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Monthly Report of Radioactive Waste Management Activities

August 1976

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RADIOACTIVE WASTE MANAGEMENT
STATUS REPORT
August 1976

The following summary represents the status of the Mound Laboratory Waste Management activities for the month of August 1976. The items reported include efforts and activities conducted by various departments of the Laboratory.

I. Program Changes

None

II. Current Activities

A. There were no shipments of TRU waste to the INEL 20-year retrievable storage pad in Idaho during the month of August due to budgetary constraints.

ICC hearings dealing with the sole train issue are continuing. It is expected that no ruling will be forthcoming for several months.

Mound Laboratory plans to make two shipments of TRU waste to Idaho in September. All indications are that the three rail carriers who handle Mound Laboratory's TRU waste on its route to Idaho will continue to ship at existing rates. Previous plans to bring in ConRail for a review of packaging and handling for the various categories of TRU waste are on hold.

B. In August a total of 3698 ft³ of low level radioactive waste was shipped to Chem Nuclear's Barnwell, South Carolina burial grounds under an existing contract with Nuclear Engineering Company. This figure included 2827 ft³ of low level alpha waste from the R Building Upgrading and 871 ft³ of low level tritiated waste. The existing NECO contract, which was modified after the Kentucky excise tax was applied to allow for the extra cost of shipping to Barnwell, expires on October 31, 1976. However, funds will run out before the end of September. Therefore, steps have been taken to obtain a new contract based upon the competitive bids submitted earlier this quarter by Chem Nuclear, NECO and SouthWest Nuclear. All three bid on the basis of burial at the Barnwell site. The contract has been awarded to Chem Nuclear and approval signatures are currently being obtained. The new contract, based upon a projected waste shipment of 35,500 ft³ for FY-1977 should be active by October 1, 1976. The cost per cubic foot of typical Mound waste will be approximately \$2.38 versus \$2.10/ft³ under the old NECO contract and \$2.40/ft³ with the existing modified NECO contract.

ERDA response to a request from NECO to contact the Kentucky Department of Revenue concerning the excise tax is still under consideration. The question was referred to J. F. McNett, legal counsel with ERDA/ALO. Some informal

discussions have been held with Mr. McNett concerning actions that Mound Laboratory might take. However, no official guidance has been received at this time.

Recently in a telephone conversation with R. L. Armbruster, NECO's legal counsel, it was learned that NECO has not taken any legal action to date against the State of Kentucky. They have been talking with the Department of Revenue seeking a reasonable interpretation of the law which would exempt Federal contractors, but have met with no success. It was not indicated when or if NECO would file suit.

C. On August 31, 1976, the first shipment of tritiated waste was made to the Nevada Test Site. This initial shipment consisted of 42 55-gallon drums containing a total of 683,400 curies of tritium. The drums, after paint touchup, inspection of gaskets, labeling, checks for surface contamination and other QA procedures were loaded into a NECO Super Tiger overpack and transported to Nevada by Tri-State Trucking. At the test site the drums were unloaded without incident and moved to the specially constructed storage pad. Each drum was identified with a labeled number on its lid and a uniquely numbered seal was placed through the bolt on the bolt ring. Data packets were prepared listing the contents of each drum. A set was sent with the driver and a duplicate set was transmitted to NV00 by mail. The second shipment of 42 drums was prepared and left the Laboratory for Nevada on September 7, 1976. A third shipment is scheduled for September 13, 1976. The fourth and final shipment of this series will be made in October consisting of the current inventory of 83 gallon drums (11), 4 classified drums and the remainder of the 55 gallon drum inventory, leaving approximately 6-8 drums on-site. Successful disposition of Mound Laboratory's high level tritiated waste at NTS represents the culmination of many months of queries and negotiations on the part of ERDA and MRC waste management personnel.

D. During recent discussions with R. Y. Lowery, ERDA/ALO, it was agreed that Mound Laboratory's acid TRU waste could be released for shipment to the 20-year retrievable storage pad in Idaho. The acid on Florco waste may be shipped immediately. This decision was made on the basis of Idaho's acceptance of conclusions reached by Mound and ALO personnel.

Ref. (1) Letter D. D. Davis, ERDA/ALO to G. Wehmann ERDA/ID dated February 6, 1976.

Ref. (2) Letter G. Wehmann, ERDA/ID to D. D. Davis ERDA/ALO dated April 1, 1976.

Mound has had all TRU acid waste on hold to investigate potential pressure buildup within the drums. In line hydrogenous waste has also been on hold because of potential hydrogen generation problems. In a letter to ALO on July 7, 1976, Mound detailed a plan for disposing of the acid on Autodri and hydrogenous waste categories. Although the acid waste has been released, Mound will continue with its program of inspection on the Acid/Autodri packages as described in this letter. Action on the hydrogenous disposal plan is subject to approval from Idaho, which is expected. The program consists basically of redrumming and diluting the hydrogenous waste with LSA material to bring the total drum contents below the 4×10^5 nanocuries/gram of alpha emitting material which has been set for acceptable hydrogenous waste.

E. Transfer of low level beta waste water from SW to WDA Buildings where it is solidified for burial continues to be made by truck in 30 gallon HDPE lined drums. This operation was necessitated due to leakage of the underground pipeline normally used for transfer. There have been inconveniences, but no major problems in pumping out the beta water sumps in SW Building into the drums for transport to the solidification facility. However, this scheme is recognized as only an interim solution. Meetings of involved personnel have resulted in the decision to proceed with the installation of a new above the ground high integrity transfer line. The line will be easily pressure tested and monitored for leaks. It will give absolute assurance that no beta water is added to the environment by this operation. Engineering is actively pursuing design of the line.

F. Further runs were made with the LSA cyclone incinerator in August to collect additional data on the effectiveness of the venturi scrubber for the removal of particulate from the off gas. In addition, experiments continue regarding the expected life of a single HEPA filter placed downstream of the off gas handling system. Also during the month further data was collected on temperature and pressure at various points throughout the incinerator and its support equipment. Work has begun on fabrication of an additional fume hood to permit burning of "hot" trash. It is expected that burning of Pu-238 contaminated LSA trash will begin before the end of the 1st quarter of FY-1977. Modifications are also being made to more effectively dissipate the radiant heat from the drum during the burn. This will allow a more continuous operation to be carried out without excessive heat loads to the surroundings.

III. Future Plans

Tritium waste shipments will continue to the Nevada Test site. A new contract for burial of low level waste will be enacted.

IV. Waste Inventory/Shipping Summary

The enclosed table details the waste activity that has occurred during the past month. The data is broken down by specific containers and type of waste. The summary describes activity centered around the staging area for shipments (Building 23). It does not include materials at each collection pad (maxima at these areas are set forth in an internal memo, "Handling of Radioactive Wastes," dated August 10, 1972) and, thus, lags generation by a few days at the most.

Radioactive Waste Management Status Report

IV. WASTE INVENTORY/SHIPPING SUMMARY (Continued)

	30 Gal. Drums		55 Gal. Drums		83 Gal Drums		Boxes		Total Volume (FT ³)	TRU Volume (FT ³)
	LSA+	B&LQ [‡]	LSA	B&LQ	LSA	B&LQ	LSA	B&LQ		
Beginning Inventory	-	153 ⁽¹⁾	89	728	-	11	8	3	8,205	5,584
Accumulated	-	-	75	25	-	-	43	-	5,059	8
Shipped	-	-	72	42	-	-	32	-	4,007	-
Ending Inventory	-	153	92	695 ⁽²⁾	-	11	19	3	9,257	5,592
Shipped FY-76A	-	-	72	42	-	-	70	-	8,009	-

+ LSA-Low Specific Activity Waste, for Plutonium (Group I), activity levels are less than 100 nCi/gram and 1 mCi per package; may be shipped by van.

‡ B&LQ - Type B and Large Quantity Waste (Group I). Activity levels between 1 mCi and 20 Ci per package for Type B and greater than this amount for Large Quantity; must be shipped in appropriate DOT approved container; Super Tiger or ATMX railcar.

* TRU contaminated refers to definition of TRU waste as contained in September 19, 1973, AECM 0511 issue and subsequent guidance from ALO, and consists primarily of Plutonium-238.

(1) These 153 drums are greater than 10 nCi/gram and will require repackaging in TRU containers.

(2) This value includes 109 of the 120 drums of tritium and classified waste on which negotiations with SRP and NTS for burial are currently being conducted. The remaining 11 drums are listed in the 83-gallon column.

SUMMARY-TRITIUM WASTE 8/31/76

Breakdown by Waste Category - No of Drums

10	Solid
1	Solid and Octane Mixed
8	Octane
28	Oil
2	Water - Historical Samples
69	Water
1	Water (Big 'T')
1	Hardware
<u>120</u>	

Breakdown by Size of Drum - No. of Drums

11	83 gallon
<u>109</u>	55 gallon
120	

Classification Status

Classified	4 Drums
Unclassified	<u>116</u> Drums
	120 Drums

Breakdown by Quantity and Category

83-Gallon Drum Categories

3.87	Solid
0.67	Solid + Octane Mixed
1.97	Octane
4.38	Oil
7.19	Water - Historical Samples
230.07	Water
17.60	Water (Big 'T')
<u>Negl.</u>	Hardware
265.75 g	

Octane	-	8
Big 'T'	-	1
Solid	-	<u>2</u>
		11

Breakdown by Activity Index - No. of Drums

1	L-Low	<10 curies/ft ³
62	I-Intermediate	10-1000 curies/ft ³
<u>57</u>	H-High	>1000 curies/ft ³
120		

Breakdown by Curie Content - No. of Drums

1	Small Qty.	Up to 25 Ci/Pkg
19	Type A	Up to 1000 Ci/Pkg
94	Type B	1000 to 50,000 Ci/Pkg
<u>6</u>	Large Qty.	>50,000 Ci/Pkg
120		

SUMMARY REPORT

Chem Nuclear's Barnwell, South Carolina Burial Ground

Since Mound Laboratory is currently sending its low level radioactive waste to the Barnwell site for burial and since it appears that the new contract for disposition of the waste will be with Chem Nuclear, some background information concerning this site might be of interest.

Chem Nuclear Systems, Inc., operates a burial ground on an ~300-acre site 6 miles west of Barnwell, South Carolina. In operation since 1971, the site is bordered on the west by the Barnwell Nuclear Fuel Plant operated by Allied-General Nuclear Services, and by the ERDA Savannah River Plant. The area is sparsely populated, with agriculture as the major industry. The land is generally flat. Annual rainfall is 43 in. and is evenly distributed throughout the year.

The soil is composed mainly of 3-5 ft of sand, underlain by red clay sand extending to a depth of about 70 ft. Below this there is about 400 ft of sand followed by 700 ft of silt, clay and sand above several hundred to as much as several thousand feet of claystone, siltstone, sandstone and conglomerate. Detailed studies of the geology and hydrology for this area have been prepared for Chem Nuclear Systems and for the adjacent Barnwell Nuclear Fuel Plant. See References 3 and 4.

Rainfall sinks rapidly into the surface sand and moves south at a rate of 0.1-0.2 ft/day toward a small tributary of the Savannah River. The only known use of the river for domestic water supply occurs 90 miles downstream.

There is an aquifer in the sand 75 ft below the ground. Beds of kaolin and kaolinitic sand in the 25-70 ft depth range act as a permeability barrier separating the surface waters from confined waters below. Some groundwater is encountered at depths of 40-50 ft below the surface. The water table is not expected to be closer than 30 ft below the ground surface.

The principle aquifers from which major local water supplies are drawn are recharged 20 or more miles northwest of the site. There are some private wells nearby which extend to depths of less than 150 ft. The amount of water withdrawn from these wells is small. It is thought to be highly unlikely that this source could become contaminated by material escaping the burial ground.

A recent GAO report² concerning the U. S. burial grounds, both commercial and ERDA, looked at the Barnwell geology and hydrology and compared it with desirable site criteria set down in a USGS report of 1974 which were:

- 1) The site should be generally devoid of surface water.
- 2) Erosion and weathering should not be at a rate which could greatly alter the land surface over the next few hundred years.
- 3) The hydrology must be such that flow from the disposal site does not lead to areas which provide potential pathways to man, such as fractured bedrock, public waterways, and aquifers used for water supply.
- 4) The hydrogeologic conditions must be simple enough for reliable residence time predictions to be made.
- 5) The predicted residence time of radionuclides must be several hundred years.
- 6) The natural water table should be below the disposal site by at least several meters.
- 7) Large water table fluctuations should be unlikely.

GAO determined that characteristics not well defined at the Barnwell site in this regard included

- a) The extent of porous and permeable sand and gravel.
- b) Fluctuations in the water table.

These items need further investigation as they pertain to the possible migration of radioactivity in the burial grounds. USGS has plans to conduct these surveys at Barnwell as well as other commercial disposal sites.

The burial trenches are dug to a depth of 20 ft and are 475 ft long x 50 ft wide at the top, reducing to 40 ft at the bottom. The bottom of the trench has a 1% slope toward one end. A 1 x 1 ft ditch runs along the centerline of the trench and is filled with crushed rock to assure drainage and collection of water should water enter the trench. In addition, it is now current practice to put 3-5 ft of sand on the bottom of the trench as a safety factor to keep waste containers above any minor amounts of water that might enter the trench. Galvanized steel stand pipes are located at each end of the trench and at 1/3 and 2/3 the length of the trench. These pipes are 3 in. in diameter and extend to the bottom of the rock-filled ditch in the trench so that the completed trenches may be checked periodically for the presence of water.

Cartons and boxes of waste are stacked in the trench with drums being dumped in a random fashion. Wastes are covered each night and a minimum of 8 in. of dirt separates shipments of special nuclear material (SNM). Trenches are filled with waste to within 3 ft of the original ground surface. The waste is covered with 8-13 ft of compacted dirt which is mounded. The dirt cover is 5 ft thick at the edge and 10 ft thick above centerline and extends 5 ft beyond each edge of the burial trench to a drainage channel surrounding each trench. There is a minimum of 10 ft of undisturbed earth between trenches.

The trenches are monitored each month for the presence of water; none has been found to date.

Ten on-site sample wells extending ~75 ft to the shallow aquifer are located several feet beyond the end of every trench. These wells are sampled semiannually. No radioactivity above background levels has been detected in these samples or in 20 additional wells to the water table which are located around the perimeter of the burial ground. Off-site air, vegetation, soil and animal life are monitored either continuously or on a regular basis. The State of South Carolina conducts an independent survey program.

With respect to long term care of the Barnwell site, the GAO report found that South Carolina has attempted to define what long-term care will require and to establish burial payments in line with such requirements. The South Carolina Department of Health and Environmental Control recently received a report on a special study it commissioned concerning the funding arrangements for meeting the State's obligation relative to maintenance, surveillance, and contingency costs associated with the Barnwell site. The two major factors that the study considered were (1) the charge per cubic foot

- 1) the charge per cubic foot for adequate long-term care, and
- 2) the funding arrangements needed to protect the State if the licensee ceased operations before the planned decommissioning date.

South Carolina currently receives 8 cents for each cubic foot of waste buried. As of January 1975, the State had a balance of \$118,283 in an interest-earning account. In addition, the licensee maintains a \$20,000 performance bond. The study concluded that

- 1) the required size of the perpetual care fund as of January 1975 should have been \$1,643,550 to generate sufficient income to pay for the annual routine surveillance and maintenance costs,

- 2) \$130,000 should be added to the fund each year for contingencies, and
- 3) \$2,583,400 would be required by 1955 to adequately maintain the site.

In 1955--the estimated date the site would reach capacity--the fund will have \$1,211,971 at the current charge of 8 cents a cubic foot. This would leave a shortage of \$1,371,429. The study recommended an increase of 6 cents a cubic foot, or a total fee of 14 cents for each cubic foot of waste buried. The study also recommended that the licensee execute a \$1,621,172 performance bond to protect the taxpayers of South Carolina from being required to bear the cost of long-term care for the site should the licensee cease operation before the planned decommissioning date.

In general it appears that operations and conditions at the Barnwell site compare favorably with other burial sites. In addition the State and people of South Carolina recognize the importance of the nuclear power industry to their economic and social well being and, hence, are more receptive to the burial grounds operation than some other States.

References

1. WASH 1269, "Tritium Control Technology," T. B. Rhinehammer and P. H. Lamberger, December 1973.
2. "Improvements Needed in the Land Disposal of Radioactive Wastes - A Problem of Centuries," GAO Report to Congress, January 12, 1976.
3. "Geology and Hydrology of Proposed Chem Nuclear Services, Inc. Waste Disposal Site Near Barnwell, South Carolina," H. S. Johnson (December 1969) 20 pp.
4. Allied Chemical Company Barnwell Nuclear Fuel Plant Safety Analysis Report, (November 1968).