EPA's Environmental Radiation Ambient Monitoring System (ERAMS) Role in Post-Emergency Response

John G. Griggs, David P. Garman, and Rhonda S. Cook

National Air and Radiation Environmental Laboratory
USEPA/Office of Radiation and Indoor Air, Montgomery, AL

INTRODUCTION

The U. S. Environmental Protection Agency is currently reconfiguring the Environmental Radiation Ambient Monitoring System (ERAMS). ERAMS is a national monitoring program which collects and performs radioanalysis on over 7,600 samples per year. EPA launched the ERAMS network in 1973 by consolidating a number of existing radiation monitoring networks.

These existing networks were mainly intended to monitor fallout. The ERAMS mission expanded to include monitoring radiation emergencies, following trends in environmental radioactivity levels, and providing data for dose calculations. Currently, ERAMS is the nation's only comprehensive radiation monitoring network, with over 300 sampling stations distributed across all 50 states and the American Territories. These stations regularly sample the nation's air particulates, precipitation, drinking water, surface water and milk, provide broad geographical coverage, and cover many major population centers. During its twenty five years of operation, ERAMS has been most successful in developing an environmental radiation database, providing information about weapons testing, and reporting on significant releases of radioactivity into the environment, such as the Chinese weapons tests of 1976 and 1977, and the Chernobyl incident in 1986. The overall responsibility for ERAMS falls under the EPA's Office of Radiation and Indoor Air (ORIA). The system is operated by the ORIA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama.

DISCUSSION

Mission Statement

The mission statement developed for ERAMS as a result of the ORIA reconfiguration efforts retains some of the elements in the original mission, but the primary focus is nuclear emergency preparedness. This focus is especially significant in light of current global politics, aging nuclear reactors in many parts of the world, and the potential threat of terrorist activities involving nuclear material.

The reconfigured ERAMS has the following mission: *To monitor environmental radioactivity in the United States and its Territories in order to provide high quality data for assessing public exposure and environmental impacts resulting from nuclear emergencies and to provide baseline data during routine conditions.*[2] This mission will be achieved by addressing three main

objectives (1) providing data for nuclear emergency response assessments; (2) providing data on ambient levels of radiation in the environment for baseline and trend analysis, and (3) informing the general public and public officials about levels of radiation in the environment. Although the primary objective of the proposed system is to provide data for the assessment of a national nuclear emergency in the short and long term, the ambient monitoring component is essential to maintain system readiness, competency, and high quality data. Both operational modes, energy and ambient, will provide information to the public and public officials.

ERAMS Reconfiguration

Based upon the mission and objectives, all elements of ERAMS, from sample collection through analysis, data reporting, and dissemination, were analyzed according to specific criteria. The conclusions that were developed resulted in recommendations for system changes designed to provide an optimized national radiation monitoring system.

Several factors guided the selection of media to be sampled in the proposed system. Paramount among these were the objectives of the system and the intended uses of the data generated. The following media selection criteria were developed: principal transport medium of radioactivity during a nuclear incident or release, short and long term indicators of health and environmental impacts, significant human pathway, Federal, State and Tribal interest in baseline data for comparison to facility and site monitoring, and concern by the general public and public officials. Based on these selection criteria, the following media were selected: air particulates, precipitation, drinking water, and milk. In addition, gamma monitors are proposed to provide real-time measurement capability to the system.

Given the resource requirements of sample analysis, a major consideration in determining sampling frequency is an approach that allows for minimal sampling frequency while ensuring the system meets its objectives. For air particulate sampling, the sampling equipment determines the sampling frequency, which in most instances would be twice weekly. For other media, the routine sampling frequency needed to maintain system readiness is judged to be two collections per year. In the event of a nuclear emergency, the sampling frequency would be increased to daily collections, with the exception of precipitation, which would be increased to each precipitation event.

The overall strategy for locating ERAMS sampling sites is based on the system's fundamental mission of supporting emergency and post emergency preparedness and response and developing national baselines and trends of environmental levels of radiation. This strategy, to the extent possible, will utilize the existing set of sampling sites. Air particulate, drinking water and precipitation sampling sites will provide for maximum major population and geographical coverage, and add U. S. border monitoring. Population coverage is further augmented by sampling at several population centers near major nuclear sites. Sampling sites for milk collection will focus on the top 20 milk producing states, which account for 85% of the milk consumed in the U. S. Real-time gamma monitors are proposed to be initially employed at each of the ten EPA regional offices and at ten U S. border locations. Another influence on sampling

site locations is the fact that all station operators are volunteers who have a limited range of geographical mobility.

Emergency and Post-Emergency Response

In the event of a major nuclear incident, data from ERAMS will be used to determine the immediate and long-term environmental and public health impacts. Specifically, in terms of public health, data from the monitoring system will be used for dose assessments. Depending on the results of the dose assessments, this information could be used by the EPA, States, and Tribal governments to protect public health by issuing warnings and protective action recommendations to the public. Other Federal agencies may also utilize the data for their respective roles during a nuclear emergency. Given the public's perception of radiation, the data will be used extensively to respond to public officials and the public. Since a major nuclear incident could potentially affect the world community, data users may include the governments of other countries and international organizations. EPA's role under the Federal Radiological Emergency Response Plan is long-term monitoring in the vicinity of an incident following control of the actual incident. ERAMS will assist in providing valuable data in support of this agency responsibility.

During a major nuclear incident, the EPA will place all or selected ERAMS stations on an accelerated status. The number of stations activated will depend on the type, location, and scale of the emergency. These stations will provide daily samples for analysis. The ERAMS stations will continue to operate on an accelerated status until radiation levels return to baseline levels. The data can then be compared to baseline data available in the ERAMS database and Environmental Radiation Data (ERD) reports. The ERAMS database and ERD reports provide valuable baseline and trend information used to determine elevated levels of radioactivity released to the environment during a radiological emergency.

The analytical schemes in the reconfigured ERAMS employ cost-effective screening methods, such as gross alpha and beta analysis, which are effective in measuring overall changes in the levels of radioactivity in the environment and detecting action levels to trigger more resource intensive radionuclide-specific analyses. For emergency and post emergency response, the screening methods will still be employed, but the number of nuclide-specific analyses will increase significantly. The type of nuclide-specific analyses performed will be based on the nature of the emergency, with priority given to radionuclides that are significant contributors to dose.

Results of analyses are compiled, reported and distributed quarterly in the ERD reports by NAREL. Sample composite analyses are performed and reported annually. An excerpt of an ERD air particulate composite report is provided in Table 1.[3] ERAMS data can also be accessed on the Internet at: "www.epa.gov/narel/erdonline.html".

Table 1. Plutonium and Uranium in Airborne Particulates, July-December 1994 Composites.

Location	^{238}Pu aCi/m^3 ±2σ	$^{239-240}Pu$ aCi/m^3 ±2σ	^{234}U aCi/m^3 ±2σ	^{235}U aCi/m^3 ±2σ	^{238}U aCi/m^3 ±2σ
VA: Lynchburg	0.2 0.3	0.3 0.3	131 10	3.4 0.8	10.6 1.5
VA:Virginia Beach	ND	0.1 0.2	13.9 1.4	0.8 03	12.7 1.3

CONCLUSION

The assessment of ERAMS has strongly affirmed the importance and need for a nationwide ambient radiation monitoring network, especially in the event of a major nuclear incident. The primary consideration in designing the proposed monitoring system is the assessment of public health and environmental impacts resulting from national and international emergencies. Since emergency and post emergency response is contingent upon a system being in place and operational at the time of an incident, significant design attention was paid to the routine operations of the system. Under the reconfigured system, ERAMS stations can efficiently be placed on an accelerated status, during an emergency. This will provide rapid sample collection and analysis, the data from which can then be compared to baseline and trend analyses data available in the ERAMS database and ERD reports. The reconfigured system also will provide real-time gamma measurement capability, increase population coverage, minimize expense, and make data evaluation results available electronically.

REFERENCES

1. U. S. Environmental Protection Agency (EPA), "Environmental Radiation Ambient Monitoring System (ERAMS) Manual". (EPA 520/5-84-007,008,009), May, 1988.

2. U. S. Environmental Protection Agency (EPA), "Proposed Reconfiguration Design for the Environmental Radiation Ambient Monitoring System (ERAMS)", November, 1997.

3. U. S. Environmental Protection Agency (EPA), "Environmental Radiation Data Report 80". (EPA-402-R-97-003), February, 1997.