APPENDIX F

DIESEL TRANSPORT REFRIGERATION UNIT ENGINES SENSITIVITY STUDIES FOR DISPERSION MODELING

Initial Plume Height and Buoyancy Flux

Although the sources for the TRU health risk assessment were treated as area sources, it is recognized that the emission plume will have upward buoyancy flux due to the upward velocity of the engine exhaust and the temperature difference between the engine exhaust and the ambient air. To demonstrate this upward buoyancy, ARB staff performed several screening analyses based on: high speed versus low speed of the TRU engine; high exhaust temperature versus low exhaust temperature; night time ambient air temperatures versus day time ambient air temperatures; and unstable versus stable meteorological conditions.

Using SCREEN3, ARB staff charted the effective plume height based on scenarios encompassing the above variables. The largest difference in effective plume height was found when comparing night time and day time effective plume heights. These daytime and night time effective plume heights were used as the initial emission height based on operations occurring during day time hours (7 AM to 7 PM) or night time hours (7 PM to 7 AM). Ambient temperatures used to estimate these effective plume heights were 302 K (84° F) for operations occurring during day time hours and 280 K (44° F) for operations occurring during night time hours. Atmospheric stability was set to emulate conservative day and night time conditions. For these analyses SCREEN3 was modeled using “F” stability for night conditions and “D” stability for day conditions. The resulting effective plume heights, and initial emission heights used for our analyses were a day time initial emission height of 4.46 meters and an initial emission height of 12.79 meters for night time conditions.

The initial vertical dispersion parameter (s_z) used for this analysis both for day and night time conditions was 2.5 meters. This value was determined using the methods described in the ISCST3 user’s guide.

Characterization as an area source and a point source

Sensitivity studies were done to demonstrate that impacts from TRU emissions would show little difference when the source is characterized as area or point. The table below shows a comparison of cancer health impacts due to a TRU engine modeled as an area source and as a point source. The table is only used to illustrate the similarity of modeled impacts as point and area sources particularly.

Difference in Potential Cancer Risk due to Point and Area Source TRUs (Risk per million)

Total TRU Hours of Operation per Week	Downwind Distance (m) from Sources									
	40	60	80	100	120	140	160	180	200	220
7	-24	-10	-5	-3	-1	-1	-1	-1	-1	-1
14	-48	-19	-9	-4	-2	-2	-2	-2	-2	-2
20	-69	-27	-13	-6	-4	-3	-3	-2	-3	-2
30	-103	-40	-19	-9	-6	-4	-4	-4	-3	-3
40	-137	-53	-25	-12	-8	-6	-6	-5	-4	-4
50	-171	-67	-32	-15	-10	-7	-6	-6	-5	-4

Meteorological Data: West Los Angeles (1981)
Emission Rate = 0.7 g/bhp-hr.
Emission Parameters: Engine Size - 35 hp, Load Factor - 60%.
Annual emissions assume 52 weeks of operation, 6 AM - 9 PM