DOE Reports Involving Volcanism
(Igneous Events and Consequences)

Prepared For:

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And

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September 2007

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No Date

ENCLOSURE 1 STATUS OF THE VOLCANISM PROGRAM AND PLANTS FOR ISSUE RESOLUTION
LSN #: DN2001496883 Participant #: ALG.20040511.0649 Document Date: 01/01/1901 Provide the physical framework (characteristics of igneous features and processes) for Quaternary magmatism/volcanism near Yucca Mountain as needed to constrain event probabilities and effects.

STATUS OF VOLCANISM STUDIES FOR THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
LSN #: DN2001966641 Participant #: ALA.20040215.1100 Document Date: 01/01/1901 First, what is the range of possible future volcanic events? Second, what is the probability of each type of volcanic event? is defined as the recurrence rate of volcanic events.

CHAPTER 6: HISTORY OF VOLCANISM STUDIES
LSN #: DN2001473452 Participant #: ALJ.20040511.4537 Document Date: 01/01/1901 The RIP computer code was used to compare releases of a simulated repository without volcanic events to releases for simulations using time histories including volcanic disruptive events.

DISCUSSION OF THE SIX NRC CONCERNS ON VOLCANISM
LSN #: DN2001441476 Participant #: ALA.20040128.0893 Document Date: 01/01/1901 DISCUSSION OF THE SIX NRC CONCERNS ON VOLCANISM. The limited evidence available points to volcanism being a waning process.

1983

SCR PART C VOLCANISM, SECTION 2.1.1 (C)
LSN #: DEN000017825 Participant #: NNA.19900629.0042 Document Date: 01/01/1983 SCR PART C VOLCANISM, SECTION 2.1.1 (C). 7(,os -7-U 7. 83.3,(SCR Part C Volcanism 2.1.1 Information Need STAt. This allows an identification of the more likely sites of future volcanism. z z n 0 0 N 0 0 a N

1986

NNWSI UNIT EVALUATION AT YUCCA MOUNTAIN, NEVADA TEST SITE: NEAR FIELD MECHANICAL CALCULATIONS USING A CONTINUUM JOINTED ROCK MODEL IN THE JAC CODE
LSN #: DN2000034322 Participant #: ALB.20040511.3679 Document Date:

01/01/1986 Department of Energy Forrestal Building Washington, DC 20585 S. A. Mann, Manager Crystalline Rock Project Office U.S. Department of Energy Post Office Box 14100 U.S. Nuclear Regulatory Commission Washington, D.C. 20555 V. M. Glanzman U.S.

1987

ROCK JOINT COMPLIANCE STUDIES
LSN #: DN2001490143 Participant #: ALA.20040127.2927 Document Date: 01/01/1987 ROCK JOINT COMPLIANCE STUDIES . J. E. Shaheen (RW-44) Outreach Programs Office of Policy, Integration, and Outreach U. S. Department of Energy Forrestal Building Washington, D. C. 20585 J. O. Neff Salt Repository Project Office U. S. Department of Energy

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT NUMERICAL ANAYLYSES OF THE G- TUNNEL SMALL-DIAMETER HEATER EXPERIMENTS
LSN #: DN2002085750 Participant #: ALA.20040307.5837 Document Date: 05/01/1987 Printed in the United States of America Available from National Technical Information Service U.S. Department of Commerce 5285 Port Royal Road Springfield, VA 22161 NTIS price codes Printed copy: A08 Microfiche copy: A01 ,

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT SPECIFICATION OF A TEST PROBLEM FOR HYDROCOIN LEVEL 3 CASE 2: SENSITIVITY ANALYSIS FOR DEEP DISPOSAL IN PARTIALLY SATURATED, FRACTURED TUFF
LSN #: DN2000284961 Participant #: ALK.20040511.4049 Document Date: 09/02/1987 Fracture -I0 -I0_2 -10"' -10 -10' -III' Pressure Head (m) Figure A6. Capacitance Coefficients for Vitric Unit Ev 10-3 10-4 10-5 a 10-6 E >, 10-7 U 10-a U 10-9 u 75 10-10 10-11 10-12 10-13 10-14 Fracture Conductivity I I Composite Conductivity

1988

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS, 1986 TO 1987, A BIBLIOGRAPHY, DOE/OSTI-3406 SUPPLEMENT 1 (THIS IS A CORRECTION TO NN1.19880803.0047) (C)
LSN #: DN2002139001 Participant #: MOL.20030804.0208 Document Date: 07/01/1988 Based on analyses of the confining pressures in the pillar and the joint movement near the room, it is concluded that the Topopah Spring unit is more suitable than the Calico Hills unit for the placement of a nuclear waste repository.

NUCLEAR WASTE POLICY ACT (SECTION 113) -- SITE CHARACTERIZATION PLAN, YUCCA MOUNTAIN SITE, NEVADA RESEARCH AND DEVELOPMENT AREA DOE/RW-0199 VOLUMES I - IX (C)

LSN #: DEN000873004 Participant #: HQO.19881201.0002 Document Date: 12/01/1988 . Table 8.3.3.2-2. General design constraints passed to Issue 1.11.

1989

DOE TECHNIQUES FOR DETERMINING PROBABILITIES OF EVENTS AND PROCESSES AFFECTING THE PERFORMANCE OF GEOLOGIC REPOSITORIES
LSN #: DN2001490694 Participant #: ALA.20040126.5082 Document Date: 06/01/1989 The possibility of volcanism cannot be ruled out entirely, however. No clear relation has been identified between these episodes and tectonic events. At the present time, we appear to be passing through such a period of unusually intense volcanism.

1992

DOE REFERENCE FILES FOR THE VOLCANISM ISSUE RESOLUTION WORKING GROUP (SCPB: N/A)
LSN #: DN2001654418 Participant #: MOL.19970129.0103 Document Date: 06/30/1992 LANL to PNL Transmittal of Crowe report 'Disruptive Event Transmitted with Analysis: Volcanism and Igneous Intrusion' NNA.900510.0107 ("Disruptive Event Analysis: Volcanism and Igneous #001 NNA.900510.0107 91--178 document

1993

DOE STATUS OF VOLCANIC HAZARD STUDIES FOR THE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
LSN #: DN2001480359 Participant #: ALA.20040319.0659 Document Date: 02/01/1993 If the events have an occurrence probability of > 10$ yr 1, a two-step logic will be used to assess the significance of the events. There are several key questions that must be answered to assess the risk of future volcanism.

NRC CNWRA 93-01S, 'NRC High-Level Radioactive Waste Research at the CNWRA January through June 1993'.
LSN #: NRC000014605 Participant #: ML033650178 Document Date: 08/12/1993 Volcanism research also provides support of NRC reactive work during the prelicensing stage.

1994

DOE PRELIMINARY DRAFT - VOLCANISM STATUS REPORT, SECTION VII: VOLCANIC RISK ASSESSMENT FOR THE POTENTIAL YUCCA MOUNTAIN SITE (C)
LSN #: DEN001269748 Participant #: MOL.20020530.0089 Document Date: 04/06/1994 First, what is the range of possible future volcanic events? Second, what is the probability of each type of volcanic event? is defined as the recurrence rate of volcanic events.

DOE NRC HLW RESEARCH ON VOLCANISM
LSN #: DEN000111037 Participant #: ALE.20040511.9062 Document Date: 04/20/1994 NRC HLW RESEARCH ON VOLCANISM. EVOLUTION OF VOLCANISM KTU'S GEOLOGY USER NEEDS DEVELOPMENT OF RES VOLCANISM PROJECTS Established 1989 by NMSS, Transmitted to RES January 1990 (Bernero to Beckjord letter) ^ C l: Analogue Studies of…

NRC CNWRA 94-013, 'Geophysics Review Topical Report: Application of Seismic Tomographic and Magnetic Methods to Issues in Basaltic Volcanism.'
LSN #: NRC000019647 Participant #: ML040160528 Document Date: 06/23/1994 CNWRA 94-013, "Geophysics Review Topical Report: Application of Seismic Tomographic and Magnetic Methods to Issues in Basaltic Volcanism.".

1995

NRC CNWRA 95-003, 'A Critical Review of Data in the CNWRA Volcanism Geographic Information System (GIS) Database.'
LSN #: NRC000022078 Participant #: ML040160675 Document Date: 01/13/1995 CNWRA 95-003, "A Critical Review of Data in the CNWRA Volcanism Geographic Information System (GIS) Database.". Type 5 KTUs are included, indicating that evaluation of the KTUs related to volcanism may require independent NRC research efforts.

DOE NRC HIGH-LEVEL RADIOACTIVE WASTE RESEARCH AT CNWRA JULY-DECEMBER 1994
LSN #: DN2002094408 Participant #: ALA.20040112.7066 Document Date: 02/01/1995 Key elements of the research design include the development of robust probability models for cinder cone volcanism and creation of a comprehensive database on cinder cone volcanism in the southwestern United States.

NRC Revised LA-12908-MS, 'Status of Volcanism Studies for the Yucca Mountain Site Characterization Project.'
LSN #: NRC000022042 Participant #: ML003746980 Document Date: 03/31/1995 First, what is the range of possible future volcanic events? Second, what is the probability of each type of volcanic event? The ~ is defined as the recurrence rate of volcanic events.

1996

DOE YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT LONG-RANGE PLAN B00000000-01717-4600-00061 REVISION 00 AUGUST 1996
LSN #: DN2001967932 Participant #: MOL.19970211.0056 Document Date: 08/01/1996 J P- 90 , "U- 40. ODC: Engineering judgement based on previous

development programs. This task will include the use of the fabrication specifications and methods to develop bottom up estimates.

1997

DOE SUMMARY OF THE DOE/NRC TECHNICAL EXCHANGE ON IGNEOUS ACTIVITY PROGRAM FEBRUARY 25-26, 1997; PVHA97TE
LSN #: DN2001463917 Participant #: ALI.20050308.9604 Document Date: 02/26/1997 SUMMARY OF THE DOE/NRC TECHNICAL EXCHANGE ON IGNEOUS ACTIVITY PROGRAM FEBRUARY 25-26, 1997; PVHA97TE NRC believes that an annual probability of 10-7/yr is a reasonably conservative upper 4. 7 , bound for extrusive events.

DOE PROJECT INTEGRATED SAFETY ASSESSMENT & 3.3.3 IGNEOUS ACTIVITY-VOLCANISM; Sec-3303
LSN #: DN2001363943 Participant #: ALC.20050302.8687 Document Date: 08/28/1997 PROJECT INTEGRATED SAFETY ASSESSMENT & 3.3.3 IGNEOUS ACTIVITY-VOLCANISM; Sec-3303 The study of volcanism also provides input to design with respect to the likelihood of ash-fall at the site.

DOE 1997. HILL AND TRAPP. CHAPTER 2, NRC ANNUAL REPORT. IGNEOUS ACTIVITY; VOLCAN97.WPD
LSN #: DEN001405815 Participant #: ALB.20040610.7027 Document Date: 02/11/1997 Misses own assertion that the volcanism id focused in those areas. Bottom line is that the P(volcanism effects) will be considered in PA. Disruption by volcanism prob calc may need a revisit.

DOE SUMMARY OF THE DOE/NRC TECHNICAL EXCHANGE ON IGNEOUS ACTIVITY PROGRAM FEBRUARY 25-26, 1997 ROCKVILLE, MD; PVHA97TE
LSN #: DN2001382207 Participant #: ALD.20050308.5894 Document Date: 02/26/1997 SUMMARY OF THE DOE/NRC TECHNICAL EXCHANGE ON IGNEOUS ACTIVITY PROGRAM FEBRUARY 25-26, 1997 ROCKVILLE, MD; PVHA97TE NRC believes that an annual probability of 10-7/yr is a reasonably conservative upper 4. bound for extrusive events.

1998

DOE ISSUE RESOLUTION STATUS REPORT DATED 03/27/1998 KEY TECHNIAL ISSUE IGNEOUS ACTIVITY SUMMARY OF THE KEY TECHNICAL ISSUE (KTI); prelimr5
LSN #: DN2001441783 Participant #: ALH.20050302.8634 Document Date: 03/27/1998 For example, the definition of an igneous event requires knowledge of recurrence rates to determine whether the event was singular or repeated.

DOE ISSUE RESOLUTION STATUS REPORT KEY TECHNICAL ISSUE IGNEOUS ACTIVITY REVISION 1 (C)

LSN #: DEN000704957 Participant #: MOL.19980909.0045 Document Date: 07/01/1998 Sensitivity to shifts in the locus of volcanism can be accomplished by weighing more recent (e.g., Pliocene and Quaternary) volcanic events more heavily than older (e.g., Miocene) volcanic events

DOE ISSUE RESOLUTION STATUS REPORT DATED JULY 16, 1998 KEY TECHNICAL ISSUE IGNEOUS ACTIVITY, REVISION 1 SUMMARY OF THE KEY TECHNICAL ISSUE (KTI); Igneous Activity R1 30 Day
LSN #: DN2001368543 Participant #: ALC.20050228.3012 Document Date: 07/16/1998 ISSUE RESOLUTION STATUS REPORT DATED JULY 16, 1998 KEY TECHNICAL ISSUE IGNEOUS ACTIVITY, REVISION 1 SUMMARY OF THE KEY TECHNICAL ISSUE (KTI); Igneous Activity R1 30 Day minimal risk from an igneous event at the proposed Yucca Mountain repository".

DOE YUCCA MOUNTAIN SITE DESCRIPTION; S-3-09
LSN #: DN2001299040 Participant #: ALD.20050228.5146 Document Date: 09/01/1998 The program to understand igneous activity and volcanism in the vicinity of Yucca Mountain supports the need to describe and assess the site (10 CFR 60.21(c)(1)) and to analyze the geology of the site (10 CFR 60.21(c)(I)(ii)(A)).

1999

DOE IgneousTechIssues
LSN #: DN2001389750 Participant #: ALE.20050214.1932 Document Date: 01/08/1999 Acceptance Criterion #2 (Probability) models must use definitions of igneous events consistently. Discussion in the IRSR has called each vent a separate event (p. 20) and this impacts igneous activity frequency of occurrence estimates.

DOE GEOTECHNICAL ISSUES RELEVANT TO IGNEOUS ACTIVITY SCENARIOS FOR DISRUPTIVE EVENTS; IgneousTechIssues
LSN #: DN2001368346 Participant #: ALC.20050220.7979 Document Date: 01/20/1999 GEOTECHNICAL ISSUES RELEVANT TO IGNEOUS ACTIVITY SCENARIOS FOR DISRUPTIVE EVENTS; IgneousTechIssues Acceptance Criterion #2 (Probability) models must use definitions of igneous events consistently.

DOE WM04 PaperR4
LSN #: DN2001078064 Participant #: ALB.20040618.2582 Document Date: 05/03/1999 The total system performance assessment then calculates the risk (annual radioactive dose) to a hypothetical individual at some distance from the repository disrupted by the igneous event.

DOE TEC3.10Q Rev K
LSN #: DN2000079754 Participant #: ALH.20040612.3123 Document Date: 05/17/1999 Input Data: Feeds to: V1230 Number of Packages Hit; Preparation

of Chapter 3 of the report, Consequences of Tectonic Events for Performance Assessment Responsible Organization: PAO Due Date: 30-Oct-99 Draft K, 06/06/04 2

DOE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT MODEL COVER SHEET DSNFAND OTHER WASTE FORM DEGRADATION ABSTRACTION; OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT MODEL COVER SHEET
LSN #: DEN001262850 Participant #: ALA.20040626.1797 Document Date: 06/30/1999 These groups are individual categories of spent fuel into one of w hich all D SN F types would fall for DBE and/or TSP A analysis purposes.

DOE ISSUE RESOLUTION STATUS REPORT KEY TECHNICAL ISSUE: IGNEOUS ACTIVITY; Irsr_dis
LSN #: DN2001076141 Participant #: ALT.20040617.0248 Document Date: 10/08/1999 ISSUE RESOLUTION STATUS REPORT KEY TECHNICAL ISSUE: IGNEOUS ACTIVITY; Irsr_dis In the Quaternary, the locus of volcanism shifted to the southern portion of the Coso volcanic field.

2000

DOE DISRUPTIVE EVENTS INTRODUCTION & TSPA-VA AS PRELUDE TO SR AND LA & STRUCTURE OF DE REPORT AND AMRS TO SUPPORT TRPA-SR VOLCANISM:; 1.17.00 DE for Lawyers
LSN #: DN2001219673 Participant #: ALA.20050216.4303 Document Date: 01/12/2000 DISRUPTIVE EVENTS INTRODUCTION & TSPA-VA AS PRELUDE TO SR AND LA & STRUCTURE OF DE REPORT AND AMRS TO SUPPORT TRPA-SR VOLCANISM:; 1.17.00 DE for Lawyers

DOE 1.17.00 DE for Lawyers
LSN #: DN2001390463 Participant #: ALE.20050308.5281 Document Date: 01/13/2000 1.17.00 DE for Lawyers. Structure of DE Report and AMRs to Support TSPA-SR Volcanism: Provide conceptual models and data for TSPA-SR modeling of two scenarios Volcanic Eruption (VA Direct Release) Igneous Intrusion Groundwater Transport (VA Enhanced

DOE CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM MANAGEMENT & OPERATING CONTRACTOR & UNSATURATED ZONE FLOW AND TRANSPORT MODEL PROCESS MODEL REPORT & TDR-NBS-HS-000002 REV 00 03/XX/2000; UZPMR2000-1to5_00
LSN #: DN2001022272 Participant #: ALC.20040611.1450 Document Date: 03/01/2000 Excavation Effects, Surface Roughness, and D rift Degradation Model Validation. 202 3.9.4.7 Seepage Threshold Prediction. 203 3.9.4.8 Summary Abstraction of Seepage into Drifts

NUMBER OF WASTE PACKAGES HIT BY IGNEOUS INTRUSION; mcneish3_13
LSN #: DEN001284097 Participant #: ALA.20040617.0256 Document Date: 03/13/2000 NUMBER OF WASTE PACKAGES HIT BY IGNEOUS INTRUSION; mcneish3_13

UZPMR2000-1to5_00
LSN #: DN2002027028 Participant #: ALD.20050228.9373 Document Date: 03/14/2000 Excavation Effects, Surface Roughness, and Drift Degradation Model Validation. 202 3.9.4.7 Seepage Threshold Prediction. 203 Summary Abstraction of Seepage into Drifts

3.10 VOLCANISM; 3-10draft32200figs-MLS
LSN #: DN2001334253 Participant #: ALA.20050325.9290 Document Date: 03/22/2000 Las Vegas, Nevada: CRWMS M&O. CRWMS M&O 2000. Characterize Framework for Igneous Activity at Yucca Mountain, Nevada. Needs Project CRWMS M&O 2000. Number of Waste Packages Hit by Igneous Intrusion.

ANALYSIS AND PRESENTATION OF IGNEOUS EVENTS IN UPCOMING PUBLIC DOCUMENTS; 2k-3-21 Volcanism Presentation
LSN #: DN2002026231 Participant #: ALO.20040612.8714 Document Date: 03/23/2000 ANALYSIS AND PRESENTATION OF IGNEOUS EVENTS IN UPCOMING PUBLIC DOCUMENTS; 2k-3-21 Volcanism Presentation events of low probability of occurrence (less than one chance in 10,000 over 10,000 years) can be excluded from the analysis 10 CFR 63.113(b)

2k-3-21 Volcanism Presentation
LSN #: DN2001326785 Participant #: ALA.20050401.7192 Document Date: 03/23/2000 expected annual dose to the average member of the critical group shall not exceed 25 mrem at any time during the first 10,000 years after permanent closure Highly improbable events treated the same as expected events

ANALYSES AND DEVELOPMENT OF CONCEPTUAL MODELS FOR DISRUPTIVE EVENTS; DE PMR Section 3 Rev 00C-COPY
LSN #: DN2001762147 Participant #: ALB.20040615.6003 Document Date: 04/01/2000 ANALYSES AND DEVELOPMENT OF CONCEPTUAL MODELS FOR DISRUPTIVE EVENTS; DE PMR Section 3 Rev 00C-COPY

CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM MANAGEMENT & OPERATING CONTRACTOR DISRUPTIVE EVENTS PROCESS MODEL REPORT; DE-PMR_Rev00B
LSN #: DN2001329553 Participant #: ALB.20040615.6208 Document Date: 04/07/2000 Discussions in this section describe more specifically how the

information in the Disruptive Events PMR and supporting documents address the individual igneous activity consequence acceptance criteria.

DOE CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM MANAGEMENT & OPERATING CONTRACTOR DISRUPTIVE EVENTS PROCESS MODEL REPORT; DE-PMR_Rev00B
LSN #: DN2001329553 Participant #: ALB.20040615.6208 Document Date: 04/07/2000 Discussions in this section describe more specifically how the information in the Disruptive Events PMR and supporting documents address the individual igneous activity consequence acceptance criteria.

DOE REVIEW COPY PLUS DIRS SHEETS FOR TDR-NBS-MD-000002, REVISION 00C, DISRUPTIVE EVENTS PROCESS MODEL REPORT (C)
LSN #: DN2002066708 Participant #: MOL.20000727.0006 Document Date: 04/13/2000 Summary of Disruptive Events AIRS Supporting Analysis of Volcanism Characterize Framework for Igneous Activity at Yucca Mountain, Nevada Number of Waste Packages Hit by Igneous Intrusion Volcanism FEPs in the Disruptive Events FEPs AMR

DOE CONCURRENCE DRAFT PLUS DIRS WITH COMMENTS FOR TDR-NBS-MD-000002, REVISION 00D, DISRUPTIVE EVENTS PROCESS MODEL REPORT (C)
LSN #: DN2002065054 Participant #: MOL.20000727.0016 Document Date: 04/26/2000 Discussions in this section describe more specifically how the information in the Disruptive Events PAM and supporting documents address the individual. igneous activity consequence acceptance criteria.

DOE FINAL CHECK AND BACKCHECK PLUS DIRS SHEETS WITH COMMENTS FOR TDR-NBS-MD-000002, REVISION 00E, DISRUPTIVE EVENTS PROCESS MODEL REPORT (C)
LSN #: DN2001593872 Participant #: JOL.20000727.0019 Document Date: 04/28/2000 Nevada, ' Igneous Consequence Consequences The models adequately account ' Characterize Framework for Igneous Activity at Yucca for changes in magma ascent characteristics and Mountain.

DOE P. SWIFT DRAFT OF 05/31/2000 & 3.10 VOLCANISM; 3-10draft53100MLS
LSN #: DN2001336964 Participant #: ALA.20050325.9311 Document Date: 05/31/2000 Las Vegas, Nevada: CRWMS M&O. CRWMS M&O 2000. Characterize Framework for Igneous Activity at Yucca Mountain, Nevada. Needs Project CRWMS M&O 2000. Number of Waste Packages Hit by Igneous Intrusion.

DOE 3. ANALYSES AND DEVELOPMENT OF CONCEPTUAL MODELS FOR DISRUPTIVE EVENTS; DEPMRICN1sec3_yxiang
LSN #: DN2001208592 Participant #: ALA.20050324.3998 Document Date:

07/01/2000 ANALYSES AND DEVELOPMENT OF CONCEPTUAL MODELS FOR DISRUPTIVE EVENTS; DEPMRICN1sec3_yxiang Disruptive events FEPs represent natural systems processes that have the potential to significantly affect repository performance events.

DOE PREVIOUS DISRUPTIVE EVENTS WORK AND TSPA APPROACH FOR SITE RECOMMENDATION; Final-Sec 2 prt 1 REV 00 ICN 02
LSN #: DN2001415295 Participant #: ALF.20050302.3033 Document Date: 07/01/2000 This represents the intrusive phase of volcanism that is common to both eruptive and intrusive events. Figure 2-5 is the event tree for waste entrainment in a volcanic ash cloud during an eruptive event.

DOE DISRUPTIVE EVENTS PROCESS MODEL REPORT FOR TDR-NBS-MD-000002, REVISION 00, ICN 01 - APPROVED (C)
LSN #: DN2001620634 Participant #: MOL.20000727.0085 Document Date: 07/27/2000 Discussions in this section describe more specifically how the information in the Disruptive Events PMR and supporting documents addresses the individual igneous activity consequence acceptance criteria.

DOE IGNEOUS ACTIVITY PROBABILITY SUBISSUE; Perry-trc
LSN #: DN2001206622 Participant #: ALA.20050318.7138 Document Date: 08/31/2000 IGNEOUS ACTIVITY PROBABILITY SUBISSUE; Perry-trc . U.S. Department of Energy Office of Civilian Radioactive Waste Management Igneous Activity Probability Subissue Presented to: DOE-NRC Technical Exchange Meeting Igneous Activity KTI Presented by:

DOE Final-Sec 2 prt 1 REV 00 ICN 02
LSN #: DN2002016997 Participant #: ALB.20050426.0236 Document Date: 09/12/2000 This represents the intrusive phase of volcanism that is common to both eruptive and intrusive events. Figure 2-5 is the event tree for waste entrainment in a volcanic ash cloud during an eruptive event.

DOE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT ANALYSIS/MODEL COVER SHEET CLAD DEGRADATION FEPS SCREENING ARGUMENTS; OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT ANALYSIS/MODEL COVER SHEET CLAD DEGRADATION FEPS SCREENING ARGUMENTS
LSN #: DEN001290021 Participant #: ALA.20040626.2305 Document Date: 10/01/2000 Screening Decision : Include Screening Argument: ANL-W IS-MD-000008 R EV 00 IC N 01 59 April October 2000 , Localized corrosion is included as a perforation mechanism in the CS N F Cladding Degradation Component.

NRC ANL-WIS-MD-000005, Rev 00, ICN 1, 'Features, Events, and Processes: Screening for Disruptive Events.'

LSN #: NRC000001983 Participant #: ML010400431 Document Date: 11/10/2000 ANL-WIS-MD-000005, Rev 00, ICN 1, "Features, Events, and Processes: Screening for Disruptive Events.".

DOE VOLCANISM FEPS IN THE AMR FEATURES, EVENTS, AND PROCESSES & SEISMICITY AND STRUCTURAL DEFORMATION FEPS IN THE AMR FEATURES, EVENTS, AND PROCESSES: DISRUPTIVE EVENTS
LSN #: DN2001903282 Participant #: ALA.20040302.7446 Document Date: 12/01/2000 PREVIOUS DISRUPTIVE EVENTS WORK AND TSPA APPROACH FOR SR Features, Events, and Processes Analysis for Disruptive Events SUMMARY OF DISRUPTIVE EVENTS AMRs SUPPORTING ANALYSIS OF VOLCANISM Number of Waste Packages Hit by Igneous Intrusion

DOE TECHNICAL BASIS FOR RESOLUTION OF THE IGNEOUS ACTIVITY KEY TECHNICAL ISSUE; ML0119302540
LSN #: DN2001066523 Participant #: ALF.20040618.4086 Document Date: 12/01/2000 Radioactive release associated with intrusive, igneous events is through hydrologic flow and transport, rather than through direct transport by volcanic processes.

DOE DISRUPTIVE EVENTS PROCESS MODEL REPORT, TDR-NBS-MD-000002, REVISION 00, ICN 02 (C)
LSN #: DN2001640006 Participant #: MOL.20001220.0047 Document Date: 12/01/2000 Discussions in this section describe more specifically how the information in the Disruptive Events PMR and supporting documents addresses the individual igneous activity consequence acceptance criteria.

DOE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT ANALYSIS/MODEL COVER SHEET TOTAL SYSTEM PERFORMANCE ASSESSMENT (TSPA) MODEL FOR SITE RECOMMENDATION & OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT ANALYSIS/MODEL REVISION RECORD & ATTACHMENT I GOLDSIM GRAPHICAL ELEMENTS & ATTACHMENT II SEEPDLL AVERAGE SEEPAGE FLUX AND SEEPAGE FRACTION & ATTACHMENT III SOILEXP SOIL EROSION DLL & ATTACHMENT IV SOFTWARE ROUTINE T2-BINNING V. 1.0 & ATTACHMENT V SOFTWARE ROUTINE WT-BINNING V. 1.0 & ATTACHMENT VI SOFTWARE ROUTINE MAKEPTRK V. 2.0 & ATTACHMENT VII PREWAP SOFTWARE ROUTINE REPORT & ATTACHMENT VIII TSPA-SR MODEL DATA SUBMITTAL `README' FILE & ATTACHMENT IX DLL OUTPUT FILES FOR MODEL VALIDATION; tspa_mr.pdf
LSN #: DN2000295911 Participant #: ALC.20040610.2260 Document Date: 12/06/2000 The seepage flow for a given realization is then randomly sampled from the Beta distribution using a random number (r) generated by the seeped ll routine.

NRC Technical Basis for Resolution of the Igneous Activity Key Technical Issue.
LSN #: NRC000028123 Participant #: ML043440617 Document Date: 12/14/2000

Sensitivity to shifts in the locus of volcanism can be accomplished by weighing more recent (e.g., Pliocene and Quaternary) volcanic events more heavily than older (e.g., Miocene) volcanic events

DOE 25792
LSN #: DN2002024980 Participant #: ALF.20050208.5711 Document Date: 12/19/2000
25792. Features, Events and Processes: Disruptive Events Primary FEP: Igneous Activity The effects of changes in groundwater temperature (as reflected by hydrothermally driven mass transfer) are discussed in the FEP "Hydrologic response to igneous

NRC 'Technical Basis for Resolution of Igneous Activity Key Technical Issue.'
LSN #: NRC000011002 Participant #: ML011930254 Document Date: 12/31/2000
Technical Basis for Resolution of Igneous Activity Key Technical Issue.". 3.1.2.2 Summary There is no one generally accepted criterion to singularly define an igneous event.

2001

DOE DRIFT-SCALE COUPLED PROCESSES (DRIFT-SCALE TEST AND THC SEEPAGE) MODELS & FIGURE 91. TH SIMULATION (TPTPLL VERSUS TPTPMN). TIME PROFILES OF MODELED AIR MASS FRACTIONS IN THE GAS PHASE IN FRACTURES (SIMILAR IN MATRIX) AT THREE DRIFT WALL LOCATIONS.; 201-Atts
LSN #: DN2001026276 Participant #: ALI.20040615.5544 Document Date: 01/01/2001
DRIFT-SCALE COUPLED PROCESSES (DRIFT-SCALE TEST AND THC SEEPAGE) MODELS & FIGURE 91. TH SIMULATION (TPTPLL VERSUS TPTPMN). Drift-Scale Coupled Processes (Drift-Scale Test and THC Seepage) Models N0120/U0110 153288 LL001100931031.008.

DOE DE ANL-WIS-MD-000005 REV 00 ICN 1.doc
LSN #: DN2000286848 Participant #: ALB.20040610.5612 Document Date: 02/21/2001 DE ANL-WIS-MD-000005 REV 00 ICN 1.doc. Features, Events and Processes: Disruptive Events Primary FEP: Igneous Activity (continued) The effects of changes in groundwater temperature (as reflected by hydrothermally-thermally driven mass transfer) are

DOE MTS PRELIMINARY DRAFT; Models List NFE
LSN #: DN2001092159 Participant #: ALC.20040612.6661 Document Date: 03/09/2001 Concluded that a measured water and gas compositions f or the DST. This is shown with simulations of the DST (Section 6.2.7), kinetic data f or mineral-water reactions, and models and parameter sets f or 3.3.1; THC AMR Sect.

DOE YUCCA MOUNTAIN PRELIMINARY SITE SUITABILITY EVALUATION, PRELIMINARY DRAFT C,E. SMISTAD COMMENTS (C)

LSN #: DEN001322205 Participant #: MOL.20020611.0089 Document Date: 06/08/2001 The probability of disruption of the repository by a conduit (eruptive event) was calculated in the report Characterize Framework for Igneous Activity at Yucca Mountain, Nevada (CRWMS M&O 2000ak).

ENCLOSURE SUMMARY HIGHLIGHTS OF NRC/DOE TECHNICAL EXCHANGE AND MANAGEMENT MEETING ON IGNEOUS ACTIVITY JUNE 21-22, 2001 LAS VEGAS NEVADA ATTACHMENT 1 SUMMARY OF THE RESOLUTION OF THE KEY TECHNICAL ISSUE ON IGNEOUS ACTIVITY - AGREEMENTS REACHED & ATTACHMENT 2 SUMMARY OF THE RESOLUTION OF THE KEY TECHNICAL ISSUE ON IGNEOUS ACTIVITY - AGREEMENTS NOT REACHED & ATTACHMENT 3 CHANGES TO EXISTING IGNEOUS ACTIVITY NRC/DOE AGREEMENTS & ATTACHMENT 4 AGENDA IGNEOUS ACTIVITY TECHNICAL EXCHANGE 06/21/2001-06/22/2001 & ATTACHMENT 5 TECHNICAL EXCHANGE - IGNEOUS ACTIVITY THURSDAY, 06/21/2001 & ATTACHMENT 6 PRESENTER'S SLIDES OVERVIEW OF IGNEOUS ACTIVITY; NRC summry of 6-01 TE on Igneous.tif
LSN #: DN2002013348 Participant #: ALA.20040610.7021 Document Date: 06/22/2001 loss from leaching and thus leads to reduced re-suspension of radionuclides. He concluded that volcanism is episodic and that a temporal link exists between volcanism in the Lunar Crater-Crater Flat areas.

YUCCA MOUNTAIN PRELIMINARY SITE SUITABILITY EVALUATION, PRELIMINARY DRAFT H,EXECUTIVE SUMMARY WITH INCORPORATED COMMENTS FROM J. YOUNKER AND SRT (C)
LSN #: DEN001325314 Participant #: MOL.20020611.0200 Document Date: 07/10/2001 Four proposed criteria, 10 CFR through identify four potentially disruptive events: 1. Volcanism 2. Seismic events 3. Nuclear criticality 4. Inadvertent human intrusion. Seismic Events-The TSPA model forecasts no releases from seismic events.

REVIEW OF TWO PAPERS DESCRIBING POSSIBLE DISRUPTION OF A NUCLEAR WASTE REPOSITORY AT YUCCA MOUNTAIN BY SHOCK WAVES OR PYROCLASTIC DEBRIS FROM A DIKE INTRUSION INTO THE REPOSITORY.; Woods--Yucca Mtn
LSN #: DN2001021966 Participant #: ALH.20040615.3233 Document Date: 09/05/2001 Bokhove, Onno, and Andrew W. Woods, 2001, Explosive magma-air interactions by volatile-rich basaltic melts in a dike-drift geometry. Are there any examples of basaltic fissure eruptions initiating with shock waves?

SUMMARY OF RECENT INFORMATION RELEVANT TO DISRUPTIVE EVENTS VOLCANISM AND SEISMICITY & ATTACHMENT A SUMMARY FIGURE TABLES FOR IGNEOUS-RELATED AMRS & ATTACHMENT B SUMMARY OF RELATIONSHIPS OF SEISMIC-RELATED AMRS; DETUILRREV00A

LSN #: DN2001838556 Participant #: ALN.20040617.9198 Document Date: 10/15/2001 SUMMARY OF RECENT INFORMATION RELEVANT TO DISRUPTIVE EVENTS VOLCANISM AND SEISMICITY & ATTACHMENT A SUMMARY FIGURE TABLES FOR IGNEOUS-RELATED AMRS & ATTACHMENT B SUMMARY OF RELATIONSHIPS OF SEISMIC-RELATED AMRS; DETUILRREV00A

volcseis.doc
LSN #: DN2000972514 Participant #: ALB.20040610.4639 Document Date: 10/15/2001 This new information has the potential to influence the calculation of the probability of an igneous event and the potential to help evaluate the conservatism and, as needed, to alter the existing modeling of potential consequences of such an event.

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT MODEL COVER SHEET DSNF AND OTHER WASTE FORM DEGRADATION ABSTRACTION
LSN #: DN2001849478 Participant #: ALP.20040617.5417 Document Date: 12/21/2001 These groups are individual categories of spent fuel into one of which all DS NF types would fall for DBE and/or TSP A analysis purposes.

2002

REVISION 00B OF TECHNICAL REPORT, TDR-NBS-GS-000027 REVISION 00, FOR NATURAL ANALOGUE SYNTHESIS REPORT, BY AM SIMMONS, WITH STEVE HARRIS REVIEW COMMENTS (C)
LSN #: DEN001441862 Participant #: MOL.20020320.0250 Document Date: 02/08/2002 REVISION 00B OF TECHNICAL REPORT, TDR-NBS-GS-000027 REVISION 00, FOR NATURAL ANALOGUE SYNTHESIS REPORT, BY AM SIMMONS, WITH STEVE HARRIS REVIEW COMMENTS (C). ulvospinel (Fe;,TiO4) and ilmenite (Fe/ti0). The Canadian nuclear waste disposal concept

PLANNING FOR DISRUPTIVE EVENTS DEPARTMENT AR CHARACTERIZE FRAMEWORK FOR IGNEOUS ACTIVITY AT YUCCA MOUNTAIN, NEVADA & TASK SHEET: PRODUCTION OF ANALYSIS REPORT; 3.5.02 AR Igneous Frmwk1
LSN #: DN2001835979 Participant #: ALC.20050220.7806 Document Date: 03/14/2002 PLANNING FOR DISRUPTIVE EVENTS DEPARTMENT AR CHARACTERIZE FRAMEWORK FOR IGNEOUS ACTIVITY AT YUCCA MOUNTAIN, NEVADA & TASK SHEET: PRODUCTION OF ANALYSIS REPORT; 3.5.02 AR Igneous Frmwk1

2003

DTNs status as Post-PVAR with Roadmap
LSN #: DEN001502692 Participant #: ALU.20040617.9295 Document Date: 01/29/2003 DRIFT SCALE TEST - THERMO- THC S IMULATIONS OF

THE HYDROLOGIC CHEMICAL DRIFT SCALE TEST AND LB0108DSTTHC01.002 SIMULATIONS - VARIABLE T, Synthetic W ater /// THC S EEPAGE MODEL: 2. PCO2, AND PERCHED W ATER INPUT /OUTPUT FILES 10 SCENARIOS.

DOE Conservatism Report; tbl Conservatism Review
LSN #: DEN001275969 Participant #: ALB.20040618.1684 Document Date: 03/31/2003 UZ Conservative All seepage into drift is counted (not jus t seepage above waste package) A mount of seepage w as thought to be more defensible than the seepage locations in the model

.

DOE DRIFT-SCALE COUPLED PROCESSES (DST AND TH SEEPAGE) MODELS; U0240-Rev00E_redline 10_03_03
LSN #: DN2001059218 Participant #: ALC.20040618.1330 Document Date: 04/01/2003 Obviously, more complex abstraction models--giving rise to less seepage--are also MDL-NBS-HS-000015 REV 00E 128 April 2003 , Drift-Scale Coupled Processes (DST and TH Seepage) Models possible.

DOE FEATURES, EVENTS, AND PROCESSES: DISRUPTIVE EVENTS, ANL-WIS-MD-000005, REVISION 01A, QER CHECK COPY, MARKUP AND DIRS: COMMENTS, RESPONSES AND ACCEPTANCES-K MCFALL (C)
LSN #: DN2001635901 Participant #: MOL.20040112.0184 Document Date: 07/04/2003 FEATURES, EVENTS, AND PROCESSES: DISRUPTIVE EVENTS, ANL-WIS-MD-000005, REVISION 01A, QER CHECK COPY, MARKUP AND DIRS: COMMENTS, RESPONSES AND ACCEPTANCES-K MCFALL (C) . conducted and documented in Chapter 10 of the TSPA for the Viability Assessment

DOE AP-2.14Q CONCURRENCE COPY/QER INTERIM FINAL CHECK COPY REVISION 02D OF MODEL REPORT N0120/U0110, MDL-NBS-HS-000001 REVISION 02, DRIFT-SCALE COUPLED PROCESSES (DST AND THC SEEPAGE) MODELS, BY N SPYCHER (C)
LSN #: DN2001094671 Participant #: MOL.20031001.0334 Document Date: 07/29/2003 Output files of simulations with the reactive transport model TOUGHREACT V2.4 (LBNL 2001 [160880]S. Each simulation contains the output files CHEMICAL.OUT, FLOW.OUT, SOLUTE.OUT, TEC_CONC.DAT, TEC GAS.DAT, and TEC MIN.DAT.

DOE SITE-SCALE SATURATED ZONE FLOW MODEL, MDL-NBS-HS-000011, REV 01C, DRAFTS, BACKCHECK COPY WITH LEIGH LECHEL COMMENTS WITH DIRS (C)
LSN #: DN2000211218 Participant #: MOL.20031218.0206 Document Date: 08/13/2003 SITE-SCALE SATURATED ZONE FLOW MODEL, MDL-NBS-HS-000011, REV 01C, DRAFTS, BACKCHECK COPY WITH LEIGH LECHEL COMMENTS WITH DIRS (C) . (1996 [100465 f^ pp '0-32) indicate that there are no long-term consistent trends in the data from wells at Yucca

DOE REQUEST FOR ADDITIONAL INFORMATION -- IGNEOUS ACTIVITY AGREEMENT 1.02: U.S. DEPARTMENT OF ENERGY POSITION ON VOLCANIC HAZARD AT YUCCA MOUNTAIN AND PLANS FOR CONFIRMATORY STUDIES; DOE-NRC Letter REV IA 1.02 RAI Rev 00U
LSN #: DN2001192570 Participant #: ALG.20040618.7470 Document Date: 08/13/2003 In addition, a model of waning volcanism in the region is strongly supported by a pattern of decreasing volcanism, rather than the single event that forms the basis for the NRC's interpretation.

DOE FEATURES, EVENTS AND PROCESSES IN SZ FLOW AND TRANSPORT; ANL-NBS-MD-chckB Doc Sept12
LSN #: DN2001021863 Participant #: ALD.20040617.5341 Document Date: 09/01/2003 Silicic volcanism (magmatism) is an early phase event in the development of crustal features. Silicic volcanism (magmatism) is an early phase event in the development of crustal features.

DOE DIKE/DRIFT INTERACTIONS MODEL REPORT; DDI_2_of_8 FINALb changes.doc
LSN #: DN2001013792 Participant #: ALA.20040610.2689 Document Date: 09/01/2003 DIKE/DRIFT INTERACTIONS MODEL REPORT; DDI_2_of_8 FINALb changes.doc It might be argued that such interactions with a basaltic magma would be more energetic due to the higher magma temperature of the magma.

DOE SAND 2003-3056J REPORT ON CONSIDERATION OF THE POTENTIAL FOR IGNEOUS INTRUSION TO PROMOTE CRITICALITY OF SPENT NUCLEAR FUEL DISPOSED IN UNSATURATED TUFF (C)
LSN #: DN2001694040 Participant #: MOL.20040516.0153 Document Date: 09/23/2003 One might hypothesize that volcanism plays a role similar to disruptive events in conventional probabilistic risk assessments (PRAs) of engineered systems such as nuclear reactors.

DOE CONSIDERATION OF THE POTENTIAL FOR IGNEOUS INTRUSION TO PROMOTE CRITICALITY OF SPENT NUCLEAR FUEL DISPOSED IN UNSATURATED TUFF
LSN #: DN2001697928 Participant #: MOL.20040607.0025 Document Date: 09/25/2003 One might hypothesize that volcanism plays a role similar to disruptive events in conventional probabilistic risk assessments (PRAs) of engineered systems such as nuclear reactors.

DOE IGNEOUS ACTIVITY AGREEMENT 1.02: U.S. DEPARTMENT OF ENERGY POSITION ON VOLCANIC HAZARD AT YUCCA MOUNTAIN AND PLANS FOR CONFIRMATORY STUDIES & ENCLOSURE REQUEST FOR ADDITIONAL INFORMATION - IGNEOUS ACTIVITY AGREEMENT 1.02 - PHASED ANALYSIS AND DATA COLLECTION PLAN; DOE-NRC Letter REV IA 1.02 RAI Rev 00W-

rry_fvp
LSN #: DN2001198360 Participant #: ALB.20040618.2654 Document Date: 10/01/2003 OVERNIGHT MAIL & REQUEST FOR ADDITIONAL INFORMATION - IGNEOUS ACTIVITY AGREEMENT 1.02: U.S. The NRC staff has suggested that a new period of volcanism in the region has been initiated.

DOE TECHNICAL BASIS DOCUMENT & KTI ISSUES TRACKING; Open Items Volcanism
LSN #: DEN001456087 Participant #: ALN.20040612.5780 Document Date: 10/03/2003 TECHNICAL BASIS DOCUMENT & KTI ISSUES TRACKING; Open Items Volcanism Volcanism TBD BSC 2003. Features, Events, and Processes: Disruptive Events. Volcanism TBD BSC 2003. Number of Waste Packages Hit by Igneous Intrusion.

DOE SCIENTIFIC ANALYSIS COVER SHEET FOR FEATURES, EVENTS AND PROCESSES IN SZ FLOW AND TRANSPORT, ANL-NBS-MD-000002 REVISION 02E, DRAFT, 2.14 REVIEW COPY (C)
LSN #: DN2001632090 Participant #: MOL.20040130.0501 Document Date: 10/15/2003 BSC 2003 [161836], Section Volcanism and igneous activity within the Yucca Mountain region is now in a relatively quiescent phase; any future igneous activity in the Yucca Mountain region will be basaltic in origin.

DOE IGNEOUS AND VOLCANIC EVENTS; Intro to 2_3_13
LSN #: DN2001051890 Participant #: ALM.20040617.1678 Document Date: 10/21/2003 The model for igneous and volcanic events is defined as an igneous scenario class covering two modeling cases. The early period of Miocene silicic volcanism in the southwestern Nevada volcanic …

DOE QER BACKCHECK COPY REVISION 00B (WITH COMMENTS AND RESPONSES) OF MODEL REPORT U0065, MDL-NBS-HS-000020 REVISION 00, PARTICLE TRACKING MODEL AND ABSTRACTION OF TRANSPORT PROCESSES, BY BRUCE ROBINSON (WITH DIRS REPORT) (C)
LSN #: DN2000234628 Participant #: MOL.20040210.0247 Document Date: 10/29/2003 Eq. 6-2) n (Random number=0.82 . 0.5 a 2 0 d a 3 U Particle Residence Time MDL-NBS-HS-000020 REV OOB 41 October 2003

DOE EDayAP-2-14Q Review CopyE_SZ FEPs 1029
LSN #: DN2002011248 Participant #: ALB.20050315.5917 Document Date: 11/03/2003 BSC 2003 [161836], Section 6.2). Volcanism and igneous activity within the Yucca Mountain region is now in a relatively quiescent phase; any future igneous activity in the Yucca Mountain region will be basaltic in origin.

DOE Introduction to 2.3.13, Impact on TBD #13, request for detailed Framework AMR probability results to be in Section 2.2.2.2

LSN #: DN2001065385 Participant #: ALL.20040617.6245 Document Date: 11/05/2003 Laboratory data, field work and natural analog data provide an direct or indirect technical basis for the TSPA-LA conceptual model and parameters necessary to model igneous and volcanic events.

2004

DOE ASPECTS OF IGNEOUS ACTIVITY SIGNIFICANT TO A REPOSITORY AT YUCCA MOUNTAIN, NEVADA (DRAFT) (MARK-UP) (C)
LSN #: DN2001689480 Participant #: MOL.20040524.0673 Document Date: 01/19/2004 The total system performance assessment then calculates the risk (annual radioactive dose) to a hypothetical individual at some distance from the repository disrupted by the igneous event.

DOE WM04 PaperR4
LSN #: DEN001283429 Participant #: ALA.20040617.5591 Document Date: 01/23/2004 The total system performance assessment then calculates the risk (annual radioactive dose) to a hypothetical individual at some distance from the repository disrupted by the igneous event.

DOE FIGURE 1.2-1 FIGURE 6.2-1 FIGURE 6.2-2 FIGURE 6.2-3 SCIENTIFIC ANALYSIS COVER SHEET & 2. SCIENTIFIC ANALYSES TITLE FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT; ANL-NBS-MD-000002 REV02H_02-01-04_KME
LSN #: DN2001060448 Participant #: ALA.20040621.2633 Document Date: 02/01/2004 ExcludedLow consequence Screening Decision: 1.2.10.02.0A, 1.2.06.00.0A, 1.2.04.07.0A Related FEPs: Screening Argument: Volcanism and igneous activity within the Yucca Mountain region has undergone two developmental phases.

DOE WM04 PaperR4
LSN #: DN2001067741 Participant #: ALA.20040621.2753 Document Date: 02/09/2004 The total system performance assessment then calculates the risk (annual radioactive dose) to a hypothetical individual at some distance from the repository disrupted by the igneous event.

DOE 06/06/2004-DRAFT DRAFT ASPECTS OF IGNEOUS ACTIVITY SIGNIFICANT TO A REPOSITORY AT YUCCA MOUNTAIN, NEVADA; WM04 PaperR3
LSN #: DEN001233832 Participant #: ALD.20040618.6014 Document Date: 03/04/2004 The total system performance assessment then calculates the risk (annual radioactive dose) to a hypothetical individual at some distance from the repository disrupted by the igneous event.

DOE FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT
LSN #: DN2001097292 Participant #: DOC.20040329.0004 Document Date: 03/26/2004 FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT As extension rates declined, silicic volcanism was replaced with basaltic volcanism. Post-caldera building igneous activity within the Yucca Mountain peaked approximately 7 m.y.a.

DOE Enclosure 1 wo DOE by grp R1
LSN #: DN2001147533 Participant #: ALA.20040621.7376 Document Date: 03/30/2004 Enclosure 1 wo DOE by grp R1. Enclosure 1 Changes to KTI Agreement Response Schedule (sorted by response group and date to NRC) Revised Date to KTI Agreement Description Date to NRC NRC Effectiveness of the PTn to dampen episodic flow, including…

DOE ARGUMENTS FOR EXCLUSION OF FEATURES, EVENTS, AND PROCESSES TABLE; SAR 2.2 Exclusion Table revised050304
LSN #: DN2002074624 Participant #: ALD.20040824.5921 Document Date: 05/03/2004 Therefore, the probability of criticality for this igneous disruptive event FEP is considered negligible and is set to zero. As extension rates declined, silicic volcanism was replaced with Igneous basaltic volcanism.

DOE 2.3.11 IGNEOUS EVENTS; SAR2311outline
LSN #: DN2001749738 Participant #: ALA.20040826.1855 Document Date: 05/17/2004 2.3.11 IGNEOUS EVENTS; SAR2311outline . 2.3.11 Igneous Events 2 .3 .1 1 .2.7 Seepage Reaction with Cooled Basalt 2.3.11.1 System Description and Integration 2. 3. 1 1.2.7.1 Formulation Coupling of Models 2. 3. 1 1.2.7.2 Abstraction Probability 2 .3

DOE ROUGH DRAFT BSC/DOE VOLCANISM POSITION TO NRC; Volcanism Path forwrd WP Draft
LSN #: DN2001077965 Participant #: ALD.20040618.6782 Document Date: 06/06/2004 ROUGH DRAFT BSC/DOE VOLCANISM POSITION TO NRC; Volcanism Path forwrd WP Draft Rough Draft BSC/DOE Volcanism Position to NRC Introduction Volcanism is the number 1 risk to TSPA compliance for LA.

DOE DRAFT K ANALYSIS AND MODEL REPORTS SUPPORTING TECTONIC HAZARDS PMR; TEC3.10Q Rev K
LSN #: DN2000123350 Participant #: ALA.20040617.0424 Document Date: 06/10/2004 Input Data: Feeds to: V1230 Number of Packages Hit; Preparation of Chapter 3 of the report, Consequences of Tectonic Events for Performance Assessment Responsible Organization: PAO Due Date: 30-Oct-99 Draft K, 06/10/04 2

DOE ATTACHMENT IV ADDRESSING YUCCA MOUNTAIN REVIEW PLAN FINAL REPORT ACCEPTANCE CRITERIA RELATED TO SITE

CHARACTERIZATION, IDENTIFICATION OF EVENTS WITH PROBABILITIES GREATER THAN 10^(-8) PER YEAR, AND VOLCANIC DISRUPTION OF WASTE PACKAGES; ATTACHMENT IV
LSN #: DN2001761199 Participant #: ALA.20040903.3191 Document Date: 07/13/2004 The parameters developed in this report and needed in the analysis of volcanic disruption of waste packages are the results of calculations of the length and orientation of dikes and the number of eruptive centers within the repository.

DOE FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT; RIT_ANL-NBS-MD-000002_10-06-04PM_arnold
LSN #: DN2002016112 Participant #: ALC.20050324.0816 Document Date: 09/01/2004 ExcludedLow consequence Screening Decision: Screening Argument: 336 Volcanism and igneous activity within the Yucca Mountain region have undergone two 337 developmental phases.

2005

DOE 3.10 VOLCANISM; Section 3-10a Redline
LSN #: DN2001323768 Participant #: ALA.20050328.4539 Document Date: 02/23/2005 Perry, F.V. and Bowker, L.M. 1998. "Petrologic and Geochemical Constraints on Basaltic Volcanism in the Great Basin." Las Vegas, Nevada: CRWMS M&O. CRWMS M&O 2000. Characterize Framework for Igneous Activity at Yucca Mountain, Nevada.

DOE ANALYSIS AND MODEL REPORTS SUPPORTING TECTONIC HAZARDS PMR; TEC3.10QMay14
LSN #: DN2000877896 Participant #: ALD.20050308.3487 Document Date: 02/17/2005 Input Data: Feeds to: V1230 Number of Packages Hit; Preparation of Chapter 3 of the report, Consequences of Tectonic Events for Performance Assessment Responsible Organization: Performance Assessment (Barr) Due Date: 30-Oct-99 Draft F 02/17/05 2 ,

DOE DRAFT TEXT DE REPORT DISRUPTIVE EVENTS REPORT FIRST DRAFT; Disruptive Events Report
LSN #: DN2002017840 Participant #: ALB.20050325.5431 Document Date: 03/12/2005 Estimates of the dose consequences of igneous activity on the proposed Yucca Mountain high-level radioactive waste repository will be acceptable provided that:" 2-8 Refs for AMRs or calculations and 9NUREG-1563.

DOE IA Criteria
LSN #: DN2001246930 Participant #: ALA.20050423.7581 Document Date: 04/08/2005 IA Criteria. rate or probability of basaltic volcanism should reflect the clustered nature of basaltic volcanism and shifts in the locus of basaltic volcanism through time.

Re: Revised IRSR 'GODO' Database & 'Introduction'; All IRSRs
LSN #: DN2002066795 Participant #: ALA.20050426.8571 Document Date: 04/09/2005 Re: Revised IRSR "GODO" Database & "Introduction"; All IRSRs . igneous activity in the YMR will be acceptable provided that: - The models are consistent with observed patterns of volcanic vents and related igneous features in the YMR." 499,"IRSR, Rev

DESIGN DOCUMENT (DD) FOR GMFIX V1.61 (C)
LSN #: DN2002195737 Participant #: MOL.20050817.0094 Document Date: 05/09/2005 The exact position of the first Mach disc will be measured when the internal structures at the first Mach disc do not display any significant changes in time (i.e., have reached a local and internal steady state), at -1.0x10.2 s.

IIRSR Review Section 5.1.3.02 (Volcanic Events)(3)LTS
LSN #: DN2002045069 Participant #: ALA.20050722.5802 Document Date: 05/21/2005 IIRSR Review Section 5.1.3.02 (Volcanic Events)(3)LTS. Project studies show the stability November 5, IA.1.01 November 5, 5.2.1.5.3.2 Analysis Process values as high as 10-6 per year using Bayesian estimates 5.1.2.2-2 and 2004, CCU IA.1.02 2003, CCU

FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT, BIOSHERE REFS UPDATE, REFS UPDATE, AUGUST 2005 (C)
LSN #: DN2002244629 Participant #: MOL.20060613.0109 Document Date: 08/01/2005 Screening Decision: Excluded-Low consequence Screening Argument: Volcanism and igneous activity within the Yucca Mountain region have undergone two developmental phases.

ANL-NBS-MD-000002_8-17-05_REVG_accept
LSN #: DN2002186296 Participant #: ALB.20051018.2833 Document Date: 08/18/2005 ExcludedLow consequence Screening Decision: Screening Argument: Volcanism and igneous activity within the Yucca Mountain region have undergone two developmental phases.

FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT
LSN #: DN2002193336 Participant #: DOC.20050822.0012 Document Date: 08/20/2005 FEATURES, EVENTS, AND PROCESSES IN SZ FLOW AND TRANSPORT. Screening Decision: Excluded-Low consequence Screening Argument: Volcanism and igneous activity within the Yucca Mountain region have undergone two developmental phases.

2006

PROBABILISTIC VOLCANIC HAZARD ANALYSIS UPDATE YUCCA MOUNTAIN PROJECT FIELD TRIP VOLCANIC EVENT DEFINITION AND HISTORY OF VOLCANISM IN THE YUCCA MOUNTAIN REGION 05/01/2006-

05/04/2006 SOUTHERN NEVADA; Field trip sum-drft2
LSN #: DN2002234936 Participant #: ALA.20060626.0170 Document Date: 05/04/2006 The PVHA-U relates to the technical bases for establishing the probability that the Yucca Mountain repository will be disrupted by a future igneous event (i.e., the volcanic hazard).

DOE U.S. DEPARTMENT OF ENERGY OFFICE OF REPOSITORY DEVELOPMENT DESIGN DOCUMENT FOR:GMFIX V. 1.62 REV. NO: 00C DOCUMENT ID: 11192-DD-1.62-00 STN: 11192-1.62-00 VERIFICATION COPY; GMFIX-1.62-DD-00C
LSN #: DN2002242803 Participant #: ALA.20060626.0266 Document Date: 05/09/2006 Input Values As provided in Ladenburg et al's experiments [1949] paper. Typically, the first Mach shock disc will be detected downstream from the nozzle by a high gas density gradient (or high concentration of iso-density fringes).

DOE SOFTWARE VALIDATION REPORT (SVR) FOR GMFIX V1.62 (C)
LSN #: DN2002277379 Participant #: MOL.20060810.0022 Document Date: 07/25/2006 SOFTWARE VALIDATION REPORT (SVR) FOR GMFIX V1.62 (C) Gas iso-density contour line with the clear horizontal]n Mach disc at -1.3 (or 13 mm). Clearly the first Mach disc is marked by a strong density gradient between 12 and 14 mm as expected.

2007

DOE Hackett Summary drft 2 kjc kej
LSN #: DN2002390092 Participant #: ALA.20070520.0008 Document Date: 02/28/2007 Since the Pliocene, there has been a decrease in the volume per event but an increase in frequency of volcanism, relative to the frequency during the Pliocene.