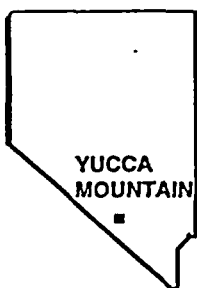


U.S. DEPARTMENT OF ENERGY

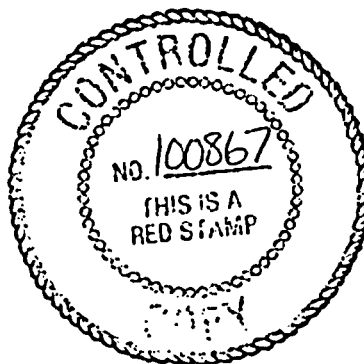
WM



YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT

CONSOLIDATED SAMPLING IN THE EXPLORATORY STUDIES FACILITY

REV. 3



TEST PLANNING PACKAGE 92-14

WH0301
102.6
WM-11



JUNE 1995

300127

UNITED STATES DEPARTMENT OF ENERGY

YMP-071-R2
06/06/94

YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT
TEST PLANNING PACKAGE APPROVAL AND RELEASE

Test Planning Package Title: Consolidated Sampling in the Exploratory Studies Facility Revision: Rev. 3

Test Planning Package Number: TPP 92-14

Responsible PE: R. Oliver

Summary of Scope: Collect samples in the Exploratory Studies Facility for a variety of hydrologic, geologic, chemical, and thermomechanical tests. Previous version (Rev. 2) has been revised to make the TPP structure content consistent with the test planning package outline in YAP-5.5Q, Rev. 0. The associated job package will provide implementing detail for carrying out the test in defined phases during ESF construction.

Job Package Number: JP 92-20C

WBS Number (third level): 1.2.2, 1.2.4, and 1.2.3

Affected Organizations: USGS, LANL, SNL and LLNL

Concurrence of requirements by affected Technical Project Officers and Assistant Managers

TPO: ^{for} L. Hayes Robert W. Craig Date: 6/20/95

TPO: J. Canepa [Signature] Date: 6/26/95

TPO: ^{for} W. Clarke [Signature] Date: 20 Jun 95

TPO: L. Costin (Acting) F. J. Schell for LSC Date: 6/23/95

TPO: _____ Date: _____

Affected Assistant Managers:

AM: R. Spence [Signature] Date: 6/20/95
(YMOAD)

AM: _____ Date: _____

AM: _____ Date: _____

Release to:

Assistant Manager for
Administration for job assembly

for nonfield work

YMSCO Approvals:

Responsible Assistant Manager: W. A. Hirdley FOR Date: 6/26/95
S. Jones
(AMSP)

**TEST PLANNING PACKAGE 92-14
CONSOLIDATED SAMPLING IN THE EXPLORATORY STUDIES FACILITY**

CONTENTS

1.0	LIST OF STUDY PLANS OR SCIENTIFIC INVESTIGATION PLANS USED IN SCIENTIFIC INVESTIGATION.....	2
2.0	WORK SCOPE	2
3.0	INVESTIGATION CONTROLS.....	4
3.1	Interference.....	4
3.2	Impacts to Waste Isolation	5
3.3	Environmental Impacts.....	5
3.4	Consolidated Performance Criteria and Constraints.....	5
3.5	Safety Analysis	5
4.0	OTHER INSTRUCTIONS.....	5
4.1	Sequencing Recommended for Performing Multiple Investigations.....	5
4.2	Data Submittals (YAP-SIII.3Q)	5
4.3	Sample Collection	6
4.4	Computer Software	6
5.0	DESCRIPTION OF OPEN SITE CHARACTERIZATION PLAN COMMENTS (YAP-30.3)	6
6.0	REFERENCES TO DESIGN REQUIREMENTS.....	6
7.0	COST AND SCHEDULE DATA	7
8.0	QA PREPARATION	7
8.1	Closure of QA Concerns	7
8.2	Q-List Items/Activities.....	7
9.0	READINESS REVIEW	8
	ATTACHMENT 1: TEST-SPECIFIC PERFORMANCE CRITERIA AND CONSTRAINTS	9
	ATTACHMENT 2: CONSOLIDATED SAMPLING SCHEDULE PLANNING BASIS.....	20

1.0 LIST OF STUDY PLANS OR SCIENTIFIC INVESTIGATION PLANS USED IN SCIENTIFIC INVESTIGATION

The following study plans are controlled Yucca Mountain Site Characterization Project (YMP) documents that describe plans for consolidated sampling activities which will be implemented in the Exploratory Studies Facility (ESF); 8.3.4.2.4.4, "Engineered Barrier System Field Tests," 8.3.1.2.2.2, "Water Movement Tests," 8.3.1.3.2.1, "Mineralogy, Petrology, and Chemistry of Transport Pathways," 8.3.1.3.2.2, "History of Mineralogic and Geochemical Alteration of YM," 8.3.1.9.2.1, "Natural Resource Assessment of Yucca Mountain, Nye County, Nevada," and 8.3.1.5.2.1, "Characterization of Yucca Mountain Quaternary Regional Hydrology," 8.3.1.3.4.2, "Biological Sorption and Transport," 8.3.1.2.2.3, "Characterization of the Percolation in the Unsaturated Zone-Surface-Based Study," 8.3.1.15.1.8, "In-Situ Design Verification," 8.3.1.15.1.1, "Laboratory Thermal Properties," 8.3.1.15.1.2, "Laboratory Thermal Expansion Testing," 8.3.1.15.1.3, "Laboratory Determination of the Mechanical Properties of Intact Rock," 8.3.1.15.1.4, "Laboratory Determination of Mechanical Properties of Fractures," 8.3.1.2.2.4 "Characterization of the Yucca Mountain Unsaturated Zone in the Exploratory Studies Facility," 8.3.1.2.2.7.2, "Aqueous-Phase Chemical Investigations Unsaturated Zone Hydrochemistry," and 8.3.4.2.4.5, "Engineered Barrier System Field Tests."

2.0 WORK SCOPE

Section 2.0 References:

- R2.1 Letter: Edwards to Boak, "Design and Construction-Related Information for U.S. Geological Survey Sample Collection Activities in the Exploratory Studies Facility North Ramp (SCP: 8.3.1.2.2.3.1, 8.3.1.9.2.1.1, and 8.3.1.5.2.1.5)," dated August 5, 1994.
- R2.2 Facsimile: Blink to Boak, "Information needed for Consolidated Sampling in the Exploratory Studies Facility", dated July 11, 1994.
- R2.3 Letter: Mitchell to Elkins, "Transmittal of Supplemental Design and Test-Related Information for the ESFDR (D&TRI) Los Alamos Tests in the ESF North Ramp and Test Alcoves," LA-EES-13-LV-07-94-022, dated July 12, 1994.
- R2.4 Letter: Shephard to Boak, "Request for Planning for Consolidated Sampling in the ESF North Ramp (Test Planning Package 92-14, R1)," dated July 6, 1994.
- R2.5 Letter: Edwards to Boak, "Sampling in the ESF to Support Hydrochemical Characterization of the Unsaturated Zone," dated August 9, 1994.
- R2.6 Letter: Edwards to Elkins "Test Planning Information for Intact Fracture Test-FY95" dated January 10, 1995.
- R2.7 Memorandum: Mitchell to Brady, "Request for Sandia National Laboratories Planning Information for Consolidated Sampling in the Exploratory Studies Facility (Test Planning Package 92-14, Revision 2)," dated January 27, 1995.

- R2.8 Memorandum: Mitchell to Edwards, "Request for U. S. Geological Survey Planning Information for Consolidated Sampling in the Exploratory Studies Facility (Test Planning Package 92-14, Revision 2)," dated January 27, 1995.
- R2.9 Memorandum: Mitchell to Blink, "Request for Lawrence Livermore National Laboratory Planning Information for Consolidated Sampling in the Exploratory Studies Facility (Test Planning Package 92-14, Revision 2)," dated January 27, 1995.
- R2.10 Memorandum: Whelan to Mitchell, "Revisions to Test Planning Package (TPP) 92-14", dated February 5, 1995.
- R2.11 Memorandum: Mitchell to Fabryka-Martin, "Request for Los Alamos National Laboratory Water Movement Tests Planning Information for Consolidated Sampling in the Exploratory Studies Facility, (Test Planning package 92-14, Rev. 2)", dated February 15, 1995.
- R2.12 Facsimile: Severson to Degner, "Core Sample Collection for Intact Fracture Test - FY95", dated February 16, 1995.
- R2.13 Record of Verbal Communication: Fabryka-Martin to Degner, dated February 24, 1995.
- R2.14 Record of Verbal Communication: Pott to Degner, dated March 1, 1995.
- R2.15 Record of Verbal Communication: Brady to Degner, dated March 1, 1995.

Samples are collected under this test planning package for the following tests, which are discussed in the following sections of the Site Design and Test Requirements Document (SD&TRD):

<u>Test Title</u>	<u>SD&TRD Section</u>
1. Chloride & Chlorine-36 Measurements of Percolation at YM	3.2.1.2.B.2.a
2. Matrix Hydrologic Properties Testing	3.2.1.2.B.3.a
3. Petrologic Stratigraphy of the Topopah Spring Member	3.2.1.3.B.1.a
4. Mineral Distributions Between Host Rock And Accessible Environment	3.2.1.3.B.1.b
5. Fracture Mineralogy	3.2.1.2.B.1.c
6. History of Mineralogic and Geochemical Alteration of YM	3.2.1.3.B.2.a
7. Biological Sorption and Transport	3.2.1.2.D.2
8. Studies of Calcite and Opaline Silica Vein Deposits	3.2.1.5.B.1.e
9. Geochemical Assessment of Yucca Mountain in Relation to the Potential for Mineralization	3.2.1.9.B.1.a
10. Repository Horizon Rock-Water Interaction	3.2.4.2.A.4.b
11. Air Quality and Ventilation Experiments	3.2.1.15.A.8.d
12. Laboratory Thermal Properties	3.2.1.15.A.1.a
13. Laboratory Thermal Expansion Testing	3.2.1.15.A.1.b
14. Laboratory Determination of Mechanical Properties of Intact Rock	3.2.1.15.A.3

- | | |
|--|---------------|
| 15. Laboratory Determination of Mechanical Properties of Fractures | 3.2.1.15.A.4 |
| 16. Aqueous-Phase Chemical Investigations | 3.2.1.2.B.7.b |
| 17. Intact-Fracture Test in the Exploratory Studies Facility | 3.2.1.2.B.4.a |
| 18. Hydrochemistry Testing in the ESF | 3.2.1.2.B.4.h |
| 19. Characterize the Effects of Introduced Materials on Water Chemistry in the Post Emplacement Environment. | 3.2.4.2.A.5 |

The purpose of the tests is to collect samples in the ESF for a variety of hydrologic, and geologic, mechanical, and chemical tests.

ESF common facility design requirements are met by current Title II drawings and specifications that are the controlling documents for the current version of the ESFDR. Any changes to ESF design requirements are handled through the design interface.

3.0 INVESTIGATION CONTROLS

- R3.1 "Exploratory Studies Facility Design Requirements", YMP/CM-0019.
- R3.2 Letter: Statton to Oliver, "Waste Isolation and Test Interference Evaluations for the ESF Starter Tunnel Construction - JP 92-20, and Planned Tests," LV.SC.BWD.3/93-074, dated March 24, 1993.
- R3.3 Memorandum: Dyer to File, "Approval of Lithium Bromide and Related Controls for Use as the Tracer in Underground Construction Water at the Exploratory Studies Facility (ESF)," RSED:JRD-3560, dated April 1, 1993.
- R3.4 Letter: Oliver to Elkins, "Submitted Test Interference Evaluation Acceptance for Exploratory Studies Facility Ramps, Main Drift, and Alcoves (SCPb: N/A)" LA-EES-13-LV-07-94-007, dated July 6, 1994.
- R3.5 Letter: Boak to Elkins, "Waste Isolation Evaluation for Exploratory Studies Facility North Ramp and Test Alcoves (SCPb: N/A)" LA-EES-13-LV-07-94-019, dated July 12, 1994.
- R3.6 Letter: Dixon to Simecka, "Amended Approval of Land Access and Environmental Compliance for Field Work Involving Exploratory Studies Facility (ESF) Construction of Package 1A (92-015.14) (SCP:N/A)," POCD:JCM-4299, dated May 24, 1993.

The following controls are based on section references, including evaluations to address potential test interference and waste isolation impacts (including planned use of tracers, fluids, and materials [TFM]) and information from principal investigators (PIs).

3.1 Interference

None identified in excess of controls identified in Reference R3.2.

3.2 Impacts to Waste Isolation

None identified in excess of controls identified in Reference R3.2.

3.3 Environmental Impacts

All work shall conform to Reference R3.6 and YAP-30.2.

3.4 Consolidated Performance Criteria and Constraints

See Attachment 1 for a list of consolidated test-specific performance criteria and constraints.

3.5 Safety Analysis

Potential environmental, safety, and health concerns regarding the interactions between test activities and construction activities are addressed by safety analysis, written by the participant organization(s) and transmitted to the ESF TCO under official memorandum. The ESF TCO safety representative compiles this information and provides an overview for each specific test. A reference to the ESF TCO safety analysis is made in the Job Package (JP) for the test(s) to be conducted. A new safety analysis is prepared each time workscope is changed or modified. A copy of each safety analysis is maintained by the ESF TCO.

There are no radiological safety issues associated with these activities.

4.0 OTHER INSTRUCTIONS

4.1 Sequencing Recommended for Performing Multiple Investigations

See Attachment 1.

4.2 Data Submittals (YAP-SIII.3Q)

Participants are responsible for collection, management, submittal of data, and for compliance with Project and participant plans and procedures as described in the job package.

All transfers of data between YMP participants, submittal of data to the YMP database, or transfer of data to outside parties shall be conducted in accordance with YAP-SIII.3Q and other applicable plans and procedures.

Key data to be obtained are described in the referenced job package; this includes, but is not limited to, bulk rock and water samples for site characterization analyses and supporting construction-related TFM samples. Any instrument installation associated with sampling will be documented.

4.3 Sample Collection

All samples shall be collected, handled, and transferred in accordance with YAP-SII.4Q and in a manner that provides traceability. All sample locations shall be surveyed and photographed. See Attachment 1 and JP 92-20C for test-specific sample collection requirements.

4.4 Computer Software

No software has been identified by the PI(s) for use in the field.

5.0 DESCRIPTION OF OPEN SITE CHARACTERIZATION PLAN COMMENTS (YAP-30.3)

Section 5.0 References:

- R5.1 Letter: Statton to Oliver, "Waste Isolation and Test Interference Evaluations for the ESF Starter Tunnel Construction - JP 92-20, and Planned Tests," LV.SC.BWD.3/93-074, dated March 24, 1993.

No open constraints or commitments associated with the Site Characterization Plan (SCP) have been identified for this activity.

6.0 REFERENCES TO TEST SPECIFIC REQUIREMENTS

Section 6.0 References:

- R6.1 Letter: Edwards to Boak, "Sampling in the ESF to Support Hydrochemical Characterization of the Unsaturated Zone," dated August 9, 1994.
- R6.2 Letter: Edwards to Elkins "Test Planning Information for Intact Fracture Test - FY95" dated January 10, 1995.
- R6.3 Letter: Whelan to Mitchell, "Revisions to Test Planning Package (TPP) 92-14", dated February 5, 1995.
- R6.4 Facsimile: Severson to Degner, "Core Sample Collection for Intact Fracture Test - FY95", dated February 16, 1995.
- R6.5 Record of Verbal Communication: Fabryka-Martin to Degner, dated February 24, 1995.
- R6.6 Record of Verbal Communication: Pott to Degner, dated March 1, 1995.
- R6.7 Record of Verbal Communication: Brady to Degner, dated March 1, 1995.

References R6.1 through R6.7 provide test specific requirements.

7.0 COST AND SCHEDULE DATA

Section 7.0 References:

R7.1 Letter: Burke to Oliver, "Response to Requests for Support,"
LV.BMS.RAS.3/93.027, dated March 19, 1993.

R7.2 Memorandum: Rainey to Kinter, "Request for Supplemental PACs Information,"
dated July 7, 1994.

<u>Participant</u>	<u>WBS</u>	<u>P&S Account</u>
LANL	1.2.3.2.1.1.2	OA32112
LANL	1.2.3.3.1.2.2	OA33112
LANL	1.2.3.2.1.1.1	OA32111
LLNL	1.2.3.12.4	OL3C4 KMH (Sampling)
LLNL	1.2.3.12.5	OL33C5LDZ (Sampling)
USGS	1.2.3.3.1.2.3	OG33123
USGS	1.2.3.6.2.2.1	OG36221
USGS	1.2.3.7.2.1	OG33721
USGS	1.2.3.2.2.1.2	OG32212
USGS	1.2.3.3.1.2.7	OG33127
SNL	1.2.3.2.7.1.1	OS32711
SNL	1.2.3.2.7.1.2	OS32712
SNL	1.2.3.2.7.1.3	OS32713
SNL	1.2.3.2.7.1.4	OS32714
SNL	1.2.4.2.1.1.4	OS42114
SNL	1.2.4.6.2	OS462

See Attachment 2 for further detail on the schedule planning basis. The task dates and estimated duration are based on current design and construction strategies. These tasks, dates, and duration are subject to change. Changes will be controlled through the Project planning basis and reflected in applicable job packages or approved Project schedules.

8.0 QA PREPARATION

8.1 Closure of QA Concerns

No QA concerns have been identified.

8.2 Q-List Items/Activities

General guidance for application of the Quality Assurance Requirements and Description (QARD, DOE/RW/0333P) to site characterization activities is provided by the test organization in conjunction with the Project Office YMP/90-55 Q-List. The quality affecting elements for this activity are limited to data and samples collected in support of Study Plans listed in section 1.0.

The following quality assurance grading reports (QAGR) associated with the testing activities have been approved:

<u>Participant</u>	<u>QAGR</u>	<u>WBS</u>	<u>Subject</u>
LANL	1	1.2.3.2	Geology (Mineralogy, Petrology & Pathways)
LANL	10	1.2.3.3.1	Geohydrology
LLNL	LLNL-QAG-L030	1.2.3.12.4	Sample Analyses for Engineered Barrier System Field Prototype Test
LLNL	LLNL-QAG-L041	1.2.3.12.5	Man-made Materials - Scoping/Test Design and Prototype Applications
USGS	G1233123	1.2.3.3.1.2.3	Characterization of Percolation in the Unsaturated Zone--Surface-Based Study
USGS	G123721	1.2.3.7.2.1	Natural Resource Assessment of Yucca Mountain, Nye County, Nevada
USGS	G12362321	1.2.3.6.2.2.1	Characterization of the Yucca Mountain Quaternary Regional Hydrology
USGS	G1233121		Characterization of Structural Features in the Site Area
USGS	G1233127		Hydrochemical Characterization of the Unsaturated Zone
SNL	007	1.2.3.2.7.1.1	Laboratory Thermal Properties
SNL	006	1.2.3.2.7.1.2	Laboratory Thermal Expansion Testing
SNL	023	1.2.3.2.7.1.3	Laboratory Determination of Mechanical Properties of Intact Rock
SNL	024	1.2.3.2.7.1.4	Laboratory Determination of Mechanical Properties of Fractures
SNL	001	1.2.4.2.1.1.4	In Situ Design Verification
SNL	053	1.2.4.6.2	Sealing Testing

9.0 READINESS REVIEW

The Assistant Manager for Scientific Programs has determined that a readiness review is not required.

TEST-SPECIFIC PERFORMANCE CRITERIA AND CONSTRAINTS FOR CONSOLIDATED SAMPLING IN THE EXPLORATORY STUDIES FACILITY

Attachment 1 References:

- A.1 Letter: Edwards to Boak, "Sampling in the ESF to Support Hydrochemical Characterization of the Unsaturated Zone," dated August 9, 1994.
- A.2 Letter: Whelan to Mitchell, "Revisions to Test Planning Package (TPP) 92-14", dated February 5, 1995.
- A.3 Facsimile: Severson to Degner, "Core sample Collection for Intact Fracture Test - FY95", dated February 16, 1995.
- A.4 Record of Verbal Communication: Fabryka-Martin to Degner, dated February 24, 1995.
- A.5 Record of Verbal Communication: Pott to Degner, dated March 1, 1995.
- A.6 Record of Verbal Communication: Brady to Degner, dated March 1, 1995.

A consolidated list of performance criteria and constraints, derived from the test organization and focused on specific testing needs for this phase of the activity, is found below. References A.1 through A.6, along with a review of the job package by the Los Alamos National Laboratory Exploratory Studies Facility Test Coordination Office (ESF TCO), provided the basis for design and test-related information.

The following performance criteria and constraints represent the controlled requirements basis for tests to be conducted in the Exploratory Studies Facility. Not all portions of these tests will be conducted at all locations; however, all tests will be conducted in a manner consistent with these requirements. Test requirements will be implemented through job packages and referenced design specifications and drawings and controlled procedures. Compliance with test requirements will be demonstrated through records submissions and reporting requirements.

Supplemental planning information, other reference information, and a review of the reference information by the ESF TCO were used as indicated to modify, add, supplement, or otherwise amend performance criteria and constraints; this information is fully consistent with the section references and ESF Title II design.

A. General Consolidated Sampling Program

The following are general criteria and constraints for all sampling activities covered by this Test Planning Package. Specific criteria and constraints for each specific test follows this section.

Performance Criteria

- 1a. Ability to collect bulk rock samples; short (less than 1-m [3.3 ft]) core; and samples of TFM from all ramps, drifts, and alcoves.
- 1b. Ability to access any given sample location for resampling, if judged necessary, must be maintained.
- 1c. Standard ESF utilities are adequate to conduct sampling activities.

Constraints

- A. Each bulk rock and short (less than 1-m [3.3 ft]) core sample location shall be surveyed and photographed unless precluded by safety considerations.
- B. Sampling will generally occur concurrent with or subsequent to geologic mapping activities.
- C. Sampling will be coordinated with other testing and construction activities and can be conducted during facility construction without impact to construction activities except in instances noted below.
- D. No water shall be used in the immediate vicinity of any sampling location (zone of potential interference to be determined) without approval of the PI, except for misted water in compressed air used to clean tunnel surfaces prior to geologic mapping and chemically tagged water used for construction purposes. Areas of exclusion may be set up in order to preclude the use of misted water around unidentified sample locations that may be impacted by the use of misted water.
- E. No tracer shall be used in the vicinity of any sampling location without approval of the PI, except for tracer use in construction water. For water applied underground in dust suppression; blasthole drilling; in grout, mortar, concrete and shotcrete; wall washing (blowdown) prior to mapping; and other construction applications, addition of a universal tracer is required. Lithium bromide shall be the only tracer (universal) required and acceptable from the standpoint of ESF testing. The concentration of lithium bromide tracer in construction water should be 20 ppm (as bromide) with an acceptable tolerance of $\pm 10\%$ (range of 18 ppm to 22 ppm). Tracer system verification should include an automated volumetric analyzer (electrode) and periodic sampling for laboratory analysis. Use of TFM, especially in proximity to sample locations, shall be documented and samples of TFM will be provided to PIs upon request.
- F. Any drilling necessary to obtain samples shall be done dry unless otherwise indicated by the PI for a specific test.
- G. Sample orientation shall be described and recorded. The sample orientation shall be marked on the sample unless doing so would potentially alter sample analyses.
- H. No IDCS interface is required.

- I. Sampling activities are covered in JP 92-20C unless noted for a specific test.

A.1 CHLORIDE & CHLORINE-36 MEASUREMENTS OF PERCOLATION AT YUCCA MOUNTAIN

Performance Criteria

- 1a. Ability to collect approximately 20 to 50 kg (44 to 110-pound) samples from each sample location in the ESF North Ramp and alcoves. Each sample location should be surveyed and photographed. Samples should not be taken in close proximity to spills of chemicals or construction water.
- 1b. Provide the ability to collect samples concurrently with construction by dry-coring or reaming. Individual fragments of any given sample must be chip size or larger (i.e. not rock flour).
- 1c. Provide the ability to collect several samples from each geologic unit identified by the Geologic Mappers, from breccia zones, lithologic contacts, intensely fractured zones, and wet zones encountered in the ESF north ramp and alcoves.
- 1d. Key data to be collected are rubble and wall rock samples for laboratory analyses of chlorine-36, chloride, and bromide.

Constraints

- A. The timing of this test will vary according to the construction method used in the ESF ramp and alcoves. In general, sampling can be conducted during facility construction without impact to construction activities. In some instances, samples may have to be deferred until completion of some construction activities to avoid interference with the construction schedule. However, wet zones and perched water require immediate sampling in order to protect the integrity of these samples and to obtain water samples while water is still flowing.
- B. Sampling of wet zones and occurrences of perched water must be coordinated with the Perched Water Test.

A.2 MATRIX HYDROLOGIC PROPERTIES TESTING

Performance Criteria

- 1a. Samples will be required from all lithologic units penetrated by the ESF. Samples adjacent to lithologic contacts and from bedded intervals are of particular importance.
- 1b. Ramp and drift walls may need to be sampled as soon as they are excavated. The samples would be block samples or small core plugs, preferably collected by the USGS or

designated representatives. Long-term access to sample locations on the ramp and drift walls may be required.

- 1c. Key data to be collected are core and wall rock samples for laboratory analyses of matrix hydrologic properties.

Constraints

No constraints identified.

A.3 INTACT-FRACTURE TEST IN THE EXPLORATORY STUDIES FACILITY

Performance Criteria

- 1a. Short overcore samples will be required from the; 1) Tiva Canyon welded (North and/or South ramp), 2) Paintbrush nonwelded (North and/or South ramp), 3) Topopah Spring welded (MTL), 4) vitric Calico Hills nonwelded, and 5) the zeolitized Calico Hills nonwelded. Sample locations will be chosen by the PI using the detailed mapping information, if available and by visual inspections. Relatively undisturbed rock cores containing a single, through-going fracture will be collected.
- 1b. An alcove may be needed if the core samples are collected where a drill rig and dust collector may block through traffic. The PI will work with the ESF designer to identify and specify design requirements related to potential interference with traffic in the ramps and/or drifts.
- 1c. Samples from fractures of two orientations will be collected from various locations using dry drilling techniques. Both types of core will be collected a short distance (620 to 1240-mm [2 to 4-ft]) from the mined surface. This is dependent on the type of excavation methods used. The preferred orientation shall be parallel to the excavated floor (i.e. on a rib). However, samples may be collected from the floor (invert) or roof (crown) of the excavation.

Radial fractures are oriented approximately perpendicular to the core axis. A 19-mm (3/4-in) pilot hole is drilled beyond the fracture plane; anchors and a PI-supplied threaded rod is used to secure the fracture plane; the pilot hole is overcored; and a 254-mm (10-in) OD, 610-mm (2-ft) long core is withdrawn.

Axial fractures are oriented parallel to the core axis. The fracture plane is overcored; a 254-mm (10-in) OD, 610-mm (2-ft) long core is banded, and the core is withdrawn.

- 1d. Six to twelve core samples of each fracture orientation will be collected from each hydrologic unit sampled.

Constraints

- A. The core samples do not have to be collected immediately following construction. However, these cores shall be collected as soon as possible so the lengthy laboratory

tests to be conducted can be started. This test should be done before any lining material is installed in the ESF or the sample locations marked before any lining material is installed.

- B. If other tests are to be conducted in the vicinity of the collection sites which may introduce thermal, mechanical, or chemical changes near these collection sites, the core samples shall be collected before the area is perturbed.

A.4 PETROLOGIC STRATIGRAPHY OF THE TOPOPAH SPRING MEMBER

Performance Criteria

- 1a. Samples will be collected from the rock exposures created by underground workings.
- 1b. Long term access to sample locations may be required.
- 1c. Any drilled sample will be collected using hand-held drills only.
- 1d. Oriented samples may be required.
- 1e. Key data to be collected include collection of bulk rock samples to determine the petrologic variability within the devitrified Topopah Spring Member at Yucca Mountain, and to define the stratigraphic and lateral distribution of this variability.

Constraints

No constraints identified.

A.5 MINERAL DISTRIBUTIONS BETWEEN HOST ROCK AND ACCESSIBLE ENVIRONMENT

Performance Criteria

- 1a. Samples will be collected from the rock exposures created by underground workings.
- 1b. Long term access to sample locations may be required.
- 1c. Any drilled sample will be collected using hand-held drills only.
- 1d. Oriented samples may be required.
- 1e. Key data to be obtained are samples of minerals, including clay segregations, macroscopic fossil root forms, calcite, and opal.

Constraints

No constraints identified.

A.6 FRACTURE MINERALOGY

Performance Criteria

- 1a. Samples will be collected from the rock exposures created by underground workings. Hand samples with fracture surface areas totaling approximately 50-75 cm² (8 to 12 inches²) will be required along selected fractures and fault zones throughout the ESF north ramp and north ramp alcoves. Cores of up to 30 cm (12 inches) in length may be required in fault zones. Each sample location shall be surveyed and photographed.
- 1b. Long term access to sample locations may be required. Additional sampling (hand samples and/or short cores) of fractures or faults exposed in the walls or roof of accesses, drifts and alcoves may be required after construction and mapping are completed. This may require temporary removal of small areas of mesh.
- 1c. Drilled samples will be collected using hand-held drills only.
- 1d. Oriented samples may be required.
- 1e. Key data to be obtained are samples of fracture filling or coating minerals.

Constraints

- A. Samples must be free of hydrochloric acid (HCl). Exposure of fracture to other materials (except lithium bromide used to tag underground water use) that could be deposited on fracture surface should be minimized.

A.7 HISTORY OF MINERALOGIC AND GEOCHEMICAL ALTERATION OF YUCCA MOUNTAIN

Performance Criteria

- 1a. Wall-rock samples will be collected by the Alteration History PI (or designee) from the north and south ramps, from the Main Topopah Spring Test Level (MTL), from the drifts in the tuff of Calico Hills, and from any other drifts. Oriented samples may be required.
- 1b. Small-scale hand drilling may be required to collect samples; no other drilling will be required.
- 1c. For the most part, this test can be conducted during facility construction without impact to construction activities. The activity will be conducted in two phases. An early phase of sampling and spot-detail mapping during construction will be followed by more sampling as needed. Accessibility for sampling on a long-term basis is desired. Gels must be sampled as soon as possible after exposure by excavation. If fault zones or other features requiring surface treatment for stabilization (e.g., shotcrete) are encountered during excavation, then the ability to examine them before they are covered is desired, provided that safety considerations permit.

- 1d. Key data to be obtained are samples of alteration features, such as samples from lithophysae, cooling cracks, or breccia zones and samples of natural gels.

Constraints

- A. The gel-collection part of this test requires integration with the perched-water test and geologic mapping activities. Gel samples must be collected promptly prior to installation of ground support or wall washing, if practicable. Gel samples shall be kept cool or refrigerated during transport and storage.
- B. Sampling shall not be done in locations where chemicals (except lithium bromide used to chemically tag underground water use) have been deliberately or accidentally applied to rock surfaces.
- C. Samples will generally be collected using a hammer and chisel; if an alternative sampling method (such as a hydraulic splitter) is utilized, the method shall be identified in the sample description section of the Sample Collection Report.

A.8 BIOLOGICAL SORPTION AND TRANSPORT

Performance Criteria

- 1a. Ability to aseptically collect an (approximately) 500-ml (17oz) pristine sample.
- 1b. Ability to collect samples concurrent with construction activities. Samples should be collected as soon as possible after the TBM trailing gear has passed the potential sample location. Sample collection will not impact the progress of the TBM.
- 1c. Ability to collect samples throughout the facility within all units and at contacts.
- 1d. If coring is required to collect samples, coring must be conducted dry. The depth of the core should be sufficient to ensure pristine samples, and to avoid interference from contaminants which may be introduced by excavation or other activities. Contaminants of concern include air, water and drilling fluids.
- 1e. Long-term access will be required.
- 1f. Key data to be collected include collection of bulk rock samples for determining the microorganisms on the transport (either positive or negative) of radionuclides to the accessible environment and determining the numbers, types, and metabolic activities of microorganisms present in Yucca Mountain.

Constraints

- A. No water shall be used in the immediate vicinity of any sampling location.

- B. All sample collection will be supervised by the principal investigator (PI), or designee, or by personnel trained by the PI. A split of all samples will be hand carried offsite by the PI or designee for immediate processing.

A.9 TESTS (THERMAL & MECHANICAL) USING SAMPLES OBTAINED FROM THE EXPLORATORY STUDIES FACILITY

Performance Criteria

- 1a. No special room or alcove is required. The tests entail sampling in each of the thermomechanical units encountered in the ESF, with an emphasis on the TSw2.

Constraints

- A. This test can be scheduled independently of the scheduling of other tests.
- B. Test preparation can be performed at any time after the test location is exposed. The use of underground resources (personnel and equipment) will be based on scheduled availability and preferably coincide with scheduled TBM shut down. Slow down of excavation progress will be avoided. Construction progress impact (far behind face) will be limited to minor interference with support personnel (maintenance crews, ramp transportation vehicles, priority testing support, etc.)
- C. No interference envelope exists. Samples should be taken from rock that has not been disturbed by excavation or other testing. Dry coring may be required in some cases.

A.10 REPOSITORY HORIZON ROCK-WATER INTERACTION

Performance Criteria

- 1a. There is no space requirement; no alcove is needed. The locations of sampling include the North and South Ramps and the Main Test Level; sampling will emphasize the lithophysal zone of Topopah Spring Tuff, the contact of Paintbrush Tuff nonwelded unit and Topopah Spring, basal vitrophyre of Topopah Spring, and the top of the zeolitic tuff of the Calico Hills unit.
- 1b. Bulk rock samples may be obtained by mechanical means from drift surfaces, although slotting or line drilling to obtain samples away from the immediate drift surface may be required.
- 1c. All sample analysis will be performed in the laboratory by LLNL personnel.
- 1d. The timing of sample collection is flexible.

Constraints

- A. The tests shall be started as early as possible so that adequate information can be provided for the license application date.
- B. Sample locations must be approved by the responsible PI prior to the sampling activity. Samples will be collected by the PI or designated representative.

A.11 Characterize the Effects of Introduced Materials on Water Chemistry in the Post Emplacement Environment

Performance Criteria

- 1a. Ability to collect bulk samples of construction materials (including concrete, shotcrete, metal, PVC pipe, fuel, and solvent) used in the ESF, along with bulk samples (and possibly short cores) of ramp and drift walls at selected locations to examine the effects of materials introduced as a result of construction on natural conditions.
- 1b. Ability to emplace artificial materials at PI-selected locations and later retrieve these materials for laboratory analyses.
- 1c. Key data to be collected are wall rock samples (and possibly short core samples) and samples of construction materials for laboratory analysis.

Constraints

- A. Long-term access to sample locations may be required.
- B. The PI or designated representative will select sample collection and emplacement locations.
- C. Sterile collection procedures may be required. If so, the PI will emplace and/or collect samples.

A.12 STUDIES OF CALCITE AND OPALINE SILICA VEIN DEPOSITS

Performance Criteria

- 1a. Hand samples approximately 15 x 15 x 15 cm (6 x 6 x 6 in) (or large enough to include much of the thicker portions of the secondary mineralization) will be required along selected fractures and fault zones throughout the ESF (accesses, drifts, and available alcoves).
- 1b. Samples orientation shall be described and recorded.
- 1c. Key data to be obtained are samples of secondary mineralization containing calcite or opaline silica in faults and fractures, along with adjacent wall rock.

Constraints

No constraints identified.

A.13 GEOCHEMICAL ASSESSMENT OF YUCCA MOUNTAIN IN RELATION TO THE POTENTIAL FOR MINERALIZATION

Performance Criteria

- 1a. Hand samples will be required along selected fractures and fault zones throughout the ESF (accesses, drifts, and available alcoves), as well as representative samples from each geologic unit.
- 1b. Samples orientation shall be described and recorded.
- 1c. Key data to be obtained are samples of potential natural resources, especially compounds concentrated by primary magmatic processes, secondary weathering, or hydrothermal alteration. There is special interest in precious metals and pathfinder elements, including gold, silver, copper, lead, zinc, mercury, thorium, uranium, antimony, fluorine, barium, arsenic, and yttrium.
- 1d. Samples will be collected from any area showing evidence of the presence of naturally occurring hydrocarbons.

Constraints

- A. Mappers shall collect representative samples from each geologic unit. The PI or a designated representative will determine the need for additional samples. If additional samples are required, the PI shall select, collect, and transport the additional samples.

A.14 AQUEOUS-PHASE CHEMICAL INVESTIGATIONS

Performance Criteria

- 1a. Hand samples weighing approximately 10 grams (0.4 oz) will be required along selected fractures and fault zones throughout the ESF (accesses, drifts, and available alcoves).
- 1b. Samples orientation shall be described and recorded.
- 1c. Key data to be obtained are samples of secondary mineralization containing calcite.

Constraints

No constraints identified.

A.15 HYDROCHEMISTRY TESTS IN THE EXPLORATORY STUDIES FACILITY

Performance Criteria

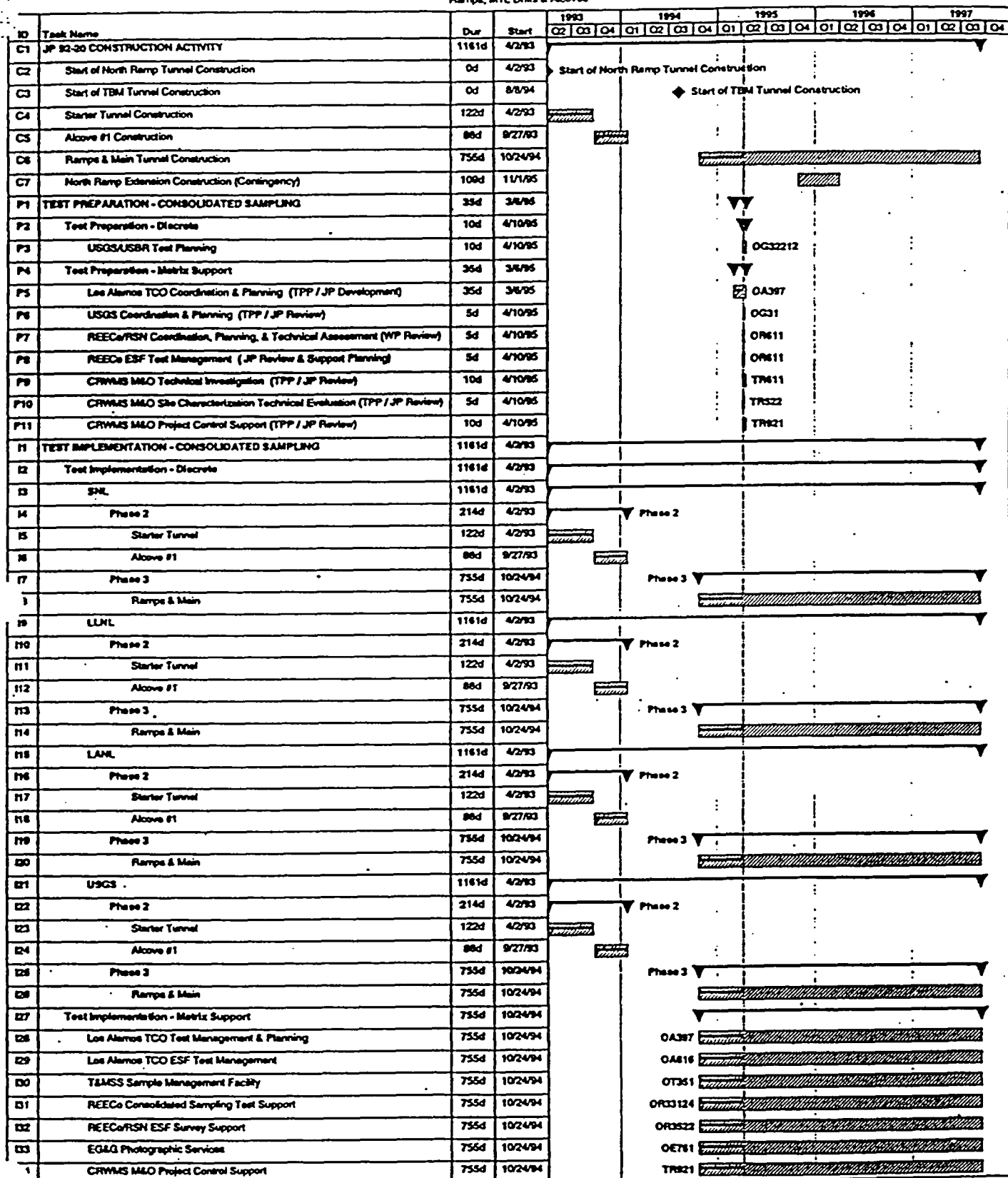
- 1a. Samples of all traced water used at the ESF shall be provided for chemical analysis.
Samples may be collected from all water system taps.
- 1b. Samples of any apparent natural perched water shall be collected.
- 1c. Samples from all construction-related TFM shall be provided
upon the request of the TCO.

Constraints

- A. Chemically trace all water used at the ESF.
- B. Sample collection for bulk materials collected for this activity is covered by JP 92-20C.
Sample collection from boreholes is covered by JP 95-1.


Consolidated Sampling Schedule Planning Basis

JP 92-20C
Ramps, MTL Drifts & Alcoves



Project: Consolidated Sampling
Date: 4/10/95
Revision #1

Task  Milestone 
Progress  Summary 

Checked By: 
Approved By: 