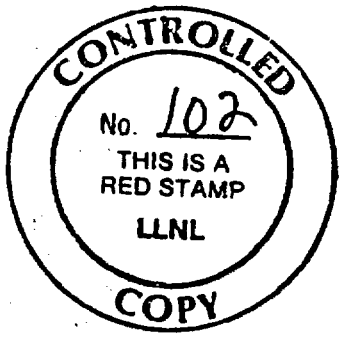

ACTIVITY PLAN

DEVELOP SCENARIO IDENTIFICATIONS

Sub-Activity I-20-20a of the "Scientific Investigation Plan for Waste Package Performance Assessment Conceptual Design Cycle".

WBS 1.2.1.4.2

L. Jardine, Technical Project Officer — 11/3/89 Date

D. Short, YMP Quality Assurance Manager — 30 Nov 1989 Date

W. O'Connell, Performance Assessment Technical Area Leader — 29 Nov, 1989 Date

A. MacIntyre, Scenarios Task Leader — 29 Nov, 1989 Date

R. Stout, Waste Form Acting Technical Area Leader — 29 Nov. 1989 Date

Preface

This activity plan addresses the work to be completed for subactivity I-20-20a for fiscal year 90.

The fundamental objective of activity I-20-20 is the clear and inclusive definition of the set of anticipated and unanticipated process and event sequences that will establish the range of cases for which waste package, and the engineered barrier system (EBS), performance must be predicted.

The activity is composed of four subactivities as listed below:

1) I-20-20a, Develop Scenario Identifications .
2) I-20-20b, Separate Scenarios into Anticipated and Unanticipated Categories.
3) I-20-20c, Develop parameters describing scenarios.
4) I-20-20d, Determine adequacy of design envelope.

The first subactivity provides listing of potential scenarios as required in the Site Characterization Plan (SCP) Section 8.3.5.10 [1]. Expert opinion methodology development will be initiated under this subactivity and applied in subsequent iterations. Using the initial set of defined scenarios, the second subactivity will determine the means of categorizing the activities as anticipated or unanticipated and provide broad parameter estimates.

The second subactivity requires the development and application of decision criteria. Also the expert opinion methodologies will be completed and along with uncertainty analyses will be applied to provide the broad parameters estimates. The second subactivity will commence shortly (1-2 months) after initiating the first subactivity.

The third subactivity will develop and assemble the parameters of the near field environment and of the waste package and EBS. This subactivity will develop descriptions of: how parameters of the far field influence the near field, taking into account interactions of the waste package and EBS with its environment; what parameters are determined by repository and waste package design; and how parameters of the near field and the waste package evolve under processes at the waste package and EBS scale. This portion of the subactivity will require intense integration and interface with the other LLNL technical areas (see Section 6.0) and the far-field performance assessment (SNL-ALB). Much of this data does not exist to date and the initial effort, this fiscal year, will consist of gathering what data there is and identifying when the remaining data will evolve. The second part of this subactivity requires

point estimate and probablistic characterizations. Test/model results, expert opinion and uncertainty analysis will be used to provide this data.

The fourth subactivity requires the first two subactivities be completed, at least preliminarily. In fact without some input from subactivity three (I-20-20c), not much can really be done in this area. We will determine the most current description of the design envelope for the waste packages (section 8.3.4.2 of the SCP).

1.0 SCIENTIFIC INVESTIGATION PLAN (SIP)

This subactivity is described in the "Scientific Investigation Plan for Waste Package Performance Assessment Activities Conceptual Design Phase" [2]. The Work Breakdown Structure (WBS) number for this SIP is 1.2.1.4.2.

1.1 Activity Identity

This subactivity is identified as I-20-20a, "Develop Scenario Identifications" which is part of the activity identified as I-20-20, "Scenario Identification, Categorization and Quantification." This is one of four subactivities of I-20-20.

1.2 Quality Assurance Level Assignment

A quality assurance level of QA I has been assigned to activity I-20-20. The subactivity I-20-20a has the same QA level.

1.3 Responsibilities

The Scenarios Task Leader is responsible for the completion of the work. The Performance Assessment Technical Area Leader is responsible for overall management and technical direction. These responsibilities are implemented in accordance with quality proceedure 033-YMP-QP1.0.[3].

2.0 PURPOSE AND OBJECTIVES

The purpose of subactivity I-20-20a is to identify and document scenarios for all anticipated and unanticipated processes and events. The subactivity I-20-20a will:
1) complete the credible far-field scenarios to the waste package and engineered barrier system (EBS),
2) review the far-field scenarios excluded on the basis of consequence for potential impact on the waste package and EBS and,

3) identify the local or near-field scenarios which could affect waste package and EBS performance.

Fiscal year 1990 activities will be limited to preliminary identification of the scenarios in the above three areas.

3.0 ACTIVITY DESCRIPTION

The credible far-field scenarios are identified in the Site Characterization Plan (SCP) Section 8.3.5.13 [4]. Recent and on-going Yucca Mountain Project (YMP) and Performance Assessment/Technical Integration Group (PA/TIG) work and activities will be reviewed and examined for additional updated information. Original participants will be queried as necessary.

The far-field scenarios, which have been previously excluded from total-system performance assessment consideration on the basis of consequences, will be identified from review of the studies conducted to select the credible far-field scenarios [5,6,7]. As with the identification of the credible scenarios YMP and PA/TIG work will be examined and study participants queried.

The primary information required for far-field scenarios is the most current, complete quantitative description of the sequence/consequence of processes for postulated event initiators. The identification of unknowns and the schedule for their resolution will be documented. Near field environment models and test data will be utilized to determine the near field effects of the far-field parameters. The resultant information will be used with the container materials models and test data to provide the set of processes and events for the waste form assessments. The majority of this work will entail review of existing documentation and test results.

Local or near-field scenarios will be identified by describing local event initiators and conditions and then proceeding on a path similar to that described above for the far-field scenarios. Literature searches will be used initially to compile the set of initiators. An adaptation of failure modes and effects analysis (FMEA) will also be considered [8]. The development of expert opinion methods will commence under this subactivity. The expert opinion work to be completed under this activity is the compilation of methods and the preliminary selection of the preferred methods [9]. As with far-field information, identification of unknowns and the schedule for their resolution will be documented.

The scenario identification information will be formatted to facilitate computerized databasing if at a future date we choose to do so. Scenario information will be presented in a succinct form with references as appropriate.

3.1 Technical Review

A review of the preliminary scenario identification report will be conducted in accordance with quality procedure 033-YMP-QP-2.4 "Technical Reviews" [10]. This review will occur when the scenarios have been identified. Informal reviews of both method and results will occur throughout the process. The scientific notebook will be reviewed by the PA Technical Area Leader on a periodic basis in accordance with 033-YMP-QP 3.4, "Scientific Notebooks" [11].

3.2 Hold Points

Technical review will occur prior to formal transmittal of the identifications for use on other activities.

Progress will be reported to the Technical Area Leader in a monthly report. If changes in project scope require scenario identification changes, it is the responsibility of the Technical Area Leader to communicate this to the Task Leader in writing.

3.3 Equipment

Not applicable

3.4 Materials

Not applicable

3.5 Special Environmental Conditions

Not applicable

3.6 Special Training/Qualification Requirements

Not applicable

3.7 Activity Closeout

The FY90 products will consist of a preliminary report at fiscal year end. The final product of this subactivity will be a UCID report documenting the method and scenarios identified. Interim UCID reports will be issued in accordance with the repository design phases. Supporting

documentation such as scientific notebooks and technical review comments will be retained by the task leader until the document package is transferred to the local records center at the conclusion of the subactivity or at least annually.

4.0 PRECISION AND ACCURACY

Not applicable

5.0 IN-PROCESS DOCUMENTATION

In-process documentation includes data sheets, meeting minutes, teleconference notes and literature reviews. This information will be recorded in a controlled scientific notebook in accordance with 033-YMP-QP-3.4, "Scientific Notebooks" [12]. Preliminary reports will be written and maintained by the Task Leader until such time that they have completed review and are finalized. Status of the subactivity will be transmitted to the Technical Area Leader in monthly reports.

5.1 Data Recording and Data Reduction

Not applicable

5.2 Analysis

Not applicable

6.0 INTERFACES

This subactivity can be initiated independently of other activities; however, activities I-20-22, I-20-23 and I-20-28 require input from this subactivity before they can be completed. [13] The Technical Area Leader is the same for these activities and the subactivity. This subactivity also provides input to activities D-20-50 and D-20-65, models for release of radionuclides from the spent fuel and glass waste forms respectively. [14,15] Additionally, input will be provided to activity G-20-06, Diffusive Radionuclide Transport Model. [16]. These activities are in the Waste Form Modeling & Testing Technical Area. These activity numbers, their titles and respective technical areas are provided below.

Number	Name	Technical Area
I-20-22	PANDORA 1.1 Development	Performance Assessment
I-20-23	PANDORA 2.0 Development	Performance Assessment

I-20-28	Source Model 1-1 Development	Performance Assessment
D-20-50	Spent Fuel Waste Form Release Models	Waste Form Model and Test
D-20-65	Glass Waste Form Release Models	Waste Form Model and Test
G-20-06	Diffusive Radionuclide Transport Model	Waste Form Model and Test

Technical interfaces to other participants and to the DOE are controlled in accordance with project office administrative procedures. Internal technical interfaces follow quality procedure 033-YMP-QP-3.5, "Control of Internal Technical Interfaces," [17].

7.0 SCHEDULE

The schedule of key milestones are depicted in Table 1. For this fiscal year the subactivity will prepare a preliminary report on identified scenarios during the second quarter. The report will be revised as necessary after the container materials are selected to identify potential changes as a result of the selection. The preliminary report will also include a description of the methodology developed to date.

Table 1.

Milestone Earned Values

PA Scenario Identification Sub Activity

Time From Start	Milestone	Earned Value
3 mo.	Draft Report	40%
6 mo.	Revised Report	40%
7 mo.	Report Issued	20%
		100%

Estimated total manpower required: 15 m-m (1.4 FTE)

8.0 TECHNICAL IMPLEMENTING PROCEDURES

No Technical Implementing Procedures are required for the initiation of Activity I-20-20. Scenario development methodologies will utilize techniques currently published in the literature such as event trees. Where new or substantially modified methodologies are required, controlling instruction will be provided by scientific notebook or TIP, if appropriate.

9.0 SPECIAL CASES (PROCUREMENT)

Not applicable

10.0 REFERENCES

1. Site Characterization Plan: Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Vol. VII, Part B, US DOE-OCRWM, Oak Ridge, Tennessee, June 1989, pp. 8.3.5.10-58 to 8.3.5.10-62.

2. Scientific Investigation Plan for Waste Package Performance Assessment Activities: Conceptual Design Cycle, LLNL-YMP, Livermore, California, 1989, pp.13,14.

3. "Organization," 033-YMP-QP-1.0, in LLNL Yucca Mountain Project Quality Procedures Manual, LLNL, Livermore, California, 1989.

4. Site Characterization Plan: Yucca Mountain Site, Nevada Research and Development Area, Nevada, DOE/RW-0199, Vol. VII, Part B, US DOE-OCRWM, Oak Ridge, Tennessee, June 1989, pp. 8.3.5.13-25 to 8.3.5.13-56.

5. Performance Assessment for Underground Radioactive Waste Disposal Systems, Safety Series No. 68, IAEA, Vienna, Austria, 1985.

6. A Multiattribute Utility Analysis of Sites Nominated for Characterization for the First Radioactive-Waste Repository - A Design - Aiding Methodology, DOE/RW-0074, DOE, Washington, D.C., 1986.

7. Ben Ross, A First Survey of Disruption Scenarios for a High-Level-Waste Repository at Yucca Mountain, Nevada, SAND 85-7117, SNL-YMP, Albuquerque, New Mexico, 1987.

8. IEEE Guide for General Principles of Reliability Analysis of Nuclear Power Generating Stations Protection Systems, IEEE std 352-2975, IEEE, New York, NY, 1975.

9. Wm. J. Roberds, Robert J. Plum and Paul J. Visca, Proposed Methodology for Completion of Scenario Analysis for the Basalt Waste Isolation Project, RHO-BW-CR-147P, Rockwell Hanford Operations, Richland, WA, November 1984, pp. 9-11; 54-56.

10. "Technical Review," 033-YMP-QP-2.4, in LLNL Yucca Mountain Project Quality Procedures Manual, LLNL, Livermore, California, 1989.

11. "Scientific Notebooks," 033-YMP-QP-3.4, in LLNL Yucca Mountain Project Quality Procedures Manual, LLNL, Livermore, California, 1989.

12. "Scientific Notebooks," 033-YMP-QP-3.4, in LLNL Yucca Mountain Project Quality Procedures Manual, LLNL, Livermore, California, 1989.

13. Scientific Investigation Plan for Waste Package Performance Assessment Activities: Conceptual Design Cycle, LLNL-YMP, Livermore California, 1989, pp.13,15-18.

14. Scientific Investigation Plan for YMP Spent Fuel Waste Form Testing, LLNL-YMP, Livermore, California, May 31, 1989, pp. 25-27.

15. Scientific Investigation Plan for YMP Glass Waste Form Testing, LLNL-YMP, Livermore, California, Sept. 27, 1989, pp. 23-26.

16. Scientific Investigation Plan for NNWSI WBS Element 1.2.2.3.4 (non EQ3/6 Data Base Portion), Integrated Testing, LLNL, Livermore, California, May 29, 1987, p. 13.

17. "Control of Internal Technical Interfaces," 033-YMP-QP-3.5, LLNL Yucca Mountain Project Quality Procedures Manual, LLNL, Livermore, California, 1989.

11.0 APPENDICES

Not applicable

Waste Package Performance Assessment

1. Scientific Investigation Plan (SIP) No. SIP-PA-2 titled "SIP for Waste Package Assessment Activities Conceptual Design Cycle" WBS 1.2.1.4.2

2. Activity Plan titled "Develop Scenario Identifications" Sub-activity I-20-20a