

Center for Nuclear Waste Regulatory Analyses

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Contract No. NRC-02-97-009
Account No. 20-1402-461

U.S. Nuclear Regulatory Commission
ATTN: John S. Trapp
Office of Nuclear Material Safety and Safeguards
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Subject: Completion of Intermediate Milestone "Xenolith Formation and the Development of Basaltic Volcanic Conduits During the 1975 Tolbachik Eruptions, Kamchatka, with Implications for Volcanic Hazards Assessments at Yucca Mountain, Nevada" (IM 20-1402-461-860)

Dear Dr. Trapp:

Enclosed is the report that fulfills the requirements of IM 20-1402-461-860, entitled "Xenolith Formation and the Development of Basaltic Volcanic Conduits During the 1975 Tolbachik Eruptions, Kamchatka, with Implications for Volcanic Hazards Assessments at Yucca Mountain, Nevada." This report summarizes the results of CNWRA work conducted at Tolbachik and Yucca Mountain Region (YMR) volcanoes to evaluate the amount of subsurface disruption associated with basaltic volcanic eruptions. In contrast to published studies, this report presents information on subsurface disruption associated with basaltic volcanoes that are reasonably analogous to Quaternary YMR volcanoes.

The geometry of subsurface disruption at repository depths controls the number of waste packages potentially entrained during a volcanic eruption. Rock around a volcanic conduit can be fragmented and entrained at several stages of a basaltic eruption. Deposits from the 1975 Tolbachik eruption show that little wall-rock entrainment occurs during the most energetic parts of the magmatic eruption. Instead, wall-rock entrainment is enhanced in later stages of the eruption due to reductions in conduit flow-pressure and interactions between deep (>500 m) groundwater and magma. Although the 600 m depth to the water table at Yucca Mountain likely precludes hydromagmatic activity during initial stages of a future basaltic eruption, late-stage hydromagmatic interactions and associated conduit widening are possible at this site. Work presented in this milestone supports conduit diameters up to 50 m at repository depths, which is the value currently used in Performance Assessment.

Following programmatic acceptance by the NRC, this report will be submitted to the Journal of Volcanology and Geothermal Research. If you have any questions please contact Dr. Brittain Hill at (210) 522-6087 or me at (210) 522-5183.

Sincerely,
H. Lawrence McKague for
H. Lawrence McKague
Element Manager, Geology and Geophysics

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Enclosure

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