

Lead Hazard Control Clearance Survey

Final Report

Prepared for:
**U.S. Department of Housing and Urban Development
Office of Lead Hazard Control and Healthy Homes**

Prepared by:
David Cox, PhD
Gary Dewalt, PhD

QuanTech, Inc.

October 2015

This work was conducted under
Contract No. R-PHI-01043

Acknowledgments

HUD personnel contributing to this work include:

Eugene Pinzer, MS, CIH (Government Technical Monitor)
Peter J. Ashley, DrPH
Warren Friedman, PhD, CIH

Table of Contents

Section	Page
Executive Summary.....	v
1.0 INTRODUCTION	1
2.0 SURVEY DESIGN AND OPERATIONS	1
2.1 Sample.....	1
2.2 Questionnaire and Administration.....	2
2.3 Administration of the Questionnaire.....	3
2.4 Response Rate	3
3.0 RESULTS	3
3.1 General Questions	3
3.2 Unit Specific Questions	5
3.2.1 Descriptive Statistics	5
3.2.2 Data Analysis	6
4.0 CONCLUSIONS	10

List of Figures

Figure	Page
Figure 1 Distribution of RLs by Grantee ($\mu\text{g}/\text{ft}^2$)	5
Figure 2 Cumulative Distribution of Floor Clearance Levels ($\mu\text{g}/\text{ft}^2$)	8
Figure 3 Cumulative Distribution of Window Sill Clearance Levels ($\mu\text{g}/\text{ft}^2$)	8
Figure 2 Cumulative Distribution of Window Trough Clearance Levels ($\mu\text{g}/\text{ft}^2$)	9

List of Tables

Table		Page
Table 1.	Disposition of Grantees Recruited for Survey	12
Table 2.	General Question 1 - Identification of Organization Completing Questionnaire	12
Table 3.	General Question 2 - Types of Organizations Completing Questionnaire	12
Table 4.	General Question 3 - Unit Recruitment Triggers by Fiscal Year	13
Table 4A.	General Question 4 - Unit Recruitment Triggers by Ranking Order (all fiscal years combined)	13
Table 5.	General Question 5 - Number of Units Completed in Last Year	14
Table 6.	General Question 6 - Reporting Limit for Floor Clearance Samples ($\mu\text{g}/\text{ft}^2$)	15
Table 7.	Unit Specific Question 1 - Types of Housing Units	16
Table 8.	Unit Specific Question 2 - Unit Construction Year	16
Table 9.	Unit Specific Question 3 - Actions Taken to Prepare Units for Final Clearance Testing after LHC Completed	17
Table 10.	Unit Specific Questions 4 and 5 - Number of Units Passing Clearance on 1st and 2nd Tries on Floors	18
Table 11.	Unit Specific Question 6 - Actions Taken After Clearance Failures on Floors	18
Table 12.	Unit Specific Questions 9 and 10 - Number of Units Passing Clearance on 1st and 2nd Tries on Windowsills	19
Table 13.	Unit Specific Question 11 - Actions Taken After Clearance Failures on Windowsills	19
Table 14.	Unit Specific Questions 14 and 15 - Number of Units Passing Clearance on 1st and 2nd Tries on Window Troughs	20
Table 15.	Unit Specific Question 16 - Actions Taken After Clearance Failures on Window Troughs	20
Table 16A.	Distribution of Floor Clearance Results (all units: 2 to 20 $\mu\text{g}/\text{ft}^2$)	21
Table 16B.	Distribution of Floor Clearance Results (all units: 21 to 40 $\mu\text{g}/\text{ft}^2$)	23
Table 17.	Distribution of Windowsill Clearance Results	25
Table 18.	Distribution of Window Trough Clearance Results	27

List of Appendices

Attachment		Page
Appendix A	Questionnaire	29
Appendix B	Investigation of Unusually Low Reporting Limits	32

Executive Summary

A survey of HUD's Office of Lead Hazard Control and Healthy Homes (OLHCHH) lead hazard control (LHC) grantees from fiscal years 2010-2012 was conducted for the Office to determine whether the grantees were able (using current tools, methodologies and systems) to consistently achieve dust lead clearance levels well below the current federal standards of 40 $\mu\text{g}/\text{ft}^2$ on floors, 250 $\mu\text{g}/\text{ft}^2$ on windowsills and 400 $\mu\text{g}/\text{ft}^2$ on window troughs, following lead hazard control activities. A questionnaire was sent to all 124 2010-2012 grantees provided by OLHCHH. A total of 98 grantees returned a completed questionnaire. Twenty seven respondents were 2010 grantees, 32 were 2011 and 39 were from 2012. Of the remaining 26 grantees, 18 were nonresponsive despite repeated contact attempts and 8 were unable to respond for lack of grant funds.

The questionnaires were programmed in MS Excel 2007, using Visual Basic macro code to prevent invalid entries and guide the respondents through the questions in the correct order. There were 6 general questions to collect information about the respondents, their participant recruitment methods, their experience completing units in calendar year 2014 and the reporting limit (RL) for floor dust lead clearance samples reported by their analytical laboratories. There were 18 housing unit-specific questions to collect data on the lead clearance results for floors, windowsills and window troughs obtained in a random sample of the housing units in which each grantee completed LHC and achieved clearance under the current federal standards. The sample design provided that all completed housing units had approximately equal probabilities of selection while ensuring that less active grantees were adequately represented and more active grantees were reporting on more recently completed units.

Lead clearance testing results were ultimately collected from 1,552 housing units. There were 7,211 floor clearance samples, 4,893 windowsill clearance samples and 2,787 window trough clearance samples. The sample design ensured that the floor, windowsill and window trough sample results constituted an approximately random sample of all final clearance results on floors, windowsills and troughs. The data were analyzed to determine the percentage of units cleared at or below various final clearance levels for floors, windowsills and window troughs, taking into account the large number of samples reporting final clearance results below the laboratory's RL. RLs for 1 ft^2 floor samples ranged from 2 to 20 $\mu\text{g}/\text{ft}^2$, with the majority of grantees (65%) reporting an RL of 10 $\mu\text{g}/\text{ft}^2$. RLs for windowsill and window trough samples depend on the area sampled, which can vary from as little as 0.07 ft^2 or less to more than 1 ft^2 . Sample areas for sills and troughs were not collected in order to limit the reporting burden on the grantees, and RLs for these samples are therefore unknown. The distributions of final clearance sample results ($\mu\text{g}/\text{ft}^2$) for floors, windowsills and window troughs are shown in the table below¹.

FLOORS		WINDOWSILLS		WINDOW TROUGHS	
Level	Percent	Level	Percent	Level	Percent
≤ 5	72%	≤ 40	$\geq 87\%$	≤ 40	$\geq 82\%$
≤ 10	85%	≤ 60	$\geq 91\%$	≤ 80	$\geq 92\%$
≤ 15	90%	≤ 80	$\geq 96\%$	≤ 100	$\geq 94\%$
≤ 20	94%	≤ 100	$\geq 97\%$	≤ 150	$\geq 97\%$

¹Because sampled areas are unknown, some unknown number of windowsill samples reported as above a given level are actually below their reporting limit. Hence, the percent of windowsill samples reported at or below any given level represents a lower bound on the true percent. The same is true for window troughs.

Of the final floor clearance sample results, an estimated 85% were at or below $10 \mu\text{g}/\text{ft}^2$, at least 97% of final windowsill clearance results were at or below $100 \mu\text{g}/\text{ft}^2$, and at least 94% of final window trough clearance results were at or below $100 \mu\text{g}/\text{ft}^2$. We conclude that a reduction in the federal clearance standard for floors from $40 \mu\text{g}/\text{ft}^2$ to $10 \mu\text{g}/\text{ft}^2$, a reduction in the federal clearance standard for windowsills from $250 \mu\text{g}/\text{ft}^2$ to $100 \mu\text{g}/\text{ft}^2$ and a reduction in the federal clearance standard for window troughs from $400 \mu\text{g}/\text{ft}^2$ to $100 \mu\text{g}/\text{ft}^2$ are all technically feasible using the methods currently employed by OLHCHH LHC grantees to prepare for clearance. The most common methods used included various types of cleaning as well as sealing of floors, sills and troughs. Overlaying or replacing flooring, and lining of window troughs, were less common. It was further found that the stated reductions in clearance standards for floors and sills are generally feasible using the more common methods (cleaning and sealing) exclusively.

1.0 INTRODUCTION

On August 10, 2009, a petition was submitted to EPA to increase protections from lead hazards in residential housing by reducing federal action levels for lead. This included lowering the dust lead (clearance) hazard standards at 40 CFR 745.65(b), 40 CFR 745.227(e)(8)(viii), and 40 CFR 745.227(h)(3)(i) from 40 micrograms of lead per square foot of surface area ($\mu\text{g}/\text{ft}^2$) to 10 $\mu\text{g}/\text{ft}^2$ or less for floors, and from 250 $\mu\text{g}/\text{ft}^2$ to 100 $\mu\text{g}/\text{ft}^2$ or less for window sills. The petition can be found at

http://www.epa.gov/oppt/chemtest/pubs/EPA_Lead_Standards_Petition_Final.pdf.

In a response dated October 22, 2009, EPA, writing on behalf of itself and HUD, agreed to study the issue of whether the lead hazard standards should be changed, and to collaborate with HUD on this effort. The response is at <http://www.epa.gov/oppt/chemtest/pubs/epa-response.pdf>.

The following questions were identified as key in understanding whether or not it is technically feasible, with the tools, methodologies, and systems currently in use, to lower the dust clearance standards:

- (1) Can organizations familiar with the conduct of lead hazard control (LHC) routinely achieve dust lead clearance levels well below the current federal action levels?
- (2) How low are the lead clearance values routinely obtained by these organizations?

A source of organizations familiar with the conduct of clearance testing is HUD's OLHCHH LHC grantees, for which the key questions become:

- (1) Can LHC grantees routinely achieve dust lead clearance levels well below the current federal action levels?
- (2) How low are the lead clearance values routinely obtained by the LHC grantees?

To address these questions, HUD tasked QuanTech to conduct a survey of their fiscal year 2010, 2011, and 2012 LHC grantees to collect and analyze clearance test results. (Specifically, the LHC grants are conducted under two programs, the Lead-Based Paint Hazard Control and Lead Hazard Reduction Demonstration (LHRD) grant programs.) QuanTech refined a draft version of a questionnaire provided by HUD and developed an MS Excel spreadsheet, complete with drop-down menus, to capture two types of data from the grantees: (a) General data about their grant and (b) Unit specific data about the conduct of lead clearance in a set of randomly selected units reported by the grantee as having been completed under their grant (LHC done and final clearance successfully achieved). This report describes the design, conduct and findings of the survey. Tables referenced throughout the report are grouped together at the end of the report following the conclusion section but before the appendices. This information collection, including the survey design, was approved by the Office of Management and Budget (OMB); no personal data were collected.

2.0 SURVEY DESIGN AND OPERATIONS

2.1 Sample

The original plan was to survey the entire universe of 2010, 2011 and 2012 LHC grantees. Lists of these grantees, obtained from OLHCHH, comprised a total of 124 grants as shown in Table 1. For each of these grantees, OLHCHH provided a list of housing units (street addresses) where the grantee reported completing LHC and clearance testing. A total of 12,953 unit addresses was obtained from HUD for the 124

grantees. The following sampling strategy was used to select a total of 2,064 units for inclusion in the survey:

- For grantees with 10 or less units, select all units (2 grantees, 8 units).
- For grantees with 10 to 49 units, randomly select 10 of the units (18 grantees, 180 units).
- For grantees with 50 to 100 units, randomly select 20% of the units (42 grantees, 636 units).
- For grantees with >100 units, randomly select 20% of the units from the most recently completed 100 units (62 grantees, 1240 units).

Under this sampling strategy, most units completed by the 2010-2012 grantees (except less recently completed units for the most active grantees) had approximately the same probability of selection. This approximates a simple random sample of units while ensuring that less active grantees (who could be less proficient in achieving clearance) are adequately represented and more active grantees are reporting on more recently completed units.

2.2 Questionnaire and Administration

The questionnaire, shown in paper form in Appendix A, consists of two sections:

- **General Questions Section, questions GQ1 through GQ6.** This section was used to collect general data about the respondent (GQ1 and GQ2), and included questions about recruitment triggers (GQ3 and GQ4), experience completing units in the last 12 months (GQ5) and laboratory reporting limits (RLs) for analysis of floor dust lead clearance samples (GQ6). This last general question is important in helping answer the 2nd key question (How low are the lead clearance values routinely obtained by the LHC grantees?) since grantees should not be receiving (and reporting) floor dust lead clearance sample results less than the RL stated by their laboratory. The questionnaire was configured to require that the grantee complete the General Questions section prior to entering data for any housing units so that the RL entered by the grantee could be used as a lower value limiter when entering floor clearance sample results.
- **Unit Specific Questions Section, questions UQ1 through UQ18.** This section was used to capture lead clearance results obtained in different units that were selected for inclusion in the survey. The questionnaire was configured to require the grantee to answer these 18 questions for each housing unit:
 - UQ1 and UQ2 captured the type and construction year of the unit.
 - UQ3 asked what actions were taken to prepare for final clearance testing after the LHC work was completed.
 - UQ4 through UQ8 captured final floor clearance data, “final” meaning the sample result that passed clearance. UQ4 and UQ5 identified whether or not the unit passed clearance on floors the 1st and 2nd tries, respectively, with UQ6 capturing the types of actions used to achieve clearance after one or more clearance failures. UQ7 was used to identify the number of final clearance samples and UQ8 captured the lead result for each final clearance sample.
 - UQ9 through UQ13 captured windowsill data in the same manner as UQ4 through UQ8.
 - UQ14 through UQ18 captured window trough data in the same manner as UQ4 through UQ8.

Because many grantees are familiar with and often use spreadsheets to track their grant activities, the questionnaire was programmed into an MS Excel spreadsheet using Visual Basic macro code. Drop-down menus were created to provide grantees with pick list choices for multi-choice questions and all

entries were displayed to the grantee to provide immediate feedback on their data entry. Controls were added to prevent invalid data entries to the degree possible and help ensure that the types of data entered were consistent with the questions being asked. Housing units selected for all the grantees were placed into a hidden sheet so that a single master version of the spreadsheet could be used for all the grantees. A hidden admin-only set of macros were used to create individual spreadsheets from the master for each of the 124 grantees. This ensured that only those completed units selected for the grantee would be displayed as needing to be answered. The programmed questionnaire incorporated quality control checks on the respondents' entries to ensure that required data fields were completed and various skip patterns built into the survey were followed. The spreadsheet was configured to retain the entered data even in cases where a grantee inadvertently exited the spreadsheet without saving the file. A detailed instruction set was placed into the spreadsheet and was the only sheet visible when grantees first opened the questionnaire file. To encourage the grantees to read the instructions carefully, access to other sheets was provided by a radio button placed at the bottom of the instruction sheet. Other radio buttons were provided throughout to help the grantee navigate the questionnaire.

2.3 Administration of the Questionnaire

Each of the targeted 124 grantees was contacted by email, with an attachment containing the questionnaire configured to show only those units that were applicable to and selected for their grant along with the instruction set. A considerable follow-up effort by email and phone was required to encourage response.

2.4 Response Rate

As shown in Table 1, eight (8) of the 124 grantees were unable to respond due to lack of grant funding and were categorized as ineligible. The majority (6 out of 8 or 75%) had the oldest grants (2010), which is not surprising given that these typically 3-year grants would have been closed out long before the survey was conducted.

Eighteen (18) of the remaining 116 grantees were non-responsive despite multiple contact attempts. Thus, ninety-eight (98) out of a total of 116 potentially eligible grantees responded producing an overall response rate of 84.5% (98/116). Thirty nine (39) respondents were 2012 grantees, 32 were 2011 and 27 were from 2010.

3.0 RESULTS

3.1 General Questions

Table 2 identifies the organization completing the questionnaire (GQ1). The vast majority (95%) were completed by the grantee itself. Table 3 shows the type of organization completing the questionnaire (GQ2). Almost all (95%) identified themselves as a state or local government agency (91 plus 2 in the "other" category).

Table 4 identifies activities that trigger recruitment of a housing unit in the grant (GQ3). All but 3 grantees made use of outreach and recruitment drives to bring units into their program. Presence of an EBL (elevated blood lead level) child, based on a notice or abatement order from a Health Department, was the next most commonly mentioned recruitment trigger (89% of grantees), followed by combining LHC with rehab (77%), and the presence of an LBP hazard (deteriorated LBP or elevated lead levels in dust) in the home (72%). The incidence of the various recruiting triggers was very similar in all three fiscal years, taking into account the number of grants in each year.

GQ4 asked the grantees to rank the recruitment triggers in order of frequency of use. Table 4A shows the results of this ordering, with 1 the most frequent and 10 the least frequently used trigger, for all years

combined. The most important recruitment trigger was outreach and recruiting for 42 grantees, followed by presence of an EBL child (27 grantees) and combining LHC with rehab (10 grantees).

Table 5 provides results on the number of housing units completed by each grantee in the past 12 months (GQ5). The table provides summary counts for all fiscal years combined as well as by individual fiscal year. The largest counts for each grouping are shown in bold text. Pilot testing of the survey to 3 grantees was performed in December 2014; administration of the survey to the remainder of the grantees began in early January 2015. Therefore, "...in the past 12 months..." means the 2014 calendar year. Since many of the 2010 grants would have been closed, unless these grantees had follow-on grants, it was expected that 2010 grantees would have lower unit completion counts (less recent experience) than the 2011 and 2012 grantees and this is the general trend shown in the table. However, the differences between the fiscal years are small with all three fiscal years showing about 50% of the grantees completing between 1 to 50 units in the last year.

Table 6 provides results on the reporting limit (RL) for floor clearance samples in $\mu\text{g}/\text{ft}^2$ with a separate column for each the different RL reported and a last column showing the total count of grantees for the range of RLs from 2 to 20 $\mu\text{g}/\text{ft}^2$. The highest RL reported (20) is consistent with the maximum allowed reporting limit as defined under EPA's National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements (LQSR), Revision 3.0, July 05, 2007.² According to the LQSR, "...the laboratory shall demonstrate it can achieve a quantitation limit equal to or less than 50% of the lowest action level for dust wipe samples". This means that the maximum value of the RL can be no larger than 20 $\mu\text{g}/\text{ft}^2$ for dust lead clearance samples³.

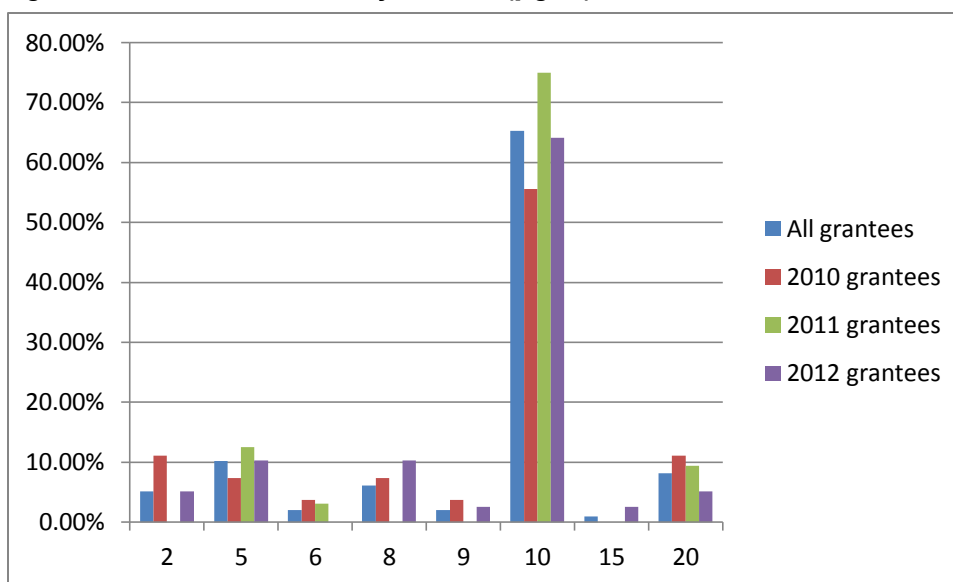
Table 6 and Figure 1 show that the majority of the grantees (65%) had RLs (from their laboratories) of 10 $\mu\text{g}/\text{ft}^2$ on floor clearance samples (See Note 1). Of the 7 other RLs on floors, only 5 $\mu\text{g}/\text{ft}^2$ was reported by more than 10% of grantees. Table 6 represents the RLs in the final survey dataset after conducting an investigation into what appeared to be unusually low RLs originally reported by some grantees.

A detailed discussion of this investigation is presented in Appendix B.

Note 1: RL data for windowsills and window trough samples were not captured in the survey. In the case of floor clearance samples, the general sample collection guidance is to collect a 1 ft^2 area. Therefore this RL is applicable to the great majority of floor clearance samples. However, the available sampling area on windowsills and window troughs is variable depending on the size of the window. Sample collection areas on windows larger than 1 ft^2 reduce the value of the RL and likewise, sample collection areas smaller than 1 ft^2 increase the value of the RL. The only practical way to capture the RL on window samples would have been to ask the grantees for the sample collection areas for each of the window sample results entered into the questionnaire. This amount of detail was felt to be too burdensome to the grantees.

² National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements, Revision 3.0, July 05, 2007.

³ We are treating "quantitation limit" and "reporting limit" as synonyms in this report.

Figure 1. Distribution of RLs by Grantee ($\mu\text{g}/\text{ft}^2$)

3.2 Unit Specific Questions

3.2.1 Descriptive Statistics

Lead clearance testing results were ultimately collected on a total of 1,604 units from the 98 grantees completing the survey. Data from 52 units was discarded, primarily because no floor samples were collected, leaving 1,552 units in the final dataset. Tables 7 and 8 identify the type and age of the units in the final dataset (UQ1 and UQ2). Almost half were detached single family homes, while less than 20% were apartments. Almost all were built before 1960, and over three quarters before 1940.

Table 9 provides a summary of the items that were selected by the grantees as actions they took to prepare units for final clearance testing (UQ3). UQ3 is a "check all that apply" question. There were 14 units for which the only response was "Other" with no action specified. These 14 units were excluded from the table, leaving 1,538 units. The average unit had 2.9 actions taken to prepare for clearance. The most frequent actions, HEPA vacuuming and a HEPA/Wet wash/HEPA cycle, were taken in 2/3 of the units. A wet detergent wash using a general purpose cleaner was done in over half the units. It is interesting that more than twice as many units were wet-washed with a general purpose cleaner as were washed with trisodium phosphate (807 units vs. 371), suggesting that trisodium phosphate is often being replaced with a general purpose cleaner (an environmentally desirable outcome).

All 1,538 units had some form of cleaning a – d performed (see Table 9); 905 units (58.8%) had **only** one or more of the cleaning types a – d performed to prepare for clearance. A total of 999 units (65.0%) had only cleaning (a – d) or sealing of the floors performed. Overlaying or replacing floors were done in only 8.8% of units, so that over 90% of units were cleared on floors using only some form of cleaning and/or sealing. Sealing, overlaying or replacing floors was done in 23.5% of units. Thus, over three quarters of units were cleared on floors by cleaning alone. Similarly, over three quarters of windowsills and 90% of troughs were cleared by cleaning alone.

It is important to note that some grantees had trouble interpreting this question, an issue that first surfaced during the pilot testing of the questionnaire. The wording for this question as shown in Appendix A includes modifications to the draft questionnaire wording to be clearer about the intent of the question. However,

despite this, it was difficult for some grantees to distinguish between actions taken specifically to prepare for clearance and actions routinely done as part of LHC. This confusion is evident from the "Other" entries which are summarized in the bottom half of Table 9. The majority of the actions listed are clearly better characterized as LHC activities rather than actions taken specifically to prepare for clearance. Hardly any could be interpreted as actions taken specifically to prepare floors, windowsills or window troughs for clearance.

Table 10 provides a summary of the number of units passing clearance on floors on the first and second tries (UQ4 and UQ5). The great majority (86.0%) passed clearance on the first try with only 217 (190+27, 14%) out of 1552 units requiring some type of additional action and retesting. Of the 217 failing clearance on the first try, only 27 (12.4%) failed clearance on the second try.

Table 11 summarizes the actions taken in units that failed clearance on the first and second tries on floors (UQ6). UQ6 is a "check all that apply" question so the total counts add up to more than the total number of units. The vast majority (96.5%) of actions taken for units failing only on the first try involved only re-cleaning (82.7%) or sealing (13.8%). For units failing both first and second clearance attempts, more expensive action than re-cleaning or sealing was required in 15% of cases.]

Table 12 provides a summary of the number of units passing clearance on the first and second tries on windowsills (UQ9 and UQ10). Seven percent (7%) of the 1552 units had no windowsill sample results. The great majority (~90%) passed clearance on the first try with only 52 (48+4, 3.4%) out of 1552 units requiring some type of action and retesting.

Table 13 summarizes the actions taken in units that failed clearance on the first and second tries on windowsills (UQ11). UQ11 is a "check all that apply" question so the total counts add up to more than the total number of units. For units that failed the first time only, the great majority (~90%) were able to correct the problem by re-cleaning (75.9%) and/or sealing (18.8%). The same is true for units that failed both the first and second tries where 3 out of 4 units listed as failing both the first and second tries were able to correct the problem by re-cleaning. Repainting was reported to be used as the corrective action for the other unit.]

Table 14 provides a summary of the number of units passing clearance on the first and second tries on window troughs (UQ14 and UQ15). More than a third of the units (36.2%) had no window trough results⁴. All but a few (less than 2%) passed clearance on the first try.

Table 15 summarizes the action taken in units that failed clearance on the first and second tries on troughs (UQ16). UQ11 is a "check all that apply" question so the total counts add up to more than the total number of units. Of the 990 units where troughs were tested, 962 (97.2%) passed clearance on the first try. Of the 28 units that failed clearance on the first try, all but one passed on the second try, almost all of which were just re-cleaned. One unit failed clearance on the second try and required one or more rounds of additional cleaning to pass.

3.2.2 Data Analysis

Tables 16A and 16B show the total number of samples reported by each grantee at each final clearance lead level on floors from 2 $\mu\text{g}/\text{ft}^2$ to 40 $\mu\text{g}/\text{ft}^2$. Virtually all results reported were in whole-number units; a small number were rounded to the nearest whole number for purposes of this table. The tables also show the stated reporting limit (RL) for a 1 ft^2 wipe sample for each grantee's laboratory. The total number of

⁴ Most likely, we suspect, because there were no troughs to test.

samples at, and at or below, each lead level is also shown, as well as the percentage of the total (7,211 samples, an average of 4.6 per unit) at or below each lead level.

As discussed in Section 2.1, the sample of units in the survey approximates a simple random sample, so that the final clearance results also represent approximately a simple random sample of final floor clearance levels achieved by HUD's LHC grantees. All final clearance levels are, by definition, at or below 40 $\mu\text{g}/\text{ft}^2$. However, an estimated 95% are at or below 20 $\mu\text{g}/\text{ft}^2$ and at least 74% at or below 10 $\mu\text{g}/\text{ft}^2$. The qualifier "at least" with respect to the 10 $\mu\text{g}/\text{ft}^2$ level is necessary because some of the final clearance levels above 10 $\mu\text{g}/\text{ft}^2$ were in fact below the laboratory's reporting limit. For example, grantee 98 reported 49 values below its laboratory's reporting limit of 20 $\mu\text{g}/\text{ft}^2$. Some of these lead levels may actually be at or below 10 $\mu\text{g}/\text{ft}^2$. The 74% figure therefore represents a lower bound on the percent of final clearance results at or below 10 $\mu\text{g}/\text{ft}^2$.

To obtain a more accurate estimate of the percent of final clearance results at or below 10 $\mu\text{g}/\text{ft}^2$, we conducted a nonparametric statistical analysis using the Kaplan-Meier method⁵. This method was originally developed to perform nonparametric estimation of lifetimes from incomplete data, typically data that is truncated by the ending of a study period⁶. Consider, for example, an animal study of the efficacy of a new cancer treatment where the objective is to estimate the time for which animals survive at various levels of treatment. Typically, some animals will remain alive at the end of the study period so that their survival time is known only to be greater than or equal to the study's duration. This type of data is termed *right censored*. Non-detect final clearance results in the present survey are *left censored*, i.e., they are known only to be less than or equal to the RL. The Kaplan-Meier method can be applied to left censored data by a simple transformation³ in which each result is subtracted from the largest reported result (e.g., 40 $\mu\text{g}/\text{ft}^2$ for floor data).

The first step in the analysis was to estimate the total number of samples below the reporting limit at each lead level. The cells in *italics* with light grey shading in Table 12A show large clusters of samples at the stated RL for each grantee. Virtually all these samples were reported as nondetect (below the RL). Cells in **bold** with darker grey shading show other large clusters at lead levels above the stated reporting limit for various grantees. For example, grantee #1 shows a cluster of 15 samples at the stated RL of 5 $\mu\text{g}/\text{ft}^2$, but an even larger cluster of 69 samples at 20 $\mu\text{g}/\text{ft}^2$. It is extremely unlikely that many of these 69 samples at 20 $\mu\text{g}/\text{ft}^2$ have detectable results, because one would expect a relatively uniform distribution of detectable results (such as the small number of samples at all levels except 5 and 20 $\mu\text{g}/\text{ft}^2$ for this grantee). It is therefore likely that the clustering of results at 20 $\mu\text{g}/\text{ft}^2$ indicates a second RL for this grantee at 20 $\mu\text{g}/\text{ft}^2$ in addition to the stated RL of 5 $\mu\text{g}/\text{ft}^2$. The same is true for the other grantees with cells highlighted in orange.

To investigate this issue, we requested two lab reports from each of the 11 grantees with an apparent second RL greater than 10 $\mu\text{g}/\text{ft}^2$. The two reports selected were from units showing final clearance results at the second RL. Ten of the 11 grantees provided the reports requested. In every case, the values reported at the second RL were, in fact, nondetects, as suspected. In some cases, a second laboratory with the higher RL was used for some units (though not previously reported to us), while in others a floor sample area less than 1 ft^2 was used, thereby increasing the RL for such samples. Based on the results of this

⁵ Dennis R. Helsel, *Nondetects and Data Analysis: Statistics for Censored Environmental Data*, Wiley-Interscience (2005), Chapter 6.

⁶ E.L Kaplan and Paul Meier, *Nonparametric Estimation from Incomplete Observations*, Journal of the American Statistical Association, Vol. 53, No. 282 (Jun., 1958), pp. 457-481.

investigation, we decided to treat all samples in the orange highlighted cells as nondetects, like those in the yellow highlighted cells at the stated reporting limit. All non-highlighted cells were treated as detectable results. We should point out these or similar assumptions had to be made for analysis purposes because the data reported by the grantees did not distinguish detectable from nondetectable results. For example, a result of “< 20 µg/ft²” from the lab was reported to us as 20 µg/ft², without the < sign.

The Kaplan-Meier analysis of the floor data, with the stated assumptions, gave the following results for the percentage of floor clearance results at or below the specified lead dust loadings:

- Floor clearance level ≤ 5 µg/ft²: 71.6%
- Floor clearance level ≤ 10 µg/ft²: 85.4%
- Floor clearance level ≤ 15 µg/ft²: 90.1%
- Floor clearance level ≤ 20 µg/ft²: 93.5%.

The cumulative distribution of final floor clearance levels, as estimated by the Kaplan-Meier method, is shown in Figure 2.

Figure 2. Cumulative Distribution of Floor Clearance Levels (µg/ft²)

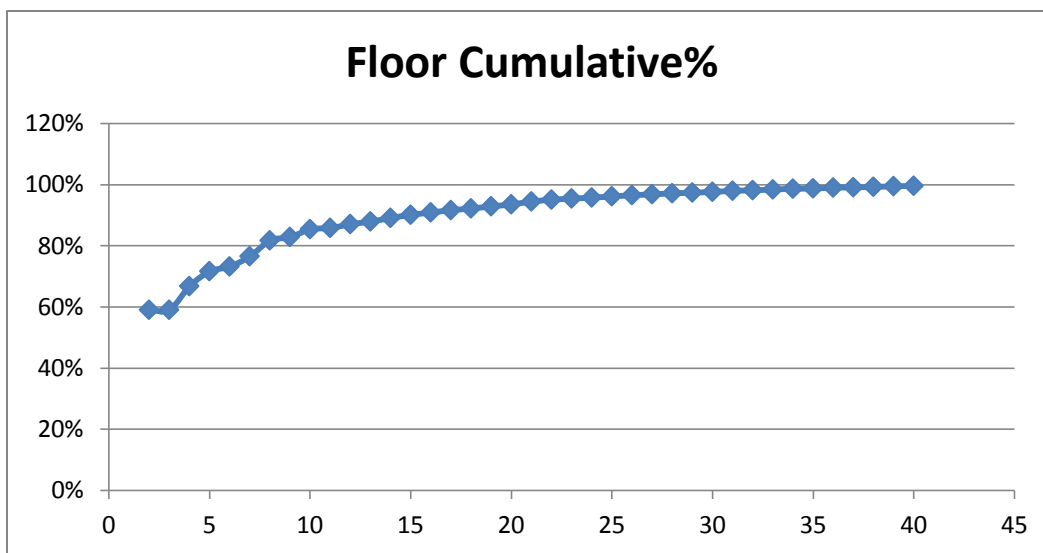
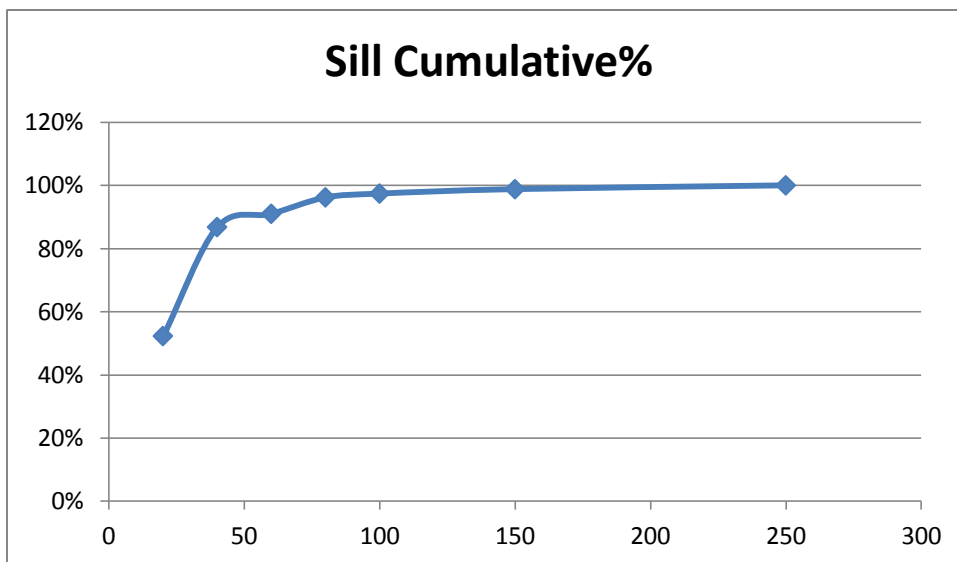


Table 17 shows the total number of samples reported by each grantee for various ranges of clearance lead levels on windowsills up to the current standard of 250 µg/ft². The cumulative distribution of windowsill clearance levels is shown in Figure 3.

Figure 3. Cumulative Distribution of Window Sill Clearance Levels ($\mu\text{g}/\text{ft}^2$)



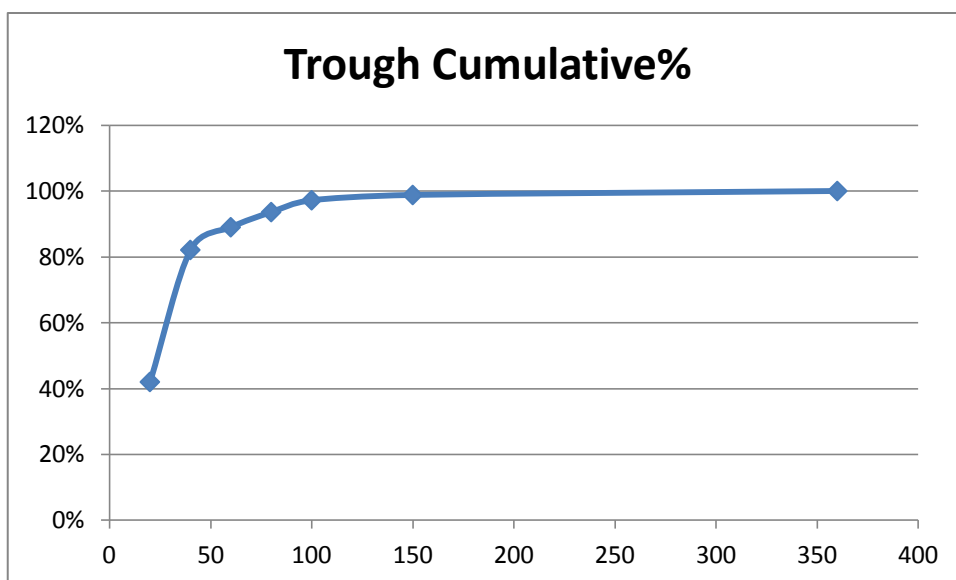
Unlike floors, where a 1 ft² sampling area is standard, the sampling area for windowsills varies depending on the size of the sill and can range from as little as 10 in² to over 1 ft² in the case of very large sills. Since the reporting limit depends on the area sampled, and we did not ask the grantees to report sampling areas, there is no way to reliably determine which test results are nondetectable for windowsills. The type of Kaplan-Meier analysis of the data conducted for floors cannot therefore be done for windowsills. The percent of samples at or below each level in Table 15 does, however, represent a lower bound on the true percent of samples at or below that level, with the following results for the percentage of windowsill clearance results at or below the specified lead dust loadings:

Windowsill clearance level $\leq 40 \mu\text{g}/\text{ft}^2$: at least 86.8%

Windowsill clearance level $\leq 60 \mu\text{g}/\text{ft}^2$: at least 91.0%

Windowsill clearance level $\leq 100 \mu\text{g}/\text{ft}^2$: at least 97.4%.

Table 18 shows the total number of samples reported by each grantee for various ranges of clearance lead levels on window troughs up to the current standard of 400 $\mu\text{g}/\text{ft}^2$. The cumulative distribution of window trough clearance levels is shown in Figure 4 below.

Figure 4. Cumulative Distribution of Window Trough Clearance Levels ($\mu\text{g}/\text{ft}^2$)

As for windowsills, which samples are nondetectable cannot be determined for window troughs because the areas sampled vary widely depending on the size of the trough. The percent of samples at or below each level in Table 17 represents a lower bound on the true percent of samples at or below that level, with the following results for the percentage of window trough clearance results at or below the specified lead dust loadings:

Window trough clearance level $\leq 40 \mu\text{g}/\text{ft}^2$:	at least 82.1%
Window trough clearance level $\leq 80 \mu\text{g}/\text{ft}^2$:	at least 92.0%
Window trough clearance level $\leq 100 \mu\text{g}/\text{ft}^2$:	at least 93.6%
Window trough clearance level $\leq 150 \mu\text{g}/\text{ft}^2$:	at least 97.2%.

4.0 CONCLUSIONS

The analysis of the data in Tables 16A and 16B shows that much lower clearance levels than the current standard of $40 \mu\text{g}/\text{ft}^2$ on floors were routinely achieved by the HUD LHC grantees in the survey. In particular, a floor clearance level of $10 \mu\text{g}/\text{ft}^2$ was achieved in over 85% of cases even though the grantees were only attempting to clear at $40 \mu\text{g}/\text{ft}^2$. We conclude that a reduction in the floor clearance level from $40 \mu\text{g}/\text{ft}^2$ to $10 \mu\text{g}/\text{ft}^2$ as requested in the original petition to EPA is technically feasible using the methods currently employed by HUD LHC grantees to prepare for clearance. In addition, the data in Table 9 shows that only cleaning of floors was conducted in 75% of the units in the survey, and only cleaning and/or sealing of floors in 90% of units. Thus, a clearance level of $10 \mu\text{g}/\text{ft}^2$ is generally technically feasible using only cleaning and/or sealing of floors.

It should be noted that a floor clearance level of 10 $\mu\text{g}/\text{ft}^2$ would require, under EPA's rules⁷, use of a laboratory with a reporting limit no greater than half this level, i.e., 5 $\mu\text{g}/\text{ft}^2$ for a 1 ft^2 sampling area. While 15 of the 98 grantees (15.3%) surveyed reported RLs of 5 $\mu\text{g}/\text{ft}^2$ about two thirds (65.3%) had RLs of 10 $\mu\text{g}/\text{ft}^2$. The cost impact of a lower RL is an important question. Although a detailed study of this issue is beyond the scope of the present project, an informal examination of publicly available pricing information of the testing industry showed considerable variability in the prices for lead dust wipe analysis. Prices are highly dependent of turnaround time as well as volume. Single-sample retail pricing is in the range of \$6 to \$25 for RLs of 5-10 $\mu\text{g}/\text{ft}^2$ (based on 1 ft^2 sampling areas) with 3-day turnaround or longer. Prices appear to increase significantly (up to doubling the cost) for same day service. However, large volume pricing can reduce the per sample cost for same-day pricing to the range of \$4.50 to \$7.00 per sample with RLs of 5 to 10 $\mu\text{g}/\text{ft}^2$. Also, the RLs could be effectively halved without increasing analysis cost by mandating sampling collection areas of 2 ft^2 for floor wipe clearance samples. While this would need to be piloted to ensure the feasibility of widespread adoption, it should be noted that, in clearance sampling, surfaces to be sampled must first pass a visual clearance. This ensures that dust loading is already low and mandating use of a 2 ft^2 collection area for floor wipe clearance samples will likely not introduce analytical problems by overloading the wipe with dust. In contrast, for risk assessments, increasing sampling areas is problematic because it can generate analysis problems resulting from increased dust loading overwhelming the fixed amount of chemicals used to prepare the samples for instrumental analysis. All things considered, a reduction in RLs to 5 $\mu\text{g}/\text{ft}^2$ is likely feasible at a reasonable cost. In addition, the requirement for a reduced RL is likely to spur improvements in analysis techniques to meet the lower requirement at a reasonable cost.

The data (Table 17) show that over 97% of windowsills treated by HUD LHC grantees were cleared at or below 100 $\mu\text{g}/\text{ft}^2$. Thus, a reduction in the windowsill clearance standard from 250 $\mu\text{g}/\text{ft}^2$ to 100 $\mu\text{g}/\text{ft}^2$ is technically feasible using the methods employed by HUD LHC grantees to prepare for clearance. In fact, approximately 75% of windowsills can be cleared at 100 $\mu\text{g}/\text{ft}^2$ by cleaning alone. Moreover, even lower clearance levels on sills are feasible; at least 86.8% of windowsills cleared at or below 40 $\mu\text{g}/\text{ft}^2$.

Although window troughs were not mentioned in the petition to EPA, (the petition concerned dust hazard levels, and none exists for window troughs, only a clearance level) it is clear from the data in Table 18 that much lower clearance levels than the current standard of 400 $\mu\text{g}/\text{ft}^2$ were routinely achieved by the HUD LHC grantees. A trough clearance standard of 100 $\mu\text{g}/\text{ft}^2$ or lower is technically feasible using the methods employed by HUD LHC grantees to prepare for clearance.

⁷ National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements (LQSR), Revision 3.0, July 05, 2007.

Disposition	Count of Grantees by Fiscal Year				Fraction of Eligible
	2010	2011	2012	All Years	
Number of grantees in original contact list	41	39	44	124	
Number of grantees unable to respond due to lack of grant funding	6	2	0	8	
Number of eligible grantees ^a	35	37	44	116	100.0%
Number of eligible grantees <u>not</u> completing questionnaire	8	5	5	18	15.5%
Number of eligible grantees completing questionnaire	27	32	39	98	84.5%

^a excludes grantees who were identified either by the grantee or by the GTR as having no grant funds

Organization	Count of Grantees by Fiscal Year				Fraction of Total
	2010	2011	2012	All Years	
a. The grantee	26	30	37	93	94.9%
b. A subgrantee	1	1	1	3	3.1%
c. A contractor to the grantee or a subgrantee	0	1	1	2	2.0%
All types	27	32	39	98	100.0%

Organization Type	Count of Grantees by Fiscal Year				Fraction of Total
	2010	2011	2012	All Years	
a. State/local health department	7	10	10	27	27.6%
b. State/local community or economic development department	9	12	15	36	36.7%
c. State/local community building or housing development department	9	8	11	28	28.6%
d. Non-governmental organization	0	0	1	1	1.0%
e. Certified abatement contractor	0	0	0	0	0.0%
f. Certified renovation firm	0	0	0	0	0.0%
g. Risk assessment firm	0	0	1	1	1.0%
h. Other – write in ^a	2	2	1	5	5.1%
All types	27	32	39	98	100%

^a "Other" entries included: 1 Children's Hospital, 1 State Housing Finance Agency, 1 State Agency, 1 Quasi-government Community Action Agency and 1 not defined.

Recruitment Trigger	Total Count of Grantees				
	2010	2011	2012	Total	Percent of Grantees
Outreach and recruiting drives	25	31	39	95	96.9%
EBL child ^a	24	29	34	87	88.8%
Combining lead hazard control work with other rehabilitation or modernization work	22	23	30	75	76.5%
Significant lead-based paint hazard ^b	20	23	28	71	72.4%
Building code, housing code, or other code violation	9	16	17	42	42.9%
Neighborhood characteristics	8	5	7	20	20.4%
Other – write in ^c	5	4	8	17	17.3%
Transfer of ownership or occupancy	2	1	0	3	3.1%

^a Notice or abatement order from a Health Department because of a child in the unit with an elevated blood lead (EBL) level.
^b Dust lead levels above federal standards or deteriorated LBP in unit.
^c “Other” entries included word of mouth and referrals from partners.

Recruitment Trigger	Count of Grantees by Ranking Order ^a											Total (any order)	Percent of Grantees
	1	2	3	4	5	6	7	8	9	10			
Outreach and recruiting drives.	42	15	10	9	8	5	4	2	0	0	95	96.9%	
EBL child ^b	27	16	21	12	5	3	2	1	0	0	87	88.8%	
Combining lead hazard control work with rehab or modernization	10	14	17	14	10	7	2	1	0	0	75	76.5%	
Significant lead-based paint hazard ^c	7	13	14	18	10	4	5	0	0	0	71	72.4%	
Building code, housing code, or other code violation	4	2	11	4	9	8	4	0	0	0	42	42.9%	
Neighborhood characteristics	1	10	3	2	2	0	2	0	0	0	20	20.4%	
Other – write in ^d	7	5	4	1	0	0	0	0	0	0	17	17.3%	
Transfer of ownership or occupancy	0	0	0	0	1	1	0	1	0	0	3	3.1%	
All triggers combined	98	97	94	78	63	45	24	7	2	0		100.0%	

^a 1=most frequent trigger, 10=least frequent trigger.
^b Notice or abatement order from a Health Department because of a child in the unit with an elevated blood lead (EBL) level.
^c Dust lead levels above federal standards or deteriorated LBP in unit.
^d “Other” entries included word of mouth and referrals from partners.

Table 5. General Question 5 - Number of Units Completed in Last Year										
Range of units->	Count of Grantees by Number of Units Completed								Mean Units Completed	Standard Deviation (%)
	1 to 25	26 to 50	51 to 75	76 to 100	101 to 125	126 to 150	151 to 175	176 to 200		
Count Category										
All Grant Years Combined										
Grantee count	22	28	20	15	5	3	4	1	59	69%
Percent of grantees	22.4%	28.6%	20.4%	15.3%	5.1%	3.1%	4.1%	1.0%		
Cumulative percent of grantees	22.4%	51.0%	71.4%	86.7%	91.8%	94.9%	99.0%	100%		
2012 Grants										
Grantee count	9	6	7	3	0	2	0	0	51	67%
Percent of grantees	33.3%	22.2%	25.9%	11.1%	0.0%	7.4%	0.0%	0.0%		
Cumulative percent of grantees	33.3%	55.6%	81.5%	92.6%	92.6%	100%	100%	100%		
2011 Grants										
Grantee count	7	8	9	4	2	1	0	1	58	71%
Percent of grantees	21.9%	25.0%	28.1%	12.5%	6.3%	3.1%	0.0%	3.1%		
Cumulative percent of grantees	21.9%	46.9%	75.0%	87.5%	93.8%	96.9%	96.9%	100%		
2012 Grants										
Grantee count	6	14	4	8	3	0	4	0	65	68%
Percent of grantees	15.4%	35.9%	10.3%	20.5%	7.7%	0.0%	10.3%	0.0%		
Cumulative percent of grantees	15.4%	51.3%	61.5%	82.1%	89.7%	89.7%	100%	100%		
The largest counts in a column are shown in bold.										

Table 6. General Question 6 - Reporting Limit for Floor Clearance Samples (µg/ft²)									
Reporting Limit->	Count of Grantees by Reporting Limit								Total #Grantees
	2	5	6	8	9	10	15	20	
Count Category	All Fiscal Years Combined								
Grantee count	5	10	2	6	2	64	1	8	98
Percent of grantees	5.1%	10.2%	2.0%	6.1%	2.0%	65.3%	1.0%	8.2%	
Cumulative percent of grantees	5.1%	15.3%	17.3%	23.5%	25.5%	90.8%	91.8%	100%	
	2010 Grants								
Grantee count	3	2	1	2	1	15	0	3	27
Percent of grantees	11.1%	7.4%	3.7%	7.4%	3.7%	55.6%	0.0%	11.1%	
Cumulative percent of grantees	11.1%	18.5%	22.2%	29.6%	33.3%	89%	89%	100%	
	2011 Grants								
Grantee count	0	4	1	0	0	24	0	3	32
Percent of grantees	0.0%	12.5%	3.1%	0.0%	0.0%	75.0%	0.0%	9.4%	
Cumulative percent of grantees	0.0%	12.5%	15.6%	15.6%	15.6%	90.6%	90.6%	100%	
	2012 Grants								
Grantee count	2	4	0	4	1	25	1	2	39
Percent of grantees	5.1%	10.3%	0.0%	10.3%	2.6%	64.1%	2.6%	5.1%	
Cumulative percent of grantees	5.1%	15.4%	15.4%	25.6%	28.2%	92.3%	95%	100%	

Unit Type	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
a. Detached Single Family Home	203	263	286	752	48.5%
b. Duplex/Triplex	148	157	132	437	28.2%
c. Row House/Town House	18	30	19	67	4.3%
d. Low Rise Apartment (1-3 Floors)	88	48	97	233	15.0%
e. High Rise Apartment (>3 Floors)	24	12	7	43	2.8%
f. Mobile/Manufactured Home	0	0	0	0	0.0%
g. Other ^a	3	10	7	20	1.3%
Totals	484	520	548	1552	100%

^a Other entries included: 2 multifamily units (unit count not specified), 7 multifamily units (≤ 6 units), 6 multifamily units (> 6 units), 3 shelters, 1 mixed residential/commercial use and 1 not defined.

Unit Age	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
a. 1990 to Present	0	0	0	0	0.0%
b. Between 1978 and 1989	0	1	0	1	0.1%
c. Between 1960 and 1977	25	23	10	58	3.7%
d. Between 1946 and 1959	66	73	69	208	13.4%
e. Between 1940 and 1945	26	38	39	103	6.6%
f. 1939 or Before	367	381	420	1168	75.3%
g. Don't Know	0	4	10	14	0.9%
Totals	484	520	548	1552	100%

Action	Total Count of Units				Percent of Units
	2010	2011	2012	Total	
a. HEPA vacuuming	311	379	335	1025	66.6%
b. HEPA/Wet wash/HEPA cycle	340	299	392	1031	67.0%
c. Wet detergent wash using trisodium phosphate	72	106	193	371	24.1%
d. Wet detergent wash using a general purpose cleaner	220	345	242	807	52.5%
Any cleaning (a – d)	482	511	545	1538 ^a	100%
Cleaning (a – d) only	298	334	273	905	58.8%
e. Seal flooring	114	91	85	290	18.9%
Cleaning (a – d) and/or seal flooring only	331	361	307	999	65.0%
f. Overlay flooring	45	37	17	99	6.4%
g. Replace flooring	32	13	16	61	4.0%
Overlay or replace flooring	57	46	33	136	8.8%
Seal, overlay or replace flooring	135	120	107	362	23.5%
h. Seal windowsills	118	83	177	378	24.6%
i. Seal window troughs	77	40	27	144	9.4%
j. Install window trough liners	19	24	19	62	4.0%
Seal troughs or install liners	77	64	45	186	12.1%
k. Other – write in	24	54	63	141	9.2%
Breakdown of Other (k) Responses					
					Percent of Total
Window Replacement	13	41	13	67	47.5%
Component replacement/enclosure	0	0	2	2	1.4%
Paint Stabilization	2	0	13	15	10.6%
Wet scrape, prime painting, encapsulation and removal.	0	4	0	4	2.8%
Wet scrape, encapsulation, prime painting and door replacement.	0	0	1	1	0.7%
Soil remediation	0	0	1	1	0.7%
Cleaning – various types	4	4	13	21	14.9%
Cleaning with disposable wipes	3	0	19	22	15.6%
Encapsulation/enclosure	2	5	1	8	5.7%
All Other combined	24	54	63	141	100.0%

^a 14 units, whose **only** entry for UQ 3 was "Other" with no specific action defined, were removed from this table.

Table 10. Unit Specific Questions 4 and 5 - Number of Units Passing Clearance on 1st and 2nd Tries on Floors					
Unit Age	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
Passed clearance on 1st try	425	435	475	1335	86.0%
Failed Clearance on 1st try only	48	76	66	190	12.2%
Failed Clearance on both 1st and 2nd try	11	9	7	27	1.7%
Totals	484	520	548	1552	100%

Table 11. Unit Specific Question 6 - Actions Taken After Clearance Failure on Floors					
Unit Age	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
Actions Taken for Units Failing the 1st Try Only					
a. Re-cleaning	47	76	63	186	82.7%
b. Sealing	12	7	12	31	13.8%
c. Replacement	1	1	0	2	0.9%
d. Overlaying	0	0	1	1	0.4%
e. Other ^a	1	4	0	5	2.2%
Totals	61	88	76	225	100%
Actions Taken for Units Failing Both the 1st and 2nd Try					
a. Re-cleaning	8	8	6	22	66.7%
b. Sealing	2	1	3	6	18.2%
c. Replacement	2	0	0	2	6.1%
d. Overlaying	0	1	0	1	3.0%
e. Other ^b	0	1	1	2	6.1%
Totals	12	11	10	33	66.7%
^a Other: "HEPA vacuum" for 4 (2011) units and 1 "We think cross contamination from mops. They discarded their mops and purchased with new" for 1 (2010) unit.					
^b Other: "New carpet" for 1 (2011) unit and "scrub and wet vacuum on hardwood floor" for 1 (2012) unit.					

Category	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
No windowsill samples collected	44	32	32	108	7.0%
Passed clearance on 1st try	421	473	498	1392	89.7%
Failed Clearance on 1st try only	18	14	16	48	3.1%
Failed Clearance on both 1st and 2nd try	1	1	2	4	0.3%
Totals	484	520	548	1552	100%

Action	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
Actions Taken for Units Failing the 1st Try Only					
a. Re-cleaning	18	8	15	41	75.9%
b. Sealing	3	2	3	8	14.8%
c. Replacement	0	0	0	0	0.0%
d. Other ^a	0	5	0	5	9.3%
Totals	21	15	18	54	100%
Actions Taken for Units Failing Both the 1st and 2nd Try					
a. Re-cleaning	1	1	1	3	75.0%
b. Sealing	0	0	0	0	0.0%
c. Replacement	0	0	0	0	0.0%
d. Other ^b	0	0	1	1	25.0%
Totals	1	1	2	4	100%
^a Other: not defined for all 5 (2011) units.					
^b Other: "repainted" for 1 (2012) unit.					

Category	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
No window trough samples collected	164	196	202	562	36.2%
Passed clearance on 1st try	313	315	334	962	62.0%
Failed Clearance on 1st try only	6	9	12	27	1.7%
Failed Clearance on both 1st and 2nd try	1	0	0	1	0.1%
Totals	484	520	548	1552	100%

Action	Count of Units by Fiscal Year				
	2010	2011	2012	All Years	Fraction of Total
Actions Taken for Units Failing the 1st Try Only					
a. Re-cleaning	6	9	12	27	93.1%
b. Sealing	1	1	0	2	6.9%
c. Replacement	0	0	0	0	0.0%
d. Install trough liner	0	0	0	0	0.0%
e. Other ^a	0	0	0	0	0.0%
Totals	7	10	12	29	100%
Actions Taken for Units Failing Both the 1st and 2nd Try					
a. Re-cleaning	1	0	0	1	100.0%
b. Sealing	0	0	0	0	0.0%
c. Replacement	0	0	0	0	0.0%
d. Install trough liner	0	0	0	0	0.0%
e. Other ^b	0	0	0	0	0.0%
Totals	1	0	0	1	100%

Table 16A. Distribution of Floor Clearance Results (all units: 2 to 20 µg/ft²)																				
		Summary Data on All Grantees Combined																		
Pb level (µg/ft²)		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cumulative%		2%	2%	2%	7%	7%	7%	10%	13%	74%	75%	78%	79%	79%	81%	82%	82%	83%	84%	94%
Cumulative count		145	164	177	475	502	536	742	932	5343	5421	5589	5663	5728	5862	5910	5946	5993	6034	6810
Count		145	19	13	298	27	34	206	190	4411	78	168	74	65	134	48	36	47	41	776
Grantee	RL	Counts of Results by Grantee																		
43	2	63	4	1	4	2		1		1			1	1	1	2				
50	2	22	9	2	1	1														
51	2	4	1						1	61	1		1			1				
52	2	41	5	9	4	3	2	1	4	8	1						1			1
56	2	15			1	1			1	56	1	1			1			2		
1	5				15		3		1	1			2					1		69
5	5				27	1	2	2		3	1									
26	5				18	2			2	12			1		1				1	1
27	5				16	2	1		1	22	1			1	1			1		
45	5				28					22	1			1				1		
46	5				2		1		1	17		1		2				1		57
48	5				42		1	2		29	1		1		1					
71	5				32	1	5			27	1			2					1	
95	5				48	2	3	1	2	2					1	1			1	1
96	5			1	60	7	6	2	3	1	3	1	1		1			1		1
81	6						8		1	1		35		1			1	1		
82	6					5	2	1	3	84								1		1
2	8							47	1	11										4
7	8							56	3	1	2				2	1		1		4
8	8							23	1	5	1									
9	8							2		23				1	9					6
10	8							37	2		1	1	1	1	1	14		1	1	
12	8							31	1	1	1	2	2	1	22	2	1	1	1	
35	9								64	24	4	3	1	2	3	1	1	2	2	1
66	9								98	1	3	14	3		2	1				
3	10									100	4	1	1	2				3	2	1
4	10									39										2
11	10									35	3	1	8	4	1		1		1	
13	10									59					3					4
14	10									74		1	2	2		3			1	
15	10									72		1		3						1
16	10									99	1	2	1	1	1				2	1
17	10									63	1		3	2	2	2	3	2	2	2
18	10									74		16	2			1				
19	10									45	1				1	1	1		3	
20	10									42	7	1	3	4	2	3	1	1	1	2
21	10									77			1	3	1	1				
22	10									34	1	2							1	2
24	10									50										
25	10									69	1			1						1
28	10									31	1	48	3	3			2		1	2
29	10									20										
30	10									25										
32	10									27	3	5	1	4	3	2	1	5		2
33	10									32							1	2		1
34	10									33	1		1	2	1					1
36	10									37		1		1	4					
37	10									44	1	1		3	1	1		1	1	
38	10									53	3	1	1			1				
39	10									48						1				
40	10									23	1	1	1	1	1					
41	10									34					1					
42	10									46	1					1				
44	10									89	1	2	3					1		1
47	10									51			1			1				
49	10									56	1	2	1		2		1			
53	10									74	1			1	2				2	2
54	10									144				2	2	1			1	

Table 16A. Distribution of Floor Clearance Results (all units: 2 to 20 µg/ft²)																			
Summary Data on All Grantees Combined																			
Pb level (µg/ft²)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cumulative%	2%	2%	2%	7%	7%	7%	10%	13%	74%	75%	78%	79%	79%	81%	82%	82%	83%	84%	94%
Cumulative count	145	164	177	475	502	536	742	932	5343	5421	5589	5663	5728	5862	5910	5946	5993	6034	6810
Count	145	19	13	298	27	34	206	190	4411	78	168	74	65	134	48	36	47	41	776
Grantee	RL	Counts of Results by Grantee																	
55	10								75		1	1							
57	10								58				1			2			
58	10																2		36
60	10								97	1	1	1		1					
61	10								101	2	2			1	2	1		1	1
62	10								150	5	5	2	2	1	3	2	2	1	3
63	10								61	1	4	1			1				5
64	10								60		1	1	1	1	3	1	1	2	9
65	10								60			4							1
67	10								135						1				
68	10								141								1		
69	10								85		1				1				2
70	10								164	1	1					1			
72	10								52	2								1	
73	10								39		1	2				1	1		1
74	10								109				1				1		
75	10								65	1			1						34
76	10								42	1						2		2	
80	10								59								1		2
83	10								50		1								
84	10								38	1	1	3	1		1	1		3	
85	10								43	1				1	1				1
86	10								38		1					1		1	
87	10								31	1							1		
88	10								35		1	1		1	1	2	2		
89	10								66		2	2	2	1	2	2	1		2
90	10								69	2	1	2	1		2	2		3	1
91	10								133	2		3	2		2	2	2	3	1
92	10								110	1		1	2	3			3	1	3
93	10								9										4
94	10								24										
6	15													39					1
23	20																		59
31	20																		91
59	20																		51
77	20																		1
78	20																		77
79	20																		70
97	20																		100
98	20																		49

Yellow highlight shows data at the Reporting Limit (RL); Orange highlights show clusters of results above stated RL.

Table 16B. Distribution of Floor Clearance Results (all units: 21 to 40 µg/ft²)

		Summary Data on All Grantees Combined																			
Pb level (µg/ft²)		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Cumulative%		95%	95%	96%	96%	97%	97%	97%	97%	98%	98%	98%	98%	99%	99%	99%	99%	99%	99%	100%	100%
Cumulative count		6854	6881	6903	6932	6960	6982	7003	7021	7038	7063	7077	7094	7112	7119	7138	7145	7156	7171	7180	7211
Count		44	27	22	29	28	22	21	18	17	25	14	17	18	7	19	7	11	15	9	31
Grantee	RL	Counts of Results by Grantee																			
43	2																				
50	2																				
51	2	1													1						
52	2	1	1				1														
56	2								1												
1	5									1											
5	5	1									1										
26	5				1					1			1	1					1		1
27	5				1		1												1		
45	5																				
46	5	1																			
48	5																				
71	5							1					2						1		
95	5		1		1			1		2						1					
96	5					2							2			1					
81	6														1			1			
82	6																				
2	8																				
7	8									1							1				
8	8																				
9	8																				2
10	8	1			1			1													
12	8		1	1							1										
35	9	1			1	1	3	3	2		1		1		1				1		
66	9	2							1												
3	10	1			1			2	1								1			1	
4	10																				
11	10		1			1	1	2					1	2					1		
13	10				3					4						3					1
14	10	1					1			1	1				1	1					3
15	10			2			1			3				1							
16	10		1								1										1
17	10	1			4	2			1	2	1			1						1	
18	10						1														
19	10										1									2	3
20	10	3			1	1			1		1								1		2
21	10	2													2						
22	10		1																	1	
24	10																				
25	10										1										
28	10	1					2				1			2							
29	10																				
30	10																				
32	10	1		2		1			1	1										1	
33	10		1													1					2
34	10										1										1
36	10									1						1					
37	10					1							1			1					
38	10								1	1											
39	10	1	1			1															
40	10		2	1					1												
41	10													1							
42	10																				
44	10												1							1	
47	10																				
49	10																				
53	10			1		2					1	1				3					
54	10								1								1	1			

Table 16B. Distribution of Floor Clearance Results (all units: 21 to 40 µg/ft²)

		Summary Data on All Grantees Combined																			
Pb level (µg/ft²)		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Cumulative%		95%	95%	96%	96%	97%	97%	97%	97%	98%	98%	98%	98%	99%	99%	99%	99%	99%	99%	100%	100%
Cumulative count		6854	6881	6903	6932	6960	6982	7003	7021	7038	7063	7077	7094	7112	7119	7138	7145	7156	7171	7180	7211
Count		44	27	22	29	28	22	21	18	17	25	14	17	18	7	19	7	11	15	9	31
Grantee	RL	Counts of Results by Grantee																			
55	10					1													1		
57	10							1	1												
58	10																				
60	10																				
61	10	1			1			1			2	1	1	1	1					1	
62	10							1	1					3	1	1		1	2	1	
63	10			1			2				1							2			
64	10		1					1			1							1			
65	10												1								
67	10	1		1															1		
68	10											1									
69	10				1	1				1											
70	10	2	2			1			2												
72	10																				
73	10	1	1																		
74	10	1			1							1									
75	10		1						1		1										
76	10	1							2		1									1	
80	10																				9
83	10								1				1								
84	10		2		2																
85	10	1	1																		
86	10																				
87	10										1					1					
88	10			1		1						1									
89	10	2	1	1			1	2		1	1		1	1		1		2		1	
90	10	1				1		1						1	1			1		2	
91	10	2	1		1							1	1		1		1		1		
92	10	2		1	1	2				1	1	1	1		1		1	2			
93	10				1																
94	10																				
6	15																				
23	20	1																			
31	20		1	1			1		1	1	1	1			1	1		1		1	
59	20			2		2								2					1		
77	20	7	3	6	6	6	6	3	1	1		1	1	1		1					2
78	20	1			1																1
79	20		2				1														
97	20																				
98	20	1	1	1		1					1	1	1								

Table 17. Distribution of Windowsill Clearance Results							
Pb level (µg/ft ²)	≤ 20	21-40	41-60	61-80	81-100	101-150	151-250
Cumulative%	52.3%	86.8%	91.0%	96.2%	97.4%	98.8%	100.0%
Cumulative count	2560	4246	4453	4705	4765	4835	4893
Count	2560	1686	207	252	60	70	58
Grantee	RL	Counts of Results by Grantee					
1	5	13	1	0	37	0	0
2	8	5	9	2	0	0	0
3	10	23	57	9	3	1	0
4	10	1	31	3	0	0	0
5	5	10	15	3	0	0	0
6	15	11	7	1	1	0	1
7	8	19	17	1	0	0	0
8	8	4	6	0	0	0	0
9	8	26	20	5	0	0	0
10	8	14	4	2	0	0	0
11	10	8	14	4	1	1	3
12	8	20	12	2	0	0	0
13	10	19	33	1	0	0	0
14	10	28	7	2	0	0	1
15	10	0	65	4	0	1	3
16	10	0	67	3	0	0	2
17	10	49	18	5	2	2	3
18	10	20	15	10	5	0	0
19	10	30	1	0	0	0	0
20	10	0	27	17	1	1	4
21	10	0	70	2	0	1	4
22	10	32	3	1	1	0	0
23	20	0	51	0	1	0	0
24	10	0	47	0	0	0	0
25	10	36	10	0	0	0	1
26	5	11	16	0	0	1	2
27	5	31	9	4	1	0	1
28	10	42	15	3	5	3	0
29	10	53	0	0	0	0	0
30	10	12	23	1	0	0	0
31	20	7	3	3	62	4	3
32	10	37	5	0	0	1	0
33	10	0	34	3	0	1	1
34	10	0	25	11	1	2	0
35	9	36	20	2	1	1	2
36	10	24	9	3	0	0	0
37	10	27	5	1	4	0	1
38	10	33	8	2	2	0	0
39	10	33	5	1	1	2	0
40	10	23	2	1	0	0	0
41	10	19	1	0	0	0	0
42	10	41	4	0	0	0	0
43	2	41	3	1	0	0	2
44	10	34	6	0	0	0	0
45	5	23	1	0	0	0	0
46	5	11	29	0	0	0	0
47	10	11	5	0	0	0	0
48	5	24	10	4	1	0	0
49	10	26	5	0	0	0	0
50	2	19	0	0	0	0	0
51	2	12	18	3	1	0	2
52	2	39	5	2	0	0	1
53	10	10	20	7	2	0	0

Table 17 (cont). Distribution of Windowsill Clearance Results								
Pb level ($\mu\text{g}/\text{ft}^2$)		≤ 20	21-40	41-60	61-80	81-100	101-150	151-250
Cumulative%		52.3%	86.8%	91.0%	96.2%	97.4%	98.8%	100.0%
Cumulative count		2560	4246	4453	4705	4765	4835	4893
Count		2560	1686	207	252	60	70	58
Grantee	RL	Counts of Results by Grantee						
54	10	71	3	0	1	1	0	0
55	10	0	73	0	0	1	1	0
56	2	37	6	0	0	0	0	0
57	10	35	18	3	3	0	1	0
58	10	27	6	2	1	2	1	1
59	20	0	0	0	32	0	0	0
60	10	74	9	1	0	0	2	0
61	10	57	22	4	1	1	1	1
62	10	56	19	4	1	0	2	6
63	10	3	29	4	1	1	2	2
64	10	37	17	4	3	1	0	0
65	10	7	37	12	2	10	4	2
66	9	0	0	0	49	6	0	1
67	10	71	23	1	0	0	2	1
68	10	72	33	2	0	1	0	0
69	10	35	29	5	1	0	0	0
70	10	64	12	1	1	0	0	0
71	5	51	3	0	0	0	0	0
72	10	37	3	0	0	0	0	0
73	10	37	4	0	0	0	0	0
74	10	9	67	1	0	1	1	1
75	10	50	25	1	0	1	0	0
76	10	24	7	2	0	0	1	0
77	20	35	11	0	1	1	1	2
78	20	5	67	3	1	0	0	0
79	20	48	3	1	0	1	0	1
80	10	10	45	2	0	1	0	0
81	6	43	56	4	3	2	3	0
82	6	61	5	1	0	0	0	0
83	10	32	0	1	0	0	0	0
84	10	30	7	0	0	1	0	0
85	10	17	6	1	0	0	1	0
86	10	36	6	1	0	2	1	0
87	10	0	22	2	1	0	0	0
88	10	41	1	0	0	0	0	0
89	10	0	44	2	4	3	3	2
90	10	53	16	3	3	1	2	3
91	10	36	23	1	2	0	1	2
92	10	38	15	2	0	0	1	1
93	10	0	5	0	0	0	0	0
94	10	17	0	0	1	0	0	0
95	5	31	3	3	0	0	1	1
96	5	27	9	1	3	0	0	1
97	20	73	2	0	2	0	1	1
98	20	26	2	3	2	0	0	0

Table 18. Distribution of Window Trough Clearance Results							
Pb level (µg/ft ²)	≤ 20	21-40	41-60	61-80	81-100	101-150	151-360
Cumulative%	41.9%	82.1%	89.0%	92.0%	93.6%	97.2%	100.0%
Cumulative count	1167	2287	2481	2564	2608	2710	2787
Count	1167	1120	194	83	44	102	77
Grantee	RL	Counts of Results by Grantee					
1	5	0	0	0	0	0	0
2	8	0	0	0	0	0	0
3	10	0	0	0	0	0	0
4	10	0	0	0	0	0	0
5	5	0	0	0	0	0	0
6	15	0	7	4	1	3	3
7	8	8	1	0	0	0	0
8	8	0	0	0	0	0	0
9	8	0	1	1	0	0	0
10	8	9	1	0	0	0	1
11	10	2	6	3	4	0	2
12	8	7	5	1	0	1	0
13	10	0	50	2	0	2	0
14	10	19	8	3	0	1	0
15	10	0	54	4	1	2	5
16	10	0	67	3	3	1	2
17	10	57	18	4	3	0	0
18	10	6	4	3	0	0	1
19	10	0	1	0	0	0	0
20	10	0	17	10	1	2	1
21	10	0	63	6	3	4	1
22	10	26	11	0	1	0	2
23	20	0	50	1	0	1	1
24	10	0	44	1	0	1	0
25	10	31	12	1	1	1	0
26	5	2	1	1	0	2	0
27	5	22	7	4	0	0	1
28	10	33	13	6	1	0	5
29	10	14	0	0	0	0	0
30	10	1	0	0	0	0	0
31	20	0	0	0	0	0	0
32	10	22	8	1	0	1	0
33	10	0	0	0	0	0	0
34	10	0	0	0	0	0	0
35	9	7	14	5	4	0	2
36	10	10	11	8	2	0	0
37	10	19	8	3	3	2	0
38	10	10	13	3	2	1	1
39	10	22	10	3	1	0	1
40	10	17	6	1	1	0	0
41	10	16	2	3	0	0	0
42	10	23	9	0	1	0	0
43	2	15	0	0	1	0	1
44	10	20	13	1	0	0	0
45	5	17	5	0	0	0	1
46	5	9	27	2	0	0	0
47	10	7	7	0	0	0	0
48	5	26	7	4	0	1	0
49	10	17	10	3	1	0	0
50	2	11	3	1	0	0	0
51	2	2	7	3	0	2	0
52	2	14	3	3	2	1	0
53	10	9	18	12	0	0	0

Table 18 (cont). Distribution of Window Trough Clearance Results								
Pb level (µg/ft2)		≤ 20	21-40	41-60	61-80	81-100	101-150	151-360
Cumulative%		41.9%	82.1%	89.0%	92.0%	93.6%	97.2%	100.0%
Cumulative count		1167	2287	2481	2564	2608	2710	2787
Count		1167	1120	194	83	44	102	77
Grantee	RL	Counts of Results by Grantee						
54	10	0	0	0	0	0	0	0
55	10	0	48	0	0	0	0	0
56	2	30	7	1	1	0	0	0
57	10	36	6	0	0	1	0	0
58	10	0	0	0	0	0	0	0
59	20	0	0	0	14	0	0	1
60	10	52	20	2	7	0	0	2
61	10	46	20	7	1	1	3	2
62	10	23	25	5	1	2	2	2
63	10	0	16	10	1	0	1	2
64	10	10	4	0	0	1	2	2
65	10	0	0	0	0	0	0	0
66	9	0	0	0	0	0	45	11
67	10	12	0	2	0	0	1	1
68	10	6	1	0	0	1	0	0
69	10	17	38	2	0	0	1	1
70	10	49	19	0	0	0	0	0
71	5	38	11	3	2	0	0	0
72	10	39	3	1	0	0	0	0
73	10	35	4	2	1	0	0	1
74	10	3	77	2	0	0	0	1
75	10	24	14	2	4	3	5	0
76	10	18	13	2	0	1	0	1
77	20	33	10	2	0	0	1	2
78	20	0	48	20	5	0	2	0
79	20	9	1	1	0	0	1	0
80	10	8	39	2	0	0	0	0
81	6	24	43	3	4	0	0	0
82	6	0	0	0	0	0	0	0
83	10	0	0	0	0	0	0	0
84	10	5	0	0	0	0	0	0
85	10	0	0	0	0	0	0	0
86	10	0	0	0	0	0	0	0
87	10	0	0	0	0	0	0	0
88	10	0	0	0	0	0	0	0
89	10	0	0	0	1	0	0	0
90	10	0	0	0	0	0	0	0
91	10	25	6	6	0	2	4	2
92	10	33	7	0	3	2	2	1
93	10	0	0	0	0	0	0	1
94	10	0	0	0	0	0	0	0
95	5	8	2	1	1	0	0	0
96	5	22	10	3	0	1	1	0
97	20	20	0	0	0	0	0	0
98	20	12	6	1	0	0	0	1

Appendix A
Questionnaire Questions

Lead Clearance OMB-approved survey (OMB No. 2539-0025) - General Questions	
Question	Pick List options
<p>Question GQ1: Regarding this HUD Lead Hazard Control grant, please indicate your organization type:</p>	<p>a. The grantee b. A subgrantee c. A contractor to the grantee or a subgrantee</p>
<p>Question GQ2: Please indicate the category that best describes your organization:</p>	<p>a. State/local health department b. State/local community development, or economic development department c. State/local community buildings or housing development department d. Non-governmental organization e. Certified abatement contractor f. Certified renovation firm g. Risk assessment firm h. Other</p>
<p>Question GQ3: What triggers recruitment of homes into the grant (check all that apply)?</p>	<p>a. Abatement order from a Health Department as a result of a child with an elevated blood lead level b. Notice from a Health Department of a child with an elevated blood lead level c. Building code, housing code, or other code violation d. Combining lead hazard control work with other rehabilitation or modernization work e. Transfer of ownership or occupancy f. Lead dust levels in the home are above the lead hazard standards g. Presence of deteriorated lead-based paint in the home h. Neighborhood characteristics i. Outreach and recruiting drives. j. Other</p>
<p>Question GQ4: Please rank unit recruitment triggers by frequency with most frequent at the top of the list.</p>	
<p>Question GQ5: On how many dwelling units have you performed lead hazard control work and clearance testing in the past 12 months?</p>	
<p>Question GQ6: What is the reporting limit of your laboratory for floor lead dust wipe samples in $\mu\text{g}/\text{ft}^2$ (generally indicated by a less-than sign (<) preceding the laboratory reported result)?</p>	

Appendix A
Questionnaire Questions

Lead Clearance OMB-approved survey (OMB No. 2539-0025) - Unit Specific Questions	
Question	Pick List options
<p>Question UQ1: Please identify the type of dwelling (check one):</p>	<ul style="list-style-type: none"> a. Detached Single Family House b. Duplex/Triplex c. Row House/Town House d. Low Rise Apartment (1-3 Floors) e. High Rise Apartment (>3 Floors) f. Mobile/Manufactured Home g. Other
<p>Question UQ2: Please identify the construction date of this unit (check one):</p>	<ul style="list-style-type: none"> a. 1990 to Present b. Between 1978 and 1989 c. Between 1960 and 1977 d. Between 1946 and 1959 e. Between 1940 and 1945 f. 1939 or Before g. Don't Know
<p>Question UQ 3: What actions were taken in this unit to prepare for the final clearance testing after the lead hazard control work was completed (check all that apply)?</p>	<ul style="list-style-type: none"> a. HEPA vacuuming b. HEPA/Wet wash/HEPA cycle c. Wet detergent wash using trisodium phosphate d. Wet detergent wash using a general purpose cleaner e. Seal flooring f. Overlay flooring g. Replace flooring h. Seal windowsills i. Seal window troughs j. Install window trough liners k. Other
<p>Question UQ 4: Did this unit pass clearance on floors on the FIRST TRY?</p>	
<p>Question UQ 5: Did this unit pass clearance on floors on the SECOND TRY?</p>	
<p>Question UQ 6: Please identify the type of action taken to achieve clearance on floors in this unit AFTER ONE OR MORE CLEARANCE FAILURES (check all that apply)</p>	<ul style="list-style-type: none"> a. Re-cleaning b. Sealing c. Replacement d. Overlaying e. Other
<p>Question UQ 7: (Excluding blanks) How many FINAL floor dust wipe clearance samples were collected in this unit ("FINAL" means those passing clearance levels, not those failing to pass clearance)?</p>	
<p>Question UQ 8: Please enter the lead LOADING levels ($\mu\text{g}/\text{ft}^2$) for each of the FINAL floor dust wipe clearance samples:</p>	
<p>Question UQ 9a Did you collect FINAL clearance samples for WINDOWSILLS in this unit?</p> <p>Question UQ 9b Did this unit pass clearance on windowsills on the FIRST TRY?</p>	
<p>Question UQ 10 Did this unit pass clearance on windowsills on the SECOND TRY?</p>	

Appendix A
Questionnaire Questions

Lead Clearance OMB-approved survey (OMB No. 2539-0025) - Unit Specific Questions	
Question	Pick List options
<p>Question UQ11 Please identify the type of action taken to achieve clearance on windowsills in this unit AFTER ONE OR MORE CLEARANCE FAILURES (check all that apply):</p>	<p>a. Re-cleaning b. Sealing c. Replacement d. Other</p>
<p>Question UQ12 (Excluding blanks) How many FINAL windowsill dust wipe clearance samples were collected in this unit ("FINAL" means those passing clearance levels, not those failing to pass clearance)?</p>	
<p>Question UQ13 Please enter the lead LOADING levels ($\mu\text{g}/\text{ft}^2$) for each of the FINAL windowsill dust wipe clearance samples:</p>	
<p>Question UQ14 Did you collect FINAL clearance samples for WINDOW TROUGHS in this unit? Question (14b) Did this unit pass clearance on window troughs on the FIRST TRY?</p>	
<p>Question UQ15 Did this unit pass clearance on window troughs on the SECOND TRY?</p>	
<p>Question UQ16 Please identify the type of action taken to achieve clearance on window troughs in this unit AFTER ONE OR MORE CLEARANCE FAILURES (check all that apply):</p>	<p>a. Re-cleaning b. Sealing c. Replacement d. Install trough liner e. Other</p>
<p>Question UQ17 (Excluding blanks) How many FINAL window trough dust wipe clearance samples were collected in this unit ("FINAL" means those passing clearance levels, not those failing to pass clearance)?</p>	
<p>Question UQ18 Please enter the lead LOADING levels ($\mu\text{g}/\text{ft}^2$) for each of the FINAL window trough dust wipe clearance samples:</p>	

Appendix B Investigation of Unusually Low Reporting Limits

Introduction

Data on the lab's reporting limit (RL) for floor dust samples (in $\mu\text{g}/\text{ft}^2$) was collected in GQ6 of the general questions section of the questionnaire. In addition, the questionnaire was programmed to require completion of the general questions before answering any unit specific questions. The primary reason for this was to be able to disallow any floor dust sample entries less than the lab's RL. This quality control check was limited to floor samples and not applied to window samples because the general floor sampling guidance is to conduct a 1 ft^2 sample on floors but not windows (sampling areas on window sills and troughs vary based on the size of the window). If the grantee tried to enter a floor result less than the RL, a pop-up window was displayed explaining why the entry was invalid and that entries less than the RL could only be made by going back to general question 6 and changing the RL.

During the development of the questionnaire, it was recognized that some grantees could experience a change in RL between some of their units. For example, a change in method or a change in laboratory can result in a change in the RL. In addition, the National Lead Laboratory Accreditation Program (NLLAP) requires that method detection limits (MDL) be determined on a quarterly basis and a change in the RL, which is based on the MDL, could be an outcome of those determinations. However, it was believed that many grantees would have difficulty correctly reporting the RL, so that requiring them to provide a separate RL for each unit in the questionnaire would be overly burdensome. This belief was based on issues raised during pilot testing of the questionnaire which led to the inclusion of an example lab report (within the questionnaire) to illustrate what should be reported as the RL.

Unusually Low Reporting Limits

We expected to see RLs ranging from about 6 to 20 $\mu\text{g}/\text{ft}^2$. This was based on a general understanding of the costs of analysis and the maximum allowed reporting limit as defined under EPA's National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements (LQSR), Revision 3.0, July 05, 2007. According to the LQSR, "...the laboratory shall demonstrate it can achieve a quantitation limit equal to or less than ... 50 % of the lowest action level for dust wipe samples". This means that the maximum value of the RL can be no larger than 20 $\mu\text{g}/\text{ft}^2$. The lower end of 6 $\mu\text{g}/\text{ft}^2$ was as an estimate based on the most commonly used instrumental detection methods for lead analysis in dust wipe samples, which are Flame Atomic Absorption Spectroscopy and Inductively Coupled Plasma Atomic Emission Spectroscopy. Using the assumption that the RL is 2 times the MDL, these methods typically generate RLs of 6 or larger. However, these values are generalities and instrumental settings can be optimized to produce better MDLs. In addition, the methods used to dissolve the samples for instrumental analysis have a significant impact on the MDL. Also, the assumption that the RL is 2 times the MDL is not a requirement and laboratories are generally free to use any multiplier they wish to convert an MDL to an RL.

Seventeen of the 98 grantees reported RLs less than 6 $\mu\text{g}/\text{ft}^2$. Each was sent an email requesting clarification and a copy of a lab report showing the data from at least one unit having floor lead dust clearance levels at the reported RL. The results were as follows:

- (a) **9 grantees originally reported a RL of 5.** The reported RL was confirmed for 7 of the 9. The actual RL was 10 for 2 of the grantees. For one, the lowest reported result for any unit in the dataset was 10. Therefore, the RL was changed for this grantee from 5 to 10 to be consistent with the rest of the data. For the other grantee, thirty-eight (38) results (multiple units involved) were below the actual RL of 10. The lab report sent by this grantee indicated that a 2 ft^2 sampling area

Appendix B Investigation of Unusually Low Reporting Limits

was used for some floor samples. Based on this finding, the RL was not changed from the originally reported RL of 5, consistent with the collection of larger sample areas.

- (b) **1 grantee originally reported a RL of 3.** The reported RL was confirmed by this grantee. However data indicated that only 1 unit out of 20 had any floor clearance values reported below 5 (4 samples at <3 and 1 sample at <4. These 5 samples were changed to 5 to be consistent with the data reported for the other 19 units.
- (c) **5 grantees originally reported a RL of 2.** The reported RL was confirmed by 4 out of the 5 grantees. The fifth did not respond to the request for supporting data. However, this grantee was from the same state as two of the others reporting a RL of 2 and those two used the same laboratory. It is likely that this non-responsive grantee also used that same laboratory and that the RL of 2 is valid.
- (d) **2 grantees originally reported a RL of 1.** The reported RL was not confirmed for either of these two grantees. For one, the lab report indicated a RL of 10. However, this report also showed data lower than 10 going down to as low as their quoted MDL and it appeared that in this report the laboratory failed to abide by their stated RL of 10. A total of 10 floor lead clearance values among 6 out of 20 units in the dataset had values under the RL of 10. The RL was changed from 1 to 10 and the 10 values below 10 were changed to 10 consistent with the laboratory report examined for this grantee. For the other grantee, the laboratory report indicated that the RL was 3 not 1 for one unit. However, the lowest reported floor clearance value for all the other 13 units in the dataset was 5 suggesting a RL of 5 in all but one of 14 total units. The RL for this grantee was changed to 5 and 4 values at <3 and 1 value at <1 for the one unit were changed to 5 to be consistent with the data reported for the other 13 units.