# SECTION 1

# SUMMARY

This report is a combined Lead-Based Paint Inspection and Risk Assessment Report for the single-family residential property located at 1705 Read Avenue in Chattanooga, Tennessee. The owners of record for this property are also the occupants, Terry and Vanessa Kimbrough. A complete paint inspection and environmental sampling was conducted on November 24th, 2010 in anticipation of a rehabilitation project that may involve a partnership agreement with the Tennessee Lead Elimination Action Program (TNLEAP). TNLEAP is funded by HUD and administered by Middle Tennessee State University (MTSU).

This report documents technical data generated by a portable XRF paint analyzer, laboratory analysis of individual dust wipes and composite soil samples, a visual inspection of the property, and findings of interviews and supplemental research. John R. Fullerton, a temporary employee of TNLEAP, performed the paint inspection/risk assessment, and is the author of this report. All pertinent training and licensing certificates are included in Appendix A.

The structure is a two-story, wood framed, single family residence that was constructed in 1906. The subject house has approximately 1,815 square feet of living space that includes three Bedrooms, two Bathrooms, a combination Kitchen and Laundry Area, a Dining Room, and a large Living Room. Modifications to the original home, including the application of vinyl siding to the exterior walls, the wrapping of the roof overhang components with aluminum and vinyl, the replacement of the original wood windows with aluminum mill finish windows, the addition of the rear porch and ramp, and the general remodeling of the house during a 1998 rehabilitation by Chattanooga Neighborhood Enterprises, may preclude the property's consideration for historical register eligibility. A simplified plan of the room arrangement is included in Appendix B. The house was occupied by the owners of record at the time of the inspection, and appeared to be in good structural condition.

Lead-based paint in deteriorated condition was detected on several exterior painted components, including the Front Porch posts and the front door transom and frame. At the interior, several interior doors and their associated trim, several lower level baseboards, trim and railings at the stairway between levels, and several cased openings tested positive for Lead Based Paint via XRF examination, and have varying degrees of paint deterioration.

Dust wipe sampling was conducted at floor, window trough and window sill locations in the Living Room, Bedroom One, Bedroom Two, Bedroom Three and the Kitchen. Additionally, floor (only) samples were taken at the Front Porch, the Rear Deck, the Lower Level Entry Foyer, and the Upper Level Foyer. Laboratory analysis of these samples indicated hazardous lead dust levels at the window troughs in the Living Room, the Kitchen, Bedroom One, Bedroom Two, and Bedroom Three, as well as the concrete floor at the Front Porch.

Composite soil samples were taken from the drip lines at each side of the house (front, rear, left side and right side), from the makeshift parking area at the rear yard, as well as a composite sample that included the front and both side open yard areas. Laboratory analysis of these samples indicated hazardous lead levels within all four of the drip line composite samples, as well as the bare yard composite sample from the front and both side open yard areas.

A listing of all identified hazards, and a discussion of potential remedies, can be found in Sections Five and Six of this Risk Assessment Report. The findings of the visual inspection are documented on the forms in Appendix C.

Seven interior rooms, the front porch, plus the exterior drip line and bare yard soils, will receive some degree of work during this rehabilitation to remove deteriorated Lead Based Paint, primarily at the Front Porch posts, the front door transom and frame, several interior doors and their associated trim, several lower level baseboards, the trim and railings at the stairway between levels, and several cased openings throughout the house.

At the conclusion of any lead-based paint hazard reduction work for which a contractor receives compensation, clearance testing shall be required to measure the effectiveness of the hazard control work and clean-up effort.

| | |
|---|---|
| Testing Methodology: | Each accessible painted surface with a distinct painting history was tested using a Niton XLp 303A X-Ray Fluorescence (XRF) Spectrum Analyzer, serial number 7070. The assay date for the cadmium source is 02/15/08. The inspection resulted in 261 unique testing locations (excluding XRF calibration readings). Six composite soil samples and twenty dust wipe samples were collected for laboratory analysis (including a laboratory 'blank' labeled "Hallway Floor", sample #16). The paint testing was accomplished in accordance with the manufacturer's recommendations and the parameters listed in the EPA Performance Characteristic Sheet for the Niton XLp 303A. Samples were collected using protocols prescribed by HUD, EPA, and the American Society for Testing and Materials. When lead-based paint was detected on friction or impact surfaces, dust wipe samples were collected on horizontal surfaces at or near those locations. Details are documented on forms that are included in Appendix C. |
| Laboratory ID: | EMSL Analytical Inc.<br>3 Cooper Street<br>Westmont, NJ 08108<br>Accreditation for Environmental Lead in Soil and Dust<br>Lab ID# 100194<br>Telephone: (856) 858-4800 |
| Threshold Clearance Standards for Dust: | 40 micrograms per square foot on floors<br>250 micrograms per square foot on interior sills<br>400 micrograms per square foot on window troughs |
| Threshold Clearance Standards for Soil: | 400 parts per million in child's play area<br>(TNLEAP also recognizes Drip Line areas as a child play area)<br>1200 parts per million outside of child's play area |

# SECTION 4

# INSPECTION TESTING RESULTS

The following pages in this section contain comprehensive results from the XRF testing, a separate listing of all positive XRF results (only), and the laboratory analysis reports for the composite soil samples and individual dust wipes taken during the site visit.

Each line in the XRF table represents a unique test and is identified to a specific location. Any test that identified lead paint (a concentration of 1.0mg/cm2 or greater) is highlighted in **bold print** and is labeled "Positive" in the result column.

Dust wipe sampling was conducted at floor, window trough and window sill locations in the Living Room, Bedroom One, Bedroom Two, Bedroom Three and the Kitchen. Additionally, floor (only) samples were taken at the Front Porch, the Rear Deck, the Lower Level Entry Foyer, and the Upper Level Foyer. Laboratory analysis of these samples indicated hazardous lead dust levels at the window troughs in the Living Room, the Kitchen, Bedroom One, Bedroom Two, and Bedroom Three, as well as the concrete floor at the Front Porch.

Composite soil samples were taken from the drip lines at each side of the house (front, rear, left side and right side), from the makeshift parking area at the rear yard, as well as a composite sample that included the front and both side open yard areas. Laboratory analysis of these samples indicated hazardous lead levels within all four of the drip line composite samples, as well as the bare yard composite sample from the front and both side open yard areas.

The location descriptions on the laboratory chain of custody form match the room nomenclature on the floor plan sketches that can be found in Appendix B.

**Soil Sample Results from EMSL Analytical Inc. – Collected on-site November 24th, 2010**
**1705 Read Avenue, Chattanooga, TN**

EMSL Analytical, Inc.
3 Cooper St., Westmont, NJ 08108
Phone: (856) 858-4800 Fax: (856) 858-4571 Email: westmontlabs@emsl.com

Attn: **Faye Ralston**
**Middle Tennessee State University**
**TN Lead Elimination Action Program**
**1500 Greenland Drive**
**Murfreesboro, TN 37132**

Fax: (615) 898-5597 Phone: (615) 898-5166

Project: **RA: Kimbrough Residence, 1705 Read Avenue, Chattanooga, TN 37408**

Customer ID: MTSU25
Customer PO: P0011640
Received: 11/29/10 10:04 AM
EMSL Order: 201016535

EMSL Proj:

## Test Report: Lead in Soils by Flame AAS (SW 846 3050B*/7000B)

| Client Sample Description | Lab ID | Analyzed | Inst. Result | Lead Concentration |
|---|---|---|---|---|
| #1s<br>Collected: 11/24/2010<br>Site: High Side Drip / Veg. Garden (Comp) | 0001 | 11/30/2010 | 1500 µg/g | 1500 mg/Kg |
| #2s<br>Collected: 11/24/2010<br>Site: Left Side Drip / Veg. Garden (Comp) | 0002 | 11/30/2010 | 2000 µg/g | 2000 mg/Kg |
| #3s<br>Collected: 11/24/2010<br>Site: Rear Drip / Veg. Garden (Comp) | 0003 | 11/30/2010 | 1900 µg/g | 1900 mg/Kg |
| #4s<br>Collected: 11/24/2010<br>Site: Front Drip / Planting Area (Comp) | 0004 | 11/30/2010 | 8200 µg/g | 8200 mg/Kg |
| #5s<br>Collected: 11/24/2010<br>Site: Bare Yard - Rear Parking (Comp) | 0005 | 11/30/2010 | 540 µg/g | 540 mg/Kg |
| #6s<br>Collected: 11/24/2010<br>Site: Bare Yard - Front & 2 Sides (Comp) | 0006 | 11/30/2010 | 1300 µg/g | 1300 mg/Kg |

Initial report from

Shannon Kauffman, Lead Lab Supervisor
or other approved signatory

Reporting limit is 40 mg/kg. The QC data associated with these sample results included in this report meet the method quality control requirements, unless specifically indicated otherwise. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities.

* slight modifications to methods applied Samples received in good condition unless otherwise noted. Quality Control Data associated with this sample set is within acceptable limits, unless otherwise noted

Samples analyzed by EMSL Analytical, Inc. 3 Cooper St. Westmont NJ NJ-NELAP: 04853, AIHA-LAP, LLC: ELLAP Accreditation 100194

Test Report SoilPbAvinstRslt-7.21.0 Printed:

THIS IS THE LAST PAGE OF THE REPORT

# SECTION 5

# IDENTIFICATION OF LEAD HAZARDS

The list below was derived from the XRF inspection data, laboratory analyses, and the on-site evaluation of the risk assessor.

Hazard #1 Various components at eight door opening locations throughout the house.

Hazard #2 Various interior wood trim components, including baseboards in several rooms, cased openings, door components, and stair components at locations listed in Section Six below.

Hazard #3 The four wood posts and associated wood trim at the Front Porch.

Hazard #4 Lead dust throughout living areas inside the house.

Hazard #5 Elevated lead dust content in the combination Drip Line/Garden soil areas around the perimeter of the house, as well as bare soil areas in the yards.

# SECTION 7

# ONGOING MONITORING

The recommendations in this section are an attempt to ensure that the dwelling remains lead safe after the proposed rehabilitation is completed. This goal can be achieved by periodic evaluation of potential hazards that may develop in the future. The only assumption made here is that all lead paint hazards that have been identified in this report are addressed at least to the levels recommended in the Lead Hazard Control Plan in Section Six of this Risk Assessment.

Ongoing monitoring is a systematic approach to reviewing the paint condition on the visible surfaces and checking the integrity of control measures on a regular basis. Interior surfaces testing positive for Lead-Based Paint, and currently in a deteriorated condition, will remain exposed after the remedies in Section Six are complete at all interior components listed in Hazard Two, and the eight door locations listed in Hazard One. Exterior surfaces testing positive for Lead-Based Paint, and currently in a deteriorated condition, will remain exposed after the remedies in Section Six are complete at the four posts at the Front Porch. Though all deteriorated items that tested positive for Lead Based Paint via this Lead Paint Inspection and Risk Assessment are recommended for treatments in Section Six above, there may also be surfaces and components on this property that contain less than the threshold amount that could still pose a hazardous health risk if disturbed. A periodic review of potentially hazardous situations is recommended as follows:

1. On a continuing basis after the rehabilitation project is completed, conduct visual examinations of the painted surfaces listed above to ensure that the paint films remain intact, and free from chipping, peeling, chalking or flaking; any deterioration at these locations may re-expose a lead hazard, and corrective actions should be taken immediately.

2. A currently intact surface testing positive for lead based paint was detected at the ceiling in Bathroom One; though it is highly suspected that these positive readings may be 'bleed-through' readings from surfaces below, it is still recommended that the paint films on this ceiling, as well as the attachment of the substrates themselves, be monitored to ensure that no deterioration at this location may expose a hazardous lead exposure. Any deterioration to the paint films, or instances of the substrates becoming detached, should be addressed immediately.

3. The wood shakes and exposed wood at each gable end at the second floor were not tested, and may be assumed to contain lead-based paint. However, the homeowner stated during the interview at the field inspection that these surfaces had been stabilized and repainted within the past year. A visual inspection of these surfaces showed them to indeed be in an intact condition (see picture in Appendix B of this Risk Assessment Report). However, these surfaces should be monitored into the future, and any deficiencies in the paint films on these components should be addressed immediately to prevent possible hazardous lead exposures.

4. There are currently vegetable garden activities within the drip line areas at the rear, right, and left sides of the house; see pictures in Appendix B of this Risk Assessment Report. The soil samples taken within these areas returned hazardous lead levels at many times the allowable thresholds. These vegetable gardens are being destroyed and removed as a part of the work in Section Six above. After this remediation effort is completed, the homeowner is advised **NOT** to grow any vegetables or fruit within these areas, as the plant root systems, or the fruits/vegetables themselves (i.e., potatoes, beets, carrots) will extend below the levels where contaminated soil is replaced, and a lead hazard in ingested vegetables and/or fruit may exist.

5. About two years after completion of the hazard reduction work, request interior dust wipe sampling and exterior perimeter soil sampling from a certified inspector or risk assessor. The amount of lead dust that can contaminate a floor or window sill is virtually invisible to the naked eye. Laboratory analyses of the wipes will provide a good indicator of the integrity of the lead-based remediation job, as well as provide a check on the routine house cleaning efforts.

# SECTION 8

# PROPERTY OWNER'S DISCLOSURE OBLIGATIONS

A copy of the summary pages (Section One) from this report must be provided to new tenants and purchasers of the subject property under Federal law (24 CFR part 35 and 40 CFR part 745) before they become obligated under a lease or sales contract. After a lease or sales contract has been executed, the complete report must be provided to new purchasers and made available to new tenants. Landlords and sellers are also required to distribute an educational pamphlet and include standard warning language in their leases or sales contracts to ensure that parents have the information they need to protect their children from lead-based paint hazards.

# APPENDIX B

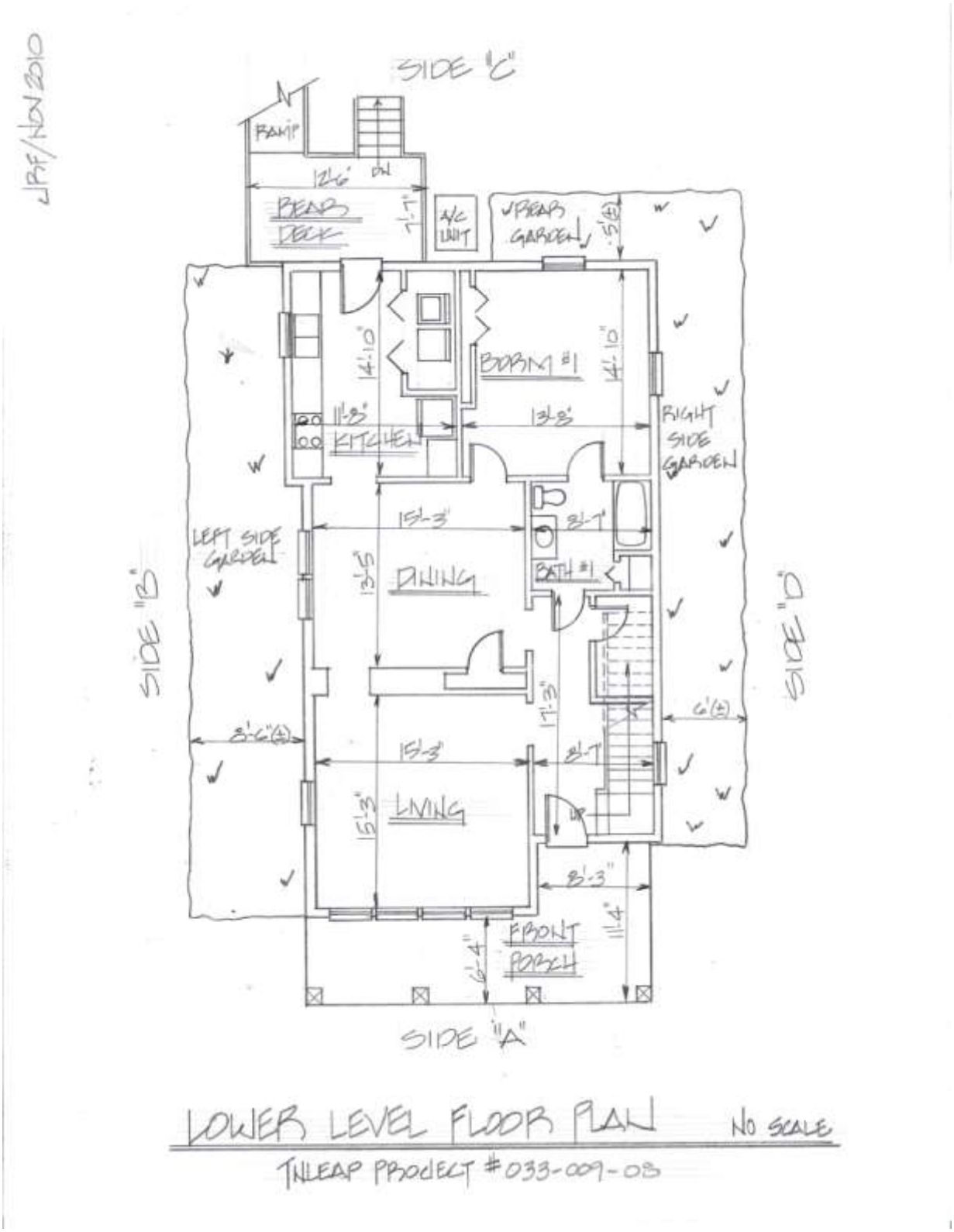
# HOUSE PLAN SKETCHES

# PHOTOGRAPHS

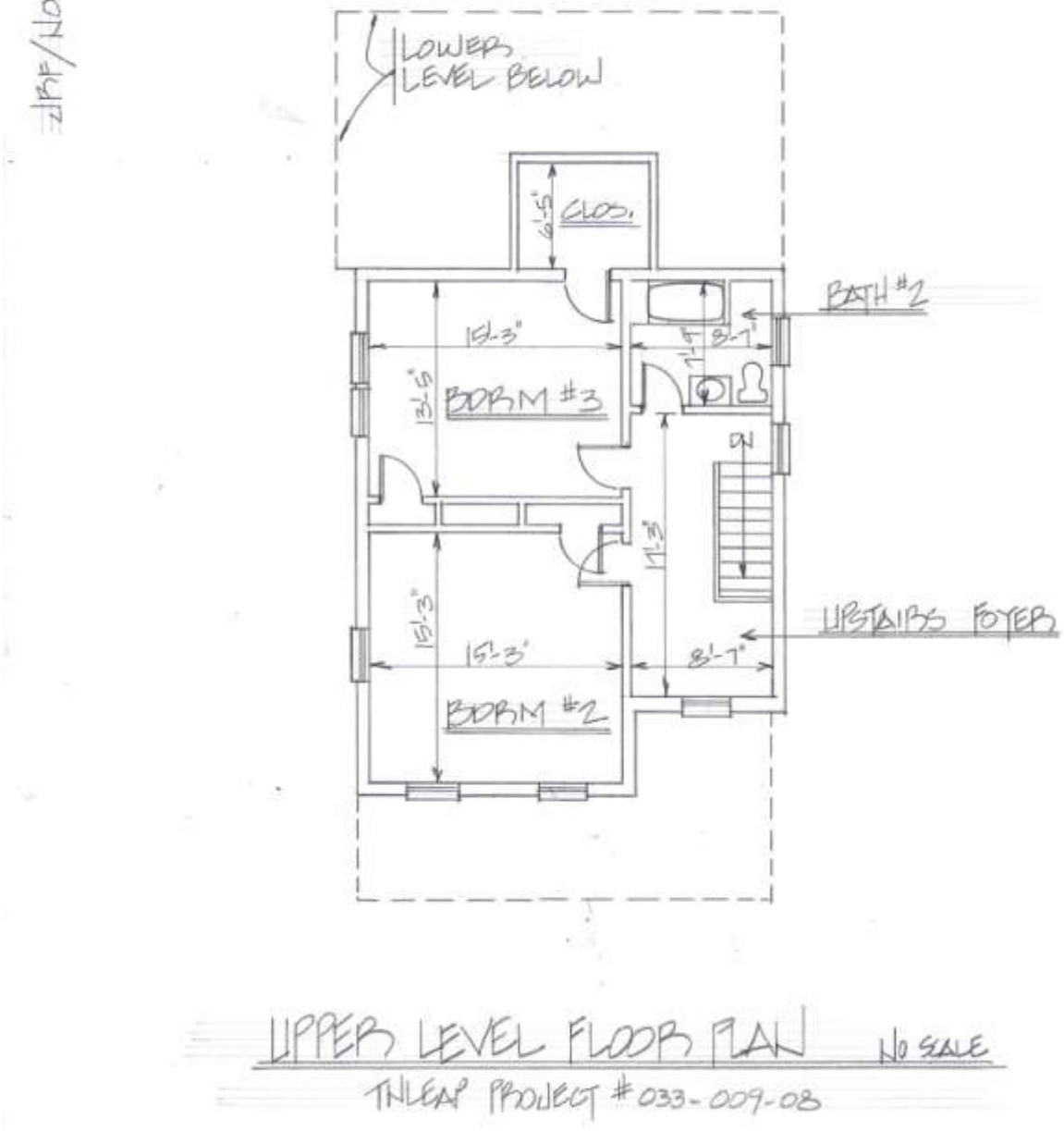
# REAL ESTATE ASSESSMENT DATA

# PROPERTY LOCATION MAP

# Lower Level Floor Plan – 1705 Read Avenue, Chattanooga, TN



# Upper Level Floor Plan – 1705 Read Avenue, Chattanooga, TN



# Pictures of 1705 Read Avenue, Chattanooga, TN
## Taken November 24th, 2010 Page One of Seven

**Front Elevation**

**Left Side Elevation**

# Pictures of 1705 Read Avenue, Chattanooga, TN
# Taken November 24th, 2010 Page Two of Seven

**Rear Elevation**

**Right Side Elevation**

# Pictures of 1705 Read Avenue, Chattanooga, TN
## Taken November 24th, 2010 Page Three of Seven

**Streetscape from the Left**


**Streetscape from the Right**

# Pictures of 1705 Read Avenue, Chattanooga, TN
## Taken November 24th, 2010 Page Four of Seven

**Front Porch – Posts, Beams and Ceiling. Beam and ceiling are wrapped, but posts are POS for LBP.**

**Gable end at Front (gable ends at right and left sides similar) – shakes and wood were not tested for LBP, as these members were stabilized and repainted within past year (per homeowner), and appear to be in an intact condition. Adjacent roof overhangs are wrapped.**

**Pictures of 1705 Read Avenue, Chattanooga, TN**
**Taken November 24th, 2010** **Page Five of Seven**

**Living Room/Foyer cased opening – POS for LBP**

**Typical construction – Stair Post and railing at lower level entry foyer are POS for LBP**

# Pictures of 1705 Read Avenue, Chattanooga, TN
## Taken November 24th, 2010 Page Six of Seven

**Vegetable Garden within Left Side Drip Line area – soil POS for LBP at many times the allowable threshold, contaminating plants/vegetables.**

**Vegetable Garden within Right Side Drip Line area – soil POS for LBP at many times the allowable threshold, contaminating plants/vegetables.**

# Pictures of 1705 Read Avenue, Chattanooga, TN
## Taken November 24th, 2010 Page Seven of Seven

**Vegetable Garden within Rear Drip Line area – soil POS for LBP at many times the allowable threshold, contaminating plants/vegetables.**

**Typical Upper Level door and transom – many components of these assemblies are POS for LBP, and opening shall receive rehabilitation.**

**Laboratory Sample Chain-of-Custody Forms – Composite Soil Samples collected from 1705 Read Avenue in Chattanooga, TN on November 24th, 2010**

201016535

EMSL ANALYTICAL, INC.

## Lead (Pb) Chain of Custody

EMSL Order ID (Lab Use Only): 201016535

| | | | |
|---|---|---|---|
| Company : MTSU - TN LEAP | EMSL Client #: MTSU25 | EMSL-Bill to: ☒ Same ☐ Different<br>If Bill to is Different note instructions in Comments** | |
| Street: 1500 Greenland Drive, Box 19 | | *Third Party Billing requires written authorization from third party* | |
| City: Murfreesboro | State/Province: TN | Zip/Postal Code: 37132 | Country: USA |
| Report To (Name): Faye Ralston | | Fax #: 615-494-8799 | |
| Telephone #: 615-494-8795 | | Email Address: fralston@mtsu.edu - see comments | |
| Project Name/Number: RA: Kimbrough Residence, 1705 Read Avenue, Chattanooga, TN 37408 | | | |
| Please Provide Results: ☐ Fax ☒ Email | Purchase Order: P0011640 | U.S. State Samples Taken: TN | |

**Turnaround Time (TAT) Options* - Please Check**

☐ 3 Hours | ☐ 6 Hours | ☒ 24 Hours | ☐ 48 Hours | ☐ 3 Days | ☐ 4 Days | ☐ 5 Days | ☐ 10 Days

**Analysis completed in accordance with EMSL's Terms and Conditions located in the Price Guide*

| Matrix | Method | Instrument | Reporting Limit | Check |
|---|---|---|---|---|
| Chips ☐ mg/cm² ☐ % by wt. | SW846-7000B/7420 or AOAC 974.02 | Flame Atomic Absorption | 0.01% | ☐ |
| Air | NIOSH 7082 | Flame Atomic Absorption | 4 µg/filter | ☐ |
| | NIOSH 7105 | Graphite Furnace AA | 0.03 µg/filter | ☐ |
| | NIOSH 7300 modified | ICP-AES | 0.5 µg/filter | ☐ |
| Wipe* ☐ ASTM ☐ non ASTM *if no box is checked, non-ASTM Wipe is assumed | SW846-7000B/7420 | Flame Atomic Absorption | 10 µg/wipe | ☐ |
| | SW846-6010B or C | ICP-AES | 0.5 µg/wipe | ☐ |
| TCLP | SW846-1311/7420/SM 3111B | Flame Atomic Absorption | 0.4 mg/L (ppm) | ☐ |
| | SW846-6010B or C | ICP-AES | 0.1 mg/L (ppm) | ☐ |
| Soil | SW846-7420 | Flame Atomic Absorption | 40 mg/kg (ppm) | ☒ |
| | SW846-7421 | Graphite Furnace AA | 0.3 mg/kg (ppm) | ☐ |
| | SW846-6010B or C | ICP-AES | 1 mg/kg (ppm) | ☐ |
| Wastewater | SM3111B or SW846-7000B/7420 | Flame Atomic Absorption | 0.4 mg/L (ppm) | ☐ |
| | EPA 200.9 | Graphite Furnace AA | 0.003 mg/L (ppm) | ☐ |
| | SW846-6010B or C | ICP-AES | 1 mg/kg (ppm) | ☐ |
| Drinking Water | EPA 200.9 | Graphite Furnace AA | 0.003 mg/L (ppm) | ☐ |

Other: | Preservation Method (Water):

Name of Sampler: John R. Fullerton, TNLBP2000-178-3093R | Signature of Sampler: John R. Fullerton

| | Sample # | Location | Volume/Area | Date/Time Sampled |
|---|---|---|---|---|
| (1) | #1s | RIGHT SIDE DRIP/VEG. GARDEN (COMP) | | 24 NOV '10 10 AM |
| (2) | #2s | LEFT SIDE DRIP/VEG GARDEN | | 24 NOV '10 10 AM |
| (3) | #3s | REAR DRIP/VEG GARDEN | | 24 NOV '10 10 AM |
| (4) | #4s | FRONT DRIP/PLANTING AREA | | 24 NOV '10 10 AM |
| (5) | #5s | BARE YARD - REAR PARKING | | 24 NOV '10 10 AM |
| (6) | #6s | BARE YARD - FRONT & 2 SIDES (COMP.) | | 24 NOV '10 10 AM |

Client Sample #'s: 1s - 6s | Total # of Samples: Six

Relinquished (Client): John R. Fullerton | Date: 24 NOVEMBER 2010 | Time: 3 PM EST

Received (Lab): | Date: 11/29/10 | Time:

Comments: Standard TAT is 24 Hours. Email all results to: fralston@mtsu.edu; jfullert@mtsu.edu; tnleap@mtsu.edu

Page 1 of 1 pages

# Niton XRF Performance Characteristic Sheets – Page One of Three



## Performance Characteristic Sheet

**EFFECTIVE DATE:** September 24, 2004 **EDITION NO.:** 1

**MANUFACTURER AND MODEL:**

Make: *Niton LLC*
Tested Model: *XLp 300*
Source: $^{109}Cd$
Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.
XLp 300A, XLp 301A, XLp 302A and XLp 303A.
XLi 700A, XLi 701A, XLi 702A and XLi 703A.
XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

### FIELD OPERATION GUIDANCE

**OPERATING PARAMETERS:**

Lead-in-Paint K+L variable reading time mode.

**XRF CALIBRATION CHECK LIMITS:**

| |
|---|
| 0.8 to 1.2 mg/cm$^2$ (inclusive) |

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 readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

**SUBSTRATE CORRECTION:**

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is not needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

**INCONCLUSIVE RANGE OR THRESHOLD:**

| K+L MODE READING DESCRIPTION | SUBSTRATE | THRESHOLD (mg/cm$^2$) |
|---|---|---|
| Results not corrected for substrate bias on any substrate | Brick | 1.0 |
| | Concrete | 1.0 |
| | Drywall | 1.0 |
| | Metal | 1.0 |
| | Plaster | 1.0 |
| | Wood | 1.0 |

# Niton XRF Performance Characteristic Sheets – Page Two of Three

*Niton XLp 300, 9/24/2004, ed. 1*

## BACKGROUND INFORMATION

### 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 from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

### 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.

### SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

### 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. Use the K+L variable time mode readings.

Conduct XRF retesting 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 housing a result is defined as the average of three readings. In multifamily housing, a result is 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 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 results.

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

Find the absolute difference of the two averages.

# Niton XRF Performance Characteristic Sheets – Page Three of Three



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.

**TESTING TIMES:**

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

| Testing Times Using K+L Reading Mode (Seconds) | | | | | | |
|---|---|---|---|---|---|---|
| | All Data | | | Median for laboratory-measured lead levels ($mg/cm^2$) | | |
| Substrate | 25th Percentile | Median | 75th Percentile | Pb < 0.25 | 0.25 ≤ Pb<1.0 | 1.0 ≤ Pb |
| Wood Drywall | 4 | 11 | 19 | 11 | 15 | 11 |
| Metal | 4 | 12 | 18 | 9 | 12 | 14 |
| Brick Concrete Plaster | 8 | 16 | 22 | 15 | 18 | 16 |

**CLASSIFICATION RESULTS:**

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

**DOCUMENTATION:**

A document titled *Methodology for XRF Performance Characteristic Sheets* 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. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.