



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

Health Consultation

**Rocky Flats Environmental Technology Site
Operable Unit 3**

**Federal Facilities Assessment Branch
Division of Health Assessment and Consultation**

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ADMIN RECORD

A-0003-000530

BACKGROUND AND STATEMENT OF ISSUES

The U S Department of Energy (DOE) Rocky Flats Field Office (RFFO) requested that the Agency for Toxic Substances and Disease Registry (ATSDR) review and provide public health comments on the Rocky Flats Environmental Technology Site Operable Unit 3 (OU3) Final Remedial Investigation (RI) report [RMRS, 1996] In the specific request for this health consultation, the RFFO requested that ATSDR review the contaminant data and interpretation of the Human Health Risk Assessment portion of the RI They further requested that ATSDR's health consultation focus on the adequacy of the selection of the contaminants of concern for OU3 and, based on these contaminants, the selection of the proposed action for the OU [DOE, 1996] In determining the contaminants of concern, the analyses included metals, pesticides, volatile chemicals and radiological materials The environmental media sampled included soils, surface water and groundwater RFFO states that based on their analyses, the only contaminants of concern are plutonium and americium [DOE, 1996]

The RF OU3 consists of publicly accessible land outside the fenced boundaries of the DOE site, east and southeast of the facility The contaminants present in OU3 are those contaminants that have migrated from the RF plant during its operational years which began in 1952 and concluded in 1992 The OU3 covers approximately 38 square miles north, south, and east of the plant boundary The primary portions of OU3 include the major watersheds of the Great Western Reservoir, Standley Lake, Mower Reservoir, and the associated surrounding soils The Great Western Reservoir and Standley Lake are used as recreational and potable water supplies The Mower Reservoir, whose water rights are privately owned, is used as an agricultural water supply source The associated soils are all soils that potentially were impacted by operations at the Rocky Flats Plant

DOE states that two events on the RF property resulted in the spread of contamination to OU3 The first event was releases from the Pad 903 storage area which held drums of plutonium contaminated oils The drums leaked, and through environmental transport mechanisms, spread contaminants downwind The second event occurred when sediments, released from holding ponds, migrated into the Great Western Reservoir

DISCUSSION

To determine the contaminants of concern, methodology varies among agencies, however, the ultimate goal, protection of the environment and public health, is similar ATSDR evaluates contaminants to determine whether exposure to them has public health significance For nonradioactive chemicals and metals, ATSDR uses comparison values--contaminant concentrations in specific media and for specific exposure routes believed to be without risk of adverse health effects -- to select

contaminants for further evaluation. ATSDR and other agencies have developed the values to provide guidelines for estimating media contaminant concentrations that are not likely to cause adverse health effects, given a standard daily ingestion rate and standard body weight [ATSDR, 1992]

Many of these values have been derived from animal studies. Health effects are related not only to the exposure dose, but also to the route of entry into the body and the amount of chemical absorbed by the body. Therefore, several comparison values may be available for a specific contaminant. ATSDR generally selects the comparison value that uses the most conservative exposure assumptions to protect the most sensitive segment of the population.

For radiological contaminants, ATSDR uses information on radiation exposure and its effects related to environmental levels prepared by federal agencies, including EPA, DOE, and the Nuclear Regulatory Commission. The agency also uses other publicly available data sources and recommendations on radiation dose limits. The National Council on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), and the United Nations Scientific Committee on the Effects of Atomic Radiation develop these non-government sources.

Evaluation of Metals and Ions

ATSDR reviewed a list of 29 metals and ions in surface waters, groundwaters, and sediments collected at various locations within OU3. Using the agency evaluation guidelines and procedures, the metals and ions listed in the DOE documentation were below levels of public health concern or were slightly above our initial environmental evaluation guidelines. For those that were above the guidelines, additional site specific evaluation indicated that those metals - antimony, arsenic, lead, and thallium - do not pose a threat to human health.

Evaluation of Radiological Contaminants

The radiological contaminants detected in OU3 included several isotopes of uranium (U, U-238/235/234), radium (Ra-226/228), and their associated decay products. The fission products strontium-89/90 (Sr) and cesium-134/136/137 (Cs) also were reported. The man-made isotopes reported included plutonium-238/239/240 (Pu) and americium-241 (Am), the decay product of Pu-241.

The concentrations of uranium, radium and the fission products were present at or near naturally occurring levels or levels associated with fallout from atmospheric weapons testing. Levels of the plutonium and americium isotopes, however, were higher than normally found in the environment, requiring additional evaluation.

Information included in the RI for OU3 indicated that Pu-239/240 was elevated in the deep sediments of the Great Western Reservoir with the maximum reported value of about 0.15 becquerels per gram (Bq/g, 4 picocuries per gram, pCi/g) at about 17 inches into sediments near the edge of the lake. Surface sediment concentrations of Pu-239/240 were present at similar concentrations (0.12 Bq/g, 3.3 pCi/g).

Plutonium concentrations in surface water and groundwater were reported at about 1×10^{-3} Bq per liter (L) and 3.2×10^{-3} Bq/L, respectively. These values are well below the Environmental Protection Agency (EPA) proposed drinking water standard for Pu-239/240. That proposed level is 2.4 Bq/L (65 pCi/L).

Surface soil concentrations of Am-241 ranged from 1.5×10^{-3} to 1.1×10^{-2} Bq/g (0.04 to 0.3 pCi/g) and the distribution of Pu-239/240 were similar. The concentrations of these radionuclides exceeded background for about 1 mile mostly east of fence line. Normal background concentrations of Am-241 in soil range from 1.1 to 5.6×10^{-4} Bq/g (0.003 to 0.015 pCi/g). For Pu-239/240, the normal background concentrations range from 3.3×10^{-4} to 1.5×10^{-3} Bq/g (0.009 to 0.04 pCi/g). Because these levels were well in excess of average background concentrations, additional analyses were required.

For these analyses, ATSDR used the recommendations and age-adjusted dose conversion factors of the ICRP in their Publication 67 [ICRP, 1994]. These factors and ATSDR processes differ from the procedures used by DOE in their analyses. The assumptions used for the ATSDR analysis were that the concentrations of radionuclides were the maximum reported in the RI for OU3. Because of the uncertainty in the differentiation of Pu-239 from Pu-240, these isotopes were considered present at equal activities, that is, 50% of the maximum value was used for each radioisotope. As these radionuclides are not bioconcentrated to any great degree in biota, ingestion of potentially contaminated foodstuffs was not considered to be a major pathway of exposure. For ATSDR analyses, the major pathway was determined to be the soil ingestion pathway.

For our analyses, we selected the following parameters. The average amount of soil ingested was 200 milligrams per day for 340 days per year. Furthermore, this ingestion was assumed to occur until the age of 21. The amount of soil ingested assumes various activities that might occur in the OU3 area. These activities include construction, recreational uses, and incidental ingestion of soils.

Using these assumptions, the total annual dose to an individual is below the 1 millisievert (100 millirem) dose limitation of the ICRP [ICRP, 1991] as well as the dose limits proposed by DOE in their protection of the public and environment (10 CFR 834). Based on these dose calculations, the levels of Am-241 and Pu-239/240 do not pose a public health hazard for current or future use of the OU3 lands.

CONCLUSIONS

- 1 The concentration of heavy metals in environmental media (surface water, groundwater, and soils) are present at levels below health concern
- 2 Concentrations of the radioisotopes, uranium and radium, are present at naturally occurring concentrations and are not expected to result in any adverse health effects
- 3 The concentrations of most of the radioisotopes associated with either fallout or fission processes are not at levels of health concern. These isotopes include various cesium and strontium isotopes
- 4 The concentrations of plutonium and americium in surface water and groundwater are well below the proposed drinking water standards and are not considered health concerns
- 5 Evaluation of radioactive constituents detected in the OU3 indicates that these levels do not pose a public health concern

Based on these determinations by ATSDR, we agree with the findings of the Department of Energy in their Human Health Risk Assessment in that the selection of the DOE contaminants of concern were based on reasonable assumptions. Furthermore, additional evaluation of these contaminants indicates that no additional activities are needed by the Department of Energy to ensure the public's health.



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REFERENCES

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