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

June 7, 2018

EA-17-200

Metro Aircraft Instruments
2135 Airport Road
Waterford, Michigan 48327
Attn: Eric Schulte

SUBJECT: METRO AIRCRAFT INSTRUMENTS-2 — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS; EXERCISE OF ENFORCEMENT DISCRETION

Dear Mr. Schulte:

I am writing to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to the property at 2135 Airport Road, Waterford, Michigan, performed on March 27-28, 2017. The results are summarized below and are discussed in further detail in the enclosed report. This survey was conducted with the permission of Metro Aircraft Instruments, who was, to our understanding, occupant and owner of the property at the time of inspection.

As described in the site summary, attached to our letter dated October 6, 2016,[1] our records indicate that the property, occupied by Metro Aircraft Instruments, was an aircraft flight instrument repair company. The staff believes Metro Aircraft Instruments likely serviced vintage aircraft self-luminous instruments (gauges) containing radium-226, a radioactive material regulated by the NRC.

During the initial site visit, the staff conducted radiation surveys over approximately 75 percent of the areas inside and 30 percent of the area outside of the building. The staff did not survey under the driveway or building foundations.

As was discussed with employees of Metro Aircraft Instruments during our initial site visit, the staff found some levels of radiation that were above the average background reading in the building. Also during our visit, the staff found elevated radiation levels on aircraft gauges, equipment switches, and other items around the office (i.e., products). However, these measurements indicate that, even with conservative assumptions, a member of the public regularly working in these areas would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use, found in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1402, *Radiological criteria for unrestricted use*.

[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML16277A249.

Up to 100 luminous products (e.g., gauges) may be possessed under a general license in accordance with 10 CFR 31.12(a)(4), *General license for certain items and self-luminous products containing radium-226*. As a general licensee, certain requirements must be followed under 10 CFR 31.12(c), which include that Metro Aircraft Instruments:

(1) Must notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive materials. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards (NMSS), U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Must not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of in accordance with 10 CFR 20.2008, *Disposal of certain byproduct material*, or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Must not export (i.e., transfer to a person or an international organization in a foreign country) products containing radium-226 except in accordance with 10 CFR Part 110, *Export and Import of Nuclear Equipment and Material*.

(4) Must dispose of products containing radium-226 only at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under 10 CFR Part 30, *Rules of General Applicability to Domestic Licensing of Byproduct* Material, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Must respond to written requests (including this request) from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If you cannot provide the requested information within the allotted time, you must, within that same time period, request a longer period to supply the information. A written justification for the request must be provided to the Director of NMSS by means of an appropriate method listed in 10 CFR 30.6(a).

As discussed in the enclosure, several of the gauges that were found on the site appear to be broken. Based on this discovery, the staff determined that a violation of NRC requirements, as stated above in item (1), occurred. Specifically, the staff identified three damaged self-luminous aircraft gauges containing radium-226, as well as elevated radiation levels on aircraft gauges and surfaces within the building, indicating a loss of radioactive material. However, Metro Aircraft Instruments had not reported this damage to the NRC, as required in 10 CFR 31.12(c)(1).

After identification of the presence of radium-containing gauges and switches during the site visit, we conducted additional measurements to test for removable contamination. Having found removable contamination, the staff placed the gauges and switches into plastic bags to control the potential spread of contamination. The bagged items were then placed into a closet. Please note that the staff did not survey each individual aircraft gauge. The other gauges in the closet should be handled with similar care to those in the bags. Once placed in the closet, the reading from the gauges exceeded the 40 microrem per hour threshold, as discussed in the

NRC's Temporary Instruction 2800/043[2] for recommending limiting routine access. Because dose rates are in excess of the threshold the staff recommended that access be limited, as discussed below.

Following placement of the items in the closet, Metro Aircraft Instruments verbally committed to comply with the general license requirements of 10 CFR 31.12. Specifically, it was verbally committed that no further work would be performed on the radium gauges, no additional radium gauges would be received, and the items in the bags and boxes in the closet would be left in that current state.

The violation of 10 CFR 31.12(c)(1) for not reporting the damaged items was evaluated in accordance with the NRC Enforcement Policy and has been characterized at Severity Level III, a violation that could have resulted in moderate safety or security consequences. However, I have been authorized, after consultation with the Director, Office of Enforcement, to exercise enforcement discretion in this case in accordance with Section 3.5, "Violations Involving Special Circumstances," of the Enforcement Policy. Consistent with the policy in Enforcement Guidance Memorandum (EGM) 09-004, "Interim Guidance for Dispositioning Violations of Naturally Occurring and Accelerator-Produced Radioactive Materials (NARM) Requirements,"[3] the NRC will not cite the violation because: (1) the failure did not result in an actual safety, health, or security consequence; (2) the failure was not willful; (3) a reasonable argument was provided that Metro Aircraft Instruments was not aware that the new requirement was applicable; and (4) Metro Aircraft Instruments committed to comply with general license requirements associated with 10 CFR 31.12. The current Enforcement Policy is included on the NRC's Web site http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

If Metro Aircraft Instruments contests this action or its significance, a response must be provided within 30 days of the date of this letter, with the basis for denial and/or corrected information, to the NRC, ATTN.: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, and Washington, DC 20555-0001.

Please note that the exercise of enforcement discretion applies only to the damaged items as identified by the staff during the initial site visit on March 27-28, 2017. Metro Aircraft Instruments is required to follow 10 CFR 31.12(c)(1) and notify the NRC should there be any indication of possible additional damage to or changes to the state of the products now in the possession of Metro Aircraft Instruments, or if Metro Aircraft Instruments acquires or receives additional gauges in the future that have indication of possible damage. Should additional damage be identified, a report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of NMSS within 30 days of the date of identification, as detailed earlier.

As discussed with employees of Metro Aircraft Instruments at the end of the site visit, it was agreed that limited access to the closet would be maintained and that a work station would not be set up immediately adjacent to the closet used to store the aircraft gauges and other contaminated items. Further, it was agreed that the items that were identified with removable contamination would be kept in plastic bags. The staff concludes that there are no immediate health and safety concerns at this site, provided these voluntary controls remain in effect. During a discussion between Mr. Eric Schulte and the staff on May 16, 2018, it was stated that

[2] ADAMS Accession No. ML16330A678.
[3] ADAMS Accession No. ML091340060.

these agreements are continuing to be followed. Additionally on May 16, 2018, Mr. Schulte told the staff that Metro Aircraft Instruments has been shut down since January 1, 2018, and is in the process of being dissolved.

In accordance with 10 CFR 31.12(c)(5), the staff requests a response to the following requests for information within **120 days** of the date of this letter:

1) Please provide plans for either continued possession of the aircraft gauges or disposition of the items.

2) Please provide information regarding the disposition of the other material that contains contamination that was quarantined by the staff in the closet, as noted in the enclosed site summary report. The staff is willing to work with Metro Aircraft Instruments going forward to determine the appropriate method for dispositioning these items.

3) Please provide information regarding the current status of Metro Aircraft Instruments and the property at 2135 Airport Road, Waterford, Michigan.

4) Please provide the name, telephone number, and e-mail address of whom the NRC should contact regarding Metro Aircraft Instruments going forward.

With respect to the limited areas where we found levels of radiation above the average background, our survey of the site does not constitute final characterization of the site. However, as discussed above, these levels indicate that, even with conservative assumptions, a member of the public regularly working in these areas would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use, found in 10 CFR 20.1402. As such, the staff has no additional questions or concerns regarding the contamination that was identified in the work area (on the benches and equipment), in the office area, and on the area outside the back door at Metro Aircraft Instruments. It is requested that if the aircraft gauges are sold or transferred, that notification be provided to individuals about the NRC requirements associated with the gauges.

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 ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

We will be contacting Metro Aircraft Instruments in the near future to answer any questions regarding this letter. Additionally, Mr. Stephen Koenick, Chief, Materials Decommissioning Branch, Division of Decommissioning, Uranium Recovery and Waste Programs, NMSS, at (301) 415-6631, or Mr. Jeffrey Whited, Project Manager, at (301) 415-4090, may also be contacted.

Sincerely,

***/RA/***

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

Docket No.: 03038985

Enclosures:
1. Site Status Report for Metro Aircraft Instruments-2 (2135 Airport Road)
2. Copy of Applicable NRC Regulations

cc w/ enclosures:
Royal Air
2141 Airport Road
Waterford, Michigan 48327
Attn: Kirt Kostich

REGISTERED LETTER – RETURN RECEIPT REQUESTED

SUBJECT: METRO AIRCRAFT INSTRUMENTS-2 — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS; EXERCISE OF ENFORCEMENT DISCRETION June 7, 2018

**DISTRIBUTION:**

RidsRgn3MailCenter M. Kunowski, RIII B. Lin, RIII J. Whited, NMSS
M. Burgess, NMSS EC L. Sreenivas, OE

**ADAMS Accession No.: ML17136A089** ***via e-mail**

| **OFFICE** | DUWP/MDB/PM | DUWP/LA | DUWP/MDB | DUWP/MDB | RIII/DNMS/BC |
|---|---|---|---|---|---|
| **NAME** | JWhited | CHolston | CGrossman* | RNelson* | MKunowski* |
| **DATE** | 05/16/2017 | 05/16/2017 | 07/20/2017 | 07/21/2017 | 05/24/2018 |
| **OFFICE** | DUWP/MDB/BC | NMSS EC | OE/EB | OGC (NLO) | DUWP |
| **NAME** | SKoenick | MBurgess* | LSreenivas* | IIrvin* | JTappert |
| **DATE** | 02/05/2018 | 01/24/2018 | 02/20/2018 | 05/24/2018 | 06/07/2018 |

**OFFICIAL RECORD COPY**

**Enclosure 1**

# OAK RIDGE ASSOCIATED UNIVERSITIES:

# SITE STATUS REPORT FOR METRO AIRCRAFT INSTRUMENTS AT 2135 AIRPORT ROAD, WATERFORD, MICHIGAN

**June 7, 2018**

# EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that Oak Ridge Associated Universities (ORAU) perform a radiation survey of the property at 2135 Airport Road in Waterford, Michigan. This property is occupied by Metro Aircraft Instruments, an aircraft flight instrument repair company established in 1967, which likely serviced vintage aircraft instruments containing radium. The objective of this survey was to locate possible discrete sources of radium, if any, associated with Metro Aircraft Instruments operations.

ORAU performed the radiation survey on March 27-28, 2017, and identified elevated levels of radiation from multiple gauges and other items, in addition to elevated readings on multiple surfaces in the facility and on an area of the asphalt outside near an exterior doorway. Because elevated levels of radiation were identified, ORAU concluded that discrete sources of radium are present in the building and potentially in the surrounding asphalt. The inspection team surveyed an estimated 75 percent of the interior floor space, most of the benchtops and cabinets within the facility, and an estimated 30 percent of the surrounding property. Based on these results and the rationale that the initial site visit already generated a robust dataset to identify the extent of contamination, it is recommended that the NRC not perform a scoping survey, but should maintain oversight by working with the site owner to control and mitigate risks from exposure to discrete sources of radium at the Metro Aircraft Instruments facility located at 2135 Airport Road.

SITE STATUS REPORT

| | |
|---|---|
| Property: | Metro Aircraft Instruments<br>2135 Airport Road<br>Waterford, MI 48327 |
| Docket Number: | 03038985 |
| Current Property Name: | Metro Aircraft Instruments |
| Current Property Owner: | Royal Air |
| Inspection Dates: | March 27-28, 2017 |
| Inspector(s): | Christine Lipa/NRC and Matthew Learn/NRC, supported by Kaitlin Engel/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 Oak Ridge National Laboratory's (ORNL) review of historical information has identified radium-226 (Ra-226) use. The property at 2135 Airport Road in Waterford, Michigan was identified as belonging to Metro Aircraft Instruments, an aircraft flight instrument repair company established in 1967, which likely serviced vintage aircraft instruments containing Ra-226 (ORNL 2015). The objectives of the initial site visit were to determine if discrete sources of Ra-226 are present, to identify the areas of highest contamination, to determine if there are any current or possible future health and safety concerns, and to determine if a more in-depth scoping survey is required to plan future actions. Surveys were performed as described within NRC's procedure, Temporary Instruction (TI) 2800/043, "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2017).

Data collected during the March 27-28, 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 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 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. Metro Aircraft Instruments, an aircraft flight instrument repair company, was established in 1967 and has grown to become one of the Great Lakes Region's largest aviation repair and overhaul stations. The facility covers a wide-range of services, including museum restorations and repairing instruments in modern corporate jets, light general aviation aircraft, and heavy cargo

aircraft. Due to historic documentation of luminous radium usage in vintage aircraft gauges, it is suspected that Ra-226 contamination could be present in the buildings used to repair these instruments (ORNL 2015). No information about radium contamination or radium cleanup was located in the public records. However, site personnel indicated that a remedial action did take place in the early 1990s after contamination was identified on the floor and benchtops on the south side of the building.

The building is single-storied, roughly 630 square meters, and consists of either concrete or brick walls. The floors are either concrete or laminate in repair/storage areas and carpeted in offices. Roughly 75 percent of the floors were accessible for radiological surveys—access was limited over the balance by storage of items or office equipment (i.e., desks, benchtops, etc.). Work benchtops are wooden with Masonite, a wood composite, on top and likely installed after the 1990s remedial action—the legs and benchtop foundation appear to be original.

The land area consists of asphalt immediately surrounding the building and a grassy/gravel area located approximately 20 meters to the west of the building. Two dumpsters are also located to the west of the building near the grassy area. Figure 1 provides an aerial view of the property. Figure 2 provides a layout of the floor plan of the facility owned by Metro Aircraft Instruments.

Figure 1. 2135 Airport Road Metro Aircraft Instruments Building Outlined in Red

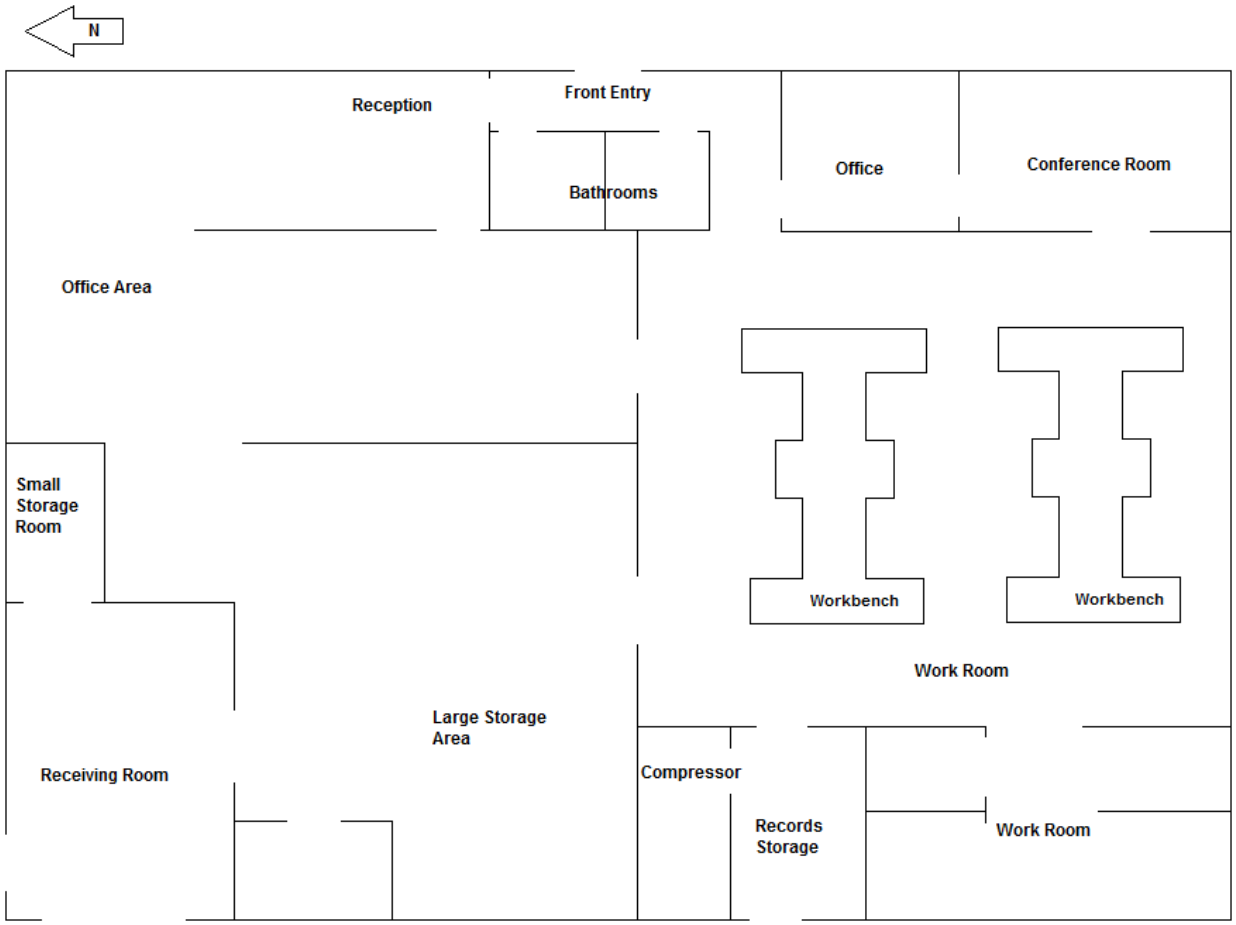



Figure 2. Layout of 2135 Airport Road Metro Aircraft Instruments Building

## 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 potential physical impediments or health and safety concerns. Based on the history of the property, if Ra-226 contamination is present, it would likely be in the west end of the building where aircraft gauges were repaired or stored. Site personnel stated that in the early 1990s (approximately 1992) a radiological survey was performed at the property during which contamination was identified on the floors and workbenches on the south side of the building. The site replaced the floors and workbenches in this area based on results from the survey. The company that performed the radiological survey could not be confirmed. The site also owns a Geiger Muller (GM) pancake detector that is used to survey incoming packages for elevated levels of radiation. If a package has elevated levels of radiation, it is supposed to be returned to the owner immediately. The GM detector was due for calibration in 1993, but still appeared to respond to radioactive material.

# 3.0 SITE OBSERVATIONS AND FINDINGS

## 3.1 Summary of Activities

The inspection team conducted an initial site visit at the 2135 Airport Road property on March 27-28, 2017. During the site visit, a pre-inspection meeting was held with Christine

Lipa/NRC, Matthew Learn/NRC, Larry Curry/Metro Aircraft Instruments, and Kaitlin Engel/ORAU. Participants discussed the inspection team's intention to perform general area surveys inside and outside of the property, as time allowed.

All accessible areas of the floor inside the building were surveyed (about 75 percent of the total area), as well as shelving containing gauges, work benchtops, and drawers in the repair workspace. Surveys were performed around the entire building perimeter (in a single pass), in the area surrounding the dumpsters, and in about 30 percent of the grassy area to the west of the building. The property beyond the chain-link fence, which also belongs to the Metro Aircraft Instruments, was not surveyed based on the results of the survey leading up to the fenced-off area.

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 (2x2) 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.[4] Field gamma spectrum measurements were made with a SAM-940 gamma spectrum analyzer. Table 1 presents the specific instruments used. Smear samples were also collected at selected locations to quantify the removable contaminant fractions.

**Table 1. Metro Aircraft Instruments-2 Survey Instruments**

| Radiation Type (units) | Detector Type | Detector Model (Number) | Ratemeter (Number) |
|---|---|---|---|
| Alpha plus beta (cpm) | Plastic Scintillator[a] | 44-142 (690, 688) | 2221 (602, 693) |
| Gross gamma (cpm) | Sodium Iodide | 44-10 (1151) | 2221 (693) |
| Gross gamma exposure meter (µR/h) | Sodium Iodide | 192 (1128) | N/A |
| Gamma Spectrum Analyzer (SAM-940) | Lanthanum Bromide | 940 (40272)[b] | 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]Device performs automatic calibration upon startup and is source checked before use.

*Summary of Daily Activities – March 27, 2017:*

The inspection team arrived on site at 13:00 for the pre-inspection meeting with the site personnel. At the completion of the site meeting, the radiological surveys began inside the building on the west side where gauges are received, stored, and repaired. Four boxes filled

[4]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).

with approximately 30-45 gauges that had elevated levels of radiation were found in a small storage room off of the receiving room on the north end of the building (see Figure 2). The boxes were moved to the receiving room (in the northwest corner of the building) so that a survey could be performed in the rest of the small storage room—no other sources of elevated radiation were identified. Surveys continued in the large storage area, just south of the receiving room, which contained over 1,000 gauges. Approximately 20-30 of the gauges in the large storage area had elevated levels of radiation. These gauges were removed from the shelves and placed with the boxes of gauges found earlier. A floor mat, in between the large storage area and the work room, was identified with elevated levels of radiation. The mat was sitting on top of exposed cement blocks in the floor. The floor below the mat was surveyed, and the mat was moved to a different location to be investigated the following day.

Before leaving the site for the day, a scan of the work benches was performed to determine if there were any immediate hazards to the workers. No immediate health hazards were identified in the work area. Elevated levels of contamination were identified on a small weight, three benchtop locations, and one gauge mounted in equipment. The weight was placed with the boxes of gauges found earlier, and additional measurements were collected on the benchtop locations with elevated radiation levels. The inspection team departed the site at 17:00.

*Summary of Daily Activities – March 28, 2017:*

The inspection team returned to the site at 08:00. More detailed surveys were performed in the work area, which also included the southwestern-most rooms. Elevated levels of radiation were identified on an empty coffee can (used in the repair process), three equipment switches (two on turntables and one on a multimeter), another benchtop location, a box of dials in a drawer, two trashcans, and two discrete areas on the floor near the work benches. These areas/items were marked for further investigation. A conference call with NRC Headquarters and Region III was held at 09:00 to discuss the results of the survey thus far. Surveys continued in the conference room, hallways, bathrooms, office area, and reception area.

One area with elevated levels of radiation was identified in the conference room. In the reception area, a display with 13 gauges was found on the reception counter. At least one gauge had elevated radiation levels—high radiation levels produced “shine” that precluded more refined measurements. The gauges were mounted into the display and could not be removed individually. The reception area is not routinely occupied. In the offices in the north of the building, gauges with elevated radiation levels were found in boxes and moved to the receiving room with the other radium gauges. A tray containing miscellaneous items with elevated radiation levels was also found in the office area. The tray had a type of oil in the bottom, and the entire tray and items in it were bagged and placed with the other items. No other areas or items with elevated radiation were found inside of the building.

The inspection team performed radiological surveys of the surrounding land area. Surveys began by circling the building and scanning the ground surface at a distance of about 1 meter from exterior walls. The grassy areas, to the east and west of the building, were also surveyed. An area approximately 2.5 meters by 0.5 meters was found with elevated radiation levels to the west of the building near an exterior door (pictured in Appendix A). This area is covered with asphalt and could not be sampled without damaging the surface. No other areas of elevated radiation were found outside in the land area.

The survey team moved back inside to collect additional data on the items found to have elevated levels of radiation. Direct measurements and smears were collected on the two intact gauges that had the highest exposure rate, on three broken gauges, on three pieces of equipment used by the employees, and the floor mat. Identified broken gauges were placed in zip-top bags. All areas where gauges were placed were surveyed for contamination (i.e., cart and benchtop). All items with elevated radiation—except the gauges mounted on the display in the reception area, the instruments used by the employees, and the trashcans—were placed in cardboard boxes and moved to the far wall of the small storage room. The floor mat was too large to be placed inside a box, but it was still moved into the small storage room with the other items.

A conference call with NRC Headquarters and Region III was held at 15:00 to discuss the results of the survey. A closeout meeting with the site owner was held to discuss the results of the survey. All areas/items with elevated radiation that remain in use were discussed and visually identified. Site personnel were also shown how to properly use their survey meter, and the inspection team recommended that the instrument be calibrated at least annually. The site employee who routinely surveys incoming packages had already left for the day, but the employee who was informed said he would pass along the information. The inspection team departed the site around 16:30.

## 3.2 Summary of Results

Pictures of surveyed items and areas are presented in Appendix A, Figures A-1 through A-14. Appendix B presents tabulated results from the site visit. Figures B-1 and B-2 present the location of discrete radiation measurements inside and outside the facility, respectively. Tables B-1 through B-2 present radiation measurement data collected inside the building, including total and removable alpha-plus-beta surface activity results in units of disintegrations per minute per 100 $cm^2$ (dpm/100 $cm^2$) (unless noted otherwise in the table), 2x2 sodium iodide detector gross responses in cpm, and gross exposure rate measurements in µR/h that were collected at contact and 1 meter or approximately waist height. Table B-3 similarly presents radiation measurement data collected from outside of the building.

The alpha-plus-beta direct measurement results 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
$\varepsilon_{tot}$ = 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

Inside the building, the 2x2 sodium iodide detector background responses generally ranged from 5,500 to 13,000 cpm. Gamma radiation levels varied based on proximity to materials known to contain naturally occurring radioactivity material (NORM) (i.e., bricks, rock salt, blasting sand). Exposure rates in background ranged from 5 to 9 µR/h at 1 meter throughout the building. The following locations/items were selected for direct measurements and smears: two gauges with the highest gamma radiation levels, three broken gauges, the workbench near a computer (topside and underside), the floor mat (topside and underside), and the three instruments currently in use that had elevated gamma radiation levels (see Tables B-1 and B-2, data associated with smear numbers 5289R0073 – 5289R0084). Exposure rates were measured on contact with these 12 locations/items and results ranged from 36 to 4,000 µR/h. The exposure rate at 1 meter from the 12 locations/items ranged from 5 to 30 µR/h, including background, which is lower than the NRC's 40 µR/h above background Action Level (AL) specified in TI 2800/043. Direct alpha-plus-beta measurement results ranged from 1,100 to 660,000 dpm/100 $cm^2$, with a background in ambient air or on the concrete floor of 180 to 300 dpm/100 $cm^2$, respectively. Smear results for removable gross alpha and beta activity ranged from < 1 to 25,940 dpm/smear (alpha) and from < 1 to 13,200 dpm/smear (beta). Smears collected on gauges and instruments were less than 100 $cm^2$, as indicated in Tables B-1 and B-2. All surfaces with elevated radiation levels were less than 100 $cm^2$, except for the floor mat, which was elevated over the entire surface (alpha-plus-beta measurement results ranged from 6,400 to 25,000 dpm/100 $cm^2$). The floor mat is approximately 0.9 m x 0.6 m in area.

The two smears (5289R0083 and 5289R0084) with the highest amount of removable activity were also subject to gamma spectrometry. Analytical laboratory results confirmed the presence of high levels of Ra-226. Note that these smears were collected directly on the face of two broken gauges.

Outside the building, the 2x2 sodium iodide detector background responses generally ranged from 5,700 to 10,000 cpm. Gamma radiation levels varied based on proximity to materials known to contain NORM (i.e., bricks). Exposure background rates ranged from 5 to 9 µR/h at 1 meter above the ground surface. One area to the north of the building had elevated radiation levels of 25,000 cpm on the 2x2 sodium iodide detector and up to 20 µR/h at 1 meter—these results were due to the stored items with elevated levels of radiation directly on the other side of the wall. An approximately 2.5 m x 0.5 m area west of the building had elevated levels of radiation. This area is 0.6 meters to the north of a door and 0.3 meters away from the building (see Appendix A). The 2x2 sodium iodide detector responses ranged from 22,000 to 60,000 cpm over this area, and the exposure rates ranged from 25 to 50 µR/h on contact, or 10 µR/h at 1 meter. The area was on asphalt; therefore, a volumetric sample could not be collected to identify the source of elevated radiation.

Table 2 provides a summary of the items or areas found with elevated levels of radiation, the exposure rate from the items or areas, and the location of the items or areas at the conclusion of the site visit. That is, many small and transportable items identified during the site visit, individually producing the radiation level described in Appendix B, were grouped in the small

storage room. This includes approximately 75 gauges, a small weight, a box of dials, a coffee can, and a tray with miscellaneous items. The floor mat was also moved to the small storage room. Therefore, Table 2 summarized radiological conditions when the inspection team left the facility.

Exposure rate measurements were collected after materials were consolidated in the small storage room. The maximum exposure rate from all items in the small storage room was 1,000 µR/h on the surface of one box, and 80 µR/h at 1 meter from the box. The exposure rate to the nearest occupied desk from the stored items was 12 µR/h with a general area background of 5 to 7 µR/h (an average of 6 µR/h was assumed).

**Table 2. Summary of Exposure Rate Measurements of Item/Areas Found with Elevated Levels of Radiation Suspected Due to Ra-226**

| Item | Location at Completion of Site Visit | Comments | Exposure Rate (µR/h)[a] | |
|---|---|---|---|---|
| | | | Contact | 1 meter |
| ~ 75 Gauges | Small Storage Room | All items placed into 5 boxes (except for the floor mat) and moved into the small storage room. Floor mat placed in small storage room separately. | 1,000 (max) | 80 |
| Small Weight | | | | |
| Box of Dials | | | | |
| 1 Coffee Can | | | | |
| Tray with Miscellaneous Items | | | | |
| 1 Floor Mat | | | | |
| 4 Benchtops | Work Room | Discrete areas less than 100 cm² | 30-80 | 5-7 |
| 3 Floor Areas | Work & Conference Rooms | Discrete areas less than 100 cm² | 10-15 | 5 |
| 2 Trashcans | Work Room | Bottom of metal trashcans | 15-30 | 5 |
| 1 Gauge Installed in Instrument | Work Room | Used in repair process | 12 | 5 |
| 3 Instruments | Work Room | 2 Turntables, 1 multimeter, used in repair process | 36-310 | 6 |
| Gauge Display | Reception | Area not routinely occupied | 400 | 7 |
| Asphalt West of Bldg. | Land Area | Area approximately 2.5 m x 0.5 m | 25-50 | 10 |

[a]Includes background of approximately 6 µR/h.

### 3.3 Summary of Dose Assessment Results

To date, a site-specific dose assessment has not been performed for the 2135 Airport Road Metro Aircraft Instruments site. However, considerations can be made for the areas of contamination (and the corresponding exposure rate measurements) identified during the initial site visit to assess potential doses to current and potential future occupants. TI 2800/043 presents two ALs that correlate to 100 mrem/yr for a worker (1 meter measurement of 40 µR/h above background) and a resident (1 meter measurement of 15 µR/h above background). These ALs account 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 Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1301, *Dose limits for individual members of*

*the public*. The 40 µR/h AL is appropriate for use when the site is configured for industrial use; the 15 µR/h AL is appropriate when the site is configured for residential use. Currently, the building used by Metro Aircraft Instruments is configured for industrial use, thus the 40 µR/h AL applies. Additionally, it is assumed that because this building is a warehouse and on airport property, it is unlikely to be used as a residence in the future.

No individual items produced gamma radiation levels in excess of the 40 µR/h AL at 1 meter. Only one area was found to be above the 40 µR/h AL at 1 meter—the small storage room after individual items were consolidated in boxes and stored there. The exposure rate to the nearest occupied workspace is 12 µR/h, compared to a general area background of 6 µR/h.

Exposure rate measurements at 1 meter from the boxed items in the building 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 occupancy, as was covered in the TI, if the entire occupancy occurs at 1 meter from the elevated measurement. The boxed items may result in a dose that exceeds the 25 mrem/yr limit for unrestricted use for a residential scenario (6,800 hours) as well, assuming a non-trivial exposure period.

Elevated alpha-plus-beta measurements of items relocated to the small storage room, up to 660,000 dpm/100 $cm^2$, were found during the site visit, with high levels of removable activity on at least two items indicating the potential for the spread of contamination. As stated previously, the items with removable contamination were placed into bags to reduce the potential spread of contamination. If these items are taken out of the bags, the potential dose from the spread of removable contamination is a significant concern, with maximum measured values of approximately 26,000 dpm/smear alpha and 13,000 dpm/smear beta, though doses are not quantified here.

Elevated alpha-plus-beta measurements on interior building surfaces other than the items placed in bags and relocated to the storage room indicate very little removable activity (on the order of 0.2% or less of the total amount). The lack of removable activity on these surfaces suggests that external gamma pathway doses will be the most significant and actual reliance on gamma exposure data is acceptable for areas outside of the storage room containing the relocated items with elevated measurements and removable contamination. Therefore, external exposure rate data collected during the site visit are sufficient for demonstrating compliance with the 100 mrem/yr criterion in these areas outside the storage room.

Further, elevated alpha-plus-beta measurements on interior building surfaces, up to 100,000 dpm/100 $cm^2$, other than the items placed in bags and relocated to the storage room, are lower than default screening values presented in Table 6.1 of the Dose Assessment Methodology Technical Basis document (NRC 2017) for their respective area of contamination. Contamination levels lower than the default screening values provide confidence that surface contamination on interior building surfaces will not result in doses exceeding 25 mrem/yr for either an industrial or residential building occupant. Moreover, considering the lack of removable activity in areas outside the storage room, the external exposure rate data also are suitable to assess whether future occupants may receive a dose in excess of the 25 mrem/yr limit for unrestricted use in 10 CFR 20.1402, *Radiological criteria for unrestricted use*. Assuming a 6,800-hour occupancy for a residential occupant scenario, as was considered in TI 2800/043, a net (rounded) exposure rate of about 4 µR/h (10 µR/h gross, including background) would be required to exceed 25 mrem/yr unrestricted dose limit. Gross exposure rates (See Table B-2) for interior areas excluding the items consolidated in the storage room ranged from 5-10 µR/h at 1 meter. Because the areas of elevated exposure rates inside the building are

generally highly localized (≤ 0.1 $m^2$) rather than uniformly distributed over a large portion of the interior building surface, it is not likely that average members of the critical group for a residential occupant scenario would spend a significant portion of their occupancy within 1 meter of the localized contamination within the building. These results provide confidence that a resident would not exceed the 25 mrem/yr limit based on residential occupancy of the building assuming the items in the storage room were properly dispositioned.

## 4.0 OBSERVATIONS AND RECOMMENDATIONS

Based on the data collected, the Metro Aircraft Instruments building contains discrete sources of Ra-226, as determined by the following observations:

- Elevated direct gamma radiation suspected due to Ra-226 was identified on approximately 75 gauges, in the land area, and other miscellaneous items (weight, coffee can, floor mat, trash cans), on benchtops, on the floor, and on instruments in use—Ra-226 is present throughout the building.
- High levels of removable Ra-226 activity were found on items surveyed.
- Elevated direct gamma radiation due to Ra-226 was positively identified on two gauges via gamma spectroscopy of the smears collected.
- The exposure rate from the stored items suspected to have Ra-226 (which were placed together to control use and get them away from the general work zone) is in excess of the 40 µR/h threshold discussed in TI 2800/043, indicating that potential doses may exceed the 100 mrem/yr limit to current occupants (i.e., 10 CFR 20.1301) assuming all of their time was spent in the closet.
- Measurements of contamination levels from areas of the site excluding the items placed in the storage room provide confidence that a resident would not exceed the 25 mrem/yr limit based on residential occupancy of the building assuming the items in the storage room were properly dispositioned.

Based on the above observations, it is recommended that the NRC not perform a scoping survey at Metro Aircraft Instruments. The rationale is that the initial site visit already generated a robust dataset that meets the scoping survey purpose: to identify the general level and extent of contamination. However, NRC should coordinate with the owner to control and mitigate risks from exposure to discrete sources of Ra-226 at the Metro Aircraft Instruments facility, especially as related to broken items with removable activity, and small areas of elevated activity in the work zone. All broken gauges, the tray with miscellaneous items, and the box of dials were placed into zip-top bags to control the potential spread of contamination. All movable items with elevated levels of radiation were placed into cardboard boxes and moved into the small storage room, including the contaminated floor mat. The site contact is aware of the location of both the stored items and the items with elevated levels of radiation that were not moved during the initial site visit. The site contact was also given basic instructions on how to perform surveys appropriately on items, and was given the recommendation to have the site survey instrument calibrated.

## 5.0 REFERENCES

NRC 2017. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, Rev. 1 U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., January. (Agencywide Documents Access and Management System [ADAMS] Accession No. ML16330A678).

NRC 2017. *Dose Assessment Technical Basis Document for U.S. Nuclear Regulatory Commission Inspectors to Assist Non-Military Radium Site Visit and Scoping Surveys,* U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., June. (ADAMS Package Accession No. ML17072A414).

ORNL 2015. *Historical Non-Military Radium Sites Research Effort Addendum*, "Metro Aircraft Instruments: Site Summary," Pgs. 89-92, Oak Ridge National Laboratory, Oak Ridge, Tennessee, November 24. (ADAMS Accession No. ML16291A488).

## APPENDIX A

## PHOTOS FROM THE METRO AIRCRAFT INSTRUMENTS SITE VISIT


**A-1. Gauge AM 6A/422**

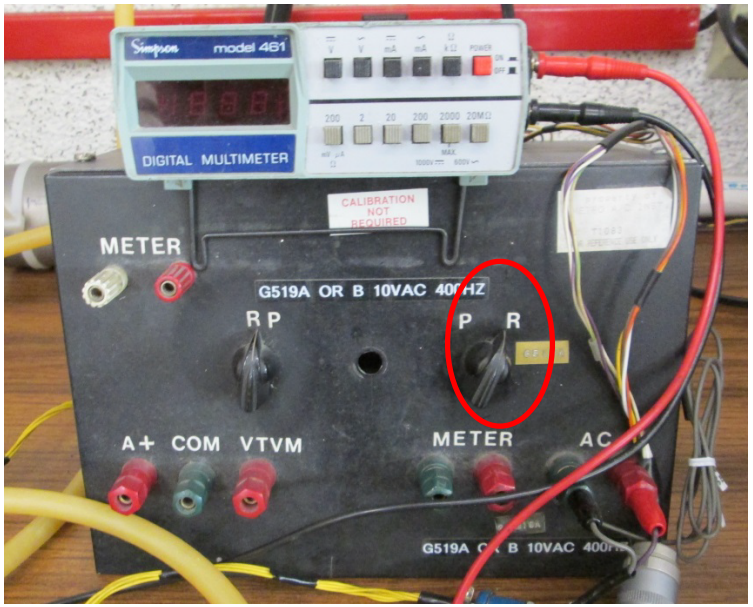

**A-2. Gauge 71673**


**A-3. Gauge AF-43-56755**


**A-4. Gauge US Gauge Co NY (no glass)**


**A-5. Gauge $O_2$ Pressure (no glass)**


**A-6. Turntables T539 (left), T549 (right). Toggle switches with elevated levels of radiation circled in red.**




**A-7. Multimeter TI083. Switch with elevated levels of radiation circled in red.**

**A-8. Floor mat with elevated levels of radiation**


**A-9. Gauges in a display in the reception area.**

**A-10. Underside of workbench with elevated levels of radiation**


**A-11. Gauges found with elevated levels of radiation**

**A-12. Items found with elevated levels of radiation**


**A-13. Storage of all items with elevated levels of radiation**


**A-14. Elevated area to the west of the building**

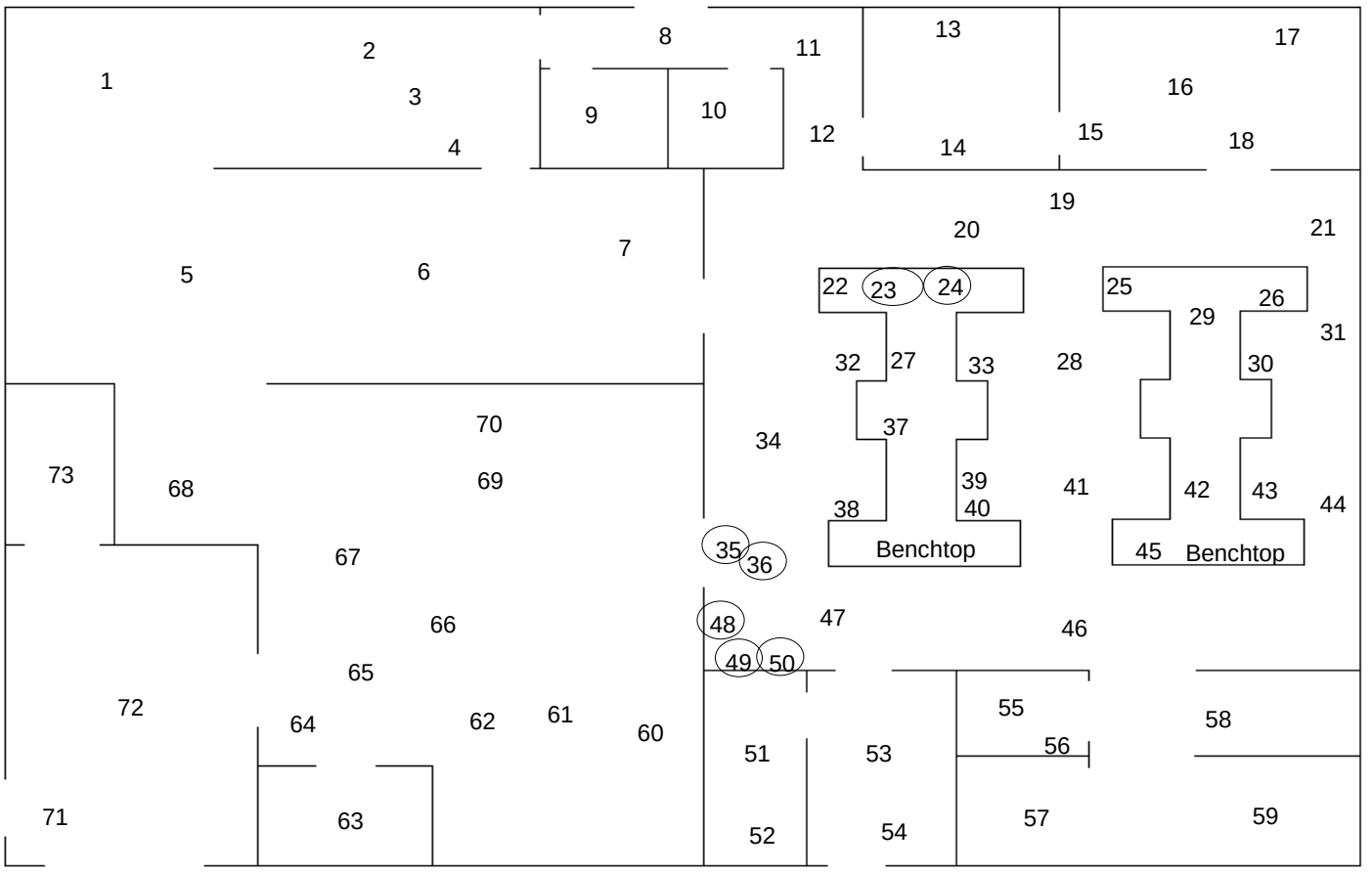
## APPENDIX B

## SURVEY MAPS AND DATA TABLES

| | | | |
|---|---|---|---|
| **Site:** Metro Aircraft Instruments #2 | **Area:** Inside | **Date(s):** 03/27/2017 03/28/2017 | **Time:** 13:30/16:45 08:20/11:00 |
| **Surveyor(s):** KME | | **Purpose:** Site Visit | |

| Radiation Type | Instrument | Detector | Background |
|---|---|---|---|
| Alpha-plus-beta | 2221 No.693, 602 | 44-142 No.688, 690 | 270 cpm[a] |
| Gamma | 2221 No.693 | 44-10 No.1151 | 5 - 15 kcpm[a] |
| Gamma | 192 No.1128 | NA | 5 - 10 µR/h[a] |

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




← N

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

| Table B-1. Metro Aircraft Instruments #2 - Inside Building | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location No. | Removable[a] | | | Alpha-plus-Beta[b] | | Gamma[c] | | | Comments |
| | Smear No. | (dpm/smear) | | Gross | Total | Contact | | 1 m | |
| | | Alpha | Beta | cpm | dpm/100 cm$^2$ | cpm | µR/hr | µR/hr | |
| 1 | — | — | — | — | — | 7,500 | — | 5 | |
| 2 | — | — | — | — | — | 7,500 | — | 6 | |
| 3 | — | — | — | — | — | 370,000 | 400 | 7 | Display with gauges |
| 4 | — | — | — | — | — | 7,000 | — | 6 | |
| 5 | — | — | — | — | — | 6,500 | — | 5 | |
| 6 | — | — | — | — | — | 6,000 | — | 5 | |
| 7 | — | — | — | — | — | 6,000 | — | 5 | |
| 8 | — | — | — | — | — | 10,000 | — | 9 | Red brick entryway |
| 9 | — | — | — | — | — | 8,000 | — | 7 | |
| 10 | — | — | — | — | — | 8,000 | — | 8 | |
| 11 | — | — | — | — | — | 8,000 | — | 7 | |
| 12 | — | — | — | — | — | 7,000 | — | 6 | |
| 13 | — | — | — | — | — | 9,000 | — | 8 | |
| 14 | — | — | — | — | — | 8,000 | — | 5 | |
| 15 | — | — | — | — | — | 8,000 | — | 7 | |
| 16 | — | — | — | — | — | 9,000 | — | 6 | |
| 17 | — | — | — | — | — | 7,500 | — | 7 | |
| 18 | — | — | — | — | — | 15,000 | 15 | 5 | Discrete location, less than 100 cm² |
| 19 | — | — | — | — | — | 6,300 | — | 6 | |
| 20 | — | — | — | — | — | 7,500 | — | 5 | |
| 21 | — | — | — | — | — | 6,800 | — | 6 | |
| 22 | — | — | — | — | — | 50,000 | 80 | 7 | Benchtop, underside, approximately 100 cm² |
| 23 | 5289R0073 | 5.6 | -2.4 | 1,896 | 1,100 | 40,000 | 40 | 5 | Benchtop, topside, approximately 100 cm² |
| 24 | 5289R0074 | 134 | 59 | 151,889 | 100,000 | 55,000 | 50 | 5 | Benchtop, topside, approximately 100 cm² |
| 25 | — | — | — | — | — | 30,000 | 30 | 5 | Benchtop, topside, approximately 100 cm² |
| 26 | — | — | — | — | — | 35,000 | 42 | 5 | Benchtop, topside, approximately 100 cm² |
| 27 | — | — | — | — | — | 6,800 | — | 5 | |
| 28 | — | — | — | — | — | 6,800 | — | 5 | |
| 29 | — | — | — | — | — | 6,500 | — | 5 | |
| 30 | — | — | — | — | — | 6,000 | — | 5 | |
| 31 | — | — | — | — | — | 7,000 | — | 5 | |
| 32 | — | — | — | — | — | 15,000 | 10 | 5 | Discrete location, less than 100 cm² |
| 33 | — | — | — | — | — | 38,000 | 30 | 5 | Trashcan bottom |
| 34 | — | — | — | — | — | 7,500 | — | 6 | |
| 35 | 5289R0081 | 16 | 2.4 | 37,195 | 25,000 | 83,000 | 90 | 10 | Floor mat, topside; Total alpha-plus-beta ranged from 6,400 up to 25,000 dpm/100 cm²; approximately 100 cm² |
| 36 | 5289R0082 | 3.5 | 9.4 | 12,247 | 7,900 | — | — | — | Floor mat, underside; approximately 100 cm² |
| 37 | — | — | — | — | — | 7,300 | — | 7 | |

| Table B-1. Metro Aircraft Instruments #2 - Inside Building | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location No. | Removable[a] | | | Alpha-plus-Beta[b] | | Gamma[c] | | | Comments |
| | Smear No. | (dpm/smear) | | Gross | Total | Contact | | 1 m | |
| | | Alpha | Beta | cpm | dpm/100 cm$^2$ | cpm | µR/hr | µR/hr | |
| 38 | — | — | — | — | — | 6,400 | — | 6 | |
| 39 | — | — | — | — | — | 18,000 | 15 | 5 | Trashcan bottom |
| 40 | — | — | | | — | 6,300 | — | 5 | |
| 41 | — | — | — | — | — | 6,700 | — | 6 | |
| 42 | — | — | — | — | — | 11,000 | 10 | 5 | Discrete location, less than 100 cm² |
| 43 | — | — | — | — | — | 12,000 | 10 | 5 | Discrete location, less than 100 cm² |
| 44 | — | — | — | — | — | 6,300 | — | 5 | |
| 45 | — | — | — | — | — | 6,500 | — | 5 | |
| 46 | — | — | — | — | — | 6,500 | — | 6 | |
| 47 | — | — | — | — | — | 7,200 | — | 6 | |
| 48 | 5289R0080 | 1.4 | 0.0 | 5,788 | 3,700 | 34,000 | 36 | 6 | TI083, multimeter, approximately 20 cm² |
| 49 | 5289R0079 | 16 | 11 | 33,547 | 22,000 | 250,000 | 260 | 6 | T549, turntable, approximately 20 cm² |
| 50 | 5289R0078 | -0.71 | 3.5 | 32,412 | 21,000 | 165,000 | 310 | 6 | T539, turntable, approximately 20 cm² |
| 51 | — | — | — | — | — | 7,000 | — | 6 | |
| 52 | — | — | — | — | — | 15,000 | — | 6 | Blasting sand |
| 53 | — | — | — | — | — | 5,700 | — | 5 | |
| 54 | — | — | — | — | — | 6,500 | — | 6 | |
| 55 | — | — | — | — | — | 6,500 | — | 5 | |
| 56 | — | — | — | — | — | 11,000 | 12 | 5 | Gauge in an instrument |
| 57 | — | — | — | — | — | 7,000 | — | 6 | |
| 58 | — | — | — | — | — | 7,000 | — | 6 | |
| 59 | — | — | — | — | — | 7,000 | — | 7 | |
| 60 | — | — | — | — | — | 8,500 | — | 7 | |
| 61 | — | — | — | — | — | 7,500 | — | 7 | |
| 62 | — | — | — | — | — | 7,000 | — | 7 | |
| 63 | — | — | — | — | — | 8,000 | — | 8 | |
| 64 | — | — | — | — | — | 7,000 | — | 7 | |
| 65 | — | — | — | — | — | 10,000 | — | 8 | |
| 66 | — | — | — | — | — | 6,000 | — | 6 | |
| 67 | — | — | — | — | — | 8,000 | — | 7 | |
| 68 | — | — | — | — | — | 7,000 | — | 7 | |
| 69 | — | — | — | — | — | 5,500 | — | 5 | |
| 70 | — | — | — | — | — | 6,500 | — | 6 | |
| 71 | — | — | — | — | — | 13,000 | 15 | 7 | Rock salt |
| 72 | — | — | — | — | — | 7,600 | — | 7 | |
| 73 | — | — | — | — | — | -- | 1000 | 80 | Consolidation of elevated items; without items exposure rate is 7 µR/h at 1 meter. |

a) As reported by the Radiological 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

| Table B-2. Metro Aircraft Instruments #2 - Gauges | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gauge ID No. | Removable[a] | | | | Alpha-plus-Beta[b] | | Gamma[c] | | | Comments |
| | Smear No. | (dpm/smear) | | Estimated Smear Area | Gross | Total | Contact | | 1 m | |
| | | Alpha | Beta | | cpm | dpm/100 cm² | cpm | µR/hr | µR/hr | |
| AM 6A/422 | 5289R0075 | 35 | 40 | 50 | 276,267 | 180,000 | 1,000,000 | 3,000 | 30 | Intact |
| 71673 | 5289R0076 | 1.4 | 8.2 | 50 | 579,079 | 390,000 | 1,000,000 | 4,000 | 25 | Intact |
| AF-43-56755 | 5289R0077 | -0.71 | 1.2 | 25 | 77,838 | 52,000 | 210,000 | 310 | 10 | Dial wrapped in paper towel and stuffed in gauge |
| US Gauge Co NY | 5289R0083 | 25,940 | 13,200 | 75 | 996,671 | 660,000 | — | 380 | 7 | Glass broken |
| Oxygen Pressure Gauge | 5289R0084 | 12,091 | 6,022 | 25 | 989,189 | 660,000 | — | 300 | 8 | Glass broken |

a) As reported by the Radiological 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:** Metro Aircraft Instruments #2 | **Area:** Outside | **Date(s):** 03/28/2017 | **Time:** 11:00/11:45 |
|---|---|---|---|
| **Surveyor(s):** KME/STP | | **Purpose:** Site Visit | |

| **Radiation Type** | **Instrument** | **Detector** | **Background** |
|---|---|---|---|
| Gamma | 2221 No.693 | 44-10 No.1151 | 5 - 10 kcpm[a] |
| Gamma | 192 No.1128 | NA | 5 - 9 µR/h[a] |

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


# = measurement location number
See attached table for measurement results

N

| Table B-3. Metro Aircraft Instruments #2 - Outside Building | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location No. | Removable | | | Alpha-plus-Beta | | Gamma [a] | | | 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 | — | — | — | — | — | 6,500 | — | 6 | |
| 2 | — | — | — | — | — | 10,000 | — | 9 | |
| 3 | — | — | — | — | — | 8,000 | — | 7 | |
| 4 | — | — | — | — | — | 25,000 | — | 20 | Elevated gauges on other side of wall |
| 5 | — | — | — | — | — | 22,000 | 25 | 10 | Area, 2.5m x 0.5m |
| 6 | — | — | — | — | — | 60,000 | 50 | 10 | Discrete area less than 100 cm² |
| 7 | — | — | — | — | — | 10,000 | — | 9 | |
| 8 | — | — | — | — | — | 8,000 | — | 7 | |
| 9 | — | — | — | — | — | 10,000 | — | 9 | |
| 10 | — | — | — | — | — | 6,000 | — | 5 | Dumpsters |
| 11 | — | — | — | — | — | 5,700 | — | 5 | |
| 12 | — | — | — | — | — | 6,000 | — | 5 | |
| 13 | — | — | — | — | — | 5,700 | — | 5 | |

a) Ludlum 44-10 NaI with Ludlum 2221 rate meter; Ludlum 192 NaI
— indicates measurement not collected at this location

**Enclosure 2**

# U.S. NUCLEAR REGULATORY COMMISSION

# APPLICABLE REGULATIONS FROM

# TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS*

# § 20.2008 Disposal of certain byproduct material.

(a) Licensed material as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in §20.1003 may be disposed of in accordance with part 61 of this chapter, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed under part 61 of this chapter, must meet the requirements of § 20.2006.

(b) A licensee may dispose of byproduct material, as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in § 20.1003, at a disposal facility authorized to dispose of such material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

[72 FR 55922, Oct. 1, 2007]

*Page Last Reviewed/Updated Tuesday, August 29, 2017*

# § 31.12 General license for certain items and self-luminous products containing radium-226

(a) A general license is hereby issued to any person to acquire, receive, possess, use, or transfer, in accordance with the provisions of paragraphs (b), (c), and (d) of this section, radium-226 contained in the following products manufactured prior to November 30, 2007.

(1) Antiquities originally intended for use by the general public. For the purposes of this paragraph, antiquities mean products originally intended for use by the general public and distributed in the late 19th and early 20th centuries, such as radium emanator jars, revigators, radium water jars, radon generators, refrigerator cards, radium bath salts, and healing pads.

(2) Intact timepieces containing greater than 0.037 megabecquerel (1 microcurie), nonintact timepieces, and timepiece hands and dials no longer installed in timepieces.

(3) Luminous items installed in air, marine, or land vehicles.

(4) All other luminous products, provided that no more than 100 items are used or stored at the same location at any one time.

(5) Small radium sources containing no more than 0.037 megabecquerel (1 microcurie) of radium-226. For the purposes of this paragraph, "small radium sources" means discrete survey instrument check sources, sources contained in radiation measuring instruments, sources used in educational demonstrations (such as cloud chambers and spinthariscopes), electron tubes, lightning rods, ionization sources, static eliminators, or as designated by the NRC.

(b) Persons who acquire, receive, possess, use, or transfer byproduct material under the general license issued in paragraph (a) of this section are exempt from the provisions of 10 CFR parts 19, 20, and 21, and § 30.50 and 30.51 of this chapter, to the extent that the receipt, possession, use, or transfer of byproduct material is within the terms of the general license; provided, however, that this exemption shall not be deemed to apply to any such person specifically licensed under this chapter.

(c) Any person who acquires, receives, possesses, uses, or transfers byproduct material in accordance with the general license in paragraph (a) of this section:

(1) Shall notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive material. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Shall not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of according to § 20.2008 of this chapter or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Shall not export products containing radium-226 except in accordance with part 110 of this chapter.

(4) Shall dispose of products containing radium-226 at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under part 30 of this chapter, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Shall respond to written requests from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the Director of the Office of Nuclear Material Safety and Safeguards, by an appropriate method listed in § 30.6(a) of this chapter, a written justification for the request.

(d) The general license in paragraph (a) of this section does not authorize the manufacture, assembly, disassembly, repair, or import of products containing radium-226, except that timepieces may be disassembled and repaired.

[53 FR 19246, May 27, 1988; 72 FR 55927 Oct. 1, 2007; 79 FR 75739, Dec. 19, 2014]

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U.S.NRC
United States Nuclear Regulatory Commission
*Protecting People and the Environment*



# § 30.6 Communications.

(a) Unless otherwise specified or covered under the regional licensing program as provided in paragraph (b) of this section, any communication or report concerning the regulations in parts 30 through 37 and 39 of this chapter and any application filed under these regulations may be submitted to the Commission as follows:

(1) By mail addressed: ATTN: Document Control Desk, Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001.

(2) By hand delivery to the NRC's offices at 11555 Rockville Pike, Rockville, Maryland.

(3) Where practicable, by electronic submission, for example, via Electronic Information Exchange, or CD–ROM. Electronic submissions must be made in a manner that enables the NRC to receive, read, authenticate, distribute, and archive the submission, and process and retrieve it a single page at a time. Detailed guidance on making electronic submissions can be obtained by visiting the NRC 's Web site at *http://www.nrc.gov/site-help/e-submittals.html;* by e-mail to *MSHD.Resource@nrc.gov;* or by writing the Office of the Chief Information Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001. The guidance discusses, among other topics, the formats the NRC can accept, the use of electronic signatures, and the treatment of nonpublic information.

(b) The Commission has delegated to the four Regional Administrators licensing authority for selected parts of its decentralized licensing program for nuclear materials as described in paragraph (b)(1) of this section. Any communication, report, or application covered under this licensing program must be submitted to the appropriate Regional Administrator. The Administrators' jurisdictions and mailing addresses are listed in paragraph (b)(2) of this section.

(1) The delegated licensing program includes authority to issue, renew, amend, cancel, modify, suspend, or revoke licenses for nuclear materials issued pursuant to 10 CFR parts 30 through 36, 39, 40, and 70 to all persons for academic, medical, and industrial uses, with the following exceptions:

(i) Activities in the fuel cycle and special nuclear material in quantities sufficient to constitute a critical mass in any room or area. This exception does not apply to license modifications relating to termination of special nuclear material licenses that authorize possession of larger quantities when the case is referred for action from NRC's Headquarters to the Regional Administrators.

(ii) Health and safety design review of sealed sources and devices and approval, for licensing purposes, of sealed sources and devices.

(iii) Processing of source material for extracting of metallic compounds (including Zirconium, Hafnium, Tantalum, Titanium, Niobium, etc.).

(iv) Distribution of products containing radioactive material under §§ 32.11 through 32.30 and 40.52 of this chapter to persons exempt from licensing requirements.

(v) New uses or techniques for use of byproducts, source, or special nuclear material.

(2) *Submissions*. (i) *Region I*. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region I non-Agreement States and the District of Columbia: Connecticut, Delaware, and Vermont. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(ii) *Region II.* The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region II non-Agreement States and territories: West Virginia, Puerto Rico, and the Virgin Islands. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(iii) *Region III.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, Missouri and the Region III Agreement States of Minnesota, Wisconsin, and Iowa. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532 –4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, and Missouri. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532–4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(iv) *Region IV.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region IV non-Agreement States and territory of Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming and Guam and Region IV Agreement States of Oregon, California, Nevada, New Mexico, Louisiana, Mississippi, Arkansas, Oklahoma, Kansas, Nebraska, and North Dakota. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region IV non-Agreement States and territory: Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming, and Guam. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

[48 FR 16031, Apr. 14, 1983, as amended at 49 FR 19630, May 9, 1984; 49 FR 47824, Dec. 7, 1984; 50 FR 14693, Apr. 11, 1985; 51 FR 36000, Oct. 8, 1986; 52 FR 8241, Mar. 17, 1987; 52 FR 38392, Oct. 16, 1987; 52 FR 48093, Dec. 18, 1987; 53 FR 3862, Feb. 10, 1988; 53 FR 43420, Oct. 27, 1988; 58 FR 7736, Feb. 9, 1993; 58 FR 64111, Dec. 6, 1993; 59 FR 17465, Apr. 13, 1994; 60 FR 24551, May 9, 1995; 62 FR 22880, Apr. 28, 1997; 68 FR 58803, Oct. 10, 2003; 70 FR 69421, Nov. 16, 2005; 71 FR 15007, Mar. 27, 2006; 72 FR 33386, Jun. 18, 2007; 73 FR 5717, Jan. 31, 2008; 74 FR 62681, Dec. 1, 2009; 75 FR 21980, Apr. 27, 2010; 75 FR 73942, Nov. 30, 2010; 76 FR 72085, Nov. 22, 2011; 77 FR 39905, Jul. 6, 2012; 77 FR 43689, Jul. 25, 2012; 78 FR 17006, Mar. 19, 2013; 78 FR 32338, May 29, 2013; 79 FR 75739, Dec. 19, 2014; 80 FR 74979, Dec. 1, 2015]

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