Comments on "The Application of an Elevated Line Source Diffusion Formula"

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The equation $\sigma_z = 3i^2x$ comes from the relation for an instantaneous cluster

$$\left(\frac{d\sigma}{dx}\right)_{\max} = \frac{2}{3}\beta i^2$$

taking $\beta = 4.5$. Use of this approximation is justified over a fair range of diffusion distance which depends upon i , the intensity of turbulence, and l , the length scale of the turbulence. However, as x increases the above approximation yields an increasing over-estimate of σ_z while the values for a continuous source may be adopted as a good approximation for the cluster (Pasquill, 1962). Although Waldron's (1963) paper does not contain the data to allow a complete evaluation of the range of applicability of the approximation, this could explain the excellent agreement in his Fig. 6 for $x < 7$ miles and the divergence for $x > 7$ miles.

To check this possibility, dosage calculations were made using values for a continuous source and normalizing to the calculated curve of Fig. 6 at 6.2 miles. The re-

lease was made at 750 ft above the tower base. Since the tower is on top of a hill approximately 250 ft above the plane over which most observations were taken, the release height, H , was taken as 1000 ft. The σ_z values for a continuous source were taken from Pasquill (1962). Since Pasquill's h parameter is the distance, from the plume center, at which the concentration is 10 per cent of the center value, $h = \sigma_z 2.15$. With most of the winds greater than 15 mph = 6.7 meters per second, Pasquill's D curve was used. Table 1 gives the results of these calculations and comparisons with the observed values and Waldron's calculations. It is thus seen that this approach yields results much closer to observed values than shown in Fig. 6.

REFERENCES

- Pasquill, F., 1962: *Atmospheric diffusion*. London, D. Van Nostrand Company Ltd., pp. 109 and 209.
Waldron, Albert W., Jr., 1963: The application of an elevated line source diffusion formula. *J. appl. Meteor.*, **2**, 740-746.

TABLE 1. Comparison of dosage observations with calculations by Pasquill's and Waldron's methods.

X (miles)	This calculation	Average observed	Calculated	Waldron's computed
			Observed	Observed
6.2	200	225	0.89	0.89
9.3	335	450	0.74	0.62
12.4	445	460	0.97	0.76
18.6	525	490	1.07	0.72
24.8	560	540	1.04	0.65