NRC Staff Responses to Licensing Board's
Second Set of Questions Regarding Environmental Matters

Question 18, FEIS, Section D.3.1.2, Page D-11: *The population densities used to calculate radioactive exposures along truck routes used during the shipping of radioactive materials to and from the EREF are based on U.S. Census 2000 data. What are the estimated exposure increases based on 2010 census data? Do these increases change the conclusions reached using the 2000 census data?*

Response 18 (K. Fischer): An increase in the total U.S. population between 2000 and 2010 does not necessarily mean increases in exposure to the population along a given transportation route. Although the 2010 Census indicates a 9.7 percent increase in the total U.S. population over that period (NRC000173 at Table 1), specific information regarding the change in population density along the routes that were used to assess transportation impacts in the FEIS would be necessary to quantitatively assess the resulting impacts. Even if the population density along a particular segment of a given route increased or decreased significantly, it would likely only result in a small net change to the population density for the entire route. In fact, population growth in most of the states through which eastward EREF shipments would travel exhibited a population growth from 2000 to 2010 that was less than the U.S. average (NRC000173 at Table 1):

Nebraska	6.7%	Kentucky	7.4%
Iowa	4.1%	Pennsylvania	3.4%
Missouri	7.0%	West Virginia	2.5%
Kansas	6.1%	Maryland	9.0%
Illinois	3.3%	New York	2.1%
Indiana	6.6%	North Carolina	4.7%
Ohio	1.6%		

Furthermore, most of the observed population growth occurred in urban areas (defined by the Census Bureau as Core Based Statistical Areas [CBSA]). By contrast, the population in areas outside CBSAs grew by 1.8 percent (NRC000173 at Table 2). As indicated in Table D-2 of the FEIS (NRC000135 at D-10), over 73 percent of all modeled routes traverse areas defined as rural population zone and are thus outside of the CBSAs.

Public health impacts from the transportation of radioactive materials are assessed using input (route selection, distances, and population density along the route) from the Transportation Routing Analysis Geographic Information System (WebTRAGIS). In the FEIS, this assessment was based on 2000 Census data. In order to accurately assess the quantitative impacts of the 2010 Census data on exposure to the populations along transportation routes for EREF radiological shipments, the National Transportation Research Center at Oak Ridge National Laboratory (ORNL) would need to update the WebTRAGIS model. The timing for this update by ORNL is currently undetermined, and is subject to the availability of funding for the U.S. Department of Energy.

Additionally, the transportation routes that were used to assess transportation impacts in the FEIS are considered representative of those that may be used over the 30-year operating lifetime of the proposed EREF. As noted in the response to Question No. 8(b), route selection may vary at the time of shipment due to factors such as construction, season, weather, and local road restrictions, which could result in slightly higher or lower impacts depending on the surrounding population.

Based on the analysis in the FEIS (which uses the 2000 Census data), the NRC staff found that the potential public health impacts of transporting radioactive materials would be SMALL, based on the risk of a latent cancer fatality being 1.2 per year from incident-free radiation exposure as compared to an estimated 0.02 latent cancer fatality per year from postulated transportation accidents (NRC000134 at 4-71 to 4-73). Even if the estimated population dose were to increase by approximately 10 percent (i.e., in proportion to the total U.S. population increase indicated by the 2010 Census), the impact conclusions presented in the FEIS (i.e., SMALL impact) would not change.

Question 19, FEIS, Section E.2.5, Page E-6: *Please describe the use of the atmospheric transport model set forth as Equation (1). In particular explain how the various parameters are selected for the EREF site. Explain also which of those parameters depends on the downwind*

distance and how that parameter depends on that distance. Also describe how this model was calibrated (if it was) and verified for the EREF site.

Response 19 (J. Arnish): As discussed in Section E.2.5 of the FEIS (NRC000135 at E-6 to E-7), Equation (4), which is derived from Equation (1), is used to calculate ground-level, sector-averaged air concentrations and is incorporated into Version 3 of the CAP88-PC computer code. For reference, Equation (4) matches Equation (11) in the CAP88-PC Users Guide, Version 3.0 (NRC000174 at 56). Site-specific parameters (including those for Equation (4)) were used in CAP88-PC when available. Specifically, the release height, H, in Equation (4) was set such that the maximum dose was calculated from either a 40-meter (m) release height (release height at the EREF) or a ground level release to simulate building wake effects. The release rate Q (curies per year) is provided in Table E-1 of the FEIS (NRC000135 at E-8), and was estimated on the basis of emissions from a 6.6 million SWU enrichment facility. The wind speed μ, atmospheric stability class, and the frequency the wind blows in any given direction were obtained from analyzing 2003-2007 atmospheric data from the Idaho National Laboratory site located near the EREF site.

The "x" in Equation (4) is the downwind distance of the receptor. The horizontal plume dispersion coefficient, σ_z, is downwind distance and stability class dependent. The dispersion coefficient is given by the formulas listed in the table below for each Pasquill stability class as taken from Section 12.1.6 of the CAP88-PC User's Guide, Version 3.0 (NRC000174 at 61). In the table below, σ_z has units of meters, where x is the downwind distance, also in units of meters.

Pasquill Category	σ_z (m)
A	$0.2x$
B	$0.12x$
C	$0.08x\ (1+0.0002x)^{-1/2}$
D	$0.06x\ (1+0.0015x)^{-1}$
E	$0.03x\ (1+0.0003x)^{-1}$
F	$0.016x\ (1+0.0003x)^{-1}$

G	Calculated by subtracting half the difference between values for categories E and F from the value for category F

The CAP88-PC computer code has not been specifically calibrated or verified for the EREF site. The Gaussian plume air dispersion model, the basis for Equation (1), as incorporated in CAP88-PC is well documented and validated. Use of the CAP88-PC code in the case of the EREF is appropriate given the relatively flat nature of the site and the use of the Brigg's "open country" dispersion coefficients in CAP88-PC (NRC000175 at 29-30).