RESULTS OF RADIOLOGICAL MEASUREMENTS AT
300 Lower Michigan Avenue
CHICAGO, ILLINOIS

ON:

MARCH 6, 2019

FOR:

Member Mechanical, Inc. dba Burke Plumbing

6321 N Avondale Suite A 211

Chicago, ILLINOIS 60631

BY:

RSSI
6312 OAKTON STREET
MORTON GROVE, ILLINOIS 60053

MARCH 21, 2019

Introduction

Member Mechanical, Inc. dba Burke Plumbing (Burke Plumbing) asked RSSI to perform surveys at 300 Lower Michigan Avenue as part of a utility replacement project. On March 6, 2019, RSSI surveyed the excavated area of the utility area. The purpose of these radiological measurements was to determine if there were radiation levels associated with thorium contamination.

Thorium-contaminated soils have been found at various locations in the Streeterville area of Chicago. Beginning in 1915, the Lindsay Light and Chemical Company (Lindsay Light) refined and used thorium in industrial operations between Illinois Street and Grand Avenue, east of Michigan Avenue. The Lindsay Light operation produced large volumes of thorium-contaminated tailings used as fill throughout Streeterville.

All isotopes of thorium are radioactive. Thorium's predominant isotopes are in the uranium and thorium decay series of naturally occurring radioactive isotopes. These series begin with uranium-238 (U-238) and thorium-232 (Th-232), respectively. Each series decays through a progression of radionuclides to a stable isotope of lead. The radionuclides include intermediate progeny, such as radium-226 (Ra-226) and radon-222 (Rn-222) in the uranium series and radium-228 (Ra-228), radium-224 (Ra-224), and radon-220 (Rn-220) in the thorium series as well as their decay products.

The EPA has set a concentration limit in soil of 5 picocuries per gram (pCi/g) total radium above background. Total radium is the sum of Ra-226 plus Ra-228. The EPA has stated that the background concentration in the Chicago Streeterville area is 2.1 pCi/g of total radium, resulting in an action level of 7.1 pCi/g total radium. The

guidelines permit release of areas for unrestricted use when the concentration of total radium in soil is no more than the action level.

Methodology

RSSI measured radiation levels using a Ludlum Model 193 with an unshielded Ludlum Model 44-10 gamma scintillation detector. The Ludlum Model 193 is a general purpose portable survey instrument with a fixed-point alarm and a quick deviation alarm that is based on the rate of change in radiation levels. The quick deviation alarm enables detection of slight changes in radiation levels. The Ludlum Model 44-10 has a 2”×2” thallium-doped sodium iodide (NaI(Tl)) gamma scintillator that responds to photons. The Ludlum Model 44-10 detector was unshielded to expose it to the survey area as completely as possible. The instrument responses was approximately 500 counts per minute (cpm) per picocurie per gram (pCi/g) of total radium. For this configuration, the EPA’s limit of 7.1 pCi/g total radium (5 pCi/g above a background total radium level of 2.1 pCi/g results) corresponds to approximately 3550 cpm above background.

Results

The excavation site was located at 300 Lower Michigan Avenue around a red fire hydrant located through a gated area. The survey was performed after the excavation was complete. The area was broken up into two zones as shown in figure 1.

Figure 1. Excavation site with zones labeled

The first zone started at the fence line and extended approximately 6 feet into the street and was approximately 6 feet wide. The second zone was from the fence line to the wall, approximately 6 feet, and 4 feet wide. Each zone was surveyed by lowering the detector and taking the highest reading for each depth of 1, 2.5, and 4 feet. There was a slight restriction on the probes mobility at 2.5 and 4 foot depth due to the presence of a gas line. The second zone was surveyed without difficulties.

Full results are shown in Appendix A. Instrument calibration records are shown in Appendix B.

Conclusions

No measurement exceeded the EPA's action level of 7.1 pCi/g total radium (5 pCi/g total radium plus local total radium background of 2.1 pCi/g).

Appendix A: Full Results

MARCH 6, 2019

Ludlum 193, SN 149080
Ludlum 44-10, “#2”
25’, unshielded
Efficiency: 500 cpm/pCi/g (thorium)
Action level: 3550 net cpm

Background: 1500 cpm
Action level: 5050 gross cpm
Check Source: 110000 cpm

Gross Counts(cpm)	Net Counts(cpm)	Total Radium (pCi/g)	Depth (ft)
2000	500	1	1
1600	100	0.2	2.5
1600	100	0.2	4
1200	0	0	1
1200	0	0	2.5
800	0	0	4

Appendix B: Calibration Records

CERTIFICATE OF CALIBRATION

RSSI

6312 West Oakton Street
Morton Grove, IL 60053-2723
Telephone: 847-965-1999
Fax: 847-965-1991
www.rssi.us

Certificate No. 051165

RSSI
Attention: Eli A. Port, Rso
6312 Oakton Street
Morton Grove, IL 60053-2723

Manufacturer: LUDLUM
Model: 193
Serial No.: 149080
Probe(s): LUDLUM 44-10, Sn: PR155592 (#2)

CALIBRATION DATA

SOURCE*	SCALE	FIELD (cpm)	READING (cpm)	FIELD (cpm)	READING (cpm)
5	x1	200	200	800	800
5	x10	2 K	2 K	8 K	8 K
5	x100	20 K	20 K	80 K	80 K
5	x1000	200 K	200 K	800 K	800 K

If the accuracy of a scale is not within +/-10% but is within +/-20% a correction factor is supplied.

LUDLUM 44-10 Efficiencies:	**Shielded, 3' cable**	**γ: 660 cpm/pCi/g (Thorium)**	**γ: 640 cpm/pCi/g (Radium)**
LUDLUM 44-10 Efficiencies:	**Unshielded, 3' cable**	**γ: 1820 cpm/pCi/g (Thorium)**	**γ: 1820 cpm/pCi/g (Radium)**
LUDLUM 44-10 Efficiencies:	**Shielded, 25' cable**	**γ: 332 cpm/pCi/g (Thorium)**	**γ: 332 cpm/pCi/g (Radium)**
LUDLUM 44-10 Efficiencies:	**Unshielded, 25' cable**	**γ: 500 cpm/pCi/g (Thorium)**	**γ: 520 cpm/pCi/g (Radium)**

Check Source: Ba-133 **Reading:** 297,400 net cpm **Cable Length:** 3'
Check Source: Ba-133 **Reading:** 118,800 net cpm **Cable Length:** 25'

Temperature: 22.5 °C **Relative Humidity**: 25 % **Barometric Pressure**: 996 mbar

Comments: Check source readings taken with label side facing detector.

Calibrated by: _____ **Date**: 03/26/18

Calibration Frequency: Annual **Recalibrate by**: 03/26/19

*SOURCE	1. Cs-137	2. Cs-137	3. Am-241	4. Cf-252	5. Electronic	6. Other
Manufacturer	U.S. Nuclear	Eon Corp.	Amersham	Amersham	LUDLUM	
Model	CCs-D-20E	64-764	AMC 13446	100	500	
Serial Number	69036EZ	722	7510 LA	FTC-CF-001	32789	
Activity	15 Ci	100 mCi	100 mCi	1801 µg	NONE	
Date	4/2009	5/2/78	6/3/84	10/8/85	11/18/09	

Calibration authorized by Illinois Department of Nuclear Safety License No. IL-01429-01 and meets the requirements of ANSI 323-1978 and MIL-STD-45662A.
Exposure rate traceable to NIST with MDH model 1015C, S.N. 2772 transfer instrument. Radcal Certificate of Conformance S116437.

PREVENTIVE MAINTENANCE PERFORMED

BATTERIES/CONTACTS CHECKED	✓	1.61 V, 1.61 V
HIGH VOLTAGE MEASURED	✓	880 VOLTS
SENSITIVITY MEASURED	✓	10 mVOLTS
METER ZERO CHECKED	✓	
INSTRUMENT CLEANED	✓	

REPAIR AND PART INFORMATION

Quantity	Description

Repair Time: _____ hours

Comments: _____

_____

_____

_____

_____

Lab Reference: 55

Ludlum 193 SN:	149080
2" × 2" ID	#2
Date Calibrated:	3/28/2018
Certificate #:	051165

Background	Shielded	Unshielded	
3' Cable	2,400	5,800	gross cpm
25' Cable	880	1,600	gross cpm

Thorium Blocks	Shielded	Unshielded	
3' Cable	9,000	24,000	gross cpm
25' Cable	4,200	6,600	gross cpm

Radium Blocks	Shielded	Unshielded	
3' Cable	8,800	24,000	gross cpm
25' Cable	4,200	6,800	gross cpm

Thorium Blocks	Shielded	Unshielded	
3' Cable	6,600	18,200	net cpm
25' Cable	3,320	5,000	net cpm

Radium Blocks	Shielded	Unshielded	
3' Cable	6,400	18,200	net cpm
25' Cable	3,320	5,200	net cpm

	10	pCi/G	
Thorium Blocks	Shielded	Unshielded	
3' Cable	660	1,820	cpm/pCi/g
25' Cable	332	500	cpm/pCi/g

	10	pCi/G	
Radium Blocks	Shielded	Unshielded	
3' Cable	640	1,820	cpm/pCi/g
25' Cable	332	520	cpm/pCi/g

Action Level	5	pCi/G	
Thorium	Shielded	Unshielded	
3' Cable	3,300	9,100	cpm above bkgr
25' Cable	1,660	2,500	cpm above bkgr

Action Level	5	pCi/G	
Radium	Shielded	Unshielded	
3' Cable	3,200	9,100	cpm above bkgr
25' Cable	1,660	2,600	cpm above bkgr

EPA Limit	7.1	pCi/G	
Thorium	Shielded	Unshielded	
3' Cable	4,686	12,922	cpm above bkgr
25' Cable	2,357	3,550	cpm above bkgr

EPA Limit	7.1	pCi/G	
Radium	Shielded	Unshielded	
3' Cable	4,544	12,922	cpm above bkgr
25' Cable	2,357	3,692	cpm above bkgr

Calibrated using the IEMA West Chicago blocks.