YMP	**Model Error Resolution Document** *Complete only applicable items.*	QA: QA Page 1 of 18

1. Document Number:	MDL-NBS-HS-000008	**2. Revision/Addendum:**	02/01	**3. ERD:**	02

4. Title:	Radionuclide Transport Models Under Ambient Conditions
5. No. of Pages Attached:	Attachment A: 11 pages; Attachment B: 6 pages (17 PAGES)

6. Description of and Justification for Change (Identify affected pages, applicable CRs and TBVs):

This Error Resolution Document (ERD) is provided to address issues identified in condition reports (CRs) CR 11020, CR 12142, and CR 12647 associated with model report *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008 REV 02 AD 01. This model report consists of a parent document (REV 02) and an addendum. All issues addressed in this ERD are relevant only to the parent document.

CR 11020 identified sample misclassification errors in DTN: LA0305AM831341.001. This DTN was used as input to the model report to determine sorption coefficient (K_d) distributions used in TSPA-LA transport models. In response to CR 11020, all samples in source DTNs LA0305AM831341.001, LA0310AM831341.001, and LA0407AM831341.005 were reviewed to identify and correct rock type misclassifications. Resolution resulted in the supersession of these source DTNs (independent of this ERD). These changes, in turn, necessitated corrections to the model report. These corrections are identified in Attachment A.

CR 12647 addressed a subset of the errors found during resolution of CR 11020. This CR noted that four rock type misclassifications in source DTN: LA0803AM831341.002 were not corrected as intended in response to closed CR action item 11020-001. These errors were corrected via supersession of this source DTN. ERD corrections related to CR 12647 and CR 11020 are addressed together in Attachment A.

CR 12142 noted instances of lithostratigraphic unit Tptpv2 (UZ model layer tsw39) being assigned to the wrong major unit (TSw). The unit is actually the uppermost unit of the CHn major unit. The model report refers in several places to tsw39 being immediately above the TSw-CHn interface. These instances are identified and corrected in Attachment A as part of corrective action 12142-005.

An impact analysis was performed and documented in Attachment B to evaluate the effects of the corrections in this ERD to outputs of the model report. For most corrections, negligible impacts are clear and are based on simple arguments. However, the rock-type classification errors for sample G1-3116 indicated a selected thorium K_d distribution for devitrified tuff might be significantly non-conservative. Consequently, modified thorium K_d distributions are defined in this ERD so that downstream impact analyses could be performed to evaluate the potential impact. The modified K_d distributions are developed and documented in DTN: LA0809SL831341.001 in Section B.1 of Attachment B.

The downstream impact analyses, which include a TSPA-LA impact analysis, are documented in *Particle Tracking Model and Abstraction of Transport Processes*, MDL-NBS-HS-000020 ERD 04. Results presented there indicate that the impacts on repository performance are negligible. A summary of the impact analysis is provided in Attachment B along with a list of documents that cite the parent (REV 02) or controlled version (REV 02 AD 01) of *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008.

7. CONCURRENCE			
	Printed Name	Signature	Date
Checker	James Schreiber	James D Schreiber	01/12/2009
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8. APPROVAL			
Originator	Paul Mariner	Paul Mariner	01/12/2009
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ATTACHMENT A

MDL-NBS-HS-000008 ERD 02 Corrections

The current version of *Radionuclide Transport Models Under Ambient Conditions* is MDL-NBS-HS-000008 REV 02 AD 01 (SNL 2007 [DIRS 177396]). This citation consists of the parent document (REV 02) in its original form and its addendum.

In this ERD, each issue and correction pertains to the parent document. Reference to the parent document is generally made below by specifying REV 02.

A.1 Corrections in Response to CR 11020 and CR 12647

Source DTNs

Several source DTNs cited in MDL-NBS-HS-000008 REV 02 have been superseded due to misclassification of rock types for a small number of samples. Table 1 indicates which DTNs have been superseded and the DTNs that supersede them. The superseded DTNs are in direct response to CR 11020 and CR 12647. This table should be used to replace each occurrence of a superseded DTN in MDL-NBS-HS-000008 REV 02 with the corresponding superseding DTN.

Table 1. Superseded DTNs Related to CR 11020 and CR 12647 and the DTNs that Supersede Them

Superseded DTNs	Superseding DTNs
LA0305AM831341.001 [DIRS 163789]	LA0803AM831341.001 [DIRS 185573]
LA0310AM831341.001 [DIRS 165865]	LA0803AM831341.001 [DIRS 185573]
LA0407AM831341.005 [DIRS 170625]	LA0809AM831341.003 [DIRS 185783]

In addition, DTN: LA0803SL831341.001 [DIRS 185784] was generated to support DTN: LA0803AM831341.001 [DIRS 185573]. It summarizes quantitative mineral abundances for size fractions of crushed rock core used in the sorption and desorption experiments. In REV 02 of MDL-NBS-HS-000008, page A-1, after the first sentence in section A2, add "and DTN: LA0803SL831341.001 [DIRS 185784]."

In Table 4-1 of REV 02, the superseded DTNs are replaced as shown in Table 1 above. In Section 9.3, the source data references of the superseded DTNs in Table 1 (above) are removed and the following superseding references are added:

LA0803AM831341.001. 1977 to 1987 Sorption Measurements of Am, Ba, Cs, Np, Pu, Pa, Sr, Th, and U with Yucca Mountain Tuff Samples. Submittal date: 03/26/2008. 185573

LA0803SL831341.001. X-Ray Diffraction Analyses of Samples Used for Sorption Studies. Submittal date: 04/16/2008. 185784

LA0809AM831341.003. Batch Sorption Coefficient Data for Plutonium on Yucca Mountain Tuffs in Representative Water Compositions. Submittal date: 09/10/2008. 185783

Americium K_d – Section A8.1

Several americium K_d measurements for sample JA-18 were misclassified in LA0305AM831341.001 [DIRS 163789] as zeolitic tuff. The correct rock type for this sample is vitric tuff. This error has no effect on the defined distributions because JA-18 was screened out due to solubility arguments (Attachment B). The following changes correct the classification of sample JA-18 by moving descriptions of sample JA-18 from the zeolitic tuff section (A8.1.2) to the vitric tuff section (A8.1.3).

1. In REV 02 on page A-15, first paragraph, remove "(excluding sample JA-18)".
2. In REV 02 on page A-16, second paragraph, remove "The data for JA-18 were discounted in derivation of the distribution because the final solutions in the experiments with this sample were oversaturated with $Am(OH)CO_3$."
3. In REV 02 on page A-17, Figure A-6a, remove all points related to JA-18 and remove JA-18 from the legend.
4. In REV 02 on page A-18, add the following statement at the end of the first paragraph "The final solutions in the J-18 experiments were oversaturated with $Am(OH)CO_3$."
5. In REV 02 on page A-18, Figure A-7, replace with Figure A-7[b] of this ERD. Do not replace the caption. Replace the superseded DTN cited between the figure and the caption with: "DTN: LA0803AM831341.001 [DIRS 185573]".
6. In REV 02 on page A-19, middle of paragraph, replace "The data for GU3-203 and GU3-1301 were rejected in derivation of the distribution because the final solutions in the experiments with this sample were oversaturated with $Am(OH)CO_3$." with "The data for GU3-1203, GU3-1301, and JA-18 were not included in the derivation of the distribution because the final solutions in the experiments with these samples were oversaturated with $Am(OH)CO_3$."

Plutonium K_d – Section A8.4

Several plutonium K_d measurements for sample G4-272 were misclassified as zeolitic tuff in DTN: LA0407AM831341.005 [DIRS 170625] and DTN: LA0803AM831341.002. The correct rock type for this sample is devitrified tuff. The effects of these misclassifications are negligible (Attachment B). The following changes correct the misclassifications appearing in figures in Section A8.4.1 and Section A8.4.2. No changes are required in the text.

1. In REV 02 on page A-39, Figure A-28, add two "New Desorption J-13 <40 Days" circle points corresponding to final Pu concentrations of 1.35E-09 and 1.33E-09 mol/L with K_d values of 2239.5 and 2307.4 mL/g, respectively. In the same figure, add two "New Sorption J-13 <40 Days" plus-symbol points corresponding to final Pu concentrations of 8.75E-08 and 9.24E-08 mol/L with K_d values of 35.3 and 32.8 mL/g, respectively. These changes are captured in Figure A-28[b] of this ERD.

2. In REV 02 on page A-40, Figure A-29, remove the desorption data points for sample G4-272. No desorption data were found in the revised DTNs for sample G4-272 that specifies 21-day test durations and J-13 solution. These changes are captured in Figure A-29[b] of this ERD.
3. In REV 02 on page A-41, Figure A-30, add two "Desorption New J-13" circle points corresponding to 13.94 days with K_d values of 2239.5 and 2307.4 mL/g. In the same figure, add two "Sorption New J-13" diamond points corresponding to 13.72 days with K_d values of 35.3 and 32.8 mL/g. Also, remove "in J-13" from chart title. These changes are captured in Figure A-30[b] of this ERD.
4. In REV 02 on page A-41, Figure A-31, add two "Desorption-New J-13" circle points corresponding to pH 8.3 and 8.4 with K_d values of 2239.5 and 2307.4 mL/g, respectively. In the same figure, add two "Sorption-New J-13 <40 Days" diamond points corresponding to pH 8.4 and 8.6 with K_d values of 35.3 and 32.8 mL/g, respectively. These changes are captured in Figure A-31[b] of this ERD.
5. In REV 02 on page A-46, Figure A-36a, remove two "New Desorption <40 Days" circle points corresponding to pH 8.3 and 8.4 with K_d values of 2239.5 and 2307.4 mL/g, respectively. In the same figure, remove two "New Sorption <40 Days" plus-symbol points corresponding to pH 8.4 and 8.6 with K_d values of 35.3 and 32.8 mL/g, respectively. These changes are captured in Figure A-36a[b] of this ERD.
6. In REV 02 on page A-49, Figure A-39a, remove plus-sign data points between pH values of 7 and 7.5. These data could not be located. These changes are captured in Figure A-39a[b] of this ERD.
7. In REV 02, Figures A-33b and A-36b, no changes are made. The reclassification of four measurements does not noticeably change the cumulative distributions shown in these figures. Corrected distributions are shown in the worksheets *G4-272 Pu devit* and *G4-272 Pu zeolitic*, in the file "CR 11020 rock sample classification.xls", which is attached to CR 11020.

Strontium K_d – Section A8.7

Four strontium K_d measurements for G1-2901 (devitrified tuff) using solution composition p#1 were incorrect (31, 31, 39, and 57 mL/g) in LA0305AM831341.001 [DIRS 163789], as identified in the CR 11020 extent of condition analysis (file: "CR 11020 Rock sample classification.xls", worksheet "G1-2901 Sr devitrified"). The effects on the distributions in Figure A-51b are negligible (Attachment B).

1. In REV 02 in Figure A-50 and Figure A-51a on pages A-63 and A-64, move the "p#1 Old" points at 42 days from 169, 199, 265, and 267 mL/g down to K_d values of 31, 31, 39, and 57 mL/g.

Thorium K_d – Section A8.8

The correct classification for Sample G1-3116 is zeolitic tuff. Two thorium K_d measurements for G1-3116 were misclassified in LA0305AM831341.001 [DIRS 163789] as devitrified. In addition, Figure A-59d was found to display one too many vitric tuff K_d values. The impacts of these corrections are negligible (Attachment B).

1. In REV 02 on page A-71, second paragraph, replace "1,213 to 23,800" with "940 to 3,900".
2. In REV 02 on page A-72, third paragraph, replace "Based on the data" with "Based on the data for final solution concentrations below the solubility limit".
3. In REV 02 in each of two figures, Figure A-58 and Figure A-59a, on pages A-71 and A-72, replace the two points having the highest K_d values for devitrified tuff with open square symbols for zeolitic tuff.
4. In REV 02 on page A-73, replace Figure A-59b with Figure A-59b[b] of this ERD. Correct the caption by replacing "Strontium" with "Thorium". Replace the superseded DTN cited between the figure and the caption with: "DTN: LA0803AM831341.001 [DIRS 185573]".
5. In REV 02 on page A-74, replace Figure A-59c with Figure A-59c[b] of this ERD. Correct the caption by replacing "Strontium" with "Thorium". Replace the superseded DTN cited between the figure and the caption with: "DTN: LA0803AM831341.001 [DIRS 185573]".
6. In REV 02 on page A-74, replace Figure A-59d with Figure A-59d[b] of this ERD. Correct the caption by replacing "Strontium" with "Thorium". Replace the superseded DTN cited between the figure and the caption with: "DTN: LA0803AM831341.001 [DIRS 185573]".

Uranium K_d – Section A8.9

The correct classification for Sample G1-2698 is zeolitic tuff. Four uranium K_d measurements for G1-2698 were misclassified in LA0305AM831341.001 [DIRS 163789] as devitrified. The effects of these misclassifications on the distributions are negligible (Attachment B). The following changes correct the misclassifications appearing in figures in Section A8.9.1 and Section A8.9.2. No changes are required in the text.

1. In REV 02 in Figure A-62 on page A-77, remove the two red box points near pH 8.9 with K_d values of 4.2 and 4.5 mL/g. Also, remove the two red box points (overlapping) near pH 8.1 with K_d values of 1.3 and 1.7 mL/g.
2. In REV 02 in Figure A-63a on page A-77, remove "; Old: LA0305AM831341.001 [DIRS 163789]".
3. In REV 02 in Figure A-64 on page A-78, add two red square points at 2.2E-06 mol/L, one at a K_d of 4.2 mL/g and the other at a K_d of 4.5 mL/g. If the x-axis had extended to 1.E-08 mol/L, two more red square points would be needed at 4.4E-08 and 4.6E-08 mol/L for K_d values of 1.3 and 1.7 mL/g, respectively.
4. In REV 02 in Figure A-65 on page A-79, add two red square points at 42 days, one at a K_d of 1.3 mL/g and the other at a K_d of 1.7 mL/g.
5. In REV 02 in Figure A-66 on page A-80, add four red box points at pH values of 8.13, 8.1, 8.86, and 8.82 with K_d values of 1.3, 1.7, 4.2, and 4.5 mL/g, respectively.
6. The effects on the distributions in Figure A-63b and Figure A-67b are negligible.
7. In REV 02 in Figure A-67a on page A-80, remove "; Old: LA0305AM831341.001 [DIRS 163789]".
8. In REV 02, Figures A-63b and A-67b, no changes are made. The reclassification of four measurements does not noticeably change the cumulative distributions shown in these figures. Corrected distributions are shown in the worksheets *G1-2698 U devit* and *G1-*

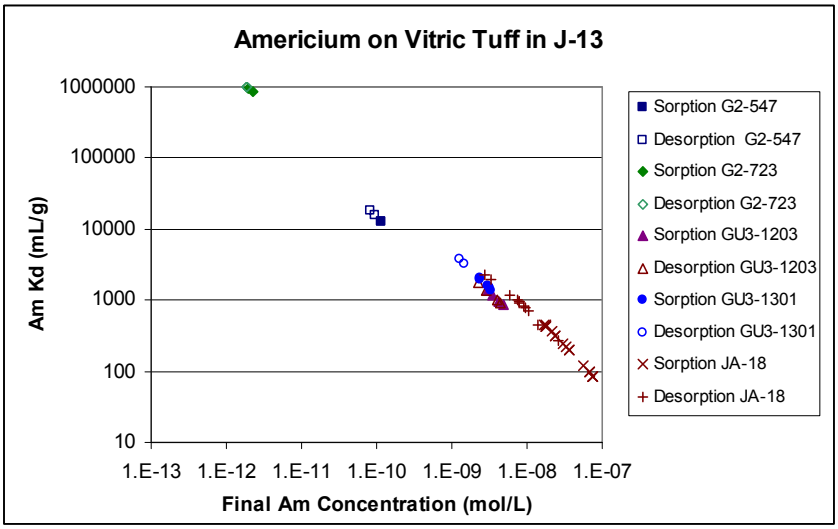
2698 U zeolitic, in the file "CR 11020 rock sample classification.xls", which is attached to CR 11020.

A.2 Corrections in Response to CR 12142

CR 12142 noted instances of a UZ model layer (tsw39) being assigned to the wrong major unit (TSw). The model layer is actually the top layer of the CHn major unit.

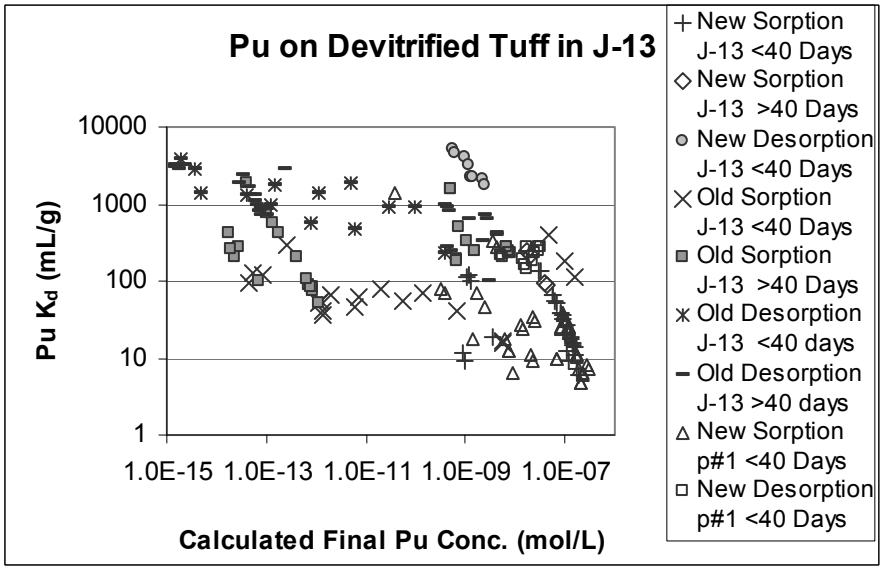
1. In Section 6.6.3 of REV 02, Figures 6-2 through 6-4, change the color of label "tsw39" from green to violet.
2. In Section 6.8.1.2 of REV 02 on page 6-63, first paragraph, replace "directly above the TSw-CHn interface (i.e., at the bottom of the TSw, corresponding to the tsw39 layer)" with "directly below the TSw-CHn interface (i.e., at the top of the CHn, corresponding to the tsw39 layer)".
3. In Section 6.8.1.2 of REV 02 on page 6-63, second paragraph, replace "immediately above the TSw-CHn interface (i.e., in the tsw39 layer)" with "immediately above the ch1z-tsw39 interface".
4. In Section 6.8.1.2 of REV 02 on page 6-63, fourth paragraph, replace "observed at the bottom of the TSw" with "observed at the top of the CHn".
5. In Section 6.8.1.2 of REV 02 on page 6-64, first sentence, replace "than at the bottom of the TSw" with "than at the top of the CHn".
6. In Section 6.8.1.2 of REV 02 on page 6-64, third paragraph, replace "distributions at the bottom of the TSw" with "distributions at the top of the CHn".
7. In Section 6.8.1.2 of REV 02 on page 6-64, fourth paragraph, replace "geology at the base of the TSw" with "geology in the CHn".
8. In Section 6.8.1.2 of REV 02 on page 6-64, last paragraph, replace "similar to that at the bottom of the TSw" with "similar to that at the top of the CHn".
9. In Section 6.8.1.2 of REV 02 on page 6-65, first full paragraph, replace "observation at the bottom of the TSw" with "observation at the top of the CHn".
10. In Section 6.9.1.2 of REV 02 on page 6-95, first paragraph, replace "immediately above the TSw-CHn interface (i.e., in the tsw39 layer)" with "immediately above the ch1z-tsw39 interface".
11. In Section 6.9.1.2 of REV 02 on page 6-96, second paragraph, replace "repository at the bottom of the TSw" with "repository at the top of the CHn".
12. In Section 6.15.4 of REV 02 on page 6-122, first paragraph, replace "fast transport to the bottom of the TSw" with "fast transport to the top of the CHn".
13. In Section 6.18.5.2 of REV 02 on page 6-132, third paragraph, replace "(b) the tsw39 layer is above the TSw-CHn interface, where significant filtration occurs" with "significant filtration occurs in the tsw39 layer".
14. In Section 6.18.5.2 of REV 02 on page 6-132, third paragraph, replace "accumulate at the TSw-CHn interface" with "accumulate at the tsw39 layer".
15. In Section 6.18.5.2 of REV 02 on page 6-133, second paragraph, replace "to the TSw-CHn interface" with "to the ch1z-tsw39 interface".
16. In Section 6.18.5.2 of REV 02 on page 6-133, third paragraph, replace "(straining) at the TSw-CHn interface" with "(straining) in the vicinity of the TSw-CHn interface".

17. In Section 6.20.2 of REV 02 on page 6-151, first paragraph, replace “fractures at both the bottom of the TSw” with “fractures at both the top of the CHn”.
18. In Section 6.20.2 of REV 02 on page 6-151, last paragraph, replace “obvious at the bottom of the TSw” with “obvious at the top of the CHn”.
19. In Section 6.20.2 of REV 02 on page 6-156, first paragraph, replace “such as the bottom of the TSw” with “such as the top of the CHn”.



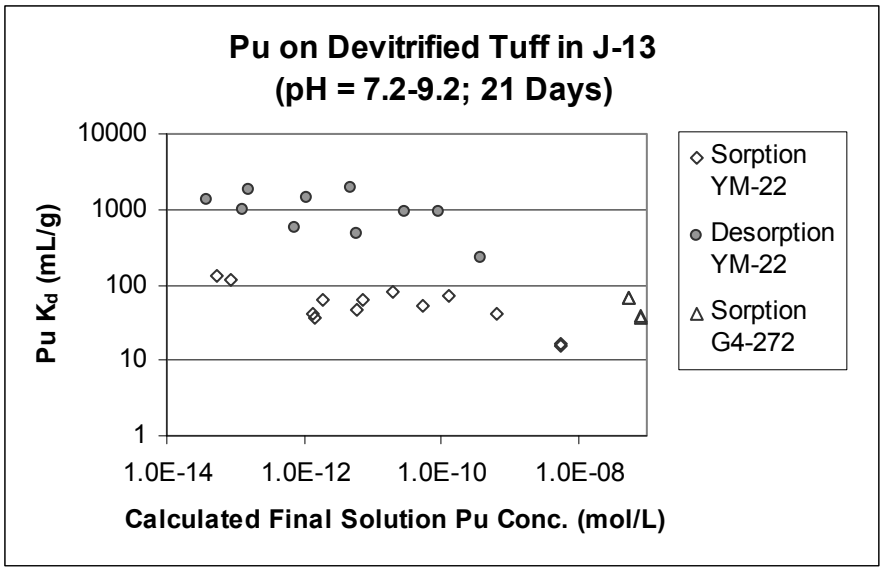
DTN: LA0803AM831341.001 [DIRS 185573]

Figure A-7[b]. Americium Sorption Coefficients on Vitric Tuff versus Calculated Final Americium Concentration in Solution



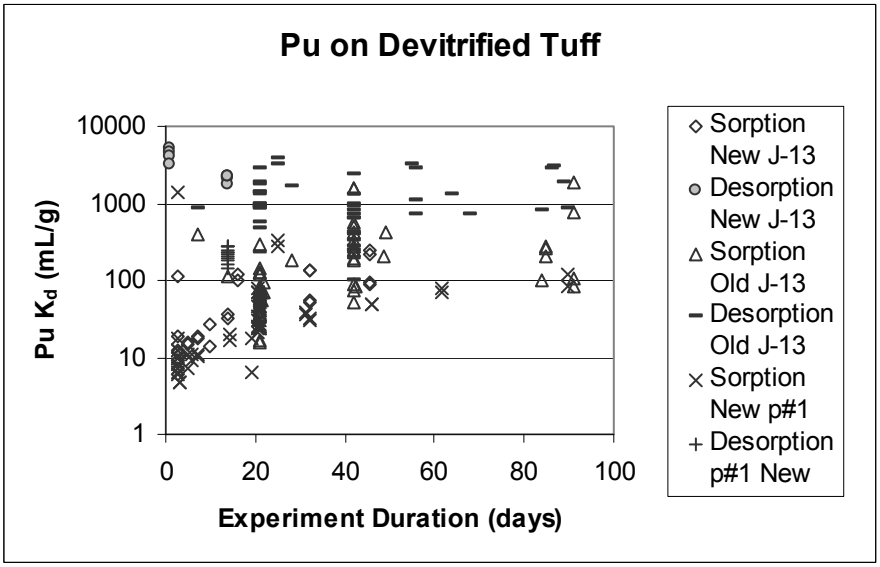
DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

Figure A-28[b]. Plutonium Sorption Coefficients on Devitrified Tuff versus Calculated Final Plutonium Concentration in Solution



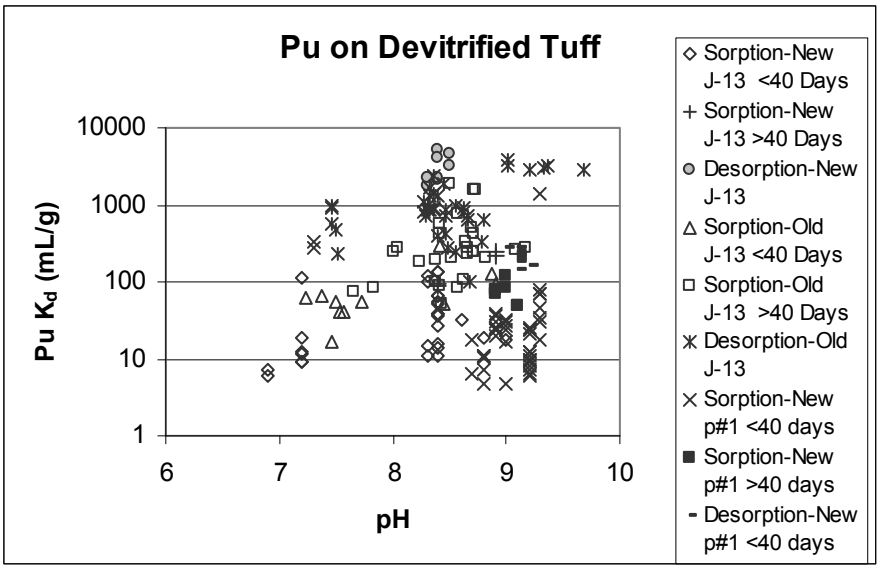
DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

Figure A-29[b]. Plutonium Sorption Coefficient versus Calculated Final Plutonium Solution Concentration in Moles/Liter for Experiments with Samples YM-22 and G4-272



DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

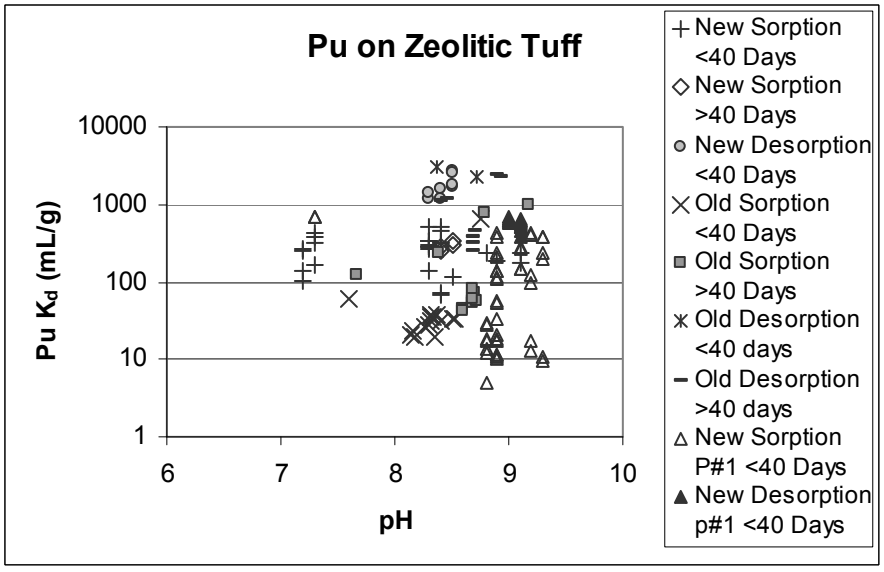
Figure A-30[b]. Plutonium Sorption Coefficient on Devitrified Tuff versus Experiment Duration for Sorption (Forward) and Desorption (Backward) Experiments



DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

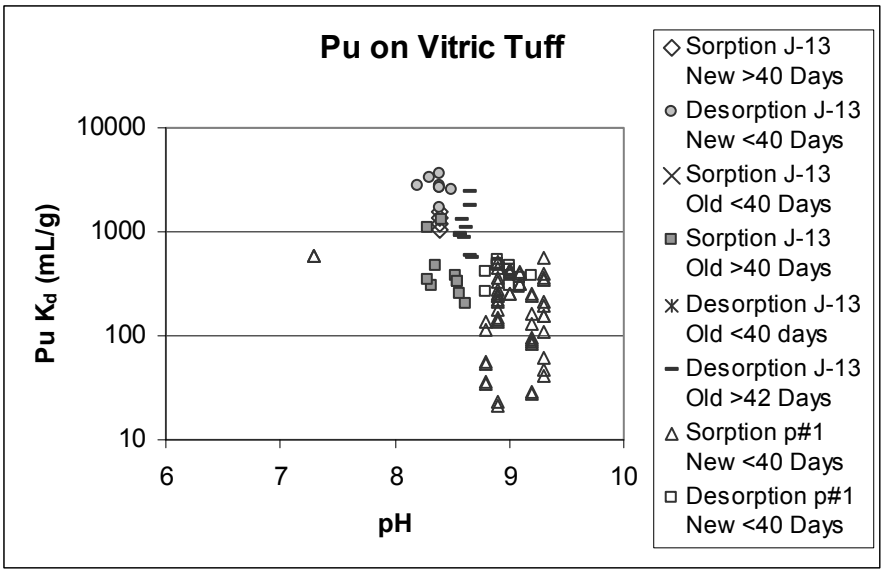
NOTE: Experiments lasting 40 days or more are plotted separately from experiments lasting less than 40 days.

Figure A-31[b]. Plutonium Sorption Coefficient on Devitrified Tuff in J-13 and Synthetic p#1 versus Solution pH in Sorption (Forward) and Desorption (Backward) Experiments



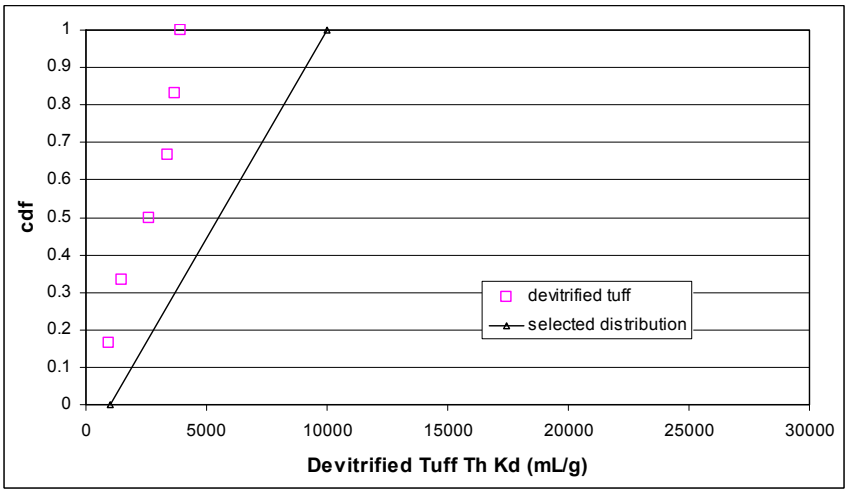
DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

Figure A-36a[b]. Plutonium Sorption Coefficient on Zeolitic Tuff in J-13 and Synthetic p#1 versus Solution pH in Sorption (Forward) and Desorption (Backward) Experiments with Durations Greater than 40 Days



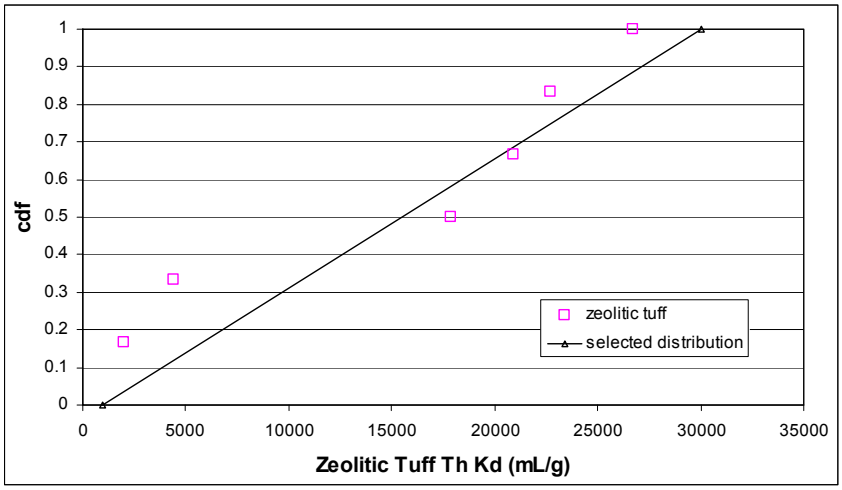
DTNs: New: LA0809AM831341.003 [DIRS 185783]; Old: LA0803AM831341.001 [DIRS 185573].

Figure A-39a[b]. Plutonium Sorption Coefficient on Vitric Tuff in J-13 and Synthetic p#1 versus Solution pH in Sorption (Forward) and Desorption (Backward) Experiments with Durations Greater than 40 Days



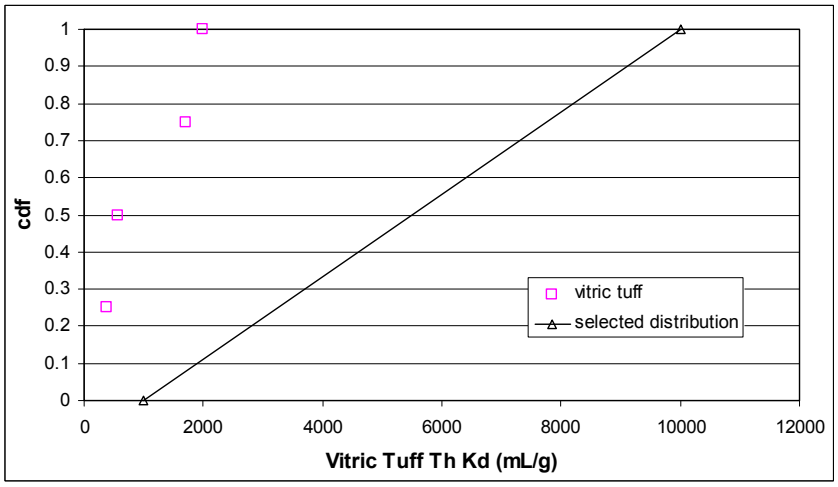
DTN: LA0803AM831341.001 [DIRS 185573]

Figure A-59b[b]. Empirical Cumulative Distribution for Thorium Sorption Coefficients on Devitrified Tuff



DTN: LA0803AM831341.001 [DIRS 185573]

Figure A-59c[b]. Empirical Cumulative Distribution for Thorium Sorption Coefficients on Zeolitic Tuff



DTN: LA0803AM831341.001 [DIRS 185573]

Figure A-59d[b]. Empirical Cumulative Distribution for Thorium Sorption Coefficients on Vitric Tuff

ATTACHMENT B

MDL-NBS-HS-000008 ERD 02 Impact Analysis

The impact analysis for MDL-NBS-HS-000008 ERD 02 is divided into two sections. Section B.1 evaluates the impact of corrections to the text and outputs of *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008 REV 02 AD 01. It also documents the development of modified thorium K_d distributions that more closely represent the ranges of K_d measurements in the corrected source DTN. Section B.2 evaluates impacts summarized in Section B.1 on downstream documents.

B.1 Impact on Text and Outputs of the Source Document

Most of the corrections identified in Attachment A of this ERD clearly have a negligible impact on the basis and conclusions of the model report. For example, the rock type misclassifications usually had unnoticeable effects on the K_d distributions because the data sets were large and the corrections did not involve values at the extremes. In addition, the selected distributions were often conservatively biased by more heavily weighting values at the low ends of the ranges (Section A6), further marginalizing the effects of the majority of the corrections. The corrections having clearly negligible impact include the following:

1. Several americium K_d measurements for sample JA-18 were misclassified as zeolitic tuff measurements. These data have no impact on the selected americium distributions because aqueous americium concentrations involving JA-18 exceed $Am(OH)CO_3$ solubility limits and hence were correctly screened out of the distributions (Section A3) and should continue to be screened out. (CR 11020)
2. Several plutonium K_d measurements for sample G4-272 were misclassified as a zeolitic tuff measurements. The correct rock type for this sample is devitrified tuff. The effects of these misclassifications on the range of data in Figure A-33b (page A-44) and Figure A-36b (page A-47) are negligible because the data sets are large and the measurements are not extreme. Specifically, measurements of 33, 35, 2240, and 2307 mL/g were moved from devitrified to zeolitic. Thus, these corrections would not have affected the selected K_d distributions. (CR 11020 and CR 12647)
3. Four strontium K_d measurements for G1-2901 (devitrified tuff) using solution composition p#1 were found to have used H-3 water instead. Because the data set is large and the measurements are not extreme, correcting these measurements has a negligible effect on the data distribution in Figure A-51b and would have had no effect on the selected distribution. (CR 11020)
4. Four uranium K_d measurements for G1-2698 were misclassified as devitrified but are actually zeolitic. Because these data sets are large (Figure A-63b and Figure A-67b), the effects on the data distributions are negligible and would have had no effect on the selected distributions. (CR 11020)
5. Several instances of a UZ model layer (tsw39) being assigned to the wrong major unit (TSw) in the report. (CR 12142)

The only corrections where a negligible impact is not obvious involve the thorium K_d distributions (CR 11020). A rock-type correction for sample G1-3116 caused the two highest thorium K_d measurements to move from devitrified (Figure A-59b) to zeolitic (Figure A-59c). As a result, the selected K_d distribution for devitrified tuff in Figure A-59b is non-conservative compared to the data (Figure A-59b, Attachment A of this ERD), i.e., it overestimates the thorium K_d for devitrified tuff by a factor of as much as 2.5, which underestimates the mobility of thorium. (The impact to the zeolitic distribution is negligible, as shown in Figure A-59c of Attachment A.) In addition, an unrelated correction was made to Figure A-59d for vitric tuff (see Figure A-59d of Attachment A). This figure (Figure A-59d) was found to display one too many vitric tuff K_d values, so it is replaced with Figure A-59d of Attachment A. While this correction did not markedly change the distribution of data for vitric tuff, it was noted that the selected distribution for vitric tuff appears to be even more non-conservative than the distribution selected for devitrified tuff. For vitric tuff, the maximum of the selected distribution is five times the maximum measured value.

Therefore, new thorium K_d distributions were developed for a TSPA impact analysis to determine whether there is an impact to repository performance. These new distributions are referred to as "modified" K_d distributions because they do not supersede the original selected distributions. The modified distributions are presented in Table B-1 and compared to the data and original selected distributions in Figures B-1 and B-2. The modified distribution is unchanged for zeolitic tuff because the original selected distribution remains representative, as shown in Figure A-59c of Attachment A of this ERD. These modified distributions of thorium K_d values are documented in DTN: LA0809SL831341.001. The direct input is source DTN: LA0803AM831341.001 [DIRS 185573].

No controlled software was used to develop DTN: LA0809SL831341.001. This DTN consists of a Microsoft Excel spreadsheet containing source data, several graphs, and the simple formulas used for displaying data for other radionuclides in Appendix A of the model report. The modified distributions are based on the general approach used in Appendix A for similar distributions. In general, the distributions are defined as uniform over the range of measurements. Maximum values are either set near the maximum measurements or markedly below them when there is considerable uncertainty. Setting the maximum below observations tends to err on the conservative side, allowing for increased radionuclide mobility in TSPA calculations. For the modified thorium K_d distributions, the approximate maximum and minimum measurements are used to define the upper and lower boundaries of the distributions.

Based on the impact analyses summarized in Section B.2, the impact of the modified distributions is negligible. Therefore, the original selected distributions are adequate and are not revised. For this reason, the corrections made in Attachment A of this ERD do not call for changes to the baseline and do not impact the overall conclusions of the report.

Table B-1. Modified Thorium K_d Distributions

Species	Unit/Analysis	Distribution	Coefficients describing distribution (mL/g)
Th	Zeolitic	Uniform	Range = 1,000 - 30,000 (no change)
	Devitrified	Uniform	Range = 900 - 4,000
	Vitric	Uniform	Range = 300 - 2,000

DTN: LA0809SL831341.001

B.2 Impact on Downstream Documents

As explained in Section B.1, the specific correction in this ERD that potentially impacts outputs and downstream documents is the correction to the rock-type classification of sample G1-3116. Because the G1-3116 correction indicates that the selected distribution of thorium K_d values for devitrified tuff may overestimate thorium adsorption (Figure B-1) and lead to reduced thorium mobility and dose, this correction could not easily be shown to have a negligible negative impact.

To evaluate the potential impact of reducing the thorium K_d distributions, two downstream models were rerun using the modified distributions defined in Table B-1. One was the UZ transport model documented in *Particle Tracking Model and Abstraction of Transport Processes*, MDL-NBS-HS-000020 REV 02 AD 02 (SNL 2008 [DIRS 184748]), and the other was the TSPA-LA model (SNL 2008 [DIRS 183478]). The results of these calculations show negligible impacts (see MDL-NBS-HS-000020 ERD 04).

Thus, the changes listed in Attachment A of this ERD have no impact on downstream documents for the following reasons:

1. There is no impact to the overall conclusions of *Radionuclide Transport Models Under Ambient Conditions,* MDL-NBS-HS-000008 REV 02 AD 01.

2. Output of *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008 REV 02 AD 01 (e.g., original K_d distributions) is unchanged.

3. Errors corrected in Attachment A are either not repeated in or have no significant impact on downstream documents as documented in separate ERDs.

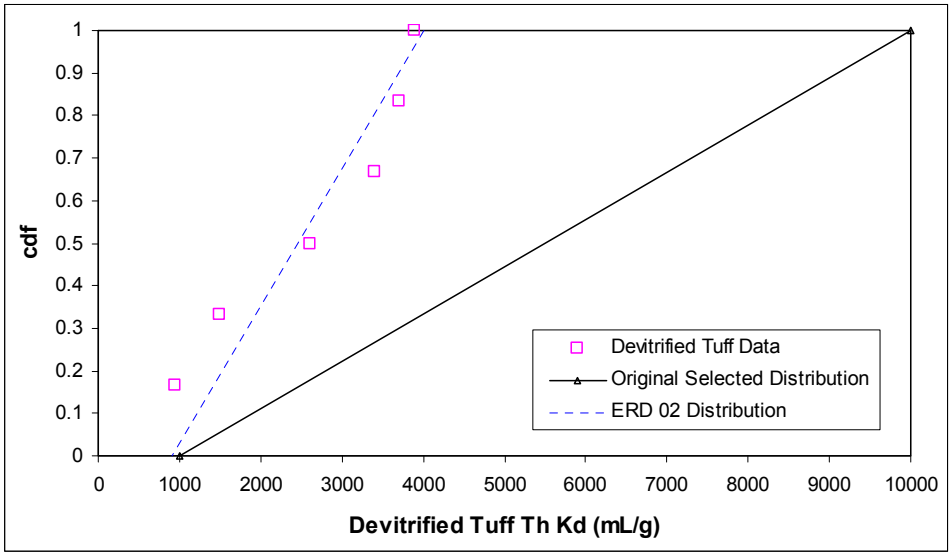
Although the CRs addressed in this ERD are relevant only to the parent document of *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008 REV 02, the parent document is included in REV 02 AD 01 which is also cited by downstream documents. Therefore, all controlled downstream documents that cite either REV 02 or REV 02 AD 01 were queried using the DIRS database. This query resulted in the documents listed in Table B-2. The impact of the corrections in Attachment A of this ERD on these documents is either negligible, not applicable, or addressed through a separate ERD, as indicated in the table.

No output DTNs of *Radionuclide Transport Models Under Ambient Conditions*, MDL-NBS-HS-000008 REV 02 AD 01 were revised as part of this ERD. Although DTN: LA0809SL831341.001 was produced for the impact analyses described in Section B.1, it does not replace the original outputs of the report.

The Yucca Mountain Repository Safety Analysis Report (SAR) was also inspected for impacts due to the changes implemented in this ERD. A scan of Section 2.3.8, titled *Radionuclide Transport in Unsaturated Zone*, revealed no references to the text and figures changed in this ERD.

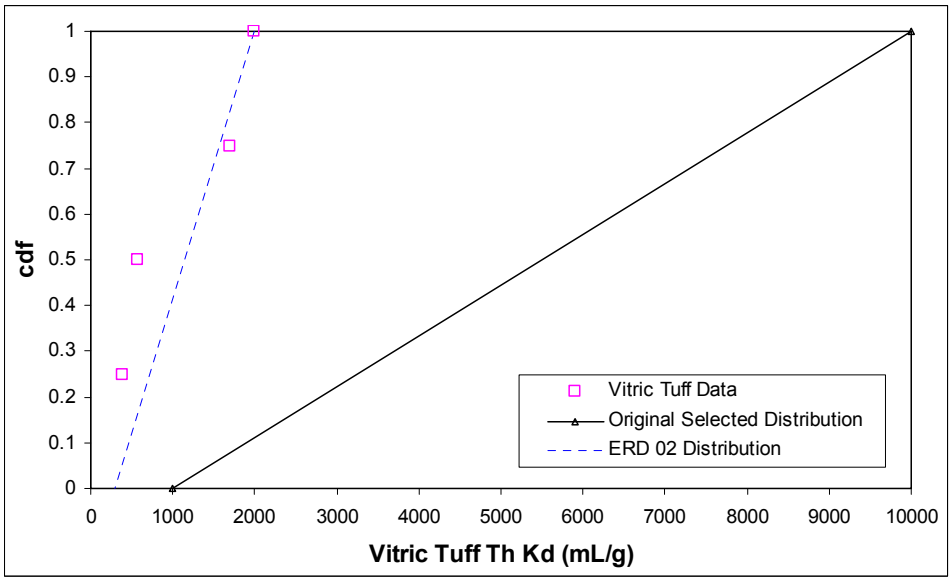
Table B-2. Controlled Documents That Cite REV 02 and REV 02 AD 01 and Relevance of ERD Changes

DIRS	Reference	Relevance of ERD Changes
170035	BSC (Bechtel SAIC Company) 2004. *Conceptual Model and Numerical Approaches for Unsaturated Zone Flow and Transport.* MDL-NBS-HS-000005 REV 01.	Direct Input: none Indirect Input: not applicable
170040	BSC 2004. *Drift-Scale Radionuclide Transport.* MDL-NBS-HS-000016 REV 01.	Direct Input: none Indirect Input: not applicable
170004	BSC 2004. *In Situ Field Testing of Processes.* ANL-NBS-HS-000005 REV 03.	Direct Input: none Indirect Input: not applicable
174101	BSC 2005. *Mountain-Scale Coupled Processes (TH/THC/THM) Models.* MDL-NBS-HS-000007 REV 03.	Direct Input: none Indirect Input: Corrected for CR 12142 in MDL-NBS-HS-000007 ERD 01; not applicable to other corrections in current ERD (this document)
177407	SNL (Sandia National Laboratories) 2007. *EBS Radionuclide Transport Abstraction.* ANL-WIS-PA-000001 REV 03.	Direct Input: none Indirect Input: not applicable
181395	SNL 2007. *Geochemistry Model Validation Report: External Accumulation Model.* ANL-EBS-GS-000002 REV 01 AD 01.	Direct Input: negligible impact to minimum, median, and 95th percentile K_d values for U and Pu on devitrified tuff (Table 6-5) Indirect Input: negligible impact
177394	SNL 2007. *Saturated Zone In-Situ Testing.* ANL-NBS-HS-000039 REV 02.	Direct Input: none Indirect Input: not applicable
184614	SNL 2007. *UZ Flow Models and Submodels.* MDL-NBS-HS-000006 REV 03 AD 01.	Direct Input: none Indirect Input: Corrected for CR 12142 in MDL-NBS-HS-000006 ERD 03; not applicable to other corrections in current ERD (this document)
183041	SNL 2008. *Features, Events, and Processes for the Total System Performance Assessment: Analyses.* ANL-WIS-MD-000027 REV 00.	Direct Input: negligible impact Indirect Input: negligible impact
184748	SNL 2008. *Particle Tracking Model and Abstraction of Transport Processes.* MDL-NBS-HS-000020 REV 02 AD 02.	Direct Input: none Indirect Input: negligible impact as documented in MDL-NBS-HS-000020 ERD 04
184797	SNL 2008. *Performance Confirmation Plan.* TDR-PCS-SE-000001 REV 05 AD 01.	Direct Input: none Indirect Input: not applicable
179962	SNL 2008. *Postclosure Analysis of the Range of Design Thermal Loadings.* ANL-NBS-HS-000057 REV 00.	Direct Input: none Indirect Input: not applicable
177464	SNL 2008. *Postclosure Nuclear Safety Design Bases.* ANL-WIS-MD-000024 REV 01.	Direct Input: negligible impact Indirect Input: negligible impact
183478	SNL 2008. *Total System Performance Assessment Model /Analysis for the License Application.* MDL-WIS-PA-000005 REV 00 AD 01.	Direct Input: none Indirect Input: Corrected for CR 12142 in MDL-WIS-PA-000005 ERD 04; negligible impact to other corrections in current ERD (this document)
182846	SNL 2007. *TSPA Information Package for the Draft Supplemental Environmental Impact Statement.* TDR-WIS-PA-000014 REV 00.	Direct Input: none Indirect Input: not applicable



DTN: LA0803AM831341.001 [DIRS 185573]. ERD DTN: LA0809SL831341.001.

Figure B-1. Empirical Cumulative Distributions for Thorium Sorption Coefficients on Devitrified Tuff



DTN: LA0803AM831341.001 [DIRS 185573]. ERD DTN: LA0809SL831341.001.

Figure B-2. Empirical Cumulative Distributions for Thorium Sorption Coefficients on Vitric Tuff