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UNITED STATES GOVERNMENT

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Memorandum

TO : M. B. Biles, Director
Division of Operational Safety

DATE: March 15, 1968

FROM : A. F. Perge, Chief, MPC Branch
Division of Operational Safety

SUBJECT: NOTES ON THULE PLUTONIUM

OS:MPC:HFS

These notes summarize development and MPC thinking on the plutonium-contaminated waste from Thule, as of March 13, 1968.

Reasons for considering material balance

From a health and safety standpoint (as distinct from an accountability standpoint) there are two reasons for attempting a material balance on the Pu in the Thule accident. The direct one is to help in the logical scoping of the continuing environs monitoring effort relative to the material unaccounted for. An indirect one is to secure data on the individual types of waste and debris to help in logically disposing of them according to established criteria for other plutonium-contaminated wastes. Obviously logic may not be the only consideration in these situations.

Weapons debris

All significant weapons debris is now thought to have been collected and sent to Rocky Flats for post-mortem. Dow has been requested (TWX from Burke to Woodruff, March 8) to use "whatever technique is feasible" to make "the most accurate estimate possible" of Pu quantity in these packages. There is no reason this material cannot be disposed of via the regular Rocky Flats solid waste disposal system, when no longer needed.

Contaminated aircraft parts

A considerable number of drums, tanks, and spare jet engine containers have been filled with contaminated aircraft debris, checked for external contamination, and stored for removal from Thule by sea. These containers have all been checked externally with instruments which look at the 185-kev gamma from U-235 and at the 60-kev gamma from Am-241 (associated with the Pu). "No appreciable amounts" of Pu were found in these containers (20th situation report from Thule). For gammas in this range, particularly for the 60-kev one, there are great differences in the self-absorption from sources at different positions within containers of metal junk. Therefore, the "no appreciable amounts" finding is pertinent to

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nuclear safety, but not to contamination. However, the total contamination in these containers is probably very small compared to the total in the snow and ice (see below). There seems to be no reason why this material cannot be disposed of at any of the AEC site solid waste burial grounds.

Parachutes

Three parachutes are now being inspected by a Sandia representative at Hanford. Hanford contractors have been asked for quantity estimate, and also for chemical form and particle size determinations. The latter is of particular interest to Dr. Wright Langham, LASL, who feels that the parachute fabric may have acted as a filter to trap a much cleaner sample of the dispersed Pu than was obtainable on the surface at the crash scene. The parachutes can be disposed of like regular Hanford solid waste when no longer needed.

Snow and ice

Filling of 25,000 gallon tanks (10' diameter x 38' long) with contaminated snow and ice through 18" diameter hole is in progress. By telephone, March 12, Dr. Langham estimates the total volume of this may reach 600,000 gallons, with a plutonium content of 1700 to 3200 grams. If this were a true solution, it would be higher than MPC_w by a factor of from 1.0 to 1.9×10^3. The material is reported as mostly very fine particles of plutonium oxide. The mean particle size is 2 microns. A one micron Millipore filter removed all but soluble material. Against the low solubility (20 micrograms/liter at room temperature, equilibrium in 14 days) there is the more nebulous possibility that a discrete particle of Pu might pass through some food chain and eventually reach man. It is also definite that this mass of snow and ice will contain many small bits of presumably contaminated debris, some of which may float. (Attempts to dig this type of debris out of the snow and ice were abandoned because of personnel contamination difficulties.) The preliminary report of the Safety Evaluation Panel indicated lack of complete agreement on permiting this debris-laden snow and ice to dissipate by melting, and recommended as "prudent" "a strong effort to remove the main focus of potential contamination at the crash site." Some possible disposal routes for this material are:

(1) Dump as liquid in the open sea. If made public, this would undoubtedly bring anti-nuclear critics down on us regardless of any data on concentrations or dilutions. Oil and carbon residues will be a problem unless they can be solubilized or separated.

(2) Bury the tanks at sea. This would require modifications to make them sink. Since they are carbon steel, they would eventually

deteriorate and this method is then the same as (1) except for delaying the dispersal and moving the dispersal point to the bottom. Oil and carbon residues will be a problem unless they can be solubilized or separated.

(3) Bury the tanks on land. This would use up considerable burial ground and would have the net effect of dispersing the liquid to the soil gradually at some future time (i.e. when the tanks deteriorate). ORNL is not concerned about the radiological aspects of this but is concerned over the logistics, particularly the amount of trench construction required.

(4) Dump the liquid immediately to a crib or specific retention trench. In quantity and concentration of Pu this material is quite comparable to liquid wastes which Hanford has disposed of to cribs or trenches in the past.

(5) Treat to decontaminate and reduce liquid volume. This would probably involve (a) coarse filtering to remove solid debris; (b) possible decantation or other separation of organic liquid, depending on its properties for interference; solubilizing of organics may be possible; (c) fine filtering for particulate Pu; (d) evaporation; (e) dumping of condensate, cribbing or tanking of bottoms.

In informal discussion March 13, R. E. Tomlinson of Atlantic Richfield Hanford thought (3), (4), or (5) would all be radiologically acceptable at Hanford and that (4) would probably be cheapest, but he would need much more information to make good cost estimate. SR Plant has evaporator capacity comparable to Hanford, but would probably not accept (3) or (4) because of traditional conservatism toward contaminating shallow ground water.

In summary, several disposal methods are probably equally acceptable by past radiological precedents for routine AEC operations. The question is then primarily a public relations one, i.e. since this is not a routine matter, how much do we want to spend to be able to say that we have done an especially thorough job? (Conversely, if it becomes very important to spend nothing, we must consider how much trouble we wish to risk by sea dumping). As for a material balance, Dr. Langham is opposed to it on grounds that (a) it gets into security problems (Ray Stone says this has never been a problem and isn't a matter of concern), (b) we don't know what went up in the cloud, (c) the Danes don't care as long as we clean up whatever is found, as we have been doing so far. If he is correct on (c), the importance of a material balance is somewhat lessened, at least for use of the Safety Evaluation Board.

Danes to be advised

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