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June 21, 2017

Mr. David Misenhimer, P.E.
Nuclear Material Safety and Safeguards
Division of Decommissioning, Uranium Recovery, and Waste Programs
Materials Decommissioning Branch
U.S. Nuclear Regulatory Commission
11545 Rockville Pike, MS T8-F05
Rockville, MD 20852

SUBJECT: SITE STATUS REPORT FOR THE FORMER INGRAHAM CLOCK COMPANY NORTH MAIN STREET PARKING LOT IN BRISTOL, CONNECTICUT
CONTRACT NO. NRC-HQ-50-17-O-0001; DCN 5307-SR-02-1

Dear Mr. Misenhimer:

Oak Ridge Associated Universities (ORAU) is pleased to provide the attached site status report for the site visit to the former Ingraham Clock Company North Main Street Parking Lot property in Bristol, Connecticut. This report follows the outline given in the Temporary Instruction 2800/043, Appendix C, and addresses comments on dose assessment methods and conclusions.

Please feel free to contact me at 865.574.0685 or Tim Vitkus at 865.576.5073 if you have any questions.

Sincerely,

David A. King, CHP, PMP
Sr. Health Physicist/Project Manager
ORAU

DAK:KE:lw

Attachment

electronic distribution: R. Chang, NRC; T. Vitkus, ORAU; File/5307; C. Grossman, NRC; E. Bailey, ORAU

Distribution approval and concurrence:	Initials
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EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that Oak Ridge Associated Universities (ORAU) perform a radiation survey of the property at the North Main Street parking lot in Bristol, Connecticut. This property is in the vicinity of the footprint once occupied by the former Ingraham Clock Company, which used radium paint in the manufacturing of clocks and watches into the late 1950s. The original factory was torn down and the land has been redeveloped. The objective of this survey was to locate possible discrete sources of radium, if any, that would be associated with former Ingraham Clock Company operations.

Based on initial research, the NRC assumed that the current site of the North Main Street parking lot was part of the property at 284 North Main Street, Bristol, Connecticut, which was once occupied by the former Ingraham Clock Company. Since the completion of the initial site visit the NRC has realized that the owner of the North Main Street parking lot had been mis-identified and that the former Ingraham Clock Company did not reside on the property.

ORAU performed the radiation survey on November 17, 2016, and did not identify elevated levels of radiation. Because no elevated levels of radiation were identified, ORAU concluded that discrete sources of radium-226 were not present on this property. Based on these results, it is recommended that the NRC not pursue additional action at the North Main Street parking lot property.

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SITE STATUS REPORT

Property:	Former Ingraham Clock Company North Main Street Parking Lot Bristol, Connecticut 06010
Docket Number:	03039038
Current Property Name(s):	North Main Street Parking Lot
Current Property Owner(s):	The Carpenter Companies
Inspection Dates:	November 17, 2016
Inspector(s):	Orysia Bailey/NRC, assisted by David King/Oak Ridge Associated Universities (ORAU)

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 U.S. Nuclear Regulatory Commission (NRC) regulatory authority as byproduct material. The NRC is evaluating properties where review of historical information has identified Ra-226 use. The property at the North Main Street parking lot in Bristol, Connecticut, was identified as property near a portion of the former Ingraham Clock Company, a clock manufacturing facility, once operated during the period from 1884 to 1958 (Oak Ridge National Laboratory (ORNL) 2015). 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 scoping survey is needed. Surveys were performed as described within NRC's procedures, Temporary Instruction (TI) 2800/043 "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2016).

2.0 PROPERTY DESCRIPTION AND INITIAL SITE VISIT CONSIDERATIONS

2.1 Property Description and History

The site summary report (ORNL 2015) provides known site details about the type, form, history, potential locations, and other information related to discrete sources of Ra-226. The ORNL report is supplemented by compiled works issued by the Agency for Toxic Substances and Disease Registry (ATSDR) (1999) and CT-DEEP (2009) that address radium dial clock companies located in the state of Connecticut. The Ingraham Clock Company was founded in 1884 and occupied several buildings on North Main Street. In 1904, as a result of increased sales as well as improvements in manufacturing and machinery, Ingraham replaced the original wooden buildings with brick ones. Clocks and watches with luminous radium paint were manufactured in these buildings, including pocket watches in 1914 and wrist watches in 1930, until production ceased in 1942 due to World War II (ATSDR 1999). Clock production resumed in 1946. In 1958 the company moved from North Main Street to Bristol's Redstone Hill Industrial Park (210 Redstone Hill Road) (ORNL 2015).

During the 1960s, the abandoned buildings at the North Main Street location were torn down as part of a redevelopment project. Extensive testing took place at the site prior to 1980. Neither the exact dates of testing nor the types of tests performed are known. Therefore, it is unknown if soil at the North Main Street locations of the former Ingraham Company was tested for radium (ORNL 2015). Test wells were drilled and still exist. Redevelopment activities included the removal of soil from the site for use as cover material at a Bristol landfill, a river running through the site was piped underground, and backfill was brought onto the site (CT-DEEP 2009). As part of the redevelopment, residential and commercial properties were constructed in the 1980s and early 1990s at the North Main Street locations. New construction took place at: (1) 430 N. Main Street in the early 1980s; (2) 284 N. Main Street in 1987; (3) 400 N. Main Street in 1989-90; and (4) 420 N. Main Street in 1990-91 (ORNL 2015). This report documents the initial site visit to the North Main Street parking lot, which was located near the former Ingraham Clock Company.

2.2 Initial Site Visit Considerations

Surveys covered up to an estimated 25% of the accessible land area of the parking lot since most of the outdoor area is covered by concrete, asphalt, cars, etc.

3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

The inspection team conducted an initial site visit with radiological surveys at the North Main Street parking lot on November 17, 2016. A pre-inspection meeting was held. Attendees were Pete Hollenbeck (radiological consultant with RSCS), Gary McCahill (Connecticut Department of Energy and Environmental Protection), Orysia Bailey (NRC), and David King (ORAU). Participants discussed the inspection team's intention to perform general area surveys of the North Main Street parking lot and adjacent properties (results of those surveys are discussed in separate site status reports).

Radiological surveys consisted of gamma radiation scans using a Ludlum model 44-10 2-inch by 2-inch sodium iodide detector (2×2) connected to a Ludlum model 2221 ratemeter/scaler and exposure rate measurements using a Ludlum model 192. The 2×2 sodium iodide detector gamma radiation measurements were collected near the ground surface, and the exposure rate readings were collected at approximately 1 meter (3 feet) above the ground surface. A SAM-940 spectrum analyzer was also available in the event elevated gamma radiation levels were identified. Table 1 presents the specific instruments used during the initial site visit.

Table 1. Ingraham Clock Company Survey Instruments

Radiation Type (units)	Detector Type	Detector (Number)	Ratemeter (Number)
Gross gamma (cpm)	Sodium Iodide	44-10 (908)	2221 (590)
Gross gamma (µR/h)	Exposure Meter	192 (1127)	N/A
Spectrum Analyzer	SAM-940	940 (864)	N/A

N/A = not applicable; ratemeter is not required
Number = equipment tracking number
cpm = counts per minute
µR/h = microRoentgen per hour

3.2 Summary of Results

Figure 2 presents a summary of results from the November 17, 2016 site visit. Inspectors identified no anomalous gamma radiation measurements. Surveys covered approximately 25% of the accessible land area, noting that most of the outdoor area is covered by concrete, asphalt, cars, etc. Because there were no anomalous readings, the SAM-940 was not used, and no samples were collected.

The 2×2 sodium iodide detector gamma radiation responses ranged from about 6,000 to 8,500 counts per minute (cpm) over asphalt which is consistent with background levels. In grassy areas, the 2×2 sodium iodide detector responses ranged from approximately 7,000 to 9,500 cpm which is consistent with background levels. Exposure rates ranged from 5 to 7 microRoentgens per hour (µR/h[1]) over asphalt. In grassy areas, the exposure rates ranged from about 6 to 7 µR/h. No areas of elevated direct gamma radiation were identified.

3.3 Summary of Dose Assessment Results

Because no radiation levels were detected above background and no discrete sources of radium were encountered, a dose attributed to discrete radium sources could not be calculated.

4.0 OBSERVATIONS AND RECOMMENDATIONS

There is no indication from the areas surveyed that the North Main Street parking lot, which is located near the former Ingraham Clock Company, contains discrete sources of Ra-226 as determined by the following observations:

- Gamma radiation levels were consistent with background levels.
- The absence of observable gamma radiation anomalies is indicative that there are no discrete sources of Ra-226 present in surface soil.
- There was no historical evidence that discrete sources of Ra-226 are present following the institution's demolition and the sites redevelopment.

Therefore, the recommendation to the NRC staff is that a more detailed scoping survey is not necessary at this time and that the NRC should not pursue additional action at the North Main Street parking lot.

[1] NOTE: Roentgen (R) 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).

SITE: Ingraham Clock Company	**AREA:** North Main Street Parking Lot	**DATE:** 11/17/16	**TIME:** 11:00 – 11:30
SURVEYOR(S): David King		**PURPOSE:** Site Visit	

TYPE	INSTRUMENT	DETECTOR	BACKGROUND
Gamma	2221 #590	44-10 #908	*
Gamma	192 #1127	N/A	*

*Readings varied from 5 to 7 uR/hr and 6,000 to 9,500 cpm depending on proximity to red brick buildings and ground materials such as concrete, asphalt, and natural media (e.g., landscaping). Surveyors noted no radiological anomalies, which is consistent with background levels.

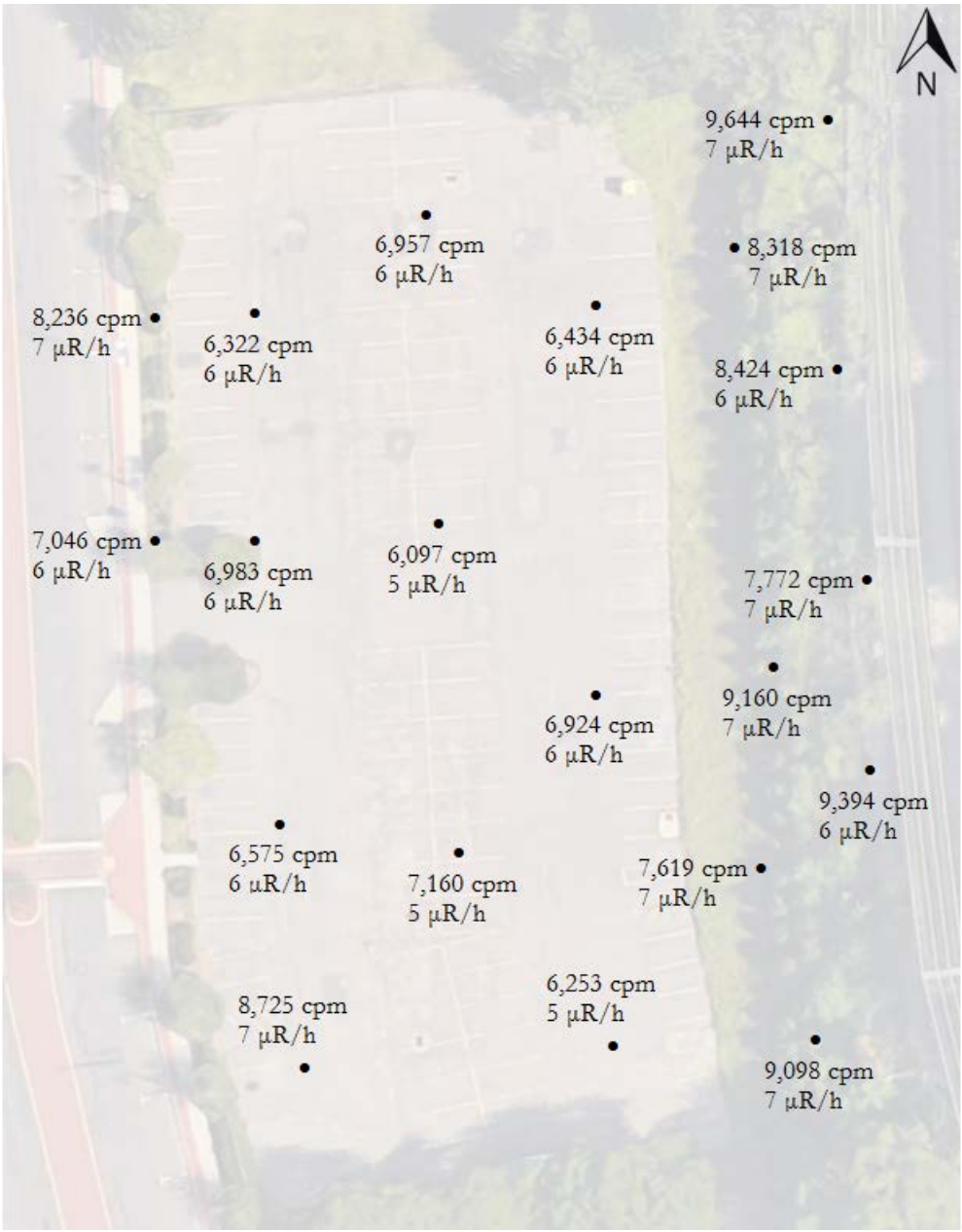

Figure 2. Survey Results for the North Main Street Parking Lot

5.0 REFERENCES

NRC 2016. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., October. (Agencywide Documents Access and Management System [ADAMS] Accession No. ML16035A053).

ORNL 2015. *Historical Non-Military Radium Sites Research Effort Addendum*, "Ingraham Clock Company: Site Summary," Pages 73-81, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 24 (ADAMS Accession No. ML16291A488).

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*. U.S. Department of Health and Human Services. January 29.

Connecticut Department of Energy and Environmental Protection (CT-DEEP) 2009. Correspondence from CT-DEEP to the U.S. Nuclear Regulatory Commission Nuclear Material Safety and Safeguards. Collection of pdf documents about Connecticut Clock Companies. Document dates range from 1998-2004. CT File.pdf, pages 228-234 and 843-849 of 1806.