UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report No. 70-824/81-04

Licensee: Babcock and Wilcox Company
P. O. Box 1260
Lynchburg, VA 24505

Facility Name: Lynchburg Research Center

Docket No. 70-824

License No. SNM-778

Inspection at Lynchburg, Virginia

Inspector: A. L. Cunningham — Date Signed: 2/11/82

Accompanying Personnel: P. C. McPhail

Approved by: for D. M. Montgomery, Section Chief, IM&EP Section
EPOS Division — Date Signed: 2/12/82

SUMMARY

Inspection on December 9-10, 1981

Areas Inspected

This special, announced inspection involved 20 inspector-hours on site in the areas of: status review of decontamination activities within radioactive contaminated areas of the Lynchburg Research Center (LRC) and contiguous sections of the Chesapeake and Ohio (C&O) railroad system right-of-way; inspection and observation of radiation survey method; random surface soil sampling of selected contaminated sectors.

Results

Of the three areas inspected, no violations or deviations were identified.

DETAILS

1. Persons Contacted

Licensee Employees

*T. C. Engelder, Director
*J. W. Cure, III, Supervisor Health and Safety
*A. F. Olsen, Senior Licensing Administrator

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on December 10, 1981 with those persons indicated in paragraph 1 above.

3. Licensee Action on Previous Inspection Findings

Not inspected

4. Unresolved Items

Unresolved items were not identified during this inspection.

5. Review of Decontamination Activity

Contamination of the restricted and unrestricted areas, within and adjacent to the Lynchburg Research Center (LRC) discussed herein, was traceable to an incident which occurred in January, 1969 involving leakage of contaminated water into a storm sewer. Investigation by the licensee disclosed a rupture in the pipe which transferred contaminated liquid from a demineralizer used in connection with the Test Reactor, to the Liquid Waste Disposal Facility. The storm sewer discharges down the hillside located immediately behind and north of Building J - the solid waste storage building. Original surveys indicated that contamination was limited to soil of the drainage area on the hillside and a marsh-like area at the base of the hill. A fence was constructed around the subject area and appropriately posted to meet the requirements of a restricted area. Radiation measurements were later conducted during the summer of 1980 when both the hillside and marshy area at the base of the hill were dryed out. The measurements confirmed that the restricted boundary was properly located on the south, east and west perimeters of the hill; however, soil sample analyses indicated that Co-60 contamination extended beyond the original north boundary of the restricted area adjacent to the Chesapeake and Ohio railroad right-of-way, to approximately twenty feet within the subject right-of-way. The extended boundary was fenced to restrict access to the area and to maintain the exposure level at the new boundary below 0.5mR/hr.

In a letter to the NRC, dated October 12, 1981, the licensee submitted a Soil Decontamination Plan which incorporated the interim external radiation

target criteria of ten microroentgens per hour (10 uR/hr) - excluding background, proposed by the NRC in its letter to the licensee dated April 21, 1981. The plan defined the methods that LRC would use to reduce the exposure level in surface soil located on B&W property and adjacent C&O railroad right-of-way. The licensee established three categories of contaminated areas: (1) restricted area - B&W property, confined largely to the hillside located behind and north of the solid waste storage facility (Bldg. J); (2) unrestricted area - not B&W property - i.e., the area adjacent to base of hill which includes the C&O Railroad right-of-way; and (3) unrestricted area - B&W property which includes the area immediately north of C&O Railroad right-of-way characterized by a small creek which crosses the property and terminates in the canal. Inspection disclosed the findings listed below.

a. Surface soil was selectively excavated from each of the above-defined contaminated areas until the exposed surface activity of such areas approached the interim decontamination criteria of 10 uR/hR as determined by radiation survey measurements using the reuter-stokes pressurized ion chamber.

b. Contaminated soil with the highest levels of activity was properly packaged and shipped offsite to a licensed waste disposal facility.

c. Remaining contaminated soil was stored within the restricted area on B&W property and appropriately posted. Stored soil was covered with plastic sheet to preclude wind and rain erosion.

d. Construction of the soil retention basin, in conformance with the Soil Decontamination Plan, was completed and backfilling of the basin with stored soil was in progress.

e. The three contaminated areas delineated above were divided into labeled grids, as required, and survey measurements of external radiation were conducted using the Reuter-Stokes pressurized ion chamber. The instrument was calibrated prior to the surveys in conformance with the agreement reached with the NRC-Region II, as referenced in the licensee's letter to the NRC dated November 19, 1981.

These findings disclosed that the Soil Decontamination Plan, committed to by the licensee, was being implemented as proposed.

6. Site Inspection

Site inspection included the following items: (1) visual inspection of the retention basin and observation of backfilling of same with previously stored contaminated soil; (2) observation of partial assembly and mounting of the shielded radiation survey meter (Reuter-Stokes pressurized ion chamber) on the scoop of a small front-end loader used in mobile surveys of the contaminated areas cited in paragraph 5, above; (3) observation of surface radiation measurements using the mobile radiation survey apparatus on randomly selected grids within assigned contaminated areas; (4)

collection of surface soil and ground water samples from selected decontaminated areas and test wells and submission of aliquots of same for isotopic analysis by NRC Region II and LRC laboratories for interlaboratory comparison of resultant data.

Inspection disclosed the findings detailed below:

a. The retention basin (220 ft. long x 50 ft. wide x 8 ft. deep) appeared to provide adequate capacity for storage of the remaining contaminated soil. Excavation of surface soil from the contaminated areas was completed prior to inspection; however, low-level contaminated soil was stored on site pending completion of construction of the retention basin. Discussions with cognizant licensee representatives disclosed that following completion of backfilling and closure of the retention basin, LRC will sample water accumulated within the basin, at least, on an annual basis, or as needed to comply with requirements committed to in the referenced Soil Decontamination Plan. Accordingly, if activity is detected in concentations which exceed 10% of the concentrations specified in Appendix B, Table 2, Column 2 of 10CFR20, the collected water will be pumped to the liquid waste retention basins for disposal as low level radioactive waste (refer to SNM.BAW-381, Appendix A, Section A.9.3.3).

b. Surface radiation measurements demonstrating use of the above cited mobile radiation survey apparatus were conducted in the following areas: center of Grid H-9 (lower zone of hillside immediately north of the solid waste storage facility within the B&W restricted area); boundary of Grids-H-8 and H-9; boundary of Grids LRR-3 and LRR-4 (lower railroad-outside B&W restricted area). Resultant surface dose rate measurements of 21 to 27 uR/hr, 10 to 12 uR/hr, and 7 uR/hr were obtained at the respective locations listed above. A fourth location, approximately fifty feet north of the main C&O Railroad right-of-way, exhibited a dose rate of 102 uR/hr. Corresponding confirmatory radiation measurements conducted by the inspectors at the indicated grids using a calibrated Eberline PRM-7 radiation monitor yielded the following: 35 uR/hr (Grid H-9); 24 uP/hr (boundary of Grids H-8 and H-9); 12 uR/hr (boundary of Grids LRR-3 and LRR-4); 135 and 160 uR/hr (approximatey fifty feet north of main railroad right-of-way along creek shoreline). The creek channels through the area north of the C&O Railroad right-of-way (designated as "unrestricted area - B&W property) and terminates in the canal. Figure 5 attached to the licensee's letter to NRC dated November 19, 1981 demonstrated that activity along the creek bed decreases to values at or below the assigned interim criteria prior to its outfall to the canal. In accordance with the soil Decontamination Plan, the LRC will establish a restricted area on this property. The fence line will be based on radiation levels not exceeding an exposure dose rate of 500 mR/yr. Further, the licensee will perform an annual direct radiation survey at the east end of the canal to detect migration of activity. All survey measurements listed above included background.

The dose rates measured were consistent with results of the licensee's surveys conducted during October and November, 1981, as reported in their letters to NRC dated October 12, 1981 and November 19, 1981 respectively.

c. As cited in the licensee's letters to NRC dated October 12, 1981 and November 19, 1981, the two culverts passing under the C&O tracks remain contaminated. The licensee, having throughly cleaned the culverts, recorded a maximum exposure dose rate of 140 uR/hr at contact. During the initial cleaning, no evidence was found that the culverts were used as a habitat for wildlife and that both culverts were too small for human occupancy. The licensee proposed to leave the culverts as found and to perform an annual surveillance as committed to in the soil Decontamination Plan, since replacement of the culverts was considered impractical in view of required removal of the railroad tracks during the operation. The inspector concurred with the proposal.

d. Surface soil sample locations and respective analytical data reported by NRC and LRC for the major radionuclides (Co-60 and Cs-137) in samples collected during inspection are summarized in Table 1, attached. Analytical data compiled by the licensee were reported to the NRC Region II via telephone on December 29, 1981 and later submitted to NRC-Region II in a letter dated January 22, 1982. Analysis of water samples conducted by both NRC and LRC indicated no apparent intrusion of surface soil radionuclide contaminants into site and offsite ground water sources. As shown in Table 1, post-decontamination surface soil sample analyses for the major nuclides cited were consistent with analytical data for soil samples collected by the licensee during their surface soil radiation surveys conducted during October and November, 1981. These data were also consistent with the measured direct radiation levels cited in paragraph 6b, above.

7. Assessment of Decontamination Plan

a. Inspection confirmed that the Soil Decontamination Plan committed to by the licensee was essentially completed. The major remaining tasks to be completed included the following: (1) backfilling of excavated contaminated areas and grassing of same; (2) where so required, fencing and posting of selected restricted and unrestricted decontaminated areas; (3) covering of the soil retention basin.

b. Soil, attached underbrush and small trees were excavated from the contaminated areas to depths which reduced surface activity to the level specified by the interim criteria (viz, 10 uR/hr, excluding background) defined in the Soil Decontamination Plan. Contaminated soil, underbrush and slash were appropriately disposed of in accordance with the referenced plan. Later contact with the licensee via telephone on December 28, 1981, and January 21, 1982 disclosed that the licensee was prepared to initiate the tasks listed below, pending NRC concurrence.

1. Backfill the excavated areas on the hillside (restricted area -B&W property) with, at least, 4-inches of clean soil and grassing of same to mitigate erosion.

2. Fence the restricted area at the base of the hill-adjacent to the C&O right-of-way. The fence line will be based on radiation levels not exceeding an exposure dose rate of 500 mR/yr as required by NRC. Conduct annual surveys along the fence line to detect migration of activity toward the railroad right-of-way.

3. Backfill excavated areas within the C&O Railroad right-of-way (unrestricted area not B&W property) with clean soil and grassing of same to provide required drainage and preclude erosion.

4. Annual surveys of direct radiation of water channel (culverts passing under C&O Railroad spur and main line) passing through the railroad right-of-way to assure that radioactivity is not migrating from LRC restricted area (hillside).

5. Establishment of restricted zone on area north of the C&O main line right-of-way (unrestricted area-B&W property). The fence line will be based on radiation levels not exceeding an exposure dose rate of 500 mR/yr as per NRC requirements.

6. Performance of annual direct radiation surveys at east end of canal to detect migration of activity to the canal via the creek discussed in paragraph 6b, above.

Performance of the above tasks would be consistent with the remaining requirements of the Soil Decontamination Plan defined in the licensee's letter to the NRC dated October 12, 1981.

The inspector concurred with the licensee's proposed solutions regarding the elevated exposure dose rates associated with the culverts and the sector of the creek bed discussed in paragraphs 6c and 6b, respectively. The additional cost and effort required by the licensee to implement further decontamination of the subject areas appear unwarranted.

TABLE I - SUMMARY OF GAMMA SPECTRAL ANALYSES OF SURFACE SOIL SAMPLES COLLECTED FROM DECONTAMINATED AREAS

Sample No.	Location	Radionuclide Concentration			
		Co-60(pCi/g)		Cs-137(pCi/g)	
		NRC	LRC	NRC	LRC
1 (SN-464)	Immediately above Grid H-1	4.2 ± 0.2	5.3	.72 ± .09	1.2
2 (SN-465)	Grid H-1	4.2 ± 0.2	5.0	.44 ± .09	0.8
3 (SN-466)	Central Area of Grid H-2	3.8 ± 0.2	5.3	0.2 ± 0.1	1.1
4 (SN-467)	Western Periphery of Grid H-2	3.7 ± 0.3	2.3	0.5 ± 0.1	0.7
5 (SN-468)	Grid H-4	5.4 ± 0.3	6.7	0.7 ± 0.1	1.4
6 (SN-469)	Random loci from Grids H-6 and H-7	11.8 ± 0.1	14.7	1.8 ± 0.2	3.3
7 (SN-470)	Random loci along boundary of Grids H-9 and H-10	2.3 ± 0.2	2.8	.48 ± 0.09	0.8
8 (SN-471)	Main Railroad Grids NRR-1 thru NRR-5 Composite Sample	3.6 ± 0.2	3.7	.22 ± .08	0.8
9 (SN-472)	Lower Railroad Grid LRR-1	7.1 ± 0.2	5.2	.83 ± .01	0.8

Sample No.	Location	Radionuclide Concentration			
		Co-60(pCi/g)		Cs-137(pCi/g)	
		NRC	LRC	NRC	LRC
10 (SN-473)	Lower Railroad Grid LRR-2	3.6 ± 0.2	3.9	.36 ± .08	0.5
11 (SN-474)	B&W Unrestricted area approximately 50 ft. NE of Railroad Row Fence Line	10.8 ± 0.1	19	6.2 ± 0.1	2.0
12 (SN-475)	(Control) B&W Facility Main Gate	-----	0.02	-----	0.5