[redacted]

[redacted]

April 29, 1958

AEC [illegible]/23

COPY NO. [illegible]

ATOMIC ENERGY COMMISSION

COBALT-60 FACILITY FOR U.S. ARMY IONIZING RADIATION CENTER

Note by the Acting Secretary

The attached letter from the Chairman, MLC, is circulated for the information of the Commission. The attachment has been referred to the Office of Industrial Development.

Harold D. Anamosa
Acting Secretary

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Military Application	24
Nuclear Materials Mgmt.	25
Operations Analysis	26
Production	27-28
Reactor Development	29-31
Research	32
Secretariat	33-38

[redacted]

CLASSIFICATION CANCELLED
[redacted]

CLASSIFICATION CANCELLED
[redacted]
BY AUTHORITY OF [redacted], OC, DOE
BY Memo DATE 3/21/80

[redacted]

CONFIRMED TO BE UNCLASSIFIED
DOE/OFFICE OF DECLASSIFICATION
[redacted] DATE 4/23/80

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

DEPARTMENT OF DEFENSE
MILITARY LIAISON COMMITTEE
P.O. BOX 1814
WASHINGTON 13, D.C.

April 17, 1958

Dear Mr. Strauss:

On February 25, 1958* I forwarded a letter to you from the Assistant Secretary of Defense (Research and Engineering) dated February 19, 1958* concerning the construction of a Cobalt-60 facility to provide a gamma source for the U.S. Army Ionizing Radiation Center. This letter indicated that the furnishing of the Cobalt-60 loading and any necessary make-up quantities should be predicated on the assumption that the Department of Defense will accept this Cobalt-60 in lieu of the other reactor products that might otherwise have been produced. In my forwarding letter to you I stated that the Department of Defense approval of the diversion of neutrons for the Cobalt-60 production would be held in abeyance until the final estimate of the cost of this material in terms of reactor products has been furnished by the Commission.

I infer from your letter of March 21, 1958** to the Assistant Secretary of Defense (Research and Engineering) that your estimates still call for an initial charge of two megacuries of Cobalt-60 and an annual make-up requirement of 500,000 curies. In your letter to me of October 3, 1957** you indicated that the diversion of neutrons to produce the initial charge of two megacuries of Cobalt-60 would mean the sacrifice of about 120 grams of tritium or about 10 kilograms of plutonium. A proportionate diversion for the annual make-up of 500,000 curies would mean an annual sacrifice of 30 grams of tritium or about 2.5 kilograms of plutonium.

This is to notify you that the Department of Defense does approve the diversion of neutrons to the approximate extent indicated above for the production of Cobalt-60 to be used as a gamma source in the U.S. Army Ionizing Radiation Center.

Sincerely yours

/s/ Herbert B. Loper
Chairman

Honorable Lewis L. Strauss
Chairman
U.S. Atomic Energy Commission

*Circulated as AEC 719/19.
**On File in Secretariat.

[redacted]

[redacted]

April 29, 1958

AEC 719/23

COPY NO. [redacted]

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CLASSIFICATION CANCELLED
~~OR CHANGED TO~~
BY AUTHORITY OF I.L. Cieslewicz, OC, DOE
BY memo DATE 8/11/80

[redacted]

[redacted]

This document contains [redacted] data as defined in the Atomic Energy Act of 1954. [redacted] for the disclosure of its contents in any manner to an unauthorized person is prohibited.

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[redacted]

[redacted]

[redacted]

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Chairman

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[redacted]

2. Food Irradiation Reactor

General Loper suggested it would be helpful to review the situation with respect to the Food Irradiation Reactor (FIR) and discuss further action to provide a gamma facility for the U.S. [Army] 1/ Ionizing Radiation Center. He traced the background of pertinent correspondence, beginning with the DOD request for the facility in November 1955, the Congressional authorization and appropriation for the FIR in the AEC FY-1957 budget, and the subsequent denial by the BOB of apportionment of funds for the reactor. He observed that when the Commission referred to the DOD the need for additional arguments as to essentiality of the facility, the Assistant Secretary of Defense (Research and Engineering) had initiated a review of the matter by the DOD's Technical Advisory Panel on Atomic Energy. He added that by letter dated August 20, 1957 to the AEC the ASD(R&E) forwarded a copy of the TAPAE report, noting that the report contained a conclusion that a cobalt-60 facility appears to offer a more practical source of gamma radiation than the FIR. The ASD(R&E) had suggested to the AEC that, before requesting reconsideration of the FIR item by the BOB, alternative courses of action be explored. The ASD(R&E) had requested information as to the availability and cost of cobalt-60 as an alternate gamma source, and expressed the necessity of continued AEC cooperation in the food irradiation program, whatever course might be decided upon. The MLC, in forwarding the ASD(R&E) letter to the AEC on August 23, 1957 had inquired as to the effect that provision of the cobalt-60 would have on plutonium production.

General Loper asked whether the Commission would consider research and development on an irradiation facility utilizing cobalt-60 a normal function of the AEC. Mr. Libby said that this question has not been considered by the Commission, but in his opinion the Commission's reply would be affirmative, inasmuch as a cobalt-60 facility would be a new application of atomic energy. He also said, in reply to General Loper's query, that

he thought the Commission could fund for ~~irradiation of the cobalt-60~~ [research and development on an irradiation facility.] [1/] He added, however, that he was not sure that the supply of cobalt would be sufficient to meet the needs of a facility of 1000 tons per month capacity. Mr. Fields said that the AEC's reply will indicate the cost of providing the cobalt-60, and the consequences to the production of weapon material.

General Loper observed that the DOD must fully support the FIR approach if apportionment of the three million dollars appropriated for construction of the reactor is to be achieved. He said that if the decision is other than to proceed with the FIR, considerable delay in realization of a gamma irradiation facility might result.

General Loper requested the opinion of the Commission as to whether, if the FIR were not to be built, any portion of the appropriated funds, which would have been used for housing and supplementary equipment for the reactor, could be applied similarly to a different form of irradiation facility. Mr. Fields replied that he did not believe that FIR funds could be so applied.

Mr. Libby suggested that it be agreed that the FIR approach be dropped, and that for the present, consideration of a pilot food irradiation plant be subordinated to prosecution of increased food irradiation for the medical evaluation program. He recommended that the AEC and DOD increase their efforts in this program, using all expedient methods to irradiate the required food. General Loper replied that expedient methods are over-expensive and inadequate for this purpose and that in his opinion the surest way to advance the food irradiation program is to expedite a decision as to the pilot plant while utilizing the Army's beta accelerator and other present sources to process food for the medical evaluation program. He agreed to the need to

maintain food processing at the level required by the medical evaluation program.

Mr. Vance pointed out that the August 20 letter from ASD(R&E) indicates that initially the gamma irradiation capacity need not be the full 1000 tons per month.

General Loper said that the DOD has not indicated that the FIR project should be dropped, and will make no decision as to a new approach until it has made a comparison of the cost and timing of alternatives. This, he said, will not be done until the Commission reply to the ASD(R&E) letter of August 20, 1957 has been received.

General Loper inquired as to the basis on which the AEC would compute the cost of cobalt-60 after the R&D phase of the pilot plant had been completed. Mr. Libby replied that cobalt-60 could be furnished at a unit price of /approximately7[1]/ $0.65 per curie (AEC out-of-pocket costs) while the radiation program is developmental; thereafter, at a rate of $2.80 per curie.

Mr. Libby commented briefly upon the desirability of utilizing a source material such as cesium-137, if this were feasible, thus avoiding the diversion of neutrons and eliminating the problem of cobalt supply. He concluded by suggesting that the meeting of Commission, ASD(R&E) and Army representatives, suggested in the August 20 letter from the ASS(R&E), be held soon.

General Loper concluded with the statement that the DOD will study its future course of action in this matter with the help of the AEC reply to the August 20 letter, and thereafter will arrange the meeting with the Commission mentioned by Mr. Libby.

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[redacted]

[redacted]

[redacted]

April 3, 1957

AEC 201/9

COPY NO. 27

ATOMIC ENERGY COMMISSION

LAYAWAY OF THE BISMUTH PHOSPHATE AND METAL RECOVERY PLANTS AT HANFORD

The attached memorandum from the Director of Production is circulated for the information of the Commission by request of the General Manager.

W. B. McCool
Secretary

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[redacted]

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[redacted] not [redacted] 954.
[redacted] disclosure of its contents in any manner to an unauthorized person is prohibited.

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BY AUTHORITY OF I L Auchinloss, OC D&C
BY [redacted] DATE 9/11/80

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DOE/OFFICE OF DECLASSIFICATION
A.D. [redacted] DATE: 3-3-80

[redacted]

[redacted]

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

MEMORANDUM March 27, 1957

TO : K. E. Fields, General Manager
THRU : David F. Shaw, Asst. Gen. Mgr. for Manufacturing

FROM : E. J. Bloch, Director
Division of Production

SUBJECT: LAYAWAY OF THE BISMUTH PHOSPHATE AND METAL RECOVERY PLANTS AT HANFORD

SYMBOL : PP:EFG

When operations at the bismuth phosphate canyons at Hanford were completed (B canyon in July 1952, and T canyon in January 1956), the two canyons were placed in a standby basis as reserve capacity until Purex operation had become well established. In the interim, careful studies were made of the possible future need for the separative capacity of the bismuth phosphate plants.

As a result of these studies, the Hanford Operations Office has recommended placing the two canyons in layaway status, and I have approved the proposal. My approval was based upon the following considerations:

1. The small capacity of the two bismuth phosphate canyons relative to the present operating rates of Redox and Purex.

2. High cost of canyon operation ($6500 operating cost per ton of uranium, including cost of TBP plant, as compared to $2800 for Redox, plus an estimated $2000 per ton in additional waste storage charges over those for Redox).

3. We anticipate that the combined reserve capacity of the Redox and Purex plants will be sufficient to serve any foreseeable requirements except a long-term shut-down of either plant.

4. In the event of any temporary deficiency in separations capacity which the canyons would be capable of overcoming, more economical alleviation by a small increase in reactor exposure level.

[redacted]

[redacted]

[redacted]

[redacted]

5. Operating disadvantages, including severe manpower problems, considerable time required for canyon start-up, need for storing depleted uranium (to permit adequate cooling) for at least a year before commencing recovery, need for reactivation of the TBP plant, as well as the high cost of standby status.

Accordingly, the two bismuth phosphate canyons will be converted from standby to layaway status in the near future. Appropriate steps will be taken to minimize equipment deterioration, to prevent contamination spread, and to reduce risk of damage by fire, water, steam, or other causes. The "cold" parts of the plants will be put in layaway in accordance with standard chemical industry practice appropriate to maintain this equipment in good condition. Essential materials for the plants will be declared excess, and the waste tank space now held for contingent future operations will be released for use by the Redox and Purex plants.

The possibility of salvaging the "cold" equipment and retiring the canyons permanently has been considered by Hanford. Such action was not proposed at this time, because no use for the equipment exists in present Hanford projects, but the possibility exists that some of the equipment might be of use in fission product recovery operations which may take place in one of the canyons. If other project needs for this equipment arise, the canyons can be "cannibalized" as appropriate. Sale off-site of the cold equipment is not contemplated, as it is estimated that the cost of removal and preparation for sale would probably exceed returns from the sale of this equipment.

As soon as present metal recovery operations at the TBP plant are completed, the need for this plant will have ceased, assuming that the bismuth phosphate canyons will not operate again. Therefore, the TBP plant also will be placed in layaway status similar to that of the B and T canyons.

Personnel from the TBP and bismuth phosphate plants will be transferred to other operations in nearly all cases when layaway conversion permits. Therefore, there will be few, if any, layoffs due to the shutdown, and a minimum dislocation of personnel.

[redacted]

[redacted]

[redacted]

AEC 201/9

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[redacted] estimated data as [redacted] authorized [redacted]

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CHANGED TO:
BY AUTHORITY OF T. J. Crenshaw, OC, DOE
BY memo DATE 9/11/80

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[redacted]

[redacted]

Identity 12/8/59 + 9/24/58

Mfg 1535
1530

Vol 1

MATERIALS 12

WASTE PROCESSING AND DISPOSAL

For Auburn post material (AEC 719)
on Food Radiation see:
Materials - 12 - Food Radiation Program

Materials-12-Waste Processing & Disposal

	Date	To	From	Class	Pgs.	No.	To	From	Class
1	9-20-60	AEC 180/13 Waste Disposal, Cmtee on Disposal of Radioactive Wastes on Land		vee ouo					
2	10-10-60	Task Force Radioactive Wastes Block, E.J.		skw u					
3	10-27-60	AEC 180/14		skw u					
4	10-14-60	Administration of Waste Disposal Responsibilities		skw ouo					
5	6-30-61	AEC 180/15 Carey Salt Co. Lyon, Kansas Mine Radioactive Materials, Utilization of		vee					
6	8-17-61	AEC 180/17 Blackfeet Indians Petroleum Research Corp		vee					
7	10-30-61	AEC 180/18		vee					
8	11-13-61	AEC 180/19		vee					
9	11-9-61	AEC 180/20		skw					
10	11-27-61	AEC 180/21		skw					

TITLE

Materials 12 Waste Processing & Disposal

NO	DATE	TO	FROM	CL	PG
1	8-6-58	~~AEC 719/25~~ ~~Subj: Materials-12-Food Radiation Program~~		vee	u
2	8-7-58	AEC 626/4 Waste Disposal in Uranium Ore Plants Radioactivity in Uranium Ore Plants Winchester Lab. Uranium Ore Processing Plants		vee	u
3	9-29-58	Waste Systems Devel. Program		vee	ouo
4	10-8-58	AEC 180/8 Radioactive Materials Mgt. Devel. Program		vee	u
5	~~9-23-58~~	~~High Intensity Food Irradiator~~ ~~Subj: Materials-12-Food Radiation Program~~ ~~Gamma Ray Food Irradiator~~ Curtiss-Wright Corp.		vee	
6	~~12-8-58~~	~~AEC 719/26~~ ~~Preservation of Foodstuff~~ ~~Subj: Materials-12-Food Radiation Program~~			
7	~~9-8-58~~	~~Hallam Nuclear Power Facility~~ ~~Subj: R.H.6~~	~~Lawrence Public Power District~~	vee	
8	2-10-59	Chugach		vee	
9	2-17-59	AEC 719/27 Waste Disposal Hearings		skw	u
10	7-22-59	AEC 719/28 Radioactive Waste Disposal into Atlantic & Gulf Coastal Waters		vee	u
11	7-24-59	Effluent Survey		skw	u
12	7-24-59	Uranium Processing Mills, Discharge of Waste Material Waste Material Discharge at Uranium Processing Mills		skw	u
13	9-30-59	McCone, John		vee	
14	12-3-59	AEC 180/12 Radioactive Wastes Handling Packaged Radioactive Wastes Policy for Handling Packaged Radioactive Wastes		vee	ouo
15	~~12-17-59~~	~~AEC 719/29~~ ~~Subj: Materials-12-Food Radiation Program~~		skw	u
16	12-31-59	Dispersal of Radioactive Materials into the Pacific via the Columbia River		vee	u
17	~~1-10-60~~	~~AEC 719/30~~ ~~Subj: Materials-12-Food Radiation Program~~		vee	ouo
18	3-8-60	Pacific Waste Disposal Site Cleveland Pneumatic Industries, Inc.		vee	
19	3-17-60	McCone, John Low Level Radioactive Waste Disposal		vee	u
20	5-9-60	Burial of Packaged Radioactive Wastes		skw	u

UNCLASSIFIED

October 27, 1960

AEC 180/14

COPY NO. 40

AEC 180/14

ATOMIC ENERGY COMMISSION

LAND DISPOSAL OF RADIOACTIVE WASTES - ADDENDUM TO AEC 180/13

Note by the Secretary

1. AEC 180/13 indicated that members of the NAS-NRC Earth Sciences Division Committee on Waste Disposal on Land visited Hanford and NRTS on June 28-July 1, 1960. Attached as Enclosure "A", for the information of the Commission in connection with consideration of AEC 180/13, is a summary review of the group's reactions and observations during the visit prepared by the Committee's Secretary. Also attached (Enclosure "B") are comments prepared by the Division of Reactor Development on the summary report of the Committee's visit.

2. Copies of the April, 1957 report of the Committee, also referred to in AEC 180/13, are being circulated to the Commission by separate memorandum. - filed in Public Readings

W. B. McCool

Secretary

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UNCLASSIFIED

ENCLOSURE "A"

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH COUNCIL

Division of Earth Sciences

COMMITTEE ON WASTE DISPOSAL
ADVISORY TO THE ATOMIC ENERGY COMMISSION

Record of activities for June 28 to July 1, 1960

ATTENDANCE

Committee members: J. C. Frye, Acting Chairman; W. E. Benson, W. B. Heroy, Sr., M. K. Hubbert, C. V. Theis, and William Thurston, Secretary.

Absent: H. H. Hess, Chairman; J. N. Adkins, and R. J. Russell

From NAS-NRC: A. F. Richards, Acting Executive Secretary

From AEC: W. G. Belter traveled with the Committee to Hanford Laboratories and the National Reactor Test Station.

SEQUENCE OF EVENTS

The group assembled in Richland, Washington on June 27 and spent a day and a half on June 28-29 at the Hanford Laboratories. On June 29 the party traveled to Idaho Falls and spent June 30 at the National Reactor Test Station. At each installation the group met with laboratory personnel in informal but carefully arranged sessions and tours, followed by general discussion periods. There was ample opportunity for individual observation and comment throughout the program.

On the night of June 30 the Committee members and Mr. Belter met to review and summarize the Committee's experiences and expressions of opinion during the preceding days.

PROGRAM

The technical program and participants may be outlined as follows:

HANFORD LABORATORIES, Richland, Washington

June 28, 1960

8:15 a.m.	Welcoming remarks: A. T. Gifford, Director, Process Engineering and Manufacturing Division, HOO, AEC and H. M. Parker, Manager, Hanford Laboratories
8:30	Orientation of the Discussions; D. W. Pearce
8:45	The Environmental Program; J. W. Healy
9:15	Geology of the Area; R. E. Brown
10:00	General Hydrology; J. F. Honstead
10:30	Laboratory and Theoretical Hydrology; R.W. Nelson
10:50	Equipment and Field Studies; J. R. Raymond

11:15 a.m. Soil Chemistry; J. L. Nelson
1:00 p.m. Tour
1:10 The Chemical Laboratories - Spray Calciner and Hot Cells
1:45 The Biophysics Laboratory - Low Level Counting
2:50 The Earth Sciences Laboratory - Hydrology Models, Mineral Chemistry, Column Studies

June 29, 1960

8:15 a.m. Large Contaminated Equipment Disposal; Raymond Tomlinson for J. H. Warren, Manager, Production Operation, CPD
8:35 Waste Disposal to Ground; C. E. Linderoth
9:00 The Ground Contamination Picture; W. A. Haney
9:30 Mineral Reactions; L. L. Ames
10:15 Engineering Features of the Waste Solidification Complex; A. M. Platt
10:45 Calcination Equipment Concepts; B. M. Johnson
11:15 Waste Management; B. F. Judson, CPD

NATIONAL REACTOR TESTING STATION, Idaho Falls, Idaho

June 30, 1960

8:30 a.m. Welcoming remarks: C. Wayne Bills, Deputy Director, Health and Safety Division
8:45 Geology and Hydrology of NRTS
Determination of Criteria for MTR-ETR and CPD Ground Disposal Operations
NRTS Well Monitoring Program
Discussed by C. Wayne Bills; Bruce L. Schmalz, Radiological Soil Scientist, AEC; and Paul Jones, U. S. Geological Survey
12:45 p.m. Tour of MTR Disposal Pond and Retention Basin
1:15 Visit Chemical Processing Plant Area
Disposal Wells
Unclassified Tour of Plant and Study of Waste Calciner Model by James Stevens, Phillips Petroleum Company
2:45 Tour of NRTS Solid Waste Burial Ground
3:15 CF-646 - Review of Program and General Discussion

The Committee is grateful to the organizations and individuals, not all of whom are named above, who devoted time and energy to making the visits instructive and profitable, and who consistently displayed such friendly courtesy as to make the trip pleasant despite the pressure of schedules and the long hours.

SUMMARY OF VIEWS

1. General: The coincidence in New York State between natural radioactivity and the congenital deformations and higher death rates should alert responsible people to the importance of proceeding with extreme caution in disposing of even low levels of radioactivity. Despite the complications in establishing statistically valid correlations there is reason to be concerned over the long-term affects of low dose rates in the light of recent findings that there is no threshold below which radioactivity has no genetic effect.

2. Centralized processing of reactor fuels brings on many complications of its own, the greatest of which is the risk involved in shipping delicate fuel elements. There is also a contradiction between emphasis on homogeneous reactors and central processing of fuel wastes. The successful development of fused salt reactors would reduce the volume of aqueous wastes.

3. It is unfortunate that the Oak Ridge National Laboratory is now considering establishing at Oak Ridge a plant to demonstrate the processing of reactor fuels because Oak Ridge has a very poor geological environment for disposal of wastes. Such an establishment would aggravate the problems of reducing the radioactivity levels in the low and medium level wastes and increase the need for immobilizing high level wastes by fixing, calcining, or some other methods. It is essential that Oak Ridge abandon the sievelike disposal pits. As the operations at the present chemical processing plant at the National Reactor Test Station slow down, it could well take on the demonstration of the chemical processing system. However, the Idaho Falls plant does not have ideal geologic conditions for disposal of wastes. The Hanford Works, though not ideal, would be superior to the Idaho Falls plant. Neither location, however, has been shown to provide safe and permanent disposal.

4. The relatively dry climate at both locations, is undoubtedly advantageous for disposal of wastes to the ground, both because of the low level of soil moisture above the water table and also because of the comparative isolation of the sites from centers of more dense human population.

5. The protection afforded by aridity can lead to over-confidence; at both sites it seemed to be assumed that no water from surface precipitation percolated downward to the water table, whereas there appears to be as yet no conclusive evidence that this is the case, especially during periods of low evapotranspiration and heavier-then-average precipitation, as when winter snows are melted. At the National Reactor Test Station pipes were laid underground without ordinary safeguards against corrosion on the assumption that the pipes would not corrode in the dry soil but they did. At NRTS plutonium wastes (plutonium half-life 24,000 years) are given shallow burial in ordinary steel (not stainless) drums on the same assumption. Corrosion of the drums and ultimate leakage is inevitable. Some plutonium will probably be adsorbed by minerals in the soil and rocks; the rest may enter the ground-water stream and be carried to the south where the water is extensively used for domestic water supply and for irrigation.

6. The movement of fluids through the vadose zone and the consequent movement of the radioisotopes are not sufficiently understood to insure safety. The work in progress is commendable and deserves encouragement. The mounting pace of nuclear developments will add to the pressures on waste disposal facilities, procedures, and research at Hanford and Idaho Falls and the future emphasis should be on safe ultimate disposal viewed from the long range and with attention to a rapidly changing world. There seems to be rather strong reliance on progress in the technology of chemical processing and fuel handling to take care of many of the waste disposal problems. Certainly the history in the last few years has shown that there have been developments that lessened the waste disposal problems. Many of these came about, however, without reference to waste disposal itself. They might be looked on as accidents -- favorable accidents -- in the

development of chemical processing techniques and technology. Such favorable happenstances should not be relied on for solving waste disposal problems.

7. Hanford: At Hanford, excellent efforts have been made. The research has been productive and encouraging, and furnishes a good base for increased emphasis. Continued good monitoring is essential. It seems to the Committee that research and development on waste disposal has received fine support from Hanford. It should be continued.

8. At the Hanford Works, it was pointed out that space for disposal to the ground through cribs is not being used up. The ion-exchange capacity of the soils is not being saturated as fast as the long-lived isotopes decay.

Soil is used throughout in a mechanical sense rather than an agricultural sense and refers to unconsolidated sediment of mixed origin, composition, and properties.

Detection limits on the radioisotopes are much lower than the limit, self-imposed by Hanford, of one-tenth of the maximum permissible concentration. When a radioisotope first appears in a monitoring well, it does not mean that the soil column has been saturated. Much exchange capacity remains when the crib is abandoned. Ruthenium makes an ideal tracer; it moves almost as fast as nitrate which, in turn, moves almost as rapidly as the water itself. Each time the waste handling procedures are changed, there is a re-evaluation of the characteristics of the soil and its chemical interactions with the waste.

9. Changing operating procedures and new developments in processing have served to decrease the quantities and concentrations of wastes being put to the ground. There has been a reduction by a factor of ten as a result of the following changes: bismuth phosphate plants were closed down, hence, wastes were no longer discharged into trenches; the condensate proved to be corrosive to the equipment then in use, and as a consequence, stainless steel ducts were installed to carry the condensate back to the Purex plant; ruthenium is being recycled.

10. The stored isotopes of cesium and strontium are past the steady state and the inventory is declining because the input has been decreasing. There has been a progressive decrease in the volume of waste material and these are at lower concentrations in the low and intermediate levels of radioactivity. Conversely, there has been an increase in concentrations in the high-level wastes. There is increasingly greater need to develop a satisfactory process for reducing the highly radioactive materials to an inert insoluble substance.

11. Idaho Falls: One of the reasons for locating the plant at Idaho Falls was the ready availability of good quality ground water. The very fact that ground water was readily available carries with it a requirement to protect the resource through adequate study of the hydrologic details. The research effort should be increased progressively for the next 10 years at least. Closing down the chemical processing plant is welcomed as giving time in which to catch up on waste disposal research. Full data are needed on the detailed stratigraphy of the basalt sequence to be able to understand and predict the local hydrology. At Idaho Falls there is less knowledge of the specific geology

than at Hanford. The Idaho Falls plant does not have a good geologic setting: the alluvial cover is thin, and the complex overlapping of basalt flows, irregular sedimentary interbeds, and intricate interconnected openings create hydrologic systems that are less predictable than at Hanford. Basalts also possess minor ion-exchange capacity as compared with the sedimentary sequences at Hanford.

12. Long-term considerations: Looking at the waste disposal program from a long-range point of view there are important points to take into consideration. In a relatively few years we will probably have a population crisis and a water crisis in this country and in the world at large. With ample sources of power we can survive: we can work low-grade ores, convert saline water to potable water, etc. Nuclear power holds the promise of being the abundant energy source needed. Intensive application of nuclear energy over many widely distributed areas increases many fold the danger of contaminating the environment and denying ourselves the increased raw materials and living space the nuclear energy is expected to open up to us.

13. With regard to the practical applications of nuclear power, we are now standing at the toe of an exponential growth-curve. Growth may well take place at a rate of about 10 percent per year, which would mean doubling the size of the industry in 6 or 7 year periods. If fusion is not realized, fission product processing may become intolerable; therefore, the criterion of safe disposal should be adhered to very closely: radioactive isotopes will not enter the biologic environment. Over long periods, the circulation of even small quantities of water becomes a hazard. It is essential that the integrity of vaults and other containment structures be guaranteed for equally long periods of time. It may seem like a far stretch of the imagination but we must also take into account the possibilities of climatic changes, changes in the pattern of ground water circulation, and the fact that all earthquakes are not confined to volcanic belts. The longer the period of time under consideration, the greater the possibilities that alterations in existing patterns will take place, both from natural and man-made causes. Weather modification may become a reality in the not-too-distant future. Radioisotopes in the ground may preclude the use of important areas that could be rendered useful through weather modification, or such areas might be inadvertently or accidentally flushed of their dangerous constituents.

14. Serious thought should be given to future developments in the field of chemical processing and the optimum location of processing plants. The whole approach should be reoriented so that things are done on a logical basis rather than allow uncontrolled evolution based on existing patterns. Conventional power generating plants are located with respect to the fuels sources that supply the energy. Transmission lines radiate out from the power-producing points. There is no need for nuclear power plants to be located where coal deposits or water power supplies are abundant. While the nuclear power industry is in its infancy, thought should be given to where the optimum or ideal locations may be and organize the generation and transmission of power accordingly. The safe permanent disposal of wastes should be the most important factor to be considered in locating the industry.

SUGGESTIONS AFFECTING THE RESEARCH PROGRAMS

1. The Committee urges that drill holes and test pits be put down and samples be taken at Hanford and Idaho Falls plant sites for scientific purposes in addition to similar work done solely in support of health and safety operations. The Committee does not pretend, however, to be able to select the locations. It recommends instead that the principal investigators be given greater opportunity to figure out where the holes are most needed, when new holes should be drilled, and what holes should be deepened. The principal investigators should have fewer routine and service jobs to do and be given more time for thoughtful research.

2. It is important to design experiments to detect the downward moving waves of moisture from rain or snowfall.

3. Sites to be used for dry burial and wet disposal should be explored in advance and wells should be installed to determine ground conditions before the sites are used; the exploratory wells can be used as monitoring wells to measure the rates and directions of migration.

4. For operating information and for scientific purposes, it is important to deepen selected wells at Idaho Falls to study the possibilities of underflow.

5. The staff at Idaho Falls working on hydrologic research would benefit from some expansion so as to speed up the work of plotting and compiling data for purposes of correlation and interpretation.

CONCLUSIONS

Neither the Hanford plant nor the Idaho Falls plant is now creating a hazard. Processing plants at sites selected because of their suitability for effective and completely safe waste disposal practices would be much preferred to chemical processing work at Idaho Falls or Hanford.

William Thurston
Secretary

Enclosure "A"

UNCLASSIFIED

ENCLOSURE "B"

Division of Reactor Development Comments on NAS-NRC Earth Sciences Division Committee on Waste Disposal on Land - Report of Activities for June 28 to July 1, 1960

1. After the NAS-NRC Earth Sciences Division Committee on Waste Disposal visited the Hanford and NRTS sites on June 28 - 30, 1960, a summary review of the group's reactions and observations during the visit was prepared by their executive secretary. While the conclusions of the Committee's report on their visit state that neither Hanford nor NRTS operations are creating a hazard at the present time, there are certain sections in the report which appear to be counter to this conclusion. In general, the Committee's pattern of operation during the past year of advisory service to the Commission has been to record what they believe to be deficiencies and not dwell on the satisfactory aspects of these operations. As an integral part of their deliberations on AEC land disposal operations and proposed development work in this area, the Committee (in essence, two members) has become involved in long philosophical discussions on separable subjects such as sea disposal, biologic and genetic effects of radiation, etc. which, it is believed are outside the scope of Committee activities. The results of these discussions have been recorded, nevertheless, as a part of their report (minutes) to the Commission. The following comments are submitted to provide additional information on several points made in the body of the Committee's trip report to Hanford and NRTS:

2. Under General - Paragraph 1 - One of the members of the Committee has extensively referred to a study by Gentry of the New York Health Department, in New York State, on the relationship of natural radioactivity and congenital malformations, thereby concluding that all radioactivity is harmful and implying that zero

man-made radioactivity should be allowed in the environment. While the over-all objectives of such a study are considered highly desirable, the specific validity of the New York study conclusions has been seriously questioned during the discussions, because of several detailed technical aspects of the work. (These include high inter-marriage rates in the group of people studied, the higher incidence of malformation in certain geological areas of New York State which contained lower concentrations of natural radioactivity than the area studied, etc.)

3. Under General - Par. 2 - We do not understand their statement on "the risk involved in shipping delicate fuel elements". In all of the Committee discussions it has been generally agreed that a greater degree of potential hazard would be associated with the shipment of high-level liquid wastes than with the shipping of solid spent fuel elements.

4. Under General - Par. 3 - At the time of these discussions, ORNL was being considered as a location for a chemical processing demonstration facility for power reactor fuels. Recent developments appear to rule out this possibility. The Committee has never been satisfied with the ORNL "sievelike disposal pits". An FY 1962 construction project to upgrade the Oak Ridge over-all waste handling system is still in the present DRD budget and if approved would eliminate this Committee objection. Regarding the last statement in the paragraph, "Neither Hanford nor the Idaho Falls plant has been shown to provide safe and permanent disposal", in discussions with the Committee it has been generally agreed that the storage of high-level wastes in underground tanks has been safe up to the present time; however, it is not considered to be permanent disposal in the ultimate sense of the word. Because of this fact, a vigorous research and development program on the conversion of

these wastes to a solid form is being pursued at several sites (see Appendix "E" to AEC 180/13). The Committee has indicated that neither Hanford nor NRTS appear suitable for the ultimate disposal of these solid wastes; we are currently investigating the feasibility of permanent storage of these wastes in geologic formations favored by the Committee, such as salt strata, etc.

4. Under General - Par. 5 - Plutonium wastes from Rocky Flats are buried at NRTS only in very low concentrations. Extensive ion exchange work on soil columns at several AEC installations has indicated a strong retention capacity for plutonium. In addition, several test wells will be drilled at the NRTS burial ground as part of the IDO FY 1961 waste disposal development program.

5. Under General - Paragraph 6 and Hanford, paragraph 9 - These paragraphs appear to be inconsistent. It is well recognized at sites such as Hanford that improvements in chemical processing technology will alleviate many waste handling problems. These process improvements are not considered as "favorable accidents". The reduction of waste volumes and the quantities of radioactivity discharged to the environment are major considerations in any modification or proposed changes in chemical processing operations.

6. Under Hanford - Paragraph 10 - The last statement "there is an increasingly greater need to develop a satisfactory process for reducing the highly radioactive materials to an inert insoluble substance" truly states one of the exact objectives of the AEC waste disposal development program. The Committee realizes this, and during their visit appeared to be very much impressed with the conversion-to-solid development work they observed at both Hanford and NRTS.

7. Under Long-term Considerations - Paragraphs 13 and 14 - The subject matter of these two paragraphs was included in Dr. Hess' letter of June 21, 1960 and is discussed in detail in AEC 180/13 (see Pages 1, 2, 12, 13, 14 and 15). It is further reiterated that interpretation of the Committee's criterion, namely, "radioactive isotopes will not enter the biologic environment" to mean that zero radioactivity should be allowed to reach man's environment raises fundamental questions of a biological and medical nature and of national policy that extend beyond the Committee's scope of activities. This point has been discussed extensively with the group. In spite of philosophical convictions which appear to be held by certain Committee members, it is the opinion of the AEC waste disposal development program staff that the Committee can continue to render valuable advisory service in the areas of ground disposal of radioactive wastes. It is believed that, as stated previously, these philosophies are concerned with matters not immediately connected with the subject matter of the group's work.

FORM AEC-204
(6-57)

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

DATE:

[redacted]

INDEX: Materials 12

[redacted]

TO:

FROM:

SUMMARY: Memo for the Commissioners and Gen. Mgr. re the visit to AEC Hdqts. by Sir William Penney, Oct. 28, 1960. Sir. Wm. Penney is interested in discussing controlled thermonuclear research and waste disposal.

FILED: Security 4-6 Visits to America

INDEXER: date of memo: 10-25-60

REMARKS:

THIS PAGE ONLY

#2 - 12 - Waste

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : Heads of Divisions & Offices, Headquarters DATE: October 18, 1960

FROM : E. J. Bloch, Assistant General Manager for Manufacturing

SUBJECT: STUDY OF DISPOSAL OF RADIOACTIVE WASTES

Reference is made to the General Manager's memorandum of October 10 and my memorandum of October 14 on "Study of Disposal of Radioactive Wastes."

Chairman McCone has emphasized the importance of this study and urged the early completion of the work of the Task Force. Accordingly, you are requested to make every effort to assure submission of the information requested in my memorandum of October 14 by no later than Friday, October 21. In the event the complete report from your division cannot be transmitted by the 21st, please transmit those portions which are available and supplement with additional information later.

10-18-60

Met. 12 - Waste Processing + Disposal B-421

OPTIONAL FORM NO. 10
5010-104
UNITED STATES GOVERNMENT

Memorandum

TO : Heads of Divisions and Offices, Hq. DATE: October 14, 1960

FROM : E. J. Bloch, Assistant General Manager for Manufacturing

SUBJECT: STUDY OF DISPOSAL OF RADIOACTIVE WASTES

Reference is made to the General Manager's memorandum of October 10, subject "Study of Disposal of Radioactive Wastes," and TWX request of October 11 to operations offices for information in that connection.

To complete the work of the General Manager's Task Force, information is needed concerning the responsibilities and functions of your office for the various aspects of radioactive waste disposal. Describe your organization and methods of operation, involving the operations offices, other divisions and offices, and advisory groups for the following appropriate items:

1. Development of policy recommendations on waste disposal matters.

2. Establishment of development programs on current and long-range problems of waste disposal.

3. Direction and coordination of developmental and operational activities.

4. Establishment, approval, and review of containment standards and operating criteria.

5. Review and appraisal of compliance with operating criteria and AEC radiation protection standards.

6. Furnishing guidance, advice and assistance to operations offices and contractors.

7. Other items related to waste management.

It is requested that the information be furnished by October 21, 1960.

10-14-60

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

~~OFFICIAL USE ONLY~~

TO : Edward J. Bloch, Asst. General Manager for Manufacturing

DATE: October 14, 1960

FROM : W. B. McCool, Secretary

SUBJECT: CENTRALIZATION OF ADMINISTRATION OF WASTE DISPOSAL RESPONSIBILITIES

SYMBOL: SECY:ABE

1. We informed your office on October 6, 1960, that at Meeting 1657 on October 5, during discussion of AEC 1049/3 - FY 1962 Budget Estimates, the Chairman requested consideration of the centralization of administration of radioactive waste disposal responsibilities within the Commission and submission of early recommendations on this matter.

2. The General Manager has directed you to prepare the recommendations requested above. We will assist you in circulating these recommendations for Commission consideration. Copies of pertinent correspondence should be provided the Office of the Secretary.

cc: Chairman
General Manager
Deputy General Manager
Asst. Gen. Mgr.
Asst. Gen. Mgr. for Adm.
Asst. Gen. Mgr. for R&S
Director, Production
Director, Research
Director, Reactor Development
Director, Biology & Medicine
Director, Isotopes Development
Director, Health & Safety
Director, Licensing & Regulations
General Counsel

~~OFFICIAL USE ONLY~~

OPTIONAL FORM NO. 10
5010-104
UNITED STATES GOVERNMENT

Memorandum

TO : Heads of Divisions and Offices, Headquarters
Managers of Operations

DATE: October 10, 1960

FROM : for A. R. Luedecke
General Manager

SUBJECT: STUDY OF DISPOSAL OF RADIOACTIVE WASTES

I have designated the following individuals to comprise a Task Force for the purpose of conducting a study of the land and water disposal of radioactive wastes.

E. J. Bloch, AGBM, Chairman
F. P. Baranowski, Division of Production
H. M. Eskildsen, Division of Reactor Development
G. M. Dunning, Office of Health and Safety
H. D. Bruner, Division of Biology and Medicine
D. E. Bostock, Office of Personnel

The scope of the study will cover the following aspects of the AEC ground and water waste disposal programs: organizational structure, responsibilities, internal and external relationships, programs and operating practices in terms of current activities and long-range solutions to problems.

Please cooperate with the Task Force by furnishing any assistance and information which they may require in connection with the study.

0-0-0

Metz Waste

Reference Sec

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT ~~OFFICIAL USE ONLY~~

Memorandum

TO : Algie A. Wells, Director
Division of International Affairs

DATE: October 8, 1960

FROM : W. B. McCool, Secretary

SUBJECT: AGENDA FOR MEETING WITH SIR WILLIAM PENNEY

SYMBOL: SECY:AHE

1. We informed your office on October 6, 1960, that at Meeting 1657 on October 5, during discussion of AEC 1049/3 - FY 1962 Budget Estimates, Mr. Graham requested public relations in connection with radiation hazards including those arising from waste disposal methods be placed on the agenda for discussion with Sir William Penney during his forthcoming visit.

2. The General Manager has directed you to arrange for discussions requested above. Copies of the Agenda should be provided the Office of the Secretary.

cc: Commissioner Graham
General Manager
Deputy General Manager
Asst. General Manager
Asst. General Manager for IA
Asst. General Manager for Mfg.
Asst. General Manager for R&ID
Asst. General Manager for Reg. & Safety
Director, Production
Director, Research
Director, Reactor Development
Director, Biology & Medicine
Director, Health & Safety
Director, Licensing & Regulations
General Counsel

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10-3-60

cy filed SA 2-7-Vinite

B-421

SEP 26 1960

Dear Dr. Eisenhower:

You may recall that we informed you last year of our plan to consider with appropriate Mexican officials and scientists various aspects of proposed radioactive waste disposal activities in the Gulf of Mexico.

U.S. Atomic Energy Commissioner Loren K. Olson recently met with Mexican Nuclear Energy Commissioner Dr. Manuel Sandoval Vallarta and discussed possible studies of sea disposal of radioactive waste materials under the joint sponsorship of the two Commissions. Dr. Vallarta indicated that he would be interested in further developing the possibility of some type of joint program for such studies. Commissioner Olson subsequently wrote to Dr. Vallarta informing him of present and future USAEC studies in this field and proposed discussions for the purpose of arranging for any of the studies, which may be of direct interest to Mexico, to be conducted jointly by the two Commissions.

Dr. Vallarta has replied that his Commission would be glad, in principle, to cooperate with the USAEC in a research program along the lines proposed by Commissioner Olson. We plan to discuss details of a joint program with the Mexican AEC in the near future.

In light of the interest which you have expressed previously in this matter, we plan to keep you informed of the results of our proposal to the Mexicans.

Sincerely yours,

cc: Chairman (2)
GM
ADMIA
Secretariat

INTERNAL CONCURRENCES:
R. F. [illegible] ____
E. D. [illegible] ____
W. E. [illegible] ____

Chairman

The Honorable Milton S. Eisenhower
President, The Johns Hopkins University
Baltimore, Maryland

IA:AA/IA:ABD IA:AGV ADMIA AGMA ARS DBM GM

DA(IA) [illegible] Wells
9-13-60

Mail & Mail Branch

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September 20, 1960

AEC 180/13

COPY NO. 40

AEC-1c/13

ATOMIC ENERGY COMMISSION

LETTER TO COMMITTEE ON WASTE DISPOSAL, NAS-NRC, REGARDING LAND DISPOSAL OF RADIOACTIVE WASTES

Note by the Secretary

The General Manager has requested that the attached report by the Director of Reactor Development be circulated for consideration by the Commission at an early date.

W. B. McCool
Secretary

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9-22-60

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ATOMIC ENERGY COMMISSION

LETTER TO COMMITTEE ON WASTE DISPOSAL, NAS-NRC,
ON THE SUBJECT OF LAND DISPOSAL OF RADIOACTIVE WASTES

Report to the General Manager
by the Director of Reactor Development

THE PROBLEM

1. To consider a proposed reply to a letter from the Committee on Waste Disposal of the Earth Sciences Division, National Academy of Sciences-National Research Council, on the subject of disposal of radioactive wastes on land.

SUMMARY

2. The major points made in the letter (see Appendix "A") from the Committee are:

a. "No system of waste disposal can be considered safe in which the wastes are not completely isolated from all living things for the period during which they are dangerous."

b. Most promising methods of (ultimate) disposal are in cavities in salt and deep disposal in certain permeable geologic formations.

c. No existing AEC installation is located satisfactorily, geologically speaking, for safe local (ultimate) disposal; and present waste disposal practices do not satisfy the Committee's criterion (a. above).

3. The Committee's recommendations are:

a. Establish waste disposal facilities at suitable geological sites where accumulated existing wastes can be processed and disposed.

b. Approved plans for waste disposal should be a prerequisite for site approval by AEC.

c. Consideration should be given to consolidation of fuel reprocessing activities at a minimum number of sites suitable for (ultimate) waste disposal.

4. A basic difficulty lies in the interpretation of the Committee's criterion for safe disposal. If it is interpreted to

mean zero man-made radioactivity should be allowed in the environment, then any atomic energy activity would be virtually impossible. Such an interpretation would also ignore the analysis, conclusions and recommendations of such groups as the National Committee on Radiation Protection, the International Commission on Radiological Protection, and the Federal Radiation Council. It is believed such considerations are beyond the scope of the Committee's activities. A listing of other comments on the letter is attached as Appendix "B".

5. A proposed response to the letter is attached as Appendix "C". This response acknowledges the validity of some of the points made by the group, but also indicates areas where it is believed the Committee gave insufficient consideration to some parts of the AEC waste management program (e.g. waste fixation work) and the actions of other groups expert in the radiation protection field (NCRP, ICRP, FRC). Our proposed reply also indicates that the Committee April 1957 recommendations formed a basis for establishing the portion of the AEC waste disposal development program which pertains to direct disposal of high-activity wastes to selected geologic formations.

6. The bulk of the AEC's high activity waste in storage and the major ground disposal program for lower activity wastes are at Hanford. As of 1959 approximately 52×10^6 gallons out of a total of 63×10^6 gallons are in storage at Hanford. About 4.32×10^{10} gallons containing 2.5×10^6 curies have been discharged, under controlled conditions, into the ground at Hanford. The other significant waste storage and/or ground disposal operations are carried out at the National Reactor Testing Station, Savannah River Plant and the Oak Ridge National Laboratory. Tables 1 and 2 summarize these data.

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TABLE 1

Summary of High-Activity Wastes in Storage

	No. of Tanks	1959 Storage Tank Capacity (10^6 gallons)	Total in Storage - 1959 - (10^6 gallons)
Hanford	145	90	52
SRP	20	23.5	10
NRTS	9	2.7	1.5

TABLE 2

Summary of Low and Intermediate Level Wastes Disposed to Ground

	- 1959 -		Cumulative Total Through 1959	
	Volume (gallons)	Curies	Volume (gallons)	Curies
Hanford	1.87×10^{10}	9×10^6	4.33×10^{10}	2.52×10^6
SRP	approx. 40×10^6	161 + H_3	1.75×10^8	2700 + H_3
NRTS	6.12×10^9	5066	3.26×10^9	1.39×10^4
ORNL	3.59×10^6	2.8×10^5	1.53×10^7	4.31×10^5

In all of these operations the levels of radioactivity in the environment to date that can be attributed to these activities have been well within generally accepted radiation protection limits. Programs are under way for reducing the volumes of high-activity (reprocessing) wastes and the volumes and activities of material disposed to the ground. A more detailed description of these operations is attached as Appendix "D".

7. The parts of the AEC waste disposal development program that relate to ultimate disposal of high-activity wastes and to ground disposal of other types of waste materials have the following objectives:

a. High-activity wastes - to develop safe practical systems for the ultimate disposal of such materials. Two

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general approaches are involved. First, the conversion to solid, preferably chemically inert form, which subsequently can be safely stored or disposed at special locations. Second, the direct disposal in special geologic formations, such as salt, in a way which would assure no deleterious effect on man, his environment or his resources for long periods of time.

b. Low-and intermediate-level wastes - to determine the nature of the inter-action between radioactive materials and natural earth materials and the characteristics of specific ground environments in order to evaluate the fate of radioactive materials introduced into the ground and to assess the capabilities and limitations of specific environments to receive these materials.

At the present time approximately $1,400,000 is being spent on these parts of the program. Work is being done at National Laboratories, other specialized Government agencies, such as U. S. Geological Survey, U. S. Bureau of Mines, universities and private organizations. The NAS-NRC Earth Sciences Division Waste Disposal Committee has assisted in the promulgation of these programs. A more detailed description of these programs is attached as Appendix "E".

STAFF JUDGMENTS

8. The Divisions of Production and Biology & Medicine and the Offices of Health and Safety and General Counsel concur in the recommendation of this paper. The Office of Public Information concurs in the recommendation that no public announcement of the exchange of correspondence be made at this time.

CONCLUSIONS

9. The high-activity waste storage and ground disposal operations to date have not resulted in environmental levels of radioactivity of public health and safety significance. Levels attributable to such operations have been well within NCRP, ICRP and other generally accepted limits.

10. From an operational standpoint, efforts should continue to be pressed to reduce the discharge of these materials to the

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environment to the lowest practicable level. These levels must be determined on the basis of an evaluation involving the characteristics of the waste involved, the specific environment in which they are to be considered and pertinent radiation protection criteria.

11. From a research and development standpoint, the development of improved or alternative methods of handling wastes disposed to the ground should be vigorously pursued. Similarly the development of safe, practical systems for ultimate disposal of highly radioactive wastes should be carried through to full-scale field demonstration as quickly as possible. This does not imply a "crash" program which is neither desirable nor required.

12. The sensitive and serious public relations implications of radioactive waste management will continue to prevail.

RECOMMENDATION

13. The General Manager recommends that the Atomic Energy Commission:

a. Approve transmittal of the letter attached as Appendix "C" to the NAS-NRC Earth Sciences Division Committee on Waste Disposal.

b. Note the summary description of present AEC waste storage and ground disposal operations, attached as Appendix "D".

c. Note the status of research and development programs on high level radioactive waste handling as described in Appendix "E".

d. Note that no news release on the exchange of correspondence will be made.

e. Note that it is not deemed necessary to advise the JCAE of the exchange of correspondence.

f. Note that this paper is unclassified.

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LIST OF ENCLOSURES

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APPENDIX "A"

NATIONAL ACADEMY OF SCIENCES
NATIONAL RESEARCH COUNCIL

DIVISION OF EARTH SCIENCES
2101 CONSTITUTION AVENUE, WASHINGTON 25, D.C.

June 21, 1960

Mr. John A. McCone, Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. McCone:

On February 28, 1955, arrangements were formalized between the Atomic Energy Commission and the National Academy of Sciences-National Research Council to provide advisory services on geological and geophysical problems related to the disposal of radioactive wastes on continental areas. Your Academy-Research Council Committee on Waste Disposal has been active for some 5 years, has held an important conference attended by about 75 scientists and engineers, has closely followed the results of research on disposal problems, and has held numerous meetings, both at AEC installations and elsewhere.

Early in its deliberations, the Committee reached the conclusion which was later stated on page 3 of the report of April 1957 that no system of waste disposal can be considered safe in which the wastes are not completely isolated from all living things for the period during which they are dangerous. This period for high-level wastes containing the long-lived isotopes of Cs^{137} and Sr^{90} is at least 600 years. After an extensive review of possible disposal methods which would satisfy the stringent conditions of safety set forth above, your Committee, in light of the technology then existing, favored the following:

1. Disposal within chambers excavated or dissolved in rock salt.

2. Deep disposal in sands or other porous and permeable rocks near the lowest parts of synclinal basins.

While it is possible that other safe disposal methods may be developed, your Committee still regards these as the most promising methods, and feels that no worthwhile advantage will be gained by further delay in stating its appraisal of the present situation, namely:

> No existing AEC installation which generates either high-level or intermediate-level wastes appears to have a satisfactory geological location for the safe local disposal of such waste products; neither does any of the present waste-disposal practices that have come to the attention of the Committee satisfy its criterion for safe disposal of such wastes.

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The Committee's recommendations are as follows:

1. The Committee regards it as urgent that action be taken for the establishment of waste-disposal facilities at suitable geological sites where the accumulated wastes of the existing installations can be processed and safely disposal of.

2. Your Committee further recommends that approved plans for the safe disposal of radioactive wastes be made a prerequisite for the approval of the site of any future installation by the AEC or under its jurisdiction.

3. In particular, your Committee recommends that the Commission consider concentrating its chemical processing activities at a minimum number of sites located at satisfactory places for the disposal of radioactive wastes.

Sincerely yours,

H. H. Hess
Chairman

Committee Members

John H. Adkins
William E. Benson
John C. Frye
William B. Heroy
M. King Hubbert
Richard J. Russell
Charles V. Theis
William Thurston, Secretary

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APPENDIX "B"

COMMENTS ON NAS LETTER

1. Dr. Hess is Chairman of the Committee on Waste Disposal of the Division of Earth Sciences of the National Academy of Sciences - National Research Council. A contract was entered into in February, 1955, with the NAS-NRC to establish such a group in the Earth Sciences Division to advise AEC (DRD) on matters related to disposal of wastes on land. The primary area of consideration was the geologic aspects of ultimate disposal of highly radioactive (reprocessing) wastes.

2. In the April, 1957, report of the Committee (NAS-NRC Publication 519), recommendation #1 (Page 6) states "Storage in tanks is at present the safest and possibly the most economical method of containing waste." Although the consensus is that tank storage is probably not the answer to the ultimate disposal problem, operating experience to date has demonstrated the safety of such operations. (cf. JCAE Hearings on Waste Disposal, Jan.-Feb., 1959; NAS-NRC Committees of the Biologic Effects of Atomic Radiation - Committee on Waste Disposal and Dispersal.)

3. Ultimate disposal in salt formations or other suitable, deep geologic strata is under active investigation. Work is being carried out by U. S. Geological Survey, Oak Ridge National Laboratory, U. S. Bureau of Mines, University of Texas, American Association of Petroleum Geologists and others. The Hess Group has contributed to guidance and advice regarding this work.

4. Dr. Hess' letter makes no mention of conversion-to-solid, fixation approach to disposal of high-level wastes. This is a major possibility and is farthest advanced in development. This was recognized in the April, 1957, Committee report in

recommendation #3. Important relationship of this approach to environmental considerations was likewise omitted from letter.

5. It has not been contemplated that the high-level wastes would be disposed into the geologic environment at existing AEC installations until and unless safety and feasibility could be demonstrated. Cavities prepared in the basement rock (2,000 ± feet depth) at the Savannah River Plant are being investigated for such purposes. This proposal was discussed with the Committee and they recommended that exploratory drilling be carried out. The geologic situation at other sites (e.g. Hanford, Idaho) does not appear to be suitable for receiving high-level liquid wastes.

6. The Committee's serious reservations concerning continuing ground disposal operations at ORNL (surface pits) are valid. Steps are being taken to alter this operation by installation of additional waste treatment facilities and development of alternative, improved waste management systems. At Hanford programs are under way to reduce quantities of material discharged to cribs and to develop alternative disposal schemes. Levels of radioactivity in the environment attributable to such disposal operations to date have been well within generally accepted limits.

7. The Committee's criterion for safe disposal, if interpreted to mean zero man-made radioactivity should be allowed in the environment, would make any atomic energy activity virtually impossible. It would also ignore the conclusions and recommendations of such groups as ICRP, NCRP, other NAS-NRC groups and FRC. Such considerations are considered to be outside the scope of the Committee's activities.

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8. Recommendations contained in the present letter are being pursued (see 3.) or in some aspects are believed to be unnecessary and impractical - for example consolidation of existing chemical processing plants at new facilities at new locations.

9. The Committee (not all members present) visited Hanford and Idaho June 27 - July 1, after the letter was transmitted. It is understood that they were apparently satisfied and raised no serious questions on current operations, approaches to improvements, new solutions to problems, etc. This was the first visit by the group to these sites.

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APPENDIX "C"

DRAFT LETTER TO DR. H. H. HESS, CHAIRMAN
COMMITTEE ON WASTE DISPOSAL, DIVISION OF EARTH SCIENCES
NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL

1. The Chairman of the Atomic Energy Commission has asked me to reply to your letter of June 21, 1960, transmitting your Committee's views on disposal of radioactive wastes.

2. First we would like to acknowledge with thanks the past services of your group.

3. It has been clear that with regard to the highly radioactive wastes evolving from the chemical processing of irradiated fuel, dispersal of the liquids into the environment is not indicated. These wastes have been, and will continue to be, stored in underground tanks until better systems can be developed and proven out. The experience accumulated during the storage of radioactive wastes in tanks at AEC installations has proven that such storage is safe and entirely satisfactory for the interim until a desirable method of ultimate disposal is developed, and meanwhile their activity is steadily decreasing. As you know, it will be necessary to store highly radioactive waste for a length of time prior to preparation of the aged waste for ultimate disposal. It is our opinion that safe, practical long-term solutions to highly radioactive waste problems at existing AEC installations will be obtained from development efforts being carried out by various groups in AEC facilities under AEC sponsorship. We, therefore, see no necessity for going to the enormous expense of relocating existing fuel element processing facilities as implied in your letter.

4. As you know, the recommendations of your group contained in its April, 1957, report, and those made at other meetings of

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the Committee, contributed to the basis for establishing development projects on the geologic approaches to ultimate disposal of these high activity liquid wastes. Included are the projects on disposal in salt formations and the investigation of the basement rock at Savannah River for disposal purposes. In addition, projects directed toward conversion of these wastes to solid form, which have achieved some quite promising results, are an important part of the over-all program. We believe your Committee is generally familiar with these programs, and the organizations involved, through reports, visits and discussions as indicated in minutes of Committee meetings. We had thought until we received your recent letter that the earth sciences aspects of our program on waste disposal development had met with your general approval.

5. The application of the Committee's criterion for safe disposal -- "no system of waste disposal can be considered safe in which the wastes are not completely isolated from all living things for the period during which they are dangerous" -- to the highly radioactive reprocessing wastes is understood, as indicated above. However, interpreting or applying this criterion to mean that zero radioactivity should be allowed to reach man's environment raises fundamental questions including those of a biological and medical nature and of national policy that extend considerably beyond the scope of the Committee's activities. The creation of the Federal Radiation Council by Executive Order and by statute, the recent hearings before the Joint Congressional Committee on Atomic Energy on the subject of radiation protection criteria and standards and the recent deliberations, conclusions and reports of the National Academy of Sciences-National Research Council Committee on Biologic Effects of Atomic Radiation attest to the complexity and wide scope of consideration associated with these questions.

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6. In arriving at conclusions and operating decisions regarding health and safety, the AEC has been guided to a considerable extent by the recommendations of such groups as the International Commission on Radiological Protection and the National Committee on Radiation Protection. Your Committee is also generally aware of how the AEC presently carries out certain of its ground disposal operations within the framework of such recommendations. We hope the visits of June 27 - July 1 by the Committee to Hanford and Idaho have added to your information in this area and are pleased to note the conclusion in your report on these visits that neither the Hanford Plant nor the Idaho Falls Plant is now creating a hazard. We also wish to assure you that careful consideration is being given to the Committee's previously noted reservations relative to certain specific operations involving ground disposal of intermediate level liquid wastes at the Oak Ridge National Laboratory.

7. With regard to the Committee's present recommendations, you are familiar with present programs being carried out to investigate and delineate geologic sites suitable for ultimate disposal of highly radioactive liquid wastes. ORNL, DuPont, University of Texas, U.S. Geological Survey, Bureau of Mines, and the American Association of Petroleum Geologists are among the organizations working in this area. The engineering and establishment of such systems involve complex questions which you have helped to frame and answers to which involve research, development and testing in a number of related fields in addition to those of the earth sciences.

8. We, of course, concur in the requirement that adequate provisions for the management of radioactive wastes be a prerequisite to the location, design, construction and operation of

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nuclear facilities, and plans for safe handling and disposal of radioactive wastes are an integral part of all proposals for nuclear installations. A careful review of waste management systems for proposed reactors by AEC staff and the AEC's Advisory Committee on Reactor Safeguards is an example of the degree of importance attached to this function even though most reactors do not produce high level liquid wastes. However, we agree that all chemical reprocessing activities should be and are, subjected to comprehensive AEC review and the problems of waste management are importantly involved.

9. Your assistance and contributions to the AEC waste disposal development program are appreciated.

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APPENDIX "D"

9/28/60

SUMMARY OF AEC WASTE STORAGE & GROUND DISPOSAL OPERATIONS

Present High Activity Waste Management Methods: At the present time, first cycle (high activity) wastes resulting from the reprocessing of irradiated fuel elements are stored in underground tanks. Other liquid wastes of large volume and low activity concentration are released to the ground environment under certain conditions. This section summarily describes these tank storage and waste discharge operations as conducted at Hanford, SRP, NRTS and ORNL. There are other facilities where radioactivity is discharged to the environment - predominately air and water - but these discharges are relatively small in comparison to the production sites, NRTS and ORNL.

Storage at Hanford: High level wastes from fuel reprocessing operations are stored in steel-lined, reinforced concrete tanks equipped with external condensers for removal of radioactive decay heat. Since 1943, 145 tanks have been constructed ranging in capacity from 54,500 gallons to 1,000,000 gallons. These tanks are arranged in "farms" with each farm having 6 to 18 individual tanks. The total tank storage capacity at Hanford is approximately 90 million gallons. Capital costs for waste storage, including improvements, instrumentation and transfer piping have amounted to $37,500,000 or about $0.40 per gallon on the average.

As of early 1959, approximately 52 million gallons of high level wastes have accumulated at Hanford. These wastes have resulted from four chemical separation processes, namely the bismuth phosphate ($BiPO_4$) precipitation process for plutonium recovery, the tri butyl phosphate (TBP) solvent extraction process for recovery of uranium from $BiPO_4$ "metal wastes", and the Redox and Purex solvent extraction processes for recovery of uranium and plutonium. Operation and maintenance of the Hanford waste storage complex requires approximately $200,000 per year.

Certain design and construction features of the Hanford waste tanks are notable. Several types of storage containers were evaluated and a 75 foot diameter reinforced concrete tank, a carbon steel liner covering the bottom and sides of the tank and a concrete dome roof was selected as the optimum design

for Hanford wastes. Liquid depths in storage have been increased from 16 feet to 30 feet to obtain maximum utilization and economy. The inner steel liner provides the first protection against leakage; the outer concrete would also contain leakage as well as provide the structural capability required for resisting external earth pressure and internal liquid and vapor pressures. Each tank farm is surrounded by seven to twelve monitoring wells designed and placed to detect possible tank failure.

During the sixteen years of operating the Hanford tank storage system, there has been substantial process development work which has resulted in stored volume reductions. Operation of the bismuth phosphate precipitation process for the recovery of plutonium produced several thousand gallons of waste per ton of uranium processed. As Redox and Purex processes were subsequently placed in operation and improved, the waste volumes per ton of uranium processed have been reduced. This storage volume advantage has been offset somewhat by higher thermal and radiolysis problems.

Heat generation rates in high level waste storage tanks can total 20 million Btus/hr. at the time filling a tank is completed. After two years storage, this rate is reduced by an order of magnitude. Heat is dissipated to the ground at an equilibrium rate of 200,000 to 500,000 Btu/hr.; when the generation rate exceeds the rate of heat dissipation through the soil, the temperature of the entire liquid mass increases until boiling occurs. Temperature profiles in the tanks range from 210°F to 255°F in the bottom sludge. Problems of self-boiling ("bumping") occur; sludge recirculation is utilized to control this phenomena. Chemical instability problems involving the decomposition of water into hydrogen and oxygen, and the radiation breakdown of sodium nitrate to form sodium nitrate and oxygen, have also been encountered.

From the chemical and thermal conditions described, the question of tank life expectancy is raised. Laboratory data, corroborated with actual test specimens, indicate that carbon steel exposed to 220°F corrodes at a rate between 10^{-5} to 10^{-4} inches per month. Based on this corrosion data, it is conservatively estimated that a tank life expectancy measured in several decades can be expected.

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Storage at Savannah River: The waste storage tanks at SRP are similiar to those at Hanford, except for decay heat removal and certain construction details necessitated by more stringent design requirements and more restrictive environmental conditions. The tanks consist of an outer steel-lined concrete shell and an inner steel tank. Monitoring equipment is provided within the free space of the "cup and saucer" arrangement for the detection of any leakage which may occur. The total volumes of tank storage now available at SRP is 18,300,000 gallons (20 tanks) with individual tank capacities ranging from 750,000 to 1,300,000 gallons. Another 4 tanks (5,200,000 gallon capacity at a cost of $2,350,000) are now under construction.

Radioactive decay heat is removed from cooled tanks by a system of horizontal and vertical cooling coils. Operating experience has indicated that 90% of the fission products are in the bottom sludge and temperatures of about 300°F have been generated in the sludge. Tank appurtenances include reflux condensers, entrainment separators, particulate filters for the control of waste vapors, and evaporators.

Total capital costs for tank storage at SRP (including the tanks under construction) have been $23,550,000. The original tank storage system (9,000,000 gal.), when the plant was constructed, had a unit cost of about $1.60/gal. The latest group of tanks (with no cooling coils) which will be used for long cooled wastes will cost in the range of $.40 to $.45 per gallon. Annual operating costs for the waste storage system is approximately $130,000.

The SRP stores all high activity wastes in tanks including first cycle wastes and second cycle wastes which have been concentrated by evaporation. In order to more effectively utilize tank storage capacity SRP has recently started to reconcentrate wastes which have been in storage. High level wastes which have been in storage for 5 years and lower activity wastes which have cooled for approximately 2 years are reconcentrated by evaporation to the point of solidification - 70% solids-and then stored in uncooled tanks. This is only possible after suitable decay periods have eliminated much of the thermal-problem.

Storage at NRTS: The storage of high level liquid wastes at the ICPP is not as extensive an operation as the previously described production facilities if consideration is based on the volumes of waste materials handled. However, when consideration is given to the quantities of fission product material associated with wastes from high enriched fuel reprocessing at ICPP, the unit costs for handling such liquid wastes are somewhat higher than low enriched uranium processing.

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The chemical process used involves a three cycle liquid-liquid extraction by which enriched uranium is recovered and fission product separation is effected. First cycle wastes containing the greatest quantity of heat generating fission products are stored in six 300,000 gallon stainless steel, water-cooled tanks. Second and third cycle wastes are stored together in three 300,000 gallon non-cooled tanks. At the present time about 1,000,000 gallons of 1st cycle wastes and 450,000 gallons of combined second and third cycle raffinates are being stored after six years of intermittent operation. Total activity in the first cycle wastes is approximately 1500 curies per gallon compared with the order of 10 curies per gallon for the latter wastes. In addition, about 30,000 gallons of zirconium wastes and 28,000 gallons of stainless steel cladding wastes are in storage. The waste volume varies from 50 to 150 gallons per pound of uranium recovered, depending upon the uranium content of the processed fuel. In addition to the aluminum nitrate wastes, four 30,000 gallon tanks are provided for storage of zirconium waste.

The total investment in ICPP storage tanks is $7,680,000. The nine permanent storage tanks for aluminum type wastes have an average unit cost of $2.63 per gallon including apportioned piping. Included in the above total cost is $580,000 for 120,000 gallons of storage for zirconium waste or $4.90 per gallon.

Present Ground Disposal Operations: From the time Hanford determined the feasibility - ca. 1945 - AEC facilities have been discharging certain radioactive wastes to the environment. These include liquid wastes, solid wastes and aerosol wastes. Liquid wastes result from laboratory, reactor and fuel processing-reprocessing operations. The most significant discharges of liquid wastes in terms of volume and activity have been at the major reactor fuel reprocessing sites. This method is used only for wastes containing relatively low concentrations of activity and under rather rigidly controlled conditions - safety being the primary, overriding consideration. Solid wastes at the reprocessing sites are buried on land. Even though these are sizeable amounts of activity involved, these are bound up in solids and when buried present a different set of considerations from liquid discharges. These considerations were discussed in AEC staff

paper 180/12. Aerosol wastes are a separate consideration from the activities of this NAS-NRC Advisory Committee.

Hanford Operations: The magnitude of this problem is evident from the fact that approximately two billion gallons of water are required each year for operation of the Hanford separation plants (approximately 50% is for process use). Obviously, only a small fraction of this water leaves the plants as a high level waste stream requiring long term storage.

Three major sources of these high volume, lower-level wastes at Hanford are: 1) process cooling water, 2) steam condensate and 3) process condensate.

The largest volume of these wastes results from process cooling water streams, normally uncontaminated, but occasionally containing less than 10^{-5} uc/ml of gross beta activity because of corrosion failure of process equipment. These wastes are discharged to natural depressions called "swamps" where the liquid seeps through the ground to the water table several hundreds of feet below. Through mid 1959, about 37.5 billion gallons and 2500 curies of mixed fission products have been discharged to swamp sites.

Steam condensate, which can be contaminated from failure of a heat transfer surface, and process condensate from a boiling radioactive solution, including the storage tanks, having an activity in the range of 10^{-1} to 10^{-3} uc/ml, are discharged to sub-surface "cribs". Originally these cribs were a box-like timber structure; recently they have had trapezoidal cross-sections, varying in length from 20 to 1600 feet. They are filled with washed and sized gravel to obtain even distribution of the wastes. In some cases "caverns", which are similar to cribs except that they do not have a timber structure, are utilized for this type of wastes. This disposal method depends on the adsorption and ion exchange capacity of the soil to retain the fission products. Through mid 1959, approximately four billion gallons of these wastes containing about 1.9 million curies of gross beta activity were discharged into 72 crib structures.

Another type of ground disposal facility used at Hanford is called "trenches". They are generally shallower than cribs and are used only once for high salt wastes or for chemically complexed isotopes which would interfere with ground exchange reactions if mixed with other wastes. This disposal method is based on the moisture retaining or "specific retention" property of dry sediments several hundred feet above the water table. No benefit is assumed for the ion exchange which occurs, and not more than 10% of the vertical earth column, with the same cross sectional area as the trench is considered to be available.

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Through June, 1959, approximately 28 million gallons of waste, containing 647,000 curies of mixed fission products, had been discharged to 18 trench sites.

Savannah River Operations: At Savannah River, use is made of open seepage basins for the disposal of high-volume, low-activity wastes from the separations areas. Normally, condensate from acid recovery as well as that from process evaporation is discharged to the basins. Both chemical separations plants have a series of three basins with depths ranging from six to ten feet with a total seepage basin area at SRP of about five acres. The first two basins in each area are small with sufficient detention time to effect removal of most suspended solids. This permits good seepage rates in the third basin. Flow to the basins averages 80,000 gpd or approximately 40 million gallons per year. The total activity released to 1959 has been 2.5 curies of alpha emitters, 240 curies of non-volatile beta emitters, and 2300 curies of iodine-131. Process cooling water at SRP from the various vessels and steam condensate from evaporator coils, which is normally not contaminated, is discharged after monitoring to surface streams.

NRTS Operations: At ICPP, from 0.8 to 1.3 millions of gallons per day of effluents from heat exchangers and condensate from the partial evaporation of high level liquid wastes prior to storage are discharged to a 600 foot deep disposal well which penetrates 150 feet below the water table. The casing is perforated from 25 feet above the static water level to the bottom of the well. During 1958, approximately 350 curies were discharged to the disposal well. Seventy percent of the activity was I-131, with the remaining activity being contributed by Zr-Nb, Ce-144 and Ru-106.

ORNL Operations: Although ORNL does not have as one of its functions the production-type of reprocessing of fuel elements, there are some significant quantities of liquid wastes associated with their laboratories and isotope production facilities. Their principle method of disposal of these wastes is to discharge them to seepage pits excavated on a hilltop on the Oak Ridge reservation.

"Highly Radioactive" Liquid Chemical Waste: The term "highly radioactive" is applied to the 7,000-gallon per day liquid chemical waste stream at Oak Ridge

National Laboratory only because this stream has the highest level of radioactivity of any waste at the Laboratory. However, compared to highly active wastes (containing 80 to 5200 curies per gallon) at production sites, this ORNL stream is misnamed, because its concentration of radioactive components is normally between 0.001 and 0.02 curie per gallon. In 1957, some experimental operations (Thorex) produced wastes having activity levels as high as 2 curies per gallon when accepted into the waste system, but the total volume of these wastes was less than 1,000 gallons. Because the research and development nature of the Laboratory brings about frequent changes in the processes that produce waste, the waste composition is not consistent. Larger volumes and higher radioactivity levels are expected from future operations. The main radioisotopes are usually cesium-137, ruthenium-106--rhodium-106, strontium-90--yttrium-90, and trivalent rare earth elements. Strontium, cesium, and trivalent rare earths constitute the major fraction of radioactivity on an average disintegration per minute basis. Sodium and nitrate account for about 70% of the non-radioactive solids in the waste.

The waste pits are three 1,000,000 gallon open cavities bulldozed in the earth in a location chosen for remoteness from the Laboratory, the type soil, and the fact that underground drainage is toward White Oak Creek. The soil, Conasauga shale, has the property of removing and retaining most of the radioactive components while the waste water and certain non-radioactive chemicals seep through it toward White Oak Creek. The pits are each 15 feet deep with sides sloping at an angle of 30°. Their top dimensions are 210 feet by 100 feet. The pits are covered with wire screen to prevent access to wildlife. The waste discharged into the pits is sampled and analyzed for radioisotopes and stable chemical ions, and the movement of these materials in the soil and in the seepage into the creek is monitored by the Health Physics Division. The only radioisotopes detected in the seepage to date are ruthenium-106, cobalt-60 and antimony-125. By the end of 1956 the seepage of ruthenium-106 was estimated to average 23 curies per year. In 1957 samples indicated 200 curies of ruthenium-106 seeped from the pits, but only 60 curies of ruthenium-106 were detected passing White Oak Dam. In 1957 a total of 41,900 curies was discharged to the pits, an increase of 20% over 1956; in 1958 52,800 curies were discharged, an increase of

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25% over 1957. These increases were due mainly to increased quantities of radioactivity being processed at the Fission Product Pilot Plant. By the end of 1959 the total of all wastes discharged to the pits since the start of this practice was 15,292,000 gallons containing 431,950 curies (at time of discharge). While ORNL waste monitoring operations have not detected any adverse effects in the Clinch River as a result of increased quantities of radioactivity seeping from the waste pits, it is proposed in FY 62 to construct additional waste processing facilities (small storage tanks, evaporator, etc.) for treatment of these wastes prior to discharge to the environment.

Control of Waste Releases: The optimum use of swamps, cribs, and trenches at Hanford; seepage basins at SRP and a disposal well at ICPP is effected only by a stringent separation of waste streams and detailed radiochemical analyses of the concentration and specific type of activity present. In addition, extensive well monitoring programs are required. At Hanford approximately 600 wells (120,000 feet of wells) have been drilled and cased; at SRP, 25 steel-cased permanent wells and 75 temporary uncased wells have been provided; and at NRTS, 15 wells from 565 to 750 feet deep have been drilled below the ICPP disposal well.

Ground disposal criteria at Hanford are based on the detection of certain long-lived radioactivity such as Sr^{90} and Cs^{137} in concentrations of 1/10 or greater of the maximum permissible concentrations in the ground water below the facility. This standard is conservative since the ground disposal facilities are 7 to 10 miles from the Columbia River and any radioactive material leaving a disposal facility must filter through this distance of soil within the project boundaries before ultimate dilution in the river. Cobalt-60 and cesium-137 have been detected in monitoring wells at distances up to 1000 feet from the disposal; however, the concentrations at this distance were 1/40 and 1/2000 of the maximum permissible concentration for these isotopes.

Ground disposal at Hanford has also been supported for over ten years by a concerted and closely correlated research and development program involving theoretical study, laboratory and field experiment and observational experience in the fields of soil chemistry, geology, hydrology, mineralogy, analytical chemistry and process engineering. Even with the restrictions and stringent

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controls required, it is of interest to consider the tremendous cost savings to AEC which have resulted from the use of this disposal method. For example, the cost of discharging wastes to swamps at Hanford was only about one-hundredth of a cent per gallon during 1958. Crib disposal averaged one-tenth to three-tenths cent per gallon through 1958. Because of volume restrictions which may be disposed in a given trench, the average cost has ranged from three to five cents per gallon. It is evident that considerable additional expense would be required for processing large volumes of crib-type wastes by conventional methods such as evaporation.

At NRTS, in order to assure that activity levels do not exceed one-tenth the maximum permissible level for the continuous consumption of water, a monitoring program is conducted which involves sampling of all production wells as well as approximately 25 off-site wells south of the site boundary. Radioactivity levels above normal background fluctuations have not been detected at any distance downstream from operating areas as a result of disposal operations.

At ORNL evaluation of the effect of liquid waste with regard to the underground water table in the main X-10 area, in the burial ground, and in the area of the waste pit operation is made by means of core holes or monitoring wells. In the main X-10 area, measurements of underground activity detected by core hole monitoring reveal levels to be insignificant. In the waste pit and burial ground area, where most of the disposable high-level waste materials are sent, activity has been detected in the monitoring wells, but it has been established that the contaminant is primarily ruthenium-106, for which the maximum permissible concentration (MPC) in water is quite high, over a hundred times higher than the MPC for strontium-90. Several surface seeps have developed in the pit area, but the location of these areas is such that the direction of ground water flow is toward White Oak Creek and the Clinch River drainage basin into which low-level liquid wastes have been released and monitored since the beginning of the Laboratory.

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APPENDIX "E"

STATUS OF RESEARCH AND DEVELOPMENT
PROGRAMS ON HIGH LEVEL RADIOACTIVE WASTE HANDLING

1. The AEC program in developing systems for ultimate disposal of high-activity radioactive wastes is directed along two promising approaches: (1) fixation or immobilization of fission products in solid, inert media (clay, glass, or ceramic structures) and (2) direct discharge to selected, geologic formations such as salt formations or deep permeable strata. While the Earth Sciences Division, NAS, Committee on Waste Disposal has been instrumental in formulation of the "direct disposal" development program, the fixation approach is directly related to the over-all ultimate disposal problem and is therefore described in the following paragraphs. In addition, the Committee has observed the development work on fixation being conducted at Hanford and NRTS and has been favorably impressed with the work.

2. Fixation: Calcination of aqueous wastes to dry solids in a fluidized bed at 400° to 500° C is the most advanced technique. A hot pilot plant of 60 gph capacity, currently under construction at NRTS and scheduled for completion in October 1960 will allow demonstration and evaluation of the process with aqueous aluminum nitrate wastes. The basic process involves the injection of waste solutions into an air-fluidized bed at 400° C. The water and nitric acid in the feed solution appear in the overhead off-gas stream; aluminum and fission product nitrates decompose to the corresponding solid oxides and are continuously withdrawn as a bottoms product. A number of severe problems associated with the extremely high levels of radio-activity involved will require resolution. The treatment of off-gases from fluidized bed operations is a serious problem, involving not only de-entrainment of micron and sub-micron size particulates by factors of 10^8, but also the equivalent separation of volatilized and subsequently condensed radioactive ruthenium oxide particulates. Heat removal from the stored Al_2O_3 solid wastes is also a problem, since Al_2O_3 is a refractory insulating material. While experience to date in the operation of a pilot plant equipment with solutions containing spiked quantities of actual aluminum nitrate type wastes indicates that these problems can be resolved, only significant scale operation on a hot basis with actual waste solutions will prove the technical feasibility of the process.

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Preliminary studies have been initiated to investigate the possible application of the fluidized bed technique to processing of wastes from Zr to SS containing fuels. The highly corrosive nature of such waste solutions presents severe corrosion problems, though these problems do not appear insurmountable. In addition, a 6 to 10 gallon/hr. fluidized bed system is being studied at Hanford to determine its feasibility for production wastes.

3. A second promising method for calcining wastes is the "radiant-heat spray calciner" also being investigated at Hanford. This continuous process involves the mixing of wastes with air for atomizing and introducing into a column where the center section of 3 sections is heated to 850°C by passing low voltage current through the entire column. The conversion to solid of the atomized spray feed is affected before it contacts the vessel side walls. The product and off-gases are withdrawn from the bottom of the column. Problems involving the use of additives for increasing calcination temperature and bulk density, nozzle plugging, and coating of the vessel walls are being investigated. Preliminary results indicate that off-gas problems may be minimal in comparison with the fluidized bed.

4. Another calcination approach being investigated is the "pot calciner" at ORNL and Hanford. This batch process involves evaporation to dryness and calcination of solids in a pot which would serve as the final storage container. Off-gases are being decontaminated in a packed distillation tower. Test runs are being made at ORNL in an 8" diameter by 78" long calciner with simulated power reactor wastes. Wastes are fed into the pot from 3-5 gph with furnace temperatures ranging from 800-900°C. Preliminary results are encouraging with problems of off-gas lines plugging and the effectiveness of a distillation tower as an aerosol attenuator now being studied.

5. At BNL, a small-scale rotary ball-kiln has been used to convert simulated wastes to an oxide form. Metal balls would prevent agglomeration and would produce a free-flowing solid product. The use of this unit for zirconium-type wastes is being studied. A cooperative BNL-ORNL engineering study is being initiated to determine the feasibility of installing this system in an ORNL hot-cell for pilot-plant runs. Mechanical seals appear to be the major problem area.

6. The use of molten sulfur at 150°C for the dehydration and denitration of simulated power reactor fuel reprocessing waste is being studied at SRP. Liquid sulfur as a fluidizing and reaction medium appears to offer the following advantages: a) effective dehydration and denitration take place at reduced temperature, b) radiation is absorbed without decomposition or gas generation, and c) its inert characteristic eliminates the potential water solubilization of certain fission products.

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7. Fixation processes in other countries are being followed with interest. In Canada the incorporation of wastes in a mineral nepheline syenite has reached the pilot plant stage. In England, studies are being made using a natural occuring aluminosilicate earth material and various glass formulations; pilot plant operation is now being initiated. In France, the use of synthetic mica is being investigated. In all of the foreign work, wastes are mixed with powders or slurries of the carrier material, fluxing agents such as sodium nitrate or sodium carborate added, and the temperature raised to 800-1300° C. Interference with bulk constituents is not encountered because the systems do not depend upon ion-exchange capacity. Field leaching tests are proposed in Canada.

8. At Johns Hopkins University, studies have been made whereby a solid aluminum oxide product from calcination would be dissolved with caustic to form sodium aluminate, followed by mixing with sodium silicate to form a hydrogel and then drying and firing to form a synthetic feldspar. This highly insoluble form of alkaline-earth metals appears to represent an optimum ultimate disposal form for strontium and cesium. With zirconium wastes, colloidal silica is added to HNO_3 solutions forming a gel, and with subsequent drying and firing, the formulation of a crystalline structure, zircon ($ZrSiO_4$) is achieved.

9. To improve the non-leaching characteristics of fired oxides, MIT is investigating the addition of vitrifying or glazing formulations (Al_2O_3-CAO-SiO_2 and Al_2O_3-CaO-SiO2-borax) and fusing the mix at temperatures up to 1250° C. Aluminum and zirconium type wastes have been studied to date.

10. Actual cost data on the conversion of high-level liquid wastes to a solid form is, of course, not available at this date. It has been estimated that for a power reactor complex operating at an over-all efficiency of 25 percent, 10,000 MWD/ton burnup and a recovery process generating 1200 gallons of wastes per ton, it would be possible to allocate as much as $8.00 per gallon for waste disposal costs without exceeding a charge of 0.16 mils per KWH, (2% of 8 mil power) for waste disposal. It is of interest to compare this cost with the estimated processing costs of the 60 gph demonstrational calciner at NRTS. Based on a 300 day per year operating period (432,000 gal/yr.), the total estimated processing costs, including 15 year depreciation, but excluding solids storage, are approximately $2.50/gal.

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storage cost estimates are based only on a limited capacity operation which is designed to demonstrate process feasibility and to obtain engineering design data. Therefore, a solids storage system, capable of holding the alumina produced from one year's operation, is estimated to cost an additional $1.10/gal. It is realized that the total cost of $3.60 per gallon of original aluminum-nitrate waste is for a demonstrational facility, and that with larger plant capacities and improved equipment and solids storage, these costs can be substantially reduced.

In summary, the first "hot" calcining plant in this country should be in operation during the latter part of 1960. Development work on parallel approaches is being intensified as potentially more effective future systems. It is hoped that engineering and pilot scale studies on these systems can be completed within the next 3-5 years.

11. Direct Disposal: Preliminary evaluations by the Committee on Waste Disposal of the Division of Earth Sciences, NAS - NRC and a subcommittee of the American Petroleum Institute, indicate that the discharge of high-level wastes into selected geologic formations may be technically feasible. The types of formations recommended for investigation are:

1) Salt domes or beds - space provided by mining or dissolution,
2) Deep synclinal basins (4-15,000 feet) containing connate brines,
3) Excavation in shale,
4) Deep porous formations.

12. The major portion of the development work accomplished to date has been directed at the possible disposal of liquid and/or solid high-level wastes into salt structures. Salt was chosen because of its unique geologic characteristics. Salt formations are dry, impervious to water, and not associated with usable ground water sources. Because of its plasticity, fractures in salt seal or close themselves. Deposits of rock salt underlie some 400,000 square miles of the United States and they represent some of the few naturally occurring dry environments in the eastern part of the country. It is calculated that the volume of high-activity wastes by the year 2000 will be about 160 acre-feet or less than 10 percent of the salt now being mined out annually. Other favorable characteristics

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of salt are: 1) its structural stability, 2) its relatively high thermal conductivity in comparison with other rocks, 3) the possible recovery of specific fission products from wastes stored in salt at some future date, 4) low seismicity of the major salt areas and 5) the low cost of mining cavities or developing solution cavities in salt.

13. The University of Texas has performed a number of laboratory studies on the structural aspects of salt cavities in addition to calculating heat generation rates. Laboratory studies at ORNL have shown that the structural properties and thermal conductivity of rock salt are not greatly affected by high radiation doses, although the creep rate for both irradiated and unirradiated samples increases with high temperature. Chemical interaction of simulated wastes with salt has not produced excessive quantities of nitrosyl chloride and chlorine. Thermal calculations have shown that it is possible to store 2-year-old, 10,000 MWD/T, 800 gal/ton waste in a 10-foot diameter sphere in salt without exceeding a temperature of 200° F.

14. To verify laboratory experiments and thermal computations, the ORNL has contracted with the Carey Salt Company to conduct a series of field investigations in their Hutchinson, Kansas, mine. The first experiment, using simulated wastes, is being carried out in an unused portion of the mine in two 7.5' x 7.5' x 10' cavities. Approximately 3200 gallons of both acid and neutralized Purex wastes are being applied heat in accordance with the decay of two year cooled waste. After about six months of operation the temperatures in both waste and the surrounding salt are approaching equilibrium and are following closely the temperature rise predicted by theoretical calculations. Problems still to be studied in detail include the migration of nuclides through salt, migration of the cavities themselves, and salt deformations. Of course, the effects of high level radiation on salt in situ has not been determined. If results of the field studies in progress continue to be favorable, it is planned to conduct radio-tracer tests and experiments with increasing quantities of activity, perhaps in a nearby salt formation on government-owned land. While the storage of a converted-to-solid high level waste in salt appears inherently more favorable than a direct discharge of high activity liquid wastes into salt, there have been no laboratory or field data obtained to date, which

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indicate that the latter approach is impractical. With it being possible to provide underground storage in salt at an estimated 3 to 4 cents per gallon, it is apparent that this attractive potential ultimate disposal method should be investigated until technical infeasibility is proven. Similarly the incentive for location of chemical processing facilities in the vicinity of salt deposits would certainly be great if previously mentioned problems can be resolved. An evaluation of the engineering considerations for storage of solids in salt is presently planned.

15. Basic laboratory studies are being conducted at Hanford, ORNL, Geological Survey and the University of North Carolina to investigate the different types of physical-chemical reactions which occur between radioactive ions and certain natural earth materials. This work is in direct support of present ground disposal operations and is leading to the development of improved systems such as field ion-exchange beds, etc.

16. During the past year at ORNL, the injection of liquid wastes into impermeable formations by a hydro-fracturing technique has been under active investigation. This method consists of mixing waste with clays and cement, and then injecting the slurry under heavy pressure into an impermeable formation by fracturing. An initial field experiment, utilizing 26,500 gallons of a cesium tagged mixture which was injected into shale at a depth of 290 feet, has been completed. Core drilling is now proceding in order to obtain information on the extent and control of the fracture pattern.

17. During 1958, a committee of the American Petroleum Institute studied, in a preliminary manner, the feasibility of injecting high level liquid wastes into deep (several thousand feet) porous formations. The committee, composed of top technical people from several petroleum companies, concluded that the method itself appears feasible. Problems which require resolution in the development of a safe deep well disposal system include ion-sorption, chemical compatibility of injected wastes with the interstitial waters and the aquifer media, heat dissipation and corrosion and radiation damage. Laboratory investigations and theoretical studies on these problem areas are being carried out by ORNL and the Bureau of Mines. Field scale investigations are dependent upon the results.

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18. The API group estimated the costs of a hypothetical deep well disposal system (assuming feasibility). The entire complex, designed to handle 250,000 gallon/day of diluted high level wastes (50:1 dilution factor), consisting of injection, disposal, bleed, and monitoring wells and a pretreatment system, would cost about 2½ million dollars. Annual cost of the operation is estimated at 1½ million dollars, or equivalent to about $.85/gal of high level waste or $.02/gal. of diluted waste.

19. In line with the API recommendations on the feasibility of deep well disposal, the U. S. Geological Survey is compiling geologic information on the distribution and general nature of deep sedimentary basins in the continental United States (3-10,000 feet deep), which would aid in the selection of a deep well field experiment site. Four basin reports are scheduled for completion during the early part of FY '61.

20. Following discussions with the duPont Company and the Committee on Waste Disposal, Division of Earth Sciences, NAS, a feasibility study involving the containment of long-cooled (10 year) wastes in under-ground mined caverns at SRP was recently initiated. Several widely spaced exploratory holes will be drilled in the separations area to depths of approximately 2000' in the underlying bedrock. Field permeability tests of the basement rock will be made and continuous core samples obtained for determination of tensile and compressive strength, thermal conductivity, and chemical compatibility of the rock with SRP wastes. Concurrent with the geological exploratory program, technical studies are planned with respect to waste characteristics, including heat generation rates, age of wastes to be stored, and the physical form of waste considered most desirable for storage. If feasibility of the method is determined, preliminary cost estimates for an underground containment system are comparable to present day tank construction costs.

21. Preliminary discussions have been held with Petroleum Research, Inc. concerning the disposal of high activity wastes in deep wells which penetrate zones of low-pressure (natural sinks). The first phase of the project would investigate pressure gradients, water salinities, chemical, electrical, and thermal nature of the rocks

and fluids, etc. in order to define and describe a suitable disposal zone which is isolated from all potentially valuable resources. Subsequent work would involve field drilling and supporting laboratory studies.

22. A substantial portion of the AEC waste disposal development program is devoted to ground disposal operations and the development of a better understanding of the phenomena involved. Program costs during FY '61 will be approximately $1,400,000 and estimated costs for FY '62 are $2,700,000. Increased costs are the result of programs involving the disposal of wastes into salt formations, deep permeable formations, mined cavities, etc. progressing to the field demonstration stage.

23. Summary: The conversion of high-activity wastes to a solid form in a fluidized bed is at the present time the most advanced technique. Operation of the waste calciner pilot plant at NRTS is scheduled for the latter part of 1960. On the direct disposal approach, results of the salt field experiment at the Carey Salt Company mine, Hutchinson, Kansas, have been entirely favorable. Investigative work on the deep-well approach is being intensified during the coming year.

Mat-12- Waste disposal B-4-#1 File Vitale

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-139
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Wednesday, July 20, 1960)

AEC TO TEST UNDERWATER TELEVISION IN OBSERVING WASTE DISPOSAL

The Atomic Energy Commission will test an underwater television camera in Massachusetts Bay, 15 miles off Boston Harbor, in making observations of a site formerly used for the disposal of low-level packaged radioactive wastes.

The underwater TV camera will be used in an expedition Thursday and Friday July 21 and 22 to an area two miles in diameter located at 42 degrees, 25.5 minutes north latitude and 70 degrees, 35 minutes west longitude in Massachusetts Bay.

Water depth in that area is approximately 50 fathoms (300 feet).

The area where the TV camera will be tested formerly was the site of radioactive waste disposal from 1952 to August of 1959 by Crossroads Marine Disposal Corp. of Boston.

A remote controlled underwater vehicle, the XN-3, recently developed by Vare Industries of Roselle, New Jersey, will be used in the July 21-22 survey.

The Department of the Navy will assist the Commission. Equipment will be transported to the bay site by the minesweeper USS Swerve.

In addition to testing the usefulness of the TV camera in observing such sites, the expedition will make a visual

(more)

7-20-60

Copy filed: Health & Reg Crossroads Marine Disposal Corp.

inspection of the condition of drums used in the waste disposal operation.

Last year the Commission amended the license of Crossroads Marine to require that the company dispose of wastes in the deep waters of the Atlantic, off the continental shelf, at a minimum depth of 6,000 feet.

A survey of the former disposal site off Boston Harbor by the U. S. Coast and Geodetic Survey and the U. S. Public Health Service for the Commission showed that there was no radioactivity attributable to the disposal operation. Results of this survey were announced in June of 1960.

The background activity measured by the Public Health Service was in the same range as that of background activity at other ocean locations where no radioactive wastes have been disposed of.

The Commission has invited observers to be present from the U. S. Fish and Wildlife Service, U. S. Coast and Geodetic Survey, Massachusetts State Department of Health, Chesapeake Bay Institute of Johns Hopkins University, Baltimore, and the Woods Hole Oceanographic Institution of Woods Hole, Mass.

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UNITED STATES GOVERNMENT

Memorandum

TO : Harold L. Price, Director
Division of Licensing and Regulation

DATE: June 24, 1960

FROM : W.B. McCool, Secretary

SUBJECT: LAND - SEA DISPOSAL OF RADIOACTIVE WASTES

SYMBOL: SECY: RVW

1. At Meeting 1630 on June 20, 1960, the Commission discussed the problem of land and sea disposal of radioactive wastes and agreed on the following guidance for the staff:

a. No new licenses for sea disposal are to be issued for the present.

b. Requests for amendments to existing waste disposal licenses are to be processed.

c. AEC contractors are to be informed that land burial of radioactive wastes is the preferred method.

d. New applications for land disposal licenses are to be accepted by AEC.

2. The General Manager has directed that you take appropriate action in accordance with this guidance. In addition, you will recall the General Manager was requested to establish a testing program on the types of packages to be used for waste disposal. In this connection, Commissioner Wilson urged that consideration be given to the use of special valves on the containers which would permit water to enter them but not allow any radioactive material to escape.

3. Please send the Office of the Secretary copies of any pertinent correspondence on this subject for the Commission's records.

cc: General Manager
Deputy General Manager
Assistant General Manager
Assistant General Manager for Administration
General Counsel
Reactor Development

Minutes - 12

1630 AEC Meeting 6-20-60

6. Land-Sea Water Disposal (See Minutes of Meeting 1617)

Mr. Price reviewed with the Commission public reaction to the May 9, 1960 announcement of a schedule of charges for disposal of radioactive waste at Oak Ridge and Idaho, and requested Commission guidance on a number of matters relating to the questions of land and sea disposal of radioactive waste material.

With regard to ocean waste diposal, the Chairman noted that the Commission had been criticized for permitting the use of containers that would break up before they reached a depth of 6,000 feet and he urged that efforts be directed toward learning more about ocean waste disposal. Mr. Graham said he agreed and noted that at present the Commission has little evidence available about the effect on the drums after they are dumped into the ocean.

The Chairman left the Meeting at this point.

Mr. Price pointed out that the announcement of the availability of two Commission-owned disposal sites had not resulted in any companies transferring their activities from sea to land disposal, although several of them had expressed an interest in expanding their businesses to include land disposal as well. He said a number of firms had charged that the establishment of Commission-owned land disposal sites was an invasion of private business rights.

Mr. Wilson commented on the tendency of disposal drums to be crushed as they sink into deeper water and he urged that valves be placed on the drums which would permit water to enter and equalize the pressure as they sink but prevent radioactive material from escaping out of the drums. He said he did not believe the Commission should object to sea disposal if the firm utilized a demonstrated safe method of sinking the drum to the bottom intact.

Mr. Graham proposed the Commission establish a policy favoring land burial and that the exceptions to this policy be limited to sea disposal for AEC laboratories located on the coasts, and to firms which can meet AEC specifications for safe disposal at sea.

* 2 pages

6-20-60

Mr. Price inquired about the prompt disposition of drums of radioactive material at various locations within the United States. Mr. Graham said he believed this material should be buried underground.

Mr. Williams left the Meeting at this point.

Mr. Price said he did not believe the Commission should place itself in the position of telling its licensees whether they must use land or sea disposal for their waste material. Mr. Graham said he agreed providing the method of disposal used is a proven, safe method.

Mr. Floberg, commenting on the lack of practical knowledge about sea disposal methods, urged that AEC undertake an intensive program of experimentation with various methods of waste disposal. He suggested, for instance, that a hundred or more drums be dropped into the ocean and recovered to determine the effects of water pressure on these drums.

In the discussion that followed the Commission provided the following staff guidance for the waste disposal program:

a. No new licenses for sea disposal are to be issued for the present;

b. Requests for amendments to existing licenses are to be processed;

c. AEC contractors are to be informed that land burial of waste disposal is the preferred method; and

d. New applications for land disposal licenses are to be accepted.

The Commissioners directed the General Manager to establish an experimental program to test various types of packaging for the disposal of radioactive waste.

Matters of Record 13421

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : Managers of Operations
Division Directors

DATE: June 9, 1960

FROM : A. R. Luedecke, General Manager

SUBJECT: DISPOSAL OF PACKAGED RADIOACTIVE WASTES

SYMBOL: PCP:FRD

The Commission has recently announced in the Federal Register the establishment of sites at Oak Ridge and Idaho as interim land burial sites for properly packaged low-level radioactive wastes. The services are being offered to all AEC licensed users of source, special nuclear and by-product materials.

The land burial services at these two sites are available to all AEC contractors not now burying solid radioactive wastes at their sites. The predetermined charges for such burial services will be based on estimated or actual cost as appropriate and will be furnished to you by the Oak Ridge and Idaho Offices. Arrangements for disposal services at these sites should be made through the respective Managers of Operations. Each office should survey all of its operations to assure that appropriate use will be made of the designated land burial sites. In those cases where another disposal method is preferred, the economic evaluation leading to such a decision should be sent to the Director, Division of Production, Washington, D. C.

I would like to have your review completed as soon as possible.

Attachment:
Federal Register Notice

6-9-60

UNITED STATES ATOMIC ENERGY COMMISSION

25 FR 5157-5158 - June 9, 1960

NOTICE OF AEC CHARGES FOR LAND BURIAL OF PACKAGED LOW-LEVEL RADIOACTIVE WASTES

1. This Notice sets forth U. S. Atomic Energy Commission (AEC) charges for land burial of packaged solid waste substances consisting of or contaminated with source, special nuclear or byproduct material and having a low level of radioactivity (packaged low-level radioactive wastes), generated by AEC-licensed users of such materials.

2. Land burial of packaged low-level radioactive wastes will be permitted at AEC sites located near Oak Ridge, Tennessee, and Idaho Falls, Idaho (the sites). Land burials of packaged low-level radioactive wastes have been carried on at the sites for AEC and others for a number of years. The sites have been established as interim land burial sites pending designation of permanent land burial sites.

3. The charges for land burial at the sites are established as $.70 per cubic foot for packaged low-level radioactive wastes, with a minimum charge of $21.00 for batches consisting of 30 cubic feet or less. All charges are f.o.b. the sites. Although these charges are subject to adjustment, the AEC intends to maintain them as stable as possible. Arrangements for land burial of packaged low-level radioactive wastes should be made with the AEC's Oak Ridge Operations Office, for land

burial at Oak Ridge, and with the Idaho Operations Office, for land burial at Idaho Falls. Requests for information concerning terms and conditions of such arrangements should be directed to:

Manager of Operations
P. O. Box E
Oak Ridge, Tennessee

Manager of Operations
P. O. Box 1221
Idaho Falls, Idaho

4. The types of packaged low-level radioactive wastes to which this Notice applies include such items as broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia, etc.

5. Shipments of packaged low-level radioactive wastes to the sites must be made in accordance with the regulations and requirements of transportation regulatory agencies, and the AEC where applicable.

Not to Waste

Vitals
WVJ

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-106
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, June 7, 1960)

SURVEY SHOWS NO ADDED RADIOACTIVITY OFF BOSTON HARBOR; AEC REPORTS ON STUDIES OF OTHER IN-SHORE AREAS

A survey of a site off Boston Harbor formerly used for the disposal of limited quantities of packaged radioactive wastes has not revealed any radioactivity attributable to the disposal operations.

Samples of water, sediments and marine organisms living in the area were collected by the U. S. Coast and Geodetic Survey and were analyzed for radioactivity by the U. S. Public Health Service at its Robert A. Taft Sanitary Engineering Center in Cincinnati. The radioactivity detected was found to be in the same range as that of background activity at other ocean locations where no radioactive wastes have been disposed of.

The site was used under AEC authorization and license from 1952 to August, 1959, by Crossroads Marine Disposal Corp. of Boston for the disposal of low-activity packaged radioactive wastes which had a total of 2,434 curies at the time of disposal. The former site is an area two miles in diameter located at 42 degrees, 25.5 minutes north latitude and 70 degrees, 35 minutes west longtude, 15 miles off Boston Harbor in Massachusetts Bay.

The license of the company was amended by the AEC in August, 1959, to require the firm to carry out its operations in deep water (1,000 fathoms) off the continental shelf. No further use of the area off Boston Harbor for disposal purposes is contemplated. The Commission's present policy is to require that

(more)

C-706

wastes be disposed of in water at least 1,000 fathoms deep and the Commission is not contemplating any change in that policy.

OTHER AREAS SURVEYED

The Massachusetts Bay site is one of four off the New England coast studied during the past year by scientists from the University of Connecticut, the U. S. Coast & Geodetic Survey and the U. S. Public Health Service, working in conjunction with the Bureau of Commercial Fisheries of the U. S. Fish & Wildlife Service. The work was part of a research program financed by the Atomic Energy Commission.

While the studies have indicated that each of the four in-shore locations would be capable of providing sufficient dilution to dispose safely of 250 curies per year of strontium 90 or its equivalent, the Commission has no plan to use or approve the use of these sites. The surveys were conducted from a long-range point of view -- to gather information for use should a need ever arise.

One of the four locations surveyed, the southern half of a restricted area known as No Man's Land and used as a Naval gunnery range, was dropped from consideration. The scientists agreed that the site was safe for the disposal of limited amounts of packaged radioactive wastes, but pointed out that nearby ocean locations are popular with fishermen and tidal and non-tidal currents through the site are predominantly landward.

The two remaining sites studied were a 25-square mile area centered at 42 degrees, 13.4 minutes north latitude and 69 degrees, 45 minutes west longitude, approximately 75 nautical miles northeast of the No Man's Land area and a 25-square mile area centered at 40 degrees, 45 minutes north latitude and 70 degrees, 52.7 minutes west longitude, approximately 28 nautical miles south of the No Man's Land site.

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6760

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

June 8, 1960

MEMORANDUM FOR CHAIRMAN McCONE
COMMISSIONER GRAHAM
COMMISSIONER FLORERG
COMMISSIONERR WILLIAMS
COMMISSIONER WILSON

I attach a memorandum to me of this date from the Director, Division of Licensing and Regulation, giving the status of amendments and applications for sea disposal of low level waste following the Commission meeting of May 6, 1960.

The reaction to our notice to applicants and reaction from public announcement of the availabil ty of two Commission-owned land disposal sites has not been one of particular enthusiasm. I believe it desirable that the Commissioners be informed more specifically with respect to public and applicant reaction to the land burial question as soon as practicable. For this purpose and in order to seek additional guidance, I, with pertinent members of the staff, would like to meet informally with the Commissioners at an early date.

/s/ A. R. Luedecke

General Manager

Attachment
as above

X-PFC-11-Reg By. Product Material

6-8-60

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

June 8, 1960

TO : A. R. Luedecke, General Manager
(THRU) William F. Finan, Assistant General Manager for Regulation and Safety

FROM : H. L. Price, Director
Division of Licensing and Regulation

SUBJECT: PENDING APPLICATIONS FOR AMENDMENTS TO COMMERCIAL SEA DISPOSAL LICENSES

Following the Commission decision on May 6, 1960 announcing a schedule of charges for land disposal at Oak Ridge and Idaho, I sent copies of the press announcement to all applicants for new sea disposal licenses and all applicants for amendments to existing sea disposal licenses inviting their attention to the availability of land burial facilities. To date there have been no withdrawals of any of these applications. In fact, we are receiving numerous calls from the applicants urging action on these applications.

In accordance with the discussion at the above-mentioned Commission meeting, we are first processing the applications for amendments to existing licenses now that we know the applicants want to pursue these amendments.

Some of these amendment requests involve minor revisions in the existing licenses which do not present any substantial safety questions. I have already acted on these by the issuance of amendments. They involve such matters as approval of the qualifications of new supervisory employees and changing the name of a licensee following its acquisition by another company. In granting this type of amendment I have taken the occasion to incorporate some provisions more restrictive than those in the existing licenses, including the more specific designation of disposal sites, the incorporation of more restrictive health physics and administrative procedures, and more restrictive conditions pertaining to transportation. Because these types of amendments did not involve a substantial safety question, the license amendments were issued without prior public notice.

(Parenthetically, I should mention that additionally there are some requests for exemption from track placarding requirements, permission to transport liquids of higher concentration than have previously been authorized, and requests for extended storage of liquids prior to solidification. We propose to deny these requests.

There remains another category of amendment requests dealing with approval of packaging techniques, types of containers, increases in possession limits, and designation of new storage facilities.

While these requests don't involve any new types of safety questions that are different in kind from questions previously acted upon in other cases, they may be interpreted by the general public and the press as presenting a substantially increased possibility of hazard. The question arises, therefore, as to whether prior notice and opportunity for hearing should be given before acting on them.

I propose to publish a 15-day notice and offer of hearing prior to acting on these amendment requests. Prior to such publication, appropriate information letters will be sent to the proper state officials.

I realize that the very act of publishing a prior notice and offering a hearing may engender unwarranted, but nevertheless difficult to handle, public relations problems. For this reason I believe that this procedure should be discussed with the Commission before any action is taken.

We have allowed about 4 weeks to go by since the distribution of the press release on land burial to be sure that these applicants still wanted the sea disposal authorizations they have requested. We are now beginning to receive insistent demands for action. It is clear that these people still want to pursue their sea disposal operations and we must now decide these cases promptly.

I understand that the need for action on some of these amendment requests stems from demands for service by AEC contractors as well as AEC licensees.

I understood at the meeting on May 6 that the Commission wanted to take one step at a time in this matter. The land burial program has now been well publicized. This memorandum explains proposed action with respect to pending amendments to existing sea disposal licenses. There still remains the step to be taken with respect to existing applications for new sea disposal licenses. There are about a half dozen of these applications pending. I will recommend a proposed action on these cases in the near future.

JUN 3 1960

Mr. David C. Eberhart, Director
The Federal Register
National Archives & Record Service
Department of Archives
Register Section
Washington 25, D. C.

Dear Mr. Eberhart:

Attached for publication in the Federal Register as a notice are an original and three certified copies of a document entitled:

Notice of AEC Charges for Land Rental of Federal Government Withdrawn Lands

Publication of the above document at the earliest possible date would be appreciated.

Sincerely yours,

S/ Sydney K. Kingsley

Attorney
Office of the General Counsel

Enclosures:
Original and 3 Cert. Cys

cc: Docket Clerk (LSE) (w/o attachment)
Mr. Hughes (IS) (w/cy of attachment)
V. E. McCool (GMB) (w/y of attachment)
Legal files (w/cy of attachment)
OGC reading files (w/cy of attachment)
Attorney chron. file (w/o attachment)
Legislative Reference Library (Mrs. Lopez)(w/cy of attachment)

Genl Counsel

TROSTEM:dd

5-13-60

6.3.60

UNITED STATES ATOMIC ENERGY COMMISSION

NOTICE OF AEC CHARGES FOR LAND BURIAL OF PACKAGED LOW-LEVEL RADIOACTIVE WASTE

1. This Notice sets forth U. S. Atomic Energy Commission (AEC) charges for land burial of packaged solid waste subsequently consisting of or contaminated with source, special nuclear or byproduct material and having a low level of radioactivity (packaged low-level radioactive waste), generated by AEC-licensed users of such materials.

2. Land burial of packaged low-level radioactive waste will be permitted at AEC sites located near Oak Ridge, Tennessee and Idaho Falls, Idaho (the sites). Land burials of packaged low-level radioactive wastes have been carried on at the sites for AEC and others for a number of years. The sites have been established as interim land burial sites pending designation of permanent land burial sites.

3. The charges for land burial at the sites are established at $.70 per cubic foot for packaged low-level radioactive wastes, with a minimum charge of $21.00 for burdens consisting of 30 cubic feet or less. All charges are f.o.b. the sites. Although these charges are subject to adjustment, the AEC intends to maintain them as stable as possible.

Arrangements for land burial of packaged low-level radioactive wastes should be made with the AEC's Oak Ridge Operations Office, for land burial at Oak Ridge, and with the Idaho Operations Office, for land burial at Idaho Falls. Requests for information concerning terms and conditions of such arrangements should be directed to:

Manager of Operations
P. O. Box E
Oak Ridge, Tennessee

Manager of Operations
P. O. Box 1221
Idaho Falls, Idaho

4. The types of packaged low-level radioactive wastes to which this Notice applies include such items as broken glassware, paper wipes, rags, cubes, animal carcasses, laboratory paraphernalia, etc.

5. Shipments of packaged low-level radioactive wastes to the sites must be made in accordance with the regulations and requirements of transportation regulatory agencies, and the AEC where applicable.

For the Atomic Energy Commission

/s/ G. R. Ludlow
General Manager

Dated at Germantown, Maryland,
this 31st day of May, 1960

Certified to be a true copy of the original

Dated June 3 1960

By Eileen K. Tingley
Certifying Officer

6/1/60

James T. Ramey, Executive Director

Honorable ~~Clinton P. Anderson~~
Chairman, Joint Committee on
Atomic Energy
Congress of the United States

Dear Senator Anderson:

On January 28, 1960, the AEC announced it would establish interim burial sites for packaged low-level radioactive wastes for use by AEC licensees. On May 9, 1960, the AEC announced it had designated Oak Ridge and Idaho as the interim burial sites. The charge for the burial of packaged low-level waste was also included in the May announcement. A copy of the first press release was sent to the Joint Committee on Atomic Energy on January 28, 1960 and the second on May 6, 1960.

The designations of Oak Ridge and Idaho as the interim burial sites and the charges for burial of packaged low-level radioactive wastes will be announced in the Federal Register. A copy of the Federal Register notice is enclosed.

Sincerely yours,

General Manager

Enclosure:
Cy of Fed. Reg. Notice

9-1-60

Materials Waste Lic

5/24/60

A. R. Luedecke, General Manager

THRU : E. J. Bloch, Assistant General Manager for Manufacturing

G. F. Quinn, Director
Division of Production

LAND BURIAL SERVICES

SYMBOL: P:FPB

At meeting 1617 on May 16, 1960, the Commission requested that the availability of land burial services for packaged radioactive wastes be announced by the placing of a Notice in the Federal Register. The Federal Register Notice to be signed by the General Manager is attached.

During the meeting, Commissioner Williams requested a more exact definition of packaged low-level waste. The Notice restricts the waste to solid substances consisting of or contaminated with source, special nuclear or by-product materials. The shipment of such waste must be made in accordance with the applicable regulations. We are advising the sites to prepare a more comprehensive statement of the criteria to include types, activities, forms, etc., for the wastes being accepted for burial.

The acceptance for land burial of radioactive wastes not contaminated by source, special nuclear or by-product material, such as radium, accelerator produced isotopes, has not been fully evaluated by the staff. This type of waste does not fall within the scope of the attached Federal Register Notice. The AEC has recently accepted from the Army Chemical Center radioactive wastes, including radium contaminated waste, for land burial. The Army Chemical Center has been disposing of such waste at sea. We plan to continue furnishing the military land burial services for such wastes and we will investigate the need for the AEC to consider land burial of similar type waste from others.

Enclosure:
Fed. Reg. Notice

9-4-5

UNITED STATES ATOMIC ENERGY COMMISSION

NOTICE OF AEC CHARGES FOR LAND BURIAL OF PACKAGED LOW-LEVEL RADIOACTIVE WASTES

1. This Notice sets forth U. S. Atomic Energy Commission (AEC) charges for land burial of packaged solid waste substances consisting of or contaminated with source, special nuclear or byproduct material and having a low level of radioactivity (packaged low-level radioactive wastes), generated by AEC-licensed users of such materials.

2. Land burial of packaged low-level radioactive wastes will be permitted at AEC sites located near Oak Ridge, Tennessee and Idaho Falls, Idaho (the sites). Land burials of packaged low-level radioactive wastes have been carried on at the sites for AEC and others for a number of years. The sites have been established as interim land burial sites pending designation of permanent land burial sites.

3. The charges for land burial at the sites are established at $.20 per cubic foot for packaged low-level radioactive wastes, with a minimum charge of $21.00 for batches consisting of 30 cubic feet or less. All charges are f.o.b. the sites. Although these charges are subject to adjustment, the AEC intends to maintain them as stable as possible.

Arrangements for land burial of packaged low-level radioactive wastes should be made with the AEC's Oak Ridge Operations Office, for land burial at Oak Ridge, and with the Idaho Operations Office, for land burial at Idaho Falls. Requests for information concerning terms and conditions of such arrangements should be directed to:

Manager of Operations
P. O. Box E
Oak Ridge, Tennessee

Manager of Operations
P. O. Box 1221
Idaho Falls, Idaho

4. The types of packaged low-level radioactive wastes to which this Notice applies include such items as broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia, etc.

5. Shipments of packaged low-level radioactive wastes to the sites must be made in accordance with the regulations and requirements of transportation regulatory agencies, and the AEC where applicable.

For the Atomic Energy Commission

/s/ A. R. Luedecke
General Manager

Dated at Germantown, Maryland,
this 31st day of May, 1960

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-97
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Wednesday, May 25, 1960)

CLINCH RIVER SURVEY STARTED BY EIGHT ORGANIZATIONS

A comprehensive study of the Clinch River downstream from the Oak Ridge area has started with eight state and federal government groups participating.

The study will broaden an existing program conducted by the Atomic Energy Commission's Oak Ridge National Laboratory which has been primarily concerned with health and safety aspects related to release of low-level radioactive waste solutions to the river. ORNL will continue its current program of surveying and sampling to assure that the concentrations of radioactive material in the river are below established limits for drinking water.

The objective of the new joint research program is to determine the dispersion and ultimate fate of radioactive materials released to the river and to evaluate the detailed physical, chemical and biological phenomena involved.

The ecological aspects of the program are designed to study the role that river plant and animal life has on the ultimate distribution of radioactive materials, and to provide information on basic aquatic biology. The study will include a survey of fish.

The joint program is under the supervision and guidance of a steering committee representing the participating organizations. Organizations involved in the study are: Atomic Energy Commission, Oak Ridge National Laboratory, the U. S. Public Health Service and the U. S. Geological Survey under terms of an interagency agreement with the AEC; the Tennessee Game and Fish Commission,

(more)

Tennessee State Health Department, Tennessee Stream Pollution Control Board and Tennessee Valley Authority.

Low-level radioactive liquid wastes are released to the Clinch River from Oak Ridge National Laboratory at White Oak Creek. The waste solutions come from the laboratory's research and chemical processing activities and have been processed through a waste treatment plant prior to discharge to the creek. Waste solutions having a higher radioactive content are stored at the laboratory in underground storage tanks, while intermediate level waste solutions are discharged to large seepage pits which utilize the ion exchange capacity of the soil for removing the radioactivity to acceptable limits. Eventual seepage from the pits is through White Oak Creek.

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(NOTE TO EDITORS & CORRESPONDENTS: This information is being issued simultaneously in Oak Ridge, Tenn. by the Commission's Oak Ridge Operations Office.)

52560

nuclear corporation of america
isotopes specialties company--division

victoria 9-2273

p.o. box 688
170 west providencia
burbank, california

May 18, 1960

Mr. John A. McCone, Chairman
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Chairman McCone:

On May 9, 1960 the United States Atomic Energy Commission issued a press release entitled "AEC DESIGNATES OAK RIDGE AND IDAHO FALLS AS INTERIM LAND BURIAL SITES FOR SOLID, PACKAGED RADIOACTIVE WASTES". This was Release No. C-85. Mr. McCone, Isotopes Specialties Company, a division of Nuclear Corporation of America, wishes to lodge a strong protest against the procedures indicated in this press release.

The first paragraph states "The Atomic Energy Commission has established two interim land burial sites for the disposal of solid, packaged radioactive wastes generated by AEC licensees." The third paragraph states "The sites at Oak Ridge and Idaho Falls are immediately available to licensees for disposal of packaged wastes. Wastes must be packaged as required by Interstate Commerce Commission regulations."

We, at Isotopes Specialties Company, are in complete agreement with the concept of land disposal of radioactive wastes. However, we are in non-agreement with the proposed method of handling this waste. The AEC has had, for several years, a number of licensed waste disposal firms which have been licensed for sea disposal. These firms are, supposedly, completely staffed and equipped to properly and safely handle the wastes. They have a substantial investment in instrumentation, health physics personnel, adequate packaging facilities, and background of "know-how" in the handling of these waste materials. Notwithstanding the aforementioned capabilities, the AEC has found it necessary to inspect and police the waste handling by these licensees.

Mr. McCone, in view of the problems that have been associated with the six or seven licensed waste disposal handlers, can you envision the problems which will arise when several hundred AEC licensees start shipping radioactive wastes to Oak Ridge and Idaho Falls? How does the Commission plan to police these shipments?

09-81-5

Our own experiences include the receipt of several shipments of improperly packaged waste from AEC licensees. As a consequence, we police all shipments prior to their being dispatched to us. What will Idaho Falls do when a shipment of several tons arrives in Idaho and is not properly packaged according to ICC regulations? Will they then return this improperly packaged material to the sender, and thus send it across the Country once again with improper packaging -- or, will they find themselves in the position of having to package it properly prior to waste disposal. When the Commission deals with waste disposal licencees, they always have the privilege of inspection and the threat of license revocation. When dealing with the AEC licensees on byproduct materials, these policing functions become greatly dilated. Actually, the requirement for policing becomes greatly increased, whereas the ability to perform this operation is actually diminished.

We have been informed that political pressure has been applied to eliminate sea disposal of radioactive wastes. We understand that Rhode Island, the Gulf States, Oregon, and even the Country of Mexico, are strenuously objecting. I wonder what the reaction of the various States will be when they are informed that radioactive waste will be transported across their borders with shipments made by people who are not licensed to act in the packaging and transport of radioactive wastes.

In conclusion, Mr. McCone, we strongly protest the mechanics set forth in Press Release No. C-85 for the packaging and shipping of radioactive wastes to the land burial sites. We strongly urge that an amendment to this release be issued in which it is stated that all packaging and shipping must be done by firms providing licensed commercial waste disposal service.

Carbon copies of this letter are being sent to Senators Kuchel and Engel, and to Congressmen Holifield, Hiestand and H. Allen Smith.

Mr. McCone, may we request your early attention and action on our protest and recommendations? Please call upon us if you require any further information on this protest.

Very truly yours,

Dr. Kenneth W. Newman
General Manager

Isotopes Specialties Company
Div. of Nuclear Corporation of America

KWN/bj

cc: Senator Thomas Kuchel
Senator Clair Engel
Congressman Chet Holifield
Congressman Edgar W. Hiestand
Congressman H. Allen Smith

Interim C-12 Reference Sec

UNITED STATES GOVERNMENT ~~OFFICIAL USE ONLY~~

Memorandum

TO : George F. Quinn, Director
Division of Production

DATE: May 10, 1960

FROM : W. B. McCool, Secretary

SUBJECT: BURIAL OF PACKAGED RADIOACTIVE WASTES

SYMBOL: SECY:RVW

1. At Meeting 1617 on May 6, 1960, the Commission:

a. Approved a public announcement such as that contained in Attachment "D" of the April 15, 1960 memorandum to the Commissioners, subject: Burial of Packaged Radioactive Wastes; and

b. Noted that a similar announcement would be placed in the Federal Register but that there would be no waiting period for public comment.

2. The General Manager has directed that you take the action required by the above decision. Please send copies of all pertinent correspondence to the Office of the Secretary.

cc: General Manager
Deputy General Manager
Asst. General Manager
Asst. Gen. Mgr. Mfg.
General Counsel

~~OFFICIAL USE ONLY~~

S-10-60

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : File

DATE: May 9, 1960

FROM : Richard V. Willit R. V. Willit
Recording Secretary

SUBJECT: BURIAL OF PACKAGED RADIOACTIVE WASTES

The attached memorandum dated April 15, 1960,* from the General Manager to the Commissioners was discussed by the Commission at Meeting 1617 on May 6, 1960. The Commission approved the draft public announcement contained in Attachment "D" of the memorandum.

*-filed in Working Package

9-8-60

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-85
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Monday, May 9, 1960)

AEC DESIGNATES OAK RIDGE AND IDAHO FALLS AS INTERIM LAND BURIAL SITES FOR SOLID, PACKAGED RADIOACTIVE WASTES

The Atomic Energy Commission has established two interim land burial sites for the disposal of solid, packaged radioactive wastes generated by AEC licensees. The sites are located at the Commission's Oak Ridge National Laboratory grounds, Oak Ridge, Tenn., and at the National Reactor Testing Station near Idaho Falls, Idaho.

The two sites have been established pending later designation of permanent land burial sites to serve various areas of the country.

The sites at Oak Ridge and Idaho Falls are immediately available to licensees for disposal of packaged wastes. Wastes must be packaged as required by Interstate Commerce Commission regulations. Licensees will pay transportation costs. Charges for burial will be at a rate of 70 cents per cubic foot with a minimum charge of $21 for 30 cubic feet of packaged waste, or less.

The types of radioactive wastes to which the Commission's land burial policy applies include broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia, etc. Highly radioactive liquid wastes resulting from the chemical processing of irradiated fuels removed from reactors will continue to be stored in the specially designed underground storage tanks at the Commission's Idaho Falls, Idaho; Hanford, Wash.; Savannah River, S.C., and Oak Ridge, Tenn., sites.

(more)

5-9-60

Details concerning the disposal service available to licensees may be obtained by writing to:

Mr. E. J. Witkowski
Oak Ridge National Laboratory
P. O. Box F
Oak Ridge, Tenn.

or

Controller Branch
Phillips Petroleum Co.
P.O. Box 2067
Idaho Falls, Idaho

- 30 -

5960

OFFICIAL USE ONLY

June 21, 1960 COPY NO. 2

ATOMIC ENERGY COMMISSION

MEETING NO. 1617

Friday, May 6, 1960, 10:30 a.m., Room 1113-B

D. C. Office

Present	Also Present
John A. McCone	Frank P. Baranowski
John S. Graham	Edward J. Bloch
John H. Williams	William F. Finan
Robert E. Wilson	Paul G. Holsted
	Richard L. Kirk
A. R. Luedecke	Joseph A. Lieberman
Loren K. Olson	Robert Lowenstein
	James R. Mason
W. B. McCool	Courts Oulahan
	Harold L. Price
	George F. Quinn
	Lester R. Rogers
	Ernest B. Tremmel
	Richard V. Willit

Burial of Packaged Radioactive Wastes (See memorandum to Commissioners on this subject, dated April 15, 1960).

The General Manager stated that in response to the Commission's request the staff had prepared a preliminary report on the economics of packaged radioactive waste disposal. The Chairman noted AEC has two dedicated sites for waste disposal and said he believed the Commission should consider the advisability of disposing of low level radioactive wastes in land burial grounds rather than at sea. Mr. Luedecke said the study had revealed that in most instances land disposal would be both feasible and less expensive than sea disposal. The Oak Ridge and Idaho sites would be capable of handling all low level radioactive wastes produced in the U.S. until 1965. He said he believed further study should be given to the need for establishing additional burial sites at a later date, and also to the question of privately operated burial sites.

Mr. Bloch explained the present study dealt only with low level solid wastes which constitute the bulk of waste material from

OFFICIAL USE ONLY

licensees. Transportation costs for this type of waste, that include such things as contaminated gloves and rags, are nominal since it does not require special shielding. Mr. Bloch said he believed nearly all licensees east of the Mississippi River should be able to ship their waste material to Oak Ridge at costs equal to or less than sea disposal. However, highly radioactive wastes from plants located near the coast and requiring concrete shielding probably could be disposed of more cheaply at sea.

The estimated cost of land disposal at the two AEC sites is seventy cents per cubic foot of properly packaged waste with a minimum charge of twenty one dollars for thirty cubic feet or less. Mr. Quinn remarked that the risk of accidental release from the burial ground would not be significantly increased by burying a large amount of waste since there is adequate control of the burial ground.

Mr. Williams emphasized the importance of establishing uniform, enforceable regulations governing the amount of shielding that would be required for various degrees of radioactivity. Mr. Bloch pointed out that the wastes would be packaged to meet Interstate Commerce Commission regulations for the transportation of radioactive material.

In response to a question by the Chairman, Mr. Bloch said the information on comparative costs of sea versus land waste disposal is incomplete, and the staff would broaden the depth and scope of the study in order to obtain more complete data.

Mr. McCone inquired whether there would be a danger of buried waste material leaching radioactivity into the earth and eventually reaching rivers and streams. Mr. Lieberman replied that this possibility would be considered in the selection of any site for waste disposal and conditions around the site would have to be kept under constant surveillance to ensure that no radioactivity was escaping.

The General Manager said he recommended the Commission approve a draft public announcement on the establishment of Oak Ridge and Idaho as interim regional burial sites. (See Attachment "D" to the April 15, 1960, memorandum for the Commissioners, subject: Burial of Packaged Radioactive Wastes.) It was noted the announcement would also be published in the Federal Register in order to inform the interested public.

The Commissioners discussed the effect of the proposed announcement on applications pending for sea disposal licenses and requests for amendments to existing sea disposal licenses. Mr. Luedecke pointed out the announcement would be sent to all applicants with the expectation that those applying for new sea disposal licenses would change to the less expensive land disposal. However, issuance of the announcement would not be intended to terminate existing licenses for sea disposal nor would it be a basis for refusing to consider new applications for sea disposal licenses. It was noted some shipping lines have undertaken waste disposal as a sideline to their regular shipping business and Mr. Finan said companies such as these could not be expected to enter into a land disposal business because of this announcement. Mr. Olson pointed out that if the Commission should issue new licenses for sea disposal, it must be prepared for the filing of protests from various public and private interests. The Chairman said he hoped the announcement would make the economics of land disposal so apparent that there would be no further requests for sea disposal licenses. However, if this should not prove to be the case, the Commission would have to consider other measures. He said the Commission must be careful to avoid an aroused public opinion critical of waste disposal practices.

The Chairman left the meeting at this point.

OFFICIAL USE ONLY

Mr. Graham urged that in studying the establishment of additional land waste disposal sites, other AEC property such as the Nevada Test Site be considered. He commented on the increased demand for land resulting from the nation's rapid population growth and said both the Federal and state governments must be careful to limit their acquisition of new land. Mr. Quinn assured Mr. Graham that AEC property, including the Nevada Test Site would be considered as possible locations for waste disposal.

Following this discussion, the Commission:

Approved a public announcement such as that contained in Attachment "D" of the April 15, 1960 memorandum to the Commissioners, subject: Burial of Packaged Radioactive Wastes.

Noted that a similar announcement would be placed in the Federal Register but that there would be no waiting period for public comment.

W. B. McCool
Secretary

Approved by the Commission: Meeting 1621, May 18, 1960

Materials 1V

March 16, 1960

MEMORANDUM FOR THE FILES OF H. C. [redacted]

At the conclusion of a meeting of the Commissioners in executive session, the Chairman, in the presence of Commissioners Flaherty and Graham, stated that the Commissioners needed further data which would enable an evaluation of the economics of ocean waste disposal.

Also present following the executive session were the General Manager, Messrs. Olson, Rogers, and Lieberman.

The Chairman noted that the Commission already had dedicated sites for land burial and that if the utilization of sites such as these were substantially cheaper than ocean disposal there would be little justification at the present time to press for ocean disposal sites in the face of strong public objection -- despite the fact that such objections might be founded on emotional fears and not on technical facts.

Accordingly, the Chairman requested the General Manager to develop a staff paper regarding the comparative costs of land vs. ocean burial. Assuming (for purposes of the paper) that ocean disposal were to be discontinued pending further research and development, the paper should analyze and tabulate the costs of packaging and transportation, and of compliance with ICC regulations and those state regulations which would appear to be more stringent than ICC regulations. Further, the paper should estimate the quantities of low-level materials destined for disposal in the foreseeable future and the amount of land, both surface and sub-surface, which would be required for the new sites; and other pertinent economic considerations.

The Chairman explained that the request does not stem from any real concern over the health and safety of the public as a result of ocean disposal to date: practices followed and methods authorized have been and are very conservative; the materials involved have been of low-levels, carefully encased and disposed of in deep waters only.

Despite the conservative practices, however, the Chairman also noted that there continued to be a need for a greater body of factual data for which continued research and development is indicated.

[redacted] - 2 -

[redacted]

s/HCB

[redacted]

[redacted]

FORM AEC-204
(8-47)

DATE:

INDEX: Materials-12-Waste Disposal

[redacted]

TO:

FROM:

SUMMARY: AEC 460/57: REPORT ON U.S. PARTICIPATION IN INTERNATIONAL CONFERENCE ON DISPOSAL OF RADIOACTIVE WASTES. Attached is a brief summary report by Joseph Liberman, Division of Reactor Development, on U.S. Participation in the International Conference on Disposal of Radioactive Wastes held during November 16-21, 1959 at Monaco. The conference was under the auspices of the International Atomic Energy Agency.

FILED:

INDEXER: O&M-6-Mtgs. & Conf.

REMARKS: date of paper: 3-18-60

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

3-18-60

★ U. S. GOVERNMENT PRINTING OFFICE—1955—[illegible]

Misc. Waste Disposal

MAR 17 1960

Memorandum to: General Manager

The Commissioners have requested that a full presentation be made to them within two weeks concerning the following economic aspects of low-level radioactive waste disposal:

a. AEC rates and procedures proposed for the disposal of such wastes from private sources at AEC land burial sites, pursuant to AEC 160/12, approved December 15, 1959.

b. Costs to both AEC and private sources of packaging, transportation, and burying such wastes at AEC land burial sites.

c. Costs to private sources of packaging, storing, and handling prior to sea disposal, and costs of disposal at sea.

d. Costs and other economic problems arising from compliance with ICC, state, and local regulations affecting the transportation of such materials for burial at AEC sites.

e. Estimate of quantities of low-level waste for which disposal must be provided, by land burial and otherwise, in the next five years; and, in the case of land disposal, estimate of land required for such burial and availability thereof.

f. Other economic information related to the above questions which the Staff considers material thereto.

(Signed) John A. McCone

John A. McCone

cc: to all Commissioners

3-17-60

AEC

Metro Waste Disposal Proposal

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-35
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Tuesday, March 8, 1960)

AEC CONTRACTS FOR STUDY OF PACIFIC WASTE DISPOSAL SITES

The Atomic Energy Commission has signed a contract with Cleveland Pneumatic Industries, Inc., of Cleveland, Ohio, for a year-long study of underwater conditions at two established waste disposal sites off the California coast.

The study is in line with the Commission's policy of continuing reappraisal of the safety of its waste disposal measures. An earlier survey of the two areas, in April, 1957, did not disclose any detectable amounts of radioactivity attributable to waste disposal operations even in the immediate vicinity of the older of the two sites.

The new survey will be carried out by the contractor's Advanced Systems Development Division, of El Segundo, California, and again will seek to measure the radioactivity, if any, resulting from the disposal of low-level packaged radioactive wastes at the two locations. The company will have associated with it in advisory capacity members of the staff of the Scripps Institution of Oceanography at La Jolla, California.

The older of the two waste disposal areas is centered at approximately 37 degrees, 39 minutes north latitude, 123 degrees, 19 minutes west longitude -- a point in the Pacific Ocean about 52 statute miles west of San Francisco. Disposal activities have been carried out there since 1946. Approximately 21,000 concrete-encased steel drums and 300 concrete boxes containing some 14,000 curies of radioactivity at the time of disposal have been deposited at the site.

(more)

Copy filed in MCS-3-2 Monitoring Program

2 of 2

The second site is in the Santa Cruz Basin, the center of which is approximately 33 degrees, 39 minutes north latitude and 119 degrees, 28 minutes west longitude, a point some 53 statute miles south of Santa Barbara. Sine 1953, 2,950 drums containing 60 curies of radioactivity have been placed at this location.

All disposals of radioactive waste at these sites have been made in depths of 1,000 fathoms or greater, or more than a mile deep.

In the new study, the Advanced Systems Development Division of Cleveland Pneumatic Industries will conduct two oceanographic field surveys at each disposal area at six-month intervals. The first cruise is schedule to begin March 8. Estimated total cost of the study is nearly $60,000.

Samples of marine life will be taken from the ocean floor by means of dredging and from the water above the disposal sites by midwater trawl operations. Bottom samples will also be used for mineral analysis of rock and clay from the sea floor, and gravity core samples will be used to measure rates of sedimentation and the possible uptake of radioactive materials by the deposits. A "profile" of water samples will be taken from top to bottom.

Water current measurements will include a check of surface currents, dispersion and bottom current velocity and direction. Laboratory work will include an analysis for radioactivity of all samples of seawater, sediments and marine life.

A unique feature of the survey will be a photographic exploration of a sizable portion of the ocean floor at each site in an effort to obtain pictures both of marine life and of the condition of drums containing the disposed radioactive material. Knowledge of the types of marine life at the sites is important in the study of the relation of radioactivity in the waters, if any, to the food chain.

The company will traverse each area by means of the survey ship Decatur, a converted minesweeper. Photographic equipment will be suspended from the vessel to a point about 10 feet above the bottom and pictures will be taken every 12 seconds at a

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towing speed of one knot. About 600 pictures are expected to be produced during each two-hour lowering of the underwater camera.

During the survey operations, each of the two sites is to be permanently marked by buoys attached to deep water mooring apparatus developed by the company. A special feature of the apparatus is the anchoring system which includes a pair of imbedment anchors that will be fired by self-contained explosive charges into the ocean floor. The mooring system will provide fixed reference points for the sites.

The State of California has been invited by the Commission, and has accepted the invitation, to observe the conduct of the ocean survey and the subsequent laboratory operations.

Upon completion of the study, the results will be made available to the public.

- 30 -

(Note to Editors & Correspondents: This information is being released simultaneously by the Commission's San Francisco Operations Office at Oakland, California.)

AEC 719/31

ESTABLISHMENT OF A RADIATION PROCESSED FOODS PROGRAM

The above paper and any subsequent material on
Food Radiation Program see: Materials 12 Food Radiation Program

FORM AEC-304
(9-57)

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

DATE:

INDEX: Materials 12

[redacted]

TO:

FROM:

SUMMARY: Memo for the Commissioners & GM re Meeting with New Jersey Delegation to Discuss Atomic Industrial Park. This mtg. will be with the Commissioners, also there will be a briefing by the AEC staff on the subject of ocean waste disposal.

FILED: IR&A 6 Power

INDEXER: date of memo: 2-10-60

REMARKS:

THIS PAGE ONLY

OFFICIAL USE ONLY

Office Memorandum · UNITED STATES GOVERNMENT

TO : File DATE: February 9, 1960

FROM : Richard T. Willis

SUBJECT: REVISION OF LETTER TO JCAE REGARDING AEC 180/12 - PROPOSED POLICY FOR HANDLING PACKAGED RADIOACTIVE WASTES

This will confirm for the Commissions records that this office was informed by Mr. William E. Hughes of Information Service, the latter contained in AEC 180/12, as originally approved by the Commissioners at Meeting 1573 on December 15, 1959, carried mention of specific program sites for disposal, one of which was Oak Ridge. Subsequently, Oak Ridge requested time for administrative preparation before public release of this decision. As the original letter was approved by the Commission, the deletion of specific sites required the General Manager's approval. This approval was obtained and the letter was forwarded to the JCAE on January 28, 1960.

OFFICIAL USE ONLY

Material 12

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.
JAN 29 1960

Mr. David C. Eberhart, Director
Office of the Federal Register
National Archives & Record Service
Washington 25, D. C.

Dear Mr. Eberhart:

Attached for publication in the Federal Register as a Notice are an original and three certified copies of a document entitled: ATOMIC ENERGY COMMISSION; 10 CFR Part 20; STANDARDS FOR PROTECTION AGAINST RADIATION.

Please advise the Commission of the filing and publication dates of this proposed rule by telephoning Code 119, Extension 3446 (Clare Miles).

Publication of the above document at the earliest possible date would be appreciated.

Sincerely yours,

Attorney
Office of the General Counsel

Enclosures:
Original and 3 Cert. Cys.

cc: Docket Clerk (L&R) (w/o attachment)
Wm. Hughes (IS) (w/cy of attachment)
W. B. McCool (GMS) (w/cy of attachment)
Legal Files (w/cy of attachment)
Madeleine W. Losee (IS) (w/cy of attachment)
OGC Reading File (w/cy of attachment)
OGC Chronological File (w/o attachment)

OEC 180/12

1-29-60

ATOMIC ENERGY COMMISSION

10 CFR PART 20

STANDARDS FOR PROTECTION AGAINST RADIATION

The following amendment is designed to prohibit issuances of licenses which would authorize the disposal of radioactive waste materials on privately owned sites by persons engaged in commercial radioactive waste disposal activities.

Notice is hereby given that adoption of the following amendment is under consideration. All interested persons who desire to submit written comments and suggestions relating to the following amendment should send them to the U. S. Atomic Energy Commission, Washington 25, D. C., Attention: Director, Division of Licensing and Regulation, within 30 days after publication of this notice in Federal Register.

Section 20.304 is amended by adding the following at the end of the section:

> The Commission will not approve any application for license to receive licensed material from other persons for disposal on land not owned by the Federal or State governments.

Dated at Germantown, Maryland, this 28 day of January 1960.

For the Atomic Energy Commission

General Manager

AEC

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WVV

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. C-12
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Thursday, January 28, 1960)

AEC FORMULATES POLICY FOR LAND DISPOSAL OF RADIOACTIVE WASTES; GOVERNMENT-CONTROLLED SITES TO BE ESTABLISHED AS NEEDED

The Atomic Energy Commission has determined that regional disposal sites for permanent disposal of low-level packaged radioactive waste materials shall be established, as needed, on State or Federal Government-owned land.

Placement of the waste materials in Government-owned lands, under long-term Government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

Preliminary to the selection of regional sites, the Commission would conduct detailed studies of the geologic, hydrologic and topographic factors in connection with any proposed site in order to ascertain that a proposed site would retain the buried materials without contamination of the environment. Once a site is put into use, monitoring procedures will be established to insure that the operations are performed in a manner which will not endanger the surrounding area.

The Commission does not contemplate that the ownership and control of the sites must necessarily be restricted to the Federal Government. As the atomic energy industry grows and the need for new sites is established, the Commission anticipates that State Governments may wish to assume some responsibility in the establishment and control of sites for the benefit of their citizens.

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Copy filed: PTC-1-1 Reg Rad Protection Reg.

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The publicly-owned disposal installations would be operated by private contractors or licensees under strict Government controls or by the Federal or State Government and would be available to all users of radioactive materials. Currently a number of Commission licensees are disposing of low-level waste material by transfer to commercial sea disposal firms operating under Commission license. Such activities would be affected by the Commission's land disposal policy only if convenience or economic factors induce disposal firms to use land burial facilities in preference to sea disposal sites.

Land requirements for disposal sites will not be large, as evidenced by the fact that over the last 15 years low-level solid or packaged wastes at Oak Ridge have been safely handled in approximately 60 acres. On the basis of this experience it is estimated that all such wastes generated between now and 1980 in the 16 states in the Northeast area, for example, could be safely disposed of in a 200 to 300 acre site.

Long-range estimates of the need for waste disposal facilities, arising out of the growth of the atomic energy industry, indicate that the establishment of the land disposal facilities will be required from time to time to insure continued maximum protection of the public health and safety.

It is expected that the first regional site will be needed in the northeastern part of the country where there is a relatively heavy and growing concentration of industrial, medical, university and other users of radioisotopes. The needs of other regions will be met later on as they develop.

Meanwhile, pending the establishment of permanent sites, consideration is being given to the use of interim sites located at AEC installations.

The types of low-level wastes to which the Commission's policy applies include broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia and other similar things which can no longer be used in experiments. Low-level liquid wastes are treated and disposed of at their points of origin under existing Government controls and regulations. High level wastes resulting from the chemical processing of irradiated fuels removed from reactors will continue to be stored in the

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specially designed underground storage tanks at the Commission's Idaho; Hanford, Washington; and Savannah River, South Carolina, sites where these fuel elements are processed.

A pricing schedule for use of the land burial facilities is being established by the Commission. When the schedule is completed it will be published along with instructions detailing the procedures to be followed in disposal of wastes at approved sites.

In connection with the policy announced today, the Commission will propose an appropriate amendment of its regulation on standards for protection against radiation (Part 20). Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State Governments. The proposed amendment will be published in the Federal Register in the next few days. Interested persons may submit written comment within 30 days after publication.

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B-421

JAN 28 1960

Honorable Herbert B. Loper
Chairman, Military Liaison Committee
to the Atomic Energy Commission
Washington 25, D. C.

Dear General Loper:

This is to inform you that the Atomic Energy Commission has approved a policy providing for the establishment on government-owned land of permanent regional disposal sites for solid packaged radioactive wastes, from AEC licensees and contractors, exceeding the limits established in 10 CFR 20. In taking this position the Commission is not, at this time, drawing a distinction between the Federal and State governments and expects that as the industry develops, the states will become more and more interested in providing these services for their citizens. However, in keeping with its responsibility for assuring the continued protection of the health and safety of the public, it is believed these facilities should be provided under government ownership and control since we have not been able to satisfactorily answer many questions regarding the responsibility for long-term aspects of such operations conducted on privately owned land.

The AEC plans to carry out the necessary investigations for the selection of sites which will be suitable for safe operation. In addition, the AEC will establish the necessary monitoring procedures to assure that operations are carried out without adversely affecting the public health and safety.

In the interim period, until requirements for additional facilities are established and specific site evaluations made, AEC is considering the establishment of interim sites located at AEC installations.

To the extent that establishment of additional sites by the Federal Government proves necessary, every effort will be made to make use of existing government-owned land. However,

AEC 150/12

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the primary objective is the continued protection of the health and safety of the public and it might be necessary, at some later date, to request legislation authorizing acquisition of private land where suitable government-owned land does not exist or cannot be made available.

The pricing structure to be adopted by AEC in connection with recovering costs associated with providing this service to private organizations or individuals during the interim period will be in accordance with existing policies of full cost recovery.

A copy of the announcement to the public is enclosed.

In connection with the policy, the Commission is preparing an appropriate amendment of its regulations on standards for protection against radiation (Part 20), copy enclosed. Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State governments. The proposed amendment will be published in the Federal Register, and interested persons will be invited to submit written comments and suggestions.

Sincerely yours,

SIGNED, A. R. LUEDECKE[1]

General Manager

Enclosures

CC's: General Manager
GME
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B&M
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PROD
DIS

January 28, 1960

Dr. Warren G. Johnson, Chairman
General Advisory Committee
to the Atomic Energy Commission
Washington 25, D. C.

Dear Dr. Johnson:

This is to inform you that the Atomic Energy Commission has approved a policy providing for the establishment on government-owned land of permanent regional disposal sites for solid packaged radioactive wastes, from AEC licensees and contractors, exceeding the limits established in 10 CFR 20. In taking this position the Commission is not, at this time, drawing a distinction between the Federal and State governments and expects that as the industry develops, the states will become more and more interested in providing these services for their citizens. However, in keeping with its responsibility for assuring the continued protection of the health and safety of the public, it is believed these facilities should be provided under government ownership and control since we have not been able to satisfactorily answer many questions regarding the responsibility for long-term aspects of such operations conducted on privately owned land.

The AEC plans to carry out the necessary investigations for the selection of sites which will be suitable for safe operation. In addition, the AEC will establish the necessary monitoring procedures to assure that operations are carried out without adversely affecting the public health and safety.

In the interim period, until requirements for additional facilities are established and specific site evaluations made, AEC is considering the establishment of interim sites located at AEC installations.

To the extent that establishment of additional sites by the Federal Government proves necessary, every effort will be made to make use of existing government-owned land. However,

the primary objective is the continued protection of the health and safety of the public and it might be necessary, at some later date, to request legislation authorizing acquisition of private land where suitable government-owned land does not exist or cannot be made available.

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Sincerely yours,

SIGNED, A. R. LUEDECKE

General Manager

Enclosures
CC's: General Manager
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JAN 28 1960

Honorable Clinton P. Anderson
Chairman, Joint Committee on Atomic Energy
Congress of the United States

Dear Senator Anderson:

This is to inform you that the Atomic Energy Commission has approved a policy providing for the establishment on government-owned land of permanent regional disposal sites for solid packaged radioactive wastes, from AEC licensees and contractors, exceeding the limits established in 10 CFR 20. In taking this position the Commission is now, at this time, drawing a distinction between the Federal and State governments and expects that as the industry develops, the states will become more and more interested in providing these services for their citizens. However, in keeping with its responsibility for assuring the continued protection of the health and safety of the public, it is believed these facilities should be provided under government ownership and control since we have not been able to satisfactorily answer many questions regarding the responsibility for long-term aspects of such operations conducted on privately owned land.

The AEC plans to carry out the necessary investigations for the selection of sites which will be suitable for safe operation. In addition, the AEC will establish the necessary monitoring procedures to assure that operations are carried out without adversely affecting the public health and safety.

In the interim period, until requirements for additional facilities are established and specific site evaluations made, AEC is considering the establishment of interim sites located at AEC installations.

To the extent that establishment of additional sites by the Federal Government proves necessary, every effort will be made to make use of existing government-owned land. However,

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the primary objective is the continued protection of the health and safety of the public and it might be necessary, at some later date, to request legislation authorizing acquisition of private land where suitable government-owned land does not exist or cannot be made available.

The pricing structure to be adopted by AEC in connection with recovering costs associated with providing this service to private organizations or individuals during the interim period will be in accordance with existing policies of full cost recovery.

A copy of the announcement to the public is enclosed.

In connection with the policy, the Commission is preparing an appropriate amendment of its regulations on standards for protection against radiation (Part 20), copy enclosed. Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State governments. The proposed amendment will be published in the Federal Register, and interested persons will be invited to submit written comments and suggestions.

Sincerely yours,

SIGNED, K. E. LUEDECKE

General Manager

Enclosures

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UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. S-2-60
Tel. HAzelwood 7-7831
Ext. 3446

FOR RELEASE AT 3:00 P.M., EST
Wednesday, January 27, 1960

Remarks Prepared by Joseph A. Lieberman*, Chief
Environmental & Sanitary Engineering Branch
U. S. Atomic Energy Commission
For Delivery to the Second Sanitary Engineering Conference
on Radiological Aspects of Water Supplies
University of Illinois, Urbana, Ill.
January 27, 1960

NUCLEAR ENERGY INDUSTRIAL WASTES

The management of radioactive wastes which includes their handling, treatment and disposal is a general problem whose thread runs through the complete fabric of nuclear energy operations. In this regard, the infant nuclear industry is no different than other industrial activities in that wastes are evolved in one form or another. Indeed, one index of the progress of industry is the effectiveness with which it manages its wastes to minimize their deleterious effects on man and his environment.

In the peaceful day-to-day application of the benefits of nuclear technology, the disposal of radioactive wastes potentially represents perhaps the major "non-beneficial" effect on the public and its resources. Accordingly, this aspect of nuclear energy operations is of direct interest and concern to the public and a wide variety of scientific and technical disciplines, including the water supply specialist.

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* In collaboration with David C. Costello, Jr., Sanitary Engineer, Environmental & Engineering Branch

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Radioactive wastes in either gaseous, liquid, or solid forms are evolved in essentially all operations associated with nuclear energy facilities beginning with mining of ore, through feed material production, reactor operation, chemical reprocessing of reactor fuels and a wide variety of uses of radiation in medicine, agriculture and industry.

Because of the nature and characteristics of the radioactivity involved, including, in specific instances, long effective life, its ability to damage human tissue, and its potential danger as an environmental contaminant, the safe handling and final disposal of radioactive wastes are integral and important aspects of nuclear operations. This importance is attested to by the efforts expended in the atomic energy program to date on this subject. More money probably has been spent, and more scientific and technological effort concentrated on facilities, operations and research with regard to this industrial waste, than on any other industrial contaminant we have known. At the present time at Atomic Energy Commission installations, there is an investment of approximately $200,000,000 in facilities for the handling, treatment and disposal of the wastes, while the estimated annual operating cost for these facilities is approximately $6,000,000.

It has been said a number of times that the widespread peaceful and beneficial application of nuclear technology will depend to a considerable degree on our ability to find practical solutions to problems of waste handling and disposal associated with nuclear operations. While it reasonably can be argued that no industry can be considered a mature segment of our economy unless and until it handles and disposes of its wastes in an acceptable manner, there is sufficient basis for the belief that the nuclear energy industry can develop in a rational way without being "bottle-necked" by its own wastes. This conviction should not, however, carry the implication that specific answers are immediately available for all problems in this field. Much research, development, pilot plant testing and field evaluation have yet to be done before firm engineering conclusions will be possible for all situations.

In order to keep the public and others having special interest in the treatment and disposal of radioactive wastes informed, public hearings were held last year before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy.

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The record of this hearing has been published in 5 volumes which cover more than 3,000 pages and represents the most comprehensive collection of technical information available on this subject.

The summary of the results of these hearings concluded that:

1. The management or disposal of radioactive wastes is not a single problem with a single solution. It varies widely, depending on the specific nature, concentration and quantity of radioactive materials involved, and on the specific environment in which it must be considered.

   The wastes can be considered in two classes which, if not sharply delineated, at least do have major differences in their nature, volume, hazard, and control: they are "low-level" and "high-level" wastes. "Low-level wastes" have a radioactivity concentration in the range of one microcurie per gallon. By way of contrast, some "high-level wastes" have concentrations of hundreds or thousands of curies per gallon -- and thus can be more than a million times more concentrated than "low-level wastes." In terms of volumes of wastes generated, billions of gallons of low-level wastes are produced each year (which are treated and dispersed as described below), whereas the volume of high-level wastes produced is much more limited. Since the beginning of the atomic program, 65 million gallons of high-level wastes have accumulated, all contained in underground storage tanks.

2. According to scientific experts who testified during the hearings, radioactive waste management and disposal practices have not resulted in any harmful effect on the public, its environment or its resources. Extensive monitoring programs have shown that concentrations of radioactivity released to the environment are well within established permissible limits. Detailed monitoring and control must be maintained in connection with waste management operations on a continuing basis for generations.

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3. Low-level wastes are being dispersed into the air, ground and water under careful control and management with or without treatment as required. The problem may be expected to increase as the nuclear-power industry increases in size or if acceptable limits of radioactivity in the environment are further reduced.

4. The final disposal of high-level wastes associated with the chemical reprocessing of irradiated nuclear fuels represents an aspect of the problem that, while safely contained for the present and immediate future, has not yet been solved in a practical, long-term engineering sense at the present time. The practice today is to reduce high-level wates in volume, if possible, and to contain or hold them in tanks. It was the consensus that tank storage is not an ultimate solution in itself but that temporary (2 - 10 years) tank storage will be an integral part of any ultimate system. Although apparently feasible solutions to the problem of ultimate disposal of high-level waste are in various stages of development, at least several years of pilot plant, prototype, and field-scale testing will be required before engineering practicality can be demonstrated.

5. It will always be necessary to use the diluting power of the environment to some extent in handling low-level waste. Present dispersal methods have been demonstrated to result in concentrations well below established permissible limits. The cost of "absolutely" processing or containing all these large volumes would be prohibitive. Since the release of even small amounts of high-level waste would use up large amounts of environment dilution capacity, the reservation of this capacity for the low-level waste where it is needed becomes another reason (in addition to protection of man and other biota) for containing the high-level waste.

6. Suggestions for final disposal of high-level wastes include:

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a. Conversion to solids by one of several methods,

b. Storage of solids in selected geological strata with major emphasis on salt beds,

c. Disposal of liquids into geological strata - either deep wells or salt beds, and

d. Disposal of liquids or solids into the sea.

Although a number of possibilities were described during the hearings, the conversion to solids and storage of these wastes in salt formations seemed to be the most favored at this time. The least favored was disposal of high-level wastes in the sea.

7. Some radioactive wastes have been disposed into the sea, but it should be emphasized that these were of a low-level, solid, packaged variety. Disposal of high-level chemical reprocessing wastes at sea is not contemplated by the Commission at this time.

8. It was generally agreed that separation of specific fission products (such as Strontium-90 and Cesium-137) only for their industrial utilization would not affect appreciably the waste disposal problem.

9. The long-term responsibilities, particularly those associated with the protection of public health, safety and natural resources, must be borne by agencies of the public at various levels of Government, but primarily the Federal. However, industry, under proper regulations, can and must ultimately assume greater responsibilities and initiative in connection with actual physical handling and disposal operations.

10. International aspects of the problem are important considerations, particularly in connection with disposal into the seas and operation of nuclear-propelled vessels and aircraft. It is essential that competent international agencies attack these problems at an early date and on a continuing basis.

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11. Initial waste disposal costs, though large in absolute numbers, appear to be a relatively small fraction of unit nuclear-power costs and within the realm of economic practicality. It must be emphasized that these economic conclusions are, at the present time, based on calculation rather than on demonstration. There does not appear to be anything inherent in the general waste problem that need retard the development of the nuclear-energy industry with full protection of the public health and safety if a bold and imaginative, yet realistic, research and development program is carried out.

12. From an environmental health and safety standpoint, the types of potential waste-management problems which will require continued efforts and supervision in the future are as follows:

    a. Controlled releases of low-level wastes under careful supervision to protect the environs from various nuclear energy operations,

    b. Possible leaching of small fractions of high-level wastes from underground storage sites, and

    c. Accidental, irregular releases from nuclear energy operations.

Based on projections of nuclear power growth in the United States, it has been estimated during the hearings that it would be 20 to 25 years before the national waste storage demand for high-level wastes from nuclear power would equal the present volume of about 50 million gallons in storage at Hanford, Washington. With new chemical processing and waste treatment systems, there are reasonable prospects for reduction of these volumes. Vigorous efforts should be continued in the research program to find a "foolproof" method for fixation of high-level wastes into solids in less than 20 to 25 years.

The technology for control of low-level wastes appears to be sufficiently straightforward so that the contribution of

radiation exposure from waste-dispersal operations can continue to be a small percentage of the total exposure of man from all radiation sources. Nonetheless, care should be taken to control buildup of contaminants in individual links of the food chain from particular environmental concentration factors that might prevail.

The International Commission on Radiological Protection has recommended that maximum permissible radiation exposure for the population at large from environmental contamination of all sources should be about one-third of the average radiation exposure from medical sources. Testimony during the Congressional hearings indicated that it is not expected that waste-disposal activities alone will use up all of this in the foreseeable future.

It is important to emphasize that the management of radioactive wastes, from an environmental and engineering standpoint particularly, cannot be considered as a single problem with a single, optimum solution. The great variation in the characteristics of the waste from various processes, including half-life, chemical state and concentration, physical nature, quantities and location of the nuclear facility are all important in assessing the significance of the hazard and in establishing design and operating criteria for waste handling.

The major objective of waste management is control over the radiation hazards. Obviously, this involves control over the mobility in the environment of the waste products themselves. This introduces the two basic waste disposal concepts that are applicable to the waste problem in its broadest sense. The radioactive materials may be permanently confined or isolated within restricted areas, away from people and their resources. This is the concept of "concentrate and contain." On the other hand, the radioactivity may be irreversibly reduced to safe levels by dilution in nature. This is the concept of "dilute and disperse." For example, with suitable environmental conditions, certain types of laboratory liquid wastes at radiation levels of only a few times greater than drinking water standards may be disposed of under the latter concept. On the other hand, highly active liquid wastes from the chemical processing plants must be handled under the former philosophy. For all practical purposes, the

wastes from chemical processing contain, by far, the greatest concentrations and total quantities of radioactivity and constitute the bulk of the long-term technological problem of waste disposal. It should be emphasized, however, that the fact that wastes containing smaller quantities of radioactivity may be amenable to direct dispersal in the environment makes it inherently important to carefully control such operations to assure that the safe capacity of the environment is not exceeded.

Characteristics of gaseous and/or airborne particulate wastes vary widely depending upon the nature of the operation from which they originate. In gaseous form they may range from rare gases, difficult to remove, such as Argon (A^{41}) from air-cooled reactors, to highly corrosive gases such as hydrogen fluoride (HF) from chemical and metallurgical processes. Particulate materials (aerosols) may be organic or inorganic and range in size from less than 0.05 microns to 20 microns. The smaller particles originate from metallurgical fumes caused by oxidation or vaporization. The larger particles may be acid mist droplets which are low in specific gravity and may remain suspended in air or gas streams for longer periods. An outstanding feature of air cleaning requirements for many nuclear energy operations results from the extremely small permissible concentrations of various nuclides in the atmosphere. Often removal efficiencies of the order of 99.9 percent or greater for particles less than 1 micron in diameter are necessary. These criteria are much more stringent than heretofore encountered in industrial hygiene engineering. Atmospheric diffusion and dispersion must be quantitatively evaluated so these factors can be utilized in establishing the design criteria for air cleaning systems.

Solid radioactive wastes such as non-usable contaminated equipment, non-recoverable scrap, and contaminated trash which are produced in all operations do not constitute a serious technical problem. However, if inadequate provisions are made for their proper handling and disposal, they could be a distinct nuisance and, under certain circumstances, even a hazard. The levels of radioactivity here vary from a few times background to quantities requiring substantial shielding or remote handling. The engineering of systems for handling and disposal of solid wastes has been relatively simple. Burial of such wastes under known controlled conditions and, in specific instances, disposal at sea have successfully and safely handled the problem.

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In the United States, established burial grounds for solid radioactive wastes exist only at large atomic energy production and development sites such as Oak Ridge, Idaho, Hanford, Savannah River Plant and Los Alamos. These facilities are in isolated areas with detailed geology and hydrology generally favorable to burial ground location. Within AEC, the operating establishments other than those noted above, c.f. Argonne National Laboratory and Knolls Atomic Power Plant, are in relatively small areas near densely populated sections with perhaps less favorable geology and hydrology. In these cases, the general procedure is not to dispose of wastes on site but to ship to one of the established burial grounds for final disposition.

The radioactive material involved in AEC sea disposal operations off both the Atlantic and Pacific Coasts is of a relatively low or intermediate level. The wastes originate in various AEC research and development operations and in research laboratories of hospitals, universities, etc., and are packaged within concrete in 55-gallon drums or in preformed, reinforced concrete boxes before disposal.

Since 1951 the AEC has disposed of less than 8,000 curies (at the time of disposal) into the Atlantic Ocean. This material has been contained in approximately 23,000 55-gallon drums.

In the Pacific Ocean, disposal operations began in 1946 and since then approximately 14,000 curies (at the time of disposal) contained in about 21,000 drums and 329 concrete boxes have been disposed off San Francisco coast in one area. Also since 1953 about 60 curies contained in about 2,950 55-gallon drums have been disposed in a second Pacific Ocean area.

All of these disposals are in depths of water of a thousand fathoms or greater. The radioactivity content ranges from about one-half a millicurie to 1.5 curies per drum for the solid wastes -- with most around one-half curie or less -- and from one-half millicurie to 1.5 curies per drum for the solidified liquid wastes at the time of disposal. It is our belief that these sea disposal operations are being carried out in a manner that is safe and adequate. This belief is based upon:

(1) views of experts in the marine sciences and other pertinent fields,

(2) the actual operating experience of the British in disposing of greater quantities of radioactive material in a more mobile (liquid) state, and

(3) the preliminary, but direct information obtained in both the Atlantic and Pacific Ocean disposal areas in actual field studies.

To further delineate the basis for our belief in the safety of the AEC's sea disposal operations, we would cite the recent report of the National Academy of Sciences-National Research Council (Publication 655, "Radioactive Waste Disposal into Atlantic and Gulf Coastal Waters"). The group of marine scientists that prepared this report indicated, after careful and conservative consideration of the various factors involved, that it would be feasible to dispose safely solid, packaged wastes of the type previously described at several inshore, shallower water locations along the Atlantic and Gulf Coasts. This, however, was only a feasibility study and actual disposal operations at these sites are not currently planned.

Liquid radioactive wastes are evolved in all nuclear energy operations from laboratory research to full-scale production. As previously indicated, it is important to differentiate between what we call a "high-volume, low-level" waste; for example, the contaminated laundry waste which may contain say a few microcuries of radioactivity per gallon and a "low-volume, high-level" waste resulting from chemical processing of nuclear reactor fuels which may contain up to 1,800 or more curies per gallon. Although both of these categories are radioactive wastes and both are liquid, the similarity ends right there. The engineering problems of handling and disposing of these two categories are entirely different.

During the milling operations of the nuclear fuel cycle, liquid effluents are evolved that present potential stream pollution problems due to the dissolved radium in the effluents. Present indications are that the major portion of the radium found in the streams is associated with the suspended solids discharge

and is amenable to control by available waste treatment methods. At the present time the AEC in cooperation with the U.S. Public Health Service is engaged in field studies that will result in an industrial waste guide for the uranium milling industry.

Liquid wastes with low concentrations of radioactivity originate in laboratory operations where relatively small quantities of radioactive materials are involved, ore and feed material processing, the normal operation of essentially all reactors, and also chemical processing plants. These low activity wastes, under proper environmental conditions, are susceptible to either direct disposal to nature or to disposal following minimum treatment as co-precipitation, ion-exchange, biological systems and others. Because of their relatively high volume, total costs for treatment may be substantial. Therefore, to the extent that it is absolutely safe, use is made of dilution factors that may be available in the environment and that can be assessed quantitatively. This points up the importance of proper site selection and quantitative environmental data for nuclear energy facilities.

The routine operation of power reactors produces relatively small quantities of low-level wastes. The Shippingport Reactor (PWR), as an example, uses recirculated pressurized water as reactor coolant. Activity builds up in the coolant due to activation of corrosion products, formation of tritium from lithium hydroxide used to raise the pH for corrosion control, and from possible fission products introduced by fuel ruptures. To limit the buildup of these contaminants, the coolant is continuously purified by circulating a portion of it through a bypass demineralizer.

It is significant to note that in the first year of plant operation, the total quantity of radioactivity discharged (into the Ohio River) was about 0.04 curies of mixed isotopes and about 50 curies of tritium. Both of these quantities are much less than the permissible discharge for a single month.

High-activity liquid wastes associated with the chemical processing of reactor fuels constitute the bulk of the technological problem of waste disposal. It should be pointed out clearly that these wastes do not come directly from the reactors themselves, although under the improbable conditions of reactor

malfunction some high-activity waste material may result. In the future, such wastes also may be associated with certain types of homogeneous reactors to the extent that continuous fuel processing right at the reactor is envisioned. At present (and for the immediate future), chemical processing plants are essentially the sole source of the wastes.

Chemical processing of reactor fuels is done to separate and recover unfissioned or unburned fuel from the desired product and the wastes. At the present time, this means, for the most part, separating uranium, plutonium and fission products.

The quantity of high-level wastes generated depends largely upon the chemical and metallurgical characteristics of the fuel being processed and the specific nature of the chemical process involved. It may range from 0.1 gallons to perhaps 1.5 gallons per gram of uranium processed. On a total volume basis it is estimated that we have to consider waste production rates on the order of tens of millions of gallons per year.

From the viewpoint of the environmentalist, it is perhaps misleading to apply the term "disposal" to current methods of handling highly radioactive liquid wastes. With only minor exceptions, these wastes are not "disposed of" but are stored in specially designed tanks. Since the effective life of the fission products constituting the wastes may be measured in terms of hundreds of years, it is apparent that tank storage is not a permanent, long-term answer to the disposal problem. The capital cost of tank storage varies from about $0.30 to roughly $2.00 per gallon capacity.

Based on various estimates on the growth of our nuclear power industry, one can calculate the total cumulative quantity of radioactivity to be disposed of in the future. Depending upon whose nuclear energy growth estimates are used, the radioactivity accumulations range from about 3 billion to 20 billion curies in 1965 to about 400 billion to 1000 billion in the year 2000. Now, when one considers the generally extremely low maximum permissible concentrations of radioactivity in air and water, it becomes apparent that there is not enough dilution available in nature to enable any practical, continuing dispersal of these wastes into the environment. The application of the dilute and disperse philosophy does not appear to be a very good possibility.

(more)

A possible exception, but somewhat academic at the present time, is disposal at sea. Most proposals for this approach envision the utilization of the vast dilution volumes in the oceans as the primary basis of the operation. However, from an oceanographic viewpoint, the quantitative assessment of dilution, diffusion or transport in large water masses of the ocean is rather difficult. Also, the degree of reconcentration of radioactivity in marine life and its long-term ecological implications is surrounded by considerable uncertainty at present. This existing lack of quantitative oceanographic information, when added to the substantial problems of handling and transporting highly radioactive materials to possible suitable disposal sites and the actual placing of these materials in specific ocean depths, lead one to rather negative conclusions regarding the disposal of significant quantities of high-level wastes at sea.

The AEC is carrying out an extensive research and development program in the field of waste management. In general, the projects may be categorized in terms of the types of wastes involved.

A substantial part of present development efforts in low-level waste management relate to geophysical and environmental aspects of dispersal operations. These features deserve emphasis on two counts. First, from the standpoint of direct waste dispersal operations, a quantitative evaluation of the specific behavior of the atmosphere, hydrosphere and lithosphere at the location involved is imperative if rational engineering criteria for waste facilities and their performance are to be established. Second, the environmental aspects of the site of the nuclear plant as they relate to effluent control, potential hazards and plant design should be considered early in site selection.

The use of surface waterways for dispersal of certain low-level liquid wastes is actively practiced at a number of AEC operated installations in the United States. The utilization of available dilution factors in these waterways is predicated upon a quantitative determination of specific dilution and/or concentration phenomena. Although certain principles of environmental behavior may be generally applicable, it is important to recognize the variability of the environment and its effect on actual

quantities of radioactivity that may be dispersed. In addition, it is equally important that active programs of control be continuously maintained to assure that the safe capacity of specific environments is not exceeded.

In general, the operating philosophy that prevails is that such environmental dilution factors may be utilized in waste dispersal if it can be demonstrated (by studies as indicated above) that these practices can be carried out without deleterious effect on man or his resources.

A similar approach applies to the dispersal of low and intermediate level radioactive wastes to the ground. Some factors that must be evaluated include the chemical (and radionuclide) composition of the waste, the adsorption and ion exchange capacities of the receiving earth materials, the ground water hydrology of the area involved, and utilization of these ground water resources. There are a number of specific questions which have not yet been answered as precisely as one would like in an engineering sense. Such phenomena as dilution or diffusion of waste streams in moving ground water have not been completely described. At AEC installations, the criteria established for disposal into the ground are generally based upon empirical data obtained from laboratory and field experiments carried out with actual wastes and earth materials involved. In the laboratory column, experiments are done with column materials characteristic of the soil profile. Liquid wastes are added to determine breakthrough of specific nuclides. This information is then extrapolated to field operations.

Development activities directed toward establishment of systems for ultimate disposal of high-level wastes are being pursued along the following lines:

With regard to treatment and processing, there has been a substantial investigative effort on the fixation of radioactive material in chemically inert solid media. The objective is to so convert the wastes into a solid, nonleachable material that they may be permanently stored, that is, disposed in specific environments with negligible long-term hazard. Two general schemes for accomplishing this objective have been under development at several AEC and university laboratories.

One involves the conversion of the highly radioactive liquid wastes to a solid oxide form by heating in some kind of liquid-solid contactor. Work on this approach is being done at the Idaho Chemical Processing Plant and the AEC National Laboratories.

The other general scheme involves incorporating the radioactive material either physically or chemically in clays, glasses, or synthesized crystal minerals such as feldspars or micas. These two general ideas can fit together in that the solid oxide may be used as a starting material in a further fixation system, or the oxide material may be put through a leaching step to remove the soluble radioactivity, and the leach solution can then be fixed in another solid material.

Enough laboratory work has been done to indicate the technical feasibility of several such systems. Engineering development is farthest advanced at the Idaho Chemical Processing Plant where a fluidized bed technique is being utilized to convert the liquid wastes to a solid oxide. At Idaho the construction of a 60-gallon per hour prototype development unit is well along and the unit will go into "cold" operation in the near future. Generally in all of these systems practical solutions to a number of important associated problems have yet to be demonstrated on an engineering scale. These problems include control of radioactive aerosols and gases, volatilization of specific fission products, and corrosion.

The possibility of direct disposal of high-level wastes -- the wastes associated primarily with the chemical processing plants -- into selected geologic formations has been under active consideration for about the past 2½ years. The feasibility, practicality and safety of such systems will be demonstrated only after extensive laboratory and field experiments which are just now being initiated. Engineering and economic analyses are in their early stages, but sufficient work has been done to justify pursuit of such approaches at least on a limited scale. Of the geologic formations proposed for this purpose in the United States, which include salt structures, deep synclinal basins, impermeable shales and certain deep porous formations, disposal into prepared cavities in salt is the most advanced in programming. Field investigations with synthetic wastes are presently under way in

an unused portion of the Carey Salt Company mine in Hutchinson, Kansas.

At the present time it would appear that one optimum solution to the problem of final disposal of highly radioactive liquid wastes would include the conversion of the waste into a solid, preferably inert, form and the long-term, essentially permanent, storage of these solids in a specially selected geologic formation such as a salt bed. As the degree of inertness of the solid material is increased, the requirements for the geologic formation become less restrictive. Interim tank storage would be an integral part of such a system.

Intimately related to progress in waste management are substantial improvements in chemical reprocessing that have led to reduced waste volumes, reduction of non-radioactive dissolved solids in the wastes and other improvements in certain existing processes. This attack on the problem at its source represents an important contribution in the waste field.

Although one has to be very careful to distinguish between aspiration, reality and speculation in this field, it is our own strong feeling that the development program has thus far found solutions to some of the waste problems and at least indicated solutions to others. While much research, development, pilot-plant testing and field experiment and evaluation have yet to be done before firm engineering conclusions will be possible for all situations, with proper attention to this phase of the nuclear industry, including the research and development program, we believe the industry can develop in a rational way without being "ham-strung" by its own wastes.

- 30 -

A. R. Luedecke, General Manager

THRU : William F. Finan, Assistant General Manager
for Regulation and Safety

H. L. Price, Director
Division of Licensing and Regulation

LAND DISPOSAL OF RADIOACTIVE WASTES - 10 CFR 20 AMENDMENT JAN 27 1960

At meeting 1573 on December 15, 1959, the Commission approved both the proposed policy for land disposal of packaged radioactive wastes and the issuance of the proposed amendment to 10 CFR Part 20 set forth in AEC 150/12.

By memorandum, dated January 15, 1960, the Director of Information Services requested, and subsequently received, your approval of the modification of the news release attached to AEC 150/12 to eliminate reference to Oak Ridge and Idaho as interim land disposal sites. A similar change was made in the forthcoming annual report. In view of the foregoing, the draft letter to the JCAE, NLC, and GAC, attached as Appendix C to AEC 150/12, has also been modified.

It is requested that you sign the attached letters to the JCAE, NLC and GAC, and proposed amendment to 10 CFR Part 20, "Standards for Protection Against Radiation." The attachments have the approval of the Office of the General Counsel and the Division of Reactor Development.

The news release will be issued in accordance with standard procedures.

Enclosures:
JCAE letter
GAC letter
NLC letter
Proposed Part 20
Amendment

CC: General Manager
Congressional (2)
Secretariat
DRD - Attn. Dr. Lieberman
OGC - Attn. Mr. Lowenstein
Production
DCI
Finance

1-27-60

DATE:

INDEX: MATERIAL-12-Waste Processing & Disposal

TO:

FROM:

SUMMARY: AEC 646/70: STATE OF NEW JERSEY INTEREST IN ATOMIC ENERGY PROGRAMS. Letter from Governor Meyner of New Jersey expressing the State of New Jersey's interest in the constructive use of nuclear energy in New Jersey. Also the state of New Jersey would like to discuss the disposal of radioactive waste off the New Jersey Coast.

FILED:

INDEXER: LR&A-6- Power

REMARKS: date of paper: 1-13-60

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

December 31, 1959

MEMORANDUM FOR CHAIRMAN McCONE
COMMISSIONER FLORINI
COMMISSIONER GRAHAM
COMMISSIONER WILLIAMS

SUBJECT: DISPOSAL OF RADIOACTIVE MATERIALS INTO THE PACIFIC VIA THE COLUMBIA RIVER

The attached memorandum regarding the disposal of radioactive materials into the Pacific via the Columbia River is forwarded for your information.

The staff, together with the Manager of the Hanford Laboratories, is preparing recommendations concerning: (a) whether additional studies should be undertaken in order to ascertain the effects of these radioactive materials being discharged into the Pacific; (b) if so, what type of studies and how extensive they should be; and (c) the best way in which to release to the public data already developed.

SIGNED, A. R. LUEDECKE

General Manager

Attachment:
Ltr memo Lieberman thru Pittman to GM 12/14/59, subject as above

CC: General Manager
Mr. McCool - w/o encl.
Hollingsworth - Chron

DEP/ GEN. MGR. GEN. MGR.

12-3159 12-31-59

12-31-59

Office Memorandum • UNITED STATES GOVERNMENT

TO : A. R. Luedecke, General Manager DATE: DEC 14 [illegible]
(THRU) Frank K. Pittman, Director AEC for
Division of Reactor Development
FROM : Joseph W. Lieberman, Chief, Environmental & Sanitary
Engineering Branch, Division of Reactor Development JWL

SUBJECT: DISPERSAL OF RADIOACTIVE MATERIALS INTO THE PACIFIC VIA THE COLUMBIA RIVER

SYMBOL: RD:NT:ESE:JAL

One of the U. S. papers presented at the IAEA - UNESCO Conference on Disposal of Radioactive Wastes was entitled, "Movement of Radioactive Effluents in Natural Waters at Hanford," by J. F. Honstead. Just prior to the presentation of this paper, and because of the dogmatic position taken by the Russians against disposal into the sea, the representatives from Hanford expressed some concern (which I shared) in anticipation of a possible question concerning the quantity and nature of radioactive materials entering the sea, via the discharge of Hanford reactor coolant into the Columbia River. Although they indicated they were prepared for such a question it did not arise.

Last Friday (December 11, 1959) this same subject was brought up in the course of a meeting of the Committee on Waste Disposal and Dispersal of the National Academy of Sciences, National Research Council. I learned on Thursday that it had also been discussed at a recent meeting of the Committee on Oceanography and Fisheries of the NAS-NRC. (Both of these Committees are part of the NAS-NRC overall Committee on the Biologic Effects of Atomic Radiation. The June, 1956, reports of the BEAR committees, copy attached, are presently being up-dated and are scheduled for publication in early January, 1960).

Heretofore the subject of radioactivity in the Columbia River has been discussed primarily in connection with possible effects on public water supplies at Pasco and Kennewick, and on Columbia River fisheries, e.f. JCAE hearings on Industrial Radioactive Waste Disposal, and in general, it has been noted that the concentrations of radioactive materials in both areas have been well within accepted maximum permissible levels. A quick check of the record of the hearings noted above did not disclose any specific mention of total quantities of radioactive materials, although such numbers easily could be derived from Columbia River streamflow and radioactivity concentration data. For example, using 1958 average gross beta concentration at Pasco of 9150 μμc/l and a nominal streamflow of 100,000 cfs. gives roughly 2500 curies per day at Pasco. Similar calculations, taking into account time of flow, decay, etc. would enable one to estimate total quantities of radioactive materials entering the Columbia River estuary, i.e. the sea. However, as far as could be determined, such quantities have not been stated heretofore.

At the Friday meeting of the NAS-NRC Committee on WD&D, H. M. Parker, Manager of Hanford Laboratories, also noted that this subject was discussed at the Oceanography and Fisheries Committee meeting a week or so earlier (one of his people, R. F. Foster, is a member of the committee). Mr. Parker also gave some recent estimates of radioactive materials reaching the mouth of the Columbia River as follows:

Isotope	Curies/day
P^{32}	20
Cr^{51}	900
Zn^{65}	10
Np^{239}	70
Sr^{90}	< 0.2
Total	~ 1000

These values have been checked by radiometric analysis of river samples taken near the mouth of the river.

If one considers only curies, this exceeds the British discharges into the Irish Sea.

In notes that he gave me it is estimated that the concentration of radioisotopes in the Columbia River near its mouth ranges from 1% to 3% of the drinking water MPC. In conversation after the meeting Mr. Parker noted that in persons being checked in the Hanford whole-body counter detectable levels of Zn^{65} (presumably from fall-out) have been determined. Substantially higher (but presumably below significant public health levels) burdens of Zn^{65} detected in some individuals apparently are related to their consumption of oysters (which concentrate the Zn^{65}) from the Columbia River estuary. I asked Mr. Parker if all this did not indicate the need for further or expanded studies in the Columbia River estuary. He stated that a proposal for such work had been submitted in the past. Since I am not aware of such a proposal I assume it was submitted to DRM.

Dr. Abel Wolman, the Chairman of the NAS-NRC Committee on WD&D stated in the meeting that he proposed in the Committee's report to reiterate that radioactive materials discharged to rivers eventually get to the sea in amounts determined by their behavior in the environment and that their subsequent behavior in the marine environment and their effect on marine resources must be assessed, without making any specific or quantitative reference to the Columbia River. It was indicated that there should be liaison between his committee and the Committee on Oceanography and Fisheries to assure that the statements of both groups were consistent.

Because of the past interest shown in this subject and possible public relations implications, I believed you would wish to be informed with regard to this situation as soon as possible.

cc: Prod B&M
OH&S L&R

UNITED STATES GOVERNMENT

Memorandum

TO : Frank K. Pittman, Director
Division of Reactor Development
Harold L. Price, Director
Licensing and Regulation

DATE: December 17, 1959

FROM : W. B. McCool, Secretary

SUBJECT: COMMISSION DECISION ON AEC 180/12 - PROPOSED POLICY FOR HANDLING PACKAGED RADIOACTIVE WASTES

SYMBOL: SECY:RVW

1. This will confirm our telephone notification on December 16, 1959, that at Meeting 1573 on December 15 the Commission:

a. Approved the policy that permanent land disposal sites for packaged radioactive wastes be established on a regional basis on Government-owned land, either Federal or State;

b. Authorized the General Manager to designate Oak Ridge and Idaho as interim disposal sites pending an over-all study of requirements for additional regional facilities, and evaluation of specific sites to fulfill such requirements;

c. Noted that recommendations of the staff regarding the establishment of such additional sites will be submitted to the Commission for approval prior to action leading to transfer of land from other Government agencies or initiation of legislation required for acquisition of land together with specific recommendations regarding whether such operations should be conducted under contract with AEC, or through some other arrangement (such as leasing to licensees);

d. Noted that in accordance with past AEC practices when site selections were being made, site selection activities will be conducted with as little publicity as possible but that appropriate and useful public relations activities will be undertaken at the time of selection of sites to help assure public acceptance;

e. Noted that the Managers of Operations and the Division of Finance will establish the pricing formula in connection with the operation of these burial ground facilities in accordance with existing procedures and under the applicable principles of full-cost recovery;

f. Approved the issuance for public comment of the proposed amendment to Part 20, attached as Appendix "D" to AEC 180/12;

g. Noted that the Joint Committee on Atomic Energy, General Advisory Committee and Military Liaison Committee will be advised by letter such as Appendix "C" to AEC 180/12, and the public will be informed by a news release such as Appendix "D" to AEC 180/12; and

h. Noted that AEC 180/12 is unclassified;

2. The General Manager has directed that you take the action necessary to comply with this decision.

3. This will confirm our understanding that your office will prepare the letters to the JCAE, GAC, and MLC. Please send the Office of the Secretary copies of these letters.

cc: General Manager
Deputy General Manager
Asst. Gen. Mgr. for Adm.
Asst. Gen. Mgr. for Regulation & Safety
Asst. Gen. Mgr. for R&ID
Asst. Gen. Mgr. for Mfg.
Director, Information Services
Director, Inspection
Director, Production
Director, Military Application
Congressional Liaison
Director, Research

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Informal Mtg. 12-8-59

3. AEC 180/12 - Proposed Policy for Handling Packaged Radioactive Wastes

Mr. Pittman reviewed AEC 180/12 and said that for the disposal of wastes associated with laboratory and research activities and routine reactor operations it was recommended that burial grounds on government land be established. He said only government agencies can assure responsible management because of the long periods of time the grounds must be monitored and maintained. Mr. Floberg commented that a pricing policy which might prevent states from entering this program should be avoided.

Mr. Price pointed out that the Commission's determination to prevent the disposal of radioactive wastes except on government land would be formalized by publication of a statement to this effect in the Federal Register.

Mr. McCone said he did not think the Commission could defend a position based upon a belief that a private entity could not establish as much perpetuity as a state or the Federal Government. Mr. Pittman said the requirement for burying wastes on government land could be defended in that there must be continuing inspection and maintenance, and there would not be sufficient incentive for such care on private property. Mr. Olson added that the recommended position could be defended because of the AEC's need for assurance of the proper discharge of its responsibility.

The Chairman suggested emphasis be placed on contractor operation of the program in the proposed news release.

At this point, all members of staff left the meeting except Messrs. McCool, Hollingsworth, Burrows, Campbell, Coppedge and Starr.

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1573th AEC Meeting 12-15-59 ~~SECRET~~ RS

2. AEC 180/12 - Proposed Policy For Handling Packaged Radioactive Wastes

The General Manager reviewed a staff proposal that the Commission approve a policy establishing permanent land disposal sites for packaged radioactive wastes on a regional basis on either Federal or State-owned land. He pointed out that the recommendation had been considered by Mr. McCone and Mr. Floberg at an informal meeting on December 8, 1959.*

The Commission:

a. Approved the policy that permanent land disposal sites for packaged radioactive wastes be established on a regional basis on Government-owned land, either Federal or State;

b. Authorized the General Manager to designate Oak Ridge and Idaho as interim disposal sites pending an over-all study of requirements for additional regional facilities, and evaluation of specific sites to fulfill such requirements;

c. Noted that recommendations of the staff regarding the establishment of such additional sites will be submitted to the Commission for approval prior to action leading to transfer of land from other Government agencies or initiation of legislation required for acquisition of land together with specific recommendations

regarding whether such operations should be conducted under contract with AEC, or through some other arrangement (such as leasing to licensees);

d. Noted that in accordance with past AEC practices when site selections were being made, site selection activities will be conducted with as little publicity as possible but that appropriate and useful public relations activities will be undertaken at the time of selection of sites to help assure public acceptance;

e. Noted that the Managers of Operations and the Division of Finance will establish the pricing formula in connection with the operation of these burial ground facilities in accordance with existing procedures and under the applicable principles of full-cost recovery;

f. Approved the issuance for public comment of the proposed amendment to Part 20, attached as Appendix "D" to AEC 180/12;

g. Noted that the Joint Committee on Atomic Energy, General Advisory Committee and Military Liaison Committee will be advised by letter such as Appendix "C" to AEC 180/12, and the public will be informed by a news release such as Appendix "D" to AEC 180/12; and

h. Noted that AEC 180/12 is unclassified.

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December 3, 1959

AEC 180/12

COPY NO. 49

ATOMIC ENERGY COMMISSION

PROPOSED POLICY FOR HANDLING PACKAGED RADIOACTIVE WASTES

Note by the Secretary

The General Manager has requested that the attached report by the Directors of Reactor Development and Licensing and Regulation be circulated for consideration by the Commission at an early date.

W. B. McCool
Secretary

DISTRIBUTION	COPY NO.
Secretary	1
Commissioners	2 - 6, 54-56
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Deputy Gen. Mgr.	8
Asst. Gen. Mgr. Mfg.	9
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ATOMIC ENERGY COMMISSION

PROPOSED POLICY FOR HANDLING PACKAGED RADIOACTIVE WASTES

Report to the General Manager by the Directors of Reactor Development and Licensing and Regulation

THE PROBLEM

1. To consider a proposed policy covering land disposition of packaged radioactive waste materials evolving from AEC contractor and licensee operations.

SUMMARY

2. Because the quantities of contaminated materials are increasing in proportion to the growth of the atomic energy industry, a clear-cut policy covering the final disposition of packaged radioactive waste materials is urgently required. The wastes in question are those associated with laboratory and research activities and routine reactor operations. High-level liquid wastes resulting from the chemical processing of irradiated fuels or bulk low-level liquid wastes are not included.

3. Existing technology permits the disposal of such wastes on land or in the sea in accordance with acceptable standards for radiation protection. However, these operations are hindered because of complex administrative, legal and public relations issues which are inherently involved in such operations. The major questions requiring resolution are (1) whether in view of the AEC's responsibility to protect the public health and safety against radiation hazards, the AEC should limit land disposal of radioactive wastes to sites owned by agencies of the Federal or State Governments, (2) the selection of such sites, and (3) the role of commercial participation in this area.

4. Most wastes from AEC operations are handled by land burial at AEC sites. Certain installations such as Brookhaven National Laboratory and Livermore Radiation Laboratory, because of their location, have disposed of laboratory wastes at sea. In line with the present government policy of not competing with industry, wastes from licensee operations are not generally accepted by the AEC for disposal at AEC facilities.

5. Nine commercial firms have been licensed to provide waste disposal services. Seven of these licenses have been for sea disposal while two others are for more restricted activities (temporary storage and shipment only). In the past all applications for licenses involving land burial have been rejected because of specified deficiencies in each particular case (e.g., hydrology of proposed site, etc.), although it also has been noted that applicants had not demonstrated an ability to guarantee maintenance and control of the burial sites for the extended period of time essential to public safety.

6. Land disposal, except in certain situations, appears to have definite advantages over sea disposal. The establishment of regional burial grounds for packaged wastes will provide a critically needed service. Because of the inability of entities other than government agencies to assure competent and responsible management of burial sites for the long periods of time over which the potential radioactivity hazard might extend, such operations should be permitted only on government-owned land. While the long-term position restricting such burial grounds to government-owned land should be clearly stated, it is not necessary to restrict this to land owned by the Federal Government. New York already has expressed some interest in establishing such a site and as the industry grows the interest of the States in performing this service

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for their citizens can be expected to increase. Under present law the AEC could license a State to dispose of the materials on State-owned land. On an interim basis, use of burial ground facilities at Oak Ridge National Laboratory and Idaho Operations Office as regional installations is recommended.

STAFF JUDGMENTS

7. The Divisions of Biology and Medicine, Finance, Production, Information Services and the Office of General Counsel concur in the recommendation of this paper.

CONCLUSIONS

8. Both sea and land disposal of packaged wastes are safe and technically feasible and the use of either method should not be precluded where is has advantages over the other.

9. The ultimate responsibility for disposition of radioactive waste materials, whether on land or at sea, should be retained by the AEC because of inherent long-term implications.

10. Land disposal of radioactive wastes has advantages in many situations and steps should be initiated now for the selection and establishment of regional burial grounds. Because of the inability of entities other than Government agencies to assure competent and responsible management of burial sites over the long periods of time over which the potential radioactivity hazard might extend, such operations should be permitted only on government-owned land. States may become interested in providing such services for their own citizens as the industry grows. Temporary sites at Oak Ridge and NRTS should be formally established now. These sites can handle these wastes for a period of two to three years without overloading the sites. During this time surveys for additional sites must be conducted and arrangements made for the acquisition or transfer of land.

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11. Sea disposal likewise has definite advantages in certain situations, but the "ultimate" Government responsibility for these waste materials does not require Government responsibility for physical operations in the same sense as with burial on land. Licensees could continue these operations with the Government exercising its regulatory responcibility through designation of areas in which material could be discharged, controlling the packaging of discharged material and providing adequate monitoring of these activities.

RECOMMENDATION

12. The General Manager recommends that the Atomic Energy Commission:

a. Approve the policy that permanent land disposal sites for packaged radioactive wastes be established on a regional basis on Government-owned land, either Federal or State.

b. Authorize the General Manager to designate Oak Ridge and Idaho as interim disposal sites pending an over-all study of requirements for additional regional facilities, and evaluation of specific sites to fulfill such requirements.

c. Note that recommendations of the staff regarding the establishment of such additional sites will be submitted to the Commission for approval prior to action leading to transfer of land from other Government agencies or initiation of legislation required for acquisition of land together with specific recommendations regarding whether such operations should be conducted under contract with AEC, or through some other arrangement (such as leasing to licensees).

d. Note that in accordance with past AEC practices when site selections were being made, site selection activities will be conducted with as little publicity as possible but that appropriate and useful public relations activities will be undertaken at the time of selection of sites to help assure public acceptance.

e. Note that the Managers of Operations and the Division of Finance will establish the pricing formula in connection with the operation of these burial ground facilities in accordance with existing procedures and under the applicable principles of full-cost recovery.

f. Approve the issuance for public comment of the attached proposed amendment to Part 20;

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g. Note that the Joint Committee on Atomic Energy, General Advisory Committee and Military Liaison Committee will be advised by letter such as Appendix "C", and the public will be informed by a news release such as Appendix "D".

h. Note that this paper is unclassified.

LIST OF ENCLOSURES

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APPENDIX "A"

BACKGROUND

1. The need for waste disposal services for packaged radioactive wastes from AEC contractor and licensee operations is increasing. Quantities of contaminated materials that must be safely disposed of are increasing in proportion to the growth of the atomic energy industry. This is true not only for AEC operations, but also for the increasing amounts of radioactive waste materials that must be discarded by licensees -- especially from the growing reactor and isotope programs.

2. The low-level radioactive waste materials associated with laboratory and research activities and routine reactor operation are the ones with which this paper is concerned. They now include such things as broken glassware, paper wipes, rags, non-usable equipment, ashes, animal carcasses, laboratory paraphernalia from experiments and, in the future, are expected to include such things as fuel rod end pieces, ion exchange resins and other similarly contaminated materials associated with reactor operations. Not included as a consideration here are low-level liquid wastes which cannot be solidified and packaged. These are treated and disposed of at their points of origin under existing controls and regulations. Highly radioactive fission product wastes resulting from chemical reprocessing of irradiated fuels, which are presently evolved only at AEC installations and which are stored at the AEC sites where they are produced, are likewise not included in the category of waste materials under consideration. Nationwide, the total quantities of solid or packaged waste materials requiring off-site disposal is estimated to be of the order of 150,000 cubic feet per year at the present time.

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3. The larger AEC operations have made provision for waste disposal on site. These sites are Hanford, LASL, SRP, NRTS, and Oak Ridge. In general, these locations are isolated from populous areas. NRTS and Oak Ridge also receive and dispose of wastes from other AEC contractors. Other laboratories, such as Brookhaven and NRDL, because of their location, have disposed of their wastes at sea. Certain AEC installations such as KAPL, ANL, Mound Laboratory, etc., with site limitations, have shipped wastes to Oak Ridge.

4. The disposal of radioactive waste materials from AEC licensee operations is governed by AEC regulations. Applications for licenses to engage in commercial radioactive waste disposal on privately-owned land have been received. The applications have been denied basically because of the inability of applicants to assume long-term maintenance and control of the burial site. The attached proposed amendment would prohibit the Commission from approving any application for license to receive radioactive material for disposal on privately-owned land.

5. In line with the present Government policy regarding competition with industry, waste materials generated outside of AEC operations are not generally accepted by the AEC for disposal. (Oak Ridge, however, does receive material from a restricted number of licensees under special arrangements.) Based on this policy, nine licenses have been issued to commercial firms to provide waste disposal services. Seven of the above licenses have been for sea disposal (with operations conducted in accordance with standards set forth in NBS Handbook 58), while the other two are for more restricted activities preparatory to final disposal (i.e., temporary storage and shipment only).

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DISCUSSION

6. Technically, the considerations are relatively straightforward for establishing either land burial sites or sea disposal sites and are similar for both. These have to do with selecting a site which is suited to receive the radioactive materials without adversely affecting the public health, safety and welfare, and with due consideration to the economic factors involved. Criteria for selecting and operating a land burial facility are set forth in Appendix "B". Site factors such as geology, surface and ground water hydrology, and meteorology, etc., would require detailed investigation and would dictate the choice of site, whether on land or at sea.

7. The technical feasibility of carrying out land burial and sea disposal operations in a safe and adequate manner has been demonstrated and selection of either method should be based primarily on economics. Land economics is affected by the geographical distribution of waste producers and regional burial areas will be required, over the long term, as the needs for such facilities develop in different areas.

8. Radioactive waste from the Atomic Energy Commission's own operations is largely handled by land disposal. That a decision on such handling of commercially generated wastes eventually would be required has long been recognized. Criteria for conducting such operations have been developed (Appendix "B") and development programs to improve ways and means of handling, concentrating or diluting and packaging wastes have been a continuing and rapidly expanding part of the AEC program.

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9. With the major consideration being protection of the public health and safety, however, there has been a continuing concern as to how the AEC can assure protection of the public health and safety under conditions involving commercial ownership and operation of land burial sites. Some of the materials will be radioactive for hundreds of years -- much longer than the life of individuals (licensees) or of most companies and corporations. The question of how private concerns can demonstrate satisfactorily their ability to discharge this responsibility has not been answered satisfactorily. The need for long-term precautions related to the health and safety aspects of burial ground operations make it essential for the Government to limit the extent of commercial participation in such activities to a relatively short term, either as contractor or lessee to the Government.

10. Even if this were not so, practical considerations bring one to the same conclusion. If licenses for commercial disposers were to be granted on an "open market" basis, the AEC would be confronted with either an arbitrary restriction on the number of licenses granted, the possibility of an excessive number of burial grounds and/or a poor distribution of waste burial facilities and a significantly larger task of monitoring these facilities over an indefinite, but long-term, in the future. If storage or burial of substantial quantities at the point of origin of these wastes were permitted, i.e., on licensee sites, the increasing number of sources of such wastes would result in an even larger number of widely scattered sources of potential environmental contamination, each of which would have to be monitored, inspected and otherwise closely administered and each of which also would involve withdrawal of land from potential uses over long periods of time. Any

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short-term advantages of convenience and of lower initial costs to the Government would be more than offset by the more extensive environmental and administrative problems created in exercising the health and safety responsibility.

11. Thus, the problems of long-term responsibility for protection of the public health and safety where land burial is used, seem best solved by making such disposal possible only on Federal or State Government-owned land. Present estimates indicate that approximately 200-300 acres would adequately service a region like the 16 northeastern states, at least until 1980. This estimate is based on quantitative data obtained from land burial operations at ORNL. The area required for the burial of wastes originating outside of Oak Ridge is approximately 2-1/2 acres per year. Because of the economics of packaging, handling and transportation, it appears most desirable to establish a limited number (5 to 10) of such regional burial sites.

12. In taking the position that burial grounds should be on Government-owned and controlled land, it is not necessary or desirable at this time to limit this to land owned by the Federal Government. As noted above, New York State already has expressed some interest in such a site. As the atomic energy industry grows, state-owned and controlled burial grounds may prove to be a desirable long-range plan. Public announcements of any policy decision should make this clear and, as additional sites are needed, the staff should work with the appropriate state representatives with the expectation that interest of the states in participating in performing this service for their citizens will increase. To the extent that operation of such sites by AEC might be required, the extent of Government competition with industry may

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be tempered by the method of operation finally selected. This might be by direct Government operation, and AEC contract with a selected operator or by leasing the burial site to an acceptable licensee under controlled conditions (similar to lease arrangements for commercial enterprises in the National Parks).

13. The selection and establishment of such sites will require time and need not be done except as the quantities of waste being generated make it necessary. Of immediate concern are the 16 northeastern states in which there are presently 2512 licensees and this number is growing at a fast rate (20% more as of July 31, 1959 than on May 31, 1958). The State of New York has recognized this need, has indicated a willingness to cooperate with the Commission in establishing such a site (AEC 646/64), and has even suggested certain salt deposit areas within its borders for consideration.

14. It is therefore, proposed that a policy be adopted authorizing the conduct of commercial land waste disposal activities. For the immediate future, the Idaho and Oak Ridge areas could be designated as interim sites and those offices authorized to accept such wastes from licensees for burial. Existing ICC and CAB regulations concerning shipments of such radioactive wastes are adequate to cover the material while in transit.

15. Meanwhile, investigations should be undertaken to select a burial site to serve the Northeast. As conditions warrant, additional site selection reviews would be undertaken for other parts of the country. To the extent it becomes necessary for AEC to establish such sites on Federal property, every effort would be made to locate suitable regional burial ground facilities on land

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presently owned by the Government. Procurement of private land will be considered only in the event no suitable Government-owned land can be made available. Any action to acquire such land would be submitted to the Commission for advance approval of either (a) action to designate other AEC sites as regional land burial grounds; or (b) action to obtain the transfer of land from another Government agency; or (c) initiation of a request for legislation to permit acquisition of private lands in the event no suitable Government-owned land is found to serve an area requiring such a site.

16. It should be emphasized that in recommending the establishment of regional burial grounds, the staff does not propose or contemplate that these burial grounds would operate as a substitute for sea disposal. The safety of sea disposal operations is supported by the advice of experts in the marine sciences and borne out by the actual results of sea disposal operations carried out up to the present time both here and abroad. The conditions and limitations which have been observed by the Commission in its own disposal operations and which have been imposed on licensees assure that these ocean disposal activities are without hazard. Since, except for specific situations, burial on land is more economical and more convenient it can be expected that land burial generally would be used rather than sea disposal.

17. If this policy is approved, it will be necessary to establish price schedules for use by Oak Ridge and Idaho for the immediate future. This can be accomplished by the Division of Finance and the Managers of Operations involved, under existing procedures regarding application of full-cost recovery principles.

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18. For the longer term, and particularly where sites not used by AEC for other operations may become involved, consideration will be given both to contract operation or to leasing the site to a qualified licensee for operation, with AEC control accomplished either through regulation or through lease provisions. (For example, the National Parks Service maintains price-controls over some commercial establishments in the National Parks through its leasing arrangements.)

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APPENDIX "B"

CRITERIA FOR SELECTION AND OPERATION OF A REGIONAL WASTE-BURIAL FACILITY

I. Purpose and Scope.

A. It is the purpose of the facility to provide space and services for the shallow burial of certain types of radioactive waste as follows:

1. Low-level solids consisting of such things as contaminated rags, laboratory equipment, animal carcasses, etc., where packaging but not biological shielding is required.

2. For low-level liquids, such as result from use of isotopes in medicine, research, industrial process control, etc., where packaging but not biological shielding is required. (It is not contemplated that bulk liquids will be handled in this facility.)

3. For intermediate-level solids, such as contaminated ion exchange resins, evaporator concentrates, end pieces of fuel rods, irradiated test materials, etc., where both packaging and biological shielding are required.

B. The containment of activity within the burial site is to depend primarily on the natural environment and generally not on manufactured containers.

C. It will be necessary to select a natural environment and provide site operation such that existing standards for protection against radiation will be met.

II. Mechanisms by which Radioactivity Might Migrate Off-Site.

A. Natural mechanisms

1. Subsurface flow of water with activity in solution and/or (rarely) suspension. Transport by subsurface flow of water may be totally or partially counterbalanced by sorption systems such as ion exchange on earth materials through which the water is moving.

2. Overland flow of water with activity in solution and/or suspension. Transport by surface water may be totally or partially counterbalanced by sorption systems such as ion exchange on earth materials over which the water is moving.

3. Transport and diffusion in the atmosphere. Such transport will depend on nature of waste materials and their handling and packaging. Generally speaking, atmospheric transport can be kept as low as is necessary by proper packaging and handling.

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4. Assimilation in natural life processes of animals and plants. This would be controlled to the maximum extent possible by operational practices.

5. Molecular diffusivity of activity. This probably is negligible because rate of movement is extremely slow.

B. Artificial mechanisms

1. Operational accidents - activity attached to operating personnel and equipment moving in and out of containment area.

2. Fire and/or explosions.

III. Criteria for Site Selection.

(Note: The following criteria are intended to apply to a humid climate, in particular to the northeastern part of the U.S., where, at the present time, the need is greatest for a regional burial facility. They would have to be modified in order to apply to other climatic or physiographic regions. For example, in the arid southwest, the hydrologic criteria would have to take into account interior drainage, very low water tables, etc. In addition, the criteria are not intended to apply to abandoned coal mines, caves, and similar structures which generally are not usable for this purpose because of adverse drainage, difficulty of access, or other conditions. Salt mines, however, are a special case and each such possibility should be considered on its merits.)

A. Geologic environment

1. Bedrock should be predominantly shaly, the thicker the better and the softer the better.

2. Unconsolidated overburden should be clay, or clay-rich material, preferably at least 20 feet thick. Weathered shale bedrock may be considered as part of the over-burden if it can be excavated with power shovel or other similar equipment.

B. Hydrologic environment

1. Ground Water

a. It is desirable to locate the site in an area where potable ground water is not available or is scarce.

b. Ground water at the site preferably should be hydraulically isolated from ground water in surrounding terrane, i.e., ground water should drain into a nearby stream or streams before moving off-site. Other locations might be acceptable if ground water motion is slow enough to preclude the contamination of off-site well supplies.

c. The seasonal minimum depth to the water table at the site should be about 10 feet below land surface. It is recognized that a clay-rich overburden often

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goes with a high water table. However, it may be possible to get both clay overburden and reasonably low water table under favorable topographic conditions, i.e., where site is drained by nearby streams flowing 20 or more feet below average land surface elevation of the site. (Note: A shallow water table, while undesirable from an operational point of view would not in itself rule out a site from consideration. However, the water table should never be so shallow as to cause swamp conditions, or to be within reach of shallow-rooted vegetation.)

2. Surface Water

a. There should be few, if any, on-site places where surface drainage could accumulate. If such places exist, they should not be used for burial.

b. Streams draining the site should not be intensively used for water supplies, stock watering, swimming, fishing, etc., within a reasonable distance from the burial ground. The intent in site selection is to choose a site such that off-site leakage of radioactivity shall not exceed specified health and safety limits; however, success of a given site in providing the necessary confinement is a thing that may be reasonably expected but which cannot be categorically guaranteed in advance of actual use. Hence, if downstream water utilization is low, an additional safety factor is provided.

C. Topography

1. Most of the area should be relatively flat or gently rolling.

2. Erosion and/or gullying should be negligible or controllable.

D. Accessibility

1. Site should be reasonably accessible by rail and motor transport and, if possible, by water transport.

E. Population density

1. Low population densities, especially in downstream and downwind directions are desirable.

F. Climate

1. For year round accessibility and ease of operation, mild climate and moderate rainfall are preferred.

G. Property value

1. Land of marginal or low value is preferred.

2. Site should be so located or sufficiently large to prevent its depressing the value of peripheral privately-owned land.

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H. Area

1. It is estimated that a minimum of about 150 acres is required for 20 years operation, with provision for expansion as necessary. In the event the site is surrounded by private land, a buffer zone may be required.

IV. Site Operation

A. Physical Requirements

1. The provision of one building equipped with facilities for an office for record keeping, locker room and perhaps maintenance of mechanical equipment appears almost mandatory. A second structure for temporary storage of wastes prior to burial may be desirable.

2. A concrete unloading platform accessible to rail transportation may be desirable for receiving waste containers. Equipment should be available for platform and vehicle decontamination.

3. The burial ground site should be enclosed by appropriate anti-personnel, anti-animal fencing.

4. Adequate signs warning of the presence of radioactive materials should be posted at conspicuous locations.

B. Mechanical Requirements

1. Equipment typical of sanitary landfill operations appear to be required; the exact type and extent of equipment would be determined by site conditions.

a. A caterpillar bulldozer, dragline or similar equipment, a 2-1/2 ton truck, and a fork lift appear essential for initial operation.

b. A crane may be required for unloading large rail (or barge) shipments. (This may be rented as the need arises).

C. Burial Methods

1. The entire burial procedure could follow generally accepted sanitary landfill practice. This includes trenching, backfilling, etc.

2. Trench or excavation details (length, depth, etc.) would vary with site characteristics. The type of waste and radiation level would generally determine the depth of cover.

3. Some consideration may be given to waste segregation, i.e., one area for low-level beta-gamma wastes, another for alpha wastes. The provision of a separate area for reclaiming items after suitable periods of decay time may be desirable.

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4. For erosion control, it may be desirable to sod or plant other shallow rooted vegetation on all filled trenches after natural subsidence of the backfilled area.

D. Packaging Requirements

1. Packaging for transport should conform with applicable federal or state regulations governing shipment of radioactive substances interstate and/or intrastate.

2. Materials should be shipped in disposable containers. Special arrangements may be made for use of returnable containers or shields where circumstances warrant.

E. Monitoring Procedures

1. The entire operation would be conducted in accordance with AEC and applicable State health and safety regulations.

2. Radiation survey instruments and personnel monitoring equipment will be required to insure safe operation of the facility. The equipment should be kept in good repair. Standby equipment may be required.

3. Protective clothing and other radiation safety devices should be available as required.

4. An area monitoring program, including peripheral wells for detection of potential ground water contamination, and periodic sampling of the surrounding streams, soil, vegetation, etc. shall be required. The extent of monitoring requirements will vary from site to site and will depend on site characteristics and location. Both program and data should be examined critically from time to time - possibly by an independent advisory committee.

5. Each waste shipment should be accompanied by a detailed packing list which would describe the type, estimated amount and activity of material being shipped, volume, weight, method of packing, and unshielded radiation reading.

6. Accurate records of all items buried should be maintained. Establishment of a permanent grid system to provide a record of specific burial location for disposed materials may be helpful.

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APPENDIX "C"

DRAFT LETTER TO JOINT COMMITTEE ON ATOMIC ENERGY, GENERAL ADVISORY COMMITTEE AND MILITARY LIAISON COMMITTEE

1. This is to inform you that the Atomic Energy Commission has approved a policy providing for the establishment on government-owned land of permanent regional disposal sites for solid packaged radioactive wastes from AEC licensed isotope users and from AEC contractors exceeding the limits established in 10 CFR 20. In taking this position the Commission is not, at this time, drawing a distinction between the Federal and State governments and expects that as the industry develops, the states will become more and more interested in providing these services for its citizens. However, in keeping with its responsibility for assuring the continued protection of the health and safety of the public, it is believed these facilities should be provided under government ownership and control since we have not been able to satisfactorily answer many questions regarding the responsibility for long-term aspects of such operations conducted on privately owned land.

2. The AEC plans to carry out the necessary investigations for the selection of sites which will be suitable for safe operation. In addition the AEC, will establish the necessary monitoring procedures to assure that operations are carried out without adversely affecting the public health and safety.

3. In the interim period, until requirements for additional facilities are established and specific site evaluations made, AEC plans to utilize the existing burial facilities at ORNL and at Idaho to fulfill present needs.

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4. To the extent that establishment of additional sites by the Federal Government proves necessary, every effort will be made to make use of existing government-owned land. However, the primary objective is the continued protection of the health and safety of the public and it might be necessary, at some later date, to request legislation authorizing acquisition of private land where suitable government-owned land does not exist or cannot be made available.

5. The pricing structure to be adopted by AEC in connection with recovering costs associated with providing this service to private organizations or individuals during the interim period will be in accordance with existing policies of full cost recovery.

6. A copy of the announcement to the public is enclosed.

7. In connection with the policy, the Commission is proposing an appropriate amendment of its regulations on standards for protection against radiation (Part 20). Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State governments. The proposed amendment will be published in the Federal Register on _____. Interested persons may submit written comment within 30 days after that date.

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APPENDIX "D"

NEWS RELEASE

AEC FORMULATES POLICY FOR LAND DISPOSAL OF RADIOACTIVE WASTES; GOVERNMENT-CONTROLLED SITES TO BE ESTABLISHED AS NEEDED

1. The Atomic Energy Commission has determined that regional disposal sites for permanent disposal of low-level packaged radioactive waste materials shall be established, as needed, on state or Federal Government-owned land.

2. Placement of the waste materials in Government-owned lands, under long-term Government control, will assure adequate protection of the public health and safety throughout the period of any potential hazard.

3. Preliminary to the selection of regional sites, the Commission would conduct detailed studies of the geologic, hydrologic and topographic factors in connection with any proposed site in order to ascertain that a proposed site would retain the buried materials without contamination of the environment. Once a site is put into use, monitoring procedures will be established to insure that the operations are performed in a manner which will not endanger the surrounding area.

4. The Commission does not contemplate that the ownership and control of the sites must necessarily be restricted to the Federal Government. As the atomic energy industry grows and the need for new sites is established, the Commission anticipates that state Governments may wish to assume some responsibility in the establishment and control of sites for the benefit of their citizens.

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5. The publicly-owned disposal installations would be operated by Federal or state Government or by contractors or licensees under strict Government controls and would be available to all firms engaged in the disposal of radioactive waste materials. Currently most non-Commission program waste material is disposed of at sea by commercial firms operating under Commission license and control. Such activities would be affected by the Commission's land disposal policy only if convenience or economic factors induce disposal firms to use land burial facilities in preference to sea disposal sites.

6. Land requirements for disposal sites will not be large, as evidenced by the fact that over the last 15 years low-level solid or packaged wastes at Oak Ridge have been safely handled in approximately 60 acres. On the basis of this experience it is estimated that all such wastes generated between now and 1980 in the 16 states in the Northeast area, for example, could be safely disposed of in a 200 to 300 acre site.

7. Long-range estimates of the need for waste disposal facilities, arising out of the growth of the atomic energy industry, indicate that the establishment of the land disposal facilities will be required from time to time to insure continued maximum protection of the public health and safety.

8. It is expected that the first regional site will be needed in the northeastern part of the country where there is a relatively heavy and growing concentration of industrial, medical, univereity and other users of radioisotopes. The needs of other regions will be met later on as they develop.

9. Until regional state or Federal Government-owned sites are established, the Commission's Oak Ridge National Laboratory

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site in Tennessee and the National Reactor Testing Station site in Idaho will receive low-level wastes from non-Commission users of radioactive materials. Heretofore Oak Ridge has been used on a limited scale for the disposal of commercial wastes.

10. The types of low-level wastes to which the Commission's policy applies include broken glassware, paper wipes, rags, ashes, animal carcasses, laboratory paraphernalia and such other similar things which can no longer be used in experiments. Low-level liquid wastes are treated and disposed of at their points of origin under existing Government controls and regulations. High level wastes resulting from the chemical processing of irradiated fuels removed from reactors will continue to be stored in the specially designed underground storage tanks at the Commission's Idaho, Hanford, Washington, and Savannah River, South Carolina, sites where these fuel elements are processed.

11. A pricing schedule for use of the land burial facilities by commercially licensed companies is being established by the Commission. When the schedule is completed it will be published along with instructions detailing the procedures to be followed in disposal of wastes at approved sites.

12. In connection with the policy announced today, the Commission is proposing an appropriate amendment of its regulation on standards for protection against radiation (Part 20). Under the existing Part 20, Commission licensees may dispose of very low concentrations of radioactive waste by burial in the soil. Under the proposed amendment, licensees could continue this practice for their own wastes, but the Commission would not approve an application for license to receive waste material from other persons for disposal on land not owned by the Federal or State

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governments. The proposed amendment will be published in the Federal Register on _____. Interested persons may submit written comment within 30 days after that date.

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TITLE 10 -- ATOMIC ENERGY

CHAPTER I--ATOMIC ENERGY COMMISSION

PART 20--STANDARDS FOR PROTECTION AGAINST RADIATION

The following amendment is designed to prohibit issuances of licenses which would authorize the disposal of radioactive waste materials on privately owned sites by persons engaged in commercial radioactive waste disposal activities.

Notice is hereby given that adoption of the following amendment is under consideration. All interested persons who desire to submit written comments and suggestions relating to the following amendment should send them to the U.S. Atomic Energy Commission, Washington 25, D.C., Attention: Director, Division of Licensing and Regulation, within 30 days after publication of this notice in Federal Register.

Section 20.304 is amended by adding the following at the end of the section:

> The Commission will not approve any application for license to receive licensed material from other persons for disposal on land not owned by the Federal or State governments.

DISTRIBUTION

September 30, 1959

MEMORANDUM FOR: THE GENERAL MANAGER

I have heard many favorable comments regarding the Task Force Briefings in Boston and Washington on radioactive waste disposal. Since they are evidently so effective, it seems to us that we should arrange a similar briefing in the Houston area, including representatives of the Mexican government.

Would you please consider this suggestion from a public relations standpoint and, unless you perceive any objections, arrange for such a briefing?

John A. McCone

WLO/pe

V-A m-6. Briefings
W-A-6-Rg - Industrial Waste Disposal

2-30-59

SEP 3 1958

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

In our memorandum of July 25, 1958, regarding a public information program on radioactive waste and fallout, reference was made in items 3 and 9 to the possible scheduling of seminars on all aspects of radioactive waste disposal in Washington and in other areas around the country where particular interest has been aroused.

The holding of seminars was deferred owing to the fact that we understood that the Commission would act upon the policy governing land disposal which might involve abandonment of sea disposal; and the Joint Committee hearings starting July 29 cleared the air for the journalists who were interested in radioactive waste to a considerable degree.

Yesterday this subject was discussed further with the AE Ad Hoc Committee of representatives of interested Divisions and it was agreed that scheduling of a seminar in Washington should be deferred until the Commission establishes a policy on land disposal.

With respect to possible seminars elsewhere, it was noted that a group from AEC will be in Boston on September 25 to meet with state and local officials on waste disposal matters, as a result of the Military Sea Transportation Service license application. It is expected that the Governor's Atomic Energy Coordinator will invite members of the press to be present at this meeting. Following the meeting, members of the AEC group will make themselves available to the press. Since the correspondents present will have heard the presentations by the various AEC people and will have opportunity following the meeting to ask questions of the AEC group, the result will be something closely akin to the kind of seminar that we have in mind.

Similarly, a meeting is being arranged between AEC representatives and the heads of state departments in California. It is expected that press representatives will also be present at that meeting, and the AEC people will follow the same procedure as at Boston; that is, members of the group will make themselves available to answer questions.

9-3-58

-Hdg 1578 - Radioactive Waste Disposal
attachments: 8-20-58 memo from Salisbury
9-2-58 memo from [illegible]

On September 17 Jesse Johnson is to talk at the Mining Congress at Denver and will give a review of what has been done at the AEC, PHS, and other agencies concerning disposal of wastes in the mills and also the hazards in the mines. This will constitute a review for the press in the inter-mountain area and elsewhere of the steps that have been taken and will in a considerable degree put forward the material that would come into a seminar on the Colorado Plateau and elsewhere about mills and mines.

Mr. Johnson's speech and the meetings in Massachusetts and California will in considerable degree do what we would be able to do by press seminars and we do not favor scheduling any outside of Washington until the Commission has acted on land disposal. We will keep you in touch with plans for seminars following that action.

cc: Ad Hoc Committee Members

Dario Costello, Jr. ID
Dr. Charles Dunham, DBM, attn: Forrest Western
Edward Diller, Jr. PRED
Richard Kirk, LAS, attn: Ebar Price
E. Van Blarcom, RM

Those Listed Below

AUG 1 0 1959

Morse Salisbury, Director
Division of Information Services

PUBLIC INFORMATION PROGRAMS ON RADIOACTIVE WASTE, FALLOUT
AND [illegible] IN [illegible]

[illegible]: [illegible]

For your information, the General Manager has returned my memorandum of July 24 to him on the above subject, with notes indicating general approval of the proposed actions outlined.

Action already has been taken on Items 1 and 6 of the information plan outlined in the memorandum. Those related to the issuance of news releases on the [illegible] will [illegible].

The General Manager noted, without comment, Item 3, regarding the scheduling of a seminar in Washington, D.C. on waste disposal, and Item 4, regarding the issuance of the first AEC Quarterly Statement on Fallout. Our present judgment is that a seminar should not be scheduled at this time, for the following reasons: (1) the Joint Committee hearing on July 29 has cleared the air to a considerable degree regarding waste disposal, (2) discussion of land disposal should be postponed until Commission policy is established, and (3) we do not believe that there is wide enough media interest in the Colorado Plateau situation to justify a seminar on it alone at this time, particularly since the

(continued)

Addressees:
David C. [illegible], Jr., [illegible]
Dr. Charles L. Dunham, DBM
[illegible] F. Miller, Jr., [illegible]
[illegible] L. [illegible], [illegible]
[illegible] C. Van [illegible], [illegible]
[illegible], [illegible]
William [illegible], [illegible]

Commission's position was set forth in detail in a news release issued on July 31. In regard to Item 4, the quarterly fallout statement has been transmitted to the General Manager by the Division of Biology and Medicine.

The General Manager approved Item 5 (adoption of a clear policy prohibiting issuance of raw data on fallout to news media except the board in order to offset the effect of unfeasible requests for these data by prejudiced writers). We understand that the Division of Biology and Medicine is acting to put this policy into effect.

The General Manager also approved Item 6 (preparation and issuance of a comprehensive c. and d. list on waste disposal), and Item 7, (similar action on a c. and d. on fallout.) Both of these are in the process of preparation.

The General Manager approved Item 8, (preparation of special sections on waste disposal and fallout for the annual report to be issued in January 1956). Plans are underway for these sections.

Item 9 was on the scheduling of seminars in the Rocky Mountain area, in Houston or New Orleans, and in New York or Washington. The General Manager commented: Overall idea good. Each seminar (timing and subject matter) will have to be evaluated separately."

In regard to Item 10 (action to inform the public further regarding inland waste disposal and/or storage), the General Manager commented: Land waste disposal must wait establishment of Commission policy."

cc: F. Tobey, DBS

OFFICE ▶	ISF	DBS	DIS
SURNAME ▶	LOlder:jb	SThompson	MSalisbury
DATE ▶	8/11/55	8/11/55	8/10

Form AEC-318 (Rev. 9-53)

OFFICE OF THE GENERAL MANAGER

To: Mr. Hollingsworth

Mr. Tongue

Mr. Salisbury

See margin notes.

A.R.L.
8/1/59

Memo 414 7/24/59
DIS to GM thru AOMA, Subj: Public Information Program on Radioactive Waste, Fallout and Health and Safety in Uranium Mines

Received in Office of the Director
Division of Information Services
AUG 4 1959
Date..... Time.....

OPO.000470

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : A. R. Luedecke, General Manager
(THRU) R. E. Hollingsworth, AGM

DATE: July 24, 1959

FROM : Morse Salisbury, Director
Division of Information Services

SUBJECT: PUBLIC INFORMATION PROGRAM ON RADIOACTIVE WASTE, FALLOUT AND HEALTH AND SAFETY IN URANIUM MINES

SYMBOL: IS:ST

In conformance with your discussion of July 21, 1959 with Messrs. Dunham, Pittman, Kirk, Sherman and Thompson and the resulting directions on the above subject to the Divisions of Biology and Medicine, Reactor Development, Licensing and Regulation, Raw Materials, Production and Information Services, we have to date done the following:

July 22, 1959-

a. Discussed in the Division of Information Services the quickest and best ways and means of achieving the objective of enlightenment of the news media and public about the Commission's responsibilities and actions on the subject matters.

b. Prepared list of possible projects for consideration of Ad Hoc Committee of representatives of the concerned divisions.

c. Called meeting of Committee for mid-afternoon to discuss acceptability and feasibility of projects proposed by DIS and the methods of getting done such projects as the Committee approved. The meeting was postponed, after conferees had started to assemble, because too many staffers necessary to the meeting were tied up in a crash conference with you.

July 23, 1959 - The first Ad Hoc Committee meeting was held. The results are described in the attachment to this memo.

July 24, 1959 - Prepared this report to you. Proceeding with activity indicated in attachment hereto.

Attachment:

CC: H. S. Traynor, AGM

MINUTES OF MEETING #1,
AD HOC STAFF COMMITTEE ON RADIATION INFORMATION PROGRAM

The initial meeting of the Committee was held in the office of Morse Salisbury on Thursday, July 23, 1959 at 3 p.m. with the following in attendance:

David C. Costello, Jr., RD
Dr. Charles L. Dunham, R&M
Edward F. Miller, Jr., PROD
Richard L. Kirk, L & R
E. C. Van Blaricom, RM
Morse Salisbury)
Shelby Thompson)
William E. Hughes), IS

Salisbury and Thompson recapped briefly the highlights of the discussion of July 21, 1959 which the General Manager had with representatives of the above listed divisions (except PROD) regarding his wish for immediate initiation of a comprehensive program of public information actions aimed at enlightening the general public regarding the AEC's responsibilities and actions in connection with radioactive wastes, health and safety in uranium mines and fallout. Consideration of the items in a list of possible projects distributed by the DIS July 22, 1959 was requested for the purpose of determining which projects were desirable, acceptable and feasible, and the conferees were asked to nominate additional items for similar consideration.

Discussion of items then proceeded as follows-

ITEM 1. Issuance of a release on the order to the Uranium Reduction Company of Moab, Utah, stating the terms of the order but also containing, as background information, the facts to date regarding the mills named in the earlier orders and including a statement on the current degree of hazard in the Animas River below Durango, Colo. This release was expected to be ready for issuance late Wednesday, July 22.

ITEM 2. Issuance of a release on the new, upcoming orders affecting the six mills cited in the first go-round. This release would contain recapitulation of the prior regulatory events and their rationale, a description of the Commission's responsibility in these matters and, at the GM's specific request, a description also of the Commission position with respect to operating personnel and the public on health and safety matters relative to uranium mines. This release and the orders would issue simultaneously as soon as possible, perhaps later this week.

DISCUSSION - The Committee was advised by Mr. Hughes that the General Manager had directed that the releases projected in Items 1 and 2 be consolidated and that drafting work by DIS and L & R was proceeding; that the release might be issuable along with the orders before the close of business Friday, July 24, 1959. (As of the writing of this minute on July 24, 1959, the orders may issue today, but in order to get desired news play and public impact, the release would be scheduled for issuance for afternoon papers of Monday, July 27, 1959.)

Released issued 2

ITEM 3. Scheduling of a seminar on radioactive waste disposal -- all aspects -- for next week at the H. St. Building for all newsmen wishing to attend. Propose 3 to 5 p.m. with statements made and questions answered within their purview by representatives of Licensing & Regulation, Reactor Development, Biology & Medicine, Production and Raw Materials, with Inspection in standby to reply to any queries in its area. The session to be completely on the record, with no limits on the nature of the questions, and all for attribution and for immediate news use if desired. However, the objective of the seminar would be to instruct the listeners regarding the nature of the Commission's responsibilities and action role in connection with all aspects of radioactive waste disposal. The principal short term objectives of the seminar would be to place in perspective the nature and degree of hazard being dealt with on the Colorado Plateau and to reduce the concern of seaboard areas regarding the imminence of extensive disposal of wastes offshore and of waste collecting sites (such as Houston and New Britain) regarding the extent of activity and degree of hazard involved in such pre-disposal activities.

DISCUSSION - Mr. Costello stated that it would be impossible for the DRD personnel who would be involved in a Washington seminar to give proper time and attention to it until after the scheduled JCAE hearing on waste disposal which is to start Wednesday, July 29, so it was immediately indicated by the DIS spokesmen that the timing of the seminar would be at a later time and subject to concurrence of all concerned. There was general agreement as to the desirability and feasibility of the proposed seminar and general under-

standing that it would involve (a) only AEC Headquarters personnel and (b) require little or no special preparation, on the assumption that those specialists supplied for the seminar by the concerned divisions would be so cognizant of the subject that they would be competent to make a comprehensive presentation and to handle virtually any technical question that might arise. It was concluded that the DIS would make a further proposal regarding the timing of the seminar and would then conduct preliminary discussions of the method and scope of presentation among the principals involved. The DIS further will evaluate the immediate advisability of such a seminar on the basis of judgment of the usefulness of the forthcoming hearings in providing basic facts on the subject for the enlightenment of the news media representatives for whom the seminar would be tailored.

noted

ITEM 4. Action to give wide and prominent issuance to the first AEC quarterly report on fallout. An effort should be made to issue this very soon, next week, if possible.

DISCUSSION - Dr. Dunham led off with comment that he felt the report had need for a summary statement which would cover the decline in surface air levels, of hot spots and or SR 90. The Committee discussion suggested also the need for a description of the maximum permissible levels and some interpretation of their meaning for lay consumption. (DIS, which in the meantime was reviewing the initial draft of the report has concurred in the views in both points made above but feels the summary should be a quite full popularization of the information in the report proper, pointing up positive developments which should be emphasized, providing in the summary, for likely use by most non-technical reporters, the full story of the report in lay language.) The target date for issuance of the report by DIS to its full list of over 5,000 regular mailing list recipients was proposed by Dr. Dunham as about the first of August. It was noted that there was nothing compulsive about this date but that it is highly desirable that the report issue as soon as an acceptable version can be developed.

noted

ITEM 5. Adoption of a clear policy permitting issuance of raw data on fallout to news media across the board in order to offset the effect of undeniable requests for these data by prejudiced writers. Before the end of this week, if possible.

DISCUSSION - There was agreement between the B. & M. and DIS representatives that the proposed policy be made effective as quickly as possible to that, among other things, a pending request from Gamarekian of the Washington Post to the New York Health & Safety Lab for certain raw data could be handled in the manner proposed. Dr. Dunham requested that the General Manager be notified by this Minute that the policy and procedure proposed under Item 5 had the concurrence of the Ad Hoc Committee and that it was expected that such raw data would be issued as necessary, as information supplementing the last previous quarterly report on fallout. Presuming no objection from the General Manager, B.&M. and DIS plan to proceed accordingly.

Approved

ITEM 6. Preparation and issuance of a comprehensive Q. & A. list on waste disposal. For possible distribution at the seminar next week or, if not ready by that time, for general dissemination to news media and other interested elements as early as possible. Also to be processed into a printed leaflet for distribution to students and teachers and other inquirers on general atomic energy subjects.

ok

ITEM 7. Similar action on a Q. & A. on fallout.

DISCUSSION - DIS representatives noted that drafts have been prepared of both proposed Question and Answer listings and that both will be expedited to condition of appropriate full concurrence. Their immediate use would be as a reference for the Public Information Service staffers in answering newsmen's queries and in reply to general correspondence on the subjects, with other Divisions utilizing the lists as complementary information in connection with more specialized correspondence. The fallout Q. and A. also is to become a resource of the USIS in its overseas news activities. Both lists will be printed in form amenable to easy mailing and will, it is hoped, constitute the principal part of effective replies to the letters written to [illegible] subjects of waste disposal and fallout. [illegible] estimated agreement with the proposed

ok

ITEM 8. Preparation of special sections on waste disposal and fallout for the annual report to be issued in January 1960. These sections also to be printed as separate leaflets and given wide distribution beyond that received by the annual report.

approved

DISCUSSION - Committee agreement on the desirability of this activity was indicated.

ITEM 9. Scheduling of additional seminars such as-

a. In the Rocky Mountain area, Denver or Albuquerque, on regional waste disposal and plant and mine health and safety if resolution of the Animas River situation and developments on other Colorado Plateau situations indicates such a meeting would be useful. To be held within the next 30 days.

b. In Houston or New Orleans, on offshore waste disposal. Within 60 days.

c. In New York or Washington, on offshore waste disposal, if the seminar on the general subject of waste disposal planned for next week does not seem to have dealt adequately with the offshore segment of the problem. Within 60 days.

overall idea good. Each seminar (timing and subject matter) will have to be evaluated separately

(In consideration of seminars, must take into account the method of handling information on specific situations so that the Commission's relation to regulatory actions is not compromised.)

DISCUSSION - It was felt that there should be most careful assessment of the desirability and/or timing of the proposed seminars in order to avoid the possibility of focussing the attention of news media on the subject in a way or at a time that could excite rather than assure the public. The question of the feasibility of discussion of specific cases without compromise of the Commission's arm's length relationship between its operating side and its regulatory side was discussed and further views in this connection from L. & R. were to be sought. It was agreed that at the right time and in the right place and within the limits of the competence and authority of the spokesmen involved, such seminars appeared to be both desirable and feasible, but that further specific recommendations from DIS would be prepared and discussed before any seminar is scheduled.

ITEM 10. Action to inform the public further regarding inland waste disposal and/or storage. Seminar or what? Timing?

DISCUSSION - Specific discussion regarding informational action on inland waste disposal was to be deferred pending the guidance expected to arise from the Commission's consideration Wednesday, July 29 of a staff paper by RD on the subject. Note was taken also of the possible need for a statement on the policy, procedures and activities of the Commission bringing up to date the public's understanding of our sea disposal activity, but Committee work on this subject was put off in view of a pending release on the subject, prepared by DIS at the General Manager's direction for imminent issuance, and pending opportunity to observe the scope, comprehensiveness and media reaction to the hearing set for Wednesday.

land waste disposal must wait establishment of Comm. Policy

ITEM 11. Exploitation of the informational bases or products of any of the foregoing actions with the mass media -- wide circulation magazines, radio, TV, newspaper syndicates, wire services.

DISCUSSION - Discussion of appropriate developments under Item 11 was to be undertaken by the Committee as proposals for exploitation were developed and presented by the DIS.

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August 20, 1959

AEC 544/4

COPY NO. 35

ATOMIC ENERGY COMMISSION

SPECIAL PROGRAM FOR INSPECTION OF URANIUM ORE PROCESSING MILLS

Note by the Secretary

The General Manager has requested that the attached memorandum and enclosures from the Director of Inspection be circulated for the information of the Commission.

W. B. McCool
Secretary

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UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 10, 1959

MEMORANDUM

TO : A. R. Luedecke,
General Manager

FROM : Curtis A. Nelson, Director
Division of Inspection

SUBJECT: SPECIAL PROGRAM FOR INSPECTION OF URANIUM ORE PROCESSING MILLS LICENSED UNDER 10 CFR 40

SYMBOL : INS:LDL

Attached is a copy of a memorandum dated August 5, 1959, from the Manager, Idaho Operations Office, which reports the current status of the special inspection program for the uranium ore processing mills.

In summary, the collection of survey data has been completed for five mills. All remaining mills which are under contract to the Division of Raw Materials are scheduled for survey by October 2, 1959. Survey teams consist of AEC personnel, several of which have been detailed from other Operations Offices. All samples collected by survey teams will be analyzed under the direction of the Idaho Manager. Personnel from several AEC contractor organizations have been detailed to assist the Idaho personnel in the analytical work.

Enclosures:
1. Cpy memo, Johnson to Nelson, dtd 8/5/59
2. Cpy mill inspection schedule

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ENCLOSURE I

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 5, 1959

MEMORANDUM

TO : Curtis A. Nelson, Director
Division of Inspection, Washington, D. C.
(THRU) Frank K. Pittman, Director, Reactor
Development, Washington, D. C.

FROM : Allan C. Johnson, Manager
Idaho Operations Office

SUBJECT: INSPECTION OF URANIUM MILLS

SYMBOL : LI:DIW

The collection of survey data will be completed at the following mills by August 8, 1959:

Vitro Uranium Company, Salt Lake City, Utah	R-137
Union Carbide Nuclear Company, Green River, Utah	R-105
Trace Elements Corporation, Maybell, Colo.	R-212
Uranium Reduction Company, Moab, Utah	R-161
Vanadium Corporation of America, Durango, Colo.	R-102

Attached is the proposed schedule of surveys for the remaining uranium mills which are under contract to the Division of Raw Materials. In order to meet the attached schedule, it will be necessary to rely upon the noted Operation Offices to supply either those individuals whose names appear or individuals of comparable capabilities. Each of the Operation Offfices has expressed a willingness to supply the personnel for this program.

In view of the unfamiliarity of the majority of the participants with mill surveying and the continual change in personnel from week to week, we have deemed it advisable to have three individuals at all of the larger mills and two at the smaller mills. This has been somewhat tempered by the known, existing conditions at individual mills. One or more individuals of each two- or three-man team will be experienced to the extent of having participated in at least two previous mill surveys.

The total number of individuals participating in the program is much larger than would be expected for a continuing program. It is our opinion that the continued use of personnel from any one office would potentially jeopardize their own programs. Additionally, we feel it inadvisable to require any one individual to be a member of a survey team for more than three consecutive weeks.

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The scheduling, where possible, has been arranged so that at least one individual from AL, CH, or HA Inspection Divisions will be a member of the team during the surveys of those mills which are physically located in their respective geographical areas.

Additional survey equipment, as immediately available, has been ordered to supplement that which has been loaned to us by the Health and Safety Laboratory, New York Operations Office. However, the total equipment which is, or will be, available is not sufficient to adequately equip four teams simultaneously for continuous surveying. Therefore, concurrent surveying of four mills has been scheduled for only two different weeks, August 17 and September 8. Because of the geographical proximity of the four mills in the Grants, New Mexico, area and the intention of performing the surveys without prior announcement to mill management, it has been deemed advisable to schedule these four mills during the same week. The one additional mill in the Grants area, Anaconda, which has previously been visited twice by our own Inspection Division, is scheduled during the week of August 24. Four additional mills have been concurrently scheduled during the week of August 17 in order to meet the proposed surveying of all mills by October 15.

The analyses of all samples collected by the survey teams will be performed under the direction of the Chief, Analysis Branch, Health and Safety Division, Idaho Operations Office. To supplement the Analysis Branch personnel, two analytical chemists each, from the General Electric Company, Hanford, Washington, and the National Lead Company, Fernald Area Office, Cincinnati, Ohio, and one from the New Brunswick Laboratory, New Brunswick, New Jersey, will be at the National Reactor Testing Station beginning August 11.

In addition to information gathered by the survey teams, e.g., radiation levels, airborne concentrations of materials, and effluent samples, personnel at each mill are being supplied with film badges by the Personnel Metering Branch, Health and Safety Division, Idaho Operations Office. This service, on a monthly basis, will be continued for a three-month period to indicate which, if any, of the mill personnel are receiving doses sufficient to warrant continuing personnel monitoring equipment to be supplied thereafter by the mill management. It should be noted that the information obtained from this program will not be complete until considerably after the October 15 date.

With further regard to personnel from other Operation Offices and contractor personnel therefrom, it is understood that travel to and from Idaho Falls (or the survey area) and personal services will be charged to the travellers' normal program assignments, as indicated by the General Manager's TWX to all Managers, dated July 31, 1959.

Attachment:
Mill Inspection Schedule

ENCLOSURE II

MILL INSPECTION SCHEDULE - August 17 to October 9, 1959

Aug. 17	Rare Metals (AL)	R-172	Kerr-McGee (AL)	R-157	UCH (Rifle)	R-105	UCM (Uravan)	R-105
	Kant	ID LI	O'Neill	ID H&S	Holmes	ID LI	Williams	GJ
	Woolsey	AL	Giboney	SR	Osloond	ID H&S	Ball	ID H&S
	Peery	OR	Whitman	AL		GJ		GJ
Aug. 24	Texas-Zinc	R-185	Anaconda (AL)	R-138				
	Kant	ID LI	Giboney	SR				
	Peery	OR	Whitman	AL				
	Ball	ID H&S	Osloond	ID H&S				
Aug. 31	UCN (Slick Rock)	R-105	Climax	R-134				
	Held	ID H&S	Johnston	ID LI				
	Peery	OR	Carothers	SR				
Sept. 8	Homestake-Sapin(AL)	R-213	Homestake-N.Mex.(AL)	R-214	Phillips(AL)	R-216	Kermac(AL)	R-217
	Kant	ID LI	Holmes	ID LI	O'Neill	ID H&S	Nelson	AL
	Woolsey	AL	Williams	GJ	Whitman	AL	Osloond	ID H&S
	Carothers	SR				GJ		GJ
Sept. 14	Gunnison	R-209	Cotter	R-197				
	Holmes	ID LI	Carothers	SR				
	Ball	ID H&S	Woolsey	AL				
Sept. 21	Lucky Mc	R-223	Western Nuclear	R-205				
	Held	ID H&S	O'Neill	ID H&S				
	Williams	GJ	Nelson	AL				
		GJ		CH				
Sept. 28	Dawn (HA)	R-187	Mines Development(CH)	R-174				
	Brunstad	HA	Holmes	ID LI				
	Kant	ID LI		CH				
	Osloond	ID H&S		GJ				
Oct. 5	Lakeview (HA) No License		Susquehanna-Western	R-228				
	Brunstad	HA	Holmes	ID LI				
	Kant	ID LI		CH				
				GJ				

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5. Waste Disposal Meeting

Mr. Graham reported he had received a call from Mr. William Carmichael, Vice President of the University of North Carolina, who inquired on behalf of the Governor about an AEC press announcement on waste disposal.[1/] Mr. Graham said the Governor was interested in learning more about AEC's waste disposal plans in order that his administration might decide whether to formally intervene in any AEC action affecting North Carolina. Mr. Graham suggested that a meeting be arranged with the Governors of North Carolina and Virginia, U.S. Department of Public Health officials and AEC representatives to explain fully the AEC waste disposal program. He said it would also be helpful to have representatives from Pennsylvania and Connecticut in attendance since AEC had already carried on successful waste disposal operations from these two states. Mr. Graham expressed the belief that such a broad presentation of the waste disposal program would relieve the apprehensions of the Governors and they in turn could relay this information to their respective states.

After discussion, the Commissioners agreed that a meeting of this nature should be arranged in the near future. Mr. Graham also requested that if the meeting could not be arranged by August 25, 1959, the deadline for filing intervention petitions be extended at least until after the meeting is held.

The General Manager said he would arrange such a meeting as soon as possible and suggested that officials from states other than North Carolina and Virginia be invited as persons familiar with the Commissions waste disposal program and not as State representatives, in order to avoid the appearance of a regional meeting on the matter. The Commissioners requested Mr. Luedecke to proceed on this basis.

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Materials-12

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

Secretariat

B-421

Tel. HAzelwood 7-7831
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NOTE TO EDITORS AND CORRESPONDENTS:

Attached for your information are a statement by A. R. Luedecke, General Manager of the Atomic Energy Commission, and a summary of the Commission's licensing activities in sea disposal of radioactive wastes, presented at the hearing on the disposal of low level radioactive wastes at sea, held Wednesday, July 29, 1959 by the Special Sub-committee on Radiation of the Joint Committee on Atomic Energy of the Congress.

Attachments

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7-31-59

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. S-21-59
Tel. HAzelwood 7-7831
Ext. 3446

Statement by A. R. Luedecke, General Manager
U.S. Atomic Energy Commission, before the
Special Sub-committee on Radiation of the
Joint Committee on Atomic Energy of the Congress
Wednesday, July 29, 1959

The Atomic Energy Commission is pleased to have this opportunity to present this statement regarding its programs relating to disposal of low-level radioactive wastes into the oceans. In our statement today we shall discuss briefly our plans concerning the recent report of the National Academy of Sciences - National Research Council, Publication No. 665, entitled "Radioactive Waste Disposal Into Atlantic and Gulf Coastal Waters". We shall also describe generally the kinds of radioactive wastes which have been disposed, or are under consideration for disposal, into the oceans; the conditions and limitations which the Commission has imposed on such disposals to insure protection of the health and safety of the public and its natural resources; the kinds of disposals which have been made into the oceans from Commission operations and the disposal activities of Commission licensees.

We shall also refer to the Commission's research and development programs pertinent to the sea disposal of radioactive wastes. Finally, as requested by the Joint Committee on Atomic Energy, we shall comment briefly on H. R. 8187.

At the outset, it should be emphasized that the primary objective of the Commission with respect to sea disposal operations is to assure the protection of man and his natural resources.

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Publication of the NAS - NRC report appears to have led to a misconception that the Commission would approve the suggested sites for immediate use. There is no urgent requirement for in-shore disposal sites. The Commission has no intention of designating any such site in the future without first thoroughly investigating, with the assistance of other interested federal and state agencies, the physical and biological conditions of the area, as recommended by the NAS - NRC committee.

It is emphasized that the Commission has not made a decision to use or approve the use of these in-shore sites, even if the results of the studies and investigations are favorable from a safety standpoint. Such decision is a question for future consideration.

In addition, if a site were definitely established as suitable for use as a disposal ground without endangering the health and safety, the Commission would not license the commercial use of the site without providing an opportunity for a public hearing on the matter, as required by its rules of practice.

The NAS-NRC Report

The NAS-NRC Committee study and report was requested and sponsored by the Bureau of Commercial Fisheries, Office of Naval Research, and the Atomic Energy Commission. The nature of the request was to examine the feasibility of disposing of the low-level wastes closer to shore than the 1000 fathom disposal sites used by AEC. Feasibility was considered primarily from the point of view of safety. The study group considered in-shore areas as safe for disposing of solid or packaged, low-level wastes up to 250 curies per year of the most biologically significant isotope without causing any adverse effect on man, provided proper precautions are taken in assessing and utilizing the sea disposal sites. We understand a representative of the NAS - NRC Committee is here to testify today in detail concerning the report. We believe that the report has furnished much useful and needed information on this subject.

In anticipation of a possible need for a coastal disposal site in the New England area where there is a relatively heavy concentration of industrial, medical, university and other users of radioisotopes, the Commission is making arrangements to

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conduct field investigations of four Atlantic Ocean areas off the New England coast to determine if a specific site could be designated, when needed, for the safe disposal of small quantities of low level radioactive wastes and to establish the conditions under which such wastes could be deposited at the site. The studies, to begin in September, will be conducted with the assistance of the Coast and Geodetic Survey, the Public Health Service and scientists from the University of Connecticut. The AEC is financing all of this work.

The Commission does not presently contemplate investigating any other suggested Atlantic coastal areas because a need for their use is not foreseen in the near future. The Commission tentatively plans to investigate areas in the Gulf of Mexico sometime next year. None of the suggested Gulf locations has been designated for this study as yet.

After consultation with representatives of the NAS - NRC Committee, local representatives of the United States Fish and Wildlife Service and representatives of the Massachusetts Departments of Public Health and Marine Resources, the AEC has eliminated from its consideration two of the in-shore disposal sites in the New England area suggested in the NAS - NRC report because use of these areas might interfere with sport and commercial fishing activities. These sites are: A rocky ledge, known as "Browns Ledge" 10 miles from Sakonnet, Rhode Island, at 41°19'7N and 71°063'W, and a two-mile-diameter site in which unexploded depth charges have been dumped, located 10 miles from Point Judith, Rhode Island, at 41°14'N and 71°25'W.

Two of the four sites to be investigated were specifically suggested by the NAS - NRC Committee in its report. One of these sites is an area two miles in diameter, located in Massachusetts Bay at 42°25.5'N and 70°35'W, which has been used by the Crossroads Marine Disposal Corporation of Boston as a disposal ground for small quantities of low level wastes. The company's license has been amended to require that as of August 15, 1959 it carry out its disposal operations in deep waters (1000 fathoms) off the continental shelf, at two locations -- one 150 miles southeast of Sandy Hook, New Jersey and the other 200 miles off Cape Cod. The other site is an explosives dumping area, 10 miles by 10 miles, located 45 miles from Sakonnet Point, Rhode Island, at 40°45'N and 70°52'W.

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The other two sites were not identified in the NAS - NRC report but were suggested by the NAS - NRC Committee, local representatives of the United States Fish and Wildlife Service and representatives of the Massachusetts Departments of Health and Marine Resources for further investigation. They are near sites included in the NAS - NRC report. One site is a 10-mile by 10-mile area known as No Man's Land. This is an area already restricted and used as a Navy gunnery range. It is approximately 12 miles south of Martha's Vineyard at 41°15'N and 70°43'W. The other is an area reported to be devoid of biological life located approximately 15 miles east of South Wellfleet, Massachusetts, at 42°05'N and 69°46'W.

The Coast and Geodetic Survey will take samples and make measurements to evaluate the dispersing effect of tides and currents and the uptake of radioactivity by clays and silts and by biological systems. The biological sample gathering will be carried out in collaboration with Dr. John S. Rankin, marine biologist of the University of Connecticut. The Water Supply and Water Pollution Control Group of the Public Health Service Robert A. Taft Sanitary Engineering Center at Cincinnati, Ohio, will make measurements of radioactivity in the biological and sediment samples to determine background radiation conditions.

After the field data have been gathered and analyzed the Commission will convene a group of marine scientists to evaluate the results. In the course of the evaluation other Federal and State agencies having an interest in the matter will be consulted.

If one of these in-shore disposal sites is approved, periodic monitoring of the site would be carried on in order continuously to assure that the capacity of the site to receive these radioactive materials safely is not exceeded.

Nature and Extent of Ocean Waste Disposal to Date

In evaluating or establishing any waste disposal system, three basic considerations are involved as follows:

1. The specific nature and quantity of the radioactive waste to be disposed of.

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2. The characteristics of the receiving environment.

3. Basic radiation protection standards established by the Commission in its regulation, Standards for Protection Against Radiation (10 CFR 20).

The radiation protection standards established by the Commission are based on the best available biological and medical information and on recommendations of the National Committee on Radiation Protection and the International Committee on Radiation Protection. The recommendations of the two committees have been agreed to by various national and international organizations.

Radioactive wastes are considered by many people as an uncategorized entity. The word "radioactive" has been so strongly impressed that it has become an all-inclusive term, to the point where important characteristics of waste such as quantity and concentration of radioactive material and detailed chemical and physical nature are often overlooked. However, these characteristics are the keys to meaningful understanding and discussion of radioactive waste operations.

The radioactive material involved in AEC sea disposal operations off both the Atlantic and Pacific Coasts is of a relatively low or intermediate level compared with highly radioactive wastes produced at AEC production sites such as Hanford or the National Reactor Testing Station. The wastes disposed at sea contain quantities of radioactivity normally associated with research and development activities rather than production or chemical reprocessing. For example, in terms of radioactivity concentration, the relatively small quantity of liquid wastes finally disposed at sea (after solidification) are less than a curie and generally in the thousandth or millionth of a curie per gallon range, whereas the liquid high level waste resulting from chemical processing operations at Idaho might have concentrations in the hundreds or thousands of curies per gallon. Thus we have a factor of difference in concentration of the order of tens or hundreds of millions. Also, the total number of gallons (i.e., total quantity of radioactivity) evolving from the two situations is vastly different. As an example, in 1957 the AEC diposed off both coasts of the United States at designated locations 686 55-gallon drums of solidified laboratory waste liquids (this volume includes concrete and other solidifying

agents). On the other hand there are about 65 million gallons of high level wastes in storage at Hanford, Savannah River and Idaho. We do not propose to dispose of these at sea, even though some oceanographers may indicate that a "dilute and disperse" waste disposal approach may be theoretically possible.

The wastes considered for sea disposal originate in various AEC research and development operations and in research laboratories of hospitals, universities, industrial firms and other places where radioactive isotopes are used for various purposes. The radioactive waste itself usually is in the form of contamination on equipment such as test tubes, bottles, rubber gloves, blotting paper and rubber tubing. This trash is packaged within concrete in 55-gallon drums or in preformed, reinforced concrete boxes before disposal.

Although experience in other countries has demonstrated the safety and practicality of disposal of bulk radioactive liquids at sea, all radioactive wastes disposed of by the AEC and licensees off both the Pacific and Atlantic Coasts of the United States have been in the solid or packaged form, with two minor exceptions. These exceptions involve millicurie quantities. Most of the waste has been contained in 18-gauge, 55-gallon drums with concrete liners and concrete tops and bottoms for weighting and shielding purposes.

Since 1951 the AEC has disposed of a quantity of radioactivity estimated at slightly less than 8000 curies (at the time of disposal) into the Atlantic Ocean. This material has been contained in approximately 23,000 55-gallon drums. Two major disposal areas have been used. One is located approximately 150 miles southeast of Sandy Hook (38° 30' N, 72° 06' W). Since early 1957 most of the disposals have been in an area approximately 230 miles southeast of Sandy Hook (37° 50' N, 70° 35'W). In addition, the reactor structure of the Seawolf prototype at West Milton was disposed into the former area in early 1959. Both of these areas are off the continental shelf and in a thousand fathoms of water or deeper. Although the number of curies associated with this equipment was estimated at 33,000, it was all in the form of induced activity in the Type 347 stainless steel and would be released to the sea only through corrosion of this material. Based on known corrosion rates, it is estimated that this release rate would not be more than two or three curies per year.

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In the Pacific Ocean sea disposal operations began in 1946. Since then approximately 14000 curies (at the time of disposal) contained in about 21000 drums and 329 concrete boxes have been disposed in an area approximately 48 miles west of the Golden Gate (approximately 37° 39'N., 123° 26'W). Also since 1953 about 60 curies contained in about 2950 55-gallon drums have been disposed in an area approximately 53 miles west of Pt. Vicente, California (approximately 33° 39'N., 119° 28'W)*. Both of these areas are in depths of water of a thousand fathoms or greater. These operations were carried out by the U.S. Navy at the Commission's request. The radioactivity content ranges from about one-half a millicurie to 15 curies per drum for the solid wastes -- with most around one half curie or less, and from one-half millicurie to 1.5 curies per drum for the solidified liquid wastes at the time of disposal. The AEC has not disposed of any radioactive waste materials into the Gulf of Mexico.

At present there are 7 commercial firms licensed by the Atomic Energy Commission to collect, package, store and dispose at sea, in at least 1,000 fathoms, solid or packaged low-level radioactive waste generated by AEC licensees and contractors using radioisotopes in medicine, industry, agriculture, research and training. Four such firms are licensed to dispose of waste in the Pacific Ocean and their records show that approximately one-half curie of byproduct material and 15 pounds of source material have been disposed in the Pacific Ocean to date. Four firms are licensed to dispose in the Atlantic Ocean and their records indicate a total disposal of approximately 2500 curies of byproduct and source material to date.

In addition, 8 organizations are licensed by the Commission to dispose of the waste generated in their own laboratories. Six of these organizations have disposed in the Atlantic Ocean a total quantity of approximately 31 curies of activity. Two licensees in this category have disposed of approximately 101 curies of activity in the Pacific Ocean.

In addition to the above described licensed waste disposal operations, a few licensed users of byproduct materials

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*Distances noted in this paragraph are in nautical miles (6000 feet) rather than statute miles of 5280 feet.

disposed of waste at sea prior to 1958 but have discontinued the practice. In this group, six organizations disposed of a total of approximately 4 curies into the Atlantic, two organizations a total of less than 1 curie into the Pacific and two organizations a total of approximately 10 curies into the Gulf of Mexico. There are at present 5 license applications for disposal of radioactive waste pending. Two of these concerns propose to dispose of packaged waste in the Pacific Ocean, 1 in the Atlantic Ocean, and 1 in the Pacific or the Atlantic Ocean. One application to dispose of packaged radioactive waste in the Gulf of Mexico in 1000 fathoms of water is pending review by the Atomic Energy Commissioners.

We have prepared a detailed summary of sea disposal licenses currently in effect. This summary includes an identification of the sites authorized for each of the licensees to dispose of radioactive wastes. With the permission of the Committee, I should like to furnish copies of the summary for the record. We should also like to furnish for the use of the Committee a copy of a typical sea disposal license showing the various conditions and limitations incorporated in the license to assure proper handling and disposal of the radioactive waste. This license is one issued in May, 1959 to the Public Health Service, National Institutes of Health. At a later point in our prepared statement, we shall describe the licensing procedures observed by the Commission in connection with sea disposal licenses.

The major objectives of the criteria for our sea disposal operations are to assure adequate packaging for safe handling between the site of the waste originator and the final disposal and to assure the sinking of the packages in the sea, generally in areas 1,000 fathoms or deeper. For example, the package must be able to withstand handling operations during loading and unloading procedures without exposing the contents. A minimum of 10 pounds per gallon of displacement volume is required to assure sinking. Packages also must be properly labeled. If materials are shipped by common carrier, conformance with Interstate Commerce Commission and Coast Guard regulations is required.

It is not required that the packages be so constructed as to maintain their complete structural integrity at a depth of 1000 fathoms of water, although the package and its contents must be fabricated and prepared to prevent the material from floating

to the surface. With the quantities and characteristics of the radioactive materials involved and with the diffusion and transport capabilities of the ocean environment, it is not necessary to assure continued containment of the radioactivity at 1,000 fathoms., In fact, allowing the natural processes of diffusion and dilution to act assists in the prevention of buildup of significant sources of radioactivity. A secondary factor is the difficulty and expense involved in constructing true pressure vessels to withstand the tremendous pressures at great ocean depths.

Protection of the public health and safety, as stated previously, is the overriding consideration in the management and administration of all atomic energy operations including the disposal of radioactive wastes at sea. It is our belief that these sea disposal operations are being carried out in a manner that is safe and adequate. This belief is based upon:

(1) views of experts in the marine sciences and other pertinent fields;

(2) the actual operating experience of the British in disposing of greater quantities of radioactive material in a more mobile (liquid) state; and

(3) the preliminary, but direct information obtained in both the Atlantic and Pacific Ocean disposal areas in actual field studies.

To further delineate the basis for our belief in the safety of the AEC's sea disposal operations, we would cite the recent report of the NAS - NRC (Publication 655 previously referred to). The group of marine scientists that prepared this report, indicated after careful and conservative consideration of the various factors involved, that it was feasible to dispose safely solid, packaged wastes of the type previously described at several in-shore, shallower water locations along the Atlantic and Gulf Coasts.

Mention must be made of the British experience in disposing of bulk liquid wastes into the Irish Sea. As a result of detailed investigation by British atomic energy facilities and public health authorities, the British Government concluded that it would be safe to discharge radioactive materials directly

through a three mile pipeline into the Irish Sea at the rate of 1,000 curies per month. As a result of actual monitoring studies during an extended period of discharge at that rate, it was determined that the discharge rate could be increased safely to 10,000 curies per month. Reports of this work have been published.

In October, 1957, at the request of the Commission, a survey of the Atlantic Ocean disposal area located approximately 150 miles southeast of Sandy Hook was conducted by the Chesapeake Bay Institute in cooperation with the U.S. Coast and Geodetic Survey. The survey consisted of taking a series of samples of ocean bottom in and near the disposal site. Radiological analyses of these samples indicated no radioactivity detectable above background levels. A similar survey by the Scripps Institution of Oceanography of both the Pacific Ocean disposal areas previously noted indicated comparable results. Although the surveys were of a preliminary nature, the direct data obtained do not indicate any buildup of radioactivity of significance in the disposal areas.

General Nature of AEC Research and Development Programs Pertaining to Sea Disposal

The AEC supports an extensive research and development program in oceanography and the marine sciences that relates directly to the disposal of radioactive materials in the oceans. It was one of the three Federal agencies that originally requested the NAS to establish a Committee on Oceanography and has contributed to the support of that group since its establishment. It has also actively participated in the inter-agency Coordinating Committee on Oceanography since the inception of that group.

In the AEC Division of Reactor Development in FY 1960, expenditures in the amount of approximately $250,000 are planned in connection with research and development projects pertaining directly to the disposal of radioactive materials in the marine environment. These projects include investigation of estuarine circulation and the fate of radioactive materials which may be introduced into esturial waters. Specific field data is being obtained in New York Harbor and model studies of other estuaries have been carried out at the Vicksburg Waterways Experiment Station of the Corps of Engineers. Organizations involved or cooperating in this work are the Maritime Administration, U.S. Coast and Geodetic Survey and the Chesapeake Bay Institute of the Johns Hopkins University.

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In the AEC Division of Biology and Medicine, a number of projects in the field of marine biology and physical oceanography are being supported. Although some of these projects were initiated in connection with weapons tests, the information obtained is also applicable in many respects to sea disposal activities. A detailed summary of this program was recently presented to the Subcommittee on Oceanography of the House Committee on Merchant Marine and Fisheries. A copy of that report has been furnished to the Joint Committee on Atomic Energy separately.

Procedures Observed in Licensing Disposal of Radioactive Waste in the Sea

An applicant for a license to dispose of radioactive waste in the ocean must submit a detailed description of his proposed activities including the type and quantities of radioactive material to be possessed; the waste container and packaging specifications; the site for packaging and storage of the waste; transportation procedures; instrumentation for measurement of radiation levels and contamination; radiation safety and emergency procedures to be followed in collecting, packaging, storage, transportation and disposing of the waste material; the disposal location including the depth of water; and the type of records to be maintained.

A pre-licensing visit is made to the applicant by a technical representative of the Division of Licensing and Regulation prior to issuing such a license. The purpose of the visit is to carefully review all aspects of the proposed program with the applicant, and to assure that the program can be conducted in accordance with the Commission's regulations and conditions which will be added to the license. An evaluation is made of the site for packaging and storage of radioactive waste. Attention is given to such factors as the size of the site, nature of surrounding area, and possible effects of fire or flood on the site and the surrounding area. In addition, the applicant's radiation protection procedures, proposed equipment and facilities, method of packaging, container specifications, radiation instrumentation, method and place of final disposal, transportation, and storage, are reviewed and discussed. If the visit discloses evidence that certain aspects of the proposed program may not meet the criteria for issuing such a license, these deficiencies are pointed out to the applicant.

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The information and technical data submitted by the applicant is thoroughly reviewed by the Commission's technical staff which includes specialists in the field of radiation protection and waste disposal.

As in the case of Commission disposal operations, in licensing sea disposal of low-level radioactive wastes the Commission uses, as its criteria, its radiation protection regulations (Part 20, 10 CFR) and the recommendations of the National Committee on Radiation Protection contained in National Bureau of Standards Handbook 58, "Radioactive Waste Disposal in the Ocean." Thus the licenses contain detailed provisions to assure (1) disposal will be in a minimum of 1000 fathoms of water, (2) the waste material will be packaged in such a manner that under the conditions of handling, storage and shipment the packages cannot be easily damaged or broken and contains sufficient shielding for protection, (3) the containers will be of sufficient density to reach the ocean bottom without appreciable loss of contents, (4) the package will be appropriately labeled for identification purposes, and (5) containers will conform to applicable shipping regulations of the Interstate Commerce Commission, Coast Guard and conditions of the AEC license.

Other special conditions are placed on all sea disposal licenses. These include specification of a sea disposal location or reference to one, notification to the AEC before sea disposals are made, and a time limit for storing the radioactive waste. Also based on the training and experience of the individuals handling the wastes and the equipment and facilities available, certain licensees are not permitted to open containers of waste received from customers but may only package these containers for sea disposal by encasing them in sufficient concrete to obtain the proper density. Because of the widespread interest in ocean disposal of radioactive materials and to keep interested persons fully informed, the Commission publishes in the Federal Register notices of receipt of applications for, proposed issuances and issuances of, licenses authorizing radioactive waste disposal services resulting in sea disposal. When a license application is received a notice of receipt of application is published in the Federal Register. At the time the AEC staff completes its evaluation of the application and determines that the proposed activities meet the requirements for a license, a notice of proposed issuance of the license, the proposed license, and a statement of

safety considerations are published in the Federal Register. Fifteen days are allowed for interested parties to intervene and request a hearing. If there are no requests for interventions, the license is issued as proposed. If an interested party or the applicant intervenes as provided in the Commission's "Rules of Practice" or if there is sufficient public interest demonstrated, the matter is set down for a public hearing. The Commission's hearing examiner presides at such hearings and determines from the evidence adduced whether or not and under what conditions the proposed license should be issued. The hearing examiner's decision is subject to review by the AEC Commissioners on their own motion or if exceptions to his decision are filed by any of the parties to the hearing.

In addition, copies of license applications, Federal Register notices and licenses involving sea disposal are on file in the Commission's Public Document Room for inspection. Copies of the above-mentioned notices and licenses are sent to the Governor and other interested authorities in each state where the applicant will operate.

As indicated in the summary of licensed waste disposal operations which we handed up for the record, hearings have been held on an application by The Walker Trucking Company and an application by Industrial Waste Disposal Corporation.

H. R. 8187

H. R. 8187 is a bill to impose certain restrictions on the disposal of radioactive material in the Gulf of Mexico. It would prohibit the disposal of any radioactive material in the Gulf of Mexico at a point a) less than 200 miles from the shoreline of any State of the United States; b) where the water is less than 1000 fathoms deep; or c) where the waters are used customarily for commercial sports or fishing.

In addition, it would prohibit the disposal of any radioactive material into the Gulf of Mexico unless the material is in a container of "such character and strength that it will remain intact indefinitely, regardless of the depth of the water in which it is deposited." Moreover, if the shipment of radioactive material originated or was assembled in a State bordering on the Gulf of Mexico, disposal in the Gulf would be prohibited

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unless permission to dispose of the material had been obtained from the State or an authorized official or agency of the State.

Since receiving the request of the Joint Committee for comments on H. R. 8187, we have not had an opportunity to prepare detailed comments on the bill. We should like to say, however, that the Commission would not look favorably on the bill.

The disposal of radioactive material into the seas (including the Gulf of Mexico), involves detailed considerations of many technical factors. As previously indicated, these include a) the nature and characteristics of the radioactive materials; b) the oceanographic features of the site proposed for disposal, including the ocean currents and the biological characteristics; c) the nature of the packaging methods; d) other technical factors that may be involved in the particular disposal activity.

We believe that such questions can more appropriately be resolved by quasi-judicial and quasi-legislative procedures, subject to the Administrative Procedures Act, as carried out by the Atomic Energy Commission and other Federal administrative agencies. We believe that it would be undesirable to establish by legislation specific prohibitions which do not take into account the many varying, technical and scientific considerations involved in this complex subject.

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SUMMARY OF LICENSING ACTIVITIES RELATING TO
DISPOSAL OF RADIOACTIVE WASTES AT SEA

Firms providing commercial waste disposal service -

1. American Mail Line, Ltd., 740 Stuart Building, Seattle 1, Washington, was issued a license in August 1958 to dispose of radioactive waste in the Pacific Ocean. The licensee is authorized to receive waste already packaged for sea disposal only from the Boeing Airplane Company, Seattle, Washington. The licensee acts only as a carrier of the waste from Seattle to the disposal location and is authorized to dispose of this packaged waste in the Pacific Ocean at locations at least 150 miles from the Continental Shelf at a minimum depth of 1000 fathoms during regular voyages of their ships. To date, this licensee has made one sea disposal consisting of 540 millicuries of byproduct material and 15 pounds of source material at 51° 31' North latitude and 139° 00' West longitude.

2. Coastwise Marine Disposal Corporation, 5216 South Van Ness, Los Angeles, California, was issued a license in June 1959 authorizing the disposal of radioactive wastes in the Pacific Ocean. The licensee's facilities are located at 2100 West 15th Street, Long Beach, California. Containers of waste received from customers may be opened in connection with preparing the waste for sea disposal. The licensee requested permission to dispose of packaged waste in the Pacific Ocean at a location recommended by the State of California and has been so authorized by the Commission. The waste material must be disposed of within a 5-mile radius circle, the center of which is 32° 00' North latitude and 121° 30' West longitude where the ocean depth is 2000 fathoms. There are five disposal sites in the Pacific Ocean recommended by the State of California which have a minimum depth of 2000 fathoms and are at least 60 miles from any sea mount. To date, this licensee has not disposed of any licensed radioactive material in the Pacific Ocean.

3. Isotopes Specialties Company, 170 West Providencia, Burbank, California, was issued a license in August 1958 authorizing the disposal of radioactive wastes in the Pacific Ocean. Containers of waste received from customers may be opened in connection with preparing the wastes for sea disposal. The licensee requested permission to dispose of wastes in the Pacific

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Ocean at the locations recommended by the State of California and has been so authorized by the Commission. To date, this licensee has not disposed of any licensed radioactive material in the Pacific Ocean.

4. Nuclear Engineering Company, Inc., 2600 North Main Street, Walnut Creek, California, was issued a license in October 1958 authorizing the disposal of radioactive wastes in the Atlantic and Pacific Oceans. The firm's facilities are located in Cowell, California, and Kearny, New Jersey. The licensee is authorized to open containers of waste received from customers in connection with preparing the wastes for sea disposal. The disposal site in the Atlantic Ocean is within a 3 mile radius of 38° 50' North latitude and 72° 00' West longitude or an area bounded by North latitudes 39° 00' and 38° 50' and West longitudes 72° 00' and 72° 16' where the depth is at least 1000 fathoms. These disposal sites are in the same location as those used by the Commission for sea disposal. In the Pacific Ocean, the licensee requested permission to dispose of wastes at the locations recommended by the State of California and has been so authorized by the Commission. To date, this licensee has not disposed of any licensed radioactive material in either the Atlantic or Pacific Oceans.

5. Crossroads Marine Disposal Corporation, 26 T Wharf, Boston, Mass., has been authorized since 1952 to dispose of low-level radioactive waste at an inshore disposal area in the Atlantic Ocean 12 to 15 miles from the coast at 42° 25.5' North latitude and 70° 35' West longitude. The depth at this location is about 50 fathoms. The disposal location is designated as an explosive and toxic chemical dumping area by the U. S. Army Corps of Engineers and therefore one not used for commercial or recreational activities. This license has been amended, effective August 15, 1959 requiring disposal in the Atlantic Ocean at a minimum depth of 1,000 fathoms within an area bounded by 41° 38' and 41° 28' North latitude and 65° 28' and 65° 45' West longitude or within a 5-mile radius circle the center of which is at 38 30' North latitude and 72 00' West longitude. This latter area is used by the Commission for disposal of packaged radioactive waste. Containers of waste received from customers may not be opened but only further packaged for sea disposal. To date, this licensee has disposed of about 2,440 curies of byproduct and source material.

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6. New England Tank Cleaning Company, 135 First Street, Cambridge, Mass., was issued a license in September 1958 authorizing the disposal of radioactive wastes in the Atlantic Ocean. The licensee's facilities are located at Great Brewster Island, Boston, Massachusetts, and the National Dock Yard, Boston, Massachusetts. Containers of waste received from customers may not be opened but only further packaged for sea disposal. The disposal site is in the Atlantic Ocean within the area bounded by 41° 38' and 41° 28' North latitude and 65° 28' and 65° 45' West longitude where the minimum depth is 1,000 fathoms. To date, this licensee has not disposed of any licensed radioactive material in the Atlantic Ocean.

7. The Walker Trucking Company, 1283 to 1285 East Street, New Britain, Connecticut, was issued a license in March 1959 authorizing the disposal of radioactive wastes in the Atlantic Ocean. The licensee's facilities are located on Brownstone Avenue in Portland, Connecticut. Containers of waste received from customers may not be opened but only further packaged for sea disposal. The disposal site is in the Atlantic Ocean within a three mile radius of 38 50' North latitude and 72 00' West longitude at a minimum depth of 1,000 fathoms. This disposal site is in the same location as that used by the Commission for disposal of packaged radioactive waste. To date, this licensee has not disposed of any licensed radioactive material in the Atlantic Ocean. The licensee has requested an amendment to his license to use an additional site for packaging and temporary storage in New Britain. A hearing is being held on this application for amendment.

8. There are five license applications for disposal of radioactive wastes pending. Applications have been received from Ocean Transport Co., Richmond, California, and California Salvage Company, San Pedro, California, to dispose of packaged radioactive wastes in the Pacific Ocean. An application has been received from Nuclear-Chem Corporation, Bellerose, New York, to dispose of packaged radioactive waste in the Atlantic Ocean. Also, an application has been received from the Military Sea Transportation Service, Washington, D. C., to dispose of packaged radioactive waste from government operations in both the Atlantic and Pacific Oceans. An application from the Industrial Waste Disposal Corporation, Houston, Texas, to dispose of packaged radioactive waste in the Gulf of Mexico at 1000 fathoms is pending review by the Atomic Energy Commission.

Organizations licensed to dispose of their own waste at sea -

9. The National Institutes of Health, of the Public Health Service, Bethesda, Maryland, was issued a license in May 1959 authorizing disposal in the Atlantic Ocean at a location within a 5-mile radius of 36° 56' North latitude, 74° 23' West longitude at a minimum depth of 1000 fathoms. This site is approximately 105 miles from Cape Henry Virginia. The licensee also receives for disposal properly packaged waste from the Naval Research Laboratory, the National Bureau of Standards, and other government agencies in the Washington area. The waste is transported to sea by the U. S. Coast Guard accompanied by NIH personnel. To date NIH has disposed of about 30 curies of by-product material.

10. The U. S. Naval Radiological Defense Laboratory was issued a license in May 1959 authorizing disposal of radioactive waste in the Pacific Ocean at a location within a 5-mile radius of 37° 41' North latitude and 123° 25' West longitude at a minimum depth of 1000 fathoms or at other areas when approved by the Commission. The location designated is one which has been used by the Commission for disposal of packaged radioactive waste. To date this licensee has disposed of about 100 curies of its own waste.

11. Atlantic Refining Company, Philadelphia, Pennsylvania, is authorized to dispose of radioactive wastes in the Atlantic Ocean. The site used is about 180 miles from shore and located at 32° 30' North latitude and 75° 45' West longitude where the minimum depth is 1000 fathoms. To date this licensee has disposed of about 650 millicuries of byproduct material.

12. Socony Mobil Oil Company, Paulsboro, New Jersey, is authorized to dispose of radioactive wastes in the Atlantic Ocean within an area bounded by 31° 10' and 32° 54' North latitudes and 72° 20' and 85° 17' West longitudes at a minimum depth of 1000 fathoms. To date this licensee has disposed of about 1.6 millicuries of byproduct material.

13. California Research Laboratory, Richmond, California, is authorized to dispose of radioactive wastes in the Pacific Ocean at 30° 43' North latitude and 139° 06' West

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longitude where the minimum depth is 1000 fathoms. To date this licensee had disposed of about 1 curie of byproduct material.

14. U. S. Naval Medical Research Laboratory, New London, Connecticut, is authorized to dispose of radioactive waste in the Atlantic Ocean at a minimum depth of 1000 fathoms. To date this licensee has not disposed of byproduct material in the ocean.

15. In addition, the U. S. Fish and Wildlife Service, Beaufort, North Carolina and the University of Georgia, Sapelo Island, Georgia, are authorized to dispose of very low-level radioactive waste in liquid or readily dispersable solid form directly into the Atlantic Ocean without packaging. The type and quantity of the waste and the immediate dilution involved are such that this waste could be disposed of by sanitary sewer or burial under the provisions of 10 CFR 20, "Standards for Protection Against Radiation." The site used by the Fish and Wildlife Service is about 8 miles off the North Carolina Coast at 34° 32' North latitude and 76° 40' West longitude. To date about 500 millicuries of byproduct material have been disposed of at this site. The disposal site used by the University of Georgia is about 3 miles off the Georgia Coast. To date about 2.3 millicuries of byproduct material have been disposed of.

16. In addition to the above described licensed waste disposal operations, a few licensed users of byproduct materials disposed of wastes at sea prior to 1958 but are not doing so now. In this group, six organizations dumped a total of approximately 4 curies into the Atlantic, two organizations dumped a total of less than 1 curie into the Pacific and two organizations dumped a total of approximately 10 curies into the Gulf of Mexico. All of the disposals in the Gulf of Mexico and most of those in the Atlantic and Pacific Oceans were at depths of greater than 1000 fathoms.

17. Thus, to date Commission licensees have disposed of approximately 2,600 curies of radioactive material in the Atlantic Ocean, approximately 102 curies in the Pacific Ocean and approximately 10 curies in the Gulf of Mexico.

AEC

Materials - 12. Waste Processing & Disposal

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D.C.

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FOR IMMEDIATE RELEASE
(Thursday, July 30, 1959)

AEC ORDERS LICENSEES TO IMPROVE SAFETY OF MILL OPERATIONS

The Atomic Energy Commission has issued follow-up orders to the operators of five uranium processing mills in a further step to assure that concentrations of radioactive material in mill areas and in wastes discharged into streams are brought within permissible limits established in Commission regulations.

Plans for bringing their operations into compliance with regulations have been submitted by the mills as required by letter orders issued by the Commission May 22, 1959. Under the new orders, performance in accordance with these plans is made a condition of the companies' licenses to possess and process uranium ores. The companies are advised, in the orders issued July 24, 1959, that the Commission will inspect the mills to learn whether adequate measures have been taken or whether additional measures are required.

The plants affected are the Uravan, Colorado, and Green River, Utah, mills of Union Carbide Nuclear Company; the Durango, Colorado, mill of Vanadium Corporation of America; the Maybell, Colorado, mill of Trace Elements Corporation (a unit of Union Carbide Corporation); and the Salt Lake City, Utah, mill of Vitro Uranium Company.

Corrective actions planned include improved control procedures for the discharge of wastes into streams; further use of settling ponds to reduce the concentrations of toxic and radioactive materials in mill effluent; equipment additions and modifications to reduce mill dust including use of mist sprays to wet down uranium, and use of industrial vacuum cleaners, air ducts, and dust collectors. The mills will conduct

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Related Material - Industrial Hygiene

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improved survey programs to determine the effectiveness of measures taken to reduce dust and, where necessary, to lower the concentrations of radioactive materials, including radium, discharged into streams.

Some corrective measures have already been accomplished and others will be carried out in the next few months.

Sixth Mill Receives Letter Order

In a related action, the Commission has issued a letter order dated July 13, 1959 to Uranium Reduction Company, directing the company to submit by August 15, 1959, a detailed plan for bringing operations at the company's Moab, Utah, mill into compliance with licensing regulations. Inspections of the mill, the letter order stated, indicate that the company (1) has failed to make adequate surveys in working areas of the mill to determine concentrations of airborne radioactivity and (2) has failed to determine the concentrations of radioactive material, including radium, discharged as liquid effluent from the mill.

The order to Uranium Reduction Company and the five orders issued May 22 are based upon mill inspections carried out by Commission representatives. Orders to other uranium mills will be issued, if warranted, as the inspections continue.

The Animas River

In its letter order of May 22 to Vanadium Corporation of America, the Commission advised the company that operations at its Durango, Colorado, mill appeared to be in violation of the Commission's regulations and the terms of the company's license. Among other things, the letter order stated that mill had released radioactive material, including radium, into the Animas River without first having demonstrated that the concentrations were not likely to expose any individual in excess of permissible limits.

The Commission believes that no immediate health hazard exists as a result of the discharge of the mill's effluent into the Animas. Water containing the maximum permissible concentrations of radium allowed by present Commission regulations could be continuously and exclusively consumed by an individual for a period of 70 years before he would have taken radium into his body in excess of the limits recommended by the National Committee

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on Radiation Protection. Concentration was measured down stream in the Animas River during the past year by the U.S. Public Health Service. At several points where the waters are used, the measurements show that the highest concentration was about two and a half times the permissible concentration. Radium was being discharged into the Animas River at a rate such that an individual could continuously and exclusively consume water at the points of intake for 50 years before taking radium into his body in excess of the recommendations of the NCRP.

The Atomic Energy Commission has worked closely with the states and the U.S. Public Health Service on the problem of river contamination by uranium mills.

In 1950 the waters of the Animas River were sampled by the Public Health Service. The samples, based on an analysis made at the University of Rochester, indicated that the radium content was within permissible concentrations by then accepted international standards. Again in 1955 the Animas River was sampled and the radium content was below permissible limits.

Since 1956 the Public Health Service by statute has had the responsibility for determining whether interstate streams were being contaminated by industrial operations, sewage disposal or from other causes. In 1958, at the request of New Mexico the PHS, with the cooperation of the Atomic Energy Commission, undertook a comprehensive survey of the Animas River. The survey required nearly a year, and the report was issued at Santa Fe, New Mexico, in June 1959.

Before issuance of the June 1959 PHS report, the Durango mill had taken steps designed to eliminate further contamination of the Animas River. These steps were reported to the Commission in response to the May 22 letter to Vanadium Corporation of America, and also were reported at the June meeting in Santa Fe.

Under regulations and standards established by the Commission in 1957, AEC began a series of mill inspections late in that year. These initial inspections indicated that most mills had failed to make required surveys and to keep records which would show the extent of radioactivity in mill working areas and in mill effluent. The mills were notified of this situation by letter and in response the companies stated that they would take remedial action. Follow-up inspections begun last year and still continuing indicate that, in general, reported plans had been carried out only partially. The Commission therefore issued on May 22, 1959, the first of a series of letter orders directing

that steps be taken without further delay to correct the situation.

As part of its program to improve the safety aspects of mill operations, the Commission is financing an industrial waste survey of uranium milling operations on the entire Colorado Plateau undertaken by the Public Health Service at the request of the Commission. Principal objectives of this survey are to develop full information concerning airborne radioactivity in working areas and radiation levels of mill effluent, and to develop guides for improved handling of mill wastes.

In 1958 the Johns Hopkins University, under contract to the Commission, carried out a study of the Colorado River from Glenwood Springs, Colorado, and of the Gunnison River from Gunnison, Colorado, to Cisco, Utah, to determine possible effects of liquid waste discharges from the uranium mills on those streams. Data developed during this study are now being evaluated. Preliminary study of the data indicates that no emergency situation exists as a result of concentrations of radium in the waters.

About two years ago the Commission instructed its Process Development Laboratory at Winchester, Massachusetts, to extend its research and development activities to develop procedures for reducing radiological hazards associated with mill operations. Resulting information developed to date has been made available to mills and the Public Health Service, and published for distribution through the Office of Technical Services of the Department of Commerce.

Uranium Mines

The Atomic Energy Commission does not exercise regulatory authority over uranium mines. The Commission has had a strong and continuing interest, however, in possible hazards to the health of workers engaged in uranium mining, principally from radon gas, and it has participated in and financed a number of pertinent activities during the last decade including a program of environmental studies carried out under direction of the U.S. Public Health Service; an annual series of medical examinations of miners; and related medical studies carried out by the University of Rochester. To help accomplish the medical examinations of the miners, the Commission, through its Grand Junction (Colorado) Operations Office, has provided equipment for mobile teams of doctors who visit uranium mines and conduct on-the-spot examinations.

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Recently, an inter-agency group met to consider the extent of the health hazard in the mines, how Federal agencies can most effectively assist the states to reduce the levels of radiation in the mines, and what additional authority at the federal level may be desirable or necessary. The first meeting of this group was held in May. Representatives were present from the U.S. Public Health Service, the Atomic Energy Commission, the U.S. Bureau of Mines, the Bureau of Indian Affairs, and the U.S. Department of Labor. Committees are being set up to work toward the objectives of the inter-agency group.

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Materials-2

July 30, 1959

MEMORANDUM FOR: GENERAL MANAGER

The Chairman reminded me today that he had requested a review of our inspection program at an early date.

He also stated that he would like for the staff to review with the Commission our whole waste disposal program. I advised him that it was my understanding that recommendations were coming forward in form of a Staff Paper concerning the possible establishment of national or regional waste disposal sites. He indicated that in the event such a paper was in process, he would like to make sure that the background for the recommendations contains a concise but yet complete resume of the overall waste disposal program. This could be done either orally at the Commission Meeting or in writing. Although he did not indicate a timetable, I am sure he does not expect this as soon as the inspection briefing.

Dwight A. Ink

DAI/po

7-28-59

STANDARD FORM NO. 64

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Office Memorandum • UNITED STATES GOVERNMENT

TO : Those Listed Below

DATE: July 30, 1959

FROM : Harold D. Anamosa,
Acting Secretary

SUBJECT: BRIEFING ON WASTE DISPOSAL PROGRAM

SYMBOL: SECY:RVW

1. At Meeting 1530 on July 28, 1959, during discussion of the July 29, JCAE hearing on radioactive waste disposal, the Commissioners requested a general briefing on the AEC waste disposal program.

2. The General Manager has directed that you jointly prepare this briefing. We will be glad to assist you in scheduling it on the Commission's agenda.

TO: Frank K. Pittman, Director
Division of Reactor Development

E. J. Bloch, Director
Division of Production

Harold L. Price, Director
Division of Licensing & Regulation

cc: General Manager
Asst. Gen. Mgr. for R&ID
Director, Biology & Medicine
D. C. Office

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750-59

STANDARD FORM NO. 64

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Office Memorandum • UNITED STATES GOVERNMENT

TO : File

DATE: July 29, 1959

FROM : A. H. Ewing

SUBJECT: RADIOACTIVE WASTE DISPOSAL PROGRAM

This will confirm for the Commission records that I was informed today of a decision by Mr. Hollingsworth and Mr. Tammaro to assign to to Messrs. Lieberman, Dunham, Pittman and Salisbury the responsibility for a program on the above subject requested by Mr. McCone at Meeting 1528 on July 15, 1959.

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7-2959

JUL 20 1959

P. L. Pittman

A. [redacted] (Signed) A. Tamplin

RADIOACTIVE WASTE DISPOSAL; COMMISSION REQUEST MADE AT MEETING 1508 ON JUNE 15

This will confirm your discussion with Board Items this morning concerning the request, contained in Mr. Ammon's memorandum of July 21, 1959, Item 1a, that "a program be developed to insure the health and safety of the public and atomic industry employees."

The assignment was originally given to Dr. Dunham, and to Mr. Salisbury (for Item 1b of the Secretariat's memo). In view of the subject matter, -- waste disposal, -- it is more appropriate that your office have primary responsibility to comply with Item 1a, coordinating, of course, with Dr. Dunham. Mr. Salisbury's responsibility for Item 1b remains unchanged.

The change in assignment (from Dr. Dunham to you) has been discussed with Mr. Libbrecht, Dr. Dunham, Mr. O'Neill (Secretariat) and Mr. Boivin. All are agreeable to the change.

cc: C. L. Dunham
H. Salisbury
J. B. Boivin
A. J. O'Neill ✓ TF

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[illegible]

[illegible]

[illegible]

[illegible]

cc: General Manager
D. C. Office

~~OFFICIAL USE ONLY~~

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[illegible]	RVWillit/ekf					
[illegible]	7/28/59					

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Materials 12

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1530 AEC Mtg. 7-28-59 C

6. <u>JCAE Hearing on Waste Disposal</u>
(See Minutes of Meeting 1528)

Mr. Graham referred to a JCAE hearing on the problem of radioactive waste disposal scheduled for July 29, 1959, and said he questioned whether the Commissioners should attend the hearing. He pointed out that later in the year the Commission would be called upon, in its regulatory capacity, to hear a case involving radioactive waste disposal in the Houston area. An appearance before the JCAE at the present time on the question of waste disposal might be taken as an indication of bias on the part of the Commission, he said. After discussion the Commissioners agreed that it would not be appropriate for them to appear at the hearing. ~~They requested~~ that the General Manager present the Commission's statement, including an introductory statement setting forth their reason for not attending. Mr. McCone said he would telephone Senator Anderson later in the day to notify him of the Commission's decision not to attend.

Mr. Graham said he had serious reservations about the methods of radioactive waste disposal. Mr. McCone and the other Commissioners requested that they be presented a general briefing on the entire waste disposal problem, including nuclear wastes from naval reactors.

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7-28-59

x-Ref to Reg and Waste Disposal

FORM AEC-324
(8-47)

DATE:

INDEX: MH&S-11-Industrial Hygiene

[redacted]

TO: President Eisenhower

FROM: Chairman McCone

SUMMARY: Re recent inquires into the Commission's policies and regualtions for disposal by uranium processing mills of radioactive waste and how this effects the public and AEC mill employess' health and safety.

FILED:

INDEXER: Materials-12-Waste Processing & Disposal

REMARKS: date of letter: 7-24-59

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

7-24-59

☆ U. S. GOVERNMENT PRINTING OFFICE—1955—[illegible]

UNCLASSIFIED

July 22, 1959

AEC 719/28

COPY NO. 33

ATOMIC ENERGY COMMISSION

RADIOACTIVE WASTE DISPOSAL INTO ATLANTIC AND GULF COASTAL WATERS

Note by the Acting Secretary

1. The attached letter from the Chairman, JCAE, is circulated for the information of the Commission. The letter has been referred to the Division of Reactor Development.

2. The Special Assistant for Congressional Relations has advised that a JCAE hearing on this matter has been scheduled for 2:00 p.m., Wednesday, July 29, 1959.

Harold D. Anamosa
Acting Secretary

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CONGRESS OF THE UNITED STATES
JOINT COMMITTEE ON ATOMIC ENERGY

July 20, 1959

Honorable John A. McCone
Chairman, Atomic Energy Commission
Washington 25, D. C.

Dear John:

Members of the Joint Committee on Atomic Energy have been concerned with the recommendations of the eight-man panel of scientists named by the Committee on Oceanography of the National Academy of Scientists - National Research Council. This is Publication 655 entitled RADIOACTIVE WASTE DISPOSAL INTO ATLANTIC AND GULF COASTAL WATERS and was released for Sunday morning papers of June 21.

Because of the intense interest which this press release developed, Senator Pastore has suggested to me that the matter is one on which there might be a special report to the Joint Committee from the Atomic Energy Commission. This point of view has been checked with Representative Chet Holifield who, as Chairman of the Special Subcommittee on Radiation Hazards of the Joint Committee, conducted some waste disposal hearings earlier this year, and he was very much interested in this entire field.

In behalf of them and other members of the committee, I would ask that you have your staff prepared to come up and report to us on the plans of the Atomic Energy Commission for radioactive disposal into Atlantic and Gulf Coastal waters.

I am also sending you a copy of H. R. 8187, introduced by Representative Thompson of Texas, which has just been referred to our committee and on which you might want to report to us at the time of your visit. I think you had a copy of the bill, but if you are going to report on it, there ought to be verbal testimony as well as the written report, and this should be handled by the Holifield committee at that time.

I am also suggesting to Senator Pastore that if there are areas either in the Atlantic or Gulf coastal waters where hearings should be held, I would appreciate it if he would contact the necessary groups of citizens and, in conjunction with Representative Holifield, arrange to hold such hearings.

Sincerely yours,

/s/

Clinton P. Anderson

Material - file

Office Memorandum · UNITED STATES GOVERNMENT

TO : Files

DATE: July 21, 1959

FROM : Anthony H. Ewing

SUBJECT: RADIOACTIVE WASTE DISPOSAL

At Meeting 1528 on July 15, 1959, during Commission discussion of radioactive waste disposal matters reference was made to the attached article by Edward Cowdrick in the "Washington Post and Times Herald" of that date.

HEW Acts to End A-Contamination of Rivers

By Edward Gamarekian
Staff Reporter

The Department of Health, Education, and Welfare yesterday outlined a series of steps to bring a halt to radioactive contamination of United States rivers and streams by uranium refineries.

Approximately half of the 28 ore-processing plants now in operation are dumping radium and other waste products into rivers in the West, according to HEW investigators. Of the rivers checked so far, the majority have been found to contain concentrations of radium far in excess of the maximum "permissible" limit. It was 22 times as high in one instance.

HEW Secretary Arthur S. Flemming, at one of his regular press conferences yesterday, reported that the first Federal enforcement action was about to end the contamination of the Animas River—a stream that runs from Colorado into New Mexico.

Studies would begin next year on three rivers in Wyoming, he said—the Bighorn, Sweetwater and North Platte.

Flemming also disclosed that he had asked United States Surgeon General Leroy E. Burney to determine how much effort it would take to study all of the streams that now are being contaminated with radioactive wastes.

Sen. Clinton P. Anderson (D-N. M.), Chairman of the Senate-House Committee on Atomic Energy and a frequent critic of the Atomic Energy Commission's handling of the river contamination problem, said yesterday it was apparent that the AEC had abdicated its responsibility to the United States Public Health Service (a division of HEW).

Flemming was asked at his press conference what action, if any, HEW had taken on the report of the Public Health Service's advisory committee on radiation that was issued on March 28, almost four months ago. This report called for the transfer of the responsibility for the public health aspects of atomic energy from the AEC to the PHS.

Flemming said a decision would be reached within the next 30 days. The transfer is now being studied by the Administration.

Several bills that would bring about such a transfer by legislative action already have been introduced in the Senate and House. None has yet been reported out of committee. Hearings on the Senate bill already have begun but temporarily are being held up. If the Administration makes the transfer itself, the bills will probably be pigeonholed.

A report on the contamination of 17 major streams and lakes from the radioactive fallout from atomic tests also was released yesterday. Although Flemming stated that the levels were very low, the data presented in the report was not revelatory. The report listed levels of gross activities up to 2863 units (micromicrocuries per liter) but did not identify the radioactive elements. This much strontium-90 would be exceedingly dangerous whereas this amount of most of the other atomic bomb end-products would not.

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Office Memorandum • UNITED STATES GOVERNMENT

TO Dr. Charles L. Dunham, Director
Division of Biology & Medicine
Morse Salisbury, Director
FROM Division of Information Services
Harold D. Anamosa,
Acting Secretary

DATE: July 21, 1959

SUBJECT:

RADIOACTIVE WASTE DISPOSAL

SYMBOL:SECY:AHE

1. This will confirm our telephone notification on July 17 that at Meeting 1528 on July 15 during discussion of the problem of radioactive waste disposal, the Commission:

Requested that a program be developed to:

a) Insure the health and safety of the public and atomic industry employees, and

b) Convincingly inform the public of the facts in connection with this program.

2. The General Manager has directed that you report to him your plans for complying with the Chairman's request. Please inform us by memorandum when you have done so. We will be glad to provide you further information on the Commission discussion of this matter.

cc: Chairman
General Manager
Asst. Gen. Mgr. for Adm.
Asst. Gen. Mgr.
Asst. Gen. Mgr. for R&ID
Director, Licensing & Regulation
General Counsel
Director, Production
Director, Reactor Development
Director, Inspection
Director, Raw Materials
D. C. Office

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7-21-59

1528th AEC Meeting 7-15-59 cpc

1. Radioactive Waste Disposal

Mr. McCone referred to a July 15, 1959, Washington newspaper article 1/ regarding the radiation contamination of rivers and said he was seriously concerned about the growing volume of criticism AEC was receiving on the problem of radiation contamination.

Mr. Hollingsworth reviewed the history of AEC actions dealing with the problem of radioactive contamination of rivers by uranium oxide mills. The initial action under the Atomic Energy Act of 1954 was a regulation (10 CFR Part 20) issued in February 1957 to control the radioactive level of effluent and dust being released into the rivers and atmosphere by the mills. Inspections conducted in the fall of the same year revealed cases of noncompliance. Letter notices of violations were issued to these operators during the period of May through December of 1958. Reinspection of notified mills was begun in January 1959, to verify corrective changes proposed by the mills. The reinspections still being conducted had shown only six of the twenty-three notified to be in violation. Mr. Hollingsworth pointed out that in May 1959 orders were issued to the six mill operators directing them to show a schedule of corrective action by July 1, 1959.

Mr. Johnson noted that the Public Health Service in discharging their responsibility under the Water Polution Act had made surveys of the affected rivers beginning in 1950. He said at that time they found that only in one case had the permissible radioactive level of effluent been exceeded by the mills, and it was not considered serious enough to prosecute. Dr. Dunham said that in his close association with the Public Health Service on this matter they had not shown alarm over the radioactive contamination. In reply to a question by Mr. Floberg, Dr. Dunham said that the seriousness of the contamination is not entirely reflected by the level of radioactivity in the waste products of the mills. He explained that duration of exposure to the radiation determines the amount of danger to health. Therefore, he said that both he and PHS officials believe that

7-15-59

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if the mills are compelled to take corrective measures to eliminate the excessive contamination within a reasonable period no harmful effects will result.

Mr. Hollingsworth said effective press releases had been impaired by the lengthy regulatory action but in retrospect the AEC has been deficient in the handling of public relations on this matter. An outline for a public relations campaign, he said, was forwarded to him earlier in the day by the Director of Information Services, which he believed would be helpful in dispelling the misconceptions appearing in the press.

In reply to a question by Mr. McCone, Mr. Hollingsworth said the AEC responsibility extends only to the control of the radioactive level of effluent and dust released by the mills. He noted that the condition of the rivers as a whole is the responsibility of the Public Health Service. The Chairman said he was concerned about the fact that violations of an AEC order had continued for two years, regardless of the fact that Public health is not presently endangered. He noted that the mill operators would minimize their operating expenses until forced to install the necessary equipment to prevent the contamination.

With regard to the problem of fallout, Mr. Hollingsworth said the first quarterly press release on fallout is scheduled to be issued early in August. These reports are intended to disseminate to the public factual information about fallout.

Mr. Hollingsworth then turned to the public misunderstandings concerning AEC policies on ocean disposal of radioactive waste. Mr. Price pointed out that the AEC had been disposing of radioactive waste from its facilities for a number of years by dumping it in certain ocean areas and the safety of these

operations has not been questioned. He said that it was not until the AEC licensed private corporations to contract for the disposal of waste from licensed isotopes users that there had been any public alarm.

The Commission then discussed the organizational responsibility for the over-all administration of the AEC waste disposal program. Mr. Graham pointed out the need for an integrated organization within the AEC to efficiently administer the entire waste disposal program and to be capable of effectively allaying the mounting public fears about this situation.

Mr. McCone proposed and the other Commissioners concurred that the responsibility for waste disposal be centralized within the AEC and that a program be developed, (a) to insure the health and safety of the public and of atomic industry employees, and (b) to convincingly inform the public of the facts in connection with this program.

UNCLASSIFIED

July 13, 1959

AEC 544/3

COPY NO. 33

ATOMIC ENERGY COMMISSION

STATUS OF COMPLIANCE OF URANIUM MILLS WITH 10 CFR 20 "STANDARDS FOR PROTECTION AGAINST RADIATION"

Note by the Acting Secretary

The General Manager has requested that the attached report by the Directors of Inspection and Licensing and Regulation be circulated for the information of the Commission.

Harold D. Anamosa

Acting Secretary

DISTRIBUTION	COPY NO.
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EXTRACT COPY

Original filed: Mining and Hygiene

AEC 544/3

7-13-59

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ATOMIC ENERGY COMMISSION

STATUS OF COMPLIANCE OF URANIUM MILLS WITH 10 CFR 20 "STANDARDS FOR PROTECTION AGAINST RADIATION"

Report to the General Manager by the
Director, Division of Licensing and Regulation
and the
Director, Division of Inspection

1. In view of recent compliance action taken by the Director, Division of Licensing and Regulation, concerning uranium mills operating under AEC license, the following summary of the potential health hazards in milling operations and status of compliance of the mills with Commission regulations is submitted for the information of the Commission.

2. Uranium milling operations preceded by more than 10 years the establishment of Commission regulatory requirements in the form of 10 CFR 20 relating to health and safety. Attached as Appendix "A" is a list of uranium processing plants and information on their operation including dates the mills first delivered uranium ore to the AEC. The uranium ore processing mills on the Colorado Plateau furnished ores for the Manhattan Engineering District and later to the Atomic Energy Commission under several types of contracts. Prior to the establishment of the regulatory program, the health and safety aspects of the mills then in operation were subject to the Walsh-Healy Act (Department of Labor). Some of the AEC contracts contained provisions dealing with health and safety. AEC representatives made surveys to assess radiological hazards associated with some mill operations; however all mills were not included in the program. In February 1957, the AEC established and published formal regulations with regard to standards for protection against radiation. Since all of the ore processing mills were licensed,

these regulations became effective for each of them. The mills are, therefore, a unique category of Commission licensee in that their processes and production methods were established in the industry before regulatory requirements were imposed, and their equipment and operating procedures did not include the controls of potential health problems from radioactive material as later required by the regulations.

3. After the Commission's regulation 10 CFR Part 20, "Standards for Protection Against Radiation," became effective in February 1957, the Commission (HASL) undertook a study of twelve of the mills, then in operation, to identify conditions and operating characteristics which might present problems in terms of compliance with the new Commission regulations. It was found that uranium dust released into the air from crushing and barreling operations exceeded the permissible concentrations specified in 10 CFR 20; also, the process liquid effluent discharged either directly into rivers, or indirectly by seepage from holding ponds, contained uranium daughter products, such as radium, in excess of the regulatory limits. These findings did not indicate an immediate hazard to the health and safety of the employees nor to the public, but did indicate the need to initiate action to assure compliance with Part 20. The regulatory limits in 10 CFR 20 are based on a continuous lifetime exposure, and exposures to concentrations of radioactive materials slightly in excess of Part 20 limits for a short period does not represent an immediate hazard.

4. After the preliminary survey study, the Commission initiated inspections of the mills in late 1957 to determine their status of compliance with 10 CFR Part 20. Initial inspections of all the mills were completed in early 1959.

Briefly, the initial inspections revealed that in general the mills had not made adequate surveys of radiation levels and concentrations of radioactive material in air and liquid effluents to demonstrate their status of compliance with Part 20. Notices of alleged violations were sent to the mills requiring them to indicate corrective measures that would be taken to initiate surveys and correct items of noncompliance. The mills indicated in their replies to the notices that corrective action would be taken.

5. The Commission recognized at this time that major deterrents to a mill compliance program was the lack of technical talent among mill personnel who would be qualified to conduct a radiological survey program, and the lack of standardized analytical techniques for making meaningful measurements of the permissible concentrations of radioactive material specified in Part 20. Accordingly, the Commission took action to inform and assist the mill operators in the technical fields of compliance. The Division of Raw Materials, in 1957, initiated a study of the AEC's Monticello Mill to develop survey procedures and control measures which would assist the mills in achieving compliance with the regulations. The AEC's Winchester Laboratory also initiated studies on analytical procedures for determining concentrations of radioactive materials in effluents and to develop procedures for extracting the radium from the ore processes. In October 1958, a meeting was held in the Grand Junction Operations Office between representatives of the AEC, the U.S. Bureau of Mines, U.S. Department of Labor, U.S. Public Health Service, and Public Health or Industrial Safety representatives from eight western states in which mills are located, and officials representing more than twenty of the mills. The purpose of this meeting was to discuss and explain the provisions of Part 20 of

the Commission's regulations, to review the licensing and inspection procedures of the Commission, and to indicate to the mill operators the cooperative efforts of the various Federal and State agencies. To provide further guidance, a meeting was held by the Division of Raw Materials with the mill operators in Grand Junction in April 1959, to discuss experience in the AEC-owned Monticello Mill and the studies on assay procedures which were conducted by the Winchester Laboratory.

6. Follow-up inspections of the mills were started in January of this year to determine the adequacy of the corrective actions as a result of the first inspection and the present state of compliance of the mills. Follow-up inspections of the mills have revealed that, with a few exceptions, the mills have not exerted sufficient effort to comply with the regulations. While the mills that were issued the notices of alleged violation as a result of the first inspection have made some radiation surveys, most of them have not made comprehensive and thorough evaluations of the concentrations of radioactive material in air to which employees are being exposed, and in effluents to the environment as required by the regulations. It has been determined by these preliminary surveys made by the mills, although incomplete as stated above, that in some areas concentrations of radioactive material in dust to which employees are exposed exceed Part 20 limits. In some cases, concentrations of radioactive material being discharged into rivers or streams also exceed Part 20 limits. Orders have recently been issued to five mills requiring them to outline in detail by July 1, 1959, the measures which they will take to achieve compliance with 10 CFR 20. Answers have been received in which the mills have outlined their programs of corrective measures. These answers are being evaluated by the

staff. Preliminary review indicates that the answers are satisfactory. However, the replies are being thoroughly evaluated to determine adequacy with regard to proposed procedures and equipment changes. The time schedules specified by the mills for corrections range from October 1959, through December 1959.

If we accept the programs outlined by the mills in their answers, we should follow up with inspections this fall. If these inspections show lack of satisfactory progress in meeting the schedules of compliance, we will then have to consider orders to show cause why the licenses should not be suspended.

7. With regard to the other mills, several follow-up inspections have been made. Some inspection reports are now in preparation and those that have been completed are being reviewed to determine appropriate enforcement action. As appropriate, orders or notices of violation will be issued to those mills that are not in compliance with the Commission's regulations.

8. The Durango mill operated by the Vanadium Corporation of America was cited in the Commission's order for exposing employees to concentration of radioactive material in the air in excess of Part 20 limits, and for releasing concentrations of radioactive material into the Animas River in excess of Part 20 limits. The discharge of radioactive waste into the Animas River by this mill was the subject of a conference held on June 24, 1959, by the U.S. Public Health Service. The conference was based on a study of the Animas River which had been made by the U.S. Public Health Service during the summer of 1958 at the request of the states of New Mexico and Colorado under the Federal Water Pollution Control Act. The study indicated that concentrations of radium in the Animas River below the Durango mill were in excess of the permissible concentrations for drinking water in unrestricted areas in 10 CFR 20 and that water being used by

persons out of the Animas River may exceed permissible limits. The Commission was invited to attend the conference and attached as Appendix "B" is a copy of a statement which was given at the conference by a Commission representative. A representative from the Durango mill indicated at the conference that corrective action has been taken and further action is planned to drastically reduce the concentrations of radium being discharged from the mill into the Animas River. The conferees (U.S. P.H.S. and States of Colorado and New Mexico) concluded that the licensee is taking appropriate action. They also concluded that it is reasonable to expect the Durango mill to correct the situation within the next 4 months. After 4 months, the conferees are to re-evaluate the situation on the basis of action taken by the Durango mill.

9. In summary, potential health hazards may be involved in uranium mill operations in two respects:

a. Concentrations of radioactive material in the dust which employees may breathe may be in excess of the limits of 10 CFR 20.

b. Concentrations of radioactive material in the relatively large volume of liquid mill effluents which may be discharged into streams may exceed the limits of 10 CFR 20.

Surveys have shown that the nature of the potential hazard is one of chronic long-term exposure rather than an acute problem requiring precipitous compliance action. Because of the necessity for modification of the equipment and facilities, several months may be required for the mills to in all cases attain compliance with Part 20. However, it is necessary that AEC compliance actions in the form of orders and follow-up inspections result in a positive program to attain compliance with Commission regulations. Inspection and enforcement action will be vigorously pursued until compliance is attained.

The Divisions of Biology and Medicine, Reactor Development, and Raw Materials have concurred in this report.

APPENDIX "A"

U. S. ATOMIC ENERGY COMMISSION
GRAND JUNCTION OPERATIONS OFFICE
GRAND JUNCTION, COLORADO

January 15, 1959

UNCLASSIFIED

URANIUM PROCESSING PLANTS

Company	Location of Mill	First Contract Signed	First U_3O_8 Delivered to AEC	Present Contract Terminates	Rated Capacity Tons of Ore Per Day	Estimated Cost of Mill
1. Anaconda Company	Grants, N. Mex.	Dec. 27, 1951	Sept. 1953	Mar. 31, 1962	3,500	$19,358,000
2. Climax Uranium Company	Grand Junction, Colo.	July 10, 1950	June 1951	July 31, 1960	330	3,088,000
3. Dawn Mining Company	Ford, Wash.	Aug. 8, 1956	Sept. 1957	Mar. 31, 1962	400	3,100,000
4. Susquehanna Western Inc.	Riverton, Wyo.	Dec. 4, 1957	Jan. 1958	Nov. 30, 1963	500	3,500,000
5. Government-owned	Monticello, Utah		Jan. 1950		350	5,000,000
6. Gunnison Mining Company	Gunnison, Colo.	Nov. 15, 1956	Feb. 1958	Mar. 31, 1962	200	2,025,000
7. Homestake-New Mexico Partners	Grants, N. Mex.	Dec. 20, 1956	Apr. 1958	Mar. 31, 1962	750	5,325,000
8. Homestake-Sapin Partners	Grants, N. Mex.	Apr. 23, 1957	Sept. 1958	June 30, 1963	1,500	9,000,000
9. Kermac Nuclear Fuels, Corp.	Grants, N. Mex.	May 3, 1957	Dec. 1958	Dec. 31, 1966	3,300	16,000,000
10. Kerr-McGee Oil Industries	Shiprock, N. Mex.	Aug. 17, 1953	Jan. 1955	Oct. 31, 1959	300	3,161,000
11. Lakeview Mining Company	Lakeview, Ore.	Nov. 18, 1957	-	Nov. 30, 1963	210	2,600,000
12. Lucky Mc Uranium Corp.	Fremont County, Wyo.	Nov. 14, 1956	Mar. 1958	Mar. 31, 1962	750	6,900,000
13. Mines Development, Inc.	Edgemont, S. Dak.	Apr. 28, 1955	Aug. 1956	Mar. 31, 1962	400	1,900,000
14. Phillips Petroleum Company	Grants, N. Mex.	Sept. 17, 1957	Aug. 1958	Dec. 31, 1966	1,725	9,500,000
15. Rare Metals Corp. of America	Tuba City, Ariz.	July 15, 1955	July 1956	Mar. 31, 1962	300	3,600,000
16. Texas-Zinc Minerals Corp.	Mexican Hat, Utah	July 17, 1956	Nov. 1957	Dec. 31, 1966	1,000	7,000,000
17. Trace Elements Company	Maybell, Colo.	Aug. 10, 1955	Dec. 1957	Mar. 31, 1962	300	2,208,000
18. Union Carbide Nuclear Company	Rifle, Colo. *	Oct. 2, 1947	Dec. 1947	Mar. 31, 1962	1,000	8,500,000
19. Union Carbide Nuclear Company	Uravan, Colo.	Apr. 13, 1949	Mar. 1950	Mar. 31, 1962	1,000	5,000,000
20. Uranium Reduction Company	Moab, Utah	June 1, 1955	Nov. 1956	Mar. 31, 1962	1,500	8,250,000
21. Vanadium Corp. of America	Durango, Colo.	Feb. 17, 1949	Aug. 1949	Mar. 31, 1962	750	813,000
22. Vitro Uranium Company	Salt Lake City, Utah	Oct. 25, 1951	Oct. 1951	Mar. 31, 1962	600	5,500,000
23. Western Nuclear Corp.	Split Rock, Wyo.	Aug. 10, 1956	Aug. 1957	Mar. 31, 1962	400	3,600,000
24. Fed. Radorock, Gas Hills Partners	Fremont County, Wyo.	Apr. 10, 1959		Dec. 31, 1966	520	
25. Globe Mining Co.	Natrona County, Wyo.	May 13, 1959		Dec. 31, 1966	490	
				TOTALS	21,065	$134,928,000

* Union Carbide Nuclear Company also buys ore at Slick Rock, Colorado, and Greenriver, Utah, as feed for the Rifle, Colorado, mill.

NOTE: Except for the Government-owned mill at Monticello, Utah, the above mills are privately owned and operated, and all are licensed to buy uranium ores from producers. The USAEC buys the concentrate product under the terms of contracts with each mill operator.

(Prepared by Information Division, GJOO)

UNCLASSIFIED

APPENDIX "B"

UNITED STATES ATOMIC ENERGY COMMISSION

Statement to be Presented at Second Session of a Conference on Pollution of ANIMAS RIVER, June 24, 1959, Santa Fe, N.M. Held by U.S. Public Health Service Under the Federal Water Pollution Control Act

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We recently received copies of the "Survey of Interstate Pollution of the Animas River" prepared by the Public Health Service's Division of Water Pollution Control. Although there may be some specific points in the report that are subject to variation in technical interpretation, the study has provided a considerable amount of useful and needed information concerning the nature and extent of discharges of radioactive effluent from the Durango Mill into the Animas River.

There is no need for me at this time to identify the specific findings and conclusions of the Division of Water Pollution Control, U.S. P.H.S., since they are all set out in the report which has been made available to those attending the conference. We note, however, that the report does contain findings that there are concentrations of radioactive material in the Animas River above those specified as permissible by the NCRP and suggests a need for reductions in those concentrations.

It may be of interest to those attending this conference to know that an extensive industrial waste survey of uranium milling operations on the entire Colorado Plateau has been undertaken by the United States Public Health Service at the request of the Atomic Energy Commission. Preliminary information from this survey should become available within the next few months.

Beginning about two years ago, the Commission instructed its Process Development Laboratory at Winchester, Massachusetts to extend its research and development activities for the purpose of developing procedures to reduce radiological hazards associated with mill operations. The objectives of these studies include reductions in concentrations of radioactive material in effluents released from the mills and reductions in radioactive dust concentrations within the mills. These studies are continuing.

The information developed to date in this program at our Winchester Laboratory has been made available to each of the ore processing mills, to the United States Public Health Service, and to a number of other interested organizations. The reports have been printed and made available for public distribution through the Office of Technical Services, U.S. Department of Commerce. These reports include the following:

(a) WIN-101, December 15, 1958, "Interim Report on Investigation into the Problem of Radioactive Pollution of Uranium Mill Effluents."

(b) WIN-111, April 1, 1958, "Second Interim Report on the Problem of Radioactive Pollution of Uranium Mill Effluents."

(c) WIN-113, December 30, 1958, "Radium Balance in the Monticello Acid RIP Uranium Mill."

(d) WIN-114, December 15, 1958, "Survey and Prevention Techniques for the Control of Radioactivity Hazards at the Monticello Uranium Mill."

Additional reports will be published in the near future.

Among the principal items reported to date are improved procedures for determining concentrations of radioactive materials present in discharged wastes; procedures for purifying waste liquors to remove radioactive materials contained therein; and data as to the extent to which radioactive materials in undissolved tailings are dissolved in water through natural weathering. During the next several months we expect to receive the final report on these studies.

It is believed that the information contained in the Public Health survey of "Pollution of the Animas River" and the data coming out of the Winchester Laboratory, together with other available information, will suggest means for alleviating the problems under consideration by this conference which are presented by operation of the Durango uranium mill.

On May 22, 1959, in accordance with procedures established by the Atomic Energy Act of 1954, as amended, and the Commission's regulations, the Commission issued an order to the Vanadium Corporation of America, operators of the Durango uranium concentrating and refining mill. The order cites the company for alleged violation of Commission regulations and orders the company to submit to the Commission on or before July 1, 1959 a full and complete statement of the measures which the company proposes to take in order to achieve full compliance with the Commission's regulations.

The alleged violations include principally (1) exposure of employees to dusts containing concentrations of airborne radioactive material in excess of limits specified in Part 20 of the Commission's regulations (Standards for Protection Against Radiation); and (2) release of radioactive material in the Animas River in concentrations in excess of those established in the Commission's regulations. Upon receipt of the reply by the Vanadium Corporation and in light of information developed at this conference and studies conducted by the U.S. Public Health Service and the Atomic Energy Commission, the AEC will, in accordance with its established procedures, take whatever steps are necessary to assure that the operations of the Durango Mill will be conducted in compliance with the Commission's regulations and will not endanger the public health and safety.

In the conduct of our further proceedings under our Act and regulations, we are anxious to keep in touch with the agencies represented at this conference, and to continue our cooperative inquiries.

AEC

UNITED STATES
ATOMIC ENERGY COMMISSION
Washington 25, D. C.

No. B-111
Tel. HAzelwood 7-7831
Ext. 3446

FOR IMMEDIATE RELEASE
(Wednesday, July 8, 1959)

NOTE TO EDITORS AND CORRESPONDENTS

The following was dictated to the wire services at 6:15 p.m. on Tuesday, July 7, 1959:

STATEMENT BY THE ATOMIC ENERGY COMMISSION

No radioactivity was present in a steel drum found last Saturday on a beach at Battle Rock State Park, Oregon, marked in a manner indicating it contained radioactive waste materials.

Examination of the drum and its contents - apparently a quantity of water and oil - at the Commission's Hanford Works, Richland, Washington showed no radioactivity. There were no identifying marks on the barrel such as are required in the waste disposal operations of Commission contractors and licensees. A number of other dissimilarities were evident:

(1) The drum was painted with white enamel, whereas the drums commonly used in waste disposal are not painted white. The condition of the enamel indicated that the drum had not been exposed to the elements for long.

(2) The drum was not weighted with concrete to insure sinking as is required in waste disposal operations.

(3) The markings on the drum were not those customarily used in waste disposal activities.

- 30 -

7859

FORM AEC-304
(8-47)

DATE:

INDEX: Materialsp12

[redacted]

TO: General Manager

FROM: John A. McCone

SUMMARY: Memo is with re to the withholding of information from the public and the United Nations on the subject of Radioactive Fallout. Mr. McCone is requesting that a study be made on this subject by the Div. of Inspection and submitted to him by the 1st of April. Also Mr. McCone would like a report concerning the activities and the responsibilities of the AEC Inspection Division. Quite independently of the above study, he would like a report at the some time concerning policies, regulations and procedures within the AEC for the licensing and handling of radioactive materials.

FILED:

INDEXER: MH&S-3Radiation

REMARKS: date of memo: 3-27-59

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

3-27-59

☆ U. S. GOVERNMENT PRINTING OFFICE: 1951 • 860407

Material 6-12

UNCLASSIFIED

February 17, 1959

AEC 719/27

COPY NO. 31

ATOMIC ENERGY COMMISSION

WASTE DISPOSAL HEARINGS

Note by the Secretary

The General Manager has requested that the attached memorandum from the Director of Licensing and Regulation be circulated for the information of the Commission.

W. B. McCool

Secretary

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General Manager	7
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AEC 719/27

UNCLASSIFIED

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

MEMORANDUM February 3, 1959

TO : A. R. Luedecke
General Manager

FROM : H. L. Price, Director
Division of Licensing and Regulation

SUBJECT: WASTE DISPOSAL HEARINGS

During my testimony today in the Waste Disposal Hearings Mr. Holifield wanted to know if the Commission considered the Division of Licensing and Regulation to be a separate and independent division. I told him yes - that this division has no promotional or operating functions. He asked the number of people in my division, the number of inspectors in the Division of Inspection, the relationship between the two divisions and how enforcement is handled.

He brought up the subject of the Piqua reactor and the several years that elapsed before the Commission dealt with the site question. I said that, in the future, the Commission would require preliminary site data along with the initial proposal in cases involving government participation like the Piqua project which is owned by the government.

He asked me to explain the administrative procedures for review of licensed cases, including the hearing procedures, and wanted to know why we couldn't have comparable public proceedings for the cases like Piqua that are not subject to licensing. I told him there were many difficulties in working out a licensing procedure for the second round cases but that we recognize the desirability of public proceedings on these cases and that I believed we would work out some parallel public procedures for those cases.

During testimony of Dr. David Price of Public Health Service, there was considerable discussion of the role of Public Health Service and the states. Mr. Holifield observed that for the long range some of AEC's responsibility might be transferred to PHS.

Also, he expressed the view that the states should develop effective programs for health and safety and that consideration should be given to denial of licenses in states which don't have effective programs.

Mr. Klassen, of the Illinois State Health Department, explained the operations of the State of Illinois with respect to atomic energy installations, both contractor and licensee, and complimented the Atomic Energy Commission for cooperating with the state. He seemed to be exceptionally knowledgeable about atomic energy matters in his state. He made a statement to the effect that it is important to avoid putting this new atomic energy industry on the brink of being economically purified out of existence.

DATE:

INDEX: MATERIALS-12-Waste Processing & Disposal

TO:

FROM:

SUMMARY: AEC 180/10 NATIONAL ACADEMY OF SCIENCE COMMITTEE REPORT ON OCEANOGRAPHY
The National Academy of Sciences-National Research Council-Committee on Oceanography will release to the press on Feb. 12,1959 the results of their study of national problems in oceanography. The report affects AEC. One of the committee's recommendations is that the responsibility for regulation of disposal of radioactive wastes should be separate from the responsibility of the Public Health Service or the Coast and Geodetic Survey.

FILED:

INDEXER: MH&S-3-2-Monitoring Program

REMARKS: date of paper: 2-16-59

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

2-16-59

DATE:

INDEX: Materials 12

TO:

FROM:

SUMMARY: AEC 180/9 - OCEANOGRAPHY RESEARCH PROGRAM

Recent developments have pointed a need for an expanded research program in oceanography and marine biology] It is necessary to determine what effects radioactive materials are being introduced into ocean waters, which include fallout, waste disposal & operation of nuclear powered naval vessesl, to determine what effect such introduction into ocean water can and will have on man.

FILED: MH&S 3-2 Monitoring Program

INDEXER: date of paper: 11-28-58

REMARKS:

U. S. ATOMIC ENERGY COMMISSION

CORRESPONDENCE REFERENCE FORM

85-88-11

Materials-12
Waste Storage + Disposal

UNCLASSIFIED

October 6, 1958

AEC 180/8

COPY NO. 29

ATOMIC ENERGY COMMISSION

RADIOACTIVE MATERIALS MANAGEMENT DEVELOPMENT PROGRAM

Note by the Secretary

1. At the Informal Meeting of the Commission on September 26, 1958, the Commission requested a complete report of the Waste Systems Development Program.

2. Attached for the information of the Commission is a report submitted by the Acting Director, Division of Reactor Development, in response to the above request.

AEC 180/8

W. B. McCool

Secretary

DISTRIBUTION	COPY NO.
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85-9-01

UNCLASSIFIED

ATOMIC ENERGY COMMISSION

RADIOACTIVE MATERIALS MANAGEMENT DEVELOPMENT PROGRAM

Report to the General Manager by the
Acting Director of Division of Reactor Development

THE PURPOSE

1. To advise the Commission of the objectives and program of Radioactive Materials Management Development.

PROGRAM OBJECTIVES

2. The primary objectives of the Radioactive Materials Management Program can be classed in two categories as follows:

a. Development of practical systems (equipment and procedures) for safe and efficient management of radioactive materials, particularly the high level fission product solutions resulting from processing of irradiated reactor fuels.

b. Establishment of rational technical criteria for safe dispersal of low-level liquid, solid, and gaseous radioactive effluents from atomic energy operations into the environs. This includes the quantitative evaluation of atmospheric, hydrologic and geologic variables or parameters.

3. A secondary but extremely important objective of the development program is to obtain the quantitative data and knowledge needed for establishing reasonable regulations and for administering the operations which bear on the environs, not only for the federal government but also for state and local governments.

4. This program complements and is vital to the fission product utilization program in that it will make it possible for fission products from the chemical separation plants to be made available to fission products separation plants in the safest and most usable form. It will also help solve the problem of packaging for subsequent processing of those fission products for which there is no immediate use.

5. Development activities in category 2 a. have been directed toward finding and developing chemical procedures for concentrating and separating radioactive residues, toward fixation of the radioisotopes, and also toward determining the feasibility of storing the high level materials more safely and cheaply in selected geologic structures such as salt formations. At the present time efforts have been largely confined to feasibility studies and bench scale laboratory investigations. With proper support, it is anticipated that in 5 years the program would be at full scale, "hot" field experiments on the geologic portions and at advanced pilot stage in the fixation work.

6. Developments under category 2 b. above have been such that immediate requirements for engineering design of land-based low-level effluent dispersal systems can be met provided sufficient data are available on the nature of the effluents and on the specific environment involved. However, with the increasing use of the environs, it is almost mandatory that studies be carried out on more intensive and extensive bases. More detailed information, for example, is required on the physical and chemical interactions between the radioactive materials and natural earth constituents. The detailed nature of movements of liquids through porous media must be better defined. The behavior of radioactive materials in surface waters must be evaluated on a more detailed basis particularly with respect to the ultimate fate of specific isotopes, i.e. ultimate fate in terms of time and space distribution and possible connections to cause deleterious effects on man.

PROGRAM

7. Development of Systems for Management. The Radioactive Materials Program involving high level fission product residues is charted along two promising and compatible courses: (1) long term - centuries if necessary - storage in selected, geologic formations such as salt structures or deep, permeable strata which will effectively isolate the radioactive hazard and (2) concentration and fixation or immobilization of the fission products in clay, glass, ceramic or other inert material. Feasibility studies (on paper) have indicated both approaches to be good possibilities.

8. In the fixation area studies are being carried out on calcination, self-sintering and ion exchange and incorporation (fixation) into structures such as clay, glass, ceramics and synthetic feldspars. By calcination it is possible to overcome interference problems caused by the high salt concentrations in fission product separations residues. The aqueous solutions of salts and fission products are converted to solid oxide form by heating. Specific fission products such as cesium and strontium might then be leached out and marketed, or, if not needed immediately, incorporated in structures such as montmorillonite clay. Another approach being looked into is the application of ceramic glazes to the oxide product to reduce the leachability in order to enhance safety in handling these products. By self-sintering it may be possible to achieve an inert, non-leachable solid product by using only the decay heat of the fission products. In these studies fresh aqueous residues are mixed with natural earth materials such as clay and limestone and allowed to steep and fuse in a well insulated tank. Recovery of cesium, stontium and rare earths by continuous electrolytic processes and formation of synthetic feldspars which would incorporate the cesium and strontium

specifically is also being studied. Consideration is given to specific separation of the long lived fission products cesium and strontium from the bulk of the reprocessing residues. These fixation studies are being carried out at the National Reactor Testing Station, Argonne National Laboratory, Brookhaven National Laboratory, University of North Carolina, Johns Hopkins University, Oak Ridge National Laboratory, Los Alamos Scientific Laboratory and the Massachusetts Institute of Technology. Calcination pilot plants are being developed at the National Reactor Testing Station, Argonne National Laboratory and Brookhaven National Laboratory and a self-sintering pilot experiment at Oak Ridge National Laboratory. Successful specific separations would make these sources available for possible industrial utilization, and would alleviate the storage problem of the bulk of the residues. Separation would not eliminate the storage problem, however, because removal of specific isotopes can only result in decontamination by a factor of about 10^4-10^6. The remaining material is still a factor of 10^3-10^5 more active than can be safely released to the environs and therefore must be stored.

9. With regard to geologic storage, more work has been done on the possible utilization of salt structures than on the other geologic formations. Structural capabilities of halite (salt) formations, chemical compatibility of Purex and acid aluminum nitrate type wastes with halite and formation impurities, and calculations of dissipation of heat generated by fission products in salt cavities have been studied. During this fiscal year a design for a "cold" field salt experiment is to be completed and follow-up studies in the field will be initiated. Site surveys of several different salt formations for carrying on a "hot" field experiment will be continued.

Development work on the other direct-storage-in-nature approaches will be planned along lines recommended by special study groups of the American Petroleum Institute and the National Academy of Sciences. Laboratory studies on deep well problems such as plugging, compatibility of formation materials with the fission product residues, heat dissipation and corrosion are planned. Studies in these areas, besides those already mentioned, are being supported at the University of Texas, University of California, USGS, and ORNL.

10. There are also some research and development projects concerned with understanding and applying fundamental laws of nature in order to better control radioactive liquid and gaseous effluents. Examples are studies of meteorology on a small scale, hydrodynamics of dispersion in quiescent and turbulent waters, mechanisms involved in ion exchange and behavior of aerosols in relation to air and gas cleaning. These projects represent the basis for further engineering development and are a vital part of the Radioactive Materials Management program. This work is being done at the National Laboratories and various universities including Harvard, MIT, Illinois, California and North Carolina.

11. As indicated, the current emphasis on the program for developing efficient systems for managing high level fission products solution is on converting feasibility and laboratory studies to pilot plant scale - engineering studies on both the fixation and geologic storage approaches. In Fiscal Year 1960, we will continue field studies of storage-in-nature systems. Sintering experiments will be continued and engineering development of equipment for calcination will continue. Field investigations on "cold" salt experiments with radioactive

tracers will be continued and it is expected that sufficient data will be developed to determine the design of a "hot" experiment. The site for the latter will have been selected and a hazards analysis for the proposed work completed. It is expected that laboratory compatibility studies on deep geologic storage will have demonstrated the limits and proven the feasibility of the method. Criteria for a desirable storage formation will be defined and site surveys for field work undertaken.

12. Establishment of Criteria for Dispersal. The phase of the Radioactive Materials Management program concerned with establishing criteria for safe dispersal of low level liquid, solid and gaseous - radioactive effluents is essential to every regulatory program - both Federal and State - which governs the amount and distribution of radioactivity released to local and regional environs. The information developed is used not only to establish safe limits for radioactivity releases but also to evaluate the safety of proposed operations at specific sites, e.g., the Division of Licensing and Regulation and the ACRS use this developed information to pass judgment on the possible effects of proposed reactor or other nuclear operations on the environs. The radioactive materials are evolved and discharged in all possible physical forms, i.e., liquid, solid and gaseous. Thus, the program must be concerned with safeguarding man and his resources from direct and indirect effects of the radioactivity via air, water, soil and food routes of transmission. Each individual radioactivity release must be considered unique because of differences in the receiving mass of air, water or soil. (As examples, the meteorological diffusibility at the NRTS differs markedly from that at the Shippingport reactor, as do the gaseous effluents; the stream dilution capabilities of

the Animas River in New Mexico differ from those of the Mohawk River in New York - so do the wastes).

13. This fiscal year studies on the fate of specific streams below KAPL, PWR and SRP operations will be continued. Similar studies, not directly related to operating installations, are being done in Illinois and in Massachusetts. A survey of effluents from uranium milling operations on the Colorado Plateau and their impact on the environs is being made. The fate of radioactivity and its possible effects in tidal estuaries in connection with the nuclear ship program is being studied in New York Harbor. An increasing utilization of our hydrogeological environs for radioactivity releases is being practiced and/or proposed for all nuclear facilities. In this connection, detailed geologic and hydrologic data are to be obtained on selected areas of the country where construction of nuclear facilities is likely to be concentrated. Meteorologic studies of atmospheric diffusion will be continued. These studies are being carried out through contract with the USGS, U. S. Weather Bureau, U. S. Public Health Service, Harvard University, Northwestern University and the Johns Hopkins University.

14. In the next few years, it is anticipated that the atomic energy industry will expand - new processes and new operations in increasing numbers will make new and increased demands on the environs. Future environmental studies will depend to a degree on the results of present work. Quantitative data on the fate of radioisotopes released from existing sites now under study will be available to engineer systems for similar future operations. Regarding site selection, it is proposed to increase the program effort on the evaluation of proposed

reactor sites prior to construction. Reconnaissance studies, topographic, geologic and hydrologic mapping, soil studies, etc., would be utilized to evaluate sites and problems of radioactivity releases before the facility is placed in operation.

15. One area where information is sorely lacking is in oceanography. The principal reason for the lack of information is the lack of money to support expensive oceanographic studies. At the present time the AEC through its contractors WAPD, BNL, UCRL and General Atomics is disposing of packaged contaminated trash at several sea disposal locations. The only available commercial means of waste disposal is sea disposal. Except for short reconnaissance surveys of AEC disposal sites last year, which in the minds of some state agencies were not conclusive, there are no quantitative data to definitely establish the safety of these operations. Even though the oceans are not considered for disposing of more than contaminated trash from seaboard installations, (and they are the receiving bodies of surface streams which receive radioactivity), it is desirable to conduct a sufficient number of oceanographic studies, both physical and biological, in order to ascertain the limitations of sea disposal from the health and safety point of view. Since sea disposal undoubtedly will appear to be an attractive method to a number of foreign countries, particularly those with limited land area and high population density, it is important to accumulate this type of oceanographic information.

Materials - 12

STANDARD FORM NO. 64

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Yellow

Office Memorandum • UNITED STATES GOVERNMENT

TO : Frank K. Pittman, Acting Director
Division of Reactor Development

DATE: September 29, 1958

FROM : W. B. McCool, Secretary

SUBJECT: WASTE SYSTEMS DEVELOPMENT PROGRAM

SYMBOL: SECY:RDC

6

1. At the Informal Meeting of the Commission on September 26, 1958 the Division request of $4.5 million for the Waste Systems Development Program was tentatively approved, subject to ratification when a quorum is available. You will recall that you stated a complete report of this program would be available for review by the Commission at the next scheduled meeting on Tuesday, September 30.

2. This will confirm that the General Manager has directed that you take the action necessary to furnish this report. A copy of your report and other pertinent correspondence should be provided the Office of the Secretary.

cc: General Manager
Asst. Gen. Mgr. for Administration
Asst. Gen. Mgr. for R&ID
General Counsel
D. C. Office

9-29-58

~~OFFICIAL USE ONLY~~

Informal Mtg. 9-26-58 one

5. Waste Systems Development Program

Mr. Pittman reviewed the budget for the waste systems development program and pointed out that the recommended reduction in this program would delay the development of adequate packaging of liquid waste which, in turn, would postpone the time when practical uses might be found for waste products. In addition, a reduction in the program would retard the economic disposal of low-level wastes and require that all fission products be separated at production sites, thus adding to plant costs. He also stated that there would be serious delay in the geological and meteorological surveys now being conducted on plant spillage effects for future site evaluations, and that all of the program projects eventually would be more costly if impaired by a lack of funds at the present time. Mr. Pittman further said that studies under the waste systems development program are being conducted by approximately fifteen companies throughout the country and that no portion of the $4.5 million requested would be spent on disposing of wastes in the ocean. Only unrecoverable waste is disposed of in this manner.

In response to Mr. Libby's question concerning industrial interest, Mr. Pittman said the results of studies of packaging waste products should increase industrial interest. Mr. Libby asked if any investment companies had expressed an interest in buying atomic wastes on a "futures" basis, and Mr. Pittman said there had been no evidence of this. After further discussion the Commissioners informally approved $4.5 million for this program, subject to ratification when a quorum is available.

AS-9-26-58

UNCLASSIFIED

August 7, 1958

AEC 626/4

COPY NO. 44

ATOMIC ENERGY COMMISSION

STUDIES OF WASTE DISPOSAL AND RADIOACTIVITY IN THE URANIUM ORE PROCESSING PLANTS

Note by the Secretary

The General Manager has requested that the attached interchange of memoranda with the Director of Raw Materials be circulated for the information of the Commission.

W. B. McCool

Secretary

DISTRIBUTION	COPY NO.
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Commissioners	2 - 6
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8-7-58

UNCLASSIFIED

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

MEMORANDUM July 15, 1958

TO : R. W. Cook
Deputy General Manager

FROM : Jesse C. Johnson, Director
Division of Raw Materials

SUBJECT: STUDIES OF WASTE DISPOSAL AND RADIOACTIVITY IN THE URANIUM ORE PROCESSING PLANTS

SYMBOL : RM:JCJ

Since the Division of Licensing and Regulation established standards of radiation tolerances for uranium mills, there has developed to an increasing degree apprehension and confusion over what should be done, who should do it, and what serious problems, if any, exist.

Milling companies are anxious to comply with the regulations but do not have qualified personnel to determine whether operations meet established standards. For the most part, they do not understand the units of measurement used in the regulations or know how to make the radiation analyses. Although there may be private firms qualified to survey the mills and determine the radiation levels, there are none who have been engaged in this particular field and there are no established survey procedures and, consequently, no basis for estimating the cost of such surveys.

A major source of concern and confusion results from the number of Government and Government-sponsored groups making or planning to make various types of preliminary investigations of radiological hazards in uranium mills, effluents of mill and stream and underground water pollution. Unless these activities are coordinated and given central direction, there is grave danger of a serious public relations problem with widespread publicity based upon rumor and partial information.

Among the Government groups involved or interested in mill surveys are the AEC, U.S. Public Health Service, Bureau of Mines, Department of Labor, and State health and water resources departments.

AEC groups which have made, or participated in preliminary surveys include the Divisions of Inspection, Licensing and Regulation, Biology and Medicine (including the New York Operations Office's Health and Safety Laboratory), Reactor Development and Raw Materials. In addition, the Division of Reactor Development has a contract for field work with Johns Hopkins University and a contract with the Public Health Service covering studies on waste problems. Under this latter contract

Reactor Development proposes to finance Public Health studies of water pollution by the mills and also an engineering study of mill processes.

It is the opinion of the Division of Raw Materials that AEC activities relating to mill surveys and inspections should be immediately coordinated and all work placed under the direction of a single division. The division responsible for the program could, of course, assign various activities to other divisions.

Other federal and state agencies also have responsibilities and interests for health and safety in connection with milling operations and for the prevention of stream pollution. It will be necessary for AEC to cooperate with these other agencies and to provide assistance, if necessary. It is our understanding that the Public Health Service has the responsibility for prevention of pollution of streams crossing state boundaries. If this is true, stream pollution studies undertaken by Public Health Service should be financed by that Agency and not by AEC, as has been proposed.

The Division of Raw Materials which administers the AEC uranium milling contracts and has the responsibility for uranium procurement, should participate in planning the mill survey program and should have advance information on the arrival of field survey parties. Our Grand Junction Office will be prepared to make arrangements for access to mills and assist the survey parties in every way.

In addition, the Division of Raw Materials is now undertaking a comprehensive survey of the AEC-owned mill at Monticello, Utah, which is operated on a fee basis by National Lead Company. In this survey we have arranged for the assistance of the Division of Biology and Medicine and other divisions. The Division of Raw Materials and its contractors have, to a large extent, been responsible for the development of milling processes now being used, and already has the Winchester Laboratory working on methods for eliminating or reducing radiation and waste disposal problems. The correction of these problems, if they exist, could have an important effect upon the cost of milling.

I strongly recommend that the General Manager's Office immediately assign to one division the responsibility of developing and directing a program for studying radiation and waste disposal at uranium ore processing plants. Other interested divisions should participate in planning and in carrying out such a program.

UNCLASSIFIED

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

MEMORANDUM July 30, 1958

TO : Jesse C. Johnson, Director
Division of Raw Materials

FROM : R. E. Hollingsworth, Assistant General
Manager for Administration

SUBJECT: STUDIES OF WASTE DISPOSAL AND RADIOACTIVITY IN THE URANIUM ORE PROCESSING PLANTS

Reference is made to your memorandum dated July 15, 1958 and our meeting of July 18, 1958.

I am advising all Divisions and Offices by copy of this memorandum that studies and surveys having as their objective the gathering of information or development of data, bearing upon the health and safety problems of the uranium milling industry, shall be at your direction and under your control.

It is of primary importance that such activities be kept separate from, but carefully coordinated with, the Commission's regulatory program. The Division of Licensing and Regulation and the Division of Inspection in performing their respective regulatory functions would benefit by any such information or data provided. It is particularly important that such data be considered in the preparation or revision of AEC regulations.

It is requested that you secure the concurrence of these two regulatory divisions before approving the initiation of any study or survey which requires contact with the licensees. Since any health and safety information which affects the regulatory program and which may benefit uranium millers at Government expense should be available to other similar licensees (such as thorium producers), the transmittal of such information to licensees must have the prior review and concurrence of the Division of Licensing and Regulation. In this regard, no advice or recommendations should be made to the licensees during or as a result of such studies or surveys except with approval of these two regulatory divisions.

Materials-2 B42

Office Memorandum • UNITED STATES GOVERNMENT

TO : Jesse C. Johnson, Director
Division of Raw Materials

DATE: July 30, 1958

FROM : R. E. Hollingsworth, Assistant General
Manager for Administration

SUBJECT: STUDIES OF WASTE DISPOSAL AND RADIOACTIVITY IN THE URANIUM ORE PROCESSING PLANTS

Reference is made to your memorandum dated July 15, 1958 and our meeting of July 18, 1958.

I am advising all Divisions and Offices by copy of this memorandum that studies and surveys having as their objective the gathering of information or development of data, bearing upon the health and safety problems of the uranium milling industry, shall be at your direction and under your control.

It is of primary importance that such activities be kept separate from, but carefully coordinated with, the Commission's regulatory program. The Division of Licensing and Regulation and the Division of Inspection in performing their respective regulatory functions would benefit by any such information or data provided. It is particularly important that such data be considered in the preparation or revision of AEC regulations.

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CC: Heads of Divisions and Offices

7-31-58