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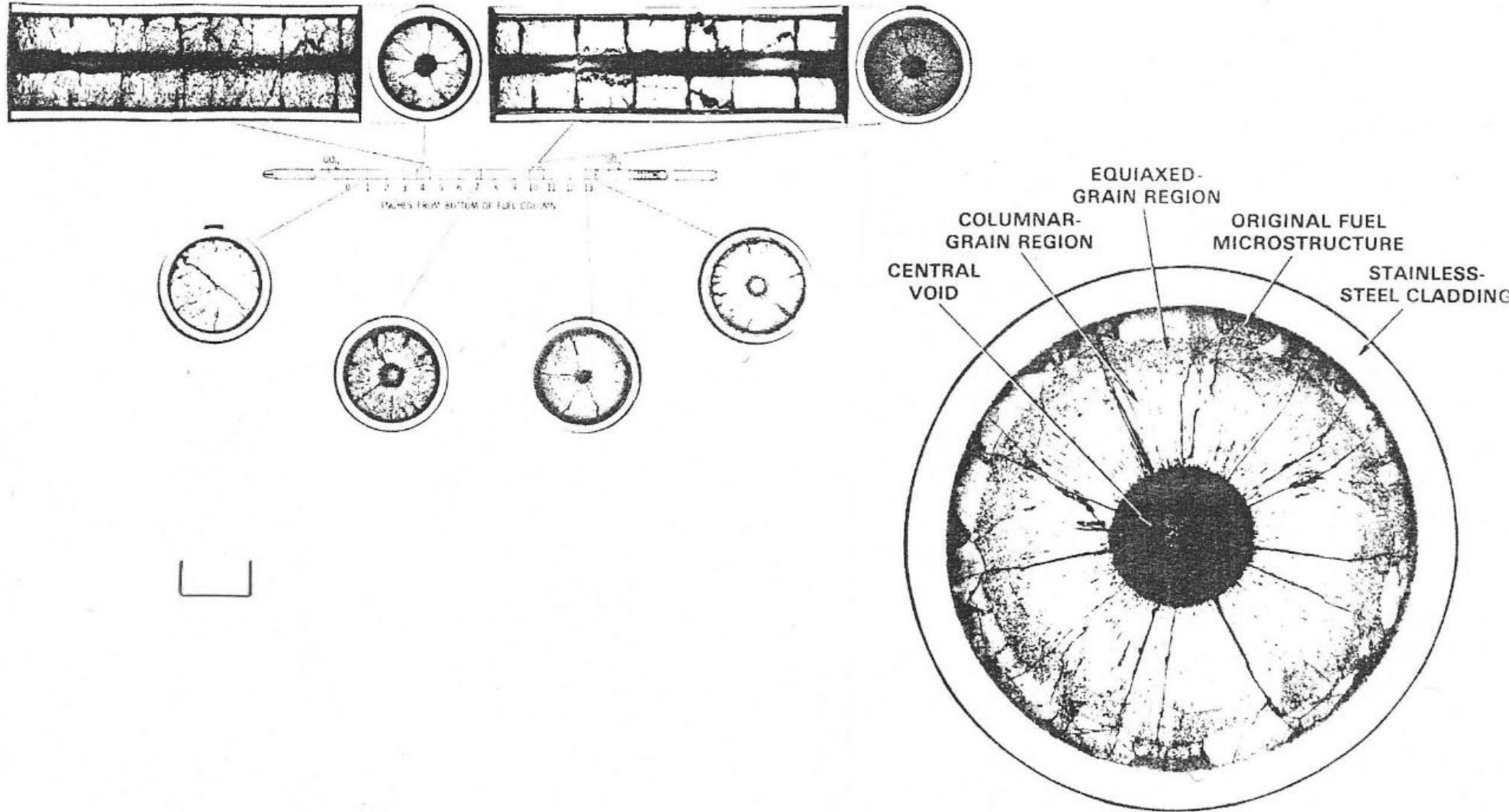
Is High Level Waste Buried at Area G?

El Rio Arriba Environmental Health Association

Len Trimmer

Ken Silver

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Test specimens were obtained by cutting fuel rods in cross-section.

IMPLICATIONS

Past disposal of high level waste in shafts at Area G has several important implications for worker and environmental health and clean-up:

- External radiation doses due to neutrons and internal doses due to fission products may have been inadequately characterized for workers near the shafts. In early years, loose fitting covers on the shafts were made from 1/2-inch steel.
- The shafts may also represent an historical source of ground-level release of fission product gases into the community.
- Clean-up plans should take into account the likelihood of finding high level waste in disposal shafts at Area G.

LAB'S OFFICIAL POSITION

In 1991, faced with public controversy over reports of high level waste at Area G, LANL managers drew up several "talking points" (*see memo*). The main points were:

- radioactive waste from research and development activities is *excluded* from DOE's definitions of high level waste
- radioactive waste resulting from studies of irradiated fuel rods is therefore exempt
- only wastes from the reprocessing of nuclear fuel meet the definition of "high level waste"

LANL has never reprocessed fuel, so there is no "high level waste" at Area G.

903

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Keith
orig: *Dale*
Cathy
Lynne

memorandum

TO EM-7 Employees
FROM *AD* A. Drypolcher, EM-7
Group Leader
SYMBOL EM7-92-291
SUBJECT

DATE August 25, 1992

MAIL STOP/TELEPHONE E517/7-7391

WASTE MANAGEMENT DOCUMENTS AND INFORMATION

Waste management activities at Los Alamos National Laboratory (LANL) continue to receive both local and national attention.

Because waste management has such a high visibility, remember that information and documents in your possession are for the daily performance of your duties and are critical to our effectiveness in carrying out EM-7 mission and responsibilities. These documents must remain under your control. Make copies only to support business.

These documents are for official use only. Occasionally documents should be stamped with "For Official Use Only" to help us control our documents and increase our sensitivity to the information contained within. You may make such documents available or give them to others outside the Laboratory only when a written request has been made to the Laboratory. Some documents may require a classification review in OS-6, Classification Office, before they can be released outside the Laboratory. Any and all requests from the media must first come to us through the Laboratory's Public Information Office.

For more information on document control, see your section leader. For more information about classification reviews, call Peggy Durbin, 5-3364. For more information about handling requests from the media, call me at 7-7391

Everyone in the Waste Management Group is a critical part of a program that everyone can be proud of. Through your hard work and dedication, you have made our program something that the Laboratory and the nation can be proud of. Your efforts are appreciated.

AD:ge

RECEIVED AUG 26 1992

Cy: T. Gunderson, EM-DO, MS K491
C. Nylander, EM-DO, MS K491
EM-7 Group File, MS E517

POINT PAPER ON HIGH-LEVEL RADIOACTIVE WASTE

Summary

Only radioactive waste that results from reprocessing of spent nuclear fuel is classified as high-level radioactive waste. Los Alamos National Laboratory has disposed of radioactive waste resulting from the studies of irradiated fuel rods. This waste, however, came from research and testing of fuel materials, not from reprocessing of spent nuclear fuel. From the definitions below, it is clear that the radioactive wastes disposed or stored at LANL fall into the low-level (either routine or high-exposure) or TRU (contact-handled or remote-handled) waste categories. None of the waste disposed at LANL, in the past or at present, is classified as high-level radioactive waste.

High Level Waste Definitions

The Department of Energy (DOE) defines categories of radioactive waste in DOE Order 5820.2A dated September 26, 1988. The Order defines high-level waste as "The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in the reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation." High level waste is generated only during reprocessing of spent nuclear fuel as defined by DOE Order 5820.2A.

Transuranic Waste Definitions

Transuranic (TRU) waste is defined by DOE as "Without regard to source or form, waste that is contaminated with alpha-emitting transuranium [atomic number >92] radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. Heads of Field Elements can determine that other alpha-contaminated wastes, peculiar to a specific site, must be managed as transuranic waste." DOE-Albuquerque has broadened this definition in DOE/AL Order 5820.2 to include all alpha emitters with half-lives greater than 20 years, in concentrations greater than 100 nCi/g at the time of assay, with the exceptions of natural and depleted uranium.

DOE further defines remote-handled TRU waste as a separate category of TRU waste. Remote-handled TRU is defined as "Packaged transuranic waste whose external surface dose rate exceeds 200 mrem per hour. Test specimens of fissionable material irradiated for research and development purposes only and not for the production of power or plutonium may be classified as remote-handled transuranic waste." Packaged TRU Waste with external surface dose rates less than or equal to 200 mrem/h is termed "contact-handled" TRU.

Low-Level Waste Definitions

Low-Level Waste is defined by DOE as "Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear

fuel or 11e(2) byproduct material (mill tailings) as defined in the Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less than 100 nCi/g."

Dose Rates

To put the 200 mrem/h dose rate into perspective, a person in direct contact for one hour with a package containing radioactive waste having an exposure rate of 200 mrem/h would receive a radiation dose equivalent to about 3 or 4 average chest x-rays. The natural background radiation dose at Los Alamos is approximately 320 mrem/y (this includes dose received from Radon gas).

External radiation dose rate does not determine whether radioactive waste is high-level, low-level, or TRU. Dose rate determines only whether TRU waste is contact-handled or remote-handled. Therefore, it is possible to have low-level waste with high radiation exposure rates. In fact, LANL low-level radioactive waste is generally categorized into two classes: routine low-level waste with radiation dose rates less than or equal to 200 mrem/h, and high-exposure low-level waste with radiation dose rates above 200 mrem/h.

Radioactive Wastes Handled at LANL

Since the early 1960's, LANL has studied test specimens of irradiated material extracted from fuel rods from research and test reactors. As a result of these studies, radioactive wastes have been generated that have been disposed at LANL.

Radioactive wastes generated were from studies of fuel rods from several research and test reactors. From the early 1960's through 1969, uranium fuel rods from the Rover reactor project were studied. Plutonium fuel rods from the Los Alamos Molten Plutonium Reactor Experiment (LAMPRE) were studied in the mid 1960's. From 1969 through 1986, uranium and plutonium fuel rods were studied from the Fast Breeder Test Reactor (EBR-2) located at Idaho Falls and from the Fast Flux Test Facility (FFTF) located at Hanford, Washington. During these studies, test specimens were removed from these fuel rods for analysis at LANL.

Wastes that were disposed at LANL consisted of these test specimens and other wastes (such as paper, plastic, small saw blades, laboratory glassware, etc.) related to their study. The actual fuel rods were sent to either Idaho Falls or Hanford for storage or disposal. No fuel rods were disposed at LANL.

Wastes generated in these studies fall into one of two categories of waste as defined by DOE. Because the waste disposed at LANL did not result from reprocessing of spent nuclear fuel rods, but resulted from test specimens of fissionable material irradiated for research and development and not for production of power or plutonium, the waste falls into the category of either low-level or TRU waste. Because radiation exposure rates of this waste were often greater than 1000 Roentgen/h (1,000,000 mR/hr) at the time

of disposal, the waste was categorized as either remote-handled TRU or high-exposure low-level waste based on the amount of TRU material in the waste.

Spent nuclear fuel is currently generated at LANL by the Omega West Reactor. This spent fuel, however, is not reprocessed or disposed at LANL. It is shipped to Idaho Falls for storage or disposal.

When radioactive waste is disposed at LANL, sufficient earth cover is provided to reduce dose rates at the surface of the disposal location to levels which prevent exposures to the public. Ongoing environmental monitoring programs have demonstrated that there have been no measurable increased adverse environmental impacts due to the disposal of wastes generated during these fuel rod studies. The locations where fuel rod waste has been disposed show no elevated dose rates when compared to other locations at the disposal facility. There has also been no detectable increase of fission products in either the air or soil at the disposal facility.

"Because the waste disposed at LANL did not result from reprocessing of spent nuclear fuel rods, but resulted from test specimens of fissionable material irradiated for research and development and not for production of power or plutonium, the waste falls into the category of either low-level or TRU waste."

Another Example of High Level Waste at Area G

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO Johnny Harper, MS J595
EM-7 Section Leader
FROM Charles Villareal, EM-7
SYMBOL EM-7D-92-168
SUBJECT AVAILABLE PITS AND SHAFTS

DATE March 9, 1992
MAIL STOP/TELEPHONE J595/5-6148

For your information here is a list of pits and shafts available for disposal of various types of waste here at TA-54, Area-G.

SHAFT NUMBER	DIAMETER	WASTE TYPE
21	12in	open
22	12in	sources
23	12in	open
131	6ft	MFP
132	6ft	animal tissue
136	6ft	mid level H3
137	6ft	mid level H3
143	6ft	MFP
144	6ft	open
145	6ft	lined for MW
146	6ft	lined for MW
147	6ft	graphite
148	6ft	HEPA filters
149	6ft	open
307	2ft	control rods
308	3ft	Be disposal
C-13	4ft	PCB disposal
156-168	3ft	high level H3
300	9.5ft	lead sheilded sources
301	9.5ft	open

PIT NUMBER

31	RAD. Asbestos Disposal
37	Low Level Waste Disposal
39	Low Level Disposal

Los Alamos

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

memorandum

TO: Distribution

DATE: February 28, 1991

FROM: A. Drypolcher, HSE-7 Group Leader,
MS E517

MAIL STOP/TELEPHONE: J592/7-6095

T. Gunderson, HSE-Division, MS K491

FROM: E. Derr, HSE-7 RadWaste Section

SYMBOL: HSE-7B-91-33

SUBJECT: POINT PAPER ON HIGH LEVEL RADIOACTIVE WASTE (FUEL ROD QUESTION)

February 1, a response was drafted to the question of whether or not "high-level" radioactive waste has ever been buried on Laboratory property. This draft response was distributed for comment and attached is the final paper.

The only major change from the draft was the elimination of the NRC definition of high-level waste. There were several reasons for eliminating the NRC definition. The NRC definition defines "irradiated reactor fuel" as high-level waste (HLW). This appears to include the waste that has been disposed at Los Alamos National Laboratory that resulted from the fuel rod studies. However, under the Energy Reorganization Act of 1974 (when the AEC was split into NRC and ERDA (DOE), NRC was to regulate HLW generated at DOE facilities except that waste which was used for, or a part of, research and development activities. The NRC does not, however, spell this out in their definition of HLW. The DOE definitions do spell out this exclusion for test specimens of irradiated material used for research and development purposes.

To eliminate confusion to the general public, the NRC definition was eliminated (1) because the NRC does not regulate the waste in question and (2) because the public might perceive an inconsistency between the NRC and DOE definitions and come to the incorrect conclusion that we have indeed disposed of HLW at Los Alamos National Laboratory.

ED:rfg

Cy: A. Tiedman, ADO, MS A120
E. Wewerka, ADCM, MS A102
J. Puckett, HSE-DO, MS K490
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D. Sandstrom, MST-DO, MS G756

DOCUMENTARY EVIDENCE

Confirmation of the disposal of irradiated reactor fuel is contained in the landmark report, "History and Environmental Setting of LASL Near-Surface Land Disposal Facilities for Radioactive Wastes..." (LA-6848-MS) by Margaret Anne Rogers.

<u>Shaft</u>	<u>Date</u>	<u>Description</u>	<u>Reported Quantities</u>
#2	September 27, 1966	Irradiated Pu cell waste	1125 Ci MFPs 2 ft ³ TRU
#9	February 26, 1969	Fuel elements	22 ft ³ U
	March 18, 1969	Fuel elements	1 Ci MFPs
#10	February 26, 1969	Fuel elements	13 ft ³ U
#13	February 2, 1970	Irradiated ²³⁵ U fuel	1 ft ³ , 28 g U
	May 25, 1970	Fuel elements	12 ft ³ U
#24	October 1, 1970	Unloaded fuel elements	8 ft ³
#25	April 1, 1970	Fuel elements ²³⁵ U + FP	1 Ci MFP
	"	"	2.5 Ci MFP
#26	April 15, 1970	Fuel elements	10 ft ³
#27	May 22, 1970	²³⁵ U, ²³⁹ Pu reactor fuel	5 Ci MFPs, 0.2 ft ³ TRU, 3.4 g TRU
#47	June 19, 1972	Fuel + waste material	5.5 Ci MFP
#74	April 19, 1973	Fuel elements	0.246 Ci MFP
#76	January 25, 1974	Irradiated ²³⁹ Pu & ²³⁵ U fuel	65 Ci

Note: As shown in the far right column, "Reported Quantities" do not always denote the total number of curies of radioactive materials disposed of in the shafts.

Material Disposal Area G (MDA-G) is the main radioactive waste disposal site for LANL. There are 91 disposal shafts that received waste prior to implementation of RCRA regulations on November 19, 1980. Shafts range in diameter from 1 to 6 ft, and are 25 to 60 ft in depth. Many shafts are of unknown size. Most shafts are unlined, with the remainder being cement lined; information of shaft lining is unavailable for several shafts. Shafts are separated by a minimum distance of 7.5 ft. Shafts are layered with 0.5 ft layers of crushed tuff between waste layers, filled to within 3 ft of the surface, and capped with 3 ft of clean concrete.

UNIT	PERIOD OF USE	DIAMETER / DEPTH (FEET)	LINING	WASTE VOLUME (CU. FT.)	WASTE DESCRIPTION
Shaft 1	1966 - 1967	2 / 25	u.l.	63	cell trash, irradiated metal, animal tissue
Shaft 2	1966 - 1967	2 / 25	u.l.	42	dU chips, animal tissue, irradiated Pu cell waste
Shaft 3	1966 - 1967	2 / 25	u.l.	35	Pu-contaminated Na & metal, neutron generators
Shaft 4	1967 - 1968	2 / 25	u.l.	44	U-contaminated metal, U-238 samples, dU
Shaft 5	1967 - 1968	2 / 25	u.l.	29	dU, tritium-contaminated materials, U-238 contaminated metal
Shaft 6	1967 - 1968	2 / 25	u.l.	21	tritium-contaminated materials, U-235
Shaft 7	1967 - 1968	2 / 25	u.l.	52	animal tissue, PTC waste, tritium, dU
Shaft 8	1968 - 1969	2 / 25	u.l.	NA	Pu cell waste, animal tissue, ord boxes
Shaft 9	1968 - 1969	2 / 25	u.l.	70	hot cell waste, Pu cell waste, EBR-II waste, fuel elements
Shaft 10	1969	2 / 25	u.l.	54	animal tissue, Pu-239 waste, U-contaminated chemicals
Shaft 11	1967 - 1969	3 / 25	u.l.	72	Pee Wee waste & trash, U-235 cell waste, graphite
Shaft 12	1966 - 1970	3 / 25	u.l.	83	cell waste, Rover waste, tritium
Shaft 13	1966 - 1970	3 / 25	u.l.	122	animal tissue, EBR hardware, reactor parts
Shaft 14	1966 - 1969	1 / 25	c.l.	NA	U-235 vermiculite, neutrized solution HCl + U-235
Shaft 15	1969 - 1970	1 / 25	c.l.	8	tritium in H3PO4, hot cell waste
Shaft 16	1969	1 / 25	c.l.	4	tritium
Shaft 17	1970 - 1974	1 / 25	c.l.	NA	tritium pump, U-235 in Na
Shaft 18	1970 - 1973	1 / 25	c.l.	13	neutrized Na, Cs-137 + Ba-140
Shaft 19	1971 - 1974	1 / 25	c.l.	NA	Pu-239 solution, reacted Pu-239
Shaft 20	1974 - 1975	1 / 25	c.l.	8	sorbed Pu-239 solution
Shaft 24	1969 - 1970	2 / 25	u.l.	44	animal tissue, dU, unloaded fuel elements
Shaft 25	1969 - 1971	2 / 25	u.l.	45	dU, U-238 residue, U-238 contaminated metal
Shaft 26	1969 - 1970	2 / 25	u.l.	56	hot cell trash, fuel elements, dU-contaminated metal
Shaft 27	1970	2 / 25	u.l.	13	irradiated material, dU-contaminated metal
Shaft 28	1970	2 / 25	u.l.	14	LA notebooks, U-235 residues
Shaft 29	1970 - 1971	2 / 25	u.l.	24	thermocouple waste, U-235 residue
Shaft 30	1970 - 1971	2 / 25	u.l.	11	animal tissue, Pu-239 hot cell waste
Shaft 31	1970 - 1971	2 / 25	u.l.	47	dU
Shaft 32	1970 - 1971	2 / 25	u.l.	33	LAPRE-II lines and valves, animal tissue, irradiated stainless steel
Shaft 33	1970 - 1971	2 / 25	u.l.	15	Pu-239 hot cell waste
Shaft 34	1970 - 1972	6 / 60	?	932	U-contaminated oil
Shaft 38	1970 - 1974	3 / 40	u.l.	69	Rover reactor parts, LAMPRE-II tank
Shaft 39	1970 - 1973	6 / 60	?	537	tritium-contaminated equipment
Shaft 40	1971	2 / 25	u.l.	28	animal tissue
Shaft 41	1971 - 1972	2 / 25	u.l.	71	animal tissue, graphite
Shaft 42	1972	2 / 25	u.l.	56	animal tissue, U-contaminated metal
Shaft 43	1971 - 1972	2 / 25	u.l.	43	U-contaminated metal, dU
Shaft 44	1971 - 1972	2 / 25	u.l.	61	animal tissue, Pu-239 contaminated vermiculite, dU with graphite
Shaft 45	1971 - 1972	2 / 25	u.l.	70	Pu-contaminated steel, U-235 residues

(continued)

UNIT INFORMATION, continued

UNIT	PERIOD OF USE	DIAMETER / DEPTH (FEET)	LINING	WASTE VOLUME (CU. FT.)	WASTE DESCRIPTION
Shaft 46	1972	2 / 25	u.l.	38	animal tissue, Pu-239 contaminated steel
Shaft 47	1972	2 / 25	u.l.	32	animal tissue, contaminated metal, fuel waste (no vol.)
Shaft 48	1972	2 / 25	u.l.	19	hot cell trash, fuel waste (no vol.)
Shaft 49	1972	2 / 25	u.l.	21	animal tissue
Shaft 50	1974 - 1976	6 / 60	?	581	tritium (1,110 Ci.)
Shaft 51	1975	2 / 25	u.l.	52	hot cell waste
Shaft 52	1975 - 1976	2 / 25	u.l.	6	Pu, U, MFP, MAP, hot cell wastes
Shaft 53	1975 - 1976	2 / 25	u.l.	560 (?)	MFP, cell wastes, Pu-239, U-235
Shaft 54	1976	2 / 25	u.l.	6	MFP, cell trash
Shaft 55	1976 - 1977	2 / 25	u.l.	20	hot cell trash
Shaft 56	1977	2 / 25	u.l.	11	cell waste, contaminated parts from SRL
Shaft 57	1977	2 / 25	u.l.	8	hot cell waste
Shaft 58	1972 - 1973	3 / 25	u.l.	88	hot cell waste, dJ
Shaft 59	1973 - 1974	6 / 60	?	120	tritium-contaminated steel, tools, and wastes
Shaft 60	1972 - 1974	3 / 25	?	1165 (?)	oil contaminated with U-235, Pu-239
Shaft 61	1973 - 1974	3 / 25	u.l.	143	Be waste, U-238 contaminated metal, animal tissue
Shaft 62	1976	3 / 25	u.l.	141	animal tissue, Pu-238, P-32
Shaft 63	1976	3 / 25	u.l.	28	dJ, residues
Shaft 64	1976 - 1977	3 / 25	u.l.	32	animal wastes, U-235
Shaft 65	1976 - 1977	3 / 25	u.l.	123	classified U wastes, targets, animal tissue
Shaft 66	1976 - 1979	3 / 25	u.l.	25	animal tissue
Shaft 67	1977	2 / 25	u.l.	48	targets, cell trash
Shaft 68	1977	2 / 25	u.l.	23	cell trash, classified notebooks
Shaft 69	1977	2 / 25	u.l.	NA	AC parts from recovery
Shaft 70	1975 - 1976	6 / 60	?	NA	contaminated oil
Shaft 72	1972 - 1973	2 / 25	u.l.	61	irradiated stainless steel, hot cell waste and trash
Shaft 73	1973	2 / 25	u.l.	43	hot cell, trash
Shaft 74	1973	2 / 25	u.l.	69	Pu-239 waste
Shaft 75	1973	2 / 25	u.l.	61	Pu-238 waste, cell trash
Shaft 76	1973 - 1974	2 / 25	u.l.	75	hot cell trash
Shaft 77	1974	2 / 25	u.l.	33	hot cell trash, Pu-239 hot cell trash
Shaft 78	1974 - 1975	2 / 25	u.l.	80 (?)	cell wastes, reactor wastes, irradiated box ends
Shaft 79	1974 - 1975	2 / 25	u.l.	46	hot cell waste, irradiated metal
Shaft 80	1975 - 1976	2 / 25	u.l.	25	sodalime, Ta-182 chips, animal tissue
Shaft 81	1976	2 / 25	u.l.	NA	animal tissue (12 boxes)
Shaft 82	1978	2 / 25	u.l.	1	trash, chemical wastes
Shaft 83	1978	2 / 25	u.l.	44	animal tissue, depleted U
Shaft 84	1978	2 / 25	u.l.	NA	trash from SRL, cell trash
Shaft 85	1978	2 / 25	u.l.	12	neutralized Na Dowanol, cell trash
Shaft 86	1977	2 / 25	u.l.	NA	spalation products, classified materials
Shaft 87	1977	2 / 25	u.l.	23	cell wastes
Shaft 88	1977 - 1978	2 / 25	u.l.	NA	cell wastes
Shaft 89	1977 - 1978	2 / 25	u.l.	12	animal tissue (5 boxes), cell wastes
Shaft 90	1978	2 / 25	u.l.	25	dJ, hot cell trash
Shaft 91	1977 - 1978	3 / 50	u.l.	54	spalation products, animal waste, cell trash, trash cans
Shaft 92	1977 - 1978	3 / 50	u.l.	60	spalation products, uranyl-nitrate in HNO3
Shaft 96	1977 - 1979	6 / 50	?	2155 (?)	U-contaminated oil, niobium, zirconium, chlorides, aluminum shell
Shaft 109	3/80 - 7/80	?	?	53	spalation products, trash cans
Shaft 110	1979	?	?	79	spalation products, animal tissue, mixed

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