PHASE I REVIEW: DOE PLAN FOR CHARACTERIZATION OF METEOROLOGY FOR REGIONAL HYDROLOGY (STUDY PLAN 8.3.1.2.1.1, Revision 0)

by

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September 27, 1991

Introduction

The purpose of the DOE "Study Plan for Characterization of Meteorology for Regional Hydrology" is to describe and outline strategies for characterizing the meteorology on and around Yucca Mountain with particular emphasis on precipitation. Data from this study plan will be used as input to the following studies:

a)	8.3.1.2.1.2	Regional Surface-water Runoff and Streamflow
b)	8.3.1.16.1.1	Flood Potential and Debris Hazards
c)	8.3.1.2.2.1	Unsaturated-Zone Infiltration
d)	8.3.1.2.2.6	Unsaturated-Zone Gas Flow
e)	8.3.1.2.1.3	Regional Ground-water Flow System
f)	8.3.1.2.3.1	Site Saturated-Zone Groundwater Flow Systems
g)	8.3.1.5.1.1	Modern Regional Climate

This study plan consists of one activity which is the Characterization of Meteorology for Site and Regional Hydrology (8.3.1.2.1.1.1). The meteorological parameters to be analyzed include: precipitation, air temperature, relative humidity, barometric pressure, shortwave radiation, wind speed and direction, lightning occurrences and cloud formations. Analysis of these parameters will provide diurnal, seasonal, and spatial variability. Lightning and cloud formation data are being collected as part of a study of storm profiles. Precipitation will be analyzed in the most detail.

A Phase I review of the study plan was done with respect to (A) DOE/NRC agreement on the content of study plans, (B) Identification of objections, (C) Closure of NRC open Items, and (D) The need for a Detailed Review (See Review Plan for NRC Staff Review of DOE Study Plans, Revision I, 12/6/90).

Evaluation of Study Plans Relative to the Agreement and to the Responsible DOE Contractors QA Program (Objectives 1 and 5)

Criterion 1 - The content of the study plan under review is reasonably consistent, as appropriate for the activities, tests and analyses described, with the Agreement (NRC-DOE meeting on the level of detail for site characterization plans (SCP) and study plans, May 7-8, 1986).

Staff Review: Attached (Attachment A) is an itemized checklist of the study plan content as compared to the agreement on content resulting from the NRC/DOE level of detail meeting. In general, the content of the study plan is reasonably consistent with the agreement. The details of field tests are contained in the technical procedures which were not provided as part of the study plan. However, the overall descriptions of the tests and analyses as provided in the study plan are complete enough for the staff to make a determination as to the apparent adequacy of the study plan.

Criterion 2- All study plan references have been provided when the study plan was issued.

Staff Review: The study plan lists 54 references in addition to the DOE Site Characterization Plan (SCP). Of these, only 2 were listed as references for Chapter 5, Climatology and Meteorology, of the SCP. Of the remainder, 40 appeared to be available as government reports, articles in technical journals, and textbooks. None of the references are necessary for the staff to make an adequate Phase I evaluation of the study plan. The Staff may, however, request some of the listed meteorological references as part of the review of the licence application.

Criterion 3:- Open items relative to the QA program of the DOE contractor responsible for the study plan that could call into question the quality of the study plan, have been resolved.

Staff Review : [TO BE DETERMINED BY THE QA REVIEWER]

Identification of Objections (objectives 2 through 6)

Criterion 1 - Potential adverse effects on repository performance:

Staff Review: Adverse effects on repository performance are not expected. The major impacts on the site will be in the forms of new road construction, off-road vehicle use, installation of power lines, grading of gaging station sites, and emplacement of structures. These impacts are expected to be minimal.

Criterion 2 - Potential significant and irreversible/unmitigable effects on characterization that would physically preclude obtaining information necessary for licensing.

Staff Review: None. The tests are passive in nature and will not have any significant effect on their surrounding environment.

Criterion 3 - Potential significant disruption to characterization schedules or sequencing of studies that would substantially reduce the ability of DOE to obtain information necessary for licensing.

Staff Review: The activities of this study are expected to have little or no interference with other planned tests. The applicant has stated that in those few cases where activities may interfere, the investigators have planned to sequence testing so as to maximize data collection and minimize interference. Although no examples of sequencing specifically to minimize interference were identified, the staff considers this approach to be very workable in view of the small amount and type of interference expected.

Criterion 4 -Inadequacies in the QA program which must be resolved before work begins.

Staff Review: [TO BE DETERMINED BY THE QA REVIEWER]

Closure of NRC Open Items (Objectives 8 and 11)

Staff Review: Not applicable - DOE did not propose to close any open items with this study plan in its transmittal letter.

Need for Detailed Technical Review

A study plan is a candidate for a detailed technical review if it meets any of the following 5 criteria from step 6 of part 4.2 of the Review Plan.

In summary: This study plan is a candidate for a detailed technical review based on criteria 1 (key site related issue). However, data collection and analysis are by standard practices which have been previously used and developed for hydrometeorological investigations and research. The primary factor which makes this study unique is the number of different parameters being collected and analyzed (as listed in the introduction). The staff does not see any apparent problems with attempting to measure all of these parameters simultaneously or sequentially and does not recommend a detailed technical review. The staff also does not recommend a technical exchange specifically for regional meteorology provided that the meteorological input is described during the technical exchanges for the various specific

studies supported by this study plan.

Criterion 1- The study plan may be related to one or more key site related issues.

Staff Review: Data from the study will aid in the resolution of total system performance, ground-water travel time, radiological safety issues, and design issues concerned with the repository, engineered barrier system and seals for shafts and boreholes.

Criterion 2- The study plan pertains to some NRC open items.

Staff Review:- The study plan does not directly pertain to any NRC open items.

Criterion 3- The study plan describes unique, state-of-the-art tests or analysis methods that do not have a supportive scientific history of providing data usable in licensing.

Staff Review: Analyses to be performed in this study are well established with a history of scientific experience. Procedures for all tests and analyses to be used have already been prepared and have been in implementation for at least two years.

Criterion 4- The study plan describes a study critical to the evaluation of site performance that cannot be repeated for a number of years due to its disruption of the natural baseline.

Staff Review: The analyses and tests are passive in nature, therefore there will be no disruption of the natural baseline.

Criterion 5 - The study has some other critical relationship to potential licensing concerns.

Staff Review: The staff has no licensing concerns in regard to this study plan other than those listed above.

ATTACHMENT A

Phase I Review of Study Plan 8.3.1.2.1.1
Characterization of Meteorology for Regional Hydrology

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September 27, 1991

I. Purpose and Objective

Describe the information to be obtained in the study.
Yes__X__ No_____ N/A_____

Provide the rationale for information to be obtained.
Yes__X__ No_____ N/A_____
Relationship between characterization parameters and performance parameters is provided in Table 4.2-1.

II. Rationale for Study/Investigation

Provide rationale for tests and analysis, indicating alternatives considered and options, advantages, and limitations.
Yes__X__ No_____ N/A_____

Provide the rationale for the number, location, duration and timing of tests, considering uncertainty, and identify obvious alternatives.
Yes__X__ No_____ N/A_____
An analysis is shown in Figure 3.1-27 showing % error vs. number of stations added to network.

Describe the constraints for the study, considering:
- Potential site impacts
  Yes__X__ No_____ N/A_____

- Need to simulate repository conditions
  Yes_____ No_____ N/A__X__

- Required Accuracy and precision
  Yes__X__ No_____ N/A_____

- Limits of Analytical Methods
  Yes_____ No__X__ N/A_____
The limits of the analytical methods in many cases can be inferred from the discussions.

- Capability of Analytical Methods
  Yes__X__ No_____ N/A_____

- Time required vs. time available
  Yes__X__ No_____ N/A_____

- Scale of Phenomena and Parameters
  Yes__X__ No_____ N/A_____

- Interference among test
  Yes_____ No_____ N/A__X__

The tests are all passive tests.

- Interference between tests and ES
  Yes_____ No_____ N/A__X__

Same as above.

III. Description of Tests and Analysis
For each Type of Test

- Describe general approach that will be used.
  Yes__X__ No_____ N/A_____

- Describe key parameters that will be measured in test and experimental conditions under which the test will be conducted.
  Yes__X__ No_____ N/A_____

- Indicate number of tests and locations.
  Yes__X__ No_____ N/A_____

- Summarize test methods if non-standard procedure, summarize steps of test, how it will be modified, and reference technical procedure.
  Yes__X__ No_____ N/A_____

- Indicate level of QA and provide rationale for any tests not QA level.
  Yes_____ No_____ N/A_____
  [TO BE DETERMINED BY QA REVIEWER]

- Reference the applicable specific QA requirements applied to test.
  Yes_____ No____ N/A_____
  [TO BE DETERMINED BY QA REVIEWER]

- Specify tolerance, accuracy, and precision required in test.
  Yes_____ No__X__ N/A_____

The tolerance, accuracy and precision associated with the

instrumentation will be provided in the technical procedures manuals. Recording accuracies of some instruments are also provided in the text of the SP.

- Indicate range of expected results and basis for those results.
  Yes_____ No__X__ N/A_____

The range of the expected results for many of the tests may be obtained from the discussions provided in the SP.

- List equipment requirements, briefly describing special equipment.
  Yes__X__ No_____ N/A_____

- Describe techniques to be used for data reduction and analysis.
  Yes__X__ No_____ N/A_____

Some are described in text and some techniques should be described in the associated technical procedures.

- Describe representativeness of test, indicating limitations and uncertainties that apply to use of results.
  Yes__X__ No_____ N/A_____

- Provide illustrations of test locations.
  Yes__X__ No_____ N/A_____

- Discuss relationship of test to set performance goals and confidence levels.
  Yes__X__ No_____ N/A_____

<u>For Each Type of Analysis</u>

- State purpose of analysis, indicate conditions to be evaluated and describe any uncertainty analysis.
  Yes__X__ No_____ N/A_____

- Describe methods of analysis, including analytical expressions and numerical models to be used.
  Yes__X__ No_____ N/A_____

- Reference the technical procedures document that will be followed during analysis.
  Yes__X__ No_____ N/A_____

- Indicate levels of QA applied.
  Yes_____ No_____ N/A_____
  [TO BE DETERMINED BY QA REVIEWER]

- Identify data input requirements.
  Yes__X__ No_____ N/A_____

- Describe expected output and accuracy.
  Yes__X__ No_____ N/A_____

- Describe representativeness of analytical approach, indicating limitations and uncertainties that apply to results.
  Yes_____ No__X__ N/A_____

This information may be inferred from the discussions.

IV. Application of Results

Briefly discuss where results from study will be used for support of other studies.
Yes__X__ No_____ N/A_____

Refer to specific performance assessment analyses.
Yes__X__ No_____ N/A_____

Describe where information from study will be used in construction equipment and engineering system design and development.
Yes__X__ No_____ N/A_____

Describe where information from study will be used in planning other characterization activities.
Yes_____ No_____ N/A__X__

V. Schedules and Milestones

Provide durations of and interrelationships among principal activities associated with this study.
Yes__X__ No_____ N/A_____

List key milestones including decision points associated with study activities.
Yes__X__ No_____ N/A_____

Describe timing of study relative to other studies and other program activities.
Yes__X__ No_____ N/A_____

Provide dates for activities for the study plans: reference section 8.5 in SCP.
Yes_____ No__X__ N/A_____

Years are shown but specific durations and start and finish dates are not shown because they are still being developed.