THE COLORADO COMMITTEE FOR ENVIRONMENTAL INFORMATION

Subcommittee on Rocky Flats

Boulder, Colorado

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PLUTONIUM CONTAMINATION IN THE DENVER AREA

I. INTRODUCTION

On January 13, 1970, the Subcommittee on Rocky Flats, Colorado Committee for Environmental Information, submitted a report to the U. S. Atomic Energy Commission summarizing its preliminary findings concerning the plutonium hazards associated with the operations of the Dow Rocky Flats plutonium plant. This report and the issues involved were discussed on February 10, 1970, at a meeting in Denver attended by representatives of the AEC, the Dow Chemical Company, the Colorado Department of Public Health, and our Committee.

The present report of our Committee is an interim report to the public summarizing our findings with respect to offsite plutonium contamination and clarifying the issues on the nature and possible significance of the plutonium contamination hazards.

II. BACKGROUND

The Rocky Flats plutonium plant, operated by the Dow Chemical Company under U. S. Atomic Energy Commission contract, is located only six to eight miles west of densely populated suburbs of Denver. The May 11, 1969, plutonium fire at this plant, involving a very large quantity of plutonium, therefore attracted much local public attention and concern.

Reflecting this public concern, the Colorado Committee for Environmental Information formed a subcommittee to investigate the implications of Rocky Flats plant plutonium fires and operations for the public health and safety. The basis of our concern are the unusual and uncertain hazards of plutonium contamination. Plutonium oxide dust particles produced in plutonium fires are among the most serious cancer-producing agents known. In particular, since the radioactivity from plutonium oxide dust particles (such as those produced in the May 11, 1969, fire) is millions of times more intense than that from naturally occurring radioactive dust particles of the same size, only minute amounts in the lung are sufficient to cause cancer. The radioactivity of these small plutonium oxide particles is not readily diluted by rain, snow or other natural processes because plutonium oxide is very insoluble. Moreover, since plutonium has a half-life of 24,000 years (only one-half of the radioactivity will disappear in 24,000 years) plutonium contamination is essentially permanent. Accumulation of any plutonium contamination in our environment is therefore not only our problem but our children's, our grand children's and so on for thousands of generations.

The Colorado Committee first discussed possible plutonium contamination of the local environment with representatives of Dow and the AEC at a meeting on June 17, 1969. At that meeting Major General Edward Giller, Assistant General Manager for Military Applications of the AEC, agreed to the fullest possible cooperation, within the limits of national security, on those aspects of the Rocky Flats operation which relate to plutonium contamination of the local environment. In subsequent discussions with the Rocky Flats staff it was learned that radioactivity measurements in the Rocky Flats environs did not distinguish plutonium from natural alpha radioactivity in air or water samples. Also it was learned that no measurements were being made to determine the buildup of plutonium in soils and lake sediments.

In order to assess the possible hazard from plutonium contamination it is necessary to make soil measurements to find out how much plutonium is present, how it is distributed, and how rapidly it is accumulating. Because the Dow Rocky Flats staff indicated a reluctance to undertake soil measurements, an independent program of soil measurements was arranged.

The results for offsite soil measurements show that there is already between 100 and 1000 times more plutonium in the local environment than there would be if good containment practices were continually maintained at the Rocky Flats plant. Although it cannot be said that present levels of plutonium in offsite soils constitute a significant hazard, there is too much scientific uncertainty about plutonium hazards to make a definitive statement without more adequate information. The AEC has yet to explain how so much radioactivity escaped from the plant and a comprehensive investigation of the distribution of plutonium in soils in and around the plant area is necessary to help answer this question. The May 11, 1969, fire is the most likely source of the contamination and surrounding communities may have been saved from far more serious levels of plutonium contamination only by the fortunate chance that winds during the fire were light easterlies and northeasterlies.

With regard to the question of whether or not a hazard exists, an important question must be raised. It it the responsibility of citizens to demonstrate that a definite health hazard results from a given pollutant, or is it the responsibility of the polluter to demonstrate that there is no hazard? This question should not be answered by scientists alone. It must be openly discussed by an informed citizenry, and each citizen should make his views known to his elected representatives in government.

III. PLUTONIUM IN OFFSITE SOILS

Beginning in late August, the collection of soil samples and measurement of plutonium in the samples was carried out by S. E. Poet and E. A. Martell

of the National Center for Atmospheric Research, Boulder, Colorado. About three months later Dr. Martell advised General E. B. Giller, of the AEC Division of Military Applications, that disturbing amounts of plutonium were present in offsite soils, especially in areas east of the plant. About that time Dow also began to measure plutonium in soil samples.

Results obtained by Poet and Martell, giving the plutonium content of twenty offsite soil samples and a number of reservoir water and sediment samples, were included in the CCEI Report of January 13, 1970. Additional soil data obtained by Poet and Martell were presented to participants at our February 10th conference with the AEC and others in Denver. Up to the present time, no data specifically for plutonium in soils, water samples, lake sediments or air filters have been forthcoming from the AEC, Dow Chemical Company, or the Colorado State Public Health Office.

The results for offsite soils in areas around the Rocky Flats plant are summarized on the accompanying map. Each number on the map indicates the place where the soil sample was taken and the amount of plutonium in the local environment in excess of what would be there from nuclear test fallout alone. For example, the number 210 on the map means that the top 3/8 of an inch of soil at that location has received 210 times as much plutonium from Rocky Flats as it has from nuclear test fallout. It is important to keep in mind that essentially no plutonium occurs naturally.

Measurements of two vertical profiles of samples from undisturbed soils east of Rocky Flats show that nearly all the plutonium is in the top 1/8 inch layer of soil. The presence of most of the plutonium in a thin surface layer of the soil strongly indicates that it came from a very recent release of plutonium from Rocky Flats. The May 11, 1969, fire appears to us to be the most likely source, although some members of the Dow Rocky Flats staff maintain that it came from an area east of their building complex where the ground was heavily contaminated with plutonium from leaky drums of liquid wastes.

Our preliminary estimate indicates that an amount of plutonium exceeding a Curie is present in offsite areas. This estimate does not include the plutonium deposited within a sixteen square mile area immediately surrounding the Rocky Flats plant which was not accessible to us. This amount should be compared with the 0.038 Curies that the AEC and Dow have indicated as having been released in normal day to day operations over the last seventeen years. It seems apparent that quantities of plutonium, hundreds of times the carefully controlled and monitored total Rocky Flats stack effluent, have found their way into the local soils, indicating a serious lack of good containment and waste handling practices.

IV. THE PROBLEMS OF HAZARD ASSESSMENT

Perhaps the most difficult and uncertain part of this whole problem is the assessment of the risk to the people in the Denver metropolitan area resulting from the plutonium present in soils around the Rocky Flats plant. There are two important aspects of the problem which must be resolved, each involving large uncertainties:

(1) How many plutonium particles will be deposited in the lungs of individuals living in surrounding areas as a result of the surface soil and airborne plutonium contamination?

(2) What is the cancer risk to an individual with a given number of plutonium particles in his lung?

The plutonium escaping from the Rocky Flats plant and being deposited on downwind surfaces is mainly in the form of plutonium oxide dust particles about 1/100,000 inch in diameter. Because plutonium oxide particles are very insoluble in water, their entry into our food chain is not considered to be the main hazard. However such small particles are readily inhaled and deposited in the lung where they can cause cancer. Plutonium oxide particles in soil surfaces may be continuously recycled into the air we breath by the strong gusty surface winds in this area and by vehicular traffic as well.

The possible hazards to the public due to plutonium on soil surfaces can be estimated only when we have much better information about the soil distribution of plutonium, the effectiveness of the pickup processes, and the size of the airborne plutonium particles.

How much plutonium in your lungs is bad for you? Any amount is undesirable, but how much must there be before a significant risk of cancer exists? This question is currently under hot debate by many experts in the field. Much of the uncertainty stems from the fact that body tissue immediately surrounding a pure plutonium oxide dust particle is subject to radiation millions of times more intense that that from an average naturally occuring radioactive dust particle of the same size. The currently accepted standards for permissible lung burdens of radioactive materials are based on the assumption that the lung is uniformly irradiated. This assumption does not take into account the fact that radiation from plutonium oxide particles in the lung is absorbed entirely in the lung tissue immediately surrounding these particles. Drs. Tamplin and Geesaman of the Bio-Medical Division of the AEC, Livermore Laboratory have presented some persuasive arguments which indicate that these standards are as much as 100 times too permissive when applied to plutonium. Even the International Committee on Radiation Protection, upon whose recommendations our standards are based, has indicated that the problem of setting

a permissible lung burden for particles of radioactive material of high specific activity is unresolved. Although other scientists disagree, the fact remains that if the current standards are too lenient, plutonium in soils around Rocky Flats may be approaching or may even have reached levels of some significance to the local population. We obviously need better statistics on the effects of plutonium in the human lung and it would be unfortunate indeed if those statistics were gathered at the expense of the people living in this area.

V. THE ROCKY FLATS SITE

It is regrettable that eighteen years ago when the Rocky Flats plant was built at its present site little was known about the hazards on which public safety criteria for the siting of such a nuclear facility should be based. Repeated expansion of the plant operations plus the westward growth of greater Denver have magnified the problem. Several densely populated communities (see map) are only six to eight miles east of the plant and thinly populated areas nearer the plant are growing rapidly. Each expansion of the plant gives rise to an increase in the volume of plutonium contaminated effluents. If we had it to do over today, it is unlikely that any responsible member of the AEC would recommend the location of a plutonium processing plant immediately upwind of Denver or any other major urban area. For all these reasons the question of whether or not the continued operation of the plant at its present site can be accepted depends heavily on the outcome of the debate on permissible lung burdens of plutonium, on the seriousness of present and projected levels of plutonium in our soils and waters, and on the possibility of major releases of plutonium in future fires and accidents. The final decision on this important question rests with an informed public and their elected representatives.

One of the important unpredictables about future operations at Rocky Flats is the possible occurrence of fires and accidents that will result in further releases of plutonium to the outside environment. Past major fires, accidents and plutonium releases at Rocky Flats include the following events. On September 11, 1957, a fire, initiated by the spontaneous combustion of metallic plutonium in a production drybox line, spread through the ventilation system and released an undetermined amount of plutonium to the atmosphere. Property damage was nearly one million dollars. On June 12, 1964, an explosion occurred when plutonium chips were dropped into a carbon tetrachloride bath. On October 15, 1965, plutonium chips caught fire in a large room, exposing about 400 employees to plutonium oxide fumes. In March 1967, air filter samples from a station in Denver, averaged over the full month period, showed a plutonium concentration about ten times higher than the average for other stations in the United States. Plutonium contamination from leaky drums stored in the open just east of the plant reportedly was redistributed by winds, mainly in the period between Spring 1967, when Dow started to move the drums for reprocessing, and September 1969, when a four inch thick asphalt slab was placed over the contaminated area. The fifty million dollar fire of May 11, 1969, released a yet undertermined amount of plutonium and possibly was the main source of the offsite contamination.

It is not possible to make realistic predictions about the number and magnitude of plutonium releases in the future. It can only be stated that the record up to now is not very reassuring.

VI. THE NEED FOR MORE INFORMATION

Our Committee is heartened by the AEC February 10, 1970, announcement of their plans for an expanded offsite monitoring program. This program involves an increase in the number of measurements of air, water and soil samples and includes the specific analysis of plutonium in many of the samples. The Colorado Public Health Service has also increased its measurement program.

Even with these measurements, however, the magnitude of the health hazard will be difficult to assess. With respect to the soil contamination, the problem is to find out how much plutonium finds its way from the soil to the lung and lymphoid tissue of people living in the area. To make such determinations, detailed information on the soil and wind conditions and on the size and concentration of airborne plutonium particles is needed. Our Committee feels that the AEC and its contractors should investigate these matters and make their results available without undue delay, in detailed reports. Such studies also should be carefully reviewed by an independent group with the qualifications to do so.

One question of overriding importance must be resolved before we can assess the possible significance of plutonium contamination in the Denver area. What level of plutonium oxide particles in the air we breathe and in our lungs is acceptable to the public at large? The fact that some of the AEC's own biomedical experts are saying that one percent of the present permissible lung burden of plutonium oxide particles may cause a cancer is the main basis for differences of opinion about the significance of the offsite contamination. To answer this question we clearly cannot wait the several decades needed to accumulate sufficient statistics on cancer produced by plutonium in the lung. This question should be resolved by a scientific body independent of the U. S. Atomic Energy Commission consisting of the best qualified medical research people available. Until then, any statements about the lack of significance of the present offsite contamination are unjustified.

Approved by the Board of Directors for the Colorado Committee for Environmental Information.

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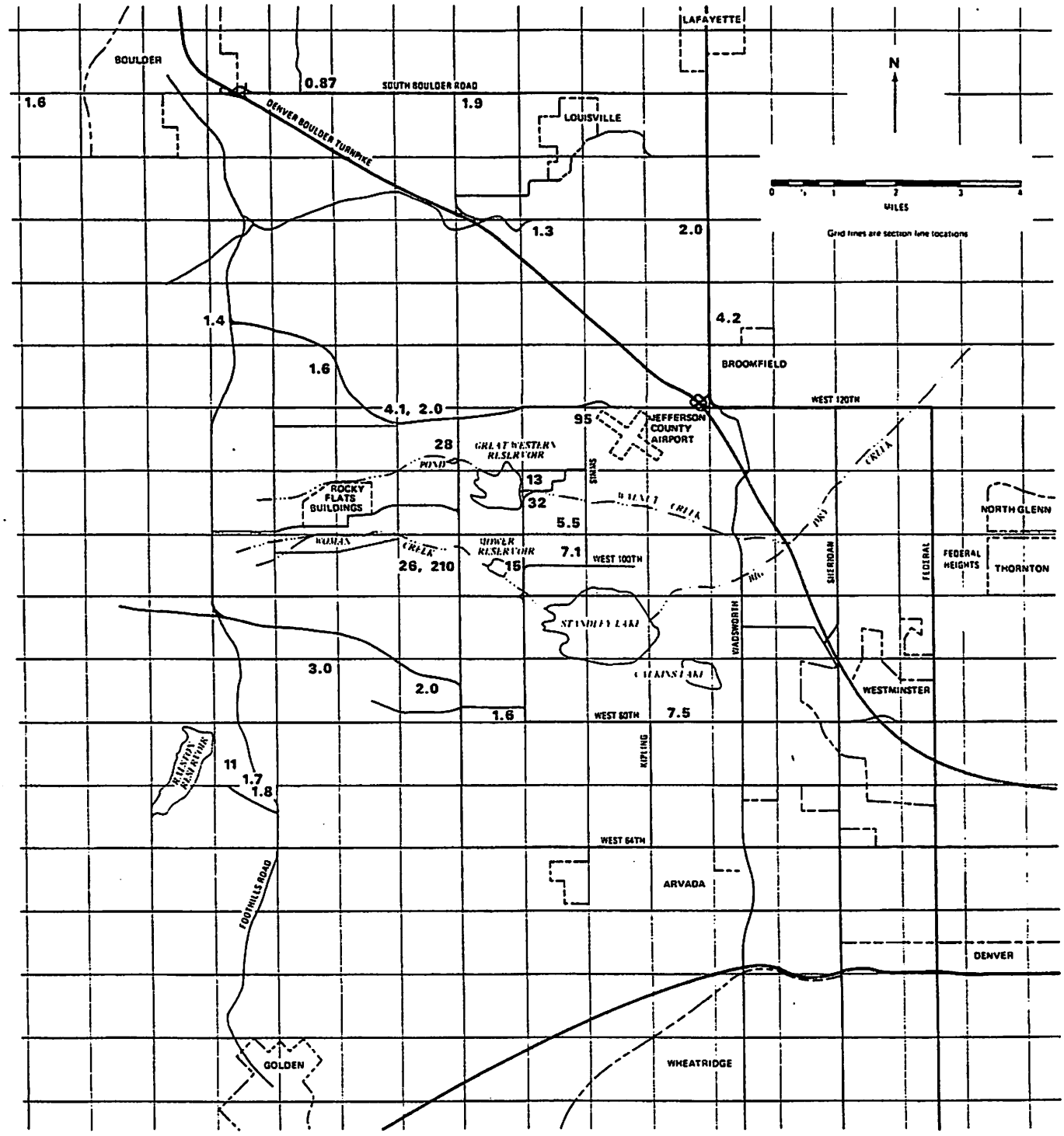

FIGURE 1: Numbers indicate relative amounts of plutonium contamination from the Rocky Flats Plant in each location from which soil samples were taken.