See file Pocket 1

WM Record File 109.2 | WM Project 1 | Docket No. | PDR ✓ | LPDR | Distribution: | (Return to WM, 623-SS) 23

SUMMARY OF
NRC/DOE MEETING
ON
SUBSYSTEM PERFORMANCE ALLOCATION

DATE/LOCATION OF MEETING:

September 26-27, 1985
Willste Building, Rm. 106
Silver Spring, MD.

ATTENDEES/ORGANIZATIONAL AFFILIATION:

A list of attendees is attached as Enclosure 1.

BACKGROUND/FACTS:

The meeting was held to resolve follow-up items from an April 17, 1985 meeting on the same subject. A copy of the agenda is attached as Enclosure 2. Prior to the meeting NRC provided DOE with a copy of the talking paper attached as Enclosure 3 to serve as the basis for discussion.

The meeting started with a presentation (Enclosure 4) by NRC which summarized the examples provided in the talking paper. DOE presented its response (Enclosure 5). The DOE presentation included new viewgraphs mixed with some viewgraphs used by DOE during the April 17 meeting. During the meeting, this led to some confusion over what are DOE's current positions on certain key points. Accordingly, DOE marked up Enclosure 5 to distinguish the new viewgraphs from the older ones.

Subsequent discussion led to the observations, agreements, and open items stated below. State and Tribal representatives were present and participated throughout the meeting.

OBSERVATIONS/AGREEMENTS/OPEN ITEMS:

1. DOE and NRC agree that performance goals are not to be construed as performance criteria.

2. DOE and NRC agree that the initial performance goals and confidence levels are subject to change, indeed they are likely to change as more information is gathered throughout site characterization.

3. DOE and NRC agree that the initial estimates of performance goals and confidence levels, because of insufficient data, may be somewhat arbitrary; however, DOE will use its best efforts to establish these initial estimates based on sound technical/management judgment. The bases for goals and confidence levels, including relationships with overall system goals and with test programs, will be given. In both the initial allocation and in

subsequent revisions, DOE will make every effort to quantify performance goals; however, the bases for numerical goals, when given, will involve both quantitative analysis and qualitative analysis based on technical judgments. Both performance goals and confidence level targets will be stated as precisely as practicable.

4. DOE and NRC agree that performance goals will be set for each performance measure to guide the testing program and that these goals will be presented in the SCP. The goals will consist of specified values for the performance measure and an indication of the desired level of confidence in this specified value. These indications of the level of confidence will be a specified numerical value where possible and appropriate; a range of values; or, as a fall-back, a qualitative statement (e.g., "high," "medium," or "low", where these terms are specifically defined).

5. DOE agrees with NRC that the rationale for every test or suite of tests will be provided in the SCP and that this rationale, where the tests relate to resolution of performance issues, will include the relationship of the tests to the set performance goals and confidence levels.

6. NRC and DOE both recognize that in the simple performance allocation example presented by DOE, the confidence levels developed by analyses may not be single values, but a range of values reflecting the uncertainties in the conceptual models and the existing data. Any confidence levels chosen on the basis of such calculations will necessarily involve technical judgments regarding the uncertainties in the analyses. The example does serve to illustrate an approach to carrying out the agreements of points 4 and 5 above.

7. DOE agrees that the NRC definitions of reliability taken from NUREG-0960, Vol. 1, page 9-5 and confidence level (attached in Enclosure 4) will be adopted for use in the development of the Site Characterization Plans.

8. DOE recognizes that the site characterization program logic diagram in NUREG-0960 as modified in Enclosure 4 will be used by the NRC in its review of the DOE site characterization plans; however, it was agreed that the step labeled "establish component requirements" would be replaced by "set performance goals" as given in Enclosure 6. DOE agrees with these steps as modified and the logic sequence in this schematic. Although the logic diagrams that will appear in the site characterization plans will be more detailed, they will be consistent with the NRC schematic.

9. NRC and DOE agree that prior to issuance of the SCPs, DOE staff will discuss tentative performance goals and confidence levels with NRC staff in the appropriate project-specific technical meetings (e.g., groundwater travel time in the hydrology meetings for each project). Also, performance allocation meetings will be held with each project prior to

SCP issuance to discuss the overall project specific performance allocations.

Seth M. Coplan 9/27/85

Seth M. Coplan
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U. S. Nuclear Regulatory Commission

Donald H. Alexander 9/27/85

Donald H. Alexander
Division of Geosciences and
Technology
Office of Geologic Repositories
U. S. Department of Energy

ENCLOSURE 1
Ltr'd w/Summary of NRC/DOE Mtg
9/26-27

NRC/DOE MEETING ON PERF. ALLOC
SEPT. 26-27, 1985

ATTENDEES

Name	Organization
Donald Alexander	DOE-HQ
Pauline Brooks	NRC-WMRP
Larry Rickertsen	Western
S. M. Coplan	NRC; WM
H.J. MILLER	NRC/WMRP
Bob Baca	Rockwell/BWIP
Wayne Walker	NRC/WMRP
Scott GRACE	NRC/WMRP
John Voglewede	NRC/WMEG
John S. Trapp	NRC/WM6T
Young C Kim	Univ. of Ariz./EI/NRC
GREGORY B. BAECHER	MIT/NRC
Ralph Stein	DOE/HQ
Felton Bingham	SNL
Regina Hunter	SNL
Robert Cranwell	SNL
JEROME R PEARRING	NRC/WMEG
David TIKTINSKY	NRC/WMEG
Andrew P. Avel	DOE/CH - Columbus SRPO
MALCOLM KNAPP	NRC/WM6T
Joel Hunt	NRC/WMLU
Robert L. Johnson	NRC/WMRP
Chad Glenn	NRC/WMRP
John Graham	Rockwell/BWIP
DINESH GUPTA	NRC/WMEG
King Stablein	NRC/WMRP
VIETCHAU NGUYEN	YAKIMA/EWA
SUSAN BILHORN	NRC-WMRP
TOM JUNGLING	NRC-WMEG
Sher Bahadur	NRC/WMEG
William K. Terry	Rockwell/BWIP
JAMES SHAPLEY	ROCKWELL/BWIP

(2)

ATTENDEES (CONT'D)

Name	Organization
JOHN D. RANDALL	NRC/RES
KIEN C. CHANG	NRC/WMEG
CHARLES H PETERSON	NRC/WMEG
Michael J. Conroy	Weston
Richard Codell	NRC
Guy Martin, Jr	WESTON
Chris Pilny	SAIC/NUSI
TIM JOHNSON	NRC/WMEG
Kenneth W. Stephens	Aerospace Corp.
SAM C. MATTHEWS	Battelle, ONWI
JOHN D WADDELL	Battelle, ONWI
Paul W. Eslinger	Boeing CSR/BWIP
Steve Baker	
DANIEL I. HERBORN	ROCKWELL/BWIP
John T. Greeves	NRC/WMEG
Atef Elzeftawy	NRC/WMRP
Charles R Cole	PNL/PASS
John Peshel	NRC/WMEG
Larry Boesch	Aerospace Corp
PETE RAMATOWSKI	Umatilla Reservation
RON F HALEMOON	NEZ PERCE TRIBE
M. S Nataraja	NRC, WMEG
D. J. FEHRINGER	NRC/WMRP
Stan Echols	DOE-GC
PHILIP S JUSTUS	NRC Geology-Geophysics

ATTENDEES (CONT'D)

Name	Organization
JACK WITMAN	STATE OF UTAH

ENCLOSURE 2

AGENDA

September 26-27, 1985

NRC/DOE MEETING ON SUBSYSTEM PERFORMANCE ALLOCATION

Silver Spring, MD
Room 106, Willste Building

o	Introduction	NRC/DOE	September 26, 9:00 AM
o	Utility of Pre-setting Confidence Levels for Target Performance Goals - Discussion	NRC/DOE	
o	Lunch		12:00 Noon
o	Definitions of Confidence and Reliability - Discussion	NRC/DOE	
o	Logic Diagram - Discussion	NRC/DOE	
o	Agreements	NRC/DOE	3:00 PM To be resumed September 27 at 9:00 AM if necessary

ENCLOSURE 3

EXAMPLES FOR DISCUSSION

NRC/DOE MEETING ON

PERFORMANCE ALLOCATION

SEPTEMBER 1985

(The examples in this paper are intended only to illustrate the concepts of performance allocation and to facilitate discussion. These examples should not be interpreted as specifications by the NRC staff of specific values to be used in a performance allocation for any particular site, nor should the example approaches be construed as being the only approaches that might be used. The applicant must allocate performance for each site based on the individual features of the site and on the applicant's allocation of the resources to be devoted to site characterization.)

Need for performance allocation:

Part 60 sets out performance objectives for three of the major barriers of a repository system, but leaves to the applicant's discretion the proposed means by which compliance with the performance objectives is to be demonstrated. For example, the engineered barrier system release rate specified in Part 60 can potentially be achieved by a low groundwater flux coupled with low solubilities, by a low waste form leach rate, or by reliance on other engineered barriers such as bentonite backfill materials. Part 60 also leaves open (i.e., to the applicant's discretion) the means by which compliance with the EPA standards will be demonstrated. Two general approaches are available: a) better than required performance from one or more of the barriers addressed in Part 60 (provided that a multiple barrier approach is retained), or b) reliance on another characteristic of the disposal system, such as the site geochemistry.

Both DOE's site characterization plans and NRC's reviews of those plans will be significantly affected by the specific approach selected by DOE. In order to determine if the kind and amount of testing and investigation is sufficient -- "how much is enough" -- DOE should specify as early as possible the barriers to be relied on and the level of performance sought from each barrier.

Need for redundancy in initial allocation:

The initial allocation of performance for a repository system will necessarily be made with incomplete information regarding the performance capabilities of the system barriers, and it can be expected that further study will show some barriers unable to to perform as well as first anticipated. The NRC staff therefore considers it necessary to include a degree of conservatism and redundancy between barriers in the initial performance allocation. The NRC staff considers it to be the applicant's responsibility to determine the appropriate degree of redundancy between barriers, based on recognition and consideration of the uncertainties that exist in barrier performance. The following are two examples of how this could be accomplished:

1) Establish dual goals for each barrier. "Design" goals would be the minimum performance goals needed to assure compliance with regulatory provisions, while "expected performance" goals would be based on more optimistic, but realistic, expectations of barrier performance. The performance allocation would clearly state that any values within the range would produce acceptable repository performance.

2) Designate selected barriers to be held "in reserve." Each barrier in the initial repository system design would initially be classified according to whether credit would or would not be taken for the barrier in evaluating repository performance, and whether the barrier would be kept "in reserve" in the event that other barriers fail to perform as well as initially anticipated. For example, compliance with the waste package containment criterion of Part 60 might be attempted based only on the performance of the canister material. If this were to prove unsuccessful, credit could be taken later for any packing or other waste package materials included in the repository design. (Testing under a full quality assurance program sufficient to support licensing findings would, of course, need to be initiated on a schedule which would permit incorporation of "reserve" barriers when needed.)

Such provisions for redundancy would help to ensure that regulatory requirements will ultimately be met and will provide a basis for revising the performance allocation through periodic iterations as site characterization proceeds.

Example performance allocation:

For a hypothetical repository site the following performance goals might be established:

Containment time -- 1,000 years design containment time within the waste package (to be achieved through a combination of spent fuel cladding and canister) with the expected failure rate during the first 1,000 years not to exceed X % per year.

Release rate -- 1 part in 100,000 per year from the engineered barrier system (i.e., the waste packages and underground facility, as specified in Part 60) to be achieved by the low leachability properties of the spent fuel pellet material. Bentonite packing and backfill materials will be incorporated into the repository design, but will not be relied on to achieve the release rate goal unless testing of spent fuel leaching properties indicates that spent fuel pellets are unable to achieve the specified release rate goal.

GW travel time -- 5,000 years through the unsaturated zone from the repository horizon to the water table. No credit for travel time through the saturated zone to the environment unless the travel time in the unsaturated zone proves unexpectedly short or difficult to evaluate.

Geochemistry -- An analysis of the overall system, with the parameters listed above, and including a margin of safety, indicates that the following retardation factors will be appropriate to assure compliance with the EPA standards:

Nuclide	Retardation factor
X-63	15
Y-127	25
Z-249	5

Confidence level -- To the extent that uncertainties in determination of the above parameters can be quantified, test programs will be designed to produce an XX % confidence level that the parameter will achieve at least the desired level of performance. Those uncertainties which cannot be quantified (for example, the applicability of models or test methods) will be evaluated by an independent peer review group with the goal of achieving an approximately equivalent, though unquantified, level of confidence.

Importance for test program:

The following example illustrates, for an idealistic case, how specification of both a performance goal and a confidence level can help to determine an appropriate test plan.

Assume: Available information about the site has produced preliminary estimates of the magnitude and spatial distribution of the parameters necessary to calculate the groundwater travel time. (Such information would include that presented in the EA's.) Based on this preliminary information, a test program is to be designed which will produce, during site characterization, the additional information necessary to support a license application.

In order to demonstrate that the GW travel time meets or exceeds its goal at the stated level of confidence, and using the preliminary estimates of gradient, porosity, etc., it is determined that the following criteria need to be met for the effective hydraulic conductivity over the applicable flow path:

Goal -- Conductivity less than 10^{-8}
Confidence level -- 90%

(Here the confidence level addresses both measurement uncertainties and uncertainty in knowledge of the spatial variability of the parameter, as estimated using geostatistical methods.)

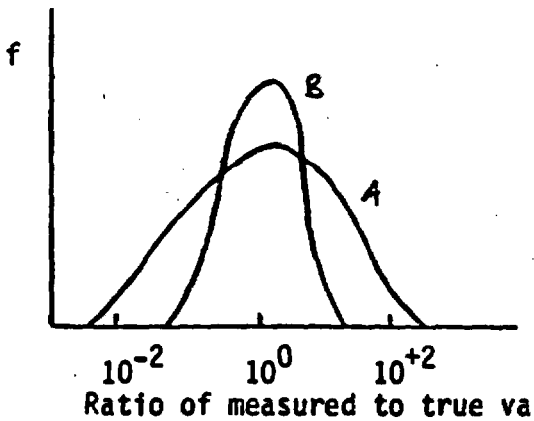
The actual confidence level achieved will depend on the stated goal, the measured values, and the test program employed. Suppose two test programs are available. Based on the sensitivity of the test methods used, the number of measurements, and the spatial distribution of test locations, the following can be estimated:

Test program A can measure conductivity values to within 2 orders of magnitude.

Test program B, a much more extensive and costly program, can measure conductivity values to within one order of magnitude.

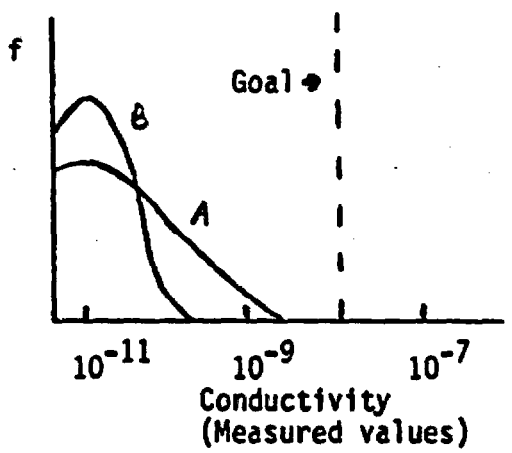
Conceptually, the sensitivities of the two test programs can be illustrated as shown on the following page.

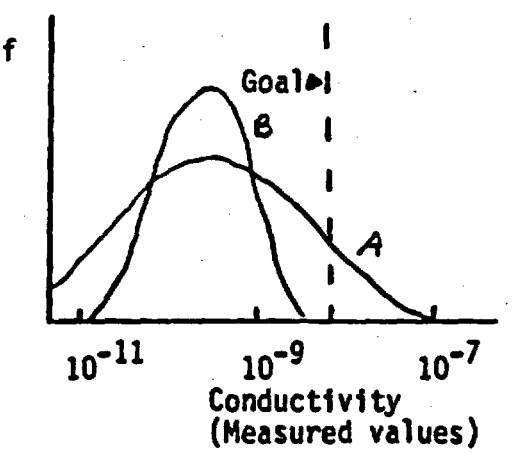
EXAMPLES



The figure above illustrates only the estimated sensitivities of the test programs -- not any actual measured values. This figure includes two main considerations -- the precision of a testing method and the geostatistical uncertainty in the spatial variation of a parameter after measurements at a specified number of locations. Thus, whatever the true value of a parameter is, and whatever its spatial variation, test program A will be able to provide measurements within two orders of magnitude of the "true" values and program B within one order of magnitude.

The importance of establishing performance goals and confidence levels on selection of a test program can be illustrated for different expectations regarding the measurement results. If the measured value of the conductivity is expected (based on current knowledge) to be about 10^{-11}, then test program A would be appropriate. If the conductivity is expected to be about 3×10^{-10}, then test program B would be needed. Neither test program would be adequate if the conductivity is expected to be only slightly (less than an order of magnitude) less than the goal, requiring either development of more sensitive testing methods or an iteration of the performance allocation. The first two situations are illustrated schematically below.





NRC staff position:

A performance allocation should be developed as early as possible in order to guide development of plans for site characterization. This performance allocation should specify 1) the particular barriers which will be relied upon to provide waste isolation, 2) the level of performance sought from each barrier, and 3) the level of confidence with which DOE will demonstrate that this level of performance is achieved.

PERFORMANCE ALLOCATION

A PERFORMANCE ALLOCATION SHOULD BE DEVELOPED AS EARLY AS POSSIBLE.

THIS PERFORMANCE ALLOCATION SHOULD SPECIFY:

- o PARTICULAR BARRIERS RELIED UPON
- o LEVEL OF PERFORMANCE FOR EACH BARRIER
- o LEVEL OF CONFIDENCE FOR LEVEL OF PERFORMANCE

THE PERFORMANCE ALLOCATION SHOULD BE REVISED PERIODICALLY TO REFLECT SC TEST RESULTS.

ENCLOSURE 4

APPROACH TO PERFORMANCE ALLOCATION

- o FLEXIBILITY
  - DUAL GOALS TO ESTABLISH A RANGE OF ACCEPTABLE PERFORMANCE
  - RESERVE GOALS
- o REDUNDANCY

HYPOTHETICAL EXAMPLE

	BARRIER/ COMPONENT	PERFORMANCE TARGET	CONFIDENCE LEVEL
CONTAINMENT TIME	WASTE PACKAGE/ CLAD, CANISTER	1000 YRS.	A%
RELEASE RATE	EBS/PELLET	10^{-5}/YR.	B%
GWTT	UNSAT'D ZONE	5000 YRS.	C%
EPA STANDARD	ABOVE TARGETS AND THESE RETARDATION FACTORS	X-63 15 Y-127 25 Z-249 5	D%

IMPORTANCE FOR TEST PROGRAM
EXAMPLE

GOAL -- CONDUCTIVITY LESS THAN 10^{-8}

CONFIDENCE LEVEL -- 90%

TWO TEST PROGRAMS

TEST PROGRAM A -- GOOD TO 2 ORDERS OF MAGNITUDE

TEST PROGRAM B -- GOOD TO 1 ORDER OF MAGNITUDE

IF PRELIMINARY ESTIMATE OF CONDUCTIVITY IS

10^{-11}, USE TEST PROGRAM A

3×10^{-10}, USE TEST PROGRAM B

$\sim 10^{-8}$, USE NEITHER

DEFINITION OF RELIABILITY

DOE'S PROPOSED DEFINITION:

RELIABILITY IS "THE PROBABILITY THAT FAILURE DOES NOT OCCUR IN OR OVER A SPECIFIED TIME INTERVAL." (C F. HENLEY AND KUMAMOTO, RELIABILITY ENGINEERING AND RISK ASSESSMENTS, PAGE 289.)

NRC'S DEFINITION:

RELIABILITY IS THE PROBABILITY THAT A SYSTEM OR COMPONENT, WHEN OPERATING UNDER STATED ENVIRONMENTAL CONDITIONS, WILL PERFORM ITS INTENDED FUNCTION ADEQUATELY FOR A SPECIFIED INTERVAL OF TIME. (DRAFT SITE CHARACTERIZATION ANALYSIS OF THE SITE CHARACTERIZATION REPORT FOR THE BASALT WASTE ISOLATION PROJECT, NUREG-0960, VOL. 1, page 9-5)

DEFINITION OF CONFIDENCE LEVEL

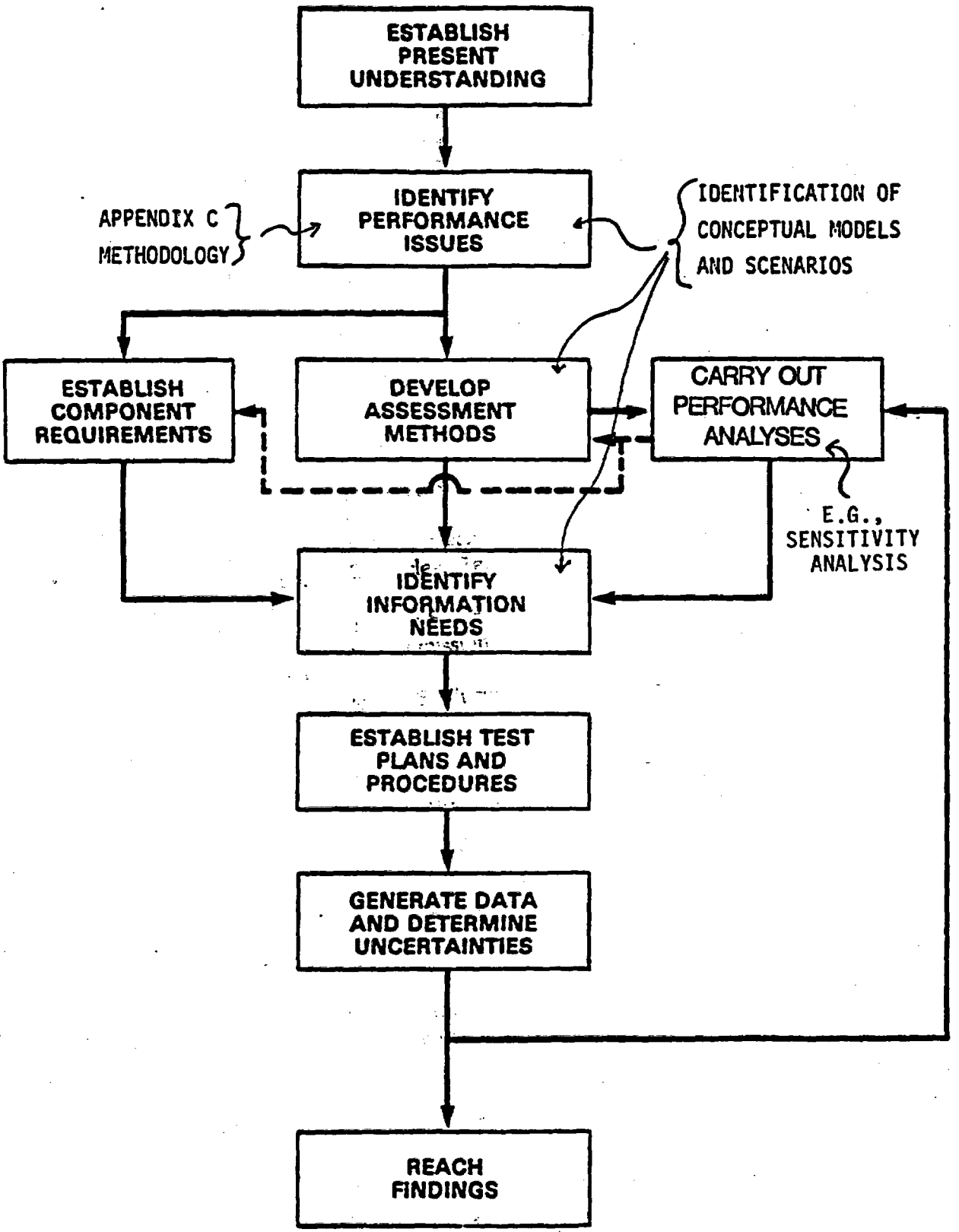
DOE'S PROPOSED DEFINITION:

CONFIDENCE LEVEL IS "THE PROBABILITY THAT THE TRUE VALUE IS AT LEAST (OR AT MOST) A SPECIFIED VALUE." (HENLEY AND KUMAMOTO, PAGE 245).

NRC'S PROPOSED DEFINITION:

CONFIDENCE LEVEL IS "THE PROBABILITY THAT THE TRUE VALUE OF AN UNCERTAIN PARAMETER OR PERFORMANCE MEASURE IS AT LEAST AS FAVORABLE AS A SPECIFIED VALUE."

FROM NUREG - 0960
APRIL 1983



ENCLOSURE 5

Utility Of Performance Allocation In The Site Characterization Program

DONALD H. ALEXANDER

September 26, 1985

DOE CONCERNS REGARDING PERFORMANCE ALLOCATION

- DOE AGREES THAT SETTING PERFORMANCE GOALS IS USEFUL FOR GUIDING THE TESTING PROGRAM AND FOR PRIORITIZING DATA NEEDS
- THERE IS CONCERN THAT IT MAY NOT BE RECOGNIZED THAT MANY OF THE PERFORMANCE GOALS WILL BE SET BY SUBJECTIVE JUDGMENT BY EXPERTS
- THERE IS CONCERN THAT DOE MAY NOT BE GRANTED THE FLEXIBILITY TO CHANGE THE GOALS THAT GUIDE TESTING AS THE UNDERSTANDING OF THE SYSTEM INCREASES
- DOE IS CONCERNED THAT THE PERFORMANCE GOALS SET ON THE BASIS OF WHAT IS KNOWN BEFORE CHARACTERIZATION MAY BE VIEWED AS CRITERIA AGAINST WHICH TO ASSESS THE SYSTEM

PERFORMANCE ALLOCATION

- SETTING OF POSTCLOSURE PERFORMANCE GOALS IN ORDER TO GUIDE TESTING AND TO PRIORITIZE TESTS TO BE CONDUCTED
- BASED UPON CURRENT CONCEPTUAL MODELS
- SUBJECT TO CHANGE AS UNDERSTANDING OF THE SYSTEM INCREASES
- MAY INVOLVE QUANTITATIVE ANALYSES INVOLVING EXISTING DATA AS WELL AS QUALITATIVE CONSIDERATIONS BY APPROPRIATE EXPERTS

PERFORMANCE GOALS

- TARGETS SET FOR PERFORMANCE MEASURES OF THE SYSTEM AND ITS SUBSYSTEMS
- INCLUDE BOTH SPECIFIED VALUES FOR THE PERFORMANCE MEASURES AND AN INDICATION OF LEVELS OF CONFIDENCE IN THESE SPECIFIED VALUES
- ARE NOT PERFORMANCE CRITERIA FOR THE SYSTEM, BUT GUIDE THE TESTING PROGRAM
- GOALS FOR THE KIND AND LEVEL OF INFORMATION TO BE OBTAINED
- GOALS CAN BE EXPECTED TO BE MODIFIED IF NEW CONCEPTUAL MODELS OF THE SYSTEM ARE DEVELOPED

ROLE OF PERFORMANCE GOALS IN EVALUATING THE SITE CHARACTERIZATION PROGRAM

- NRC WILL REVIEW THE SITE CHARACTERIZATION PROGRAM TO DETERMINE WHETHER INFORMATION OBTAINED WILL RESULT IN A SUCCESSFUL LICENSE APPLICATION
- NRC HAS ESTABLISHED SPECIFIC PERFORMANCE OBJECTIVES FOR BARRIERS TO HELP IN THIS EVALUATION
- IN ADDITION NRC HAS INDICATED THAT PERFORMANCE GOALS TO BE SPECIFIED BY DOE WILL HELP IN THIS EVALUATION
- DOE WILL SPECIFY IN THE SCP THE PERFORMANCE MEASURES BELIEVED TO BE INDICATORS OF WHETHER THE PERFORMANCE OBJECTIVES WILL BE MET, BASED UPON PRESENT INFORMATION
- IN MANY CASES DOE WILL SPECIFY TARGET VALUES FOR THESE MEASURES, (PERFORMANCE GOALS)
- DOE DOES NOT BELIEVE IT IS PRUDENT OR HELPFUL TO GUESS* AT LEVELS OF CONFIDENCE IN THESE VALUES PRIOR TO OBTAINING AND SYNTHESIZING DATA AND CONDUCTING SYSTEM PERFORMANCE ASSESSMENTS

* DOE believes that a guess at the level of confidence in a performance goal is inappropriate and insufficient. DOE believes that subjective judgement using scientific and technical experts for setting performance goals and indicating a level of confidence is appropriate when quantitative analyses cannot be employed.

WHAT IS THE APPROACH FOR ASSIGNING PERFORMANCE GOALS?

A. DEFINE SYSTEM, SUBSYSTEM, COMPONENTS,AND THEIR FUNCTIONS

B. ESTABLISH TENTATIVE PERFORMANCE GOALS FOR THESE ELEMENTS

C. DEVELOP PARAMETER MODELS, ANALYTICAL TECHNIQUES, AND DATA BASE

D. IDENTIFY KEY FACTORS

E. ASSESS PERFORMANCE OF SYSTEM, SUBSYSTEMS AND COMPONENTS

IF NECESSARY REALLOCATE PERFORMANCE GOALS, REFINE MODELS, MODIFY DESIGNS, OR PERFORM ADDITIONAL TESTING. ABOVE STEPS CAN THEN BE REVISITED

APPLICATION TO TEST PROGRAM

- PERFORMANCE ALLOCATION IS A USEFUL APPROACH TO THE PRIORITIZATION OF TESTS AND TO GUIDING THE KIND AND DEGREE OF TESTING NEEDED

- OTHER CONSIDERATIONS (ABILITY TO CLOSE ISSUES, SCHEDULE, COST) MUST ALSO BE TAKEN INTO ACCOUNT IN SETTING PERFORMANCE GOALS

- SOME TESTING MAY BE CONDUCTED FOR PURPOSES OTHER THAN RESOLVING SPECIFIC PERFORMANCE ISSUES; HOWEVER, THE BASIS FOR SUCH TESTING MUST BE FULLY JUSTIFIED IN THE PROGRAM

EXAMPLES OF DIRECT PERFORMANCE GOALS

SUBSYSTEM: WASTE PACKAGE SYSTEM

PERFORMANCE OBJECTIVE:	**RADIONUCLIDE CONTAINMENT FOR A PERIOD TO BE SPECIFIED BETWEEN 300 AND 1000 YEARS**
COMPONENT	**GOAL (EXAMPLES)***
WASTE FORM	**NO GOAL**
CLADDING	**LIFETIME >300 YEARS**
CANISTER	**CORROSION OF 80% OF THICKNESS >2000 YEARS**
DISPOSAL CONTAINER	**CORROSION OF 90% OF THICKNESS >1000 YEARS**
PACKING MATERIAL	**NO GOAL**
HOST ROCK	**NO GOAL**

* See new slide (9/26) on "classes of barriers." In this new context DOE would specify a "primary barrier," e.g., the container; "barriers held in reserve," e.g., canister and cladding; and barriers for which no credit will be taken e.g., waste form, packing, host rock.

PERFORMANCE GOALS VS CREDIT 4/17

- PERFORMANCE GOALS ARE APPLIED TO SYSTEMS WHICH CAN BE CHANGED AS PART OF THE DESIGN PROCESS

- TAKING "CREDIT FOR PERFORMANCE" APPLIES BOTH TO THE *NATURAL SYSTEM* AS WELL AS THE *ENGINEERED BARRIER SYSTEM* AND IS THE PROCESS OF DETERMINING WHAT PARTS OF THE SYSTEM WILL BE DEPENDED UPON TO CONTRIBUTE TO MEETING PERFORMANCE OBJECTIVES

CONFIDENCE LEVELS FOR PERFORMANCE GOALS

- CONFIDENCE LEVEL IS PROBABILITY THAT THE TRUE VALUE IS AT LEAST (OR AT MOST) THE SPECIFIED VALUE
- CONFIDENCE LEVELS FOR PERFORMANCE GOALS ARE NOT DETAILED MEASURES OF THE ACCURACY OF A TEST
- CONFIDENCE LEVELS FOR PERFORMANCE GOALS CAN BE EXPECTED TO CHANGE AS THE CONCEPTUAL MODELS CHANGE
- CONFIDENCE LEVELS FOR PERFORMANCE GOALS MAY BE SET THROUGH QUANTITATIVE ANALYSIS, SUBJECTIVE CONSIDERATIONS, OR BOTH

UNCERTAINTIES THAT CAN AFFECT RELIABILITY VALUES

- MEASUREMENT ERROR
- HETEROGENEITIES, eg. SPATIAL VARIATION
- UNCERTAINTIES IN CONCEPTUAL AND PARAMETER MODELS
- UNCERTAINTIES IN FUTURE STATES OF NATURE
- EXTRAPOLATION OF SHORT TERM TESTS TO LONG TERM CONDITIONS

DOE recognizes that there are other sources of uncertainty e.g., human error.

CLASSES OF BARRIERS

1. PRIMARY BARRIERS
   - MAJOR CONSIDERATION IN TESTING PROGRAM
   - PERFORMANCE GOALS SET

2. BARRIERS "HELD IN RESERVE"
   - ALSO REQUIRE TEST PLANS
   - PERFORMANCE GOALS SET

3. BARRIERS FOR WHICH NO CREDIT WILL BE TAKEN
   - NO PLANS FOR TESTING

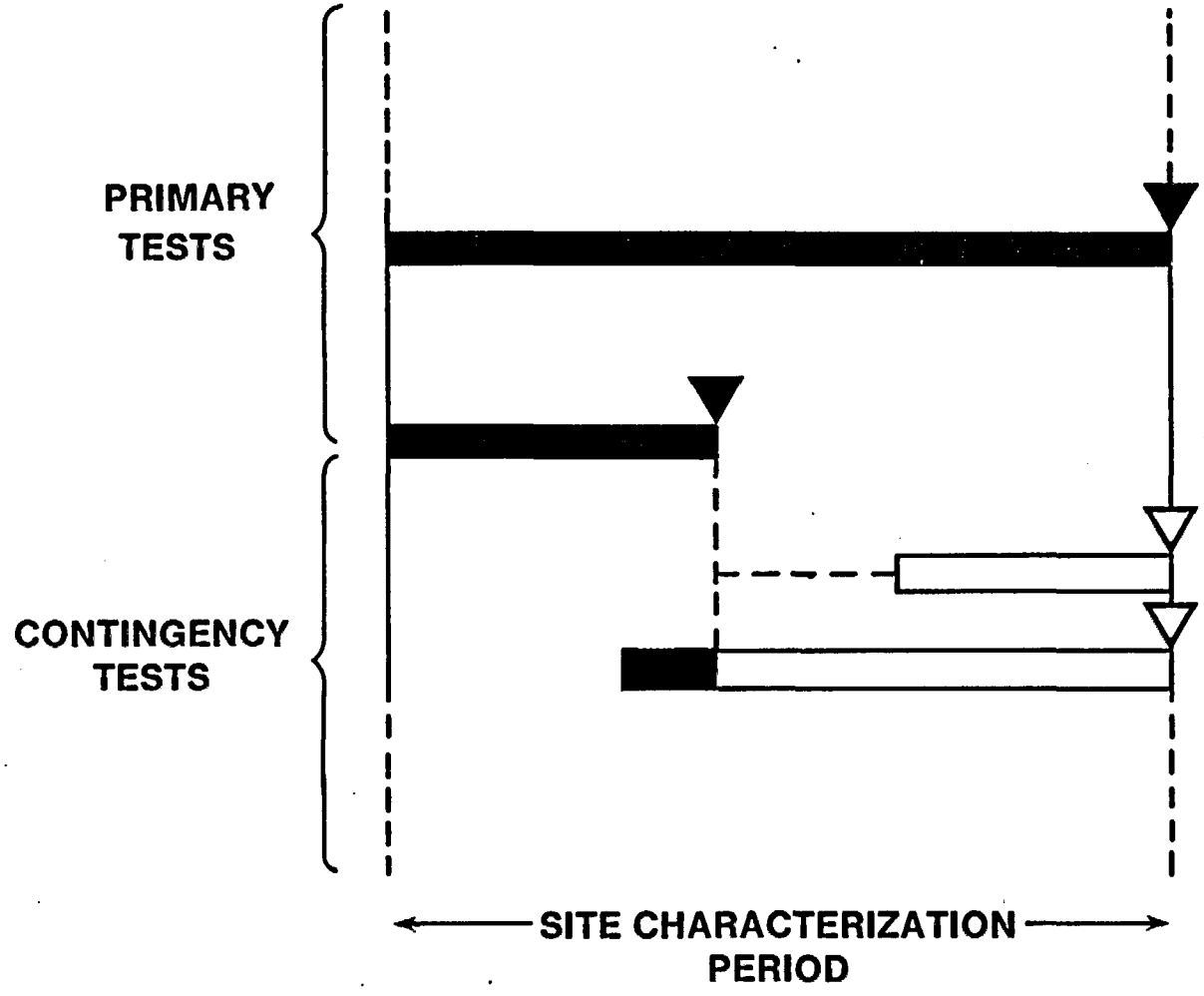
EXTENT OF CREDIT FOR PERFORMANCE

- DOE BELIEVES THAT PRESENT INFORMATION IS SUFFICIENT NOW TO IDENTIFY AREAS WHERE CREDIT* MAY BE TAKEN
- DOE DOES NOT BELIEVE DATA ARE ADEQUATE TO SPECIFY RELATIVE CREDIT* OR THE EXTENT OF CREDIT FOR SPECIFIC COMPONENTS OR FEATURES
- FURTHER, EXTENT OF CREDIT*, IF TAKEN TOO FAR, CAN BE CONSTRUED AS ADDITIONAL PERFORMANCE OBJECTIVES
- FLEXIBILITY IN THE PERFORMANCE ASSESSMENT MAY BE REMOVED TOO EARLY IN THE SITE CHARACTERIZATION PROGRAM
- AT THIS STAGE, BEYOND IDENTIFYING AREAS WHERE CREDIT* MAY BE TAKEN, DOE DOES NOT BELIEVE THAT EXTENT OF CREDIT* IS USEFUL IN EVALUATING TEST PLANS OR THE SITE CHARACTERIZATION PROGRAM **

* Credit now defined in terms of performance goals

** DOE believes that performance goals as defined in the slide, "performance goals," can be used to guide testing and to prioritize tests to be conducted.

EXAMPLE TEST SCHEDULE



9/26

EXAMPLE OF PERFORMANCE ALLOCATION TO GUIDE TESTING

1. Assume site conceptual model is well-enough developed to provide a cumulative probability distribution for ground-water travel time.

2. Assume that there is a finite probability that the travel time is less than 10,000 years.

3. Assume that the decision has been made to show compliance with the EPA Standard by requiring the delay for all radionuclides to the accessible environment to exceed 10,000 years with a confidence level of 95%.

4. Analysis using theoretical distributions for other parameters shows several ways to achieve this goal:

   a) Retardation factor of 5 with confidence level of 99%.

   b) Retardation factor of 10 with confidence level of 85%.

   c) Retardation factor of 20 with confidence level of 50%.

   d) Container lifeline of 10,000 years with confidence level of 70%.

5. Goal (b) is chosen to define the testing program (for this issue).

6. In addition, the container is considered as a barrier held in reserve.

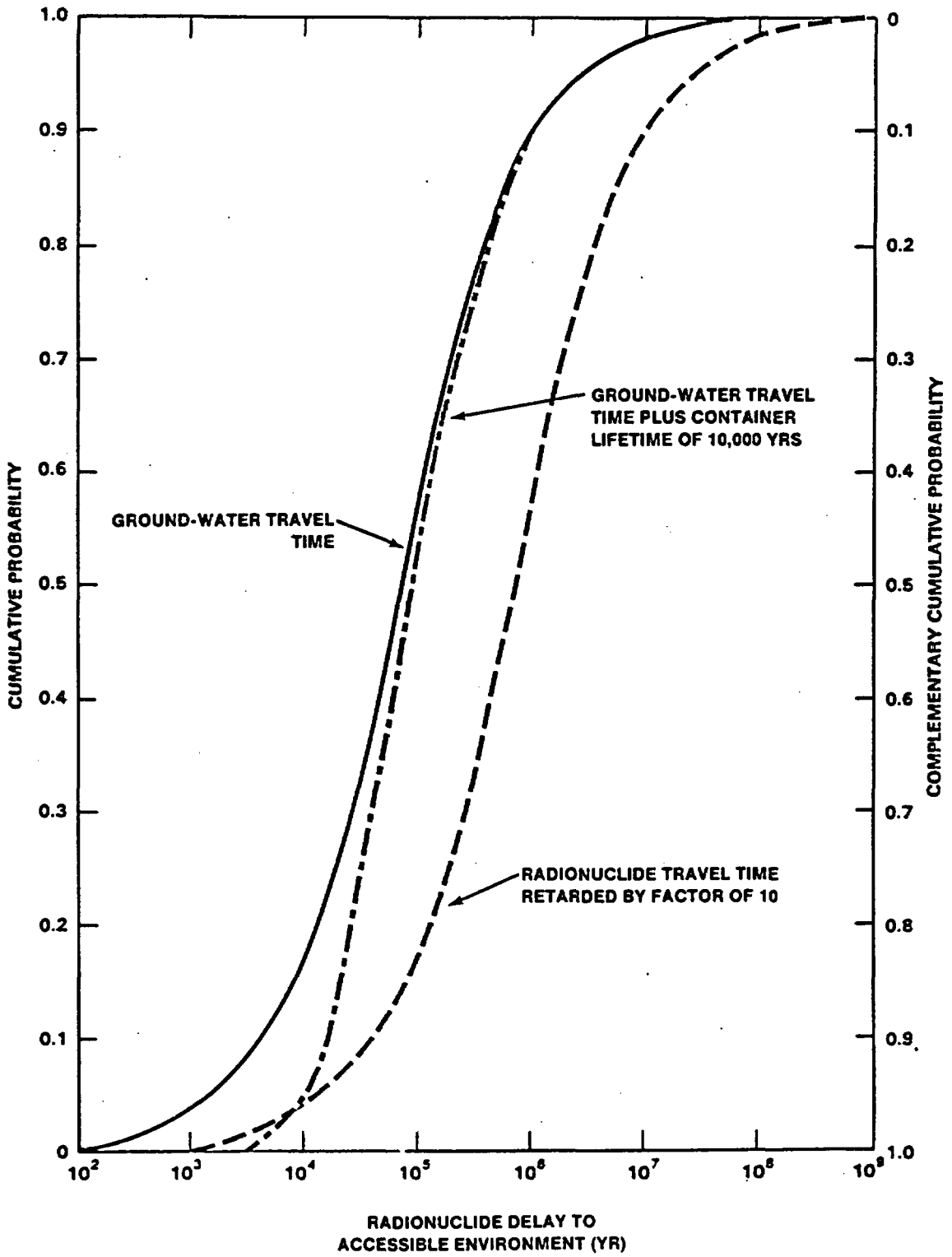
7. The testing program is then developed based on these choices:

   - Test for retardation parameters.

   - Provide for contingency testing of container degradation parameters.

9/26

EXAMPLE OF PERFORMANCE ALLOCATION TO GUIDE TESTING



APPLICATION TO PRECLOSURE PERFORMANCE

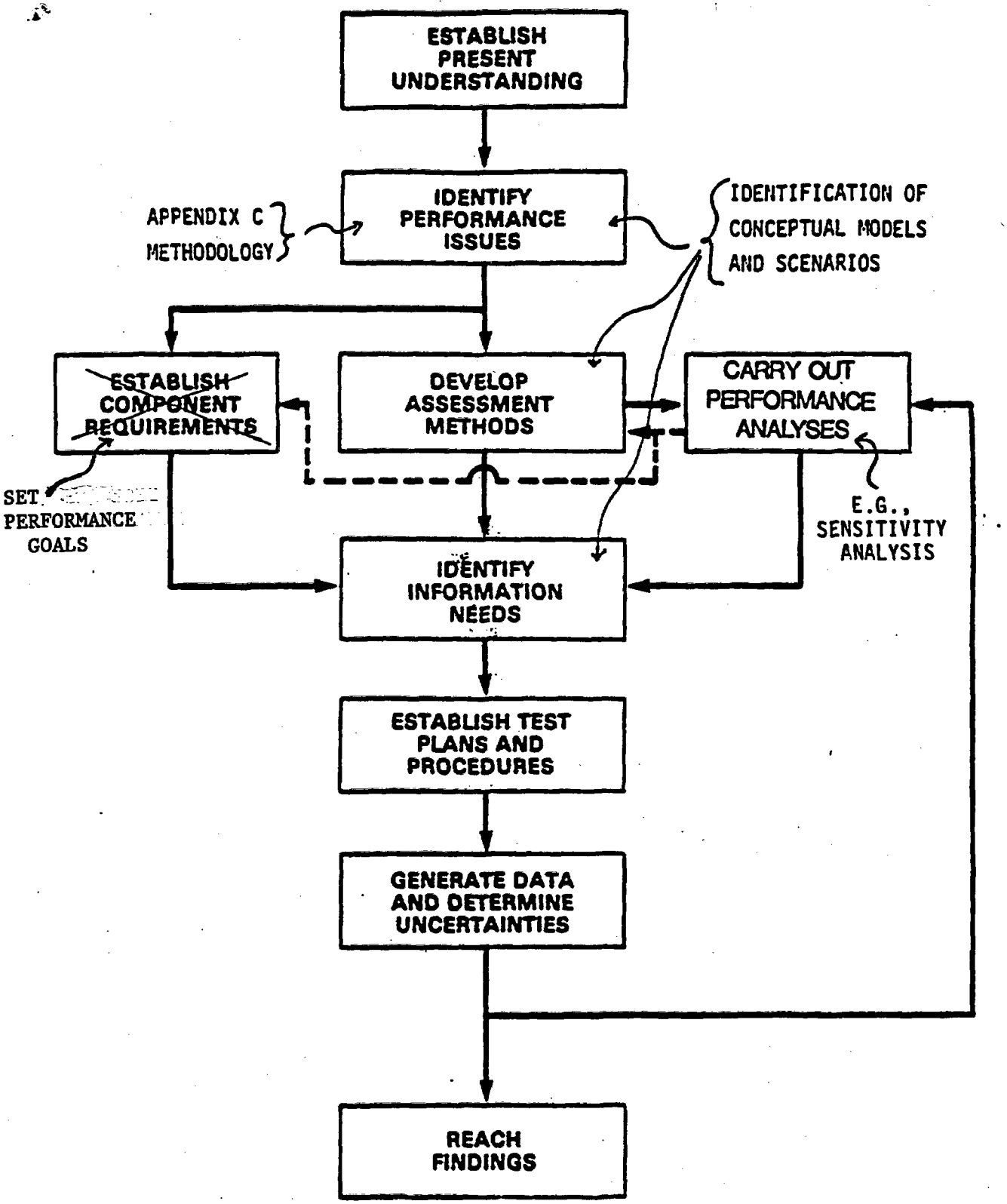
- PRECLOSURE PERFORMANCE ISSUES DIFFER FROM POSTCLOSURE PERFORMANCE ISSUES (E.G., PRECLOSURE PERFORMANCE DETERMINED ALMOST ENTIRELY BY DESIGN RATHER THAN SITE CHARACTERIZATION)

- STRATEGY FOR PRECLOSURE ASSESSMENTS SHOULD BE DISCUSSED IN THE MEETINGS ON PUBLIC SAFETY CONSIDERATION OF THE DESIGN

ENCLOSURE 6

FROM NUREG - 0960

APRIL 1983



ENCLOSURE 1

NRC/DOE MEETING ON PERF. ALLOC.
SEPT. 26-27, 1985

ATTENDEES

Name	Organization	Phone
Donald Alexander	DOE-HQ	252-1238
Pauline Brooks	NRC-WMRP	427-4780
Larry Ruckertsen	Weston	(301) 963-5214
S. M. Coplan	NRC; WM	427-4728
H.J. MILLER	NRC/WMRP	427-4777
Bob Baca	Rockwell/BWIP	FTS 444-2996
Wayne Walker	NRC/WMRP	427-4143
Scott GRACE	NRC/WMRP	427-4653
John Voglewede	NRC/WMEG	427-4276
John S. Trapp	NRC/WM&T	427-4545
Young C. Kim	Univ. of Ariz./EI/NRC	(602) 621-6067
GREGORY B. BAECHER	MIT/NRC	617/253-8435
Ralph Stein	DOE/HQ	252-5355
Felton Bingham	SNL	FTS 844-8816
Regina Hunter	SNL	FTS 846-6337
Robert Cranwell	SNL	FTS 844-8368
JEROME R PEARRING	NRC/WMEG	FTS 427-4648
David TIKTINSKY	NRC/WMEG	FTS 427-4649
Andrew P. Avel	DOE/CH - Columbus SRPO	FTS 976-9516
MALCOLM KNAPP	NRC/WM&T	FTS 427-4739
Joel Hunt	NRC/WMLU	FTS 427-4744
Robert L. Johnson	NRC/WMRP	FTS 427-6476
Chad Glenn	NRC/WMRP	FTS 427-4608
John Graham	Rockwell/BWIP	FTS 444-8506
DINESH GUPTA	NRC/WMEG	FTS 427-4742
King Stablein	NRC/WMRP	FTS 427-4611
VIETCHAU NGUYEN	YAKIMA/EWA	612-559-3706
SUSAN BILHORN	NRC-WMRP	FTS-427-4682
TOM JUNGLING	NRC-WMEG	FTS-427-4540
Sher Bahadur	NRC/WMEG	FTS-427-4495
William K. Terry	Rockwell/BWIP	FTS 444-0997
MIKE SHAPLEY	ROCKWELL/BWIP	FTS 444-7905

(2)

ATTENDEES (CONT'D)

Name	Organization	Phone
JOHN D. RANDALL	NRC/RES	(FTS 301) 427-4633
KIEN C. CHANG	NRC/WMEG	(301) FTS 427-4538
CHARLES H PETERSON	NRC/WMEG	427-4546
Michael J. Conroy	Weston	(301) 963-6873
Richard Codell	NRC	301 427 4558
Guy Martin, Jr	WESTON	301 963-5238
Chris Pflum	SAIC/NNWSI	FTS - 575-1464
TIM JOHNSON	NRC/WMEG	FTS 427-4088
Kenneth W. Stephens	Aerospace Corp.	~~(301)~~ (202) 488-6342
SAM C. MATTHEWS	Battelle, ONWI	614-424-7851
JOHN D WADDELL	Battelle, ONWI	614-424-5647
Paul W. Eslinger	Boeing CSR/BWIP	509-627-6211
Steve Baker	Rockwell/BWIP	FTS-444-4764
DANIEL I. HERBORN	ROCKWELL/BWIP	FTS 444-1653
John T. Greeves	NRC/WMEG	FTS 427-4784
Atef Elzeftawy	NRC/WMRP	FTS 427-4675
Charles R Cole	PNL/PASS	FTS 444-8451
John Peshel	NRC/WMEG	FTS 427-4735
Larry Boesch	Aerospace Corp	202-488-6393
PETE RAMATOWSKI	Umatilla Reservation	503-276-3018
RON T. HALEMOON	NEZ PERCE TRIBE	208-843-2253
M. S. Nataraja	NRC, WMEG	(301)-427-4319
D. J. FEHRINGER	NRC/WMRP	FTS 427-4796
Stan Echols	DOE-GC	252-6947
PHILIP S JUSTUS	NRC GEOLOGY-GEOPHYSICS	301-427-4684

ATTENDEES (CONT'D)

Name	Organization	Phone
JACK WITTMAN	STATE OF UTAH	(801) 538-5645