

U. S. ATOMIC ENERGY COMMISSION  
DIRECTORATE OF REGULATORY OPERATIONS  
REGION I

RO Inspection Report No: 50-219/74-04

Docket No: 50-219

Licensee: Jersey Central Power & Light Company

License No: DPR-16

Madison Avenue at Punch Bowl Road

Priority: \_\_\_\_\_

Morristown, New Jersey 07960

Category: C

Location: Oyster Creek Nuclear Station (OC)  
Forked River, New Jersey

Type of Licensee: 640 MWe - BWR (GE)

Type of Inspection: Special - (Environmental Monitoring)

Dates of Inspection: March 20, 1974

Dates of Previous Inspection: February 6-13, 1974

Reporting Inspector: *R. J. Bores*  
R. J. Bores, Radiation Specialist

*April 16, 1974*  
Date

Accompanying Inspectors: \_\_\_\_\_

\_\_\_\_\_ Date

\_\_\_\_\_

\_\_\_\_\_ Date

\_\_\_\_\_

\_\_\_\_\_ Date

\_\_\_\_\_ Date

W. M. Lowder - Physicist - USAEC - HASL

K. M. Miller - Physicist - USAEC - HASL

Other Accompanying Personnel: A. Zawistowski - N.J. Bureau of Rad. Protect.

C. McNally - N. J. Bureau of Rad. Protect. \_\_\_\_\_ Date

R. Lessler - USAEC - DL (RAB)

Reviewed By: *J. P. Stohr*  
J. P. Stohr, Senior Environmental Scientist

*4/16/74*  
Date

*B/S 73*

SUMMARY OF FINDINGS

Enforcement Action (Environmental Monitoring)

None

Licensee Action on Previously Identified Enforcement Items (Environmental Monitoring)

None - within the scope of this inspection.

Design Changes

None

Unusual Occurrences

None

Other Significant Findings (Environmental Monitoring)

A. Current Findings

None

B. Status of Previously Reported Unresolved Items (Environmental Monitoring)

None identified

Management Interview

On March 20, 1974, following the inspection, a meeting was held in the office of Mr. J. T. Carroll at Oyster Creek Nuclear Station. The following individuals were in attendance:

Mr. R. J. Bores, Radiation Specialist, AEC, RO:I  
Mr. R. Lessler, Radiological Assessments Branch, AEC, DL  
Mr. J. T. Carroll, Plant Superintendent, OC

During this meeting the inspector stated the purpose of this inspection was to provide an independent determination of the gamma radiation levels

over and adjacent to the discharge canal. The types of measurements made were discussed and that sediment samples were taken from both the intake and discharge waterways for independent analyses by New Jersey and IHSL. The inspector stated that the preliminary gamma radiation measurements indicated the levels along the canal were no higher than elsewhere in the area, but that the final results would have to await the report from HASL.

## DETAILS

### 1. Persons Contacted

Mr. J. T. Carroll, Station Superintendent, OC  
Mr. H. Kurtz, Oyster Creek Marina

### 2. General

The stated purpose of this inspection was to determine whether there was an observable effect on the ambient gamma radiation levels associated with radionuclides in the sediments along the discharge in Oyster Creek. Radiation measurements were made and sediment samples were obtained.

### 3. Environmental Radiation Measurements

The inspector accompanied and observed representatives of USAEC Health and Safety Laboratory, New York, N.Y. as they made radiation measurements along the banks and over Oyster Creek. The detailed results of these measurements, including instruments used, locations, etc., are included in the attached report (attachment 1), "Gamma Radiation Measurements at the Oyster Creek Discharge Canal March 20, 1974." The inspector observed that there was no evidence of elevated gamma radiation levels along the banks or over Oyster Creek.

In addition, the inspector obtained four sediment samples (three from Oyster Creek and one from Forked River) which were split with personnel from the State of New Jersey, Bureau of Radiological Protection. The RO:I samples were sent to the USAEC Idaho Health Services Laboratory for analysis. When the results of these analyses are available they will be included as a supplement to this report.

## ATTACHMENT I

### Gamma Radiation Measurements at the Oyster Creek Discharge Canal March 20, 1974

Wayne M. Lowder and Kevin M. Miller  
Radiation Physics Division  
USAEC Health and Safety Laboratory  
New York, N. Y.

In response to a request dated March 5, 1974, from D. F. Knuth, Regulatory Operations, to J. L. Liverman, Director, DBER, we undertook a series of gamma radiation measurements over and adjacent to the waters of Oyster Creek, which is the liquid effluent discharge canal for the Oyster Creek nuclear power station. The purpose of these measurements was to establish if there was any observable effect on ambient gamma ray levels of the presence of plant-produced radionuclides in the water or the associated sediments. Present during the survey were R. J. Bores, RO Region I; R. Lessler, DLR; and A. Zawistowski and C. McNally, N. J. Bureau of Radiological Protection. The New Jersey team collected sediment samples from both Oyster Creek and Forked River which are being independently analyzed at their laboratory and by HSL, Idaho Falls.

The instrumentation used for the measurements included two 10-inch diameter argon-filled ionization chambers (24 and 40 atm., respectively) with  $2.4 \text{ g/cm}^2$  steel walls, and two portable NaI(Tl) scintillometers. The ionization chambers are calibrated to an overall accuracy of  $\pm 3$  percent, and have a range of 0.05 to  $100 \text{ } \mu\text{R/h}$ . The portable instruments are field-calibrated against the ionization chambers, and can be read to the nearest  $0.2 \text{ } \mu\text{R/h}$ . The ion chamber response to the cosmic ray exposure rate of  $3.7 \text{ } \mu\text{R/h}$ <sup>[1]</sup> was subtracted from the total ion chamber readings in order to infer the gamma radiation intensity.

The data obtained on the survey are indicated in the accompanying table. Locations 1, 4, 7, 8, 9 and 13 are normal background locations, and the observed gamma exposure rates of 1-2  $\mu\text{R/h}$  are consistent with our earlier background data from the Oyster Creek plant site<sup>[2]</sup>. Such levels, corresponding to an annual gamma exposure of  $\sim 15\text{mR}$ , are much lower than is typical of the eastern United States. This is due to the low concentrations of uranium ( $\sim 1\text{ppm}$ ), thorium ( $\sim 3\text{ppm}$ ) and particularly potassium ( $\sim 0.3\%$ ) in the sandy soil<sup>[3]</sup>.

Locations 2, 5 and 14 are situated along the banks of Oyster Creek, where radionuclides in the water discharged from the plant might be deposited. No evidence of any elevated gamma radiation levels was observed. This result is consistent with the previous observation by the New Jersey group that most of the effluent radioactivity was deposited in mid-channel rather than on or near the shoreline<sup>[4]</sup>.

## ATTACHMENT I

Locations 3 and 10 are situated near the center of the creek, approximately 200 ft. from the nearest bank. The measurements agree with our estimate [1] of the cosmic ray intensity at sea-level plus a small additional contribution of gamma radiation from radon daughters in the atmosphere, potassium in the water, natural radionuclides in the wooden pier, and air-scattered radiation from the shore. It is noteworthy that this fairly unambiguous "measurement" of cosmic ray intensity was made over the discharge canal of a large nuclear facility, and represents nearly the lowest radiation level that is physically possible in the outdoor environment.

Location 6 is situated at a place in the parking area where the hulls of the boats are scraped. Small quantities of sediment that are removed may have mixed with the sand and gravel, as indicated by the darker color of this area. The gamma level is slightly higher here than in the rest of the parking area (e.g., location 7), and this may be indicative of the presence of very small quantities of radionuclides of plant origin. However, the level is no higher here than that in the lot across the street (location 9)

Location 11 and 12 are boats of wood and galvanized metal construction that are moored near the center of the creek. To answer the question whether the close proximity of the bottom of the hull of each of these boats to the underwater sediments resulted in an enhanced gamma radiation level, these boats were surveyed with a portable scintillometer. The gamma levels were exceedingly low, except near a large compass in boat 11. Within 3 ft. of the compass, a gamma field of greater than 10  $\mu\text{R/h}$  was noted, and the level at the operator's chair was  $\sim 5 \mu\text{R/h}$ , i.e., more than twice the normal gamma background on shore. There was no indication of increased radiation levels at accessible points near the hull bottoms. This is not surprising if the water depth beneath the hull was at least 6 inches, as seems likely. Such a depth would absorb essentially all gamma radiation emitted by the bottom sediments.

In summary, our measurements indicate that the local population, e.g., fishermen and boat owners, receives no measurable exposure from external gamma radiation emitted by radionuclides of plant origin in the discharge canal. It should be pointed out, however, that the dredging of the bottom sediments of the main channel and their removal to a local land site might produce excess gamma levels nearby comparable to or somewhat higher than the local natural background level, depending on the depth of sediment removed. This estimate is based in a calculation, using the New Jersey sediment radioactivity data [5], of the air exposure rate ( $\sim 100 \mu\text{R/h}$ ) above the exposed mid-channel sediments if the water were removed, and consideration of the mixture of the more radioactive surface layers (< 4-in. depth) with the deeper layers after transport to another site.

### References

1. W. M. Lowder and H. L. Beck, "Cosmic-ray ionization in the lower atmosphere", J. Geophys. Research, 71, 4661, 1966.
2. H. L. Beck, et al., "HASL Studies at the Oyster Creek Nuclear Electricity Generating Station", USAEC Technical Memorandum HASL-TM 72-3, 1972.
3. W. M. Lowder, et al., "Experimental investigations of the environmental radiation field," Proc. Second Int. Symposium on the Natural Radiation Environment, to be published, 1974.
4. D. E. McCurdy, "1971 Environmental Radiation Levels in the State of New Jersey," N. J. State Dept. of Environmental Protection, 1973.
5. D. E. McCurdy, et al., "Environmental Radiation Surveillance of the Oyster Creek Nuclear Generating Station", N. J. State Dept. of Environmental Protection, 1973.

Gamma Radiation Measurements

<u>Location</u>	<u><math>\gamma</math> Exposure Rate*</u> ( $\mu$ R/h)
(1) Field, E. side of Rt. 9, 200' N. of creek	2.0
(2) N. bank of creek, at Rt. 9 bridge	$1\frac{1}{2}$
(3) Sands Point Yacht Club, on wood pier, center of creek	0.3
(4) Sands Point Yacht Club, gravel parking lot	$1\frac{1}{2}$
(5) Sands Point Yacht Club, wet silt, S. side of creek	2
(6) Oyster Creek Marina, "hot spot" in parking lot	1.5
(7) Oyster Creek Marina, gravel parking lot	1.1
(8) Oyster Creek Marina, asphalt street	1
(9) Oyster Creek Marina, lot across street	$1\frac{1}{2}$
(10) Oyster Creek Marina, end of wooden pier, center of creek	0.3
(11) On board 40' boat, end of pier (slip 228)	$\frac{1}{2}$
(12) On board 40' boat, end of pier (slip 128)	$< \frac{1}{2}$
(13) Small park, 1/4 mile E. of Oyster Creek Marina, S. side of creek, sandy soil	1.6
(14) Over sandy beach at park, S. shore of creek (washed by tide)	$1\frac{1}{2}$

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\* Exposure rates are given to the nearest 0.1  $\mu$ R/h for ion chamber measurements, and to the nearest  $\frac{1}{2}$  for portable scintillometer readings.