EG&G Letter Report

NRC - 8112

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OF

THE U. S. RADIUM FACILITY

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BLOOMSBURG, PENNSYLVANIA

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Scientists:

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The Aerial Measuring System (AMS) operated by EG&G, Inc. for the United States Department of Energy was employed to conduct an aerial radiologic survey of the U. S. Radium Facility (renamed 'Safety Light Corporation/USR Metals, Inc.') and surrounding area near Bloomsburg, Pennsylvania in September of 1980. The purpose of this survey was to document the distribution of radiation levels at the site and surrounding area.

To this end, a Messerschmitt-Bolkow-Blohm BO-105S helicopter equipped with gamma-photon radiation detection equipment was flown at an airspeed of 30.5 meters per second and at an altitude of 91.5 meters above ground level. Flight lines were spaced at 91.5 meter intervals covering an area of approximately 10.36 square kilometers centered on the U. S. Radium Facility.

Exposure rate isoradiation contours were computer generated for the total gamma-photon activity (50 keV to 3,000 keV) and cesium-137 activity. These exposure rate contours were superimposed on aerial photographs; see Figures 1 and 2. The gross count exposure rates over the populated and river valley areas were 7 to 10 microroentgens per hour (μR/h), except for the U. S. Radium site which showed an exposure rate range of 8 to 13 μR/h. Cultivated land areas north of Highway 11 showed an exposure rate of 8 to 13 μR/h, the same as that over the U. S. Radium site.

Spectral analysis showed that the data collected over the cultivated land areas, population centers and over the river valley area were due only to naturally occurring gamma-photon emitters. However, the exposure rate range over the site was due in part to cesium-137 activity. As shown in Figure 2, cesium-137 contributed a maximum of 0.5 to 5.0 μR/h to the total exposure rates measured over the site.

The exposure rate levels noted above are extrapolated to 1 meter above the ground from the data collected using the aerial platform. The gross count exposure rates shown in Figure 1 contain an average cosmic ray contribution of 4 μR/h.

It should be noted that although the contour intervals depicted in Figures 1 and 2 appear to extend beyond the boundary of the land mass, these elevated levels in fact represent exposure rate values averaged over the detector's field of view. Aerial radiologic detection systems average the radiation levels due to gamma-photon emitting radionuclides existing over the area of several acres. The systems are capable of detecting anomalous gamma-photon activities and determining the specific radionuclides causing the anomalies; however, because of averaging, they tend to underestimate the magnitude of localized sources as compared with ground-based measurements. As such, the indicated radiation levels in the vicinity of anomalies are not definite and further ground-based measurements are usually required.

Lastly, exposure rate measurements were made with a pressurized ion chamber and ground samples were taken from three locations: Location 1, from the front yard of the U. S. Radium Facility, Location 2, from a cultivated field west of Elan Cemetary and Location 3, from a known area of increased gamma-photon activity immediately behind the U. S. Radium administration building. The sample analysis results and ion chamber measurements are shown in Table 1.

The data collected from Locations 1 and 2 substantiate the aerial measurement data depicted on the isoradiation contour superimposed on the aerial photograph of the site. Location 3 showed notably elevated cesium-137 activity (20-50 times above normal soil concentrations). Similar results were obtained from the aerial platform.

TABLE 1

GROUND SURVEY DATA

SAMPLE LOCATION NUMBER	SOIL MOISTURE	GAMMA PHOTON EXPOSURE RATE (μR/h)		
		Ion Chamber*	Soil Analysis Estimate**	Aerial Data
1	6.8	9.2	9.5	8-10
2	2.9	9.5	10.4	8-10
3	2.9	(***)	10.7	10-13

(*) Reuter-Stokes Model RSS-111

(**) Includes Cosmic Ray Contribution of 3.8 μR/h

(***) No ion chamber measurements taken

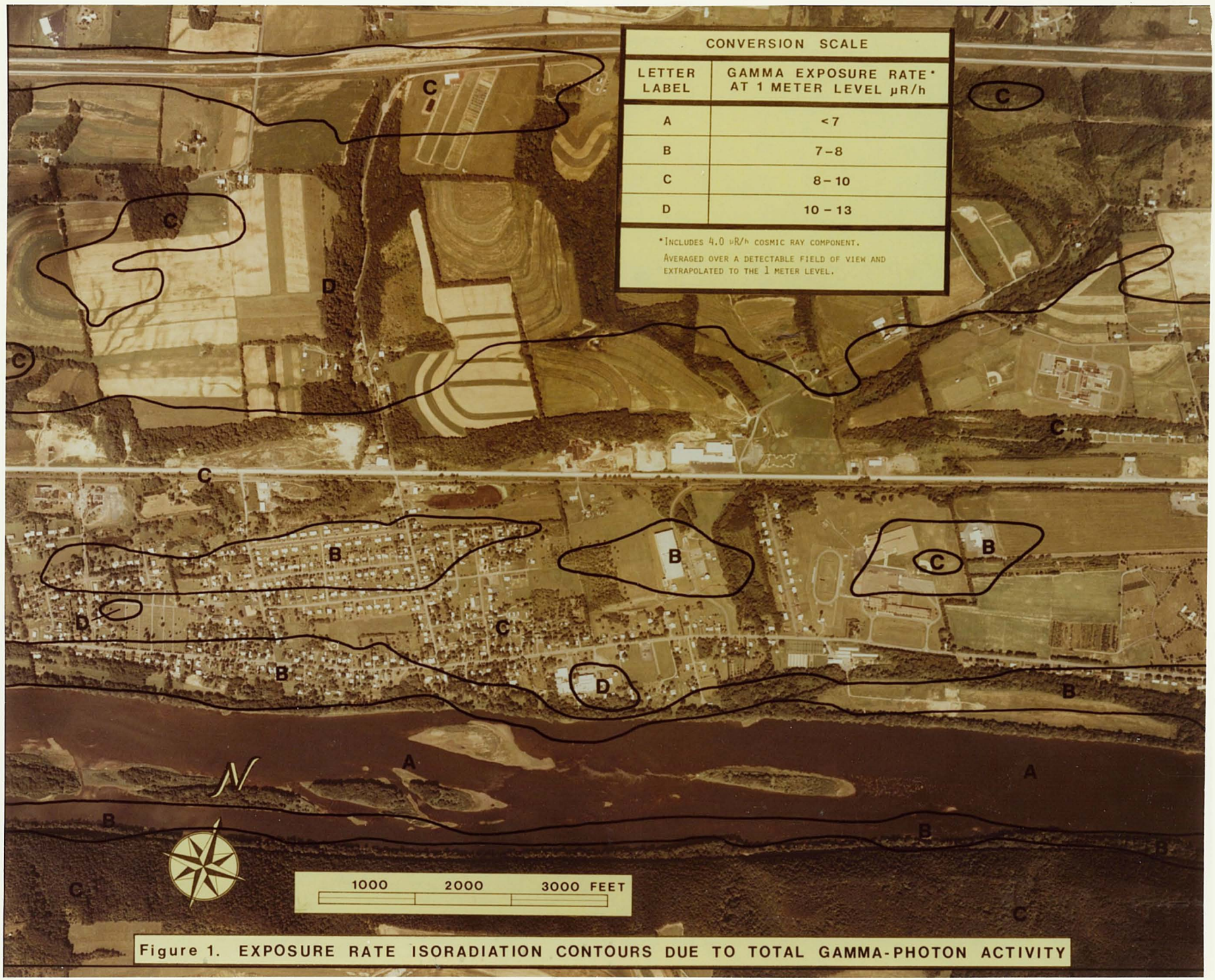

Figure 1. EXPOSURE RATE ISORADIATION CONTOURS DUE TO TOTAL GAMMA-PHOTON ACTIVITY

CONVERSION SCALE	
LETTER LABEL	GAMMA EXPOSURE RATE* AT 1 METER LEVEL μR/h
A	< .5
B	.5 – 1
C	1 – 2
D	2 – 3
E	3 – 5

*EXPOSURE RATE VALUES ARE FROM A SURFACE DISTRIBUTION OF CESIUM - 137 AVERAGED OVER A DETECTABLE FIELD OF VIEW AND EXTRAPOLATED TO THE 1 METER LEVEL.

Figure 2. EXPOSURE RATE ISORADIATION CONTOURS DUE TO CESIUM-137 SOURCES ONLY