**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**WASHINGTON, D.C. 20555-0001**

July 7, 2017

Mr. Michael Jenson
Director of Environmental
Health and Safety
Indiana University
1514 East 3rd Street
Bloomington, IN 47401

SUBJECT: SOUTH BEND WATCH COMPANY – RESULTS AND CONCLUSIONS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT

Dear Mr. Jenson:

I am writing to provide you with the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to your property at 1720-1730 East Mishawaka Avenue, South Bend, Indiana, performed on November 26, 2016.

The purposes of the initial site visit were to: 1) determine if there are health and safety concerns to current property occupants or site visitors; and 2) identify the locations with the potential for contamination and gather information for a scoping survey plan, should it be needed.

As described in our site summary, attached to our letter dated October 6, 2016, the buildings associated with the former South Bend Watch Company were torn down. Based on the history of the property and its redevelopment, NRC staff considered the likelihood of discrete sources of radium-226 (Ra-226) being located within the existing property structures to be negligible. Therefore, the initial site visit mainly focused on accessible land areas outside of the Indiana University administration building and certain sections of Level 1 of the building to try to identify any discrete Ra-226 sources that may be indicative of additional Ra-226 in subsurface soil.

As discussed within the enclosed report, NRC staff and Oak Ridge Associated Universities performed radiological surveys consisting of gamma radiation scans and exposure rate measurements. Surveys covered approximately 30 percent of the total site area since most of the site is covered and access is restricted to the areas where informative surveys can be performed. Given that historical records indicate that extensive renovation took place in the past, it is inferred that the soil surveyed in the surface scans is representative of the currently inaccessible surface soil covered by existing structures. NRC did not survey under the current parking lot or building foundations.

NRC staff concludes, based on radiological conditions observed during the initial site visit and review of the property history, that: 1) there is no indication of discrete sources of Ra-226 on the surveyed portions of the property; and 2) based on current information, a follow-on scoping survey is not required as it would not be expected to yield more information. Given these conclusions, no further actions are needed from you at this time.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions regarding this letter, please contact Mr. Stephen Koenick, Chief, Materials Decommissioning Branch, Division of Decommissioning, Uranium Recovery and Waste Programs, Office of Nuclear Materials Safety and Safeguards, at (301) 415-6631, or Mr. Matthew Meyer, Project Manager, at (301) 415-6198.

Sincerely,

***/AKock for/***

John R. Tappert, Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 03038969

Enclosure:
Site Status Report for 1720-1730 East Mishawaka Avenue (South Bend Watch Company)

REGISTERED LETTER – RETURN RECEIPT REQUESTED

**Enclosure**

**OAK RIDGE ASSOCIATED UNIVERSITIES:**

# SITE STATUS REPORT FOR THE SOUTH BEND WATCH COMPANY AT 1720-1730 EAST MISHAWAKA AVENUE, SOUTH BEND, INDIANA

**July 7, 2017**

## Executive Summary

The U.S. Nuclear Regulatory Commission (NRC) requested that Oak Ridge Associated Universities (ORAU) perform radiation surveys of the properties at 1720 - 1730 East Mishawaka Avenue in South Bend, Indiana. These properties cover the footprint once occupied by the former South Bend Watch Company, which used radium paint in the manufacturing of watches into the late 1920s. The original factory was demolished in 1957 and the land has been redeveloped. The objective of this survey was to determine whether discrete sources of radium, if any, that would be associated with the former South Bend Watch Company operations are still present.

ORAU performed the radiation survey on November 26, 2016, and did not identify elevated levels of radiation indicative of discrete sources of Ra-226. Because no elevated levels of radiation were identified, ORAU concludes that discrete sources of radium are likely not present in the building or surrounding surface or subsurface soils. Based on these results, it is recommended that the NRC not pursue additional action at the 1720 - 1730 East Mishawaka Avenue property.

SITE STATUS REPORT

Property: South Bend Watch Company
1720-1730 East Mishawaka Avenue
South Bend, IN 46615

Docket Number: 03038969

Current Property Name(s): Indiana University Administration Building

Current Property Owner(s): Indiana University

Inspection Dates: November 26, 2016

Inspector(s): Jack Giessner/ NRC, Daniel Strohmeyer/ NRC, supported by Kaitlin Engel/ Oak Ridge Associated Universities (ORAU)

Project Manager: Matthew Meyer/ NRC

## 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 Oak Ridge National Laboratory (ORNL) review of historical information has identified Ra-226 use. The property at 1720-1730 East Mishawaka Avenue in South Bend, Indiana (IN), was identified as the site of the former South Bend Watch Company, a clock manufacturing facility that operated from 1905 to 1929 (ORNL 2015). The objective of the initial site visit was to determine if discrete sources of 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 procedure, Temporary Instruction (TI) 2800/043 “Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources” (NRC 2016).

Data from the November 26, 2016 initial site visit, which includes gamma radiation scans and exposure rate measurements, are used to plan future actions that may be needed to reduce the exposure to Ra-226 of 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 TI 2800/043.

## 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 South Bend Watch Company, once located on East Mishawaka Avenue in South Bend, Indiana, was founded in 1905 and used Luma radium compound for luminous dials in watch production. During its peak years of production, the company produced 60,000 watches annually. In November 1929, the plant closed and was never reopened. In later years the

buildings were used for a warehouse, a bottling plant, an Army reserve center, and various other businesses. A fire occurred in July 1957 that burned the factory. The structure was subsequently razed and a new building was constructed on the site by Associates Investment Company, who later sold the building to Indiana University at South Bend. The building is currently used by the University as the administration building (ORNL 2015).

The administration building consists of two floors mainly used as office spaces and conference rooms. The east and west wings of Level 1 are currently undergoing remodeling. This leaves the concrete floor exposed in some areas (other areas are covered in carpet) as well as exposed electrical wires from the ceiling and walls. There is a lower level walkway that connects the administration building to another building located to the south. The walkway also provides access to an air return tunnel that runs the perimeter of the administration building. A manicured lawn surrounds the building with perimeter sidewalks, and a sidewalk that bisects the eastern lawn. Two outdoor courtyards are located on the east and west side of the building. The only access to the courtyards is through the administration building. The courtyards consist of flower beds, several trees, benches, and sidewalks composed of two distinct types of bricks. Flower beds surround most of the building. A concrete picnic area is located to the southeast of the administration building. A small fenced playground area and adjoining parking lot are located to the southwest of the administration building.

## 2.2 Initial Site Visit Considerations

It is unknown if any radium testing took place before the new building was constructed (ORNL 2015). The exact location of the former clock factory on the property could not be determined; there were no physical indications of its location, and a map from 1911 was not to scale. Based on the above history of the property and its redevelopment, NRC staff considers the likelihood of discrete sources of Ra-226 existing in current property structures to be negligible. Rather, were discrete sources of Ra-226 present, they would likely be in subsurface soils. The structures, pavement, and other obstructions on the property limited the area in which initial surveys were performed. Instead, the initial site visit focused on the accessible land areas, Level 1 of the building, and the lower level walkway between the two buildings to identify any discrete Ra-226 sources in subsurface soil. Surveys covered approximately 30 percent of the total site area since most of the site is covered and access is restricted to the areas where informative surveys can be performed.

# 3.0 SITE OBSERVATIONS AND FINDINGS

## 3.1 Summary of Activities

The inspection team conducted an initial site visit with radiological surveys at the 1720-1730 East Mishawaka Avenue property on November 26, 2016. A pre-inspection meeting was held with Greg Crouch and Mike Jenson from the University, Jack Giessner and Daniel Strohmeyer from NRC, two representatives from the State of Indiana, and Kaitlin Engel from ORAU. Participants discussed the inspection team's intention to perform general area surveys of the property. The site owner requested that surveys start inside the administration building. The inspection team was granted access to all portions of the facility.

Radiological surveys performed by the inspection team 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 NaI-based microRoentgen (μR) ratemeter.[1] As a rule-of-thumb, sodium iodide detectors can respond to gamma-emitting radionuclides located in the top 15 to 30 centimeters (6 to 12 inches) of soil. A Ludlum model 44-142 plastic scintillator was available for direct surface activity measurements, if required. Table 1 presents the specific instruments used during the initial site visit.

**Table1. South Bend Watch Company Survey Instruments**

| Radiation Type (units) | Detector Type | Detector Model (Number) | Ratemeter (Number) |
|---|---|---|---|
| Alpha plus beta (cpm) | Plastic Scintillator | 44-142 (690) | 2221 (602) |
| Gross gamma (cpm) | Sodium Iodide | 44-10 (1151) | 2221 (693) |
| Gross gamma (μR/h) | Exposure Ratemeter | 192 (1128) | N/A |

N/A = not applicable; ratemeter is not required.
No. = instrument tracking number.
cpm = counts per minute.
μR/h = microRoentgens per hour

Surveys inside of the administration building, including all spaces on Level 1 currently used or planned for future use as offices, were performed using the 2x2 sodium iodide detector and exposure ratemeter. The lower level walkway between the administration building and the building to the south were also surveyed, as well as the entry to the air return tunnel. Materials encountered inside the building included: concrete, concrete covered by carpet, various types of tile (floor, bathroom), drywall, and cement blocks.

The two outdoor courtyards surrounded by the east and west wings of the building were also scanned with the 2x2 sodium iodide detector and exposure ratemeter. Surveys focused on areas where people would linger (i.e., benches) and the land area surrounding trees, which had the potential to have surface soil that remained undisturbed during construction of the newer building. Materials in the courtyard included grass areas, concrete walkways, brick walkways, and flower beds.

Outside the administration building, areas where people would spend the most time or areas where any residual Ra-226 would most likely accumulate were scanned with the 2x2 sodium iodide detector and exposure meter. Areas investigated included the north entryway, lawn areas to the east, south, and west of the administration building, storm drains found in the grassy areas, sidewalks, picnic and bench areas, the playground, and a lower level courtyard associated with the building to the south of the administration building. Materials encountered included: concrete sidewalks, granite entryway, flower beds, manicured lawns, and rubber mulch.

[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).

## 3.2 Summary of Results

Figure 3.1 presents a summary of the results from the indoor survey of the administration building, and Figure 3.2 presents a summary of the results from the outdoor survey of the land area around the administration building. Results from the gamma radiation scans with the 2x2 sodium iodide detector are reported in counts per minute (cpm) and the results from the exposure rate meter are reported in µR/h. Inspectors identified no elevated gamma radiation measurements. Nor did they identify any discrete Ra-226 materials in surface soil at the accessed portions of the site. In addition, no records were identified that suggest discrete sources of radium existed onsite after the property's redevelopment.

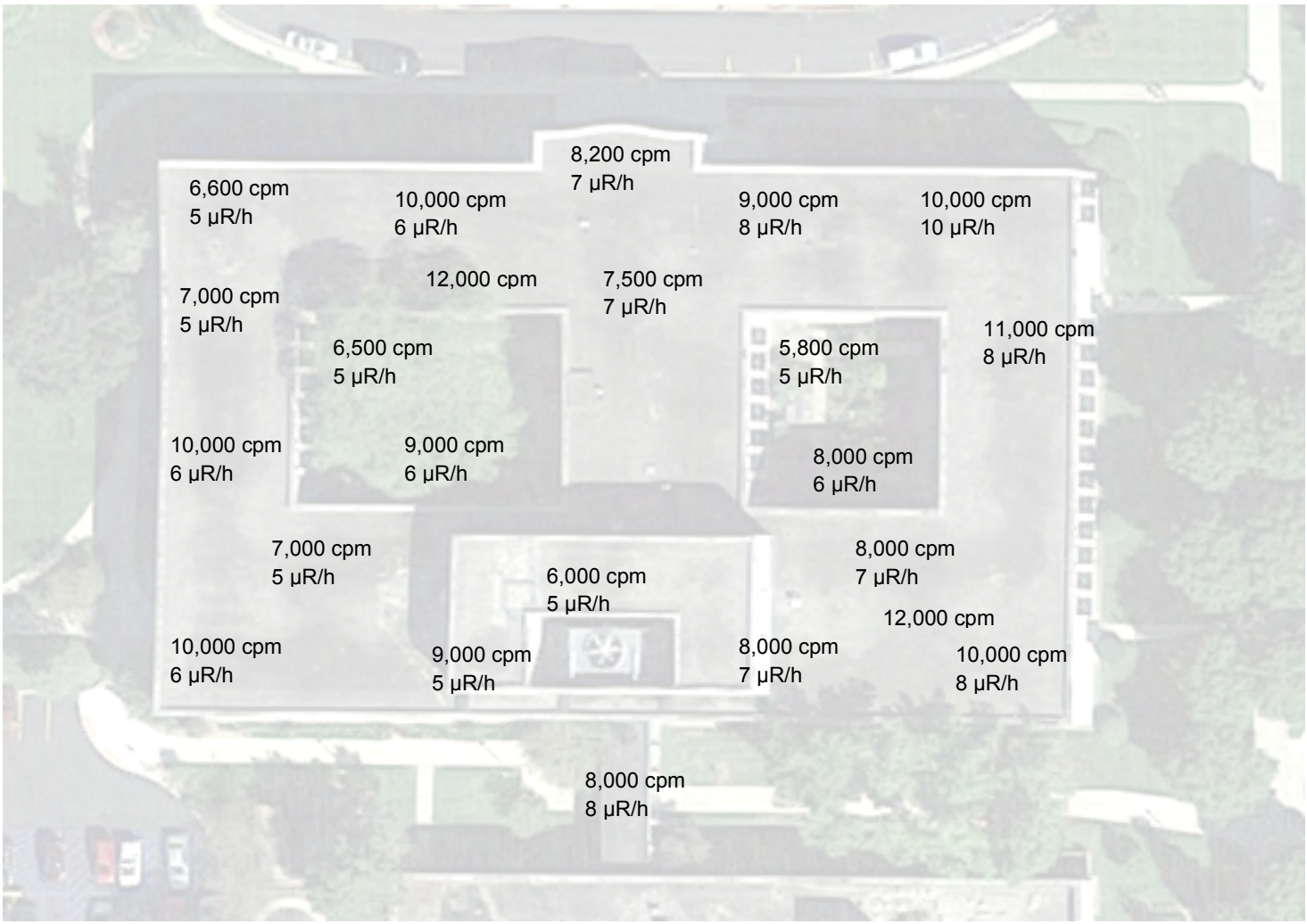
Inside the building, the 2x2 sodium iodide detector responses ranged from 6,000 to 12,000 cpm, depending on construction material type. The highest responses were encountered near bathrooms, which had tile walls, and floors and along the baseboards of the outer walls. Exposure rates ranged from 5-10 µR/h. Any elevated gamma radiation levels noted were associated with materials known to contain naturally occurring radioactive material (NORM)—i.e., the bathroom tile. Therefore, no direct alpha-plus-beta surface activity measurements using the Model 44-142 were collected inside the building.

Outside the building, the 2×2 sodium iodide detector responses ranged from 4,400 to 15,000 cpm depending on proximity to buildings, sidewalks, and grassy areas. The maximum responses were encountered on the north entrance to the building. Radiation levels only increased above the nominal site background when the NORM-containing granite construction of the entry and stairs was encountered. Exposure rates varied similarly depending on the proximity to naturally radioactive materials, with a range from 5-15 µR/h with the 15 µR/h near the north entrance.

No elevated radiation levels indicative of discrete Ra-226 sources were identified during the scans; therefore, no direct measurements, smears, or soil samples were collected at this site.

| SITE: South Bend | AREA: Admin Bldg | DATE: 11/26/2016 | TIME: 0925/1141 |
|---|---|---|---|
| SURVEYOR(S): KME | | PURPOSE: Site Visit | |

| TYPE | INSTRUMENT | DETECTOR | BACKGROUND |
|---|---|---|---|
| Gamma | 2221 #602 | 44-10 #663 | * |
| Gamma | 192 #1129 | NA | * |



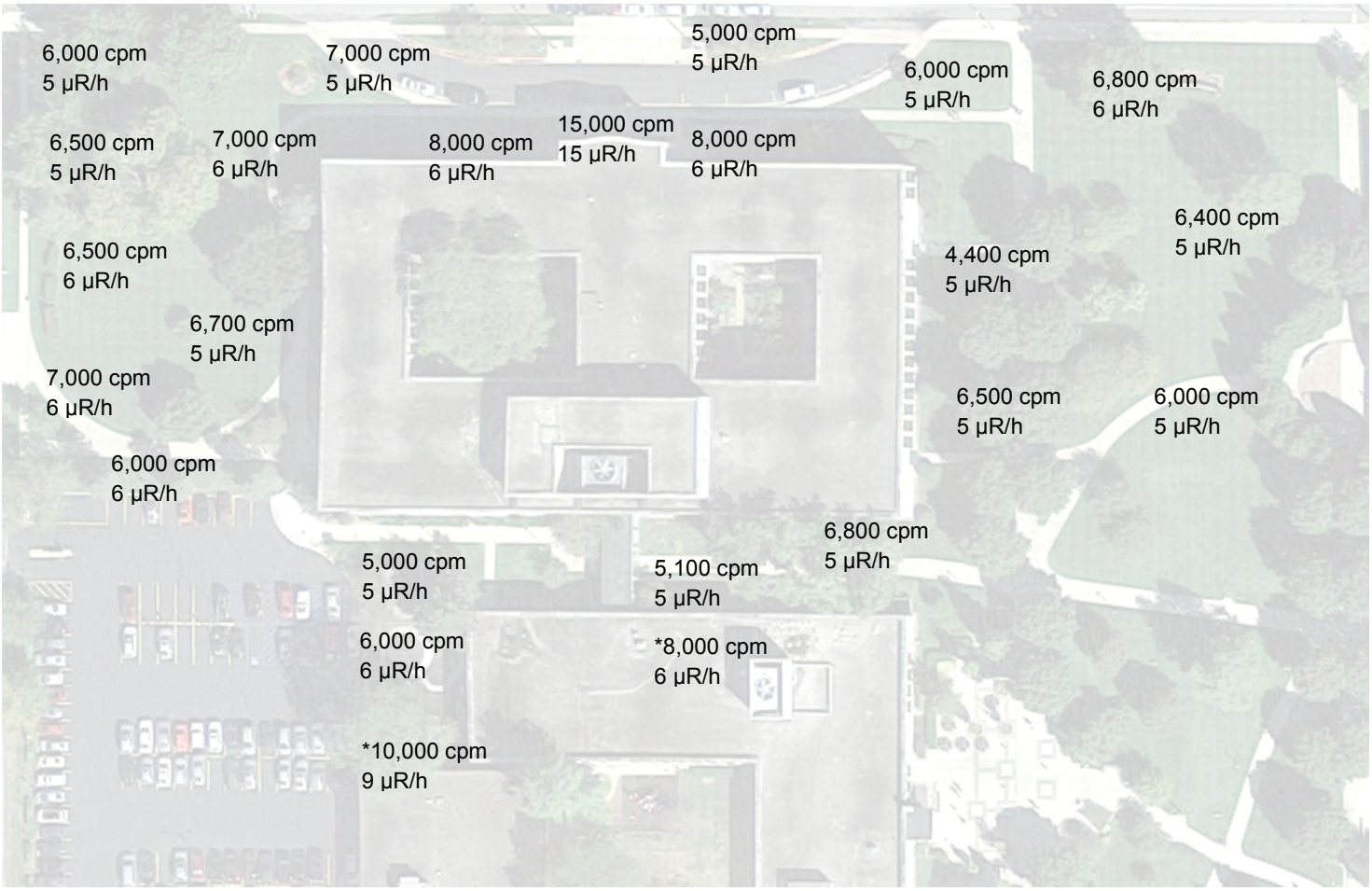

12,000 cpm found in bathrooms with tile floors and walls.

*Background varied depending on material type and the concentration of naturally occurring radioactive material in the materials.

Figure 3.1. Survey Results for Inside the Indiana University Administration Building

| SITE: South Bend | AREA: Outside Admin Bl. | DATE: 11/26/2016 | TIME: 1141/1241 |
|---|---|---|---|
| SURVEYOR(S): KME | | PURPOSE: Site Visit | |

| TYPE | INSTRUMENT | DETECTOR | BACKGROUND |
|---|---|---|---|
| Gamma | 2221 #602 | 44-10 #663 | * |
| Gamma | 192 #1129 | NA | * |




15,000 cpm was found on the granite entryway to the administration building. 10,000 cpm was found near a building to the southwest of the administration building. The entire wall of the building was elevated.

*Background levels varied based on material type and the concentration of naturally occurring radioactive material in those materials (i.e., granite or cement).

Figure 3.2. Survey Results for Outside the Indiana University Administration Building

## 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 was no indication from the areas surveyed that surface soil at the Indiana University administration building property at 1720-1730 East Mishawaka Avenue South Bend, Indiana, located on the former South Bend Watch Company site, contains discrete sources of Ra-226 as determined by the following observations:

- Gamma radiation levels were consistent with background.
- The absence of observable gamma radiation anomalies suggests 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 1957 fire and the property's subsequent redevelopment.
- Risk of potential contamination on the site is low and, if present, would most likely be found at a significant depth in the subsurface soil.

Therefore, the recommendation to the NRC staff is that a more detailed scoping survey is not necessary at this time, and NRC staff should not pursue additional action at the 1720-1730 East Mishawaka Avenue property.

# 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*, "South Bend Watch Company: Site Summary," Pgs. 134-137, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 24. (ADAMS Package Accession No. ML16291A488).

SUBJECT: SOUTH BEND WATCH COMPANY – RESULTS AND CONCLUSIONS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT

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