Enclosure

OAK RIDGE ASSOCIATED UNIVERSITIES:

SITE STATUS REPORT FOR THE FORMER SETH THOMAS CLOCK COMPANY AT 135 SOUTH MAIN STREET, THOMASTON, CONNECTICUT

OCTOBER 3, 2017

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that the Oak Ridge Associated Universities (ORAU) perform a radiation survey of the property at 135 South Main Street in Thomaston, Connecticut. This property contains a main building and clock tower that were once part of the former Seth Thomas Clock Company, which used radium paint in the manufacturing of clocks and watches into the late 1960s. The objective of this survey was to locate possible discrete sources of radium, if any, that would be associated with former Seth Thomas Clock Company operations.

ORAU performed radiation surveys of the building interior on December 14 and 15, 2016, and on January 31 to February 1, 2017. The only area that approached or exceeded our threshold for controls was the small office on the third floor of the clock tower, which was vacant. Based on these results, the owner's representative was advised during the initial site visit to limit access to the area that was found to have contamination that exceeded the public dose limit. The site owner's representative agreed with these recommendations and indicated that he will take appropriate actions to limit access where appropriate. The NRC will continue to work with the site owner to control and mitigate risks from exposure to discrete sources of radium-226.

ORAU also identified contamination on the first, second, and fourth floors. The level of contamination on the first and third floor will require remediation to the NRC's unrestricted release standard. The contamination on the second and fourth floor did not exceed the regulatory limit for unrestricted use.

SITE STATUS REPORT

Property: Seth Thomas Clock Company
135 South Main Street
Thomaston, CT 06787

Docket Number: 03038970

Current Property Name(s): UniMetal Surface Finishing

Current Property Owner(s): GLC Associates One, LLC

Inspection Dates: December 14–15, 2016
January 31–February 1, 2017

Inspector(s): Raymond Powell/NRC, John Nicholson/NRC, supported by Kaitlin Engel/Oak Ridge Associated Universities (ORAU), and Tom Hills/ORAU (Dec. 2016). Raymond Powell/NRC, Briana DeBoer/NRC, supported by Kaitlin Engel/ORAU, and Stephen Pittman/ORAU (Jan./Feb. 2017)

1.0 INTRODUCTION

The Energy Policy Act of 2005 amended section 11e.(3) of the Atomic Energy Act of 1954 to place discrete sources of radium-226 (Ra-226) under NRC regulatory authority as byproduct material. The NRC is evaluating properties where a review of historical information has identified Ra-226 use. The property at 135 South Main Street in Thomaston, Connecticut, was identified as the former Seth Thomas Clock Company, a former manufacturing facility that operated from 1915 to 1970 (ORNL 2015). Additional information on the site is also available in the Agency for Toxic Substances and Disease Registry (ATSDR) report (ATSDR 1999) and the Scientech report (Scientech 2003). The objectives of the initial site visit were to determine if discrete sources of Ra-226 and/or distributed Ra-226 contamination are present, to identify the areas of highest contamination, to determine if there are any current health and safety concerns, and to determine if a more in-depth scoping survey is needed to reach a conclusion on whether site cleanup is needed.

Data collected during the initial site visit is used to plan future actions that may be needed to reduce the exposure of Ra-226 to current or future site occupants to levels that do not exceed the applicable regulatory requirement. It is important to note that destructive testing is not generally performed as described within NRC's procedure, Temporary Instruction 2800/043 "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2017) (TI).

2.0 PROPERTY DESCRIPTION AND INITIAL SITE VISIT CONSIDERATIONS

2.1 Property Description and History

The site summary included in the "Historical Non-Military Radium Sites Research Effort Addendum" report (ORNL 2015) provides known site details about the type, form, history, potential locations, and other information related to discrete sources of Ra-226 used at the site. The Seth Thomas Clock Company, located on Main Street in Thomaston, Connecticut, was founded in 1915 and used radium compounds for luminous dials in watch production. The

facility was expanded over the years and in 1931 became a division of General Time Instruments Corporation, later known as General Time Corporation. From the 1940s to 1960s, the factory also made marine timing and navigation devices for the military. The factory was forced to shut down in 1955 due to flooding and was reopened the following year. In 1970, the company was taken over by Talley Industries, which closed the Thomaston plant and moved operations to Georgia. The factory reopened as an industrial park for various small manufacturers (ORNL 2015). Currently, the facility is owned by GLC Associates One, LLC, who leases areas of the building to other tenants.

The main building of the industrial park is approximately 29,000 square meters (Godin Property Brokers, LLC 2016) with a total of five floors (basement and four upper levels). The majority of the basement and first floor are occupied, while the second, third and fourth floors are mostly unoccupied.

The basement is used by UniMetal Surface Finishing for production, shipping, and storage. The area is routinely occupied by workers and most of the floor space is occupied by equipment. Most of the original wood flooring on the basement level has been removed exposing the original concrete flooring below; however, new concrete was poured in some areas around 1988. The first floor is used by UniMetal Surface Finishing, Palmer Deep Draw & Stamping LLC, and WTM Company, Inc. The area is routinely occupied by workers and most of the floor space is occupied by equipment; however, the northeast portion of the first floor is unoccupied and used for equipment storage. The floor contains the original wood, and the outer walls consist of red bricks. Plywood has been installed to segregate the companies' work spaces.

National Spring & Stamping is located on the second floor in the northeast portion of the building. The area is routinely occupied by workers and most of the floor space is occupied by equipment. Individual work areas are roughly 9 square meters and are located in the middle of the second floor. The rest of the second floor is open (no drywall installed). The southern portion of the second floor is used for storage and is mostly occupied by equipment. The floor contains the original wood, and the outer walls consist of red bricks.

Approximately 15-20 percent of the third floor is routinely occupied by Global Spice (northwest corner associated with measurement locations 1 and 2, plus Room C – see page B-13 of Appendix B) and Elite Strength & Performance (gym; northeast wing associated with measurement locations 5 through 10 – see page B-13 of Appendix B). The rest of the third floor is unoccupied. The third floor has been segregated into many smaller rooms with drywall. Some of these areas are used for storage. The west part of the floor was occupied by ECI Screenprint, Inc. (ECI), but is currently unoccupied. Carpeting has been installed in the front offices, while wood flooring remains in the back space. The outer walls consist of red bricks.

The fourth floor is used by The Hit Club (baseball club), located in the northeast portion of the building, and is routinely occupied in the evenings during cold weather. The floor is mostly open space with some areas used for storage of equipment. The outer walls consist of red bricks. All levels contain restrooms that have tile or poured concrete.

A clock tower is attached to the west side of the main building and extends from floors one through four. The first, second, third, and fourth floors of the clock tower are currently unoccupied. The first and second floors of the clock tower have the original wood flooring while the third and fourth floors have had carpeting installed. The first floor of the clock tower contains the original walls that consist of a type of sheetrock over red cinder blocks. The second, third, and fourth floors of the clock tower have had drywall/plywood installed to create

rooms. All four levels of the clock tower have a small storage-type closet located to the east (close to the elevator) that is made of bricks.

In 1998, the U.S. Environmental Protection Agency contacted the ATSDR to conduct a public health assessment of the former Seth Thomas Clock Factory. Seven areas of contamination were identified in isolated locations on the first through fourth floors. The report concluded that radiological contamination was detected at levels that may pose a public health hazard to occupants; however, none of the levels detected posed an immediate health problem (ORNL 2015).

In 2003, Scientech Inc., conducted radiological surveys as part of the Connecticut Radium Decontamination and Decommissioning Project. Radiological surveys identified radiological contamination on the first through fourth floors (ORNL 2015). No records indicating that remediation took place following the 1998 or 2003 surveys were identified. As of November 2015, current levels of radium contamination are unknown (ORNL 2015).

2.2 Initial Site Visit Considerations

Prior to commencing survey activities, the general building layout was examined for consistency with historical information and to identify impediments to conducting the survey and/or health and safety considerations. The four-story building appears to be the original facility. The structural integrity is sound, including floors and walls. Much of the floor space is either open or partitioned into rooms rented to various businesses. Overall, roughly 60% of the facility is accessible for radiological surveys. This percentage varies by floor; the basement and first floor have the least amount of areas available, around 40%, while the second, third, and fourth floors each have approximately 70% of area available for performing radiological surveys. During the site visits, the inspection team focused its radiological surveys on areas that are expected to have the highest potential for containing discrete sources of radiation, such as floors and windows. Surveys of walls near windows did not go above 5 feet.

3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

The inspection teams conducted site visits with radiological surveys at the former Seth Thomas Clock Factory on December 14–15, 2016 and January 31–February 1, 2017. During the first site visit, a pre-inspection meeting was held with Ron Stango and Eddie Retamar from UniMetal Surface Finishing, Raymond Powell and John Nicholson from NRC, and Kaitlin Engel and Tom Hills from ORAU. Participants discussed the inspection team's intention to perform general area surveys inside of the property. The facility manager (R. Stango) was able to recall the general locations of contamination identified during previous surveys and pointed them out to the inspection team. Plans were made to survey floors where the highest levels of contamination were identified previously (i.e., first, third, and fourth floors) as time allowed. During the second site visit, plans were made to survey the areas not covered during the previous site visit, including the basement, the first floor of the clock tower, all of the second floor, and the ECI area on the third floor, as time allowed.

Radiological surveys performed by the inspection team consisted of gamma radiation scans within the building using a Ludlum model 44-10 2-inch by 2-inch (2×2) sodium iodide detector connected to a Ludlum model 2221 ratemeter/scaler, alpha-plus-beta radiation direct

measurements using a Ludlum model 44-142 plastic scintillator connected to a Ludlum model 2221 ratemeter/scaler, and radiation exposure rate measurements using a Ludlum model 192 NaI-based microRoentgen (µR) ratemeter[1]. Table 1 presents the specific instruments used. Smear samples were also collected at selected locations to quantify the removable contaminant fractions.

Table 1. Seth Thomas Clock Company Survey Instruments

Radiation Type (units)	Detector Type	Detector Model (Number)	Ratemeter (Number)
Alpha plus beta (cpm)	Plastic Scintillator[a]	44-142 (920) Calibrated 11/23/2016 44-142 (1031)[b] Calibrated 07/06/2016, 11/03/2016, and 11/23/2016	2221 (590)[b] Calibrated 08/19/2016 2221 (1143)[b] Calibrated 08/08/2016
Gross gamma (cpm)	Sodium Iodide	44-10 (664)[b] Calibrated 08/08/2016 44-10 (908) Calibrated 11/01/2016	2221 (590)[b] Calibrated 08/19/2016 2221 (1143)[b] Calibrated 08/08/2016
Gross gamma exposure meter (µR/h)	Exposure Meter	192 (1127, 1129) Calibrated 06/03/2016	N/A
Gamma Spectrum Analyzer (SAM-940)	Lanthanum Bromide	940 (40272) Daily check source response	N/A

N/A = not applicable
Number = ORAU equipment barcode
cpm= counts per minute
µR/h= microRoentgen per hour
[a]Though traditionally used as a beta radiation detector, ORAU has calibrated the detector for measuring both alpha and beta radiation.
[b]Instrument calibrated again on 01/26/2017 prior to second visit

[1]Roentgen is a unit of exposure (energy absorbed in air), whereas a rem is a unit of dose delivered to a person (resulting from the radiation energy absorbed in that person). While Roentgen and rem are related, these are different units. Because they are similar for gamma ray energies from Ra-226, NRC makes the simplifying assumption in this case that these units are equivalent (1 Roentgen = 1 rem).

Summary of Daily Activities – December 14, 2016:

The inspection team arrived on site at 9:00 a.m. for the pre-inspection meeting with site and NRC personnel. It was decided to focus on floors with the highest levels of radiation identified during previous surveys. At the completion of the site meeting, the inspectors commenced radiological surveys inside the building on the fourth floor. The inspection team split into two groups to cover more area.

At 9:45 a.m., both inspections teams started surveys on the fourth floor; all accessible areas were scanned with the 2×2 and exposure rate meter. Areas where contamination was identified in previous surveys were given focus. Areas of elevated radiation were marked for further investigation. Five areas were selected for alpha-plus-beta direct measurements and smear sampling based on scan results. Four of the areas identified with elevated radiation were discrete locations (less than 0.05 meter diameter). One area had elevated radiation levels over an approximate 0.3 meter by 0.3 meter space with a discrete (less than 0.05 meter diameter) "hot spot" in the center. Portions of the room were inaccessible due to storage of equipment. Materials encountered included: concrete in the bathrooms, painted red brick, original wood flooring, drywall, and a type of synthetic turf covering some of the floor.

At 3:00 p.m., the inspection team moved to the third floor. All accessible areas were scanned with the 2×2 and exposure rate meter. Areas where contamination was identified in previous surveys were given focus. Areas of elevated radiation were marked for further investigation. In the third floor clock tower, 13 areas were selected for alpha-plus-beta direct measurements and smear sampling based on scan results. Four of the areas had elevated radiation levels over an approximate 1 meter by 1 meter space with a discrete (less than 0.05 meter diameter) "hot spot" in the center. Materials encountered included: carpet, tiles in the bathroom, drywall, and faux wood paneling on the walls.

The inspection team departed from the site at 7:00 p.m.

Summary of Daily Activities – December 15, 2016:

The inspection team arrived at the site at 6:45 a.m. One inspection team continued surveys on the third floor. Eight areas were selected for direct alpha-plus-beta measurements and smear sampling based on scan results. All eight elevated areas were discrete locations (less than 0.05 meters in diameter). Materials encountered included: red brick, wooden floors, and drywall. The other inspection team investigated tape that was used to hold down carpeting where elevated radiation was identified on the third floor of the clock tower.

At 7:30 a.m., the second inspection team moved to the first floor for surveys. All accessible areas were scanned with the 2×2 and exposure rate meter. Areas where contamination was identified in previous surveys were given focus. Areas of elevated radiation were marked for further investigation. Three areas were selected for direct alpha-plus-beta measurements and smear sampling. One area had elevated radiation levels over an approximate 0.6 meter by 0.6 meter space with a discrete (less than 0.05 meter diameter) "hot spot" in the center. Materials encountered included: wooden floors, drywall, red bricks, and metal sheeting over the wooden floors. Some areas of the first floor were inaccessible due to equipment or noise level.

At 3:30 p.m., the NRC inspection team held a post-inspection meeting with site personnel to discuss the results. The inspection team departed the site at 4:00 p.m.

Summary of Daily Activities – January 31, 2017:

The inspection team arrived at the site at 8:00 a.m. The inspection team started surveys on the first floor of the clock tower. All accessible areas were scanned with the 2×2 and exposure rate meter. Materials encountered included: wooden floors, inner walls of sheetrock, and outer walls of red brick.

At 9:15 a.m. the inspection team broke into two groups to survey the entire second floor. All accessible areas were scanned with the 2×2 and exposure rate meter. Areas of elevated radiation were marked for further investigation. Two areas were selected for direct alpha-plus-beta measurements and smear sampling based on scan results. Both areas were discrete locations (less than 0.05 meters in diameter). Materials encountered on the second floor included: wooden floors, drywall/plywood for the inner walls, and red brick for the outer walls.

At 1:30 p.m., the inspection teams moved to the third floor to survey the ECI area. All accessible areas were scanned with the 2×2 and exposure rate meter. Areas of elevated radiation were marked for further investigation. Two areas were selected for direct alpha-plus-beta measurements and smear sampling based on scan results. Materials encountered in the ECI area on the third floor included: carpet, wooden floors, inner drywall, and drywall over the red brick outer wall.

The inspection team departed from the site at 3:45 p.m.

Summary of Daily Activities – February 1, 2017:

The inspection team arrived at the site at 8:00 a.m. and met with the facility manager to discuss the basement of Seth Thomas. The inspection team was informed that most of the original wood flooring had been removed, exposing the original flooring below (a type of concrete). However, in some areas new concrete had been poured (around 1988). Surveys were focused on areas with original flooring, as time allowed. The inspection team broke into two groups to survey the basement. All accessible areas were scanned with the 2×2 and exposure rate meter. Some areas of the basement were inaccessible due to equipment or noise level. Materials encountered included: wooden floors, concrete floors, plywood inner walls, and red brick outer walls.

At 11:00 a.m., the NRC inspection team met with site personnel to discuss results of the site visit. The inspection team departed the site at 12:00 p.m.

3.2 Summary of Results

Surveys using the 2×2 sodium iodide detector and an exposure ratemeter were performed of approximately 70% of accessible areas, mainly floors and window sills, inside the building. The results for each area are discussed below. Pictures of surveyed areas and other locations throughout the building are presented in Appendix A, Figures A-1 through A-19. Appendix B presents tabulated results from the site visit. Tables B-1 through B-11 present total and removable alpha-plus-beta surface activity results in units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2), 2×2 gross responses in cpm, and gross exposure rate measurements in µR/h that were collected at contact and 1 meter or approximately waist height. Alpha-plus-beta direct radiation measurements are calculated using the following equation:

$$dpm/100\ cm^2 = \frac{C - B}{\varepsilon_{tot} \times G}$$

Where:
C = measured count rate (cpm)
B = background count rate (cpm)
G = geometry factor (unitless) = $\frac{Physical\ Detector\ Area\ (cm^2)}{100\ cm^2}$ = 1.0
ε_{tot} = total weighted efficiency (unitless) = 1.6

Due to the number of emissions from Ra-226 and its associated progeny, multiple radiation particles are counted during the surface activity measurement. Therefore, a total weighted efficiency for Ra-226 and its associated progeny was calculated by:

$$\varepsilon_{tot} = \sum_{n} F_n \times \varepsilon_{i,n} \times \varepsilon_{s,n}$$

Where:
F_n = fractional abundance of n^{th} emission
$\varepsilon_{i,n}$ = instrument efficiency for n^{th} emission
$\varepsilon_{s,n}$ = surface efficiency (0.25 for alpha and low-energy beta particles, 0.5 for high-energy beta particles) for n^{th} emission.

Figures B-1 through B-11 present floorplans containing the radiological survey data generated during the site visits.

In the basement, the 2×2 responses ranged from 5,500 to 11,000 cpm. Gamma radiation levels varied based on proximity with materials known to contain naturally occurring radioactive material (NORM)—i.e., red bricks, bathroom tile. Bags and drums containing aluminum oxide, ceramics, and chemicals were located throughout the floor and had elevated radiation levels, up to 16,000 cpm and 22 µR/h (These elevated radiation levels were attributed to the presence of NORM in these materials). Exposure rates ranged from 4 to 10 µR/h at 1 meter. Other than readings attributed to the presence of NORM in some of the materials, no discrete areas of elevated radiation were encountered in the basement. No locations were selected for direct measurements or smear sampling.

On the first floor, the 2×2 responses over the walls and wood floor ranged from 3,000 to 71,000 cpm. Gamma radiation levels varied based on proximity with materials known to contain NORM (i.e., red bricks, bathroom tile), although several small areas of elevated activity were also identified. Deionized water tanks, used by UniMetal Surface Finishing, also produced elevated radiation levels, including maximums of 78,000 cpm and 100 µR/h on contact. These elevated levels may be associated with accumulated NORM (e.g., in the mineral salts or resins). Exposure rates ranged from 3 to 17 µR/h at 1 meter throughout the first floor. Overall, the southern portion of the floor had lower gamma radiation levels and exposure rates compared to the northern portion of the floor. There were no obvious physical differences between the two portions that would suggest why background levels would be different. The clock tower inner walls had higher gamma radiation levels compared to inner walls located throughout the rest of the floor. These walls were composed of sheetrock, contained red cinder blocks behind the sheetrock, and were original to the building. Three locations were selected for direct measurements and smear sampling. The highest 2×2 response (71,000 cpm; general area background of 7,000 cpm) was encountered on the floor on the north side of the building near

the entrance to UniMetal Surface Finishing. This location was identified in previous surveys and covers an approximate 0.6 meter by 0.6 meter area with a distinct hot spot in the middle. Exposure rates were measured on contact for the three locations investigated further and ranged from 30 to 75 µR/h (general area background of 7 µR/h). However, the exposure rate at 1 meter for the three locations ranged from 10 to 16 µR/h, including background, which is lower than the NRC's threshold for implementing controls of 40 µR/h above background. Direct measurement results ranged from 1,500 to 21,000 dpm/100 cm^2, with a background of 330 dpm/100 cm^2. Smear sample results were below the minimum detectable concentrations (MDCs) for removable alpha and beta contamination. This result implies that the contamination identified is not easily removable or spread in its current condition.

On the second floor, the 2×2 responses ranged from 2,700 to 56,000 cpm. Gamma radiation levels varied based on proximity to materials known to contain NORM—i.e., red bricks, rocks, etc. Exposure rates ranged from 2 to 15 µR/h at 1 meter. Overall, the southern portion of the floor had lower gamma radiation levels and exposure rates comparable to the northern portion of the floor. There are no obvious physical differences between the two portions that would suggest why background levels would be different. The clock tower inner closet had higher gamma radiation levels compared to the rest of the clock tower. This closet was a smaller room (2 meters by 3 meters) composed of red brick. Multiple discrete areas of elevated radiation were detected throughout the second floor. These areas were less than 0.05 meters in diameter. A contact exposure rate measurement taken at each location was less than 40 µR/h; 1 meter exposure rate levels were consistent with the surrounding area. Two locations were selected for direct measurements and smear sampling. The highest 2×2 response (56,000 cpm, general area background of 4,000 cpm) was encountered on the floor in the northeast portion of the building. This location was not documented during previous surveys. This location was less than 0.05 meters in diameter. Exposure rates were measured on contact for the two locations investigated further and ranged from 41 to 48 µR/h (general area background of 4 µR/h). However, the exposure rate at 1 meter for these two locations ranged from 4 to 5 µR/h, including background, which is lower than the NRC's threshold for implementing controls of 40 µR/h above background. Direct measurement results ranged from 1,400 to 1,800 dpm/100 cm^2, with a background of 120 dpm/100 cm^2. Smear sample results were below the MDCs for removable alpha and beta contamination. This result implies that the contamination identified is not easily removable or spread in its current condition.

On the third floor, the 2×2 responses ranged from 3,500 to 530,000 cpm (background ranges from 5,000 to 18,000 cpm). Gamma radiation levels varied based on proximity with materials known to contain NORM (i.e., red bricks, tiles). Exposure rates ranged from 3 to 47 µR/h at 1 meter (background ranges from 4-10 µR/h). The clock tower inner closet had higher gamma radiation levels compared to the rest of the clock tower. This closet was a smaller room (2 meters by 3 meters) composed of red brick. Multiple discrete areas of elevated radiation were detected throughout the third floor that had exposure rates less than 40 µR/h on contact; 1 meter exposure rate levels were consistent with the surrounding area. There were discrete locations of elevated radiation that had exposure rates greater than 40 µR/h on contact, including background, which were investigated further. In the clock tower, office numbers were established for reporting purposes and are not designated as such on site. The highest 2×2 response (530,000 cpm, general area background of 12,000 cpm) was encountered on the windowsill in office 3 in the clock tower. This location was identified in previous surveys. Widespread areas of elevated radiation were identified in the clock tower in the women's restroom (Figure A.14), office 3 (Figure A.15), office 4 (Figure A.16), and the storage closet entryway (Figure A.17). These were no more than 1 meter by 1 meter in size. Twenty-one total locations were selected for direct measurements and smear sampling. Exposure rates were

measured on contact for the 21 locations investigated further and ranged from 19 to 600 µR/h (general area background of 5-10 µR/h). However, the exposure rate at 1 meter for these 21 locations ranged from 5 to 47 µR/h, including background, which is lower than the NRC's threshold for implementing controls of 40 µR/h above background. Direct measurement results ranged from 310 to 23,000 dpm/100 cm^2 with a background of 240 dpm/100 cm^2. Smear sample results were below the MDCs for removable alpha and beta contamination. This result implies that the contamination identified is not easily removable or spread in its current condition.

On the fourth floor, the 2×2 responses ranged from 4,000 to 200,000 cpm. Gamma radiation levels varied based on proximity with materials known to contain NORM—i.e., red bricks, bathroom tile. Exposure rates ranged from 4 to 15 µR/h at 1 meter. The highest 2×2 response (200,000 cpm, general area background of 7,000 cpm) was encountered on the floor on the north end of the building near the baseball practice areas. This location was identified in previous surveys. This location covered an approximate 0.6 meter by 0.6 meter area with a distinct hot spot in the middle. Five locations were selected for direct measurements and smear sampling. Exposure rates were measured on contact for the five locations investigated further and ranged from 10 to 240 µR/h (general area background of 5 µR/h). However, the exposure rate at 1 meter for these 5 locations ranged from 7 to 10 µR/h, including background, which is lower than the NRC's threshold for implementing controls of 40 µR/h above background. Direct measurement results ranged from 180 to 9,900 dpm/100 cm^2 with a background of 230 dpm/100 cm^2. Smear sample results were below the MDCs for removable alpha and beta contamination. This result implies that the contamination identified is not easily removable or spread in its current condition.

3.3 Summary of Dose Assessment Results

When the NRC evaluates a site for radium contamination, two determinations must be made. First, whether there are any immediate health and safety concerns that require restricting access to the contaminated area. And second, whether remediation is necessary. To date, a site-specific dose assessment has not been performed for the Seth Thomas site. However, estimates can be calculated for the areas of contamination (and the corresponding exposure rate measurements) identified during the initial site visit to assess potential doses to occupants.

To determine whether there are any immediate health and safety concerns that require restricting access to the contaminated area, current use of the site is considered to estimate if potential doses to occupants exceed 100 mrem/yr. Contamination was identified on the first, second, third, and fourth floors. All four floors are currently configured for industrial use. The TI presents an action level (AL) that correlates to 100 mrem/yr dose to a worker (i.e., 40 µR/h above background measured at one meter from the source of contamination). The AL accounts for gamma exposure alone and may be used to quickly identify radiation levels that could conservatively produce a dose above the public dose limit in 10 CFR Section 20.1301. The 40 µR/h AL was used to determine if immediate controls, for the current site configuration, is warranted.

Although multiple areas were found to be above the 40 µR/h AL on contact, no areas exceed the AL at 1 meter from the source of contamination, once background is taken into consideration. The highest net exposure rate found at 1 meter is 39 µR/h (after the 8 µR/h background is excluded), which is below the AL for industrial use. Although measurements of radiation levels (as well as consideration of the length of time the areas would typically be occupied) do not correlate to projected doses that would exceed the public dose limit of 100

mrem/yr, it was noted during the site visit that some areas were found to have measurements that corresponded to dose values that approach the public dose limit for the industrial worker scenario. In one empty office space on the third floor, the potential to exceed the public dose limit of 100 mrem/yr was considered more likely given the configuration of the room, namely, it was a small space which, if occupied as an office, it would be difficult to maintain a distance greater than a meter from discrete locations of elevated radiation that had exposure rates greater than 40 µR/h on contact (i.e., the window sill and floor locations).

Elevated alpha-plus-beta measurements, including a maximum of 23,000 dpm/100 cm^2 on the third floor, must also be considered. Smear sample data show very little removable activity (on the order of 0.1 % or less of the total amount), though dose models, such as DandD (NRC 2001), typically assume 10% removable fraction. The lack of removable activity suggests that modeled values, such as those derived using DandD, will be limited to the external gamma pathway and actual data are preferred over modeled data. Therefore, µR/h data collected during the site visit are sufficient to determine compliance with the 100 mrem/yr criterion.

To determine whether remediation is necessary, future use of the site is considered to estimate if potential doses to occupants exceed 25 mrem/yr. The NRC is aware that other former clock factory properties in Connecticut have been converted for residential uses. Therefore, a residential use scenario was used to determine if remediation is necessary. Due to the lack of removable activity, these data are also suitable to assess whether future occupants may receive a dose in excess of 25 mrem/yr limit for unrestricted use in accordance with 10 CFR 20.1402. Exposure rate measurements at 1 meter on the third floor suggest that potential doses may, based on external gamma radiation alone, exceed NRC's unrestricted use dose criterion for an industrial occupant scenario based on 2,300 hours of annual occupancy, as was covered in the TI (NRC 2017), if the entire occupancy occurs at 1 meter from the elevated measurement. If a residential annual occupancy is considered with 6,800 hours, then an additional three locations on the first floor may result in a dose in excess of 25 mrem/yr limit for unrestricted use in 10 CFR 20.1402.

4.0 OBSERVATIONS AND RECOMMENDATIONS

Based on the data collected, the former Seth Thomas Clock Company building contains discrete sources of Ra-226. ORAU made the following observations:

- Elevated direct gamma radiation due to Ra-226 was positively identified on the first, second, third, and fourth floors. All exposure rate values on the first, second, and fourth floors, excluding background, were less than the public dose limit of 100 mrem/yr (i.e., the industrial use 40 µR/h TI threshold). However, one empty office space on the third floor was considered more likely to exceed the public dose limit for the industrial worker scenario given the configuration of the room.

- Current surveys indicate that remedial actions would be required on the first and third floors to ensure doses would be below the 25 mrem/yr unrestricted use dose limits for potential future use (i.e., residential use).

Radium contamination was found in various areas throughout the property located at 135 South Main Street in Thomaston, Connecticut (i.e., the former Seth Thomas Clock Company). It was noted during the site visit that one empty office space was considered more likely to exceed the public dose limit of 100 mrem/yr for the industrial worker scenario given the configuration of the room. In response to this concern, the NRC inspector, at the end of the December 2016 initial

site visit, recommended that the owner's representative should limit access to the elevated area, specifically the office on the third floor, until further action is taken. The owner's representative agreed and indicated that he would lock the door to the office on the third floor and not rent out the space.

5.0 REFERENCES

ATSDR 1999. *Public Health Implications of Radiation Contamination at Former Clock Factories Located in Bristol (Hartford County), New Haven, (New Haven County), Thomaston (Litchfield County), and Waterbury (New Haven County), Connecticut*, prepared by the Connecticut Department of Public Health under Cooperative Agreement with The Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. January 29. (Agencywide Documents Access and Management System [ADAMS] Accession No. ML17038A052).

Godin Property Brokers, LLC 2016. Online listing of industrial properties for lease, Webpage: http://godinpropertybrokers.com/industrial/, Godin Property Brokers LLC., Accessed December 21.

NRC 2001. *Residual Radioactive Contamination from Decommissioning – User's Manual* DandD Version 2.1. NUREG/CR-5512, Vol. 2, U.S. Nuclear Regulatory Commission, April.

NRC 2017. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, Revision 1, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., October. (ADAMS Accession No. ML16330A678).

ORNL 2015. *Historical Non-Military Radium Sites Research Effort Addendum*, "Seth Thomas Clock Company: Site Summary," Pgs. 128-133, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 24. (ADAMS Accession No. ML16291A488).

Scientech 2003. *Connecticut Radium Sites Verification Survey*, prepared for: Valley Council of Governments, prepared by: SCIENTECH, Inc., New Milford, Connecticut, ML, October. (ADAMS Accession No. ML17039A514).

APPENDIX A
PHOTOS FROM THE SETH THOMAS CLOCK COMPANY SITE VISIT

Figure A-1. Seth Thomas Basement

Figure A-2. Seth Thomas Basement

Figure A-3. Seth Thomas Basement

Figure A-4. Seth Thomas First Floor

Figure A-5. Seth Thomas First Floor

Figure A-6. Seth Thomas First Floor

Figure A-7. Seth Thomas First Floor Clock Tower

Figure A-8. Seth Thomas First Floor Clock Tower Storage Closet

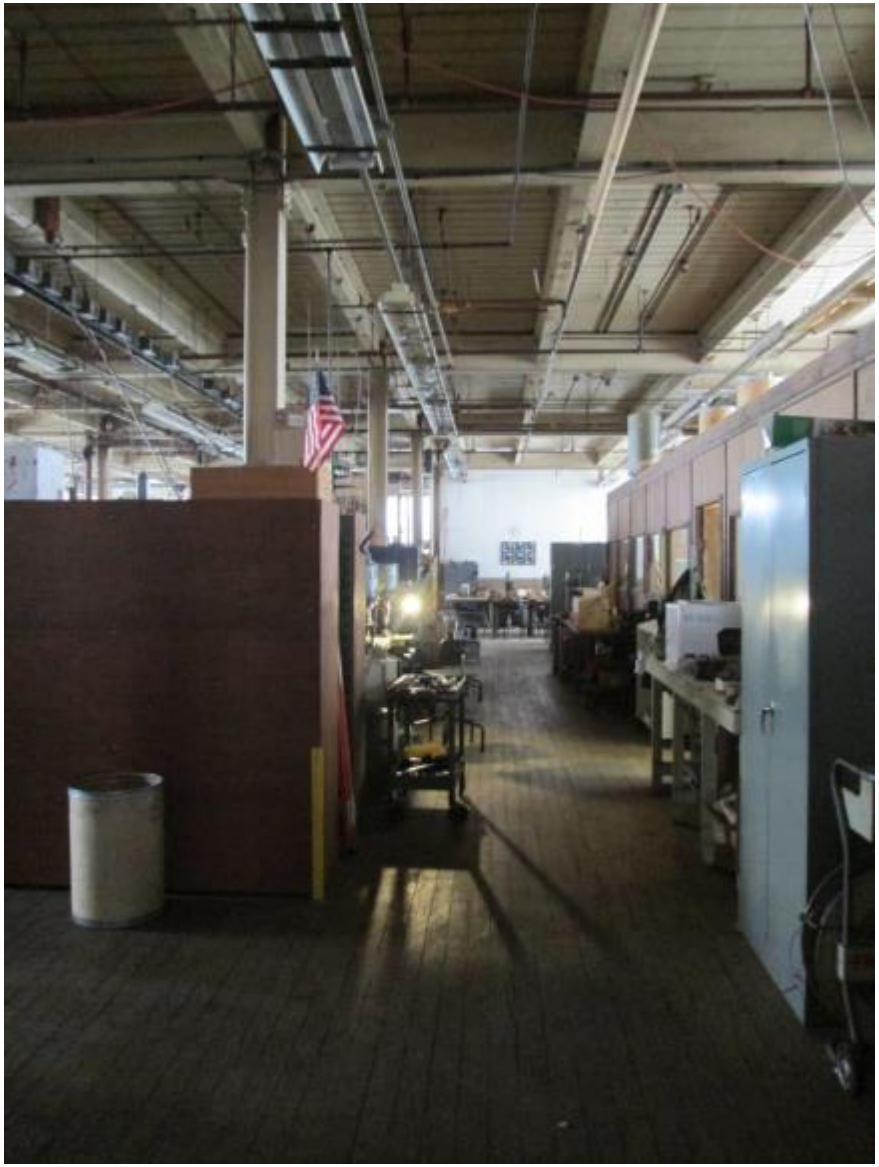


Figure A-9. Seth Thomas Second Floor

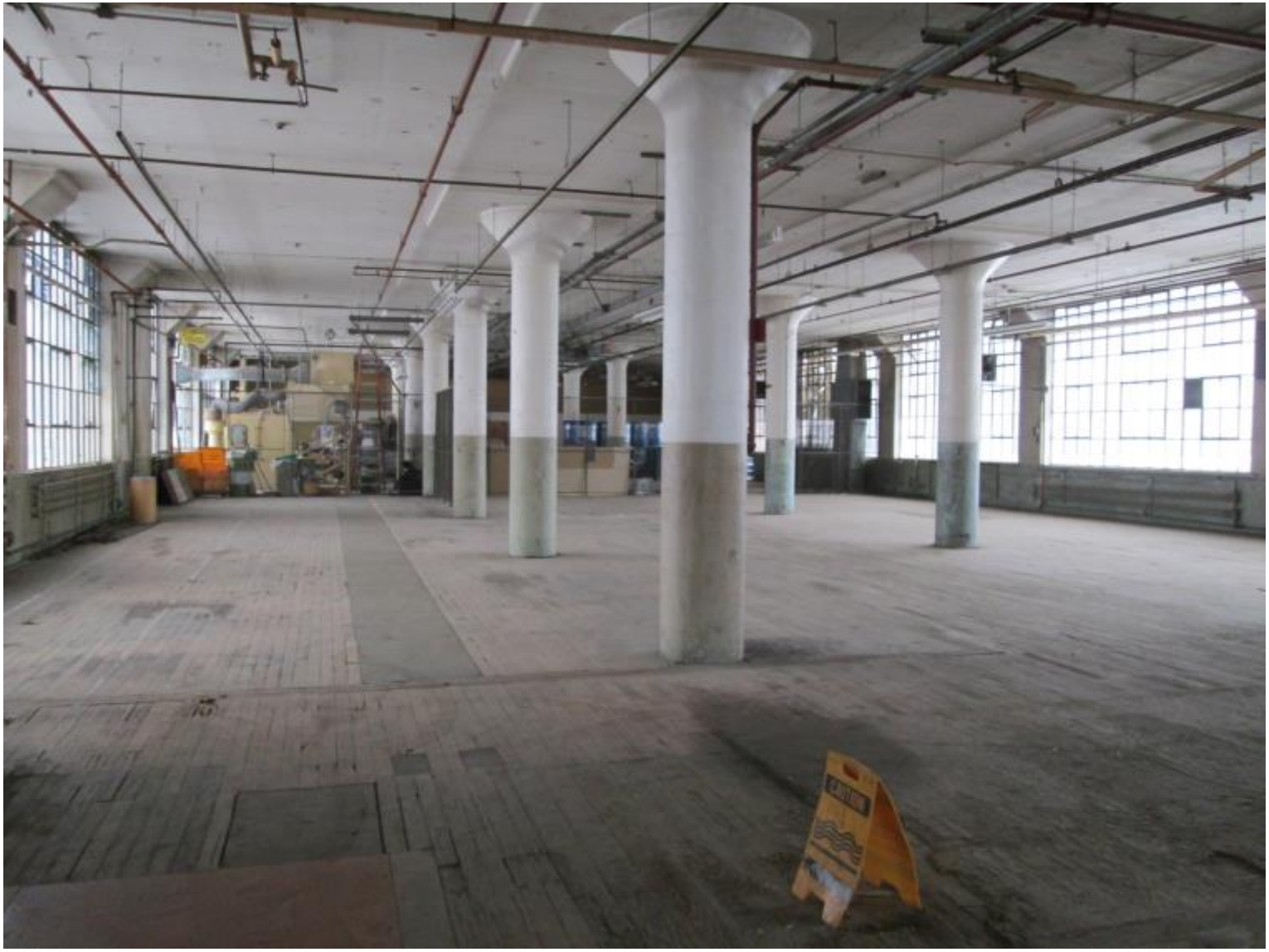


Figure A-10. Seth Thomas Second Floor

Figure A-11. Seth Thomas Second Floor

Figure A-12. Seth Thomas Third Floor

Figure A-13. Seth Thomas Third Floor

Figure A-14. Seth Thomas Third Floor Clock Tower

Figure A-15. Seth Thomas Third Floor Clock Tower

Figure A-16, Seth Thomas Third Floor Clock Tower

Figure A-17. Seth Thomas Third Floor Clock Tower

Figure A-18. Seth Thomas Fourth Floor

Figure A-19. Seth Thomas Fourth Floor

APPENDIX B
SURVEY MAPS AND DATA TABLES

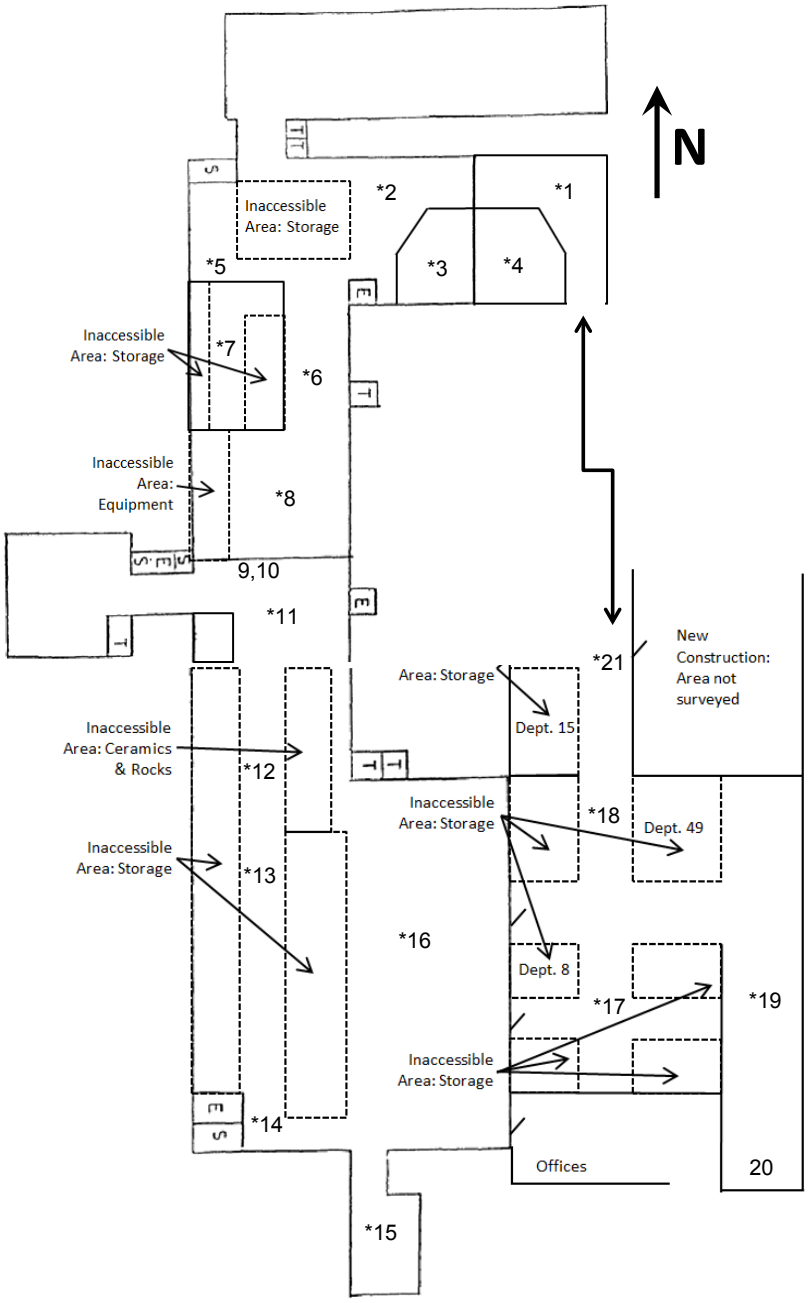
Table B-1: Seth Thomas Measurement & Smear Results - Basement									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
*1	—	—	—	—	—	8,000 - 9,500	—	6 - 7	concrete floor
*2	—	—	—	—	—	7,500 - 10,300	—	6 - 9	concrete floor
*3	—	—	—	—	—	7,000 - 8,700	—	5 - 7	concrete floor
*4	—	—	—	—	—	7,000 - 8,000	—	5 - 7	concrete floor
*5	—	—	—	—	—	7,000 - 8,000	—	5	concrete floor
*6	—	—	—	—	—	8,000 - 11,000	—	7 - 10	concrete floor
*7	—	—	—	—	—	6,000 - 8,000	—	5 - 6	concrete floor
*8	—	—	—	—	—	8,000 - 9,000	—	6 - 8	concrete floor
9	—	—	—	—	—	13,000	—	10	painted cinder block wall
10	—	—	—	—	—	11,000	—	9	concrete floor next to painted cinder block wall
*11	—	—	—	—	—	7,700 - 11,100	—	7 - 10	concrete floor
*12	—	—	—	—	—	15,000 - 16,000	—	16 - 22	concrete floor, barrels of ceramic and rock nearby
*13	—	—	—	—	—	5,500 - 10,000	—	4 - 10	concrete floor
*14	—	—	—	—	—	6,000 - 9,500	—	5 - 8	concrete floor, wall
*15	—	—	—	—	—	8,500 - 11,000	—	7 - 9	concrete floor
*16	—	—	—	—	—	5,600 - 9,200	—	5 - 7	concrete floor
*17	—	—	—	—	—	8,000 - 10,000	—	6 - 7	concrete floor
*18	—	—	—	—	—	9,000 - 10,000	—	6 - 8	concrete floor
*19	—	—	—	—	—	7,000 - 9,000	—	6 - 8	concrete floor
20	—	—	—	—	—	10,000	—	9	wall
*21	—	—	—	—	—	7,500 - 9,000	—	6 - 7	concrete floor

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
* General area measurement range
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** Basement	**Date(s):** 02/01/2017	**Time:** 08:15 – 10:45
Surveyor(s): KME/STP		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gamma	2221 No. 590, No.1143	44-10 No. 908, No.664	5.5 - 16 kcpm[a]
Gamma	192 No.1127, No. 1129	NA	4 - 22 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



◯ = smear location
= measurement location number
See attached table for measurement results
* General area measurement ranges provided in attached table.

Figure B-1. Seth Thomas, Basement

Table B-2. Seth Thomas Measurement & Smear Results - 1st Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	13,000	—	12	wooden floor
2	—	—	—	—	—	7,000	—	7	wooden floor
3	—	—	—	—	—	5,000	—	5	wooden floor
4	—	—	—	—	—	6,000	—	6	wooden floor
5	—	—	—	—	—	5,000	—	5	wooden floor
6	—	—	—	—	—	8,000	—	7	wooden floor
7	—	—	—	—	—	10,000	—	10	wooden floor
8	—	—	—	—	—	10,000	—	9	wooden floor
9	—	—	—	—	—	8,000	—	8	wooden floor
10	—	—	—	—	—	8,000	—	9	wooden floor
11	—	—	—	—	—	9,000	—	10	wooden floor
12	—	—	—	—	—	8,500	—	8	wooden floor
13	—	—	—	—	—	7,000	—	7	wooden floor
14	—	—	—	—	—	6,000	—	7	wooden floor
15	R0055	-0.37	-0.93	3,126	1,600	60,000	75	15	wooden floor, hotspot[d]
16	—	—	—	—	—	15,000	—	7	wooden floor
17	—	—	—	—	—	78,000	100	20	water tank
18	R0054	-0.37	0.29	34,641[e]	21,000[e]	35,000	30	10	wooden floor, hotspot[d]
19	R0053	-0.37	1.52	2,976	1,500	71,000	60	16	wooden floor, hotspot[d]
20	—	—	—	—	—	7,000	—	8	wooden floor
21	—	—	—	—	—	10,000	—	10	wooden floor
22	—	—	—	—	—	10,000	—	9	wooden floor
23	—	—	—	—	—	8,000	—	7	wooden floor
24	—	—	—	—	—	8,200	—	7	wooden floor
25	—	—	—	—	—	7,600	—	7	wooden floor
26	—	—	—	—	—	7,800	—	7	wooden floor
27	—	—	—	—	—	21,000	21	10	wooden floor, hotspot[d]
28	—	—	—	—	—	3,000	—	3	wooden floor
29	—	—	—	—	—	3,500	—	3	wooden floor
30	—	—	—	—	—	3,000	—	3	wooden floor
31	—	—	—	—	—	4,200	—	4	wooden floor
32	—	—	—	—	—	3,000	—	3	wooden floor
33	—	—	—	—	—	6,000	—	5	wooden floor
34	—	—	—	—	—	3,700	—	4	wooden floor
35	—	—	—	—	—	5,000	—	5	wooden floor
36	—	—	—	—	—	3,500	—	4	wooden floor
37	—	—	—	—	—	4,000	—	4	wooden floor
38	—	—	—	—	—	6,500	—	5	wooden floor
39	—	—	—	—	—	4,000	—	5	wooden floor
40	—	—	—	—	—	5,000	—	6	wooden floor
41	—	—	—	—	—	4,700	—	4	wooden floor
42	—	—	—	—	—	8,000	—	8	wall
43	—	—	—	—	—	7,000	—	7	wooden floor
44	—	—	—	—	—	5,500	—	5	wooden floor
45	—	—	—	—	—	6,000	—	5	wooden floor
46	—	—	—	—	—	8,000	—	8	wooden floor
47	—	—	—	—	—	6,000	—	5	wooden floor
48	—	—	—	—	—	9,000	—	9	wooden floor
*49	—	—	—	—	—	9,700 - 13,000	—	8.5 - 12	wooden floor, wall
*50	—	—	—	—	—	8,300 - 13,000	—	7 - 13	wooden floor, window

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
e) Possible transcription error on the original survey form
* General area measurement range
— indicates measurement not collected at this location

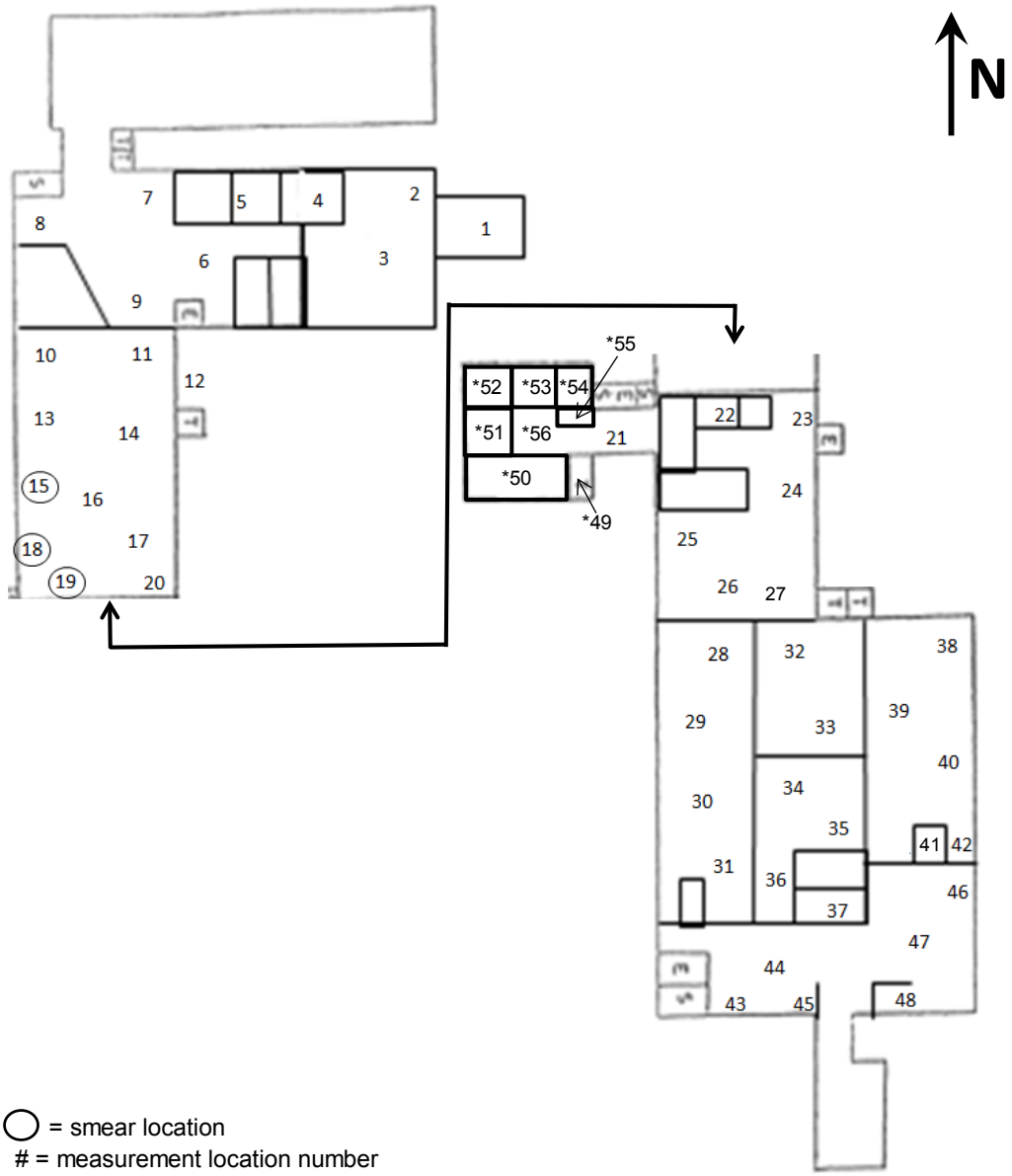
Table B-2. Seth Thomas Measurement & Smear Results - 1st Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
*51	—	—	—	—	—	9,900 - 10,900	—	9 - 10	wooden floor
*52	—	—	—	—	—	8,800 - 11,900	—	8 - 10	wooden floor, window
*53	—	—	—	—	—	10,300 - 12,800	—	8.5 - 11	wooden floor, window
*54	—	—	—	—	—	9,500 - 12,000	—	8.5 - 12	wooden floor, window
*55	—	—	—	—	—	11,600 - 14,700	—	15	storage closet, wood floor
*56	—	—	—	—	—	10,700 - 12,500	—	9 - 11.5	wooden floor

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
e) Possible transcription error on the original survey form
* General area measurement range
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** 1st Floor	**Date(s):** 12/15/2016 01/31/2017	**Time:** 07:30 – 15:00 08:15 – 09:00
Surveyor(s): KME (12/15/2016) KME/STP (01/31/2017)		**Purpose:** Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.1143	44-142 No.920	528 cpm[a]
Gamma	2221 No.1143	44-10 No.664	3 - 15 kcpm[a]
Gamma	192 No.1127	NA	3 - 15 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



◯ = smear location
= measurement location number
See attached table for measurement results
* General area measurement ranges provided in attached table.

Figure B-2. Seth Thomas, 1st Floor

Table B-3. Seth Thomas Measurement & Smear Results - 2nd Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
*1	—	—	—	—	—	3,200 - 5,000	—	3 - 5	wooden floor
2	—	—	—	—	—	25,000	21	—	wooden floor, hotspot[d]
3	—	—	—	—	—	8,000	—	6	wall
4	—	—	—	—	—	3,800	—	4	wooden floor
5	—	—	—	—	—	22,000	20	—	wooden floor, hotspot[d]
*6	—	—	—	—	—	4,300 - 5,000	—	3 - 4	wooden floor
*7	—	—	—	—	—	3,200 - 5,000	—	4 - 5	wooden floor
8	—	—	—	—	—	11,600	—	5	wooden floor
9	R0065	-0.71	0	3,067	1,800	56,000	48	5	wooden floor, hotspot[d]
10	R0066	-0.71	0	2,361	1,400	55,500	41	3.5	wooden floor, hotspot[d]
11	—	—	—	—	—	7,900	—	5	wall
12	—	—	—	—	—	6,000	—	4	wall
13	—	—	—	—	—	5,000	—	5	wooden floor
14	—	—	—	—	—	9,000	—	10	Shelf of rocks
15	—	—	—	—	—	5,000	—	5	wooden floor
16	—	—	—	—	—	6,000	—	5	wooden floor
17	—	—	—	—	—	7,000	—	—	window
18	—	—	—	—	—	10,000	—	8.5	wall
19	—	—	—	—	—	13,000	—	11.5	bathroom
20	—	—	—	—	—	6,000	—	5	wall
21	—	—	—	—	—	5,000	—	5	wooden floor
*22	—	—	—	—	—	6,700 - 8,500	—	6 - 7	wooden floor, window
*23	—	—	—	—	—	8,000 - 9,500	—	7 - 8	wooden floor
*24	—	—	—	—	—	8,300 - 10,000	—	8 - 10	wooden floor
25	—	—	—	—	—	8,300	—	7	wooden floor
26	—	—	—	—	—	13,000	—	15	wall
27	—	—	—	—	—	25,000	18	—	wooden floor, hotspot[d]
28	—	—	—	—	—	32,000	27	—	wooden floor, hotspot[d]
29	—	—	—	—	—	26,000	25	—	wooden floor, hotspot[d]
30	—	—	—	—	—	13,000	—	10	wall
31	—	—	—	—	—	35,000	30	—	wooden floor, hotspot[d]
32	—	—	—	—	—	12,000	—	9	wooden floor
*33	—	—	—	—	—	8,000 - 10,000	—	7 - 8	wooden floor
34	—	—	—	—	—	14,000	10	—	wooden floor, hotspot[d]
35	—	—	—	—	—	34,000	24	—	wooden floor, hotspot[d]
36	—	—	—	—	—	19,000	17	—	wooden floor, hotspot[d]
*37	—	—	—	—	—	4,000 - 9,000	—	3 - 8	wooden floor
*38	—	—	—	—	—	7,000 - 9,000	—	6 - 9	wooden floor
39	—	—	—	—	—	10,000	—	10	wooden floor, located between walls
*40	—	—	—	—	—	11,900 - 14,000	—	11 - 13	wooden floor, located between storage closet (concrete floors) and bathrooms (tile floors)

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
* General area measurement range
— indicates measurement not collected at this location

Table B-3. Seth Thomas Measurement & Smear Results - 2nd Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
*41	—	—	—	—	—	10,400 - 12,000	—	9 - 10	wooden floor
*42	—	—	—	—	—	8,500 - 10,700	—	8 - 10	wooden floor, window
*43	—	—	—	—	—	8,000 - 10,000	—	7 - 9	wooden floor, window
*44	—	—	—	—	—	8,400 - 10,300	—	7 - 9	wooden floor, window
*45	—	—	—	—	—	8,100 - 11,200	—	8 - 11	wooden floor, window
*46	—	—	—	—	—	14,800 - 15,600	—	15	wood floor
*47	—	—	—	—	—	9,800 - 12,200	—	8 - 11	tile floor, wall, window
*48	—	—	—	—	—	10,400 - 13,000	—	9 - 12	tile floor, wall, window
*49	—	—	—	—	—	9,200 - 12,400	—	7 - 11	wooden floor, window
50	—	—	—	—	—	8,000 - 9,800	—	7 - 9	wooden floor, window
51	—	—	—	—	—	37,400	31	—	wooden floor, hotspot[d]
52	—	—	—	—	—	13,500	—	11	wall
53	—	—	—	—	—	17,100	17	—	wooden floor, hotspot[d]
54	—	—	—	—	—	19,200	18	—	wooden floor, hotspot[d]
*55	—	—	—	—	—	8,000 - 11,500	—	5 - 10.5	wooden floor
*56	—	—	—	—	—	13,600 - 14,000	—	14 - 15	bathroom, concrete floors, wall
*57	—	—	—	—	—	2,700 - 9,300	—	2 - 9	wooden floor
*58	—	—	—	—	—	4,000 - 8,900	—	3 - 9	wooden floor

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
* General area measurement range
— indicates measurement not collected at this location

Site: Seth Thomas	Area: 2nd Floor	Date(s): 1/31/2017	Time: 09:15 – 13:30
Surveyor(s): KME/STP		Purpose: Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.1143	44-142 No.920	198 cpm[a]
Gamma	2221 No.590, No.1143	44-10 No.908, No.664	3 - 16 kcpm[a]
Gamma	192 No.1127, No.1129	NA	3 - 15 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

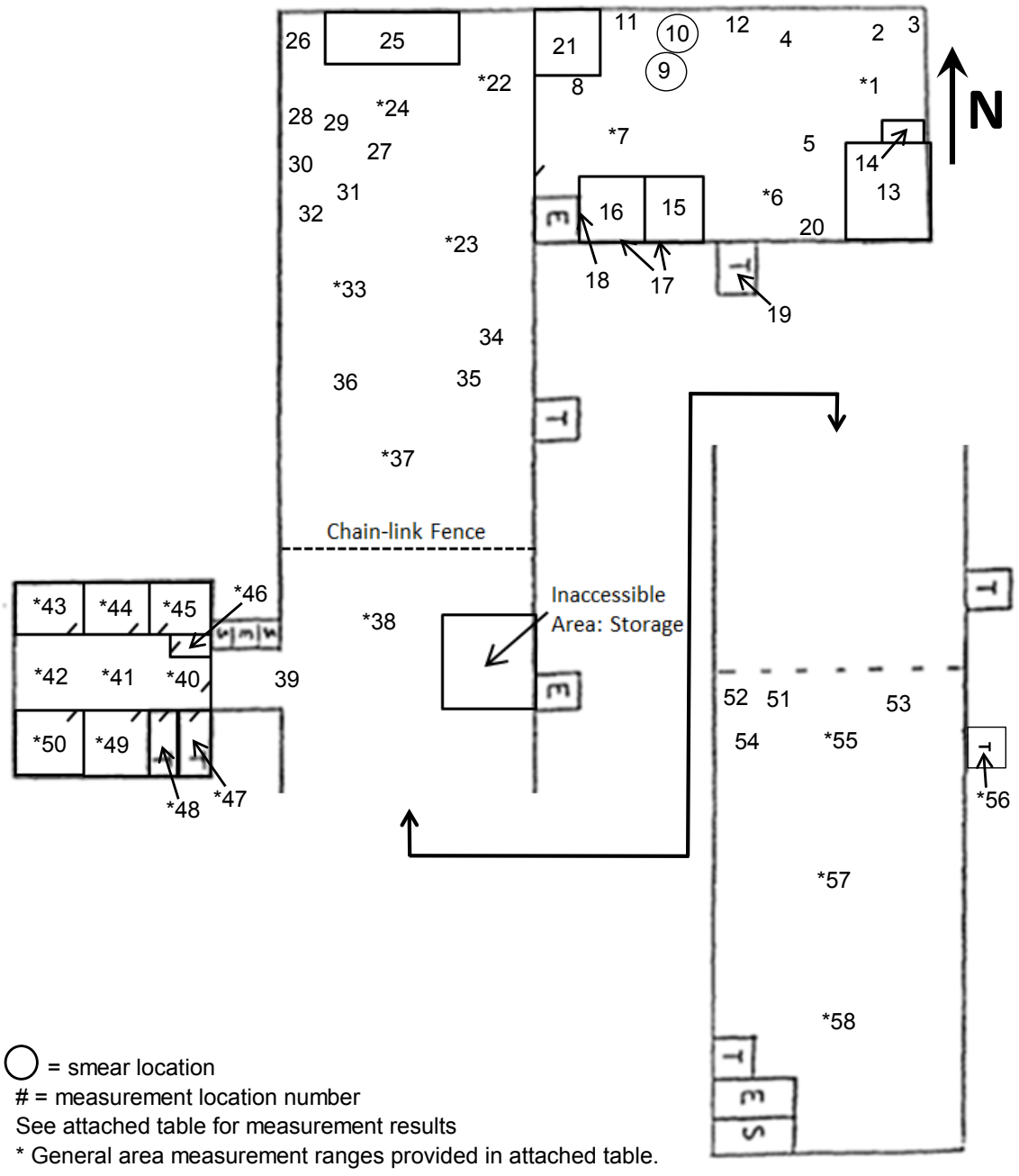


Figure B-3. Seth Thomas, 2nd Floor

Table B-4. Seth Thomas Measurement & Smear Results - 3rd Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	9,500	—	8	wooden floor
2	—	—	—	—	—	14,000	—	—	red brick wall
3	—	—	—	—	—	8,000	—	6	wooden floor
4	—	—	—	—	—	10,000	—	8	wooden floor, red brick walls
5	—	—	—	—	—	6,000	—	5	wooden floor
6	—	—	—	—	—	5,000	—	3	carpet over wooden floor
7	—	—	—	—	—	9,000	—	6	exercise mat over wooden floor; red brick wall
8	—	—	—	—	—	5,000	—	4	exercise mat over wooden floor
9	—	—	—	—	—	7,000	—	4	wooden floor
10	—	—	—	—	—	6,000	—	4	wooden floor
11	—	—	—	—	—	7,000	—	6	wooden floor
12	—	—	—	—	—	8,000	—	6	wooden floor
13	—	—	—	—	—	8,000	—	5	office, wooden floor
14	—	—	—	—	—	14,000	—	7	bathroom, concrete floor
15	—	—	—	—	—	16,000	—	8	bathroom, concrete floor, red brick wall
16	R0043	-0.37	-0.93	988	430	30,000	24	5	wooden floor, hotspot ≤ 0.2 m^2
17	—	—	—	—	—	16,000	13	8	concrete floor
18	—	—	—	—	—	7,000	—	5	wooden floor
19	—	—	—	—	—	24,000	20	9	wooden floor, hotspot ≤ 0.2 m^2
20	—	—	—	—	—	11,000	—	9	office 5, carpet over wooden floor
21	—	—	—	—	—	12,500	—	10	office 2, carpet over wooden floor, red brick walls
22	—	—	—	—	—	12,000	—	10	office 1, carpet over wooden floor, red brick walls
23	—	—	—	—	—	16,000	—	16	tile floor
24	—	—	—	—	—	18,000	—	15	carpet over wooden floor

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
— indicates measurement not collected at this location

Site: Seth Thomas	Area: 3rd Floor	Date(s): 12/14/2016 - 12/15/16	Time: 08:45 - 18:00
Surveyor(s): JTH		Purpose: Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.590	44-142 No.1031	295 cpm[a]
Gamma	2221 No.590, No.1143	44-10 No.908, No.664	5 - 18 kcpm[a]
Gamma	192 No.1127	NA	4 - 10 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

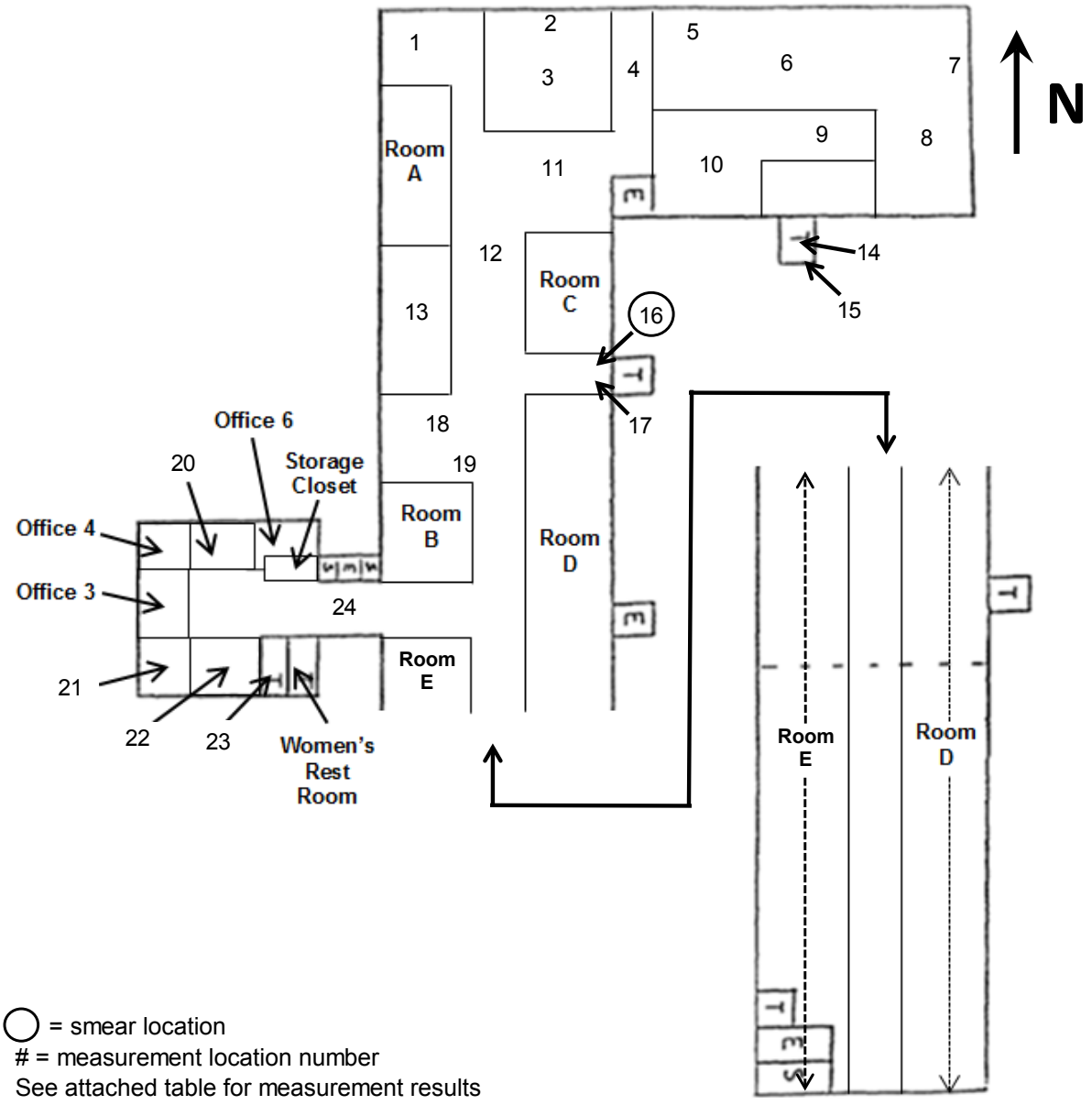


Figure B-4. Seth Thomas, 3rd Floor

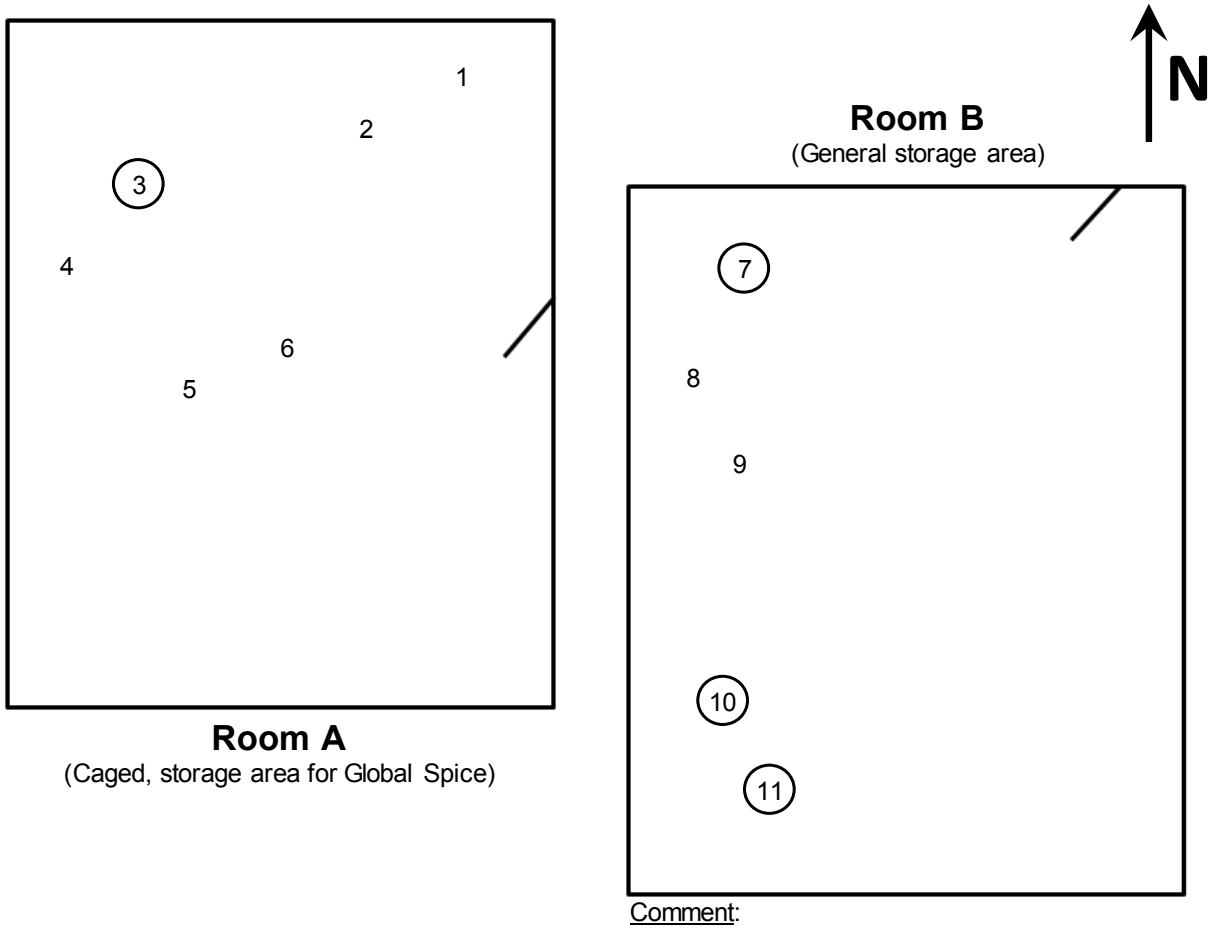
Table B-5. Seth Thomas Measurement & Smear Results - 3rd Floor (Room A, Room B)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	21,000	12	8	Room A, wooden floor, hotspot[d]
2	—	—	—	—	—	18,000	13	7	Room A, wooden floor, hotspot[d]
3	R0042	-0.37	1.52	1,444	720	32,000	19	10	Room A, wooden floor, hotspot[d]
4	—	—	—	—	—	22,000	18	10	Room A, wooden floor, hotspot[d]
5	—	—	—	—	—	21,000	15	8	Room A, wooden floor, hotspot[d]
6	—	—	—	—	—	17,500	12	6	Room A, wooden floor, hotspot[d]
7	R0056	-0.37	-2.16	16,416	10,000	83,000	65	13	Room B, wooden floor, hotspot ≤ 0.2 m^2
8	—	—	—	—	—	42,000	33	14	Room B, wooden floor, hotspot[d]
9	—	—	—	—	—	31,000	26	13	Room B, wooden floor, hotspot[d]
10	R0057	6.5	8.87	37,545	23,000	260,000	235	25	Room B, wooden floor, hotspot ≤ 0.3 m^2
11	R0058	6.5	7.65	18,260	11,000	150,000	120	23	Room B, wooden floor, hotspot[d]

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** 3rd Floor, Room A, B	**Date(s):** 12/14/16 12/15/16	**Time:** 17:00 – 19:00 13:00 – 14:00
Surveyor(s): JTH		**Purpose:** Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.590	44-142 No.1031	Room A: 295 cpm[a] Room B: 295 cpm[a]
Gamma	2221 No.590	44-10 No.908	Room A: 8 - 12 kcpm[a] Room B: 10 - 20 kcpm[a]
Gamma	192 No.1127	NA	Room A: 6 - 8 µR/h[a] Room B: 10 - 12 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



Comment:
Several discrete locations of elevated readings up to 30 kcpm were identified in Room B. Only locations with > 30 kcpm readings are noted on the map.

◯ = smear location
= measurement location number
See attached table for measurement results

Figure B-5. Seth Thomas, 3rd Floor (Room A, B)

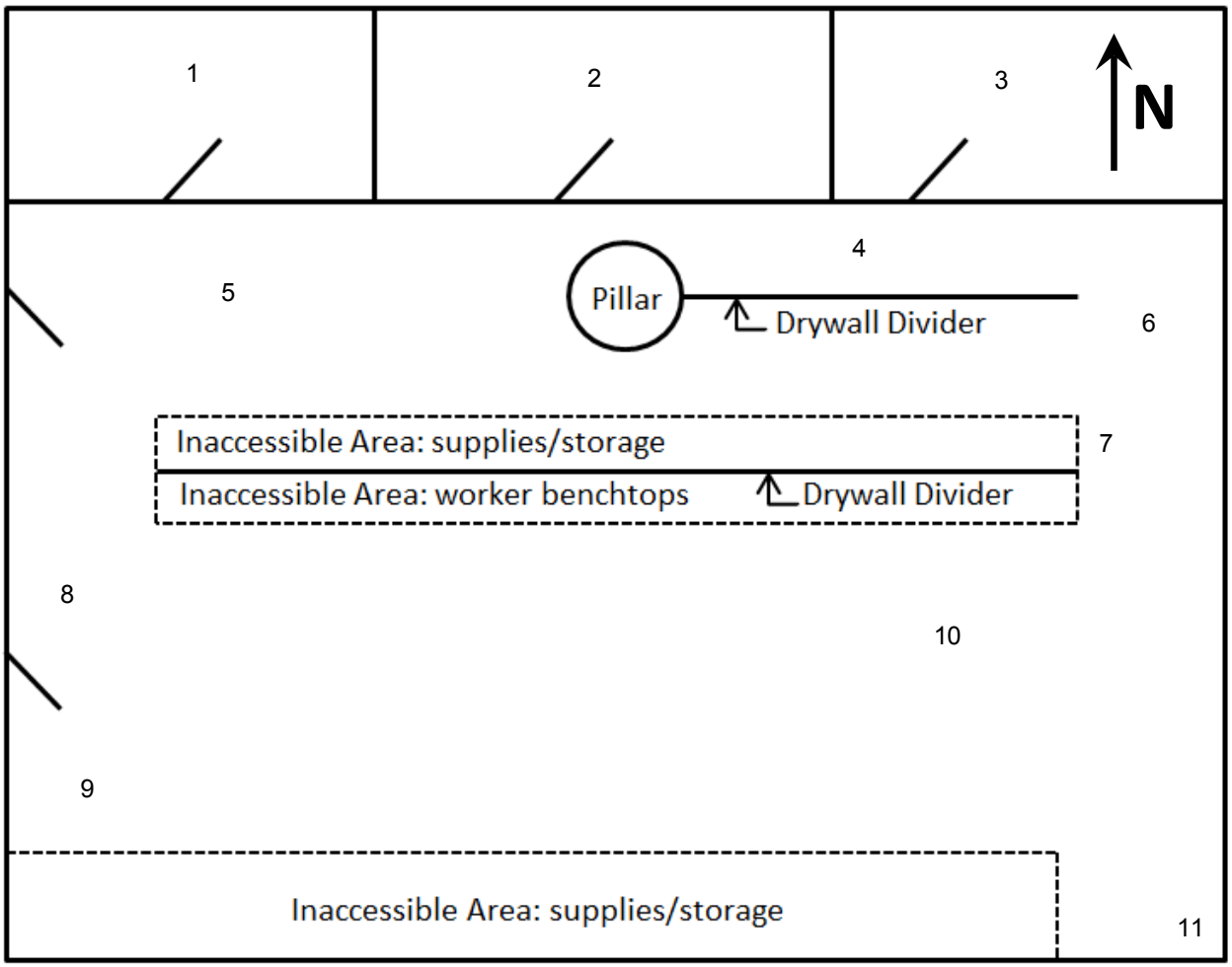
Table B-6. Seth Thomas Measurement & Smear Results - 3rd Floor (Room C)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	7,000	—	5	wooden floor
2	—	—	—	—	—	7,000	—	6	wooden floor
3	—	—	—	—	—	7,000	—	6	wooden floor
4	—	—	—	—	—	7,000	—	5	wooden floor
5	—	—	—	—	—	8,000	—	6	wooden floor
6	—	—	—	—	—	7,000	—	5	wooden floor
7	—	—	—	—	—	12,000	—	7	wooden floor
8	—	—	—	—	—	8,000	—	6	wooden floor
9	—	—	—	—	—	7,000	—	6	wooden floor
10	—	—	—	—	—	8,000	—	6	wooden floor
11	—	—	—	—	—	28,000	—	8	wooden floor, hotspot ≤ 0.2 m^2

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** 3rd Floor, Room C	**Date(s):** 12/15/16	**Time:** 14:00 – 15:00
Surveyor(s): JTH		**Purpose:** Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.590	44-142 No.1031	295 cpm[a]
Gamma	2221 No.590	44-10 No.908	8 - 12 kcpm[a]
Gamma	192 No.1127	NA	6 - 8 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



◯ = smear location
= measurement location number
See attached table for measurement results

Figure B-6. Seth Thomas, 3rd Floor (Room C)

Table B-7. Seth Thomas Measurement & Smear Results - 3rd Floor (Room D)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	9,000	—	6	wooden floor
2	—	—	—	—	—	9,000	—	7	wooden floor
3	—	—	—	—	—	11,000	—	7.5	tile floor
4	—	—	—	—	—	8,000	—	7	wooden floor
5	—	—	—	—	—	10,000	—	8	wooden floor
6	—	—	—	—	—	13,000	—	8	tile floor, red brick wall
7	—	—	—	—	—	11,000	—	8	wooden floor
8	R0059	-0.37	0.29	14,718	9,000	65,000	42	9	wooden floor, hotspot ≤ 0.1 m^2
9	—	—	—	—	—	11,000	—	8	wooden floor
10	—	—	—	—	—	10,000	—	8	wooden floor
11	—	—	—	—	—	11,000	—	9	wooden floor
12	—	—	—	—	—	24,000	—	10	wooden floor, hotspot ≤ 0.2 m^2
13	—	—	—	—	—	12,000	—	8	wooden floor
14	—	—	—	—	—	11,000	—	9	wooden floor
15	—	—	—	—	—	13,000	—	9	wooden floor
16	—	—	—	—	—	11,000	—	8	wooden floor
17	—	—	—	—	—	6,000	—	7	wooden floor
18	—	—	—	—	—	20,000	—	—	concrete floor, red brick wall
19	—	—	—	—	—	6,000	—	4	wooden floor
20	—	—	—	—	—	5,000	—	3	wooden floor
21	—	—	—	—	—	9,000	—	7	wooden floor
22	—	—	—	—	—	11,000	—	—	wooden floor, red brick wall
23	—	—	—	—	—	4,000	—	3	wooden floor
24	—	—	—	—	—	5,000	—	3	wooden floor
25	—	—	—	—	—	6,000	—	4	wooden floor
26	—	—	—	—	—	5,000	—	4	wooden floor
27	—	—	—	—	—	7,000	—	7	wooden floor
28	—	—	—	—	—	12,000	—	6	wooden floor, red brick wall

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
— indicates measurement not collected at this location

Site: Seth Thomas	Area: 3rd Floor, Room D	Date(s): 12/15/16	Time: 15:00 – 17:00
Surveyor(s): JTH		Purpose: Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.590	44-142 No.1031	295 cpm[a]
Gamma	2221 No.590	44-10 No.908	4 - 13 kcpm[a]
Gamma	192 No.1127	NA	3 - 9 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

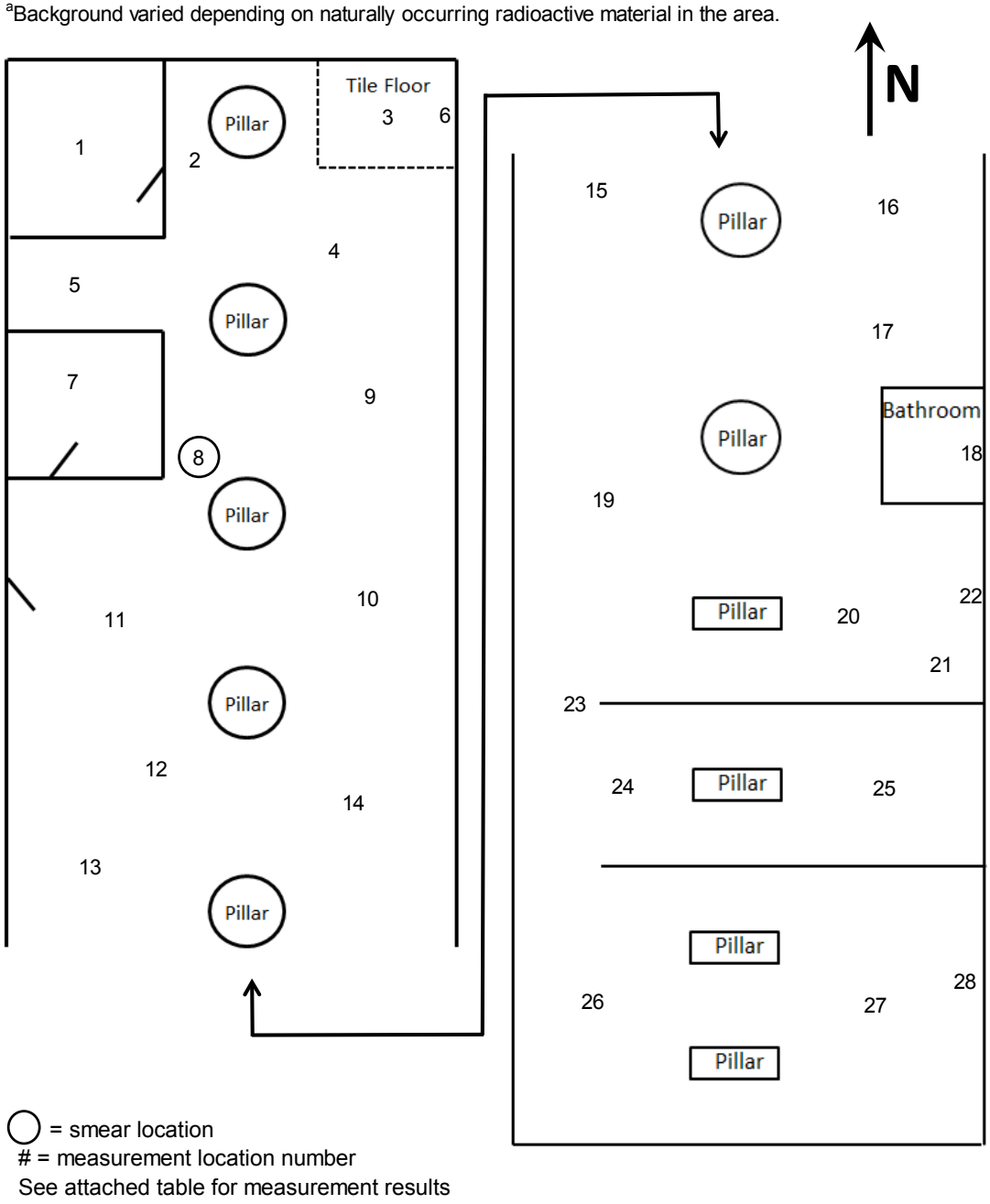


Figure B-7. Seth Thomas, 3rd Floor (Room D)

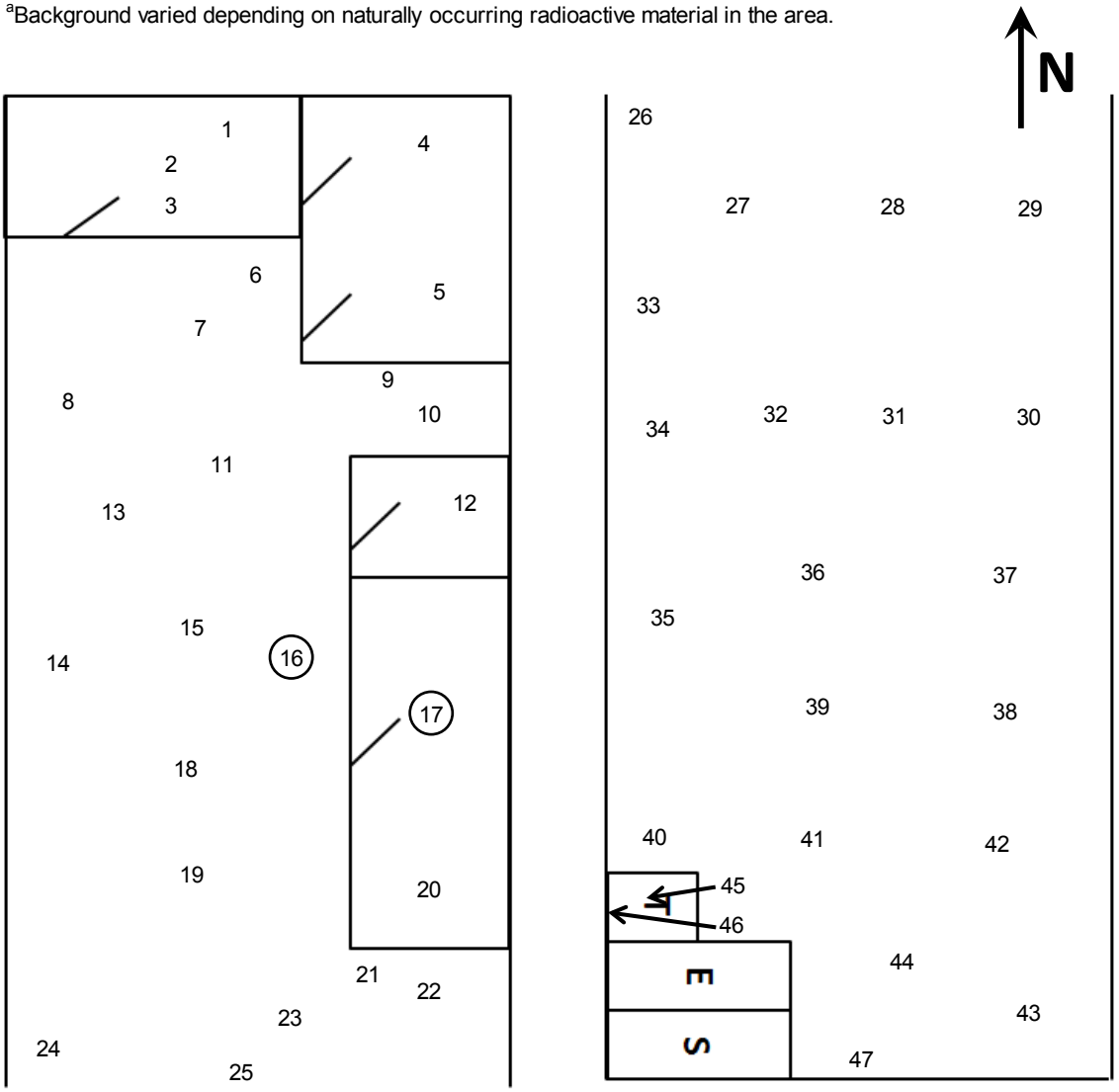
Table B-8. Seth Thomas Measurement & Smear Results - 3rd Floor (Room E)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	12,000	—	10	carpet over wooden floor
2	—	—	—	—	—	23,000	20	—	carpet over wooden floor, hotspot[d]
3	—	—	—	—	—	25,000	20	—	carpet over wooden floor, hotspot[d]
4	—	—	—	—	—	11,000	—	9	carpet over wooden floor
5	—	—	—	—	—	13,000	—	11	carpet over wooden floor
6	—	—	—	—	—	11,000	—	10	carpet over wooden floor
7	—	—	—	—	—	25,000	18	—	carpet over wooden floor, hotspot[d]
8	—	—	—	—	—	16,000	—	10	carpet over wooden floor, red brick wall
9	—	—	—	—	—	12,000	—	12	carpet over wooden floor
10	—	—	—	—	—	24,000	18	—	carpet over wooden floor, hotspot[d]
11	—	—	—	—	—	36,000	27	—	carpet over wooden floor, hotspot[d]
12	—	—	—	—	—	12,000	—	9	carpet over wooden floor
13	—	—	—	—	—	18,000	—	10	carpet over wooden floor
14	—	—	—	—	—	14,000	—	12	carpet over wooden floor, red brick wall
15	—	—	—	—	—	42,000	33	—	carpet over wooden floor, hotspot[d]
16	R0067	1.39	9.40	1,905	960	48,500	41	10	carpet over wooden floor, hotspot[d]
17	R0068	-0.71	-2.35	3,770	2,100	83,400	80	11	carpet over wooden floor, hotspot[d]
18	—	—	—	—	—	12,000	—	10	carpet over wooden floor
19	—	—	—	—	—	52,000	33	—	carpet over wooden floor, hotspot[d]
20	—	—	—	—	—	12,000	—	10	carpet over wooden floor
21	—	—	—	—	—	11,000	—	10	carpet over wooden floor
22	—	—	—	—	—	26,000	20	—	carpet over wooden floor, hotspot[d]
23	—	—	—	—	—	20,000	—	11	carpet over wooden floor, hotspot[d]
24	—	—	—	—	—	8,000	—	6	carpet over wooden floor
25	—	—	—	—	—	10,000	—	5	carpet over wooden floor
26	—	—	—	—	—	6,100	—	6	wooden floor
27	—	—	—	—	—	5,200	—	5	wooden floor
28	—	—	—	—	—	4,800	—	4	wooden floor
29	—	—	—	—	—	4,500	—	4	wooden floor
30	—	—	—	—	—	3,500	—	4	wooden floor
31	—	—	—	—	—	3,500	—	4	wooden floor
32	—	—	—	—	—	4,000	—	4	wooden floor
33	—	—	—	—	—	5,800	—	4	wooden floor
34	—	—	—	—	—	4,500	—	5	wooden floor
35	—	—	—	—	—	5,400	—	5	wooden floor
36	—	—	—	—	—	3,600	—	4	wooden floor
37	—	—	—	—	—	3,800	—	3	wooden floor
38	—	—	—	—	—	3,800	—	3	wooden floor
39	—	—	—	—	—	4,200	—	4	wooden floor
40	—	—	—	—	—	6,500	—	6	wooden floor
41	—	—	—	—	—	6,500	—	5	wooden floor
42	—	—	—	—	—	5,400	—	5	wooden floor
43	—	—	—	—	—	7,200	—	7	wooden floor
44	—	—	—	—	—	6,500	—	6	wooden floor
45	—	—	—	—	—	7,600	—	6	wooden floor
46	—	—	—	—	—	11,500	—	11	wooden floor, red brick wall
47	—	—	—	—	—	9,000	—	9	countertop

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
— indicates measurement not collected at this location

Site: Seth Thomas	Area: 3rd Floor, Room E	Date(s): 1/31/16	Time: 13:00 - 15:00
Surveyor(s): KME/STP		Purpose: Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.1143	44-142 No.920	367 cpm[a]
Gamma	2221 No.590, No.1143	44-10 No.908, No.664	3 - 18 kcpm[a]
Gamma	192 No.1127, No.1129	NA	4 - 12 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



◯ = smear location
= measurement location number
See attached table for measurement results

Figure B-8. Seth Thomas, 3rd Floor (Room E)

Table B-9. Seth Thomas Measurement & Smear Results - 3rd Floor Clock Tower (Women's RR, Office 3)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	28,000	—	22	Women's RR, carpet floor, hotspot[d]
2	R0040	-0.37	-0.93	1,250	540	40,000	33	22	Women's RR, carpet floor, hotspot[d]
3	—	—	—	—	—	39,000	—	24	Women's RR, carpet floor, hotspot[d]
4	—	—	—	—	—	43,000	—	—	Women's RR, carpet floor, hotspot[d]
5	—	—	—	—	—	40,000	—	26	Women's RR, carpet floor, hotspot[d]
6	—	—	—	—	—	30,000	—	—	Women's RR, carpet floor, hotspot[d]
7	—	—	—	—	—	40,000	—	21	Women's RR, carpet floor, hotspot[d]
8	—	—	—	—	—	43,000	—	—	Women's RR, carpet floor, hotspot[d]
9	—	—	—	—	—	40,000	—	25	Women's RR, carpet floor, hotspot[d]
10	—	—	—	—	—	33,000	—	—	Women's RR, carpet floor, hotspot[d]
11	R0039	1.92	-2.16	1,582	750	46,000	41	23	Women's RR, carpet floor, hotspot[d]
12	—	—	—	—	—	45,000	—	23	Women's RR, carpet floor, hotspot[d]
13	—	—	—	—	—	42,000	—	—	Women's RR, carpet floor, hotspot[d]
14	—	—	—	—	—	51,000	—	—	Women's RR, carpet floor, hotspot[d]
15	—	—	—	—	—	44,000	—	23	Women's RR, carpet floor, hotspot[d]
16	—	—	—	—	—	35,000	—	—	Women's RR, carpet floor, hotspot[d]
17	R0038	-0.37	1.52	2,384	1,300	62,000	60	24	Women's RR, carpet floor, hotspot[d]
18	—	—	—	—	—	32,000	—	—	Women's RR, carpet floor, hotspot[d]
19	—	—	—	—	—	43,000	—	21	Women's RR, tile floor, hotspot[d]
20	—	—	—	—	—	25,000	—	—	Women's RR, tile floor, hotspot[d]
21	—	—	—	—	—	16,000	—	18	Office 3, carpet floor, hotspot[d]
22	—	—	—	—	—	20,000	—	—	Office 3, carpet floor, hotspot[d]
23	—	—	—	—	—	20,000	—	16	Office 3, carpet floor, hotspot[d]
24	R0048	-0.37	5.20	1,290	570	30,000	23	30	Office 3, carpet floor, hotspot[d]
25	—	—	—	—	—	17,000	—	—	Office 3, carpet floor
26	—	—	—	—	—	16,000	—	—	Office 3, carpet floor
27	—	—	—	—	—	30,000	—	28	Office 3, carpet floor, hotspot[d]
28	—	—	—	—	—	60,000	—	30	Office 3, carpet floor, hotspot[d]
29	R0047	-0.37	3.97	5,173	3,000	111,000	140	40	Office 3, carpet floor, hotspot[d]
30	—	—	—	—	—	75,000	—	31	Office 3, carpet floor, hotspot[d]

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
— indicates measurement not collected at this location

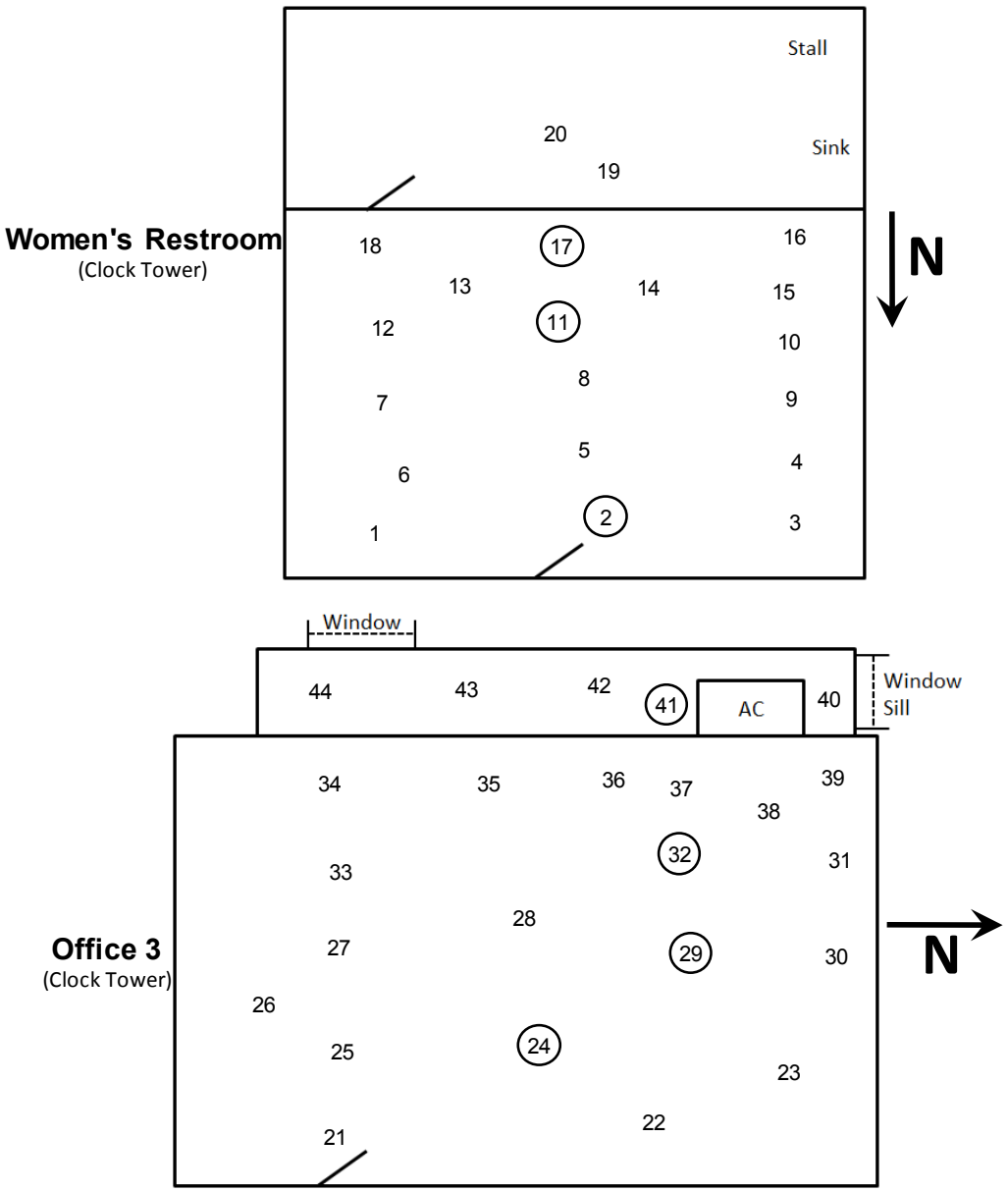
Table B-9. Seth Thomas Measurement & Smear Results - 3rd Floor Clock Tower (Women's RR, Office 3)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
31	—	—	—	—	—	180,000	—	—	Office 3, carpet floor, hotspot[d]
32	R0041	4.21	-0.93	21,213	13,000	428,000	400	47	Office 3, carpet floor, hotspot[d]
33	—	—	—	—	—	35,000	—	—	Office 3, carpet floor, hotspot[d]
34	—	—	—	—	—	37,000	—	24	Office 3, carpet floor, hotspot[d]
35	—	—	—	—	—	70,000	—	31	Office 3, carpet floor, hotspot[d]
36	—	—	—	—	—	117,000	—	—	Office 3, carpet floor, hotspot[d]
37	—	—	—	—	—	—	—	43	Office 3, carpet floor, hotspot[d]
38	—	—	—	—	—	360,000	—	—	Office 3, carpet floor, hotspot[d]
39	—	—	—	—	—	134,000	—	38	Office 3, carpet floor, hotspot[d]
40	—	—	—	—	—	18,000	—	—	Office 3, wooden window sill
41	R0049	-0.37	2.75	29,588	18,000	530,000	600	44	Office 3, wooden window sill, hotspot[d]
42	—	—	—	—	—	175,000	—	—	Office 3, wooden window sill, hotspot[d]
43	—	—	—	—	—	40,000	—	—	Office 3, wooden window sill, hotspot[d]
44	—	—	—	—	—	21,000	—	—	Office 3, wooden window sill

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
— indicates measurement not collected at this location

Site: Seth Thomas	Area: 3rd Floor, Women's Restroom & Office 3	Date(s): 12/14/2016	Time: 17:00 - 18:00
Surveyor(s): KME		Purpose: Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.1143	44-142 No.920	382 cpm[a]
Gamma	2221 No.1143	44-10 No.664	12 kcpm[a]
Gamma	192 No.1127	NA	8 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.



◯ = smear location
= measurement location number
See attached table for measurement results

Figure B-9. Seth Thomas, 3rd Floor Clock Tower (Women's Restroom, Office 3)

Table B-10. Seth Thomas Measurement & Smear Results - 3rd Floor Clock Tower (Office 4, Office 6, Storage Closet)									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	56,000	—	27	Office 4, carpet floor, hotspot[d]
2	R0044	-0.37	2.75	2,475	1,300	80,000	60	32	Office 4, carpet floor, hotspot[d]
3	—	—	—	—	—	70,000	—	—	Office 4, carpet floor, hotspot[d]
4	—	—	—	—	—	60,000	—	26	Office 4, carpet floor, hotspot[d]
5	—	—	—	—	—	27,000	—	—	Office 4, carpet floor, hotspot[d]
6	—	—	—	—	—	50,000	—	25	Office 4, carpet floor, hotspot[d]
7	—	—	—	—	—	40,000	—	22	Office 4, carpet floor, hotspot[d]
8	R0045	-0.37	1.52	1,299	570	32,000	35	24	Office 4, carpet floor, hotspot[d]
9	—	—	—	—	—	30,000	—	20	Office 4, carpet floor, hotspot[d]
10	—	—	—	—	—	19,000	—	—	Office 4, carpet floor, hotspot[d]
11	—	—	—	—	—	23,000	—	17	Office 4, carpet floor, hotspot[d]
12	R0046	-0.37	5.20	879	310	20,000	21	17	Office 4, carpet floor, hotspot[d]
13	—	—	—	—	—	25,000	—	—	Office 4, carpet floor, hotspot[d]
14	—	—	—	—	—	12,000	—	10	Office 4, carpet floor, average reading for room
15	—	—	—	—	—	18,000	—	15	Outside area from Storage Closet, carpet floor, average for area
16	—	—	—	—	—	15,000	—	14	Outside area from Storage Closet and Office 6, carpet floor, average for area
17	R0052	-0.37	5.20	7,706	4,600	150,000	130	17	Storage Closet, tile floor under carpet, hotspot ≤ 0.1 m^2
18	R0051	-0.37	-0.93	4,494	2,600	80,000	110	20	Storage Closet, seam between tile and concrete floor under carpet, hotspot ≤ 0.1 m^2
19	—	—	—	—	—	50,000	45	16	Outside area from Storage Closet and Office 6, carpet floor, hotspot[d]
20	R0050	-0.37	2.75	2,849	1,500	60,000	55	10	Office 6, carpet floor, hotspot[d]
21	—	—	—	—	—	12,000	—	10	Office 6, carpet floor, average for Office 6

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
d) Surrounding areas with elevated activity made it difficult to determine hotspot dimensions. On average, hotspots ≤ 0.3 m^2.
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** 3rd Floor, Office 4, 6, & Storage Closet	**Date(s):** 12/14/2016	**Time:** 18:00 - 19:00
Surveyor(s): KME		**Purpose:** Site Visit	

Radiation Type	Instrument	Detector	Background
Alpha-plus-beta	2221 No.1143	44-142 No.920	382 cpm[a]
Gamma	2221 No.1143	44-10 No.664	12 kcpm[a]
Gamma	192 No.1127	NA	8 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

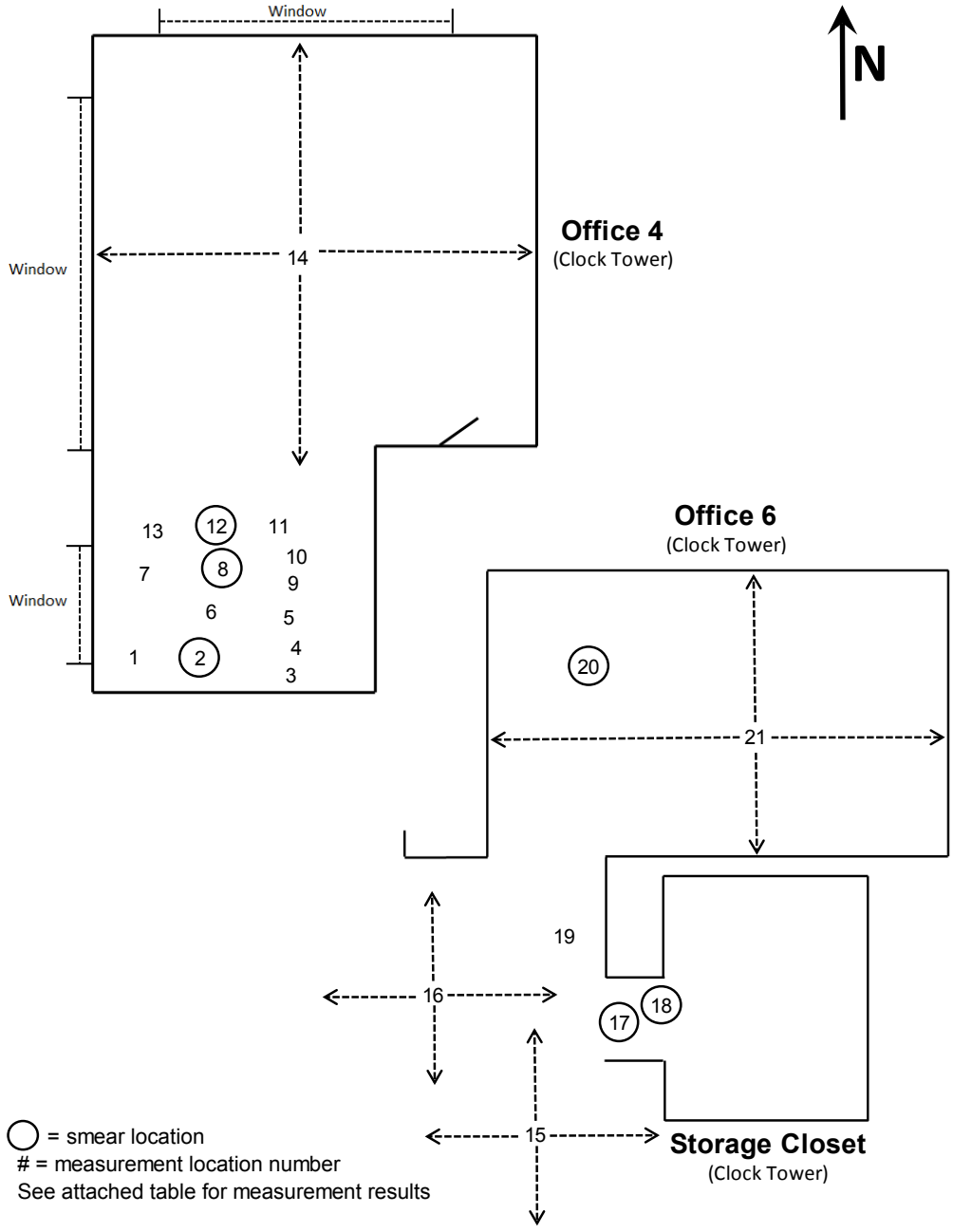


Figure B-10. Seth Thomas, 3rd Floor Clock Tower (Office 4, Office 6, & Storage Closet)

Table B-11. Seth Thomas Measurement & Smear Results - 4th Floor									
Location No.	Removable[a]			Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)		Gross	Total	Contact		1 m	
		Alpha	Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
1	—	—	—	—	—	6,000	—	5	wooden floor
2	—	—	—	—	—	6,400	—	5	wooden floor
3	—	—	—	—	—	5,000	—	4	wooden floor
4	—	—	—	—	—	5,700	—	6	wooden floor
5	—	—	—	—	—	5,000	—	5	wooden floor
6	—	—	—	—	—	12,000	—	10	concrete floor
7	—	—	—	—	—	5,000	—	4	wooden floor
8	—	—	—	—	—	4,500	—	4	wooden floor
9	—	—	—	—	—	5,700	—	5	wooden floor
10	—	—	—	—	—	6,200	—	5	wooden floor
11	R0034	-0.37	2.75	652	180	10,000	10	7	wooden floor, hotspot ≤ 0.2 m^2
12	R0033	-0.37	-2.16	16,167	9,900	200,000	240	7	wooden floor, hotspot ≤ 0.2 m^2
13	—	—	—	—	—	7,000	—	5	wooden floor
14	—	—	—	—	—	6,000	—	5	wooden floor
15	—	—	—	—	—	6,000	—	5	wooden floor
16	—	—	—	—	—	9,000	—	—	wooden floor
17	R0036	-0.37	2.75	1,645	800	30,000	24	10	wooden floor, hotspot ≤ 0.2 m^2
18	R0035	-0.37	-2.16	1,504	710	30,000	24	9	wooden floor, hotspot ≤ 0.2 m^2
19	—	—	—	—	—	6,400	—	6	wooden floor
20	—	—	—	—	—	7,000	—	6	wooden floor
21	—	—	—	—	—	7,200	—	7	wooden floor
22	—	—	—	—	—	8,000	—	7	wooden floor
23	—	—	—	—	—	14,000	—	9	wooden floor
24	—	—	—	—	—	6,800	—	7	wooden floor
25	R0037	-0.37	1.52	2,078	1,100	19,000	15	7	wooden floor, hotspot ≤ 0.2 m^2
26	—	—	—	—	—	6,300	—	5	wooden floor
27	—	—	—	—	—	7,300	—	7	wooden floor
28	—	—	—	—	—	7,000	—	6	wooden floor
29	—	—	—	—	—	17,500	—	15	Inside vault, concrete floor
30	—	—	—	—	—	9,500	—	8	wooden floor
31	—	—	—	—	—	7,000	—	7	wooden floor
32	—	—	—	—	—	7,500	—	7	wooden floor
33	—	—	—	—	—	8,000	—	6	wooden floor
34	—	—	—	—	—	10,000	—	8	bathroom, concrete floor
35	—	—	—	—	—	5,500	—	6	wooden floor
36	—	—	—	—	—	6,500	—	5	wooden floor
37	—	—	—	—	—	8,000	—	7	wooden floor
38	—	—	—	—	—	10,000	—	6	brick wall
39	—	—	—	—	—	4,000	—	4	wooden floor
40	—	—	—	—	—	6,500	—	5	wooden floor
41	—	—	—	—	—	6,000	—	5	wooden floor
42	—	—	—	—	—	8,000	—	6	wooden floor
43	—	—	—	—	—	11,000	—	8	brick wall

a) As reported by the Radiochemistry and Environmental Analytical Laboratory in Oak Ridge, Tennessee
b) Ludlum 44-142 plastic scintillator with Ludlum 2221 rate meter
c) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
— indicates measurement not collected at this location

Site: Seth Thomas	**Area:** 4th Floor	**Date(s):** 12/14/2016	**Time:** 09:45 – 15:00
Surveyor(s): KME/JTH		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Alpha-plus-beta	2221 No.1143	44-142 No.920	367 cpm[a]
Gamma	2221 No.590, No.1143	44-10 No.908, No.664	5 - 13 kcpm[a]
Gamma	192 No.1127	NA	4 - 10 µR/h[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

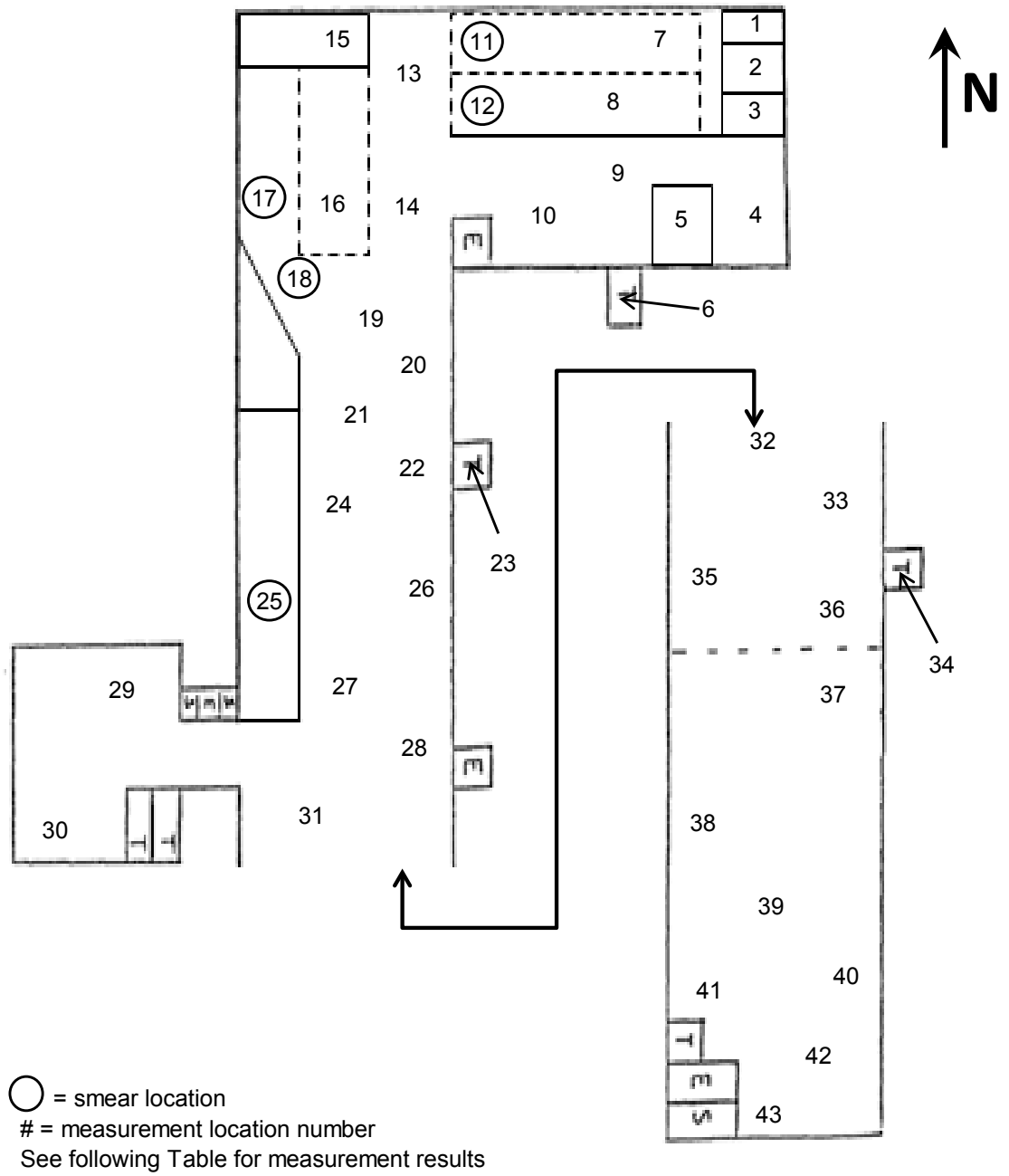


Figure B-11. Seth Thomas, 4th Floor