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NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT



MONTHLY REPORT

DECEMBER 1984

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE

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PDR WASTE
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SUMMARY

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT

DECEMBER 1984

KEY ACTIVITIES

WBS 2.1, SYSTEMS

Two finite-element meshes were digitized on the APPLICON graphics system for use in parameter-modeling studies of the unsaturated and saturated flow systems at Yucca Mountain.

Benchmarking activities continued. The two-dimensional structure for a site-scale, isothermal benchmarking problem for SAGUARO and NORIA was developed by modelers. A two-dimensional vapor-transport benchmarking problem was drafted to be run at SNL, LLNL, and LBL.

WBS 2.2, WASTE PACKAGE

The two-dimensional and three-dimensional numerical models for the stability of rock blocks adjacent to emplacement holes were modified to include non-linear discontinuity behavior. Different approaches were reviewed for identifying blocks that require stability analysis.

No indication of corrosion has been identified on cladding samples from the two-month electrochemical scoping experiment. X-ray diffraction analyses were performed to identify the oxide states of oxidized fuel samples.

The stainless steel coupons being tested in J-13 water at different temperatures were examined after 10,000 hours of exposure. Two types of crevice corrosion were identified. The rate of corrosion attack is decreasing with time.

Drawings for spent-fuel canister and space frame designs have been developed. The concept involves collocating contaminated spent-fuel hardware in the same canister with spent-fuel rods.

WBS 2.3, SITE

Absolute gravity measurements were made at Mercury, the south end of Yucca Flat, Test Cell "C" near Calico Hills, and the top of the Mt. Charleston gravity calibration loop. These represent the first absolute gravity measurements in the state of Nevada.

Major-element modeling was completed for hypersthene hawaiites, a newly-recognized rock group among the basalts of the NTS region. The modeling verified that these basalts are derived from a different parental magma than the straddle-type basalts.

Measurements began of the chlorine-36 content of samples collected at Yucca Mountain. The data will be used to assess the infiltration rate of precipitation.

Sorption measurements were completed for uranium, selenium, neptunium, and technetium. Technetium was eluted through a G2-2017 crushed-tuff column containing mordenite and clinoptilolite; 24 percent was retained. The remaining 76 percent was eluted at the same volume as expected for anions. This phenomenon needs to be understood because it may represent an unexpected natural barrier to technetium migration at Yucca Mountain.

The comparison is proceeding of curved-isotherm transport models and distribution-coefficient transport models for predicting and describing contaminant transport in the subsurface environment.

WBS 2.4, REPOSITORY

A two-dimensional continuum model has been coded to study the heated-block experiment. Modeling has focused on evaluating the thermomechanical effects resulting from the relative placement of the heaters and the flatjack.

The joint-behavior concepts utilized in the CAVS model and features emphasized in SNL finite-element codes were incorporated into a more general jointed-rock code called the Joint Empirical Model (JEM). JEM includes joint normal and shear properties for four nonorthogonal joint sets in a continuum; previous models were limited to three orthogonal joint sets.

The analysis has been completed of a mechanism for airborne transport of radionuclides involving convective air flow through the shafts. The analysis was performed using a resistance network similar to that used in mine-ventilation studies.

WBS 2.5, REGULATORY/INSTITUTIONAL

The EA was released to the public on December 26, 1984. Logistic arrangements were finalized for the EA briefings and hearings. Advance copies of the EA were delivered to State and local officials and Congressional offices.

A draft Annotated Table of Contents for the Site Characterization Plan was developed and agreed upon by DOE/HQ and the three waste storage projects.

WBS 2.6, EXPLORATORY SHAFT

Title I design studies for the 6-ft-diameter shaft (ES-2) continued, along with redesign of the surface facilities to accommodate ES-2. One option being considered to provide more area includes relocating the sewage lagoon and using this area for some of the trailers originally intended for the site pad.

WBS 2.7, TEST FACILITIES

Mineralogic and petrographic analyses were performed on samples obtained adjacent to boreholes at the SFT-C which contained spent fuel and electrical simulators. Documentation and fracture analysis of post-test cores were completed. The fracture data base was compiled, annotated, and prepared as microfiche.

A matrix of in situ stresses, stress ratios, deformation moduli, and Poisson's ratios was developed based on post-test measurements in the Climax stock. A mesh was generated to evaluate a new approach for modeling the effects of high explosive shocks on the rock.

The first of three scheduled monthly operations was completed at E-MAD to collect incremental krypton release from fuel assembly B41, which is suspected of having one or more defective fuel rods.

WBS 2.8, LAND ACQUISITION

No activities were reported this month.

WBS 2.9, PROGRAM MANAGEMENT

The NNWSI Project baselined WBS was sent to DOE/HQ. PMS staff members loaded, compiled, and linked the RADTRAN code for transportation studies; added report options to the Change Control Board applications program in INGRES; and created changes in the Correspondence and Tracking Log, a program in INGRES that is shared by the T&MSS contractor and the WMPO staff.

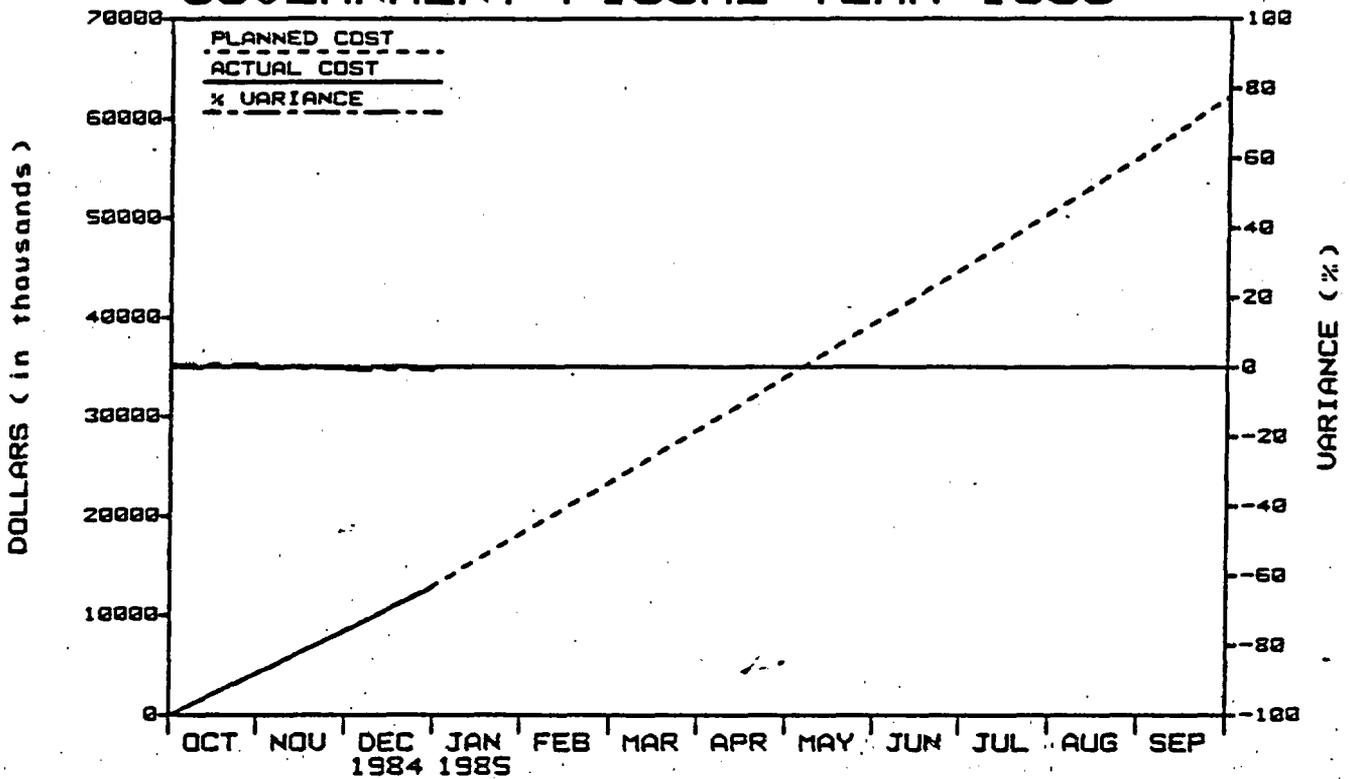
FUNDING OVERVIEW

The month-end programmatic estimated costs were \$12,860,000 against a plan of \$12,988,000 resulting in a cost underrun of \$128,000 through the month of December. The total FY 85 budget (80) for the NNWSI Project was \$66,835,000 which breaks down to \$64,390,000 in operating funds and \$2,445,000 in capital equipment funds.

The following are the year-to-date plans, costs, and variances:

	<u>Plan</u>	<u>Cost</u>	<u>Variance</u>
2.1 Systems	\$ 792,000	\$ 781,000	\$ 11,000
2.2 Waste Package	1,200,000	1,124,000	76,000
2.3 Site	4,246,000	4,200,000	46,000
2.4 Repository	2,072,000	2,344,000	(272,000)
2.5 Regulatory & Institutional	728,000	783,000	(55,000)
2.6 Exploratory Shaft	1,214,000	1,076,000	138,000
2.7 Test Facilities	543,000	595,000	(52,000)
2.9 Program Management	2,193,000	1,957,000	236,000
Total	<u>\$12,988,000</u>	<u>\$12,860,000</u>	<u>\$128,000</u>

WBS 2 NNWSI PROJECT GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	4173	8511	12988	18174	23387	28688	34020	39413	44831	50562	56057	62177
COST (x1000)	4206	8474	12860	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	-33	37	128	0	0	0	0	0	0	0	0	0
% VARIANCE	1	0	-1	0	0	0	0	0	0	0	0	0

NNWSI PLANNING AND SCHEDULING
BUDGET DISTRIBUTION

DECEMBER 1984

<u>CONTRACTORS</u>	(\$000) <u>BEGINNING</u> <u>FUNDING</u>	<u>CHANGE</u>	(\$000) <u>ENDING</u> <u>FUNDING</u>
SNL	\$18,234	100	\$18,334
LLNL	8,115	450	8,565
LANL	10,130	-	10,130
USGS	9,108	-	9,108
SAIC	6,575	-	6,575
REECO	4,286	849	5,135
H&N	753	-	753
F&S	1,212	-	1,212
WSI	220	-	220
PAN AM	50	-	50
STATE GRANT	1600	-	1600
MISCELLANEOUS	495	-	495
NTS ALLOCATION	403	51	454
RESERVE	2,169	<410>	1759
SUBTOTAL	<u>\$63,350</u>	<u>1040</u>	<u>\$64,390</u>
CAPITAL EQUIPMENT	2,485	<40>	2,445
TOTAL	<u>\$65,835</u>	<u>1,000</u>	<u>\$66,835</u>

HOZZ



PROJECT

PROJECT STATUS

2.1 SYSTEMS

OBJECTIVE

The objective of this task is to apply the concept of systems to the development and design of the repository, both the surface and subsurface facilities, and to the evaluation of the effectiveness of the geologic and hydrologic environment in isolating radionuclides.

ACTIVITIES

At the end of November 1984 the initial draft of the NNWSI System Description was submitted to WMPO for review. In early December copies of the draft were sent to the NNWSI Technical Project Officers for review and comment. The project report will be coordinated through two workshops tentatively scheduled for January and April 1985.

A preliminary cost analysis was performed to compare the cost of a repository for on-site consolidated spent fuel to a repository for unconsolidated spent fuel. The results indicate that further work needs to be performed in this area before a decision regarding fuel consolidation can be made.

Two files were created to add new data to the Tuff Data Base. These new files cover new borehole information recently received from Holmes & Narver and geologic and stratigraphic information for USW H-4 from the U.S. Geological Survey reference USGS-OFR-84-449. Early in December 1984 the MASS archival system, on which backup Tuff Data Base Information was stored, was suddenly withdrawn from the OPEN NOS computing system. Most of December was spent learning the new archival system, RECLAIM, and retrieving a portion of the data-base files from MASS. Over 300 files are being moved to the RECLAIM system. This move will be finished in the middle of January 1985.

In response to the recent receipt of new well information and the surface geologic map by Scott and Bonk (1984), the computer graphics group is updating the thermal-mechanical surface definitions. Finite-element mesh definitions of the water table and of a cross section for use by the Flow and Radionuclide Transport Task are also being generated.

All reviews and associated revisions were completed for a draft report entitled "Preliminary Bounds on the Expected Postclosure Performance of the Yucca Mountain Repository Site" (SAND84-1492). A total of 15 copies of the report were provided to WMPO for support of the Environmental Assessment (EA) review process. A summary version of the report was submitted to the "Journal of Geophysical Research" for publication. This report provides a strong basis for concluding that the Yucca Mountain site will comply with all regulatory requirements for expected postclosure conditions, assuming that the current understanding of site conditions is not altered significantly by data collected during future characterization activities.

Incorporation of comments by first-level SNL management was completed for a contractor report from Lawrence Berkeley Laboratory (LBL) entitled "Hydrologic Mechanisms Governing Fluid Flow in Partially Saturated, Fractured, Porous Tuff

at Yucca Mountain" (SAND84-7202). The report, submitted for final review at SNL, presents a conceptual approach to modeling the effects of discrete fractures on water movement through the unsaturated zone at Yucca Mountain. This report, associated with Milestone 103, was scheduled for delivery to WMPO on September 30, 1984, but will not be ready for delivery until the middle or end of January 1985.

Two finite-element meshes were digitized on the APPLICON graphics system during December 1984 for use in parametric-modeling studies of the unsaturated and saturated flow systems at Yucca Mountain. Initial runs of the ISOQUAD groundwater flow code were completed at SNL using the mesh to establish the steady-state potentiometric surface consistent with observed static water levels in the drillholes at Yucca Mountain.

Following editorial, peer, and first-level line review, the initial draft of the paper entitled "Source Term Considerations for a Potential Nuclear-Waste Repository Located in Unsaturated Tuff" (SAND84-2547C) was revised and is being submitted for approval at WMPO. This paper will be published in the proceedings of the Nuclear Energy Agency (NEA)/DOE-sponsored workshop on the source term for radionuclide migration from high-level waste or spent nuclear fuel.

The report entitled "Effect of Water Flux on Spent-Fuel Dissolution in a Potential Nuclear Waste Repository in Tuff" (SAND84-1007) is being revised to be compatible with the report "Source Term Considerations for a Potential Nuclear Waste Repository Located in Unsaturated Tuff" (SAND84-2547C).

Under SNL's contract, LBL is numerically analyzing heat and fluid flow near the repository. The most significant result of the studies conducted during 1984, as outlined in the annual report submitted to SNL during December, was that an equivalent fracture continuum model can be used satisfactorily to approximate thermo-hydrological conditions and that such a model reduces the numerical work in comparison to an explicit fracture model by a factor of 20.

A letter report was formulated in which a common near-field hydrological problem was defined to be solved at LLNL, SNL, and LBL. The letter report, to be issued in early January 1985, will satisfy the milestone that was due November 30, 1984. The standardization of input and output information should ensure that the results produced by each participant will be comparable.

Documentation of concepts and codes used by performance assessment to model flow and radionuclide transport progressed significantly in several areas. A letter report entitled "An Outline of Mathematical Concepts of Radionuclide Transport in Partially Saturated, Fractured Tuff" was completed and sent to WMPO on December 13. The report describes the mathematical basis for the transport calculations to be done by performance assessment and includes a discussion of how sorption and diffusion contribute to retardation of radionuclide migration when the dominant flow path is through fractures. A draft of the manual for the two-phase, vapor, heat, air, and water transport code, NORIA, was received and is being peer reviewed. Documents describing the NNWSI flow and transport codes NORIA, SAGUARO, TRACR3D, and FEMTRAN were sent to Atkins Research Company, an English consulting firm compiling an international catalog of codes for analysis of high-level radioactive waste repositories. Members of SNL's Fluid Mechanics and Heat Transfer Division presented a paper

at the winter AGU meeting in San Francisco describing the velocity calculation routines that have been developed for SAGUARO and NORIA. The paper was entitled "A Consistent Procedure for Calculating Water Transport Velocities in Partially Saturated Porous Media."

Benchmarking activities continued as several new problems are being formulated. The two-dimensional structure for a site-scale, isothermal benchmarking problem for SAGUARO and NORIA was developed by modelers. A two-dimensional vapor-transport benchmarking problem to be run at SNL, LLNL, and LBL was drafted. The COVE 1 benchmarking study of the SAGUARO, TRUST, TRACR3D, FEMTRAN, and TRUMP codes continued.

The letter report entitled "An Outline of Mathematical Concepts of Radionuclide Transport in Partially Saturated, Fractured Tuff" was submitted to WMPO on December 13, 1984.

The document entitled "Fracture and Matrix Hydrologic Characteristics of Tuffaceous Materials from Yucca Mountain, Nye County, Nevada" (SAND84-1471) was formally submitted to WMPO on January 3, 1985.

PLANNED WORK

During January-March 1985, the System Description Task group will concentrate on writing Section 8.1.1 of the NNWSI SCP and the development of example information needs. Revision of the NNWSI System Description document and preliminary planning for the NNWSI Systems Engineering Management Plan will begin.

A conceptual design, construction, and operating cost estimate for a waste-handling building to package 3000 MTU/yr of unconsolidated spent fuel will be prepared.

Bulk-property data from the recent USGS report USGS-OFR-84-552 will be input to the data base in late January 1985.

The programs for the Tuff Data Base Document will be revised as needed and Tuff Data Base Document 9 will be produced and distributed in late January 1985.

The Computer Graphics group will use updated thermal-mechanical surface definitions to generate cross sections, surface structure maps, and isopach maps of the defined units. Vertical thickness profiles within uniform-area grids will be generated. These profiles will be provided to the Radionuclide Releases from Total Systems Task group.

Work during February and March 1985 will focus on initial modeling of the movement of fluids through the Yucca Mountain site. The two finite-element meshes constructed during November and digitized during December 1984 will be assigned material properties and boundary conditions for initial saturated and unsaturated zones.

LBL has indicated that the following studies need to be performed to provide a firmer basis for the continuum fracture model: (1) test calculations during resaturation, (2) studies using open-versus-closed boundary conditions at the

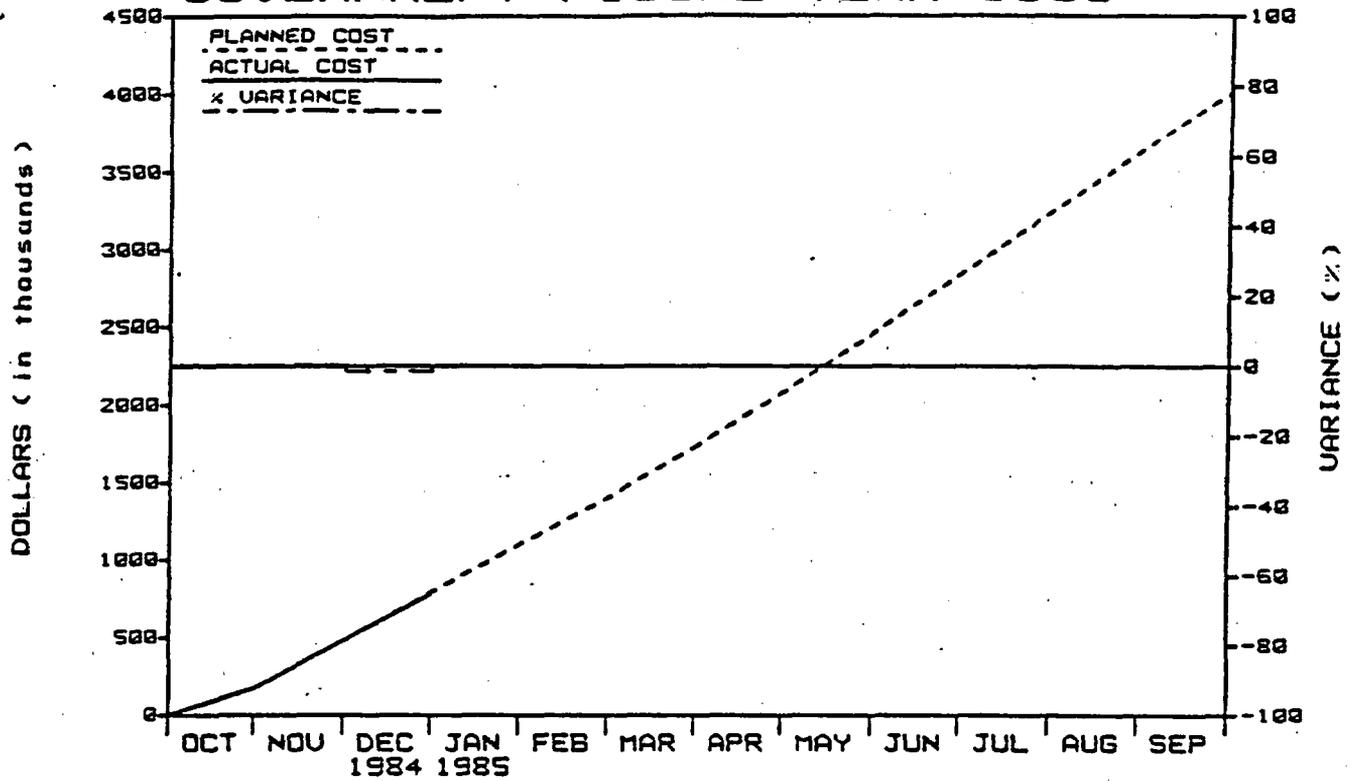
borehole wall, and (3) calculations for a range of possible formation parameters and conditions. These studies will be performed as the limited funding allows.

The letter report on the NNWSI Data Priority Study is being written. This letter report will be a preview and partial summary of the report entitled "Priorities on Types of Data Needed to Assess the Postclosure Performance of a Nuclear Waste Disposal System located at Yucca Mountain, Nevada Research and Development Area, Nevada" (SAND85-0003).

PROBLEM AREAS

None.

WBS 2.1 SYSTEMS GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	174	481	792	1099	1404	1732	2081	2461	2846	3238	3629	4008
COST (x1000)	174	482	781	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	-1	11	0	0	0	0	0	0	0	0	0
% VARIANCE	0	0	-1	0	0	0	0	0	0	0	0	0

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
SNL	2.1	PRELIMINARY SYSTEM DESCRIPTION		▲										
SNL	2.1	NNWSI PROJECT SYSTEM REQUIREMENTS DRAFT											▲	
SNL	2.1	SYSTEM ENGINEERING MANAGEMENT PLAN											▲	

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.2 WASTE PACKAGE

OBJECTIVE

The primary objective of this task is to develop a technical basis and engineering capability to design, test, and fabricate a waste package that is compatible with the hydrological conditions and geochemical environment in the unsaturated zone beneath Yucca Mountain.

ACTIVITIES

This month the milestones and schedules for waste package activities were reviewed and some modifications were made to reflect the preliminary guidance on schedule adjustments received during the mid-November HQ program and budget reviews.

Budget adjustments were made to reflect the additional funds LLNL expects to receive to implement the copper barrier material test plan. Contingency plans were developed to deal with uncertainty of funding continuity to support the DHLW testing work which is supported directly by OCRWM.

The Waste Package Coordination Group met in Las Vegas on December 11-12 to formally review the OCRWM-Weston draft report on Common Waste Package Evaluation. The conclusion of this report (that based on repository factors alone, there is insufficient incentive to pursue a common waste package design for all geologic media) received unanimous endorsement. However, many details of the report are based on outdated material and will need to be modified.

Additional draft QA requirements and procedures were completed and transmitted to WMPO for review and approval prior to implementation by LLNL. Work continued on the development of implementing procedures for the requirements previously defined and submitted. In particular, the procedure for determination of quality levels has received significant attention.

Waste Package Environment

The two-dimensional and three-dimensional numerical models for the stability of rock blocks adjacent to emplacement holes were modified in December to include non-linear discontinuity behavior. Different approaches were reviewed for identifying blocks that require stability analysis. The keyblock approach, which has been the springboard for the LLNL emplacement-hole stability work, remains the most versatile and efficient means for block identification. The field observations of blocks in the Climax stock and at G-Tunnel were prepared for back analysis with the three-dimensional model.

This month, the larger (8.23 cm diameter) fractured sample of Topopah Spring tuff has been saturated with J-13 water in the pressure vessel. Permeability was determined at $P_c = 5.0$ MPa, $P_d = 2.5$ MPa, and at room temperature. Between measurements, the sample was at an effective pressure of 4.5 MPa. The permeability at room temperature of the larger sample is compatible with that of the smaller (2.54 cm diameter) sample.

Electrical resistivity for the larger sample was determined in the same way as for the smaller sample. In addition, the impedance camera concept is being tested by measuring electrical resistance from 14 electrodes evenly distributed around the circumference of the sample. So far two images (tomographs) of the resistivity within the sample have been made. This is the first application of the impedance camera and results are still being reduced.

Waste-Form Testing

Testing of spent fuel in J-13 water is continuing on schedule. Sample analyses have been completed on 120-day samples from both the Turkey Point and H. B. Robinson fuel tests in J-13 water. These data have been compared to previous results with Turkey Point fuel in deionized water and some interesting data trends are apparent.

No indication of corrosion has been identified on cladding samples from the two-month electrochemical scoping experiment. The oxide layer and oxide-metal interface appear unchanged in comparison with untested samples at a magnification of approximately 10,000x. The ongoing 6- and 12-month test results had pH levels in the 8.7 to 8.9 range and small temperature deviations of -2° and -3°C were corrected. The organic carbon level in the test solution has risen to 60 ppm. This level of organic carbon may interfere with the objectives of this experiment since organics may act as a corrosion inhibitor. A recommendation to remedy this situation is in preparation.

X-ray diffraction analyses to identify the different oxide states of oxidized fuel samples, all of which have similar patterns, was successfully performed using Ag standards and spectrum-matching programs. This is a significant advance in devising analytical methods for providing data to understand oxidation mechanisms.

It will be necessary to adapt the unsaturated test method for use with spent fuel. Because of the unique and heterogeneous nature of spent fuel and the documented difficulty in simulating spent fuel, only tests on actual spent fuel can be used to simulate a realistic reaction process. Since tests done with actual spent fuel need to be well-documented in advance, it is necessary to demonstrate the utility of the unsaturated test method on non-irradiated fuel in order to anticipate any problems that may arise. The first objective of this effort is to demonstrate, using non-irradiated fuel and the prescribed unsaturated test flow conditions, whether a measurable amount of uranium is released into solution. Two tests using pressed and sintered UO_2 pellets were started on November 8, 1984. Samples taken after 6.5 weeks on December 17, 1984 have been submitted for analysis. The test will continue for another 6.5 weeks. The second objective is to demonstrate whether or not a reaction between fuel and water can be monitored under conditions more applicable to spent fuel and expected repository conditions. Tests are planned using fuel in zircaloy cladding that has been fractured or sliced.

The one year test using DWPF glass doped with U, Cs, and Sr is continuing as planned. The 26-week samples were taken during December and showed weight losses that were consistent with the 13-week results. Solution analyses are in progress.

A test series is in progress using a method similar to the unsaturated test, but with Teflon reaction vessels and no stainless steel in the system. A major difference observed in these tests is that the glass samples gain weight in contrast to the small weight loss observed in the full test system.

A second series of tests was initiated to investigate the effects of changing the contact rate between the water and the glass/stainless steel test assembly and to study the effects of cut vs. as-cast glass surfaces. These tests were started in December; the first samples will be taken in January.

Metal Barrier Testing

The stainless steel coupons being tested in J-13 water at different temperatures were examined after 10,000 hours of exposure. Two types of crevice corrosion were identified: (1) continuous (uniform) crevice corrosion under the head of the nylon screw and (2) crevice-related pitting where the crevice washer touched the back of the coupon. As previously observed, the general corrosion rate of austenitic stainless steels appears to be independent of the temperature and the alloy composition for the range tested here. All values of the general corrosion rate are low, which is the expected result for the stainless steels under the experimental conditions. Comparison of the 10,000-hour data with previous exposure intervals at approximately 3500, 5000, and 7500 hours shows a general downward trend in the rate with time. If expressed on an annualized basis and compared to the general corrosion rate, the data indicate that these stainless steels are not prone to localized attack even in tight crevices in J-13 water.

The long-term crevice corrosion experiment was terminated after 1300 hours. The higher nitrogen-containing 304LN stainless steel showed less evidence of attack than the lower nitrogen-containing 304L. The addition of molybdenum further improved crevice-corrosion resistance. The lowest crevice-corrosion resistance was shown by 316LN.

Other Materials

The final report describing the permeability and pore-fluid chemistry of Topopah Spring tuff plus J-13 water in a temperature gradient was received at LLNL from USGS, Menlo Park. Following technical review, the report will be sent to WMPO.

Design, Fabrication, and Prototype Testing

A drawing package for spent fuel canister and space frame designs has been developed by SNL. The concept involves collocating contaminated spent-fuel hardware in the same canister with spent-fuel rods and accommodates intact, reactor pre-consolidated or repository-consolidated spent-fuel rod assemblies in 26-inch outer diameter canisters. Design details have been worked out concerning manufacture of the canister and space frames as well as loading of the fuel rod assemblies in the canister at the repository.

The report entitled "Three-Dimensional Thermal Analyses of a Conceptual Waste Package Design for the Disposal of Pressurized Water Reactor Spent Fuel" has been submitted for QA review. The calculations involved assume a stainless steel space frame.

Work has begun on modeling the current SNL canister and space frame design for the repository consolidated PWR spent-fuel rod assemblies.

A feasibility evaluation of a copper canister design is underway. Design parameters such as critical stress locations and relative severity of load inputs are being studied for possible handling and retrieval conditions.

Performance Assessment

Efforts leading to the development and verification of a one-dimensional waste package system model are continuing. This effort includes (1) characterization of the expected hydrothermal environment in the tuff repository, (2) assembly of a thermodynamic and kinetic data base adequate to treat the expected chemical processes involving waste-package corrosion and radionuclide release from waste forms, and (3) coordination of the different submodels within the performance assessment system model.

Work is continuing to develop a suitable driver routine for the NNWSI waste package system model; the logic of this routine will be formulated to allow for processes unique to the vadose zone, such as unsaturated ground-water flow, steam corrosion of waste package materials, and liquid-vapor phase transitions.

A SNL draft document entitled "Descriptions of a Common Near-Field Hydrothermal Problem and Necessary Input Parameters" is currently under review by LLNL staff members.

PLANNED WORK

Waste Package Environment

Three level 3 milestones have been rescheduled. The milestone concerning geochemical modeling of Topopah Spring tuff and J-13 water reactions was rescheduled to January 31, 1985; the report on rocking autoclave studies using crushed Topopah Spring tuff and J-13 water was rescheduled to March 31, 1985; and the report on techniques for stability analysis of emplacement holes in discontinuous rock was rescheduled to March 31, 1985.

Waste-Form Testing

Completion of the "C-ring" test device, delayed by machine shop priority emergency work, is expected to be completed by the end of January. The startup of the "C-ring" stress corrosion scoping test is still expected to start on schedule by April 15.

Metal Barrier Testing

Additional crevice corrosion experiments are planned. The lower resistance of 316LN will be studied, as will the effects of inclusions and delta ferrite on crevice corrosion initiation.

Design, Fabrication, and Prototype Testing

The most credible accident scenario for canisters during handling and transportation at the repository has been defined as an 8-foot horizontal drop on an unyielding rail (4 inches high x 1/2 inch wide) with the rail axis at a right angle to the canister axis. The impact with the rail will be direct (not oblique) and the impact location will be the canister midpoint. Failure has been defined as the effective stress exceeding two-thirds of the material ultimate strength for either the canister or the internal space frame. Computer analyses, which will begin in January, will be run until the maximum stresses in the canister and space frame are reached.

PROBLEM AREAS

Waste Package Environment

The deliverable date for the milestone report entitled "Reaction of Topopah Spring Tuff with J-13 Water: A Geochemical Modeling Approach using the EQ3/6 Reaction Path Code," will be delayed approximately one month. The EQ3NR computer code that is used to calculate the chemical equilibria of waters from laboratory analyses has indicated some inconsistencies in the J-13 analyses. The EQ3NR version 3230B released April 2, 1984 was used for all calculations. Changes to the data base for the major ions have recently been completed and are being re-investigated. It is also possible that there are inconsistencies in the analytical data that do not show any obvious trends and have not been detected. An important part of this milestone is to demonstrate the usage of EQ3/6 as a tool for the interpretation of experimental data. This problem must be resolved before the modeling of experimental results can be made with any certainty.

The report entitled "Hydrothermal Interaction of Crushed Topopah Spring Tuff and J-13 Water at 90°C, 150°C, and 250°C using the Dickson-Type, Gold Cell Rocking Autoclaves", which was scheduled for delivery January 31, 1985, will have to be delayed. The anion analyses for the 90°C experiment are still incomplete. Writing of the other sections of the report will continue.

Time delays have increased significantly for solution analyses. LLNL has taken steps to try to reduce the delays and to get the backlog of samples awaiting analysis cleared.

Waste-Form Testing

Data reduction for tests using the U-doped and actinide-doped glasses supplied to LLNL by the MCC has raised some questions about the glass compositions. A good correlation of release rates for Mo, B, and Na is obtained if the composition data from the LLNL analysis is used. Correlation discrepancies of as much as 30 percent are found if the MCC-supplied composition analysis is used. LLNL is conducting further analyses of the glass, but suspects that its data are correct since a good correlation of release for those elements is the expected result. There are two possible explanations for the discrepancies: the MCC data may be wrong or the glass may be very inhomogeneous and the sample analyzed by the MCC really was up to 30 percent different. If the glass is

really that inhomogeneous, it is useless for controlled-test purposes. No further use of these materials is planned until the problem is resolved.

Metal Barrier Testing

None.

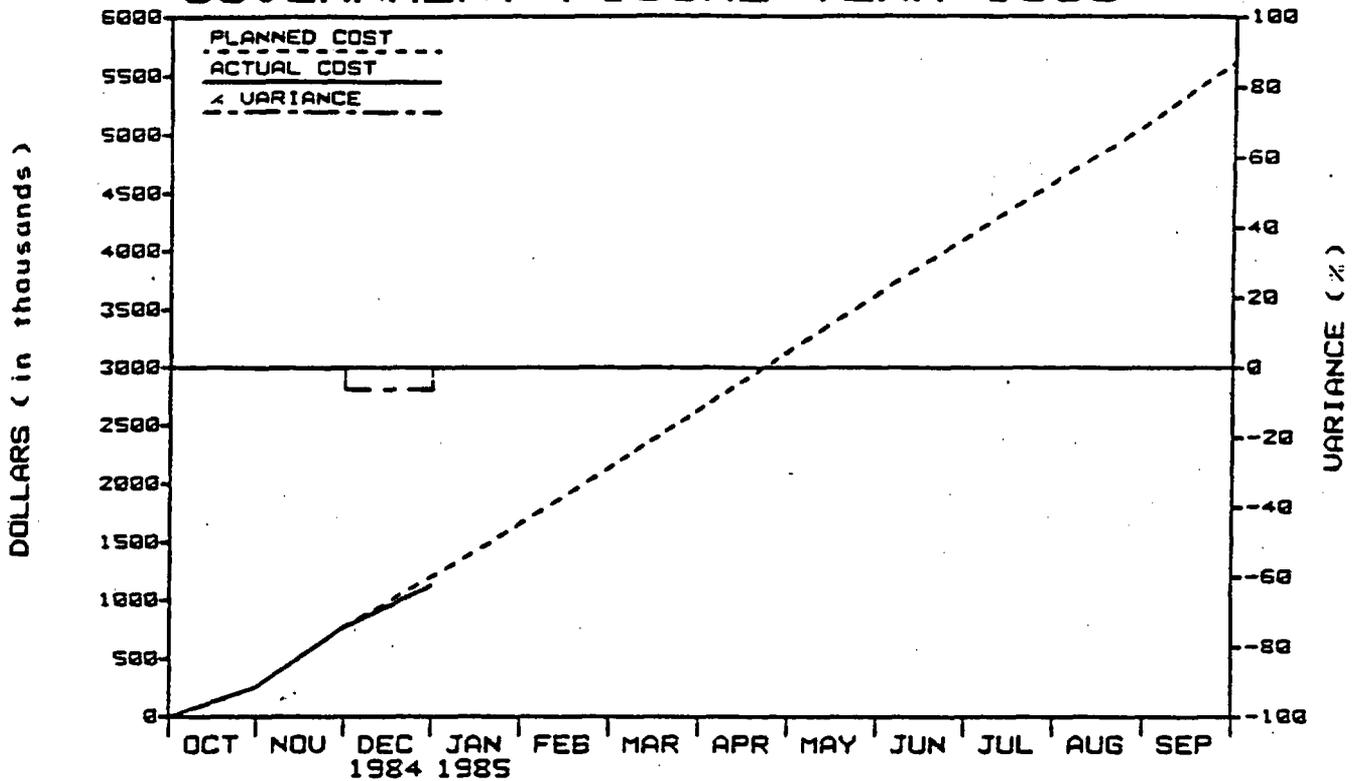
Design, Fabrication, and Prototype Testing

None.

Performance Assessment

Reassignment of personnel from the waste package performance assessemnt sub-task to other program-related activities (especially revision and review of the SCP) has resulted in some slippage in the completion dates of performance assessment deliverables. The two Level 3 Milestone Documents "Report on Evaluation of WAPPA Thermal Submodel" and "Report on Evaluation of WAPPA Mechanical Submodel" have been delayed. The current delivery date is January 31, 1985, but this may continue to slip.

WBS 2.2 WASTE PACKAGE GOVERNMENT FISCAL YEAR 1985



	252	771	1200	1652	2142	2642	3137	3626	4113	4596	5072	5615
PLAN (x1000)	252	769	1124	0	0	0	0	0	0	0	0	0
COST (x1000)	0	2	76	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	0	-6	0	0	0	0	0	0	0	0	0
% VARIANCE												

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
LLNL	2.2	ESTABLISH INTERIM PRODUCT SPECIFICATIONS			◆									
LLNL	2.2	INPUT TO DOE/HQ REPORT TO CONGRESS ON COPPER FOR WASTE PACKAGE											▲	
LLNL	2.2	PRE-CLOSURE ANALYSIS OF SELECTED CONCEPTUAL DESIGNS			◆									

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◆ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.3 SITE

OBJECTIVE

The objective of this task is to determine whether Yucca Mountain is a suitable location for a high-level waste repository. The effort is divided into two areas of study. The first is understanding the characteristics of the rock mass that lies below the surface of Yucca Mountain. This encompasses the geology (structure and stratigraphy), hydrology (both saturated and unsaturated zone), geochemistry (chemical reactions that can be expected when waste is emplaced), and mineralogy and petrology (the study of the materials that will control the isolation and engineering characteristics of the rock). The second is understanding the processes and events that could occur in the area surrounding Yucca Mountain that could serve as potential disruptive forces. These efforts include the study of tectonics, seismicity, and volcanism, and the regional hydrologic, paleohydrologic, and paleoclimatologic systems.

ACTIVITIES

Geology

Mapping continued of the bedrock of the Bare Mountain quadrangle and of the Crater Flat faults. A report is being prepared that discusses some older-over-younger faults that are Tertiary extensional features. Field work consisted of cleaning and gridding trench walls and detailed logging of the trenches on the west side of Yucca Mountain.

The color proof for USGS Miscellaneous Investigations Series Map I-1519 was edited. This is a compilation at a scale of 1:48,000 of nine previously published geologic quadrangle maps. Geologic cross sections for the northwest quarter of the Bullfrog 15-minute quadrangle are being prepared.

Two open-file reports were published and distributed by the USGS: "Regional Structural Setting of Yucca Mountain, Southwestern Nevada, and Late Cenozoic Rates of Tectonic Activity in Part of the Southwestern Great Basin, Nevada and California" (OFR 84-854) and "Preliminary Report on Late Cenozoic Faulting and Stratigraphy in the Vicinity of Yucca Mountain, Nye County, Nevada" (OFR 84-788).

Absolute gravity measurements were made at Mercury, CP2 (south end of Yucca Flat), Test Cell "C" near Calico Hills, and the U.S. Forest Service Ranger Station near the top of the Mt. Charleston gravity calibration loop. This work represents the first absolute gravity measurements in the state of Nevada.

The report entitled "Interpretation of Gravity Data in a Complex Volcano-Tectonic Setting, Southwestern Nevada" was published in the Journal of Geophysical Research.

Major-element modeling was completed for hypersthene hawaiites, a newly recognized rock group among the basalts of the NTS region. The modeling verified that these basalts are derived from a different parental magma than the straddle-type basalts. Variations among basalt groups of the hypersthene

hawaiites cannot be modeled by fractionation of reasonable phenocryst phases. Hypersthene hawaiites are common in the basalts of the silicic episode and absent from the younger-rift and older-rift basalts. This supports previous conclusions of petrologic continuity in the geochemistry of basalts erupted in the NTS region for the last 8.6 Myr.

A report entitled "Ground Motion at Yucca Mountain from Underground Nuclear Explosions at Pahute Mesa" (SAND84-2296) was completed. Copies for technical review and WMPO policy review were prepared. The report is a summary of the weapons-test seismic investigations through FY 84 and provides interpretation of the data necessary to support the conceptual design. It fulfills the reporting obligation for FY 84.

Hydrology

Since the completion of the pumping test of UE-25c#3 in November, water levels have been monitored for several weeks to yield data for determining the magnitude of change in water levels caused by barometric and earth tidal stresses. Data from the test are being reduced for interpretation. The effect on interpretation of pressure losses within tubing and packer systems during injection tests is being investigated. During tests of permeable zones, these pressure losses are significant, approximately equal to the pressure drop within the formation during the test. Effects on normalized pressure plots are still being investigated.

The following USGS reports received approval for publication: "Finite-element Simulation of Ground-Water Flow in the Vicinity of Yucca Mountain, Nevada-California," and "Simulated Effects of Increased Recharge on the Ground-Water Flow System of Yucca Mountain and Vicinity, Nevada-California."

The water-level measurement program in the Yucca Mountain vicinity continued through December. Wells are now being equipped with automatic water-level measuring devices. Water-level information for wells USW H-4 and UE-25b#1 is recorded on magnetic tape. Equipment is being installed and tested at USW H-1.

The USGS National Mapping Division has completed field work on a survey of well elevations at NTS. This was undertaken for accurate contour mapping of the water level.

Twenty-nine downhole station depths were selected in test hole USW UZ-6 for the purpose of setting transducers, psychrometers, and the dissipation instruments. Moisture, temperature, and pressure plots from test hole USW UZ-1 were updated. Fourteen neutron holes for monitoring moisture content and flow through the alluvium were completed and logged.

Geochemistry

Filtration experiments at Well J-13 are continuing. A measurable amount of solids was collected in a month's time and methods are now being developed to remove the solids from the membrane.

Analyses began this month at the University of Rochester's Nuclear Structure Laboratory to measure the chlorine-36 content of samples collected on field

trips to Yucca Mountain during June and August. When the analyses are complete, the data will be used to assess the infiltration rate of precipitation at the sampled sites during the 25 years since the deposition of the chlorine-36 "bomb pulse."

Recently published entropy data for clinoptilolite are being used to investigate the effects of aqueous silica activity on the metastability of clinoptilolite.

Copies were distributed to Project participants of SRL calculations for the radionuclide content of defense high-level waste as a function of time after discharge from the reactor.

Work is continuing on determination of the formation constants of Am(III) and Pu(IV) with carbonate and the solubility product of hydrous plutonium oxide. These quantities are needed to calculate plutonium and americium solubility in water from Yucca Mountain.

Measurements of sorption coefficients for U and Se in H-3, UE-25p#1, J-13, and deionized water have been completed and the results calculated. There were no unexpected results. These measurements are part of the ground-water composition effect studies.

Long-term Np and Tc sorption measurements have been completed. Little change in the sorption coefficients was observed over a 15-month time span.

Technetium was eluted through a G2-2017 crushed-tuff column containing mordeite and clinoptilolite; 24 percent was retained. The remaining 76 percent was eluted at the same volume as expected for anions. This important phenomenon needs to be understood because it may represent an unexpected natural barrier to technetium migration at Yucca Mountain.

LANL installed the TRACR3D-WAFE graphics postprocessor on the LLNL system to enhance LLNL's group study of heat and mass transport near the waste container.

The comparison is proceeding of curved-isotherm transport models and distribution-coefficient transport models for predicting and describing contaminant transport in the subsurface environment. Results show that distribution coefficient transport models can be used only when the amount of contaminant adsorbed is extremely small. Aqueous geochemical interactions should be taken into account to better predict contaminant transport.

Modifications are being made to the multicomponent transport code, TRANQL, to include precipitation/dissolution reactions. Presently there are no multicomponent transport models that include these reactions.

Field measurements of diffusivity will require the development and testing of appropriate borehole sealing and overcoring techniques. Information about small-diameter packers is being collected from manufacturers to determine the suitability of commercially available equipment for this work. Modeling calculations with the TRACR3D code are being performed to guide the selection of the overcore bit size. Results of the calculations this month indicate that a 12-in-diameter overcore bit should be large enough to prevent the bit cooling

fluid from interfering with the measurements of tracer concentrations in the overcored tuff.

Arsenic, ammonia, lithium hydroxide, lithium nitrite, and strontium data have been added to the LLNL thermodynamic data base. All the small MCRT data files are now incorporated into the new master data file. Zeolite data received from LANL has been incorporated into DATAO.

In addition to the report on the addition of precipitation kinetics to EQ3/6, an additional review of the theory of geochemical kinetics is being prepared.

The geochemical codes WATEQ and PHREEQE are being brought up on the LLNL computers so that comparisons can be made with EQ3NR calculations on Waste Package Subtask water analyses.

The Guinier camera for x-ray diffraction analysis of small powder samples was installed and aligned. This facility will allow x-ray analysis of small fracture samples that previously could not be studied by x-ray diffraction. Topopah Spring petrographic stratigraphy studies were extended to samples from UE-25a#1 and the textural criteria for determining position within the Topopah were successfully applied to a sample from Fran Ridge supplied by LLNL. A report entitled "Minerals in Fractures of the Unsaturated Zone from Drill Core USW G-4, Yucca Mountain, Nye County, Nevada" was completed and is being edited.

PLANNED WORK

Geology

Final revisions are being made to the Volcanism Status Report before its issuance as a Los Alamos report.

Hydrology

Pressure and moisture data will be collected from USW UZ-6 after it has been stemmed.

Some data was received from the USGS analytical facility for precipitation samples collected between August 1983 and August 1984. A report will be prepared after all data become available.

Work continues on the ground-water quality data base. The accuracy of all data entries is being rechecked prior to publication.

Meteorology

A draft preface was prepared for the Meteorological Monitoring Plan and will be transmitted to WMPO for review in early January. Requests for quotes (RFQ) for equipment were sent to potential bidders. A bidders package will be prepared for WMPO approval when quotes are received. Holmes & Narver is preparing the monitoring station site preparation and electrical drawings. REECO is procuring the monitoring towers. The monitoring system is scheduled to be operational May 1, 1985.

Geochemistry

The chlorine-36 analyses will be completed. If the results indicate that valuable hydrologic data could be obtained by sampling additional sites at Yucca Mountain, then arrangements will be made to do the additional sampling.

The report on the thermodynamic model for analcime will be completed. A detailed examination will be made of the feasibility of using solubility measurements to determine thermodynamic properties for zeolites.

LANL proposes to compare the kriging procedures developed last year with the "multikernal modulation" method used at SNL for the interpolation of sparse data. A sensitivity analysis will be attempted of the one-dimensional radionuclide model results.

Alteration mineralogy studies will be extended in January to include samples from Crater Flat Spring deposits. Topopah Spring petrographic stratigraphy studies will be extended to a survey of the more lithophysae-rich samples from USW G-2. Exploratory strontium isotope studies on zeolites will begin.

PROBLEM AREAS

Geology

None.

Hydrology

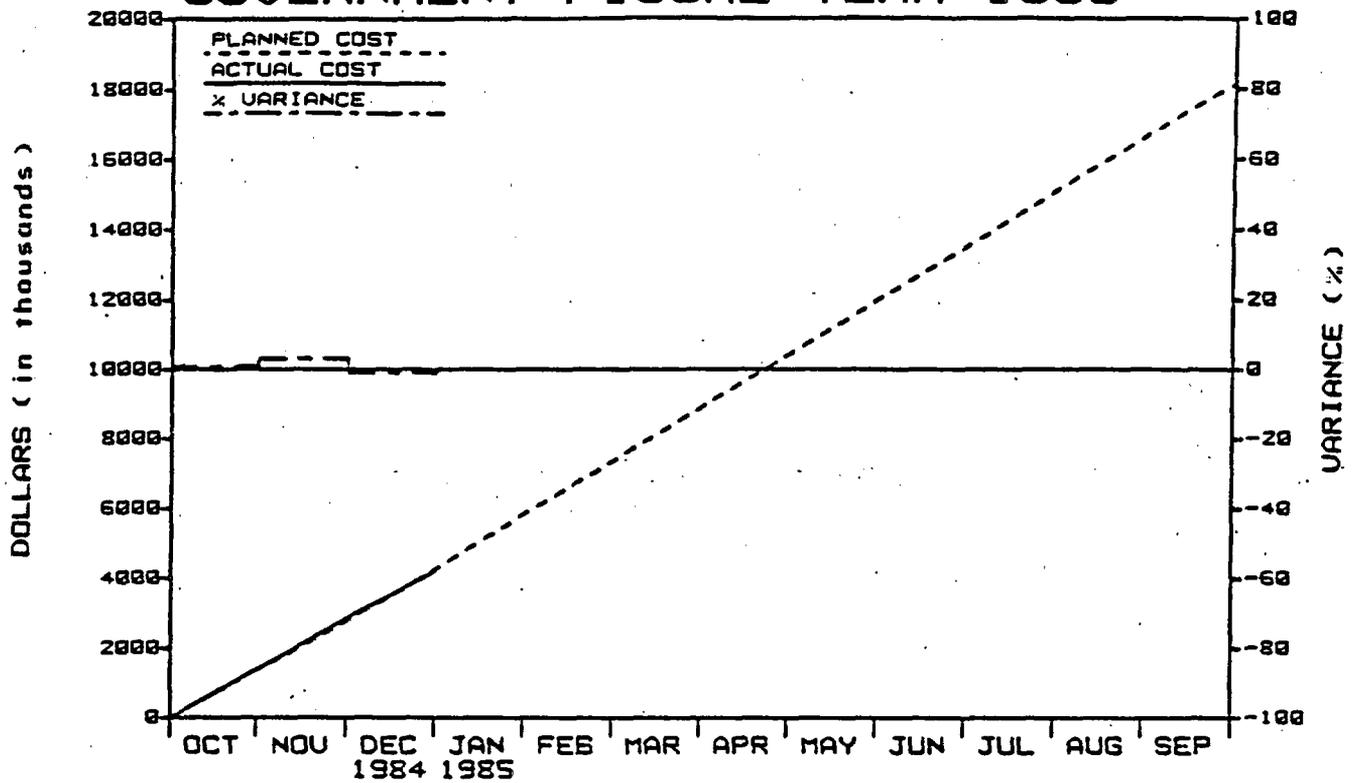
None.

Geochemistry

Work continued on the report entitled "Assessment Report on Sorption Kinetics" which is one month behind its scheduled delivery date.

Because allocation of time on the LLNL main computer system is being severely curtailed by larger weapons programs, funds must be obtained to purchase a super-mini workstation dedicated to the development and utilization of the EQ3/6 modeling effort.

WBS 2.3 SITE INVESTIGATIONS GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	1374	2778	4246	5836	7356	8887	10434	11991	13501	15088	16633	18149
COST (x1000)	1386	2861	4200	0	0	0	0	0	0	0	0	0
VARANCE (x1000)	-12	-83	46	0	0	0	0	0	0	0	0	0
x VARANCE	1	3	-1	0	0	0	0	0	0	0	0	0

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
LANL	2.3	LETTER RPT. ON GROUNDWATER CHEMISTRY ALONG FLOW PATH	◇											
SNL	2.3	WEAPONS TEST SEISMIC REPORT				▲								
USGS	2.3	COMPLETE PALEOBOTANY STUDY OF YUCCA MOUNTAIN	▲											
LANL	2.3	COMPLETE REPORT ON VOLCANIC HAZARDS ANALYSIS		◇										
LANL	2.3	PROGRESS RPT. ON 3-D MINERALOGIC MODEL OF YM	◆											
SAIC	2.3	IMPLEMENTATION OF METEOROLOGICAL MONITORING PLAN										▲		

▲ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.4 REPOSITORY

OBJECTIVE

The objective of this task is to develop the engineering capability to design, construct, operate, and decommission a repository in tuff. Four specific technical areas are involved that include (1) determination of the physical and mechanical properties of the rock matrix and rock mass that are important to the design and construction of an underground structure; (2) engineering analysis and evaluation of technical details that are important to the design and operation of a repository; (3) development of the techniques of sealing a repository as part of decommissioning; and (4) preparation of a site-specific design that will be accommodated within the development of the equipment to construct the repository, handle the waste and waste package, and transfer the waste and waste package within the repository system.

ACTIVITIES

Rock Mechanics

The paper entitled "Calculation of Overburden-Induced Stresses at Rainier Mesa, Nevada" (SAND84-1638A) was presented at the fall American Geophysical Union meeting. This effort laid the groundwork for a similar study of in situ stress at Yucca Mountain.

The abstracts "Analysis of the Elastic and Strength Properties of Yucca Mountain Tuff, Southern Nevada" (SAND84-2145A) and "In Situ Stress at the Nevada Test Site: Implications About In Situ Stress at Yucca Mountain" (SAND84-2021A) were accepted for publication in the proceedings of the 26th U.S. Symposium on Rock Mechanics.

One of the goals in the development of the G-Tunnel Underground Facility has been to establish a data-acquisition system that could be controlled from two satellite work stations. Field personnel from SNL have now set up the HP 9845 system so that system commands can originate at either work station.

Part of the G-Tunnel pressurized-slot testing consists of a slot-cutting evaluation. One development has been a chain saw capable of cutting a slot 2 m square. In the demonstration cutting, considerable wear was observed on the diamond-based cutting tips. A small-scale study was undertaken by SNL to evaluate cutting efficiencies. One effort within the G-Tunnel mining evaluation is to measure permeability profiles along boreholes in regions where welded tuff is to be mined and where pre- and post-mining measurements are to be used to evaluate blast damage. The permeability cart, developed for radionuclide-migration testing in nonwelded tuff, has been modified for testing in welded tuff, where higher flow-rate capacities are needed. The apparatus has been assembled underground and trial runs have been initiated. As part of the permeability-profile development effort, profiles will be run in boreholes used by LLNL in their electromotive force topography work, with the understanding that results are to be shared with LLNL.

A two-dimensional continuum model has been coded to study the heated-block experiment. Modeling has focused on evaluating the thermomechanical effects resulting from the relative placement of the heaters and the flatjack. Preliminary results have shown that areas with vertical tensile stress were formed in the lower part of the block at depths from 2 to 3 m and that the thermomechanical effects are likely to be the cause of the development of the horizontal fracture at 2 m during the first thermal cycle.

RE/SPEC has been involved in preparing numerical models for pressurized slot measurement evaluations. Utilization of a model that describes joint-normal and shear behavior has been an important activity in this effort. RE/SPEC has worked with the crack and void strain (CAVS) model that was developed for the Stripa project. RE/SPEC has taken the joint behavior concepts utilized in the CAVS model and incorporated these with other features emphasized in SNL finite-element codes to formulate a more general jointed-rock code. The new development is called the Joint Empirical Model (JEM) and features inclusion of joint normal and shear properties for four nonorthogonal joint sets in a continuum. Previous modeling was limited to three orthogonal joint sets. This development should greatly enhance pressurized-slot evaluations because geometrical restrictions will be minimized.

Work on a draft report on the mechanical properties of the Topopah Spring Member in borehole USW G-4 is continuing. This report should be completed by March 1985.

Work continued on the laboratory-testing characterization of the bulk, thermal, and mechanical properties of tuff samples from existing deep core holes at Yucca Mountain. This work should be completed by March 1985.

Work continued on the definition of a laboratory testing plan for material from exploratory shaft (ES) activities.

The report entitled "Geoengineering Properties of Potential Repository Units at Yucca Mountain, Southern Nevada" (SAND84-0221) was submitted to WMPO in December.

Grain-density values were determined on samples from drillholes USW G-4 and USW GU-3 for inclusion in the EA reference document entitled "Fracture and Matrix Hydrologic Characteristics of Tuffaceous Materials from Yucca Mountain, Nye County, Nevada" (SAND84-1471). The values were used for porosity and saturation-level calculations.

Hydrothermal properties and property correlations, which are to be incorporated into modeling efforts coordinated between SNL, LLNL, and LANL, were reviewed and modifications were suggested. The input will be used in a hydrothermal test problem to be used in benchmarking the codes NORIA, WAFE, and TOUGH and for analysis for the engineered barrier system.

Sealing

The report entitled "Repository Sealing Plan for the Nevada Nuclear Waste Storage Investigations -- Fiscal Years 84 to 90" (SAND84-0910) has been sent through SNL line review and the appropriate changes have been made. Final

modifications are being made to the activity networks to be consistent with the latest milestones submitted to WMPO.

The report entitled "Hydrologic Calculations to Evaluate Backfilling Shafts and Drifts for a Prospective Nuclear Waste Repository in Unsaturated Tuff" is being modified in response to SNL line review.

One concrete sample (CL-40 CON-23) and two grout samples (82-022 and 82-030) were evaluated in a study of water-retention characteristics and hydraulic conductivity. The bulk density of each individual subsample was measured to determine the volumetric water content. The desaturation values and hydraulic conductivities were determined after vacuum saturation.

December was devoted to updating the fault-seal-dissolution model and updating preliminary work on the position paper on a seal-material-degradation model. The simplified dissolution model now has built-in assumptions that will limit the strict application of the results to the ultimate prediction of the stability of a grout used in a repository application; this must be considered preliminary.

The analysis has been completed of a mechanism for airborne transport of radio-nuclides involving convective air flow through the shafts. This mechanism could occur during the period when the repository is relatively cool. The exploratory shaft and escape shaft are located within the repository boundaries and will be relatively hot. Air may be drawn in through the shafts and ramps outside the repository area and may flow out of the exploratory and egress shafts after passing through some of the emplacement rooms. The analysis was performed using a resistance network similar to that used in mine-ventilation studies. This method estimates the total flow as well as the distribution of flow between the mains and the waste-emplacement areas. Different runs have been made to examine the influence of backfill permeability and the presence of a damage zone around the shafts.

A draft report entitled "Hydrological Analyses to Determine the Need for Sealing Components" was submitted for SNL internal review. Generally, the reviewers concur with the types of analyses performed and with the selection of input parameters. The calculations involved water inflow into the shaft from a hypothetical surface source; description of water at the base of the shaft; water inflow into the repository from the hypothetical surface-water source; and inflow into the repository from a drift intersecting a discrete fault.

Facilities

A continuing review of Bechtel National Inc.'s efforts to prepare conceptual design documents was conducted by SNL Division 6311. The information reviewed included (1) physical protection and safeguards design basis, (2) energy conservation-evaluation report (heating, ventilating, and air-conditioning systems), (3) waste-handling-building flow diagrams, floor plan, and details, and (4) domestic fire-protection storage and distribution (central surface facilities).

A review of the status of the underground design, now roughly 30 percent complete, was held at SNL December 6-7, 1984. The summary presented at the

meeting of work done to date by Parsons-Brinckerhoff Quade and Douglas (PBQD) represents the status of the underground conceptual design for the next year.

The report entitled "Nevada Nuclear Waste Storage Investigations: Socio-economic Impacts of Constructing a High-Level Waste Repository at Yucca Mountain" (SAND84-7201) was published. The report is an NNWSI Project EA reference.

Two reports were submitted for printing in December. The first is entitled "Meteorological Design Parameters for the Candidate Site of a Radioactive Waste Repository at Yucca Mountain, Nevada" (SAND84-0440/2). The second report is entitled "Preliminary Safety Assessment Study for the Conceptual Design of a Repository in Tuff at Yucca Mountain" (SAND83-1504).

Repository Performance Assessment

Abstracts entitled "Measurement and Calculation of the Mechanical Properties of a Highly Fractured Rock" (SAND84-2020A) and "Calculation of Laboratory Stress-Strain Behavior using a Compliant Joint Model" (SAND84-7210A) were accepted for presentation and publication at the 26th U.S. Symposium on Rock Mechanics. The abstracts summarize the combined efforts of SNL and RE/SPEC to verify and validate the compliant-joint material model. The abstracts will be expanded into papers for the Rock Mechanics Symposium proceedings.

The document entitled "Quality Assurance Procedure for NNWSI Analysis and Calculation Control" (QAP III-3) has been submitted for line review. The document provides the necessary procedure for instituting, tracking, and documenting thermomechanical analytical and calculational efforts for SNL Division 6310.

The final draft has been received of the memo entitled "Review of the Jointed Rock Model for the ADINA Code" (8327-5857) by Agbabian Associates. The memo includes a comparison of drift stability between the ubiquitous joint model of ADINA and the elastic model of HEFF. The results are very similar and suggest that joint effects, as represented by ADINA, are not significant and that an elastic model may be adequate.

SNL Division 1524 summarized its 1984 work in a memo entitled "ADINA Comparison of Three Candidate Emplacement Drift Standoff Distances for the Horizontal Emplacement Scheme in Tuff," dated November 13, 1984. Results in this memo indicate standoff is not a major factor in drift stability and that the standoff can be chosen based on thermal considerations.

Based upon thermal decay data in the Generic Requirements for a Mined Geologic Disposal System (GR) document, Appendix B, a plot of initial Areal Power Density has been produced based on energy density for 1000 years.

PBQD underground layouts were reviewed. In general, they were consistent with work done at SNL, except that a 20 percent extraction ratio was not maintained at the vertical emplacement access drifts and the horizontal emplacement drifts did not allow 30 feet for operating the drilling and emplacement equipment.

Waste quantities, characteristics, and emplacement schedules, outlined in the report entitled "Reference Nuclear Waste Descriptions for a Geologic Repository

at Yucca Mountain, Nevada" (SAND84-1848), were recalculated on the basis of new ORIGEN2 decay data for pressurized-water-reactor (PWR) and boiling-water-reactor (BWR) spent fuel. The ORIGEN2 calculations were recently completed at Oak Ridge National Laboratories and will be baselined as an addendum to Appendix B of the "Generic Requirements for a Mined Geologic Disposal System." The waste-description document will be submitted for final management review and publication in January 1985.

PLANNED WORK

Rock Mechanics

The major effort planned for the pressurized-slot experiment will be to complete the evaluation of the diamond cutting tips and then to start procurement of a new 2 m chain containing the most effective tips. The new JEM code will be input into SANCHO for initial verification. Then the pressurized-slot calculations will commence.

The mining of the U12g.12 drift is expected to be completed in January 1985. Drift convergence will be monitored throughout the mining period and for a minimum of one week afterwards. Measurements will be terminated when convergence stops or when steady-state conditions are achieved. After the mining, the next major activity will be the drilling of 12 holes into the welded tuff so that various measurements can be made. The fracture-permeability profile measurements will be scheduled first. Work will begin on setting up the data-acquisition system.

Various analytical and computational evaluations will be conducted to support preparation of final reports on the heated-block and small-diameter-heater experiments.

The report entitled "Preliminary Characterization of the Petrologic, Bulk, and Mechanical Properties of a Lithophysal Zone within the Topopah Spring Member of the Paintbrush Tuff" (SAND84-0860) will be submitted to WMPO in January 1985.

Analysis of the thermal-expansion data from the Yucca Mountain tuffs will continue in January 1985. No data were analyzed in December 1984.

Experimental measurements will continue on laboratory testing of the hydrologic properties of discrete fractures.

The results of a model to calculate the relationship between rock-mass relative hydraulic conductivity and suction head will be documented for inclusion in an SNL report that describes the physical and mathematical bases for the model used in the computer code TOSPAC.

Sealing

A formal response will be sent from SNL to LANL concerning the significance of the damaged zone and shaft liner associated with ES sealing. The repository sealing plan and hydrologic calculations report associated with the sealing concepts will be modified for publication. Numerical calculations, both hydrologic and airborne, have been performed. In addition, the SNL draft

response has been prepared which will be used by LANL to establish the appropriate quality-assurance (QA) levels to be implemented for the ES design and construction features.

Planned work includes refinement of the dissolution model, preparation of a position paper on the potential for degradation of cementitious-based materials, and the development of the preliminary geochemical design requirements to support the design-requirements effort. Additional limited laboratory testing will be undertaken to support the position on degradation of cementitious-based seal materials.

Convection through the rock mass and other mechanisms for airborne release such as gas expansion due to heating and diffusion will be examined in future months. Hydrologic calculations will continue. The calculations, together with the airborne calculations, will be used to establish the design requirements for sealing.

Facilities

All effort on shaft and ramp design has been curtailed, with only minimal effort planned for the remainder of FY 85. However, the sites of ramp openings will be established during FY 85.

During the balance of FY 85 (1) existing subsurface excavation designs will be documented for incorporation into a design-description document supporting the SCP, (2) design descriptions will be generated in support of the SCP design reference document, and (3) functional criteria for subsurface excavations will be generated. An underground ventilation philosophy will be developed. Design criteria for underground service systems will be developed. These criteria will be included in the functional-design-criteria document.

Repository Performance Assessment

In January 1985 a new geometrical baseline will be established. This will incorporate thermal calculations using the thermal decay data of Appendix B of the GR and will establish borehole spacings and the method for calculating areal power density.

PROBLEM AREAS

Rock Mechanics

Testing to determine the parametric effects on mechanical properties of the Topopah Spring Member continues to be delayed by equipment problems at RE/SPEC and by changes in testing priorities within the supporting SNL organization.

Sealing

None.

Facilities

None.

Repository Performance Assessment

Verification, validation, and qualification of in-house codes may be significantly affected by availability of SNL staff.

Peer review of the report entitled "Parametric Study of the Underground Excavations for a Nuclear Waste Repository in Tuff" is being held up because of commitments to other milestones.

2.5 REGULATORY/INSTITUTIONAL

OBJECTIVE

The objective of the Regulatory/Institutional task is to provide the capability for interfacing with all the institutions and to meet the requirements identified in various laws and regulations pertaining to the siting, design, and construction of a nuclear waste repository and a test and evaluation facility. The principal laws and regulations which govern the licensing of these include the Atomic Energy Act of 1954, the National Environmental Protection Act (NEPA) of 1969, and the Nuclear Waste Policy Act (NWPA) of 1982, 10 CFR Part 60 and 40 CFR Part 191.

ACTIVITIES

Regulatory Compliance

A draft Annotated Table of Contents (ATOC) for the SCP was developed by representatives from DOE/HQ and the three waste-storage projects during the first week of December 1984. The NNWSI SCP annotated outline that was developed earlier served as a strawman for this effort. Review of the ATOC is in progress and a meeting to finalize the ATOC is scheduled at DOE/HQ early in January 1985, after which the ATOC will be baselined.

On December 17 a meeting was held of NNWSI Project participants to discuss possible revisions of the Issues Hierarchy to bring it in line with 10CFR60 and 10CFR960. From that meeting, a small working group was assigned to develop a strawman Issues Hierarchy to be presented at the SCP meeting scheduled for January 17.

A draft guidance package outlining USGS and LANL involvement in site characterization was begun in December. The package included a milestone network for major activities through 1990 based on the requirements of 10CFR960, a comparison of suggested activities to presently defined milestones, and comparisons between the present list of milestones and the FY 85 budgets for USGS and LANL. The package is scheduled for delivery to WMPO on January 10.

Comments and recommendations concerning the NRC draft In Situ Testing Technical Position and the Issue-Oriented Site Technical Positions (ISTPs) for Yucca Mountain were received from Project participants. The comments were consolidated and edited for WMPO transmittal to OCRWM; additional detailed comments on the ISTPs are being prepared for delivery in January.

Work continued on the DOE/NRC Site-Specific Agreement. Guidance for responding to a WMPO request for information needed to implement the Agreement was prepared and transmitted to the TPOs.

The draft annotated outline for the Regulatory Compliance Plan was prepared and is being reviewed.

Environmental Compliance

The Environmental Compliance Plan and the Environmental Data Base Management Plan are being internally reviewed. An interim progress report was presented to WMPO on December 21, 1984. These two plans will be incorporated into the project WBS next month.

The EA was released to the public on December 20, 1984. Public briefings on the EA content will be held in January 1985 and public hearings will be held in February.

The draft report on ways of assessing local attitudes and perceptions is being revised following the meeting on the status of this activity with WMPO on November 19, 1984.

A detailed two-phased activity plan for studying transportation impacts and transportation radiological risk was prepared and submitted to WMPO for approval (L84-MIF-743).

The tourism study, which assesses potential impacts to Southern Nevada tourism if a repository were to be constructed at Yucca Mountain, was revised and transmitted to WMPO.

PLANNED WORK

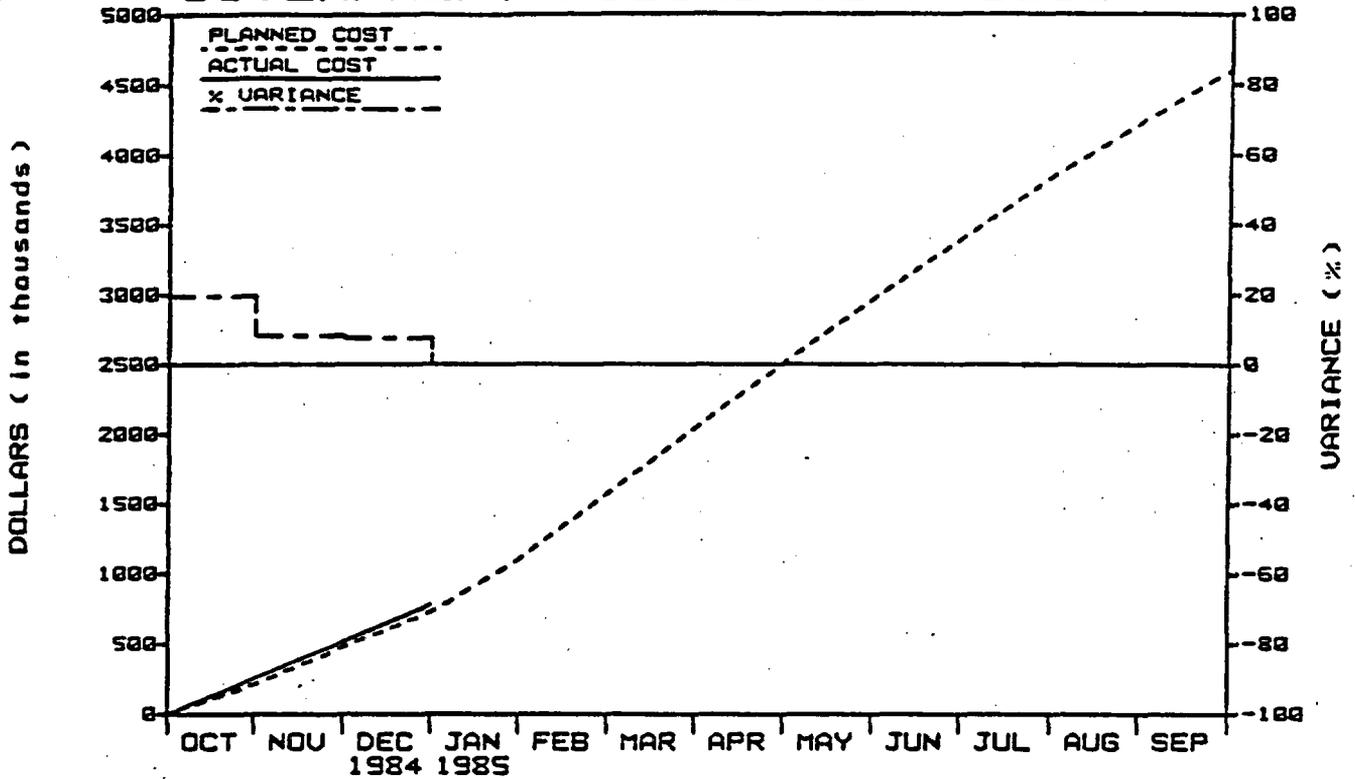
A meeting will be scheduled in January 1985 to address the SCP Issues Hierarchy. Actual SCP preparation will continue during 1985.

Community service profiles have been developed for Nye and Clark counties. In mid-January the draft report that incorporates existing data for these areas will be reviewed a second time with community representatives from Clark and Nye counties, Beatty, Amargosa Valley, and Pahrump.

PROBLEM AREAS

None.

WBS 2.5 REGULATORY & INSTITUTIONAL GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	213	476	728	1104	1577	2050	2516	2967	3395	3841	4228	4605
COST (X1000)	255	515	783	0	0	0	0	0	0	0	0	0
URIANCE (X1000)	-42	-39	-55	0	0	0	0	0	0	0	0	0
X URIANCE	20	8	8	0	0	0	0	0	0	0	0	0

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
SAIC	2.5	DRAFT SITE CHARACTERIZATION PLAN	█											
SAIC	2.5	FINAL SITE CHARACTERIZATION PLAN	█										△	
SAIC	2.5	NNWSI REFERENCES FOR EA COMPLETE		◇										
SAIC	2.5	DRAFT ENVIRONMENTAL ASSESSMENT	█		▲									
SAIC	2.5	FINAL ENVIRONMENTAL ASSESSMENT	█									△		
SAIC	2.5	EA COMMENT/RESPONSE DOCUMENT	█									△		

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.6 EXPLORATORY SHAFT

OBJECTIVE

The objective of this task is to identify and plan the tests that need to be conducted at the repository horizon as a part of detailed site characterization and to design and construct the Exploratory Shaft (ES) and the underground test area in Yucca Mountain. The primary focus of this effort will be to establish the basis for evaluating the unsaturated zone in a welded tuff formation. In addition, an effort will be made to define the nature of the unsaturated zone with regard to water content and water movement, and the nature of the natural barriers between the repository horizon and the static water level.

ACTIVITIES

Internal technical review of a progress report describing the use of a high frequency electromagnetic (HFEM) geotomography technique in fractured, welded tuff was completed at LLNL this month. "Preliminary Evaluation of Alterant Geophysical Tomography in Welded Tuff" describes the HFEM measurements made in G-Tunnel at NTS and their analysis and interpretation. Plans were developed for core drilling at the HFEM site in G-Tunnel to confirm experimental results because previous drilling (with a significantly smaller drill rig) was unable to provide samples of adequate quality. Engineering-scale experiments are also being developed to evaluate the HFEM technique for use in the ES.

Revisions to the logic network for the Waste Package Environment Tests were prepared by LLNL based on initial scoping calculations and on test construction considerations and were provided to SAIC and LANL. A set of revised budget estimates for FY 86 through 91 was also prepared and sent to LANL near the end of the month. Several questions and concerns about the ESTP schedule and budget were raised while the estimates were being formulated. These questions were sent to LANL with the estimates; their resolution will allow the quality of the budget estimates to be improved.

No revisions have yet been made in the version of the Waste Package Environment Test conceptual test plan that is included in the ESTP. The ESTP Committee met in December at SNL and will meet again in January in Las Vegas. An NRC draft position paper entitled "In Situ Testing During Site Characterization for High-Level Nuclear Waste Repositories" was critically reviewed and comments were sent to SAIC/Las Vegas.

ESF design by the architect-engineers is continuing. Title I design studies for the 6-ft-diameter shaft (ES-2) continued, along with redesign of the surface facilities to accommodate ES-2. REECO has requested that the site pad be increased in size to better accommodate the mining operations. One option being considered to provide more area includes relocating the sewage lagoon and using this area for some of the trailers originally intended for the site pad.

LANL and SAIC personnel have continued to work with ESF participants on updating the various logic networks (schedules). During this month a strawman was prepared in cooperation with REECO on the ESF site construction activities.

ESF cost estimates are continually being revised to reflect the delays in start of ESF construction dates and the change in the Work Breakdown Structure.

Draft Work Plans were completed for all of the ESF (WBS 2.6) activities except the ESF testing activities (WBS 2.6.9) that are being performed by SNL, LLNL, and USGS.

D. Vieth completed all of his review comments on the 25 tests proposed in the ESTP, Rev. 0 document. A first editorial pass was made on several chapters in Part I of the ESTP, Rev. 0 (those least likely to change drastically for Rev. 1).

The routine upgrade of the Exploratory Shaft IDS operating system and utility software was accomplished. This upgrade provides the latest versions of the system, compilers, and supporting software.

The software package for data management and analysis of common data items has been selected. The order was placed after competitive selection and a successful QA pre-award survey of the vendor. The package is RS/1 from Bolt, Beranek, and Newman (BBN).

PLANNED WORK

The meetings between the Principal Investigators and D. Vieth are scheduled between January 17 and 23. Much of the ESTP work this month will be to prepare for these meetings.

Preparation of a proposal for prototype air coring will continue during January.

The RS/1 software package for the IDS should be received and installed in January.

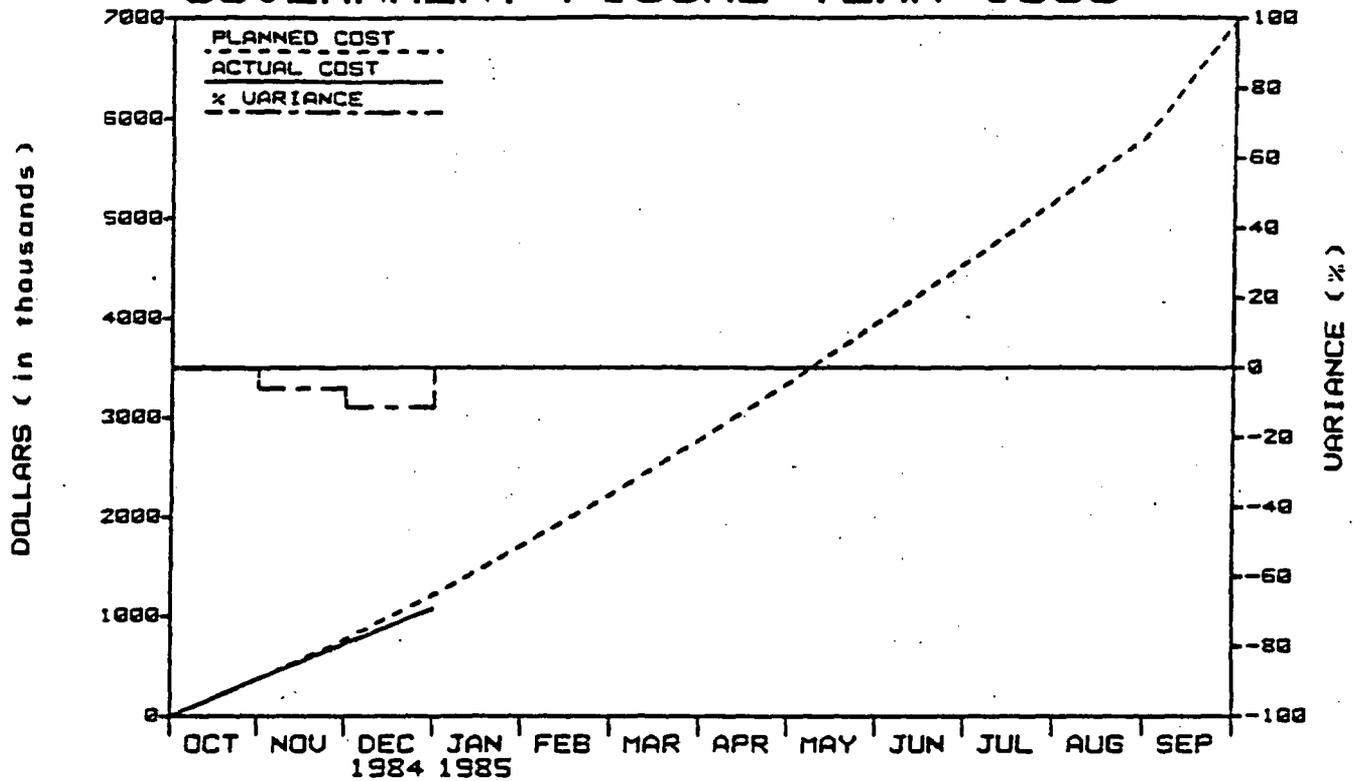
PROBLEM AREAS

LLNL suggests that the budget estimates recently furnished to LANL not be sent forward until contingency and escalation are re-established. LLNL also suggests that their escalation value be used for FY 86 because it reflects local conditions related to expected overhead increases.

Current ESF cost estimates are based on the Title II design of last spring, adjusted to include ES-2, and the November 1983 version (Rev. 0) of the ESTP. Changes in the design and scope of testing and increased emphasis on quality assurance could have a significant effect on the total cost estimate. Corrective action will be to obtain new cost estimates after ESF Title II design and WMPO review of the ESTP, Rev. 0 are complete.

Scheduled December installation of the prototype weather system was delayed by adverse weather. Installation will now be done in January.

WBS 2.6 EXPLORATORY SHAFT GOVERNMENT FISCAL YEAR 1985



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PLAN (x1000)	371	770	1214	1709	2226	2780	3343	3940	4539	5162	5807	6964
COST (x1000)	370	724	1076	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	1	46	138	0	0	0	0	0	0	0	0	0
% VARIANCE	0	-6	-11	0	0	0	0	0	0	0	0	0

Variance Explanation: Delays in scheduled work have caused the cost to underrun the budget.

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
LANL	2.6	COMPLETE ESTP & SUBMIT TO DOE/HQ FOR FINAL REVIEW & APPROVAL						◊						
LANL	2.6	ISSUE ESTP												▲

▲ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◊ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.7 TEST FACILITIES

OBJECTIVE

The major objective of this task is the design, construction, and operation of the test facilities that support technology development for other waste management programs and other geologic repository projects. The two major facilities operated under this WBS element are the Climax Spent Fuel Test Facility and the E-MAD Facility.

ACTIVITIES

Spent Fuel Test-Climax

Three important parts of the geological investigations program were completed by LLNL this month. First, mineralogic and petrographic analyses were performed on samples obtained adjacent to boreholes which contained spent fuel and electrical simulators. This study examined mineral assemblages, modal mineral abundances, and mineral chemistry. The results address changes which may have occurred as a result of heat alone or heat in combination with ionizing radiation. The draft report is being peer reviewed. Second, documentation and fracture analysis of post-test cores were completed. The core-logging data have been entered into a data base which is accessed by a recently developed code to produce report-quality pictorial and textual summaries of the logs. Third, the fracture data base which resulted from geological mapping of the SFT-C facility was compiled, annotated, and prepared as microfiche for use by future researchers. This large data set should prove valuable in generic and site-specific research concerning distribution, orientation, and interconnectivity of fracture systems in brittle rocks.

Several aspects of the performance and reliability of the borehole rod extensometers were investigated this month. This is the last instrument type to be analyzed and documented for a major project report on the instrumentation deployed at the SFT-C.

Analyses of all other instrument types were completed and documented in the draft instrumentation report. Error analyses were performed for convergence wire extensometers, borehole fracture monitors, borehole deformation gauges, IRAD vibrating-wire stressmeters, Watt transducers, and ventilation instrumentation. Reliability statistics were also compiled for the last three of these instrument types.

Laboratory testing of the USBM overcore cell was completed. These tests aim to answer questions concerning gauge hysteresis and lack of repeatability which were observed during field calibrations. The necessary data have been collected and are being analyzed.

A large aluminum forging was received this month for evaluating the effect of borehole size on the apparent deformation modulus determined by a Goodman borehole jack. Ultrasonic testing revealed two minor flaws near the outer surfaces of the block, far outside the region where they would influence test results. The block will be prepared for heat treating next month. Testing

should begin in February. A test procedure was reviewed and approved for these laboratory calibrations and evaluations.

A matrix of in situ stresses, stress ratios, deformation moduli, and Poisson's ratios was developed based on post-test measurements in the Climax stock. ADINA calculations of the mine-by experiment were completed for eight cases using these parameter values. In addition, a mesh was generated to evaluate a new approach for modeling the effects of high explosive shocks on the rock. A valid one-dimensional simulation of the effects of a nearby free surface on the detonation of a line charge is being sought. Development of a three-dimensional finite-length heat transfer model of the SFT-C is also in progress.

The report entitled "Geologic Structure Mapping Database, Spent Fuel Test-Climax, Nevada Test Site" was submitted by LLNL to WMPO for programmatic review and was approved for publication. Two draft reports entitled "Post-Test Core Logging of Selected Core Samples for the Spent Fuel Test-Climax" and "Mineralogic and Petrologic Investigation of Post-Test Core Samples from the Spent Fuel Test-Climax" have been completed and are in peer review.

E-MAD

At DOE/NV request, tasks recommended for continuation in FY 85 were submitted for review and approval. These included Project Management, Capability Maintenance, Data Collection, CALTP Support, Fuel Temperature Test, Fuel Integrity Monitoring, Safety Assessment Document, Fuel Assembly Decay Heat Rate Measurement, Waste Package Closure, and Quality Assurance Support to DOE/NV Quality Assurance.

An evaluation is being conducted of the prototype PWR fuel-handling tool adapter that was fabricated in November. The adapter was designed to allow attachment to and use of a load cell.

A letter report was prepared and transmitted to DOE/NV outlining the storage history and FY 84 activities involving the 17 fuel assemblies at E-MAD. The report lists all operations, storage configurations, major equipment usage, gas sampling activities and results, fuel assembly and canister characterization activities, and Material Interaction Test Capsule retrieval.

WTSD-Nevada Operations Quality Assurance administrative procedures, in support of the WTSD Quality Assurance Plan WTSD-TME-046, were reviewed and updated for submission to WMPO. New procedures were written to cover requirements of the NNWSI Project work defined in the NNWSI Quality Assurance Plan, NVO-196-17, Revision 3.

With the exception of fuel assembly B02, which is being utilized in the fuel temperature test, all E-MAD fuel assemblies are now stored in the Hot Bay lag storage pit. All canisterized fuel assemblies located in the lag storage pit are in a safe configuration. The maximum recorded canister temperatures are well below the canister design limits.

An automatic digital temperature control system was activated for operation of the Fuel Temperature Test. This system replaced the manual analog control system which had been used since the test was initiated.

The month-19 operation of the test was completed. The month-20 temperature profile was initiated and the criteria met. The maximum fuel temperature for this month's operation is 227.5°C.

Swipe samples were collected from the seven fuel assemblies being stored in unwelded canisters, completing the first semi-annual integrity monitoring of E-MAD fuel assemblies. The samples were sent to the laboratory for analysis.

The first of three scheduled monthly operations was completed to collect samples of incremental krypton release from fuel assembly B41, which is suspected of having one or more defective fuel rods. These activities are being performed at the request of Pacific Northwest Laboratory.

The NV Quality Assurance Manual has been routed to principal staff for final review prior to approval by the Manager. Five examples of Quality Assurance Program Plans have been forwarded to the Director of Quality Assurance for review prior to issuance.

PLANNED WORK

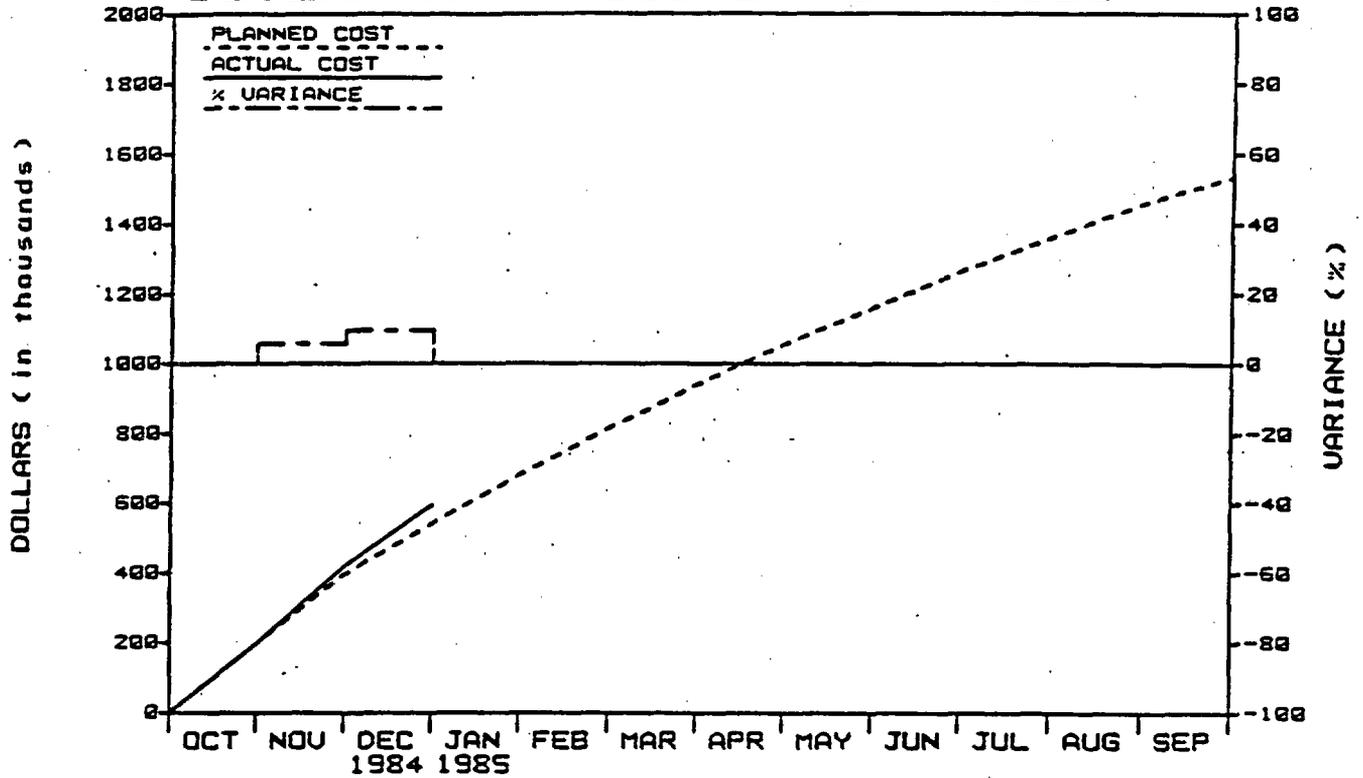
Analysis of SFT-C field data will continue. Calculations of the mine-by will be completed and prepared and a report on the subject will be initiated. Heat transfer calculations will continue. The draft reports on instrumentation performance and USBM gauge evaluations will be completed and submitted for peer review.

Operation of the Fuel Temperature Test will continue, as will monthly gas sampling and atmosphere exchange operations.

PROBLEM AREAS

None.

WBS 2.7 TEST FACILITIES GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	197	397	543	682	817	941	1057	1161	1267	1362	1459	1535
COST (x1000)	197	420	595	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	-23	-52	0	0	0	0	0	0	0	0	0
% VARIANCE	0	6	10	0	0	0	0	0	0	0	0	0

2.8 LAND ACQUISITION

OBJECTIVE

The objective of this task is to maintain access to land adjacent to the Nevada Test Site that is controlled by the U.S. Air Force and the Bureau of Land Management and to protect land that could be used for a high-level waste repository and the surrounding buffer zones.

ACTIVITIES

None.

PLANNED WORK

To be included in future NNWSI Project Monthly Reports.

PROBLEM AREAS

None.

2.9 PROGRAM MANAGEMENT

OBJECTIVE

The objective of this task is to manage all activities of the NNWSI Project by all contractors. The five major areas identified are Project Management, Project Control, Interface Activities, Quality Assurance, and Generic Requirements Document (GRD) Support.

ACTIVITIES

Project Monitoring System

PMS staff supported WMPO in preparing for the overall "Site Guidance Plan Schedule" being used to ensure that new statements of work for all participants specify tools required to support the SCP and balance of the site investigations.

Replanning for the preparation and construction of the first and second shaft at the Yucca Mountain Exploratory Shaft facility was begun by LLNL and supported by SAIC/PMS staff.

The baselined WBS was forwarded to DOE/HQ per their request. Additional changes to the structure for the site and exploratory shaft elements have been requested by participants. These will be placed before the Change Control Board (CCB) at the next PM-TPO meeting.

Updates of and changes to participant input for baselining level 1 and 2 milestones was received during December. No input has been received for USGS for FY 85. All available data will be forwarded to the CCB for their review before the next PM-TPO meeting.

A partial set of project guidance materials for the site and the regulatory and institutional elements was prepared during December in support of WMPO efforts to produce revised statements of work for NNWSI Project participants. This and other guidance materials should be placed under the change control process to ensure consistent planning throughout the project.

Network Plans and Schedule Status

The status of the various WBS elements, as provided by the participating organizations, was incorporated into the networks. A summary of the work done to each of the WBS elements follows.

WBS 2.1 Systems - An update was completed to the SNL systems plan which reflects new and revised milestones submitted on December 21, 1984.

WBS 2.2 Waste Package - The network plan was updated to reflect status provided by LLNL. Both the summary and detailed network plans reflect all milestone changes approved through the end of December.

WBS 2.3 Site - Network plans are being reworked by LANL and USGS to reflect changes that resulted from the Annual Budget Review. This planning is expected to be complete in January 1985.

WBS 2.4 Repository - FY 85 changes in the repository design work plan have been incorporated into the network plan for design. SNL is replanning the rock mechanics and the sealing research effort; no new status data have been received on these two elements.

WBS 2.5 Regulatory and Institutional - Additional detail was added to this network and status was obtained for ongoing work.

WBS 2.6 Exploratory Shaft (ES) - The strawman networks for all Exploratory Shaft tests were completed in December. Each test was combined with others in the same discipline to create four networks. No further modifications are expected until after the PI meetings with D. Vieth in January. Work has begun on modifying WBS 2.6 to more accurately group and separate the different functions within the construction and testing phases of the Project. Work was also begun on the Work Breakdown Structure dictionary for the lower levels of the WBS for the Exploratory Shaft.

WBS 2.9 Project Management - Quality Assurance network plans were reviewed and statused, and work is continuing on an integrated plan for all program management subtasks.

Software Applications

PMS staff members loaded, compiled, and linked the RADTRAN code for transportation studies; added report options to the Change Control Board applications program in INGRES; and created changes in the Correspondence and Tracking Log, a program in INGRES that is shared by the T&MSS contractor and the WMPO staff.

Reporting

The NNWSI Project Monthly Progress Report for September 1984 was transmitted to DOE/HQ on December 10, 1984, and the October report was transmitted to WMPO on December 4, 1984. The MSA for November was delivered to WMPO on December 15.

Weekly Informal Reports were issued for the weeks ending November 7, November 14, November 21, November 28, December 5, and December 12, 1984.

Weekly Highlights were issued for the weeks ending December 6, December 13, and December 20, 1984.

Quality Assurance

Six of the twenty-one T&MSS QA Supporting Procedures (QPs) have been revised and are being reviewed by the SAIC Review Committee; the remainder are being revised. Because of extended sick leave and heavy workload, it is evident that assistance is required if a reasonable schedule for completion is to be maintained. Therefore, plans have been made to obtain assistance from SAIC/McLean for a period of two weeks in January 1985.

Because of the lengthy review cycle and the necessity for coordination with the approval and issue of the associated T&MSS Administrative Procedures (APs), a change has been requested to the milestone due date to February 15, 1985.

Responses from T&MSS to NNWSI Audit 84-9 were submitted to WMPO on December 9, 1984, by letter L84-SBS-691. No reply has been received.

Three procedures of the LLNL QAPP were submitted to WMPO on December 14. They were Procedures 033-NNWSI-P 6.1 - Document Control, 033-NNWSI-P 15.0 - Nonconformances, and 033-NNWSI-P 16.0 - Corrective Action. The procedure on Quality Assurance Records (033-NNWSI-P 17.0) is finished and will be handcarried to WMPO on January 9. The records inventory project is on schedule; computer entry and physical refileing have begun.

As previously reported, the NNWSI Project Quality Assurance Plan, Revision 3, was issued on October 30, 1984. The effective date for implementation was November 1, 1984. The status of the project-wide implementing procedures, SOPs, are as follows.

1. NNWSI-SOP-02-01, QAPP Requirements, Revision 0. This SOP was issued in November with an effective date of December 12, 1985.
2. NNWSI-SOP-02-02, Assigning Quality Levels. A strawman was issued to the TPOs on November 7, 1984, for review and comment. Comments were received and the major comments were presented and discussed at the November 1984 TPO meeting. The procedure was redrafted and will be reissued in January 1985.
3. NNWSI-SOP-03-02, Computer Code Assessment. SAIC has informed WMPO of a plan and the effort required to redraft this procedure and is awaiting WMPO response.
4. NNWSI-SOP-03-03, Verification of Data Generated pre-NNWSI Project QA Plan. A redraft of this procedure is in progress by five individuals from various NNWSI Project participants. The procedure will be issued by February 20, 1985.
5. NNWSI-SOP-15-01, Nonconformance Control System, Revision 0. This SOP was issued September 12, 1984; the effective date was September 28, 1984.
6. NNWSI-SOP-17-01, QA Records Management. ESI is meeting with the project participants for input into the procedure. A draft should be completed by February 1985.

The WMPO QAPP, Revision 2, and twelve QMPs were issued on November 30, 1984. The effective date for implementation is December 10, 1984. The QA Records Procedure will be issued at a later date pending completion of the ESI. A controlled copy was transmitted to D. C. Newton, OGR, for review and approval.

NNWSI Project Surveillance (Report WMPO/NV-SR-85-005) of SNL NNWSI records was performed. There were no nonconformances observed. NNWSI Project Surveillance (Report WMPO/NV-SR-85-006) of LANL ES-2 design was performed. There were no nonconformances observed.

Status of NNWSI Project Audits for FY 84

Audit No.	Participant Audited	Status
84-1	USGS	Closed May 5, 1984.
84-2	LLNL	Closed May 3, 1984.
84-3	SNL	Closed June 6, 1984.
84-4A	F&S	Closed October 10, 1984.
84-4B	H&N	Closed November 14, 1984.
84-5	USGS	Responses from USGS on ten audit findings were received and found to be satisfactory. This audit will remain open until the procedures are reviewed by WMPO.
84-6	LANL	Comments have been sent to LANL for further clarification. Audit still open.
84-7	W/WTSD	Closed October 12, 1984.
84-8	REEC0	Comments have been sent to REEC0 requesting further clarification. Audit still open.
84-9	SAIC/T&MSS	Waiting for responses from audit findings. Audit still open.

Office Service Support

During December, graphics prepared materials for the EA Briefing Book and briefing materials for both the NRC/DOE QA meeting and the PM Program Review meeting.

Logistical arrangements were finalized for the EA briefings and hearings. D. Vieth was briefed on these arrangements and a letter was drafted detailing these arrangements. A draft "State Fact Sheet" prepared by OCRWM was reviewed for distribution with the EAs. Advance copies of the EA were delivered to State and local officials and Congressional offices.

Work continued this month to make available 15 hard copies and 50 microfiche copies of each of the approximately 500 references to the EA. Distribution of the references was initiated and mostly completed in December. The references were sent to 11 Nevada libraries, to the State, and to the NRC.

PLANNED WORK

Work plans for the Project Management Plan have been received from LLNL and SNL and are being reviewed for completeness and format. LANL, SAIC, and USGS will submit work plans in January. SAIC work plans are approximately 50 percent complete. D. L. Vieth changed the delivery date of the Project Management Plan to March 19, 1985. A change request will be submitted to change Level 2 Milestone M907.

The Project Plan will be delivered to WMPO in early January. It is complete except for current budget and cost data and two brief sections that D. Vieth is preparing.

Verification of action taken to satisfy the T&MSS Audit Findings for T&MSS Audit 84-2 will be completed before January 31, 1985.

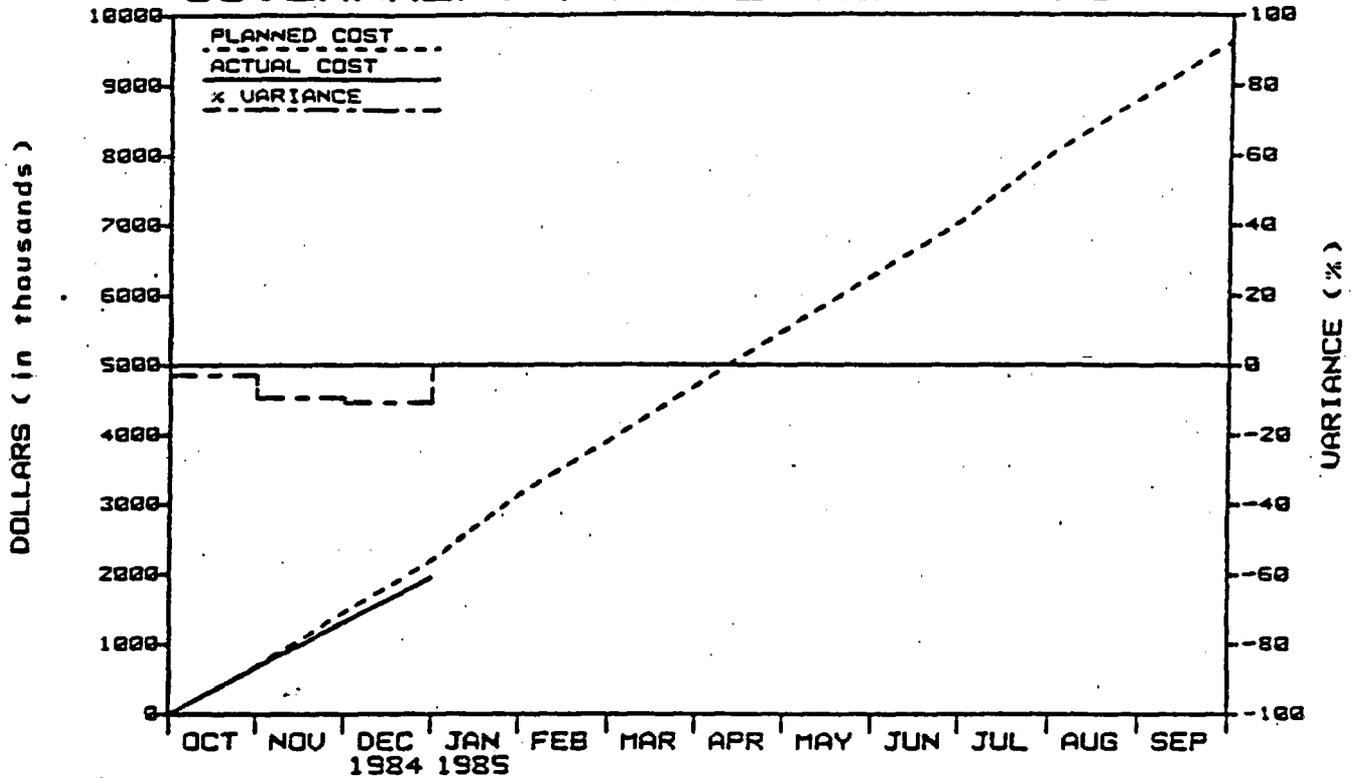
A revised schedule for FY 85 audits is being prepared for WMPO approval and issuance. The schedule needs to be revised because of the impact of the status of the NNWSI Project participants' QAPP reviews. It is estimated that the first audit will start in April 1985.

The Participating Organizations and NTS Support Contractors have submitted their QAPPS for review. They have also submitted the majority of their QA implementing procedures. Preliminary reviews of these documents have begun and the expected completion of the initial review is March 22, 1985.

PROBLEM AREAS

Only two of the surveillances scheduled for December were performed because of the Records Management System Phase II activities. Surveillances for the remainder of FY 85 may not be performed because of the heavy workload in other higher priority areas.

WBS 2.9 PROJECT MANAGEMENT GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	583	1446	2193	3132	3913	4708	5497	6281	7045	8007	8811	9620
COST (x1000)	663	1311	1957	0	0	0	0	0	0	0	0	0
VARIANC (x1000)	20	135	236	0	0	0	0	0	0	0	0	0
% VARIANCE	-3	-9	-11	0	0	0	0	0	0	0	0	0

Variance Explanation: Cost plans did not accurately reflect scheduled work. Manpower shortages caused the costs to underrun the budget. A new cost plan is being prepared.

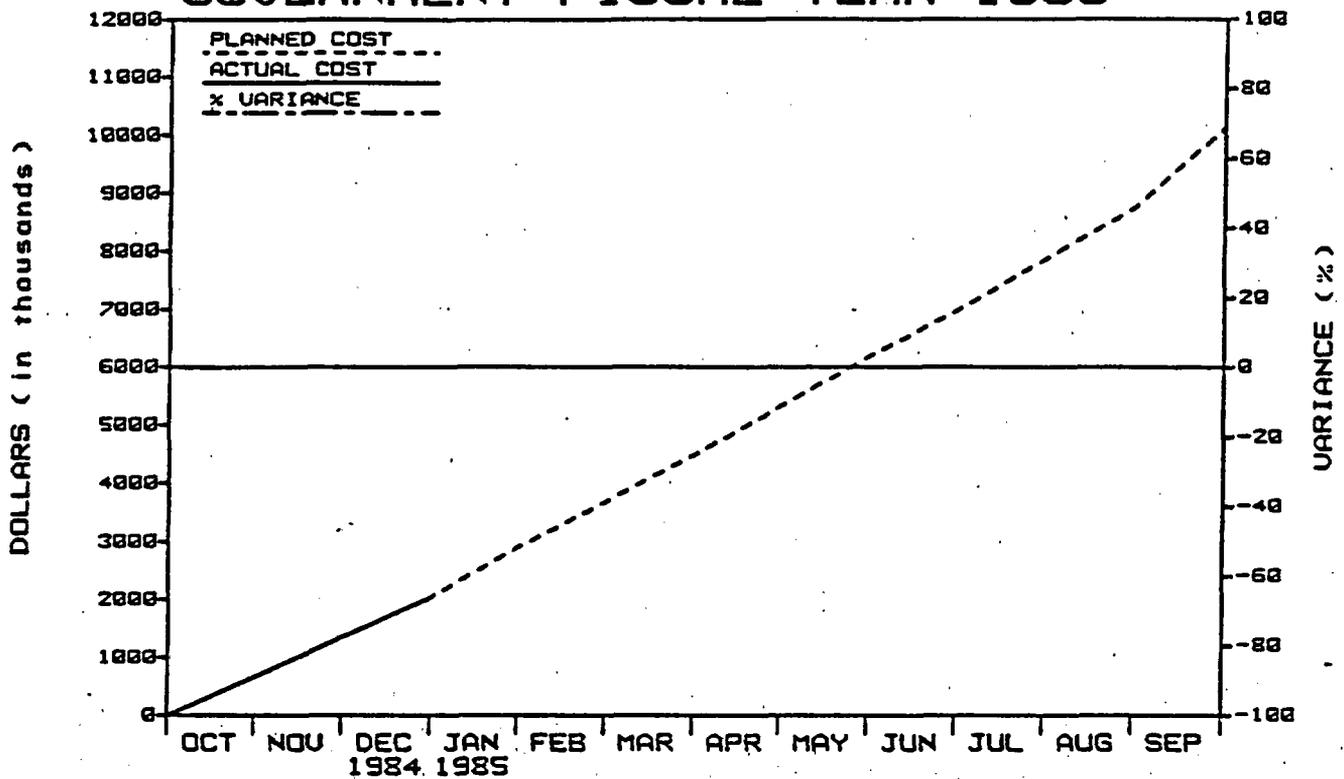
RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
SAIC	2.9	SUBMIT FY 1985 NNWSI PROJECT PLAN TO DOE/HQ		△										
SAIC	2.9	SUBMIT NVO-196-18 (REV. 2) TO DOE/HQ		▲										



PARTICIPANT

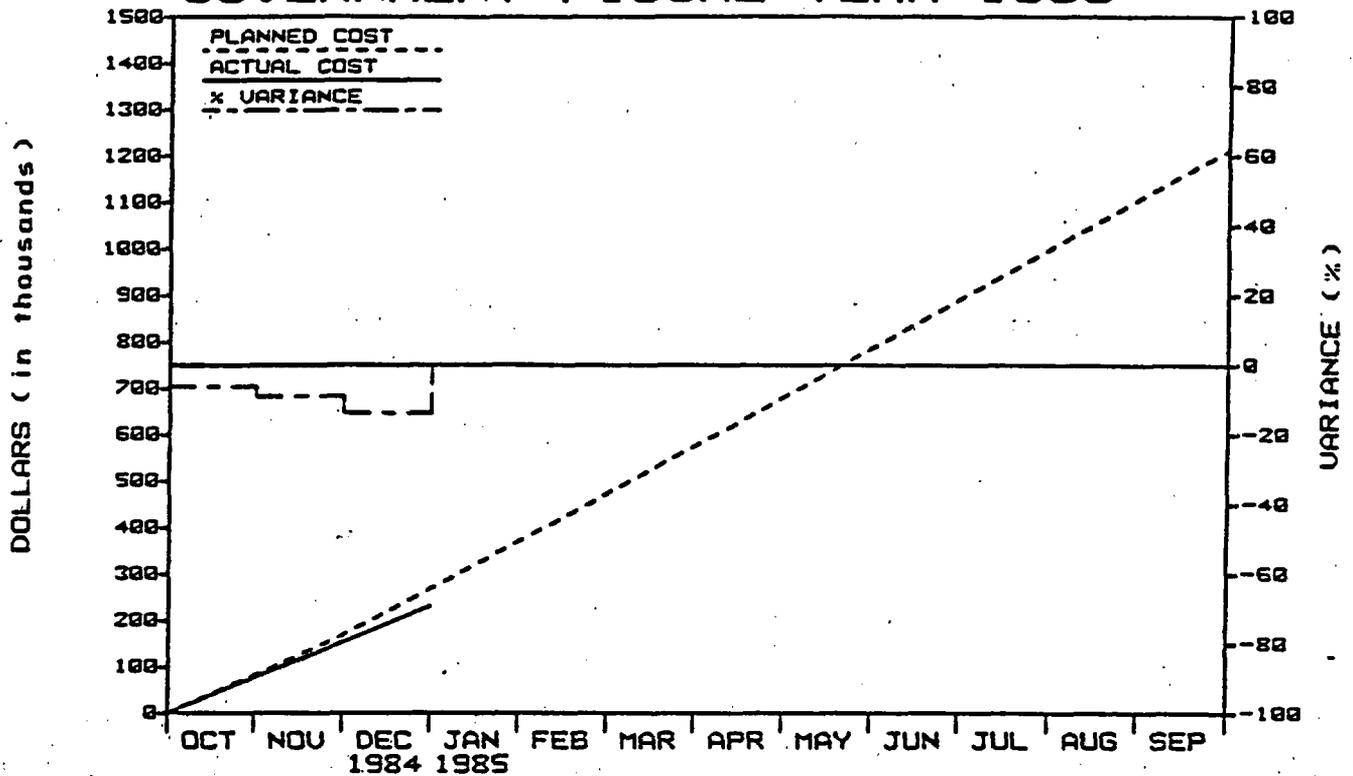
BUDGET vs COST

LOS ALAMOS NATIONAL LABORATORY GOVERNMENT FISCAL YEAR 1985



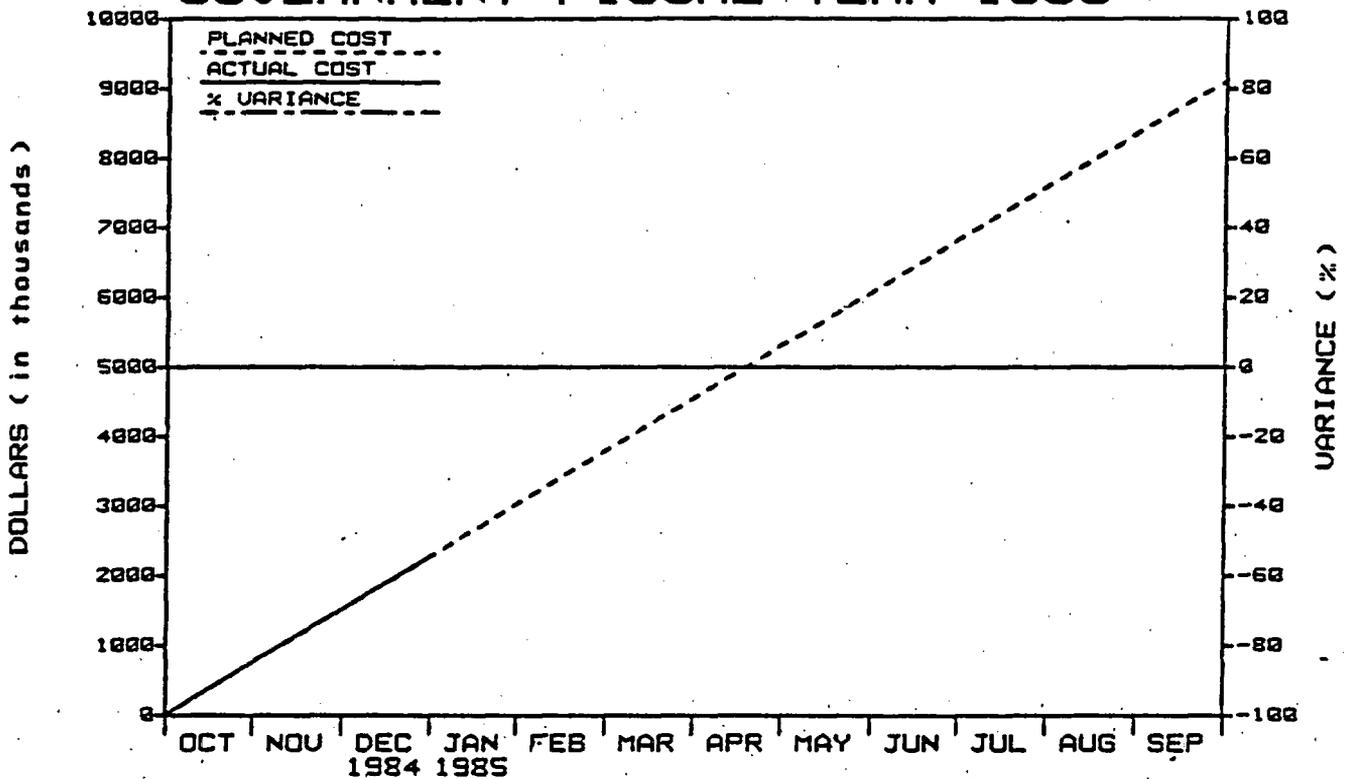
PLAN (x1000)	656	1354	2039	2892	3678	4491	5328	6187	6983	7859	8741	10130
COST (x1000)	656	1354	2039	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	0	0	0	0	0	0	0	0	0	0	0
% VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0

FENIX & SCISSION, INC GOVERNMENT FISCAL YEAR 1985



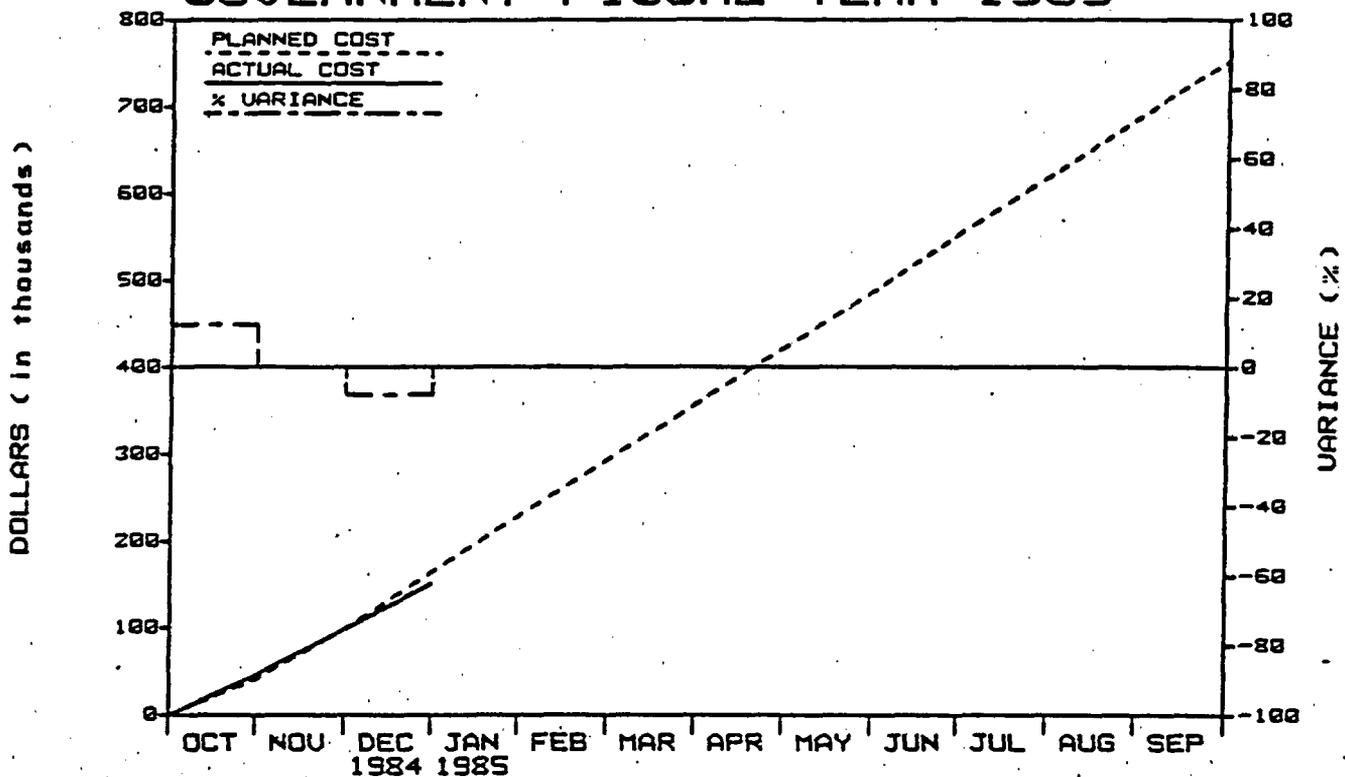
PLAN (X1000)	82	168	268	370	473	576	681	787	893	1000	1107	1212
COST (X1000)	77	153	231	0	0	0	0	0	0	0	0	0
VARIANCE (X1000)	5	15	37	0	0	0	0	0	0	0	0	0
% VARIANCE	-6	-9	-14	0	0	0	0	0	0	0	0	0

U. S. GEOLOGICAL SURVEY GOVERNMENT FISCAL YEAR 1985



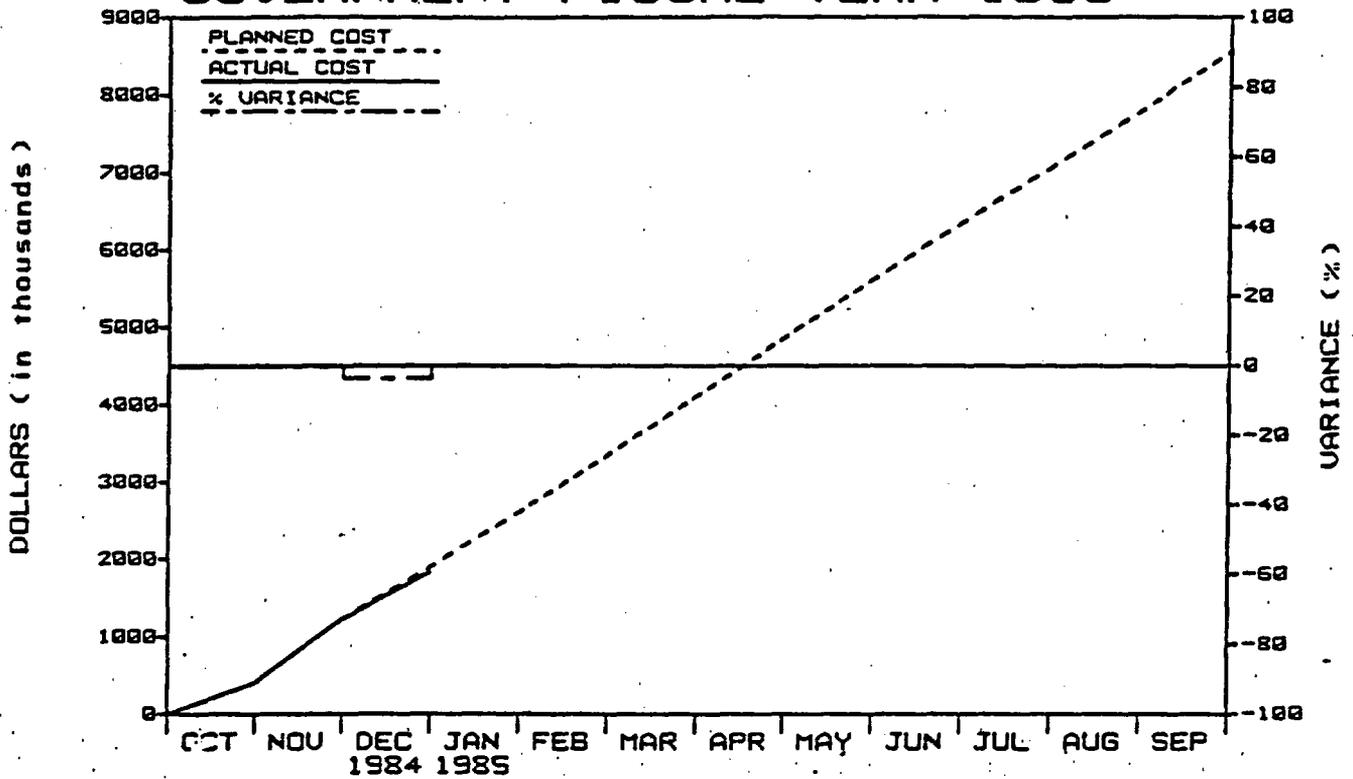
PLAN (x1000)	760	1520	2277	3035	3805	4559	5319	6074	6836	7594	8353	9108
COST (x1000)	760	1520	2277	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	0	0	0	0	0	0	0	0	0	0	0
x VARIANCE	0	0	0	0	0	0	0	0	0	0	0	0

HOLMES & NARVER GOVERNMENT FISCAL YEAR 1985



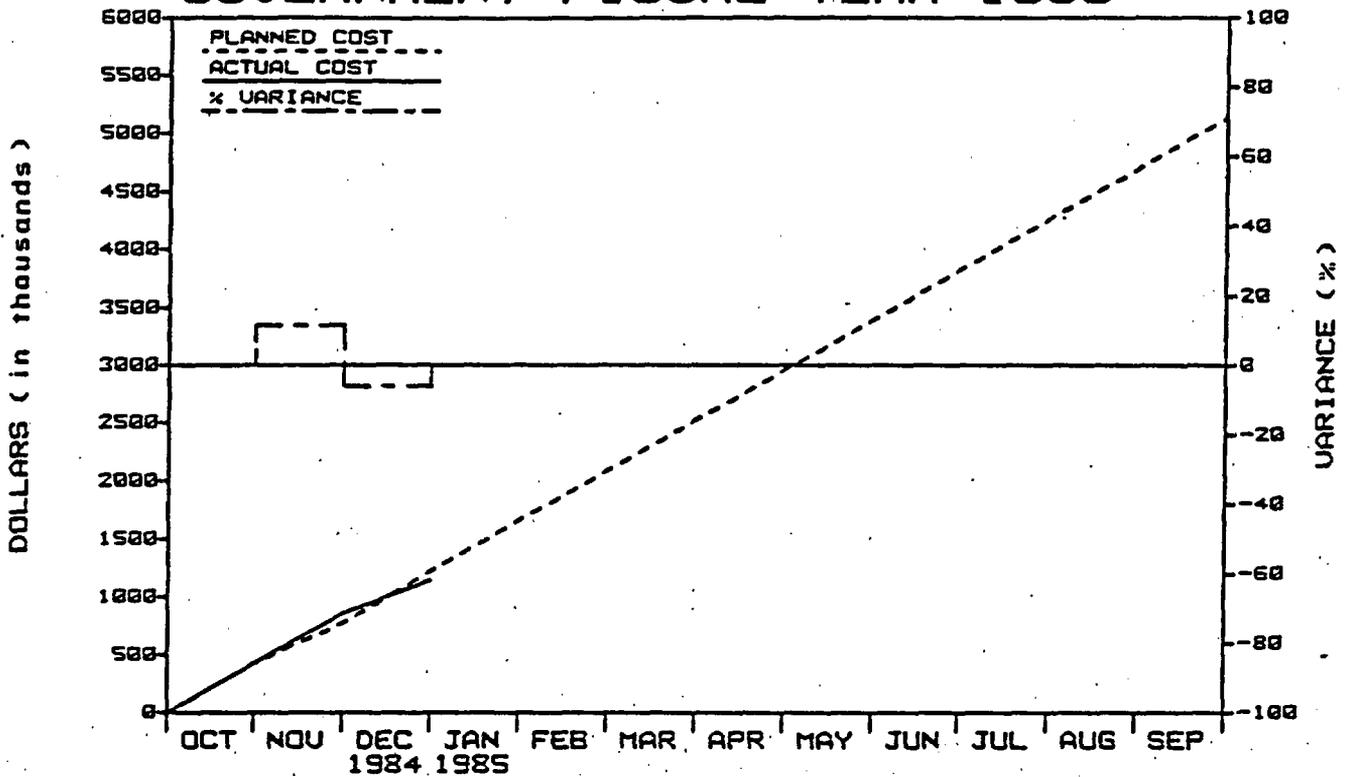
PLAN (X1000)	41	99	164	228	293	357	422	487	553	618	686	753
COST (X1000)	46	99	151	0	0	0	0	0	0	0	0	0
VARIANCE (X1000)	-5	0	13	0	0	0	0	0	0	0	0	0
% VARIANCE	12	0	-8	0	0	0	0	0	0	0	0	0

LAWRENCE LIVERMORE NATIONAL LABORATORY GOVERNMENT FISCAL YEAR 1985



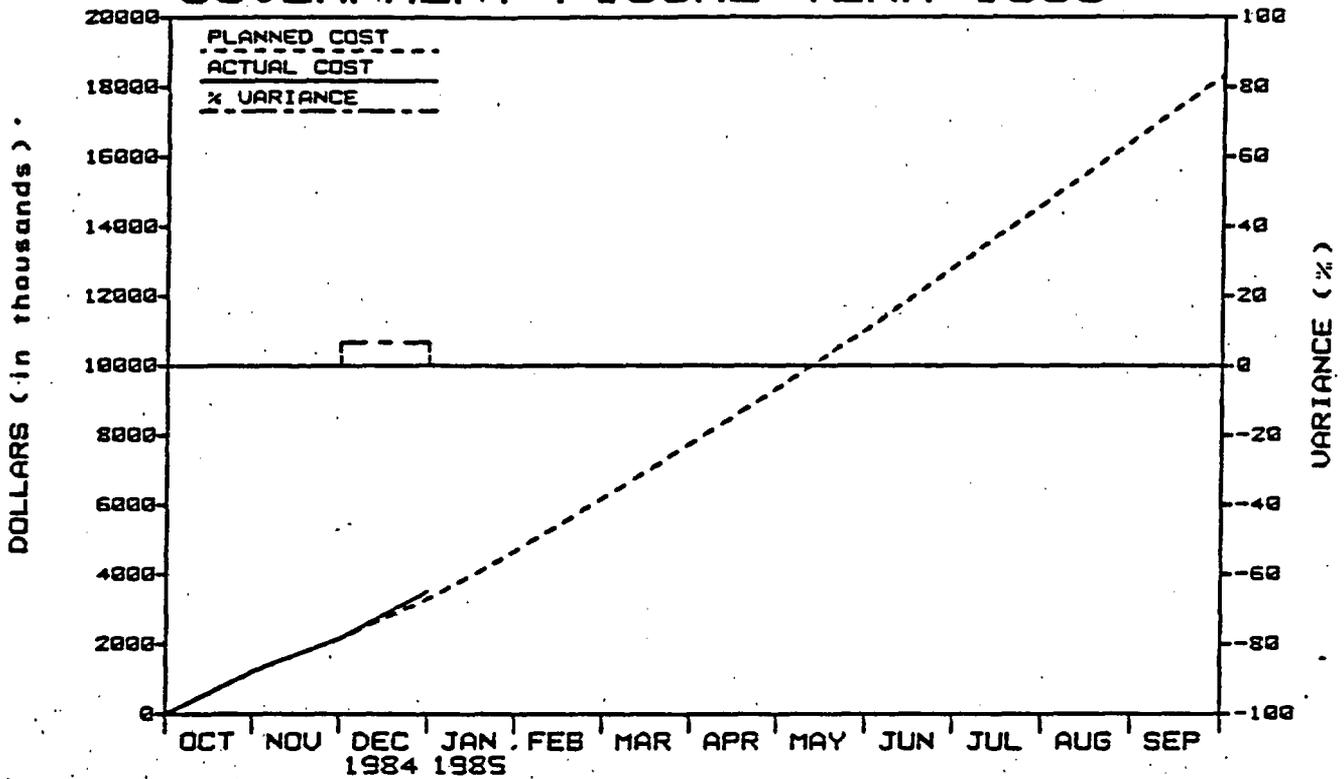
PLAN (x1000)	484	1229	1899	2603	3345	4107	4860	5607	6347	7066	7787	8565
COST (x1000)	484	1226	1829	0	0	0	0	0	0	0	0	0
URIANCE (x1000)	0	3	70	0	0	0	0	0	0	0	0	0
% URIANCE	0	0	-4	0	0	0	0	0	0	0	0	0

REECO GOVERNMENT FISCAL YEAR 1985



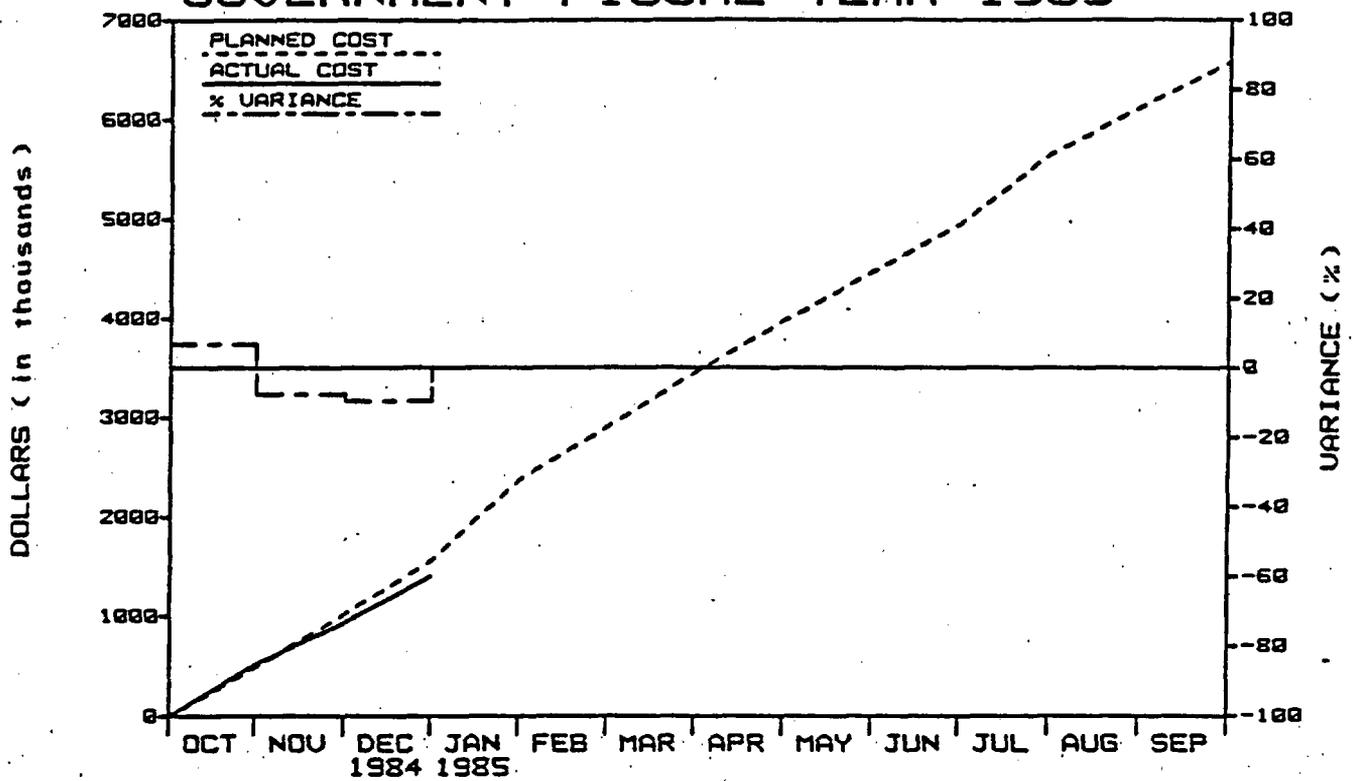
PLAN (x1000)	426	772	1222	1658	2092	2527	2960	3394	3827	4262	4696	5135
COST (x1000)	426	861	1148	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	-89	74	0	0	0	0	0	0	0	0	0
% VARIANCE	0	12	-6	0	0	0	0	0	0	0	0	0

SANDIA NATIONAL LABORATORIES GOVERNMENT FISCAL YEAR 1985



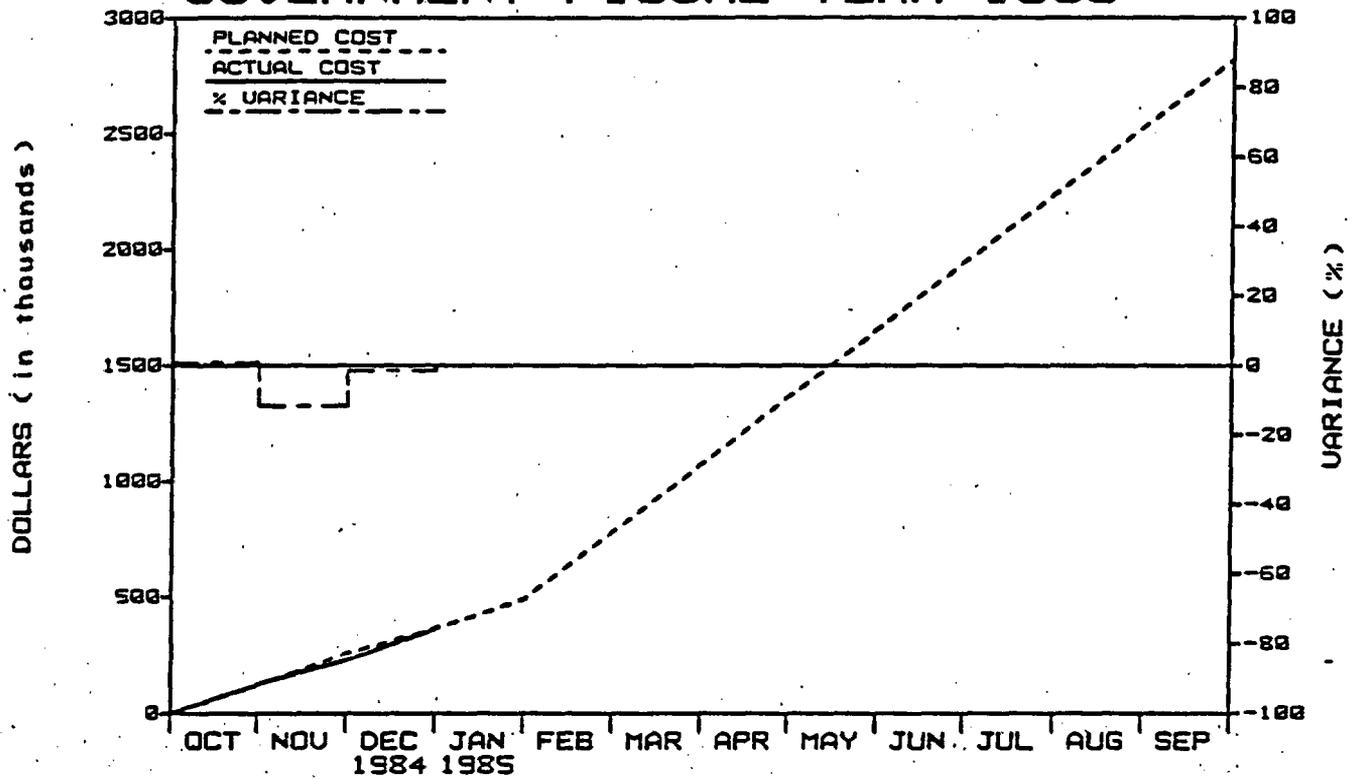
PLAN (x1000)	1230	2160	3290	4664	6191	7761	9363	11048	12833	14650	16448	18334
COST (x1000)	1230	2160	3511	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	0	0	-221	0	0	0	0	0	0	0	0	0
% VARIANCE	0	0	7	0	0	0	0	0	0	0	0	0

SCIENCE APPLICATIONS INT'L CORP. GOVERNMENT FISCAL YEAR 1985



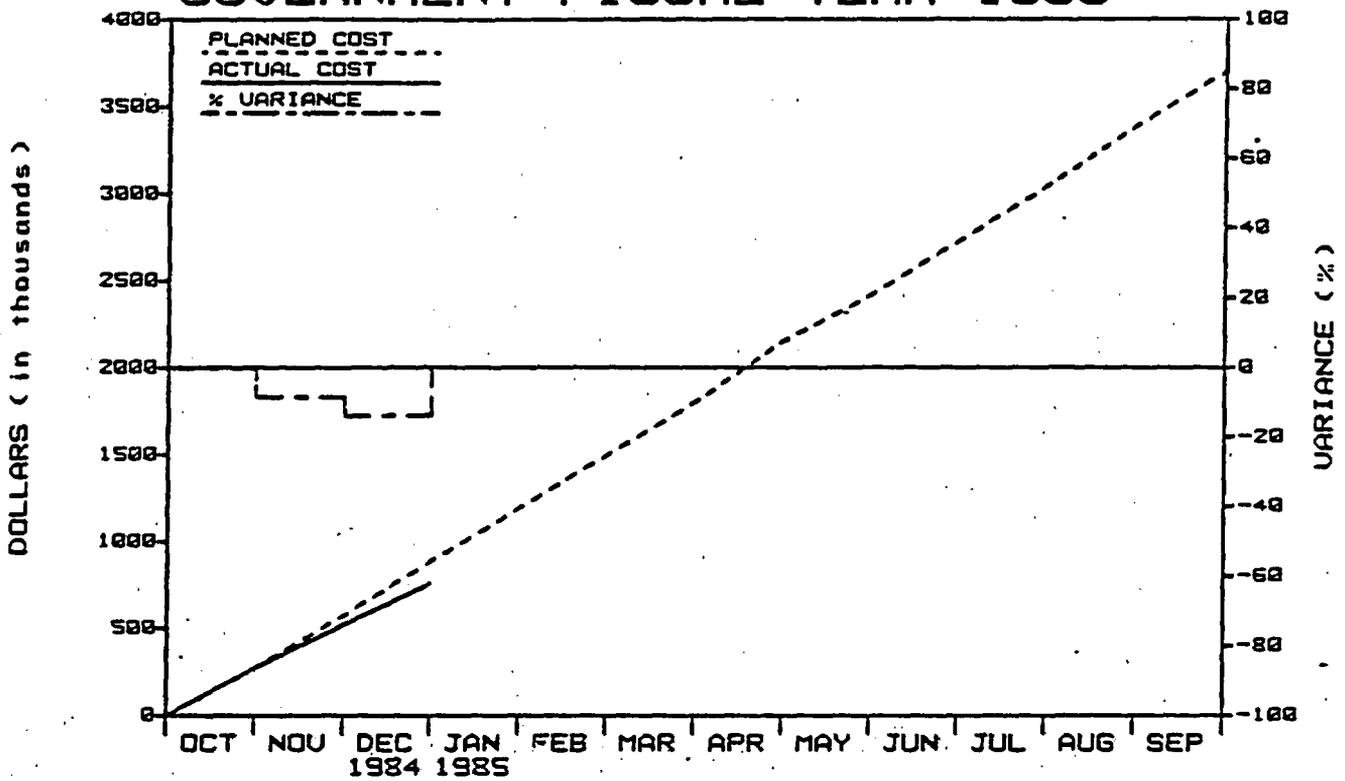
PLAN (x1000)	486	1019	1558	2370	2905	3453	3970	4468	4947	5648	6123	6575
COST (x1000)	519	942	1408	0	0	0	0	0	0	0	0	0
VARIANCE (x1000)	-33	77	150	0	0	0	0	0	0	0	0	0
% VARIANCE	7	-8	-10	0	0	0	0	0	0	0	0	0

MISCELLANEOUS CONTRACTORS GOVERNMENT FISCAL YEAR 1985



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
	1984	1984	1984	1985	1985	1985	1985	1985	1985	1985	1985	1985
PLAN (X1000)	122	258	366	489	788	1072	1364	1656	1947	2240	2531	2819
COST (X1000)	123	228	361	0	0	0	0	0	0	0	0	0
VARIANCE (X1000)	-1	30	5	0	0	0	0	0	0	0	0	0
% VARIANCE	1	-12	-1	0	0	0	0	0	0	0	0	0

E-MAD GOVERNMENT FISCAL YEAR 1985



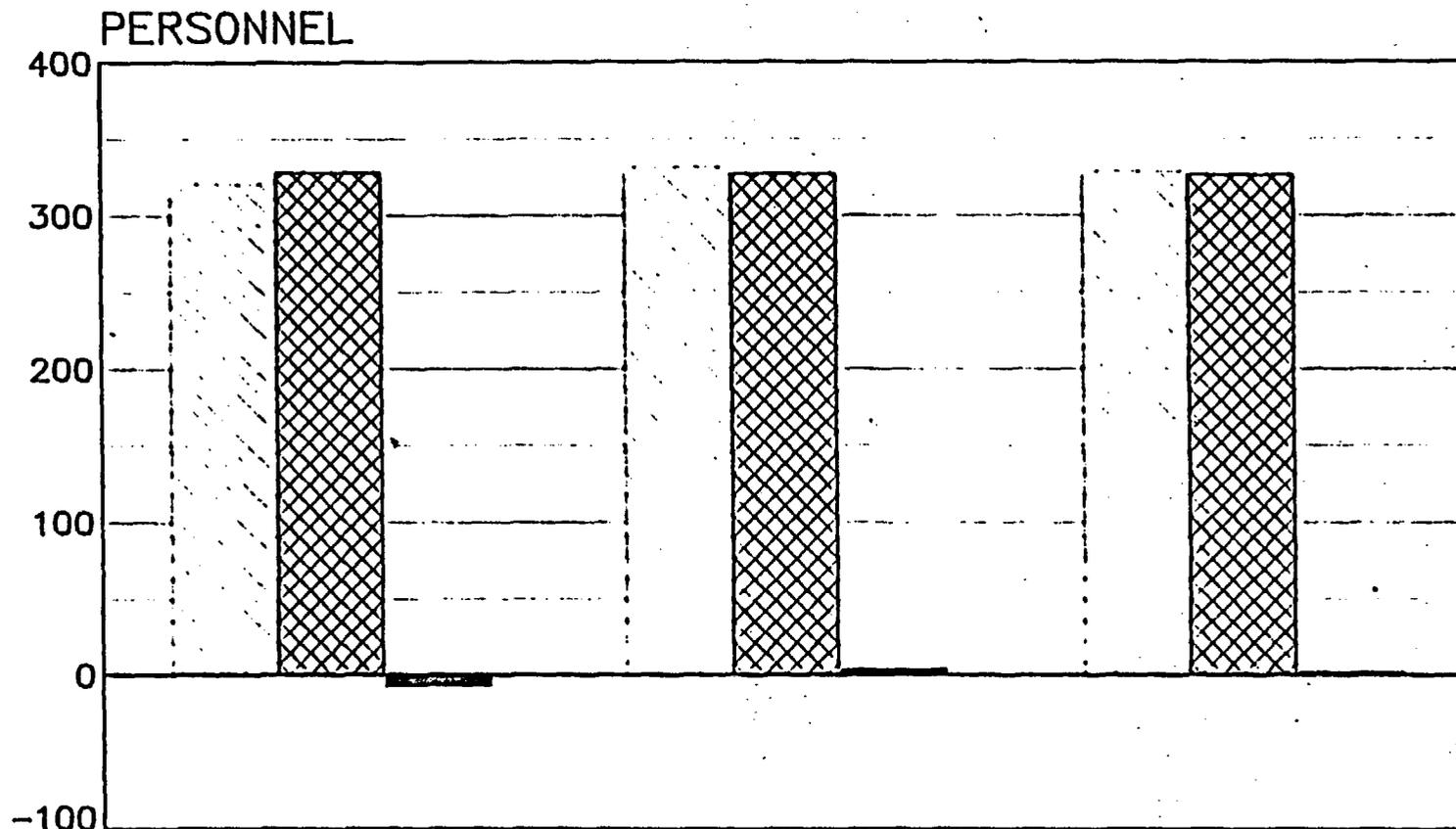
PLAN (X1000)	274	573	884	1189	1494	1802	2154	2417	2727	3038	3385	3700
COST (X1000)	273	524	761	0	0	0	0	0	0	0	0	0
VARIANCE (X1000)	1	49	123	0	0	0	0	0	0	0	0	0
% VARIANCE	0	-9	-14	0	0	0	0	0	0	0	0	0

NNWSI LEVEL I MILESTONES

FY 1985

NNWSI NUMBER	WBS	RESP. AGENCY	MILESTONE DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	REMARKS	ANTICIPATED COMPLETION DATE
M151	2121S	SNL	Preliminary System Description	11/21/84		Behind Schedule	
M120	2121S	SNL	NNWSI Project System Requirements Draft for Project Baselineing	07/30/85			
M108	2121S	SNL	System Engineering Management Plan	08/30/85			
M250	2221L	LLNL	Establish Interim Product Specifications	08/30/84		CCB Action Pending	12/31/84
M222	2232L	LLNL	Input to DOE/HQ Report to Congress on Copper for Waste Package	08/30/85			
M251	224L	LLNL	Pre-closure Analysis of Selected Conceptual Design	09/28/84	12/20/84		
M354	23411A	LANL	Letter Report on Groundwater Chemistry Along Flow Path	08/30/84		Behind Schedule	
M357	23224S	SNL	Weapons Test Seismic Report	01/15/85			
M358	23351G	USGS	Complete Paleobotany Study of Yucca Mountain	10/15/84		Behind Schedule	
M356	23231A	LANL	Complete Report on Volcanic Hazards Analysis	09/28/84		Behind Schedule	11/30/84
M355	2342A	LANL	Progress Report on 3-D Mineralogic Model of Yucca Mountain	08/31/84	10/10/84		
M364	236T	SAIC	Implementation of Meteorological Monitoring Plan	06/01/85			
M406	24221S	SNL	Horizontal Waste Emplacement Equipment Development Plan	06/01/85			
M447	24231S	SNL	Seal Development Plan for Repository to OCRWM for Review	11/12/84	12/17/84		
M521	2522T	SAIC	Draft Site Characterization Plan Submitted to DOE/HQ	07/30/85			
M522	2522T	SAIC	Final Site Characterization Plan	08/20/85			
M523	2531T	SAIC	NNWSI References for EA Complete	08/01/84		Behind Schedule	12/01/84
M502	2531T	SAIC	Draft Environmental Assessment	11/30/84	11/29/84		
M504	2531T	SAIC	Final Environmental Assessment	05/05/85			
M503	2531T	SAIC	EA Comment/Response Document	05/30/85			
M660	2691A	LANL	Complete Exploratory Shaft Test Plan and Submit to DOE/HQ for Final Review and Approval	08/31/84		Behind Schedule	03/29/85
M666	2691A	LANL	Issue Exploratory Shaft Test Plan (ESTP)	09/20/85			
M701	2721L	LLNL	Termination of Routine Access and LLNL to Spent Fuel Test-Climax Facility	09/28/84	09/28/84		
M901	2911T	SAIC	Submit FY 1985 NNWSI Project Plan to DOE/HQ for Approval	11/30/84		Behind Schedule	03/15/85
M915	293T	SAIC	Submit NVO-196-18 (Rev. 2) NNWSI Project Quality Assurance Program Plan and Implementing Procedures to DOE/HQ for Approval	11/30/84	11/30/84		

- NNWSI PROJECT STAFFING -
FISCAL YEAR 1985



	OCTOBER	NOVEMBER	DECEMBER
BUDGET	321	332	329
ACTUAL	329	328	327
VARIANCE	-8	4	2