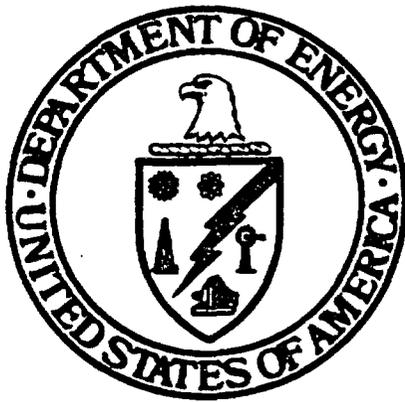


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NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT



MONTHLY REPORT

JUNE 1984

UNITED STATES DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE

SUMMARY
NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT
June 1984

KEY ACTIVITIES

WBS 2.1, Systems

NNWSI Project staff from the Repository Performance Assessments Division participated in an information briefing for D. Alexander, DOE/HQ, for all of the Repository Deployment Program projects.

NNWSI Project staff also participated in a workshop at DOE/HQ Weston on June 14-15 to revise the Mined Geologic Disposal System Generic Requirements document.

New experimental data from PNL have been incorporated into a report: "Fracture and Matrix Hydrologic Characteristics of Tuffaceous Material from Yucca Mountain, Nye County, Nevada."

The interactive Graphics Information System was used to generate six versions of the Yucca Mountain water-table model in an attempt to identify data points that are introducing the largest perturbations in the trends given by the analytical model.

WBS 2.2, Waste Package

A report entitled, "Petrologic and Geochemical Characterization of the Topopah Spring Member of the Paintbrush Tuff: "Outcrop Samples Used in Waste Package Experiments," was sent to DOE/NV for review. And, an abstract: "Dachiardite Formation by Hydrothermal Alteration of a Devitrified High-Silica Rhyolite," was submitted to the 1984 Geological Society of America national meeting.

The second fractured tuff experiment was completed. The experiment shows that fracture healing can occur under conditions in which the fracture is never completely dried out.

The revised test plan for the second series of cladding containment credit tests of spent fuel was reviewed and approved. This series of tests is to be run in J-13 water.

Testing of irradiated Zircaloy in the presence of J-13 water and crushed Topopah Spring tuff has begun that will attempt to determine the failure mechanisms and rates for cladding material in the expected repository environment.

A series of parametric test has begun at Argonne National Laboratory to investigate the effect of stainless steel on glass-water reactions for the unsaturated test method and on the role of the perforated stainless steel plate used in those tests on retention of water on the glass surface.

Representatives from the Copper Development Association, the International Copper Research Association, copper producers, and interested consultants met in New York City and recommended five materials to be considered in future testing programs to qualify materials for long-term geologic containment in a tuff repository.

Chapter 9 of the Site Characterization Plan is being revised for the September draft. DOE/HQ "Position on Engineering Requirements for the SCP," and the NRC Draft Technical Position, "Design Information Requirements," were reviewed and discussed with representatives from LLNL, SNL, SAI, WMPO, DOE/HQ, and Weston in Albuquerque on June 20.

NNWSI Project staff from LLNL, SNL, and WMPO completed a pre-baselined review of the DOE/HQ Mined Geologic Deposit Siting Generic Requirements Document at Weston.

WBS 2.3, Site

Pumping, sampling, and analyses of groundwaters from isolated permeable zones of well USW H-6 began on June 8.

The Level 1 milestone, "Groundwater Chemistry Along Flow Paths Between Repository and the Accessible Environment," was distributed June 11 to WMPO and to USGS/Denver for comment.

An ideal-site mixing model for the thermodynamics of the analcime solid solution is complete. The model agrees well with available experimental and field data, but the data insufficient to preclude the possibility that a significant not-ideal component may exist.

An open-file report was submitted for review entitled, "Preliminary Report on Seismic Refraction Profiles Along Crater Flat and Across Bare Mountain, Nye County, Nevada." The report will support the NNWSI Project's geologic investigation.

Laser surveys have been completed to determine the precise latitude, longitude, and elevation for seismograph stations for two seismic refraction profiles; one is east of and the other is transverse to Yucca Mountain.

On June 20, an Unsaturated Zone Hydrology activity planning meeting was held with USGS and SAI staff in which a detailed WBS was developed as well as activity definition and schedule.

The final two WBS Dictionaries for Regional Geology and Tectonics and Volcanism were completed by SAI/Golden.

LLNL staff participated in the NEA workshop on the Coupling of Hydrology and Geochemical Models in Paris, France, on June 12-13. The workshop was designed to identify and discuss methods for coupling geochemical and hydrologic models within the performance assessment system used to analyze potential nuclear waste repository sites.

All chemical data for the volcanism final report are complete and will allow a consistent data matrix for major and trace elements for all basaltic rocks of the Nevada Test Site region.

WBS 2.4, Repository

A report entitled, "Recommendation for a Second Access for the Yucca Mountain Exploratory Shaft Facility," was completed that analyzes several options for developing a second access and recommends an option of a slightly increased exploratory shaft diameter and a ramp from the east into the test facility.

NNWSI Project staff attended the 25th U.S. Symposium on Rock Mechanics in Evanston, Illinois, and presented a paper entitled, "Ambient Temperature Testing of the G-Tunnel Heated Block."

WBS 2.5, Regulatory/Institutional

A joint ESTP-SCP meeting was held in Las Vegas on June 12 to discuss a consistent approach to relating testing requirements, information needs, and regulatory requirements. The goal of the meeting was to link the Exploratory Shaft Test Plan and other test plans for field or lab tests to the information needs specified in Section 10.3 of the SCP. A general agreement was reached on the SCP schedules and issues; and, a means by which to prioritize the information needs was discussed.

Comments on the working draft, "SCP Management Plan," were submitted to WMPO on June 6. A number of concerns were raised with this document and were related primarily to organizational complexity, schedule limitations, and unwarranted procedural requirements.

A set of transcripts and documents that were generated during NRC deliberations of 10CFR960 were forwarded to SAI for retention. On June 22, the NRC concurred on the guidelines.

WBS 2.6, Exploratory Shaft

LANL staff attended a meeting on May 30-31 at Parsons Brinkerhoff in San Francisco to produce a draft report, which will be issued by SNL, on the recommended strategy for the dual-access Exploratory Shaft Facility.

The ESTP Committee met on June 13-14 and discussed items that included the La Jolla group memory, budgets, prototype testing requirements, and the second "shaft."

The hardware for the Integrated Data System (IDS) initial prototype development system has been installed.

WBS 2.7, Test Facilities

The final draft of the in situ stress measurements report was received from Foundation Sciences, Inc. As the technical content fulfills the contractual obligations, final payment on the contract was released to FSI.

Testing was completed on the integrity of borehole extensometer connecting rods and anchors.

Six tours of the Spent Fuel Test-Climax facility were conducted for 151 people during the month of June.

Thermal monitoring of canisterized fuel assembly 803, which has been utilized in storage testing in Drywell 3 since 1980, was discontinued.

A contract deliverable report was prepared to document integration of an automatic digital temperature control system into the Fuel Temperature Test System.

WBS 2.9, Program Management

The USGS Drilling Plan was updated to reflect the status through June 15, 1984.

A draft network plan was developed to incorporate construction of a second ingress shaft from the exploratory shaft.

A draft of the Administrative Procedures Manual was transmitted to WMPO June 15, 1984.

A new Environmental Assessment production schedule was developed for the August 13, 1984, submission of the draft EA.

The draft Meteorological Monitoring Plan was completed on June 18, 1984.

A workshop for the Participating Organizations and NTS Support Contractors was held June 5-6, 1984, to provide interpretation and to answer questions regarding the NNWSI Project QAP, NVO-196-17 (Rev. 2).

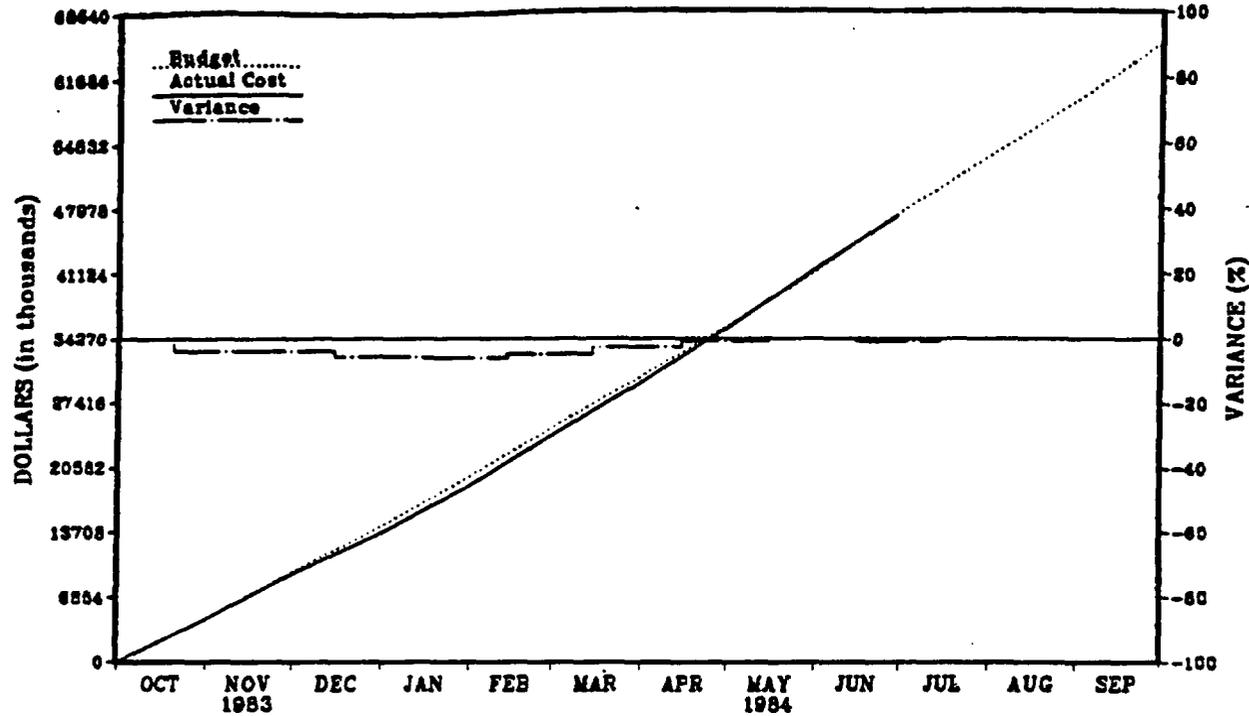
FUNDING OVERVIEW

The month-end programmatic estimated costs were \$47,166,000 against a plan of \$47,532,000, which resulted in a cost underrun of \$366,000 through the month of June. The plan is based on a \$67M FY 1984 funding authorization.

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

	<u>Plan</u>	<u>Cost</u>	<u>Variance</u>
2.1 Systems	\$2,726,000	\$2,378,000	\$348,000
2.2 Waste Package	3,509,000	3,359,000	150,000
2.3 Site	17,026,000	17,184,000	<158,000>
2.4 Repository	8,713,000	8,307,000	406,000
2.5 Regulatory & Institutional	2,010,000	2,308,000	<298,000>
2.6 Exploratory Shaft	1,887,000	1,762,000	125,000
2.7 Test Facilities	4,797,000	5,125,000	<328,000>
2.9 Program Management	5,787,000	5,617,000	170,000
NTS Allocation	667,000	716,000	<49,000>
State Grant	<u>410,000</u>	<u>410,000</u>	<u>-0-</u>
Total	\$47,532,000	\$47,166,000	\$366,000

NNWSI Project GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	4559.	9581.	14393.	19713.	24850.	30297.	35570.	41487.	47535.	53332.	59186.	65285.
Cost (x1000)	4383.	9207.	13579.	18556.	23681.	29452.	35221.	41435.	47166.	0.	0.	0.
Variance (x1000)	174.	374.	814.	1157.	1169.	846.	349.	32.	369.	0.	0.	0.
% Variance	-4.	-4.	-6.	-6.	-5.	-3.	-1.	0.	-1.	0.	0.	0.

**NNWSI PLANNING & SCHEDULING
BUDGET BASELINE
JUNE, 1984**

<u>CONTRACTORS</u>	<u>BEGINNING FUNDING</u>	<u>CHANGE</u>	<u>ENDING FUNDING</u>
SNL	\$17,800	<43>	\$17,757
LLNL	8,298	-	8,298
LANL	9,090	-	9,090
USGS	7,777	-	7,777
SAI	5,861	-	5,861
REECo	9,498	40	9,538
H&N	470	-	470
F&S	1,168	-	1,168
WESTINGHOUSE	2,746	-	2,746
WSI	200	-	200
PAN AM	30	-	30
MISCELLANEOUS	579	-	579
NTS ALLOCATION	847	3	850
RESERVE	46	-	46
TOTAL (BA)	\$64,410	-	\$64,410
FORWARD FINANCING	(500)	-	(500)
CAPITAL EQUIPMENT	3,090	-	3,090
TOTAL (BA)	\$67,000	-	\$67,000



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

All staff from the NNWSI Project Repository Performance Assessments Division participated in a general information briefing for D. Alexander (DOE-HQ) and personnel from Weston and Pacific Northwest Laboratory (PNL) who will be responsible for coordinating Performance Assessment for all the Repository Deployment Program projects. Follow-up meetings on specific topics were held the second day of the meeting.

The NNWSI Project Repository Performance Assessment Division supplied a list of NNWSI Project Performance Assessment issues to be used by W. Bennett (DOE/HQ) in a briefing for the new Director of the Office of Civilian Radioactive Waste Management.

Nevada grid coordinate and elevation data for new exploratory drill holes at Yucca Mountain were entered in the Tuff Data Base. Work continued on modifications to the user-friendly interface for the Tuff Data Base.

NNWSI Project staff participated in a June 14-15 workshop at DOE-HQ/Weston to revise the Mined Geologic Disposal System Generic Requirements (GR) document and the subsequent revision of the GR document. The GR document will be sent to GRD projects in early July for baselining.

New experimental data from PNL have been analyzed and incorporated into the report: "Fracture and Matrix Hydrologic Characteristics of Tuffaceous Material from Yucca Mountain, Nye County, Nevada." R. R. Peters and E. A. Klavetter

completed a major rewrite of the document and sent it to the coauthors at PNL for review.

Ten additional samples of Yucca Mountain tuff were sent to PNL for testing to determine saturated hydraulic conductivities and moisture content as a function of suction head. The tests will attempt to determine saturated hydraulic conductivities lower than PNL's previous lower experiment limit of 1.3×10^{-9} centimeters per second.

SNL's Geotechnical Design Division staff used the Interactive Graphics Information System to generate six versions of the Yucca Mountain water-table model in an attempt to identify data points that are introducing the largest perturbations in the trends given by the analytical model. The surface models were generated using various combinations of data from exploratory water-table and non-water-table drill holes at Yucca Mountain and control points. It appears that the water-table data derived from holes USW H-1 and USW G-1 account for the biggest anomaly in the water-table surface generated by the model. After reviewing the results and based upon all of the available drill-hole data, it was decided to generate the water-table model manually using the analytical surface as a baseline.

SAND84-3908, "Preliminary Bounds on the Expected Post-Closure Performance of the Yucca Mountain Repository Site, Southern Nevada," by S. Sinnock, T. T. Lin, and J. P. Brennen was submitted for preliminary technical review. The document is to be used as a reference for the NNWSI Project Environmental Assessment.

F. B. Nimick and R. L. Williams revised the document entitled, "A Three-Dimensional Geologic Model of Yucca Mountain, Southern Nevada," in response to comments made during line review. The document will be used as a reference for the NNWSI Project Environmental Assessment.

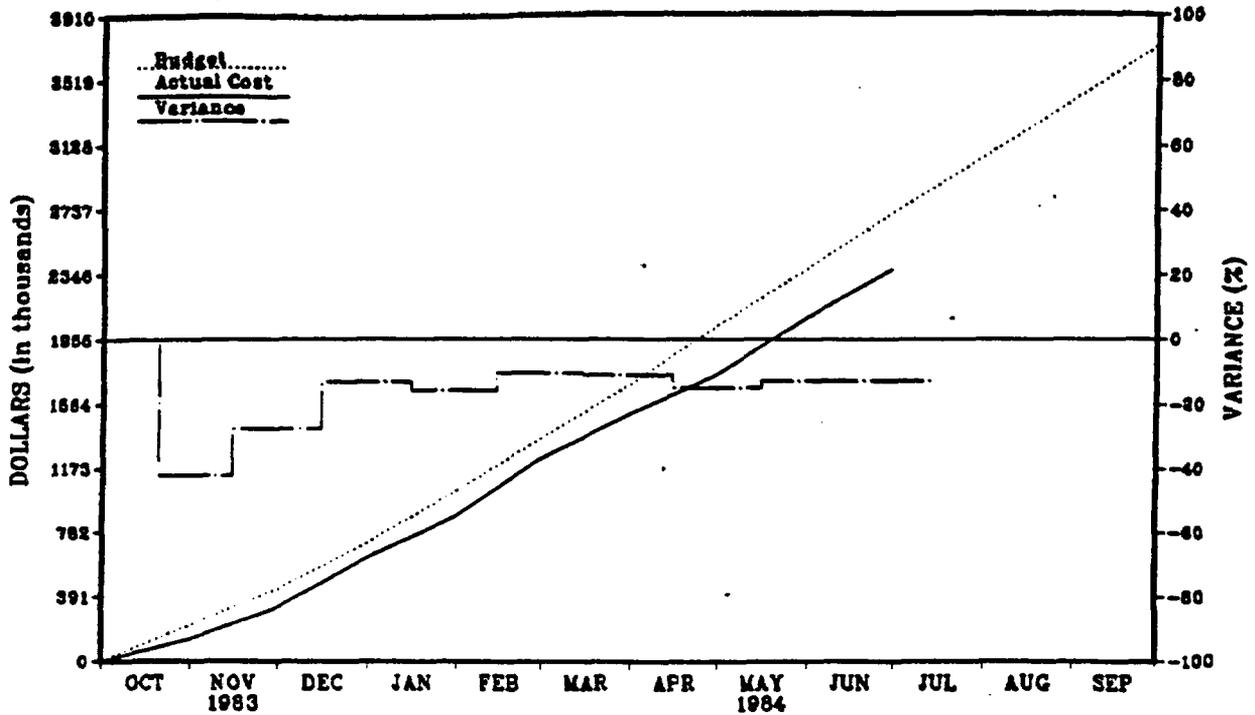
A report, "Effect of Host-Rock Dissolution and Precipitation on Permeability in a Nuclear Waste Repository in Tuff," SAND84-1092, by J. W. Braithwaite and F. B. Nimick has been reviewed revised, and resubmitted for final review. Results of the analysis showed that the flow of groundwater in and around a radioactive waste repository in the Topopah Spring unit at Yucca Mountain would

not be affected significantly by dissolution and reprecipitation of host-rock minerals.

Peer and editorial review has been completed on another report: "The Effect of Water Flow Rate on Spent Fuel Dissolution in a Repository in Tuff," SAND84-1007, by J. W. Braithwaite.

Results obtained using the two-dimensional unsaturated hydrologic code SAGUARO compared closely with the results obtained with TOSPAC for the sample problem of infiltration through layers of unsaturated tuff. TOSPAC results were obtained using composite, average curves for permeability. SAGUARO has a difficult time solving the problem using the fracture/matrix curves. An attempt will be made to run the problem with NORIA. The more sophisticated iteration and time-stepping techniques in NORIA may resolve the difficulties.

WBS 2.1, Systems GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	220.	442.	724.	1043.	1362.	1692.	2046.	2387.	2726.	3059.	3398.	3724.
Cost (x1000)	127.	320.	628.	877.	1219.	1504.	1741.	2083.	2378.	0.	0.	0.
Variance (x1000)	93.	122.	96.	166.	143.	188.	305.	304.	348.	0.	0.	0.
% Variance	-42.	-28.	-13.	-16.	-10.	-11.	-15.	-13.	-13.	0.	0.	0.

Variance Explanation: Continued delays in staffing additional personnel have reduced data base costs. In addition, there has been a reduction in costs because of EA efforts.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
SNL	2.1	PRELIMINARY PERFORMANCE ASSESSMENT FOR EA			△	◆								
SNL	2.1	PRELIMINARY SYSTEM DESCRIPTION DOCUMENT										△		◆
SNL	2.1	USERS MANUAL FOR DATA BASE SYSTEM FOR PARTICIPANTS										△		◆

△ 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 hydrologic conditions and geotechnical environment in the unsaturated zone beneath Yucca Mountain.

ACTIVITIES

The report entitled, "Petrologic and Geochemical Characterization of the Topopah Spring Member of the Paintbrush Tuff: Outcrop Samples Used in Waste Package Experiments," by K. Knauss was forwarded to DOE/NV for policy review.

An abstract entitled, "Dachiardite Formation by Hydrothermal Alternation of a Devitrified High-Silica Rhyolite," by K. Knauss and W. Beiriger was prepared for submission to the 1984 Geological Society of America national meeting. The paper describes the hydrothermal formation of zeolites in the mordenite group from crystalline Topopah Spring tuff as a result of reaction with J-13 water.

During June, the second fractured tuff experiment was completed. This sample had shown a sharp permeability decrease of about a factor of ten when the sample was heated under saturated conditions from room temperature to 96°C. No further decrease in permeability was found on heating to 140°C and holding at that temperature. During June, the temperature was decreased from 140°C to room temperature; permeability was measured at 140°C, 96°C, 28°C and 23°C. There was a further decrease of about a factor of three over that temperature range. The sample was removed from the pressure vessel and found to be coherent. After slicing the sample into four sections, it was found that only one section, which was on the downstream end, had healed. The healed portion

of the sample was examined by scanning electron microscope and found to contain minerals that are similar to the secondary assemblage observed in rock-water interaction tests. This experiment is significant in that it shows that fracture healing can occur under conditions in which the fracture is never completely dried out.

The revised test plan for the second series of cladding containment credit tests of spent fuel was reviewed and approved. Testing has begun on a set of samples that contain in-tact cladding, a laser puncture defect, a machined slit defect, and bare spent fuel. This series of tests is being run in J-13 water. Analytical methods have been extended to allow very sensitive determinants of iodine and improved detection limits for technetium and neptunium.

Testing of irradiated Zircaloy in the presence of J-13 water and crushed Topopah Spring tuff has begun. The purpose of these tests is to determine the failure mechanisms and rates for cladding material in the expected repository environment. The Zircaloy cladding segments were defueled and bundled together to represent the configuration in a canister of consolidated rods. The bundle was wrapped with a strip of 304L stainless steel to simulate contact of a canister with the fuel rods. The bundle is partially submerged in the water so that liquid- and vapor-phase corrosion may be studied in the single experiment. The tests will be run at 90°C for periods of two, six, and twelve months.

Four samples of actinide-doped glass (ATM-8) were leached for seven days at a surface area of glass solution volume ratio (SA/V) of 0.5 and 1.0 cm⁻¹. The purpose of these experiments was to determine if the release rates of neptunium and plutonium from the glass were sufficient to allow concentration measurements to be made by alpha counting on small aliquots. Results indicated that this technique would be adequate.

A final series of parametric release tests of DWPF glass was initiated using an SA/V ratio of 1.0 cm⁻¹. These tests will be used to correlate with previous results obtained by Savannah River Laboratory (SRL) and to compare with results at the SA/V for tests conducted in Topopah Spring in tuff reaction vessels. Tests of up to 28 days duration have been completed.

A series of parametric tests are underway at Argonne National Laboratory to investigate the effect of stainless steel on glass-water reactions for the unsaturated test method and on the role of the perforated stainless steel plate used in those tests on retention of water on the glass surface. The tests that were terminated after 6 and 13 weeks of total exposure showed slight weight gains by the glass. This contrasts with weight loss when stainless steel and plates are present and the steel reaction vessels are used.

The contract for waste acceptance specifications between DOE and the utility companies was reviewed along with comments on the contract prepared by Weston. Some suggestions for modifications to the contract were made. It was recommended that the requirement for separate NNWSI Project specifications for spent fuel be dropped, and that the acceptance specification that was in preparation be revised to refer to DWPF and West Valley waste forms only.

Based upon the appraisals of preliminary and prototype testing and on discussions with SRL personnel, 30 reaction vessels were fabricated for use in unsaturated testing. The production of these vessels was completed during June.

Stainless Steel Corrosion Testing in J-13 Water

Weight loss specimens of the candidate stainless steels were removed from the cells of J-13 water maintained at different temperatures for periodic examination and determination of the general corrosion penetration rates by the weight loss experienced by each coupon during the exposure period. The latest exposure interval represented 7500 hours. The coupons are exposed in five different cells maintained at 50°C, 70°C, 80°C, 90°C, and 100°C, respectively. The general corrosion rate was calculated for each alloy at each temperature from the weight loss of three replicate specimens in each cell. The average of these three individual results was taken. The variation among the population of three was small. In nearly all cases, the general corrosion rates show a decrease with an increase in test duration. All of the measured corrosion rates are small; that is to say, they are less than 1.0 $\mu\text{m}/\text{yr}$ (0.04 mils/yr). The magnitudes of corrosion rates appear to be insensitive to the temperature, which was over the 50°C-100°C range, and to the alloy composition.

Slotted Teflon washers were placed around the nylon fasteners used to support the coupons. The washers are designed to create a geometrical crevice so that crevice-sensitive alloys should show preferential attack in this area. Some slight amount of attack has been noted for all of the alloys at 100°C and for the 347 stainless steel at 90°C. So far, none of the other alloys have shown any attack at lower temperatures. As with the general corrosion rate, the penetration rate of this "localized attack" appears to decrease with an increase in the exposure duration. The next planned examination of these coupons will occur after 10,000 exposure hours. More explicit experiments aimed at determining crevice corrosion susceptibility are planned.

Electrochemical investigations into the corrosion behavior of the different stainless steels is pursued as these investigations complement the weight loss studies and give further insight into the susceptibility of the different candidates toward localized corrosion, such as pitting, crevice, and intergranular attack.

During June, the electrochemical performance of Type 316L stainless steel was investigated in detail. From polarization curves, the following electrochemical parameters were obtained:

Test Solution	Corrosion Potential (V vs SCE)*	Pitting Potential (V vs SCE)*
1	-0.202	+0.77
2	-.210	+0.20
3	-.286	+0.75
4	-.220	+0.68

* Saturated calomel electrode

Neither test solutions 1, 3, or 4 have a pitting potential that is close enough to the corrosion potential so that pit initiation would be expected to occur. J-13 water with the simple 100 ppm chloride ion addition (solution #2) shows quite different behavior from the other test solutions, in that the pitting and

corrosion potential are much closer together and the hysteresis between the forward and backward potential scan shows a pattern different from that of the other three polarization curves. However, the general corrosion rates for 316L stainless steel in all four test solutions as determined by tafel slope extrapolation were all quite similar.

Representatives from the Copper Development Association (CDA), the International Copper Research Association (INCRA), copper producers, and interested consultants met in New York City on May 24 and recommended five materials to be given consideration in any future testing program to qualify materials for long-term geological containment in a tuff repository. Their list of materials is as follows:

- Copper No. C10200 - Oxygen-Free Copper. This is a high-conductivity copper that serves as the reference canister material in the Swedish KBS program.
- Copper Alloy No. C17200 - Beryllium Copper. This is a high-strength precipitation-hardenable alloy.
- Copper Alloy No. C18100 - MZC Copper. This is an oxygen-free copper with small additions of magnesium, zirconium, and chromium to increase the mechanical properties.
- Copper Alloy No. C61300 - Aluminum Bronze. This alloy is expected to have good corrosion and oxidation resistance in mildly oxidizing environments.

Inspection of 304L Stainless Steel Canister from the Climax Spent Fuel Test

The stainless steel canister that contains the D-34 fuel assembly and which is emplaced in hole CEH01 in the Climax Spent Fuel Test was sectioned and cleaned at the Westinghouse EMAD facility at the NTS. The approximately 15-foot long canister was cut into seven sections and was steam- and detergent-cleaned to remove radioactive debris. This particular canister contained spent fuel rods, and for approximately eight months of the three-year operational period of the

Climax test, the bottom half of the canister was in contact with Climax groundwater.

The salinity of this water is about 10 times that of J-13 well water. The temperature of the canister surface hovered near 90°C during this immersion period. Thus, the surface of the canister was exposed to a possibly worst-case combination of "wet" conditions, concentrated electrolyte, and irradiation (gamma dose rate about 10^4 rads/hr). Furthermore, the area of the canister that was exposed to the water contained a longitudinal seam weld and a circumferential weld near the canister bottom.

The canister surface appears to be mostly free of any evidence of corrosion attack in the base metal and in the welded region. The one exception is a small area, which is about 1/4-inch in diameter, is away from any welds, and is about 3 feet from the canister bottom. Some corrosion product, which looks like ferric, is visible around a singularity on the canister surface. This area may indicate some "rusting" around a "weld splatter" and the crevice area which this situation would produce. Comparative metallographic specimens will be taken from the appropriate areas on the canister surface above and below the water line, the weld regions, the base metal, and in the weld splatter region in which some possible localized attack occurred. Appropriate microscopic and surface analyses will be performed.

A revision of Chapter 9, Waste Form and Package, was initiated for the September draft of the Site Characterization Plan. Staff members reviewed the DOE/HQ "Position on Engineering Requirements for the SCP" and the NRC Draft Technical Position "Design Information Requirements." This material was discussed with representatives from LLNL, SNL, SAI, WMPO, DOE/HQ, and Weston in Albuquerque on June 20.

A pre-baseline review of the DOE/HQ Mined Geologic Deposit Siting (MGDS) Generic Requirements Document was completed at Weston (June 14-15) by NNWSI Project staff from LLNL, SNL, and WMPO. The review brought together representatives from all projects and identified a number of problems with both the pre- and post-closure systems that must be corrected before they can be

baselined. A summary of the NNWSI Project review comments was prepared by G. Yeager (SNL) and was forwarded to WMPO.

Two proposals entitled, "Near-Term Non-High-Level Wastes of Concern in Repository Design" (PNL) and "Repository Waste Characteristics" (ORNL) that had been submitted to DOE/HQ were reviewed by LLNL staff, and the comments were telephoned to Weston.

PLANNED WORK

A new dehydration/rehydration experiment will be started using a four-inch diameter sample with a fracture. The larger scale sample will minimize the possibility of interference in flow patterns due to sample edge effects.

Waste form test planning is underway for corrosion testing that will simulate the containment period conditions for the case in which a water-logged fuel pin is present inside the canister. These tests will use deionized water to simulate the water that might have been picked up by a breached rod during pool storage. The test temperature will be 170°C, which requires the use of autoclaves. Planning is also in progress for "c-ring" stress corrosion cracking tests of irradiated Zircaloy.

Final preparations were made for a series of tests in rock reaction vessels using the actinide-doped commercial glass (ATM-8). The reaction vessels and J-13 water were equilibrated for three weeks to provide water chemistry that would simulate that of vadose zone water that had moved downward by gravity flow through the increasing thermal field of the repository. Testing using this "pre-equilibrated" water will begin in July.

Parametric testing of actinide-doped glass samples will begin that will determine the sensitivity of release rate from the glass to system components and parameters.

Testing of glass waste form materials in a gamma radiation field will begin in July.

A series of experiments using actinide-doped glass (ATM-8) in Topopah Spring tuff reaction vessels will begin in July. Tests will be conducted at 90°C for 1, 3, and 6 months.

Plans for the near future are concerned with testing the "nuclear grades of 316L," low carbon (0.02% maximum) and high nitrogen (0.11% compared to 0.06% in the standard L grade). In addition to being more resistant to low temperature sensitization and therefore to intergranular attack, these alloys are more resistant to pitting and crevice attack as well. Auger electron spectroscopy of the exposed metal surfaces are planned to investigate the role of nitrogen (and its possible synergism with molybdenum) in increasing the localized corrosion resistance of these grades of stainless steel. A special crevice corrosion cell is being fabricated for more detailed study of this phenomenon.

Evaluation and verification of WAPPA submodels will continue through this fiscal year. In FY 1985, these models will be incorporated into a waste package system model (with a flow-transport submodel and data bases for metal corrosion and waste form release rates) to predict the long-term performance of the NNWSI Project waste package subsystem.

2.3 SITE

OBJECTIVE

The objective of this task is to determine if Yucca Mountain is a suitable location for a repository for high-level waste. The effort is divided into two areas of study. The first area is the development of the understanding of the characteristics of the rock mass that lies below the surface of Yucca Mountain. This encompasses the study of 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 area is the development of an understanding of the processes and events that could occur in the environs surrounding Yucca Mountain that could serve as a potential disruptive force to impact a repository. These efforts include the study of the tectonics, seismicity, volcanism, regional hydrology, paleohydrology, and paleoclimatology.

ACTIVITIES

The pumping, sampling, and analyses of groundwaters from isolated permeable zones of well USW H-6 started on June 8. The permeable zone, which is located in the Tram unit, was the first zone tested. Based on the analyses, at the end of two weeks of pumping at a rate of 205 gpm the groundwater is thought to be formation water. During the week of June 25, the packets and pump will be relocated to the upper permeable zone and that zone will be pumped and analyzed in a similar manner.

The Level 1 milestone "Groundwater Chemistry Along Flow Paths Between Repository and the Accessible Environment, " was distributed June 11 to WMPO and USGS/Denver for comment.

Samples for ^{36}Cl measurements of rainfall infiltration at Yucca Mountain were collected during a field trip this month. One suite of 15 samples was obtained

from a 8-ft deep trench that was bulldozed at the site of the Exploratory Shaft. A suite of 12 samples was gathered at trench Yucca Wash 6, which had been identified as a useful site for this investigation from field sampling performed in February. The results of the ^{36}Cl analyses are expected to provide reliable infiltration data, which has been integrated over the past 25 years, about alluvial formations at Yucca Mountain.

To determine the extent of infiltration into fractured tuff, soil samples were collected from three sites on the crest of Yucca Mountain and from a site with fractured tuff near the Exploratory Shaft, and terrain conductivity measurements were made to obtain the extent of subsurface fracturing. The data from this survey will be used to select one or more sites for additional ^{36}Cl sampling to permit measurement of infiltration into fractured tuff.

Hydrothermal Geochemistry

An ideal-site mixing model for the thermodynamics of the analcime solid solution is complete. The model agrees well with available experimental and field data; however, the data are insufficient to preclude the possibility that a significant non-ideal component may exist.

Thermal expansion and compressibility of quartz, albite, and analcime had to be included in the model so that the high-pressure hydrothermal data could be modeled adequately.

The model suggests that the analcime that is present in Yucca Mountain crystallized with cristobolite rather than with quartz, which is the silica polymorph that now coexists with the analcime, when silica activities were near equilibrium.

In support of the dynamic transport process project, three new 2-m columns have been assembled, G2-1951, G1-2698, and G3-4868. G2-1951 has mordenite as a major component, G1-2698 clinoptilolite, and G3-4868 analcime. These columns will provide data that elucidates the interaction of anions and actinides with each of these minerals.

During June, the data base for determining petrographic stratigraphy within the Topopah Spring Member was completed for available samples from USW G-4 and USW GU-3. This project is directed toward the determination of distinctive petrographic features within the Topopah that will provide an indication of stratigraphic position.

To support this project, a compilation of zeolitized, devitrified, vitric, and vitrophyric zones down through the Crater Flat Tuff was prepared from data for 15 drill holes at Yucca Mountain. These data will be analyzed geostatistically for comparability between localities.

Also, in support of the mineralogy/petrology project, a draft report on fracture mineralogy above the static water level in USW G-4 was prepared and the report: "Variations in Authigenic Mineralogy and Sorptive Zeolite Abundance at Yucca Mountain, Nevada, Based on Studies of Drill Cores USW GU-3 and G-3" (LA-9707-MS) went to press.

H. Ackermann, W. Mooney, and V. Sutton submitted an open-file report for review entitled, "Preliminary Report on Seismic Refraction Profiles Along Crater Flat and Across Bare Mountain, Nye County, Nevada." This report will support the NNWSI Project's geologic investigation by the USGS.

Laser surveys have been completed to determine the precise latitude, longitude, and elevation for seismograph stations for two seismic refraction profiles; one is east of and the other is transverse to Yucca Mountain. Each line will be about 40-km long and will have 120 stations and 10 shot holes per line. Field work will not take place before August and is pending resolution of a contract dispute with the explosive supplier. Prior field testing of the ammonium nitrate explosive in California disclosed that the compound, which is designed for low-pressure applications, was ineffective in the 150-ft deep drill holes because of incomplete detonation.

As part of the hydrologic investigations project, W. Wilson described USGS hydrologic activities at NTS during a field trip for Assistant Secretary Broadbent, U. S. Department of the Interior on June 12. He also presented a

talk on hydrologic studies at Yucca Mountain as part of a seminar series at the USGS Water Quality Laboratory in Denver on June 21.

The lowest permeable zone in test well USW H-6, which has a depth interval from 77 to 788 meters in the Tram Member, was isolated with packers, and a pump was run into 7-inch casing to a depth of \pm 670 meters and tested at 217 gpm. The long-term pumping test for collection of hydraulic and water chemistry data began on June 8 (LANL and USGS). The initial groundwater that was pumped from the well was still contaminated with soap. Water samples were collected from the interval for water chemistry and isotope geochemical analyses during the second week of pumping. After nearly three weeks of pumping from the Tram Member, packers and pump were reset in USW H-6 to conduct the second water sampling test of the hole. Water was being pumped from the interval from 1994 ft to 2120 ft (Bullfrog Member) at month's end. The drilling crew moved back to the USW UZ-6 site on June 28.

The construction pad at the USW UZ-6 site was completed, and the Ideco 525 rig was mobilized and began drilling at the deep unsaturated zone test hole. Drilling was progressing slowly at the end of June.

Data are being prepared by SAI (Golden) for the conceptual hydrology model. The dimensions, layout, and blocking of the model have been completed. The following six zones are included: Tiva Canyon; Pah Canyon; Topopah Spring; Calico Hills, Vitriified and Zeolitized; and the Fractured Fault Zone. Hydraulic conductivity, permeability, and matrix potential data as a function of saturation are needed for each zone. These data are scattered among several of the labs and are in raw form with varying units. It is taking considerable time to find and format them for input to the computer model. A schematic was prepared that indicates the dimensions, geologic formations, and the blocking for modeling. The raw data for each of the six zones have been identified and correlated. However, the present model assumes a constant anisotropy, i.e., the horizontal permeabilities are multiplied by the anisotropy factor to obtain the vertical permeability. To have a meaningful conceptual model for Yucca Mountain, it is essential to have a different anisotropy factor for each zone. This correction has been made to the computer code, and an example problem run was completed using the finite difference

hydrology model. The collection of the input data for the conceptual model has been completed; however, there are some problems to be resolved with the boundary conditions.

An Unsaturated Zone Hydrology activity planning meeting was held June 20, with W. Wilson and P. Montazer (USGS) and R. Wise and R. Knecht (SAI). A detailed WBS was developed as well as activity definition and schedule. The intent is to develop a detailed plan and network for the entire UZ effort from now to the estimated completion date. This will be used to define the activities, assess the time-phase person-hour requirements, and assist with budget planning exercises.

A stellar cast of scientists completed a two-week in-field peer review of soils work at Yucca Mountain to assure the quality of ongoing research. The caucus began in Mercury and ended June 28 in Menlo Park and was partly a view of work accomplished and partly a planning session for projected efforts. Soils were assessed as indicators of paleoclimate and as indices of infiltration in the unsaturated zone.

J. Stock submitted an abstract for the Geological Society of America (GSA) National meeting this fall in Reno, Nevada, on the magnitude and orientation of stress at Yucca Mountain as determined by hydraulic fracturing.

The final two WBS Dictionaries for Regional Geology and Tectonics and Volcanism were completed by SAI (Golden). Modifications were made based on data obtained from M. Carr. Those modifications were needed both to indicate the separation of Regional Geological activities from those of Tectonics and to maintain consistency with the WBS.

D. Isherwood (LLNL) participated in the NEA Workshop on the Coupling of Hydrological and Geochemical Models in Paris, France, on June 12-13, 1984. The goal of the workshop was to identify and discuss methods for coupling geochemical and hydrologic models within the performance assessment system used to analyze potential nuclear waste repository sites. The consensus of the workshop reflected skepticism regarding the development and use of fully coupled codes. There was no general agreement on how to carry out the coupling. It seems

unreasonable to proceed toward constructing a fully coupled megacode because many of the processes now modeled independently in existing geochemical and transport codes are not understood fully yet. Also, the computer facilities that are needed to run fully integrated codes are limited. EQ3/6 was presented as the most highly developed reaction progress computer code package that is being designed specifically to handle geochemical problems related to nuclear waste.

MCRT data files have been constructed for cobalt and chromium. The data files were compiled at the University of Colorado, Boulder, and transmitted by direct link with the computer center on campus. Verification of the data is being done using the MCRT code at LLNL via remote link. This addition to the data base is required to model interactions involving metallic barrier materials.

Work is continuing on the unification of MCRT data files. The software changes to allow use of a unified data file have been completed and tested on a small, prototype-unified file. This new system will allow the future addition of some badly needed data management functions. A revised format has been adopted for citing data sources within the master data file.

The draft version of the "User's Guide to the EQ6 Graphics Postprocessor" has been completed and it is being reviewed.

A data base update of aqueous complexes, including Na-K-Mg-Ca-H-OH-Cl-HCO₃-CO₃-SO₄ has begun. All revised data files will be included in the new MCRT master data file.

The ³⁶Cl samples will be prepared for isotopic analysis on a tandem accelerator mass spectrometer. The soil samples collected in conjunction with the fracture infiltration studies will be analyzed for chloride content.

Serial sorption measurements of Pu have begun using the supernatant from sorbed samples. These experiments will help determine whether or not Pu that is not sorbed in six-week sorption experiments will sorb onto fresh tuff.

Data from fracture flow columns with sorbing tracers are being entered on the INC VAX for analysis. Although strontium and barium have been eluted through three fractured cores, cesium has been held up and has not appeared in the element for over three weeks. This is preliminary evidence that mass transfer kinetics has not been exceeded in these experiments.

Six samples were analyzed for major elements by X-ray diffraction (XRD) to complete all chemical data for the volcanism final report. There is now a consistent data matrix for major and trace elements for all basaltic rocks of the Nevada Test Site region.

The preliminary draft of the volcanism final report is one-third complete. Significant progress has been made this fiscal year toward resolving the issues of compositional changes in volcanic fields of the DV-PR zone through time, the question of bimodal volcanism, the patterns of incompatible element enrichment with time, and hydrovolcanic activity. Current data are insufficient to resolve the question of the deep structure of the DV-PR volcanic zone.

LANL is still awaiting replacement equipment for the thermal-analysis system. Because of the delay, environmental cell analysis of zeolites using the Siemens X-ray diffraction unit is being re-instituted.

PROBLEMS AREAS

Some deficiencies have been identified in the "economy" calculational mode installed in EQ6 last month. These are being analyzed for correction.

Full testing of EQ6 with the precipitation option has been delayed because some matrix coding bugs were discovered when the preliminary test cases were run. The milestone deliverable date has been rescheduled for September 1, 1984.

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. Five specific technical areas are involved that include (1) the 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) the engineering analysis and evaluation of the various technical details that are important to the design and operation of a repository; (3) the development of the techniques of sealing a repository as part of decommissioning; and (4) the preparation of a site-specific design that will be accommodated within the development of the equipment to construct the repository, handle the waste and the waste package, and transfer the waste and the waste package within the repository system.

ACTIVITIES

Summary cost estimates have been prepared for a reference repository in tuff at Yucca Mountain and for a two-stage repository as defined in the June 27 revised version of "Cost Guidelines for Two-Stage Repository Technical Evaluation Study," DOE RW-23.

Studies to determine the preferred location for repository surface facilities include a program of bore-hole drilling to provide stratigraphic data for each of the six proposed sites being considered for repository surface facilities. The proposed location of exploratory hole RF-7 was shifted about 300 feet because in a routine preconstruction survey of the site the archaeologist from the University of Nevada, Desert Research Institute, Social Sciences Center discovered aboriginal artifacts.

A report SAND84-1261, "Recommendation for a Second Access for the Yucca Mountain Exploratory Shaft Facility," by Sandia National Laboratories and Parsons Brinckerhoff Quade & Douglas, Inc., was completed. The report analyzes several options to be considered in developing a second access and recommends

an option of a slightly increased exploratory shaft diameter and a ramp from the east into the test facility. The report includes cost and schedule estimates for the facility.

"Comparison of Two Thermomechanical Codes for Jointed Rock Used in NNWSI Calculations" SAND84-7152 by D. K. Parrish (RE/SPEC) and R. K. Thomas has been submitted for peer review. The report details results of identical boundary value problems solved by Sandia (ADINAT and ADINA codes) and RE/SPEC (SPECTROM-41 and SPECTROM-11 codes) in 2-D finite element heat transfer/thermomechanical analyses typical of a nuclear waste repository in tuff.

R. M. Zimmerman attended the 25th U.S. Symposium on Rock Mechanics in Evanston, Illinois, June 25-27, 1984. He presented a paper entitled, "Ambient Temperature Testing of the G-Tunnel Heated Block." The paper is coauthored by M. P. Board, E. L. Hardin, and M. D. Voegelé (SAI). He also participated in the ASTM subcommittee meeting on rock mechanics.

Mechanical testing of 36 samples of Topopah Spring from USW G-2 has been completed, and test data are being reduced. Mechanical properties for the various lithologic subunits of the Topopah Spring have been obtained from USW G-1, USW G-2, USW GU-3, and USW GU-4.

The completion of mechanical testing on samples from the deep-cored holes is a major step toward accomplishment of analysis of the three-dimensional variability of mechanical properties of the Topopah Spring at Yucca Mountain.

NORIA computer code feasibility calculations of a proposed evaluation experiment for liquid-vapor transport were completed. The results showed that the scale of the region of detectable, liquid-vapor transport is small for a laboratory-scale heated block with a reasonable temperature field.

The experimental apparatus to investigate water movement through fractures has been assembled, and leak tests have been performed successfully on the pore fluid and confining fluid loops. The software for the instrumentation is being developed. A safe operating procedure (SOP) is being submitted for sign-off.

The following reports were submitted by The Pennsylvania State University to SNL for technical review:

- "Reactivity of a Tuff-Bearing Concrete: CL-40 CON-14." (This report is one of two that establishes basic properties of tuff-bearing concrete.)
- "Compatibility Between Select Cementitious Material and Topopah Spring Member Tuff."

A preliminary dissolution model for a fracture seal was prepared by PSU. It is undergoing review by SNL and LANL. This dissolution model will be used to guide future laboratory analyses.

PLANNED WORK

Plans are being formulated to excavate a repository-sized room in the densely welded tuff at the G-Tunnel Underground Facility (GTUF). The room would have a height/width ratio of 0.6, which is similar to that for horizontal emplacement concepts. Measurements will be made in direct support of those that are planned in the shaft convergence, demonstration breakout room, and drift and pillar monitoring tests planned in the E5. Room closure, stress changes, and roof bolt load resulting from excavation are to be monitored. Some of the closure phenomena is to be monitored from a nearby drift, U12g12, which is in nonwelded tuff. The U12g12 drift is being driven in the tunnel for exploratory purposes and is to be reoriented slightly to facilitate the planned measurements. Eventually, the extension of the U12g12 drift will provide another rail access to GTUF. Preliminary design modeling has begun that will provide scoping calculations for experiment design. Linear-elastic 2-D finite element calculations have been performed and a draft test program is being reviewed.

PROBLEM AREAS AND ACTIONS TAKEN

Continued equipment problems at RE/SPEC have delayed mechanical testing to determine parameter effects by approximately two months. The anticipated start

time for testing is now the end of July. Testing has been extended into the first part of FY 1985.

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 the 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 that govern the licensing of these include the Atomic Energy Act of 1954, the National Environment Policy Act (NEPA) of 1969, and the Nuclear Waste Policy Act (NWPA) of 1982, 10 CFR Part 60 and 40 CFR Part 191. To facilitate understanding, regulatory and institutional activities may be further subdivided into five categories: (1) Site Recommendation Report, (2) Repository Licensing, (3) Site Characterization Report/Site Characterization Plan (SCR/SCP), (4) Environmental Assessment, and (5) State Interactions.

ACTIVITIES

A joint ESTP-SCP meeting to discuss a consistent approach to relating testing requirements, information needs, and regulatory requirements was held June 12 in Las Vegas. The goal of the meeting was to link the Exploratory Shaft Test Plan and other test plans for field or lab tests to the information needs specified in Section 10.3 of the SCP. The means by which performance assessments will utilize the information were also discussed. A general agreement was reached on the SCP schedules and issues; and, a means by which to prioritize the information needs was discussed. A letter was transmitted to all of the TPOs informing them of the recommendations of the joint ESTP-SCP meeting. Final comments on the SCP schedule and a list of all SCP authors was also requested from the TPOs.

Comments on the working draft, "SCP Management Plan," were submitted to WMPO on June 6. A number of concerns were raised with this document and were related primarily to organizational complexity, schedule limitations, and unwarranted procedural requirements.

Comments on the EPA's working draft No. 4 of 40CFR191 and its associated preamble (dated May 21, 1984), were prepared for WMPO and were transmitted to DOE/HQ on June 6. The differences that were noted between the earlier version of Working Draft No. 4 and Working Draft No. 3, both of which were commented on previously, were minimal. The majority of WMPO's earlier concerns remained valid.

Draft "protocols" for conducting DOE/NRC data reviews and workshops were prepared and transmitted to NNWSI Project participants. A number of comments and recommendations were received and will be considered during final procedure preparation.

Comments on draft Licensing Coordinating Group meeting minutes were provided to Weston and DOE/HQ. Additionally, other information requested during the meeting including copies of previously conducted WMPO/NRC meetings and comments on proposed generic licensing issues were forwarded to Weston.

A set of transcripts and documents generated during NRC deliberations of 10CFR960 were forwarded to SAI for retention. On June 22, the NRC concurred on the guidelines. NNWSI Project Representatives attended several NRC and DOE meetings at which the guidelines and Mission Plan were discussed.

The Preamble to the "General Guidelines for Recommendation of Sites," was reviewed and comments, in the form of a draft letter to DOE/HQ, were prepared on June 6.

PLANNED WORK

A significant amount of time during the report period was devoted to assisting and preparing the two DOE/NRC Data Reviews (repository design and hydrology) and the geochemistry workshop that is scheduled for July 10-12. Agendas were developed through a series of correspondence and conference calls between involved NNWSI Project participants and NRC.

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, the effort will be conducted to define not only the nature of the unsaturated zone with regard to water content and water movement, but the nature of the natural barriers between the repository horizon and the static water level as well.

ACTIVITIES

LANL staff attended a meeting on May 30-31 at Parsons Brinckerhoff in San Francisco, California, to produce a draft report, which will be issued by SNL, on the recommended strategy for a dual-access Exploratory Shaft Facility (ESF). The recommended option is for a 16-ft finished i.d. ES and a 19-ft diameter, 6700-ft long muck ramp.

The ESTP Committee met on June 13-14. Agenda items included discussion of the La Jolla group memory, budgets, prototype testing requirements, and the second "shaft."

The hardware for the Integrated Data System (IDS) initial prototype development system has been installed. No major problems were encountered with the installation of either the main system or the prototype breakout-room system. The operating system and support software have been installed also, and work began on installation of the third-party supporting software.

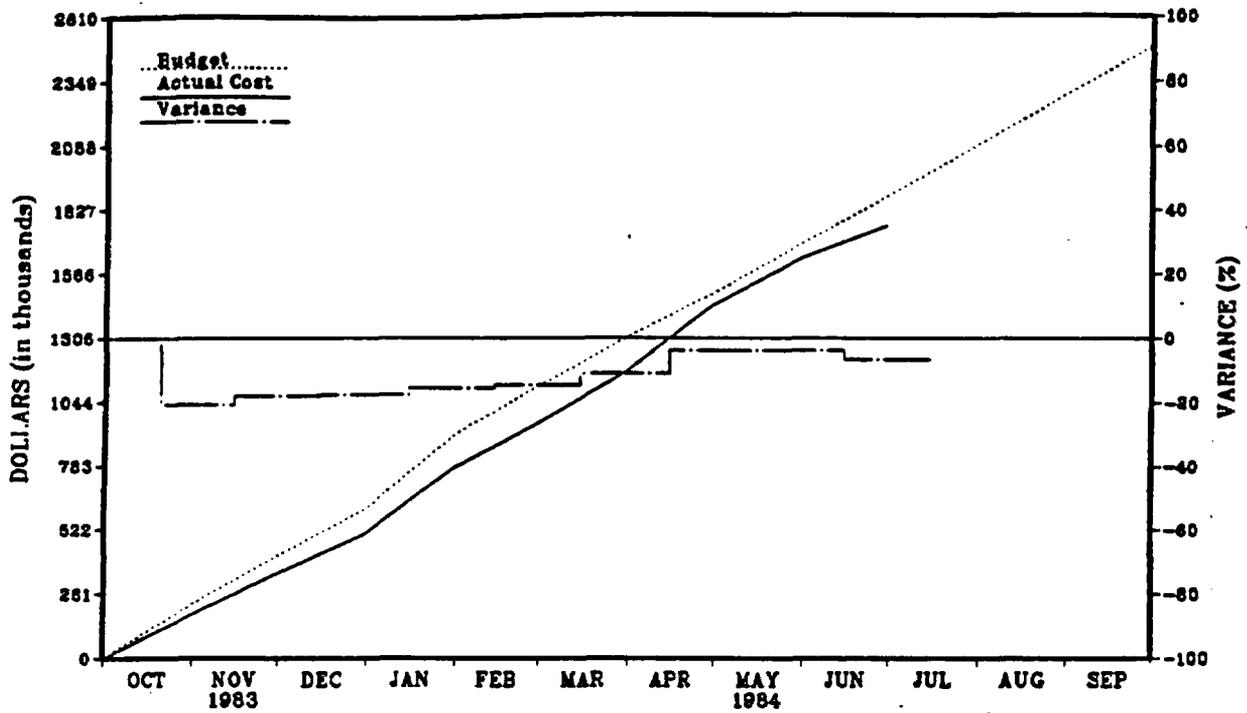
The draft of the second revision to the Conceptual Design Report has been completed.

PLANNED WORK

A revised cost-estimating format for each of the 25 proposed ES tests will be developed by Los Alamos personnel. The revised format will be sent to the principal investigators for their consideration.

In July, the system performance and definition studies will begin that will use the prototype hardware. This activity supports development of the preliminary design for the IDS software.

WBS 2.6, Exploratory Shaft GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	224.	421.	612.	917.	1113.	1313.	1492.	1695.	1887.	2084.	2297.	2490.
Cost (x1000)	178.	346.	504.	773.	949.	1169.	1436.	1629.	1762.	0.	0.	0.
Variance (x1000)	46.	75.	108.	144.	164.	144.	56.	66.	125.	0.	0.	0.
% Variance	-21.	-18.	-18.	-16.	-15.	-11.	-4.	-4.	-7.	0.	0.	0.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
LANL	2.6	COMPLETE ESTP & SUBMIT TO HQ FOR FINAL REVIEW AND APPROVAL											△	◇

△ 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 Deployment (GRD) Projects. The two major facilities operated under this WBS element include the Climax Spent Fuel Test Facility and the E-MAD Facility.

ACTIVITIES

Climax Spent Fuel Test Facility

Following completion of the petite sismique survey for determination of rock mass deformation moduli, the 43 source and receiver locations were surveyed optically. The petite sismique technique operates in the frequency domain and, therefore, does not require precise knowledge of source and receiver locations. However, data obtained during the petite sismique survey will also be used to calculate the "dynamic" moduli of the rock mass. These dynamic moduli values are based on compression and shear wave velocities. Therefore, distances between sources and receivers must be precisely known. The 43 source and receiver stations form 176 travel paths the lengths of which are determined from the optical survey results.

The final draft of the in situ stress measurements report was received from Foundation Sciences, Inc. Since the technical content fulfills the contractual obligations, final payment on the contract was released to FSI. As noted in last month's report, FSI went out of business at the end of May 1983.

Testing of the integrity of bore-hole extensometer connecting rods and anchors was completed. These tests addressed possible data errors arising from two sources. First, several extensometer connecting rods failed during the spent-fuel storage phase of the test. Impending failures in other rods could produce erroneous displacement data. Second, loss of anchorage pressure (on either the

burst-type or pressure-maintenance-type inflation systems) could permit slippage of the anchors that would be erroneously recorded as rock displacement data.

Mothballing of systems was completed. The subsurface and surface facilities are now considered to be decommissioned in accordance with test completion plans.

The data acquisition system trailer was removed from the NTS security checklist effective June 11, 1984. The trailer no longer contains high-cost or sensitive equipment. The trailer will be locked and normal property control will be in effect. The personnel shaft, canister access shaft, and control skid remain on the security checklist.

The 80 original magnetic tapes of SFT-C test data were shipped from the data acquisition system trailer in Area 15, NTS, to the LLNL computer center in Livermore. The LLNL does not have adequate long-term storage facilities, but it is establishing the capability with the EG&G/NLV office. These tapes contain all radiological, operational, and test status data in addition to displacement, stress, temperature, flow rate, and power data acquired during the test.

A set of briefing notes was prepared to assist the DOE/OPA in their responsibilities as coordinators and briefers for tours on the SFT-C. Plans are in place to accomplish an orderly transition of tour support responsibility from the LLNL to the DOE/OPA.

The Facilities Use Permit, which assigns health and safety responsibilities to W. Patrick (LLNL), has been revised. LLNL will retain their overall responsibility so that planned tests can be accomplished expeditiously at the Climax facility. The revised permit establishes the DOE/OPA responsibilities associated with tour support.

Six tours of the SFT-C were conducted for 151 people during the month of June.

E-MAD

Tours

Seven tours were conducted for approximately 190 visitors to E-MAD in June and included the following:

<u>DATE</u>	<u>TOUR GROUP</u>
6/1/84	Nellis Air Force Base A443 Military Airlift Wing
6/6/84	Dixie College Energy Institute
6/18/84	REECo employee dependents
6/19/84	Navy Reserve group (Theater Nuclear Warfare)
6/25/84	University of Nevada at Las Vegas political science students
6/26/84	DOE Headquarters employees
6/27/84	City of North Las Vegas officials

Thermal monitoring of canisterized fuel assembly B03, which has been utilized in storage testing in Drywell 3 since 1980, was discontinued. Remote fuel handling operations to retrieve and transfer the canisterized fuel assembly into the Hot Bay were completed by using the railroad locomotive, Manned Control Car, and Emplacement/Installation Vehicle. Canister gas and full-volume filtration samples were acquired, and the canister was cut open. After the fuel assembly was removed from the cut canister, the surface condition of the four sides of the fuel assembly was documented on videotape by using the E-MAD closed circuit television system, and a photo mosaic of the zero degree face of the fuel assembly was taken. The fuel assembly was inspected visually through the E-MAD Hot Bay wall periscope. Surface contamination swipe samples were acquired from designated fuel rod surfaces to characterize the contamination and to assess the integrity of the fuel. Surface contamination swipe samples were taken from the interior of the cut canister, and the residue was collected from the canister. Analysis of these samples and residue is in process. Then, the Material Interaction Test capsules were removed. After completion of these activities, the fuel assembly was placed in a temporary canister and installed in the E-MAD lag storage pit.

All canisterized fuel assemblies that are located in the drywells and lag storage pits are in a safe configuration. The maximum recorded canister temperatures are well below the canister design limits.

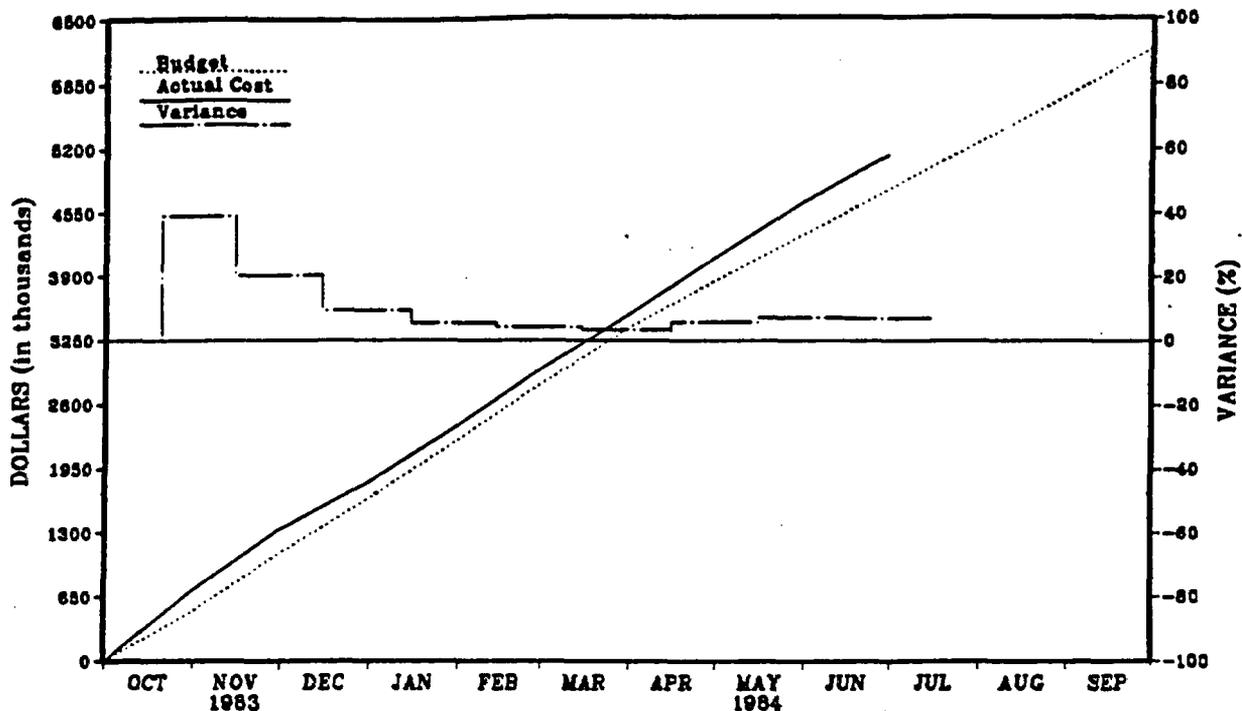
All monitored fuel assemblies reflect a normal profile over the past month.

A contract deliverable report was prepared to document integration of an automatic digital temperature control system into the Fuel Temperature Test System.

PROBLEM AREAS

There was one liner thermocouple failure during the reporting month. There are presently a total of 16 liner thermocouples inoperative as follows: DW-1 (3), DW-2 (4), DW-3 (6), and DW-5 (3).

WBS 2.7, Test Facilities GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	506.	1100.	1651.	2249.	2815.	3359.	3870.	4337.	4797.	5258.	5728.	6198.
Cost (x1000)	705.	1323.	1803.	2373.	2932.	3503.	4090.	4646.	5125.	0.	0.	0.
Variance (x1000)	-199.	-223.	-152.	-124.	-117.	-144.	-220.	-309.	-328.	0.	0.	0.
X Variance	39.	20.	9.	6.	4.	3.	6.	7.	7.	0.	0.	0.

NNWSI LEVEL 1 MILESTONES

RESP. AGENCY	WBS	MILESTONE DESCRIPTION													
			O	N	D	J	F	M	A	M	J	J	A	S	
LLNL	2.7	TERMINATION OF ROUTINE ACCESS AND LLNL TOUR SUPPORT TO SFT-C							△						◇
LLNL	2.7	COMPLETE DECISION ANALYSIS ON USE OF CLIMAX FACILITY												(OPEN)	

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

2.8 LAND ACQUISITION

OBJECTIVE

The objective of this task is to maintain access to the 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 the 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 AND ACTIONS TAKEN

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 (QA), and GRD Support.

ACTIVITIES

The USGS Drilling Plan was updated to reflect the status through June 15, 1984. Additional refinement of this plan is required and has been requested.

Limited updates and revisions to the Exploratory Shaft (ES) network were received from the participants. The ES network was subdivided to provide three major networks in lieu of a single plan; i.e., Design and Site, Construction, and Testing. In turn, the testing network is divided into the following five groups of tests: Geologic, Hydrologic, Geochemical, Geomechanical, and Engineered Barrier Tests.

A draft network plan was developed to incorporate construction of a second egress shaft from the exploratory shaft.

Work Breakdown Structure (WBS)

Analysis of the DOE/HQ proposed WBS continued during June with a review of the latest input received from DOE/HQ. A compromise position between the NNWSI Project and the Basalt Waste Isolation Project (BWIP) is anticipated during July to minimize the impact of anticipated changes. A position paper proposing this compromise will be developed for presentation to DOE/HQ by DOE/NV.

A draft of the Administrative Procedures Manual was transmitted to WMPO June 15, 1984. The submittal contained a draft of all of the procedures and drafts of all other available materials that were specified in the May 1 outline together with printed index tabs for use in a hard-cover binder.

A new Environmental Assessment production schedule was developed for the August 13, 1984, submission of the draft EA.

The draft Meteorological Monitoring Plan was completed on June 18, 1984.

The 35-mm slide library has been indexed by number, subject, and presentation. A computer program was designed to assist in the organization and maintenance of the slide library.

Final illustrations of fact sheets entitled, "What is Tuff?" and "Why Yucca Mountain?" were completed and submitted to DOE/OPA.

The QASC participated as an observer in a Sandia National Laboratory QA audit of Bechtel Corporation on June 26, 1984. The purpose of the audit was to determine whether or not Bechtel had satisfactorily implemented the QA requirements set forth in their NNWSI Project QA manual.

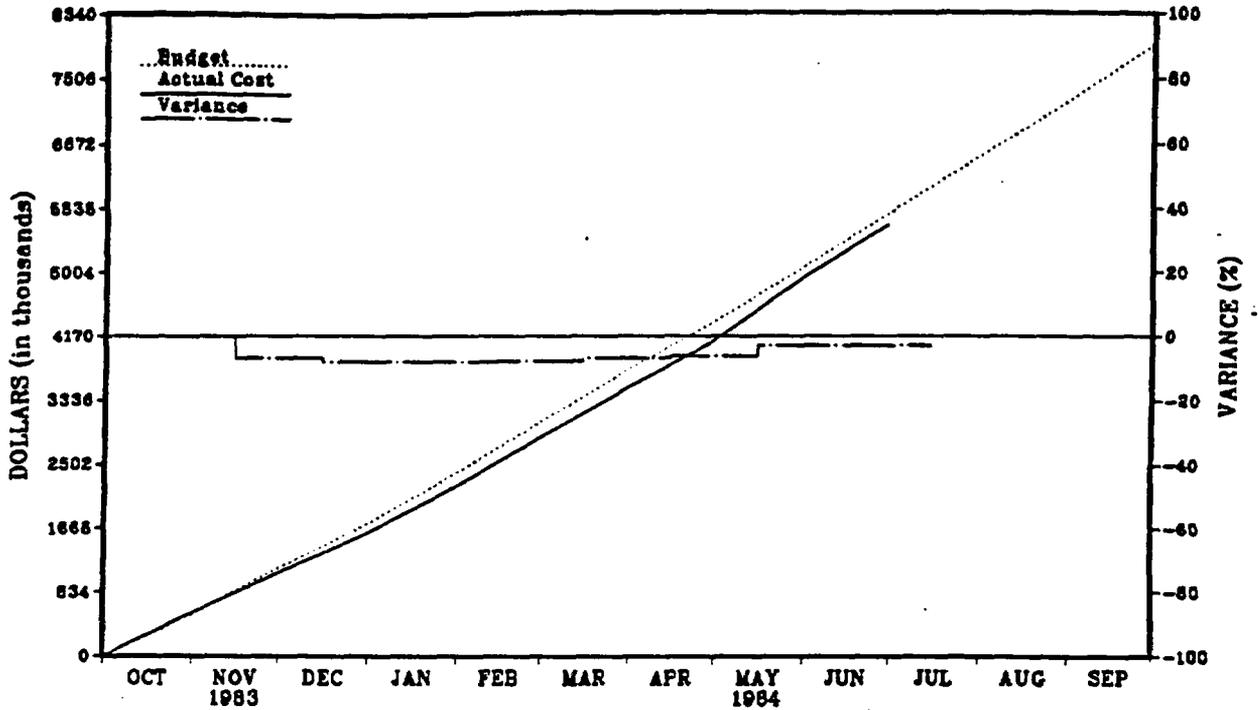
A workshop for the Participating Organizations and NTS Support Contractors was held June 5-6, 1984, to provide interpretation and to answer questions regarding the NNWSI Project QAP, NVO-196-17 (Rev. 2).

A meeting of WMPO, QAD/NV, and QASC was held on June 11 to resolve the major issues raised by the workshop participants.

PROBLEM AREAS AND ACTIONS TAKEN

The SCP network was updated to show the current status that indicated a potential delay in issuing the SCP from March 29, 1985, to May 13, 1985. This potential delay was inferred from the lack of reported progress on the prioritization work associated with Chapter 10.

WBS 2.9, Program Management GOVERNMENT FISCAL YEAR 1984



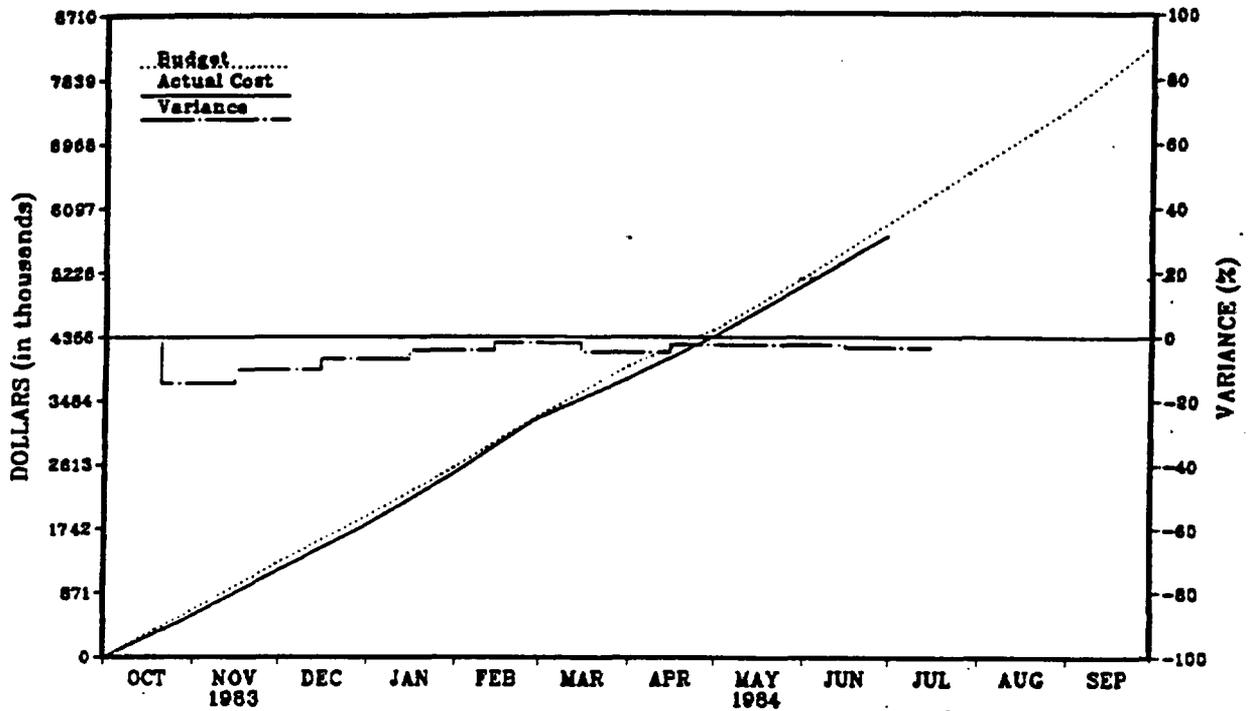
Budget (x1000)	552.	1153.	1738.	2404.	3067.	3761.	4366.	5079.	5787.	6510.	7231.	7945.
Cost (x1000)	551.	1073.	1599.	2208.	2828.	3495.	4091.	4923.	5617.	0.	0.	0.
Variance (x1000)	1.	80.	139.	196.	239.	256.	275.	156.	170.	0.	0.	0.
% Variance	0.	-7.	-8.	-8.	-8.	-7.	-6.	-3.	-3.	0.	0.	0.



PARTICIPANT

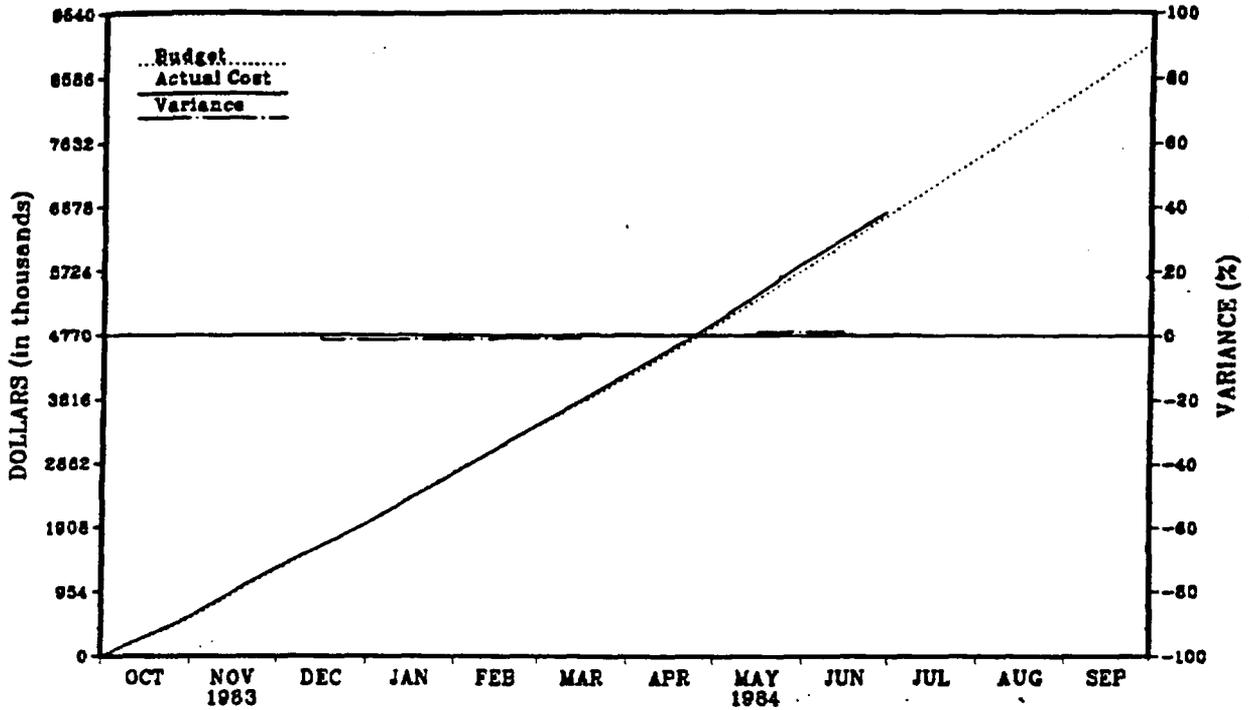
BUDGET vs COST

Lawrence Livermore National Laboratory GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	641.	1290.	1920.	2597.	3284.	3972.	4463.	5172.	5911.	6671.	7436.	8298.
Cost (x1000)	549.	1157.	1785.	2490.	3224.	3778.	4361.	5052.	5724.	0.	0.	0.
Variance (x1000)	92.	133.	135.	107.	60.	194.	102.	120.	187.	0.	0.	0.
% Variance	-14.	-10.	-7.	-4.	-2.	-5.	-2.	-2.	-3.	0.	0.	0.

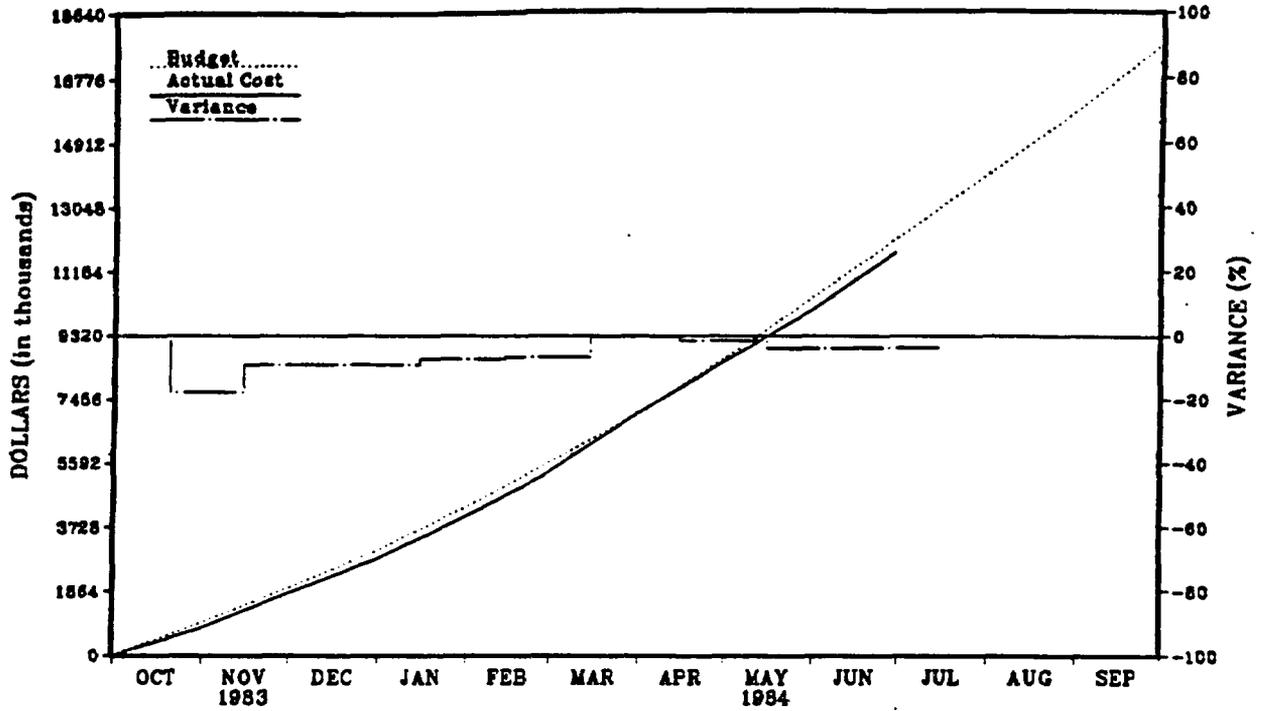
Los Alamos National Laboratory GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	568.	1298.	1971.	2738.	3437.	4163.	4907.	5757.	6568.	7400.	8245.	9090.
Cost (x1000)	568.	1298.	1944.	2703.	3402.	4179.	4923.	5830.	6595.	0.	0.	0.
Variance (x1000)	0.	0.	27.	35.	35.	-16.	-16.	-73.	-27.	0.	0.	0.
% Variance	0.	0.	-1.	-1.	-1.	0.	0.	1.	0.	0.	0.	0.

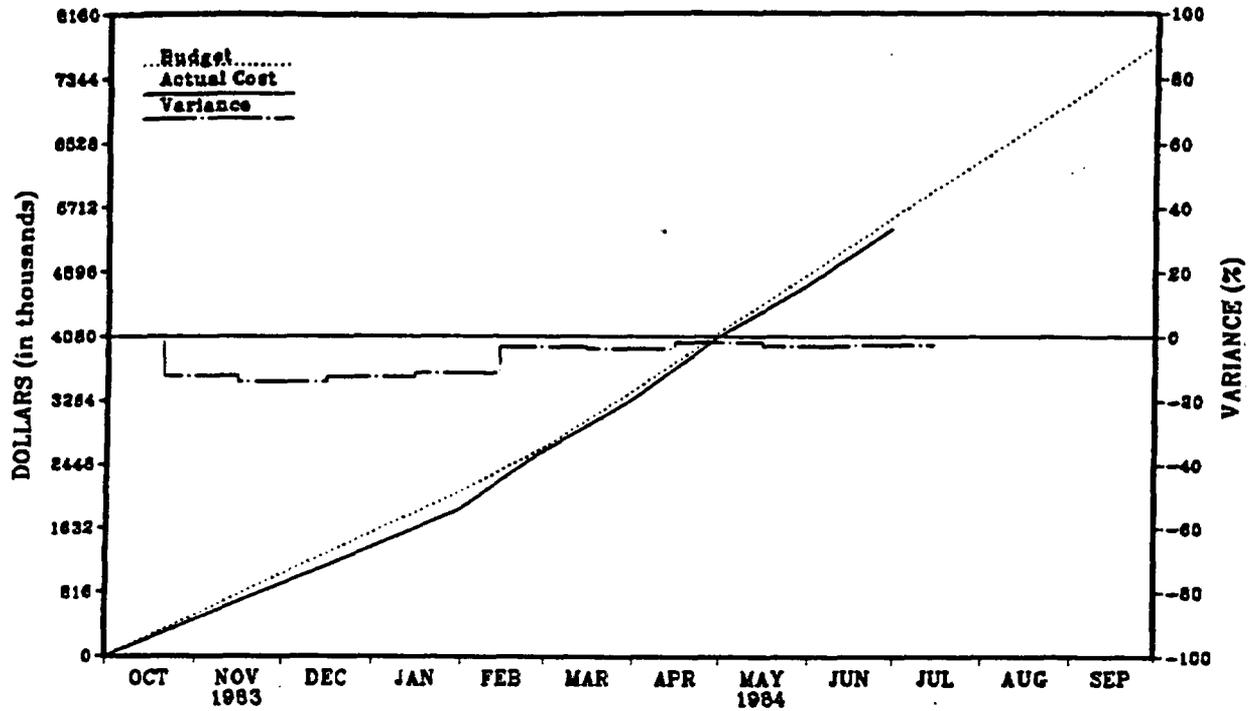
Sandia National Laboratories

GOVERNMENT FISCAL YEAR 1984



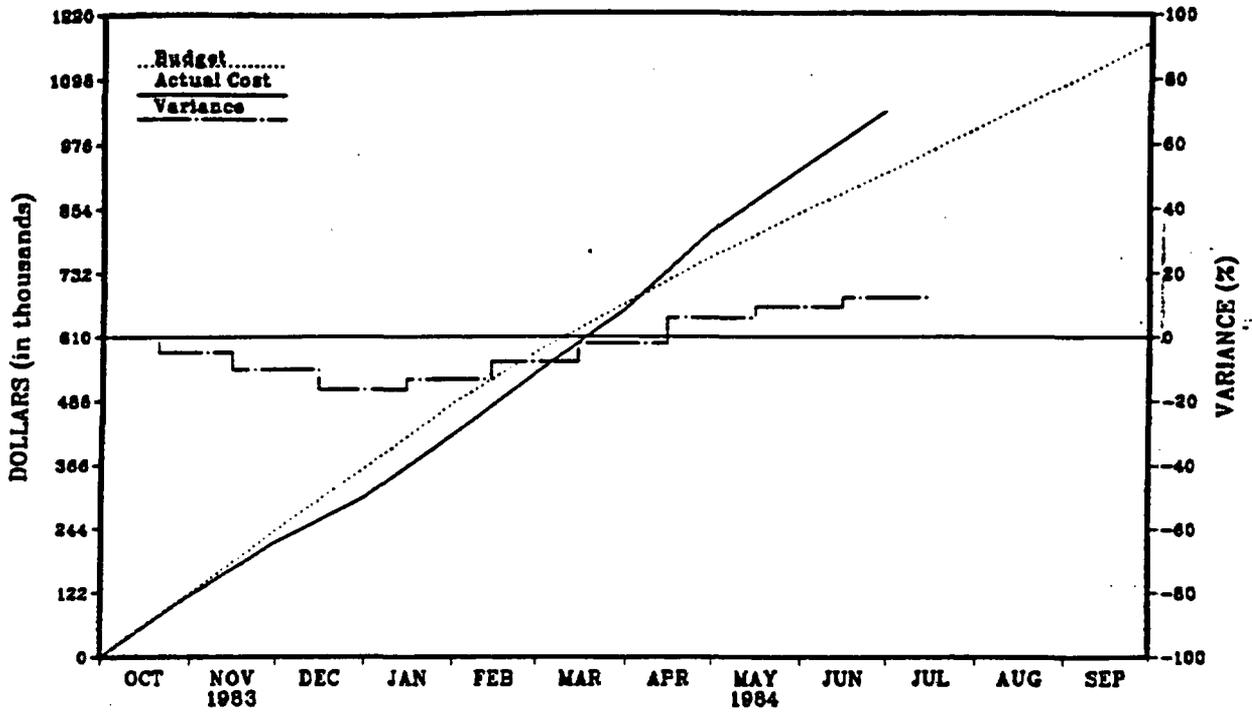
Budget (x1000)	960.	1971.	3068.	4330.	5629.	7060.	8676.	10454.	12195.	13994.	15822.	17757.
Cost (x1000)	790.	1796.	2788.	4025.	5259.	7043.	8536.	10059.	11745.	0.	0.	0.
Variance (x1000)	170.	175.	280.	305.	370.	17.	139.	395.	450.	0.	0.	0.
% Variance	-18.	-9.	-9.	-7.	-7.	0.	-2.	-4.	-4.	0.	0.	0.

U. S. Geological Survey GOVERNMENT FISCAL YEAR 1984



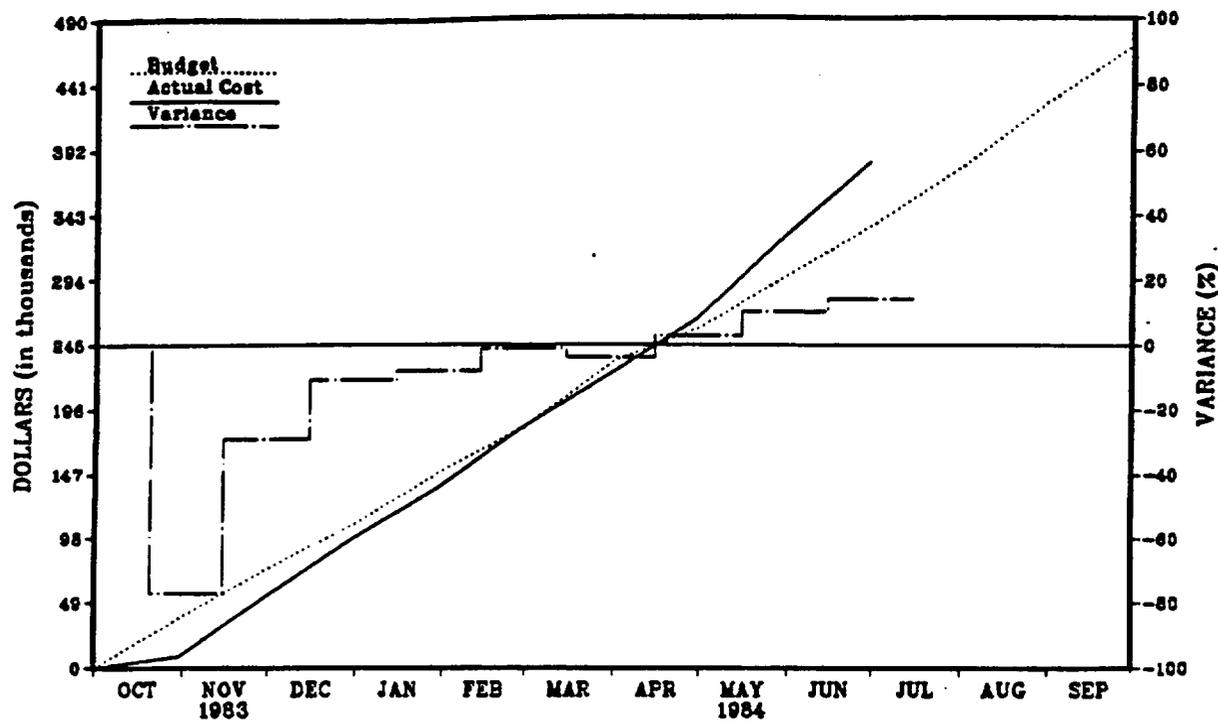
Budget (x1000)	524.	1080.	1583.	2108.	2678.	3402.	4145.	4883.	5608.	6334.	7055.	7777.
Cost (x1000)	459.	911.	1383.	1868.	2585.	3268.	4065.	4732.	5451.	0.	0.	0.
- Variance (x1000)	65.	149.	200.	240.	91.	134.	80.	151.	157.	0.	0.	0.
% Variance	-12.	-14.	-13.	-11.	-3.	-4.	-2.	-3.	-3.	0.	0.	0.

Fenix and Scisson, Inc.
GOVERNMENT FISCAL YEAR 1984



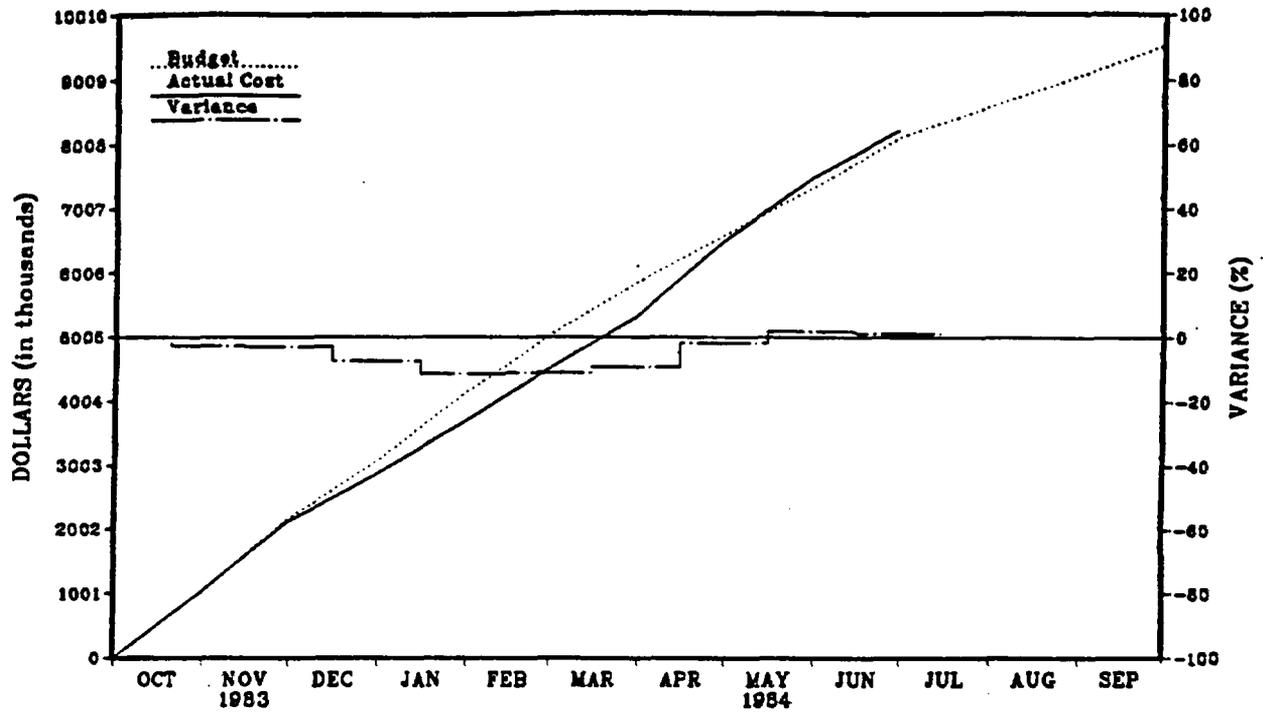
Budget (x1000)	122.	243.	360.	485.	602.	676.	784.	847.	922.	1004.	1087.	1188.
Cost (x1000)	116.	218.	301.	421.	536.	662.	809.	925.	1036.	0.	0.	0.
Variance (x1000)	6.	25.	59.	64.	46.	14.	-45.	-78.	-114.	0.	0.	0.
% Variance	-5.	-10.	-16.	-13.	-8.	-2.	6.	9.	12.	0.	0.	0.

Holmes and Narver, Inc.
GOVERNMENT FISCAL YEAR 1984



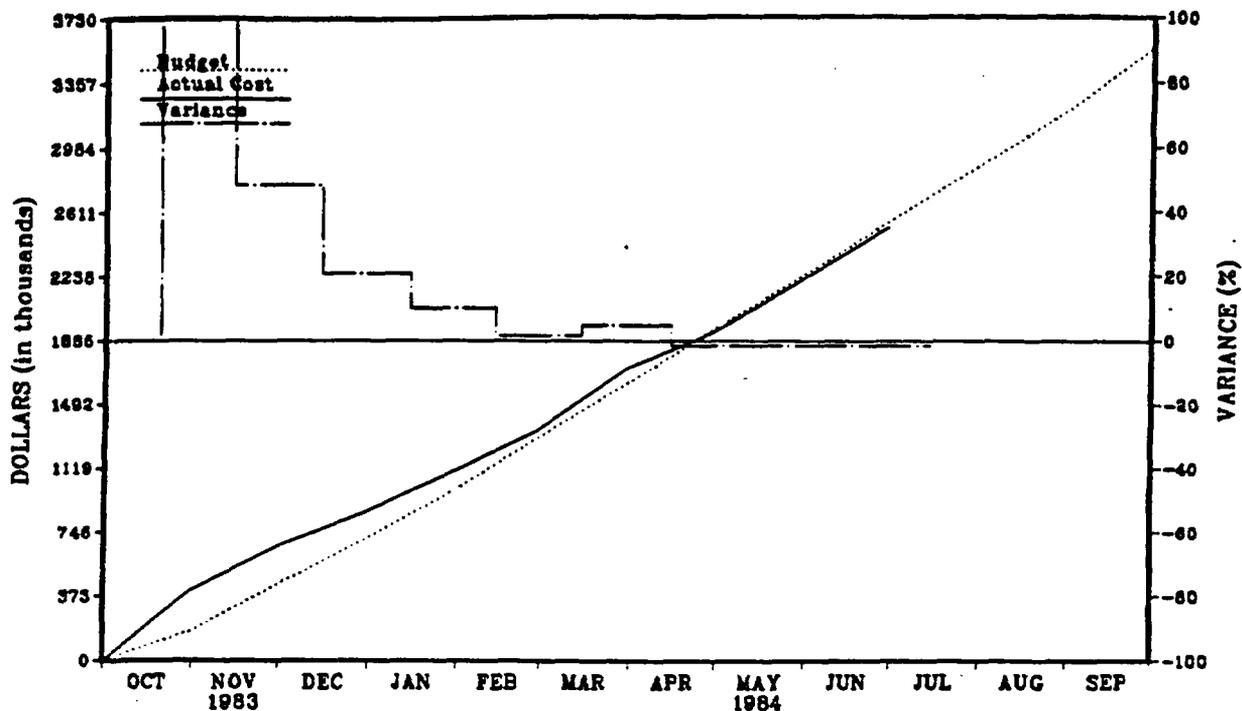
Budget (x1000)	39.	76.	110.	150.	183.	233.	258.	298.	336.	379.	429.	470.
Cost (x1000)	9.	54.	98.	138.	181.	224.	265.	328.	363.	0.	0.	0.
Variance (x1000)	30.	22.	12.	12.	2.	9.	-7.	-30.	-47.	0.	0.	0.
% Variance	-77.	-29.	-11.	-8.	-1.	-4.	3.	10.	14.	0.	0.	0.

Reeco GOVERNMENT FISCAL YEAR 1984



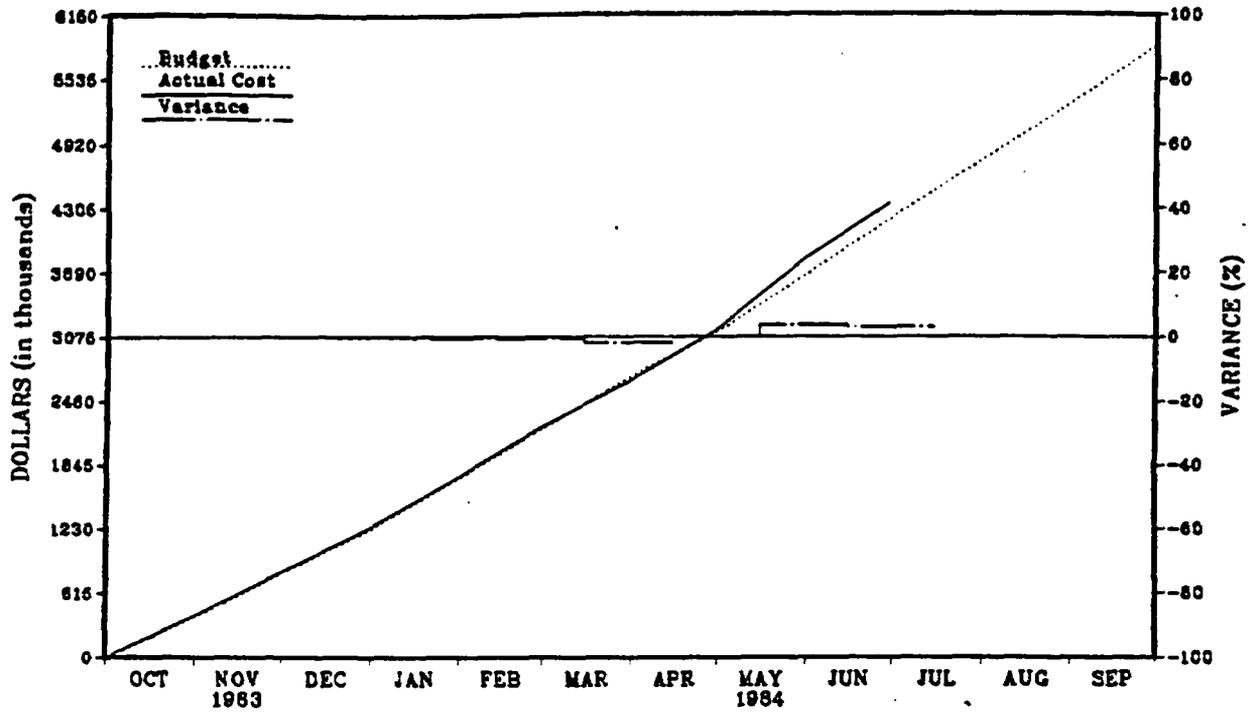
Budget (x1000)	1042.	2182.	3094.	4158.	5043.	5871.	6605.	7348.	8131.	8597.	9083.	9538.
Cost (x1000)	1014.	2115.	2864.	3687.	4485.	5324.	6490.	7470.	8231.	0.	0.	0.
Variance (x1000)	28.	67.	230.	469.	558.	547.	116.	-124.	-100.	0.	0.	0.
% Variance	-3.	-3.	-7.	-11.	-11.	-9.	-2.	2.	1.	0.	0.	0.

Miscellaneous Contractors GOVERNMENT FISCAL YEAR 1984



Budget (x1000)	175.	448.	717.	1003.	1311.	1631.	1942.	2255.	2555.	2877.	3197.	3555.
Cost (x1000)	402.	665.	868.	1106.	1332.	1711.	1913.	2223.	2525.	0.	0.	0.
Variance (x1000)	-227.	-217.	-151.	-103.	-21.	-80.	29.	32.	40.	0.	0.	0.
% Variance	100.	48.	21.	10.	2.	5.	-1.	-1.	-2.	0.	0.	0.

Science Applications, Inc.
 GOVERNMENT FISCAL YEAR 1984

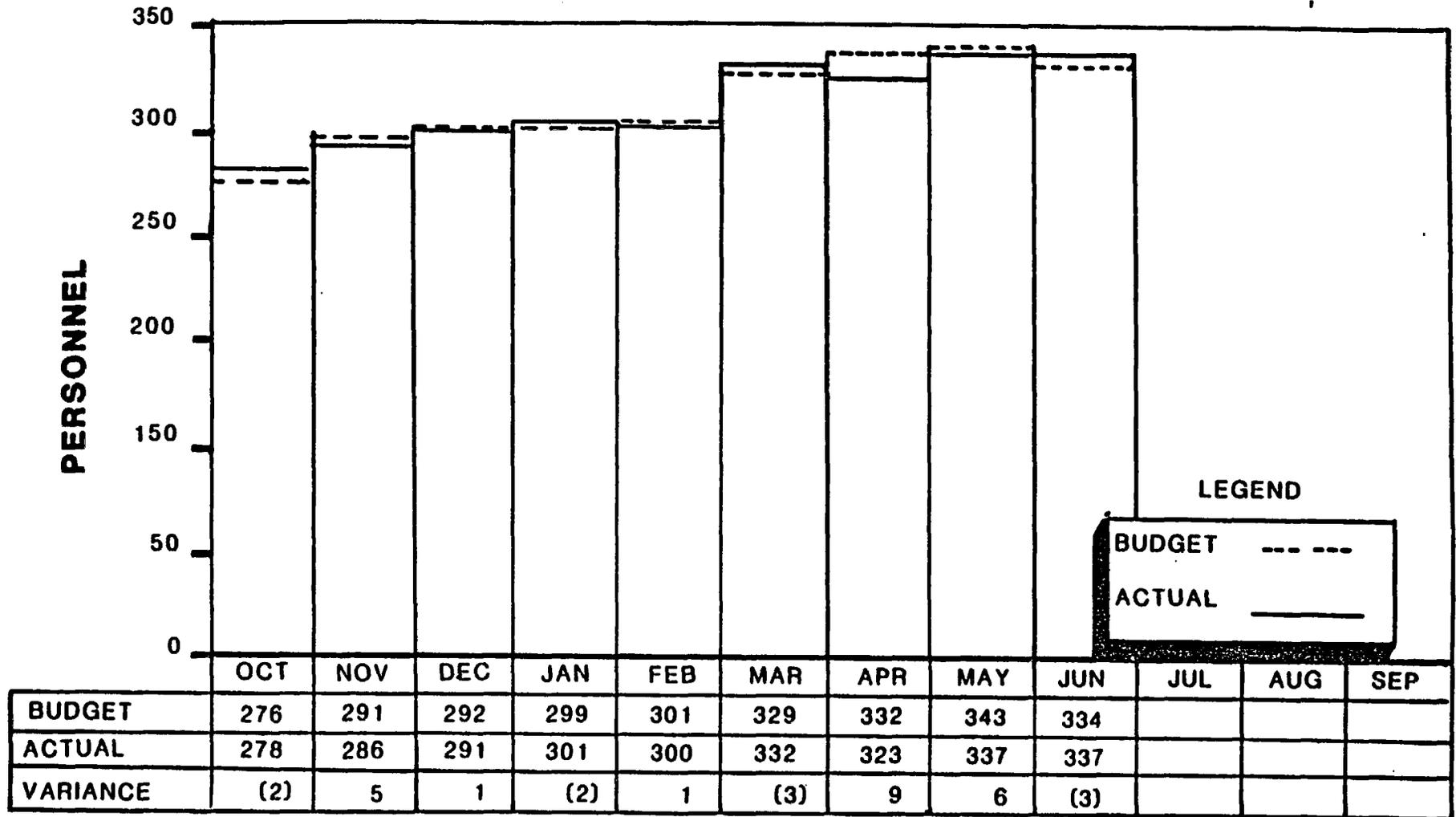


Budget (x1000)	386.	811.	1234.	1727.	2204.	2701.	3126.	3673.	4219.	4766.	5310.	5861.
Cost (x1000)	386.	811.	1232.	1719.	2185.	2650.	3129.	3610.	4350.	0.	0.	0.
Variance (x1000)	0.	0.	2.	8.	16.	51.	-3.	-137.	-131.	0.	0.	0.
% Variance	0.	0.	0.	0.	-1.	-2.	0.	4.	3.	0.	0.	0.

NNWSI LEVEL I MILESTONES

FY 1984

NNWSI NUMBER	WBS	RESP. AGENCY	MILESTONE DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	REMARKS
M150	2112	SNL	PRELIMINARY PERFORMANCE ASSESSMENT FOR EA	01/15/84	01/15/84	
M151	2111	SNL	PRELIMINARY SYSTEM DESCRIPTION DOCUMENT	08/30/84		BEHIND SCHEDULE
M152	2111	SNL	USERS MANUAL FOR DATA BASE SYSTEM FOR PARTICIPANTS	08/30/84		
----	22	LLNL	SUMMARY LOGIC NETWORK FOR WP DESIGN AND DEVELOPMENT	01/16/84	01/16/84	
M250	2221	LLNL	ESTABLISH INTERIM PRODUCT SPECIFICATIONS	08/30/84		
M251	223	LLNL	PRE-CLOSURE ANALYSIS OF SELECTED CONCEPTUAL DESIGNS	09/28/84		
M352	2317	LANL	DRAFT RPT. ESTIMATING WATER FLOW & RN TRANS. ALONG FLOW PATH	02/02/84	02/02/84	
M353	2352	USGS	GROUNDWATER LEVEL DATA AND PRELIMINARY POTENTIOMETRIC-SURFACE MAPS, YUCCA MOUNTAIN AND VICINITY, NYE COUNTY, NV	06/29/84	03/30/84	
M354	2311	LANL	LETTER REPORT GROUNDWATER CHEMISTRY ALONG FLOW PATHS	08/30/84		
M356	2361	LANL	COMPLETE REPORT ON VOLCANIC HAZARDS ANALYSIS	09/28/84		
M355	232	LANL	PROGRESS RPT. QN 3-D MINERALOGIC MODEL OF YM	08/31/84		
M357	2364	SNL	WEAPONS TEST SEISMIC REPORT	10/30/84		
----	24	SNL	SUBMIT SUMMARY LOGIC NETWORK FOR REPOSITORY	01/16/84	01/16/84	
M447	2431	SNL	SEAL DEVELOPMENT PLAN FOR REPOSITORY	05/30/84		BEHIND SCHEDULE
M592	252	SAI	DRAFT EA	02/29/84	02/29/84	
M523	25	WMPO	NNWSI REFERENCES FOR EA COMPLETE	08/01/84		
M521	254	SAI	DRAFT SCP TO HQ	08/15/84		BEHIND SCHEDULE
M660	2652	LANL	COMPLETE ESTP & SUBMIT TO HQ FOR FINAL REVIEW AND APPROVAL	08/31/84		
M701	271	LLNL	TERMINATION OF ROUTINE ACCESS AND LLNL TOUR SUPPORT TO SFT-C	09/30/84		
M706	271	LLNL	COMPLETE DECISION ANALYSIS ON USE OF CLIMAX FACILITY		OPEN (IN FY84)	



NNWSI PROJECT STAFFING