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Document Abstract

Summarizes early chemical and radionuclide liquid discharge to Los Alamos Canyon and radiological measurements in canyons.

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XV. THE CANYON PROBLEM AT LOS ALAMOS

by

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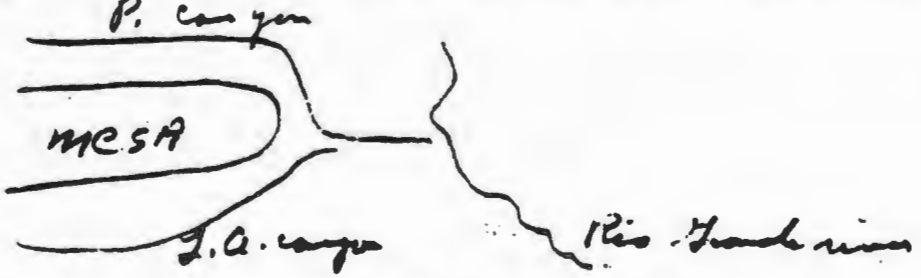
Los Alamos National Laboratory last notified H-1

Review of the Nature of the Problem

It would be best to discuss first the geological position of Los Alamos and a little of the history. As you all probably know, Los Alamos is located at an altitude of 7,300 feet above sea level. We will represent a bird's-eye view of the mesa on which the project is located:



On the south side of the mesa there is a canyon 200 feet deep, -- Los Alamos Canyon. On the north side is another -- Pueblo Canyon. In the early beginning of the project the tendency was to flow radioactive wastes into the canyons and hope it was forgotten because of the inaccessibility of the location. These two canyons join two miles east of the mesa and drop 2,000 feet to the Rio Grande Valley where a series of arroyos conducts the water to the Rio Grande River. During rains the canyon beds have a flowing stream. This stream runs down from the mountains through both canyons which is about five miles. The water probably drops underground at some point. During the dry season this stream dries up and stagnant pools form in the canyon bed. The Rio Grande River runs down to the Gulf of Mexico and forms a boundary between Texas and the country of Mexico.

The rock strata of the mesa is of volcanic crater origin of soft tufa with very little surface soil. Located just west of the mesa is the largest extinct volcano in the world.

One road leads up to the project from the Rio Grande Valley and leaves the project pretty well isolated. On the mesa are three principle chemical research areas -- areas I, II, and III.

Chemical & Contaminated Waste Disposal

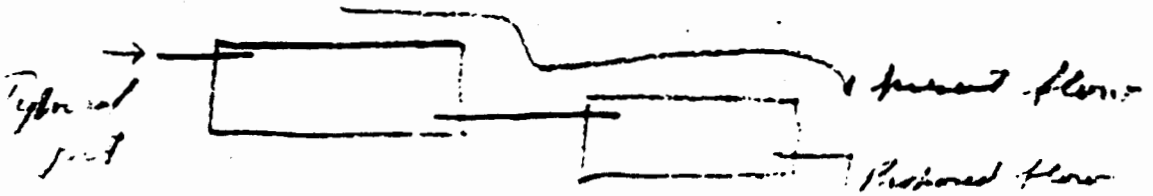
We have one chemical line which connects all the chemical laboratories in area No. I, the Technical Area. It starts near Los Alamos Canyon and makes connection with 5 of the laboratory buildings. This line

drains the laboratory floors, sinks and operations in these laboratories, and then runs across the mesa to Pueblo Canyon. There is no dilution whatsoever in the line and the effluents flow directly over the canyon wall.

The general tendency has been, in the past, in the chemical areas which process all the radioactive materials to drain the effluents off into the canyon, and hope the water either dilutes the material or that it runs down to the Rio Grande River. Because of the prevailing winds from the southwest which might pick up the dried contaminated effluent and blow it across the project, the effluent has been piped across the project to Pueblo Canyon instead of dropping the contamination into the south canyon.

In area No. II we have 4 chemical drains from each of the 4 separate buildings. These lines, however, connect with loose gravel seepage pits which were designed to filter radioactive contamination from the effluent. These seepage pits are approximately 20 feet long and are filled with loose gravel and sand. The water collects on the surface of the sumps because of the inefficient operation of the pit.

For some reason the seepage pits have clogged up and the effluent is now collecting on the surface of the pits. It forms a drain right over the surface to the second seepage pit and then down into the canyon:



In area No. III we have two contaminated effluent lines, connected to seepage pits the same as at area No. II, which drain into Pueblo Canyon. The contaminated laundry has 2 lines from the washers. They empty into a seepage pit like the others and they also have become clogged. It may be that the lint from the clothing is clogging the loose sand and gravel, or it may be the soap. We don't know. The pit, however, is not working properly. The water is collecting on top and in certain periods of the year the effluent dries up. The water is stagnant on the surface of the pit and when it dries up, it could form contaminated dust which would blow over the DP Site. We have checked for air counts during the period when the strong winds blow, but have detected very low alpha air contamination. We should expect the winds to pick up the contaminated dust.

Extent of Contamination

We believed the effluent contaminated the canyon wall and adjacent areas so in order to determine the extent of contamination we made a series of surveys of the canyon. Each survey was divided into 4 different parts:

1. Direct Instrument Survey

The first part was a direct instrument survey of the canyon ground. The instrument survey extended all the way to the Rio Grande River -- approximately 10 miles. We found, around area No. I, that the effluent line, the canyon wall, and the bottom of the canyon had alpha counts up to 20,000 per minute by instrument survey. This area was also checked with a Geiger Survey Meter. The pit-beds from area No. II were checked and the surface of the bed was found to be highly contaminated as well as the canyon wall and the canyon itself. In the sump beds the contamination we found to be as high as 5,000 counts per minute on the surface.

2. Analysis of the Effluent

We collected approximately 5 water samples from each of the effluent lines which were analyzed for radioactive materials, such as plutonium, uranium, and mixed fission products, toxic metals, and fluorine. Uranium waste was detected in small quantities. In analyzing for toxic non-radioactive materials we found fluorine in concentrations up to 20 milligrams per 100 milliliters. These samples were collected at 8:00, 10:00 and 3:00 o'clock. It would be very difficult to judge from the assays of the effluent just how much fluorine we were throwing down the canyon. Pb was found in concentrations up to .01 of 1% per weight. We found Pu in the waste effluents from the Tech Area to be present in amounts of 0.01 γgm per liter of fluid. In area No. II we found plutonium contamination to be no higher than in area No. I. In area No. III plutonium is not handled at all. Pu ran around .01 d/m per liter of effluent from area No. III.

The volume of effluent from area No. III is very small so the total amount of Po or Pu would be small. Along with the natural disintegration of Po, 140 days, it would indicate under the condition, that Po contamination would not be much of a health hazard. Whether plutonium would be reconcentrated in the canyon I don't know.

3. Soil Samples

The soil samples were collected immediately adjacent to the walls and at spots along the canyon bed. The soil samples were analysed for radioactive materials. We found the soil samples collected from the seepage pits along area No. II and III to contain up to 5,000 disintegrations per minute per 100 grams of soil of plutonium. Along the wall we didn't take any rock. We found a detectable amount of plutonium around area No. II 100 feet in either direction from the pit outlet. In area No. III we found polonium in the soil samples as high as 300,000 disintegrations per minute per 100 grams of soil.

4. Stagnant Water Samples

Water samples were collected from stagnant water in the sumps, the effluents in each chemical line and from stagnant pools in the canyon. Liter volumes of the water were taken wherever stagnant pools could be found. During the dry season they are pretty well dried up. We found up to 5,000 disintegrations (Pu) per minute per liter of stagnant water. In area No. III we found 140,000 disintegrations (Po) per minute

per liter of water. In the pools in the canyon itself, immediately below the effluent outlets we found up to as much as 500 disintegrations (Pu) per liter.

Soil and water samples were analyzed for Pu, U, radioisotopes and fluorine and toxic metals. In the Rio Grande River counts of radioactive material were normal background. There was no material found that we could attribute as coming from the project. In general, we found the canyon walls and canyon beds adjacent to the sump outlets to be highly contaminated. Radioactive contamination drops off rapidly 100 feet in either direction from the sump outlets. That may be natural filtration of the soil itself. We do know the plutonium is bound very tightly in the soil and it takes elaborate extraction to remove it from the soil.