



H. E. Bradbury, Director, LASL

August 4, 1951

Gaelen Felt, Group J-15

492

SMALL-PARTICLE CONCENTRATIONS

SD-4962

The concentration near the ground of radioactivity carried by particles in the range from 0 to 5 microns has been estimated, following your request, on the basis of the fall-out model described in my memorandum to Graves (LAB-J-2362). Since a calculation of the general expression for the distribution of activity with cloud height as a function of time is more complex than warranted by the results, the approximation has been made that all of the small-particle activity has fallen from the same height. The simplified expression for the total small-particle activity from an interval of height Δh at \bar{h} is therefore:

$$\Delta A = \frac{1.2 \times 10^3}{\sqrt{D}} \left(\frac{V}{D}\right)^{1.2} \cdot \left\{ \int_0^{x_5} x^2 e^{-x^2} dx \right\} \cdot \left\{ \frac{9}{2} \frac{\bar{h}^{7/2}}{h_0^{9/2}} \Delta h \right\} \text{ megacuries}$$

where

BEST COPY AVAILABLE

- V = wind velocity in mph
- D = distance the cloud has traveled in miles
- x = particle diameter "d" in microns
mean particle diameter "a"

$$x_5 = \frac{5}{a}$$

h_0 = cloud height in miles

$$h = \frac{x_5^2 a^2 D}{7.26 V} \times 10^{-3}$$

OPENNET ENTRY	
<input type="checkbox"/> Authorized for Public Release	Date: 8/4/51
By: B.S. for P. K. K. / Y.E.S.	Date: NV0123580
<input type="checkbox"/> Not Authorized for Public Release	Date:

The general assumptions leading to the above expression for ΔA are discussed in the memorandum to Graves. The specific values of the parameters for the present estimate are:

- V = 10 mph
- D = 50 miles
- h_0 = 1 mile
- a = 75 microns

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW	
SINGLE REVIEW AUTHORIZED BY: A.A. SWILGARD 11/2/94	DETERMINATION (CIRCLE NUMBER(S))
REVIEWER (GDD):	1. CLASSIFICATION RETAINED
NAME: M.L. KOUBAM	2. CLASSIFICATION CHANGED TO:
DATE: 11/25/94	3. CONTAINS NO DOE CLASSIFIED INFO
	4. COORDINATE WITH:
	5. CLASSIFICATION CANCELLED
	6. CLASSIFIED INFO BRACKETED
	7. OTHER (SPECIFY):

~~CONFIDENTIAL USE ONLY~~

H. E. Bradbury

- 2 -

August 4, 1951

The choice of \bar{h} , the height from which the 5-micron particles must fall by Stoke's Law in order to be near the ground at D, leads to a conservatively high value for the concentration. The activity carried by particles smaller than 5 microns and contained in the same volume at D should properly be weighted by a factor $h^{7/2}/\bar{h}^{9/2}$ where $h \leq \bar{h}$.

The volume occupied by the small-particle activity at D is assumed to be

$$\Omega = \pi \left(\frac{D}{12} \right)^2 \Delta h$$

Substitution of numbers into the various expressions leads to an average concentration

$$\frac{\Delta A}{\Omega} = 5.13 \times 10^{-7} \text{ microcuries/meter}^3$$

A change of the parameter "a" from 75 microns to 5 microns will increase this estimate approximately by a factor 2×10^3 . One should note in addition that at 50 miles the concentration varies as $V^{-2.3}$ for $V \approx 1/6$ mph.

GARLEN FELT
Group J-15

OLF:lh

Distribution:
Copies 1 thru 6 - Bradbury
Copy 7 - Graves
Copy 8 - Clark
Copy 9 - White, H-DO
Copy 10 - J-Sequence
Copy 11 - LASL M&R

US DOE ARCHIVES 326 U.S. ATOMIC ENERGY COMMISSION
RG <u>DOE HISTORIAN (OBM)</u>
Collection <u>1132</u>
Box <u>3362</u>
Folder <u>#5</u>

~~CONFIDENTIAL USE ONLY~~

DOE ARCHIVES