ATOMIC ENERGY OF CANADA LIMITED

A CRITICAL COMPILATION AND REVIEW OF DEFAULT SOIL SOLID/LIQUID PARTITION COEFFICIENTS, K_d, FOR USE IN ENVIRONMENTAL ASSESSMENTS

by

D.H. Thibault, M.I. Sheppard and P.A. Smith

Whiteshell Nuclear Research Establishment
Pinawa, Manitoba, Canada ROE 1LO

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COMPILATION ET EXAMEN CRITIQUES DES COEFFICIENTS MANQUANTS DE PARTAGE, K_d, SOLIDES/LIQUIDES DU SOL POUR EMPLOI EN ÉVALUATIONS ENVIRONNEMENTALES

par

D.H. Thibault, M.I. Sheppard et P.A. Smith

RÉSUMÉ

Les évaluations en matière d'environnement du Concept canadien d'évacuation (stockage permanent) des déchets de combustible nucléaire en formations de roche plutonique demandent des analyses de la migration des nucléides d'une enceinte d'évacuation à la biosphère. En analyses de la migration des nucléides entraînés par les eaux souterraines à travers la géosphère, les morts-terrains et le sol meubles, on se sert de modèles demandant des coefficients de partage (K_d) solides/liquides pour décrire l'interaction des nucléides et des matières solides. Ce rapport présente des coefficients de partage solides/liquides spécifiques des éléments; les coefficients s'appuyent sur une étude bibliographique détaillée. Les valeurs pour les argiles le limon (silt), le sable et les sols organiques y sont résumés. Les coefficients de partage des éléments suivants y sont présentés: américium, antimoine, arsenic, baryum, bore, cadmium, calcium, carbone, cérium, césium, chrome, cobalt, cuivre, europium, iode, fer, plomb, lithium, manganèse, molybdène, septunium, nickel, niobium, palladium, phosphore, plutonium, polonium, radium, ruthénium, samarium, sélénium, argent, strontium, technétium, tellurium, terbium, thorium, étain, tritium, uranium, zinc et zirconium On compare les valeurs compilées en cette étude avec les ensembles précédents de valeurs de K_d; ces valeurs sont celles recommandées pour emploi avec les modèles de sol, sédiments à grande profondeur et morts-terrains de l'Étude d'Impact sur l'Environnement du Concept canadien d'évacuation des déchets de combustible nucléaire.

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ABSTRACT

Environmental assessments of the Canadian concept for disposal of nuclear fuel waste in plutonic rock formations require analyses of the migration of nuclides from the disposal vault to the biosphere. Analyses of nuclide migration via groundwater through the geosphere, unconsolidated overburden and soil use models requiring solid/liquid partition coefficients (K_d) to describe the interaction of the nuclides with the solid materials. This report presents element-specific soil solid/liquid partition coefficients based on a detailed survey of the literature. Values for clays, silt, sand and organic soils are summarized. Partition coefficients for the following elements are presented: americium, antimony, arsenic, barium, boron, cadmium, calcium, carbon, cerium, cesium, chromium, cobalt, copper, curium, europium, iodine, iron, lead, lithium, manganese, molybdenum, neptunium, nickel, niobium, palladium, phosphorus, plutonium, polonium, radium, ruthenium, samarium, selenium, silver, strontium, technetium, tellurium, terbium, thorium, tin, tritium, uranium, zinc, and zirconium. The values compiled in this study are compared with earlier K_d value compendiums and are the values recommended for use in the soil, deep sediment and overburden models for the Environmental Impact Statement on the concept for disposal of Canada's nuclear fuel waste.

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1. INTRODUCTION

Canada is considering geological containment in a vault deep in plutonic rock in the Canadian Shield as a method for disposal of its nuclear fuel waste. Assessment of the integrity of geological containment requires pathways analysis to determine the travel time from the vault to and through the biosphere of all the elements associated with the waste (Mehta and Goodwin 1988). The travel time and the predicted element concentrations in the biosphere will depend upon the interaction of the elements with their surroundings as they migrate. This interaction has been described using a solid/liquid partition coefficient, K_d, for unconsolidated regolith, soil and rock (Gillham et al. 1981a and 1981b, Vandergraaf 1982). This report documents K_d values for soil, according to the four major soil types found on the Canadian Shield. The K_d values are required for the soil, deep sediment and overburden assessment models used in the Canadian Nuclear Fuel Waste Management Program (Goodwin et al. 1987, Sheppard in preparation, Bird et al. in preparation).

Details of the chemistry of these elements can be found in the references listed in Appendix A. Details of the soils and experiments for the K_d value database compiled here are presented in table form in Appendix B.

2. METHODS

The data were extracted from the literature. The complete list of references are shown in Appendix A. The data were accumulated in a computerized spreadsheet (Appendix B). Only one value was entered for each soil reported in the literature. For example, where K_d values for a range of soil to solution ratios, competing cations, contact solution concentrations or pH values were reported for the same soil, the geometric mean of these results were recorded for that soil. Geometric as opposed to arithmetic means are required because K_d values are lognormally distributed (Sheppard and Evenden 1989). The single values for each soil's values were used to obtain geometric means for each element and soil type.

The mineral soils were categorized by texture into sand, clay and loam. The soils that contained ≥ 70% sand-sized particles were classed as sand soils and those containing ≥ 35% clay-sized particles were classed as clay soils Loam soils had an even distribution of sand-, clay-, and silt-sized particles or consisted of up to 80% silt-size particles. Organic soils contained > 30% organic matter and were either classic peat or muck soils or the litter horizon of a mineral soil.

If no data existed in the literature for a given element, then the soil-to-plant concentration ratio (CR) was used as an indicator of the element's bioavailability and a means to predict a default K_d value (Baes et al. 1984). The CR values used for each element are from Baes et al. (1984), and are shown in Table 1. Because of the strong negative correlation between CR and K_d values, this technique is successful. The model used was

$$\ln K_d = a + stex + b (\ln CR).$$

The values for the coefficients are

$$\ln K_d = [4.62 + stex - 0.56(\ln CR)]$$

where, if the soil = sand, stex = -2.51,
if the soil = loam, stex = -1.26,
if the soil = clay, stex = -0.84, and
if the soil = organic, stex = 0.

The regression analysis was carried out using the Reg procedure in SAS (Statistical Analysis Systems). The observed and predicted values and their residuals from the regression analysis are shown in Appendix C.

Appendices A, B and C can be obtained on diskette from the authors.

3. RESULTS AND DISCUSSIONS

Baes and Sharp (1983) compiled soil K_d values for several elements relevant to the nuclear industry (Table 2). Similarly, Coughtrey et al. (1985) have reported best estimates and ranges for soil K_d values (Table 3). Earlier, we compiled a literature search of data for the elements relevant to the Canadian Nuclear Fuel Waste Management Program for each of the four major soil types found on the Canadian Shield (Sheppard et al. 1984). This present compendium includes our earlier data and additional data obtained through a more recent literature search. The data are presented for each element by soil type in Tables 4 through 7, and the geometric mean K_d values are summarized by soil type in Table 8.

The data from our study and the studies of Baes and Sharp (1983), and Coughtrey et al. (1985) are shown in Table 9.

The database from Coughtrey et al. (1985) is not very complete and will not be discussed in detail. To compare Baes and Sharp (1983) with our study (Table 10), we used only our data for silt and clay, which tend to represent the agricultural soils of Baes and Sharp. Their best estimates (exp (μ)) are generally lower than those in our study for silt and clay, except for Cr, Po, Pu, Sr, U and Th, which are higher. The use of the lower K_d values of Baes and Sharp would lead to lower soil concentrations in assessment models, and might result in the underprediction of doses in some pathways. Table 11 compares the ranges of only the silt and clay values of our study with the ranges of Baes and Sharp (1983). This comparison clearly shows that even the range of values reported by Baes and Sharp is generally lower than the range of values in our study.

We grouped the elements by K_d value and highlighted Tc, I, U and Np, some of the more mobile elements, to illustrate the dependence on soil type. Generally the K_d values are lower in sandy soils than in either loam or clay soils. Iodine K_d values are unaffected by mineral grain-size but increase dramatically as organic matter content increases. Other elements that have higher mean values for organic soils than for clay soils are Ag, Ni, Am, and Th.

4. CONCLUSIONS

This compendium updates our earlier study (Sheppard et al. 1984) and also that of Baes and Sharp (1983). It provides the latest K_d data found in the international literature, including major studies carried out in the U.S., Europe and Asia since the 1950s. This database will be used for the Environmental Impact Statement on the concept for disposal of Canada's nuclear fuel waste.

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* Unrestricted, unpublished report available from SDDO, Atomic Energy of Canada Limited Research Company, Chalk River, Ontario, K0J 1J0.

TABLE 1

CONCENTRATION RATIO (CR) VALUES (WET WT. BASIS) USED TO ESTIMATE K_d VALUES FOR EACH ELEMENT[a]

Element	CR	Element	CR
Ac	8.8×10^{-4}	P	8.7×10^{-1}
Ag	1.0×10^{-1}	Pa	6.3×10^{-4}
Am	1.4×10^{-3}	Pb	1.1×10^{-2}
Be	2.5×10^{-3}	Pd	3.8×10^{-2}
Bi	8.7×10^{-3}	Po	6.3×10^{-4}
Br	3.8×10^{-1}	Pu	1.1×10^{-4}
C	1.4×10^{-0}	Ra	3.3×10^{-3}
Ca	8.8×10^{-1}	Rb	3.8×10^{-2}
Cd	1.4×10^{-1}	Re	3.7×10^{-1}
Ce	2.5×10^{-3}	Ru	1.9×10^{-2}
Cm	2.1×10^{-4}	Sb	5.0×10^{-2}
Co	5.0×10^{-3}	Se	6.3×10^{-3}
Cr	1.9×10^{-3}	Si	8.8×10^{-2}
Cs	2.0×10^{-2}	Sm	2.5×10^{-3}
Fe	1.0×10^{-3}	Sn	7.5×10^{-3}
H	1.2×10^{-0}	Sr	6.3×10^{-1}
Hf	8.8×10^{-4}	Ta	2.5×10^{-3}
Ho	2.5×10^{-3}	Tc	2.4×10^{-0}
I	3.8×10^{-2}	Te	6.2×10^{-3}
K	2.5×10^{-1}	Th	2.1×10^{-4}
Mn	6.3×10^{-2}	U	2.1×10^{-3}
Mo	6.3×10^{-2}	Y	3.7×10^{-3}
Nb	5.0×10^{-3}	Zn	3.8×10^{-1}
Ni	1.5×10^{-2}	Zr	5.0×10^{-4}
Np	2.5×10^{-2}		

[a] Derived from Baes et al. 1984 (Fig. 2.1) by dividing by four to get CR values on a wet weight basis.

TABLE 2

ESTIMATES OF THE DISTRIBUTION OF K_d FOR VARIOUS ELEMENTS IN AGRICULTURAL SOILS AND CLAYS OF pH 4.5 TO 9.0
(from Baes and Sharp, 1983, Table 4)

Element	Number of Observations	μ[a]	σ[b]	exp (μ) (0.50)[c] (L kg^{-1})	Observed range (L kg^{-1})
Ag	16	4.7	1.3	110	10 to 1 000
Am	46	6.7	3.0	810	1.0 to 47 230
As(III)	19	1.2	0.61	3.3	1.0 to 8.3
As(V)	37	1.9	0.52	6.7	1.9 to 18
Ca	10	1.4	0.78	4.1	1.2 to 9.8
Cd	28	1.9	0.86	6.7	1.26 to 26.8
Ce	16	7.0	1.3	1 100	58 to 6 000
Cm	31	8.1	1.9	3 300	93.3 to 51 900
Co	57	4.0	2.3	55	0.2 to 3 800
Cr(II)	15	7.7	1.2	2 200	470 to 150 000
Cr(VI)	18	3.6	2.2	37	1.2 to 1 800
Cs	135	7.0	1.9	1 110	10 to 52 000
Cu	55	3.1	1.1	22	1.4 to 333
Fe	30	4.0	1.7	55	1.4 to 1 000
K	10	1.7	0.49	5.5	2.0 to 9.0
Mg	58	1.7	0.52	5.5	1.6 to 13.5
Mn	45	5.0	2.7	150	0.2 to 10 000
Mo	17	3.0	2.1	20	0.37 to 400
Np	44	2.4	2.3	11	0.16 to 929
Pb	125	4.6	1.7	99	4.5 to 7 640
Po	6	6.3	0.65	540	196 to 1 063
Pu	40	7.5	2.3	1 800	11 to 300 000
Ru	17	5.4	1.0	220	48 to 1 000
Se(IV)	19	1.0	0.65	2.7	1.2 to 8.6
Sr	218	3.3	2.0	27	0.15 to 3 300
Tc	24	-3.4	1.1	0.033	0.0029 to 0.28
Th	17	11	1.5	60 000	2 000 to 510 000
U	24	3.8	1.3	45	10.5 to 4 400
Zn	146	2.8	1.9	16	0.1 to 8 000

[a] The mean of the logarithms of the observed values.

[b] The standard deviation of the logarithms of the observed values.

[c] Percent cumulative probability.

TABLE 3

BEST ESTIMATE AND CALCULATED RANGE OF K_d VALUES
(from Coughtrey et al. 1985)[a]

Element	Best Estimate (L kg^{-1})	Calculated Range (L kg^{-1})
Ag	50	ND[b]
Am	~ 2 000	1 200 - 8 700
Br	< 2	ND
Cd	32 - 50	ND
Ce	ND	ND
Cl	ND	ND
Cm and higher actinides	ND	98 - 52 000
Co	ND	ND
Cr	ND	ND
Cs	1000	1 000 - 10 000
Fe	9 (soluble form)	4 - 9 (soluble form)
I	~ 6	ND
Lanthanides (other than Ce)	ND	ND
Mn	20	19 - 99
Mo	9	ND
Na	ND	ND
Nb	ND	ND
Ni	~ 20	ND
Np	~ 50	0.16 - 929
Pu	5 000	18 - 10 000
Rb	ND	ND
Ru	1 - 20	ND
S	ND	ND
Sb	ND	ND
Se	> 9	ND
Sn	ND	ND
Sr	ND	ND
Tc	0.11	ND
Te	ND	ND
Zn	≥ 20	ND
Zr	ND	ND

[a] From section entitled "Environmental data for radioisotopes. Parameters for soils, plants and aquatic ecosystems".

[b] ND = no data

<u>TABLE 4</u>

<u>SAND SOIL K_d VALUES (L kg^{-1})</u>

Element	Number of Observations	μ[a]	σ[b]	exp (μ)[c]	Range
Ac		6.1[d]		450	
Ag	12	4.5	[illegible]	90	2.7 to 1 000
Am	29	7.6	2.6	1900	8.2 to 300 000
Be		5.5		250	
Bi		4.6		100	
Br		2.7		15	
C	3	1.1	0.8	5	1.7 to 7.1
Ca		1.8		5	
Cd	14	4.3	1.3	80	2.7 to 625
Ce	12	6.2	1.6	500	40 to 3 968
Cm	2	8.4	2.4	4000	780 to 22 970
Co	33	4.1	2.8	60	.07 to 9 000
Cr	15	4.2	2.1	70	1.7 to 1 729
Cs	81	5.6	2.5	280	0.2 to 10 000
Fe	16	5.4	2.6	220	5 to 6 000
H	3	-2.7	0.4	0.06	0.04 to 0.1
Hf		6.1		450	
Ho		5.5		250	
I	22	0.04	2.2	1.0	0.04 to 81
K		2.6		15	
Mn	54	3.9	1.4	50	6.4 to 5 000
Mo	15	2.0	1.1	10	1.0 to 52
Nb		5.1		160	
Ni	11	6.0	1.5	400	60 to 3 600
Np	16	1.4	1.7	5	0.5 to 390
P		1.8		5	
Pa		6.3		550	
Pb	3	5.6	2.3	270	19 to 1 405
Pd		4.0		55	
Po	36	5.0	1.6	150	9 to 7 020
Pu	39	6.3	1.7	550	27 to 36 000
Ra	3	6.2	3.2	500	57 to 21 000
Rb		4.0		55	
Re		2.3		10	
Ru	7	4.0	1.4	55	5 to 490
Sb	1	3.8		45	
Se		5.0		150	
Si		3.5		35	
Sm		5.5		245	
Sn		4.9		130	
Sr	81	2.6	1.6	15	0.05 to 190
Ta		5.4		220	
Tc	19	-2.0	1.8	0.1	0.01 to 16
Te		4.8		125	
Th	10	8.0	2.1	3 200	207 to 150 000
U	24	3.5	3.2	35	0.03 to 2 200
Y		5.1		170	
Zn	22	5.3	2.6	200	0.1 to 8 000
Zr		6.4		600	

[a] Mean of the logarithms of the observed values.
[b] Standard deviation of the logarithms of the observed values.
[c] Geometric mean rounded to two significant digits.
[d] Nuclides with no observations have predicted default values for μ and exp (μ) using plant/soil concentration ratios (CRs).

TABLE 5

SILT SOIL K_d VALUES (L kg^{-1})

Element	Number of Observations	μ[a]	σ[b]	exp (μ)[c]	Range
Ac		7.3[d]		1 500	
Ag	4	4.8	1.1	120	28 to 333
Am	20	9.2	1.4	9 600	400 to 48 309
Be		6.7		800	
Bi		6.1		450	
Br		3.9		50	
C		2.9		20	
Ca		3.4		30	
Cd	8	3.7	1.6	40	7.0 to 962
Ce	5	9.0	1.5	8 100	1200 to 56 000
Cm	4	9.8	0.7	18 000	7666 to 44 260
Co	23	7.2	1.3	1 300	100 to 9 700
Cr	4	3.4	2.9	30	2.2 to 1 000
Cs	54	8.4	1.3	4 600	560 to 61 287
Fe	18	6.7	0.7	800	290 to 2 240
H		3.0		20	
Hf		7.3		1 500	
Ho		6.7		800	
I	33	1.5	2.0	5	0.1 to 43
K		4.0		55	
Mn	38	6.6	2.6	750	40 to 77 079
Mo		4.8		125	
Nb		6.3		550	
Ni		5.7		300	
Np	11	3.2	1.2	25	1.3 to 79
P		3.2		25	
Pa		7.5		1 800	
Pb	3	9.7	1.4	16 000	3500 to 59 000
Pd		5.2		180	
Po	13	6.0	1.3	400	24 to 1 830
Pu	21	7.1	1.2	1 200	100 to 5 933
Ra	3	10.5	3.1	36 000	1262 to 530 000
Rb		5.2		180	
Re		3.7		40	
Ru	2	6.9	0.0	1 000	0
Sb		5.0		150	
Se		6.2		500	
Si		4.7		110	
Sm		6.7		800	
Sn		6.1		450	
Sr	43	3.0	1.7	20	0.01 to 300
Ta		6.8		900	
Tc	10	-2.3	1.1	0.1	0.01 to 0.4
Te		6.3		500	
Th		8.1		3 300	
U	8	2.5	3.3	15	0.2 to 4 500
Y		6.6		720	
Zn	12	7.2	2.4	1 300	3.6 to 11 000
Zr		7.7		2 200	

[a] Mean of the logarithms of the observed values.
[b] Standard deviation of the logarithms of the observed values.
[c] Geometric mean rounded to two significant digits.
[d] Nuclides with no observations have predicated default values for μ and exp (μ) using plant/soil concentration ratios (CRs).

TABLE 6

CLAY SOIL K_d VALUES (L kg^{-1})

Element	Number of Observations	μ[a]	σ[b]	exp (μ)[c]	Range
Ac		7.8[d]		2 400	
Ag	5	5.2	0.4	180	100 to 300
Am	11	9.0	2.6	8 400	25 to 400 000
Be		7.2		1 300	
Bi		6.4		600	
Br		4.3		75	
C		0.8		1	
Ca		3.9		50	
Cd	10	6.3	0.9	560	112 to 2 450
Ce	4	9.9	0.5	20 000	12 000 to 31 623
Cm		8.7		6 000	
Co	15	6.3	1.8	550	20 to 14 000
Cr		7.3		1 500	
Cs	28	7.5	1.6	1 900	37 to 31 500
Fe	7	5.1	1.6	165	15 to 2 121
H		3.3		30	
Hf		7.8		2 400	
Ho		7.2		1 300	
I	8	0.5	1.5	1	0.2 to 29
K		4.3		75	
Mn	23	5.2	2.0	180	23.6 to 48 945
Mo	7	4.5	1.2	90	13 to 400
Nb		6.8		900	
Ni	10	6.5	0.7	650	305 to 2 467
Np	4	4.0	3.8	55	0.4 to 2 575
P		3.5		35	
Pa		7.9		2 700	
Pb		6.3		550	
Pd		5.6		270	
Po		8.0		3 000	
Pu	18	8.5	2.1	5 100	316 to 190 000
Ra	8	9.1	1.3	9100	696 to 56 000
Rb		5.6		270	
Re		4.1		60	
Ru	1	6.7		800	0
Sb		5.5		250	
Se		6.6		740	
Si		5.2		180	
Sm		7.2		1 300	
Sn		6.5		670	
Sr	24	4.7	2.0	110	3.6 to 32 000
Ta		7.1		1 200	
Tc	4	0.2	0.06	1	1.16 to 1.32
Te		6.6		720	
Th	5	8.6	2.6	5 800	244 to 160 000
U	7	7.3	2.9	1 600	46 to 395 100
Y		6.9		1 000	
Zn	23	7.8	1.4	2 400	200 to 100 000
Zr		8.1		3 300	

[a] Mean of the logarithms of the observed values.
[b] Standard deviation of the logarithms of the observed values.
[c] Geometric mean rounded to two significant digits.
[d] Nuclides with no observations have predicted default values for μ and exp (μ) using plant/soil concentration ratios (CRs).

TABLE 7

ORGANIC SOIL K_d VALUES (L kg^{-1})

Element	Number of Observations	μ[a]	σ[b]	exp (μ)[c]	Range		
Ac		8.6[d]		5 400			
Ag	4	9.6	0.9	15 000	4 400	to	33 000
Am	5	11.6	1.7	112 000	6 398	to	450 000
Be		8.0		3 000			
Bi		7.3		1 500			
Br		5.2		180			
C		4.2		70			
Ca		4.5		90			
Cd	9	6.7	2.3	800	23	to	17 000
Ce	1	8.1		3 300	0		
Cm	1	8.7		6 000	0		
Co	6	6.9	1.5	1 000	120	to	4 500
Cr	4	5.6	2.7	270	6.0	to	2 517
Cs	9	5.6	3.6	270	0.[illegible]	to	145 000
Fe	1	6.4		600	0		
H		4.3		75			
Hf		8.6		5 400			
Ho		8.0		3 000			
I	9	3.3	2.0	25	1.4	to	368
K		5.3		200			
Mn	1	5.0		150	0		
Mo	3	3.3	0.5	25	18	to	50
Nb		7.6		2 000			
Ni	6	7.0	0.9	1 100	360	to	4 700
Np	3	7.1	0.4	1 200	857	to	1 900
P		4.5		90			
Pa		8.8		6 600			
Pb	6	10.0	0.5	22 000	9 000	to	31 590
Pd		6.5		670			
Po		8.9		7 300			
Pu	7	7.5	2.6	1 900	60	to	62 000
Ra		7.8		2 400			
Rb		6.5		670			
Re		5.0		150			
Ru	5	11.1	0.3	66 000	39 000	to	87 000
Sb		6.3		550			
Se		7.5		1 800			
Si		6.0		400			
Sm		8.0		3 000			
Sn		7.4		1 600			
Sr	12	5.0	1.8	150	8	to	4 800
Ta		8.1		3 300			
Tc	24	0.4	1.8	1	0.02	to	340
Te		7.5		1 900			
Th	3	11.4	4.6	89 000	1 579	to	13 000 000
U	6	6.0	2.5	410	33	to	7 350
Y		7.9		2 600			
Zn	8	7.4	1.6	1 600	70	to	13 000
Zr		8.9		7 300			

[a] Mean of the logarithms of the observed values.
[b] Standard deviation of the logarithms of the observed values.
[c] Geometric mean rounded to two significant digits.
[d] Nuclides with no observations have predicted default values for μ and exp (μ) using plant/soil concentration ratios (CRs).

TABLE 8

SUMMARY OF GM[a] K_d VALUES (L kg^{-1}) FOR EACH ELEMENT BY SOIL TEXTURE

Element	Sand	Silt	Clay	Organic
Ac	450[b]	1 500	2 400	5 400
Ag	***90***	***120***	***180***	***15 000***
Am	***1 900***	***9 600***	***8 400***	***112 000***
Be	250	800	1 300	3 000
Bi	100	450	600	1 500
Br	15	50	75	180
C	***5***	20	1	70
Ca	5	30	50	90
Cd	***80***	***40***	***560***	***800***
Ce	***500***	***8 100***	***20 000***	***3 300***
Cm	***4 000***	***18 000***	6 000	***6 000***
Co	***60***	***1 300***	***550***	***1 000***
Cr	***70***	***30***	1 500	***270***
Cs	***280***	***4 600***	***1 900***	***270***
Fe	***220***	***800***	***165***	***600***
H	***1***	20	30	75
Hf	450	1 500	2 400	5 400
Ho	250	800	1 300	3 000
I	***1***	***5***	***1***	***25***
K	15	55	75	200
Mn	***50***	***750***	***180***	***150***
Mo	***10***	125	***90***	***25***
Nb	160	550	900	2 000
Ni	***400***	300	***650***	***1 100***
Np	***5***	***25***	***55***	***1 200***
P	5	25	35	90
Pa	550	1 800	2 700	6 600
Pb	***270***	***16 000***	550	***22 000***
Pd	55	180	270	670
Po	***150***	***400***	3 000	7 300
Pu	***550***	***1 200***	***5 100***	***1 900***
Ra	***500***	***36 000***	***9 100***	2 400
Rb	55	180	270	670
Re	10	40	60	150
Ru	***55***	***1 000***	***800***	***66 000***
Sb	***45***	150	250	550
Se	150	500	740	1 800
Si	35	110	180	400
Sm	245	800	1 300	3 000
Sn	130	450	670	1 600
Sr	***15***	***20***	***110***	***150***
Ta	220	900	1 200	3 300
Tc	***1***	***1***	***1***	***1***
Te	125	500	720	1 900
Th	***3 200***	3 300	***5 800***	***89 000***
U	***35***	***15***	***1 600***	***410***
Y	170	720	1 000	2 600
Zn	***200***	***1 300***	***2 400***	***1 600***
Zr	600	2 200	3 300	7 300

[a] GM = geometric mean rounded to two significant digits.

[b] Values with italic bold numbering come from the *literature.*
Values with regular numbering are predicted using plant/soil concentration ratios (CRs).

TABLE 9

COMPARISON OF OUR COMPILATION WITH THOSE OF BAES AND SHARP (1983) AND COUGHTREY ET AL. (1985)

Element	This Study[a]								Baes & Sharp[b] Agricultural soils and clays of pH 4.5 to 9.0		Coughtrey et al.[c]	
	Sand		Silt		Clay		Organic					
	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	Best Estimate	Range
Ac	450		1500		2400		5400				50	ND[d]
Ag	90	2.7-1000	120	28-333	180	100-300	15000	4400-33000	110	10-1000	~ 2000	1200-8700
Am	1900	8.2-300000	9600	400-48309	8400	25-400000	112000	6398-450000	810	1.0-47230		
As(III)									3.3	1.0-8.3		
As(V)									6.7	1.9-18		
Be	250		800		1300		3000					
Bi	100		450		600		1500					
Br	15		50		75		180				< 2	ND
C	5	1.7-7.1	20		1		70					
Ca	5		30		50		90		4.1	1.2-9.8		
Cd	80	2.7-625	40	7.0-962	560	112-2450	800	23-17000	6.7	1.26-26.8	32-50	ND
Ce	500	40-3968	8100	1200-56000	20000	12000-31623	3300	0	1100	58-6000	ND	ND
Cl											ND	ND
Cm	4000	780-22970	18000	7666-44260	6000		6000	0	3300	93.3-51900	ND	98-52000
Co	60	.07-9000	1300	100-9700	550	20-14000	1000	120-4500	55	0.2-3800	ND	ND
Cr	70	1.7-1729	30	2.2-1000	1500		270	6-2517			ND	ND
Cr(II)									2200	470-150000		
Cr(VI)									37	1.2-1800		
Cs	280	0.2-10000	4600	560-61287	1900	37-31500	270	.4-145000	1100	10-52000	1000	1000-10000
Cu									22	1.4-333		
Fe	220	5-6000	800	290-2240	165	15-2121	600	0	55	1.4-1000	9	4-9
H	.06	.04-.1	20		30		75					
Hf	450		1500		2400		5400					
Ho	250		800		1300		3000					
I	1	.04-81	5	0.1-43	1	.2-29	25	1.4-368			~ 6	ND
K									5.5	2.0-9.0		
Mg									5.5	1.6-13.5		
Mn	50	6.4-5000	750	40-77079	180	23.6-48945	150	0	150	0.2-10000	20	19-99

continued...

TABLE 9 (concluded)

Element	This Study[a]								Baes & Sharp[b] Agricultural soils and clays of pH 4.5 to 9.0		Coughtrey et al.[c]	
	Sand		Silt		Clay		Organic					
	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	exp(μ)	Range	Best Estimate	Range
Mo	10	1.0-52	125		90	13-400	25	18-50	20	0.37-400	9	ND
Na											ND	ND
Nb	160		550		900		2000				ND	ND
Ni	400	60-3600	300		650	305-2467	1100	360-4700			~ 20	ND
Np	5	0.5-390	25	1.3-79	55	.4-2575	1200	857-1900	11	0.16-929	~ 50	0.16-929
P	5		25		35		90					
Pa	550		1800		2700		6600					
Pb	270	19-1405	16000	3500-59000	550		22000	9000-31590	99	4.5-7640		
Pd	55		180		270		670					
Po	150	9-[illegible]020	400	24-1830	3000		7300		540	196-1063		
Pu	550	27-36000	1200	100-5933	5100	316-190000	1900	60-62000	1800	11-300000	5000	18-10000
Ra	500	57-21000	36000	1262-530000	9100	696-56000	2400					
Rb	55		180		270		670				ND	ND
Ru	55	5-[illegible]90	1000	0	800	0	66000	39000-87000	220	48-1000	1-20	ND
S											ND	ND
Sb	45		150		250		550				ND	ND
Se	150		500		740		1800				> 9	ND
Se(IV)									2.7	1.2-8.6		
Si	35		110		180		400					
Sm	245		800		1300		3000					
Sn	130		450		670		1600				ND	ND
Sr	15	.05-190	20	.01-300	110	3.6-32000	150	8-4800	27	0.15-3300	ND	ND
Ta	220		900		1200		3300					
Te											ND	ND
Tc	.1	.01-16	0.1	.01-.4	1	1.16-1.32	1	.02-340	.033	.0029-0.28	0.11	ND
Th	3200	207-150000	3300		5800	244-160000	89000	1579-13000000	60000	2000-510000		
U	35	.03-2200	15	.2-4500	1600	46-395100	410	33-7350	45	10.5-4400		
Y									510•	160-1640•		
Zn	200	.1-8000	1300	3.6-11000	2400	200-100000	1600	70-13000	16	0.1-8000	=> 20	ND
Zr	600		2200		3300		7300				ND	ND

[a] From our study, Tables 4 to 7. [b] Baes and Sharp (1983). [c] Coughtrey et al. (1985). [d] No data available.
• From Baes et al. (1984, Table 2.13).

TABLE 10

GROUPING OF ELEMENTS BY K_d AND SOIL TEXTURE USING GEOMETRIC MEAN K_d's FROM THIS STUDY AND HIGHLIGHTING MAJOR TRENDS IN THE DATA. PREDICTED VALUES NOT USED.

	This study				Baes and Sharp (1983)
K_d Values exp (μ)	Sand	Silt	Clay	Organic	Agricultural soils and clays of pH 4.5 to 9.0
< 1	H Tc*	Tc			Tc
1-10	I Mo, Np	I	I Tc	Tc	Cd
10-100	Ag, Cd, Co, Cr, Mn, Ru, Sr, U	Cd, Cr Np Sr, U	Mo Np	I Mo	Co, Fe, Mo Np Pb, Sr, U Zn
100-1000	Ce, Cs, Fe, Ni, Pb, Po, Pu, Ra, Zn	Ag, Fe, Mn, Po	Ag, Cd, Co, Fe, Mn, Ni, Sr	Cd, Co, Cr, Cs, Sr, U	Ag, Am, Mn Po Ru
1000-10 000	Am, Cm, Th	Am, Ce, Co, Cs, Pu, Zn Zn	Am, Cs, Pu, Ra, Th, U	Ni Np Pu, Zn	Ce, Cm, Cs, Pu
> 10 000		Cm, Pb, Ra	Ce	Ag, Am, Pb, Ru, Th	Th

* Tc, I, U and Np - highlighted to illustrate the dependence on soil type.

TABLE 11

COMPARISON OF RANGES OF K_d (FROM TABLE 9) OF BAES AND SHARP (1983) AND SILT AND CLAY SOILS FROM THIS STUDY

Elements	This Study: Silt and Clay	Baes and Sharp: Agricultural Soils and Clays of pH 4.5 to 9.0	Rating of Baes and Sharp Data
Ag	28 - 333	10 - 1 000	high
Am	25 - 400 000	1 - 47 230	low
Cd	7 - 2 450	1.26 - 26.8	low
Ce	1 200 - 56 000	58 - 6 000	low
Cm	7 666 - 44 260	93.3 - 51 900	low & wider
Co	20 - 14 000	.2 - 3 800	low
Cs	37 - 61 287	10 - 52 000	equal
Fe	15 - 2 240	1.4 - 1 000	low
Mn	23.6 - 77 079	.2 - 10 000	very low
Mo	13 - 400	.37 - 400	equal
Np	1.3 - 2 575	.16 - 929	low
Pb	3 500 - 59 000	4.5 - 7 640	very low
Po	24 - 1 830	196 - 1 063	low & narrow
Pu	100 - 190 000	11 - 300 000	high
Sr	.01 - 1.32	15 - 3 300	very high
Tc	.01 - 1.32	.0029 - .28	equal
Th	244 - 160 000	2000 - 510 000	very high
U	.2 - 395 100	10.5 - 4 400	very low
Zn	3.6 - 100 000	.1 - 8 000	very low

APPENDIX A

ELEMENT REFERENCES

(Arranged Alphabetically by Element Name)

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APPENDIX B

DETAILS OF SOILS AND EXPERIMENTS FOR THE

K_d VALUE DATABASE COMPILATION

LITERATURE SURVEY SUMMARIES

(The tables are arranged alphabetically by element name)

TABLE B-1

AMERICIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	SAT	pH PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Am	241	Silt loam	19	56	25	2.8		5.9	5.41		20	1.29	0.06			29800	Sharpsburg series	Tab 2	Nishita et al., 1981
Am	241	Silt loam	19	56	25	2.8			6.56		20	1.29	0.06			17780	Sharpsburg series	% main clay minerals	Nishita et al., 1981
Am	241	Sandy loam	55	33	12	2.4		5.3	4.39		15	1.65	0.05			9635	Malbis (Louisianna)		Nishita et al., 1981
Am	241	Sandy loam	55	33	12	2.4			5.71		15	1.65	0.05			8063	Malbis (Louisianna)	Soil properties see Wallace et al., 1979	Nishita et al., 1981
Am	241	Sandy loam	65	33	2	5.7		5.0	4.58		15	1.52	0.04			1549	Lyman (Maine)		Nishita et al., 1981
Am	241	sandy loam	65	33	2	5.7			6.17		15	1.52	0.04			182	Lyman (Maine)	Nishita, 1981 (Tab 1-p 1) (Extract) chem prop	Nishita et al., 1981
Am	241	clay loam	29	39	32	0.6		7.8	7.12		30	1.20	0.04			35630	Holtville (calcareous = 12% CaCO3)	Nishita, 1981 (Tab 2 - nuclide conc)	Nishita et al., 1981
Am	241	clay loam	29	39	32	0.6			8.04		30	1.20	0.04			47230	Holtville (calcareous = 12% CaCO3)		Nishita et al., 1981
Am	241	sandy loam	70	28	2	8.4		6.0	5.71		15	5.29	0.10			21870	Aiken (California)		Nishita et al., 1981
Am	241	sandy loam	70	28	2	8.4			6.72		15	5.29	0.10			10660	Aiken (California)		Nishita et al., 1981
Am	241	silt loam	27	58	15	2.5		6.7	6.12		25	2.41	0.08			23870	Yolo (California)		Nishita et al., 1981
Am	241	silt loam	27	58	15	2.5			6.98		25	2.41	0.08			20210	Yolo (California)		Nishita et al., 1981
Am	241	muck	70	30	0	40.8		7.2	6.14		60	1.57	0.10			7266	Egbert		Nishita et al., 1981
Am	241	muck	70	30	0	40.8			7.54		60	1.57	0.10			5529	Egbert		Nishita et al., 1981
									Extrac pH				NH4 [illegible] NH4NO3						
												Initial log Am (moles/l)							
Am		loamy sand	(89.4)	10.1	0.5	—	0.8	7.0			4.9	-6.75				1200-8700	Burbank (Wash.) (subsoil)	(ref Routson et al., 1977) ( ): cal from silt/clay	Rai et al., 1981
Am		sand	(59.2)	3.6	37.2	—	<0.2	5.1			2.5	-7.32				1.67	S Carolina (subsoil)	(ref Routson et al., 1977). ( ): cal from silt/clay	Rai et al., 1981
Am		silt loam	12.6	65.8	21.6	3.61		5.3			16.88	-7.52				48309	Muscatine	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am		loamy sand	76.0	21.2	2.8	0.43		8.1			5.94	-7.52				7143	Burbank	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am		silt loam	32.0	56.0	12.0	0.84		6.5			10.76	-7.52				9709	Ritzville	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am		sand	94.6	1.6	3.8	0.21		5.2			0.69	-7.52				2481	Fuquay (F3) South Carolina	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am		sandy loam	65.2	29.0	5.8	0.45		8.1			6.14	-7.52				1250	Hanford (HF-A)	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am		loam	47.6	39.4	18.0	0.60		8.3			15.04	-7.52				39216	Idaho Falls (ID A)	(ref Sheppard et al., 1976 Glover et al., 1977)	Rai et al., 1981
Am	241	peat						4.0								0.85 • 10e5 -- 0.43	(6-8 cm) (0.13 d) Lefgrens Bog, NY	Tab 5a (Rd)	Schell et al., 1985
Am	241	peat						4.0								1.6 • 10e5 -- 0.85	(6-8 cm) (1 d) Lefgrens Bog, NY	Tab 8 = comparison S[illegible]ley '82	Schell et al., 1985
Am	241	peat						4.0								2.3 • 10e5 -- 1.1	(6-8 cm) (4 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								3.1 • 10e5 -- 1.8	(6-8 cm) (10 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								4.5 • 10e5 -- 2.64	(6-8 cm) (15 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								----------------	(6-8 cm) (23 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								----------------	(20-21 cm) (0.13 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								1.8 • 10e5 -- 0.9	(20-21 cm) (1 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								2.3 • 10e5 -- 0.95	(20-21 cm) (4 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								2.9 • 10e5 -- 1.1	(20-21 cm) (10 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								4.5 • 10e5 -- 2.3	(20-21 cm) (15 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								3.4 • 10e5 -- 1.3	(20-21 cm) (23 d) Lefgrens Bog, NY		Schell et al., 1985
Am	241	peat						4.0								0.87 • 10e5 -- 0.4	(6-8 cm) (0.13 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								1.3 • 10e5 -- 0.5	(6-8 cm) (1 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								78 • 10e5 -- 0.4	(6-8 cm) (4 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								1.5 • 10e5 -- 0.53	(6-8 cm) (10 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								----------------	(20-22 cm) (0.13 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								2.2 • 10e5 -- 1.3	(20-22 cm) (1 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								1.2 • 10e5 -- 0.4	(20-22 cm) (4 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	241	peat						4.0								1.2 • 10e5 -- 0.32	(20-22 cm) (10 d) Spruce Flats Bog, PA (contains illite)		Schell et al., 1985
Am	243	Bentonite + brine B						7.3								[illegible]000		(Tab 1: pH after agitation)	Nowak, 1980
Am	243	10% Bentonite + sand + brine B						7.3								[illegible]00		* Kd calc based on bentonite mean - mixture of bentonite, charcoal, mordenite & stibnite : effective backfill: ≥550	Nowak, 1980
Am		sand	89	3	8											300,000 (140,000)	Beatty 1, Nevada	Abst: Kd highest in a saline Alluvial Basin deposits high in montmorillonite & zeolites	Neiheisel, 1983
Am		sand	91	2	7											250,000	Beatty 2, Nevada		Neiheisel, 1983
Am		sand	83	2	15											100,000	Beatty 5, Nevada	Tsul: Kd: mineral phase char. Tab2: Relationship: texture,	Neiheisel, 1983
Am		clayey sand	58	6	36											56,000	Barnwell 4, S. Carolina	surface area & clay min. comp. Tab3: soil text. & min comp	Neiheisel, 1983
Am		clayey sand	68	11	21											65,000	Barnwell 12, S. Carolina	Tab4: Kd: 6 radionuclides Fig6: text. diagram	Neiheisel, 1983

continued...

TABLE B-1 (continued)

NO.	ICB	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT. PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP. CATION	% COMP. CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
An		clayey sand	73	8	19				(mv)						130,000 (170,000)	Barnwell 14, S. Carolina	Fig7- Kd vs. sorptive materials	Nesheiwat, 1983
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.5 (5)	431	3.7 (14 wks)				.1 M	1005 A B	N.E. Netherlands	Kd column = ( ) = reducing conditions	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.1 (5)	449	3.7 (14 wks)				1.0 M	1830 A-B	N.E. Netherlands	(Appendix 1)	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.1 (5)	438	3.7 (14 wks)				2.0 M	1280 A B	N.E. Netherlands	(D.N = Pu-Np-Tc)	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	7.1 (6)	421	3.7 (14 wks)				1 M	3020 A B	N.E. Netherlands	This report is a problem - 1000's of Kd values	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.6 (6)	420	3.7 (14 wks)				1.0 M	3815 A B	N.E. Netherlands	Kd's function of pH, Eh, M & time = appendices	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.7 (6)	408	3.7 (14 wks)				2.0 M	3950 A-B	N.E. Netherlands	Aer = Aerobic	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.2 (5)	12	3.7 (8 wks)				0.1 M	2100 AN-B	N.E. Netherlands	pH in ( ) - initial pH	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	5.7 (5)	0	3.7 (8 wks)				1.0 M	420 AN-B	N.E. Netherlands	A - aerobic - Kd column	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	5.8 (5)	5	3.7 (8 wks)				2.0 M	245 AN-B	N.E. Netherlands	AN = anaerobic - Kd column	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.4 (6)	67	3.7 (8 wks)				0.1 M	1730 AN-B	N.E. Netherlands	B = batch - Kd column	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.7 (6)	-73	3.7 (8 wks)				1.0 M	1580 AN-B	N.E. Netherlands	C = column - Kd column	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.6 (6)	96	3.7 (8 wks)				2.0 M	2600 AN-B	N.E. Netherlands	M = molarity - Rock salt (anhydrite)	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	[illegible].37 (5)	66	3.7 (18 wks)				0.1 M	1240 AN-C	N.E. Netherlands	involves salt domes	Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	5.8 (5)	216	3.7 (18 wks)				1.0 M	325 AN-C	N.E. Netherlands		Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	5.7 (5)	59	3.7 (18 wks)				2.0 M	315 AN-C	N.E. Netherlands		Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.4 (6)	[illegible]	3.7 (18 wks)				0.1 M	6530 AN-C	N.E. Netherlands		Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.[illegible] (6)	32	3.7 (18 wks)				1.0 M	2065 AN-C	N.E. Netherlands		Prins et al., 1986
An	241	glauconite sand	91.1	2.9	6.0	0	0	6.[illegible] (6)	18	3.7 (18 wks)				2.0 M	1605 AN-C	N.E. Netherlands		Prins et al., 1986
An		sand (Gohy 1012)						6.3 (5)	28	155Ca++(7wks)				0.012 M	445 AN B	Gorleben (FRG)		Prins et al., 1986
An		sand (Gohy 1012)						7.8 (7)	12	155Ca++(7wks)				0.012 M	270 AN B	Gorleben (FRG)		Prins et al., 1986
An		sand (Gohy 1012)						6.1 (5)	25	155Ca++(7wks)				.05 M	520 AN B	Gorleben (FRG)		Prins et al., 1986
An		sand (Gohy 1012)						7.9 (7)	19	155Ca++(7wks)				.05 M	185 AN B	Gorleben (FRG)		Prins et al., 1986
An		sand (Gohy 2120)						7.4 (6.8)	3	1.18Ca++(7wks)				1.0 M	940 AN B	Gorleben (FRG)		Prins et al., 1986
An		sand (Gohy 2120)						7.2 (6.8)	-29	1.18Ca++(7wks)				2.5 M	2045 AN-B	Gorleben (FRG)		Prins et al., 1986
An	111	sandy clay	60.4	19.4	20.2	0.18		8.4		10.44					43500 (CF)	1D-B	CF = gel filtration method ? - Kd column	Sheppard, J.C., 1981
An	111	sandy clay	60.4	19.4	20.2	0.18		8.4		10.44					1600 (C)	1D-B	C = centrifugation ? - Kd column	Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					3850 (CF)	R117	tab 3 = Am Kd	Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					1380 (C)	R117	tab 2 - diffusion factor (D)	Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					35700 (CF)	AHN	p 13 = conclusion	Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					10200 (C)	AHN		Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					23300 (CF)	RKS		Sheppard, J.C., 1981
An	111	silt loam	32.0	56.0	12.0	0.84		6.5		10.76					1700 (C)	RKS		Sheppard, J.C., 1981
An		clay						3.8		64.76					2.5 log	Bentonite	(Tab.2 = Am Kd)	Billen, 1982
An		clay						4.3		64.26					2.7 log	Bentonite		Billon, 1982
An		clay						5.5		64.26					3.3 log	Bentonite		Billon, 1982
An		clay						5.7		64.26					3.0 log	Bentonite		Billon, 1982
An		clay						6.1		64.26					3.5 log	Bentonite		Billon, 1982
An		clay						6.3		64.26					3.7 log	Bentonite		Billon, 1982
An		clay						6.5		64.26					3.7 log	Bentonite		Billon, 1982
An		clay						7.0		64.26					4.7 log	Bentonite		Billon, 1982
An		clay						7.2		64.26					5.2 log	Bentonite		Billon, 1982
An		clay						7.4		64.26					4.8 log	Bentonite		Billon, 1982
An		clay						8.0		64.26					5.2 log	Bentonite		Billon, 1982
An		clay						12.4		64.26					5.2 log	Bentonite		Billon, 1982
An		fine sandy loam				2.4	-	5.3 (4.39)	-	15	1.65				9.635x10E3	Malbis (Louisiana)	When the value is bracketed, it is the pH of the extract	Nishita et al., 1979
An		fine sandy loam				2.4	-	5.3 (5.71)		15	1.65				8.043x10E3	Malbis (Louisiana)		Nishita et al., 1979
An		fine sandy loam				5.7	-	5.0 (4.58)		15	1.52				1.549x10E3	Lyman (Maine)		Nishita et al., 1979
An		fine sandy loam				5.7	-	5.0 (6.17)	-	15	1.52	.			1.87x10E2	Lyman (Maine)		Nishita et al., 1979
An		light loam				8.4	-	6.0 (5.71)	-	15	5.29	-			2.187x10E4	Aiken (California)		Nishita et al., 1979
An		light loam				8.4	-	6.0 (6.72)	-	15	5.29	-			1.066x10E4	Aiken (California)		Nishita et al., 1979
An		coarse sand				-	-	7 - 8		-					4x10E2	(Netherlands)		Hemstra & Verkerk, 1977
An												Na (90% sat solution)						
An			76	21.2	2.8	0.43	-	8.1	-	5.94	-	-			7.14x10E2	(Richland, Washington)		Ames & Rai, 1978
An			91.2	7.8	1	1.19	-	4.0	-	2.01					4.76x10E2	Fuquay (Barnwell,SC) 0-5 c		Ames & Rai, 1978
An			91.6	5.4	3	0.99	-	6.7	-	1.79					4.17x10E2	Fuquay (Barnwell,SC) 5-15 c		Ames & Rai, 1978
An			94.6	1.6	3.8	0.21	-	5.2	-	0.69					2.49x10E2	Fuquay (Barnwell,SC) 15-50 c		Ames & Rai, 1978
An			85.2	29	5.8	0.45	-	8.1	-	6.14					1.25x10E2	Hanford A		Ames & Rai, 1978
An			83.6	12.6	3.8	0.17	-	8.4	-	4.95		-			8.33x10E2	Hanford B		Ames & Rai, 1978
An			42.6	39.4	18	0.6	-	8.6	-	15.04		-			3.92x10E3	Idaho A		Ames & Rai, 1978
An			60.4	19.4	20.2	0.18	-	8.4	-	10.44		-			4.35x10E4	Idaho B		Ames & Rai, 1978
An			83.4	8.8	7.8	0.16	-	8.4	-	6.38	-	-			3.7x10E4	Idaho C		Ames & Rai, 1978
An			49.2	28.4	22.4	0.98	-	7.7	-	18.36		-			1.09x10E4	Idaho D		Ames & Rai, 1978

continued...

TABLE B-1 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT. PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Am			44	20	36	2.4	0.4	5.7	0.41	20.9					2.5x10E3+210*	Colorado A (Rocky Flats)	* Kd val. det. with init. Am conc. of 10E-10mol/l	Glover et al., 1976
Am			64	14	22	3.4	0.3	5.6	0.52	17.5					6.0x10E2+-24	Colorado B (Sugar Loaf)	** S. Carolina subsoil Kd vals. for Am w.r.t. calcium and sodium as competing ion, over 2 orders of magnitude are reported in Routson et al., 1975	Glover et al., 1976
Am			44	24	32	0.2	7.2	8.3	0.43	13.9					3.0x10E2+10*	Idaho B		Glover et al., 1976
Am			56	11.0?	23	0.3	5.2	8.0	0.47	9.2					8.2x10E2+43*	Idaho C		Glover et al., 1976
Am			38	32	30	0.1	0	7.5	0.45	17.5					1.0x10E4+-1.5x10E4*	Idaho D		Glover et al., 1976
Am			74	12	14	0.3	0.5	8.0	0.43	6.4					1.2x10E2+-7*	Washington A (Hanford)		Glover et al., 1976
Am			74	12	14	0.1	0	8.2	0.44	5.1					2.3x10E2+-5*	Washington B (Hanford)		Glover et al., 1976
Am			78	7	20	0.7	0.2	5.4	0.54	2.2					8.2x10E1+-1**	S. Carolina (Barnwell)		Glover et al., 1976
Am			48	34.0?	18	0.7	0.2	6.4	0.49	7.0					4.0x10E2+11*	New Mexico (Los Alamos)		Glover et al., 1976
Am			82	9	9	0.6	0.7	4.8	0.57	3.8					3.9x10E2+20*	Arkansas B		Glover et al., 1976
Am		Silty clay loam				2.8		5.9 (5.41)		20	1.29				2.98x10E4	Sharpsburg (Iowa)	When the value is bracketed, it is the pH of the extract	Nishita et al., 1979
Am		Silty clay loam				2.8		5.9 (6.56)		20	1.29				1.728x10E4	Sharpsburg (Iowa)		Nishita et al., 1979
Am		loam				2.5		6.7 (6.12)		25	2.41				2.387x10E4	Yolo (California)		Nishita et al., 1979
Am		loam				2.5		6.7 (6.98)		25	2.41				2.021x10E4	Yolo (California)		Nishita et al., 1979
Am			16	50	34	0.8	1.72	7.8	0.44	15.5					5.9x10E3+-230*	Idaho A	* Kd val. det. with init. Am conc. of 10E-10mol/l	Glover et al., 1979
Am			9	54	37	2.3	0.6	2.3	0.57	16.2					1.8x10E3*	Arkansas C		Glover et al., 1979
Am			31	53	16	3.6	0.7	3.6	0.56	17.4					1.6x10E3+-190*	Illinois		Glover et al., 1979
Am		Clay				0.6		7.8 (7.12)		30	1.2				3.563x10E4	Holtsville	When the value is bracketed, it is the pH of the extract	Nishita et al., 1979
Am						0.6	-	7.8 (8.04)		30	1.2				4.723x10E4	Holtsville		Nishita et al., 1979
Am		clay				-		7.8		-		(20% sat. solution)			5x10E4	(Netherlands)		Hamstra & Verkerk, 1977
Am			5	31	64	0.7	2.4	7.9	0.42	29.6					5.2x10E3+970*	Colorado C (Rocky Flats)	* Kd val. det. with init. Am conc. of 10E-10mol/l	Glover et al., 1976
Am			32	32	36	1	0	4.9	0.49	20.5					2.6x10E3+470*	Tennessee (Oak Ridge)		Glover et al., 1976
Am			32	32	36	2.2	0	5.4	0.45	16.0					9.2x10E2+-79*	New York (West Valley)		Glover et al., 1976
Am			10	34	56	3.2	0.9	6.2	0.52	34.4					2.9x10E3+180*	Arkansas A		Glover et al., 1976
Am		abyssal red clay					-	2.7		-		0.68 mol/l NaCl			25.1			Erickson, 1980
Am		abyssal red clay				-	-	6.9		-		0.68 mol/l NaCl			4.0x10E5			Erickson, 1980
Am		organic				40.8		7.2 (7.14)	-	60	1.52				7.266x10E[illegible]	[illegible]bert	When the value is bracketed, it is the pH of the extract	Nishita et al., 1979
Am		organic				40.8		7.2 (7.54)		60	1.57				5.522x10E[illegible]	[illegible]bert		Nishita et al., 1979

TABLE B-2

ANTIMONY K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT. PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sb	125							3.11							<10000-2	SRP - Savannah River Plant	(Fig 12, p 46, Kd/pH)	Hoeffner, 1985
Sb	125							3.6							<10000 <1000	SRP - Savannah River Plant	at pH 6.8 Kd 600-40 mL/g nearly all Sb removed from soil	Hoeffner, 1985
Sb	125	SRP burial ground						3.4							>4000	SRP - Savannah River Plant	(Tab 1)	Stone et al., 1984
Sb	125	SRP burial ground						4.7							3800	SRP - Savannah River Plant		Stone et al., 1984
Sb	125	SRP burial ground						5.3							2300	SRP - Savannah River Plant		Stone et al., 1984
Sb	125	SRP burial ground						7.2							180	SRP - Savannah River Plant		Stone et al., 1984

TABLE B-3

ARSENIC K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
As		fine sandstone and silty sand						2.0								0	Jeffrey City, Wyoming	(As) Tab 4	Haji Djafari et al., 1981
As		fine sandstone and silty sand						4.5								25		p 226 : site geology	Haji Djafari et al., 1981
As		fine sandstone and silty sand						5.75								200		p 230 : split rock formation	Haji-Djafari et al., 1981
As		fine sandstone and silty sand						7.0								300			Haji-Djafari et al., 1981

TABLE B-4

BARIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ba		Sand	74	3	3			4.781	4.28F							0.4	SE coastal plain - s. ly clay loam - SP#3	Tab 1=soil properties. Tab.4= hydralic conductivity	Eichholz & Whang, 1987
Ba		Sand						4.781	4.25F							0.4		Tab.5= transport parameters & Kd	Eichholz & Whang, 1987.
Ba		Sand						4.781	4.27F							0.5		Tab 3= sol 1 to 4 - pH and Kd	Eichholz & Whang, 1987.
Ba		Solution 1						2.31								1.0			Eichholz & Whang, 1987
Ba		Solution 2						4.04								2.0			Eichholz & Whang, 1987.
Ba		Solution 3						6.95								6.3			Eichholz & Whang, 1987
Ba		Solution 4						10.40								644.3			Eichholz & Whang, 1987.
Ba		Smectite Clay						7.5 - 7.8							1.7x10E/mMol/L	(9.3+-0.7)x10E4	20 degrees C Core LL44 CPC-2, Pacific Ocean, depth: 5871m	(Ba) Batch (tab.1: Kd vs. temp.). Smectite subseabed clay	Kenna, 1980.
Ba		Smectite Clay						7.5 - 7.8							1.7x10E/mMol/L	(5.5+-0.3)x10E4	60 degrees C Core LL44-CPC-2, Pacific Ocean, depth: 5871m		Kenna, 1980.

TABLE B-5

CADMIUM K_d VALUES

NUC	ISO#	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT	pH PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cd	109	loamy sand					1 1	7 0								<1000	1) Gleysol	Cd 109 (fig 2) ?log:Kd	Bunzl and Schimmack, 1988
Cd	109	loamy peat					0.5	6 8								1000	2) Sapric Histosol, strongly humidied	fig 4 & 5	Bunzl and Schimmack, 1988
Cd	109	sandy loam					(100)	5 7								100-1000	3) Cambisol, brown soil from loess		Bunzl and Schimmack, 1988
Cd	109	sandy loam					(63)	7 1								<1000->1000	4) Cambisol, brown soil		Bunzl and Schimmack, 1988
Cd	109	loamy sand					(5)	4 6								100	5) Acrisol, parabrown soil, Ah		Bunzl and Schimmack, 1988
Cd	109	loamy sand					23	4 6								100	6) Acrisol, parabrown soil, B-horizon		Bunzl and Schimmack, 1988
Cd	109															<1000	B Bentonite, Sud-chemie AG Manchen		Bunzl and Schimmack, 1988
Cd	109															1000	P1 Spag. peat (high moor) Steinhuder Meer, Hannover		Bunzl and Schimmack, 1988
Cd	109															>1000	P2 Spag. peat (high moor) Kenigsdorf, Bavaria		Bunzl and Schimmack, 1988
Cd		sand 2A	87 3	8 4	6.6	2 7		4 9			9 4		(10E-2M CaCl2)			10-3/0		(abstract) (TAB 1 = soil prop -other info)	Christensen, 1987
Cd		sand 25B	88 5	7 2	2.7	1 6		5 0			7 0		(10E-2M CaCl2)			(soil Ph range		(tab 1=footnote=data from Lamm, CC, 1971, Tidsskrift for	Christensen, 1987
Cd		sand 25C	86 3	7 7	5 3	0 7		4 7			5 2		(10E-2M CaCl2)			3 7 5 8)		planteavl 75,703) (fig 1=Kd=solute conc vs soil conc)	Christensen, 1987
Cd		sand 28A	83 6	7 5	4 9	4.0		4 8			10 8		(10E-2M CaCl2)					(fig 2=Kd=solute conc vs soil conc)	Christensen, 1987
Cd		sand 28B	88 0	4 2	6 1	1 7		5 1			6 5		(10E-2M CaCl2)					(fig 3=Kd=solute vs soil=comparison Cd-Ni-Zn-Cr-Cu-Pb=	Christensen, 1987
Cd		sand 28C	93 4	2.9	2 9	0 8		5 1			2 6		(10E-2M CaCl2)					other metals compete for Cd sorption sites) (fig 4=Kd vs pH	Christensen, 1987
Cd		sand 50A	72 2	13 3	11.2	3.3		4 9			12 3		(10E-2M CaCl2)					9 soils) (conclusion p 302) 2A to 50C = topsoil	Christensen, 1987
Cd		sand 50B	64 8	17 7	14 [illegible]	3 3		4 3			[illegible] 5		(10E-2M CaCl2)					116C to 167C : subsoil (0 5 to 1 0m)	Christensen, 1987
Cd		sand 50C	51 0	23 5	23 2	2.3		4 2			8 4		(10E-2M CaCl2)						Christensen, 1987
Cd		sand 116C	83 8	8 [illegible]	8 1	0.3		4 4			4 7		(10E-2M CaCl2)			230-1/00		(e. Ni,Co,Zn Kd:3-14 times lower)	Christensen, 1987
Cd		sand 163C	96 4	0 8	2 4	0 4		5 3			2 6		(10E-2M CaCl2)			(Cd only)			Christensen, 1987
Cd		sand 167C	75 0	10 8	14 0	0.3		6 4			8 0		(10E-2M CaCl..)						Christensen, 1987
Cd		clay minerals (more silt and	24 5	54 5	21 0			5 1		70	115mMc/Kg	13 3g/Kg				none given	Al-Montmorillonite, Vermiculite, Kaolinite	(abstract) (tab 1-soil prop (<mm fraction)	Zabowski and Zasoski, 1987
Cd		sand than clay)														? can calculate	CEC : mMc/Kg	(fig 1:adsorption rates)	Zabowski and Zasoski, 1987
Cd																from adsorption dat.	[illegible] /Kg	(fig 2:difference-NaNO3 - sludge leach)	Zabowski and Zasoski, 1987
Cd		clay minerals (more silt and	22 5	47 5	30.0			5 3		44	74mMc/Kg	17 1g/Kg				(fig)	V: Vermiculite, Chlorite	(fig 3 : metal adsorption in relation to metal ion activity)	Zabowski and Zasoski, 1987
Cd		sand than clay)																	Zabowski and Zasoski, 1987
Cd		clay minerals (more silt and	50 5	38 5	11 0			5 7		0 01	88mMc/Kg	11 5g/Kg					C:Chlorite, Vermiculite, Illite, Illite-Verm Kaolinite		Zabowski and Zasoski, 1987
Cd		sand than clay)																	Zabowski and Zasoski, 1987
Cd					13 0			6 2			112					10-1000	Mean of 32 Danish soils	(tab 3 = soil char - Kd correlations)	Anderson and Christensen, 1988
																		(tab 4 = Regression coeff.)	Anderson and Christensen, 1988
																		(fig 1 = log Kd for Cd - function of pH)	Anderson and Christensen, 1988
																		(tab 2 = soil prop.) Conclusions	Anderson and Christensen, 1988
																			Anderson and Christensen, 1988
Cd		sand	96 4	0 8	2 4	0 4		5 3			2 6		CaCl2			?	Soil #163C	Soil depth = 50-100 cm (fig 1 3 = Kd vs Zn conc)	Christensen, 1987
		sandy loam	75.0	10.8	14.0	0.3		6 4			8 0		CaCl2			?	Soil #167 C	Tab 1 = Kd (Cd) = Kd (Zn), Kzn (Conclusions)	Christensen, 1987
																		Soil propsfrom ref# 11-44=tab 1 Christensen, 1987	Christensen, 1987
Cd	109		80	17	3		0	3 7			125me/Kg		CaCl2			97 (42-222)		Kd column ( ) = Kd range Tab 1 = soil prop	Schimmack et al., 1987
																		tab 2 = Kd	Schimmack et al., 1987
Cd		PA (0-30 cm)				31 7		5			134	0 88 (1 40)	0 1M Ca(NO3)2			0 67 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2 1)	tab 1 = soil prop also mineralogy of clay soil.CECX pH 5.7	Tiller et al., 1984
Cd		PA (0-30 cm)				31.7		6			134	0 88 (1 40)	0 1M Ca(NO3)2			1 67 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2 1)	two % Fe, Mn = ug/g Tab 2 = clay constituents	Tiller et al., 1984
Cd		PA (0-30 cm)				31.7		7			134	0 88 (1 40)	0 1M Ca(NO3)2			5 01 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2 1)	tab 5 = Kd (lg-1), cd-Ni-Zn solution conc:10 -6 molar	Tiller et al., 1984
Cd		LA (0-30 cm)				5		5			65	1 18 (2 62)	0 1M Ca(NO3)2			0.10 (lg-1)	Adalf (N Germany), Silicate clay (2 1)	(0 N = Ni, Zn) (CEC used h 7)	Tiller et al., 1984
Cd		LA (0-30 cm)				5		6			65	1 18 (2.62)	0 1M Ca(NO3)2			0 39 (lg-1)	Adalf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Cd		LA (0-30 cm)				5		7			65	1.18 (2 62)	0 1M Ca(NO3)2			1.33 (lg-1)	Adalf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Cd		PEL (0-15 cm)				3.1		5			99	0 45 (1 61)	0 1M Ca(NO3)2			0 16 (lg-1)	Pellustert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Cd		PEL (0-15 cm)				3 1		6			99	0 45 (1 61)	0 1M Ca(NO3)2			0 34 (lg-1)	Pellustert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Cd		PEL (0-15 cm)				3.1		7			99	0 45 (1 61)	0 1M Ca(NO3)2			0 83 (lg-1)	Pellustert (Australia), Silicate clay (2.1)		Tiller et al., 1984
Cd		E46 (0-15 cm)				2 4		5			70	0 9 (0 55)	0 1M Ca(NO3)2			0 53 (lg 1)	Pelloxerert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Cd		E46 (0-15 cm)				2 4		6			70	0 9 (0 55)	0 1M Ca(NO3)2			0 73 (lg-1	Pelloxerert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Cd		E46 (0-15 cm)				2 4		7			70	0 9 (0 55)	0 1M Ca(NO3)2			1 48 (lg-1)	Pelloxerert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Cd		KN (40-60 cm)				1.0		5			53	4 (2 26)	0 1M Ca(NO3)2			0 10 (lg-1)	Aqualf (N Germany), Silicate clay (2.1)		Tiller et al., 1984
Cd		KN (40-60 cm)				1 0		6			53	4 (2 26)	0.1M Ca(NO3)2			0.30 (lg-1)	Aqualf (N.Germany), Silicate clay (2 1)		Tiller et al., 1984
Cd		KN (40-60 cm)				1 0		7			53	4 (2.26)	0.1M Ca(NO3)2			0 67 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Cd		PS B (20-30 cm)				0 8		5			24	09 (4 79)	0 1M Ca(NO3)2			006 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1 1/Fe)		Tiller et al., 1984
Cd		PS B (20-30 cm)				0 8		6			24	09 (4 79)	0 1M Ca(NO3)2			0 03 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1 1/Fe)		Tiller et al., 1984
Cd		PS B (20-30 cm)				0 8		7			24	09 (4 79)	0 1M Ca(NO3)2			0.30 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1 1/Fe)		Tiller et al., 1984

continued...

TABLE B-5 (concluded)

NUC.	ISN	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cd		KN (40 60 cm)				1 0		5		53	4 (2 26)	0 1M Ca(NO3)2			7 10 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al , 1984
Cd		KN (40 60 cm)				1 0		6		53	4 (2 25)	0 1M Ca(NO3)2			0 30 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al , 1984
Cd		KN (40-60 cm)				1.0		7		53	4 (2.26)	0 1M Ca(NO3)2			0 67 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al , 1984
Cd		PS.B (20-30 cm)				0.8		5		24	09 (4 79)	0 1M Ca(NO3)2			006 (lg-1)	Palexeralf (N Germany), Silicate clay free oxide (1 1/Fe)		Tiller et al , 1984
Cd		PS.B (20 30 cm)				0 8		6		24	09 (4 79)	0.1M Ca(NO3)2			0 03 (lg-1)	Palexeralf (N Germany), Silicate clay free oxide (1 1/Fe)		Tiller et al , 1984
Cd		PS.B (20 30 cm)				0 8		7		24	09 (4 79)	0.1M Ca(NO3)2			0 30 (lg-1)	Palexeralf (N Germany), Silicate clay free oxide (1 1/Fe)		Tiller et al , 1984
Cd		W (0-15 cm)				4 9		5		32	77 (19 3)	0 1M Ca(NO3)2			089 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al , 1984
Cd		W (0-15 cm)				4 9		6		32	77 (19.3)	0 1M Ca(NO3)2			0 45 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al , 1984
Cd		W (0-15 cm)				4 9		7		32	.77 (19.3)	0 1M Ca(NO3)2			7 03 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al., 1984
Cd		LB (30-50 cm)				1 1		5		53	54 (6 0)	0 1M Ca(NO3)2			072 (lg-1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1)		Tiller et al , 1984
Cd		LB (30-50 cm)				1 1		6		53	54 (6 0)	0 1M Ca(NO3)2			075 (lg 1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1)		Tiller et al., 1984
Cd		LB (30-50 cm)				1 1		7		53	54 (6 0)	0.1M Ca(NO3)2			0 43 (lg 1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1)		Tiller et al , 1984
Cd		PB (50-60 cm)				16 5		5		87	5 20 (7 37)	0 1M Ca(NO3)2			042 (lg-1)	Aquod (N Germany), Silicate clay/from oxide (2 1/Fe)		Tiller et al., 1984
Cd		PB (50-60 cm)				16 5		6		87	5 20 (7 37)	0 1M Ca(NO3)2			0 33 (lg-1)	Aquod (N Germany), Silicate clay/from oxide (2 1/Fe)		Tiller et al , 1984
Cd		PB (50-60 cm)				16 5		7		87	5 20 (7 37)	0 1M Ca(NO3)2			3 04 (lg-1)	Aquod (N Germany), Silicate clay/from oxide (2 1/Fe)		Tiller et al , 1984
Cd		Goethite (lab)						5							053 (lg-1)	Goethite (lab prep)		Tiller et al , 1984
Cd		Goethite (lab)						6							545 (lg-1)	Goethite (lab prep)		Tiller et al., 1984
Cd		Goethite (lab)						7							3 35 (lg-1)	Goethite (lab prep)		Tiller et al., 1984
Cd		Kaolinite, #3			<2 u					11/mmol/Kg		1M NaNO3				Birch Pit, Macon Georgia	CEC = mmolеKg-1 (Cd (NO3)2)	Tiller et al., 1984
Cd		Montmorillonite, #25			<2 u					860mmol/Kg		1M NaNO3				Upton, Wyoming	(O.N = Zn) (Fig 2.3 = Kd of Cd + Zn)	Garcia-Miragaya, 1983
																		Garcia-Miragaya, 1983
Cd		loamy sand	86.3	6 8	6 2	0.7		6 0		7 5		.001 M CaCl2			no Kd	Denmark	(Tab.1 = soil prop.) Batch. (Cd)	Christensen, 1984
Cd		sandy loam	69 5	12 0	10.0	0 5		~ 5		17 5		.001 M CaCl2			no Kd	Denmark	(Tab.2 = % Cd sorption = 20h, 35 wk, 67 wks) (Fig 2 to 5 = sorption isotherms)	Christensen, 1984
Cd		sand	96.4	0 8	2.4	0 4		6 65		2 6		001 M CaCl2			780	163 = C-horizon Denmark	(Cd) (Tab : soil prop) Batch	Christensen, 1985
Cd		sand	96 4	0 8	2 4	0 4		5 5		2 6		001 M CaCl2			250	163 = C-horizon Denmark	Tab.3 = Kd's	Christensen, 1985
Cd		sandy loam	74 9	10 8	14 0	0.3		6.65		8 0		001 M CaCl2			1700	167 - C-horizon Denmark	Tab.2 = Waste leachate characteristics	Christensen, 1985
Cd		sandy loam	74.9	10.8	14 0	0.3		5 5		8.0		001 M CaCl2			225	167 = C-horizon Denmark	Fig. 2 to 6 = sorption isotherms	Christensen, 1985
Cd		sand	96 4	0.8	2 4	0 4		6 65		2 6		Compost A			3 5	163 = C-horizon Denmark		Christensen, 1985
Cd		sand	96.4	0.8	2 4	0.4		5 5		2 6		Compost A			1 2	163 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10 8	14 0	0 3		6 65		8 0		Compost A			6 5	167 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10.8	14.0	0.3		5 5		8 0		Compost A			5 2	167 = C-horizon Denmark		Christensen, 1985
Cd		sand	96 4	0.8	2.4	0.4		6 65		2.6		Compost B			4 9	163 = C-horizon Denmark		Christensen, 1985
Cd		sand	96 4	0 8	2.4	0 4		5 5		2 6		Compost B			1 1	163 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74.9	10.8	14 C	0 3		6 55		8 0		Compost B			13	167 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10 8	14 0	0 3		5 5		8 0		Compost B			3 3	167 = C-horizon Denmark		Christensen, 1985
Cd		sand	96 4	0 8	2 4	0 4		6 65		2 6		Slag			10	163 = C-horizon Denmark		Christensen, 1985
Cd		sand	96 4	0.8	2.4	0.4		5.5		2 6		Slag			ND	163 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10.8	14.C	0 3		6 65		8 0		Slag			26	167 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10 8	14 C	0 3		5 5		8 0		Slag			ND	167 = C-horizon Denmark		Christensen, 1985
Cd		sand	96 4	0 8	2.4	0.4		6 65		2 6		Sewage sludge			25	163 = C-horizon Denmark		Christensen, 1985
Cd		sand	96.4	0 8	2.4	0 4		5 5		2 6		Sewage sludge			ND	163 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10.8	14.C	0 3		6 65		8 0		Sewage sludge			21	167 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10.8	14.C	0 3		5 5		8 0		Sewage sludge			ND	167 = C-horizon Denmark		Christensen, 1985
Cd		sandy loam	74 9	10.8	14 C	0 3		6 4 (5 5)		8 0		CaCl2		20 mg Cd/L	175	167 = C-horizon Denmark	(Cd) (Fig.3 = Cd Kd vs Zn conc.)	Christensen, 1985
Cd		sandy loam	74 9	10 8	14 C	0.3		6 4 (5 5)		8 0		CaCl2		800 ug Cd/L	100	167 = C-horizon Denmark	(Fig.4 = ZnKd vs Zn conc) (Fig. 1 & 2 = Sorption isotherm) (ON = Zn)	Christensen, 1985
Cd		Hallandale fine sand				14 5g/Kg		8 20		1.13ueq/g					0 072 L/g	Pompano Beach, Florida	Tab 1 = cations in soil Tab 2 = soil charact	Wong et al , 1983
Cd		Plantation Muck - bottom layer				27 9g/Kg		7 30		1 58ueq/g					0 323 L/g	Pompano Beach, Florida	Tab 3 = heavy metals in soil Tab 4 = linear Kd (L/g)	Wong et al., 1983
Cd		Plantation Muck - middle layer				670 7g/K		7 20		4 09ueq/g					0 193 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff Fig 1 & 2 = isotherms = Cr, Ni	Wong et al , 1983
Cd		Plantation Muck - top layer				705.2g/K		7.10		4 53ueq/g					0 506 L/g	Pompano Beach, Florida	(O.N. = Cu, Zn, Mn, Ni, Fe, Cr, Ca)	Wong et al., 1983
Cd		Sand				-	-	6 5	-	31 6	-				66 7*	Sandy soil (Braunschweig) 0-20 cm	*= 1 week equilibration	Poelstra et al., 1979
Cd		Sand				-	-	6 5	-	31 5	-				47 6*	Sandy soil (Braunschweig) 30-40 cm	*= 1 week equilibration	Poelstra et al., 1979
Cd		Sand			0	3.5	-	4 5 - 5 0	-	22	-	[Ca2+] = 0-0 015 mol/L			7 62x10E2	Soil C, sandy soil		Gerritse et al , 1982
Cd		Sand			20	2.5	-	7 5 - 8 0	-	16		[Ca2+] = 0-0 015 mol/L			5 0x10E2	Soil D, sandy soil		Gerritse et al , 1982
Cd		Fine sand				1.4	-	8 2		11					72	Hallandale fine sand		Wong et al , 1983
Cd		Silt		<74 mm		0.72	-	8 4	-	60	1 07	.			76	Imperial (California)		Garcia-Miragaya, 1980
				<74 mm		1 8	-	6 0	-	25	1 07				9 8	Olivenhain (California)		Garcia-Miragaya, 1980
				<74 mm		1 5	-	5 8	-	24	8 29	-			16	Boomer (California)		Garcia-Miragaya, 1980
Cd		Clay			23	6	trace	7 4	-	-	-				625*	(Valburg) 0-30 cm	*= 1 week equilibration	Poelstra et al , 1979
Cd		Organic				16 3	-	5 2	-	33 8	-				23	organic		Garcia-Miragaya, 1980
Cd		Peat				95	-	5 1 (H2O)	-	-	-				370*	(Schoonebeek), peat	*= 1 week equilibration	Poelstra et al , 1979
						90		4 5				[Ca2+] - 0-0 015 mol/L			1 44x10E3	Soil A		Gerritse et al , 1982
						>90		4 to 5				[Ca2+] = 0-0 015 mol/L			9 0x10E3	Peat A		Gerritse et al , 1982
						>90		6 2				[Ca2+] = 0 0 015 mol/L			.76x10E3	Soil B		Gerritse et al , 1982
Cd		Sphagnum peat				-	-	4 to 5	-	-	-				.7x10E4	Peat		Wolf et al , 1977
Cd		Sphagnum peat				-	-	4 to 5				0 025 mol Ca2+/mL sol			3x10E1	Peat		Wolf et al , 1977
Cd		Plantation muck				47	-	7 2	-	34	-				341	average of 3 layers		Wong et al , 1983

TABLE B-6

CALCIUM K_d VALUES

NUC.	IS#	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ca		Hallandale fine sand				14 5g/Kg		8 20		1 13ueq/g					1 117 L/g	Pompano Beach, Florida	Tab 1 - cations in soil Tab 2 - soil charact.	Wong et al., 1983
Ca		Plantation Muck - bottom layer				27 9g/Kg		7 30		1 58ueq/g					2 164 L/g	Pompano Beach, Florida	Tab 3 heavy metals in soil Tab 4 - linear Kd (L/g)	Wong et al., 1983
Ca		Plantation Muck - middle layer				670 7g/Kg		7 20		4 09ueq/g					2 784 L/g	Pompano Beach, Florida	Tab 5 - Langmuir coeff Fig 1 & 2 isotherms - Cr, Ni	Wong et al., 1983
Ca		Plantation Muck - top layer				705 2g/Kg		7 10		4 53ueq/g					0 751 L/g	Pompano Beach, Florida	(0 N - Cu, Zn, Mn, Ni, Cd, Cr)	Wong et al., 1983

TABLE B-7

CARBON K_d VALUES

NUC	TSI	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
C		sandy	sandy moraine					H14CO3							0 8 • 10e3 (m3/Kg)	sandy moraine, Sweden	(contact time 3d)	Anderson et al., 1982
C		sandy	sandy moraine					H14CO3							1 1 • 10e3 "	sandy moraine, Sweden	(contact time 1w)	Anderson et al., 1982
C		sandy	sandy moraine					H14CO3							2 6 • 10e3 "	sandy moraine, Sweden	(contact time 5w)	Anderson et al., 1982
C		sandy	sandy moraine					H14CO3							2 2 • 10e3 "	sandy moraine, Sweden	(contact time 6m)	Anderson et al., 1982
C		clay	clayish moraine					H14CO3							1 3 • 10e3 "	clay moraine, Sweden	(contact time 3d)	Anderson et al., 1982
C		clay	clayish moraine					H14CO3							2 0 • 10e3 "	clay moraine, Sweden	(contact time 1w)	Anderson et al., 1982
C		clay	clayish moraine					H14CO3							3 0 • 10e3 "	clay moraine, Sweden	(contact time 5w)	Anderson et al., 1982
C		clay	clayish moraine					H14CO3							2 3 • 10e3 "	clay moraine, Sweden	(contact time 6m)	Anderson et al., 1982
C		sand													6 90	Almassippi, Core 10, Section 1	Pers comm Sections = 3 0 cm thick	Anderson et al., 1982
C		sand													9 24	Almassippi, Core 10, Section 2		Sheppard, 1989
C		sand													4 60	Almassippi, Core 10, Section 3		Sheppard, 1989
C		sand													3 94	Almassippi, Core 10, Section 4		Sheppard, 1989
C		sand													3 96	Almassippi, Core 10, Section 5		Sheppard, 1989
C		sand													7 20	Almassippi, Core 10, Section 6		Sheppard, 1989
C		sand													5 24	Almassippi, Core 10, Section 7		Sheppard, 1989
C		sand													6 69	Almassippi, Core 10, Section 9		Sheppard, 1989
C		sand													7 64	Almassippi, Core 10, Section 10		Sheppard, 1989
C		sand													9 35	Almassippi, Core 10, Section 11		Sheppard, 1989
C		sand													9 47	Almassippi, Core 10, Section 13		Sheppard, 1989
C		sand													9 33	Almassippi, Core 10, Section 15		Sheppard, 1989
C		sand													16 47	Almassippi, Core 10, Section 17		Sheppard, 1989
C		sand													9 80	Almassippi, Core 10, Section 18		Sheppard, 1989
C		sand													5 48	Almassippi, Core 12, Section 1		Sheppard, 1989
C		sand													6 55	Almassippi, Core 12, Section 2		Sheppard, 1989
C		sand													4 68	Almassippi, Core 12, Section 3		Sheppard, 1989
C		sand													3 19	Almassippi, Core 12, Section 4		Sheppard, 1989
C		sand													7 24	Almassippi, Core 12, Section 5		Sheppard, 1989
C		sand													8 39	Almassippi, Core 12, Section 6		Sheppard, 1989
C		sand													7 95	Almassippi, Core 12, Section 7		Sheppard, 1989
C		sand													7 05	Almassippi, Core 12, Section 9		Sheppard, 1989
C		sand													9 72	Almassippi, Core 12, Section 10		Sheppard, 1989
C		sand													5 93	Almassippi, Core 12, Section 11		Sheppard, 1989
C		sand													3 43	Almassippi, Core 12, Section 13		Sheppard, 1989
C		sand													6 53	Almassippi, Core 12, Section 15		Sheppard, 1989
C		sand													7 34	Almassippi, Core 12, Section 17		Sheppard, 1989
C		sand													6 54	Almassippi, Core 12, Section 18		Sheppard, 1989
C		sand													0 25	Milner Ridge, Core 15, Section 9		Sheppard, 1989
C		sand													0 27	Milner Ridge, Core 15, Section 10		Sheppard, 1989
C		sand													0 37	Milner Ridge, Core 15, Section 12		Sheppard, 1989
C		sand													1 00	Milner Ridge, Core 15, Section 13		Sheppard, 1989
C		sand													1 12	Milner Ridge, Core 15, Section 14		Sheppard, 1989
C		sand													3.20	Milner Ridge, Core 15, Section 15		Sheppard, 1989
C		sand													4 37	Milner Ridge, Core 15, Section 16		Sheppard, 1989
C		sand													0 81	Milner Ridge, Core 15, Section 17		Sheppard, 1989
C		sand													1 41	Milner Ridge, Core 15, Section 18		Sheppard, 1989
C		sand													0 86	Milner Ridge, Core 15, Section 19		Sheppard, 1989
C		sand													2 61	Milner Ridge, Core 15, Section 20		Sheppard, 1989
C		sand													0.65	Milner Ridge, Core 20, Section 3		Sheppard, 1989
C		sand													0 53	Milner Ridge, Core 20, Section 9		Sheppard, 1989
C		sand													0 70	Milner Ridge, Core 20, Section 11		Sheppard, 1989
C		sand													1 60	Milner Ridge, Core 20, Section 12		Sheppard, 1989
C		sand													1 32	Milner Ridge, Core 20, Section 13		Sheppard, 1989
C		sand													1 94	Milner Ridge, Core 20, Section 14		Sheppard, 1989
C		sand													1 56	Milner Ridge, Core 20, Section 16		Sheppard, 1989
C		sand													1 66	Milner Ridge, Core 20, Section 17		Sheppard, 1989
C		sand													1 13	Milner Ridge, Core 20, Section 18		Sheppard, 1989
C		sand													4 11	Milner Ridge, Core 20, Section 19		Sheppard, 1989
C		sand													7 03	Milner Ridge, Core 20, Section 20		Sheppard, 1989

TABLE B-8

CERIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ce	139	Sand					1 1	7 0							1000	1 Gleysol	Fig 1	Bunzl & Schimmack, 1988
Ce	139	Org					0 5	6 8							>1000	2 Sapric Histosol-strongly humified		Bunzl & Schimmack, 1988
Ce	139	Sand					?(100)	5 7							1000	3 Cambisol, brown soil from loess		Bunzl & Schimmack, 1988
Ce	139	Sand					?(63)	7 1							1000 10000	4 Cambisol,brown soil		Bunzl & Schimmack, 1988
Ce	139	Sand					?(5)	4.6							<1000	5 Acrisol,parabrown so l,Ah		Bunzl & Schimmack, 1988
Ce	139	Sand					?(23)	4 6							>100	6 Acrisol,parabrown soil,Bl horizon		Bunzl & Schimmack, 1988
Ce	139	Clay						8 0(0 1NCaNo3)		0 7 meq/g					10000-100000	H-Bentonite,Sud Chemie AC Munchen		Bunzl & Schimmack, 1988
Ce	139	Org						6 0(0 1NCaNo3)		2.1 meq/g					1000 10000	P1 Sphag peat,Steinhuder Meer,Hannover		Bunzl & Schimmack, 1988
Ce	139	Org						7 0(0 1NCaNo3)		0 65 meq/g					>10000	P2 Sphag peat,Konig morf,Bavaria		Bunzl & Schimmack, 1988
Ce	144	SRP burial ground						3 95							100 (1)	SRP (burial ground)	SRP - Savannah River Plant (burial ground)	Hoeffner, 1985
Ce	144	SRP burial ground						4 12							97 (2)	SRP (burial ground)	Tab 7	Hoeffner, 1985
Ce	144	SRP burial ground						....							75 (4)	SRP (burial ground)	( ) - in Kd col = equil time in days	Hoeffner, 1985
Ce	144	SRP burial ground						4 29							40 (7)	SRP (burial ground)		Hoeffner, 1985
Ce	141		59 7	28 4	12 0		0 2	6 7 CaCl2		8 7					620 25400	Alfisol, parabrown earth (0 30 cm) (Ap horizon)	Kd (log N) (mean 4700)	Bunzl et al., 1985
Ce	139		80	17	3		0	3 7 CaCl2							316 (170 740)			Schimmack et al., 1987
Ce	141	Ap				1.19		8 3 (solution)		16 4					>10000	Auenrendzina (Biblis) (0 22 cm)		Bunzl et al., 1984
Ce	141	C				1 15		8 3 (solution)		17 7					>10000	Auenrendzina (Biblis) (22 30 cm)		Bunzl et al., 1984
Ce	141	Cc				1.01		8 2 (solution)		16 2					>10000	Auenrendzina (Biblis) (30 47 cm)		Bunzl et al., 1984
Ce	141	fG-Cc				0 25		8 1 (solution)		8 5					>10000	Auenrendzina (Biblis) (47 90 cm)		Bunzl et al., 1984
Ce	141	2fGr				0 14		8 2 (solution)		6 4					>10000	Auenrendzina (Biblis) (90 128 cm)		Bunzl et al., 1984
Ce	141	3Gr				0.02		8 2 (solution)		0 7					>1000	Auenrendzina (Biblis) (128 132 cm)		Bunzl et al., 1984
Ce	141	Ap				2 41		7 3 (solution)		8 7					>10000	Parabrown (Escheweiler) (0 31 cm)		Bunzl et al., 1984
Ce	141	Al				0.71		7 4 (solution)		9 5					>10000	Parabrown (Escheweiler) (31-52 cm)		Bunzl et al., 1984
Ce	141	BtAl				0 34		7 2 (solution)		8 3					>10000	Parabrown (Escheweiler) (52-62 cm)		Bunzl et al., 1984
Ce	141	AlBt				0 30		6 8 (solution)		8 3					>10000	Parabrown (Escheweiler) (62 73 cm)		Bunzl et al., 1984
Ce	141	Bt1				0 30		6 7 (solution)		12 5					>10000	Parabrown (Escheweiler) (73 89 cm)		Bunzl et al., 1984
Ce	141	Bt2				0 25		6 2 (solution)		13 2					>10000	Parabrown (Escheweiler) (>89 cm)		Bunzl et al., 1984
Ce	141	heavy clay		15	85			8 2 (7 3 -- 2)		26 -- 2					12000 -- 1000	Loviisa savi Finland (9 04 9 11 m)	(Tab 13 : Ce Kd - pH)	Nikula, 1982
Ce	141	heavy clay		11	89			8 4 (7 1 -- 1)		21 -- 2					15000 -- 1000	Olkiluotu savi, Finland (2 09-2 15 m)	pH in tab 13 - ( ) in pH column	Nikula, 1982
Ce	141	heavy clay		32	68			8 0 (7 2 -- 1)		25 -- 1					27000 -- 5000	Salo savi, Finland (6 28-6.35 m)	(ON = Sr-Cs-Co-Mn-Zn)	Nikula, 1982
Ce	141	silty clay loam		62	38			7 0 (7 3 -- 1)		17 -- 1					12000 -- 2000	Jamsa savi, Finland (2 24 3 31 m)	in finnish with english summary	Nikula, 1982
Ce	141	loamy sand	79	21				6 4 (7 0 -- 1)		2 8 -- 27					2000 -- 700	Loviisa moseen, Finland (4 00 m)	(Fig 8 = Ce Kd vs CEC)	Nikula, 1982
Ce	141	sandy loam	65	35				6 4 (7 2 -- 1)		3 2 -- 2					1200 -- 300	Olkiluoto moseen Finland (1 5 m)		Nikula, 1982
Ce	141	loamy sand	73	27				6 8 (7 6 -- 1)		2 1 -- 3					970 -- 140	Juuka moseen Finland (3 5-4 0 m)		Nikula, 1982
Ce	141	sandy loam	66	34				6.2 (7 0 -- 1)		2 3 -- 3					2700 -- 900	Partala moseen, Finland (2 2-2 5 m)		Nikula, 1982
Ce	141	loam	41	37	22			9 7 (8 4 -- 1)		18 -- 5					13000 -- 3000	Kakola kalliosavi Finland (44 m)		Nikula, 1982
Ce	141	sandy loam	57	29	14			9.9 (8 1 -- 1)		40 -- 4					56000 -- 24000	Metsaaro kalliosavi, Finland (24 m)		Nikula, 1982
																		Nikula, 1982
																		Nikula, 1982
Ce		sandy subsoil												10E-4MNO3	1100		(O N = Sr, Cs, Ru)	Schwarzer et al., 1982

TABLE B-9

CESIUM K_d VALUES

NUC.	ISO	SOIL type	% SAND	% SILT	% CLAY	% RC	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cs		sand	74	3	23			5.60	(5.43)							404.8	SE coastal plain, sandy clay loam, (SP #3)	(tab.1: soil properties)(tab 4: hydraulic conductivity)	Eichholz and Whang, 1987
Cs		sand	74	3	23			5.60	(5.36)							416.7	SE coastal plain, sandy clay loam, (SP #3)	(pH in ( )= final pH)(tab 5: transport parameters + Kd)	Eichholz and Whang, 1987
Cs		sand	74	3	23			5.60	(5.36)							401.7	SE coastal plain, sandy clay loam, (SP #3)		Eichholz and Whang, 1987
Cs	137	silt														3021	sandy soil with fine silt	(tab.3)	Ohnuki and Wadachi, 1983
Cs	137	clay						6.0		+200 mV						7500	glacial till	(Cs-137)	Bell and Bates, 1988
Cs	137	sand						6.0		+200 mV						3890	fine-coarse sand (C1 2)	(tab.1 = GW composition) GW=groundwater	Bell and Bates, 1988
Cs	137	sand						6.0		+200 mV						2600	med-coarse sand (C3)	(tab.2 = soil description)	Bell and Bates, 1988
Cs	137	sand						6.0		+200 mV						2800	coarse sand (C6)	(good conclusions) (tab.4=Kd's)	Bell and Bates, 1988
Cs	137	sand						6.0		+200 mV						1700	medium sand	(tab.3 = activities (Bq))	Bell and Bates, 1988
Cs	134	clay														~37	>2 um size	clay smectite	Carlsen and Bo, 1982
Cs	134	clay														6.3 • 10e3	<2 um size	(Cs-134) (p 101) = DIFFICULT =	Carlsen and Bo, 1982
Cs		clay						8.6			0.7 meq/g		(0.1 N Ca nitrate)			>10e5 (log)	B-bentonite, Sud-Chemie, AC Munchen (montmorillonite 50% and 10% kaolinite)	(? log=Kd)	Bunzl and Schimmack, 1988
Cs		loamy sand					1.1	7.0(base satu)								10e3-10e5 (log)	1 Cleysol, permanent grassland		Bunzl and Schimmack, 1988
Cs		loamy peat					0.5	6.8(base satu)								10e3-10e5 (log)	2 Peat land (saoric Histosol), stongly humified	(fig. 4+5) also ar	Bunzl and Schimmack, 1988
Cs		sandy loam						5.7(base satu)								10e3-10e5 (log)	3 Cambisol, brown soil from loess		Bunzl and Schimmack, 1988
Cs		sandy loam						7.1(base satu)								10e3-10e5 (log)	4 Cambisol,brown soil		Bunzl and Schimmack, 1988
Cs		loamy sand						4.6(base satu)								10e3-10e5 (log)	5 Acrisol, parabrown soil, Ah		Bunzl and Schimmack, 1988
Cs		loamy sand						4.8(base satu)								10e3-10e5 (log)	6 Acrisol, parabrown soil, B-horizon		Bunzl and Schimmack, 1988
Cs		fibric organic						6.0			2.1 meq/g		(0.1N CaNO3)			>10 log	P1, Sphag peat (high moor), Steinhuder Meer, Hannover 0.36% ash	(P1 and P2 = slightly decomposed, shredded 0.3-0.8 mm)	Bunzl and Schimmack, 1988
Cs		fibric organic						7.0			0.65 meq/g		(0.1N CaNO3)			>10 log	P2, Sphag peat (high moor),Konigsdorf,Bavaria, 1.0% ash	(1-6) 0-20 cm and seived to 2mm, Freising, Bavaria	Bunzl and Schimmack, 1988
Cs		clay						5.10					.002 M NaCl			1000	Montmorillonite clay, Bellefourche S D		Gee et al., 1983
Cs		clay						5-10					.01 M NaCl			1000		(Kd = from fig 2 p.208)	Gee et al., 1983
Cs		clay						5-10					.1 M NaCl			100		(better to refer to Relyea & Silva, 1981 PNL-3890, Fig.2)	Gee et al., 1983
Cs		clay						5-10					1.0 M NaCl			>10			Gee et al., 1983
Cs	137	peat						4.0								.02 • 10e4 -- .005	(1 day) (6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.029 • 10e4 -- .006	(4 day) (6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.012 • 10e4 -- .003	(8 day) (6-8 cm) Lefgrens Bog, NY	(tab.5c) (Cs-137) (Kd)	Schell et al., 1985
Cs	137	peat						4.0									(11 day) (6-8 cm) Lefgrens Bog, NY	(tab.8 = comparison - Sibley, 1982)	Schell et al., 1985
Cs	137	peat						4.0								.04 • 10e4 -- .008	(15 day) (6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.05 • 10e4 -- .009	(30 day) (6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.017 • 10e4 -- .003	(1 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.006 • 10e4 -- .002	(4 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0									(8 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.027 • 10e4 -- .005	(11 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.02 • 10e4 -- .004	(15 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								.007 • 10e4 -- .002	(30 day) (20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Cs	137	peat						4.0								2.9 • 10e4 -- .65	(1 day) (6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								3.6 • 10e4 -- .79	(4 day) (6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								4.1 • 10e4 -- .91	(8 day) (6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								10.? • 10e4 -- 3.9	(15 day) (6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								14.5 • 10e4 -- 4.2	(30 day) (6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								1.0 • 10e4 -- .2	(1 day) (20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								1.1 • 10e4 -- .2	(4 day) (20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								1.9 • 10e4 -- .41	(8 day) (20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								1.1 • 10e4 -- .22	(15 day) (20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	peat						4.0								1.4 • 10e4 -- .3	(30 day) (20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Cs	137	SRP						3.95								>1250 (1d)	SRP soil = Savannah River Plant		Hoeffner, 1985
Cs	137	SRP						4.12								>1250 (2d)	SRP soil = Savannah River Plant	( ) = Equil. time days in Kd column	Hoeffner, 1985
Cs	137	SRP														>1250 (4d)	SRP soil = Savannah River Plant	(tab.7) (p 43) == see Co ==	Hoeffner, 1985
Cs	137	SRP						4.29								>1250 (7d)	SRP soil = Savannah River Plant		Hoeffner, 1985
Cs	134	SRP						3.95								>500 (1d)	SRP soil = Savannah River Plant		Hoeffner, 1985
Cs	134	SRP						4.12								>500 (2d)	SRP soil = Savannah River Plant		Hoeffner, 1985
Cs	134	SRP														>500 (4d)	SRP soil = Savannah River Plant		Hoeffner, 1985

continued...

TABLE B-9 (continued)

NUC	IS#	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cs	134	SRP						4.29							>500 (7d)	SRP soil - Savannah River Plant		Hoeffner, 1985
Cs								2.10						5 × 10E-4 M	>10 >100 log	SRP soil : Savannah River Plant	(1=Cs conc)	Hoeffner, 1985
Cs								2-8						5 × 10E-6 M	>10-<1000 log	SRP soil : Savannah River Plant		Hoeffner, 1985
Cs								2-8						5 × 10E-8 M	>100 >1000 log	SRP soil : Savannah River Plant		Hoeffner, 1985
Cs								5.2-5.4							410	normal GW* (GW pH : 5.2-5.4)	*GW : groundwater	Hoeffner, 1985
Cs								5.2-5.4							170	GW + 25 ppm K		Hoeffner, 1985
Cs								5.2-5.4							105	GW + 50 ppm K	(fig 14, p 51 - pH-Kd-conc	Hoeffner, 1985
Cs								5.2-5.4							90	GW + 57 ppm K	Cs sorption very dependent on pH	Hoeffner, 1985
Cs								5.2-5.4							370	GW + 40 ppm Ca		Hoeffner, 1985
Cs								5.2-5.4							300	GW + 30 ppm Mg	(tab 15 p 53)	Hoeffner, 1985
Cs								4.6							160	GW + 85 ppm Fe		Hoeffner, 1985
Cs								4.6							327	Cs only		Hoeffner, 1985
Cs								5.2-5.4							420	Cs + 25 ppm Na		Hoeffner, 1985
Cs								5.6							540	GW + 70 ppm carbonates		Hoeffner, 1985
Cs								5.2-5.4							3200	Deionized water		Hoeffner, 1985
Cs								5.2-5.4							920	Deionized water + 2.3 ppm K		Hoeffner, 1985
Cs		A4	29.7	40.2	17.5	0.17	39	7.81 (8.50)		5.3		CaCl2			3529 (tab 6)	upper Oxidized till		Johnston et al., 1985 (Cherry)
Cs		A8	32.6	34.2	14.6	0.2	43	7.99 (8.60)		3.4		CaCl2			1557 (tab 6)	upper Oxidized till		Johnston et al., 1985 (Cherry)
Cs		DE	28.4	38.2	22.2	0.29	43	7.89 (8.45		6.2		CaCl2			17026 (tab 6)	upper Oxidized till	tab 6	Johnston et al., 1985 (Cherry)
Cs		A12	37.5	35.8	11.9	0.21	44	8.08 (8.78)		2.5		CaCl2			591 (tab 6)	lower Unweathered till	tab 7	Johnston et al., 1985 (Cherry)
Cs		A23	32.8	32.0	13.3	0.20	46	8.08 (8.82)		2.9		CaCl2			611 (tab 6)	lower Unweathered till	good conclusions	Johnston et al., 1985 (Cherry)
Cs		A32	36.1	35.8	10.6	0.10	45	8.14 (8.90)		2.0		CaCl2			692 (tab 6)	lower Unweathered till	pH col : soil paste pH in CaCl2 and (H2O) in brackets	Johnston et al., 1985 (Cherry)
Cs		A38	35.7	31.2	9.1	0.18	23	8.20 (8.98)		2.2		CaCl2			751 (tab 6)	lower Unweathered till	% organic : % carbonate content : Tab.1	Johnston et al., 1985 (Cherry)
Cs		D14	37.8	36.9	11.1	0.27	39	8.10 (8.70)		3.1		CaCl2			1248 (tab 6)	lower Unweathered till	tab 1 = % sand, silt, clay = <100%	Johnston et al., 1985 (Cherry)
Cs		D23	36.6	41.8	8.7	0.24	44	8.18 (8.92)		2.1		CaCl2			1000 (tab 6)	lower Unweathered till	tab 2 = chem prop	Johnston et al., 1985 (Cherry)
Cs		D28	37.8	38.7	11.4	0.23	42	8.30 (8.93)		2.1		CaCl2			1019 (tab 6)	lower Unweathered till	tab 3 : GW +/_, lab & field pH	Johnston et al., 1985 (Cherry)
Cs		D33	36.9	37.7	11.1	0.16	48	8.30 (8.95)		2.0		CaCl2			853 (tab 6)	lower Unweathered till		Johnston et al., 1985 (Cherry)
Cs		D38	36.3	34.5	4.8	0.11	51	8.31 (9.02		6.3		CaCl2			1180 (tab 6)	lower Unweathered till		Johnston et al., 1985 (Cherry)
Cs		B2-26	—	----	-----	0.17	41	7.75 (8.69)		0.8		CaCl2			283 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		C7 22	—	----	-----	0.23	52	7.92 (8.54)		0.8		CaCl2			594 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		C8	—	----	-----	0.13	65	8.23 (8.82)		0.9		CaCl2			372 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		C10	—	----	-----	0.15	58	8.28 8.75		0.9		CaCl2			85 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		C12	—	----	-----	0.19	56	8.05 8.70		0.7		CaCl2			166 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		Q17	—	----	-----	0.16	61	8.14 8.72		0.8		CaCl2			332 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		W22	—	----	-----	0.22	21	8.15 ___		0.9		CaCl2			303 (tab 7)	sand		Johnston et al., 1985 (Cherry)
Cs		clay = Na-bentonite														Resadiye, Turkey	(p 296=adsorption primarily a surface phenomenum)	Ertsen et al.,1988
Cs		clay = Ca-bentonite														Giresun, Turkey	(fig.2=size) (tab.2,3=anion/cation conc.) Conclusions.	Ertsen et al.,1988
Cs		clay = kaolinite														Mihaliccik, Turkey	(tab.4 = 13 elements in 4 clays)	Ertsen et al.,1988
Cs		clay = kaolinite-alunite														Sindirgi, Turkey	(p 270-intro) (tab.1=Cs conc's)	Ertsen et al.,1988
Cs		clay = kaolinite														Kure, Turkey	(4 days to equilibrate) Kd-part size(um) fig 9,11,12,13))	Ertsen et al.,1988
Cs		Fuquay loamy sand													no Kd	(Ap-horizon) Barnwell	(tab 1=chem + physical pr)	Essington et al., 1981
Cs		Fayette silt loam													no Kd	(Ap-horizon) Illinois	(tab 4 = %sorption = Pu,Am,U,Cs)	Essington et al., 1981
Cs		Cecil loam													no Kd	(B-horizon) clayey		Essington et al., 1981
Cs		Puye sandy loam													no Kd	(C-horizon)		Essington et al., 1981
Cs	137	Ap-horizon	50.7	28.4	12.0	C=2.4	0.2	6.7		8.7		CaCl2			(5200-16500)	Alfisol (Parabraun earth) (0-30 cm)	(tab 3 = Kd) (tab 1 = soil prop) (tab 7 = %c, CEC, pH, by horizon)(Kd= log N)(Kd av = 8900)	Bunzl et al., 1985
Cs	137	Synthetic mordenite + Brine A						6.7							27		(tab 3) (illite from Silver Falls, Montana)	Nowak, 1980
Cs	137	Synthetic mordenite + 1% A						7.3							12000		Synthetic mordenite = Norton Zeolon 900	Nowak, 1980
Cs	137	Synthetic mordenite + Brine B						6.6							74			Nowak, 1980
Cs	137	Synthetic illite + Brine B						5.6							115			Nowak, 1980
Cs		sand	89	3	8										3300 (4300)	Beatty 1, Nevada	(tab 1: Kd- mineral phase char.)	Neiheisel, 1983
Cs		sand	91	2	7										4500	Beatty 2, Nevada	tab2=relationship-texture surf area & clay mineral compos	Neiheisel, 1983
Cs		sand	83	2	15										8200	Beatty 5, Nevada	tab 3- soil text & mineral compos	Neiheisel, 1983
Cs		clayey sand	58	6	36										2500	Barnwell 4, South Carolina	tab 4: Kd- F radionuclide	Neiheisel, 1983
Cs		clayey sand	66	11	21										3100	Barnwell 12, South Carolina	(fig 6- text diagram)(fig 7- Kd vs sorptive minerals)	Neiheisel, 1983
Cs		clayey sand	73	8	19										1500 (900)	Barnwell 14, South Carolina		Neiheisel, 1983

continued...

TABLE B-9 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% OC	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cs															↑		(Fig.1,2 = Kd vs Cs conc) Many fancy formulas	Bunzl and Schultz, 1985
																	two soils = bentonite and humic	Bunzl and Schultz, 1985
																		Bunzl and Schultz, 1985
Cs		organic LFH-Ah						5 2		81 2cmol/kg					45 8 (--)	0-4 cm	Kd column: leachate = no ( ) GW = ( )	Sheppard et al., 1987
Cs		sand Ae						5 1		2 9cmol/kg					32 4 (0 3)	4-15 cm	CEC = cmol/kg	Sheppard et al., 1987
Cs		sand - Bf-Bfgj						5 2		2 1cmol/kg					17 2 (-)	15-45 cm		Sheppard et al., 1987
Cs		sand C-Cgj						6 2		1 7cmol/kg					6.5 (1 5)	>45 cm		Sheppard et al., 1987
Cs	137	loamy sand	80	17	2			3 7		125 mekg 1		CaCl2			3100 (9 5-10500)		Kd column:( ): Kd range, (Cs-137)	Schimmack et al., 1987
Cs																	tab 1 = soil prop. tab 2 = Kd	Schimmack et al., 1987
Cs	137	O				--		3 7		.					350	(0 cm) (C-I-K) Ranker (Irebel), FRC		Bachhuber et al., 1982
Cs	137	Ah				1 7		3 7		8 9					120	(4 cm) (C-I-K) Ranker (Irebel), FRC	Tab 1 = soil prop.	Bachhuber et al., 1982
Cs	137	C				3 4		4 3		2 6					840	(15 cm) (C-I-K) Ranker (Irebel), FRC	C = chlorite, I = illite, K = kaolinite	Bachhuber et al., 1982
Cs	137	U						4 0							370	(0 cm) (C-I-K) Podsol (Gorleben), FRC	M = montmorillonite	Bachhuber et al., 1982
Cs	137	Ah				1̄ 9		3 5		7̄ 8					70	(3 cm) (C-I-K) Podsol (Gorleben), FRC	tab.2 = Kd - pH	Bachhuber et al., 1982
Cs	137	E				2 1		4 3		5 8					90	(23 cm) (C-I-K) Podsol (Gorleben), FRC	tab 3 = water vel., Ds = Dispersion length	Bachhuber et al., 1982
Cs	137	Bh,fe				4 3		3 9		30 ?					14	(27 cm) (C-I-K) Podsol (Gorleben), FRC	tab 4 = retardation factors	Bachhuber et al., 1982
Cs	137	Bfe				1 6		4 0		4 8					120	(32 cm) (C-I-K) Podsol (Gorleben), FRC	tab.5 = migration rates	Bachhuber et al., 1982
Cs	137	BC				0.2		4 6		2 6					700	(42 cm) (C-I-K) Podsol (Gorleben), FRC	Fig.2 = breakthrough curves	Bachhuber et al., 1982
Cs	137	C						4 5							1070	(100 cm) (C-I-K) Podsol (Gorleben), FRC	Fig.1 = sorption isotherm	Bachhuber et al., 1982
Cs	137	Ah				2̄ 4		4 4		7̄ 8					60	(0 cm)(C-I-K-M) Brown (Brunkendorf)	Fig 3 = time intervals	Bachhuber et al., 1982
Cs	137	Bv				0 3		4 5		3 0					200	(9 cm)(C-I-K-M) Brown (Brunkendorf)	Fig 6 = comparisions of batch, column and fallout Kd's	Bachhuber et al., 1982
Cs	137	BC				.05		4 6		4 7					360	(48 cm)(C-I-K-M) Brown (Brunkendorf)	X-reference #41-44	Bachhuber et al., 1982
Cs	137	C				--		6 3							390	(95 cm)(C-I-K M) Brown (Brunkendorf)		Bachhuber et al., 1982
Cs	137	Ap				19		8 3 (solution)		16̄ 4					>10000	(0 27 cm) Auenrendzina (Biblis)	(tab 1)	Bunzl et al., 1984
Cs	137	C				15		8.3 (solution)		17 7					>10000	(22-30 cm) Auenrendzina (Biblis)	Fig.1,2 = Kd-soil horizon	Bunzl et al., 1984
Cs	137	Cc				01		8 2 (solution)		16 2					>10000	(30-47 cm) Auenrendzina (Biblis)	Fig 3 = Kd vs Ca + Na ions	Bunzl et al., 1984
Cs	137	fCrCc				25		8 1 (solution)		8 5					100000	(47-90 cm) Auenrendzina (Biblis)	Fig 4 = Kd-comparison column + batch	Bunzl et al., 1984
Cs	137	2fCr				14		8 2 (solution)		6 4					10000	(90-128 cm) Auenrendzina (Biblis)	Fig 5 = Kd - 6 soils (A-horiz)	Bunzl et al., 1984
Cs	137	3Cr				.02		8 2 (solution)		0 7					>1000	(128-132 cm) Auenrendzina (Biblis)	Fig 6 = Kd - 5 soils (1 0 m)	Bunzl et al., 1984
Cs	137	Ap				41		7 3 (solution)		8 7					<10000	(0-31 cm) Parabrown (Eschweiler)	Abstract	Bunzl et al., 1984
Cs	137	Al				.71		7 4 (solution)		9 5					>10000	(31-52 cm) Parabrown (Eschweiler)		Bunzl et al., 1984
Cs	137	BtAl				.34		7.2 (solution)		8 3					>10000	(52-62 cm) Parabrown (Eschweiler)		Bunzl et al., 1984
Cs	137	AlBt				30		6 8 (solution)		8 3					>10000	(62-73 cm) 0309/Parabrown (Eschweiler)		Bunzl et al., 1984
Cs	137	Bt1				.30		6.7 (solution)		12 5					>10000	(73-88 cm) Parabrown (Eschweiler)		Bunzl et al., 1984
Cs	137	Bt2				.25		6 2 (solution)		13 2					<100000	(>88 cm) Parabrown (Eschweiler)		Bunzl et al., 1984
Cs	+	red-brown clayey						5 4 +- 0 7							AV = 3 3 e3	Chestnut Ridge, ORNL	(Cs +) (tab 18)	Seeley and Kelmers, 1984
															(H = 1 1 E4)		(O N. = U-Sr-Co-Eu-Th-Tc-I)	Seeley and Kelmers, 1984
															(L = 1 1 E2)		RS-5 mg Cs/L = conc Report has 100s of Kds	Seeley and Kelmers, 1984
Cs	134	Heavy clay		15	85			8 2(7 5+- 2)		26+-2					4700+-300	Loviisa Savi, Finland (9 04 - 9 11 m)	(Tab.1=soil prop + pH)	Nikula, 1982
Cs	134	Heavy clay		19	81			8 2(7 4+- 2)							4400+-100	Loviisa Savi, Finland (9 73 - 9 80 m)	(Tab 9: Sr Kd + pH) (pH in Tab 9 - ( ) in pH column)	Nikula, 1982
Cs	134	Heavy clay		11	89			8 4(7 4+- 1)		71+-2					1400+-30	Olkiluoto Savi, Finland (2 08 2 15 m)	(O N = Sr,Co,,Mn,Zn,Ce) Tab 7=CEC Tab 2=soil prop	Nikula, 1982
Cs	134	Heavy clay		32	68			8 3(7 4+-.1)		5.7+-2					600+-40	Olkiluoto Savi, Finland (2 49 2 56 m)	Finnish with English summary Fig.11 = Cs Kd vs Rf	Nikula, 1982
Cs	134	Heavy clay		32	68			8 0(7 5+- 2)		25+-1					18000+-3000	Salo Savi, Finland (6 28 - 6 35 m)	Fig 2 = Cs Kd vs NaCl Fig. 5 = Cs Kd vs Cs conc.	Nikula, 1982
Cs	134	Silty clay loam		62	38			7.0(7 4+- 2)		17+-5					6000+-400	Jamsa Savi, Finland (2 24 - 3 31 m)	Fig 7 = Cs Kd vs pH Fig.13 = Cs Kd vs Rf	Nikula, 1982
Cs	134	Loamy sand	79	21	79			6 4(7 0+- 1)		2 8+-.2					560+-20	Loviisa moreeni, Finland (4 m)	(pH in ( ) = Kd function of pH from Tab 19)	Nikula, 1982
Cs	134	Sandy loam	65	35	65			6 4 2+-.2)		3 2+-.2					2100+-100	Olkiluoto moree , Finland (1 5 m)		Nikula, 1982
Cs	134	Loamy sand	73	27	73			6 0(5+-.2)		2 1+-.3					200+-10	Juuka moreeni, Finland (3 5 - 4 0 m)		Nikula, 1982
Cs	134	Sandy loam	66	34	66			6 2(6 9+- 1)		2 3+- 3					560+-60	Partala moreeni, Finland (2.2 -2 5 m)		Nikula, 1982
Cs	134	Loam	41	37	22			9 7(8.7+- 2)		18+- 5					3600+-800	Kakola Kalliosavi, Finland (44 m)		Nikula, 1982
Cs	134	Sandy loam	57	29	14			9 9(8.5+- 1)		40+-4					970+ 90	Metsaara kalliosavi, Finland (24 m)		Nikula, 1982
Cs	134											01M NaCl			1300+-300	Olkiluodon sediment	Tab 14 = Sr + Cs Kd = NaCl (M) Olkiluodon sediment	Nikula, 1982
Cs	134											08M NaCl			380+-30	Olkiluodon sediment		Nikula, 1982
Cs	134											5 M NaCl			180+-10	Olkiluodon sediment		Nikula, 1982
Cs	134											1.0 M NaCl			140+-10	Olkiluodon sediment		Nikula, 1982
Cs	134											01M NaCl			3600+-300	Loviisan sediment	Tab.15 = Sr + Cs Kd = NaCl (M) Loviisan sediment	Nikula, 1982
Cs	134											05M NaCl			2800+-200	Loviisan sediment		Nikula, 1982

continued...

TABLE B-9 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cs	134											1 M NaCl			2100+-200	Lovisan sediment		Nikula, 1982
Cs	134											4 M NaCl			1000+-100	Lovisan sediment		Nikula, 1982
Cs	134													3.0x10E-7M Cs	29000+-6000	Salon savessa	Tab 17 : Cs conc. v Kd Salon savessa	Nikula, 1982
Cs	134													3.1x10E-7M Cs	23000+-6000	Salon savessa	Tab 19 : Cs Kd v pH - Lovisan savessa	Nikula, 1982
Cs	134													4.0x10E-7M Cs	20000+-3000	Salon savessa		Nikula, 1982
Cs	134													1.3x10E-6M Cs	18000+-3000	Salon savessa		Nikula, 1982
Cs	134													1.0x10E-5M Cs	1300+-100	Salon savessa		Nikula, 1982
Cs	134													1.0x10E-4M Cs	720+-10	Salon savessa		Nikula, 1982
Cs	134													1.0x10E-3M Cs	76+-2	Salon savessa		Nikula, 1982
Cs	134							(3.6)							800+-130	Lovisan savessa, Finland	(Tab 19 : Cs Kd v pH Lovisan savessa)	Nikula, 1982
Cs	134							(4.7)							810+-40	Lovisan savessa, Finland	(pH in ( ) : Kd function of pH from Tab 19)	Nikula, 1982
Cs	134							(5.6)							890+-10	Lovisan savessa, Finland		Nikula, 1982
Cs	134							(6.4)							990+-130	Lovisan savessa, Finland		Nikula, 1982
Cs	134							(7.1)							1040+-100	Lovisan savessa, Finland		Nikula, 1982
Cs	134							(7.2)							1120+-40	Lovisan savessa, Finland		Nikula, 1982
Cs	134							(8.1)							1780+-40	Lovisan savessa, Finland		Nikula, 1982
Cs	134							(8.9)							1330+-90	Lovisan savessa, Finland		Nikula, 1982
Cs	137	Loam	45.0	35.0	20.0	3.0		7.7 (in H2O)		30.9					13310	Facolta (F), Po Valley, Italy	Conc =378 33uCi/mg - same conc. for other nuclides	Carini et al., 1985
Cs	137	Sandy loam	70.0	20.0	10.0	2.5		6.0 (in H2O)		7.2					1405	Vercelli (V), Po Valley, Italy	(O.N = Co,Mn,Fe,I) Tab 1 = soil prop	Carini et al., 1985
Cs	137	Sandy Loam	74.2	14.0	11.8	1.94		7.8 (in H2O)		6.3					2971	Carpaneto (C), Po Valley, Italy	Tab 3 = Kd = 72 hour	Carini et al., 1985
Cs	137	Clay loam	36.3	27.5	36.2	2.8		7.8 (in H2O)		37.3					19314	Villanova (Vi), Po Valley, Italy		Carini et al., 1985
Cs	137	Clay loam	31.4	36.2	32.4	3.5		7.7 (in H2O)		39.3					[illegible]	Sarmato (S), Po Valley, Italy		Carini et al., 1985
Cs	137	Sandy loam	56.1	27.5	16.4	1.34		7.9 (in H2O)		15.0					5031	Monticelli (M), Po Valley, Italy		Carini et al., 1985
Cs	137	Sandy loam	64.0	23.5	12.5	1.21		6.8 (in H2O)		4.4					901.3	5 Po Valley, Italy		Carini et al., 1985
Cs	137	Clay loam	32.5	30.0	37.5	4.96		7.6 (in H2O)		35.4					13889	15 Po Valley, Italy		Carini et al., 1985
Cs	137	Clay loam	39.5	27.0	33.5	2.54		7.9 (in H2O)		24.1					14116	17 Po Valley, Italy		Carini et al., 1985
Cs	137	Clay loam	31.5	29.0	39.5	2.91		7.7 (in H2O)		33.5					16212	19 Po Valley, Italy		Carini et al., 1985
Cs	137	Clay loam	37.0	32.0	31.0	1.94		6.4 (in H2O)		24.5					1427	41 Po Valley, Italy		Carini et al., 1985
Cs	137	Sand	88.5	6.2	5.3	1.54		7.5 (in H2O)		7.1					789.7	55 Po Valley, Italy		Carini et al., 1985
Cs	137	Loam	31.0	44.0	25.0	2.68		7.9 (in H2O)		22.6					7206	61 Po Valley, Italy		Carini et al., 1985
Cs	137	Sandy clay loam	50.5	19.5	30.0	4.08		6.4 (in H2O)		25.8					2288	65 Po Valley, Italy		Carini et al., 1985
Cs	137	Sandy loam	59.0	22.0	19.0	1.67		6.0 (in H2O)		13.5					1736	73 Po Valley, Italy		Carini et al., 1985
Cs	137	Loam	42.5	43.5	14.0	1.67		7.8 (in H2O)		23.2					61287	77 Po Valley, Italy		Carini et al., 1985
Cs	137	Loam	43.0	27.5	29.5	6.3		7.1 (in H2O)		34.9					8538	81 Po Valley, Italy		Carini et al., 1985
Cs	137	Clay	24.5	24.5	51.0	3.85		7.5 (in H2O)		35.1					11521	93 Po Valley, Italy		Carini et al., 1985
Cs	137	Sandy subsoil												10E-4M HNO3	25	Gorleben site, FRG	(O.N = Sr,Ce,Ru)(Fig 3&4:Kd vs HNO3-HAW sol.) (Kd vals from Fig 3 & R210/4) 5 formulas (Fig 5 = adsorp. + desorp. Kds) NUFIS code	Schwarzer et al., 1982
Cs	137	Sand								(11.3)					500	A	(Tab 2: soil type; Tab 5: CEC + Kd) (in JAP)	Inoue & Morisawa, 1976
Cs	137	Silt-clay								(241.7)					2900	B	CEC = ( ) - meq/g 9 Tab. 2 Fig	Inoue & Morisawa, 1976
Cs	137	Silt-clay								(55.6)					2500	C	(O.N = Sr,Co,Mn,Zn,Ag,Fe,Mo)	Inoue & Morisawa, 1976
Cs	137	Gravel-sand								(69.5)					3000	D		Inoue & Morisawa, 1976
Cs	137	Silt-clay								(167.9)					5000	E		Inoue & Morisawa, 1976
Cs	137	Silt-sand								(47.8)					1700	F		Inoue & Morisawa, 1976
Cs	137	Gravel								(28.9)					1000	G		Inoue & Morisawa, 1976
Cs	137	Silt clay								(117.9)					300	H		Inoue & Morisawa, 1976
Cs	137	Silt-clay								(140.5)					1000	I		Inoue & Morisawa, 1976
Cs	137	Silt-clay								(246.0)					7000	J		Inoue & Morisawa, 1976
Cs	137	Fine sand								(60.3)					200	K		Inoue & Morisawa, 1976
Cs	137	Silt								(149.0)					8000	L		Inoue & Morisawa, 1976
Cs	137	Sand								(24.3)					1500	M		Inoue & Morisawa, 1976
Cs	137	Gravel								(27.1)					300	N		Inoue & Morisawa, 1976
Cs	137	Fine sand								(122.8)					3000	O		Inoue & Morisawa, 1976
Cs	137	Fine sand								(38.6)					1500	P		Inoue & Morisawa, 1976
Cs	137	Silt-clay								(200.1)					2000	Q		Inoue & Morisawa, 1976
Cs		Smectite clay						7.5 7.8						3x10E-7mMol/L	1100+-24	60 degrees C, Core LL44-GPC-3 Pacific Ocean, depth= 5821m	(Batch) (Tab 1 - Kd vs temp degrees C)	Kenna, 1980

continued...

TABLE B-9 (concluded)

NUC.	IS#	SOIL type	% SAND	% SILT	% CLAY	% O.C	% CaCO3	pH SAT. PASTE	EH (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cs		Smectite clay						7 5 - 7.8						3x10E-7mMol/L	343 10	20 degrees C, Core LL44-CFC-2 Pacific Ocean, depth= 5821m	Smectite subseabed clay	Kenna, 1980
Cs		LFH-Ah						5		81.2cmol/kg					- (0 4' -2 77)	0-4 cm Gleyed Dystric Brunisol	Pers. comm (0 N - I, Cr, Tc, U, Th, Mo, Np)	Sheppard, 1989
Cs		Ae						5.1		2 9cmol/kg					173 7--2 8 0 75--1 04)	4-15 cm Gleyed Dystric Brunisol	Kd= Leach = no ( ). Kd: GW: ( ).	Sheppard, 1989
Cs		Bfj-Bfjgj						5.2		2 1cmol/kg					50 9--0 6(0 20--1 52)	15-45 cm Gleyed Dystric Brunisol	soil type, pH, CEC, soil desc. from BLC-1Y (JE016(3)).	Sheppard, 1989
Cs		C-Cgj						6 2		1 7cmol/kg					14 2--1 3(0 34- 1 42)	>45 cm Gleyed Dystric Brunisol		Sheppard, 1989
Cs		Sand	100	-	-	0 03	41.3	8 3 (CaCl2)	-	1 4		see ref			1 19x10E2	Soil #4 (WNRE)		Gillham et al., 1981a
Cs			93	5	2	0 05	40.8	7 8 (CaCl2)	-	1 2	-	see ref			1.37x10E3	Soil #6 (Leamington)		Gillham et al., 1981a
Cs			96	4	0	0 51	0	6 3 (CaCl2)	-	1 1	-	see ref			7 4x10E1	Soil #7 (CRNL) Chalk River Nuclear Lab., Chalk River, Ontario		Gillham et al., 1981a
Cs			52	45	3	0 08	0	5 0 (CaCl2)	-	1 6		see ref			1x10E4	Soil #8 (North Bay)		Gillham et al., 1981a
Cs			50	24	17	1 4	0	6 5 (CaCl2)	-	1 9	-	see ref			1x10E3	Soil #10 (WNRE)		Gillham et al., 1981a
Cs			62	31	7	0 38	18 3	7.6 (CaCl2)	-	2 2	-	see ref			1x10E4	Soil #11 (WNRE)		Gillham et al., 1981a
Cs			52	39	9	0 33	43.4	8 0 (CaCl2)	-	0 7	-	see ref			1 5x10E2	Soil #12 (BNPD): Bruce Nuclear Power Development		Gillham et al., 1981a
Cs			95	2	2	.3	11 1	8 0 (CaCl2)	-	0 4	-	see ref			5x10E2	Soil #13 (C.F.B Borden)		Gillham et al., 1981a
Cs			60	22	18	2 05	7 1	7.8 (CaCl2)	-	21 2		see ref			1x10E2	Soil #16 (Alberta)		Gillham et al., 1981a
Cs			87	9	4	.1	0.07	8.23 (CaCl2)	-	5		see ref			5x10E3--320	Sediment B (Solution 1)		Serne et al., 1978
Cs			-	-	-		-	-			-	SO4			18	Iron and silty sands		Tymochowicz, 1981
Cs		(<0 074mm)	94	6		-	-	-	-	-	-				9 5x10E2	Composite soil		Schmalz, 1972
Cs		river sand				-	-	7 - 8	-	-	-	90%NaCl sol			10	River sand		Hemstra & Verheek, 1977
Cs		subsoil sand				-	2	8 6	-	5	-	4 mol/L NaCl			16 4	Hanford subsoil		Rhodes, 1957
Cs		clinoptilolite				-	-	-	-	-	-	-			4 2x10F3	Clinoptilolite (Idaho)		Wildung & Rhodes, 1963
Cs		Burbank soil				-	-	-	-	-	-	groundwater			9x10E3	Burbank soil		Hajek & Ames, 1968
Cs		Burbank soil				-	-	-	-	-	-	3 mol/L NaNO			4.66x10E2	Burbank soil		Hajek & Ames, 1968
Cs		Burbank soil				-	-	-	-	-	-	0 5mol/L NaCl			1 09x10E3	Burbank soil		Hajek & Ames, 1968
Cs		Burbank soil				-	-	-	-	-	-	25mmol/L CaCl2			5 21x10F3	Burbank soil		Hajek & Ames, 1968
Cs			84	13	3	0 16	2.8	-	-	5 1	0 63	0 2mol/L NaCl			2 40x10E3	Burbank sand (average profile)		Routson, 1973
Cs												see ref						
Cs			63	37	5	0 21	1.36	-	-	5 3	1 02	0.2mol/L NaCl			3 51x10E3	Ephrata sand (average profile)		Routson, 1973
Cs												see ref						
Cs		sand				-	-	7.0	-	-	-	-			98*	Four mile creek	*also data for sorption vs. pH, see reference	Zelazny et al., 1978
Cs		sand				-	-	7.0	-	-	-	-			84*	Pen Branch		Zelazny et al., 1978
Cs		sand				-	-	7 0	-	-	-	-			40*	Par Pond		Zelazny et al., 1978
Cs		Silt	36	35	29	0 43	33 6	8 1 (CaCl2)	-	8 4	-	see ref			1 78x10E4	Soil #1 (WNRE)		Gillham et al., 1981a
Cs			34	35	31	0 4	34.1	8 1 (CaCl2)	-	8 6	-	see ref			1 84x10E4	Soil #3 (WNRE)		Gillham et al, 1981a
Cs			28	41	31	1 27	21.2	7.7 (CaCl2)	-	5 9	-	see ref			1.81x10E3	Soil #5 (Leamington)		Gillham et al, 1981a
Cs			12	55	33	0 35	0	6.7 (CaCl2)	-	10.2	-	see ref			2x10E4	Soil #9 (North Bay)		Gillham et al., 1981a
Cs			34	34	32	0 35	5 1	7 7 (CaCl2)	-	32 7	-	see ref			1x10E4	Soil #14 (Alberta)		Gillham et al., 1981a
Cs			45	44	11	0 14	1 4	8 83 (CaCl2)	-	12	-	see ref			1 35x10E4--4741	Sediment A (Solution 1)		Serne et al., 1978
Cs		alluvial silt loam (Ap)					-	-	-	-	-	-			3x10E4	Captina silt loam, Ap		Rogowski & Tamura, 1965
Cs		medium loam				-	-	-	-	-	-	0 1mol/L HNO3			6 5x10E2	Sodpodzolic soil		Aleksakhin, 1965
Cs			31	69	0	-	-	-	-	2 6	-	-			5 32x10E3	alluvial soil (Cadarache)		Rancon, 1972
Cs			30	62	0	-	-	-	-	2 7	-	-			9 55x10E3	alluvial soil (Cadarache)		Rancon, 1972
Cs			18	66	16	-	-	-	-	6.3	-	-			1 04x10E4	Vindobonian sed. (Cadarache)		Rancon, 1972
Cs			40	45	15	-	-	-	-	1 8	-				1.14x10E4	Vindobonian sed. (Cadarache)		Rancon, 1972
Cs			34	52	14	-	-	-	-	4 9	-	-			7 3x10F3	Vindobonian sed (Cadarache)		Rancon, 1972
Cs			45	47	8	-	-	-	-	1 5	-	-			6 2x10E3	Vindobonian sed (Cadarache)		Rancon, 1972
Cs			7	92	1	-	-	-	-	4 2	-	-			2 07x10E4	sandy-clay sed (Durance R)		Rancon, 1972
Cs			18	71	11	-	-	-	-	3 5	-				1 52x10E4	sandy-clay sed (Durance R)		Rancon, 1972
Cs			3	96	1	-	-	-	-	5 7	-				2.0x10E4	sandy-clay sed (Durance R)		Rancon, 1972
Cs		silty clay, CH-3			3	-	-	-	-	-	-	-			3 0x10E3	silty clay (Idaho)		Wildung & Rhodes, 1963
Cs		silty clay, PC 2			2	-	-	-	-	-	-	-			2 7x10E3	silty clay (Idaho)	-	Wildung & Rhodes, 1963
Cs			44	50	6	0 22	3 8	-	-	11	1 21	0 2mol/L NaCl			3 96x10E3	Ritzville silt (avg profile)		Routson, 1973
Cs			31	34	35	0 81	5 2	7 8 (CaCl2)	-	31 5	-	see ref			1 0x10E4	Soil #15 (Alberta)		Gillham et al., 1981a
Cs		Clay 10% < 0 02 um					-	-	-	35	-				3 15x10E4	very fine suspended sediments (Durance River)		Rancon, 1972
Cs		clay					-	7 - 8	-	-	-	90% NaCl sol			2x10E2	clay		Hemstra & Verheek, 1977
Cs		Savannah River sed (<100 um)					-	-	-	-	-	NaCl			.5 (n=8)	Savannah River sediments		Elprince et al, 1977
Cs		Savannah River sed (<100 um)					-	7 0							130*	Savannah River clay	* Also data for sorption versus pH, see ref	Zelazny et al, 1978

TABLE B-10

CHROMIUM K_d VALUES

NUC	IS#	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cr		loam								600 mmol/kg					1000	Orthic Black Chernozem	(Tab 1) (CEC : mmol kg⁻¹)	Sheppard and Sheppard, 1987
Cr		sand								16 mmol/kg					100	Orthic Regosol		Sheppard and Sheppard, 1987
Cr		organic - LFH Ah						5 2		81 2cmol/kg					262 9 (E 0)	LFH Ah 0-4 cm Gleyed Dystric Brunisol	Kd column : no ( ) : leachate	Sheppard et al., 1987
Cr		sand Ae						5 1		2 9cmol/kg					91 1 (35 0)	Ae 4-15 cm Gleyed Dystric Brunisol	Kd column : ( ) : groundwater	Sheppard et al., 1987
Cr		sand - Bfj-Bfjgj						5.2		2 1cmol/kg					134 5 (160 2)	Bfj-Bfjgj 15-45 cm Gleyed Dystric Brunisol	soil type, pH, CEC & no l description	Sheppard et al., 1987
Cr		sand - C-Cgj						6 2		1 7cmol/kg					53 1 (8 9)	C-Cgj >45 cm Gleyed Dystric Brunisol		Sheppard et al., 1987
Cr	6	sand	95 7	3 3	1 0	0 1		6 45 (paste)			0 4 umol/L				52 (B)	Telluride alluvium, Colorado	Cr (6) Alluvial aquife	Stollenwerk and Grove, 1985
Cr	6	sand	95 7	3 3	1 0	0 1		6 45 (paste)			1400 umol/L				1 7 (B)	Telluride alluvium, Colorado	8 figures : ? calculate Kd's	Stollenwerk and Grove, 1985
Cr	6	sand	95 7	3 3	1 0	0 1		6 45 (paste)			2 25 mmol/Kg				2 3 (C)	Telluride alluvium, Colorado	batch & two column exp'	Stollenwerk and Grove, 1985
																	% O M : lg Kg-1 (ashing 450 C)	
																	(% S/S/C : calculated from grain size distrib : Tab 1)	
																	(G W pH : 6 8 : Tab 3)	
																	B = Batch	
																	C = column	
																	(CrO4: conc)	
Cr															8 4	Rayman series	(Cr)	Ramirez et al., 1985
Cr															110 4	Toa series	both series : prevalent crop land soils in Puerto Rico	Ramirez et al., 1985
																	(Tab 1 : CrKd Kd in l g : Batch	
																	0084034 l/g	
																	1104353 l/g	
																	(Fig 1 : Lapidus-Amundson linear isotherm)	
																	(Fig 2 : Langmuir nonlinear isotherm)	
Cr		LFH-Ah						5 2		81 2cmol/kg					2517 2+-1 7(-)	0-4 cm Gleyed Dystric Brunisol	Pers Comm (ON: No, I Cs, Tc, U, Th, Mo)	Sheppard, 1989
Cr		Ae						5 1		2 9cmol/kg					814 4+ 0 9(-)	4-15 cm Gleyed Dystric Brunisol	Kd: leach : no ( ) Kd GW: ( )	Sheppard, 1989
Cr		Bfj-Bfjgj						5 2		2 1cmol/kg					476 2+ 0 4( )	15-45 cm Gleyed Dystric Brunisol	Soil type, pH, CEC, so desc. from BLC-1Y (JEQ(3))	Sheppard, 1989
Cr		C-Cgj						6 2		1 7cmol/kg					685 1+-0 8(-)	>45 Gleyed Dystric Brunisol		Sheppard, 1989
Cr		Hallandale fine sand				14 5g/Kg		8.20		1 13ueq/g					1 729 L/g	Pompano Beach, Florida	Tab 1: cations in soil Tab 2: soil charact	Wong et al., 1983
Cr		Plantation Muck - bottom layer				27.9g/Kg		7 30		1 58ueq/g					0 346 L/g	Pompano Beach, Florida	Tab 3: heavy metals in soil Tab 4: linear Kd(L/g)	Wong et al., 1983
Cr		Plantation Muck - middle layer				670.7g/Kg		7.20		4 09ueq/g					0 865 L/g	Pompano Beach, Florida	Tab 5: Langmuir coeff (ON: Cu, Zn, Fe, Mn, Ni, Cd, Co)	Wong et al., 1983
Cr		Plantation Muck - top layer				705.2g/Kg		7 10		4 53ueq/g					2 905 L/g	Pompano Beach, Florida	Fig 1&2: isotherms Cr, Ni.	
Cr		clayey				0 24		5 1		3 72cmol+/Kg	10 2				approx 8	Cecil	Cecil: kaolinitic, thermic Typic Hapludults.	Selim & Amacher
Cr		fine silty				0 99		6 4		8 31cmol+/Kg	1 14				approx 3 6	Olivier	Olivier: mixed, thermic Aquic Fraguidalfs	Selim & Amacher
Cr		mixed				0 94		5 4		1 20cmol+/Kg	2 20				approx 2 2	Windsor	Windsor: mesic Typic Udipsamments	Selim & Amacher
																	CEC: cmol(+)/kg Fe2O3 : % Kd calculated from Fig 6	
																	7 Tabs , 11 Figs	

TABLE B-11

COBALT K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Co	57	loamy sand					1.1	7.0							<100 >100 log	1 Gleysol	(Fig 2) Co57	Bunzl & Schimmack, 1988
Co	57	loamy peat					6.5	6.8							>100 log	2 Sapric Histosol, strongly humified		Bunzl & Schimmack, 1988
Co	57	sandy loam						5.7							<100 >100 log	3 Cambisol, brown soil from loess		Bunzl & Schimmack, 1988
Co	57	sandy loam						7.1							100 log	4 Cambisol		Bunzl & Schimmack, 1988
Co	57	loamy sand						4.6							100 log	5 Acrisol, parabrown soil, Ah horizon		Bunzl & Schimmack, 1988
Co	57	loamy sand						4.6							<10 log	6 Acrisol, parabrown soil, U-horizon		Bunzl & Schimmack, 1988
Co	57	clay						8.0							1000 10000 log	B Bentonite, Sud-Chemie AC Munchen		Bunzl & Schimmack, 1988
Co	57	fibric organic						6.0		2.1 meq/g		0.1N Ca(NO3)2			1000 log	P1 - Sphag peat (high moor), Steinhuder Meer, Hannover		Bunzl & Schimmack, 1988
Co	57	fibric organic						7.0		0.65 meq/g		0.1N Ca(NO3)2			1000 10000 log	P2 Sphag peat (high moor), Konigsdorf, Bavaria		Bunzl & Schimmack, 1988
Co	57	Organic - peat						4.0							3.9x1000--.75	(6-8cm)(1 day) Lefgrens Bog, NY (higher org cont than PA)	(Co-57) (Tab 5d (Rd)) (Tab 8- comparison Sibley '82)	Schell et al., 1985
Co	57	Organic - peat						4.0							3.7x1000--.73	(6-8cm)(4 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							3.4x1000--.66	(6-8cm)(8 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0								(6-8cm)(11 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							3.8x1000--.77	(6-8cm)(15 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							2.8x1000--.54	(6-8cm)(30 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							6.4x1000--1.3	(20-21cm)(1 day) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							6.8x1000--1.3	(20-21cm)(4 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0								(20-21cm)(8 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							7.2x1000--1.4	(20-21cm)(11 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							5.1x1000--1.0	(20-21cm)(15 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							4.5x1000--.89	(20-21cm)(30 days) Lefgrens Bog, NY (higher org cont than PA)		Schell et al., 1985
Co	57	Organic - peat						4.0							25x1000--.05	(6-8cm)(1 day) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							[illegible]x1000--.06	(6-8cm)(4 days) Spruce Flats Bog PA		Schell et al., 1985
Co	57	Organic - peat						4.0							19x[illegible]--.004	(6-8cm)(8 days) Spruce Flats Bog PA		Schell et al., 1985
Co	57	Organic - peat						4.0							43x1000--.08	(6-8cm)(15 days) Spruce Flats Bog PA		Schell et al., 1985
Co	57	Organic - peat						4.0							20x1000--.04	(6-8cm)(30 days) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							25x1000--.05	(20-21cm)(1 day) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							26x1000--.05	(20-21cm)(4 days) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							23x1000--.05	(20-21cm)(8 days) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							18x1000--.04	(20-21cm)(15 days) Spruce Flats Bog, PA		Schell et al., 1985
Co	57	Organic - peat						4.0							12x1000--.03	(20-21cm)(30 days) Spruce Flats Bog, PA		Schell et al., 1985
Co		Sand	89	2	9			4.5							4.5	SRP soil 1 (8-12 ft.)		Hoeffner 1985
Co		Sand	72	5	23			5.0							29.0	SRP soil 2 (Blend - 40-48 ft.)		Hoeffner 1985
Co	60	Sand						4.94 (final)						2.5Mx10E4 NaCl	26	SRP soil	(Tab 6)(In addition to soil also GROUNDWATER & TRENCHWATER)	Hoeffner, 1985
Co	60	Sand						4.93 (final)						25Mx10E4 NaCl	28	SRP soil	Barnwell trenchwater: Kd = 15 ml/g	Hoeffner, 1985
Co	60	Sand						4.97 (final)						2.5Mx10E4 NaNO3	24	SRP soil	Synthetic trenchwater = Kd = 1000 ml/g	Hoeffner, 1985
Co	60	Sand						4.93 (final)						25Mx10E4 NaNO3	24	SRP soil	Lab Kd = 5-30 for Barnwell sediment	Hoeffner, 1985
Co	60	Sand						4.91 (final)						2.5Mx10E4 KCl	21	SRP soil	Omitted Tab 7 = effect of Fe ion on Co	Hoeffner, 1985
Co	60	Sand						4.73 (final)						25Mx10E4 KCl	9	SRP soil		Hoeffner, 1985
Co	60	Sand						4.91 (final)						2.5Mx10E4 KNO3	22	SRP soil		Hoeffner, 1985
Co	60	Sand						4.70 (final)						25Mx10E4 KNO3	11	SRP soil		Hoeffner, 1985
Co	60	Sand						4.96 (final)						No salt	26	SRP soil		Hoeffner, 1985
Co	60	Sand						4.95 (final)						2.5Mx10E4 MgCl2	16	SRP soil		Hoeffner, 1985
Co	60	Sand						4.58 (final)						25Mx10E4 MgCl2	5	SRP soil		Hoeffner, 1985
Co	60	Sand						4.93 (final)						2.5Mx10E4 Mg(NO3)2	17	SRP soil		Hoeffner, 1985
Co	60	Sand						4.65 (final)						25Mx10E4 Mg(NO3)2	6	SRP soil		Hoeffner, 1985
Co	60	Sand						4.91 (final)						2.5Mx10E4 CaCl2	17	SRP soil		Hoeffner, 1985
Co	60	Sand						4.66 (final)						25Mx10E4 CaCl2	4	SRP soil		Hoeffner, 1985
Co	60	Sand						5.19 (final)						2.5Mx10E4 Na2SO4	48	SRP soil		Hoeffner, 1985
Co	60	Sand						5.36 (final)						25Mx10E4 Na2SO4	62	SRP soil		Hoeffner, 1985
Co	60	Sand						2-7						(HCO3- & OH-)	2-10000	SRP soil	FIG 1 Effect of Cobalt Kd	Hoeffner, 1985
Co	60	Sand						2-7						(K, Ca & Mg)	2-10000	SRP soil	FIG 2 Effect of K, Ca and Mg on Cobalt	Hoeffner, 1985
Co	60	SRP						3.4							3.5	SRP=Savannah River Plant - burial ground	Co-60 (Tab 1)	Stone et al., 1988
Co	60	SRP						4.7							10	SRP=Savannah River Plant - burial ground		Stone et al., 1988
Co	60	SRP						5.3							70	SRP=Savannah River Plant - burial ground		Stone et al., 1988
Co	60	SRP						7.2							>10000	SRP=Savannah River Plant - burial ground		Stone et al., 1988

continued...

TABLE B-11 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Co		Sand	89	3	8										2600(1800)	Beatty 1, Nevada	( )-reducing conditions Beatty Nev., Barnwell,SC ,W Valley,NY	Neiheisel, 1983
Co		Sand	91	2	7										520	Beatty 2, Nevada	(abst -Kds highest in alkaline alluvial basin deposits high	Neiheisel, 1983
Co		Sand	83	2	15										9000	Beatty 5, Nevada	in montmorillonite and zeolite) Tab1:Kd-mineral phase char	Neiheisel, 1983
Co		Clayey Sand	58	6	36										96	Barnwell 4, South Carolina	Tab 2-relationship-texture,sur ace area + clay mineral comp	Neiheisel, 1983
Co		Clayey Sand	68	11	21										136	Barnwell 12, South Carolina	Tab 4 - Kd - 6 radionuclides	Neiheisel, 1983
Co		Clayey Sand	73	8	19										24(130)	Barnwell 14, South Carolina	Fig 6- text diagram (Fig 7- Kd vs sorptive minerals)	Neiheisel, 1983
Co					13.0			6.2		117					10 1000	Mean of 32 Danish soils	Tab 3- Soil char - Kd correlations Tab 4- Regression coeff Fig 1- log Kd for Cd-function of pH. Tab 2- soil prop.	Anderson & Christensen,1988
Co	57		80	17	3		0	3.7 (CaCl2)		125meq 1					41 (17-80)		Kd column ( )- Kd range. Tab 1 soil properties. Tab 2- Kd	Schimmack et al., 1987
Co	**	Red-brown clayey						6.0- 1.0							(AV)1 6E3	Chestnut Ridge, ORNL	Tab 1R:Kd Report had 100s of Kds RS - 5mg Co/l = conc	Seeley & Kelmers 1984
Co	**														(H)7 9E3		(O N -U,Sr,Cs,Eu,Th,Tc,I)	Seeley & Kelmers 1984
Co	**														(L)7 1E1		AV: Average, H: High, L: Low	Seeley & Kelmers 1984
Co	58	Heavy clay - 1		15	85			8.2(7.5--2)		26--2					2200--700	Loviisa Sav, Finland (9.04 - 9.11 m)	Co 58	Nikula, 1987
Co	58	Heavy clay - 2		19	81			8.2(7.3--1)							1800--200	Loviisa Sav, Finland (9.73 - 9.80 m)	(Tab 11 - Co Kd - pH) (O N - ..,Sr,Mn,Zu,Ce)	Nikula, 1982
Co	58	Heavy clay - 3		11	89			8.4(7.3--1)		21--2					990	Olkiluoto Sav, Finland (2.08 - 2.15 m)	In Finnish with English summar. 13 Figures	Nikula, 1982
Co	58	Heavy clay - 4		32	68			8.3(7.4--2)		[illegible]					410--30	Olkiluoto Sav, Finland (2.49 - 2.56 m)	(pH in Tab 11 - ( ) in pH column)(Fig.11 = Co Kd vs.Pf)	Nikula, 1982
Co	58	Heavy clay - 5		32	68			8.0(7.3--1)		25--1					14000	Salo Sav, Finland (6.28 - 6.35 m)		Nikula, 1982
Co	58	Silty clay loam - 6		62	38			7.0(7.3--1)		17--5					4500--500	Hamma Sav, Finland (2.24 - 3.31 m)		Nikula, 1982
Co	58	Loamy sand - 7	79	21				6.4(7.5--1)		2.8--2					160--10	Loviisa moreen, Finland (4 m)		Nikula, 1982
Co	58	Sandy loam - 8	65	35				6.4(7.4--1)		[illegible]					140--20	Olkiluoto moreen, Finland (1.5 m)		Nikula, 1982
Co	58	Loamy sand - 9	73	27				6.8(6.9--1)		[illegible]					400--30	Juuka moreen, Finland (3.5 - [illegible] m)		Nikula, 1982
Co	58	Sandy loam - 10	66	34				6.2(6.6--1)		[illegible]					880	Partala moreen, Finland (2.2 - 2.5 m)		Nikula, 1982
Co	58	Loam - 11	41	37	22			9.7(8.7--1)		1--5					9700--700	Kakola [illegible] kalliosav, Finland (44 m)		Nikula, 1982
Co	58	Sandy loam - 12	57	29	14			9.9(8.3--2)		40--4					2900--400	Metsaaro kalliosav, Finland (24 m)		Nikula, 1982
Co	60	Sand	91.2	7	1.8										.07--0.01(0.1--1.0)	B - Rupert sand	(Co-60EDTA (Tab 5-Kd-column + batch) Kd not in ( ) = column	Jones et al., 1990
Co	60	Sand	91.2	7	1.8										.09--0.02(0.9-[illegible])	[illegible] - Rupert Sand	for Hanford sediments A: from Ringold geological formation	Jones et al., 1990
Co	60	Loamy-sand	81.2	15	3.8										18	A - from Ringold formation	B: from surface, Rupert sand (? sic torrimsamment) (O N - Tc,I,Sr,3H)	Jones et al., 1990
Co	58	Loam	45.0	35.0	20.0	3.0		7.2 (in H2O)		30.2					2495	Facnita (F) Po Valley, Italy	(Conc 329.33 uCi/mg - same inc for O N)	Carini et al., 1985
Co	58	Sandy loam	70.0	20.0	10.0	2.5		6.0 (in H2O)		2.2					232.2	Vercelli (V) Po Valley, Italy	(O N : Cs,Mn,Fe,I)	Carini et al., 1985
Co	58	Sandy Loam	74.2	14.0	11.8	1.94		7.8 (in H2O)		6.3					956.2	Garostane (G) Po Valley, Italy	Tab 1- soil properties	Carini et al., 1985
Co	58	Clay loam	36.3	27.5	36.2	2.8		7.8 (in H2O)		32.3					3728	Villanova (V), Po Valley, Italy	Tab 3- Kd = 72 hours	Carini et al., 1985
Co	58	Clay loam	31.4	36.2	32.4	3.5		7.7 (in H2O)		39.3					3859	Sarmato (S) Po Valley, Italy		Carini et al., 1985
Co	58	Sandy loam	56.1	27.5	16.4	1.34		7.9 (in H2O)		15.[illegible]					4313	Monticelli (M), Po Valley, Italy		Carini et al., 1985
Co	58	Sandy loam	64.0	23.5	12.5	1.21		6.8 (in H2O)		4.4					1047	5 Po Valley, Italy		Carini et al., 1985
Co	58	Clay loam	32.5	30.0	37.5	4.96		7.6 (in H2O)		35.4					1617	15 Po Valley, Italy		Carini et al., 1985
Co	58	Clay loam	39.5	27.0	33.5	2.54		7.8 (in H2O)		24.1					3204	17 Po Valley, Italy		Carini et al., 1985
Co	58	Clay loam	31.5	29.0	39.5	2.91		7.7 (in H2O)		33.5					5894	19 Po Valley, Italy		Carini et al., 1985
Co	58	Clay loam	37.0	32.0	31.0	1.94		6.4 (in H2O)		24.5					2557	41 Po Valley, Italy		Carini et al., 1985
Co	58	Sand	88.5	6.2	5.3	1.54		7.5 (in H2O)		7.1					547.0	55 Po Valley, Italy		Carini et al., 1985
Co	58	Loam	31.0	44.0	25.0	2.68		7.9 (in H2O)		22.6					2391	61 Po Valley, Italy		Carini et al., 1985
Co	58	Sandy clay loam	50.5	19.5	30.0	4.08		6.4 (in H2O)		26.8					580.3	65 Po Valley, Italy		Carini et al., 1985
Co	58	Sandy loam	59.0	22.0	19.0	1.67		6.0 (in H2O)		13.5					701.3	73 Po Valley, Italy		Carini et al., 1985
Co	58	Loam	42.5	43.5	14.0	1.67		7.8 (in H2O)		23.2					2590	77 Po Valley, Italy		Carini et al., 1985
Co	58	Loam	43.0	27.5	29.5	6.3		7.1 (in H2O)		34.9					1373	81 Po Valley, Italy		Carini et al., 1985
Co	58	Clay	24.5	24.5	51.0	3.85		7.5 (in H2O)		35.1					4610	93 Po Valley, Italy		Carini et al., 1985
Co	60	Sand								(11.3)					100	A	(Tab 2- soil type) (Tab 5- CEC + Kd) (in JAP)	Inoue & Morisawa, 1976
Co	60	Silt clay								(24.7)					150	B	CEC: ( ) - meq/g	Inoue & Morisawa, 1976
Co	60	Silt clay								(55.6)					250	C	(O N = Sr,Cs,Mn,Zn,Ag,Fe,Mo)	Inoue & Morisawa, 1976
Co	60	Gravel-sand								(67.5)					400	D	9 Tab 3 Fig	Inoue & Morisawa, 1975
Co	60	Silt-clay								(167.9)					350	E		Inoue & Morisawa, 1976
Co	60	Silt-sand								(47.8)					250	F		Inoue & Morisawa, 1976
Co	60	Gravel								(78.9)					200	G		Inoue & Morisawa, 1976
Co	60	Silt-clay								(117.9)					400	H		Inoue & Morisawa, 1976
Co	60	Silt-clay								(140.5)					20	I		Inoue & Morisawa, 1976
Co	60	Silt-clay								(246.0)					150	J		Inoue & Morisawa, 1976
Co	60	Fine sand								(60.3)					10	K		Inoue & Morisawa, 1976
Co	60	Silt								(149.0)					100	L		Inoue & Morisawa, 1976
Co	60	Sand								(24.3)					200	M		Inoue & Morisawa, 1976
Co	60	Gravel								(17.1)					180	N		Inoue & Morisawa, 1976
Co	60	Fine sand								(122.8)					400	O		Inoue & Morisawa, 1976
Co	60	Fine sand								(38.6)					100	P		Inoue & Morisawa, 1976
Co	60	Silt-clay								(200.1)					80	Q		Inoue & Morisawa, 1976
Co	60	Sandy						8.0							4500 (-)	Co - Hanford site	(Co-60 and Co-60EDTA)(Tab 1- atch + col = Kd)(O N =3H)	Jones et al., 1983
Co	60	Sandy						8.0							1.0 (0.1)	Co/EDTA - Hanford site	( ) - in Kd column Col method Batch: 7 days	Jones et al., 1983
Co	60																Fig 1- Co vs col depth Fig Co 60EDTA vs 3H mobility	
Co	60																Fig 3- Co-60EDTA vs 3 soils	

TABLE B-12

COPPER K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cu																A1		Zabowski and Zasoski, 1987
Cu																A1		Zabowski and Zasoski, 1987
Cu																B2		Zabowski and Zasoski, 1987
Cu																B2		Zabowski and Zasoski, 1987
Cu																C		Zabowski and Zasoski, 1987
Cu																C		Zabowski and Zasoski, 1987
Cu																C		Zabowski and Zasoski, 1987
Cu																C		Zabowski and Zasoski, 1987
Cu																C		Zabowski and Zasoski, 1987
Cu		Hallandale fine sand				14.5g/Kg		8.20		1.13ueq/g					0.206 L/g	Pompano Beach, Florida	Tab 1 = cations in soil. Tab 2 = soil charact.	Wong et al., 1983
Cu		Plantation Muck - bottom layer				27.9g/Kg		7.30		1.58ueq/g					0.266 L/g	Pompano Beach, Florida	Tab 3 = heavy metals in soil. Tab 4 = linear Kd (L/g)	Wong et al., 1983
Cu		Plantation Muck - middle layer				670.7g/Kg		7.20		4.09ueq/g					0.076 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff. Fig 1 & 2 = isotherms = Cr, Ni	Wong et al., 1983
Cu		Plantation Muck - top layer				705.2g/Kg		7.10		4.53ueq/g					0.248 L/g	Pompano Beach, Florida	(O.N. = Zn, Fe, Mn, Ni, Cd, Cr, Co)	Wong et al., 1983

TABLE B-13

CURIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PAS	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Cm	244	silty loam	19	56	25	2.8		5.9	5.41		20	1.29		0.06		25350	Sharpsburg series	% main clay minerals (Tab 2)	Nishita et al., 1981
Cm	244	silty loam							6.56							13860		(comp. Cation = Mn4MHNO3 extract)	Nishita et al., 1981
Cm	244	sandy loam	55	33	12	2.4		5.3	4.39		15	1.65		0.06		8523	Malbis series	Wallace et al., 1979 soil properties	Nishita et al., 1981
Cm	244	sandy loam							5.71							6809		Nishita, 1981	Nishita et al., 1981
Cm	244	sandy loam	65	33	2	5.7		5.0	4.58		[illegible]	[illegible]		0.04		1374	Lyman series	(Tab 1 & F1) (Extract) chem. prop.	Nishita et al., 1981
Cm	244	sandy loam							6.17							186		(Tab 2 nuclid. conc.)	Nishita et al., 1981
Cm	244	clay loam	29	39	32	0.6		7.8	7.12		30	1.20		0.04		36620	Holtville series		Nishita et al., 1981
Cm	244	clay loam							8.04							51900	(Calcareous, 1[illegible] % CaCO3)		Nishita et al., 1981
Cm	244	sandy loam	70	28	2	8.4		6.0	5.71		15	5.29		0.10		30920	Aiken series		Nishita et al., 1981
Cm	244	sandy loam							6.72							15020			Nishita et al., 1981
Cm	244	silt loam	27	58	15	2.5		6.7	6.12		25	2.41		0.08		21780	Yolo series		Nishita et al., 1981
Cm	244	silt loam							6.98							17090			Nishita et al., 1981
Cm	244	muck	70	30	0	40.8		7.2	7.14		60	1.12		0.10		6772	Egbert series		Nishita et al., 1981
Cm	244	muck							7.54							5056			Nishita et al., 1981
									Extract pH					Mn 4 M HNO3 Extract					
Cm	244	sediment						3.0								1730 (filtered)	Pond B, SRP	Batch	Adriano, D.C., et al., 1981
Cm	244	sediment						3.0								1070 (dialysed)	Pond B, SRP	Tab 4 - Kd's	Adriano, D.C., et al., 1981
Cm	244	sediment						3.0								1750 (deionized)	Pond B, SRP	SRP = Savanna River Plant	Adriano, D.C., et al., 1981
Cm	244	sediment						3.0								940 (filt.)	Par Pond, SRP		Adriano, D.C., et al., 1981
Cm	244	sediment						3.0								920 (dialys.)	Par Pond, SRP		Adriano, D.C., et al., 1981
Cm	244	sediment						3.0								1550 (deion.)	Par Pond, SRP		Adriano, D.C., et al., 1981
Cm	244	sediment						5.0								37400 (filt.)	Par Pond, SRP		Adriano, D.C., et al., 1981
Cm	244	sediment						5.0								17500 (dialys.)	Par Pond, SRP		Adriano, D.C., et al., 1981
Cm	244	sediment						5.0								74500 (deion.)	Par Pond, SRP		Adriano, D.C., et al., 1981

TABLE B-14

EUROPIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Eu	154	Clay														approx. [illegible]	>2um size, smectite	DIFFICULT	Carlsen & Bo, 1982
Eu	154	Clay														5.6x10E3	<2um size, smectite		Carlsen & Bo, 1982
Eu	154	Red-brown clayey						5.0+-0.7								AV : 6 (H : 6.1E4) (L : 5.4E1)	Chestnut Ridge, ORNL	Tab 10: Kd; Report had 100s of Kds (0.1 - 11.5m Cs,Ce,Th,Tc,I) 55.5mgEu/L conc.	Seeley & Kelmers, 1984
Eu	154	Smectite clay						7.5 - 7.8								(1+-0.2)x10E7	20 degrees C, Core LL44 GPC 2, Pacific Ocean, depth: 5821m		Kenna, 1980
Eu	154	Smectite clay						7.5 - 7.8								(1.1+-0.3)x10E7	60 degrees C, Core LL44 GPC 2, Pacific Ocean, depth: 5821m		Kenna, 1980

TABLE B-15

IODINE K_d VALUES

NRC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
I	129														No Data		1-129 Kd : formula p 410	Boone et al , 1985
I	127	Fh Ah						5 2		81 2cmol/Kg					367 8 (198 0)	0 4 cm	1 127 Tab 1: soil properties.	Sheppard et al , 1987
I	127	Ae	Sand					5 1		? 9cmol/Kg					90 7 (18 2)	4 15 cm	( ) in Kd column : Ground water (G W)	Sheppard et al , 1987
I	127	Bf_j-Bf_{jgj}	Sand					5 2		? 1cmol/Kg					8 7 (0 8)	15 45 cm	no ( ) in Kd column : Leachate (L)	Sheppard et al , 1987
I	127	C Cg_j	Sand					6 2		1 7cmol/Kg					0 5 (0 1)	>45 cm	CEC - cmol/Kg Tab.6: Kd comp field + batch.	Sheppard et al., 1987
I	131		80	17	3		0	3 7		?9me/Kg		CaCl2			30(17-56)		Kd col. ( )-Kd range Tab.1: soil prop. Tab.2: Kd	Schimmack et al., 1987
I	131	Ap				1 19		8 3(solution		16 4					>10	(0-22cm) Auenrendzina (Biblis), FRG	(1-131) Fig 1&2 : Kd - soil horizon	Bunzl et al., 1984
I	131	C				1 15		8 3(solution		17 7					1	(22-30cm) Auenrendzina (Biblis), FRG	Fig 3: Kd vs Ca + K ions	Bunzl et al., 1984
I	131	Cc				1 01		8 2(solution		16 2					<100	(30-47cm) Auenrendzina (Biblis), FRG	Fig 4: Kd - comparison column + batch	Bunzl et al., 1984
I	131	fCrCc				0 25		8 1(solution		8 5					>10	(47 90cm) Auenrendzina (Biblis), FRG	Fig 5: Kd - 6 soils (A-horizon)	Bunzl et al., 1984
I	131	2fCr				0 14		8 2(solution		6 4					<10	(90-128cm) Auenrendzina (Biblis), FRG	Fig 6: Kd - 5 soils (1.0m).	Bunzl et al., 1984
I	131	3Cr				0 07		8 2(solution		0 7					<10	(128-132cm) Auenrendzina (Biblis), FRG	Abstract	Bunzl et al., 1984
I	131	Ap				2 41		7 3(solution		8 7					>1 0	(0 31cm) Parabrown (Eschweiler), FRG		Bunzl et al , 1984
I	131	Al				0 71		7 4(solution		9 5					>0 1	(31 52cm) Parabrown (Eschweiler), FRG		Bunzl et al , 1984
I	131	BtAl				0 34		7 2(solution		8 3					0 1	(52-62cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
I	131	AlBt				0 30		6 9(solution		8 3					0 1	(62 73cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
I	131	Bt1				0 30		6 7(solution		12 5					>0 1	(73-88cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
I	131	Bt2				0 25		6 2(solution		13 2					0 1	(>88cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
I		red brown clayey						5 8 --0 6							AV : 1 8E-1	Chestnut Ridge, ORNL	Tab 18: Kd Report had 100's of Kds	Seeley & Kelmers,1984
I															(H : 1 8E0)		(O N : U,Sr,Cs Ca,Eu,Th,Tc)	Seeley & Kelmers,1984
I															(L : 1 4E-2)		PS - 5mg I/L : conc	Seeley & Kelmers,1984
I		sand	74	3	3			5 65 (5 21)							3 6	SE Coastal Plain (Sandy clay loam) (SP#3)	see ((Cs/1) (Ra/1)	Eichholz & Whang,1987
I		sand	74	3	3			5 65 (5 39)							5 5	SE Coastal Plain (Sandy clay loam) (SP#3)	( ) in pH columns : final pH	Eichholz & Whang,1987
I		sand	74	3	3			5 65 (5 24)							4 5	SE Coastal Plain (Sandy clay loam) (SP#3)		Eichholz & Whang,1987
I		organic						? 28+ 0 11							2 3 to 43 8	sphagnum peat (0 40cm)	(Tab.4:compare insitu & lab Kd)(Wildung et al ,1974)	Sheppard,DHT,1988
I		organic						6 70+ 0 04							0 . 64 1	sphagnum peat (40-80cm)	Kd column: ± 65%	Sheppard,DHT,1988
I		organic						5 34 to 6 87							2 4 to 37 8	reed/sedge peat (0-26 cm)		Sheppard,DHT,1988
I		clay						7 28+-0 08							0 1 to 3 1	(SCE) >26cm		Sheppard,DHT,1988
I		loamy sand	84 7	10 0	3	1 4		6 5				KCl			17 5+ 0 8	Podsol	(Tab 1)	Bors et al ,1987
I		clay silt	4 6	71 9	2 5	2 4		7 5				KCl			27 6+ 1 4	Chernozem	Fig 3- NIA vs Kd values in podzol + chernozem	Bors et al.,1987
I	131	loamy sand					1 1	7 0							<10 <1000 log	1 Gleysol		Bunzl & Schimmack, 1988
I	131	loamy peat					0 5	6 8							<10-<1000 log	2 Sapric Histosol, strongly humified		Bunzl & Schimmack, 1988
I	131	sandy loam						5 7							>1->100 log	3 Cambisol, brown soil from loess		Bunzl & Schimmack, 1988
I	131	sandy loam						7 1							>1-<1000 log	4 Cambisol		Bunzl & Schimmack, 1988
I	131	loamy sand						4 6							10-<100 log	5 Acrisol, parabrown soil, Ah-horizon		Bunzl & Schimmack, 1988
I	131	loamy sand						4 6							approx 10 log	6 Acrisol, parabrown soil, B-horizon		Bunzl & Schimmack, 1988
I	131	clay						8 0		0 7meq/g		0 1NCaNO3			>1 log	B - Bentonite, Sud-Chemie AG Munchen		Bunzl & Schimmack, 1988
I	131	fibric organic						6 0		2 1meq/g		0 1NCaNO3			approx 100 log	P1 - Sphag peat (high moor), Steinhuder Meer, Hannover		Bunzl & Schimmack, 1988
I	131	fibric organic						7 0		0 65meq/g		0 1NCaNO3			100 1000 log	P2 Sphag peat (high moor), Konigsdorf, Bavaria		Bunzl & Schimmack, 1988
I	127	SRP												5 ppm I	19 0	SRP - Savannah River Plant soil - burial ground	(Tab 14) (p. 50) (1-127)	Hoeffner 1985
I	127	SRP												50 ppm I	5 35	SRP - Savannah River Plant soil - burial ground	(also, Stone et al , 1984. See Co/1 (1-7?))	Hoeffner 1985
I	127	SRP												500 ppm I	3 62	SRP - Savannah River Plant soil - burial ground		Hoeffner 1985
I	131	Ap-horizon	59 7	28 4	1 0		0 2	6 7		8 7		CaCl2			5 2-18 Av=8 8	(0-30cm) Alfisol (parabrown earth)	(1-131) see Cs/4 Kd = ?looN CEC= 87 meq/Kg	Bunzl et al ,1985
I	129	Charcoal#1 + Brine A						6 6							35		1-129 (Tab 2) see Pu/2	Nowak,1980
I	129	Charcoal#2 + Brine A						6 7							53			Nowak,1980
I	129	Charcoal#3 + Brine A						6 5							18			Nowak,1980
I	129														No Kd	Tokai soil	(Tab 1:soil properties) (Fig.1:breakthrough curves)	Uchida & Kamada, 1983
I	129														No Kd	Nakaminato soil	(Fig 2:breakthrough curves)(Fig 3&4:redistribution curves)	Uchida & Kamada, 1983
I	129														No Kd	Toyoura sand	(Fig.5:equilibrium period) Abstract (Iodine-NaI)	Uchida & Kamada, 1983
I	125	Sand	91 2	7	8										(C 5+ 0 2)	B Rupert sand	Tab 5: Kds column(in ( )) + batch(not in ( ))	Jones et al ,1980
I	125	Sand	91 2	7	8										.04 (0 5+-0 4)	B - Rupert sand	Two Hanford sediments A: from Ringold geological formation,	Jones et al ,1980
I	125	Loamy sand	81 2	15	8										.06 (0 7+-0 3)	A - from Ringold formation	B: from surface, Rupert sand (typic torripsamment)	Jones et al ,1980
I	125	Loamy sand	81 2	15	8										- (0 2+-0 1)	A - from Ringold formation	(O N : Tc,I,Se,3H)	Jones et al ,1980
I	125	Loam	45 0	35 0	2 0	3 0		7 2 (in H2O)		30 9					34 94	Faceita (F), Po Valley, Italy	(conc :378 33 u Ci/mg - same conc. for other nuclides)	Carini et al , 1985
I	125	Sandy loam	70 0	22 0	1 0	2 5		6 0 (in H2O)		7 2					21 92	Vercelli (V), Po Valley Italy	(O N :Ca,Co,Mn,Fe) Tab. 1: soil properties	Carini et al , 1985

continued...

TABLE B-15 (concluded)

NUC	ISO Soil Type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
I	125 Sandy Loam	74.2	14.0	11.8	1.94		7.8 (in H2O)		5.3					24.64	Carpatano (C), Po Valley, Italy	Tab 3 = Kd - 72 hours	Carini et al., 1985
I	125 Clay loam	36.3	27.5	36.2	2.8		7.8 (in H2O)		32.3					31.93	Villanova (V), Po Valley, Italy		Carini et al., 1985
I	125 Clay loam	31.4	36.2	32.4	2.5		7.7 (in H2O)		39.3					36.37	Sarmato (S), Po Valley, Italy		Carini et al., 1985
I	125 Sandy loam	56.1	27.5	16.4	1.34		7.9 (in H2O)		15.0					18.01	Monticelli (M), Po Valley, Italy		Carini et al., 1985
I	125 Sandy loam	64.0	23.5	12.5	1.21		6.8 (in H2O)		4.4					9.86	5 Po Valley, Italy		Carini et al., 1985
I	125 Clay loam	32.5	30.0	37.5	4.96		7.6 (in H2O)		35.4					32.54	15 Po Valley, Italy		Carini et al., 1985
I	125 Clay loam	39.5	27.0	33.5	2.54		7.8 (in H2O)		24.1					22.89	17 Po Valley, Italy		Carini et al., 1985
I	125 Clay loam	31.5	29.0	39.5	2.91		7.7 (in H2O)		33.5					25.59	19 Po Valley, Italy		Carini et al., 1985
I	125 Clay loam	37.0	32.0	31.0	1.94		6.4 (in H2O)		24.5					11.56	41 Po Valley, Italy		Carini et al., 1985
I	125 Sand	88.5	5.2	5.3	1.54		7.5 (in H2O)		7.1					73.16	55 Po Valley, Italy		Carini et al., 1985
I	125 Loam	31.0	44.0	25.0	2.68		7.9 (in H2O)		22.6					34.58	61 Po Valley, Italy		Carini et al., 1985
I	125 Sandy clay loam	50.5	19.5	30.0	4.08		6.4 (in H2O)		26.8					20.00	65 Po Valley, Italy		Carini et al., 1985
I	125 Sandy loam	59.0	22.0	19.0	1.67		6.0 (in H2O)		13.5					9.12	73 Po Valley, Italy		Carini et al., 1985
I	125 Loam	42.5	43.5	14.0	1.67		7.8 (in H2O)		23.2					17.95	77 Po Valley, Italy		Carini et al., 1985
I	125 Loam	43.0	27.5	29.5	6.3		7.1 (in H2O)		34.9					42.37	81 Po Valley, Italy		Carini et al., 1985
I	125 Clay	24.5	24.5	51.0	3.85		7.5 (in H2O)		35.1					29.11	93 Po Valley, Italy		Carini et al., 1985
I	Organic				100		6.3 (CW)				6m KCl			1.36 L/kg	Sphagnum peat U.R.L., Lac du Bonnet, Manitoba	(Kd from abstr)%Cw= groundwate) Tab4= Kd as depth & dis	Sheppard,DHT,PAS,1988
I	Organic						4.8							137(rainfall)	Commercial Sphagnum peat	(Tab 6)(Fig 12= log Kd vs log CR)	Sheppard & Evenden, 1988
I	Organic						4.8							49(Fall 1)	Commercial Sphagnum peat	(D N - Se,Cs,Pb,U)	Sheppard & Evenden, 1988
I	LFH-Ah						5.7		81.2cmol/Kg					(1.9--2.0)	0-4 cm Gleyed Dystric Brunisol	Pers Comm (D N = Ne, Cr, Cs, c, U, Th, Mo)	Sheppard, 1989
I	Ae						5.1		2.9cmol/Kg					(0.1--0.7)	4-15 cm Gleyed Dystric Brunisol	Kd: Leachate = no ( ) Kd= Groundwater = ( )	Sheppard, 1989
I	Bfj-Bfjgj						5.2		2.1cmol/Kg					(.06-0.4)	15-45 cm Gleyed Dystric Brunisol	Soil type, Ph, CEC & soil desc from BLC-IY(JEQ16(3))	Sheppard, 1989
I	C-Cgj						6.2		1.7cmol/Kg					(.04-0.4)	>45 cm Gleyed Dystric Brunisol		Sheppard, 1989
I	Sand		31	7	0.38									0.23	Soil # 11 (WNRE)		Gillham et al., 1981a
I			39	9	0.33									0.28	Soil # 12 (BNPD)		Gillham et al., 1981a
I			22	18	2.05									0.69	Soil # 16 (Alberta)		Gillham et al., 1981a
I			29	5.8	0.45									0.2	Hanford A		Ames & Rai, 1978
I			32.4	18	0.6									0.55	Idaho A		Ames & Rai, 1978
I			28.4	22.4	0.98									0.7	Idaho D		Glover et al., 1976
I			20	36	2.4									1.21	Colorado A		Glover et al., 1976
I	Silt		50	34	0.8									1	Idaho A		Glover et al., 1976
I			54	37	2.3									1.73	Arkansas C		Glover et al., 1976
I			53	16	3.6									0.79	Illinois		Glover et al., 1976
I			35	25	0.43									0.83	Soil # 1 (WNRE)		Gillham et al., 1981a
I			36	29	0.41									0.87	Soil # 2 (WNRE)		Gillham et al., 1981a
I			35	31	0.4									0.88	Soil # 3 (WNRE)		Gillham et al., 1981a
I			41	31	1.77									0.96	Soil # 5 (Lemington)		Gillham et al., 1981a
I			55	33	0.35									0.93	Soil # 9 (North Bay)		Gillham et al., 1981a
I			34	32	0.85									0.94	Soil # 14 (Alberta)		Gillham et al., 1981a
I				29.1	7.1									1.5	Hromaston silt (average profile)		Juo & Barber, 1970
I			50	6	0.23									0.18	Ritzville silt		Routson, 1973
I	Clay		34	35	0.81									1.03	Soil # 15 (Alberta)		Gillham et al., 1981a
I			32	36	1									1.07	Tennessee (Oak Ridge)		Glover et al., 1976
I			32	36	2.7									1.24	New York (West Valley)		Glover et al., 1976
I			34	56	3.2									1.83	Arkansas A		Glover et al., 1976

TABLE B-16

IRON K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Fe		Sand	89	3	8										1700 (800)	Beatty 1, Nevada	Beatly, Nevada Barnwell, S Carolina. West Valley, N.Y	Neiheisel, 1983
Fe		Sand	91	2	7										6000	Beatty 2, Nevada	(abst. = Kds highest in alkaline Alluvial Basin deposits high	Neiheisel, 1983
Fe		Sand	83	2	15										1800	Beatty 5, Nevada	in montmorillonite & zealites)	Neiheisel, 1983
Fe		Clayey Sand	58	6	36										6000	Barnwell 4, South Carolina	Tab 1=Kd=mineral phase char. Kd col.=( )=reducing conditions	Neiheisel, 1983
Fe		Clayey Sand	68	11	21										6000	Barnwell 12, South Carolina	Tab2=Relationship=texture,surface area & clay mineral comps	Neiheisel, 1983.
Fe		Clayey Sand	73	8	19										600 (680)	Barnwell 14, South Carolina	Tab 3= Soil text. & mineral comps Tab.4=Kd=6 radionuclides	Neiheisel, 1983.
																	Fig 6=text. diagram. Fig.7=Kd vs. sorptive minerals.	Neiheisel, 1983.
Fe		Loam								600mmol/kg					490	Orthic Black Chernozem	(Tab. 1) (CEC= mmolkg-1)	Sheppard & Sheppard, 1987.
Fe		Sand								16mmol/kq						Orthic Regosol		Sheppard & Sheppard, 1987.
Fe	59	Loam	45 0	35 0	20 0	3.0		7 7 (in H20)		30 9					515.5	Facolta (F), Po Valley, Italy	(Conc = 378.33 uCi/mg - same concentration for O.N.)	Carini et al., 1985.
Fe	59	Sandy loam	70.0	20.0	10 0	2.5		6.0 (in H20)		7 2					294 4	Vercelli (V), Po Valley, Italy	(O N = Co,Cs,Mn,I)	Carini et al., 1985.
Fe	59	Sandy Loam	74.2	14 0	11 8	1.94		7 8 (in H20)		6 3					375 1	Carostano (C), Po Valley, Italy	Tab.1= soil properties	Carini et al., 1985.
Fe	59	Clay loam	36.3	27 5	36 2	2 8		7 8 (in H20)		32 3					1259	Villanova (Vi), Po Valley, Italy	Tab 3= Kd = 72 hours	Carini et al., 1985
Fe	59	Clay loam	31 4	36 2	32 4	3 5		7 7 (in H20)		39 3					1154.	Sarmato (S), Po Valley, Italy		Carini et al., 1985.
Fe	59	Sandy loam	56.1	27.5	16 4	1 34		7 9 (in H20)		15 0					803 8	Monticelli (M), Po Valley, Italy		Carini et al., 1985.
Fe	59	Sandy loam	64 0	23.5	12 5	1 21		6 8 (in H20)		4 4					290 5	5 Po Valley, Italy		Carini et al., 1985.
Fe	59	Clay loam	32.5	30.0	37.5	4 96		7.6 (in H20)		35 4					1185	15 Po Valley, Italy		Carini et al., 1985.
Fe	59	Clay loam	39.5	27.0	33 5	2 54		7 8 (in H20)		24 1					2028	17 Po Valley, Italy		Carini et al., 1985.
Fe	59	Clay loam	31 5	29 0	39 5	2 91		7 7 (in H20)		33 5					2240	19 Po Valley, Italy		Carini et al., 1985.
Fe	59	Clay loam	37.0	32.0	31.0	1 94		6 4 (in H20)		24 5					567 2	41 Po Valley, Italy		Carini et al., 1985.
Fe	59	Sand	88.5	6 2	5 3	1 54		7 5 (in H20)		7 1					424 1	55 Po Valley, Italy		Carini et al., 1985
Fe	59	Loam	31.0	44 0	25 0	2 68		7 9 (in H20)		22 6					2231	61 Po Valley, Italy		Carini et al., 1985.
Fe	59	Sandy clay loam	50.5	19 5	30 0	4 08		6 4 (in H20)		26 8					409 3	65 Po Valley, Italy		Carini et al., 1985.
Fe	59	Sandy loam	59 0	22.0	19 0	1 67		6 0 (in H20)		13 5					547 5	73 Po Valley, Italy		Carini et al., 1985.
Fe	59	Loam	42 5	43.5	14 0	1 67		7 8 (in H20)		23 2					2012	77 Po Valley, Italy		Carini et al., 1985
Fe	59	Loam	43.0	27.5	29 5	6.3		7 1 (in H20)		34 9					1796	81 Po Valley, Italy		Carini et al., 1985.
Fe	59	Clay	24.5	24.5	51.0	3.85		7 5 (in H20)		35 1					2121	93 Po Valley, Italy		Carini et al., 1985
Fe	59	Sand								(11 3)					8	A	(Tab 2= soil type) (Tab 5= CEC + Kd) (in JAP)	Inoue & Morisawa, 1976.
Fe	59	Silt-clay								(241 7)					500	B	CEC = ( ) = meq/g. 9 tables, 3 figures.	Inoue & Morisawa, 1976.
Fe	59	Silt-clay								(55 6)					100	C		Inoue & Morisawa, 1976.
Fe	59	Gravel-sand								(69 5)					500	D		Inoue & Morisawa, 1976
Fe	59	Silt-clay								(167 9)					120	E		Inoue & Morisawa, 1976
Fe	59	Silt-sand								(47 8)					200	F		Inoue & Morisawa, 1976.
Fe	59	Gravel								(79 9)					5	G		Inoue & Morisawa, 1976.
Fe	59	Silt-clay								(117 9)					60	H		Inoue & Morisawa, 1976
Fe	59	Silt-clay								(140 5)					250	I		Inoue & Morisawa, 1976.
Fe	59	Silt-clay								(246 0)					-	J		Inoue & Morisawa, 1976
Fe	59	Fine sand								(60 3)					5	K		Inoue & Morisawa, 1976.
Fe	59	Silt								(149 0)					1000	L		Inoue & Morisawa, 1976.
Fe	59	Sand								(24 3)					-	M		Inoue & Morisawa, 1976.
Fe	59	Gravel								(27 1)					40	N		Inoue & Morisawa, 1976.
Fe	59	Fine sand								(122.8)					250	O		Inoue & Morisawa, 1976.
Fe	59	Fine sand								(38.6)					5	P		Inoue & Morisawa, 1976.
Fe	59	Silt-clay								(200 1)					15	Q		Inoue & Morisawa, 1976
Fe		Hallandale fine sand				14 5g/Kg		8.20		1 13ueq/g					0 616 L/g	Pompano Beach, Florida	Tab 1 = cations in soil. Tab 2 = soil charact.	Wong et al., 1983
Fe		Plantation Muck - bottom layer				27.9g/Kg		7 30		1.58ueq/g					0.159 K/g	Pompano Beach, Florida	Tab 3 = heavy metals in soil. Tab 4 = linear Kd (L/g).	Wong et al., 1983
Fe		Plantation Muck - middle layer				670 /g/kg		7 20		4.09ueq/g					1 127 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff. Fig 1 & 2 = isotherms = Cr, Ni	Wong et al., 1983
Fe		Plantation Muck - top layer				705.2g/kg		7 10		4 53ueq/g					0.521 L/g	Pompano Beach, Florida	(O N = Cu, Zn, Mn, Ni, Cd, Cr, Ca)	Wong et al., 1963

TABLE B-17

LEAD K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Pb	210	Fine sandstone - silty sand						?2.0							20		(Pb 210) Tab 4	Haji-Djafari et al., 1981
Pb	210	Fine sandstone - silty sand						4.5							100		p 226 Site geology	Haji-Djafari et al., 1981
Pb	210	Fine sandstone - silty sand						5.75							1500		p 230 : Split Rock Formation	Haji-Djafari et al., 1981
Pb	210	Fine sandstone - silty sand						7.0							4000			Haji-Djafari et al., 1981
Pb		organic				100		4.8							9000 (all)	commercial sphagnum peat	(Pb) (Tab 6) (Fig 12 : log Kd vs log cr)	Sheppard and Evenden, 1988
																	Tab 6 - Kd = GM (geometric mean)	Sheppard and Evenden, 1988
Pb		Loam			15			7.3		17					21000 L/Kg	2 Port Hope, Ontario	(U N Th, U) Port Hope soils Pers comm	Sheppard, MCE & RJP, 1989
Pb		Medium sand			2			4.9		5.8					19 L/Kg	3 Port Hope, Ontario	Tab 1: soil charact Tab 11: Kd (L/Kg)	Sheppard, MCE & RJP, 1989
Pb		Organic			<1			5.5		120					30000 L/Kg	4 Port Hope, Ontario	4 soils , remainder , ND	Sheppard, MCE & RJP, 1989
Pb		Fine sandy loam			11			7.4		8.7					59000 L/Kg	6 Port Hope, Ontario		Sheppard, MCE & RJP, 1989
Pb		Sand	-	-	0	3.5	-	4.5 - 5.0	-	22	-	[Ca2+] - 0-0.015 mol/L			2.8x10E2	Soil C		Gerritse et al., 1982
Pb																		
Pb			-	-	0	3.5		4.5 - 5.0		22		[Ca2+] - 0-0.015 mol/L			1.3x10E3	Soil C		Gerritse et al., 1982
Pb																		
Pb			-	-	20	2.5	-	7.5 - 8.0	-	16	-	[Ca2+] - 0-0.015 mol/L			3.5x10E3	Soil D		Gerritse et al., 1982
Pb																		
Pb		Unpolluted organic soil				90		4.5				-			2.52x10E4	Soil A		Gerritse et al., 1982
Pb																		
Pb		Unpolluted peat				>90	-	4 - 5	-		-	[Ca2+] - 0-0.015 mol/L			1.8x10E2	Peat A		Gerritse et al., 1982
Pb																		
Pb		Unpolluted peat				>90	-	4 - 5	-	-	-	[Ca2+] - 0-0.015 mol/L			6 3x:	Peat A		Gerritse et al., 1982
Pb																		
Pb		Polluted peat				>90		6.2		-	-				2.34x10E4	Soil B		Gerritse et al., 1982
Pb		Sphagnum peat				-		4 - 5	-	-					6x10E4	- -		Wolf et al., 1977
Pb		Sphagnum peat				-	-	4 - 5	-	-	-	0.025 meq Ca2+/m			2x10E2			Wolf et al., 1977

TABLE B-18

LITHIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Li		Bandelier tuff (silicic glass)										0.0? N CaCl2					No Kd's determined used Kd = 0.08 in model calculations (13 figures)	Neighton & Wagenet, 1986

TABLE B-19

MANGANESE K_d VALUES

NUC.	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Mn	54	Heavy clay -1		15	85			8.2(7 1- 2)		26--2					100^--200	(9 04 - 9 11 m) Lovisa sav., Finland	(Mn-54) (Tab.10 = Mn Kd + pH)	Nikula, 1982
Mn	54	Heavy clay -3		11	89			8 4(7 3-- 2)		21--2					96--1	(2 08 - 2 15 m) Olkiluoto Savi, Finland	(pH in Tab 10 - ( ) in pH column)	Nikula, 1982
Mn	54	Heavy clay -4		32	68			8.3(7.1- 2)		5 7--2					34--5	(2 49 - 2 56 m) Olkiluoto Savi, Finland	(O N = Sr,Cs,Co,Zn,Ce) (Fig. 11 = Mn Kd vs Rf)	Nikula, 1982
Mn	54	Heavy clay -5		32	68			8 0(7 0-- 1)		25--1					4100--1200	(6 28 - 6 35 m) Salo Savi, Finland	Soil type classified by DHT from texture triangle.	Nikula, 1982
Mn	54	Silty clay loam -6		62	38			7.0(7.2-- 1)		17--5					430--70	(2 74 - 3 31 m) Jamsa Savi, Finland		Nikula, 1982
Mn	54	Loamy sand -7	79	21				6 4(7 1-- 1)		2 8-- 2					96--3	(4 m) Lovisa moreen, Finland		Nikula, 1982
Mn	54	Sandy loam -8	65	35				6 4(7 3--.1)		3 2-- 2					4 --3	(1.5 m) Olkiluoto moreen, Finland		Nikula, 1982
Mn	54	Loamy sand -9	73	27				6 8(7 0--.1)		2 1-- 3					160--10	(3 5 - 4 0 m) Juuka moreen, Finland		Nikula, 1982
Mn	54	Sandy loam -10	66	34				6 7(7 0-- 1)		2 3-- 3					130--10	(2 2 - 2 5 m) Portala moreen, Finland		Nikula, 1982
Mn	54	Loam -11	41	37	22			9 7(8.3- 2)		18--5					4300--300	(44 m) Kakola Kalliosavi, Finland		Nikula, 1982
Mn	54	Sandy loam -12	57	29	14			9 9(8.1--.2)		40--4					2700--100	(24 m) Meisaara kalliosavi, Finland		Nikula, 1982
Mn	54	Loam	45 0	35.0	0.0	3.0		7.7 (in H2O)		30 9					16851	Facolta (F), Po Valley, Italy	(Mn-54)	Carini et al 1985
Mn	54	Sandy loam	70 0	20 0	0 0	2.5		6 0 (in H2O)		7 2					106 1	Vercelli (V), Po Valley, Italy	(Conc = 328 33uCi/mg - same conc. for other elements)	Carini et al., 1985
Mn	54	Sandy Loam	74.2	14.0	1 8	1 94		7 8 (in H2O)		6 3					11002	Gargatano (G), Po Valley, Italy	(O.N = Cs,Co,Fe,I) Tab. 1 = soil properties	Carini et al., 1985
Mn	54	Clay loam	36.3	27.5	6.2	2.8		7 8 (in H2O)		32 3					54118	Villanova (Vi), Po Valley, Italy	Tab 3 = Kd = 72 hours	Carini et al., 1985
Mn	54	Clay loam	31 4	36 2	2 4	3 5		7 7 (in H2O)		39 3					37370	Sarmato (S), Po Valley, Italy		Carini et al., 1985
Mn	54	Sandy loam	56.1	27.5	6 4	1.34		7 9 (in H2O)		15 0					24325	Monticelli (M), Po Valley, Italy		Carini et al., 1985
Mn	54	Sandy loam	64.0	23.5	2.5	1.21		6 8 (in H2O)		4 4					573 4	5 Po Valley, Italy		Carini et al., 1985
Mn	54	Clay loam	32.5	30.0	7.5	4 96		7.6 (in H2O)		35 4					[illegible]	15 Po Valley, It 'y		Carini et al., 1985
Mn	54	Clay loam	39.5	27.0	3.5	2.54		7 8 (in H2O)		24 1					[illegible]	17 Po Valley, Italy		Carini et al., 1985
Mn	54	Clay loam	31 5	29 0	9.5	2 91		7 7 (in H2O)		33 5					57215	19 Po Valley, Italy		Carini et al., 1985
Mn	54	Clay loam	37.0	32 0	1 0	1 94		6 4 (in H2O)		24 5					1929	41 Po Valley, Italy		Carini et al., 1985
Mn	54	Sand	88 5	6.2	5 3	1.54		7 5 (in H2O)		7 1					3513	55 Po Valley, Italy		Carini et al., 1985
Mn	54	Loam	31.0	44 0	5 0	2 68		7 9 (in H2O)		22 6					33726	61 Po Valley, Italy		Carini et al., 1985
Mn	54	Sandy clay loam	50.5	19.5	0 0	4 08		6.4 (in H2O)		26 8					457 2	65 Po Valley, Italy		Carini et al., 1985
Mn	54	Sandy loam	59.0	22 0	9.0	1 67		6 0 (in H2O)		13 5					523 6	73 Po Valley, Italy		Carini et al., 1985
Mn	54	Loam	42.5	43.5	4 0	1 67		7 8 (in H2O)		23 2					47960	77 Po Valley, Italy		Carini et al., 1985
Mn	54	Loam	43.0	27.5	9 5	6 3		7.1 (in H2O)		34 9					486 9	81 Po Valley, Italy		Carini et al., 1985
Mn	54	Clay	24.5	24 5	1.0	3 85		7 5 (in H2O)		35.1					48945	93 Po Valley, Italy		Carini et al., 1985
Mn	54	Sand								(11.3)					150	A	(O N = Sr, Cs, Co, Zn, Ag, Fe, Mo). (in JAP)	Inoue & Morisawa, 1976
Mn	54	Silt-clay								(241 7)					2100	B	Tab 2= soil type Tab 5= CEC + Kd	Inoue & Morisawa, 1976
Mn	54	Silt-clay								(55 6)					250	C	CEC - ( ) = meq/g	Inoue & Morisawa, 1976
Mn	54	Gravel-sand								(69 5)					5000	D	* = Mn-56 was used instead of Mn-54, - = not determined.	Inoue & Morisawa, 1976
Mn	54	Silt-clay								(167 9)					10000	E		Inoue & Morisawa, 1976
Mn	54	Silt-sand								(47 8)					30	F		Inoue & Morisawa, 1976
Mn	54	Gravel								(28 9)					500	G		Inoue & Morisawa, 1976
Mn	54	Silt-clay								(117 9)					700	H		Inoue & Morisawa, 1976
Mn	54	Silt-clay								(140 5)					70	I		Inoue & Morisawa, 1976
Mn	54	Silt-clay								(246 0)					-	J		Inoue & Morisawa, 1976
Mn	54	Fine sand								(60 3)					50	K		Inoue & Morisawa, 1976
Mn	54	Silt								(149 0)					250	L		Inoue & Morisawa, 1976
Mn	54	Sand								(24 3)					14 *	M		Inoue & Morisawa, 1976
Mn	54	Gravel								(27 1)					800	N		Inoue & Morisawa, 1976
Mn	54	Fine sand								(122 8)					2000	O		Inoue & Morisawa, 1976
Mn	54	Fine sand								(38 6)					70	P		Inoue & Morisawa, 1976
Mn	54	Silt-clay								(200 1)					100	Q		Inoue & Morisawa, 1976
Mn		Hallandale fine sand				14.5g/Kg		8 20		1 13ueq/g					.071 L/g	Pompano Beach, Florida	Tab 1 = cations in soil. Tab 2 = soil charact.	Wong et al., 1983
Mn		Plantation Muck - bottom layer				27 9g/Kg		7 30		1 58ueq/g					186 L/g	Pompano Beach, Florida	Tab 3 - heavy metals in soil Tab 4 = linear Kd (L/g).	Wong et al., 1983
Mn		Plantation Muck - middle layer				670.7g/Kg		7 20		4 09ueq/g					036 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff Fig 1 & 2 = isotherms = Cr, Ni.	Wong et al., 1983
Mn		Plantation Muck - top layer				705.2g/Kg		7 10		4 53ueq/g					.226 L/g	Pompano Beach, Florida	(O N = Cu, Zn, Fe, Ni, Cd, Cr, Co)	Wong et al., 1983
Mn			88.03	8 67	3.3	1 41		6 1							24 95324	1 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			83.84	10.91	5.25	1 21		6 8							29 86283	2 Oxford County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			90	6 66	3 33	1.34		6 9							30 39695	3 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			92.09	5 41	2.5	1 81		6 3							18 18357	4 Norfolk County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			83 49	9.9	6 6	3.5		6.2							34 38714	5 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			90 44	6.23	3 32	2.02		7.2							41 88678	6 (Dendaue 87811W)	Kd = linKd (Pers. communication)	Sheppard, 1989

continued...

TABLE B-19 (concluded)

NUC	ISØ	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Mn			89 49	5 47	5.05	2 15		7.2								35 07696	7 Norfolk County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			90.37	6.28	3.35	1.21		6.6								21 73877	8 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			81 98	9.64	8.38	3.9		7 1								75.87942	9 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			90 95	5.75	3.29	2 55		5 6								14 41441	10 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			68.7	24 53	6.77	0 87		6								6 436572	11 Norfolk County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			82.68	16.47	0 84	1.75		6.2								16 52034	12 Norfolk County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			93.9	4.88	1.22	1 48		6 1								14 53838	13 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			91 39	4.92	3 69	1.88		6 5								30 49643	14 Brant County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			89.3	5 76	4 94	2 08		5 8								18 22498	15 Brant County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			88.12	9.42	2.46	1 68		6 7								29 74587	16 Brant County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			61.2	20.26	18.54	6 59		6 8								72 45494	17 Kent County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			89.56	5.43	5 01	2 62		7 1								43 39133	18 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			86.83	9.06	4 12	3 5		6 7								29 17709	19 Middlesex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			88 96	8.59	2 45	1 48		6 4								16 17499	20 Middlesex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			75 37	14 95	9 68	13.18		6								94 174	21 Middlesex County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			71 93	21.59	6 48	5 51		7								210.94	22 Middlesex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			93.04	4 91	2 05	1 48		6 5								39 3532	23 Middlesex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			91 99	6.32	1 69	1 14		6 5								37 26716	24 Middlesex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			91 07	4 87	4 06	1 75		6								31 91192	25 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			95.3	2 99	1 71	2 49		6 9								74 07016	26 Elgin County Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			20.98	33 34	45 68	3 09		6								46 53332	27 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			83.64	11 74	4.61	1 87		7 1								45 09788	28 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			84 68	9.52	5.8	4 3		6 6								88 09434	29 Kent County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			91 78	3.7	4 57	2 89		6 1								72 65781	30 Kent County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			30.89	23.21	45.91	5.78		7 1								68 22806	31 Kent County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			69 4	17 67	12.93	14.79		6 6								[illegible]	32 Kent County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			91.39	5.74	2 87	1 68		6 1								[illegible]	33 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			22 08	49 55	28 37	3 97		7 1								54 29927	34 Bruce County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			39.59	40.84	19.57	3.5		7 5								60 6383	35 Kent County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			92.95	3.32	3.73	1 68		5 7								13 09019	36 Elgin County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			91.51	6.56	1.93	0 74		6 7								19 89193	37 Elgin County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			88 47	7.84	3 69	2.87		6 8								56 76449	38 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			88.86	7.02	4 13	0		0								19.71843	39 Norfolk County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			91.01	5.72	3.27	1.95		5 6								13 7643	40 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			82.42	8.79	8.79	5.78		7.2								74 79869	41 Elgin County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			61.94	25 23	12 83	4 64		6 2								37 05058	42 Oxford County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			83 77	10.4	5 83	3 74		6 3								34 08741	43 Oxford County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			20.38	53.39	26.23	5 65		6 8								71.2223	44 Oxford County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			33.56	45.44	21	4.98		6 6								59 78855	45 Oxford County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			28.29	37.83	33 88	13.04		7								147 235	46 Waterloo County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			19.11	43.36	37.53	3 9		7 1								56.23789	47 Wellington County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			91.33	4 96	3.72	2 77		7 1								46 84659	48 Elgin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			21.25	28 06	50.69	4 5		5 5								73 57529	49 Essex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			28.06	33.04	38 9	4 03		6 8								46 88911	50 Essex County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			3 91	50 73	45.37	5 92		7 4								74 83125	51 Kent County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			60.17	25	14.83	4.64		7 2								67 35673	52 Wellington County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			49 59	32 51	17 5	9 28		7.3								137 347	53 Dufferin County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			24.35	49.15	26.5	5.85		7 4								82 9041	54 Dufferin County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			23 92	59.69	16 39	8 34		7 3								250 5596	55 Grey County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			56.68	30 82	12.5	3 09		7 2								68 42676	56 Grey County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			23 99	36 71	39.3	7 66		6 6								[illegible]	57 Bruce County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			38.73	41.21	20.06	9 78		7 2								85 66531	58 Perth County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			29 85	49 11	21 05	3 5		7								42 01284	59 Perth County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			24 6	58 2	17.2	3.83		7								72 14479	60 Huron County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			26.53	45 97	27.5	12 91		7.2								116 4787	61 Huron County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			24.84	35.71	39 45	2 02		7 5								49 45202	62 Huron County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			14 99	38 49	46.57	0		0								63 69554	63 Lambton County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			29 85	33 84	36 31	4 64		6 7								75 61793	64 Lambton County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			37 58	39 6	22 87	3 03		7 3								66 58794	65 Wellington County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			43 57	27 98	28 46	0		0								346 4575	66 Wellington County, Ontario	Kd = linKd (Pers communication)	Sheppard, 1989
Mn			40 37	38 03	21 6	0		0								238 8713	67 Wellington County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			49.64	29.45	20 9	5.24		7 2								40.17307	68 Wellington County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989
Mn			89.13	6.69	4.18	4 1		5 8								24 92562	69 Essex County, Ontario	Kd = linKd (Pers. communication)	Sheppard, 1989

TABLE B-20

MOLYBDENUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Mo		LFH-Ah						5 2		81 2cmolkg-1					50 3 (20 8)	0-4 cm Gleyed Dystric Brunisol	Tab 1= soil prep. BLG-1Y	Sheppard et al., 1987
Mo		Ae						5 1		2 9cmolkg-1					26 1 (15 8)	4-15 cm Gleyed Dystric Brunisol	Kd: Leach = no ( ). Kd: GW: ( )	Sheppard et al., 1987
Mo		Bfj-Bfjgj						5 2		2 1cmolkg-1					51 9 (7 7)	15-45 cm Gleyed Dystric Brunisol	CEC= cmolkg-1	Sheppard et al., 1987
Mo		C-Cgj						6 2		1 7cmolkg-1					14 2 (14 2)	>45 Gleyed Dystric Brunisol		Sheppard et al., 1987
Mo	99	sand								(11 3)ueq/g					1	A	(Mo-99) Tab.2 = soil type	Inoue and Morisawa, 1976
Mo	99	silt-clay								(241 7)ueq/g					140	B	Tab.5 = CEC & Kd	Inoue and Morisawa, 1976
Mo	99	silt-clay								(55 6)ueq/g					40	C	(CN = Cs,Co,Mn,Zn,Ag,Fe)	Inoue and Morisawa, 1976
Mo	99	gravel-sand								(69 5)ueq/g					6	D	CEC = ( ) = ueq/g (in JAP)	Inoue and Morisawa, 1976
Mo	99	silt-clay								(167 9)ueq/g					160	E	9 Tabs. 3 fig	Inoue and Morisawa, 1976
Mo	99	silt-sand								(47 8)ueq/g					60	F		Inoue and Morisawa, 1976
Mo	99	gravel								(28 9)ueq/g					5	G		Inoue and Morisawa, 1976
Mo	99	silt clay								(117 9)ueq/g					13	H		Inoue and Morisawa, 1976
Mo	99	silt clay								(140 5)ueq/g					400	I		Inoue and Morisawa, 1976
Mo	99	silt-clay								(246 0)ueq/g					200	J		Inoue and Morisawa, 1976
Mo	99	fine sand								(60 3)ueq/g					20	K		Inoue and Morisawa, 1976
Mo	99	silt								(149 0)ueq/g					270	L		Inoue and Morisawa, 1976
Mo	99	sand								(24 3)ueq/g					--	M		Inoue and Morisawa, 1976
Mo	99	gravel								(27 1)ueq/g					1 3	N		Inoue and Morisawa, 1976
Mo	99	fine sand								(122 8)ueq/g					8	O		Inoue and Morisawa, 1976
Mo	99	fine sand								(38 6)ueq/g					1 8	P		Inoue and Morisawa, 1976
Mo	99	silt clay								(200 1)ueq/g					40	Q		Inoue and Morisawa, 1976
Mo		LFH-Ah						5 2		81 2cmol/kg					18 3+-0 7(-)	0-4 cm Gleyed Dystric Brunisol	Pers Comm (O N : Np, I, Cs, Cr, Tc, U, Th)	Sheppard, 1989
Mo		Ae						5 1		2 9cmol/kg					10 2+-0 7(-)	4-15 cm Gleyed Dystric Brunisol	Kd= Leachate = no ( ) Kd= Groundwater = ( )	Sheppard, 1989
Mo		Bfj-Bfjgj						5 2		2 1cmol/kg					5 1+-0 3(-)	15-45 cm Gleyed Dystric Brunisol	Soil type, Ph, CEC & soil desc from BLG-1Y(JEQ16(3))	Sheppard, 1989
Mo		C-Cgj						6 2		1 7cmol/kg					13 3- 0 8( )	>45 cm Gleyed Dystric Brunisol		Sheppard, 1989

TABLE B-21

NEPTUNIUM K_d VALUES

NUC	ISO	SOIL TYPE	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Np	237	silt loam	13	56	25	2.8		5.2 (5.83)		20	1.29	Mn 4M	06		35	Sharpsburg series, (mesic Typic Argiudolls)	Np 237 (tab. 2)	Nishita et al,1981
Np	237	silt loam				2.8		(6.85)				HNO3			95		in pH column ( ) = extract. H	Nishita et al,1981
Np	237	sandy loam	55	33	12	2.4		5.3 (4.08)		15	1.65	Mn 4M	05		3	Malbis series, (Plinthic Paleudults)	Soil properties, pH, CEC from Wallace et al,1979	Nishita et al,1981
Np	237	sandy loam				2.4		(5.57)				HNO3			18		Soil type and % main clay minerals from Nishita, 1981(1 215)	Nishita et al,1981
Np	237	sandy loam	65	33	2	5.7		5.0 (4.42)		15	1.52	Mn 4M	04		3	Lyman series, (Typic Haplorthods)		Nishita et al,1981
Np	237	sandy loam				5.7		(5.06)				HNO3			32			Nishita et al,1981
Np	237	clay loam	29	39	32	0.6		7.8 (7.29)		30	1.20	Mn 4M	04		41	Holtsville (calcareous-12% CaCO3), (Typic Torrifluvent)		Nishita et al,1981
Np	237	clay loam				0.6		(8.28)				HNO3			117			Nishita et al,1981
Np	237	sandy loam	70	28	2	8.4		6.0 (5.56)		15	5.29	Mn 4M	10		26	Aiken series, (Xeric Haplohumults)		Nishita et al,1981
Np	237	sandy loam				8.4		(6.57)				HNO3			108			Nishita et al,1981
Np	237	silt loam	27	58	15	2.5		6.7 (6.13)		25	2.41	Mn 4M	08		52	Yolo series, (Typic Xerorthents)		Nishita et al,1981
Np	237	silt loam				2.5		(6.83)				HNO3			81			Nishita et al,1981
Np	237	muck	70	30	0	40.8		7.2 (6.24)		60	1.57	Mn 4M	10		786	Egbert series, (Histosol) (not classified)		Nishita et al,1981
Np	237	muck				40.8		(7.25)				HNO3			929			Nishita et al,1981
Np	237	organic						6.28(0.11)							1000(+-700)	PCF (0-40 cm)	In 6511 (no tab.) (SD +-x)	Sheppard and Thibault, 1988
Np	237	organic						6.09(0.04)							1000(+-400)	PCL (40-80 cm)		Sheppard and Thibault, 1988
Np	237	organic						5.94(7.28)							30	SCF (0-40cm)		Sheppard and Thibault, 1988
Np		Litter = LFH Ah						5.2		81.2cmol/kg					( )	0-4 cm	Tab 1 soil prop. CEC: cmol/Kg)	Sheppard et al., 1987
Np		Ae = Ae						5.1		2.9cmol/kg					4.2 (5.8)	4-15 cm	Kd in ( ) GW, leachate no ( )	Sheppard et al., 1987
Np		Up. B = Bfj Bfjgj						5.2		2.1cmol/kg					1.6 (0.8)	15-45 cm		Sheppard et al., 1987
Np		Low. B = C-Cgj						6.2		1.7cmol/kg					0.6 (0.5)	>45 cm		Sheppard et al., 1987
Np	237	Glauconite sand	91.1	2.9	6.0			6.6 (5)	395 mV	3.7				1 M	13.7 (A B)	(30 weeks) N.E. Netherlands	(Np 237) (Appendix 3) (O.N. Am,Pu,Tc)	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.6 (5)	389 mV	3.7				1 M	12.6 (A B)	(30 weeks) N.E. Netherlands	This report is a problem Kd>1000's	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.5 (5)	396 mV	3.7				2 M	15.6 (A B)	(30 weeks) N.E. Netherlands	Kds function of pH, Eh, M, time - APPENDICES	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.5 (6)	387 mV	3.7				1 M	37.3 (A B)	(30 weeks) N.E. Netherlands	Aer: Aerobic pH in ( ) initial pH	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			7.0 (6)	391 mV	3.7				1 M	14.4 (A [illegible]	(30 weeks) N.E. Netherlands	In Kd column, A: aerobic, AN: anaerobic, B: batch, C: column	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.9 (6)	384 mV	3.7				2 M	25.7 (A [illegible]	(30 weeks) N.E. Netherland	M: molarity Rock salt (anhydrite)	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.8 (5)	19 mV	3.7				1 M	2.9 (AN-B)	(6 weeks) N.E. Netherlands	Involves - salt dome	Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.9 (5)	1 mV	3.7				1 M	1.4 (AN-B)	(6 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.9 (5)	11 mV	3.7				2 M	1.6 (AN-B)	(6 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.4 (6)	5 mV	3.7				1 M	8.0 (AN-B)	(6 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.5 (6)	21 mV	3.7				1 M	4.8 (AN-B)	(6 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.7 (6)	-7 mV	3.7				2 M	5.7 (AN-B)	(6 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.5 (5)	138 mV	3.7				1 M	1.4 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.7 (5)	114 mV	3.7				1 M	1.2 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			5.8 (5)	75 mV	3.7				2 M	1.2 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.4 (6)	191 mV	3.7				1 M	3.2 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.2 (6)	101 mV	3.7				1 M	8.8 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Glauconite sand	91.1	2.9	6.0			6.3 (5)	-7 mV	3.7				2 M	6.6 (AN-C)	(8.5 weeks) N.E. Netherlands		Prins et al., 1986
Np	237	Sand, Gohy 1012						(5)	15 mV	155/Ca++				.012M	(AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 1012						7.5 (7)	9 mV	155/Ca++					25.8 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 1012						6.0 (5)	15 mV	155/Ca++				.05 M	30.5 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 1012						5.9 (5)	10 mV	1.183/Ca++				1 M	59.0 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 2120						7.4 (6.8)	25 mV	1.183/Ca++				1 M	66.0 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 2120						5.9 (5)	21 mV	1.183/Ca++				2.5 M	32.0 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np	237	Sand, Gohy 2120						7.5 (6.8)	19 mV	1.183/Ca++				2.5 M	38.0 (AN-B)	(6 weeks) Gorleben, FRG		Prins et al., 1986
Np		LFH-Ah						5.2		81.2cmol/kg					- -	0-4 cm Gleyed Dystric Brunisol	Conc. Comp. (O.N.: I, Cs, ..., Tc, U, Th, Np)	Sheppard, 1989
Np		Ae						5.1		2.9cmol/kg					(2.3+-0.9)	4-15 cm Gleyed Dystric Brunisol	Kd: leachate ... ( ) Gw: Groundwater = ( )	Sheppard, 1989
Np		Bfj Bfjgj						5.2		2.1cmol/kg					1.8+-0.4(1.5+-0.4)	15-45 cm Gleyed Dystric Brunisol	Soil type, Ph, CEC & soil desc. from BLC IY(JEQ16(3))	Sheppard, 1989
Np		C-Cgj						6.2		1.7cmol/kg					2.5+-0.7(5.0+-0.9)	>45 cm Gleyed Dystric Brunisol		Sheppard, 1989
Np	237	Clay (fraction)						6.5				Sat Ca(NO3)2			320	(2 um fraction (clay) of silt loam	Np(5) 237 Tab2: Kd (Cs, Eu, Th, U)	Dahlman et al., 1976

continued...

TABLE B-21 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EC (s)	CEC meq/100g	% IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Np		fine sandy loam				2.4		5.3 (4.08)		15	1.65				3	Malbis (Louisiana)	When value in bracketed it is extract pH	Nishita et al., 1979
Np		fine sandy loam				2.4		5.3 (5.57)		15	1.65				18	Malbis (Louisiana)		Nishita et al., 1979
Np		fine sandy loam				5.7		5.0 (4.42)		15	1.52				3	Lyman (Maine)		Nishita et al., 1979
Np		fine sandy loam				5.7		5.0 (6.06)		15	1.52				37	Lyman (Maine)		Nishita et al., 1979
Np		light loam				8.4		6.0 (5.56)		15	5.29				25	Aiken (California)		Nishita et al., 1979
Np		light loam				8.4		6.0 (6.57)		15	5.29				109	Aiken (California)		Nishita et al., 1979
Np		sand						2.5 3.1				0.002mol/l Ca			2.37	Burbank (Washington)		Routson et al., 1977
Np		sand						2.5 3.1				0.2mol/l Ca			0.36	Burbank (Washington)		Routson et al., 1977
Np		sand						2.5 3.1				0.015mol/l Na			3.9	Burbank (Washington)		Routson et al., 1977
Np		sand						2.5 3.1				3.0mol/l Na			3.2	Burbank (Washington)		Routson et al., 1977
Np		sandy clay						2.5 3.1				0.002mol/l Ca			0.75	South Carolina		Routson et al., 1977
Np		sandy clay						2.5 3.1				0.2mol/l Ca			0.16	South Carolina		Routson et al., 1977
Np		sandy clay						2.5 3.1				0.015mol/l Na			0.7	South Carolina		Routson et al., 1977
Np		sandy clay						2.5 3.1				3.0mol/l Na			0.4	South Carolina		Routson et al., 1977
Np			76	21.2	2.8	0.43		8.1		5.94					15.4	Burbank (Richland, Washington)		Ames & Rai, 1978
Np			94.6	1.6	3.8	0.21		5.2		0.69					32.4	Fuquay (5-50 cm)		Ames & Rai, 1978
Np		sand				0.39		8.1	0 sat						390- 16	N.E. Irish Sea Sediment		Fowler & Ashton, 1982
Np		silty clay loam				2.8		5.9 (5.83)		20	1.29				35	Sharpsburg (Iowa)	When value in bracketed it is extract pH	Nishita et al., 1979
Np		silty clay loam				2.8		5.9 (6.85)		20	1.29				95	Sharpsburg (Iowa)		Nishita et al., 1979
Np		loam				2.5		6.7 (6.13)		25	2.41				52	Yolo (California)		Nishita et al., 1979
Np		loam				2.5		6.7 (6.83)		25	2.41				81	Yolo (California)		Nishita et al., 1979
Np			12.6	65.8	21.6	3.61		5.3		16.88					1.27	Muscatine		Ames & Rai, 1978
Np			32	56	12	0.84		6.5		10.76					20.2	Ritzville		Ames & Rai, 1978
Np		clay				0.6		7.8 (7.29)		30	1.20				41	Holtsville	When value in bracketed it is extract pH	Nishita et al., 1979
Np		clay				0.6		7.8 (8.28)		30	1.20				117	Holtsville		Nishita et al., 1979
Np		clay				0.86		8.1	0 sat						1250- 310	NW Mediterranean sea sediment		Fowler & Ashton, 1982
Np		clay				0.29		8.1	0 sat						3200- 1800	NE Atlantic sea sediment		Fowler & Ashton, 1982
Np		organic				40.8		7.2 (5.24)		60	1.57				786	Fobert	When value in bracketed it is extract pH	Nishita et al., 1979
Np		organic				40.8		7.2 (7.25)		60	1.57				923	Fobert		Nishita et al., 1979

TABLE B-22

NICKEL K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORC	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ni		sand	90	3	8										2100 (1700)	Healty 1 Nevada	(Abst: Kds highest in alkali: Alluvial Basin Deposits high	Neiheisel, 1983
Ni		sand	91	2	7										3200	Healty 2, Nevada	in montmorillonite & zeolite Tab1: Kd: mineral phase char	Neiheisel, 1983
Ni		sand	83	2	15										3600	Healty 5, Nevada	Tab2=Relationship:texture, surface area & clay mineral comp	Neiheisel, 1983
Ni		clayey sand	58	6	36										115	Barnwell 4, South Carolina	Tab3= soil text. & minerals. Tab4: Kd= 6 radionuclides	Neiheisel, 1983
Ni		clayey sand	68	11	21										120	Barnwell 12, South Carolina	Fig6: text. diagram Fig7 K vs sorptive minerals	Neiheisel, 1983
Ni		clayey sand	73	8	19										116 (150)	Barnwell 14, South Carolina		Neiheisel, 1983
Ni					13			6.2		112					10-1000	mean of 32 Danish soils	Tab 3- Soil char - Kd correlations Tab 4: Regress. coeff	Anderson and Dunn, 1988
																	Fig1: log Kd for Cd-function of pH Tab2: soil prop CONCLUS	Anderson and Dunn, 1988
																	(XR=32-44- (not included in [illegible] Table, Cd-Co-zn)	Anderson and Dunn, 1988
Ni		clay	40.1	16.3	43.6	2.00		6.70		16.89		15.0			388	Mecklenberg clay	(Tab 1 = soil prop.) (Tab 3 - Kd)	Reddy and Dunn, 1986
Ni																		Reddy and Dunn, 1986
Ni		loam	45.9	34.6	19.6	2.75		6.80		12.51		11.2			227	Wilkes loam	(Fig. 3,4 - Kd vs metal conc.)	Reddy and Dunn, 1986
Ni		sand	63.4	21.5	15.2	2.68		4.67		6.02		5.1			152	Iredell sandy loam	(Tab 4 : regression analysis equat.)	Reddy and Dunn, 1986
																	Abstr. and Conclusions	Reddy and Dunn, 1986
																		Reddy and Dunn, 1986
Ni		PA (0-30 cm)				31.7		5		134	0.88 (1.40)	0.1M Ca(NO3)2			0.72 (lg-1)	Aquod (N. Germany) Org/silicate clay (OM/2:1)	Tab 5 Kd(lg-1) Cd, Ni, Zn solution	Tiller et al., 1984
Ni		PA (0-30 cm)				31.7		6		134	0.88 (1.40)	0.1M Ca(NO3)2			1.69 (lg-1)	Aquod (N. Germany) Org/silicate clay (OM/2:1)	(Xref - Cd, Zn) Tab 2- clay constituents	Tiller et al., 1984
Ni		PA (0-30 cm)				31.7		7		134	0.88 (1.40)	0.1M Ca(NO3)2			4.92 (lg-1)	Aquod (N. Germany) Org/silicate clay (OM/2:1)	Tab 1= soil prop. also minerology of clay soil, CEC,	Tiller et al., 1984
Ni		LA (0-30 cm)				5		5		65	1.16 (2.62)	0.1M Ca(NO3)2			0.17 (lg-1)	Adalf (N. Germany) Silicate clay (2:1)	pH 5 & 7	Tiller et al., 1984
Ni		LA (0-30 cm)				5		6		65	1.18 (2.62)	0.1M Ca(NO3)2			0.48 (lg-1)	Adalf (N. Germany) Silicate clay (2:1)		Tiller et al., 1984
Ni		LA (0-30 cm)				5		7		65	1.18 (2.62)	0.1M Ca(NO3)2			1.89 (lg-1)	Adalf (N. Germany) Silicate clay (2:1)		Tiller et al., 1984
Ni		PEL (0-15 cm)				3.1		5		99	0.45 (1.61)	0.1M Ca(NO3)2			0.15 (lg-1)	Pellustert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		PEL (0-15 cm)				3.1		6		99	0.45 (1.61)	0.1M Ca(NO3)2			0.34 (lg-1)	Pellustert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		PEL (0-15 cm)				3.1		7		99	0.45 (1.61)	0.1M Ca(NO3)2			0.80 (lg-1)	Pellustert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		E46 (0-15 cm)				2.4		5		70	0.9 (0.55)	0.1M Ca(NO3)2			0.25 (lg-1)	Pelloverert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		E46 (0-15 cm)				2.4		6		70	0.9 (0.55)	0.1M Ca(NO3)2			0.51 (lg-1)	Pelloverert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		E46 (0-15 cm)				2.4		7		70	0.9 (0.55)	0.1M Ca(NO3)2			1.11 (lg-1)	Pelloverert (Australia) silicate clay (2:1)		Tiller et al., 1984
Ni		KN (40-60 cm)				1.0		5		53	4 (2.26)	0.1M Ca(NO3)2			.075 (lg-1)	Aqualf (N. Germany) silicate clay (2:1)		Tiller et al., 1984
Ni		KN (40-60 cm)				1.0		6		53	4 (2.26)	0.1M Ca(NO3)2			0.21 (lg-1)	Aqualf (N. Germany) silicate clay (2:1)		Tiller et al., 1984
Ni		KN (40-60 cm)				1.0		7		53	4 (2.26)	0.1M Ca(NO3)2			0.68 (lg-1)	Aqualf (N. Germany) silicate clay (2:1)		Tiller et al., 1984
Ni		PS B (20-30 cm)				0.8		5		24	.09 (4.79)	0.1M Ca(NO3)2			.009 (lg-1)	Pallevertalf (N. Germany) silicate clay/iron oxide (1:1/Fe)		Tiller et al., 1984
Ni		PS B (20-30 cm)				0.8		6		24	.09 (4.79)	0.1M Ca(NO3)2			.067 (lg-1)	Pallevertalf (N. Germany) silicate clay/iron oxide (1:1/Fe)		Tiller et al., 1984
Ni		PS B (20-30 cm)				0.8		7		24	.09 (4.79)	0.1M Ca(NO3)2			1.01 (lg-1)	Pallevertalf (N. Germany) silicate clay/iron oxide (1:1/Fe)		Tiller et al., 1984
Ni		W (0-15 cm)				4.9		5		32	.77 (19.3)	0.1M Ca(NO3)2			0.10 (lg-1)	Haplohumox (Australia) iron oxide/silicate clay (Fe/1:1)		Tiller et al., 1984
Ni		W (0-15 cm)				4.9		6		32	.77 (19.3)	0.1M Ca(NO3)2			0.49 (lg-1)	Haplohumox (Australia) iron oxide/silicate clay (Fe/1:1)		Tiller et al., 1984
Ni		W (0-15 cm)				4.9		7		32	.77 (19.3)	0.1M Ca(NO3)2			2.67 (lg-1)	Haplohumox (Australia) iron oxide/silicate clay (Fe/1:1)		Tiller et al., 1984
Ni		LB (30-50 cm)				1.1		5		53	.54 (6.0)	0.1M Ca(NO3)2			.075 (lg-1)	Udalf (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		LB (30-50 cm)				1.1		6		53	.54 (6.0)	0.1M Ca(NO3)2			0.31 (lg-1)	Udalf (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		LB (30-50 cm)				1.1		7		53	.54 (6.0)	0.1M Ca(NO3)2			0.78 (lg-1)	Udalf (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		PB (50-60 cm)				16.5		5		87	5.20 (7.37)	0.1M Ca(NO3)2			.053 (lg-1)	Aquod (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		PR (50-60 cm)				16.5		6		87	5.20 (7.37)	0.1M Ca(NO3)2			0.41 (lg-1)	Aquod (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		PR (50-60 cm)				16.5		7		87	5.20 (7.37)	0.1M Ca(NO3)2			3.70 (lg-1)	Aquod (N. Germany) silicate clay/iron oxide (2:1/Fe)		Tiller et al., 1984
Ni		Goethite (lab)										0.1M Ca(NO3)2			0.23 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
Ni		Goethite (lab)										0.1M Ca(NO3)2			0.63 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
Ni		Goethite (lab)										0.1M Ca(NO3)2			4.90 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
																11 Glessol	(Fig. 3)	Bunzl and Schimmack, 1988
Ni		Hallandale fine sand				14.5g/Kg		8.20		1.13ueq/g					0.604 L/g	Pompano Beach, Florida	Tab 1 - cations in soil Tab 2 = soil charact	Wong et al., 1983
Ni		Plantation Muck - bottom layer				27.9g/Kg		7.30		1.58ueq/g					2.328 L/g	Pompano Beach, Florida	Tab 3 - heavy metals in soil Tab 4 = linear Kd (L/g)	Wong et al., 1983
Ni		Plantation Muck - middle layer				670.7g/Kg		7.20		4.09ueq/g					1.090 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff. Fig 1 & 2 = isotherms = Cr, Ni	Wong et al., 1983
Ni		Plantation Muck - top layer				705.2g/Kg		7.10		4.53ueq/g					0.892 L/g	Pompano Beach, Florida	(O N = Cu, Zn, Mn, Ni, Cd, Ca)	Wong et al., 1983

TABLE B-23

PHOSPHORUS K_d VALUES

NUC	IS#	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
P		-						7.0				?.55 (NH4)2HPO4			approx 250->1500	#1- Red Yellow Latosols & Regosols #2- Dark-Red Latosols #3. Dark Red Latosols & Terra Rosa Legitima #4- Terra Rosa Estruturada	Concl high correlation Kd: %clay,%Al,%Fe & P cont. in soil Fig 2,3,4= soil fert.diagram Fig.5= Kd vs %clay Fig 6=Kd vs %Al Fig.7= Kd vs. %Fe Fig 8=Kd vs. total P Good paper #1 sandy, #2-sandy (carbonated) #3&4 clay >30%clay,>1.8%Fe,>40mgP/100g,>2mgSiO2/100g,Kd>1000	Miyake, 1987
P																	Fig 1= %clay vs. P-sorption coeff Fig 2: %Fe vs P-sorption coeff Fig 3: Ca vs P-sorption coeff Fig 4= Al vs P-sorption coeff Fig 5= %c vs P-sorption coeff Fig 6: 1 0ppm P vs 4000ppm P	Miyake, 1979

TABLE B-24

PLUTONIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Pu	239	silt loam	19	56	25	2 8		5 9	(5 83)		[illegible]	1 29		0 06		6302	Sharpsburg series	Smain clay minerals Ta le 2	Nishita et al , 1981
Pu	239	silt loam	19	56	25	2 8			(6 85)							3024	Sharpsburg series	** see Np/1 **	Nishita et al , 1981
Pu	239	sandy loam	55	33	12	2 4		5 3	(4 08)		15	1 65		0 05		850	Malbis series	Nishita, 1 215 1981 (T , 1 p 61)	Nishita et al , 1981
Pu	239	sandy loam	55	33	12	2 4			(5 57)							1515	Malbis series	(Extract) chem prop	Nishita et al , 1981
Pu	239	sandy loam	65	33	2	5 7		5 0	(4 42)		15	1 52		0 04		958	Layman series	(Tab 2 radion conc)	Nishita et al , 1981
Pu	239	sandy loam	65	33	2	5 7			(6 06)							33	Layman series	Wallace et al ,1979, NUREG/CR-0701 = sand/silt/clay	Nishita et al , 1981
Pu	239	clay loam	29	39	32	0 6		7 8	(7 29)		30	1 20		0 04		744	Holtsville series (calcareous 12% CaCO3)		Nishita et al , 1981
Pu	239	clay loam	29	39	32	0 6			(8 28)							361	Holtsville series (calcareous 12% CaCO3)		Nishita et al , 1981
Pu	239	sandy loam	70	28	2	8 4		6 0	(5 56)		15	5 23		0 10		6865	Aiken series		Nishita et al , 1981
Pu	239	sandy loam	70	28	2	8 4			(6 57)							1352	Aiken series		Nishita et al , 1981
Pu	239	silt loam	27	58	15	2 5		6 7	(6 13)		25	2 41		0 08		4938	Yolo series		Nishita et al , 1981
Pu	239	silt loam	27	58	15	2 5			(6 83)							4341	Yolo series		Nishita et al , 1981
Pu	239	muck	70	30	0	40 8		7 2	(6 24)		30	1 57		0 10		2951	Fobert series		Nishita et al , 1981
Pu	239	muck	70	30	0	40 8			(7 25)							1655	Fobert series		Nishita et al , 1981
									Extract pH					Mn & MAN Extract					Nishita et al , 1981
																			Nishita et al , 1981
																			Nishita et al , 1981
																			Nishita et al , 1981
Pu		clay	11	11	76			3-8								5 1000 Pu (4)	Savannah River Plant soil	Tab 1 p 10 (maybe that' all that's needed for Hoeffner 85)	Hoeffner, 1985
Pu		clay	11	11	76			1-4								5 10000 Pu (3)	Savannah River Plant soil	Pu sorption onto SRP so : dependent on pH and oxidation	Hoeffner, 1985
Pu		clay	11	11	76			1-8								10? (10000 Pu (4)	Savannah River Plant soil	state of Pu and moistur content of soil)	Hoeffner, 1985
																		moisture content (p 57 "relatively DRY soil,	Hoeffner, 1985
																		Pu Kd : 3000 to 6000 ml g")	Hoeffner, 1985
																		Fig 15 Kd vs pH (Prou , 1958)	Hoeffner, 1985
																			Hoeffner, 1985
Pu	239	clay						6 0		+200 (mv						7600	glacial till	(Tab 4 - Kd's) (Pu-239	Bell and Bates, 1988
Pu	239	C1 2 sand						6 0		+200 (mv						1800	fine-coarse sand (C1 2)	Tab 1- GW comp Tab 2: soil description (good conclusions)	Bell and Bates, 1988
Pu	239	C3 sand						6 0		+200 (mv						80	medium-coarse sand (C3)	Tab 3: activities Bq	Bell and Bates, 1988
Pu	239	C6 sand						6 0		+200 (mv						32	coarse sand (C6)		Bell and Bates, 1988
Pu	239	sand						6 0		+200 (mv						340	medium sand		Bell and Bates, 1988
							(%ignition loss)												
Pu		humus					1 74 --	1 0				256 -- 018				66 75 - 26 84	(0 16 cm) brown	carbonate content in al profiles = negligible	Jakubick and Kahl, 1982
Pu		humus					0 936	4-5 5								106 0 -- 33 71	(0-16 cm) brown		Jakubick and Kahl, 1982
Pu		humus					2 11 --	1 0				221 -- 063				107 1 -- 75 47	(0-16 cm) Ranker	(SMAR03 soi) (Soil pro ile according to Fig 3)	Jakubick and Kahl, 1982
Pu		humus					1.094	3 5-6								13 4 -- 2 19	(0-16 cm) Ranker	(Tab 1 : % Fe - Ign lo s %)	Jakubick and Kahl, 1982
Pu		humus					4 69 --	1 0				108 - 015				143 0 -- 59 27	(0 16 cm) Podzol	(Fig 4 S/C - Kd) (con lusions)	Jakubick and Kahl, 1982
Pu		humus					1 261	3-4 4								100 0 -- 39 86	(0-15 cm) Podzol	Brown/Brunkendorf	Jakubick and Kahl, 1982
Pu		humus/sand					0 55 --	1 0				222 -- 016				23 6 -- 2 51	(16-26 cm) brown	Ranker/Trebel	Jakubick and Kahl, 1982
Pu		humus/sand					0 058	4 5 5								370 6 -- 133 76	(16-26 cm) brown	Podzol/Gor'eben	Jakubick and Kahl, 1982
Pu		humus/sand					0 953	1 0				252 -- 017				20 4 -- 7 50	(16-26 cm) Ranker		Jakubick and Kahl, 1982
Pu		humus/sand					-- 158	3 5-6								37 8 -- 27 11	(16 26 cm) Ranker		Jakubick and Kahl, 1982
Pu		humus/sand					2 413 --	1 0				090 -- 018				54 2 -- 20 55	(16 26 cm) Podzol		Jakubick and Kahl, 1982
Pu		humus/sand					0.648	3-4 4								190 7 -- 172 54	(16-26 cm) Podzol		Jakubick and Kahl, 1982
Pu		sand					614 --	1 0				247 - 018				20 1 -- 2 26	(26-48 cm) brown		Jakubick and Kahl, 1982
Pu		sand					083	4 5 5								181 7 -- 119 91	(26-48 cm) brown		Jakubick and Kahl, 1982
Pu		sand					918 --	1 0				241 - 055				12 8 - 7 30	(26 48 cm) Ranker		Jakubick and Kahl, 1982
Pu		sand					206	3 5-6								197 1 - 82 98	(26 48 cm) Ranker		Jakubick and Kahl, 1982
Pu		sand					3 119 --	1 0				308 - 107				48 5 -- 14 74	(26-48 cm) Podzol		Jakubick and Kahl, 1982
Pu		sand					3 100	3 4 4								907 5 -- 388 57	(26-46 cm) Podzol		Jakubick and Kahl, 1982
Pu	238	Bentonite + brine A						6 7								2900		Pu (4) 238 (Tab 1 : pH after agitation)	Novak, 1980
Pu	238	10% bentonite + sand + brine A						6 7								520		(Kd calculated based on bentonite mass) (mixture of	Novak, 1980
Pu	238	Bentonite in sand + brine A						6 7								5200		bentonite, charcoal, mordenite and Na titanate = effective	Novak, 1980
Pu	238	Bentonite + brine B						7 1								30000		backfill - p 550)	Novak, 1980
Pu	238	10% bentonite + sand + brine B						7 1								3600			Novak, 1980
Pu	238	Bentonite in sand + brine B						7 1								36000			Novak, 1980
Pu	238	sand	89	3	8											700 (16000)	Beatty 1, Nevada	Beatty, Nevada Barnwell, S Carolina	Neiheisel, 1983

continued...

TABLE B-24 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Pu	238	sand	91	2	7											5000	Beatty 2, Nevada	West Valley, NY (abst: Kd's highest in alkaline alluvial basin deposits high in montmorillonite and zeolites) TAB 1 = Kd . mineral phase char. tab 2 . relationship - texture, surface area + clay mineral comp (tab 4 = Kd = 6 radionuclides) Fig 6 = text diagram (Fig 7 = Kd vs sorptive minerals) kd column = ( ) = reducing conditions	Neiheisel, 1983
Pu	238	sand	83	2	5											1800	Beatty 5, Nevada		Neiheisel, 1983
Pu	238	clayey sand	58	6	6											22500	Barnwell 4 South Carolina		Neiheisel, 1983
Pu	238	clayey sand	68	11	1											3700	Barnwell 12 South Carolina		Neiheisel, 1983
Pu	238	clayey sand	73	8	9											135 (120000)	Barnwell 14, South Carolina		Neiheisel, 1983
Pu	238	sandy loam	74	12	14	0.3	0.6	7.9		0.41	6.4					100	WA A NC (10e-8)	( ) initial Pu conc., M (p 4 - Tab.1 = soil text.) (p 5 - Tab.2 = chem and phys prop.) (p.17 & 18 - Tab.1 & 2 = Kd's) (ID A, ID - B, WA - B - 40 cm remaining soils = 0-20 cm (surface)(subsurface)) NC = not classified NA = not available Tab.3 (p 7 & 8) = % Pu sorbed vs. time interval Summary and Conclusions	Polzer and Miner, (2), 1982
Pu	238	sandy loam	74	12	14	0.3	0.6	7.9		0.42	6.4					98	" (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	74	12	14	0.3	0.6	7.9		0.44	6.4					35	" (10e-6)		Polzer and Miner, (2), 1982
Pu	238	clay loam	38	32	30	1.0	0.0	7.8		0.44	17.5					2000	ID D Polatis series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	clay loam	38	32	30	1.0	0.0	8		0.41	17.5					1500	ID-D Polatis series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	clay loam	38	32	30	1.0	0.0	7.9		0.41	17.5					310	ID D Polatis series (10e-6)		Polzer and Miner, (2), 1982
Pu	238	silty clay loam	16	50	34	0.8	17.2	8.4		0.45	15.5					1700	ID A Polatis series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	silty clay loam	16	50	34	0.8	17.2	8		0.44	15.5					4300	ID A Polatis series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	silty clay loam	16	50	34	0.8	17.2	7.8		0.45	15.5					5000	ID A Polatis series (10e-6)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	66	11	23	0.3	5.2	8.4		0.44	8.2					690	ID-C Polatis series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	66	11	23	0.3	5.2	8		0.43	8.2					4100	ID C Polatis series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	66	11	23	0.3	5.[illegible]	[illegible]		0.44	8.2					4000	ID C Polatis series (10e-6)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	24	32	0.2	7.[illegible]	[illegible].8		0.44	13.2					320	ID-B Polatis series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	24	32	0.2	7.9	8.9		0.41	13.2					330	ID-B Polatis series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	24	32	0.2	7.9	8.6		0.40	13.2					140	ID-B Polatis series (10e-6)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	74	12	14	0.1	0.[illegible]	7.8		0.50	3.8					430	WA-B NC (10e-8)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	74	12	14	0.1	0.0	7.8		0.45	3.8					600	WA B NC (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	74	12	14	0.1	0.0	7.8		0.43	3.8					680	WA B NC (10e-6)		Polzer and Miner, (2), 1982
Pu	238	clay	5	31	64	0.7	2.4	8		0.49	29.6					1900	CO-C NC (10e-8)		Polzer and Miner, (2), 1982
Pu	238	clay	5	31	64	0.7	2.4	7.8		-	29.6					1800	CO-C NC (10e-7)		Polzer and Miner, (2), 1982
Pu	238	clay	5	31	64	0.7	2.4	8.2		0.44	29.6					2000	CO C NC (10e-6)		Polzer and Miner, (2), 1982
Pu	238	sand	78	2	20	0.7	0.2	5.5		0.48	2.9					280	SC Fuquay series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	sand	78	2	20	0.7	0.2	5.2		0.53	2.9					870	SC Fuquay series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sand	78	2	20	0.7	0.2	5.2		0.53	2.9					1000	SC Fuquay series (10e-6)		Polzer and Miner, (2), 1982
Pu	238	loam	36	42	18	0.7	0.2	6.9		0.48	7.4					100	NM Los Alamos series (10E-8)		Polzer and Miner, (2), 1982
Pu	238	loam	36	42	18	0.7	0.2	6.0		0.47	7.4					200	NM Los Alamos series (10E-7)		Polzer and Miner, (2), 1982
Pu	238	loam	36	42	18	0.7	0.2	6.2		0.51	7.4					220	NM Los Alamos series (10E-6)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	32	32	36	1.0	0.0	4.9		---	20.5					2600	TN (NA) (10e-8)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	32	32	36	1.0	0.0	4.9		---	20.5					1200	TN (NA) (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sandy loam	32	32	36	1.0	0.0	5.0		0.53	20.5					14000	TN (NA) (10e-6)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	20	36	2.4	0.4	6.5		0.49	20.0					2200	CO-A (NC) (10e-8)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	20	36	2.4	0.4	6.2		---	20.0					2700	CO-A (NC) (10e-7)		Polzer and Miner, (2), 1982
Pu	238	clay loam	44	20	36	2.4	0.4	6.8		0.43	20.0					1200	CO-A (NC) (10e-6)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	64	14	22	3.4	0.3	5.8		0.53	17.5					190	CO-B (NA) (10e-8)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	64	14	22	3.4	0.3	5.8		0.54	17.5					130	CO-B (NA) (10e-7)		Polzer and Miner, (2), 1982
Pu	238	sandy clay loam	64	14	22	3.4	0.3	5.8		0.53	17.5					43	CO-B (NA) (10e-6)		Polzer and Miner, (2), 1982
Pu	238	clay loam	32	38	30	2.7	0.0	6.0		---	16.0					870	NY Fulton series (10e-8)		Polzer and Miner, (2), 1982
Pu	238	clay loam	32	38	30	2.7	0.0	6.0		0.54	16.0					1100	NY Fulton series (10e-7)		Polzer and Miner, (2), 1982
Pu	238	clay loam	32	38	30	2.7	0	6.1		0.43	16.0					870	NY Fulton series (10e-6)		Polzer and Miner, (2), 1982
Pu	239	glauconite sand	91.1	2.9	5.0	0.0	0.[illegible]	6.3 (5)		438 mV	3.7	(5 wks)			1 M	9780 (A-B)	N E Netherlands	(Pu-239,240) Appendix 2 ** see Am/3 ** (0 N. = Am - Np - Tc) pH in ( ) = initial pH Kd = function of pH, Eh, M, time Appendices This report is a problem = 1000's of Kd's Am-241 (Appendix 1) (0 N = Pu-Np-Tc)	Prins et al., 1986
Pu	240	glauconite sand	91.1	2.9	5.0	0.0	0.0	6.0 (5)		442 mV	3.7	(5 wks)			1 M	8435 (A-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	5.0	0.0	0.0	5.7 (5)		457 mV	3.7	(5 wks)			2 M	9640 (A-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.6 (6)		435 mV	3.7	(5 wks)			1 M	9725 (A-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	5.0	0.0	0.0	6.4 (6)		421 mV	3.7	(5 wks)			1 M	7870 (A-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.4 (6)		435 mV	3.7	(5 wks)			2 M	7900 (A-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	5.0	0.0	0.0	6.1 (5)		59 mV	3.7	(7 wks)			1 M	4295 (AN-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	5.8 (5)		34 mV	3.7	(7 wks)			1 M	5920 (AN-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	5.9 (5)		14 mV	3.7	(7 wks)			2 M	4740 (AN-B)	N E Netherlands		Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.4 (6)		19 mV	3.7	(7 wks)			1 M	2730 (AN-B)	N E Netherlands		Prins et al., 1986

continued...

TABLE B-24 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.5 (6)	26 mV	3.7	(7 wks)			1 M	13585 (AN-B)	N.E. Netherlands	Aer : Aerobic	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.5 (6)	-49 mV	3.7	(7 wks)			2 M	3515 (AN-B)	N.E. Netherlands	pH in ( ) : initial pH	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	5.37 (5)	66 mV	3.7	(18 wks)			1 M	1700-8000 (AN-C)	N.E. Netherlands	A : aerobic - Kd column	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	5.8 (5)	216 mV	3.7	(18 wks)			1.0 M	1700-8000 (AN-C)	N.E. Netherlands	AN : anaerobic - Kc column	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	5.7 (5)	-59 mv	3.7	(18 wks)			2 M	1700-8000 (AN-C)	N.E. Netherlands	B : batch - Kc column	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.4 (6)	2 mV	3.7	(18 wks)			0.1 M	1700-8000 (AN-C)	N.E. Netherlands	C - column - Kc column	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.4 (6)	-32 mV	3.7	(18 wks)			1 M	1700-8000 (AN-C)	N.E. Netherlands	M : molarity : salt conc	Prins et al., 1986
Pu		glauconite sand	91.1	2.9	6.0	0.0	0.0	6.6 (6)	18 mV	3.7	(18 wks)			2 M	1700-8000 (AN-C)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 1012						6.1 (5)	49 mv	155 (Ca++	(7 wks)			012 M	244 (AN-B)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 1012						7.7 (7)	20 mV	155 (Ca++	(7 wks)			012 M	143 (AN-B)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 1012						6.0 (5)	38 mV	155 (Ca++	(7 wks)			05 M	162 (AN-B)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 1012						7.9 (7)	26 mV	155 (Ca++	(7 wks)			05 M	126 (AN-B)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 2120						7.3 (6.8)	9 mV	1 183 (Ca++	(7 wks)			1 M	438 (AN-B)	N.E. Netherlands		Prins et al., 1986
Pu		sand, Gohy 2120						7.2 (6.8)	-21 mV	1 183 (Ca++	(7 wks)			2.5 M	643 (AN-B)	N.E. Netherlands		Prins et al., 1986
																		Prins et al., 1986
Pu	237	Clay (fraction)						6.5				5mMCa(NO3)2			300000	<2 um fraction (clay) of silt loam	Tab 2: Kd (O.N. Th,U,Np) Pu(4)-237	Dahlman et al., 1976.
Pu		Clay						1.77		64.26				6.45x10E-6M Pu(6)	2.4 log	Bentonite	Pu(6) (Tab 1: Pu Kd) (O.N. = Am(3))	Billon, 1982
Pu		Clay						2.99		64.26				6.44x10E-6M Pu(6)	2.0 log	Bentonite		Billon, 1982
Pu		Clay						5.73		64.26				6.42x10E-6M Pu(6)	2.4 log	Bentonite		Billon, 1982
Pu		Clay						6.70		64.26				6.41x10E-6M Pu(6)	2.7 log	Bentonite		Billon, 1982
Pu		Clay						7.00		64.26				6.40x10E-6M Pu(6)	4.1 log	Bentonite		Billon, 1982.
Pu		Loam						6.52 (5.0)							2.4x10E3	Tokai-mura, Naka-gun, Ibaraki-ken JAPAN	(Pu) (Tab 3: Kd, 3 wks)(Tab 2: synthetic GW constituents)	Senoo et al., 1988.
Pu		Loam						6.52 (5.1)							4.6x10E3	Tokai-mura, Naka-gun, Ibaraki-ken JAPAN	(Fig 3: Kd between glass and liquid stage)	Senoo et al., 1988.
Pu		Medium sand						6.52 (5.7)							1.9x10E3	Tokai-mura, Naka-gun, Ibaraki-ken JAPAN	(Fig 4. Pu concentration from column)	Senoo et al., 1988
Pu		Medium Sand						6.52 (5.8)							9.7x10E2	Tokai-mura, Naka-gun, Ibaraki-ken JAPAN	pH in ( ) = pH after 3 weeks	Senoo et al., 1988.
Pu		Fine sandy loam				2.4	-	5.3 (4.08)	-	15	1.65	-			8.5x10E2	Malbis (Louisiana)		Nishita et al., 1979
Pu		Fine sandy loam				2.4	-	5.3 (5.57)	-	15	1.65	-			1.515x10E3	Malbis (Louisiana)		Nishita et al., 1979
Pu		Fine sandy loam				5.7	-	5.0 (4.42)	-	15	1.52	-			9.58x10E2	Lyman (Maine)		Nishita et al., 1979
Pu		Fine sandy loam				5.7	-	5.0 (6.06	-	15	1.52	-			3.3x10E1	Lyman (Maine)		Nishita et al., 1979
Pu		Light loam				8.4	-	6.0 (5.56)	-	15	5.29	-			6.85x10E3++	Aiken (California)		Nishita et al., 1979
Pu		Light loam				8.4	-	6.0 (6.57)	-	15	5.29	-			1.357x10E3	Aiken (California)		Nishita et al., 1979
Pu		coarse sand				-	-	7-8	-	.	.	Na (90% sat. solution)			2x10E2	(Netherlands)		Hamstra & Verkerk, 1977
Pu																		
Pu			44	20	36	2.4	0.4	5.7	0.41	20	-				2.2x10E3--460-	Colorado A (Rocky Flats)		Glover et al., 1976
Pu			64	14	22	3.4	0.3	5.6	0.52	17.5	-				2.0x10E2--24-	Colorado B (Sugar Loaf)		Glover et al., 1976
Pu			44	24	32	0.2	7.9	8.3	0.43	13.8	-	-			3.2x10E2--26-	Idaho B		Glover et al., 1976
Pu			66	11	23	0.3	5.2	8.0	0.47	8.2		-			6.9x10E2--110-	Idaho C		Glover et al., 1976
Pu			38	32	30	0.1	0	7.5	0.45	17.5		-			2.1x10E3--640-	Idaho D		Glover et al., 1976
Pu			74	12	14	0.3	0.6	8.0	0.43	6.4	-	-			1.0x10E2--7-	Washington A (Hanford)		Glover et al., 1976
Pu			74	12	14	0.1	0	8.2	0.44	5.8	-	-			4.3x10E2--27-	Washington B (Hanford)		Glover et al., 1976
Pu			78	2	20	0.7	0.2	5.4	0.54	2.9	-	-			2.8x10E2--5-	S. Carolina (Barnwell)		Glover et al., 1976
Pu			48	34	18	0.7	0.2	6.4	0.49	7	-	-			1.0x10E2--5-	New Mexico (Los Alamos)		Glover et al., 1976
Pu			82	9	9	0.6	0.7	4.8	0.57	3.8	-	-			8.0x10E1--3-	Arkansas B		Glover et al., 1976
Pu		Subsoil sand				-	2	8.6 (6.5)	-	5	-	-			1.314x10E3	Hanford		Rhodes, 1957
Pu		Subsoil sand				-	2	8.6 (9.3)	-	5	-	-			2.0x10E2	Hanford		Rhodes, 1957
Pu		silty clay loam				2.8	-	5.9 (5.83)	-	20	1.29	-			6.307x10E3	Sharpsburg (Iowa)		Nishita et al., 1979
Pu		silty clay loam				2.8	-	5.9 (6.85)	-	20	1.29	-			3.024x10E3	Sharpsburg (Iowa)		Nishita et al., 1979
Pu		Silt - loam				2.5	-	6.7 (6.13)	-	25	2.41	-			4.938x10E3	Yolo (California)		Nishita et al., 1979
Pu		Silt - loam				2.5	-	6.7 (6.83)	-	25	2.41	-			4.341x10E3	Yolo (California)		Nishita et al., 1979
Pu			16	50	34	0.8	17.2	7.8	0.44	15.5	-	-			1.7x10E3--70-	Idaho A		Glover et al., 1976
Pu			9	54.9	37	2.3	0.6	2.3	0.57	16.2	-	-			4.3x10E2- 23-	Arkansas C		Glover et al., 1976
Pu			31	53	16	3.6	0.7	3.6	0.56	17.4	-	-			2.3x10E2--10-	Illinois		Glover et al., 1976
Pu		Silt - suspended in seawater				-		-	-	-	-	-			9x10E4			Pillai & Mathew, 1976
Pu		Clay				0.6	-	7.8 (7.29)	-	30	1.2				7.44x10E2	Holtsville		Nishita et al., 1979
Pu						0.6	-	7.8 (8.28)	-	30	1.2				3.61x10E2	Holtsville		Nishita et al., 1979
Pu						-	-	7-8		.		Na (90% sat. solution)			1x10E4	(Netherlands)		Hamstra & Verkerk, 1977
Pu																		
Pu			5	31	64	0.7	2.4	7.9	0.42	29.6					1.9x10E3- 110-	Colorado C (Rocky Flats)		Glover et al., 1976
Pu			82	32	36	1	0	4.8	0.49	20.5	-				2.6x10E3--640-	Tennessee (Oak Ridge)		Glover et al., 1976
Pu			32	37	36	2.7	0	5.4	0.45	16	-				8.1x10E2--130-	New York (West Valley)		Glover et al., 1976
Pu			10	34	56	3.2	0.9	6.2	0.57	34.4	-				7.1x10E2- 36-	Arkansas A		Glover et al., 1976
Pu		treated clay				-	.	4.0	.	.	.	5 mmol/L Ca2+ (Ca NO3)2			1.9x10E5	20% Pu(VI)		Bondietti & Reynolds, 1976
Pu		Clay fraction					-	6.5	.	.	.	5 mmol/L Ca2+ (Ca NO3)2			1.04x10E5	237Pu(IV) Ca-sat. soil clay fraction		Bondietti et al., 1975
Pu		Clay fraction					-	6.5	.	.	.	5 mmol/L Ca2+ (Ca NO3)2			1.68x10E5	238Pu(IV) Ca-sat. soil clay fraction		Bondietti et al., 1975
Pu		Clay fraction					-	6.5	.	.	.	5 mmol/L Ca2+ (Ca-acetate)			7.5x10E4	239(VI) Ca-sat. soil clay fraction		Bondietti et al., 1975
Pu		abyssal red clay						7.7			.	0.68 mmol/L NaC			3.16x10E2			Erickson, 1980
Pu		abyssal red clay						6.9			.	0.68M NaCl solution			2.5x10E3	-		Erickson, 1980
Pu		Organic				40.8	-	7.2 (6.24)	-	60	1.57				2.951x10E3	Fobert		Nishita et al., 1979
Pu		Organic				40.8	-	7.2 (7.25)	-	60	1.57				1.655x10E3	Fobert		Nishita et al., 1979
Pu		Organic bone charcoal				-		7.0		.					6.2x10E4			Tamura, 1972
Pu		Organic coconut charcoal				-		7.0		.					2.5x10E4			Tamura, 1972

TABLE B-25

POLONIUM K_d VALUES

NUC.	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Po	210	fine sandstone & silty clay						7.0							0		(Po-210) Tab 4	Haji-Djafari et al., 1981
Po	210	fine sandstone & silty clay						4.5							0		• 226 : site Geology	Haji-Djafari et al., 1981
Po	210	fine sandstone & silty clay						5.75							12		• 230 : Split Rock formation	Haji-Djafari et al., 1981
Po	210	fine sandstone & silty clay						7.0							25			Haji-Djafari et al., 1981
Po		Sand	42	32	26	6.1	-	7.6		22.8	-	-			120+-5	Nunn silty clay loam (A11)(Colorado)	* All error terms in this table are standard error of the mean (S.E.)	Hansen & Watters, 1971
Po			-	-	-	-		-	-	-	-	-			203+-22	Nunn silty clay loam (A12)(Colorado)		Hansen & Watters, 1971
Po			-	-	-	-	-	-	-	-	-	-			310+-41	Nunn silty clay loam (B1)(Colorado)		Hansen & Watters, 1971
Po			-	-	-	-	-	-	-	-	-	-			766+-148	Nunn silty clay loam (B2t)(Colorado)		Hansen & Watters, 1971
Po			-	-	-	-	-	-	-	-	-	-			1213+-186	Nunn silty clay loam (B3Ca)(Colorado)		Hansen & Watters, 1971
Po					-	-			-	-		-			643+-85	Nunn silty clay loam (C Ca)(Colorado)		Hansen & Watters, 1971
Po			40	31	39		-	7.9		-		-			723+-83	Dinsdale silty clay loam (C)(Iowa)		Hansen & Watters, 1971
Po			45	42	13	2.3	-	6.5	-	5.4	-				172+-26	Lapeer loam (Ap)(Wisconsin)		Hansen & Watters, 1971
Po			54	22	24	-	-	6.7				-			206+-11	Lapeer loam (B21)(Wisconsin)		Hansen & Watters, 1971
Po			59	20	21		-	5.5	-			-			508+-34	Lapeer loam (B22)(Wisconsin)		Hansen & Watters, 1971
Po			62	15	23	-	-	5.7		-		-			814+-47	Lapeer loam (B3)(Wisconsin)		Hansen & Watters, 1971
Po			72	18	10	-	-	7.8				-			275+-9	Lapeer loam (C1)(Wisconsin)		Hansen & Watters, 1971
Po			95	0	5		-	5.9		3.0		-			26+-2	Adamsville (A1)(Florida)		Hansen & Watters, 1971
Po			84	6	10	-	-	5.4	-	2.6	-	-			35+-3	Elanton (A1)(Florida)		Hansen & Watters, 1971
Po			95	2	3	-	-	5.5		1.8		-			25+-2	Lakeland (A1)(Florida)		Hansen & Watters, 1971
Po			97	1	2	-	-	5.5		1.5		-			17+-1	Leon (A1)(Florida)		Hansen & Watters, 1971
Po			-			-	-								15+-0.6	Leon (A2)(Florida)		Hansen & Watters, 1971
Po			-	-	-	-	-								55+-17	Leon (Bn)(Florida)		Hansen & Watters, 1971
Po			-	-	-	-	-					-			77+-29	Leon (C)(Florida)		Hansen & Watters, 1971
Po			96	2	2		-	5.6		4.6					17+-1	Ruskin (A1)(Florida)		Hansen & Watters, 1971
Po			57	30	13	-		5.5		-		-			13+-2	Darling gravelly sandy loam (B2)(Colorado)		Hansen & Watters, 1971
Po			74	17	8	-	-	5.7	-						30+-7	Darling gravelly sandy loam (B2ir)(Colorado)		Hansen & Watters, 1971
Po			80	16	4	-	-	6.0	-	-					66+-9	Darling gravelly sandy loam (C1)(Colorado)		Hansen & Watters, 1971
Po			74	22	4	-	-	8.0		-					75+-8	Darling gravelly sandy loam (C2)(Colorado)		Hansen & Watters, 1971
Po			49	39	12	4	-	6.6	-	16.8	-	-			254+-22	Cogebic sandy loam (A2)(Wisconsin)		Hansen & Watters, 1971
Po			57	30	13	-	-	5.6	-	-	-	-			371+-36	Cogebic sandy loam (Bir)(Wisconsin)		Hansen & Watters, 1971
Po			47	29	24	-	-	6.8	-	-	-	-			137+-5	Cogebic sandy loam (Birh)(Wisconsin)		Hansen & Watters, 1971
Po		Sand	68	27	5	-	-	5.9	-	-	-	-			242+-25	Cogebic sandy loam (B3)(Wisconsin)		Hansen & Watters, 1971
Po			46	44	10	2.4	-	6.8	-	5.1	-	-			227+-20	Onaway fine sandy loam (Ao)(Wisconsin)		Hansen & Watters, 1971
Po			46	43	11	-	-	6.9			-	-			412+-150	Onaway fine sandy loam (Birh)(Wisconsin)		Hansen & Watters, 1971
Po			67	20	13	-	-	8.2		-	-	-			2248+-1200	Onaway fine sandy loam (C1)(Wisconsin)		Hansen & Watters, 1971
Po			67	20	13	-	-	8.4	-			-			7020+-3600	Onaway fine sandy loam (C2)(Wisconsin)		Hansen & Watters, 1971
Po			82	5	13	-	-	6.3		2.7	-	-			76+-1	Amite (A1)(Alabama)		Hansen & Watters, 1971
Po			91	0	9	-	-	5.0	-	1.9	-	-			188+-15	Independence (A1)(Alabama)		Hansen & Watters, 1971
Po			63	27	10	-	-	5.6	-	3.4		-			49+-3	Wickham (A1)(Alabama)		Hansen & Watters, 1971
Po		Silt	11	68	21	3.8		5.8		25.2		-			1030+-49	Dinsdale silty clay loam (A)(Iowa)		Hansen & Watters, 1971
Po			17	55	28	-	-	5.6	-			-			976+-127	Dinsdale silty clay loam (B)(Iowa)		Hansen & Watters, 1971
Po			3	73	24	4.5	-	5.5	-	28.4	-	-			1136+-118	Muscatine silty clay loam (A)(Iowa)		Hansen & Watters, 1971
Po			10	61	29	-	-	5.9	-	-	-	-			968+-32	Muscatine silty clay loam (B)(Iowa)		Hansen & Watters, 1971
Po			11	65	24	-		7.8	-	-		-			1830+-210	Muscatine silty clay loam (C)(Iowa)		Hansen & Watters, 1971
Po			10	80	10	2.1		5.9		11.2		-			970+-160	Fayette silt loam (Ao)(Wisconsin)		Hansen & Watters, 1971
Po			8	71	21	-	-	6.2		-	-	-			172+-3	Fayette silt loam (B1)(Wisconsin)		Hansen & Watters, 1971
Po			5	66	29	-	-	6.1	-	-	-	-			92+-3	Fayette silt loam (B21)(Wisconsin)		Hansen & Watters, 1971
Po			2	66	32	-	-	5.6	-	-	-	-			597+-55	Fayette silt loam (B22)(Wisconsin)		Hansen & Watters, 1971
Po			5	65	30		-	5.3		-		-			80+-2	Fayette silt loam (B23)(Wisconsin)		Hansen & Watters, 1971
Po			5	66	29	-	-	5.5	-	-		-			772+-29	Fayette silt loam (C1)(Wisconsin)		Hansen & Watters, 1971
Po			33	57	15	3.8	-	5.1	-	28.9	-				24+-1	Darling gravelly sandy loam (A1)(Colorado)		Hansen & Watters, 1971
Po			27	55	18	-	-	5.5	-	16.4	-				405+-28	Congaree (A1)(Alabama)		Hansen & Watters, 1971
																		Hansen & Watters, 1971

TABLE B-26

RADIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ra																	No Kd reported, but % Ra sorbed in Table 6 (including 14 soils + phys. properties) SEDIMENT	Landa and Reid, 1982
Ra	226	fine sandstone + silty sand						2 0							0			Haji-Djafari et al., 1981
Ra	226	fine sandstone + silty sand						4 5							12		Tab 4 p 226 = site geology	Haji-Djafari et al., 1981
Ra	226	fine sandstone + silty sand						5 75							60		p 230 = split rock formation	Haji-Djafari et al., 1981
Ra	226	fine sandstone + silty sand						7 0							100			Haji-Djafari et al., 1981
Ra		Sand	93	5	2	0 05	40 8	7 8(CaCl2)		1 19		Initial Ra conc before soil contact 1 6x10E-5 mg/L			106+ 16	Leamington (6) medium sand		Gillham et al., 1981b
Ra			91 1	6 8	1 3	3 1	-	5 2		10 9		Ca2+ 0 05mol/L			4x10E3	St. Thomas		Nathwani & Phillips, 1979
Ra			91 1	6 8	1 3	3 1		5 2		10 9		no Ca			3 8x10E4	St. Thomas		Nathwani & Phillips, 1979
Ra		Silt	35	36	29	0 41	33 8	8 5(CaCl2)	.	8 32		Initial Ra conc before soil contact 4x10E-5 mg/L			1262+ 370	WNRE (2) clay loam		Gillham et al., 1981b
Ra			6 7	47 9	45 4	16 2	-	5 4		34 7		Ca2+ 0 05mol/L			1 1x10E5	Wendover		Nathwani & Phillips, 1979
Ra			6 7	47 9	45 4	16 2	-	5 4		34 7		no Ca			9 5x10E5	Wendover		Nathwani & Phillips, 1979
Ra			43 7	48 9	7 4	1	-	4 3		10 4		Ca2+ 0 05mol/L			2 0x10E4	Grimsby		Nathwani & Phillips, 1979
Ra			43 7	48 9	7 4	1	-	4 3		10 4		no Ca			1 2x10E5	Grimsby		Nathwani & Phillips, 1979
Ra		Clay	31	34	35	0 81	5 2	7 8(CaCl2)		4		Initial Ra conc before soil contact 3 7x10E-5 mg/L			696+ 191	...erta clay loam		Gillham et al., 1981b
Ra		Clay				-	-	7 55?	.			Na+ 289 mg/L Ca2+ 75 mg/L			5 6x10E4	clay, mud		Allard et al., 1977
Ra		Clay sediment					-	-	-	-					13 3x10E3+	clay sediment (Pacific)	+min values reptd & data based on desorp of deep sea clays	Cochran & Krishnaswami, 1980
Ra		Clay sediment					-	-	-	-		-			10 5x10E3+	clay sediment (Pacific)		Cochran & Krishnaswami, 1980
Ra		Clay sediment				-	-	-	-		-	-			8x10E3+	clay sediment (Pacific)		Cochran & Krishnaswami, 1980
Ra		Clay sediment				-	-		-			-			4 3x10E3	clay sediment (Pacific)		Cochran & Krishnaswami, 1980
Ra		Clay sediment				-	-	-	-						14 9x10E3+	clay sediment (Pacific)		Cochran & Krishnaswami, 1980
Ra		Clay sediment				-	-	-	-		-				17 4x10E3+	clay sediment (Pacific)		Cochran & Krishnaswami, 1980

TABLE B-27

RUTHENIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	CONC CATION	% CONC CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ru	103	loamy sand					1.1	7.0							log	1) Cleysol	(Fig. 3) (Ru103)	Bunzl & Schimmack, 1988
Ru	103	loamy peat					0.5	6.8							10e1 - <10e3 log	2) Sapric Histosol, strongly humidied		Bunzl & Schimmack, 1988
Ru	103	sandy loam					?(100)	5.7							>10e1 <10e3 log	3) Cambisol, brown soil from loess		Bunzl & Schimmack, 1988
Ru	103	sandy loam					?(63)	7.1							>10e1 - <10e3 log	4) Cambisol, brown soil		Bunzl & Schimmack, 1988
Ru	103	loamy sand					?(5)	4.6							>10e1 - >10e2 log	5) Acrisol, parabrown soil, Al		Bunzl & Schimmack, 1988
Ru	103	loamy sand					?(23)	4.6							>10e1 - <10e2 log	6) Acrisol, parabrown soil, D-horizon		Bunzl & Schimmack, 1988
Ru	103	clay						8.0		0.7 meq/g					>10e3 <10e4 log	B Bentonite, Sud chemie AG Munchen		Bunzl & Schimmack, 1988
Ru	103	peat													>10e2 <10e3 log	P1 Spag. peat (high moor) Steinhuder Meer, Hannover		Bunzl & Schimmack, 1988
Ru	103	peat													<10e3 log	P2 Spag. peat (high moor) Keniasdorf Bavaria		Bunzl & Schimmack, 1988
Ru	106	organic peat						4.0							0.38 x 10e4 ± .07	(6-8 cm)(0.13 day) Lefarens Bog, NY	Tab 5b (Rd) (Ru-106)	Schell et al., 1985
Ru	106	organic peat						4.0							1.3 x 10e4 ± .02	(6-8 cm)(1 day) Lefarens Bog, NY	(Tab 8 = comparison - Sibley 82)	Schell et al., 1985
Ru	106	organic peat						4.0							3.3 x 10e4 ± .91	(6-8 cm)(4 days) Lefgrens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							6.8 x 10e4 ± .31	(6-8 cm)(10 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							8.0 x 10e4 ± 1.8	(6-8 cm)(15 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							------------	(6-8 cm)(23 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							8.6 x 10e4 ± 1.1	(6-8 cm)(27 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							------	(6-8 cm)(30 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							------------	(20-21 cm)(0.13 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							1.2 x 10e4 ± .07	(20-21 cm)(1 day) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							3.0 x 10e4 ± .19	(20-21 cm)(4 days) Lefgrens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							4.3 x 10e4 ± 1.1	(20-21 cm)(10 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							5.9 x 10e4 ± .49	(20-21 cm)(15 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							8.2 x 10e4 ± .87	(20-21 cm)(23 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							----	(20-21 cm)(27 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							8.7 x 10e4 ± .84	(20-21 cm)(30 days) Lefarens Bog, NY		Schell et al., 1985
Ru	106	organic peat						4.0							0.76 x 10e4 ± .05	(6-8 cm)(0.13 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							2.5 x 10e4 ± .44	(6-8 cm)(1 day) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							4.1 x 10e4 ± .01	(6-8 cm)(4 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							3.9 x 10e4 ± .13	(6-8 cm)(10 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							------------	(6-8 cm)(15 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							------------	(20-22 cm)(0.13 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							1.2 x 10e4 ± .05	(20-22 cm)(1 day) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							3.9 x 10e4 ± .37	(20-22 cm)(4 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							5.1 x 10e4 ± .11	(20-22 cm)(10 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	organic peat						4.0							5.4 x 10e4 ± .54	(20-22 cm)(15 days) Spruce Flats Bog, PA		Schell et al., 1985
Ru	106	SRP soil (burial grd)						3.95							>63	SRP - Savannah River Plant	1 eq. time days (Ru 106) (Ru 103)	Hoeffner, 1985
Ru	106	SRP soil (burial grd)						4.12							>63		2 eq. time days (Tab 7, p 43)	Hoeffner, 1985
Ru	106	SRP soil (burial grd)						----							>63		4 eq. time days also Stone et al., 1984 (1-77)	Hoeffner, 1985
Ru	106	SRP soil (burial grd)						4.29							>63		7 eq. time days	Hoeffner, 1985
Ru															100-500		Lab conditions (upper limit, pH 4 to 6, Fig. 11)	Hoeffner, 1985
Ru	103		80	17	3		0	3.7 (CaCl2)		125 meq/kg					37 (14-73)		Kd col. ( ):Kd range Tab.1:soil prop Tab 2:Kd	Schimmack et al., 1987
Ru	103	Ap (0-22 cm)				1.19		8.3 (solution)		15.4					>100	Auenrendzina (B.bl.s)	Fig.1 & 2 = Kd - soil horizon Fig 3 = Kd vs Ca + Ka ions	Bunzl et al., 1984
Ru	103	C (22-30 cm)				1.15		8.3 (solution)		17.7					>100	Auenrendzina (B.bl.s)	Fig 4 : Kd - comparison column + batch	Bunzl et al., 1984
Ru	103	Cv (30-47 cm)				1.01		8.2 (solution)		15.2					>100	Auenrendzina (B.bl.s)	Fig 5 : Kd - 6 soils (A-horiz.)	Bunzl et al., 1984
Ru	103	I Cv Cv (47-90 cm)				0.25		8.1 (solution)		8.5					1000	Auenrendzina (B.bl.s)	Fig 6 : Kd - 5 soils (1.0m) Abstract	Bunzl et al., 1984
Ru	103	2 I Cv (90-128 cm)				0.14		8.2 (solution)		6.4					100	Auenrendzina (B.bl.s)		Bunzl et al., 1984
Ru	103	3 Cv (128-132 cm)				0.02		8.2 (solution)		0.7					1000	Auenrendzina (B.bl.s)		Bunzl et al., 1984
Ru	103	Ap (0-31 cm)				2.41		7.3 (solution)		8.7					>100	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	103	Al (31-52 cm)				0.71		7.4 (solution)		9.5					1000	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	103	BtAl (52-62 cm)				0.34		7.2 (solution)		8.3					>1000	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	103	AlBt (62-73 cm)				0.30		6.8 (solution)		8.3					>1000	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	103	Bt1 (73-88 cm)				0.30		6.7 (solution)		17.5					>1000	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	103	Bt2 (> 88 cm)				0.25		6.2 (solution)		13.2					>1000	Parabrown (Lscheeiler)		Bunzl et al., 1984
Ru	106	clay						6.0	-200(mv)						800	** see Cs/1 **	(Tab 4 - Kds)(Tab 1 = CW composition)	Bell and Bates, 1988
Ru	106	C1 2 sand						6.0	-200(mv)						490		(Tab 2 - Soil Description)(Good conclusions)	Bell and Bates, 1988
Ru	106	C3 sand						6.0	-200(mv)						82		(Tab 3 - Activities (Bq))	Bell and Bates, 1988
Ru	106	C5 sand						6.0	-200(mv)						34			Bell and Bates, 1988
Ru	106	sand						6.0	-200(mv)						5			Bell and Bates, 1988
Ru	103	An-horizon	59.7	28.4	12.0	2.4	0.2	6.7 (CaCl2)		8.?					23-200	Alfisol (Parabrown earth)(0-30 cm)	(Tab 3 - Kd)(Tab 1 - soil prop.)	Bunzl et al., 1985
															(log N)		(Tab 2 : %C, CEC, pH by horizon)	Bunzl et al., 1985
															(AV 93)			Bunzl et al., 1985
Ru	106	Sandy subsoil												10E-4M HNO3	90	Gorleben site FRG	(D.N. Sr, Cs, Co)(Kd values from Fig. 3 & 4)	Schwarzar et al., 1987
																	(Fig. 3 & 4 - Kd vs HNO3-NaN sol.)(5 formulas)	
																	(Fig. 5 - adsorp. & desorp. Kds) NOFIS code	

TABLE B-28

SELENIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	SAT PASTE pH	EH (v)	CEC meq/100g	% REL IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Se		sphagnum peat						4.8							105 l/Kg	Rainfall	(Tab 6 Kd, geom. mean)	Sheppard and Evenden, 1988
Se		sphagnum peat						4.8							110 l/Kg	Fall 1	(FN 1, Cs, Pb, I)	Sheppard and Evenden, 1988
Se		sphagnum peat						4.8							310 l/Kg	Fall 2	(Sphag peat - Fibric Mesinol)	Sheppard and Evenden, 1988
Se		sphagnum peat						4.8							230 l/Kg	Final		Sheppard and Evenden, 1988
Se		sand			12	3.2		5.3							70	Soil 1	Table 1 - physico - chem. prop	Vuori, et al., 1989
Se		sand			15	3.3		6.0							70	Soil 2	Tab 2 - sorption of selenate : calc. Kd from this table	Vuori, et al., 1989
Se		sand			19	3.7		6.3							36	Soil 3	Concentration of element - 5000 ug Se g-1 soil	Vuori, et al., 1989
Se		loam			28	4.2		4.5							146	Soil 4		Vuori, et al., 1989
Se		clay			30	4.6		4.5							120	Soil 5		Vuori, et al., 1989
Se		clay			31	2.8		6.5							90	Soil 6		Vuori, et al., 1989
Se		clay			31	4.0		4.4							96	Soil 7		Vuori, et al., 1989
Se		clay			34	3.0		4.9							36	Soil 8		Vuori, et al., 1989
Se		clay			39	5.6		4.5							210	Soil 9		Vuori, et al., 1989
Se		clay			42	6.4		4.1							76	Soil 10		Vuori, et al., 1989
Se		clay			42	11.9		4.5							180	Soil 11		Vuori, et al., 1989
Se		clay			47	4.6		5.0							140	Soil 12		Vuori, et al., 1989
Se		clay			49	3.4		6.0							80	Soil 13		Vuori, et al., 1989
Se		clay			49	17.4		5.4							90	Soil 14		Vuori, et al., 1989
Se		clay			56	2.3		6.0							110	Soil 15		Vuori, et al., 1989
Se		clay			72	2.6		6.0							176	Soil 16		Vuori, et al., 1989
Se		clay			84	1.0		4.9							246	Soil 17		Vuori, et al., 1989
Se		clay			87	9.0		4.7							170	Soil 18		Vuori, et al., 1989

TABLE B-29

SILVER K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	SAT PASTE pH	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Ag	110m	Sand								(11.3)					75	A	(Tab 2 - soil type) (Tab 5 CEC - Kd)	Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(241.7)					100	B	(U.N.: (Cr,Co,Mn,Zn,Ag,Fe,Mo) (in JAP)	Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(55.6)					300	C	CEC : (ueq/g) (9 tables, 3 Fig.)	Inoue & Morisawa, 1976
Ag	110m	Gravel-sand								(69.5)					1000	D		Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(167.9)					200	E		Inoue & Morisawa, 1976
Ag	110m	Silt-sand								(47.8)					350	F		Inoue & Morisawa, 1976
Ag	110m	Gravel								(28.9)					10	G		Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(117.9)					170	H		Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(140.5)					200	I		Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(246.0)						J		Inoue & Morisawa, 1976
Ag	110m	Fine sand								(60.3)					20	K		Inoue & Morisawa, 1976
Ag	110m	Silt								(149.0)					100	L		Inoue & Morisawa, 1975
Ag	110m	Sand								(24.3)						M		Inoue & Morisawa, 1976
Ag	110m	Gravel								(27.1)					300	N		Inoue & Morisawa, 1976
Ag	110m	Fine sand								(122.8)					400	O		Inoue & Morisawa, 1976
Ag	110m	Fine sand								(38.6)					60	P		Inoue & Morisawa, 1976
Ag	110m	Silt-clay								(200.1)					80	Q		Inoue & Morisawa, 1975
Ag		Sand	-	-	0	3.5	-	4.5-5.0	-	22					1.6x10E2	Soil C		Gerritse et al., 1982
Ag			-	-	20	2.5	-	7.5-8.0	-	16	.	.			5.6x10E2	Soil D		Gerritse et al., 1982
Ag			-	.	-	-	-	4.8		.		0.1 mol/L CaCl2			2.7	Florida 1 - sand		Graham, 1973
Ag			.	.	.	.	-	6.2				0.1 mol/L CaCl2			33.0	Florida 2 - sand - organic matter		Graham, 1973
Ag		Silt	.	.	-	.	-	5.0				0.1 mol/L CaCl2			28.0	Missouri 23		Graham, 1973
Ag			-	-	-	.	-	7.4		.		0.1 mol/L CaCl2			200	Missouri 24		Graham, 1973
Ag			.		-	.	-	6.6	.		.	0.1 mol/L CaCl2			333	Missouri 38		Graham, 1973
Ag		Organic	-		.	90	-	4.5	-						4.4x10E3	Soil A		Gerritse et al., 1982
Ag				.	.	>90		4 to 5							2.7x10E4	Peat A		Gerritse et al., 1982
Ag			.	.	.	>90	.	6		.	.				1.7x10E4	Peat B		Gerritse et al., 1982
Ag			.	.	.	>90	.	6.2		.	.				3.3x10E4	Soil B		Gerritse et al., 1982

TABLE B-30

STRONTIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sr	90	loam										Hs++				USSR	USSR heavy-moraine loam (30% argillaceous particles) size <1 um repr. kaolinite, montmorillonite, and hydromica Kd values affected by dose & dose rate: Tab1. Tab4:Kd Tab. 4	Sobolev,1985
Sr	85	clay						6.0	+200 mV						50	glacial till		Bell and Bates 1988
Sr	85	sand						6.0	+200 mV						40	fine-coarse sand (C1-2)		Bell and Bates 1988
Sr	85	sand						6.0	+200 mV						30	medium-coarse sand (C3)		Bell and Bates 1988
Sr	85	sand						6.0	+200 mV						8	coarse sand (C6)		Bell and Bates 1988
Sr	85	sand						6.0	+200 mV						9	medium sand		Bell and Bates 1988
Sr	85	clay													~55	>2 um size, smectite	(Sr-90) (p 101) difficult	Carlsen and Bo, 1982
Sr	85	clay													32 + 10e3	<2 um size, smectite		Carlsen and Bo, 1982
Sr	85	loamy sand					1.1	7.0							<50	1) Gleysol	** see Cs/1 ** also see fig 4 & 5	Bunzl and Schimmack, 1988
Sr	85	loamy peat					0.5	6.8							100-150	2) Sapric Histosol,strongly humified		Bunzl and Schimmack, 1988
Sr	85	sandy loam					?(100)	5.7							<50	3) Cambisol,brown soil from loess		Bunzl and Schimmack, 1988
Sr	85	sandy loam					? (63)	7.1							<50	4) Cambisol,brown soil		Bunzl and Schimmack, 1988
Sr	85	loamy sand					? (5)	4.6							~50	5) Acrisol, parabrown soil, Ah		Bunzl and Schimmack, 1988
Sr	85	loamy sand					? (23)	4.6							~50	6) Acrisol, parabrown soil, O-horizon		Bunzl and Schimmack, 1988
Sr	85	clay						8.0		0.7 meq/g		0.1N CaNo3			~50	B Bentonite,Sud-chemie AG Manchen		Bunzl and Schimmack, 1988
Sr	85	fibric organic						6.0		2.1 meq/g		0.1N CaNo3			150	P1 Spag peat (high moor) Steinhuder Meer,Hanover		Bunzl and Schimmack, 1988
Sr	85	fibric organic						7.0		0.65 meq/g		0.1N CaNo3			100	P2 Spag peat (high moor) Konigsdorf,Bavaria		Bunzl and Schimmack, 1988
Sr	90	sand	72.6	17.4	0.0			6.5 (paste)		5.5		01N CaCl2 pH 6.7			5.5 + 10e-2	sandy loam (Puye)	(tab 1)(selective coeff p.312)(good figures).01N CaCl2=pH6.7	Keren,1983
Sr	90	silt	17.5	57.5	5.0			6.1 (paste)		16.2		01N CaCl2 pH 6.7			1.3 + 10e-2	silt loam (Larjo)	( ) brackets in Kd column = column breakthrough	Keren,1983
Sr	--	sand	89.0	2	9.0			5.5	273	0.5					5.1 (3.1)	61.5 feet deep		Ryan,1982
Sr	--	sand	96.0	1	4.0			5.5	273	0.3					1.1 (1.3)	62.0 feet deep		Ryan,1982
Sr	--	sand	95.0	1	5.0			5.5	273	0.6					8.7 (5.6)	63.0 feet deep		Ryan,1982
Sr	--	sand	91.0	1	8.0			5.5	273	1.1					10.1 (6.3)	63.5 feet deep		Ryan,1982
Sr	--	sand	88.0	1	1.0			5.5	273	0.7					5.4 (37.0)	64.0 feet deep		Ryan,1982
Sr	--	sand	84.0	2	4.0			5.5	273	1.3					10.9	65.0 feet deep		Ryan,1982
Sr	--	sand	89.0	1	0.0			5.5	273	0.6					5.3 (35.0)	65.5 feet deep		Ryan,1982
Sr	85	organic				peat		4.0							3700 -- 74 (1d)	(6-8 cm) Lefgrens Bog, NY	Lefgrens > org content than PA (tab 5a) (Rd) (Sr-85)	Schell et al., 1985
Sr	85	organic				peat		4.0							3900 -- 78 (4d)	(6-8 cm) Lefgrens Bog, NY	(tab 8=comparison-Sibley 82)	Schell et al., 1985
Sr	85	organic				peat		4.0							3200 -- 65 (8d)	(6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							---------- (11d)	(6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							3300 -- 69 (15d)	(6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							3200 -- 65 (30d)	(6-8 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							6600 -- 1.4 (1d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							7300 -- 1.5 (4d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							---------- (8d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							8300 -- 1.7 (11d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							5400 -- 1.1 (15d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							4800 -- 95 (30d)	(20-21 cm) Lefgrens Bog, NY		Schell et al., 1985
Sr	85	organic				peat		4.0							230 -- 03 (1d)	(6-8 cm) Spruce Flats Bog, PA	Spruce Flats > inorganic content than NY	Schell et al., 1985
Sr	85	organic				peat		4.0							180 -- 04 (4d)	(6-8 cm) Spruce Flats Bog, PA	(tab 8=comparison-Sibley 82)	Schell et al., 1985
Sr	85	organic				peat		4.0							---------- (8d)	(6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							340 -- 07 (11d)	(6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							230 -- 05 (15d)	(6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							200 -- 04 (30d)	(6-8 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							80 -- 03 (1d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							180 -- 04 (4d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							---------- (8d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							340 -- 07 (11d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							230 -- 05 (15d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	organic				peat		4.0							200 -- 04 (30d)	(20-22 cm) Spruce Flats Bog, PA		Schell et al., 1985
Sr	85	sand	89	2	9			4.5							2.8	Soil 1 (8-10')	p.26 (tab.8)	Hoeffner, 1985
Sr	85	sand	72	5	23			5.0							9.3	Soil 2 (blend 40-48')	(tab 8) ** see Co **	Hoeffner, 1985
Sr	85	sand						5.0 final				2.5M+10E4NaCl			26	SRP Soil	Kd changes (w. changing clay content) mainly	Hoeffner, 1985
Sr	85	sand						5.0 final				25M+30E4NaCl			23	SRP Soil		Hoeffner, 1985

continued...

TABLE B-30 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG.	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sr	85	sand						5.0 final				2.5M=10E4NaNO3			24	SRP Soil	result of pH changes	Hoeffner, 1985
Sr	85	sand						5.0 final				25M=10E4NaNO3			22	SRP Soil		Hoeffner, 1985
Sr	85	sand						5.0 final				2.5M=10E4KCl			20	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.7				25M=10E4KCl			7	SRP Soil		Hoeffner, 1985
Sr	85	sand						5.0				2.5M=10E4KNO3			21	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.8				25M=10E4KNO3			7	SRP Soil		Hoeffner, 1985
Sr	85	sand						5.0				no salt			22	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.9 final				2.5M=10E4MgCl2			25	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.6 final				25M=10E4MgCl2			5	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.8 final				2.5M=10E4Mg(NO3)			14	SRP Soil	(tab 8) Kd equi- none day	Hoeffner, 1985
Sr	85	sand						4.5 final				25M=10E4Mg(NO3)			6	SRP Soil	(20-200 ppm Fe decreased in Kd=15-2 ml/g)	Hoeffner, 1985
Sr	85	sand						4.8 final				2.5M=10E4CaCl2			17	SRP Soil	no Fe:(Kd-25):tab 9	Hoeffner, 1985
Sr	85	sand						4.6 final				25M=10E4CaCl2			5	SRP Soil		Hoeffner, 1985
Sr	85	sand						5.2 final				2.5M=10E4Na2SO4			52	SRP Soil		Hoeffner, 1985
Sr	85	sand						5.2 final				25M=10E4Na2SO4			86	SRP Soil		Hoeffner, 1985
Sr	85	sand						4.9 final				no salt			16	SRP Soil		Hoeffner, 1985
Sr	85	sand						2-7			(HCO-3 & OH-)				2-1100		Fig 4 (effect of pH on Sr Kd)	Hoeffner, 1985
Sr	85	sand						2-7			(K,Ca & Mg)				2-1100		Fig 8 (effect of K, Ca or Mg on Sr Kd)	Hoeffner, 1985
Sr	90	A4	29.7	40.2	17.5	0.17	39%	7.81 (8.50) water		5.3		CaCl2			10.6	Upper Oxidized Till	fantastic paper for info	Johnston et al., 1985
Sr	90	A8	32.6	34.7	14.6	0.2	43%	7.99 (8.60) water		3.4		CaCl2			6.6	Upper Oxidized Till	(Sr-90) (tab 1-physical prop.)	Johnston et al., 1985
Sr	90	D8	28.4	38.2	22.2	0.29	43%	7.89 (8.45)		6.2		CaCl2			---	Upper Oxidized Till	sand-silt-clay does not equal 100%	Johnston et al., 1985
Sr	90	A12	37.5	35.8	11.9	0.21	44	8.08 (8.78)		2.5		CaCl2			---	Lower Unweathered Till		Johnston et al., 1985
Sr	90	A23	32.8	32.0	13.3	0.20	46	8.08 (8.82)		2.8		CaCl2			4.1	Lower Unweathered Till		Johnston et al., 1985
Sr	90	A32	36.1	35.8	10.6	0.10	45	8.14 (8.90)		2.0		CaCl2			4.8	Lower Unweathered Till	(tab 1 give Calcite + Dolomite = %Carb.)	Johnston et al., 1985
Sr	90	A39	35.7	31.2	9.1	0.18	73	8.20 (8.98)		2.2		CaCl2			5.[illegible]	Lower Unweathered Till	= CaCO3	Johnston et al., 1985
Sr	90	D14	37.8	36.9	11.1	0.27	39	8.10 (8.70)		3.1		CaCl2			---	Lower Unweathered Till	(tab 2 = chem prop., cations, CEC)	Johnston et al., 1985
Sr	90	D23	36.6	41.8	8.7	0.24	44	8.18 (8.92)		2.1		CaCl2			4.0	Lower Unweathered Till	et al = cherry	Johnston et al., 1985
Sr	90	D26	37.8	38.7	11.4	0.23	42	8.30 (8.93)		2.1		CaCl2			4.5	Lower Unweathered Till	(tab 3:groundwater cations/anions, lab + field pH)	Johnston et al., 1985
Sr	90	D33	36.9	37.7	11.1	0.16	48	8.30 (8.95)		2.0		CaCl2			3.7	Lower Unweathered Till		Johnston et al., 1985
Sr	90	D38	36.3	34.5	4.8	0.11	51	8.31 (9.02)		6.3		CaCl2			3.6	Lower Unweathered Till	(tab 5=Kd synthetic soil Cs)	Johnston et al., 1985
Sr	90	R2-26	—	----	-----	0.17	41	7.75 (8.69)		0.8		CaCl2			2.5	Sand	good conclusions	Johnston et al., 1985
Sr	90	C2-22	—	----	-----	0.23	52	7.92 (8.54)		0.8		CaCl2			2.9	Sand		Johnston et al., 1985
Sr	90	C8	—	----	-----	0.13	65	8.23 (8.82)		0.9		CaCl2			2.0	Sand	** see Cs **	Johnston et al., 1985
Sr	90	C10	—	----	-----	0.15	58	8.28 8.75		0.9		CaCl2			1.3	Sand		Johnston et al., 1985
Sr	90	C12	—	----	-----	0.19	56	8.05 8.70		0.7		CaCl2			2.6	Sand		Johnston et al., 1985
Sr	90	D17	—	----	-----	0.16	61	8.14 8.72		0.8		CaCl2			2.1	Sand		Johnston et al., 1985
Sr	90	W22	—	----	-----	0.22	21	8.15		0.9		CaCl2			1.9	Sand		Johnston et al., 1985
Sr	85	Ap horizon	59.7	28.4	12.0	C=2.4	0.2	6.7 (CaCl2)		8.7		CaCl2			20-25 (log-N°) (AV:29)	(0-30 cm) Alfisol (Parabrown earth)	Tab 3: Kd Tab 1: soil ; oo Tab 2: %C,CEC,pH by horizon	Bunzl et al., 1985
Sr	85	Sodium titanate + brine A						6.7							125			Nowak, 1980
Sr	85	Sodium titanate + 1% A						7.2							100,000		(tab 3)	Nowak, 1980
Sr	85	Sodium titanate + brine B						7.2-7.5							540		** see Pu/2 sodium titanate, synthetic inorganic exchanger	Nowak, 1980
Sr	90	SRP						3.4							1.5	SRP=Savannah River Plant - burial ground soil		Stone et al., 1984
Sr	90	SRP						4.7							7.5	SRP=Savannah River Plant - burial ground soil	SR-90 (tab 1)	Stone et al., 1984
Sr	90	SRP						5.3							38	SRP=Savannah River Plant - burial ground soil		Stone et al., 1984
Sr	90	SRP						7.2							3000	SRP=Savannah River Plant - burial ground soil		Stone et al., 1984
Sr	--	clayey sand				0.607				0.665		CaCl2			25.7	T-1 : 0-45 cm, Tokai		Uchida and Kamada, 1987
Sr	--	fine sand				0.607				0.665		CaCl2			21.3	T-5 : 205 cm, Tokai	(tab 1 : Soil depth + type)	Uchida and Kamada, 1987
Sr	--	sandy clay				0.607				0.665		CaCl2			32.8	T-11 : 405-420 cm, Tokai	(tab 4 : Kd = CaCl2 + GW)	Uchida and Kamada, 1987
Sr	--	loam				0.607				0.665		CaCl2			110.[illegible]	T-17 : 650-700 cm, Tokai	(GW - ground water)	Uchida and Kamada, 1987
Sr	--	clayey sand				0.607				0.665		CW			26.4	T-1 : 0-45 cm, Tokai	Abstract Good paper	Uchida and Kamada, 1987
Sr	-	fine sand				0.607				0.665		CW			21.3	T-5 : 205 cm, Tokai	Tab 2 : chem prop at diff depth	Uchida and Kamada, 1987
Sr	--	sandy clay				0.607				0.665		[illegible]			33.1	T-11 : 405-420 cm, Tokai	Fig 2-3: Sr in soil vs S in sol for Tokai +	Uchida and Kamada, 1987
Sr	--	loam				0.607				0.665		[illegible]			99.3	T-17 : 650-700 cm, Tokai	Konno soils	Uchida and Kamada, 1987
Sr	--	loamy sand				0.691				0.89		CaCl2			169.8	Ya-1 : 0-20 cm, Kibune	Fig 4-5: variation of Kd vs exchange	Uchida and Kamada, 1987
Sr	--	loamy sand				0.691				0.89		CaCl2			89.3	Ya-3 : 40-60 cm, Kibune	Tab 5 : correlation of Kd	Uchida and Kamada, 1987

continued...

TABLE B-30 (continued)

NUC.	ISE	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sr	--	loamy gravel				0.691				0.898		CaCl2			111.8	Ya-7 - 120-140 cm Kibune	Fig 1 = Kd vs soil st.	Uchida and Kameda, 1987
Sr	--	gravel				0.691				0.898		CaCl2			48.9	Ya 14 - 500-520 cm, Kibune		Uchida and Kameda, 1987
Sr	--	loamy sand				0.691				0.898		CW			173.5	Ya-1 - 0-20 cm, Kibune		Uchida and Kameda, 1987
Sr		loamy sand				0.691				0.898		CW			79.5	Ya 3 - 40-60 cm, Kibune		Uchida and Kameda, 1987
Sr		loamy gravel				0.691				0.898		CW			95.9	Ya 7 - 120-140 cm Kibune		Uchida and Kameda, 1987
Sr		gravel				0.691				0.898		CW			42.3	Ya-14 - 500-520 cm, Kibune		Uchida and Kameda, 1987
Sr		humus loam				0.166				0.294		CACl2			83.5	Yb 1 (0-20 cm), Konno		Uchida and Kameda, 1987
Sr		clayey loam				0.166				0.294		CACl2			29.0	Yb-5 (80-100 cm), Konno		Uchida and Kameda, 1987
Sr		sandy loam				0.166				0.294		CACl2			32.4	Yb-20 (380-400 cm), Konno		Uchida and Kameda, 1987
Sr		sandy loam				0.166				0.294		CACl2			128.1	Yb-27 (520-540 cm), Konno		Uchida and Kameda, 1987
Sr		Tuffy loam				0.166				0.294		CACl2			77.6	Yb 39 (760-780 cm), Konno		Uchida and Kameda, 1987
Sr		humus loam				0.166				0.294		CW			130.2	Yb 1 (0-20 cm), Konno		Uchida and Kameda, 1987
Sr		clayey loam				0.166				0.294		CW			71.0	Yb 5 (80-100 cm), Konno		Uchida and Kameda, 1987
Sr		sandy loam				0.166				0.294		CW			45.9	Yb 20 (380-400 cm), Konno		Uchida and Kameda, 1987
Sr		sandy loam				0.166				0.294		CW			227.6	Yb-27 (520-540 cm), Konno		Uchida and Kameda, 1987
Sr		Tuffy loam				0.166				0.294		CW			107.3	Yb 39 (760-780 cm), Konno		Uchida and Kameda, 1987
Sr		sand	89	3	8										100 (157)	Beatty 1, Nevada	Beatty, Nv., Barnwell, S.C. (Abst = Kds highest in alkaline	Neiheisel, 1983
Sr		sand	91	2	7										82	Beatty 2, Nevada	Alluvial Basin deposits high in montmorillonite & zeolites	Neiheisel, 1983
Sr		sand	83	2	15										150	Beatty 5, Nevada	Tab 1= Kd= mineral phase char Tab 3= soil text. & min comp	Neiheisel, 1983
Sr		clayey sand	58	6	36										82	Barnwell 4, South Carolina	Tab.2=relationships texture, surf area & clay min. compos.	Neiheisel, 1983
Sr		clayey sand	68	11	21										142	Barnwell 12, South Carolina	Tab 4=Kd=6 radionuclides. Fig.6= text. diagram.	Neiheisel, 1983
Sr		clayey sand	73	8	19										190 (115)	Barnwell 14, South Carolina	Fig 7= Kd vs sorptive minerals Kd in ( )= reducing cond	Neiheisel, 1983
															?			Neiheisel, 1983
																	Fig 3,4 Kd vs Sr conc Two soils=bentonite - humic Many fancy formulas	Bunzl and Schultz, 1985
Sr	85		80	17	3			3.7		125 me/kg		CaCl2			44 (2.5-80)		Kd ( )= range (Tab.1=soil prop.)(Tab.2=Kd)(Kd in ( ) = range)	Schimmack et al., 1987
Sr	85	C			-I-K	--				--					8	(0 cm) Ranker (Trebel)	Tab 1= soil prop. Tab.2= Kd + pH.	Bachhuber et al, 1982
Sr	85	Ah			-I-K	1.7				8.9					30	(4 cm) Ranker (Trebel)	C=chlorite, I=illite, K=kaolinite, M=montmorillonite.	Bachhuber et al, 1982
Sr	85	C			-I-K	0.4				2.6					0.8	(15 cm) Ranker (Trebel)	Tab.3= water vel., Ds, dispersion length	Bachhuber et al, 1982
Sr	85	O			-I-K										31	(0 cm) Podsol (Gorleben)	Tab 4=retardation factors. Tab.5=migration rates.	Bachhuber et al, 1982
Sr	85	Ah			-I-K	1.9				7.8					80	(3 cm) Podsol (Gorleben)	Fig 2= breakthrough curves. Fig 1= sorption isotherms	Bachhuber et al, 1982
Sr	85	E			-I-K	2.1				5.8					8	(23 cm) Podsol (Gorleben)	Fig 3= time intervals	Bachhuber et al, 1982
Sr	85	Bh,fe			-I-K	4.3				30.2					20	(27 cm) Podsol (Gorleben)	Fig 6= comparisons of batch, columns, and fallout Kds	Bachhuber et al, 1982
Sr	85	Bfe			-I-K	1.6				4.8					1	(32 cm) Podsol (Gorleben)	X-ref 841-44	Bachhuber et al, 1982
Sr	85	BC			-I-K	0.2				2.6					0.9	(42 cm) Podsol (Gorleben)		Bachhuber et al, 1982
Sr	85	C			-I-K										0.6	(100 cm) Podsol (Gorleben)		Bachhuber et al, 1982
Sr	85	Ah			-I-K-M	2.4				7.8					110	(0 cm) Brown (Gorleben)		Bachhuber et al, 1982
Sr	85	Bv			-I-K-M	0.3				3.0					3	(9 cm) Brown (Brunkendorf)		Bachhuber et al, 1982
Sr	85	BC			-I-K-M	0.05				4.2					1.4	(48 cm) Brown (Brunkendorf)		Bachhuber et al, 1982
Sr	85	C			-I-K-M	--									1.6	(95 cm) Brown (Brunkendorf)		
Sr	85	Ap				1.19		8.3 (solution)		16.4					>10	(0-22 cm) Avenrendzina, (Biblis)	(Sr-85)	Bunzl et al., 1984
Sr	85	C				1.15		8.3 (solution)		17.7					>10	(22-30 cm) Avenrendzina, (Biblis)	Fig 1&2= Kd - soil horizons	Bunzl et al., 1984
Sr	85	Cc				1.01		8.2 (solution)		16.2					>10	(30-47) Avenrendzina, (Biblis)	Fig.3= Kd vs. Ca + Ka ions.	Bunzl et al., 1984
Sr	85	fCrCc				0.25		8.1 (solution)		8.5					>10	(47-90) Avenrendzina, (Biblis)	Fig.4= Kd - comparison column and batch	Bunzl et al., 1984
Sr	85	2fCr				0.14		8.2 (solution)		6.4					>10	(90-128 cm) Avenrendzina, (Biblis)	Fig 5= Kd - 6 soils (A-horizon)	Bunzl et al., 1984
Sr	85	3Cr				0.07		8.2 (solution)		0.7					1	(128-132 cm) Avenrendzina, (Biblis)	Fig 6= Kd - 5 soils (1.0m)	Bunzl et al., 1984
Sr	85	Ap				2.41		7.3 (solution)		8.7					>10	(0-31 cm) Parabrown, (Eschweiler)	Abstract	Bunzl et al., 1984
Sr	85	Al				0.71		7.4 (solution)		9.5					>10	(31-52 cm) Parabrown, (Eschweiler)		Bunzl et al., 1984
Sr	85	BtAl				0.34		7.2 (solution)		8.3					>10	(52-62 cm) Parabrown, (Eschweiler)		Bunzl et al., 1984
Sr	85	AlBt				0.30		6.8 (solution)		8.3					>10	(62-73 cm) Parabrown, (Eschweiler)		Bunzl et al., 1984
Sr	85	Bt1				0.30		6.7 (solution)		12.5					>10	(73-88 cm) Parabrown, (Eschweiler)		Bunzl et al., 1984
Sr	85	Bt2				0.25		6.2 (solution)		13.7					>10	(> 88 cm) Parabrown, (Eschweiler)		Bunzl et al., 1984
Sr	85																Good paper, presents arguments	Gillham and Cherry, 1982

continued...

TABLE B-30 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	SAT pH PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
																	good for formulas, introduction, discussions	
Sr		Bandelier tuff (silicic glass)									0 01N	CaCl2					No Kd's determined Used ...:0 90 in model calculation (13 figures)	Knighton and Wagenet, 1986
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		3.0M NaNO3			0.49	Burbank, Hanford subsoil	(Sr-90) Tab 1=soil prop. Tab 2=Kd vs (M)	Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		1.5M NaNO3			0.6	Burbank, Hanford subsoil	Tab 4 - Kd of well sediment = not used.	Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0.15 NaNO3			5.6	Burbank, Hanford subsoil	Box Behnker method	Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0.1M NaNO3				Burbank, Hanford subsoil	p. 381 Batch, soil-to-soil ...)	Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0.05M NaNO3			39.4	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0.01M NaNO3				Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0015M NaNO3			173.0	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		001M NaNO3				Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		3.0M NaNO3			0.93	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		1.5M NaNO3			1.42	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		0.15 NaNO3				Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		0.1M NaNO3			6.74	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		0.05M NaNO3				Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		0.01M NaNO3			55.4	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		0015MNaNO3				Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		001M NaNO3			146.0	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		2MCa(NO3)2			0.66	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		1MCa(NO3)2			1.25	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		05MCa(NO3)2			1.9	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		01MCa(NO3)2			7.7	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		005MCa(NO3)2			11.5	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Loamy sand		10.1	0.5		0.8(mg/g)	7.0		(pH7 0)4.9		0007MCa(NO3)2			13.3	Burbank, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		2MCa(NO3)2			0.43	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		1MCa(NO3)2			1.24	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		05MCa(NO3)2			2.21	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		01MCa(NO3)2			5.85	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		005MCa(NO3)2			12.6	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	90	Sandy loam		29.5	4.9		26.0(mg/g)	8.0		(pH7 0)4.0		002MCa(NO3)2			26.4	Tank farm, Hanford subsoil		Rouston et al., 1984
Sr	--	Red-brown clayey						6.0--0.6							AV = 6.9E2	Chestnut Ridge, ORNL	(Sr--) (Tab 18) see U/2 Report has hundreds of Kd's	Seeley & Kelmers, 1984.
Sr	--														(H = 1.6E2)		(0 N =U,Cs,Co,Eu,Th,Tc,I)	Seeley & Kelmers, 1984.
Sr	--														(L = 2.0E2)		RS = 5mg Sr/L = conc	Seeley & Kelmers, 1984.
Sr	85	Heavy clay -1		15	85			8.2(7.6--.2)		26--2					65--3	(9.04 - 9.11 m) Lovisa Savi, Finland	(Sr-85) (Tab 1 = soil pr... + pH)	Nikula, 1982
Sr	85	Heavy clay -2		19	81			8.2(7.7--.2)							54--1	(9.73 - 9.80 m) Lovisa Savi, Finland	(Tab 8 : Sr Kd - pH) (0 N = Cs,Co,Mn,Zn,Ce)	Nikula, 1982
Sr	85	Heavy clay -3		11	89			8.4(7.5--.2)		21--2					8.5--1	(2.08 - 2.15 m) Olkiluoto Savi, Finland	In Finnish with English summary 13 figures	Nikula, 1982
Sr	85	Heavy clay -4		32	68			8.3(7.5--.1)		5.7--2					3.6--1	(2.49 - 2.56 m) Olkiluoto Savi, Finland	(pH in Tab 8 - ( ) in pH column)(Fig.11 = Sr Kd vs Rf)	Nikula, 1982
Sr	85	Heavy clay -5		32	68			8.0(7.3--.1)		25--1					107--4	(6.28 - 6.35 m) Salo Savi, Finland	(Fig 3 - Sr Kd vs NaCl) Fig.4 = Sr Kd vs. Sr conc.)	Nikula, 1982
Sr	85	Silty clay loam -6		62	38			7.0(7.5--.2)		17--5					42--1	(2.24 - 3.31 m) Jamsa Savi, Finland	(Fig 6 = Sr Kd vs pH) (Fig 9 & 10 = Sr Kd vs CEC)	Nikula, 1982
Sr	85	Loamy sand -7	79	21				6.4(7.1--.1)		2.8--.2					24--5	(4 m) Lovisa moreeni, Finland	(Fig 12 = Sr Kd vs. Rf)	Nikula, 1982
Sr	85	Sandy loam -8	65	35				6.4(7.2--.1)		3.2--.2					13--1	(1.5 m) Olkiluoto moreeni, Finland	(Tab 14 = Sr - Cs Kd vs NaCl Olkiluodon sediment)	Nikula, 1982
Sr	85	Loamy sand -9	73	27				6.8(7.5--.1)		2.1--.3					13--1	(3.5 - 4.0 m) Juuka moreeni, Finland	(Tab 15 = Sr - Cs Kd vs NaCl = Lovisan sediment)	Nikula, 1982
Sr	85	Sandy loam -10	66	34				6.2(7.0--.1)		2.3--.3					19--1	(2.2 - 2.5 m) Partala moreeni, Finland	(Tab 16 = Sr conc (M) vs Kd = Salon savessa)	Nikula, 1982
Sr	85	Loam -11	41	37	22			9.7(8.7--.1)		18--5					150--10	(44 m) Kakola Kalliosavi, Finland	(Tab.18 = Sr Kd vs pH vs Lovisan savessa.)	Nikula, 1982
Sr	85	Sandy loam -12	57	29	14			9.9(8.3--.2)		40--4					180--10	(24 m) Metsaaro kalliosavi, Finland	(pH in ( ) = Kd function of pH from Tab. 18)	Nikula, 1982
Sr	85											01M NaCl			25--1	Olkiluodon sediment, Finland	Soil # 1 to 4 = bottom sediment	Nikula, 1982
Sr	85											08M NaCl			6.8--.4	Olkiluodon sediment, Finland	Soil # 11 and 12 = fracture filling	Nikula, 1982
Sr	85											0.5M NaCl			3.1--.2	Olkiluodon sediment, Finland		Nikula, 1982
Sr	85											1.0M NaCl			0.5--.4	Olkiluodon sediment, Finland		Nikula, 1982
Sr	85											01M NaCl			63--5	Lovisan sediment, Finland		Nikula, 1982
Sr	85											05M NaCl			41--4	Lovisan sediment, Finland		Nikula, 1982
Sr	85											1M NaCl			30--1	Lovisan sediment, Finland		Nikula, 1982
Sr	85											5M NaCl			6--1	Lovisan sediment, Finland		Nikula, 1982
Sr	85													2.4x10E-8M Sr	90--1	Salon savessa, Finland		Nikula, 1982

continued...

TABLE B-30 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sr	85													1.0x10E-7M Sr	94+-4	Salon savessa, Finland		Nikula, 1982
Sr	85													1.0x10E-6M Sr	90+-2	Salon savessa, Finland		Nikula, 1982
Sr	85													1.0x10E-5M Sr	88+-6	Salon savessa, Finland		Nikula, 1982
Sr	85													1.0x10E-4M Sr	62+-5	Salon savessa, Finland		Nikula, 1982
Sr	85									25+-1				1.0x10E-3M Sr	16+-1	Salon savessa, Finland		Nikula, 1982
Sr	85									25+-1				1.0x10E-2M Sr	10+-1	Salon savessa, Finland		Nikula, 1982
Sr	85							(4.0)							8.4+-2	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(5.5)							11.7+-2	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(6.7)							12.1+-2	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(6.8)							13.3+-4	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(7.2)							12.9+-2	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(7.6)							14.3+-5	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(7.8)							14.1+-2	Lovisan savessa, Finland		Nikula, 1982
Sr	85							(8.6)							14.5+-1.5	Lovisan savessa, Finland		Nikula, 1982
Sr	85	Sand	91.2	7	1.1										(6.0+-1.0)	A Rupert sand	Tab5: Kd= col.+ batch Kd in ( )= batch, not in ( )= col	Jones et al., 1980
Sr	85	Sand	91.2	7	1.1										8 (1.0+-0.2)	B-Rupert sand	Two Hanford sediments A=from Ringold geological formation, B=from surf., Rupert sand(Typic)torripsamment (ON=Co,Tc,I,H	Jones et al., 1980
Sr	89														87.55+-69.12	(n Kd=20) Site 1 1 ft depth Bhabha, India	(Sr-89) (Tab 1 = Kd vs depth = Site 1)	Amalraj et al., 1981
Sr	89														108.74+-71.46	(n Kd=20) Site 1 - 3 ft depth Bhabha, India	(no soil properties table)	Amalraj et al., 1981
Sr	89														106.0+-64.67	(n Kd=19) Site 1 - 5 ft depth Bhabha, India	(Tab 3 & 4 = velocity vs D)	Amalraj et al., 1981
Sr	89														23.65+-10.0	(n Kd=10) Site 2 1 ft depth Bhabha, India	(Tab 5 & 6 = % leachate vs diff pH)	Amalraj et al., 1981
Sr	89														63.19+-41.91	(n Kd=9) Site 2 - 3 ft depth Bhabha, India	Tab 2 - Site 2 - Kd vs. depth	Amalraj et al., 1981
Sr	89														64.34+-22.10	(n Kd=4) Site 2 5 ft depth Bhabha, India		Amalraj et al., 1981
Sr	90	Sandy subsoil												10E 4M HNO3	0.6	Gorleben site, FRG	(O N = Cs,Ce,Ru) (Fig 3 & 4 = Kd vs HNO3 - HAW sol)	Schwarzer et al., 1982
Sr	90																(Kd values from Fig 3 & 4) 5 formulas	Schwarzer et al., 1982
Sr	90																Fig 5= adsorp & desorp Kd's MOFIS code	Schwarzer et al., 1982
Sr	90	Sand								(11.3)					12	A	(Tab 2= soil type) Tab 5: CEC - Kd (in JAP)	Inoue & Morisawa, 1976
Sr	90	Silt-clay								(241.7)					30	B	CEC= ( ) = meq/g. 9 tabs 3 figs	Inoue & Morisawa, 1976
Sr	90	Silt-clay								(55.6)					40	C	(O N = Cs,Co,Mn,Zn,Ag,Fe,Mo)	Inoue & Morisawa, 1976
Sr	90	Gravel-sand								(69.5)					65	D		Inoue & Morisawa, 1976
Sr	90	Silt-clay								(167.9)					700	E		Inoue & Morisawa, 1976
Sr	90	Silt-sand								(47.8)					45	F		Inoue & Morisawa, 1976
Sr	90	Gravel								(28.9)					40	G		Inoue & Morisawa, 1976
Sr	90	Silt-clay								(117.9)					270	H		Inoue & Morisawa, 1976
Sr	90	Silt-clay								(140.5)					10	I		Inoue & Morisawa, 1976
Sr	90	Silt-clay								(246.0)					500	J		Inoue & Morisawa, 1976
Sr	90	Fine sand								(60.3)					10	K		Inoue & Morisawa, 1976
Sr	90	Silt								(149.0)					60	L		Inoue & Morisawa, 1976
Sr	90	Sand								(24.3)					25	M		Inoue & Morisawa, 1976
Sr	90	Gravel								(27.1)					15	N		Inoue & Morisawa, 1976
Sr	90	Fine sand								(122.8)					150	O		Inoue & Morisawa, 1976
Sr	90	Fine sand								(38.6)					25	P		Inoue & Morisawa, 1976
Sr	90	Silt-clay								(200.1)					70	Q		Inoue & Morisawa, 1976
Sr		Clay						7.5 - 7.8						7x10E-7 mMol/L	126+-4	(20oC) Core LL44-GPC-2, Pacific Ocean, depth= 5821 m	Batch (tab.1: Kd vs temp.)	Kenna, 1980
Sr		Clay						7.5 - 7.8						7x10E-7 mMol/L	170+-21	(60oC) Core LL44 GPC-2, Pacific Ocean, depth= 5821 m	smectite subseabed clay	Kenna, 1980
Sr		Sand	100	-	-	0.03	41.3	8.3(CaCl2)	-	1.4		see ref			2.0x10E1	Soil #4 (WNRE)		Gillham et al., 1981a
Sr			93	5	2	0.05	40.8	7.8(CaCl2)	-	1.2		see ref			2.5	Soil #6 (Leamington)		Gillham et al., 1981a
Sr			96	4	0	0.51	0	6.3(CaCl2)	-	1.1		see ref			2.0x10E1	Soil #7 (CRNL)		Gillham et al., 1981a
Sr			52	45	3	0.08	0	5.0(CaCl2)	-	1.6		see ref			1.0x10E2	Soil #8 (North Bay)		Gillham et al., 1981a
Sr			59	24	17	0.4	0	6.5(CaCl2)	-	1.9		see ref			2.5x10E1	Soil #10 (WNRE)		Gillham et al., 1981a
Sr			62	31	7	0.38	18.3	7.6(CaCl2)		2.2		see ref			5.0x10E1	Soil #11 (WNRE)		Gillham et al., 1981a
Sr			96	2	2	0.3	11.1	8.0(CaCl2)		0.4		see ref			1.0x10E1	Soil #13 (C F B Borden)		Gillham et al., 1981a
Sr			60	22	18	2.05	7.1	7.8(CaCl2)	-	21.2		see ref			5.0x10E1	Soil #16 (Alberta)		Gillham et al., 1981a
Sr			87	9	4	0.1	0.07	8.23(CaCl2)	-	5.0		see ref			1.14x10E2+-9	Sediment B (Solution 1)		Serne et al., 1978
Sr			94	6		-	-	-		-		-			2.4x10E1	Composite soil (<0.074mm)		Schmalz, 1972

TABLE B-30 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Sr		river sand				-	-	7 - 8	-		-	90% NaCl solution			2	River sand		Hamstra & Verkerk, 1977
Sr		subsoil sand				-	2	6		5		4 mol/L Na+ 0.01mol/L PO4			1.2x10E1	Hanford subsoil		Rhodes, 1957
Sr		subsoil sand				-	2	8		5					8.0x10E1	Hanford subsoil		Rhodes, 1957
Sr		sand			20	2.9	-	6		19.2		3x10E-3mol/L SrCl2			10	Sidell sand		Juo & Barber, 1970
Sr		Burbank soil				-	-	-			-	groundwater			4.8x10E1	Burbank soil		Hajek & Ames, 1968
Sr		Burbank soil				-	.	.				3mol/L NaNO3			2.1	Burbank soil		Hajek & Ames, 1968
Sr		Burbank soil				-	.		-			0.5mol/L NaCl			?.3	Burbank soil		Hajek & Ames, 1968
Sr		Burbank soil				.	.					3mol/L NaOAc			2.23	Burbank soil		Hajek & Ames, 1968
Sr			84	13	3	0.16	2.8	-		5.1	0.63	0.2mol/L NaCl see ref			1.62x10E1	Burbank sand (average profile)		Routson, 1973
Sr			63	32	5	0.21	1.36	.		5.3	1.07	0.2mol/L NaCl see ref			1.6x10E1	Ephrata sand (average profile)		Routson, 1973
Sr		aquifer sand				-	-	5.5	0.42	0.25-0.9		see ref *			1.42x10E1	Chalk River (CR) aquifer sand	* Data available for competing cations sodium, potassium, magnesium, calcium, barium and hydrogen	Patterson & Spoel, 1981
Sr		aquifer sand				-	-	5.5	0.42	0.25-0.9		see ref *			9.2	Chalk River (RA) aquifer sand		Patterson & Spoel, 1981
Sr		aquifer sand				-	-	5.5	0.42	0.25-0.9		see ref *			7.8	Chalk River (Q) aquifer sand		Patterson & Spoel, 1981
Sr		aquifer sand				-	-	5.5	0.42	0.25-0.9		see ref *			1.67x10E1	Chalk River (SB) aquifer sand		Patterson & Spoel, 1981
Sr		aquifer sand				.	.	5.5	0.42	0.25-0.9		see ref *			1.13x10E1	Chalk River (K) aquifer sand		Patterson & Spoel, 1981
Sr		aquifer sand				-	-	5.5	0.42	0.25-0.9		see ref *			[illegible]	Chalk River (HA) aquifer sand		Patterson & Spoel, 1981
Sr		Silt	36	35	29	0.43	33.6	8.1(CaCl2)	-	8.4		see ref			2.0x10E1	Soil #1 (WNRE)		Gillham et al., 1981a
Sr			35	36	29	0.41	33.8	8.1(CaCl2)	-	8.3		see ref			2.0x10E1	Soil #2 (WNRE)		Gillham et al., 1981a
Sr			34	35	31	0.4	34.1	8.1(CaCl2)	-	8.6	.	see ref			2.0x10E1	Soil #3 (WNRE)		Gillham et al., 1981a
Sr			28	41	31	1.27	21.1	7.7(CACL2)		5.9		see ref			1.0x10E1	Soil #5 (Leamington)		Gillham et al., 1981a
Sr			12	55	33	0.35	0	6.7(CACL2)	-	10.2		see ref			1.0x10E2	Soil #9 (North Bay)		Gillham et al., 1981a
Sr			34	34	32	0.85	5.1	7.7(CACL2)	-	32.7	-	see ref			8.0	Soil #14 (Alberta)		Gillham et al., 1981a
Sr			45	44	11	0.14	1.4	8.83(CACL2)	-	12.0		see ref			1.12x10E2--1	Sediment A (Solution 1)		Serne et al., 1978
Sr		medium loam			31.6	2.94	-	6.6	-	10.6					3.0x10E2--60	low ash podzolic (0.01 mm)		Aleksakhin, 1965
Sr		medium loam			41.6	1.28	-	8.4	-	12.2	.				1.7x10E2--30	Serozem (0.01 mm)		Aleksakhin, 1965
Sr			31	69	0	-	-	-	-	2.6	.				1.4x10E1	alluvial soil (Cadarache)		Rancon, 1972
Sr			38	62	0	-	-	-	-	2.7	.	.			2.3x10E1	alluvial soil (Cadarache)		Rancon, 1972
Sr			18	66	16	-	-	-	-	6.3					1.8x10E1	Vindobonian sed (Cadarache)		Rancon, 1972
Sr			40	45	15	-	-	.		1.8		.			1.6x10E1	Vindobonian sed (Cadarache)		Rancon, 1972
Sr			34	52	14	-	-	.	-	4.9		.			1.6x10E1	Vindobonian sed (Cadarache)		Rancon, 1972
Sr			45	47	8	-	.	-	-	1.5		.			1.4x10E1	Vindobonian sed (Cadarache)		Rancon, 1972
Sr			7	92	1	-	.	-	-	4.2	-				2.2x10E1	sandy-clay sed (Durance R.)		Rancon, 1972
Sr			18	71	11	-	-	-	-	3.5		.			1.6x10E1	sandy-clay sed (Durance R.)		Rancon, 1972
Sr			3	96	1	-	.	-	.	5.2		.			1.6x10E1	sandy-clay sed (Durance R.)		Rancon, 1972
Sr		silt			29.1	7.1	-	6	.	30.4	.	3x10E-3mol/L SrCl2*			5.0x10E1	Brookston silt	* Data available for competing cations sodium, potassium, magnesium, calcium, barium and hydrogen.	Juo & Barber, 1970
Sr			44	50	6	0.23	3.8	-	.	11.0	1.21	0.2mol/LNaCl			2.47x10E1	Ritzville silt (avg. profile)		Routson, 1973
Sr		Clay	31	34	35	0.81	5.2	7.8(CaCl2)		31.5		see ref			8	Soil #15 (Alberta)		Gillham et al., 1981a
Sr		heavy loam			53.4	2.04	.	6.6	-	26.1					5.7x10E2	Chestnut (0.01 mm)		Aleksakhin, 1965
Sr		heavy loam			46.6	-	.	6.7	-	30.4	.	.			1.15x10E3--140	Leached Chernozem (0.01 mm)		Aleksakhin, 1965
Sr		heavy loam			67.0	4.87	-	8.0	-	32.9	.	.			4.3x10E2--30	Southern Chernozem (0.01 mm)		Aleksakhin, 1965
Sr		clay			60.7	6.86	-	6.8	-	32.2		.			4.9x10E2--50	Thick Chernozem (0.01 mm)		Aleksakhin, 1965
Sr					100	-	.		.	35		.			4.7x10E1	very fine suspended sediment (Durance River) (<0.02 mm)		Rancon, 1972
Sr		Organic muck				49.8	-	7.0		70.0		3x10E-3mol/L SrCl2			1.5x10E2	Muck		Juo & Barber, 1970

TABLE B-31

TECHNETIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Tc	95m	Loamy Sand					1 1	7 0							1 <1 (log)	1 Gleysol	(O N : Cs,Sr,Ce,Co,Cd,Zn,Ru,I)	Bunzl & Schimmack, 1988
Tc	95m	Organic loamy peat					0 5	6 8							>1-10(log)	2 Sapric Histosol, strongly humified		Bunzl & Schimmack, 1988
Tc	95m	Sandy loam					?(100)	5 7							1 <10(log)	3 Cambisol brown soil from loess		Bunzl & Schimmack, 1988
Tc	95m	Sandy loam					?(63)	7 1							>0 1->1(log)	4 Cambisol		Bunzl & Schimmack, 1988
Tc	95m	Loamy Sand					?(5)	4 6							>1->10(log)	5 Acrisol parabrown soil, Ah horizon		Bunzl & Schimmack, 1988
Tc	95m	Loamy Sand					?(23)	4 6							>10->100(log)	6 Acrisol, parabrown soil, B-horizon		Bunzl & Schimmack, 1988
Tc	95m	Clay						8.0		0 7meq/g		(0 1NCaNo3)			>0 1 <1(log)	B - Bentonite, Sud Chemie AG Munchen		Bunzl & Schimmack, 1988
Tc	95m	Fibric Organic						6.0		2 1meq/g		(0 1NCaNo3)			approx 10(log)	P1 - Sphagnum peat (high moor), Steinhuder Meer, Hannover		Bunzl & Schimmack, 1988
Tc	95m	Fibric Organic						7 0		2 1meq/g		(0 1NCaNo3)			approx 10(log)	P2 Sphagnum peat (high moor), Konigsdorf, Bavaria		Bunzl & Schimmack, 1988
Tc	99	SRP													1 16	SRP=Savannah River Plant soil	(TcO4)(Tab 2 Kd correlation with clay content)	Hoeffner, 1985
Tc	99	SRP													1 32	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													1 31	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													0 33	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													0 10	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													0 17	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													0 23	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	99	SRP													0 14	SRP=Savannah River Plant soil		Hoeffner, 1985
Tc	95m	Ap-horizon(0-30cm)	50 2	28 4	12 0		0 2	6 7		8 7		CaCl2			0 15-0 89(Av=0 37)	Alfiso (Parabrown earth)	(Kd=7 leq-N)(Tab1- soil prop) (Tab2- %C, CEC, pH)	Bunzl et al., 1985
Tc	99	Charcoal#1 + Brine A						6 3 6 5							380		(Tab 2) (Tc0 -99)	Nowak, 1980
Tc	99	Charcoal#1 + Brine B						6 6							300			Nowak, 1980
Tc	99	Loam								(600)					0 87	Orthic Black Chernozem	(Tab1) (CEC=cmol kg-1)	Sheppard & Sheppard,1987
Tc	99	Sand								(16)						Orthic Regosol		Sheppard & Sheppard,1987
Tc	99	LFH-Ah						5 2		81 2cmolKg 1					( )	0 4cm Gleyed Dystric Brunisol	Tab 1-soil prop , CEC=cmol kg 1	Sheppard et al , 1987
Tc	99	Ae						5 1		2 9cmolKg 1					2 3( )	4 15cm Gleyed Dystric Brunisol	L-leach C: (CW) in Kd col	Sheppard et al , 1987
Tc	99	Bfj Bf(gj)						5 2		2 1cmolKg 1					1 4( )	15-45cm Gleyed Dystric Brunisol	RLC IV	Sheppard et al , 1987
Tc	99	C (g)						6 2		1 7cmolKg 1					0 1(0 2)	>45cm Gleyed Dystric Brunisol		Sheppard et al , 1987
Tc	95m		80	17	3		0	3 7(CaCl2)		125meKg-1		CaCl2			16 (2 7 43)		Kd column ( )=Kd range. Tab.1= soil properties. Tab 2: Kd	Schimmack, et al., 1987
Tc	95m	Ap				1 19		8 3(solution							>0 1	(0 22cm) Auenrendzina (Biblis), FRG	(Tab 1) Fig 1 & 2: Kd - soil horizon	Bunzl et al , 1984
Tc	95m	C				1.15		8 3(solution							>0 1	(22-30cm) Auenrendzina (Biblis), FRG	Fig 3- Kd vs Ca + Ka ions	Bunzl et al , 1984
Tc	95m	Cc				1 01		8 2(solution							>0 1	(30-47cm) Auenrendzina (Biblis), FRG	Fig 4- Kd - comparison column + batch	Bunzl et al , 1984
Tc	95m	fCrCc				0 25		8 1(solution							>0 1	(47-90cm) Auenrendzina (Biblis), FRG	Fig 5- Kd - 6 soils (A-horizon)	Bunzl et al., 1984
Tc	95m	2fCr				14		8 2(solution							>0 1	(90-128cm) Auenrendzina (Biblis), FRG	Fig 6: Kd - 7 soils (1 0m)	Bunzl et al , 1984
Tc	95m	3Cr				02		8 2(solution							>0 1	(128-132cm) Auenrendzina (Biblis), FRG	Abstract	Bunzl et al., 1984
Tc	95m	Ap				2 41		7 3(solution							>0 1	(0-31cm) Parabrown (Eschweiler), FRG		Bunzl et al , 1984
Tc	95m	Al				71		7 4(solution							<0 1	(31-52cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
Tc	95m	BLAl				34		7 2(solution							<0 1	(52-62cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
Tc	95m	AlBt				30		6 8(solution							<0 1	(62-73cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
Tc	95m	Bt1				.30		6 7(solution							<0 1	(73-88cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
Tc	95m	Bt2				25		6 2(solution							<0 1	(>88cm) Parabrown (Eschweiler), FRG		Bunzl et al., 1984
Tc	95m	Sphagnum peat				100		5 3 5 4		2 1meq/g		0 1NCaCl2			17 7+-0 7	0 5(dissolved O2=mg/dm3)	Tab 1-Kd vs O2 dissolved Fig 1=Kd vs Tc conc	Wolfrum & Bunzl, 1986
Tc	95m	Sphagnum peat				100		5 3 5 4		2 1meq/g		0 1NCaCl2			10 9+-0 3	4 6(dissolved O2=mg/dm3)	Authors referred to us in this paper, H Phy 1983	Wolfrum & Bunzl, 1986
Tc	95m	Sphagnum peat				100		5 3-5 4		2 1meq/g		0 1NCaCl2			5 8+-0 2	8 4(dissolved O2 mg/dm3)	Sphagnum peat, Steinhuder Meer near Hanover	Wolfrum & Bunzl, 1986
Tc	95m	Sphagnum peat				100		5 3 5 4		2 1meq/g		01NCaCl2			41 0+-2 0	0 5(dissolved O2=mg/dm3)	p 319 = pH 1 6,2 7,4 6,5 4 = No effect on Kd	Wolfrum & Bunzl, 1986
Tc	95m	Sphagnum peat				100		5 3 5 4		2 1meq/g		01NCaCl2			21 0+-0 9	4 6(dissolved O2=mg/dm3)		Wolfrum & Bunzl, 1986
Tc	95m	Sphagnum peat				100		5 3 5 4		2 1meq/g		01NCaCl2			9 7+-0 4	8 4(dissolved O2 mg/dm3)		Wolfrum & Bunzl, 1986
Tc		Red brown clayey						5 1+-0 2							AV = 0	Chestnut Ridge, ORNL	Tab 1A see U/2 (O N -U,Sr,Cs,Ce,Eu,Th,I)	Seeley & Kelmers, 1984
															(H - 1 6)		Rn 5mg Tc/L conc	Seeley & Kelmers, 1984
															(L - 1 0)			Seeley & Kelmers, 1984
Tc	99	Glauconite sand	91 1	2 9	6 0			5	438(mV)	3 7				1 M	0 (A-B)	(10 wks) N E Netherlands	(Appendix 4) (O N - Am,Np,Pu)	Prins, et al., 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			5	436(m)	3 7				M	0 (A B)	(10 wks) N E Netherlands	This report is a problem - Kds=1000.	Prins, et al , 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			5	448(mV)	3 7				2 M	0 (A-B)	(10 wks) N E Netherlands	Kds function of pH, Eh, M + time = APPENDICES.	Prins, et al , 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			6	415(mV)	3 7				1 M	0 (A B)	(10 wks) N E Netherlanc	Aer = Aerobic pH in ( )- initial pH	Prins, et al , 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			6	435(mV)	3 7				1 M	0 (A-B)	(10 wks) N E Netherlands	A: aerobic, AN= anaerobic, B batch, C- column and	Prins, et al., 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			6	421(mV)	3 7				2 M	0 (A-B)	(10 wks) N E Netherlands	M molarity = salt concentration	Prins, et al , 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			5 (5 8)	27(mV)	3 7				1 M	4 5 (AN B)	(7 wks) N E Netherlands		Prins, et al , 1986
Tc	99	Glauconite sand	91 1	2 9	6 0			5 (5 4)	65(mV)	3 7				1 M	3 4 (AN-B)	(7 wks) N E Netherlands		Prins, et al., 1986

continued...

TABLE B-31 (continued)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Tc	99	Glauconite sand	91.1	2.9	6.0			5 (5.5)	41(mV)	3.7				2 M	3.4 (AN-B)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			6 (6.5)	38(mV)	3.7				1 M	4.0 (AN-B)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			6 (6.6)	15(mV)	3.7				1 M	3.0 (AN-B)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			6 (6.5)	-2(mV)	3.7				2 M	3.1 (AN-B)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			5 (5.6)	150(mV)	3.7				1 M	7 (AN-C)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			5 (5.7)	178(mV)	3.7				1 M	2 (AN-C)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Glauconite sand	91.1	2.9	6.0			5 (5.8)	158(mV)	3.7				2 M	9 (AN-C)	(7 wks.) N.E. Netherlands		Prins, et al., 1986
Tc	99	Gohy 1012						5 (6.2)	37(mV)	155(Ca++)				.012 M	44 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 1012						7 (7.6)	13(mV)	155(Ca++)				.012 M	69 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 1012						5 (6.1)	7(mV)	155(Ca++)				.05 M	100 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 1012						7 (7.8)	25(mV)	155(Ca++)				.05 M	54 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 2120						6.8 (7.3)	-3(mV)	1.183(Ca++)				1.0 M	535 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 2120						5 (5.8)	8(mV)	1.183(Ca++)				1.0 M	465 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 2120						6.8 (7.2)	11(mV)	1.183(Ca++)				2.5 M	500 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	99	Gohy 2120						5 (5.7)	23(mV)	1.183(Ca++)				2.5 M	725 (AN-C)	(6 wks.) Gorleben, FRG		Prins, et al., 1986
Tc	95m	Sand	91.2	7	1.8										.03-.01(3.0-2.0)	B Rupert sand	Tab 5-Kd=column + batch Kd in ( ) batch Kd not in ( )=col	Jones et al., 1980
Tc	95m	Loamy sand	81.2	15	3.8										.04( )	A from Ringold formation	lan Hanford sediments A-from Ringold geological formation. B from surface, Rupert sand (type torripsamment) (II N Co,I,Sr,3H)	Jones et al., 1980
Tc	99	LFH Ah						5.2		81.2cmol/Kg 1						0-4 cm Gleyed Dystric Brunisol	Less Zone (D N Ne, I, Cs, Cr U, Th, Mo)	Sheppard, 1989
Tc	99	Ae						5.1		2.9cmol/Kg 1						4-15 cm Gleyed Dystric Brunisol	Kd- leachate = on ( ) Kd- Groundwater - ( )	Sheppard, 1989
Tc	99	Bfj-Bfjgj						5.2		2.1cmol/Kg 1						15-45 cm Gleyed Dystric Brunisol	Soil type Ph, CEC & soil desc from RLG-1Y(JFD16(3))	Sheppard, 1989
Tc	99	C Cgj						6.2		1.7cmol/Kg 1						>45 cm Gleyed Dystric Brunisol		Sheppard, 1989
Tc	99	Organic	-	-	-	22		5.0							1.3 L/Kg	1 Brunisol profile LH	Tab 1 - soil properties	Sheppard, MIS & WCE, 1989
Tc	99	Sand	95	3	2	0.4		4.6							0.01 L/Kg	2 Brunisol profile-Ae	Tab 2 - geom. mean aerobic Kd for 34 soils	Sheppard, MIS & WCE, 1989
Tc	99	Sand	97	1	2	0.1		4.6							0.01 L/Kg	3 Brunisol profile-Bfj,Bfjgj	KK#1 to #12 refer to sample numbers of Koch and Kay (1987).	Sheppard, MIS & WCE, 1989
Tc	99	Sand	60	29	11	8.1		3.9							-0.05 L/Kg	4 Regosol under boreal forest	collected at 9 sites in Ontario	Sheppard, MIS & WCE, 1989
Tc	99	Loam	15	31	54	7.6		7.3							-0.2 L/Kg	5 Chernozem-Ah		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	83		4.5							2.2 L/Kg	6 Sedge profile - surface 0-15 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	29	40	31	4.1		5.6							-0.2 L/Kg	7 Sedge profile - well humified 15-30 cm		Sheppard, MIS & WCE, 1989
Tc	99	Clay	40	34	26	2.4		5.5							-0.1 L/Kg	8 Sedge profile - clay mineral subsoil		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	88		4.6							0.97 L/Kg	9 Sphagnum profile A-surface 0-20 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	94		4.6							3.0 L/Kg	10 Sphagnum profile A humified 20-40 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	77		3.7							1.8 L/Kg	11 Sphagnum profile B - 0-20 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	86		3.9							2.9 L/Kg	12 Sphagnum profile B - 20-40 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	81		4.2							-0.7 L/Kg	13 Sphagnum profile B - 40-60 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	61		4.3							0.85 L/Kg	14 Sphagnum profile B 60-80 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	79		4.1							0.40 L/Kg	15 Sphagnum profile B 80-100 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	71		4.1							1.3 L/Kg	16 Sphagnum profile B 100-120 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	78		4.7							0.62 L/Kg	17 Sphagnum profile B - 120-140 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	48		4.7							0.89 L/Kg	18 Sphagnum profile B - 140-160 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	80	10	10	7.8		5.3							-0.08 L/Kg	19 Sphagnum profile B - mineral subsoil		Sheppard, MIS & WCE, 1989
Tc	99	Organic		-	-			-							-0.3 L/Kg	20 Sphagnum-surface		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	44		4.7							1.3 L/Kg	21 Sphagnum-well humified		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-			19		3.8							1.4 L/Kg	22 Organic fissure infill on outcrop		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-		-	39		3.8							0.70 L/Kg	23 KK#1 Site #1 Sphagnum 40-80 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-		-	29		3.8							0.07 L/Kg	24 KK#2 Site #1 grass and Sphagnum 15-25 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	85		3.1							2.1 L/Kg	25 KK#3 Site #2 forested Sphagnum 105-125 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-		-	85		4.8							-0.3 L/Kg	26 KK#4 Site #3 forested organic 40-60 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	61		5.4							-0.03 L/Kg	27 KK#5 Site #4 forested organic 40-60 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-		-	57		4.8							-0.03 L/Kg	28 KK#6 Site #5 forested organic 40-60 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	90		3.4							0.52 L/Kg	29 KK#7 Site #6 Sphagnum 60-80 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	71		4.7							-0.003 L/Kg	30 KK#8 Site #7 forested organic 10-20 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	51		5.6							-0.4 L/Kg	31 KK#9 Site #7 forested organic 10-20 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	60		4.8							-0.3 L/Kg	32 KK#10 Site #8 grass and sedge 15-50 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-	-	-	61		5.7							0.40 L/Kg	33 KK#11 Site #9 forest and sedge 10-25 cm		Sheppard, MIS & WCE, 1989
Tc	99	Organic	-			67		5.8							1.2 L/Kg	34 KK#12 Site #3 forested organic 35-60 cm		Sheppard, MIS & WCE, 1989

continued...

TABLE B-31 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT	pH PASTE	Eh (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Tc		Sand	87	9	4	0.1	0.07	8.25			5.0		see ref			0.07–0.32	Sediment B (solution 1)		Serne et al., 1978
Tc			87	9	4	0.1	0.07	8.2		oxidized	5.0		Na3 Citrate Cit/Tc Molar Ratio 0		(5x10-9 mol/l Tc)	0.32	Hanford soil		Franz et al., 1982
Tc			87	9	4	0.1	0.07	10.1		reduced	5.0		Na3 Citrate Cit/Tc Molar Ratio 0		(5x10-9 mol/l Tc)	52	Hanford soil		Franz et al., 1982
Tc			87	9	4	0.1	0.07	10.1		reduced	5.0		Na3 Citrate Cit/Tc Molar Ratio 1.1		(5x10-9 mol/l Tc)	388	Hanford soil		Franz et al., 1982
Tc			53	35	12	3		5.4			15.2	1.1				0.155	Aquic Fragiochrept (A1 A2)		Balogh & Grigal, 1980
Tc			95	3	2	0.2		5.7			3.2	0.6				0.051	Alfic Udipsamment (B)		Balogh & Grigal, 1980
Tc			40	38	22	2.8		6			20.4	0.7				0.078	Aquic Hapludoll (Ap)		Balogh & Grigal, 1980
Tc			77	11	12	1.8		8.3			11.7	0.2				0.000	Aquic Haploboroll (Ap)		Balogh & Grigal, 1980
Tc			59	4	37		<0.2	5.1			2.5		0.002 mol/l NaHCO3			<0.019–0.06	South Carolina subsoil		Routson et al., 1977
Tc			59	4	37		<0.2	5.1			2.5		0.008 mol/l NaHCO3			0.057–0.01	South Carolina subsoil		Routson et al., 1977
Tc			59	4	37		<0.2	5.1			2.5		0.020 mol/l NaHCO3			0.033–0.01	South Carolina subsoil		Routson et al., 1977
Tc			59	4	37		<0.2	5.1			2.5		0.200 mol/l NaHCO3			<0.010–0.04	South Carolina subsoil		Routson et al., 1977
Tc			45	44	11	0.14	.	8.8								0.04	unsaturated column		Gee & Campbell, 1980
Tc			87	9	4	0.1	.	8.2								0.03	unsaturated column		Gee & Campbell, 1980
Tc		coarse sand					8.2	8.4 (water)			1.2	1382(ug/g)	see ref			0.094	sand		Sheppard et al., 1983
Tc		Silt	45	44	11	0.14	1.4	8.8			17		see ref			2.77–0.23	Sediment A (solution 1)		Serne et al., 1978
Tc			16	52	32	8.3		7.6			27	0.4				0.028	Cumulic Haplaquoll		Balogh & Grigal, 1980
Tc			3	80	17	2.3		5.5			11.3	1.4				0.068	Typic Eutroboralf (A2)		Balogh & Grigal, 1980
Tc			9	64	27	5.4		7.7			16.9	0.1				0.118	Aeric Calciaquoll (A1)		Balogh & Grigal, 1980
Tc			9	57	34	11		7.7			30.4	0.5				0.118	Cumulic Haplaquoll (Ap)		Balogh & Grigal, 1980
Tc			37	33	30	7.3		7.8			43.5	0.3				0.076	Typic Haplaquoll (A1)		Balogh & Grigal, 1980
Tc			27	43	30	2.4		5.7			19.3	0.9				0.011	Aquic Hapludoll (A1)		Balogh & Grigal, 1980
Tc			8	60	32	3.1		6.6			26.8	1.2				0.000	Udic Haploboroll (Ap)		Balogh & Grigal, 1980
Tc		Organic charcoal						6.3	6.6				NaCl brine see ref			340	activated "Nuchar"		Nowak, 1981
Tc		Fen			3	23.5		4.5			48	0.55	0.01 or 0.05 mol/l CaCl2			0.24	Fen soil, Emmen (Netherlands)		Mousny & Myttenaere, 1981
Tc		sphagnum peat				92	4.0	3.8 (water)			64.7	1050(ug/g)	see ref			15.0	sphagnum peat		Sheppard et al., 1983

TABLE B-32

THORIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Th	228	clay						6.0	+200 (mv						24000	glacial till	(Tab 4 Kd's) (Th-228)	Bell and Bates, 1988
Th		C1.2 sand						6.0	+200 (mv						5800	fine coarse sand	(Tab 1 GW compos) (Tab 2 soil descrip)	Bell and Bates, 1988
Th		C3 sand						6.0	+200 (mv						2800	medium coarse sand	good CONCLUSIONS (Tab 3: Activities)	Bell and Bates, 1988
Th		C6 sand						6.0	+200 (mv						5800	coarse sand		Bell and Bates, 1988
Th		sand						6.0	+200 (mv						2800	medium sand		Bell and Bates, 1988
Th		LFH-Ah						5.2		81.2cmol/Kg					---- (--)	0-4 cm Gleyed Dystric Brunisol	Kd: leach ne ( ) Kd GW ( )	Sheppard et al., 1987
Th		Ae						5.1		2.9cmol/Kg					1928.6 (-)	4-15 cm Gleyed Dystric Brunisol		Sheppard et al., 1987
Th		Bf_j-Bf_jgj						5.2		2.1cmol/Kg					1271.0 (-)	15-45 cm Gleyed Dystric Brunisol		Sheppard et al., 1987
Th		C-Cgj						6.2		1.7cmol/Kg					---- (-)	>45 cm Gleyed Dystric Brunisol		Sheppard et al., 1987
Th	230	fine sandstone and silty clay						2.0							15	Jeffrey City, Wyoming	(Th-230) Tab 4	Hajj-Djafari et al., 1981
Th		fine sandstone and silty clay						4.5							5000	Jeffrey City, Wyoming	p 226: site geology	Hajj-Djafari et al., 1981
Th		fine sandstone and silty clay						5.75							11000	Jeffrey City, Wyoming	p 230: Split Rock Formation	Hajj-Djafari et al., 1981
Th		fine sandstone and silty clay						7.0							15000	Jeffrey City, Wyoming		Hajj-Djafari et al., 1981
Th		Av red-brown clayey						4.0 -- 0.7							Av		(Th 4+) (Tab 18 Kd)	Seeley and Kelmers, 1984
															(M 1.1 E4)		Report has 100s of Kds	
															(1 - 5.4 E0)		(O N U, Sr, Cs, CO, Eu, Tc, I)	
																	RS 5 mg Th/l conc	
Th		LFH-Ah						5.2		81.2cmol/Kg					1576.9+-0(-)	0-4 cm Gleyed Dystric Brunisol	Pers. Comm. (O N : Np, I, Cs, Cr, Mo, Tc,)	Sheppard, 1989
Th		Ae						5.1		2.9cmol/Kg					1862.5+-1.2(600--0)	4-15 cm Gleyed Dystric Brunisol	Kd: leachate ne ( ) Kd: Groundwater ( )	Sheppard, 1989
Th		Bf_j-Bf_jgj						5.2		2.1cmol/Kg					1153.7+-1.4( )	15-45 cm Gleyed Dystric Brunisol	Soil type, Ph, CEC & soil desc. from BLG-1 (JEQ16(3))	Sheppard, 1989
Th		C-Cgj						6.2		1.7cmol/Kg					206.9+-0.9	>45 cm Gleyed Dystric Brunisol		Sheppard, 1989
Th															(19807.2+-0.9)			
Th		medium sand			2			4.9		5.8cmol/kg					35 L/g	Port Hope, Ontario	(ON U,PB) Port Hope soils Tab 1 soil charact. Pers. comm	Sheppard, WCE & RJP, 1989
Th		organic			<1			5.5		120cmol/Kg					13000 L/g	Port Hope, Ontario	Tab 11 Kd(L/Kg) [illegible] only, other 7-)	Sheppard, WCE & RJP, 1989
Th		clay (fraction)						6.5				5mMCa(NO3)2			160000	(2um fraction (clay) of silt loam	Tab 2: Kd (ON Pu,U,Np) Th(4) 234	Dahlman et al., 1976
Th		Sand	45		30	<1	25	7.0				Th Conc			1.5x10E5	Cadarache sediment		Rancon, 1973
Th			(% SiO2)				%carbonate					(1 g/L)						
Th		Clay	40		60	0	0	3.2				Th Conc			8	clay schist		Rancon, 1973
Th			(% SiO2)				%carbonate					(1 g/L)						
Th			40		60	0	0	4.8				Th Conc			1x10E5	clay schist		Rancon, 1973
Th			(% SiO2)				%carbonate					(0.1 g/L)						
Th		Organic	5		12	60	23	6.7				Th Conc			8x10E4	river peat		Rancon, 1973
Th			(% SiO2)				%carbonate					(1 g/L)						
Th			5		12	60	23	7.4				Th Conc			1.5x10E4	river peat		Rancon, 1973
Th			(% SiO2)				%carbonate					(0.1 g/L)						

TABLE B-33

TRITIUM K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (ml/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
H	3	sand	91.2	7	1.8										.05 (2.1 +- 0.5)	R-Rupert sand	(H-3) (Tab 5 - Kd) (O N - Ce, Tc, I, Sr)	Jones et al., 1980
H	3	sand	91.2	7	1.8										.04 (2.1 +- 0.3)	R-Rupert sand	Kd not in ( ) = column Kd in ( ) = batch	Jones et al., 1980
H	3	loamy sand	81.2	15	3.8										.06 (1.1 +- 0.2)	A-from Ringold formation	Two Hanford sediments A from Ringold geological formation,	Jones et al., 1980
H	3	loamy sand	81.2	15	3.8										-- (2.1 +- 0.4)	A-from Ringold formation	R: from surface, Rupert sand (typic torripsamment)	Jones et al., 1980
H	3	sandy						8.0							0.1 (0.0)	Hanford soil	(3H) Tab 1: batch + column Kd	Jones et al., 1983
																	Kd in ( ) = col method Batch 7 days [illegible] vs col. depth	Jones et al., 1983

TABLE B-34

URANIUM K_d VALUES

NUC.	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
U	233	clay						6 0	-200(mv)						46		(tab 4 = Kd) (Tab 1= GW composition)	Bell and Bates, 1988
U		C1:2 sand						6 0							46		(Tab.2= soil descr.) (good CONCLUSIONS)	Bell and Bates, 1988
U		C3 sand						6 0							900		(Tab.3= Activities (Bq))	Bell and Bates, 1988
U		C6 sand						6 0							2200			Bell and Bates, 1988
U		sand						6 0							560			Bell and Bates, 1988
U		organic						6 78	- 0 11						6200 (1300)	PCE (0 40 cm)	(tab 4 = in situ - lab = Kd comparison)	Sheppard and Thibault, 1988
U		organic						6 09	-- 0 04						8500 (2100)	PCE (40-80 cm)		Sheppard and Thibault, 1988
U		organic						5 94	-- 0 05						3000 (2000)	SCE (1-10 cm)		Sheppard and Thibault, 1988
U		organic						6 82	-- 0 12						2500 (2900)	SCE (10-30 cm)		Sheppard and Thibault, 1988
U		clay						7 78	-- 0 08						740 (870)	SCE (30-40 cm) (clay)		Sheppard and Thibault, 1988
U		sand	89	3	8										2 (-)	Beatty 1, NV	( ) = reducing conditions	Neiheisel, 1983
U		sand	91	2	7										1	Beatty 2, NV	Beatty, Nevada Barnwell, S Carolina	Neiheisel, 1983
U		sand	83	2	15										3	Beatty 5, NV	West Valley, NY (abst.=Kd's highest in alkaline alluvial	Neiheisel, 1983
U		clayey sand	58	6	36										750	Barnwell 4, SC	basin deposits high in montmorillonite and zeolites)	Neiheisel, 1983
U		clayey sand	68	11	21										750	Barnwell 12, SC	Tab 1 = Kd = mineral phase char.	Neiheisel, 1983
U		clayey sand	73	8	19										550 (-)	Barnwell 14, Sc	tab.2 = relationship = texture, surface area - clay	Neiheisel, 1983
																	mineral comp (tab 4 = Kd = 6 radionuclides)	
																	Fig 6 = text. diagram (Fig.7 = Kd vs sorptive minerals)	
																	kd column = ( ) - reducing conditions	
U		loam								(600)					2-73	Orthic Black Chernozem	(tab 1) (CEC = cmol Kg -1)	Sheppard and Sheppard, 1987
U		sand								(16)					0-0 1	Orthic regosol		Sheppard and Sheppard, 1987
U		litter, LFH-A						5 2		81 2cmol/kg					(--)	0-4 cm Cleyed Dystric Brunisol	BLC-Y1	Sheppard et al , 1987
U		AL						5 1		2 9cmol/kg					-- (171 8)	4-15 cm Cleyed Dystric Brunisol	In Kd column, no ( ) = leach ( ) = CW	Sheppard et al., 1987
U		Un-B, Bfj-Bfjgj						5 2		2 1cmol/kg					-- (226 2)	15-45 cm Cleyed Dystric Brunisol		Sheppard et al , 1987
U		low-B, C-Cgj						6 2		1 7cmol/kg					19 8 (69 7)	>45 cm Cleyed Dystric Brunisol		Sheppard et al , 1987
U	238	fine sandstone and silty sand						2 0							100		p 226 = site geology	Hajj-Djafari et al , 1981
U	238	fine sandstone and silty sand						4 5							200		p 230 = split rock formation	Hajj-Djafari et al , 1981
U	238	fine sandstone and silty sand						5 75							1000		(U-238) tab 4	Hajj-Djafari et al., 1981
U	238	fine sandstone and silty sand						7 0							2000			Hajj-Djafari et al., 1981
U	6+	red-brown clayey						5 6	-- 1 0						AV = 3 2 e3	Chestnut Ridge, ORNL	(U+6) (tab 10 = Kd)	Seeley and Kelmers, 1984
															(H = 2 5 e4)		report had 100's of Kds	
															(L = 2 5 e2)		(O N = SR-CS-Co-Eu-Th-Tc-I)	
																	H=high L=low RS-5 mg U/L = conc. AV=average	
U		LFH-Ah						5 2		81 2cmol/kg					58 4--1 5(42 6--2 2)	0-4 cm Cleyed Dystric Brunisol, S E Manitoba	Fern Como (O N - 1, Cs, Cr, Tc, U, Th, Mo)	Sheppard, 1989
U		Ae						5 1		2 9cmol/kg					294 9--1 3(26 5--1 1)	4-15 cm Cleyed Dystric Brunisol, S E Manitoba	Kd= Leachate = nn ( ) Kd= Groundwater = ( )	Sheppard, 1989
U		Bfj-Bfjgj						5 2		2.1cmol/kg					160--0 8(15 8--0 9)	15-45 cm Cleyed Dystric Brunisol, S E Manitoba	Soil type, Ph, CEC & soil desc from BLC-1Y(JE016(3)).	Sheppard, 1989
U		C-Cgj						6.2		1.7cmol/kg					45 4--0 6(18 3--1 2)	>45 cm Cleved Dystric Brunisol, S E Manitoba		Sheppard, 1989
U		Silty loam clay			36			7 0		28					450 L/Kg	1 Port Hope, Ontario	(O N.= Th, Pb) Port Hope soils Tab.1= soil charact.	Sheppard, WCE & RJP, 1989
U		Loam			15			7 3		17					1 2 L/Kg	2 Port Hope, Ontario	Tab 2: Kd(L/Kg) 9 soils Pers. comm.	Sheppard, WCE & RJP, 1989
U		Medium sand			2			4 9		5 8					03 L/Kg	3 Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		Organic			<1			5 5		120					2900 L/Kg	4 Port H , Ontario		Sheppard, WCE & RJP, 1989
U		Fine sandy loam			10			7 4		9 1					1 9 L/Kg	5. Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		Fine sandy loam			11			7 4		8.7					2 4 L/Kg	6 Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		Fine sandy loam			10			6 6		10 8					590 L/KC	7 Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		Fine sandy loam			10			6 5		12 6					4500 L/Kg	8 Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		Fine sandy loam			17			7 1		13 4					15 L/Kg	9 Port Hope, Ontario		Sheppard, WCE & RJP, 1989
U		clay (fraction)						6 5				SrNCa(NO3)2			4400	<2um fraction (clay) of silt loam	Tab 2: Kd (ON: Pu,Th,Np) U(5)-233	Dahlman et al , 1976
U		Sand	45 (% SiO2)		30	<1	25 %carbonate	<7		-		-			16	Cadarache sediment		Rancon, 1973
U		Sand				-	-	.	-	-	-	4 3ugCO32-/mL			0 13			Yamamoto et al., 1973
U		Silt - alluvial soil				-	-		-	-		4 3ugCO32-/mL			0 25			Yamamoto et al., 1973
U		Clay	40 (% SiO2)		60	0	0 %carbonate	<7				-			270	altered schist		Rancon, 1973
U		Abyssal red clay				-	-	2 8		-		0 68mol/L NaCl			200			Erickson, 1980
U		Abyssal red clay				-	-	7 1		-		0 68mol/L NaCl			7 9x10E5			Erickson, 1980
U		Organic	5 (% SiO2)		17	60	23 %carbonate	<7							33	organic peat		Rancon, 1973

TABLE B-35

ZINC K_d VALUES

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/100g	% FREE IRON OXIDE	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Zn		loamy sand					1.1	7.0(base satu)							10e3-10e4 (log)	1 Greysol, permanent grassland	(Fig 4-5) also pr	Bunzl and Schimmack, 1988
Zn		loamy peat					0.5	6.8(base satu)							10e3-10e4 (log)	2 Peat land (sapr - Histosol), stongly humified		Bunzl and Schimmack, 1988
Zn		sandy loam						5.7(base satu)							10e2-10e3 (log)	3 Cambisol, brown soil from loess		Bunzl and Schimmack, 1988
Zn		sandy loam						7.1(base satu)							10e3-10e4 (log)	4 Cambisol,brown soil		Bunzl and Schimmack, 1988
Zn		loamy sand						4.6(base satu)							10E1 (log)	5 Acrisol, parabrown soil, Ah		Bunzl and Schimmack, 1988
Zn		loamy sand						4.6(base satu)							10E2 (log)	6 Acrisol, parabrown soil, C horizon		Bunzl and Schimmack, 1988
Zn		Clay						8.0		0.8 meq/g		(0.1N CaNO3)			10E5 (log)	B Bentonite, Sud Chemie AG Munchen		Bunzl and Schimmack, 1988
Zn		fibric organic						6.0		2.1 meq/g		(0.1N CaNO3)			10E3 (log)	F1, Sphag peat (high moor), Steinhuder Meer, Hannover 0.36% ash	(F1 and F2 : slightly decomposed, shredded 0.3-0.8 mm)	Bunzl and Schimmack, 1988
Zn		fibric organic						7.0		0.65 meq/g		(0.1N CaNO3)			>10E3 (log)	F2, Sphag peat (high moor),Koenigsdorf,Bavaria, 1.0% ash	(1.6) 0.20 cm and seived o 2mm, Freising, Bavaria	Bunzl and Schimmack, 1988
Zn		Clay minerals	24.5	54.5	21.0			5.1	70	115mMc/kg	13.3g/kg					A1 Montmorillonite, Vermiculite, Kaolinite	(Abstract)(Tab 1: soil prop., (2mm fract.)	Zabowski & Zasoski, 1987
Zn		Clay minerals	22.5	47.5	30.0			5.3	44	74mMc/kg	17.1g/kg					B2 Vermiculite, Chlorite	Fig1 adsorp rates Fig2 differences NaNO3 + sludge leach	Zabowski & Zasoski, 1987
Zn		Clay minerals	50.5	38.5	11.0			5.7	0.01	44mMc/kg	11.5g/kg					C Chlorite, Vermiculite, Illite, Illite Verm, Kaolinite	Fig3. metal adsorption - relation to metal ion activity	Zabowski & Zasoski, 1987
Zn					13.0			6.2		112					10 - 1000	Mean of 32 Danish soils	Tab3: soil char - Kd correlations Tab4: Regression coeff	Anderson & Christensen 1988
Zn																	Fig1: log Kd for Cd - function of pH Fig2: soil prop	
Zn																	Conclusions	
Zn		Clay	40.1	16.3	43.6	2.0		6.7		15.89		15.9			684	Mecklenberg clay	Tab1: soil prop Tab 3: ... Fig 3,4: Kd vs metal conc	Reddy and Dunn, 1986
Zn		Loam	45.9	34.6	19.6	2.75		6.8		17.51		[illegible]			648	Wickes loam	Tab 4: regression analys : equat	Reddy and Dunn, 1986
Zn		Sand	63.4	21.5	15.2	2.68		5.87		6.02		[illegible]			140	Iredell sandy loam	Abstract and Conclusions	Reddy and Dunn, 1986
Zn		Sand	96.4	0.8	2.4	0.4		5.3		2.6		CaCl2				Soil # 163C	Soil prop : from Christensen,1987 S811-44 = Tab 1	Christensen, 1987
Zn		Sandy loam	75.0	12.8	14.0	0.3		6.4		8.0		CaCl2				Soil # 167C	Soil depth:50-100cm Fig 1,3: Kd vs Zn conc Tab 1: KdCd - KdZn, KZn Conclusions	Christensen, 1987
Zn	65		80	17	3		0	3.7 (CaCl2)		125me/kg					41 (18-89)		Kd column ( ): Kd range Tab 1: soil prop Tab 2: Kd	Shimmack et al., 1987.
Zn		PA (0-30 cm)				31.7		5		134	0.98 (1.40)	0.1M Ca(NO3)2			0.38 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2:1)	tab 1 = soil prop also mineralogy of clay soil,CECX pH 5,7	Tiller et al., 1984
Zn		PA (0-30 cm)				31.7		6		134	0.98 (1.40)	0.1M Ca(NO3)2			1.37 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2 1)	too % Fe, Mn = ug/g Tab 2 = clay constituents	Tiller et al., 1984
Zn		PA (0-30 cm)				31.7		7		134	0.98 (1.40)	0.1M Ca(NO3)2			7.63 (lg-1)	Aquod (N Germany), Org/Silicate Clay (OM 2 1)	tab 5 - Kd (lg-1), cd-Ni Zn solution conc:10-6 molar	Tiller et al., 1984
Zn		LA (0-30 cm)				5		5		65	1.18 (2.62)	0.1M Ca(NO3)2			0.31 (lg-1)	Adalf (N Germany), Silicate clay (2 1)	(0 N = Ni, Zn) (CEC used pH 7)	Tiller et al., 1984
Zn		LA (0-30 cm)				5		6		65	1.18 (2.62)	0.1M Ca(NO3)2			1.09 (lg-1)	Adalf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Zn		LA (0-30 cm)				5		7		65	1.18 (2.62)	0.1M Ca(NO3)2			11.20 (lg-1)	Adalf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Zn		PEL (0-15 cm)				3.1		5		99	0.45 (1.61)	0.1M Ca(NO3)2			0.60 (lg-1)	Pellustert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		PEL (0-15 cm)				3.1		6		99	0.45 (1.61)	0.1M Ca(NO3)2			.95 (lg-1)	Pellustert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		PEL (0-15 cm)				3.1		7		99	0.45 (1.61)	0.1M Ca(NO3)2			2.46 (lg-1)	Pellustert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		E45 (0-15 cm)				2.4		5		70	0.9 (0.55)	0.1M Ca(NO3)2			2.04 (lg-1)	Pellusrert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		E46 (0-15 cm)				2.4		6		70	0.9 (0.55)	0.1M Ca(NO3)2			2.72 (lg-1)	Pellusrert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		E46 (0-15 cm)				2.4		7		70	0.9 (0.55)	0.1M Ca(NO3)2			4.85 (lg-1)	Pellusrert (Australia), Silicate clay (2 1)		Tiller et al., 1984
Zn		KN (40-60 cm)				1.0		5		53	4 (2.26)	0.1M Ca(NO3)2			1.05 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Zn		KN (40-60 cm)				1.0		6		53	4 (2.26)	0.1M Ca(NO3)2			1.65 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Zn		KN (40-60 cm)				1.0		7		53	4 (2.26)	0.1M Ca(NO3)2			4.60 (lg-1)	Aqualf (N Germany), Silicate clay (2 1)		Tiller et al., 1984
Zn		PS B (20-30 cm)				0.8		5		24	09 (4.79)	0.1M Ca(NO3)2			057 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1.1/Fe)		Tiller et al., 1984
Zn		PS B (20-30 cm)				0.8		6		24	09 (4.79)	0.1M Ca(NO3)2			32 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1.1/Fe)		Tiller et al., 1984
Zn		PS B (20-30 cm)				0.8		7		24	09 (4.79)	0.1M Ca(NO3)2			3.44 (lg-1)	Palexeralf (N Germany), Silicate clay from oxide (1.1/Fe)		Tiller et al., 1984
Zn		V (0-15 cm)				4.9		5		32	77 (12.3)	0.1M Ca(NO3)2			0.23 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al., 1984
Zn		V (0-15 cm)				4.9		6		32	77 (12.3)	0.1M Ca(NO3)2			1.23 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al., 1984
Zn		V (0-15 cm)				4.9		7		32	77 (12.3)	0.1M Ca(NO3)2			8.24 (lg-1)	Haplohumox (Australia), Iron oxide/silicate clay (Fe/1 1)		Tiller et al., 1984
Zn		LB (30-50 cm)				1.1		5		53	54 (6.01)	0.1M Ca(NO3)2			0.17 (lg-1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		LB (30-50 cm)				1.1		6		53	54 (6.01)	0.1M Ca(NO3)2			.52 (lg-1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		LB (30-50 cm)				1.1		7		53	54 (6.01)	0.1M Ca(NO3)2			9.88 (lg-1)	Udalf (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		PB (50-60 cm)				16.5		5		87	5.20 (7.37)	0.1M Ca(NO3)2			0.17 (lg-1)	Aquod (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		PB (50-60 cm)				16.5		6		87	5.20 (7.37)	0.1M Ca(NO3)2			2.19 (lg-1)	Aquod (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		PB (50-60 cm)				16.5		7		87	5.20 (7.37)	0.1M Ca(NO3)2			18.56 (lg-1)	Aquod (N Germany), Silicate clay/Iron oxide (2 1/Fe)		Tiller et al., 1984
Zn		Goethite (lab)						5							380 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
Zn		Goethite (lab)						6							2.70 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
Zn		Goethite (lab)						7							16.50 (lg-1)	Goethite (lab prep.)		Tiller et al., 1984
Zn		Kaolinite, #3			<2 um					117mmol/Kg		1M NaNO3				Birch Pit, Macon Georgia	CEC : mmolekg-1 (Zn (NC 12)	Garcia-Miragaya, 1983
Zn		Montmorillonite, #75			<2 um					860mmol/Kg		1M NaNO3				Upton, Wyoming	(0 N : Zn) (Fig 2,3 Kd of Cd + Zn)	Garcia-Miragaya, 1983
Zn	65	Heavy clay - 1		15	85			8.2(7.2--1)		26-?7					15000--1000	(9.04 - 9.11 m) Loviisa Savi, Finland	(Zn-65)(Tab 12: ZnKd - p)	Niibula, 1987
Zn	65	Heavy clay - 2		19	81			8.2(7.3--2)							14700--300	(9.73 - 9.80 m) Loviisa Savi, Finland	(0.N = Cs,Co,Mn,Sr,Ce)(pH in Tab 12 - ( ) in pH col)	Niibula, 1987

continued...

TABLE B-35 (concluded)

NUC	ISO	SOIL type	% SAND	% SILT	% CLAY	% ORG	% CaCO3	pH SAT PASTE	EH (v)	CEC meq/ 100g	% FREE IRON OXIDES	COMP CATION	% COMP CATION	NUCLIDE CONCENTRATION	Kd (mL/g)	SOIL LOCATION or DESCRIPTION	OTHER INFORMATION	REFERENCE
Zn	65	Heavy clay - 3		11	89			8 4(7 4- 1)		21- 2					5600- 1500	(2 06 2 15 m) Olkiluoto Sav , Finland	In Finnish with English summary 13 Figures	Nikula, 1982
Zn	65	Heavy clay - 4		32	68			8 3(7 3- 2)		5 7- 2					3000- 800	(2 49 2 56 m) Olkiluoto Sav, Finland	Fig 11: Zn Kd vs Rf	Nikula, 1982
Zn	65	Heavy clay - 5		32	68			8 0(7 3- 1)		25- 1					28000- 16000	(6 28 - 6 35 m) Salo Savi, Finland		Nikula, 1982
Zn	65	Silty clay loam - 6		62	38			7 0(7 0- 2)		17- 5					9100- 2500	(2 24 2 31 m) Jamsa Savi, Finland		Nikula, 1982
Zn	65	Loamy sand - 7	79	21				6 4(7 1- 2)		2 4- 2					5100- 100	(4 m) Loviisa moreeni, Finland		Nikula, 1982
Zn	65	Sandy loam - 8	65	35				5 4(7 3- 2)		3 2- 2					5100- 1900	(1 5 m) Olkiluoto moreeni Finland		Nikula, 1982
Zn	65	Loamy sand - 9	73	27				6 8(7 3- 1)		2 1- 3					2700- 100	(3 5 4 0 m) Juuka moreeni, Finland		Nikula, 1982
Zn	65	Sandy loam - 10	66	34				6 2(6 9- 1)		2 3- 3					3200- 200	(2 2 2 5 m) Partala moreeni, Finland		Nikula, 1982
Zn	65	Loam - 11	41	37	22			9 7(8 7- 1)		18- 5					11000- 3000	(44 m) Kabola Kallinsavi, Finland		Nikula, 1982
Zn	65	Sandy loam - 12	57	29	14			9 9(8 2- 2)		40- 4					10000- 1000	(24 m) Metsaero kallinsavi, Finland		Nikula, 1982
Zn		Sandy loam	74 9	10 8	4 0	0 3		6 4(5 5)		8 0		CaCl2		20 ug/mL	80	167C horizon, Denmark	Fig.4: Zn Kd vs. Zn conc (O N = Cd)	Christensen, 1985
Zn		Sandy loam	74 9	10 8	4 0	0 3		6 4(5 5)		8 0		CaCl2		800 ug/mL	40	167C horizon, Denmark		Christensen, 1985
Zn	65	Sand								(11 3)					90	A	(O N = Sr, Cs, Co, Mn, Ag, Fe, Mo) (in JAP)	Inoue & Morisawa, 1976
Zn	65	Silt-clay								(241 7)					1000	B	CEC = ( ) = meq/g 9 Tabs. 3 Figs	Inoue & Morisawa, 1976
Zn	65	Silt-clay								(55 6)					4000	C		Inoue & Morisawa, 1976
Zn	65	Gravel-sand								(69 5)					8000	D		Inoue & Morisawa, 1976
Zn	65	Silt-clay								(167 9)					1800	E		Inoue & Morisawa, 1976
Zn	65	Silt-sand								(47 8)					1200	F		Inoue & Morisawa, 1976
Zn	65	Gravel								(28 9)					500	G		Inoue & Morisawa, 1976
Zn	65	Silt-clay								(117 9)					800	H		Inoue & Morisawa, 1976
Zn	65	Silt-clay								(140 5)					200	I		Inoue & Morisawa, 1976
Zn	65	Silt-clay								(245 0)					3500	J		Inoue & Morisawa, 1976
Zn	65	Fine sand								(60 3)					20	K		Inoue & Morisawa, 1976
Zn	65	Silt								(147 0)					2700	L		Inoue & Morisawa, 1976
Zn	65	Sand								(74 3)					.	M		Inoue & Morisawa, 1976
Zn	65	Gravel								(27 1)					1900	N		Inoue & Morisawa, 1976
Zn	65	Fine sand								(122 8)					2000	O		Inoue & Morisawa, 1976
Zn	65	Fine sand								(38 6)					200	P		Inoue & Morisawa, 1976
Zn	65	Silt-clay								(200 1)					200	Q		Inoue & Morisawa, 1976
Zn		Hallandale fine sand				14 5g/Kg		8 50		1 13ueq/g					870 L/g	Pompano Beach, Florida	Tab 1 = cations in soil. Tab 2 = soil charact	Wong et al , 1983
Zn		Plantation muck-bottom layer				27 9g/Kg		7 30		1 58ueq/g					413 L/g	Pompano Beach, Florida	Tab 3 = heavy metals in soil Tab 4 = linear Kd (L/g)	Wong et al , 1983
Zn		Plantation muck-middle layer				670 7g/K		7 20		4 09ueq/g					375 L/g	Pompano Beach, Florida	Tab 5 = Langmuir coeff Fig 1 & 2 = isotherms = Cr, Ni	Wong et al , 1983
Zn		Plantation muck-top layer				705 2g/K		7 10		4 53ueq/g					448 L/g	Pompano Beach, Florida	(O N = Cu, Fe, Mn, Ni, Cd, Cr, Ca)	Wong et al , 1983
Zn		Sand				3 5	-	4 5 - 5 0		22		[Ca2+] 0 0 015 mol/L			7 0x101	Soil C		Gerritse et al , 1982
Zn																		
Zn		sand				2 5	-	7 5 - 8 0	-	16		[Ca2+] : 0-0 015 mol/L			2 12x103	Soil D		Gerritse et al , 1982
Zn																		
Zn						-	-	4 8	-	.	.	0 1mol/L CaCl2			0 1	Florida 1		Graham, 1973
Zn						-	-	6 2	-			0 1mol/L CaCl2			50	Florida 2		Graham, 1973
Zn		Fine sand				1 4	-	8 2	-	11					870	Hallandale fine sand		Wong et al , 1983
Zn		silt loam				-	-	5.0	-	.		0 1mol/L CaCl2			3 6	Missouri 23		Graham, 1973
Zn		silt loam				-	-	7 4	-	.		0 1mol/L CaCl2			100	Missouri 24		Graham, 1973
Zn		organic				90	-	4 5				[Ca2+] : 0 0 015 mol/L			1 89x10E3	Soil A		Gerritse et al , 1982
Zn																		
Zn		organic				>90	-	4-5	-		.	[Ca2+] : 0-0 015 mol/L			6 3x10E3	Peat A		Gerritse et al , 1982
Zn																		
Zn		organic				>90	-	6 2	-	.		[Ca2+] : 0-0 015 mol/L			2 88x10E3	Soil D		Gerritse et al , 1982
Zn												-			1 3x10E4	Peat		
Zn		sphagnum peat				-	-	4-5	-	.					7 0x10E1	Peat		Wolf et al , 1977
Zn		sphagnum peat				-	-	4-5	-	.		0 025 meq Ca2+/mL sol						Wolf et al , 1977
Zn																		
Zn		muck				47	-	7 2		34	.	-			412	Plantation muck (average of 3 layers)		Wong et al , 1983

APPENDIX C

PREDICTION OF MISSING K_d VALUES FROM CR VALUES

This appendix provides the input file containing the recommended CR values (Baes et al. 1984) for SAS* regression analysis, and the output file showing the predicted K_d values for each nuclide for each soil. A plot of predicted K_d values versus ln CR values is also shown.

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* SAS User's Guide, Statistics, Version 5, SAS Institute Inc. Cary, North Carolina, 1985.

```
data trnsfl;
input element $ Bvi    19-21  el 25-26 sakd sikd clkd orkd;
****these kd values are ln-transformed means, not GM*****;
array string(4)  sakd sikd clkd orkd;
Bvi=Bvi*10**el;
lcr=log(Bvi);
do i=1 to 4;
sand=0;
silt=0;
clay=0;
org=0;
if i=1 then sand=1;
if i=2 then silt=1;
if i=3 then clay=1;
if i=4 then org=1;
kd=string(i);output;end;
cards;
        Ac          8.8x10-4    .      .      .     .
        Am          1.4x10-3    7.6    9.2    9.0   11.6
        Be          2.5x10-3    .      .      .     .
        Br          3.8x10-1    .      .      .     .
        C           1.4x10-0    -.1    .      0.8   .
        Ca          6.8x10-1    7.0    .      .     7.5
        Cd          1.4x10-1    4.3    3.7    6.3   6.7
        Cr          1.9x10-3    4.2    3.4    .     5.6
        Cs          2.0x10-2    5.6    8.4    7.5   5.6
        H           1.2x10-0     -2.6      .      .
        Hf          8.8x10-4    .             .     .
        Ho          2.5x10-3    .      .      .     .
        I           3.8x10-2    .04    1.5    0.5   3.3
        Mo          6.3x10-2    2.0    .      4.5   3.3
        Nb          5.0x10-3    .      .      .     .
        Ni          1.5x10-2    6.0    .      6.5   7.0
        Np          2.5x10-2    1.4    3.2    4.0   7.1
        Pa          6.3x10-4    .      .      .     .
        Pb          1.1x10-2    5.6    9.7    .     10.
        Pd          3.8x10-2    .      .      .     .
        Pu          1.1x10-4    6.3    7.1    8.5   7.5
        Ra          3.3x10-3    6.2    10.5   9.1   .
        Rb          3.8x10-2    .      .      .     .
        Sb          5.0x10-2    .      .      .     .
        Se          6.3x10-3    .      .      .     .
        Si          8.8x10-2    .      .      .     .
        Sm          2.5x10-3    .      .      .     .
        Sn          7.5x10-3    .      .      .     .
        Tc          2.4x10-0    -2.0   -2.3   0.2   0.4
        Th          2.1x10-4    8.0    .      8.6   11.4
        U           2.1x10-3    3.5    2.5    7.3   6.0
        Zr          5.0x10-4    .      .      .     .
        F           8.7x10-1    .      .      .     .
        Ta          2.5x10-3    .      .      .     .
        Bi          8.7x10-3    .      .      .     .
        Po          6.3x10-4    5.0    6.0    .     .
        Sr          6.3x10-1    2.6    3.0    4.7   5.0
        Ag          1.0x10-1    4.5    4.8    5.2   9.6
        Co          5.0x10-3    4.1    7.2    6.3   6.9
        Fe          1.0x10-3    5.4    6.7    5.1   6.4
        Mn          6.3x10-2    3.9    6.6    5.2   5.0
        Ru          1.9x10-2    4.0    6.9    6.7   11.1
        Ce          2.5x10-3    6.2    9.0    9.9   8.1
        Zn          3.8x10-1    5.3    7.2    7.8   7.4
        Cm          2.1x10-4    8.3    9.8    .     8.7
        K           2.5x10-1    .      .      .     .
        Re          3.7x10-1    .      .      .     .
        [illegible] [illegible] .      .      .     .
        Y           3.7x10-3    .      .      .     .
proc reg;
model kd=sand silt clay org lcr;
output out=try predicted=ykd residual=rkd;
proc print;
proc plot;
plot kd*lcr=i ykd*lcr='*'/overlay hpos=90 vpos=25;
```

SAS 11:14 WEDNESDAY, JULY 26, 1989 1

DEP VARIABLE: KD

ANALYSIS OF VARIANCE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	4	358.02417509	89.50604377	16.466	0.0001
ERROR	87	472.91382056	5.43579104		
C TOTAL	91	830.93799565			

ROOT MSE	2.331478	R-SQUARE	0.4309
DEP MEAN	5.679783	ADJ R-SQ	0.4047
C.V.	41.04872		

NOTE: MODEL IS NOT FULL RANK. LEAST SQUARES SOLUTIONS FOR THE PARAMETERS ARE NOT UNIQUE. SOME STATISTICS WILL BE MISLEADING. A REPORTED DF OF 0 OR B MEANS THAT THE ESTIMATE IS BIASED. THE FOLLOWING PARAMETERS HAVE BEEN SET TO 0, SINCE THE VARIABLES ARE A LINEAR COMBINATIO OF OTHER VARIABLES AS SHOWN.

ORG =+1*INTERCEP-1*SAND -1*SILT -1*CLAY

PARAMETER ESTIMATES

VARIABLE	DF	PARAMETER ESTIMATE	STANDARD ERROR	T FOR H0: PARAMETER=0	PROB > |T|
INTERCEP	B	4.40136442	0.61670053	7.137	0.0001
SAND	B	2.70113	0.66172013	-4.087	0.0001
SILT	B	-1.27478	0.70415839	-1.810	0.0737
CLAY	B	-0.955709	0.70409181	-1.357	0.1782
ORG	0	0	.	.	.
LCR	1	-0.616477	0.0897167	-6.871	0.0001

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OBS	ELEMENT	BVI	E1	SAKD	SIKD	CLKD	OPKD	LCR	I	SAND	SILT	CLAY	ORG	KD	YKD	RKD
1	Ac	0.00088	-4	.	.	.	.	-7.0356	1	1	0	0	0	.	6.03452	.
2	Ac	0.00088	4	.	.	.	.	-7.0356	2	0	1	0	0	.	7.46387	.
3	Ac	0.00088	-4	.	.	.	.	-7.0356	3	0	0	1	0	.	7.78294	.
4	Ac	0.00088	-4	.	.	.	.	-7.0356	4	0	0	0	1	.	8.73865	.
5	Am	0.00140	3	7.60	9.2	9.0	11.6	6.5713	1	1	0	0	0	7.60	5.74829	1.8517
6	Am	0.00140	-3	7.60	9.2	9.0	11.6	-6.5713	2	0	1	0	0	9.20	7.17764	2.0224
7	Am	0.00140	-3	7.60	9.2	9.0	11.6	-6.5713	3	0	0	1	0	9.00	7.49670	1.5033
8	Am	0.00140	-3	7.60	9.2	9.0	11.6	-6.5713	4	0	0	0	1	11.60	8.45241	3.1476
9	Be	0.00250	-3	.	.	.	.	-5.9915	1	1	0	0	0	.	5.39084	.
10	Be	0.00250	-3	.	.	.	.	-5.9915	2	0	1	0	0	.	6.82019	.
11	Be	0.00250	-3	.	.	.	.	-5.9915	3	0	0	1	0	.	7.13926	.
12	Be	0.00250	-3	.	.	.	.	-5.9915	4	0	0	0	1	.	8.09497	.
13	Br	0.38000	-1	.	.	.	.	-0.9676	1	1	0	0	0	.	2.29373	.
14	Br	0.38000	-1	.	.	.	.	-0.9676	2	0	1	0	0	.	3.72308	.
15	Br	0.38000	-1	.	.	.	.	-0.9676	3	0	0	1	0	.	4.04215	.
16	Br	0.38000	-1	.	.	.	.	-0.9676	4	0	0	0	1	.	4.99786	.
17	C	1.40000	0	1.10	.	0.8	.	0.3365	1	1	0	0	0	1.10	1.48981	-9.3898
18	C	1.40000	0	1.10	.	0.8	.	0.3365	2	0	1	0	0	.	2.91916	
19	C	1.40000	0	1.10	.	0.8	.	0.3365	3	0	0	1	0	0.80	3.23823	-2.4382
20	C	1.40000	0	1.10	.	0.8	.	0.3365	4	0	0	0	1	.	4.19394	
21	Ca	0.88000	-1	7.00	.	.	7.5	-0.1278	1	1	0	0	0	7.00	1.77605	5.2240
22	Ca	0.88000	1	7.00	.	.	7.5	-0.1278	2	0	1	0	0	.	3.20539	.
23	Ca	0.88000	-1	7.00	.	.	7.5	[illegible]	3	0	0	1	0	.	3.52446	.
24	Ca	0.88000	1	7.00	.	.	7.5	-0.1278	4	0	0	0	1	7.50	4.48017	3.0198
25	Cd	0.14000	-1	4.30	3.7	6.3		-1.9661	1	1	0	0	0	4.30	2.90930	1.3907
26	Cd	0.14000	-1	4.30	3.7	6.3	6.7	-1.9661	2	0	1	0	0	3.70	4.33865	-0.6387
27	Cd	0.14000	-1	4.30	3.7	6.3	6.7	-1.9661	3	0	0	1	0	6.30	4.65772	1.6423
28	Cd	0.14000	1	4.30	3.7	6.3	6.7	-1.9661	4	0	0	0	1	6.70	5.61343	1.0866
29	Cr	0.00190	3	4.20	3.4	.	5.6	-6.2659	1	1	0	0	0	4.20	5.56003	-1.3600
30	Cr	0.00190	-3	4.20	3.4	.	5.6	-6.2659	2	0	1	0	0	3.40	6.98938	-3.5894
31	Cr	0.00190	-3	4.20	3.4	.	5.6	-6.2659	3	0	0	1	0	.	7.30844	.
32	Cr	0.00190	-3	4.20	3.4	.	5.6	-6.2659	4	0	0	0	1	5.60	8.26415	-2.6642
33	Cs	0.02000	-2	5.60	8.4	7.5	5.6	3.9120	1	1	0	0	0	5.60	4.10891	1.4911
34	Cs	0.02000	-2	5.60	8.4	7.5	5.6	-3.9120	2	0	1	0	0	8.40	5.53826	2.8617
35	Cs	0.02000	-2	5.60	8.4	7.5	5.6	3.9120	3	0	0	1	0	7.50	5.85733	1.6427
36	Cs	0.02000	-2	5.60	8.4	7.5	5.6	-3.9120	4	0	0	0	1	5.60	6.81304	-1.2130
37	H	1.20000	0	-2.60	.	.	.	0.1823	1	1	0	0	0	-2.60	1.58484	-4.1848
38	H	1.20000	0	-2.60	.	.	.	0.1823	2	0	1	0	0	.	3.01419	.
39	H	1.20000	0	-2.60	.	.	.	0.1823	3	0	0	1	0	.	3.33326	.
40	H	1.20000	0	-2.60	.	.	.	0.1823	4	0	0	0	1		4.28897	.
41	Hf	0.00088	-4	.	.	.	.	-7.0356	1	1	0	0	0	.	6.03452	.
42	Hf	0.00088	-4	.		.	.	-7.0356	2	0	1	0	0	.	7.46387	.
43	Hf	0.00088	4	.	.	.	.	7.0356	3	0	0	1	0	.	7.79294	.
44	Hf	0.00088	-4	.	.	.	.	-7.0356	4	0	0	0	1	.	8.73865	.
45	Ho	0.00250	-3	.	.	.	.	-5.9915	1	1	0	0	0	.	5.39084	.
46	Ho	0.00250	-3	.	.	.	.	-5.9915	2	0	1	0	0	.	6.82019	.
47	Ho	0.00250	-3	.	.	.	.	-5.9915	3	0	0	1	0	.	7.13926	.
48	Ho	0.00250	-3	.	.	.	.	5.9915	4	0	0	0	1	.	8.09497	.
49	I	0.03800	-2	0.04	1.5	0.5	3.3	-3.2702	1	1	0	0	0	0.04	3.71322	-3.6732

OBS	ELEMENT	BVI	E1	SAKD	SIKD	CLKD	ORKD	LCR	I	SAND	SILT	CLAY	ORG	KD	YKD	PKD
50	I	0.03800	-2	0.04	1.5	0.5	3.3	-3.2702	2	0	1	.	0	1.50	5.14257	-3.6426
51	I	0.03800	-2	0.04	1.5	0.5	3.3	-3.2702	3	0	0	1	0	0.50	5.46164	-4.9616
52	I	0.03800	-2	0.04	1.5	0.5	3.3	-3.2702	4	0	0	0	1	3.30	6.41735	-3.1174
53	Mo	0.06300	2	2.00	.	4.5	3.3	-2.7646	1	1	0	0	0	2.00	3.40157	-1.4016
54	Mo	0.06300	-2	2.00	.	4.5	3.3	-2.7646	2	0	1	0	0	.	4.83091	.
55	Mo	0.06300	-2	2.00	.	4.5	3.3	-2.7646	3	0	0	1	0	4.50	5.14998	-0.6500
56	Mo	0.06300	-2	2.0	.	4.5	3.3	-2.7646	4	0	0	0	1	3.3	6.1057	-2.8057
57	Nb	0.00500	-3	.	.	.	.	-5.2983	1	1	0	0	0	.	4.9635	.
58	Nb	0.00500	-3	.	.	.	.	-5.2983	2	0	1	0	0	.	6.3929	.
59	Nb	0.00500	-3	.	.	.	.	-5.2983	3	0	0	1	0	.	6.7119	.
60	Nb	0.00500	-3	.	.	.	.	5.2983	4	0	0	0	1	.	7.6677	.
61	Ni	0.01500	-2	6.0	.	6.5	7.0	4.1997	1	1	0	0	0	6.0	4.2863	1.7137
62	Ni	0.01500	-2	6.0	.	6.5	7.0	-4.1997	2	0	1	0	0	.	5.7156	.
63	Ni	0.01500	-2	6.0	.	6.5	7.0	-4.1997	3	0	0	1	0	6.5	6.0347	0.4653
64	Ni	0.01500	-2	6.0	.	6.5	7.0	-4.1997	4	0	0	0	1	7.0	6.9904	0.0096
65	Np	0.02500	-2	1.4	3.2	4.0	7.1	-3.6889	1	1	0	0	0	1.4	3.9713	-2.5713
66	Np	0.02500	-2	1.4	3.2	4.0	7.1	-3.6889	2	0	1	0	0	3.2	5.4007	-2.2007
67	Np	0.02500	-2	1.4	3.2	4.0	7.1	-3.6889	3	0	0	1	0	4.0	5.7198	-1.7198
68	Np	0.02500	-2	1.4	3.2	4.0	7.1	-3.6889	4	0	0	0	1	7.1	6.6755	0.4245
69	Pa	0.00063	-4	.	.	.	.	-7.3698	1	1	0	0	0	.	6.2405	.
70	Pa	0.00063	-4	.	.	.	.	-7.3698	2	0	1	0	0	.	7.6699	.
71	Pa	0.00063	-4	.	.	.	.	-7.3698	3	0	0	1	0	.	7.9190	.
72	Pa	0.00063	-4	.	.	.	.	-7.3698	4	0	0	0	1	.	8.9447	.
73	Pb	0.01100	-2	5.6	9.7	.	10.0	4.5099	1	1	0	0	0	5.6	4.4775	1.1225
74	Pb	0.01100	-2	5.6	9.7	.	10.0	-4.5099	2	0	1	0	0	9.7	5.9068	3.7932
75	Pb	0.01100	-2	5.6	9.7	.	10.0	-4.5099	3	0	0	1	0	.	6.2259	.
76	Pb	0.01100	-2	5.6	9.7	.	10.0	4.5099	4	0	0	0	1	10.0	7.1816	2.8184
77	Pd	0.03800	-2	.	.	.	.	-3.2702	1	1	0	0	0	.	3.7132	.
78	Pd	0.03800	-2	.	.	.	.	-3.2702	2	0	1	0	0	.	5.1426	.
79	Pd	0.03800	-2	.	.	.	.	-3.2702	3	0	0	1	0	.	5.4616	.
80	Pd	0.03800	-2	.	.	.	.	-3.2702	4	0	0	0	1	.	6.4174	.
81	Pu	0.00011	-4	6.3	7.1	8.5	7.5	-9.1150	1	1	0	0	0	6.3	7.3164	-1.0164
82	Pu	0.00011	-4	6.3	7.1	8.5	7.5	-9.1150	2	0	1	0	0	7.1	8.7458	1.6458
83	Pu	0.00011	-4	6.3	7.1	8.5	7.5	-9.1150	3	0	0	1	0	8.5	9.0649	-0.5649
84	Pu	0.00011	-4	6.3	7.1	8.5	7.5	-9.1150	4	0	0	0	1	7.5	10.0206	-2.5206
85	Ra	0.00330	-3	6.2	10.5	9.1	.	-5.7138	1	1	0	0	0	6.2	5.2197	0.9803
86	Ra	0.00330	-3	6.2	10.5	9.1	.	-5.7138	2	0	1	0	0	10.5	6.6490	3.8510
87	Ra	0.00330	-3	6.2	10.5	9.1	.	-5.7138	3	0	0	1	0	9.1	6.9681	2.1319
88	Ra	·.00330	-3	6.2	10.5	9.1	.	5.7138	4	0	0	0	1	.	7.9238	.
89	Rb	0.03800	-2	.	.	.	.	-3.2702	1	1	0	0	0	.	3.7132	.
90	Rb	0.03800	-2	.	.	.	.	3.2702	2	0	1	0	0	.	5.1426	.
91	Rb	0.03800	-2	.		.	.	-3.2702	3	0	0	1	0	.	5.4616	.
92	Rb	0.03800	-2	.		.	.	-3.2702	4	0	0	0	1	.	6.4174	.
93	Sb	0 05000	-2	.		.	.	-2.9957	1	1	0	0	0	.	3.5440	.
94	Sb	0.05000	-2	.	.	.	.	-2.9957	2	0	1	0	0	.	4.9734	.
95	Sb	0.05000	-2	.	.	.	.	-2.9957	3	0	0	1	0	.	5.2925	.
96	Sb	0.05000	-2	.	.	.	.	-2.9957	4	0	0	0	1	.	6.2482	.
97	Se	0.00630	-3	.	.	.	.	-5.0672	1	1	0	0	0	.	4.8211	.
98	Se	0.00630	-3	.	.	.	.	-5.0672	2	0	1	0	0	.	6.2504	.
99	Se	0.00630	-3	.	.	.	.	-5.0672	3	0	0	1	0	.	6.5695	.

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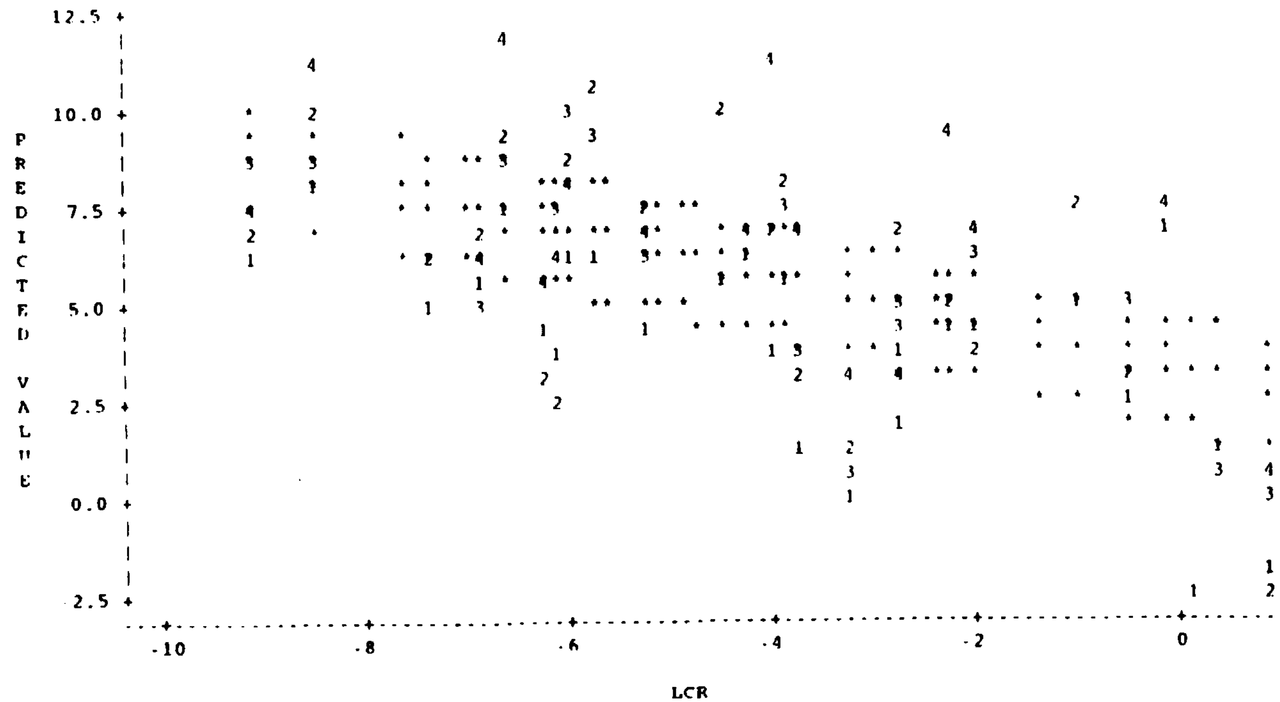
OBS	ELEMENT	BVI	EI	SAKD	SIKD	CLKD	ORKD	LCR	I	SAND	SILT	CLAY	ORG	KD	YKD	RKD
100	Se	0.00630	-3	.	.	.	.	-5.0672	4	0	0	0	1	.	7.5252	.
101	Si	0.08800	-2	.	.	.	.	-2.4304	1	1	0	0	0	.	3.1955	.
102	Si	0.08800	-2	.	.	.	.	2.4304	2	0	1	0	0	.	4.6249	.
103	Si	0.08800	-2	.	.	.	.	-2.4304	3	0	0	1	0	.	4.9440	.
104	Si	0.08800	2	.	.	.	.	2.4304	4	0	0	0		.	5.8997	.
105	Sm	0.00250	-3	.	.	.	.	-5.9915	1	1	0	0	0	.	5.3908	.
106	Sm	0.00250	-3	.	.	.	.	-5.9915	2	0	1	0	0	.	6.8202	.
107	Sm	0.00250	-3	.	.	.	.	-5.9915	3	0	0	1	0	.	7.1393	.
108	Sm	0.00250	-3	.	.	.	.	-5.9915	4	0	0	0	1	.	8.0950	.
109	Sn	0.00750	-3	.	.	.	.	-4.8929	1	1	0	0	0	.	4.7136	.
110	Sn	0.00750	-3	.	.	.	.	-4.8929	2	0	1	0	0	.	6.1429	.
111	Sn	0.00750	-3	.	.	.	.	-4.8929	3	0	0	1	0	.	6.46199	.
112	Sn	0.00750	-3	.	.	.	.	-4.8929	4	0	0	0	1	.	7.41770	.
113	Tc	2.40000	0	-2.0	-2.3	0.2	0.4	0.8755	1	1	0	0	0	-2.0	1.15753	-3.1575
114	Tc	2.40000	0	-2.0	-2.3	0.2	0.4	0.8755	2	0	1	0	0	-2.3	2.58688	-4.3869
115	Tc	2.40000	0	2.0	-2.3	0.2	0.4	0.8755	3	0	0	1	0	0.2	2.90595	-2.7059
116	Tc	2.40000	0	2.0	-2.3	0.2	0.4	0.8755	4	0	0	0	1	0.4	3.86166	-3.3617
117	Th	0.00021	-4	8.0	.	8.6	11.4	-8.4684	1	1	0	0	0	8.0	6.91782	1.0822
118	Th	0.00021	-4	8.0	.	8.6	11.4	-8.4684	2	0	1	0	0	.	8.34717	.
119	Th	0.00021	-4	8.0	.	8.6	11.4	8.4684	3	0	0	1	0	8.6	8.66623	0.3662
120	Th	0.00021	4	8.0	.	8.6	11.4	-8.4684	4	0	0	0	1	11.4	9.62194	1.7781
121	U	0.00210	-3	3.5	2.5	7.3	6.0	-6.1658	1	1	0	0	0	3.5	5.49833	-1.9983
122	U	0.00210	-3	3.5	2.5	7.3	6.0	-6.1658	2	0	1	0	0	2.5	6.92768	-4.1277
123	U	0.00210	-3	3.5	2.5	7.3	6.0	-6.1658	3	0	0	1	0	7.3	7.24674	0.0533
124	U	0.00210	3	3.5	2.5	7.3	6.0	-6.1658	4	0	0	0	1	6.0	8.20245	-2.2025
125	Zr	0.00050	4	.	.	.	.	-7.6009	1	1	0	0	0	.	6.38302	.
126	Zr	0.00050	-4	.	.	.	.	-7.6009	2	0	1	0	0	.	7.81237	.
127	Zr	0.00050	-4	.	.	.	.	-7.6009	3	0	0	1	0	.	8.13144	.
128	Zr	0.00050	-4	.	.	.	.	-7.6009	4	0	0	0	1	.	9.08715	.
129	P	0.87000	1	.	.	.	.	-0.1393	1	1	0	0	0	.	1.78309	.
130	P	0.87000	-1	.	.	.	.	-0.1393	2	0	1	0	0	.	3.21244	.
131	P	0.87000	-1	.	.	.	.	-0.1393	3	0	0	1	0	.	3.53151	.
132	P	0.87000	-1	.	.	.	.	-0.1393	4	0	0	0	1	.	4.48722	.
133	Ta	0.00250	-3	.	.	.	.	-5.9915	1	1	0	0	0	.	5.39084	.
134	Ta	0.00250	-3	.	.	.	.	-5.9915	2	0	1	0	0	.	6.82019	.
135	Ta	0.00250	-3	.	.	.	.	-5.9915	3	0	0	1	0	.	7.13926	.
136	Ta	0.00250	-3	.	.	.	.	-5.9915	4	0	0	0	1	.	8.09497	.
137	Bi	0.00870	-3	.	.	.	.	-4.7444	1	1	0	0	0	.	4.62207	.
138	Bi	0.00870	-3	.	.	.	.	-4.7444	2	0	1	0	0	.	6.05142	.
139	Bi	0.00870	3	.	.	.	.	-4.7444	3	0	0	1	0	.	6.37049	.
140	Bi	0.00870	-3	.	.	.	.	-4.7444	4	0	0	0	1	.	7.32620	.
141	Po	0.00063	-4	5.0	6.0	.	.	-7.3698	1	1	0	0	0	5.0	6.24055	-1 2405
142	Po	0.00063	-4	5.0	6.0	.	.	-7.3698	2	0	1	0	0	6.0	7.66990	-1.6699
143	Po	0.00063	-4	5.0	6.0	.	.	-7.3698	3	0	0	1	0	.	7.98897	.
144	Po	0.00063	-4	5.0	6.0	.	.	-7.3698	4	0	0	0	1	.	8.94467	.
145	Sr	0.63000	-1	2.6	3.0	4.7	5.0	-0.4620	1	1	0	0	0	2.6	1.98207	0 6179
146	Sr	0.63000	-1	2.6	3.0	4.7	5.0	-0.4620	2	0	1	0	0	3.0	3.41142	-0 4114
147	Sr	0.63000	-1	2.6	3.0	4.7	5.0	-0.4620	3	0	0	1	0	4.7	3.73049	0 9695
148	Sr	0.63000	-1	2.6	3.0	4.7	5.0	-0.4620	4	0	0	0	1	5.0	4.68620	0 3138

OBS	ELEMENT	BVI	EI	SAKD	SIKD	CLKD	ORKD	LCR	I	SAND	SILT	CLAY	ORG	KD	YKD	RKD
149	Ag	0.10000	-1	4.5	4.8	5.2	9.6	-2.3026	1	1	0	0	0	4.5	3.11673	1.3833
150	Ag	0.10000	-1	4.5	4.8	5.2	9.6	-2.3026	2	0	1	0	0	4.8	4.54608	0.2539
151	Ag	0.10000	1	4.5	4.8	5.2	9.6	-2.3026	3	0	0	1	0	5.2	4.86515	0.3349
152	Ag	0.10000	-1	4.5	4.8	5.2	9.6	-2.3026	4	0	0	0	1	9.6	5.82086	3.7791
153	Co	0.00500	3	4.1	7.2	6.3	6.9	5.2983	1	1	0	0	0	4.1	4.96353	-0.8635
154	Co	0.00500	-3	4.1	7.2	6.3	6.9	-5.2983	2	0	1	0	0	7.2	6.39288	0.8071
155	Co	0.00500	-3	4.1	7.2	6.3	6.9	-5.2983	3	0	0	1	0	6.3	6.71195	-0.4119
156	Co	0.00500	-3	4.1	7.2	6.3	6.9	-5.2983	4	0	0	0	1	6.9	7.66766	-0.7677
157	Fe	0.00100	-3	5.4	6.7	5.1	6.4	-6.9078	1	1	0	0	0	5.4	5.95571	-0.5557
158	Fe	0.00100	3	5.4	6.7	5.1	6.4	-6.9078	2	0	1	0	0	6.7	7.38506	-0.6851
159	Fe	0.00100	-3	5.4	6.7	5.1	6.4	-6.9078	3	0	0	1	0	5.1	7.70413	-2.6041
160	Fe	0.00100	-3	5.4	6.7	5.1	6.4	-6.9078	4	0	0	0	1	6.4	8.65984	-2.2598
161	Mn	0.06300	-2	3.9	6.6	5.2	5.0	-2.7646	1	1	0	0	0	3.9	3.40157	0.4984
162	Mn	0.06300	-2	3.9	6.6	5.2	5.0	-2.7646	2	0	1	0	0	6.6	4.83091	1.7691
163	Mn	0.06300	-2	3.9	6.6	5.2	5.0	-2.7646	3	0	0	1	0	5.2	5.14998	0.0500
164	Mn	0.06300	2	3.9	6.6	5.2	5.0	-2.7646	4	0	0	0	1	5.0	6.10569	-1.1057
165	Ru	0.01900	-2	4.0	6.9	6.7	11.1	-3.9633	1	1	0	0	0	4.0	4.14053	-0.1405
166	Ru	0.01900	-2	4.0	6.9	6.7	11.1	3.9633	2	0	1	0	0	6.9	5.56988	1.33012
167	Pu	0.01900	-2	4.0	6.9	6.7	11.1	-3.9633	3	0	0	1	0	6.7	5.88895	0.81105
168	Ru	0.01900	-2	4.0	6.9	6.7	11.1	-3.9633	4	0	0	0	1	11.1	6.84466	4.25534
169	Ce	0.00250	-3	6.2	9.0	9.9	8.1	-5.9915	1	1	0	0	0	6.2	5.39084	0.80916
170	Ce	0.00250	-3	6.2	9.0	9.9	8.1	-5.9915	2	0	1	0	0	9.0	6.82019	2.17981
171	Ce	0.00250	-3	6.2	9.0	9.9	8.1	-5.9915	3	0	0	1	0	9.9	7.13926	2.76074
172	Ce	0.00250	-3	6.2	9.0	9.9	8.1	5.9915	4	0	0	0	1	8.1	8.09497	0.00503
173	Zn	0.38000	-1	5.3	7.2	7.8	7.1	-0.9676	1	1	0	0	0	5.3	2.29373	3.00627
174	Zn	0.38000	-1	5.3	7.2	7.8	7.4	-0.9676	2	0	1	0	0	7.2	3.72308	3.47692
175	Zn	0.38000	-1	5.3	7.2	7.8	7.4	-0.9676	3	0	0	1	0	7.8	4.04215	3.75785
176	Zn	0.38000	1	5.3	7.2	7.8	7.4	-0.9676	4	0	0	0	1	7.4	4.99786	2.40214
177	Cm	0.00021	-4	8.3	9.8	.	8.7	-8.4684	1	1	0	0	0	8.3	6.91782	1.38218
178	Cm	0.00021	-4	8.3	9.8	.	8.7	-8.4684	2	0	1	0	0	9.8	8.34717	1.45283
179	Cm	0.00021	-4	8.3	9.8	.	8.7	-8.4684	3	0	0	1	0	.	8.66623	.
180	Cm	0.00021	4	8.3	9.8	.	8.7	-8.4684	4	0	0	0	1	8.7	9.62194	-0.92194
181	K	0.25000	-1	.	.	.	.	-1.3863	1	1	0	0	0	.	2.55186	.
182	K	0.25000	1	.	.	.	.	-1.3863	2	0	1	0	0	.	3.98121	.
183	K	0.25000	-1	.	.	.	.	-1.3863	3	0	0	1	0	.	4.30027	.
184	K	0.25000	-1	.	.	.	.	-1.3863	4	0	0	0	1	.	5.25598	.
185	Re	0.37000	-1	.	.	.	.	-0.9943	1	1	0	0	0	.	2.31017	.
186	Re	0.37000	-1	.	.	.	.	-0.9943	2	0	1	0	0	.	3.73952	.
187	Re	0.37000	-1	.	.	.	.	-0.9943	3	0	0	1	0	.	4.05859	.
188	Re	0.37000	-1	.	.	.	.	-0.9943	4	0	0	0	1	.	5.01430	.
189	Te	0.00620	-3	.	.	.	.	-5.0832	1	1	0	0	0	.	4.83092	.
190	Te	0.00620	-3	.	.	.	.	-5.0832	2	0	1	0	0	.	6.26027	.
191	Te	0.00620	-3	.	.	.	.	-5.0832	3	0	0	1	0	.	6.57934	.
192	Te	0.00620	-3	.	.	.	.	5.0832	4	0	0	0	1	.	7.53505	.
193	Y	0.00370	-3	.	.	.	.	5.5994	1	1	0	0	0	.	5.14916	.
194	Y	0.00370	-3	.	.	.	.	-5.5994	2	0	1	0	0	.	6.57851	.
195	Y	0.00370	-3	.	.	.	.	-5.5994	3	0	0	1	0	.	6.89757	.
196	Y	0.00370	-3	.	.	.	.	-5.5994	4	0	0	0	1	.	7.85328	.

SAS 11:14 WEDNESDAY, JULY 26, 1989 6

PLOT OF KD*LCR SYMBOL IS VALUE OF I
PLOT OF YKD*LCR SYMBOL USED IS *



NOTE: 104 OBS HAD MISSING VALUES 87 OBS HIDDEN