

APPENDIX E

Summary of Interview Results

SUMMARY OF INTERVIEW RESULTS

	<u>A</u>	<u>U</u>	<u>T</u>
1. How many people live in this household?	<u>3.5</u>	<u>3.6</u>	<u>3.6</u>
2. How many of these household members are			
a. over 18 years of age?	<u>2.2</u>	<u>2.1</u>	<u>2.2</u>
b. between 7 and 17 years of age?	<u>0.7</u>	<u>0.7</u>	<u>0.7</u>
c. under 7 years of age?	<u>0.6</u>	<u>0.7</u>	<u>0.6</u>
3. Do you, or another member of the household, own this house?	<u>53%</u>	<u>47%</u>	<u>51%</u>
4a. What Year was this house built?*	<u>1926</u>	<u>1943</u>	<u>1932</u>
4b. How many months has your family been living at this address?	<u>9.2</u>	<u>14.5</u>	<u>10.9</u>
5. In the last six months, have you, anyone in your household, or anyone who occasionally lives in this household, worked at any of the jobs I am about to mention? If yes, how many months during the last six months, did someone do this job?			

	Number of Houses Affected			Average for Houses with # > 0		
	<u>A</u>	<u>U</u>	<u>I</u>	<u>A</u>	<u>U</u>	<u>I</u>
a. Paint removal including scraping and sanding	<u>2</u>	<u>1</u>	<u>3</u>	<u>1.0</u>	<u>1.0</u>	<u>1.0</u>
b. Building demolition	<u>3</u>	<u>2</u>	<u>5</u>	<u>3.0</u>	<u>1.0</u>	<u>2.2</u>
c. Home remodeling or renovation	<u>4</u>	<u>1</u>	<u>5</u>	<u>1.8</u>	<u>1.0</u>	<u>1.6</u>
d. Welding	<u>1</u>	<u>2</u>	<u>3</u>	<u>6.0</u>	<u>6.0</u>	<u>6.0</u>
e. Plumbing	<u>1</u>	<u>2</u>	<u>3</u>	<u>1.0</u>	<u>3.5</u>	<u>2.7</u>
f. Sandblasting	<u>0</u>	<u>1</u>	<u>1</u>	<u>--</u>	<u>6.0</u>	<u>6.0</u>
g. Auto body work	<u>2</u>	<u>1</u>	<u>3</u>	<u>3.5</u>	<u>6.0</u>	<u>4.3</u>
h. Salvage (i.e., batteries/radiators)	<u>1</u>	<u>2</u>	<u>3</u>	<u>6.0</u>	<u>4.0</u>	<u>4.7</u>
i. Chemical plant work	<u>0</u>	<u>2</u>	<u>2</u>	<u>--</u>	<u>6.0</u>	<u>6.0</u>
j. Glass work	<u>0</u>	<u>2</u>	<u>2</u>	<u>--</u>	<u>6.0</u>	<u>6.0</u>
k. Lead smelter work	<u>1</u>	<u>0</u>	<u>1</u>	<u>6.0</u>	<u>--</u>	<u>6.0</u>
l. Foundry work	<u>0</u>	<u>0</u>	<u>0</u>	<u>--</u>	<u>--</u>	<u>--</u>
m. Oil refinery work	<u>1</u>	<u>0</u>	<u>1</u>	<u>3.0</u>	<u>--</u>	<u>3.0</u>
n. Battery manufacturing plant work	<u>0</u>	<u>0</u>	<u>0</u>	<u>--</u>	<u>--</u>	<u>--</u>
o. Other lead-related industry work	<u>0</u>	<u>0</u>	<u>0</u>	<u>--</u>	<u>--</u>	<u>--</u>

A = Abated, U = Unabated, T = Total

* = Obtain from HUD Demonstration Data, not interview.

	Number of Respondents			Percent Yes		
	<u>A</u>	<u>U</u>	<u>I</u>	<u>A</u>	<u>U</u>	<u>I</u>
9. In the last (six/NUMBER MONTHS IN Q4) months, have you or anyone else done any remodeling or renovation work <u>in this home</u> that involved removal of walls or paneling or removal of paint from walls, floors, windows, porches or other parts of the house by sanding, scraping or any other method?	<u>35</u>	<u>17</u>	<u>52</u>	<u>29%</u>	<u>18%</u>	<u>25%</u>
9. Is there renovation currently being done?*	<u>35</u>	<u>17</u>	<u>52</u>	<u>11%</u>	<u>0%</u>	<u>8%</u>
	Average					
	<u>A</u>	<u>U</u>	<u>I</u>			
10. How many dogs or cats live inside the house, have access to living areas and go outside periodically? CONFIRM THAT <u>ALL 3</u> CONDITIONS ARE MET. IF 9 OR MORE, CODE 9.	<u>0.54</u>	<u>0.41</u>	<u>0.50</u>			

	Number of Respondents			Percent Yes		
	<u>A</u>	<u>U</u>	<u>I</u>	<u>A</u>	<u>U</u>	<u>I</u>
11. In the last six months, has the dog or cat:						
a. scratched or dug in the carpeting?	<u>11</u>	<u>6</u>	<u>17</u>	<u>46</u>	<u>50</u>	<u>47</u>
b. chewed or ripped off parts of walls or molding?	<u>11</u>	<u>6</u>	<u>17</u>	<u>9</u>	<u>100</u>	<u>6</u>

	Number of Respondents			Average		
	<u>A</u>	<u>U</u>	<u>I</u>	<u>A</u>	<u>U</u>	<u>I</u>
12. In the past month, how many times did someone:						
a. Vacuum carpeted floors?	<u>31</u>	<u>16</u>	<u>47</u>	<u>15.4</u>	<u>14.8</u>	<u>15.2</u>
b. Vacuum uncarpeted floors?	<u>35</u>	<u>17</u>	<u>52</u>	<u>3.4</u>	<u>1.3</u>	<u>2.7</u>
c. Sweep uncarpeted floors?	<u>35</u>	<u>17</u>	<u>52</u>	<u>16.2</u>	<u>10.3</u>	<u>14.3</u>
d. Wet mop uncarpeted floors?	<u>35</u>	<u>17</u>	<u>52</u>	<u>12.1</u>	<u>8.8</u>	<u>11.1</u>
e. Vacuum furniture or dust furniture with a dust cloth?	<u>35</u>	<u>16</u>	<u>51</u>	<u>8.9</u>	<u>8.6</u>	<u>8.8</u>
f. Wash window sills?	<u>34</u>	<u>15</u>	<u>49</u>	<u>2.1</u>	<u>0.7</u>	<u>1.7</u>
g. Dust window sills with a dust cloth?	<u>34</u>	<u>16</u>	<u>50</u>	<u>2.3</u>	<u>2.7</u>	<u>2.4</u>

A = Abated, U = Unabated, T = Total
 * = Based on field sampling crew assessment

APPENDIX F

Sample Size Considerations

Sample Size Considerations

In determining appropriate sample sizes for interior dust sampling, two assumptions were made:

- A single sample of each sample type would be taken in each sampled room, and
- Two abated units would be sampled for every one control unit sampled.

Given these assumptions, the two main sample size considerations were: (1) the number of rooms per unit, and (2) the number of units. Let N denote the number of units and M denote the number of rooms per unit.

The value of M should be chosen to minimize overall sampling and analysis costs. Let C_U denote the overall cost of adding an additional unit to the study and C_R denote the sampling and analysis cost of taking a sample from an additional room in a unit which is already included in the study. Then the optimal number of rooms per unit is

$$M = (C_U/C_R)^{1/2} / (F_U/F_R)$$

where F_U and F_R are the unit-to-unit and within-unit standard deviation values. In Table 3-5, optimal values of M are presented for C_U/C_R from 1 to 10 and F_U/F_R from 0.25 to 2.00 by 0.25.

The ratio of the unit-to-unit standard deviation to the within-unit standard deviation (F_U/F_R) was expected to fall in the range 0.5 to 1.0. The ratio of the cost of adding a house to the cost of taking a sample in an additional room was expected to fall in the range 2 to 3. Therefore, according to Table 3-5, the optimal number of rooms per house was expected to fall in the range 2 to 3. To examine the power of tests of the hypotheses H_1 , H_2 , and H_3 as a function of the number of units, the number of rooms per house was assumed fixed at $M=2$.

Table 3-5. Optimum Number of Samples per House to Minimize Cost as a Function of Cost Ratio and Standard Deviation Ratio

C_U/C_R	F_U/F_R							
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
1	4.0	2.0	1.3	1.0	0.8	0.7	0.6	0.5
2	5.7	2.8	1.9	1.4	1.1	0.9	0.8	0.7
3	6.9	3.5	2.3	1.7	1.4	1.2	1.0	0.9
4	8.0	4.0	2.7	2.0	1.6	1.3	1.1	1.0
5	8.9	4.5	3.0	2.2	1.8	1.5	1.3	1.1
6	9.8	4.9	3.3	2.4	2.0	1.6	1.4	1.2
7	10.6	5.3	3.5	2.6	2.1	1.8	1.5	1.3
8	11.3	5.7	3.8	2.8	2.3	1.9	1.6	1.4
9	12.0	6.0	4.0	3.0	2.4	2.0	1.7	1.5
10	12.6	6.3	4.2	3.2	2.5	2.1	1.8	1.6

Tables 3-6, 3-7, and 3-8 present ratios that are detectable with 80 percent power for the hypotheses H_1 , H_2 , and H_3 , respectively. The ratios are presented as a function of the log-standard deviation of the estimated ratio and the total number of units. The middle value of the log-standard deviation was selected by setting the unit-to-unit variance to 0.3 and the within-unit variance to 0.7. These values are typical for the lead concentration measurements in the Pilot Study. The other values of the log-standard deviation are 0.5, 0.75, 1.5 and 2 times the middle value. If the total number of units is 60, then the 40 abated units used to define the typical abated unit are assumed to be the houses sampled.

Table 3-6. Ratio Detectable with 80 Percent Power for the Typical Abated Unit vs. a Control Unit

Total Number of Units (N)	$N^{1/2}$ [LSD ^(a) (Estimated Ratio)] ^(b)				
	1.05	1.58	2.11 ^(c)	3.16	4.22
30	1.71	2.25	2.94	5.04	8.65
36	1.64	2.09	2.68	4.38	7.16
42	1.58	1.98	2.49	3.92	6.19
48	1.53	1.90	2.35	3.59	5.50
54	1.50	1.83	2.23	3.34	4.99
60	1.46	1.77	2.14	3.14	4.60

(a) Log-standard deviation

(b) This value is $(6.40 F_U^2 + 3.62 F_E^2)^{1/2}$

(c) Using $F_U^2=0.3$ and $F_E^2=0.7$

Table 3-7. Ratio Detectable with 80 Percent Power for the Typical Encapsulation/Enclosure Unit vs. the Typical Removal Unit

Total Number of Units (N)	$N^{1/2}$ [LSD ^(a) (Estimated Ratio)] ^(b)				
	1.42	2.13	2.84 ^(c)	4.25	5.67
30	2.06	2.97	4.26	8.80	18.16
36	1.94	2.70	3.76	7.28	14.11
42	1.84	2.51	3.40	6.28	11.59
48	1.77	2.36	3.15	5.58	9.90
54	1.72	2.25	2.95	5.06	8.68
60	1.67	2.16	2.79	4.65	7.77

(a) Log-standard deviation

(b) This value is $(11.95 F_U^2 + 6.02 F_E^2)^{1/2}$

(c) Using $F_U^2=0.3$ and $F_E^2=0.7$

Table 3-8. Ratio Detectable with 80 Percent Power for the Typical Abated Room in the Typical Abated Unit vs. a Control Room in the Typical Abated Unit

Total Number of Units (N)	$N^{1/2} [\text{LSD}^{(a)} (\text{Estimated Ratio})]^{(b)}$				
	0.99	1.49	1.99 ^(c)	2.98	3.98
30	1.66	2.14	2.76	4.59	7.63
36	1.59	2.00	2.53	4.02	6.39
42	1.54	1.90	2.36	3.63	5.57
48	1.49	1.83	2.23	3.34	4.99
54	1.46	1.76	2.13	3.12	4.55
60	1.43	1.71	2.05	2.94	4.21

(a) Log-standard deviation

(b) This value is $(2.23 F_U^2 + 4.69 F_E^2)^{1/2}$

(c) Using $F_U^2=0.3$ and $F_E^2=0.7$

In 20 of the abated units (randomly selected), the room with the largest square footage abated and a control room were selected for sampling. In the other 20 abated units, the two rooms with the largest square footage abated were selected for sampling. If the total number of units is less than 60, then it is assumed that the a representative subset of the 40 abated units are included in the study.

To select the total number of units, it was required that a two-fold difference in lead concentrations between the typical abated unit and a control unit be detectable with 80 percent power. This requirement would allow, for example, soil lead concentrations below the critical range of 500 to 1000 $\mu\text{g/g}$ to be distinguished from soil lead concentrations above the critical range. Examining the center column of Table 3-6 leads to a requirement of the maximum number of 60 units. Current plans call for 60 total units (20 controls, 40 abated). Allowing for some recruitment failures or logistical problems (e.g., not all samples can be collected), multiplicative differences on the order of 2.25 would be detected consistently.

Tables 3-6, 3-7, and 3-8 can be used to assess the impact of changes in the total number of units or changes in the assumed values of the unit-to-unit and within-unit variances.

Table 3-9 presents correlation coefficients that will be detectable with 80 percent power as a function of sample size. The proposed 60 total units would result in correlation coefficients of 0.35 and larger being consistently detected. Correlation coefficients of -0.35 and smaller would also be consistently detected.

Table 3-9. Correlation Coefficient Detectable with 80 Percent Power

Total Number of Units (N)	Detectable Correlation
30	0.49
36	0.45
42	0.42
48	0.39
54	0.37
60	0.35

APPENDIX G

Protocol for Vacuum Sampling of Settled Dust

PROTOCOL FOR VACUUM SAMPLING OF SETTLED DUST

1.0 INTRODUCTION

Vacuum samples of settled dusts will be collected from floors (carpeted or uncarpeted), window stools, window channels, and air ducts as specified by the QAPjP. The vacuum sampling device is the cyclone dust collector as shown in Figure G-1.

Each 1-ft² section of the surface to be sampled will be vacuumed in overlapping passes (Figure G-2). A 1-ft² template will be used to define and measure the areas to be vacuumed. Smaller, well defined surfaces, such as window channels and stools, will be completely vacuumed without the use of the template. The dimensions of the area will be measured after vacuuming the surface and recorded on the sampling data form.

2.0 SAMPLING EQUIPMENT AND SUPPLIES

- Cyclone dust collectors.
- PVC tubing.
- Preweighed Gelman GN-4, 37-mm, mixed cellulose ester (MCE) filter cassettes (0.8-um pore size).
- PVC nozzles (1", 1/2", and 3/8" in diameter).
- Vacuum sampling kit (one per sample).
- 1-ft² teflon templates (full square, square "U" shaped, and "L" shaped).
- Steel measuring tape.
- Screw driver (to pry open filter cassettes and tapping cyclone dust samples, if necessary).
- Tweezers.
- Timing device (stopwatch, timer, or watch with second hand).
- Barcode labels (twelve identical labels per sample with a unique sample number).
- 1-qt and 1-gal ziplock plastic bags.

Figure G-1 Cyclone Dust Collector

G-3

F-3

Figure G-2 Vacuum Sampling Pattern

- Large plastic bags (white color for unused sampling kits, caramel color or equivalent for used sampling kits, and black or dark green color for trash).
- Field sample logs.
- Sample traceability forms.
- Vinyl gloves (powderless).
- Tyvek shoe coverings.
- Electrical extension cords.
- Electrical outlet converters (two-prong unpolarized outlet to three-prong polarized outlet)
- Wash-a-bye Baby premoistened disposable wipes to clean equipment.
- Spatula.

3.0 VACUUM SAMPLING KITS

Vacuum sampling kits will consist of preweighed (tared) 37-mm Gelman (GN-4) MCE filter cassettes packaged in two plastic ziplock bags. The filter cassette will be contained within a 1-qt ziplock bag (inner bag) which will be packaged inside a 1-gal ziplock bag (outer bag) that also contains identical barcode labels corresponding to the sample number of the filter cassette. The vacuum sampling kits will be prepared by the Sample Custodian. The field team will take possession of the sampling kits by signing the sample traceability record prepared by the Sample Custodian. The package should not be opened until the sampling materials are needed in the field.

4.0 RECEIPT OF SAMPLING KITS

The field team will receive sampling materials from the Sample Custodian via Federal Express. The shipping container will include sampling kits and other items used for sampling (i.e., gloves, disposable wet wipes, mailing labels, trash bags, etc.) that are required for one sampling site. Sample traceability records for the enclosed sampling kits will be included with each shipment.

The field team will check the sample numbers of all sampling kits in the shipment against the sample numbers on the

enclosed sample traceability record. A check mark is entered under the corresponding barcode label on the traceability record. The field team will then take possession of the sampling kits by signing and dating the sample traceability record. The kits should be examined for breakage when received in the field but not opened until needed to prevent contamination of the sampling materials.

5.0 VACUUM SAMPLING PROTOCOL

The following protocol will be used to collect vacuum samples of settled dust:

- Don shoe coverings (booties) prior to entering the dwelling.
- For small, well defined surface areas (e.g., window channels, window stools), measure the length and width of the area to be vacuumed. Record these data on the sampling data form. For larger areas, (e.g., floor), a clean, 1-ft² template will be used to define and measure the surface area to be vacuumed. If the template cannot be used on upholstery, then area sampled must be measured using a tape measure. Measurements will be made after the sample has been collected.
- Record site location, date, time, sampling location, etc. on the sampling data form (recording of pertinent sampling data will be done by the Battelle team leader).
- Prepare the cyclone dust collector (Figure G-3):
 - Remove the cassette holder plug (at bottom of cyclone sampler case) by unscrewing it. Set the holder plug aside.
 - Remove the three O-rings that hold the dust collector case's top and body together. Set these aside with the holder plug.
 - Separate the dust collector's top from its case.
 - Wipe the inside surfaces of the dust collector's top, case and cassette holder with a "Wash-a-bye Baby" wipes. Use more than one, if necessary.
 - Place the used wipes in a waste container.
 - Reassemble cyclone top and sampler case by placing the top onto the sampler case and affixing the three

O-rings. Be sure the O-ring holders on the top are aligned with those on the sampler case.

- Affix the hand vacuum to the cyclone sampler case as shown in Figure G-3.

Figure G-3. Cyclone Dust Collector, Assembled and Disassembled.

G-8

F-8

- Remove two barcode labels from the sampling kit and affix one to the field sample log and another to the sample traceability record.
- Don a pair of powerless vinyl gloves prior to handling preweighed filter cassettes. Do not touch the preweighed cassettes with bare hands.
- Remove a prelabeled filter cassette from the sampling kit. Compare the sample number on the cassette with the barcode label numbers. These numbers should all match. If they do not match discard the sampling kit.
- Pry open the top section of the filter cassette (Figure G-4) with a clean flat-edged screw driver or equivalent tool. Carefully remove the top section.

NOTE: The top section of the cassette is the side with the blue cap over the inlet. The middle retaining ring holds the filter and support pad in place against the bottom section of the cassette (Figure G-4). The retaining ring should be inspected to ensure that it is seated tightly against the bottom section. If the middle ring is not secure, the filter may tear during the sampling procedure. The seal between the bottom section of the cassette and the middle ring can be secured by squeezing to two sections firmly between the index fingers and the thumbs of both hands.

- Do not remove the red plug from the outlet located on the bottom section (suction port) of the cassette.
- Store the top section of the cassette inside the inner ziplock bag during sampling to avoid contamination.
- Retrieve the cassette holder plug and insert the filter cassette (top section has been removed) into the cassette holder plug of the cyclone dust collector with the closed end of the filter cassette seated firmly into the cassette holder plug (Figure G-5). Replace the cassette holder plug back into the cyclone holder case by screwing it tightly into the bottom of the holder case.

Figure G-4. Filter Cassette Assembly (Used for Dust Collection)

Figure G-5. Placement of Filter Cassette into Cyclone Dust Collector

G-11

F-11

- Retrieve a clean 90° elbow and a clean 1-in. ID nozzle from their containers. Attach the elbow (Figure G-6) to the sampler case's 1-in. inlet.
- Place the 1-in. ID nozzle into the open end of the 90° elbow (Figure G-6).
- Position the nozzle and the sample case vertically as shown in Figure G-6.

NOTE: If a 1/2-in. or 3/8-in. ID nozzle is used, first insert the adapter plug into the 1-in. inlet of the sampler case and then insert the nozzle, which is flexible plastic tubing, into the adaptor.

- Run an extension cord from the nearest 110-V AC outlet (or generator) to the designated sampling location and plug in the hand vacuum.

Note: If a generator is used to supply electrical power, place the generator outdoors in a location where exhaust fumes will not enter the dwelling. Non-leaded fuels should be used to run the generator.

- Turn on the pump and vacuum the area of interest (Figure G-7) evenly in overlapping passes (at least 50% overlap), first left to right, then front to back over the entire designated area (Figure G-2). Vacuum the area again using this same pattern. For a 1-ft² area, vacuuming should not exceed 2 minutes.

NOTE: THE CYCLONE SAMPLER CASE MUST BE HELD VERTICALLY THROUGHOUT THE VACUUMING PROCESS THROUGH THE REMOVAL OF THE FILTER CASSETTE.

NOTE: The template that is used to defined a surface area to be vacuum is the potential source of cross contamination between samples. The template shall be thoroughly cleaned with disposable wipes between each sample.

- When the vacuuming is complete, turn off the hand vacuum, keeping the sampler case vertical.
- Raise the humidity in the sampler case (body) by slowly blowing three breaths into the nozzle using the separator as shown in Figure G-8. (Each field team member that is performing the sampling job should have his own personal separator.) Tap the sampler case

smartly three times with a small rod (a screw driver is an example).

Figure G-6. Affixing Nozzle to Cyclone Dust Collector

Figure G-7. Sampling with Cyclone Dust Collector

G-14

F-14

Figure G-8. Separator and Its Use

G-15

F-15

- While maintaining the filter cassette in a upright position, carefully remove the nozzle and disconnect the tygon tubing.
- Replace the top section of the cassette and red outlet plug.
- Return the filter cassette to its original pre-labeled ziplock plastic bag (inner bag) and seal. Place the sealed sample and the remaining barcode labels inside the outer ziplock bag and seal.
- Remove the vinyl gloves and dispose in the black trash bag.
- Store samples in a clean container until they are shipped to the lab via Federal Express Economy Distribution Service (formerly called Standard Air). Do not ship the settled dust samples in the same container as the soil samples.

5.1 Vacuum Sampling of Dusts on Floor Samples

Vacuum sampling of floor surfaces will be conducted at the front entryway, rear entryway, and along the perimeters of rooms designated by the field team leader. A 1-ft² template will be used to define the area to be sampled. The template will be positioned at the initial sampling site designated by the field team leader and vacuum sample will be collected in accordance with the protocol presented in Section 5.0. The template is a potential source of cross contamination between samples; therefore, it shall be thoroughly cleaned with disposable wipes after each sample is collected. A 1 in. rigid nozzle will be the standard nozzle for this activity.

5.2 Vacuum Sampling of Dusts on Window Channels and Stools

Vacuum samples will be collected as specified by Battelle's field team leader. The window sill is defined as the horizontal board outside the window stool, with its channel being that surface below the window sash and inside the screen and/or storm window. The entire available surface area will be measured with a steel tape and then vacuumed using the protocol described in Section 4.0. The dimensions of the area sampled will be recorded on the Field Sample Log. The size nozzle should also be recorded.

5.3 Vacuum Sampling of Dust Inside Air Ducts

If vacuum samples are to be collected inside air ducts of forced air or gravity air heating or cooling systems, they will be collected at the air outlets designated by the field team leader. The air diffuser or register will be removed from the air outlet to gain access to air duct. The area to be vacuumed will be measured with a steel tape. The dimensions of the area sampled will be recorded on the field sample log. In most cases sampling will need to be done with the 1/2-in. or 3/8-in. flexible nozzle.

The size and shape of the duct may limit access to the interior of the duct; therefore, it may be difficult to fit the vacuum nozzle inside the duct or make an exact measurement of the area vacuumed. If direct measurement of the vacuumed area is not possible, estimate the surface area sampled. Note on the field sample log if the surface area was estimated rather than directly measured. Describe the method of sampling in the field sample log.

6.0 COLLECTION OF SIDE-BY-SIDE SAMPLES

Two vacuum samples will be collected side-by-side of the same matrix in accordance with the QAPjP. The samples will be collected using the same protocol as described above. In order to link the sampling data of the co-located samples, the I.D. number of each of the samples must be indicated on the sampling data form of the sample collected adjacent to it. This will create the bridge between the two data sets. These side-by-side samples will be handled and shipped with the regular samples.

7.0 PREPARATION OF FIELD BLANK SAMPLES

Field blank samples will consist of a filter cassette that is handled in the same manner as the regular vacuum samples except that no sample is collected.

8.0 PREPARATION OF TRIP BLANK SAMPLES

Trip blank samples will consist of a filter cassette that is handled in the same manner as the regular vacuum samples except that it is not loaded into the pickup nozzle and no sample is collected. All unused filter cassettes in the

shipping container with the exception of field blanks, will be designated as trip blanks. The following procedure will be used:

- Remove two barcode labels from a vacuum sampling kit and affix one to the field sample log and the other to the sample traceability record.
- Don a pair of powderless vinyl gloves prior to handling preweighed filter cassettes. Do not touch the preweighed cassettes with bare hands.
- Remove the prelabeled filter cassette from the inner ziplock plastic bag. Compare the sample number on the cassette with the barcode label number. These numbers should all match. If they do not match discard the sampling kit.
- Return the filter cassette to its original ziplock plastic bag (inner) and seal. Place the sealed sample inside the outer plastic bag and seal. The cassette is not loaded into the vacuum sampler and no sample is collected.
- Repeat this procedure for all unused cassettes in the shipping container, except for field blanks.
- Remove the vinyl gloves and discard in the black trash bag.
- Store and ship the trip blanks with the other vacuum samples.

9.0 CONTAMINATION AVOIDANCE

The following work practices will be instituted to prevent cross contamination between the dwellings sampled and between each sample collected within each dwelling:

- Each member of the field team will don disposable shoe coverings prior to entering the dwelling.
- Soil samples will not be collected until all dust samples are collected within the dwelling.

- Clean vinyl gloves (powerless) will be donned prior to collecting each vacuum sample and will be disposed of after each sample is collected.
- Preweighed filter cassettes must not be handled without the use of vinyl gloves to prevent the disposition of residues that may interfere with gravimetric analysis of the sample. If the filter cassette is inadvertently touched prior to collecting the sample, the filter cassette will be discarded. If a filter cassette is touched with bare hands or dropped after it has been used to collect a sample, the incident will be recorded on the Sampling Data Form. At the direction of the Battelle team leader, a substitute sample may be collected.
- The vacuum nozzle is cleaned with soapy water or "Wash-a-bye Baby" brand disposable wet wipes between each sample. Vinyl gloves will be used when cleaning nozzles and changed to a clean pair prior to collecting samples. There should be an adequate supply of clean nozzles to accommodate all the vacuum samples collected in one day (27 per dwelling times 2 dwellings per day).
- The templates will be cleaned with a "Wash-a-bye Baby" brand disposable wet wipe between each sample.
- Any electrical cords used outdoors, such as for connection to a generator, shall be cleaned prior to using them inside the dwelling.

10.0 DEVIATIONS FROM FIELD SAMPLING PROTOCOLS

Every attempt shall be made to follow this sampling protocol. Deviations from the sampling protocols may compromise the data quality and completeness objectives of the project. Deviations from the protocols will generally fall into two categories; inadvertent deviations (procedural errors), and deliberate deviations (modifications to the protocol in response to unusual conditions encountered in the field).

In the case of inadvertent deviations from the protocol, the sampling team shall fully document the deviation on the sampling data form and immediately notify the Battelle team leader and the MRI work assignment leader. Corrective action(s) shall be taken to ensure that the situation is not

repeated. If possible, samples affected by the inadvertent deviation should be recollected in accordance with the specified protocol prior to leaving the site.

Deliberate deviations from the sampling protocol must be approved in advance with a signed modification to the QAPjP. If time is critical, preliminary verbal approval may be granted by EPA, Battelle, and MRI. These verbal approvals will be followed up with a signed modification to the QAPjP. In either case, the sampling team should notify all parties concerned in a timely manner so that the approval mechanism can be expedited. The MRI work assignment leader or the

Battelle task leader is responsible for initiation of the QAPjP modification and acquiring the necessary approvals from EPA, Battelle, and MRI.

The Battelle team leader shall be notified by the sampling team when field conditions found at the sampling site do not allow full compliance with the protocol or when the protocol does not appear to apply to the situation. The condition/situation shall be fully documented in a laboratory notebook. The team leader will in turn notify the MRI work assignment leader and the Battelle task leader.

APPENDIX H

Protocol for Wipe Sampling of Settled Dust

PROTOCOL FOR WIPE SAMPLING OF SETTLED DUST

1.0 INTRODUCTION

Wipe samples of settled dust will be collected during the pilot study from uncarpeted floors, window channels, and window stools using commercially-available moistened disposable wipes ("Wash-a-bye Baby" brand). The Battelle team member will direct the MRI sampling team on the surfaces selected for sampling. The surfaces will be wiped using a sampling method that was developed by Dr. Farfel for his doctoral thesis at John Hopkins University, School of Hygiene and Public Health (Farfel, 1987). This sampling method is also found in the National Institute of Building Sciences "Guidelines for Testing, Abatement, Clean Up, and Disposal of Lead-Based Paint in Housing."

2.0 SAMPLING EQUIPMENT AND SUPPLIES

The following materials will be used to collect wipe samples:

- "Wash-a-bye Baby" wipes.
- Washable template (inside dimensions, 1 ft by 1 ft).
- Steel measuring tape.
- Marking pen.
- Wipe sampling kits.
- Tyvek shoe coverings.
- Disposable vinyl gloves (powderless).
- Large plastic bags (white color for unused sampling kits, caramel color or equivalent for used sampling kits, and black or dark green color for trash).
- Mailing labels.

3.0 WIPE SAMPLING KITS

The wipe sampling kits will consist of a 1-qt and 1-gal ziplock bags and 12 identical barcode labels. A barcode label will be affixed to the 1-qt ziplock bag. The 1-qt bag along with the remainder of the corresponding barcode labels will be inserted into the 1-gal ziplock bag and sealed. For the remainder of this protocol, the 1-qt ziplock bag will be referred to as the "inner" bag of the 1-gal ziplock bag will be referred to as the "outer" bag.

In addition, one sealed package of "Wash-a-Bye" baby brand wipes will be included with the kits. Wipe sampling kits will be provided to the field team by the Sample Custodian. The kits should be examined for breakage when received in the field but not opened until needed to prevent contamination of the sampling materials.

4.0 WIPE SAMPLING PROTOCOL

The following procedure will be used to wipe sample floor surfaces:

- Don disposable shoe covering prior to entering the dwelling.
- Surfaces to be wipe sampled will be selected by the Battelle team leader.
- Don a pair of clean, powderless, vinyl gloves.
- Remove an unused wipe sampling kit from the white plastic bag. Open the outer ziplock bag, remove one barcode label, and hand it to the Battelle team leader who will affix it to the sampling data sheet.
- Remove the seal on a package containing the wipes (if not already removed during previous sampling efforts), open the lid, start the lid dispenser, replace the lid, remove a several wipes, and discard them in the black trash bag. Use the next wipe from the container to collect the sample.
- Position a clean 1-ft² template on the surface to be sampled.
- Place the wipe flat on the surface within the sample area as defined by the template. Using an open flat hand with the fingers together wipe the marked surface

in an overlapping "S" pattern, first side to side and then front to back so that the entire 1-ft² area is covered.

NOTE: For small, well defined surfaces (i.e., window channels and stools) see alternate wipe sampling procedure below.

- Fold the wipe in half with the sample side folded in and repeat the wiping procedure within the marked surface area on one side of the folded wipe.
- Fold the wipe again with the sample side folded in.
- Insert the folded wipe into the inner ziplock plastic bag and seal. Seal the outer ziplock bag.
- Remove the vinyl gloves and dispose in the black trash bag.
- Record site location, sampling location, date, time, etc. on the sampling data form (this function will be performed by the Battelle team leader).

The wipe sampling procedure must be modified for window stools and window channels due to their limited size and geometry. They are generally too narrow to accommodate a 1-ft² template and cannot be wiped using the flat-hand technique. The following procedure will be used to collect wipe samples from window channels and stools.

- Don a pair of disposable vinyl gloves.
- Remove an unused wipe sampling kit from the white plastic bag. Open the outer ziplock bag, remove one barcode label, and hand it to the Battelle team leader who will affix it to the sampling data sheet.
- Remove the seal on a package containing the Chubbs wipes, open the lid, remove a few wipes, and discard them in the black trash bag. Use the next wipe from the container to collect the wipe sample.
- Place the wipe flat on the surface to be sampled. Holding the fingers together and flat against the stool, wipe the measured surface back and forth twice. Due to limited space, window stools will be wiped by applying pressure to the wipe using the fingertips.

- Fold the wipe in half with the sample side folded in and repeat the wiping procedure within the marked surface area on one side of the folded wipe.
- Fold the wipe again with the sample side folded in.
- Insert the folded wipe into the inner ziplock plastic bag and seal. Seal the outer ziplock bag.
- Remove the vinyl gloves and dispose in the black trash bag.
- Measure the length and width of the surface sampled. The Battelle team leader will record the data on the sampling data form.

5.0 COLLECTION OF SIDE-BY-SIDE WIPE SAMPLES

Two wipe samples will be collected side-by-side on the same surface. These samples will be collected using the same sampling technique as described above. In order to link the sampling data of the side-by-side samples, the I.D. number of each of the samples must be indicated on the sampling data form of the sample collected adjacent to it. In addition, the appropriate indication on the traceability form must also be made to transfer the information to MRI. This will create the bridge between the two data sets. These co-located samples will be handled and shipped with the regular wipe samples.

When wipe and vacuum samples are collected side-by-side, always collect the wipe sample first.

6.0 PREPARATION OF FIELD BLANK SAMPLE

The field blank will consist of a "Wash-a-bye Baby" wipe that are handled using the identical procedures used for the field samples except that no sample is collected. The following procedures will be used:

- Don a pair of disposable vinyl gloves.
- Remove an unused wipe sampling kit from the white plastic bag. Open the outer ziplock bag, remove one barcode label, and hand it to the Battelle team leader who will affix it to the sampling data sheet.

- Remove a few disposable wipes from the "Wash-a-bye Baby" container and discard them in the black trash bag. The next wipe will be used for the field blank.
- Fold the wipe in half twice.
- Insert the folded wipe into the inner 1-qt ziplock bag and seal. Seal the outer ziplock bag.
- Remove the vinyl gloves and dispose in the black trash bag.
- Store and ship the field blank with the regular field samples.

7.0 CONTAMINATION AVOIDANCE

The following work practices will be instituted to prevent cross contamination between the dwellings sampled and between samples collected within the dwelling:

- Each member of the field team will don disposable shoe coverings prior to entering the housing unit.
- Clean vinyl gloves (powderless) will be donned prior to collecting each wipe sample and will be disposed of after each sample is collected.
- The templates will be cleaned with a Wash-a-bye Baby disposable wet wipes between each use. After cleaning the template, remove the vinyl gloves and dispose in the black trash bag.
- The wipe sampling kits will be prepared by the Sample Custodian at MRI prior to shipment to the sampling site. The field team should not open the sampling kits until just prior to use.

8.0 DEVIATIONS FROM THE WIPE SAMPLING PROTOCOL

Every attempt shall be made to follow this sampling protocol. Deviations from the sampling protocols may compromise the data quality and completeness objectives of the project. In the pilot study, deviations from the protocols will generally fall into two categories; inadvertent deviations (procedural errors), and deliberate

deviations (modifications to the protocol in response to unusual conditions encountered in the field).

In the case of inadvertent deviations from the protocol, the sampling team shall fully document the deviation on the sampling data form and immediately notify the Battelle team leader and the MRI work assignment leader. Corrective action(s) shall be taken to ensure that the situation is not repeated. If possible, samples affected by the inadvertent deviation should be recollected in accordance with the specified protocol prior to leaving the site.

Deliberate deviations from the sampling protocol must be approved in advance with a signed modification to the QAPjP. If time is critical, preliminary verbal approval may be granted by EPA, Battelle, and MRI. These verbal approvals will be followed up with a signed modification to the QAPjP. In either case, the sampling team should notify all parties concerned in a timely manner so that the approval mechanism can be expedited. The MRI work assignment leader or Battelle task leader is responsible for initiation of the QAPjP modification and acquiring the necessary approvals from EPA, Battelle, and MRI.

The Battelle team leader shall be notified by the sampling team when field conditions found at the sampling site do not allow full compliance with the protocol or when the protocol does not appear to apply to the situation. The condition/situation shall be fully documented in a laboratory notebook. The team leader will in turn notify the MRI work assignment leader and the Battelle task leader.

APPENDIX I

Protocol for Composite Soil Sampling

PROTOCOL FOR COMPOSITE SOIL SAMPLING

1.0 INTRODUCTION

Soil samples will be collected with a clean soil recovery probe inserted into the ground to a depth of approximately 2 inches. The soil recovery probe consists of a 12-in stainless steel core sampler, replaceable 1-in I.D. butyrate plastic inserts, a cross-bar handle, and hammer attachment (Figure I-1). Composite samples consisting of three soil cores will be collected at each location specified in the QAPjP. The top 0.5 inch section of the soil cores will be composited at the site.

Some dwellings included in the survey may not have a lawn. The areas surrounding the structure may be paved with concrete or blacktop. For this situation, vacuum samples will be collected from the pavement. The protocols for both soil core sampling and vacuum sampling of pavement are presented below.

2.0 SAMPLING EQUIPMENT AND SUPPLIES

- 1 1/8-in diameter, stainless-steel, soil-recovery probe with cross-bar handle, 6-in length (Arts Manufacturing and Supply, American Falls, Idaho).
- AMS hammer attachment for hard, dry, or lightly frozen soils.
- 1-in diameter plungers with and without adjustable stop.
- Plastic straight edge (ruler).
- Clamp for holding liner (optional).
- Vinyl gloves (powderless).
- Soil sampling kits (one per sample)
- Large plastic bags (white color for unused sampling kits, caramel color or equivalent for used sampling kits, and black or dark green color for trash).
- Wash bottle.
- 95% Ethanol.

- Crescent wrenches (2) for disassembly of soil recovery probe.

Figure I-1. Soil Recovery Probe (Exploding Diagram)

3.0 SOIL SAMPLING KITS

Each soil sampling kit will consist of a plastic butyrate liner (1 in I.D.), two 1-gal ziplock plastic bags and twelve identical adhesive barcode labels. The plastic liner will come double sealed within the two ziplock bags. The inner bag will be pre-labeled with one of the 12 barcode labels. The remainder of the adhesive labels will be contained in the outer plastic bag. The Sample Custodian will prepare soil sampling kits.

The field team will take possession of the sampling kits by signing the sample traceability record provided by the sample custodian. The kits should be examined for breakage when received in the field but not opened until needed to prevent contamination of the sampling materials.

4.0 SOIL SAMPLING PROTOCOL

The following protocol will be used for collecting the soil samples:

- Don a clean pair of powderless vinyl gloves.
- Remove an unused soil sampling kit from the white plastic bag. Open the outer ziplock bag and remove one corresponding barcode labels from the wipe sampling kit. Hand the label to the Battelle team leader who will affix it to the sampling data form.
- Disassemble a clean soil recovery probe (unscrew the soil probe section from the coupling).
- Open the inner ziplock bag of the soil sampling kit and remove the plastic liner.
- Remove the protective end caps from the plastic liner (the end caps are optional when the liner is sealed inside a ziplock bag).
- Insert the plastic liner into the probe.
- Reassemble the probe and attach the cross-bar handle or hammer attachment.

- Push the soil recovery probe into the soil at the designated sampling site to a depth of approximately 2 inches.
- Twist and snap the coring tool to one side and remove the core sample.
- Disassemble the probe and remove the plastic liner containing the core sample.
- Insert a clean 1-in diameter plunger into the top end of the liner.
- Push out all but 0.5 inches of the core from the liner with the plunger.

Note: The plunger is equipped with an adjustable stop. The stop will be adjusted to prevent the plunger from advancing beyond 0.5 inches from the end of the liner. If necessary, the liner can be secured in a clamp during this procedure. The use of clamp is recommended when the sampling is performed by one person.

- Scrape the top of the liner with a clean straight edge to lever off soil that was pushed out of the liner. Discard the soil pushed out of the liner.

NOTE: The soil can also be leveled off with a gloved finger. Experience has shown that this is a faster method.

- With a clean plunger (without stop), push the remaining 0.5-inch section of the core sample into the prelabeled ziplock bag.

Note: A second plunger without an adjustable stop is used to push the remaining section of the core out of the liner.

- Reinsert the plastic liner into the soil recovery probe and reassemble the unit.
- Collect the remaining soil cores in the composite sample as per the QAPjP using the same method as described above. The three or five cores that constitute the composite sample are placed into the same ziplock plastic bag.

- Return the inner plastic bag containing the composite sample to the original outer ziplock plastic bag and seal.
- After each composite sample is collected, discard the plastic liner in the black trash bag.
- Wipe down the recovery probe, plungers, and straight edge with Wash-a-bye babe disposable wipes. Discard the wipes in the trash bag. If conditions are excessively cold, dampen each wipe prior to use with 95% Ethanol. This will help avoid ice buildup on the equipment from water present in the wipes.
- Remove the vinyl gloves and discard in the black trash bag.
- The Battelle team leader will record site location, sampling location, data, time, etc. on sampling data form.
- Ship soil samples to the laboratory via Federal Express Economy Distribution Service. The soil samples will be shipped in a container separate from the settled dust samples to prevent cross contamination between the sample types.

4.1 ALTERNATIVE SAMPLING PROCEDURES FOR HARD, DRY, OR FROZEN SOILS

The following is an alternate soil sampling protocol that will be used for soils that are hard, dry, or frozen.

- Remove the cross-bar handle from the soil recovery probe.
- Attach the AMS hammer to the probe.

NOTE: Some field crew members may prefer using the hammer attachment for all soil samples.

- Grip the hammer attachment firmly and drive the probe into the ground to a depth of approximately 2 inches using an up and down motion.
- If conditions do not allow for full penetration to 2 inches, make every effort to penetrate to a depth of at

least 0.5 inches. If the penetration is less than 2 inches, note the deviation from the protocol on the sampling data form.

5.0 COLLECTION OF SIDE-BY-SIDE SAMPLES

Two soil samples will be collected side-by-side in the same matrix in accordance with the QAPjP. The samples will be collected using the same protocol as described above. In order to link the sampling data of the side-by-side samples, the I.D. number of each of the samples must be indicated on the sampling data form of the sample collected adjacent to it. In addition, the appropriate indication on the traceability form must also be made to transfer the information to MRI. This will create the bridge between the two data sets. These co-located samples will be handled and shipped with the regular soil samples.

6.0 PREPARATION OF FIELD BLANKS FOR THE SOIL SAMPLING PROCEDURE

Field blank samples will consist of a core liner that are loaded into the soil recovery probe and handled in the same manner as the regular samples except no soil sample is collected. The following procedure will be used:

- Don a pair of powderless vinyl gloves.
- Remove one corresponding barcode labels from an unused wipe sampling kit (outer ziplock bag). Hand the label to the Battelle team leader who will affix it to the sampling data form .
- Remove the plastic liner from the inner ziplock bag.
- Remove the end caps from the plastic liner.
- Disassemble the soil recovery probe that has been cleaned and insert the liner into the probe .
- Reassemble the probe.
- Disassemble the probe and remove the plastic liner without collecting a sample.
- Insert the clean plungers into the liner by the same method that is normally used to extract the core from the liner.

- Scrape the top of the liner with a clean straight edge lever or with gloved finger (as done during the sampling procedure).
- Replace the end caps on the liner.
- Place the capped liner inside the original pre-labeled ziplock bag.
- Return the inner plastic bag containing the blank sample to the original outer zip-lock plastic bag and seal.
- Remove the vinyl gloves and dispose in the black trash bag.
- Ship field blanks with the other soil samples to the laboratory.

7.0 VACUUM SAMPLING OF PAVEMENT SURROUNDING THE DWELLING

Vacuum samples of dirt from pavement (concrete, brick, blacktop, etc.) will be collected with the cyclone dust collector shown in Appendix I.

The pavement will be vacuumed in the same manner as collection of indoor dust vacuum samples described in Appendix I. Refer

to the protocols in Appendix I for collection of this type of sample.

8.0 CONTAMINATION AVOIDANCE

The following work practices will be instituted to prevent cross contamination between each composite soil sample collected:

- Soil and vacuum samples of exterior pavement should not be collected until all dust samples are collected within the house.
- Clean vinyl gloves (powderless) will be donned prior to collecting each sample and will be disposed of after the sample is collected.
- The soil recovery probe, plungers, and straight edge will be cleaned with wet disposable wipes between each composite sample.
- Preweighed filter cassettes must not be touch with bare hands. Use powderless vinyl gloves to prevent the disposition of residues that may interfere with gravimetric analysis of the sample.
- The vacuum nozzle will be cleaned with soapy water or disposable wet wipes between each sample. Vinyl gloves will be used when cleaning nozzles and changed to a clean pair prior to collecting samples. There should be an adequate supply of clean nozzles to accommodate all the vacuum samples collected in one day.
- The templates will be cleaned with Wash-a-bye Baby disposable wet wipe between each sample. Vinyl gloves will be used to cleaned templates and changed to a clean pair prior to collecting samples.

10.0 DEVIATIONS FROM FIELD SAMPLING PROTOCOLS

Every attempt shall be made to follow this sampling protocol. Deviations from the sampling protocols may compromise the data quality and completeness objectives of the project. Deviations from the protocols will generally fall into two categories; inadvertent deviations (procedural errors), and deliberate deviations (modifications to the protocol in response to unusual conditions encountered in the field).

In the case of inadvertent deviations from the protocol, the sampling team shall fully document the deviation on the sampling data form and immediately notify the Battelle team leader and the MRI work assignment leader. Corrective action(s) shall be taken to ensure that the situation is not repeated. If possible, samples affected by the inadvertent deviation should be recollected in accordance with the specified protocol prior to leaving the site.

Deliberate deviations from the sampling protocol must be approved in advance with a signed modification to the QAPjP. If time is critical, preliminary verbal approval may be granted by EPA, Battelle, and MRI. This verbal approval will be followed up with a signed modification to the QAPjP. In either case, the sampling team should notify all parties concerned in a timely manner so that the approval mechanism can be expedited. The MRI work assignment leader or Battelle task leader is responsible for initiation of the QAPjP modification and acquiring the necessary approvals from EPA, Battelle, and MRI.

The Battelle team leader shall be notified by the sampling team when field conditions found at the sampling site do not allow full compliance with the protocol or when the protocol does not appear to apply to the situation. The condition/situation shall be fully documented in a laboratory notebook. The team leader will in turn notify the MRI work assignment leader and the Battelle task leader.