Three Layer Dose Contribution

The attached file contains technical changes that were previously provided by Westinghouse to the NRC and agreed upon. In the table of technical changes Westinghouse provided the "Proposed Text for Revision 1" to the Hematite DP, these technical changes were implemented independently through the HDP licensing evaluation process, and incorporated into site operating procedures.

The attached Excel file contains the analytical soil sample data for LSA 10-12, this same spreadsheet is used to calculate the weighted mean SOF for the remaining layers within the survey unit.

The Final Status Survey Plan for LSA 10-12 called for 9 systematic soil sample stations to be evaluated. The Surface stratum within LSA 10-12 was entirely removed, and therefore will not be included in the dose evaluation. Portions of the Root stratum remained within LSA 10-12, and as a result 3 of the 9 systematic soil sample stations fell on portions of the remaining Root stratum. At these 3 systematic soil sample stations the remaining Root stratum was sampled from the final excavation surface depth, to a depth of 1.5 m below the final restoration grade for the survey unit. The top 15 cm of the underlying Deep stratum was then also sampled at each of these 3 locations. The remaining portion of LSA 10-12 had been excavated into the Deep zone and 6 systematic soil samples were collected of the top 15 cm of the exposed Deep stratum.

To calculate the weighted mean SOF of these systematic soil samples the following equation is used:

$$\mathrm{SOF}_{\mathrm{avg}} = f_{SS}\sum_{i=1}^{n}\left(\frac{\overline{C}_{i,SS}}{D_{i,SS}}\right) + f_{RS}\sum_{i=1}^{n}\left(\frac{\overline{C}_{i,RS}}{D_{i,RS}}\right) + f_{DS}\sum_{i=1}^{n}\left(\frac{\overline{C}_{i,DS}}{D_{i,DS}}\right)$$

where:

n	=	Number of measured ROCs;
f_{SS}	=	Fraction of the survey unit area at the surface stratum depth;
f_{RS}	=	Fraction of survey unit area at the root stratum depth;
f_{DS}	=	Fraction of survey unit area at the deep stratum depth;
$\overline{C}_{i,SS}$	=	Average concentration for the i^{th} ROC in the surface stratum;
$\overline{C}_{i,RS}$	=	Average concentration for the i^{th} ROC in the root stratum;
$\overline{C}_{i,DS}$	=	Average concentration for the i^{th} ROC in the deep stratum;
$D_{i,SS}$	=	DCGL for the i^{th} ROC in the surface stratum;
$D_{i,RS}$	=	DCGL for the i^{th} ROC in the root stratum;
$D_{i,DS}$	=	DCGL for the i^{th} ROC in the deep stratum.

The Fraction *(f)* of the survey unit area at each stratum depth is determined by dividing the number of systematic soil samples collected in the stratum by the total number of systematic sample stations. In the case of LSA 10-12 the value for f_{SS} is 0 as no systematic samples fell in the Surface stratum (which had

been entirely removed). The value for f_{RS} is 3/9 (or 0.33), and the value for f_{DS} is 9/9 (or 1.0). The average concentration for each radionuclide is then calculated for each layer and divided by the appropriate $DCGL_w$ for each layer. These fractions are then summed for each layer providing a SOF for the Root zone, and a separate SOF for the Deep zone. Using the values for f_{RS} and f_{DS} calculated above, the weighted mean SOF for the survey unit is calculated based on the fraction of each layer remaining within the survey unit.

It should be noted that by having more than one sample in a vertical column (e.g., root and excavation) the overall sum of the area fractions ($f_{SS} + f_{RS} + f_{DS}$) can and most likely will exceed a value of 1.0. By following this sampling methodology Westinghouse is ensuring that dose from the underlying Root zone and Deep zone is evaluated, even in situations where there is overlying soil from the remaining Surface layer and Root zone respectively. Using this conservative approach to include dose from subsurface soil in the weighted mean SOF for the survey unit, the need to identify that potential contamination below the Surface layer and Root zone may or may not exist is also addressed. Additionally Westinghouse has committed that in any future case where the Surface layer and underlying Root zone are sampled, and the SOF for the individual Root zone sample exceeds a SOF of 0.5, the underlying Deep zone will also be sampled and evaluated. In cases where this is necessary the Deep zone sample that is collected will also be included in the weighted mean SOF for the survey unit.