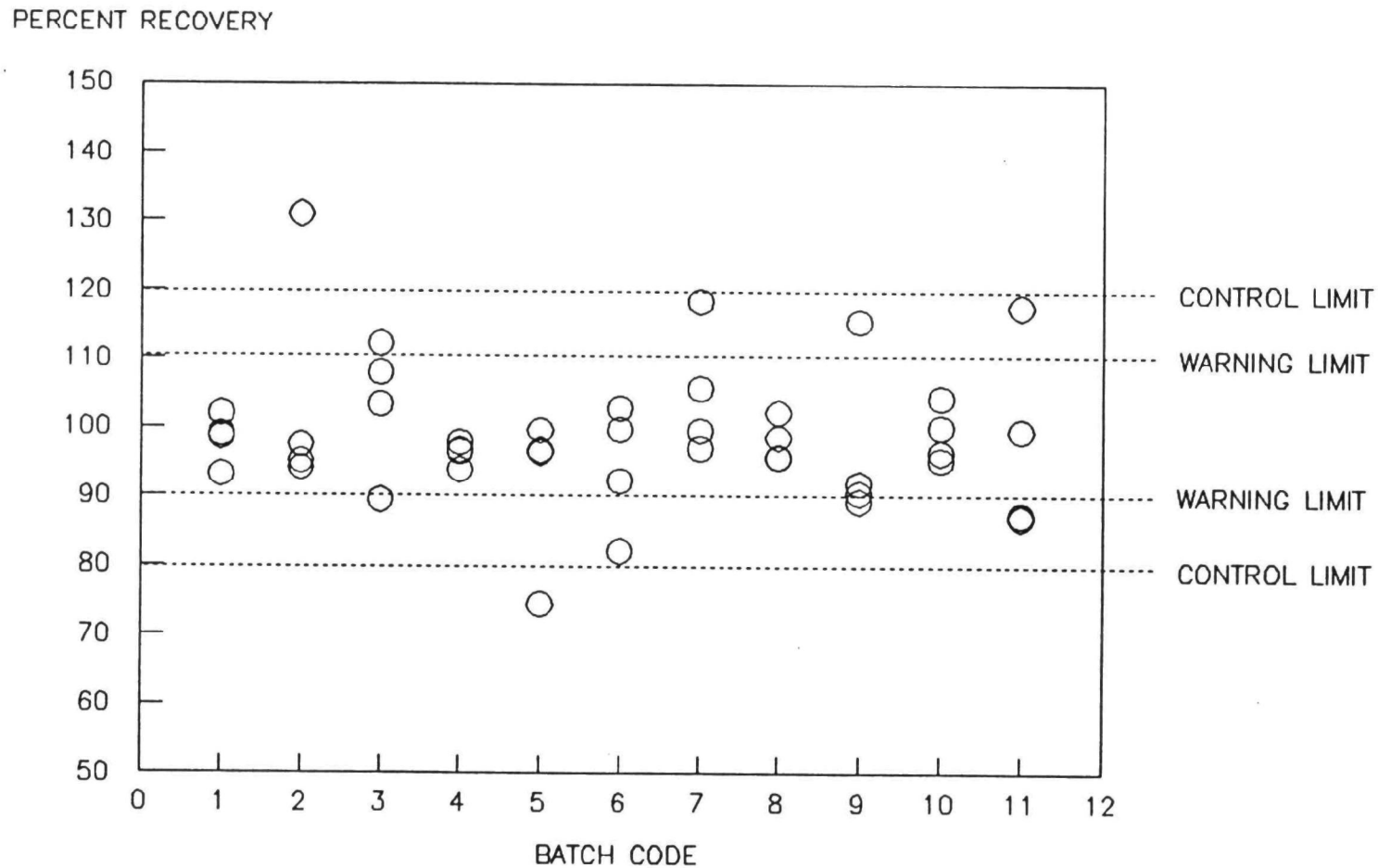


**Figure D-3. Performance - control chart of individual spiked sample recovery data, soil samples.**

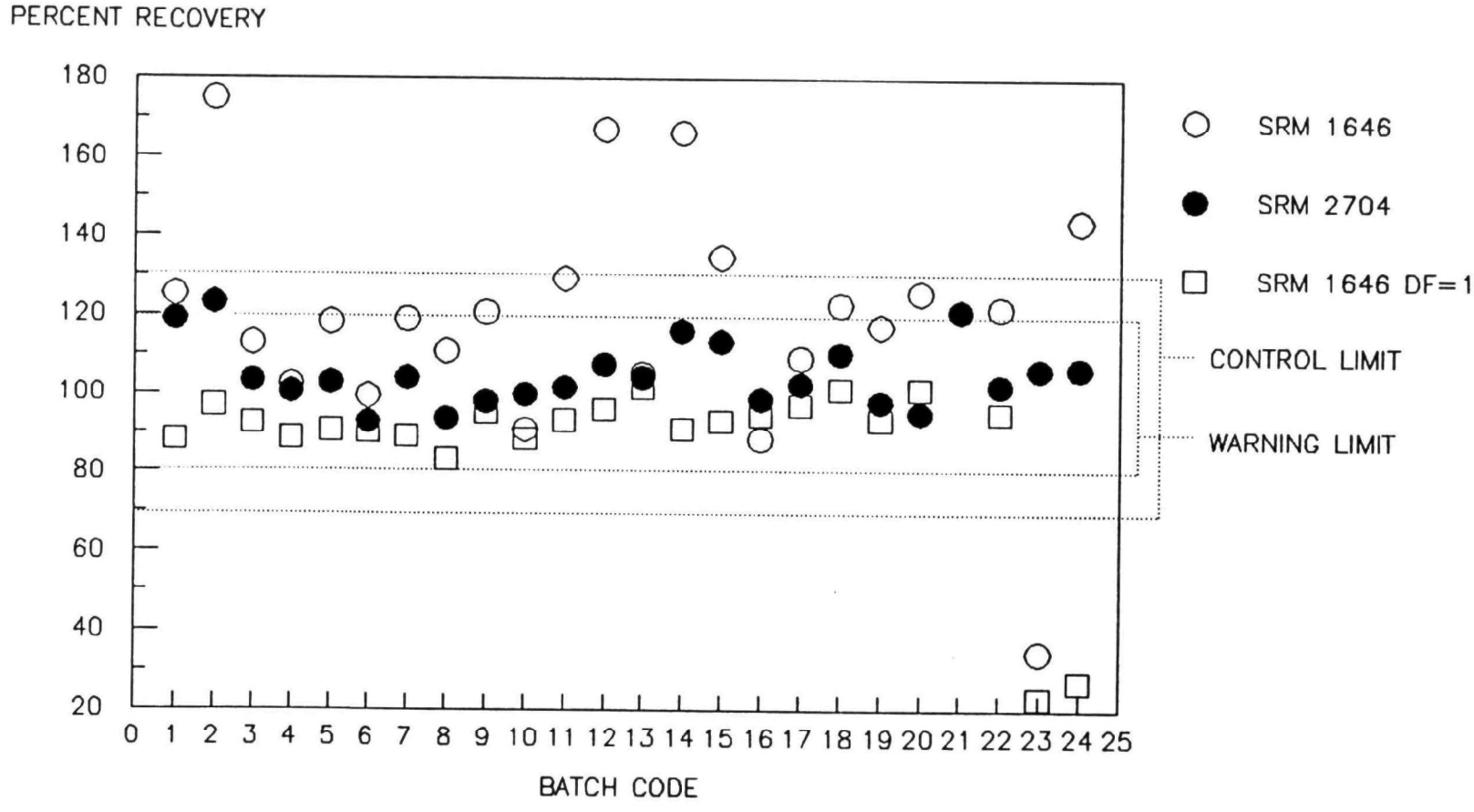


**Figure D-4. Performance - control chart of individual blind reference material recovery data, vacuum cassette samples.**

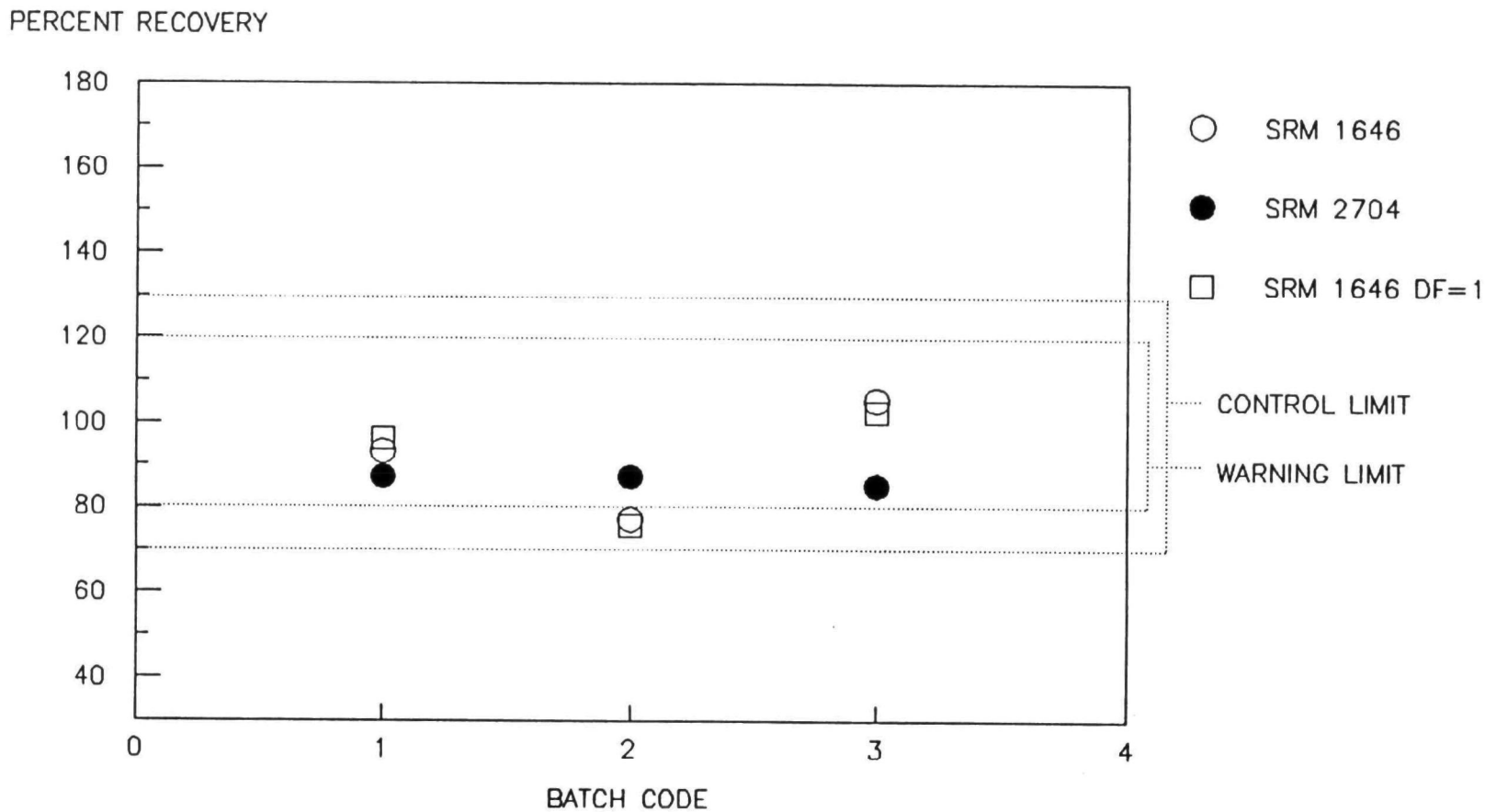


**Figure D-5. Performance - control chart of individual blind reference material recovery data, wipe samples.**

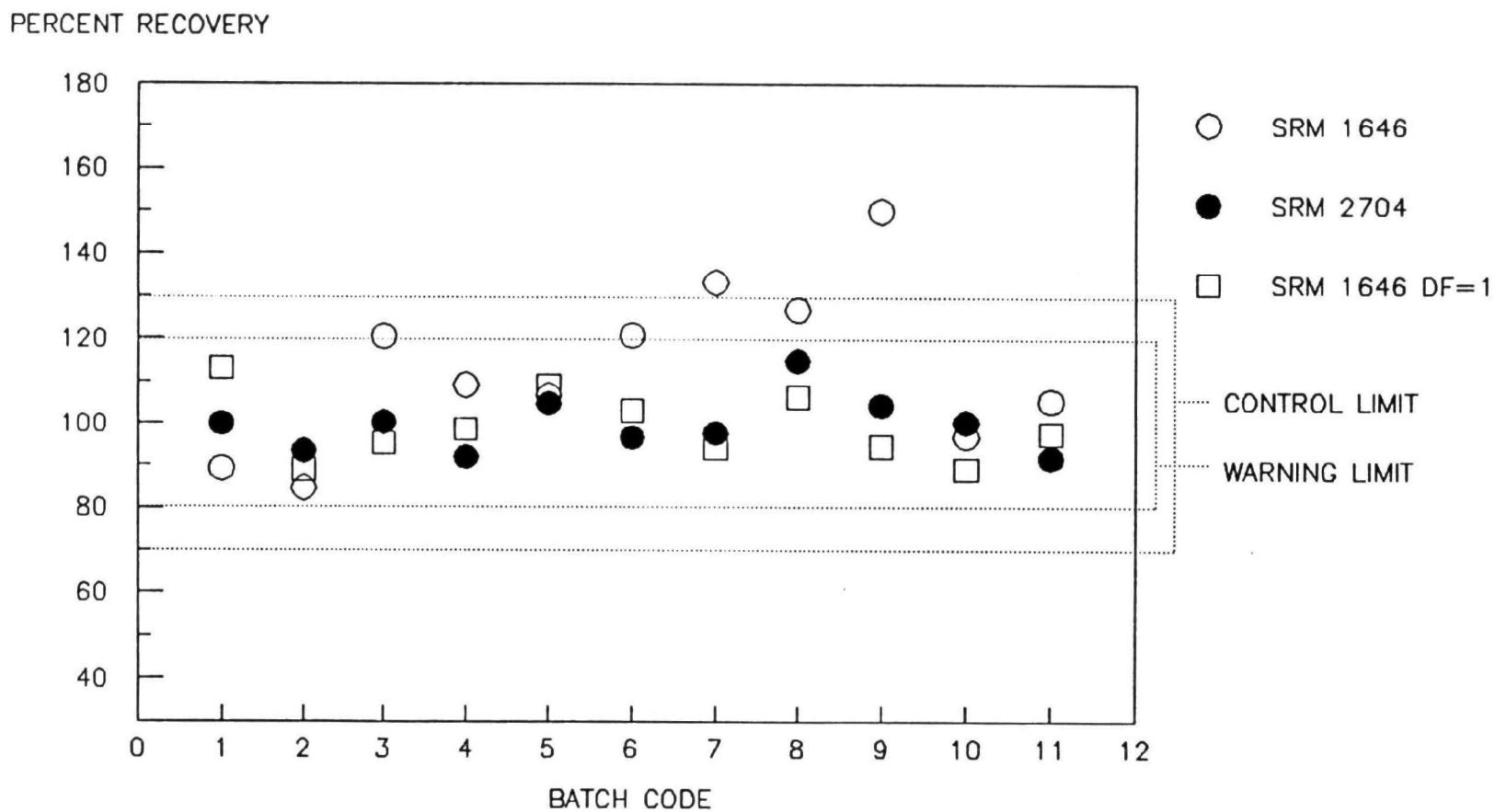


**Figure D-6. Performance - control chart of individual blind reference material recovery data, soil samples.**

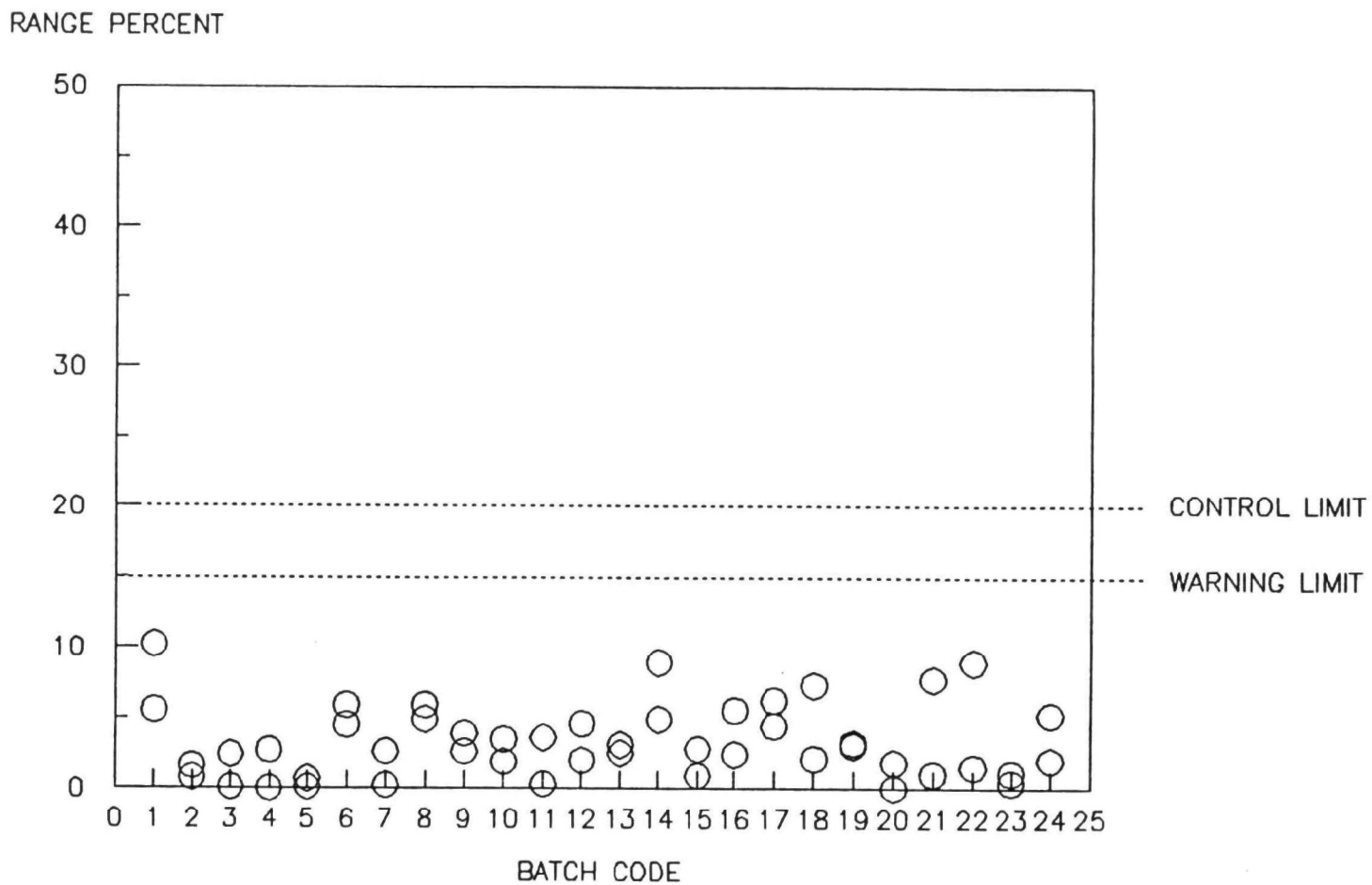


**Figure D-7. Performance - control chart of individual spiked and spiked duplicate recovery data, vacuum cassette samples.**

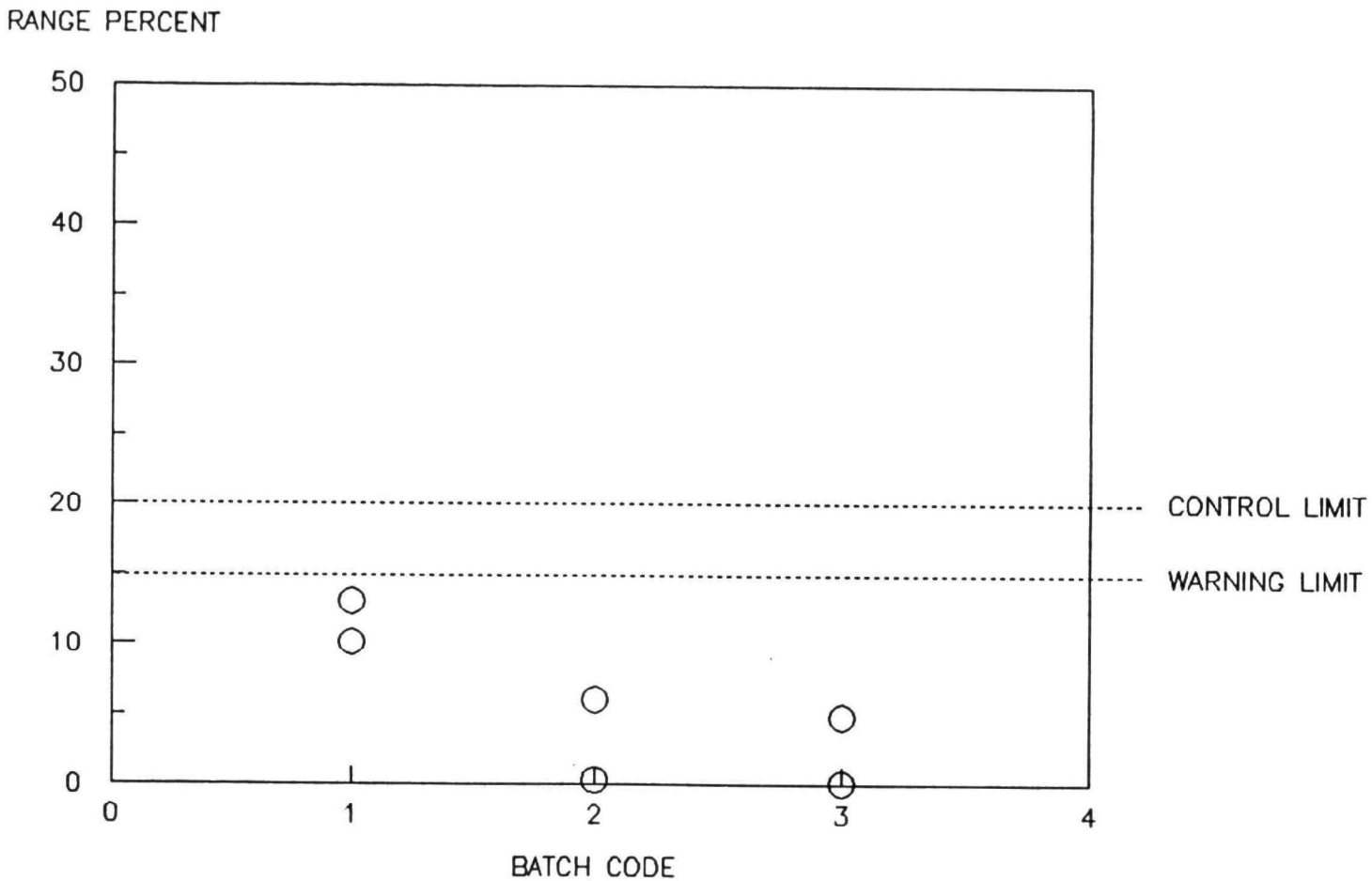


**Figure D-8. Performance - control chart of individual spiked and spiked duplicate recovery data, wipe samples.**

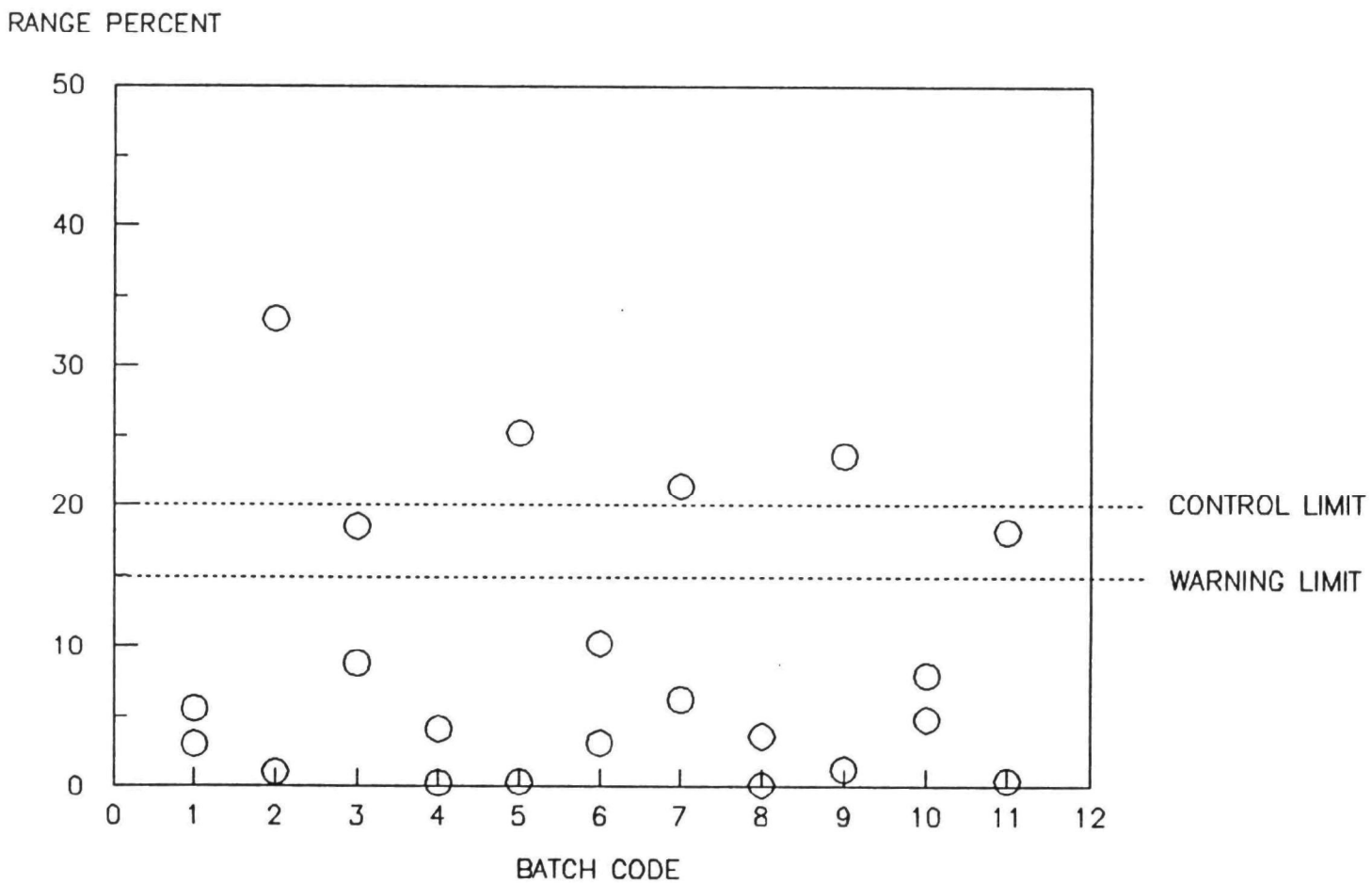


**Figure D-9. Performance - control chart of individual spiked and spiked duplicate recovery data, soil samples.**