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Office of the Director

March 31, 1989

Mr. Jerry Bellows, Manager
Brookhaven Area Office
U. S. Department of Energy
Upton, NY 11973

Dear Mr. Bellows:

**Subject: Record of Decision Concerning the Remediation of Soil
at Building 830**

Attached is a summary of the actions taken to correct the leakage of radioactive waste from the lines connected to the underground storage tanks at Building 830. Based on our soil analyses and a pathways analysis of the residual contamination, we have concluded that we have conducted sufficient remediation. The residual soil concentrations are likely to result in projected doses that are significantly below regulatory concern. Two monitoring wells will also be installed to allow for followup and verification of the efficacy of our actions. In addition, the excavated area will be covered with asphalt to further prevent leaching of any residual activity. If you have any questions, please contact me.

Sincerely,

Gerald C. Kinne
Assistant Director

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Attachment

cc: R. Casey
R. Miltenberger
J. Naidu

SUMMARY OF REMEDIATION ACTIONS TAKEN AT BUILDING 830
 FINAL UPDATE - DECEMBER, 1988
 by: R. P. Miltenberger

Background: In August of 1986, the Building Safety Service Representative for Building 830 (Department of Nuclear Engineering) requested that management evaluate the radioactive waste storage capacity of the building in order to assure that sufficient capacity existed to operate during a three-to-four week maintenance program at the Waste Concentration Facility. Inspection of the liquid levels in the tanks and the waste inventory records revealed that there was a 825 gallon discrepancy during the period of July 1984 to August 1986. By the end of August, a leak test had been performed on the holding tanks. The results of the test indicated that the tanks were not the source of the missing inventory and efforts turned towards defining the source between the building and the tanks. In addition, estimates of the inventory lost were completed and are presented in Table 1.

TABLE 1

Estimated Radionuclide Inventory in Building 830 Radioactive Waste

Radionuclide	Concentration in Liquid	Projected Activity Released to the Soil Column
	uCi/ml	mCi
Co-60	6.7E-4	2.10
Cs-137	3.0E-4	0.94
H-3	4.9E-5	0.15
Pu-239	3.8E-5	0.11
Am-241	1.2E-5	0.04

In addition to determining the estimated inventory that was lost, an initial excavation was performed to examine parts of the underground waste line that connects the building to the waste tanks. Approximately 40 feet of line were uncovered; twenty feet around the stand pipe and twenty feet next to the underground tank valve system. Neither location was observed to contain unusual levels of radioactivity in the soil.

Work on this project continued between September 1986 and April 1987. During this period, the building system was leak tested and found not to be intact. Also, the waste holding tanks were repeatedly tested and found to be leaking. In the beginning of April, the entire underground transfer line was uncovered and examined for leaks. Several areas on the line were observed to have pinhole leaks which permitted waste water to leak into the ground. The locations of the leaks were marked on the pipe and on the surface pavement.

Stick readings

On April 2, 1987, the NYSDEC was notified of the leak. Before the end of the workday, the leaking pipes had been isolated from the building and the waste tanks, soil samples had been collected for qualitative analysis in the areas of the leak(s), the excavated area was covered and a consultant (Burns and Roe) was hired to assist with data evaluation and project management of

remedial actions. Various proposals were developed between April and September 1987 but could not be implemented for various engineering or financial reasons. At the conclusion of 1987, it was decided that the work would be performed by BNL with S&EP providing technical guidance regarding the extent of remediation that was required, environmental sample/analysis of soil samples and waste disposal assistance. The BNL Plant Engineering Department would provide the labor needed for the remediation. The Department of Nuclear Energy would assist in the coordination of the work effort. During this period, the trench remained covered in order to minimize rain water intrusion into the area.

Remediation Program and Environmental Impact

In July and August of 1988, a series of soil profiles were collected to determine the extent of the contamination in the area and to develop a remediation plan. Shallow (0-30 cm) profiles were collected at nine locations along the length of the trench. The results of this sample effort are presented in Table 2. In addition, four deep (0-120 cm) profiles were collected along the trench. The results are listed in Table 3. The surface soil data indicated that most of the activity resided in the top 30 cm of soil, while the deep soil profiles indicated that some activity had migrated to lower levels. Consequently, it was decided to excavate to a depth of 120 cm and take additional soil profiles.

Excavation of the contaminated soil was accomplished during the first two weeks of November. Soil profile samples were collected on November 4 and 16. The results of the soil sample analysis are presented in Table 4. Table 5 is a composite summary of the deep profile samples collected in July, August and November, thus enabling one to observe the total distribution of contamination from pipe level down to a depth of between 210 and 300 cm. As can be observed from these data, there is some residual activity remaining in the soil following remediation. Using the concentrations observed in the sampling program, a pathway analysis was performed to assess the impact of residual contamination.

Because the pipe depth was approximately 150 cm below a paved area, the following pathways were not considered: direct exposure, recreational use and agricultural use. The only pathway of impact was contamination of ground water and subsequent ingestion by man. Results of the pathway analysis for ground water indicate that at the current soil concentrations, a non-radiation worker at the BNL site could receive a maximum dose of between 0.00012 and 0.00014 mrem/yr due to ingestion of water from the closest BNL potable water well, while a member of the general public, ingesting water from a private well located 2,900 meters downgradient of the source would receive between 0.000009 and 0.000014 mrem/yr. In order to confirm the accuracy of this assessment, two groundwater monitoring wells will be installed in 1989 at locations down gradient of the area.

Although there are some uncertainties in the models used, the doses reported were obtained using the most conservative assumptions. These data indicate that sufficient remediation has occurred. The residual soil concentrations are likely to result in projected doses that are significantly below levels of regulatory concern. The addition of the two monitoring wells will permit continued follow-up and verification of these projected doses. Because the residual soil activity represents negligible impact, the trench was backfilled with clean fill and will be covered with asphalt in 1989.

TABLE 2

Cs-137 and Co-60 SOIL CONCENTRATIONS FROM
 SHALLOW SOIL PROFILE SAMPLES COLLECTED
 AT THE BLDG. 830 LEAKING D-WASTE LINE TRENCH ON
 JULY 29, 1988

Profile Depth cm	Cs-137 Concentrations at Profile Locations								
	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9
	←-----pCi/g dry----->								
0-15	32.40	6.02	45.00	4.45	564.00	48.00	11.10	6.08	3.89
15-30	122.00	898.00	405.00	1330.00			98.20	3.32	
>30									16.00

Profile Depth cm	Co-60 Concentrations at Profile Locations								
	P-1	P-2	P-3	P-4	P-5	P-6	P-7	P-8	P-9
	←-----pCi/g dry----->								
0-15	70.10	6.81	90.40	8.26	73.00	66.50	12.30	14.40	13.10
15-30	7040.00	115.00	134.00	136.00			18.60	2.36	
>30									27.20

NOTES:

1. One sigma counting errors range from 1 to 16 percent.
2. A blank in the data field indicates that no sample was collected at that depth.
3. The average Cs-137 concentration based on N=16 data points is 98 pCi/g dry.
4. The average Co-60 concentration based on N=16 data points is 58.5 pCi/g dry.

TABLE 3

**Cs-137 and Co-60 SOIL CONCENTRATIONS FROM
DEEP SOIL PROFILE SAMPLES COLLECTED ON
AUGUST 12, 1988**

Profile Depth cm	Cs-137 Concentrations at Profile Locations			
	P-1	P-2	P-3	P-4
	←-----pCi/g dry----->			
0-30	27.8	4.73	5.14	10.8
30-60	357		5.54	2.35
60-90	216	624		
90-120			19.6	1.81

Profile Depth cm	Co-160 Concentrations at Profile Locations			
	P-1	P-2	P-3	P-4
	←-----pCi/g dry----->			
0-30	49.5	74.8	5	23.4
30-60	112		5.25	3.21
60-90	103	82.7		
90-120			51.3	2.37

NOTES:

1. One sigma counting errors range from 1 to 16 percent.
2. A blank in the data field indicates that no sample was collected at that depth.
3. Deep profiles were collected in areas adjacent to shallow sample locations P-1 (deep location id F-1), between P-4 and P-5 (deep location P-2), between P-8 and P-9 (deep location id P-3) and 2-3 feet adjacent to shallow location P-8 and P-9 (deep location id P-4).

TABLE 4

SUMMARY OF BUILDING 830 SOIL PROFILE
SAMPLE CONCENTRATIONS POST-REMEDATION

Location	Depth cm	Sample Date	Radionuclide Concentrations Result +/- 1 Sigma Error pCi/g dry,			
			Co-60	Zn-65	Cs-137	K-40
T-1	0- 30	11/04/88	26.7+/-0.16	0.50+/-0.24	10.4+/-0.19	6.55+/-0.68
Center	30- 60	11/04/88	21.6+/-0.21	nd	9.4+/-0.24	5.30+/-0.78
	60- 90	11/04/88	2.5+/-0.11	nd	1.3+/-0.13	3.97+/-1.53
	90-105	11/04/88	2.7+/-0.05	nd	1.7+/-0.08	3.18+/-0.42
	120-150	11/04/88	ns	ns	ns	ns
	150-180	11/04/88	0.9+/-0.01	nd	0.7+/-0.06	2.89+/-0.58
T-2	0- 30	11/16/88	136.+/-0.34	nd	2.8+/-0.47	7.46+/-1.80
Center	30- 60	11/16/88	171.+/-0.40	nd	nd	3.10+/-1.90
	60- 90	11/16/88	242.+/-1.46	nd	nd	8.72+/-4.00
T-3	0- 30	11/16/88	1.05+/-0.01	nd	0.29+/-0.10	5.26+/-1.50
Center	30- 60	11/16/88	0.24+/-0.02	nd	nd	2.47+/-0.37
	60- 90	11/16/88	0.77+/-0.06	nd	0.26+/-0.04	3.57+/-0.39
T-3 Off-center	0- 30	11/16/88	1.37+/-0.01	nd	0.60+/-0.06	3.54+/-0.55

nd = not detected - analytical results were below the detection limit.

ns = not sampled - due to sampling problems with the soil boring tool (ie. inability to penetrate to deeper layers or augering too deep) soil samples were not collected from this zone.

TABLE 5

BUILDING 830 TRENCH SOIL CONCENTRATIONS AT THE THREE PROFILE LOCATIONS
 - A COMPOSITE OF PRE AND POST REMEDIATION SAMPLE RESULTS

Location	Depth cm	Sample Date	Radionuclide Concentrations Result, pCi/g dry		
			Co-60	Zn-65	Cs-137
T-1	0- 30	8/12/88	49.5	nd	27.8
	30- 60		112.	nd	357.
	60- 90		103.	nd	216.
	90-120		ns	ns	ns
	120-150	11/04/88	26.7	0.5	10.4
	150-180		21.6	nd	9.4
	180-210		2.5	nd	1.3
	210-225		2.7	nd	1.7
	240-270		ns	ns	ns
270-300	0.9	nd	0.7		
T-2	0- 30	8/12/88	74.8	nd	4.7
	30- 60		ns	ns	ns
	60- 90		82.7	nd	82.7
	90-120		ns	ns	ns
	120-150	11/16/88	136.	nd	2.8
	150-180		171.	nd	nd
	180-210		242.	nd	nd
T-3	0- 30	8/12/88	5.1	nd	5.0
	30- 60		5.3	nd	5.5
	60- 90		ns	ns	ns
	90-120		51.3	nd	19.6
	120-150	11/16/88	1.1	nd	0.3
	150-180		0.2	nd	nd
	180-210		0.8	nd	0.3

nd = not detected - analytical results were below the detection limit.

ns = not sampled - due to sampling problems with the soil boring tool (ie. inability to penetrate to deeper layers or augering too deep) soil samples were not collected from this zone.