

SUPPORT FOR CONTRACTOR REQUEST

CONTRACTOR: Dr. Oliver Chadwick

RATE:

PERIOD OF PERFORMANCE: May 1, 1999 through November 1, 1999

STATEMENT OF WORK:

The primary task is focused on developing state-of-knowledge understanding of the evolution of surface geomorphology and soil properties on Yucca Mountain (YM) over the last 100,000 years in order to develop plausible future scenarios for changes in soil depth and texture as used to estimate future infiltration rates. This will entail translation of the information collected by the U.S. Geological Survey (USGS) and the Bureau of Land Management (BLM) on alluvial basins adjacent to YM to the hillslopes on YM, and, information from identified analog sites in southern Nevada.

A. Supply coefficients for predicting the effect of future climate on soil depth and texture and their effect on shallow infiltration. These coefficients will be compared with values generated for climatic analog sites selected to be relevant for YM in order to generate infiltration scenarios that are responsive to possible future climates. Specific coefficients required are as follows:

- 1) supply rate of dust deposition from atmospheric source for present and past climates;
- 2) supply values for the mineral composition of the dust component and likely changes with climate variation;
- 3) supply resistance factors appropriate for both creep and catastrophic soil movement on Yucca Mountain hillslopes;
- 4) supply appropriate rates for chemical weathering of moderately welded tuffs.

A discussion of controls on physical and chemical weathering processes will accompany the table. It will include equations and parameters required to estimate chemical weathering and mass movement on YM hillslopes such that the supplied coefficients are put in context.

Deliverable: Letter report due 6/30/99 in WordPerfect or Excel format.

B. Assist in report preparation of a CNWRA document on the effect of future climate on infiltration rates by providing two sections. One section of this report will discuss existing documents related to erosion and sediment deposition in the YM area and evaluate their contribution to knowledge of soil distribution and the change in their properties over Quaternary time scale. A second section of this report will discuss the basis for incorporation of specific processes in the model, rationale for exclusion of other processes, and uncertainty of the model results.

Deliverable: Draft letter report due 7/31/99;
Final letter report due 8/31/99 in Word Perfect format.

C. Review and critique of documents related to erosion and sediment deposition in the YM area and evaluate their contribution to knowledge of soil distribution and the change in their properties over Quaternary time scale. The USGS, BLM, and DOE are currently studying the alluvial basins surrounding YM; as these studies are completed and documents become available, reviews and critiques will be needed.

ESTIMATED UTILIZATION: 120 hours

PRIOR CONTRACTOR WORK EXPERIENCE WITH SWRI:

Dr. Chadwick worked as a consultant to SwRI during FY1998 and early FY1999.

PROGRAMMATIC NEED FOR CONTRACTOR WORK:

This work will support the Unsaturated and Saturated Flow Under Isothermal Conditions (USFIC) Key Technical Issue project. Specifically, this work will support future revisions of the USFIC Issue Resolution Status Report and related sensitivity calculations and review activities.

LIST OF ELIGIBLE CONSULTANTS CONSIDERED:

None

RATIONALE FOR SOLE/SINGLE SOURCE SELECTION:

The proposed work is a continuation of efforts in which Dr. Chadwick has been involved during the past year. He is familiar with CNWRA practices, CNWRA staff, and the details of the issues at hand.

Dr. Chadwick has an unusual combination of experience combining field studies of soil development with quantitative chemical and hydrologic modeling. He is familiar with arid land studies similar to the Yucca Mountain area. He has studied soil-vegetation relationships and the response of soils to changing environmental factors. This background is particularly well suited to the focused work anticipated for Dr. Chadwick. We are not aware of another consultant with this combination of experience.

RATIONALE FOR NOT USING SwRI RESOURCES:

We have not been able to identify a source within the Institute for this work.

PROJECT NUMBER:

20-1402-861