ATTACHMENTS

FLOOR PLAN/DIAGRAM

RISK ASSESSMENT FORMS

XRF DATA SHEETS & PHOTO LOG

LAB RESULTS

METHODOLOGY

XRF INSPECTION METHODOLOGY

According to HUD/EPA/NCHHCU Guidelines, lead in quantities equal to and greater than 1.0 mg/cm^2 must be present to be considered a lead-based paint. However, detectable lead in quantities less than 1.0 mg/cm^2 may contribute to the development of lead dust hazards even though it is not a lead-based paint hazard according to the HUD/EPA/NCHHCU definition of a lead-based paint**.**

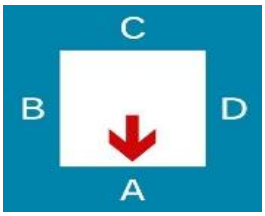
The XRF inspection portion of the risk assessment was accomplished through the measurement of the concentration of lead in paint on any surface determined to have deteriorated paint, be impacted by future renovation activities, and friction surfaces within each room equivalent on both inside the residence and on the exterior surfaces of the residence using an XRF. Determination of paint condition is described below. Only accessible painted and/or varnished surfaces meeting the mentioned criteria were tested using the direct read spectrum analyzer. The inspection was conducted following EPA's work practice standards for conducting lead-based paint activities (40 CFR 745.227), the U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (Guidelines) with the June 2012 revisions, and all State and local regulations except that a different visible color shall, by itself, result in a separate testing combination for a room equivalent. Samples are taken to represent component types; therefore, it should be assumed that similar component types in the rest of that room or room equivalent also contain lead-based paint. The same is true for negative readings. In addition, all requirements on XRF usage contained in the Performance Characteristics Sheet for the specific XRF being used were followed.

VIKEN DETECTION PB200I LEAD ANALYZER

The sampling strategy adheres to the EPA Performance Characteristic Sheet for the XRF instrument used, as well as the manufacturer's modifications and recommendations. The XRF used for detection of lead-based paint is the Viken Detection Analyzer. It was manufactured by Viken Detection, headquartered at 21 North Avenue in Burlington, MA, 01803.

Samples may be classified as POS (Positive), NEG (Negative), or NULL (Incomplete). Positive results indicate lead in quantities equal to or greater than 1.0 mg/cm2 and are considered lead-based paint. Negative results indicate lead in quantities less than 1.0 mg/cm2 and are not considered lead-based paint. However, detectable lead quantities less than 1.0 mg/cm2 may lead to the development of lead dust hazards even though it is not a lead-based paint according to the HUD/EPA standard. Incomplete/Null results should be ignored as insufficient data was collected by the XRF during the sample time to determine if the sample is positive or negative (i.e. the instrument slipped or was removed prematurely, terminating the test).

When standing in any four-sided room facing side A, which coincides with the front of the dwelling, side B will be to the right, side C will be to the rear, and side D will be to the left (clockwise from side A).



RISK ASSESSMENT METHODOLOGY

The lead-based paint risk assessment was performed to determine if the lead-based paint present in the residence presents an immediate hazard. This was accomplished through combining measurements of lead in dust, lead in soil, XRF paint analysis, visual assessment of the residence, assessment of paint condition, and by collecting occupant use information to identify and address lead-based paint hazards.

The risk assessment was performed in accordance with the EPA's work practice standards for conducting lead-based paint activities (40 CFR 745.227), and the U.S. Department of Housing and Urban Development (HUD) Chapter 5, Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (Guidelines) with the 2012 revisions.

DESCRIPTION OF PAINT CONDITION HAZARD RANKINGS

The paint condition is placed into one of two categories using the risk assessor's professional judgement. These categories are: intact and deteriorated. Based on the approximate surface area of deteriorated paint, the risk assessor then assesses the paint condition as intact or deteriorated.

Hazard ranking protocol was assessed following the HUD Guidelines for Evaluation and Control of Lead-Based Paint Hazards in Housing, dated June 2012. This information is summarized below.

Type of Building Component[1]	Total Area of Deteriorated Paint on Each Component	
	Intact[1]	**Deteriorated**[2]
Interior/ Exterior building components	Entire surface area is intact	Entire surface area is **NOT** intact
Interior components with large surface area	Entire surface area is intact	Entire surface area is **NOT** intact
Interior and exterior components w/ small surface areas	Entire surface area is intact	Entire surface area is **NOT** intact

Notes:
1. Indicates each individual building component or side of the building, not the combined surface area of similar components in a room.

2. Indicates surfaces in deteriorated condition are considered to be lead-based paint hazards as defined by Title X and should be addressed through abatement or interim controls which are described in the recommendations in this report.

DUST WIPE SAMPLE METHODOLOGY

Dust wipe samples were collected from single surfaces throughout the residence to identify lead dust hazards. Lead dust hazards can be created from deteriorated lead-based paint on the interior and exterior of the residence, specifically from friction and impact surfaces. Lead dust generated from surfaces on the exterior of the residence can also be tracked inside the residence. These samples were collected from areas where children are most likely to be exposed to dust that may present a lead hazard. Samples from the residence were collected from floors and windowsills/ stools/ troughs throughout the residence.

The EPA has established lead hazard standards for lead in dust under TSCA Section 403 (Residential Lead Hazards). The following level of lead in dust should be considered hazardous and may result in excessive lead exposure and elevated blood lead levels:

10 micrograms per square foot (µg/ft2) for floors, including carpeted floors
100 µg/ft2 for interior windowsills/window stools
400 µg/ft2 for interior window troughs (clearance only)

SOIL SAMPLE METHODOLOGY

Soil samples were collected and analyzed to determine the concentration of lead in composite soil samples. The soil samples were collected from areas of bare soil on the property. Each composited soil sample consisted of multiple sub-samples collected over the entire area of bare soil. Soil samples were analyzed by an accredited analytical laboratory and subsequently reported to EI.

The EPA has established lead hazard standards for lead in soil under TSCA Section 403 (Residential Lead Hazards). The following level of lead in soil should be considered hazardous and may result in excessive lead exposure and elevated blood lead levels:

- 400 milligrams per kilogram (mg/Kg) in children's play areas with bare residential soil (e.g., sandboxes, gardens)
- 1,200 mg/Kg (average) in bare soil for the remainder of the yard

LABORATORY ANALYSIS

Samples were shipped to an accredited laboratory via chain of custody protocol. Laboratory analysis of dust wipes samples and soil samples were performed by an EPA NLLAP (National Lead Laboratory Accreditation Program) approved laboratory. Laboratory analysis of the dust wipe samples, and soil samples was performed based on the EPA SW846-7420/ HUD – Flame Atomic Absorption Method.

LEAD HAZARD CONTROL OPTIONS

Under HUD Guidelines, there are a range of lead hazard control methods that maybe implemented at the property. It is only the responsibility of the Lead-Based Paint Risk Assessor, and The EI Group, Inc. to provide these recommended lead hazard control options. These control measures range from various interim controls (e.g., specialized cleaning, minor wet scraping, and repainting) to abatement measures (e.g., building component replacement, enclosure, and paint removal) that may not, for such reasons as funding limitations, be conducted for some time. EI has endeavored to provide information that will assist the rehabilitating organization and the homeowner in making an informed decision on this complex issue. Ultimately, the rehabilitation program and the homeowner must make the final decision.

HUD AND EPA DEFINED LEAD HAZARD CONTROL METHODS

Abatement: A measure or set of measures designed to permanently eliminate lead-based paint hazards or lead-based paint. Abatement strategies include the removal of lead-based paint, enclosure, encapsulation, replacement of building components coated with lead-based paint, removal of lead-contaminated dust, and removal of lead-contaminated soil or overlaying of soil with a durable covering such as asphalt (grass and sod are considered interim control measures). All of these strategies require preparation; cleanup; waste disposal; post-abatement clearance testing; recordkeeping; and, if applicable, monitoring. (For full EPA definition, see 40 CFR 745.223).

Cleaning: The process of using a vacuum and wet cleaning agent(s) to remove leaded dust; the process includes the removal of bulk debris from the work area.

Dust removal: A form of interim control that involves initial cleaning followed by periodic monitoring and recleaning, as needed. Depending on the severity of lead-based paint hazards, dust removal may be the primary activity or just one element of a broader control effort.

Encapsulation: Any covering or coating that acts as a barrier between lead-based paint and the environment, the durability of which relies on adhesion and the integrity of the existing bonds between multiple layers of paint and between the paint and the substrate. See, also, Enclosure.

Enclosure: The use of rigid, durable construction materials that are mechanically fastened to the substrate to act as a barrier between the lead-based paint and the environment.

Friction surface: Any interior or exterior surface, such as a window or stair tread, subject to abrasion or friction.

High Efficiency Particulate Air (HEPA) filter: A filter capable of removing particles of 0.3 microns or larger from air at 99.97 percent or greater efficiency.

Impact surface: An interior or exterior surface (such as surfaces on doors) subject to damage by repeated impact or contact.

Interim controls: A set of measures designed to temporarily reduce human exposure or possible exposure to lead-based paint hazards. Such measures include, but are not limited to, specialized cleaning, repairs, maintenance, painting, temporary containment, and the establishment and operation of management and

resident education programs. Monitoring, conducted by owners, and reevaluations, conducted by professionals, are integral elements of interim control. Interim controls include dust removal; paint film stabilization; treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; and land use controls. Interim controls that disturb painted surfaces are renovation activities under EPA's Renovation, Repair and Painting Rule.

Lead-based paint hazard control: Activities intended to control and eliminate lead-based paint hazards, including but not limited to interim controls and abatement.

Lead-specific detergent: A cleaning agent manufactured specifically for cleaning and removing leaded dust or other lead contamination.

Maintenance: In the context of lead hazard control, work intended to maintain adequate living or occupancy conditions in target housing or a pre-1978 child-occupied facility; it may have the potential to disturb known or presumed lead-based paint.

Paint stabilization: The process of wet scraping, priming, and repainting surfaces coated with deteriorated lead-based paint. Paint stabilization also includes eliminating the cause(s) of paint deterioration, cleanup and clearance.

Paint removal: The removal of lead-based paint from surfaces; this may be an abatement strategy, or it may occur as a part of a renovation project.

Replacement: A strategy of abatement that involves the removal of building components coated with lead-based paint (such as windows, doors, and trim) and the installation of new components free of lead-based paint.

Treatment: A method designed to control lead-based paint hazards. Treatment includes interim controls, abatement, and removal.

Trisodium phosphate (TSP) detergent: A detergent that contains trisodium phosphate. These guidelines do not recommend using TSP.

Useful life: The life expectancy of a coating before it requires refinishing or some other form of maintenance.

Vacuum/wet cleaning/vacuum cycle: The cleaning cycle that begins with HEPA vacuuming, followed by a wet cleaning with a detergent, followed by a final pass with a HEPA vacuum over the surface.

DEFINITIONS

Lead-Based Paint: Paint that contains 1.0 milligram per centimeter square (mg/cm^2) of lead or greater. Also measured as greater than 0.5 percent lead or has 5,000 parts per million (ppm) lead by dry weight.

Lead-Based Paint Hazards: Housing conditions that cause human exposure to unsafe levels of lead from paint. These conditions include deteriorated lead-based paint; friction, impact or chewable painted surfaces; lead-contaminated dust; or lead-contaminated soil.

LEAD HAZARD EVALUATION

Paint Testing: Testing of specific surfaces, by XRF (x-ray fluorescence) or lab analysis, to determine the lead content of these surfaces, performed by a certified lead-based paint inspector or certified lead-based paint risk assessor.

Risk Assessment: A comprehensive evaluation for lead-based paint hazards that includes paint testing, dust and soil sampling, and a visual evaluation. The risk assessment report identifies lead hazards and appropriate lead hazard reduction methods. A certified lead-based paint risk assessor must conduct the assessment.

Lead Hazard Screen: A limited risk assessment activity that can be performed instead of a risk assessment in units that meet certain criteria (e.g. good condition). The screen must be performed by a certified lead-based paint risk assessor. If the unit fails the lead hazard screen, a full risk assessment must be performed.

Clearance Examination: Clearance is performed after hazard reduction, rehabilitation or maintenance activities to determine if a unit is safe for occupancy. It involves a visual assessment, analysis of dust and soil samples, and preparation of report. A certified lead-based paint risk assessor, lead-based paint inspector, or clearance technician (independent from entity/individual conducting paint stabilization or hazard reduction) conducts clearance.

LEAD HAZARD REDUCTION

Paint Film Stabilization: An interim control method that stabilizes painted surfaces and addressed the underlying cause of deterioration. Steps include repairing defective surfaces, removing loose paint and applying new paint.

Interim Controls: Set of measures to temporarily control lead-based paint hazards. Interim control methods must be completed by qualified workers using safe work practices. Follow-up monitoring is needed.

Standard Treatments: A complete set of interim control methods that when used together temporarily control all potential lead hazards in a unit. Because they address all conditions, a risk assessment or

other evaluation is not needed. Standard treatments must be completed by qualified workers using safe work practices. As with interim controls, follow-up monitoring is needed.

Abatement: Measures to permanently control (i.e. 20 years or more) lead-based paint or lead-based paint hazards.

LBP – KEY UNITS OF MEASUREMENT

µg (microgram): A Microgram is $1/1000^{th}$ of a milligram (or one millionth of a gram). To put this unit into perspective, penny weighs 2 grams. To get a microgram, you would need to divide the penny into 2 million pieces. A microgram is one of those two million pieces.

ft^2 (Square Foot): One square foot is equal to an area that has a length of one foot (12 inches) and a width of one foot (12 inches).

µg/dL: Micrograms per deciliter is used to measure the level of lead in children's blood to establish whether intervention is needed. A deciliter ($1/10^{th}$ of liter) is a little less than half a cup. As noted above, a microgram is the same weight as one penny divided into two million parts.

mg/cm^2: Milligrams per square centimeter, used for measuring lead in finished surfaces by XRF machines.

Percent (%): Percent by dry weight, a unit of measuring lead in finished surfaces via paint chip sample analysis.

ppm: Parts per million, by weight, equivalent to µg/gram (10,000 ppm = 1 percent). Used to measure lead content in paint and soil.

LEAD-BASED PAINT STANDARDS

Definition of Lead-Based Paint – Paint or surface coating that contains at least:

- 1 milligram per centimeters square (mg/cm^2) of lead;
- 0.5 percent lead; or
- 5,000 parts per million (ppm) lead by dry weight.

DUST – THRESHOLDS FOR LEAD-CONTAMINATION (RISK ASSESSMENT/CLEARANCE)

- Floors: 10 $\mu g/ft^2$ (Risk Assessment), 40 $\mu g/ft^2$ (Clearance Only)
- Porch Floors (Clearance Only): 40 $\mu g/ft^2$
- Interior Windowsills: 100 $\mu g/ft^2$ (Risk Assessment), 250 $\mu g/ft^2$ (Clearance Only)
- Window Troughs (Clearance Only): 400 $\mu g/ft^2$

SOIL – THRESHOLDS FOR SOIL CONTAMINATION

- Play areas used by children under age 6: 400 mg/Kg
- Average for other sampled areas:1,200 mg/K

LEAD-BASED PAINT ACTIVITY SUMMARY

XRF ANALYZER PERFORMANCE CHARACTERISTICS SHEET

Performance Characteristic Sheet

6. EFFECTIVE DATE: December 1, 2015

MANUFACTURER AND MODEL:

Make: ***Heuresis***
Models: ***Model Pb200i***
Source: ***^{57}Co, 5 mCi (nominal – new source)***

FIELD OPERATION GUIDANCE

7. **OPERATING PARAMETERS**:

Action Level mode

8. **XRF CALIBRATION CHECK LIMITS**:

0.8 to 1.2 mg/cm^2 (inclusive)

SUBSTRATE CORRECTION:

Not applicable

9. INCONCLUSIVE RANGE OR THRESHOLD:

ACTION LEVEL MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick Concrete Drywall Metal Plaster Wood	1.0 1.0 1.0 1.0 1.0 1.0

HEURESIS PCS December 2015

BACKGROUND INFORMATION

10. EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated using test results on building components in the HUD archive. Testing was conducted on 146 test samples in November 2015, with two separate instruments running software version 2.1-2 in Action Level test mode. The actual source strength of each instrument on the day of testing was approximately 2.0 mCi; source ages were approximately one year.

11. OPERATING PARAMETERS

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

12. XRF CALIBRATION CHECK:

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If the average (rounded to 1 decimal place) of three readings is outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instrument into control before XRF testing proceeds.

13. SUBSTRATE CORRECTION VALUE COMPUTATION:

Chapter 7 of the HUD Guidelines provides guidance on correcting XRF results for substrate bias. Supplemental guidance for using the paint film nearest 1.0 mg/cm^2 for substrate correction is provided:

XRF results are corrected for substrate bias by subtracting from each XRF result a correction value determined separately in each house for single-family housing or in each development for multifamily housing, for each substrate. The correction value is an average of XRF readings taken over the NIST SRM paint film nearest to 1.0 mg/cm^2 at test locations that have been scraped bare of their paint covering. Compute the correction values as follows:

Using the same XRF instrument, take three readings on a bare substrate area covered with the NIST SRM paint film nearest 1 mg/cm^2. Repeat this procedure by taking three more readings on a second bare substrate area of the same substrate covered with the NIST SRM.

Compute the correction value for each substrate type where XRF readings indicate substrate correction is needed by computing the average of all six readings as shown below.

For each substrate type (the 1.02 mg/cm^2 NIST SRM is shown in this example; use the actual lead loading of the NIST SRM used for substrate correction):

Correction value = (1st + 2nd + 3rd + 4th + 5th + 6th *Reading*)/6 - 1.02 mg/cm^2

Repeat this procedure for each substrate requiring substrate correction in the house or housing development.

14. EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing.

Conduct XRF re-testing at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family and multi-family housing, a result is defined as a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and the retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF readings.

Compute the average of all ten re-test XRF readings.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

15. TESTING TIMES:

In the Action Level paint test mode, the instrument takes the longest time to complete readings close to the Federal standard of 1.0 mg/cm^2. The table below shows the mean and standard deviation of actual reading times by reading level for paint samples during the November 2015 archive testing. The tested instruments reported readings to one decimal place. No significant differences in reading times by substrate were observed. These times apply only to instruments with the same source strength as those tested (2.0 mCi). Instruments with stronger sources will have shorter reading times and those with weaker sources, longer reading times, than those in the table.

Mean and Standard Deviation of Reading Times in Action Level Mode by Reading Level		
Reading (mg/cm^2)	**Mean Reading Time (seconds)**	**Standard Deviation (seconds)**
< 0.7	3.48	0.47
0.7	7.29	1.92
0.8	13.95	1.78
0.9 – 1.2	15.25	0.66
1.3 – 1.4	6.08	2.50
> 1.5	3.32	0.05

16. CLASSIFICATION OF RESULTS:

XRF results are classified as **positive** if they are **greater than or equal** to the stated threshold for the instrument (1.0 mg/cm^2), and *negative* if they are *less than* the threshold.

17. DOCUMENTATION:

A report titled *Methodology for XRF Performance Characteristic Sheets* (EPA 747-R-95-008) provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. The report may be downloaded at http://www2.epa.gov/lead/methodology-xrf-performance-characteristic-sheets-epa-747-r-95- 008-september-1997.

This XRF Performance Characteristic Sheet (PCS) was developed by QuanTech, Inc., under a contract with the XRF manufacturer.

CERTIFICATIONS AND LICENSURE