WPO 38874

Sandia National Laboratories

Albuquerque, New Mexico 87185

date: 11 June 1996

to: James L. Ramsey, MS-1328 (Org. 6849)

Hans W. Papenguth

from: Hans W. Papenguth, MS-1320 (Org. 6832)

subject: Colloidal Actinide Retardation Parameters (WPO# 38173) for PA Calculations to Support the WIPP Compliance Certification Application

This memorandum summarizes best estimates for parameter values describing retardation of colloidal actinides in the Culebra Dolomite to be used in support of the WIPP Compliance Certification Application. The material and parameter identification codes used herein is somewhat different than those listed in your letter to me requesting parameter values (Ramsey, 1996). On the basis of our discussions during the past several weeks, however, the material and parameter identification codes, and associated values, are suitable for implementation with SECO-TP. In the attached table, I have used the following material and parameter identification names:

IDMTRL:	MF	mobile mineral fragment colloids
	AIC	mobile actinide intrinsic colloids
	MIC	mobile microbes
	HUM	mobile humic substances
	HUMOX3	actinides of oxidation state III associated with mobile humic substances
	HUMOX4	actinides of oxidation state IV associated with mobile humic substances
	HUMOX5	actinides of oxidation state V associated with mobile humic substances
	HUMOX6	actinides of oxidation state VI associated with mobile humic substances
	HUM_TH	thorium associated with mobile humic substances
	HUM_U	uranium associated with mobile humic substances
	HUM_NP	neptunium associated with mobile humic substances
	HUM_PU	plutonium associated with mobile humic substances
	HUM_AM	americium associated with mobile humic substances

IDPRAM:	FRC_KD	distribution coefficient (K_d) for colloidal actinides and Culebra fracture surfaces
	MTRX_KD	distribution coefficient (K_d) for colloidal actinides and Culebra rock matrix
	COL_FLTN	filtration coefficient for colloids during fracture transport in the Culebra
	COL_CONC	maximum mass concentration of colloidal particles associated with actinides introduced to the Culebra
	COL_DIF	free solution tracer diffusion constant for colloidal particles

The basis for the values summarized in the attached table will be described in a parameter record package ("Colloidal Actinide Retardation Parameters"; WPO# 38173). Values listed for retardation of humic actinides are from the Dissolved Actinide Retardation Research Program (L. H. Brush, PI) and are described in detail by Brush (1996b) and in another parameter record package ("Culebra Dissolved Actinide Distribution Coefficients"; WPO# 38231). Parameters for the mobile colloidal actinide source term are described in the following separate record packages for WBS 1.1.10.2.1: (1) Mineral Fragment Colloids (WPO# 35850); (2) Actinide Intrinsic Colloids (WPO# 35852); (3) Humic Substances (WPO# 35855); and (4) Microbes (WPO# 35856).

References

Brush, L. H. 1996a. Free-Solution Tracer Diffusion Coefficients ($D_{SOL}s$) for Dissolved Pu, Am, U, Th, Np, Cm, and Ra in Boreholes and the Culebra for Use in the PA Calculations to Support the WIPP CCA. SNL Memorandum to M. S. Tierney, dated 2 May 1996.

Brush, L. H. 1996b. Ranges and Probability Distributions of K_ds for Dissolved Pu, Am, U, Th, and Np in the Culebra for the PA Calculations to Support the WIPP CCA. SNL Memorandum to M. S. Tierney, dated 10 June 1996.

Brush, L. H. 1996c. Revised Free-Solution Tracer Diffusion Coefficients ($D_{SOL}s$) for Dissolved Pu, Am, U, Th, Np, Cm, and Ra in Boreholes and the Culebra for Use in the PA Calculations to Support the WIPP CCA. SNL Memorandum to M. S. Tierney, dated 11 May 1996.

Ramsey, J. 1996. Culebra Colloid Parameter Request. SNL Memorandum to Jim Nowak, dated 10 April 1996.

copy to:

MS 1328	Hong-Nian Jow, 6848
MS 1328	Amy S. Johnson, 6848
MS 1328	Martin S. Tierney, 6848
MS 1328	D. Rip Anderson, 6849
MS 1328	Mary-Alena Martell, 6849
MS 1328	James L. Ramsey, 6849
MS 1328	Christine T. Stockman, 6849
MS 1328	Michael G. Wallace, 6849
MS 1320	E. James Nowak, 6831
MS 1320	R. Vann Bynum, 6831
MS 1341	John T. Holmes, 6832
MS 1341	Laurence H. Brush, 6832
MS 1341	W. Graham Yelton, 6832
MS 1320	Yugal K. Behl, 6832
MS 1320	John W. Kelly, 6832
MS 1320	Daniel A. Lucero, 6832
MS 1320	Hans W. Papenguth, 6832
MS 1320	W. George Perkins, 6832
MS 1324	Katherine N. Gaither, 6115
MS 1324	Susan A. Howarth, 6115
MS 1343	Kurt W. Larson, 6822
DOE/CAO	Richard J. Lark
DOE/CAO	Robert A. Stroud

SWCF-A:WBS1.1.10.2.1:PDD:QA:Colloidal Actinide Retardation Parameters (2)

Parameter	Material	Value	Units	Distribution Type	Notes
FRC_KD	MF	0	mL/g	constant	
FRC_KD	AIC	0	mL/g	constant	
FRC_KD	MIC	0	mL/g	constant	
FRC_KD	HUM_OX3	0	mL/g	constant	
FRC_KD	HUM_OX4	0	mL/g	constant	
FRC_KD	HUM_OX5	0	mL/g	constant	
FRC_KD	HUM_OX6	0	mL/g	constant	
MTRX_KD	MF	0	mL/g	constant	
MTRX_KD	AIC	0	mL/g	constant	
MTRX_KD	MIC	0	mL/g	constant	
MTRX_KD	HUM_OX3	20 to 500	mL/g	refer to Brush (1996b)	1
MTRX_KD	HUM_OX4	900 to 20,000	mL/g	refer to Brush (1996b)	1
MTRX_KD	HUM_OX5	1 to 200	mL/g	refer to Brush (1996b)	1
MTRX_KD	HUM_OX6	0.03 to 30	mL/g	refer to Brush (1996b)	1
FRC_FLTN	MF	0.1	cm^-1	constant	
FRC_FLTN	AIC	0	cm^-1	constant	
FRC_FLTN	MIC	0.5	cm^-1	constant	
FRC_FLTN	HUM	0	cm^-1	constant	
COL_CONC	MF	1.0e-3	g/L	constant	2
COL_CONC	AIC	2.4e-7	g/L	constant	2,3
COL_CONC	MIC	5.0e-3	g/L	constant	2
COL_CONC	HUM	2.0e-3	g/L	constant	2
COL_DIFF	MF	2.1e-9	cm^2/sec	constant	
COL_DIFF	AIC	2.1e-8	cm^2/sec	constant	
COL_DIFF	MIC	2.1e-9	cm^2/sec	constant	
COL_DIFF	HUM_TH	1.53e-6	cm^2/sec	refer to Brush (1996a, c)	4
COL_DIFF	HUM_U	4.26e-6	cm^2/sec	refer to Brush (1996a, c)	4
COL_DIFF	HUM_NP	3e-6	cm^2/sec	refer to Brush (1996a, c)	4
COL_DIFF	HUM_PU	3e-6	cm^2/sec	refer to Brush (1996a, c)	4
COL_DIFF	HUM_AM	3e-6	cm^2/sec	refer to Brush (1996a, c)	4
Notes:					
general	None of the parameters are correlated.				
1	Distribution coefficients for sorption of humic-bound actinides in the Culebra matrix				
	are identical to those for dissolved actinides; refer to Brush (1996b) for Kd values				
2	These values are for the mass concentration of dispersed colloidal particles; refer to				
	Parameter Record Package numbers 35850, 35852, 35856, and 35855, respectively,				
	for colloidal actinide source term parameter values				
3	Pu(IV)-polymer is the only actinide intrinsic colloid with non-zero concentration				
	(refer to parameter record package WPO# 35852 for details)				
4	Diffusion constants for humic actinides are identical to those for dissolved actinides;				
	refer to Brush (1996a,c) for values				