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WESTINGHOUSE SAVANNAH RIVER COMPANY

INTER-OFFICE MEMORANDUM

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Signature on file

Technical Review

TO: Environmental Dosimetry Files

FROM: G.T. Jannik, 773–42A

Cesium-137 Bioconcentration Factor for Freshwater Fish in the SRS Environment

This memo serves to document the justification for the continuing use of a Savannah River Site (SRS) site-specific bioconcentration factor of 3,000 for cesium-137 in freshwater fish.

The Nuclear Regulatory Commission (NRC) default bioconcentration factor for cesium in fish is 2,000 (NRC, 1977). This value is taken from Thompson, et al. (1972).

It is documented in Cummins (1994) that SRS determined values ranged between 600 and 39,000 (in fish muscle). Cummins further documented that non-SRS values ranged between 400 and 14,000 (Blaylock, 1982: Coughtrey and Thorne, 1985; Jorgensen et al. 1991, Till and Meyer, 1983; Vanderploeg et al. 1975).

The original justification for the use of a cesium-137 bioconcentration factor of 3,000 for SRS fish was documented in Gladden (1982). Because this memorandum does not have a site document number, it is attached to this report.

In Jannik (1995), it is documented that in 1994, the weighted average concentration of cesium-137 in fish flesh harvested from near Savannah River Mile 120 was 0.07 pCi/g. This was approximately 3,000 times more than the 0.000023 pCi/mL concentration of cesium-137 measured (using ultra-low level techniques) in water sampled from near River Mile 120 during 1994.

In review of some other related literature (Rowan and Rasmussen, 1994; Mohler, et al., 1997; and Whicker, et al., 1990) it is shown that the bioconcentration factor for cesium-137 in fish varies greatly depending upon the 1) amount of dissolved potassium in the water, 2) amount of suspended solids in the water, 3) temperature of the water, 4) trophic

level of the fish (piscivores bioconcentrate cesium-137 much more that insectivores and benthivores), and 5) length of the food chain.

In light of all this information, it appears that no single bioconcentration factor is ideal, but the factor of 3,000 for cesium-137 in generic fish from the SRS is consistent with site data and is conservative in comparison to the NRC default value. Therefore, it should continue to be used as the site-specific factor in all applicable environmental dosimetry calculations at SRS.

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