



## Model Error Resolution Document

QA: QA  
Page 1 of 5

*Complete only applicable items.*

### INITIATION

1. Originator: Jim Houseworth/Ming Zhu	2. Date: 3/12/08	3. ERD No. MDL-NBS-HS-000008 ERD 01
4. Document Identifier: MDL-NBS-HS-000008 REV02 AD01 and Rev 02 AD 01 ACN02	5. Document Title: Radionuclide Transport Models under Ambient Conditions	

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

### I Background Information Summary

This ERD is prepared to resolve CRs and TBVs associated with *Radionuclide Transport Models under Ambient Conditions*, MDL-NBS-HS-000008 REV02 AD01.

CR 11799: There are two issues concerning Table A-2 of MDL-NBS-HS-000008 REV02 AD01. First, one of the five DTNs used to establish the ranges of pore water composition is unqualified (DTN: GS010608312272.001 [DIRS 165860]). Second, the ranges of pore water and perched water compositions cited in Table A-2 contain errors.

TBV-8447: MDL-NBS-HS-000008 REV02 AD01 and MDL-NBS-HS-000008 REV02 AD01 ACN02 cited a draft version of *Data Qualification Report for Selenium and Tin Sorption Data Obtained by Los Alamos National Laboratories 1981-1984*, DQP-MGR-HS-000001 REV 00 (SNL 2007 [DIRS 179484]). According to the original plan, TBV-8447 will be resolved when DQP-MGR-HS-000001 REV00 is approved and values cited are verified.

The errors identified in CR 11799 are analyzed herein for potential impact on the parent report as well as the following technical products that use the information from the parent report.

ANL-NBS-HS-000039 Rev. 02, *Saturated Zone In-Situ Testing*

ANL-NBS-HS-000057 Rev. 00, *Postclosure Analysis of the Range of Design Thermal Loadings*

(see attached)

### CONCURRENCE

	Printed Name	Signature	Date
7. Checker	Charles Haukwa		03/13/2008
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### APPROVAL

9. Originator	Jim Houseworth Ming Zhu		3/13/2008 3/13/08
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(Continued from Block 6)

ANL-WIS-PA-000001 Rev. 03, *EBS Radionuclide Transport Abstraction*

MDL-NBS-HS-000006 Rev. 03, *UZ Flow Models and Submodels*

MDL-NBS-HS-000020 Rev. 02, *Particle Tracking Model and Abstraction of Transport Processes*

MDL-NBS-HS-000020 Rev. 02, ADD 01, *Particle Tracking Model and Abstraction of Transport Processes*

MDL-NBS-HS-000020 Rev. 02, ACN01 ADD 01, *Particle Tracking Model and Abstraction of Transport Processes*

MDL-NBS-HS-000020 Rev. 02, ADD 02, *Particle Tracking Model and Abstraction of Transport Processes*

ANL-WIS-MD-000027 Rev. 00, *Features, Events, and Processes for the Total System Performance Assessment: Analyses*

MDL-WIS-PA-000005 Rev. 00, *Total System Performance Assessment Model/Analysis for the License Application*

MDL-WIS-PA-000005 Rev. 00, ADD 01, *Total System Performance Assessment Model/Analysis for the License Application*

TDR-PCS-SE-000001 Rev. 05, ADD 01, *Performance Confirmation Plan*

ANL-WIS-MD-000028 Rev. 00, *Delineation of the Postclosure Controlled Area*

TDR-TDIP-NS-000002 Rev. 00, *Total System Performance Assessment Data Input Package for Particle Tracking Model and Abstraction of Transport Processes (PT-1)*

TDR-TDIP-NS-000003 Rev. 00, *Total System Performance Assessment (TSPA) Data Input Package for Unsaturated Zone Radionuclide Transport Parameters Matrix Diffusion and Sorption*

TDR-WIS-PA-000014 Rev. 00, *TSPA Information Package for the Draft SEIS*

In addition, the reference to the data qualification report identified in TBV-8447 is updated in this ERD. These analyses and updates to resolve CR11799 and TBV-8447 do not have any impact on any existing downstream technical products such as the TSPA-LA or the SAR.

## **II Inputs and/or Software**

Direct inputs to this error resolution analysis include the following DTNs: GS951208312272.004 [DIRS 165858]; GS010708312272.002 [DIRS 156375]; GS011008312272.004 [DIRS 165859]; GS990208312272.001 [DIRS 146134]; and GS000608312271.001 [DIRS 153407]. These DTNs are qualified as shown in the TDMS and linked in the DIRS to the parent report.

No software controlled under IM-PRO-003, *Software Management*, is used in this analysis.

## **III Analysis and Results**

### **III.1 Analysis of CR 11799**

CR 11799 identifies two issues concerning Table A-2 of MDL-NBS-HS-000008 REV02 AD01: First, one of the five DTNs used to establish the ranges of pore water composition is unqualified

(DTN: GS010608312272.001 [DIRS 165860]). Second, the ranges of pore water and perched water compositions cited in Table A-2 (MDL-NBS-HS-000008 REV02 AD01 [DIRS 177396]) contain errors.

In regards to the unqualified DTN: GS010608312272.001 [DIRS 165860], the only the only element listed in Table A-2 that is also in the unqualified DTN: GS010608312272.001 [DIRS 165860] is potassium (K). However, the values for K in DTN: GS010608312272.001 [DIRS 165860] do not establish the upper or lower bounds for K concentrations. Therefore, the ranges in water compositions given in the other four qualified DTNs (GS010708312272.002 [DIRS 156375]; GS011008312272.004 [DIRS 165859]; GS990208312272.001 [DIRS 146134]; GS000608312271.001 [DIRS 153407]) for pore-water composition establish the ranges in composition for Table A-2 of MDL-NBS-HS-000008 REV02 AD01. Furthermore, the DTNs associated with the pore water composition in Table A-2 are indirect inputs; therefore, qualification is not required.

In regards to the errors found in the ranges of pore water and perched water compositions shown in Table A-2 (MDL-NBS-HS-000008 REV02 AD01 [DIRS 177396]), their potential impacts on and downstream technical products are discussed as follows. The following table shows the corrections to Table A-2 of MDL-NBS-HS-000008 REV02 AD01 [DIRS 177396] to resolve CR 11799.

Table A-2. Composition of Yucca Mountain UZ Waters

Element	Units	J-13 <sup>a</sup>	Perched Water Composition Ranges <sup>b</sup>	Pore Water Composition Ranges at or Below Repository <sup>c</sup>	UE 25 p#1-c <sup>a</sup>	Synthetic p#1
Ca	mg/L	11.5	2.9–45	0.2–91	87.8	
Mg	mg/L	1.76	0–4.1	0–19.7	31.9	
Na	mg/L	45	34–98	34.0–207	171	261
K	mg/L	5.3	3.9–5.8	1.5–12	13.4	
SiO <sub>2</sub>	mg/L	64.2	7.7–64	31.7–352	64.2	
Cl	mg/L	6.4	4.1–16	7.3–130	37	
SO <sub>4</sub>	mg/L	18.1	4–223	6–106	129	
HCO <sub>3</sub>	mg/L	128	112–197	47.6–384	666	691
pH		6.9	7.6–8.7	7.1–9.7	6.7	

<sup>a</sup> Ogard and Kerrisk (1984 [DIRS 100783], Table 1).

<sup>b</sup> DTN: GS951208312272.004 [DIRS 165858].

<sup>c</sup> DTN: GS010708312272.002 [DIRS 156375]; GS011008312272.004 [DIRS 165859]; GS990208312272.001 [DIRS 146134]; GS010608312272.001 [DIRS 165860]; GS000608312271.001 [DIRS 153407].

#### Errors Found in the Ranges of Pore Water Compositions:

The change for pore water Ca concentrations from the range of 0.3 to 91.8 mg/L to the range of 0.2 (DTN: GS990208312272.001) to 91 (DTN: GS990208312272.001) mg/L is negligible. The value of 91.8 mg/L comes from the TCw (DTN: GS010708312272.002), so it is not at or below the repository level.

The change for pore water Mg concentrations from the range of 0 to 24.6 mg/L to the range of 0 to 19.7 (DTN: GS010708312272.002) mg/L is negligible. The value of 24.6 mg/L was from the PTn (DTN: GS011008312272.004), so it is not at or below the repository level.

The change for pore water Na concentrations from the range of 3 to 207 mg/L to the range of 34.0 (DTN: GS010708312272.002) to 207 mg/L is substantial for the lower end of the range, but more consistent with the range of water compositions used (J-13 and UE 25 p#1-c). It is not clear where the value of 3 mg/L originally tabulated was taken.

The change for pore water K concentrations from the range of 1.4 to 148.7 mg/L to the range of 1.5 (DTN: GS011008312272.004) to 12 (DTN: GS011008312272.004) mg/L is negligible for the lower end of the range, but substantial for the upper end of the range. However, the new upper end is more consistent with the range of water compositions used (J-13 and UE 25 p#1-c). The value of 148.7 mg/L originally tabulated is a value for Na from DTN: GS011008312272.004.

The change for pore water SiO<sub>2</sub> concentrations from the range of 5 to 352 mg/L to the range of 31.7 (DTN: GS010708312272.002) to 352 mg/L is substantial for the lower end of the range, but more consistent with the range of water compositions used (J-13 and UE 25 p#1-c). It is not clear where the value of 5 mg/L originally tabulated was taken.

The change for pore water Cl concentrations from the range of 6 to 130 mg/L to the range of 7.3 (DTN: GS011008312272.004) to 130 mg/L is negligible.

The change for pore water SO<sub>4</sub> concentrations from the range of 6 to 101.1 mg/L to the range of 6 to 106 (DTN: GS990208312272.001) mg/L is negligible.

The change for pore water HCO<sub>3</sub> from the range of 8 to 384 mg/L to the range of 47.6 (DTN: GS990208312272.001) to 384 mg/L is substantial for the lower end of the range, but more consistent with the range of water compositions used (J-13 and UE 25 p#1-c). It is not clear where the value of 8 originally tabulated was taken.

The change for pore water pH values from the range of 6.7 to 9.7 mg/L to the range of 7.1 (DTN: GS011008312272.004) to 9.7 is negligible.

#### Errors Found in the Ranges of Perched Water Compositions:

The change for perched water K concentrations from the range of 3.6 to 5.8 mg/L to the range of 3.9 (DTN: GS951208312272.004) to 5.8 mg/L is negligible.

### **III.2 Impact Evaluation for TBV-8447**

Citations in MDL-NBS-HS-000008 REV02 AD01 and MDL-NBS-HS-000008 REV02 AD01 ACN02 of *Data Qualification Report for Selenium and Tin Sorption Data Obtained by Los Alamos National Laboratories 1981-1984* for DQP-MGR-HS-000001 REV 00 (SNL 2007 [DIRS 179484]). The cited report should be corrected to *Data Qualification Report for Selenium and Tin Sorption Data Obtained by Los Alamos National Laboratory, 1981 to 1984*, TDR-CRW-HS-000001 Rev 00 (SNL 2008 [DIRS 184177]) on pages 2, 8, A-4, A-5, A-6, A-7, A-8, A-9, A-

10, A-11, A-12, and B-3. Additionally, the reference citations on Figures A-1[a], A-2[a], A-3[a], A-4[a], A-5[a], and A-6[a] should be updated to SNL 2008 [DIRS 184177]. The same information as originally cited from SNL 2007 [DIRS 179484] is contained in SNL 2008 [DIRS 184177]. There is no impact of this TBV on any existing downstream technical products.

## **IV Impact Evaluation**

### **IV.1 Impact Evaluation of CR 11799**

The changes in composition ranges needed to correct errors are either negligible or render the resulting water composition ranges for UZ pore waters to agree better with the bounding water compositions of J-13 and UE 25 p#1-c that were actually used for defining water chemistry in sorption experiments. None of the other documents evaluated were impacted by either the unqualified DTN or the correction of these errors in Table A-2 of MDL-NBS-HS-000008 REV02 AD01 [DIRS 177396].

### **IV.2 Impact Evaluation of TBV-8447**

Citations in MDL-NBS-HS-000008 REV02 AD01 and MDL-NBS-HS-000008 REV02 AD01 ACN02 of *Data Qualification Report for Selenium and Tin Sorption Data Obtained by Los Alamos National Laboratories 1981-1984* for DQP-MGR-HS-000001 REV 00 (SNL 2007 [DIRS 179484]) are corrected to *Data Qualification Report for Selenium and Tin Sorption Data Obtained by Los Alamos National Laboratory, 1981 to 1984*, TDR-CRW-HS-000001 Rev 00 (SNL 2008 [DIRS 184177]). The information relied upon in the development of the distributions of sorption coefficient is not impacted by this reference change.