

November 17, 1989

MEMORANDUM

SUBJECT: Additional Comments Related to TACB Area Source Discussion.
FROM: Russell F. Lee *Russ*
Model Support Section, SRAB (MD-14)
TO: Dean Wilson
TES

I recommend that we resolve concerns about possible inaccuracies of any of the area source methodologies. To do this, comparisons should be made between each methodology and a "correct" representation of an area source, namely, a sufficiently large number of point sources to define the limit of using an infinite number of point sources to represent the area source. The point sources should be at ground level, with no plume rise. I strongly suggest that we identify the cause of the spike in the concentration profile, to determine if this is normal for the algorithm or an error in the code. I also suggest that we derive a simple scheme to determine how much an area source should be subdivided to give acceptable results at receptor at a given distance.

In my October 18 memo I suggested that we derive a simple scheme to determine how much an area source should be subdivided for ISCST to give acceptable results at a receptor at a given distance. I have located a study that provides enough information to get a rough idea of what such a scheme would be.

I have located a copy of an SRAB report, "Sensitivity of ISCST Model Predictions to Area Source Size." In this study, ISCST was run with a year's worth of meteorological data, and each of three area sources of 100, 400, and 1000 meters on a side, respectively. Concentration calculations were made at two receptors, at 100 meters and 300 meters downwind of the center of the source, respectively. The area source was represented as both as area sources and point sources, singly and subdivided into 4, 16, 64, 256, 1024, 4096, and 16,384 sources. Note that two area source algorithms are referenced in the report. One, labeled "Current ISC Area Source Algorithm," refers to older versions of ISC which would not make concentration calculations closer than 100 meters from an area (or any other) source, and is therefore no longer relevant. The other algorithm, referenced as "Future ISC Area Source Algorithm," refers to the way area source calculations are now made in ISCST.

Two results of the study are relevant to the TACB discussion. First, for both point and area sources, concentration calculations converge on a stable value as the source is subdivided into more and more sources. Second, as noted in the Summary of Results of the SRAB report, the calculations based on multiple area sources converge to a value 12 to 13% higher than those based on multiple point sources. I suspect an error in a constant in the area source algorithm is causing this. Third, from the tables in that report, it appears that area sources should probably be subdivided until the length of

the side of a source is about one-fourth or less of the distance from the downwind edge of the source to the receptor. If point sources are used to represent the original area source, they should be approximately twice as dense as the area sources, i.e., a maximum separation between point sources of about one-eighth the distance to the receptor. These figures are rough, and should not be used until confirmed by a much more detailed study.

Attachment

cc: Jerry Mersch
Joe Tikvart