



REGION I  
475 ALLENDALE ROAD  
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

June 21, 1995

MEMORANDUM TO: Ms. Kimberly J. Hardin  
Licensing Branch  
Division of Fuel Cycle Safety & Safeguards, NMSS

FROM: Robert J. Bores, Chief *RJB*  
Facilities Radiation Protection Section  
Division of Radiation Safety and Safeguards

SUBJECT: RESULTS OF NRC CONFIRMATORY SURVEYS PERFORMED AT BABCOCK &  
WILCOX'S APOLLO OFFICE BUILDING GROUNDS

NRC confirmatory surveys of the grounds of Babcock & Wilcox's former Apollo Office Building (AOB), located in Apollo, Pennsylvania have been completed. Soil sampling, surface scans and exposure rate measurements were performed on the soil located beneath the former concrete slab of the AOB basement, and surface scans and exposure rate measurements were performed on the surface of the property once the land was backfilled and leveled. Results are presented in the enclosure.

All results met guidelines previously established for unrestricted release.

If you have any questions, please contact me at (610) 337-5213 or Randolph Ragland of my staff at (610) 337-5083.

Enclosure: NRC Confirmatory Sampling and Surveys, Babcock & Wilcox's Apollo Building Grounds

Attachments:

- 1) March 28, 1995 letter from W. Adams (ORISE) to R. Ragland (NRC)
- 2) B&W's Apollo Office Building (AOB) grounds final walkover survey results dated 2/24/95 and 3/28/95

9507060316 950621  
NMSS ADOCK 07000135  
CF

*NEX I*

NRC Confirmatory Sampling and Surveys  
Babcock & Wilcox's Apollo Office Building Grounds  
Apollo, Pennsylvania

**1.0 NRC CONFIRMATORY SURVEYS ON THE APOLLO OFFICE BUILDING GROUNDS**

Babcock & Wilcox was notified in a September 7, 1994 letter from Robert C. Pierson (NRC) to B.L. Haertjens (B&W) that additional NRC confirmatory surveys were necessary for soils located on the grounds of the former Apollo Office Building (AOB). This letter indicated that once the AOB was razed, the NRC would perform confirmatory surveys of the soils beneath the former AOB, and that a final walkover survey would be performed once the land was backfilled and leveled. These confirmatory surveys have been completed. A summary of the confirmatory survey process including a description of the surveys, instrumentation used, survey methods, results and comparison with unrestricted release guidelines, and a review of B&W's final survey data appear as follows.

**1.1 SURVEY DESCRIPTION**

On February 23, 1995, the site inspector obtained soil samples, and performed surface scans and exposure rate measurements on the soils located beneath the former concrete slab of the AOB basement. On May 23, 1995, after the site was backfilled and the land leveled, the site inspector performed a "walkover" confirmatory survey of the property. This survey consisted of performing surface scans and exposure rate measurements. Special emphasis and additional survey time was spent in the areas where radioactive material was known to have been used. This included the northwest area of the former AOB (location of former "wet" laboratory) and the southern end of the former AOB (location of former instrument repair and calibration laboratory).

**1.2 INSTRUMENTATION**

The following instrumentation was used.

**1.2.1 Surface Scans**

Ludlum Analyzer  
Model 16  
(Ludlum Measurements, Inc., Sweetwater, TX)

Ludlum Detector  
Model 44-2, High Energy Gamma Scintillator  
(Ludlum Measurements, Inc., Sweetwater, TX)

Ludlum Detector  
Model 44-3, Low Energy Gamma Scintillator  
(Ludlum Measurements, Inc., Sweetwater, TX)

Eberline Pulse Rate  
Model PRM-6  
(Eberline, Santa Fe, NM)

Victoreen NaI Scintillation Detector  
Model 489-55  
(Victoreen, Cleveland, OH)

### 1.2.2 Exposure Rate Instrument

Ludlum Survey Meter  
Model 19 MicroRmeter  
(Ludlum Measurements, Inc., Sweetwater, TX)

## 1.3 SURVEY METHODS

### 1.3.1 Surface Scans

Surface scans were performed on the soil that was located beneath the former concrete slab of the AOB basement prior to backfilling, and on the surface of the property after the land was leveled. Surface scans were performed by passing the detector probe slowly over soil surface. The distance between the probe and the soil surface was maintained at a minimum - nominally about 1 cm. The following survey "investigation criteria" were used. Areas with elevated count rates would receive additional survey scans, and areas with count rates exceeding 2X the background count rate would be targeted for additional soil sampling. Identification of elevated count rates was based on visual increases in count rate indications from the count rate meter or audible signals from the associated instrument "speaker".

### 1.3.2 Exposure Rate Measurement

Measurements of gamma exposure rates were performed at one meter above the soil located beneath the former concrete slab of the AOB basement prior to backfilling, and at one meter above the surface of the property after the land was leveled. The inspector walked slowly over the property surface holding the instrument at one meter above the surface. Instrument readings were allowed to stabilize and measurements were read directly in microRoentgens per hour ( $\mu\text{R/h}$ ).

### 1.3.3 Soil Sampling

Soil samples were obtained from the soil located beneath the former concrete slab of the AOB basement. Soil sampling locations were selected by the inspector at random and by bias selection to ensure sampling from areas of soil directly below portions of the AOB known to be used for radioactive material. Approximately one kilogram of soil was collected at each sampling location. Samples were placed in plastic bags, sealed and labeled. A total of nine soil samples were obtained and all of the samples were submitted to the Oak Ridge Institute for Science and Education (ORISE) for analysis by gamma spectroscopy.

## 1.4 RESULTS AND COMPARISONS WITH RELEASE GUIDELINES

### 1.4.1 Surface Scans

No areas were identified with significantly elevated count rates, and no locations were identified with count rates exceeding 2X the background count rate.

### 1.4.2 Exposure Rate Measurements

Exposure rate measurements, including background, ranged from 10  $\mu\text{R/h}$  to 12.5  $\mu\text{R/h}$ , with an average of approximately 11  $\mu\text{R/h}$ . ORISE had previously measured background exposure rates at the Apollo Office Building site to be approximately 10  $\mu\text{R/h}$ .

For unrestricted release, the guideline for exposure rates at one meter above the surface is 5  $\mu\text{R/h}$  above background. All exposure rate measurements were well within this limit.

### 1.4.3 Soil Sampling

All soil samples were analyzed by the Oak Ridge Institute for Science and Education (ORISE). Results were submitted to the NRC in a March 28, 1995 letter from W. Adams (ORISE) to R. Ragland (NRC). This letter appears as Attachment 1. No uranium-235 was identified above the detection limits. Total uranium was not found to be statistically above the counting uncertainties in any sample; measuring less than 3.5 pCiU/g of soil. Total thorium concentrations were found to range from 1.51 pCi to 2.02 pCi/g with an average of 1.86 pCi/g.

The guidelines for unrestricted release of soil with residual concentrations of enriched uranium and thorium are 30 picocuries of total uranium per gram of soil (pCiU/g) and 10 pCi of total thorium per gram of soil, respectively. All soil concentrations were found to be well within these guidelines.<sup>1</sup>

## 1.5 REVIEW OF B&W DATA

B&W submitted final soil sampling results for the AOB to the NRC by facsimile on February 24, 1995. These results appear in Attachment 2. Results ranged from 1.09 pCiU/g of soil to 4.79 pCiU/g of soil and averaged 3.3 pCiU/g. These results, analyzed with slightly better sensitivity than NRC samples, were generally consistent with those of the NRC samples.

B&W submitted results of their final walkover survey for the AOB to the NRC in an April 4, 1995 letter from D. Sgarlata (B&W) to K. Hardin (NRC). B&W's "Apollo Office Building Site, Final Walkover Radiation Survey" appears in Attachment 2. Exposure rate measurements ranged from 8 to 12  $\mu\text{R/h}$  with an average of 10.19  $\mu\text{R/h}$ . This number is close to the average value of 11  $\mu\text{R/h}$  obtained by the NRC.

---

<sup>1</sup> Background concentrations of uranium and thorium were not subtracted.

## 1.6 ATTACHMENTS

- 1) March 28, 1995 letter from W. Adams (ORISE) to R. Ragland (NRC)
- 2) B&W's Apollo Office Building (AOB) grounds final walkover survey results dated 2/24/95 and 3/28/95