Department of Energy
Washington, DC 20585

QA: QA

MAR 19 2002

P. R. Dixon, Laboratory Lead
Los Alamos National Laboratory
University of California
P. O. Box 1663
Los Alamos, NM 87545

VERIFICATION OF CORRECTIVE ACTIONS AND CLOSURE OF DEFICIENCY REPORT (DR) BSC-01-D-135

The Office of Quality Assurance staff has evaluated the corrective actions of DR BSC-01-D-135 and determined the results to be satisfactory. As a result, the DR is considered closed.

If you have any questions, please contact either James Blaylock at (702) 794-1420 or James V. Voigt at (702) 794-1487.

James Blaylock

Ram Murthy, Acting Director
Office of Quality Assurance

OQA:JB-0801

Enclosure:
DR BSC-01-D-135

NMSS07
WM-11

cc w/encl:
N. K. Stablein, NRC, Rockville, MD
Robert Latta, NRC, Las Vegas, NV
S. W. Lynch, State of Nevada, Carson City, NV
Engelbrecht von Tiesenhausen, Clark County, Las Vegas, NV
C. K. Ho, BSC/SNL, Albuquerque, NM
J. A. Blink, BSC/LLNL, Las Vegas, NV
J. E. Houseworth, BSC/LBNL, Las Vegas, NV
C. C. Warren, BSC, Livermore, CA
R. W. Andrews, BSC, Las Vegas, NV
G. K. Beall, BSC, Las Vegas, NV
A. G. Burningham, BSC, Las Vegas, NV
J. E. Gebhart, BSC, Las Vegas, NV
S. H. Horton, BSC, Las Vegas, NV
R. P. Keele, BSC, Las Vegas, NV, M/S 280
B. E. Kirstein, BSC, Las Vegas, NV
D. T. Krisha, BSC, Las Vegas, NV
D. M. Kunihiro, BSC, Las Vegas, NV
R. E. Powe, BSC, Las Vegas, NV, M/S 280
S. H. Swenning, BSC, Las Vegas, NV
M. D. Voegele, BSC, Las Vegas, NV
R. F. Wemheuer, BSC, Las Vegas, NV
N. H. Williams, BSC, Las Vegas, NV
W. J. Glasser, NQS, Las Vegas, NV
D. G. Opielowski, NQS, Las Vegas, NV
J. V. Voigt, NQS, Las Vegas, NV
J. R. Dyer, DOE/YMSCO, Las Vegas, NV
C. E. Hampton, DOE/YMSCO, Las Vegas, NV
D. G. Horton, DOE/YMSCO, Las Vegas, NV
J. M. Replogle, DOE/YMSCO, Las Vegas, NV
B. M. Terrell, DOE/YMSCO, Las Vegas, NV

NMSSO7
WM-11

ORIGINAL

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. ☒ DEFICIENCY REPORT
☐ CORRECTIVE ACTION REPORT

NO. BSC-01-D-135

PAGE 1 OF

QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT

1. Controlling Document:
AP-3.10Q, Revision 2, ICN 3, Analysis and Models

2. Related Report No.:
OCRWM Concern # 01-206, 01-067 (per N. Voltura)

3. Responsible Organization:
BSC

4. Discussed With:
Bruce Kirstein, Jim Blink, Mike Voegele

5. Requirement:
AP-3.10Q, Revision 2, ICN 3, *Analysis and Models* states:
5.2.e) The appropriate level of confidence in the analysis or model shall include defining the appropriateness of all inputs used in the analysis or model for their intended purpose.

5.3.d) If the validation of the model was based on a combination of qualified and unqualified data, assess the impact and appropriateness of the unqualified data on the model validity. See Continuation page for additional requirements

6. Description of Condition:
Contrary to the requirements stated in Block 5, the appropriateness of the input(s), the qualification status of the data, the traceability of the data and the control of the data cannot be determined for thermal conductivity data used in the Multiscale Thermohydrologic Model, ANL-EBS-MD-000049, Revision 00, ICN 1. The thermal conductivity value(s) used in this model are directly derived from a memorandum that was not subject to the requirements of the Quality Assurance Requirements and Description, was not checked or reviewed, was not approved, and has been altered.

In addition data developed from this model using untraceable data and unqualified software have not been discussed relative to uncertainty of the data and restrictions on subsequent use. Specifically, the model states: "The impact of the uncertainty in all of the model inputs was not completely addressed because it was outside of the scope of work for this AMR." Reference Data Tracking Numbers LL000113904242.089, LL000114004242.090, LL000114104242.091, LL000509112312.003, LL000509012312.002 LL000509212312.004.

See the Continuation page for a detailed history and background.

7. Initiator: S. SWENNING Date 10/09/01

9. Does a stop work condition exist? (Not required for a DR)
☐ Yes ☒ No
If Yes, Check One: ☐ A ☐ B ☐ C ☐ D

10. Recommended Actions:
SEE BLOCK 10 RECOMMENDATIONS ON CONTINUATION PAGE

11. QA Review:
QAR VICTOR J. BARISH Date 12/7/01

12. Response Due Date:
10 Working Days From Issuance

13. DOQA Issuance Approval:
Printed Name Robert D Davis Signature James Blankenhorn Date 12/12/01

22. Corrective Actions Verified:
QAR James V. Voigt Date 3/14/2002

23. Closure Approved by:
DOQA James Blankenhorn Date 3/19/02

Exhibit AP-16.1Q.1 Rev. 12/20/1999

ENCLOSURE

1 of 9

OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. ☒DR/CAR
☐ Stop Work Order

NO BSC-01-D-135

PAGE 81 OF

10/10/01 QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT/STOP WORK ORDER CONTINUATION PAGE

Block 5 (continued)
Attachment 1, Section 4 states:
Data must be identified in a manner that facilitates traceability to associated documentation and its qualification status....Unqualified data may be used in scientific investigation, performance assessment, and design activities, provided traceability to its status as unqualified data is maintained.

All other technical information produced by Civilian Radioactive Waste Management System participants which is used as input shall be obtained from controlled source documents and shall be referenced using the appropriate document identifiers or records system accession numbers.

Attachment 1, Section 7 states–This section shall provide a summary of the analysis or modeling activity. The conclusions, including the DTNs of any associated developed data, as well as any decisions or recommendations based on the analysis or modeling activity shall be presented in this section. Conclusions shall include uncertainties and restrictions for subsequent use.

Block 6 (continued)
Detailed History and Background
The MULTISCALE THERMOHYDROLOGIC MODEL, ANL-EBS-MD-000049 REV 00 ICN 01 (October 2000), **MOL.20001208.0062** describes the hydrologic and thermal properties used. Refer to Section 4.1.7 entitled **Hydrologic and Thermal Properties of Stratigraphic Units** (page 68). This section refers to Table 4-4 entitled: Thermal Properties of Stratigraphic Units (page 72). Both the section text and table reference DTN:LB991091233129.006.

LB991091233129.006 cites as a source for this DTN SNT05071897001.012: SOURCE DATA FOR BASE CASE THERMAL PROPERTY DATA FOR TSPA-VA (TOTAL SYSTEM PERFORMANCE ASSESSMENT – VIABILITY ASSESSMENT (VA SUPPORTING DATA), and the description: SOURCE DATA FOR BASE CASE THERMAL PROPERTIES DATA FOR TSPA-VA SUBMITTED UNDER DTN:SNT05071897001.002

SNT05071897001.002 is referred to in accession numbers **MOL.19980518.0226** (March 1998) entitled DATA TRANSMITTAL PACKAGE (DTP) FOR: "BASE CASE THERMAL PROPERTY DATA FOR TSPA-VA (TOTAL SYSTEM PERFORMANCE ASSESSMENT – VIABILITY ASSESSMENT)" (WBS: 1.2.5.4.1) (DTN: **SNT05071897001.002**, TDIF #: 306664), and **MOL.19990625.0216** (June 1999) entitled: DATA TRANSMITTAL PACKAGE (DTP) FOR "BASE CASE THERMAL PROPERTY DATA FOR TSPA – VA (TOTAL SYSTEM PERFORMANCE ASSESSMENT – VIABILITY ASSESSMENT) (VA SUPPORTING DATA)" (WBS: 1.2.5.4.1) (SCP: 8.3.5.13) (DTN: **SNT05071897001.002**), TDIF #: 306664) (THIS IS A CORRECTION TO MOL.19980518.0226).
SNT05071897001.002 refers to **MOL.19980518.0229.**

MOL.19980518.0229 is a memo to distribution by N.D. Francis dated April 16, 1997. Page B-4 of this memo contains thermal conductivities for the wet and dry lithophysal values for Tsw35 (also Tptpll) of 2.02 W/(m-K) and 1.2 W/(m-K) respectively. These changed thermal conductivity values were made (in handwriting) by C.K. Ho dated 8/7/97.

These wet and dry thermal conductivity values are used in the MULTISCALE THERMODHYROLOGIC MODEL refer to Table 4-4, page 72, right-hand columns, 14-th entries (down) corresponding to tsw35.

OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. [X] DR/CAR
[ ] Stop Work Order

NO. BSC-01-D-135 Dec

PAGE 3 OF 12/11/01

QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT/STOP WORK ORDER CONTINUATION PAGE

BLOCK 10 - RECOMMENDED ACTIONS (CONTINUED)

1. Recommend that a concerted effort be undertaken to document the resolution to TBV-3260 assigned to DTN SNT05071897001.012 in technical product ANL-NBS-HS-000002, Rev. 0, ICN 0.

2. Recommend that consideration be given to revising procedures, such as AP-3.10Q, AP-3.11Q, etc., to incorporate a requirement for the authors of technical products to research sub tier inputs and to document in their technical product any TBVs. assumptions, etc. that must be resolved in order for their outputs to be used directly for LA. This is a transparency issue that has also been addressed in DR LVMO-00-D-118. (Based upon interface with Jim Blink on 12/7/01.)

3. Recommend that the metadata in ATDT for DTNs SNT05071897001.002 and SNT05071897001.012 be corrected to accurately reflect the data sources used to create the data residing in these DTNs. Also, add/link MOL.19980518.0230 (Memo dated August 7, 1997 from Clifford K. Ho and Nicholas D. Francis, subj: Correction to Base-Case Thermal Properties for TSPA-VA Modeling) to the metadata for DTN SNT05071897001.002 and SNT05071897001.012

Victor J. Baeth Jr 12/7/01

T [illegible]SPONSE:
X Initial
☐ Complete
☐ Amended

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.

DR/CAR NO. BSC-01-D-135

PAGE 1 OF

QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT (RESPONSE)

14a. Immediate Actions:
A justification/explanation of issues concerning questions about selected thermal conductivity values in DTNs SNT05071897001.002, SNT05071897001.012, and LB991091233129.006 will be developed and submitted to RPC for a 'fast track' accession number. Then the cited DTNs will be superceded in TDMS with DTNs which are identical with the exception that the questionable parameter values are removed. The accession number for the justification/explanation will also be included and will provide more current values for the thermal conductivity data and guidance on the uses for which the data are appropriate These action will prevent inappropriate use of the data being questioned until the values can be confirmed or superceded by results from testing currently underway.
Compliance Date: Feb 1, 2002

14. Remedial Actions:
The remedial actions for this deficiency are to evaluate the appropriateness of the use of thermal conductivity values in the cited DTNs in other data sets and in technical products. Impact reviews, in accordance with AP-2.14Q, will be conducted to trace the use of these values. Each usage will be evaluated for appropriateness in terms of the qualification status of the data. As necessary supplemental records packages will be prepared and submitted to RPC to clarify and justify the use of the data.

Additional corrective actions may be needed based on the findings of the extent of condition determination and will be presented in the Complete Response to this DR.

Completion Date: March 15, 2002

15. Extent of Condition:
The extent of condition will be determined during the impact review mentioned above and will be described in the Complete Response to this DR.

16. Cause: (Attach results of root cause determination prepared in accordance with AP-16.4Q for a significant deficiency.)
The cause(s) of this deficiency will be identified during the performance of the Extent of Condition determination and will be detailed in the Complete Response to this DR.

17. Action to Preclude Recurrence:
Actions to Preclude Recurrence depend on the identified cause(s) and will be described in the Complete Response to this DR.

18. Due Date:March 15, 2002
x For submittal of complete response
☐ For completion of corrective

19. Response by: NAME JAMES E. [illegible] BSC QE 1/10/02
KO RWA RF
Jane E Hancock Date: January 9, 2002 Phone: 295-7611

20. Evaluation: ☑ Accept ☐ Partially Accept ☐ Reject
James V. Voigt
QAR James V. VOIGT Date 1-17-02

21. Concurrence:
DOQA James B Leyland for Date 1/23/02

Exhibit AP-16.1Q.1

Rev. 12/20/1999

RESPONSE:
- [ ] Initial
- [x] Complete
- [ ] Amended

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.

DR/CAR NO. BSC-01-D-135
PAGE OF
QA: QA 1 pkg JEH

DEFICIENCY/CORRECTIVE ACTION REPORT (RESPONSE)

14a. Immediate Actions:
Upon further examination it was determined that the immediate actions discussed in the 1/9/02 response are not necessary because the data sets are already controlled. DTN SNT05071897001.002 is unqualified and would require a TBV if it was selected for use. DTN SNT05071897001.012 has TBV 3260 assigned to it as of 11/9/99. DTN LB991091233129.006 is identified as Technical Product Output (TPO) and will require that its input DTN be addressed (i.e. lifting TBV 3260) per AP-3.15Q prior to License Application.

Compliance Date: 11/9/99

14. Remedial Actions:
UZ Staff will modify the criteria for lifting TBV 3260 to include that the data must be accurate for their intended use. Daughter DTNs that use DTN SNT05071897001.012 as an input may continue to be used as TPO per AP-3.15Q while the TBV is in place.

15. Extent of Condition:
N/A Existing processes are in place to identify and address errors in data sets when originators select them for use in QA products, as was the case in this instance.

There is no adverse impact to ongoing work because the data sets are already controlled within the QA Program. No adverse impacts to the data will exist once the TBV removal criteria are addressed.

16. Cause: (Attach results of root cause detemination prepared in accordance with AP-16.4Q for a significant deficiency.)
Inadequate controls and technical review processes for pre-PVAR activities.

17. Action to Preclude Recurrence:
This condition occurred prior to the issuance of the Process Validation and Re-engineering (PVAR) procedure revisions of 6/30/99. Implementation of the PVAR procedures (e.g. AP-3.10Q, AP-3.11Q, AP-3.15Q), and post-PVAR procedures (e.g. AP-SIII.9Q and AP-SIII.10Q) has eliminated the conditions that lead to this deficiency.

18. Due Date: 3/14/02
- [ ] For submittal of complete response
- [x] For completion of corrective action

19. Response by: James Houseworth James Houseworth for BSC QE
Date 2/26/02 Phone 5-7611

20. Evaluation: [x] Accept [ ] Partially Accept [ ] Reject
QAR James V. Voigt James V. Voigt Date 3-12-2002

21. Concurrence:
DOQA James B Leylek for Date 3/13/02

Exhibit AP-16.1Q.1 Rev. 12/20/1999

BECHTEL SAIC COMPANY, LLC

Interoffice Memorandum

QA: QA

To:	Kathy Ryan	**No.:**	0227021652
From:	Jim Houseworth	**Date:**	
Re:	Criteria for Lifting TBV #3260	**CC:**	

Please incorporate the following additional criteria for lifting TBV 3260.

1. Demonstrate that porosity values used in the development of bulk rock thermal conductivities are representative of the geologic media, particularly the lithophysal and rock matrix porosities.

2. Thermal conductivities for rock units in the unsaturated zone must address the appropriate range of water saturation. Water saturations may range from zero water saturation in dryout zones near potential waste emplacement drifts to saturated rock matrix in condensation zones. However, lithophysal porosity will always have a negligible water saturation in the unsaturated zone.

3. Demonstrate that measurements used to establish thermal conductivities are not significantly affected by thermal convection and, for wet thermal conductivity measurements, evaporation/condensation processes. Alternatively, demonstrate that the effects of these processes are appropriately accounted for in the evaluation of thermal conductivities from the measured data.

MOL.20020228.0112

BECHTEL SAIC COMPANY, LLC

Interoffice Memorandum

QA: QA

To:	Kathy Ryan	**No.:**	0227021652
From:	Jim Houseworth *Jim Houseworth*	**Date:**	2/27/02
Re:	Criteria for Lifting TBV #3260	**CC:**	

Please incorporate the following additional criteria for lifting TBV 3260.

1. Demonstrate that porosity values used in the development of bulk rock thermal conductivities are representative of the geologic media, particularly the lithophysal and rock matrix porosities.

2. Thermal conductivities for rock units in the unsaturated zone must address the appropriate range of water saturation. Water saturations may range from zero water saturation in dryout zones near potential waste emplacement drifts to saturated rock matrix in condensation zones. However, lithophysal porosity will always have a negligible water saturation in the unsaturated zone.

3. Demonstrate that measurements used to establish thermal conductivities are not significantly affected by thermal convection and, for wet thermal conductivity measurements, evaporation/condensation processes. Alternatively, demonstrate that the effects of these processes are appropriately accounted for in the evaluation of thermal conductivities from the measured data.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT U.S. DEPARTMENT OF ENERGY WASHINGTON, D.C.	8. ☒DR/CAR ☐ Stop Work Order NO. BSC-01-D-135 PAGE OF QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT/STOP WORK ORDER CONTINUATION PAGE

VERIFICATION OF CORRECTIVE ACTIONS FOR DEFICIENCY REPORT (DR) BSC-01-D-135

BLOCK 14a – IMMEDIATE ACTIONS

Commitment: (1) No immediate actions were necessary.

Confirmation: (1) Data sets in question have adequate process controls in place. Implementation of Process Validation and Re-engineering (PVAR) procedures such as AP-3.10Q, AP-3.11Q and AP-3.15Q and the current post-PVAR procedures such as AP-SIII.9Q and AP-SIII.10Q have initiated sufficient controls to maintain data sets and technical input information.

BLOCK 14 – REMEDIAL ACTIONS

Commitment: (1) UZ Staff will modify the criteria for lifting TBV 3260 to include the data being accurate for their intended use.

Verification: (1) Examined Automated Technical Data Tracking database and confirmed DTN SNT05071897001.012 reference to TBV #3260; confirmed that the qualification status of this DTN is "Unqualified"; confirmed that TBV record in the DIRS database identified additional criteria for lifting TBV 3260 with reference to MOL.20020228.0112. MOL.20020228.0112 is an interoffice memorandum form Jim Houseworth to Kathy Ryan dated 2/27/02 with a subject matter of "Criteria For Lifting TBV #3260.

BLOCK 15 - EXTENT OF CONDITION

Commitment: (1) No commitment identified for 'Extent of Condition'.

Confirmation: (1) Existing processes are in place to identify and address potential problems with data sets selected for use in 'QA' products.

The Impact Evaluation was addressed and is reasonable based upon the processes in place to control data sets. The existing TBV process with the definition of more explicit TBV removal criteria will provide the necessary controls to adequately address all areas to be assessed prior to TBV resolution and removal.

BLOCK 16 – CAUSE

The cause of the deficient condition, "Inadequate controls and technical review processes for pre-PVAR activities" is reasonable based upon current processes for data reviews.

OFFICE OF CIVILIAN
RADIOACTIVE WASTE MANAGEMENT
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C.

8. ☒DR/CAR
☐ Stop Work Order

NO. BSC-01-D-135

PAGE OF

QA: QA

DEFICIENCY/CORRECTIVE ACTION REPORT/STOP WORK ORDER CONTINUATION PAGE

VERIFICATION OF CORRECTIVE ACTIONS FOR DEFICIENCY REPORT (DR) BSC-01-D-135 (CONTINUATION)

BLOCK 17 – ACTION TO PRECLUDE RECURRENCE

Commitment: (1) No commitments were identified for 'Actions to Preclude Recurrence'.

Confirmation: (1) Identified condition occurred prior to the PVAR process revisions of 6/30/99. Implementation of PVAR procedures such as AP-3.10Q, AP-3.11Q and AP-3.15Q and the current post-PVAR procedures such as AP-SIII.9Q and AP-SIII.10Q have initiated sufficient controls to preclude similar deficiencies.

Based upon the satisfactory verification of corrective action commitments described above, it is recommended that this DR be closed.

James V. Voigt

James V. Voigt

14 March 2002
Date