U.S. DEPARTMENT OF ENERGY

OCRWM OGR

Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS PROJECT

MONTHLY REPORT

JULY 1985

UNITED STATES DEPARTMENT OF ENERGY

NEVADA OPERATIONS OFFICE

Prepared by Nevada Nuclear Waste Storage Investigations (NNWSI) Project participants as part of the Civilian Radioactive Waste Management Program. The NNWSI Project is managed by the Waste Management Project Office of the U.S. Department of Energy, Nevada Operations Office. NNWSI Project work is sponsored by the Office of Geologic Repositories of the DOE Office of Civilian Radioactive Waste Management.

TABLE OF CONTENTS

ABSTRACT

WBS X.2.1 SYSTEMS

The Monitored Retrievable Storage Repository-Interface cost estimate proceedings are continuing. The Tuff Data Base staff is exploring the needs of the Reference Information Base. Parametric-modeling studies of the unsaturated flow system at Yucca Mountain are continuing. Work on the first draft of Volume I of the TOSPAC documentation continues.

WBS X.2.2 WASTE PACKAGE

Analysis continues of data from the two long-term hydrothermal interaction tests on Topopah Spring tuff, and evaluation of the effects of a number of parameters on the leaching/dissolution rate of glass waste forms continues. Two spent-fuel waste package design concepts were subjected to thermal analysis. Work is continuing of the development of the process modules for the waste-package system model. The influence of geologic structure on the stability of waste package emplacement holes at Yucca Mountain is being evaluated. A structural analysis simulating a fully-loaded spent-fuel container dropped seven feet has been completed.

WBS X.2.3 SITE

Drilling continued to define the geometry of the alluvial wedge beneath the site to evaluate potential for adverse amplification of ground motion, to obtain drive samples of alluvium, and to establish the degree of alluvial thinning. Work continued on contour compilation of the southern part of Yucca Mountain. Experiments were completed on water permeability measurements of borehole samples. Short term single-well tracer tests were continued to provide information on the unstressed flow fields in each borehole. Water measurements were made to determine age. Sensitivity studies continue to identify critical parameters in determining radionuclide transport times. WMPO approved the Meteorological Monitoring Plan.

WBS X.2.4 REPOSITORY

The design of the development prototype horizontal drill is continuing. Drawings of the model of the waste-package emplacement and retrieval vehicle are complete. The microstructural characterization has been made before and after hydrothermal alteration to examine changes. Initial designs for mining of the demonstration room at G-Tunnel have been completed. Work has started to investigate the effect of formation water on the underground ventilation system. Work continues to compile information about available computer codes that may be useful for pre-closure radiological-safety analysis.

WBS X.2.5 REGULATORY

The NRC approved issuance of the final unsaturated zone amendment to 10CFR60. Evaluation of Licensing Information Management System continued. Work continued on the writing and reviewing of the Site Characterization Plan (SCP). Five SCP milestones were completed. The draft CRA was author-reviewed. The EA Management Plan was reviewed by WMPO.

WBS X.2.6 EXPLORATORY SHAFT

The final F&S design review comments for the ESF subsurface facilities design were transmitted to DOE/NTS. WMPO has reviewed the draft conceptual test plan for the Waste Package Environment Test. Work continues on approaches for identifying and evaluating alternative means of characterizing portions of the repository block located laterally around the ES. Work began on the draft Final IDS Hardware Design Document.

WBS X.2.7 TEST FACILITIES

Staff efforts continued to focus on analysis of the results of post-test thermomechanical calculations and reporting on the results of post-test laboratory and field studies. Work began on the report which will document the SFT-C data management system and will release the data set to the technical community. Work continued an analyses of geomechanical data that were acquired during the three-year heating phase and the six-month cooling phase of the SFT-C. Integrity monitoring of all fuel assemblies being stored in unwelded canisters was completed.

WBS X.2.8 LAND ACQUISITION

No activity.

WBS X.2.9 PROGRAM MANAGEMENT

System development continued of the Performance Measurement Data System. The WBS was modified to include the letter "X" as a position holder until the OCRWM determines the WBS number for the OGR Program. The WBS Dictionary was baselined and copies will be forwarded to participants in August. The NNWSI Project QA Plan and four SOPs are being revised.

July 1985

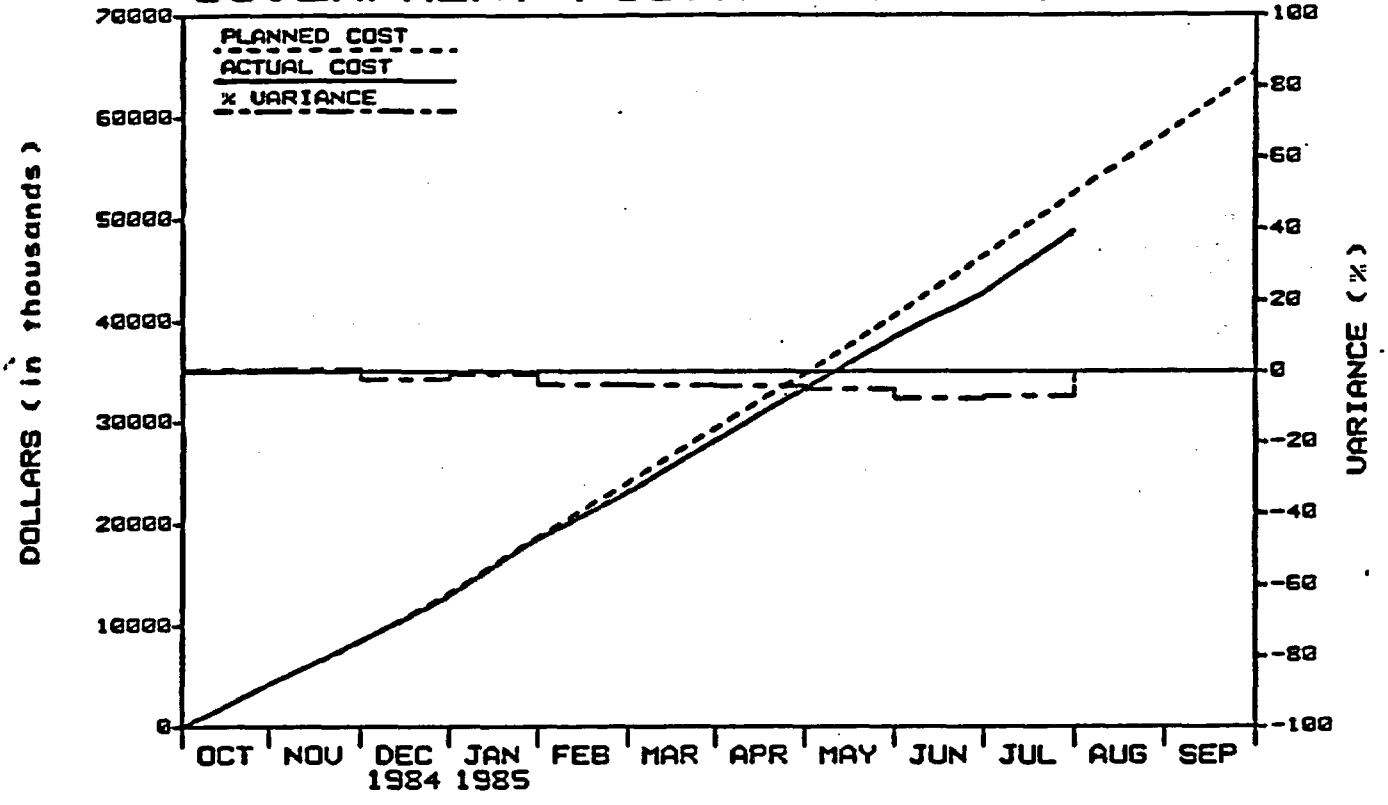
Funding Overview

The month-end programmatic estimated costs were $48,787,000 against a plan of $52,505,000 resulting in a cost underrun of $3,718,000 which calculates to a 7% variance. The total FY 85 budget for the NNWSI Project was $69,664,000 which breaks down to $64,390,000 in operating funds and $5,274,000 in capital equipment funds.

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

		Plan	($000) (Cost)	Variance	% Variance
X.2.1	Systems	$ 3,335	$ 3,092	$ 243	7
X.2.2	Waste Package	4,554	4,012	542	12
X.2.3	Site	15,218	14,299	919	6
X.2.4	Repository	9,329	8,196	1,133	12
X.2.5	Regulatory/ Institutional	5,810	4,767	1,043	18
X.2.6	Exploratory Shaft	4,747	4,635	112	2
X.2.7	Test Facilities	1,365	1,396	(31)	(2)
X.2.9	Project Management	8,147	8,390	(243)	(3)
	Total NNWSI Project	$52,505	$48,787	$3,718	7

WBS X.2 NNWSI PROJECT
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	4217	8482	13238	18656	23973	29355	34734	40504	46389	52505	58226	64390
COST (X1000)	4241	8543	12955	18478	23077	28203	33266	38440	42759	48787	0	0
VARIANCE (X1000)	-24	-61	283	178	896	1152	1468	2064	3630	3718	0	0
% VARIANCE	1	1	-2	-1	-4	-4	-4	-5	-8	-7	0	0

NNWSI PLANNING AND SCHEDULING
BUDGET BASELINE

JULY 1985

CONTRACTORS	($000) BEGINNING FUNDING	CHANGE	($000) ENDING FUNDING
SNL	$18,334	-	$18,334
LLNL	8,565	-	8,565
LANL	10,130	-	10,130
USGS	9,922	-	9,922
SAIC	7,775	-	7,775
REECo	4,608	-	4,608
H&N	898	-	898
F&S	1,212	-	1,212
WSI	200	-	200
PAN AM	50	-	50
STATE GRANT	1,744	-	1,744
MISCELLANEOUS	530	-	530
NTS ALLOCATION	422	-	422
RESERVE	-0-	-	-0-
SUBTOTAL	$64,390	-0-	$64,390
CAPITAL EQUIPMENT	5,274	-	5,274
TOTAL	$69,664	-0-	$69,664

U.S. DEPARTMENT OF ENERGY

OCRWM

OGR

Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

PROJECT STATUS

X.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

Systems Management and Integration

SNL systems-engineering staff worked with the WMPO to schedule a meeting to establish an NNWSI Project-wide Systems-Engineering Integration Group (SEIG). The SEIG will be composed of representatives from each participant and will serve as the focus for all systems-engineering activities. Goals of the meeting include drafting a SEIG charter for approval by the Change Control Board (CCB), developing an approach to an annotated outline for the SEMP, developing a SEMP schedule and assigning writing responsibilities, and planning for a tentatively scheduled OGR review of NNWSI Project systems-engineering activities.

Work on the Performance-Assessment Plan (PAP) was performed indirectly through work for the SCP. The drafts of SCP sections submitted during July will also serve as preliminary drafts of corresponding sections in the PAP.

QA procedure for the Interactive Graphics Information System (IGIS) Data Base (Milestone M197) was completed.

System Description

The preliminary SR (formerly entitled System Description) was submitted to WMPO on November 28, 1984, to fulfill Milestone M151. In preparation for baselining the SR as part of the NNWSI Project Technical Requirements Baseline, the preliminary document was reviewed by Project participants and contractors during January, February, and March 1985. Comments from reviewers were incorporated into rewrite guidance in late March 1985. (See planned work.)

Descriptions of the requirements for all of the functions that make up the Yucca Mountain MGDS have been revised. Group review of the document has started to ensure consistency of style and approach throughout the document, to document the interactions among those functions that must combine to meet requirements, to start preparation of a glossary, and to construct a matrix showing the relationship between requirements identified in the SR and those identified in the Generic Requirements document.

System Studies

The Retrieval Program Plan (Milestone M196) was sent to WMPO for policy review and approval.

Work on the fuel-consolidation study is now being reported under WBS 1.2.4.4, Operations and Maintenance.

Cost Schedule

The Monitored Retrievable Storage (MRS) Repository-Interface cost estimate activities are proceeding. Preliminary cost estimate guideline tables pertaining to labor rates, taxes, utility rates, activity duration, engineering and contingency factors, and waste-package costs have been transmitted to DOE/HQ. Preliminary, but specific, cost matrix input summary data will be prepared by Bechtel National, Inc., (BNI) for the August 5-9, 1985, MRS/Repository Interface meeting in Washington, D.C. The final cost report is due August 16, 1985.

Tuff Data Base

Tuff Data Base (TUFFDB) staff met with other Geoscience Analysis Division staff members to clarify the scope and needs of the Reference Information Base (RIB) with respect to data sources, possible data distillation methodology, QA traceability, and end-product form. The TUFFDB staff has begun evaluating the future potential of System 2000 as a source of both reference information and raw data.

TUFFDB has been updated to include bulk properties from the USGS report "Rock Property Measurements on Large-Volume Core Samples from Yucca Mountain USW GU-3/G-3 and USW G-4 Boreholes, Nevada Test Site, Nevada" (USGS-OFR-8A-552). Also, hole information was updated to show revised locations and elevations for several holes now designated as "as-built". The elevation of the dirt pad for USW G-4 was revised to 4166.9 ft and UE-25RF7 was redesignated UE-25RF7a, with UE-25RF7 now assigned to a borehole in a new location.

Computer Graphics

Active model data, which have been supported on the Applicon system, are being transferred to the Calma. Software and procedures are being developed to ensure that data integrity is maintained during the transfer process.

Surface-generation software that was developed for the Applicon has been redesigned to utilize the GE Calma system facilities. This software uses precalculated coefficients to predict the elevation of any given point on a surface.

Flow and Radionuclide Transport

A report entitled, "A Three-Dimensional Model of Thermal-Mechanical Units at Yucca Mountain, Stouthern Nevada" (SAND84-1076), Milestone M001, was sent to WMPO for policy review.

Parameteric-modeling studies of the unsaturated-flow system at Yucca Mountain continued in the area of assembling the input detail for numerical code. Studies of the saturated-flow system below Yucca Mountain and vicinity progressed in kriging the potential to produce a potentiometric surface to compare with a similar surface being derived deterministically. A semivariogram has been derived using the available well data. This empirical semivariogram is cubic and therefore unacceptable for mathematical reasons. Currently, quadratic and Gaussian semivariograms are being examined.

Considerable effort was devoted to writing the performance issue of the groundwater travel time section (Section 8.3.5.2.4) of the SCP. Work on an alternative approach to the calculation of travel times in Section 6,3.1.1.5 of the EA has been initiated for response to EA comments.

Radionuclide Source Term

Participants in the near-field hydrological problem (COVE 3) have reported all the physical constants used in their individual models in an attempt to eliminate all remaining discrepancies in the results from the initial steady-state problem. A consistent set of these constants will be sent to each participant during August 1985. After the necessary changes are made, the analysis of the actual COVE 3 problem will begin.

The majority of the activity during July 1985 involved the preparation and review of different sections of the SCP.

Contracts were initiated with LBL and RE/SPEC for FY 86. RE/SPEC will perform calculations using the Joint Empirical Model (JEM) to assess the potential effects of heat and excavation on the fracture apertures in the host rock. LBL will use their two-phase flow code, TOUGH, to study the hydrology of the near-field. Part of their studies will involve determining whether there are any significant hydrological or thermal consequences of the fracture aperture changes that RE/SPEC calculates.

Development and Certification of Computer Codes

The paper entitled, "Sensitivity of Calculated Hydrological Flows Through Multilayered Hard Rock to Material Characteristic Curves and Computational Solution Procedures" (SAND85-0773), has been submitted for departmental review.

Analysts completed initial calculations for HYDROCOIN Level 1 (benchmarking), Case 2. They have also laid out the geometry and started on the solution of Case 3. A postprocessor is being developed to implement particle-tracking capability in the flow codes SAGUARO and NORIA.

Initial flow calculations for the COVE 2A benchmarking problem have been started by SNL and LBL. COVE 2A is a code verification problem using a one-dimensional, five-layer representation of Yucca Mountain at drillhole USW G-4, with infiltration and radionuclide transport. Los Alamos will begin setting up the problem with a new code tentatively named HDOC. HDOC uses solution techniques developed for analyzing shock-wave propagation.

Radionuclide Releases from Total System

The purchase requisition for the continued development and use of the Total System Performance Assessment Code (TOSPAC) has been distributed to potential contractors. The response date is August 7, 1985; a new contract is expected to be in place by October 1985.

The papers "Fluid Flow in Fractured Rock Masses" (SAND85-0855C), and "The Effect of Percolation Rate on Water Time in Deep, Partially Saturated Zones" (SAND85-0854C), have been through peer and editorial review and are currently in managerial reveiew.

The document "Estimation of Hydrologic Properties for an Unsaturated, Fractured Rock Mass" (SAND84-2642), has been modified as a result of peer-review comments and has been submitted to management for review.

The difference equations, boundary conditions, and source term have been modified to handle fracture flow in the transport module of the TOSPAC. This first attempt at modeling transport through fractures uses a quasi-steady-state approximation to the coupling term between the matrix-transport equation and the fracture-transport equation; use of the "exact" form of the coupling term will be tried in the near future.

SAND Report on SPARTAN (Milestone M029) due on 7/30/85 was completed 7/1/85. SAND Report on NNWSI Project Data Priority Study (Milestone M126), due on 3/3/1/85, was rescheduled to 3/3/86. Letter Report on NNWSI Data Priority Study (Milestone M138) was reschedled to 9/30/85. Sensitivity Analysis of the Unsaturated Zone Hydrology of Yucca Mountain (Milestone M144) was completed 7/11/85.

PLANNED WORK

A schedule and resource requirements for the production of the NNWSI Project SEMP will be established during the mid-August 1985 systems-engineering meeting in Las Vegas, NV. The meeting should also to identify schedule and staff requirements for implementing the systems-engineering procedures to be described in the SEMP.

The SR will be submitted to SNL review in mid-August to early September 1985 prior to submission to WMPO for baselining by the rescheduled milestone date of September 30, 1985.

An annotated outline for the SR will be developed during August 1985 to meet the November 30, 1985, scheduled due date. (Milestone M261 was added on the basis of DOE-HQ guidance, but has not yet been approved by the CCB. The date, November 30, 1985, is later than the DOE/HQ guidance date of July 30, 1985.)

Ongoing cost estimating activities include continued involvement in the MRS Repository-Interface Study through August 1985, retrodocumentation of the Two-Stage Repository cost-estimating files by Los Alamos Technical Associates (LATA), development of a strategy for cost data base file transfer from architect/engineers (A/Es), and implementation of the Los Alamos CES at SNL.

Work in August 1985 will focus on continued modeling of the subsurface flow systems at the Yucca Mountain site, based on the studies of the unsaturated and saturated zones previously described. The saturated-zone study will include continuation of deriving the variogram to establish a kriged-head distribution.

The coordination of the near-field hydrology problem (COVE 3) activities will be continued. After a standardized list of the physical constants are delivered to each modeler, direction for the solution to the full problem will be given and a meeting organized for comparing the initial results.

Development of the transport module for TOSPAC, including provisions for transport in fracture flows, will continue. The rough draft of Volume I of the series of documents that describe the TOSPAC will be completed.

PROBLEM AREAS

Version 2 of the User Manual for the TUFFDB INTERFACE, to satisfy Milestone M177, will be started through the peer-review process one to two weeks late. The delay was caused by the urgent need to clarify the RIB.

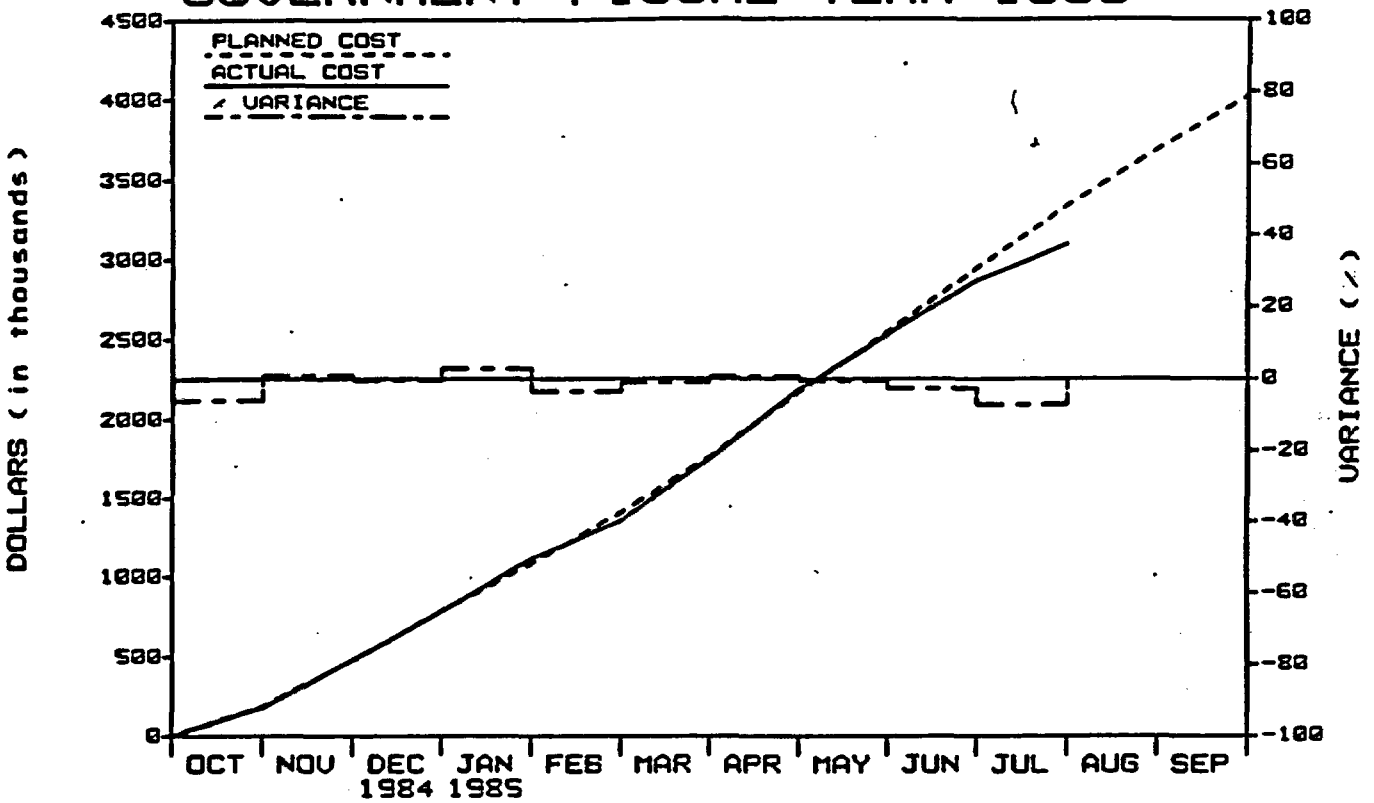
No reply has been received to the NNWSI Project comments on the DOE/HQ draft outline for the PAP. Those comments made in June 1985 raised major objections to the DOE/HQ outline, and changes to it will probably be made by DOE/HQ. Until the objections are resolved, any writing done for the PAP will have to follow the NNWSI Project outline and may be superseded if the PAP is required to follow the DOE/HQ outline.

The staff of the Geoscience Analysis Division is now required to review publications to ensure that the basic data are consistent. This task is rapidly proving to be too large for the staff due to the diversity of the information to be reviewed and the volume of reports being published. It may be necessary to spread this task out over a broader group, possibly to include members of then RIB committee.

The priority commitment of the staff assigned to this task to the preparation of the SCP and the PAP will delay the completion of any in-depth determination of the EBS and disturbed-zone boundaries (M107).

Technical activities are being delayed or postponed in order to accommodate the schedules for preparation of several planning documents: the draft SCP; the final EA; and the PAP. Further postponement of technical work may be required to accommodate the request for a Performance-Assessment Workshop with the NRC in October 1985.

WBS X.2.1 SYSTEMS
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	185	477	786	1078	1401	1761	2164	2540	2941	3335	3690	4024
COST (X1000)	174	482	781	1108	1349	1741	2179	2522	2862	3092	0	0
VARIANCE (X1000)	11	-5	5	-30	52	20	-15	18	79	243	0	0
/ VARIANCE	-6	1	-1	3	-4	-1	1	-1	-3	-7	0	0

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M120	SNL	1.2.1	YM Mined Geologic Disposal System Description (System Requirements)										△		
M108	SNL	1.2.1	System Engineering Management Plan											△	
M113	SNL	1.2.1	Performance Assessment Plan												△

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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

Waste Package Environment

Analysis of data from the two long-term (303 d) hydrothermal interaction tests on Topopah Spring tuff (Tpt) is continuing. The two short-term (64 d) hydrothermal tests on vitric tuff from the Tpt and underlying units have been terminated normally and data analyses are proceeding.

The cyclic dehydration-rehydration experiment on a large, fractured Tpt core sample has been completed and experimental data are being reduced and evaluated.

Work is continuing in the evaluation of the effects of a number of parameters (contact rate between water and glass/stainless steel surface, presence or absence of stainless steel, water volume) on the leaching/dissolution rate of various borosilicate glass waste forms.

Additional parametric tests are being carried out; the leaching of Pu, Np, and Am from ATM-12 glass is being studied. Also, data on the effect of leachate Si concentrations (J-13 water) on removal rates of Mo and B from borosilicate glass are being reduced and evaluated.

Long-term corrosion testing of copper alloys CDA 102, 613, and 715 in 90 °C J-13 water is being carried out in two different intensity radiation fields. Also, potentiodynamic polarization curves of CDA 102 in 100X concentrated J-13 have been obtained both in and out of a gamma field.

Considerable work has been done on the susceptibility of sensitized 304 stainless steel to stress corrosion cracking (SC); the effect of gamma irradiation has yet to be evaluated.

The "boil down" tests on stressed specimens of 304 and 304L stainless steel are continuing. After 50 boil-down cycles, some of the 304 specimens were visibly cracked; the build-up of corrosion products and scale will have to be removed before it can be determined whether any 304L specimens are cracked.

The general corrosion rates of candidate stainless steels have been determined on specimens after 15,000 hours of exposure; the next data points will be obtained at 25,000 hours exposure.

Two spent-fuel waste package design concepts were subjected to thermal analysis; the effect of different internal divider structure designs was evaluated. In both cases, maximum fuel temperatures were well below the peak allowable temperature of 350 °C.

The structural analysis of a simulated drop test of a fully-loaded spent fuel container has been completed; the results indicate that the container will probably not fail.

Work is continuing on the development of the process modules for the waste package system model, using the experimental data being obtained from waste form leaching and barrier corrosion testing.

The SEM/EMP analyses were completed of primary phases post-test and secondary minerals resulting from hydrothermal interaction during the long-term core wafer test (DB13). Similar post-test analyses following test DB12 were continued.

The short-term experiment with vitric tuff was successfully completed. This hydrothermal interaction experiment is being done in conjunction LANL to investigate the hydrothermal stability of vitric tuff from the Tpt and underlying units. This cooperative research effort with LANL will complement previous field studies to evaluate the susceptibility of vitrophyre to thermal alteration by emplacement of HLW in Yucca Mountain. The chemical analyses of fluid samples taken during this experiment are nearly completed. Only the K analyses via AA and the IC anion analyses are outstanding.

The influence of geologic structure on the stability of waste package emplacement holes at Yucca Mountain is being evaluated. This work uses newly developed methods to examine the behavior of rock blocks encountered in the perimeter of a typical emplacement hole. Example solutions in the report will show the effects of hole orientation and data variability on opening stability. The analyses require certain types of data; requests for available data on discontinuities and rock mass properties were sent in May to the USGS and SNL Technical Project Officers to be forwarded to the proper personnel within their respective organizations. Stability analyses cannot proceed at this time, however, since no response has been received to the requests for data. In the interim, a paper entitled "A Ground Reaction Curve Based Upon Block Theory" is being prepared for the 34th Geomechanics Colloquy, which is organized annually by the Austria Society for Geomechanics.

The large fractured Topopah tuff sample has been removed from the pressure vessel. Cursory examination reveals that the fracture was not healed as completely as was the case for the first fractured sample. In fact, the two halves were pulled apart by hand. There are no visible changes in the fracture surface from when the sample was assembled before testing.

Writing was completed on the paper entitled "Hydrothermal Interaction of Solid Wafers of Topopah Spring Tuff with J-13 Water and Distilled Water at 90 °C, 150 °C, and 250 °C using the Dickson-type, Gold Cell Rocking Autoclaves: 1. Short-term Experiments" (UCRL-53645). Internal review began at the end of this month with delivery to WMPO expected in September.

Waste Form Testing

The second run Series 2 tests (H. B. Robinson and Turkey Point fuels in J-13 water) have been sampled at 150 days. Selected chemical analyses are in progress. The tests will be terminated in late August 1985 (at approximately 200 days) in order for all chemical analyses to be completed in FY 85. Supplemental funding is being provided by LLNL for these analyses. In addition, FY 85 funding is being provided to prepare the Series 3 spent-fuel test specimens and for additional characterization of the H. B. Robinson spent fuel.

The 12-month Electrochemical Scoping Test, which was terminated in late June, has been examined visually and photographed. The fuel bundle appears the same as in the previous experiments.

The "C-ring" device and the Fluitron autoclaves are ready for installation in the Building 325 hot cell. Installation has been delayed due to higher priority work.

An unirradiated Zircaloy-4 specimen has been supplied to LLNL for ion probe evaluation to establish a baseline distribution of trace isotopes. In addition, two spent-fuel cladding samples are being prepared for analysis by HEDL using a vacuum fusion technique. One sample will be treated to remove the oxide film, and the other will just have the fuel removed.

Fabrication of the spent-fuel bundles for the electrochemical corrosion experiment is continuing. Fuel is being drilled from the ends of the sections in preparation for installation of Zircaloy-4 plugs.

A paper entitled, "Zircaloy Cladding Corrosion Degradation in a Tuff Repository - Initial Experimental Plan" (HEDL-7455) has been approved by WMPO for publication and is being distributed.

Another TGA run at 140 °C has been started to determine the influence of fuel particulate size at lower temperatures on oxidation. After 300 hours, the crushed fuel had approximately three times (as compared to a previously observed six times) the weight gain as observed in a fragment oxidized under the same conditions.

Because the NNWSI Project Unsaturated Test rigidly sets many of the test parameters, the effect that each parameter may have on the final radionuclide release needs to be studied. This is being done in 4 sets of parametric testing. Details of the tests will be described in the LLNL quarterly technical report. The tests started in May and June.

The 91-day samples from the parametric testing of the ATM-12 glass were taken down. Analysis of the leachates for the actinide components is in progress. The only samples still reacting at 90 °C are those on the 182-day cycle.

A test series of samples using ATM-1c glass and J-13 water was started in July. These samples will be leached for 7, 14, 28, and 56 days.

The results of the tests on PNL 76-68 glass have been compiled and surface analyses using SEM/EDS, SIMS, and ion microprobe have been completed. The results will be presented in a Topical Report, but final interpretation of the data requires documentation of processing conditions and glass compositions from the MCC.

Another set of gamma radiation experiments is in progress. The 182, 91, and 56 day tests have been started. One problem that occurred in the FY 84 set of tests, inhomogeneity in the SRL glass samples, was corrected by a more complete mixing and remelting of the glass prior to final pouring.

A draft manuscript prepared by the Materials Characterization Center entitled "Waste Acceptance Requirements Data Acquisition Plan" was reviewed and comments were sent to WMPO, MCC, and the Materials Integration Office.

A manuscript was prepared entitled "Derivation of a Waste Package Source Term for NNWSI from the Results of Laboratory Experiments" documents calculations to establish an upper bound to radionuclide release from spent fuel under expected conditions at Yucca Mountain.

Long-term corrosion testing of CDA 102, 613, and 715, under two different irradiated environmental conditions in the HEDL gamma facility is now well under way. Specimens from the 150 °C experiment were removed in early July following a one-month exposure. Similar specimens from the 95 °C test will be removed during the first week in August. Both sets of specimens will be examined and the determination of appropriate analyses will be made in mid-August.

Potentiodynamic polarization curves of CDA 102 in 100X concentrated J-13 water have been obtained both in and out of the gamma field. There are no real discernible differences between these two plots. As previously reported, the corrosion as well as the repassivation potentials are similar. The somewhat higher currents on the reverse scan in the gamma-irradiated case result from a higher positive excursion on the forward scan.

Tests have been done to determine whether 304 stainless steel or 316L stainless steels with various thermomechanical process histories are susceptible to stress corrosion cracking (SCC) in J-13 well water at 95 °C. SCC was not detected in any of these tests, and it was determined that metallurgical factors (the degree of cold work, sensitization temperature, and sensitization time) had such significant effects on the ductility of the steels that they could have masked low-level effects of SCC.

The 700 °C sensitization temperature used for 304 stainless steel could have been too high to produce a sensitized microstructure. Two 304 stainless steel specimens were solution-annealed and re-sensitized to determine whether the lack of SCC in previous tests was due to an inadequate sensitization treatment, or to a lack of susceptibility at 95 °C. One specimen tested in J-13 well water at 95 °C elongated over 70 percent without failure, which exceeded the elongation limit of the test machine. This suggests that 304 stainless steel, thermally treated in the manner indicated, is not susceptible to SCC under the test conditions employed.

The other re-sensitized 304 stainless steel specimen will be tested under identical conditions, but in a high-intensity gamma flux . (Any observation of SCC in this test will indicate an enhancement in the SCC mechanism from the presence of the radiation field. If SCC is not observed under these test conditions, it has been suggested that additional tests be conducted between 95 °C and 150 °C in both irradiated and unirradiated environments to gain further insight into the effect of test temperature.

A "boil down" test is being conducted at PNL. In the test, stressed U-bend specimens of 304 and 304L having a variety of thermal histories are exposed to a 200 °C environment of J-13 water conditioned with tuff rock. The water is allowed to boil to dryness on a regular basis to concentrate electrolytic species on the specimen surface. The array of specimens was examined in late July following 50 wet-dry cycles with a total exposure time of approximately 12 months. Some of the 304 specimens were visibly cracked. Specimens of 304L had visible corrosion products on the surface which may cover up incipient cracking. These specimens will be cleaned of corrosion products and scale build up and then the surfaces will be examined for crack initiation or other evidence of localized/stress corrosion. Hot and cold chemical analysis of the water and identification of corrosion products/scale layers are in progress.

Two long-term stress corrosion tests are in operation in the PNL gamma facility. The 50 °C test of stressed (U-bend) specimens of 304 and 304L stainless steels in the solution-annealed and in the annealed and sensitized condition, was opened for examination after attaining an exposure of 16-1/2 months. One sensitized U-bend specimen of 304 stainless steel appeared to be cracked. This specimen was re-inserted for additional exposure time in the vapor-rock region of the autoclave. The 90 °C test of the same materials, was opened for examination after 14 months exposure. Two U-bends of 304L stainless steel, both solution-annealed and sensitized were found to be cracked, and were removed from the test.

The Metal Barriers subtask soon will review its testing program and approach on the austenitic stainless steels and high-nickel austenitic alloys. Included in the review will be the degree of overtest conditions which should be employed.

The waste package staff met with SNL on July 8 to discuss possible spent-fuel container internal structure designs compatible with current MRS operating scenarios. A proposed design consisting of eight truncated pie-shaped modules per disposal-container is being developed. Two design concepts were analyzed. The most significant quantifiable difference between the two concepts is that the latter has an 1/8 inch "conduction wall" between the spent fuel and the container wall, whereas the former design is open between the fuel rods and the container inside wall. Thus, for the latter closed module design, with an effective air-gap between the module wall and the container wall, an increase in fuel temperature is anticipated due to heat transport losses.

The thermal analysis of the open-divider, internal structure container was completed for the purpose of establishing an upper limit bound for allowable thermal power of the loaded fuel rods.

The other thermal analysis of a container with a closed-module, internal assembly consisted of 17 assemblies of consolidated 10-year-old BWR spent fuel or six PWR 10-year-old assemblies arranged around the perimeter of the container.

A structural analysis simulating a fully-loaded, spent-fuel container dropped seven feet has been completed. The results indicate that failure of an austenitic stainless steel container will probably not occur for this scenario.

Hydrothermal modeling work continued on the COVE3 verification exercise, which will also serve as the basis for waste-package environment calculations. Preliminary results indicated a problem in modeling the gas phase permeability relationships and these initial assumptions are being re-examined.

The specification and development of process modules for the NNWSI Project waste package system model continued; current efforts focus on modeling waste form release and waste transport to the borehole wall. A simplified release scenario assumes that a vertically emplaced package has failed near the top, but is competent below, so it can maintain contact of water with the waste form. The model accounts for the limited influx of water available to the package and the solubility of the waste form in the ground-water. Design of this module is nearly complete, and the logic required to couple it with the system driver is being developed.

PLANNED WORK

A revised version of the report on functions of packing material in the unsaturated zone will be prepared. Permeability and pore fluid chemistry of a core sample of Topopah Spring tuff in a temperature gradient will be measured.

PROBLEM AREAS

Lack of response to requests for input data from Sandia is causing slippage of Milestone 2.2.2-85-II-2.

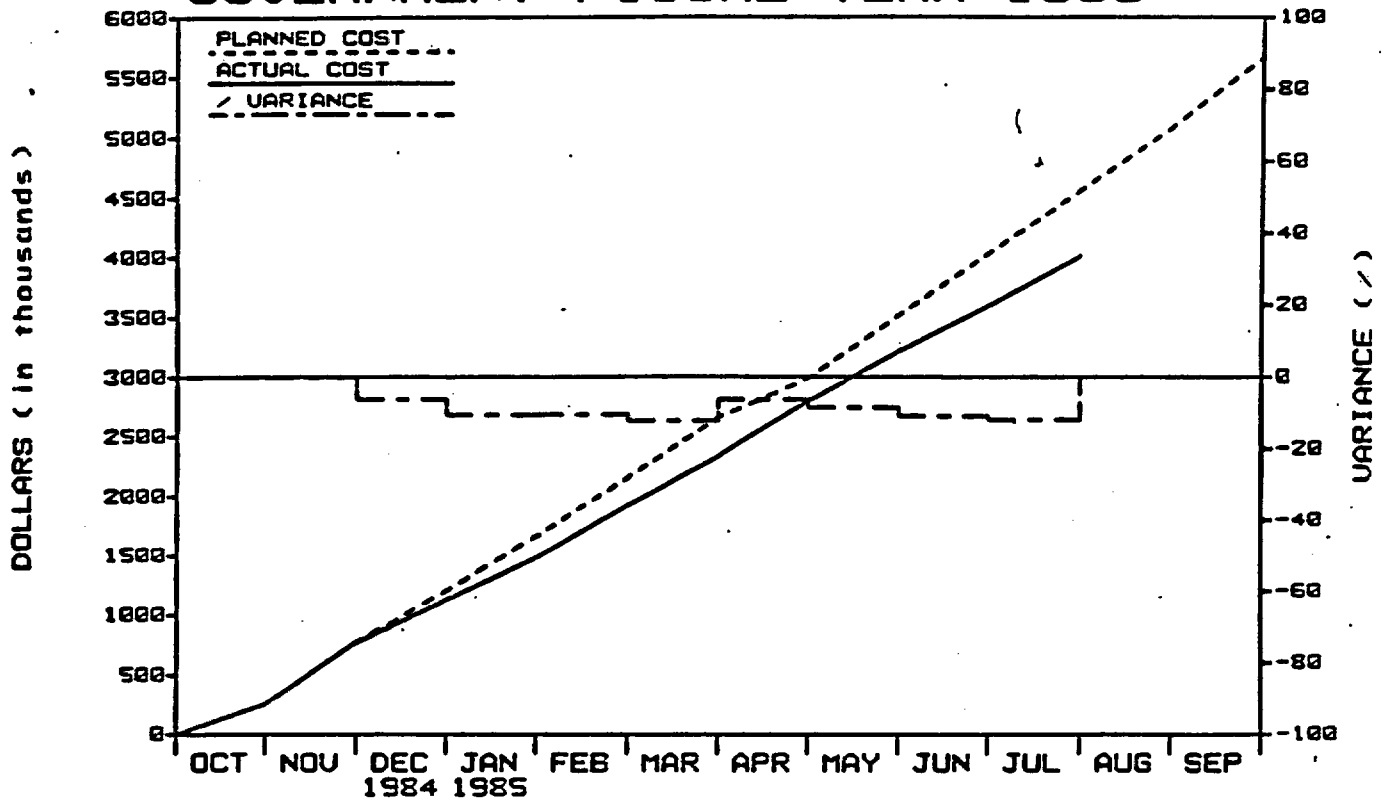
The following milestones will be delayed because of SCP preparation: 2.2.2-85-III-3 (W281), 2.2.2-85-III-5 (W209) and 2.2.2-85-III-6 (W210).

The MCC glass fabrication interim report was reviewed. The information is incomplete in several respects. A formal review was sent to the MCC on June 11, 1985, together with a request for revision and publication in referencable form. No response had been received as of August 6, 1985.

OCRWM comments on the Functional Design Criteria for the Advanced Conceptual Design have been received. More detailed quantitative criteria have been requested. The basis for some of these criteria will require input from other project participants and will require review and approval. Revision of this document will delay initiation of the Advanced Conceptual Design phase and subsequent milestones.

Difficulty is being encountered in obtaining qualified staff additions to the performance subtask. Progress is being retarded by competing activities and insufficient staff.

WBS X.2.2 WASTE PACKAGE
GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	252	771	1200	1657	2152	2657	2988	3511	4033	4554	5077	5662
COST (x1000)	252	769	1124	1480	1926	2333	2799	3216	3594	4012	0	0
VARIANCE (x1000)	0	2	76	177	226	324	189	295	439	542	0	0
% VARIANCE	0	0	-6	-11	-11	-12	-6	-8	-11	-12	0	0

VARIANCE EXPLANATION: Underrun is due to subcontractor costs not being reviewed in time for July costing; and the redirection of work effort to the SCP. Also, additional manpower has just recently become available.

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M250	LLNL	1.2.2	Establish Interim Product Specifications			◆									
M222	LLNL	1.2.2	Input to DOE/HQ Rpt. to Congress on Copper for WP											△	
M251	LLNL	1.2.2	Pre-closure Analysis of selected Conceptual Designs			◆									
M231	LLNL	1.2.2	Complete WP Conceptual Design Criteria						△						
M233	LLNL	1.2.2	Initiate WP Advanced Conceptual Design							△					

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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

Site Geology

Exploratory borehole UE-25RF9, located approximately 600 ft east of the northern part of Exile Hill in the preferred location for repository surface facilities, penetrated 65 ft of alluvium and colluvium and bottomed at 106 ft in red-brown nonwelded Tiva Canyon caprock. The drilling will help define the geometry of the alluvial wedge beneath the site to evaluate the potential for adverse amplification of ground motion.

Drillhole UE-25RF3 is being deepened from the 1984 drilling in tuffaceous sediment that is thought to be reworked Timber Mountain tuff. The borehole penetrated Rainier Mesa nonwelded tuff at 195 ft and Tiva Canyon caprock at 264 ft. The hole bottomed at 301 ft on July 17, 1985, and passed through at least four high-angle faults in both Rainier Mesa and Tiva units. Some horizontal slickensides were noted in the core, suggesting possible strike-slip motion.

UE-25RF3b drilling started and will obtain drive samples of alluvium at 10-ft intervals to a depth of 110 ft. Moisture and density values will be determined by USGS Nuclear Hydrology personnel.

Drilling of UE-25RF10 began and has established the degree of alluvial thinning as the Tiva Canyon bedrock on Exile Hill is approached from the east. The hole is structurally between RF9 and Exile Hill and should help establish subsurface geometric relationships, including the apparent fault offset of about 150 ft seen in RF9.

The borehole penetrated Tiva Canyon caprock in approximately the normal position for unfaulted structure. Thirty-seven feet of alluvium overlies the tuff at the drillsite 300 ft east of Exile Hill, suggesting that a bedrock foundation may be available for siting some structures, if needed.

Drilling of UE-25RF11 commenced and will establish the degree of alluvial thinning and the approximate location of the fault east of Exile Hill that offsets the Tiva Canyon sequence by 150 ft.

Preparation continued of isopach maps of the volcanic subunit present at Yucca Mountain. Isopach maps were revised showing total thickness for the Topopah Spring Member and thickness of the densely welded subunit of that member in the repository site area.

Field work has been completed in the southern and southwestern parts of the 1:12,000 scale geologic map of the Yucca Mountain repository site vicinity. A small amount of field work remains to be done in the northwestern corner of the map, following which the mapping will extend to the northeast towards the apparent detachment in the Calico Hills.

An open-file report manuscript entitled, "Fracturing in outcrops in the immediate vicinity of drill hole USW G-4, Yucca Mountain, Nevada; data compilation", was submitted for review. This report presents the significant parameters of 5,000 fractures in the Tiva Canyon Member of the Paintbrush Tuff as studied at 50 outcrop stations. The approved paper entitled, "Fracture Geometry of Two-Dimensional Fracture Networks at Yucca Mountain, Southwestern Nevada", was submitted by F&S to the International Symposium on Fundamentals of Rock Joints to be held at Bjorkliden, Sweden, September 15-20, for inclusion in Proceedings.

Topographic Analysis

Work continued on the contour compilation of the southern part of Yucca Mountain. The preparation of topographic maps A-1, A-2, and A-3 for open-file processing was completed this month.

Preliminary gravity and magnetic maps were completed of NTS and vicinity at a scale of 1:100,000. Several gravity and magnetic profiles on this map-area were constructed.

The following reports were approved by both DOE and the USGS Director and have been sent to GPO: "An interactive program for constructing and editing and geometries of polygons using a color graphics terminal" (USGS Open-File Report 85-233); and "An automatic program for the interpretation of two-dimensional gravity and magnetic anomalies" (USGS Open-File Report 85-377).

Seismic Investigations

A first draft was completed of a paper to be read at the Tectonics Internal Review workshop on August 19-21 in Denver. The report will discuss refraction profiles shot by in 1984 that extended from Death Valley east to Beatty and Bare Mountain, then south through Crater Flat to Amargosa Valley. The paper will allude to the entire effort but focus on the results at Crater Flat.

Rock Properties

Writing continued on the manuscript intended for outside publication discussing paleomagnetic variations in the Tiva Canyon and Topopah Spring members of the Paintbrush Tuff at Yucca Mountain. The paper was revised explaining variations in remnant directions in Topopah Spring tuff samples from Busted Butte as being caused by late welding deformation at thermal levels below blocking temperatures.

Experiments were completed on water permeability measurements of borehole samples using J-13 water rather than distilled water. A similar curve was found of declining permeability with time, paralleling the results recorded with distilled water as the permeant. However, these samples had previously been used for the distilled water permeability measurements--thus the validity of the remeasurements with J-13 water are subject to question. Future experiments will use new cores cut from pristine "wrapped" lengths of well core. The natural pore water will be left intact and J-13 water will be used as make-up water for the measurements.

An old series of water permeability measurements is nearly completed on USW G-3 and USG G-4 samples using the original technique of first dehydrating the samples and then saturating them with distilled water.

Tectonics and Volcanism

Based on the premise that older soils have a greater accumulation of fine-grained secondary carbonate and clays, and therefore tend to have a finer average grain size, grain size data were investigated on buried soils exposed in the VS-2 and CF-2 and CF-3 trenches in an attempt to relate soil development to U-trend ages of these units.

A report was written on Quaternary faulting along the east face of Bare Mountain for presentation at the Tectonics Internal Review in Denver, August 19-21. The report will be included in a Proceedings Volume.

The two-kilometer long visible fault trace, along which trenches CF-2 and CF-3 are located, has recently been recognized to extend considerably farther north than had been previously considered on the basis of a good correlation of the surface trace with linear aeromagnetic feature. The structure appears to be a major fault bounding the Yucca Mountain block on the west, and may be an extension of the Windy Wash Fault.

A report entitled, "Geology of drill hole USW VH-2, and structure of Crater Flat, southwestern Nevada" (Open-File Report 85-475), was approved by the Director and submitted for printing.

Isotope Geology

A draft of the open-file report entitled, "Uranium-Trend Dating of Quaternary Deposits in the Nevada Test Site Area, Nevada and California" was submitted to WMPO for approval on July 10. U-trend dates were determined for 31 sample suites establishing the age ranges for deposition of four major stratigraphic units at the Nevada Test Site.

Streamflow

Debris flows were investigated on the northwest side of Skull Mountain that occurred during a heavy runoff on August 19, 1984. The dissection of surficial stripes by the debris flows permitted examination of the subsurface character of the stripes in an effort to provide some understanding of their mode of

origin. The stripes consist of vertically aligned surficial concentrations of large boulders that have moderate to heavy coatings of rock varnish. Hopefully, rock-varnish dating will provide evidence on the age of their emplacement.

Scour chains were installed at the three continuously monitoring streamflow gages on lower Fortymile Wash.

Ground-Water Flow Analysis

Short-term single-well tracer tests were conducted in each of the three UE-25c holes. The purpose of the tests were to provide information on the unstressed flow fields in each borehole for estimating an optimum time duration for the drift portion of the drift-pumpback test in c#2 scheduled for September of this year.

Unsaturated-Zone Hydrology

Nine abstracts prepared for the National Water Well Association Conference were accepted for presentation in November 1985.

Drilling of the UZ holes is at a halt. Laboratory testing of the core samples from the shallow UZ holes is in progress. Preparation of the USW UZ-1 report is underway. New water samples are being obtained from the unsaturated zone by squeezing and centrifuging. Also, reports on neutron logging of test holes USW UZ-4 and 5 are being prepared.

Future Climates

Data loggers have been installed at the seven precipitation collection stations located in southern Nevada. Temperature and tipping bucket data are being recorded at 15 minute intervals.

The third set of Fortymile Wash flood samples was collected.

Seismic lines were run on Walker Lake in mid-August in preparation for October coring activities. Faulting along and parallel to the east shore of Walker Lake was noted as well as the presence of three subbasins. Preliminary results with regard to ^{13}C-organics, geochemical data, and fossil evidence indicate the presence of several periods of climate change during the past 300,000 years.

Size analyses were completed of sediments from cores from Walker Lake.

Natural Isotope Chemistry

Measurements of the ^{36}Cl content of water from Well J-13 and USW-H3 were made to determine the age of those waters. The results indicate that Well J-13 water is either old enough to permit significant decay of ^{36}Cl or may contain some dissolved nonradioactive chlorine not present in Well J-13 water.

Sorption and Precipitation

Several batch sorptions were started. The sorptions involved four different waters and plutonium or americium prepared in the usual manner. A serial sorption was started and the first measurement was completed; the data are being collected. Preparations have been made to start another set of comparisons between small fast-flow columns and batch sorptions using plutonium in carbonate buffered solutions.

Experiments have been performed to determine the effect of phosphate buffer on the sorption of ^{239}Pu by a bacteria. Although the dry weights for the bacteria have not yet been calculated, the results indicate that when the bacterial pellet is not washed, sorption is significantly reduced.

Dynamic Transport Process

The assessment Report on the Kinetics of Radionuclide Adsorption of Yucca Mountain tuff (Milestone M317) was completed.

Stereo photos of GU3-2359 have been taken. The relief will be digitized to determine the surface statistics using fractal geometry.

The statistics of measurements in heterogeneous media having dilational invariance but lacking translational symmetry are being investigated.

Retardation Sensitivity Analysis

At the fourth meeting for the development of procedure NNWSI-SOP-03-02 on July 29 in Denver, a draft was finalized by consensus of the committee and will be sent to WMPO with recommendations that the draft SOP be distributed to all participants in the NNWSI Project and the NRC for review and comment.

Statistical Analysis

Sensitivity studies continue to identify critical parameters in determining radionuclide transport times using the Sudicky-Frind model.

Satisfactory variogram estimates have been obtained using pooled data from all nine stratigraphic boundaries and robust empirical variogram estimators. The choice of a model variogram appears insensitive to the method used to remove the underlying eastward trend from the data, which is a satisfying result.

Applied Diffusion

Measurements of the coefficients of diffusion are planned as part of the Exploratory Shaft (ES) site characterization work. The ES Test Plan (ESTP) for this experiment was revised so that references to the experiment locations were given in terms of hydrostratigraphic rather than geostratigraphic units.

Geochemical Modeling Code EQ3/6

The new subroutine to calculate the compositions of hypothetical solid solutions has been incorporated into the EQ3NR code and will be added to EQ6.

Thermodynamic data for calcium were examined to find the source of the differences in saturation index calculations for some carbonate minerals done with EQ3NR and the WATEQF codes.

Mineralogy and Petrology

Improved reference intensity ratios have been determined for the minerals found at Yucca Mountain. A report entitled, "Distribution and Chemistry of Diagenetic Minerals at Yucca Mountain, Nevada" has been prepared. A letter report entitled, "Impact of Fault-Related Mineral Deposits on Site Characterization at Yucca Mountain: Studies as of July, 1985" was prepared for WMPO. The major conclusion of this report is that no mineralogic evidence has been found that would require deep-seated spring origin for the deposits within faults at Yucca Mountain.

Transportation

A plan for addressing the U. S. Air Force EA transportation questions was prepared and submitted to WMPO for review. Recommendations were sent to WMPO on organizing a DOE/HQ transportation working group.

Meteorological Monitoring Plan

WMPO approved the Meteorological Monitoring Plan. The Quality Level Assignment Sheets (QLAS) for the monitoring program were revised and all approvals were received on July 3. REECo erected the 10-meter towers in June, and the 60-meter tower was up by mid-July. SAIC has received the equipment which will be QA audited, calibrated, and installed in August 1985. The monitoring system is scheduled to be operational by early September. A procedure manual and a Readiness Review will be prepared following equipment installation.

Satisfactory results of the MMP equipment acceptance testing were received, reviewed, and the disposition of SAIC Nonconformance Report (NCR) SAIC-1 was verified and closed on July 22. A copy of the accepted verification was transmitted to WMPO.

NCR SAIC-2 was verified and closed on July 9. A copy of the accepted verification was transmitted to WMPO. This cancels the requirement for a stop work order as requested by SAIC on June 27, 1985. A copy of NCR SAIC-2 has been transmitted to WMPO.

Socioeconomics Study Plan

Work on a Socioeconomic Field Activity Plan has been discontinued until a decision is made by DOE/HQ concerning the timing for the plan. SAIC will continue to work on the activities necessary for the plan.

Work on a framework for quantifying socioeconomic impacts is proceeding on schedule as provided in the February 1985 draft annual Socioeconomic Studies Plan. Alternative computer models are being evaluated.

Planned Work

Los Alamos will prepare the report on the thermodynamics of albite, extend modeling of kinetic controls on the distribution of silica polymorphs in Yucca Mountain, and make a detailed examination of the feasibility of using solubility measurements to determine thermodynamic properties for zeolites.

The remeasurement of the neptunium isotherms on GU-31203 crushed rock under controlled atmosphere conditions are due to start within a week.

A meeting is planned for August 13 at SNL to discuss the status of coupled processes investigations within the NNWSI Project.

Work will begin on the XRD reanalysis of samples from drill hole USW G-1. This reanalysis is necessary because the initial work on these samples in 1979-1980 was by film methods that are not as quantitative as XRD.

Seismic refraction and reflection feasibility studies will begin August 5, 1985, at the reference conceptual site. Downhole velocity surveys will be conducted in the exploratory boreholes. Laboratory velocity measurements on core samples will be used for correlation of in situ velocity.

PROBLEM AREAS

The new packer equipment was tested at a facility provided by the Bureau of Reclamation at Santa Nella, California (San Luis Rey Reservoir in Central California). The packers failed in the initial testing at 4500 psi. Later in the month, the packers again failed at 8500 psi. The goal is to hold at a pressure of 10000 psi. The testing is continuing. In situ stress measurements are planned at El Cajon and Black Butte, California and at Yucca Mountain.

Milestone R397 (Report on Planned Field Demonstration of Matrix Differential and Particle Transport), scheduled for August 1985, may be delayed. This report has not been baselined and no completion date has been set.

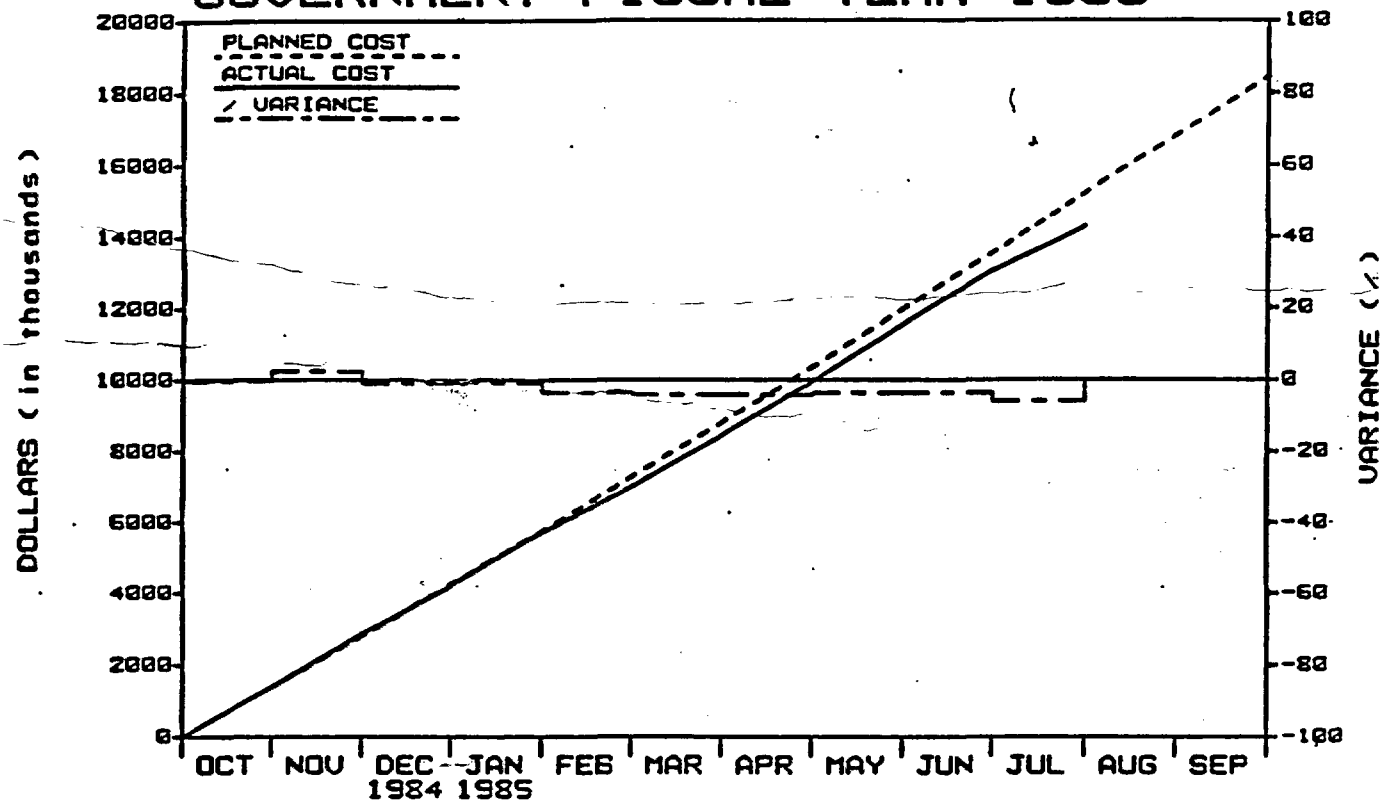
Milestone M318 (Report on the Transport of Radionuclides by Fracture Flow in Yucca Mountain tuff under Saturated Conditions), scheduled for May 30, 1985, has been delayed. No completion date is available at this time.

Milestone M313 (Summary Report on Sorption Measurements Using Well J-13 Water) scheduled for June 28, 1985, is progressing slowly. VAX problems and other commitments have delayed the effort. No new completion date has been set.

Milestone M323 and M325 (Report on Two-Dimensional Simulation of Geochemical Transport in Yucca Mountain), schedule for June 28, 1985, has been delayed. A draft report is undergoing QA review. The written approval of the draft Transportation Studies Plan submitted to WMPO in February is pending.

The delay of the start of field measurements will likely affect the scheduled completion of Milestone N448.

WBS X.2.3 SITE INVESTIGATIONS
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	1392	2797	4244	5733	7262	8795	10361	11968	13548	15218	16826	18443
COST (X1000)	1386	2861	4200	5685	6996	8423	9939	11526	13050	14299	0	0
VARIANCE (X1000)	6	-64	44	48	266	372	422	442	498	919	0	0
/ VARIANCE	0	2	-1	-1	-4	-4	-4	-4	-4	-6	0	0

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M354	LANL	1.2.3	Letter Rpt. on Groundwater Chemistry along Flow Path	◆											
M357	SNL	1.2.3	Weapons Test Seismic Rpt.				▲								
M356	LANL	1.2.3	Complete Rpt. on Volcanic Hazards Analysis		◆										
M355	LANL	1.2.3	Progress Rpt. on 3-D Mineralogic Model of YM	◆											
M364	SAIC	1.2.3	Implementation of Meteorological Monitoring Plan									△			

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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 package within the repository system.

ACTIVITIES

Repository Management and Integration

Work for the SCP-CDR continues as scheduled. Upon completion of their involvement in the MRS Repository-Interface Study, BNI will resume work as required to address repository surface-facility design for the SCP-CDR. Present plans are that BNI will resume work for the CDR on or about August 15, 1985. Parsons Brinkerhoff Quade & Douglas, Inc. (PBQD) continues with work relative to the underground portion of the design. Parts 2 and 3 of the report text by PBQD, as reflected by the annotated outline, have been sent to SNL for review.

A meeting of the NNWSI Project working group on seismicity and tectonics convened in Las Vegas, Nevada, on July 22-23, 1985. Draft definitions were discussed and will be used as a strawman for further deliberation with NRC technical staff. A "Delphi-session" was held and expert opinion was obtained from USGS scientists regarding site tectonics.

BNI is preparing a draft plan for future tectonics investigations relating to the repository surface facility. A work plan that details procedures to be followed in trenching and geophysical investigations will be appendices to the plan.

Hydrologic data is being compiled for input to the USGS to coordinate the tabulation of known data for Chapter 3 of the SCP.

Field Testing

The paper entitled, "Evaluation and Accuracy of Continuum-Based Computational Models in Relation to Field Measurement in Welded Tuff" (SAND85-0261C) was submitted to the September 1985 International Symposium on Fundamentals of Rock Joints.

The first draft of the G-Tunnel Heated Block Experiment Final Report has been completed.

Water-Migration Analysis

Hydraulic-conductivity testing is continuing at PNL. SNL has been informed that laboratory support by PNL will terminate at the end of the fiscal year because of recent manpower commitments.

The papers entitled, "Coupled Hydrothermal Flows of Liquid and Vapor in Welded Tuff: Numerical Modeling of Proposed Experiment" (SAND85-0636C), and "Slip-Flow Experiments in Welded Tuff: The Knudsen Diffusion Problem" (SAND85-0507C) have been peer reviewed and are to be included in the Proceedings of the International Symposium on Coupled Processes Affecting the Performances of a Nuclear Waste Repository.

Equipment Engineering

Drawings of a 1/12-scale model of the waste package emplacement and retrieval vehicle are complete. A fabrication order for this model will be written.

The report entitled, "Disposal of Canistered Waste in Vertical Boreholes--A Description of the System, Equipment, and Procedures for Emplacement and Retrieval" (SAND84-1010) is in management review.

A final draft of "Disposal of Canistered Waste in Horizontal Boreholes--A Description of the System, Equipment, and Procedures for Emplacement and Retrieval" (SAND84-2640) was completed.

Seal Performance Requirements

The bulk of the effort expended during July 1985 was associated with the preparation of chapters 6 and 8 of the SCP. A portion of these efforts supported Milestone M453, SCP Chapter 6 Initial Input.

The report entitled, "Vadose Water Flow Around a Backfilled Drift Located in Tuff" (SAND84-0369) was published. This report is a companion report to "Hydrologic Calculations to Evaluate Backfilling Shafts and Drifts for a Prospective Nuclear Waste Repository in Unsaturated Tuff" (SAND83-2465).

A computer run was made with the code SPARTAN to evaluate the ratio of individual radionuclide releases to the allowable (NRC) radionuclide releases. The results compare favorably with the results obtained from the FORTRAN program used to determine whether the damaged zone associated with the ES deleteriously influences the performance of the repository.

Sealing Materials

The microstructural characterization has been made of the formulation 82-22 before and after hydrothermal alteration (150°C at saturated steam pressure) to examine the changes apparent from the transformation of the expansive-phase ettringite. The sealing material has been subjected to long-term curing.

The Penn State report (CL-40 CON 14), which is being revised details the results of geochemical/hydrothermal experiments that show considerable reaction in the concrete tested at elevated temperatures. While the specimens were not grossly damaged in a few months, the results point to areas of concern and suggest means for differentiating between favorable and less favorable materials. The results suggest that the use of poorly welded tuff as a component of the sand and coarse vitric aggregate in concrete formulations is less desirable. In spite of the potential advantage of chemical compatibility between the tuffaceous concrete in general and the host rock, the enhanced chemical reactivity of glassy tuff components in the aggregate might result in increasing permeability. In contrast, a highly welded tuff would be much more resistant to reaction and therefore appears to be more desirable.

The alteration data collected from these experiments support a model for the dissolution of the sealant that involved a two-step process: the contracting lechates remove material from the sealant both by a diffusional mechanism through the pore fluid from the interior of the solid to the surface and by surface removal of the sealant in such a fashion that the surface area of the sealant continually changes.

A revised Letter Of Criteria (LOC) was prepared on the determination of the hydraulic conductivity and consolidation behavior of crushed tuff. This LOC was prepared following a detailed discussion of the purpose of the testing with personnel from the Waterways Experiment Station. Because no established testing procedures exist for measuring the hydraulic conductivity or consolidation behavior for large samples, specific testing procedures will have to be developed prior to initiation of testing. The test results will support the development of the design requirements for sealing.

Seal Concepts Development

Air-flow calculations were performed to the significance of the shafts and ramps on potential airborne release of radionuclides. The activities in this WBS task were held to a minimum so that available personnel could support the development of the SCP.

Surface Facilities

BNI has been instructed to start on the consolidation study under the special-studies contract. A task plan has been provided to BNI. The objective is to make a comparison of repository costs for spent fuel disposed at the Yucca Mountain repository--with and without fuel-rod consolidation. Three canister configurations and two emplacement modes will be considered, resulting in six cost estimates being developed for comparison. Inputs to this study are expected to be compiled by BNI by end of September 1985 and a final report will be written by SNL and submitted for SNL management by the end of November 1985.

The BNI QAP for the repository surface facilities Advanced Conceptual Design (ACD) was reviewed and approved by SNL.

Shaft/Ramps

A cost estimate for conventionally driven and machine-driven, small drifts has been completed. This information will be furnished as input to the study of alternative means of assessing geology for exploration.

All shaft and ramp designs for the SCP-CD have been completed.

Underground Excavations

Work is continuing on a report that will relate ground type, support type, opening size, and cost for underground openings anticipated at Yucca Mountain.

PBQD has completed initial designs for mining of the demonstration room at G-Tunnel. Designs include shot-hole patterns and loadings.

All underground designs for the SCP Conceptual Design (CD) have been completed.

Underground Service System

Work has been initiated to investigate the effect of formation water on the underground ventilation system. Work will quantify the quantity of water produced, evaluate the heat removed by the water, and determine the impact of this water on the ventilation system.

A new ventilation study has been authorized that will develop the system required for preretrieval cooldown and will evaluate the system's performance.

Operations and Maintenance

The "base case" for the NNWSI Project fuel-consolidatiton study has been redefined for consistency with the DOE MRS repository-interface study. It is now assumed that 10 percent of the spent fuel to be disposed of will not be amenable to consolidation. (Presumably, this includes high-burnup, damaged, and low-production fuel, but not western utility fuel that might not be consolidated for reasons of cost.)

Two meetings were held to define the fuel-consolidation-study tasks for PBQD and BNI. PBQD will provide underground layouts for four disposal configurations: consolidated fuel in NNWSI Project reference canisters, with vertical and horizontal emplacement; and intact fuel in hybrid canisters, with vertical and horizontal emplacement. PBQD will also provide estimates of mining, drilling and hole-preparation costs, as well as underground equipment and labor costs, for those four options.

BNI will provide conceptual layouts of the Waste-Handling Building for disposal scenarios with and without consolidation, along with the corresponding estimates of construction, equipment, and labor costs.

SNL will have primary responsibility for writing the consolidation-study report, which will be completed and submitted for SNL management approval in November 1985.

Repository Performance Code Development and Certification

The appropriate equations have been developed to add a second joint set capability to the Thomas compliant-joint model. Thus far, the relationships derived have been checked against published joint-closure response and the results are satisfactory. Work will begin next month to code the equations into the Thomas model.

A "hardening" rule has been added to the joint shear-response formulation in the Thomas compliant-joint model. SNL staff agreed on a tentative shear stress to shear displacement relationship based on experimental work on fractures in tuff.

Design Analysis

The first draft of Section 6.3.2.1.2 (Determination of the Maximum Areal Power Density) of the SCP was written. Work proceeded on revision of five Information Need sections for Chapter 8 of the SCP.

The draft report "Investigation of Excavation Stability in a Finite Repository" has been reviewed and recommended changes have been forwarded to the contractor. The report makes the preliminary conclusion that the current model for drift-stability calculations of reflection boundaries and vertical joints striking parallel to the drift is appropriate. That is, other joint orientations or drift locations away from the center of the underground facility do not lead to predictions of larger overstress regions.

Agapito and Associates has completed and mailed SCP reference drift-stability calculations for comparison to those done by SNL.

Thermal Analysis of BWR Spent Fuel Vertical Emplacement (Milestone N451) was completed.

Preclosure Safety Analysis

Work continues at LATA to compile information about available computer codes that may be useful for preclosure radiological-safety analysis. The status of certification and capabilities of these codes is being tabulated. PAP Volume II has been rescheduled, with NNWSI Project CCB approval to July 31, 1985.

PLANNED WORK

Parts 4 through 9 of the SCP-CDR text, as applied to the PBQD effort, are expected to be developed during August 1985. A coordination meeting is scheduled for September 5-6, 1985, to ensure that a united effort by the two A/Es and SNL will resume.

With the completion of the MRS study by BNI, the SCP-CDR work is expected to commence so that a target of preparing a draft of the final report for management review by mid-December 1985 is met.

SNL and WMPO have taken a lead role in the development of the A/E report annotated outline used by all A/Es direction for BNI A/E report, Subtask 2 group activities, networks, and detailed schedule for work completion, and annotated outline for Subtask 2 group composite report.

Cost Estimates and A/E Reports are planned for completion on August 15, 1985.

The Final Report by Subtask 5 Group is planned for completion on August 30, 1985.

The BNI draft A/E report, due July 18, 1985, was issued as scheduled, as were other commitments. Indications are that the final report due to DOE-HQ on August 15, 1985, will be delivered as required.

Work to be done includes: initiation of writing on Final Report: Small Diameter Heater Experiments; resumption of pressurized slot testing; initiation of permeability testing for welded tuff mining evaluations; and completion of drilling of permeability holes from U12g.12 drift up to the welded tuff mining area.

Work planned for August through September 1985 includes continuation of parameter-effects testing at RE/SPEC and SNL; completion of a draft report on the laboratory-determined bulk, thermal, and mechanical properties of the Topopah Spring Member; preparation of a draft report on the thermal conductivity and thermal expansion of lithophysae-rich Topopah Spring Member, and continuation of the heat-capacity study of tuff samples from Yucca Mountain.

Efforts will be devoted to the determination of the sealing design requirements. The length of time required to complete this task will depend on the time needed to revise Chapters 6 and 8 of the SCP and the time required to prepare for and attend the NRC workshop on the construction of the ES.

The preparation of the seal-materials-evaluation reports will continue. Also, a limited amount of laboratory testing will be defined to support the degradation model. The results from this testing and all previous laboratory testing will be used to establish the sealing design requirements and will be reported in the sealing-design-requirements report.

Design requirements will continue to be defined through the use of additional hydrologic and performance-assessment calculations. The contents for the SCP-CDR (sealing portions) will be investigated in the near future. Following this effort, the sealing portion of the SCP-CDR will also be prepared.

BNI has submitted a quotation for the ACD of the surface facilities. SNL is preparing a detailed breakdown of the scope of work so that the BNI quotation can be evaluated.

PROBLEM AREAS

Every effort will be made to meet the August 30, 1985, completion date for the SDR (Milestone N433) but a possibility exists that the complications of resolving comments and the competition of personnel resources may force completion to be delayed.

BNI has exceeded the initial estimate of 5,000 manhours specified by DOE/HQ for completion of the MRS Repository-Interface Study. However, this work will also support the SCP-CDR and the fuel-consolidation study that is yet to be completed by BNI. The sum and substance is that the total contract cost authorization will not have to be increased and work required by the contract will be accomplished.

The design of the development prototype horizontal drill is continuing; completion is scheduled for September 30, 1985. Fabrication of the horizontal drill will be delayed because of a change in procurement plans. The fabrication contractor will now be selected on a competitive basis instead of sole source. The anticipated delay in fabrication is six to nine months.

Work continues on the final report for the heated-block experiments. Since reviews of this document were not completed and corrections were not made to meet the July 31, 1985, date for Milestone M433, this report will be about one month late.

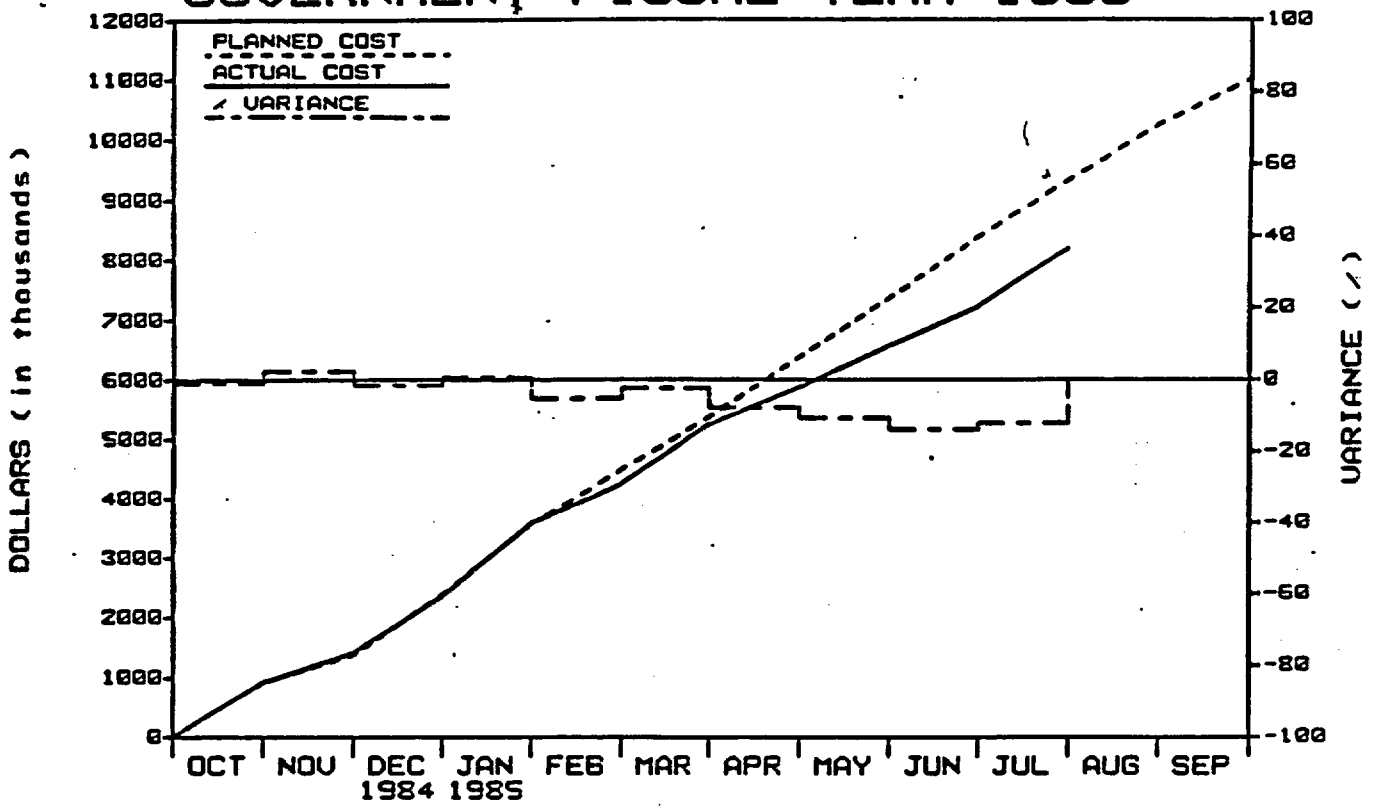
Since the same principal investigator is involved in preparing the final report for Milestone N444, this milestone will be met about one month after the scheduled date.

Involvements with the SCP, Milestone N411, and the NRC workshop on the ES will delay completion of the sealing-requirements report by at least 4 months.

The question of whether to consolidate the fuel or not, and the current effort by BNI on the MRS study, will definitely affect the ACD effort because the resolutions to these two issues are not expected before early 1986.

Commitments to the SCP have stopped progress on problem-definition memos for future work on thermal loading (allowable areal power density) and thermomechanical effects of emplacement of waste at close borehole spacings. This work is needed for design guidance to the A/E during ACD and the delay of the start of this work may impact ACD.

WBS X.2.4 REPOSITORY INVESTIGATIONS
GOVERNMENT FISCAL YEAR 1985



PLAN (x1000)	917	1359	2380	3565	4492	5380	6374	7362	8384	9329	10253	11011
COST (x1000)	909	1392	2344	3592	4256	5256	5876	6575	7224	8196	0	0
VARIANCE (x1000)	8	-33	36	-27	236	124	498	787	1160	1133	0	0
/ VARIANCE	-1	2	-2	1	-5	-2	-8	-11	-14	-12	0	0

VARIANCE EXPLANATION: Underrun is due to subcontractor costs not being received in time for July costing, and, the redirection of work effort to the SCP. Also, no fuel consolidation study has been done. Replanning is being undertaken.

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
N406	SNL	1.2.4	Horizontal Waste Emplacement Equipment Development Plan									△			
M447	SNL	1.2.4	Seal Development Plan for Repository		◆										
M430	SNL	1.2.4	Start Repository Conceptual Design												△
M432	SNL	1.2.4	NNWSI Project Site Specific Repository Design Concept Rpt.												△
R014	SNL	1.2.4	NNWSI Project Design Study: MRS - Repository Interface Task Force											△	

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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 Policy Act (NEPA) of 1969, and the Nuclear Waste Policy Act (NWPA) of 1982, 10 CFR Part 60, and 40 CFR part 191.

ACTIVITIES

Regulatory Interactions

The NRC approved issuance of the final unsaturated zone amendment to 10 CFR 60. Copies of the final rule were distributed to NNWSI Project participants. The NRC regulation for radiation protection, 10 CFR 20, is being extensively revised by the NRC and should be issued in August 1985 for public comment. Copies of the proposed revision and supporting rationale were received prior to preparing NNWSI Project comments.

Evaluation of Licensing Information Management System (LIMS) needs and objectives continued. Visits were made to ONWI on June 27, 1985 and BWIP on July 10 for familiarization with equivalent systems that are currently in place.

Support of NNWSI Project preparations for NRC meetings continued. A NNWSI Project/NRC meeting on the Waste Package was held at LLNL on July 23-24.

The SNL Data Records Management System (DRMS) is designed to archive documents pertaining to laboratory and field experiments run during the life of the NNWSI Project. As of July 24, 1985, the DRMS contains data sets for 177 laboratory tests and 25 field tests. The number of data sets is increasing at a rate of roughly three per month. In addition to data sets, reference notebooks have been added to the DRMS. Reference notebooks archive documents that are common to a number of data sets. The DRMS presently includes 44 reference notebooks, most of which pertain to laboratory data.

The proposal for the SNL interim records management was given to ESI in Denver, CO, on July 18, 1985. This proposal, which represents the SNL approach to QA records management, is to be commented on by ESI.

Site Characterization Plan

The internal review of SCP Chapter 7 (Waste Package) was held in Las Vegas between July 17 and 19. The internal review of SCP Chapter 3 (Hydrology) was completed between July 29 and 31. Extensive revisions to Chapter 3 were suggested by the IRC, and the USGS was asked to provide an estimate of the effort required to revise the document.

A draft of SCP Section 8.2.1 (Issues) has been completed. The remainder of the section is scheduled for completion by September 6, 1985. The rewrite of Section 8.4 (Site Preparation) was completed on July 29. Chapter 5 was sent to the IRC so that preparations for the review meeting scheduled for August 1 and 2, 1985, could be made; Chapter 1 will be distributed to its IRC during August.

Most of the Information Need Data Outlines (INDOs) have been received from the NNWSI Project participants. A few INDOs from USGS, half of the INDOs needed for 8.3.5 (Performance Assessment) from SNL, and all the INDOs for 8.3.4 (Waste Package) have not been received. The INDOs have been reviewed and comments returned to the participants. The major disconnects are in the correspondence between the parameters, the testing activities, and the milestones. The site program, especially geology and hydrology, will require the most work. Work has begun on scoping the content of 8.3.1 (Site) based on reviewers' comments on the data chapters, and on the requirements imposed by the DOE guideline and the Federal regulations.

Five SCP milestones have been completed: Information Need Data Outlines (INDOs) for Chapter 8 Section 8.3.1 Site Program, (Milestone M513); INDOs for Section 8.3.2 Repository Program, (Milestone M571); INDOs for Siection 8.3.3 Seals Program, (Milestone M572); INDOs for Section 8.3.5 Performance Assessment Program, (Milestone M576); and Chapter 6 Initial Input, (Milestone M453).

Revisions to Chapter 2, resulting from the IRC review in late June 1985, have been completed and submitted with the exception of the section that discusses in situ stress, which awaits written interaction by other participants, and the section to be added on soil properties. These sections and the corrected figures will be completed in time for distribution with the text for the DOE-HQ Chapter 2 review. An SCP "write-in" was conducted during the week of July 22-26, 1985, for all SNL authors of Section 8.3. The objectives were to review the draft write-ups for completeness and for interfaces with other SCP sections. Particular attention was placed on interfaces between design (Chapter 6), performance (Section 8.3.5) and repository (8.3.2 and 8.3.3). Review comments are being incorporated into the write-ups. It is anticipated that sections 8.3.1, 8.3.2 and 8.3.3 will be delivered to SAIC by August 6, 1985.

Environmental Compliance

Key Issue 3 of the Issues Hierarchy, is being reviewed and revised by the Environmental Compliance staff, and comments will be provided to the Issues Hierarchy Review committee.

Environmental Assessment

Comment responses were summarized into issue responses and were then compiled into the draft EA Comment Response Appendix (CRA). The draft CRA was author-reviewed at a NNWSI Project workshop on July 31. EA CRA authors from SAIC, SNL, and Los Alamos attended the workshop.

The EA Management Plan was reviewed by WMPO. Comments will be incorporated into the draft and a final published. The EA program Quality Level Assignment Sheets (QLAS) were prepared and received approvals.

Exploratory Shaft Geomechanical Test

A problem-definition memo that requests calculations supporting the shaft-convergence test in the draft ESTP was written, reviewed, and sent to RE/SPEC. Convergence will be assessed through elastic calculations with and without a 1-ft concrete liner.

PLANNED WORK

Site Characterization Plan

Internal reviews of the SCP that are scheduled for August 1985 are: sections 8.4, 8.6, and 8.7 August 19-21; Chapter 6 (Repository) and sections 8.3.2 (Repository) and 8.3.3 (Seals) August 21-23 (changed to September 3-6, 1985); and Chapter 5 (Climatology) August 1-2. The OCRWM review of Chapter 2 is scheduled for August 29-30.

Environmental Assessment

Work is continuing on the Environmental Permitting Plan that is being prepared to identify permits for the site characterization activities and explain the procedures necessary for WMPO to follow to obtain each permit. A draft of the plan will be sent to WMPO for review in August 1985.

The draft CRA is due to DOE/HQ on August 8, 1985. The NNWSI Project Technical Overview Committee (TOC) will meet on August 12-15, to review the draft. A DOE/HQ review workshop is scheduled for August 20-23, 1985. The final EA is still scheduled to be completed on December 20, 1985.

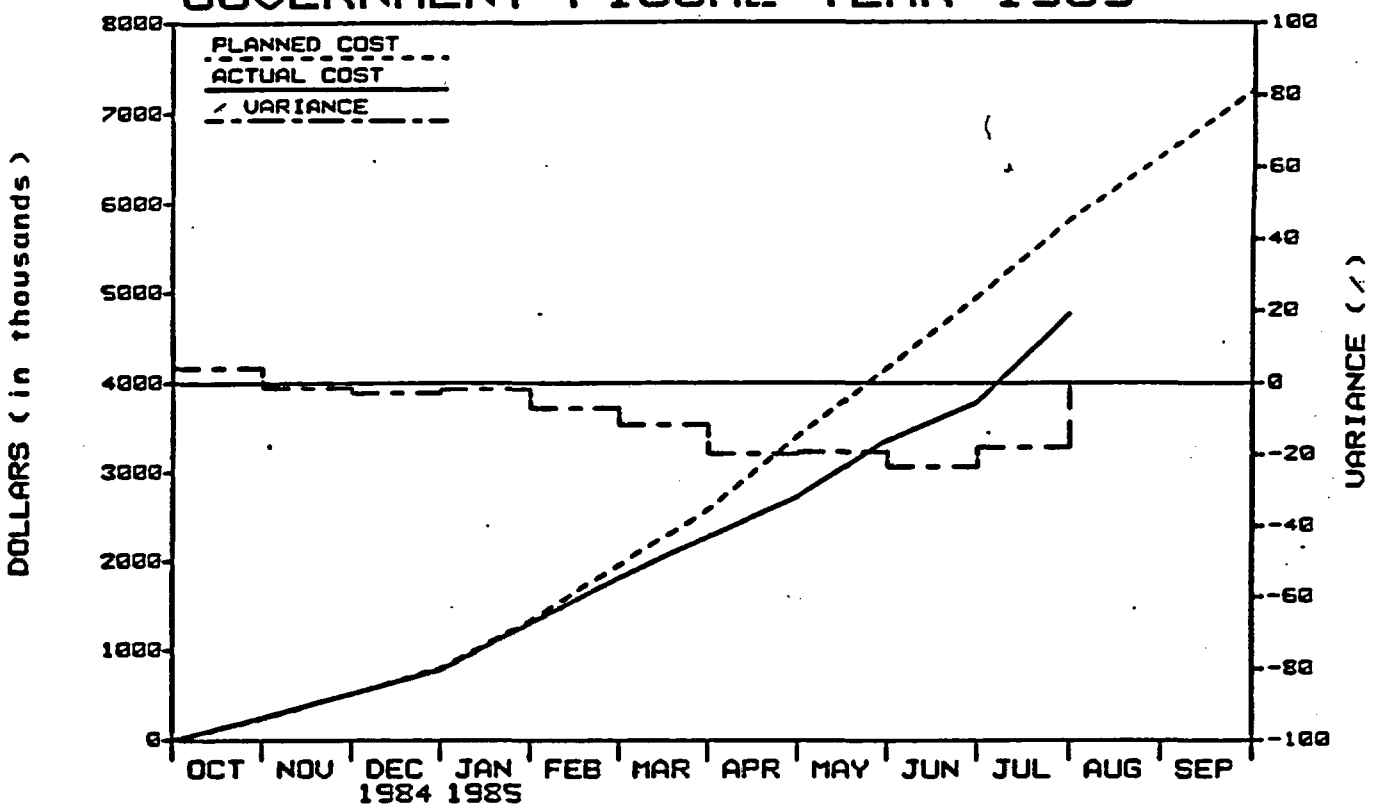
Preparations for an EA Findings Analysis meeting and OCRWM site visit scheduled for August 5-8, 1985, were completed during the last week of July. The site visit will include a one-day meeting on EA findings, a tour of Climax mine and G-Tunnel, and a field trip to the Yucca Mountain site. An EA TOC workshop is scheduled for August 12-15, 1985 in Las Vegas, and a program wide EA workshop is scheduled for August 20-23, 1985 in Washington.

The next issue of the CRA will be sent to DOE-HQ on August 9, 1985, for review and will be followed by a DOE-HQ and Project Workshop on August 20-23, 1985, in Washington, DC.

PROBLEM AREAS

The NRC Workshop, EA, and copper papers have taken over first priority for the project and are delaying the writing of the SCP Chapter 8 information needs and chapter input.

WBS X.2.5 REGULATORY & INSTITUTIONAL
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	245	522	805	1328	1953	2576	3406	4164	4952	5810	6522	7255
COST (X1000)	255	515	783	1306	1816	2275	2734	3361	3791	4767	0	0
VARIANCE (X1000)	-10	7	22	22	137	301	672	803	1161	1043	0	0
% VARIANCE	4	-1	-3	-2	-7	-12	-20	-19	-23	-18	0	0

VARIANCE EXPLANATION: Underrun is due to the SCP being behind schedule and the laboratories are not meeting their deliverables. Also, the costs for the State Grant are still well below the planned amount.

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M523	SAIC	1.2.5	NNWSI Project References for EA Complete		◆										
M502	SAIC	1.2.5	Draft Environmental Assessment		▲										
M504	SAIC	1.2.5	Final Environmental Assessment								△				
M503	SAIC	1.2.5	EA Comment/Response Document								△				

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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

Exploratory Shaft Facility Management and Integration

The last F&S design review comments for the ESF subsurface facilities design were transmitted to DOE/NTS in Mercury. A Design Review Comment Resolution meeting was held on July 1-2 at DOE/NTS. The major design issued include the ES-1 shaft and ES-2 shaft bottoms, ES-2 liner and hoisting system, and the underground ventilation system.

A joint meeting (DOE, NNWSI Project, BWIP, and Salt) was held on July 8-9 in Denver to prepare for the DOE/NRC Workshop that was held on July 18. The purpose of the meetings was to discuss generic issues of the ESF.

The July ESTP Committee meeting was held on July 11-12 at USGS/Denver.

The meeting with F&S to discuss the test hole drilling was held in Mercury on July 18.

Exploratory Shaft Test Plan

Internal (USGS, SNL, LLNL, and Los Alamos) reviews of the individual Rev. 1 test plans continued until July 19. Many changes were made to Chapter 5 (Rationale) based on reviewers' comments. Appendix B (Cost and Schedules) was completed. It is expected that the document will be delivered to WMPO by August 2.

A preliminary draft of the ESTP (Rev. 1) document was sent to WMPO on July 23.

The draft conceptual test plan for the Waste Package Environment Tests has completed WMPO review (UCID 20450) and will be printed for limited distribution as soon as final QA and management reviews have been completed at LLNL. This plan is included in Part II of NNWSI Project Exploratory Shaft Test plan (ESTP) Rev. 1. Thermomechanical scoping calculations using a finite element code were completed last month in support of technical concept development.

Work continued on approaches for identifying and evaluating alternative means of characterizing portions of the repository block located laterally around the ES. Following a review of pertinent techniques for evaluating alternatives, a decisions was made to use a "figure of merit" approach to making the assessment. Although it does not provide direct comparison of relative costs of alternatives, it is a more appropriate choice where assignment of dollar value to alternatives is not possible and where a high degree of subjectivity is present.

A draft annotated outline for OCRWM underground test plans was critically reviewed for content, and for its applicability and implications for the NNWSI Project ESTP. The draft outline, dated June 25, was found to have serious technical and programmatic shortcomings. Comments were provided to the NNWSI Project representative on the Underground Testing Coordinating Group of the OCRWM.

Estimates of needs for NTS dormitory facilities during ES testing were provided to WMPO.

Exploratory Shaft Integrated Data System

Work began on the draft Final IDS Hardware Design Document. This document will describe the ES IDS hardware by location within the complex, and the design will match the requirements of the ESTP Rev. 1.

Exploratory Shaft Geomechanical Test

A problem-definition memo that requests calculations supporting the shaft-convergence test in the draft ESTP was written, reviewed, and sent to RE/SPEC. Convergence will be assessed through elastic calculations with and without a 1-ft concrete liner.

Engineered-Barrier Design Testing

The main phase of high frequency electromagnetic (HFEM) geotomography work in the sand pit has been completed. These results of the sand pit experiments show that a simulated fracture can be observed clearly with HEFM techniques. Subtle changes in the surrounding sand were also apparent; these changes occurred as the simulated fracture was being pulled from the pit. HFEM measurements obtained while removing the fracture show that the attenuation of the sand increased as the sand compacted. Compaction occurred as the sand was struck with a hammer to help loosen the simulated fracture during its removal. The evidence collected in the sand pit suggests that HFEM methods are unlikely to create misleading artifacts in the resulting geotomographs. The test results further suggest that G-Tunnel test measurement anomolies that were not verified by dye-stained core are nevertheless of significance. A first (rough) draft of a report was completed this month in which the field experiment, sand pit experiment, and computer simulation study are described.

PROBLEM AREAS

F&S is updating and extensively reorganizing the ESF subsurface facilities construction drawings. Although F&S claims that they will accomplish the update and reorganization by September 6, it appears doubtful this can be done. On July 30, it was reported that approximately half (45 percent) of the drawings are ready for checking and 13 percent of the drawings have been checked by the F&S drafting department. To complete the effort on time will require the completion and checking of two drawings each day for the remaining 27 working days, plus all the required specifications and design studies. Another design review will probably require until October 1 to complete.

F&S is also outlining the drawings for construction support of testing, which will also be part of the design package and subcontract (no such drawings currently exist). Although it now appears that these drawings will not be as difficult as the subsurface facilities construction drawings, there will be a minimum of 30 such drawings. It was hoped earlier that the engineering test plans for the individual tests would be available as input criteria for the F&S design process.

The engineering test plans will not be ready in time to complete the design package so that the subcontract can be written on schedule. This is to be followed by the bidding process, awarding of the subcontract, purchase of shaft steel, and the start of shaft sinking (August 1986). The only source of criteria that is currently available for developing the drawings for construction support of testing is the ESTP Rev. 1. Information will be abstracted from the ESTP to develop strawman drawings and specifications. These drawings and specifications will then be sent to the Principal Investigators for review and comment.

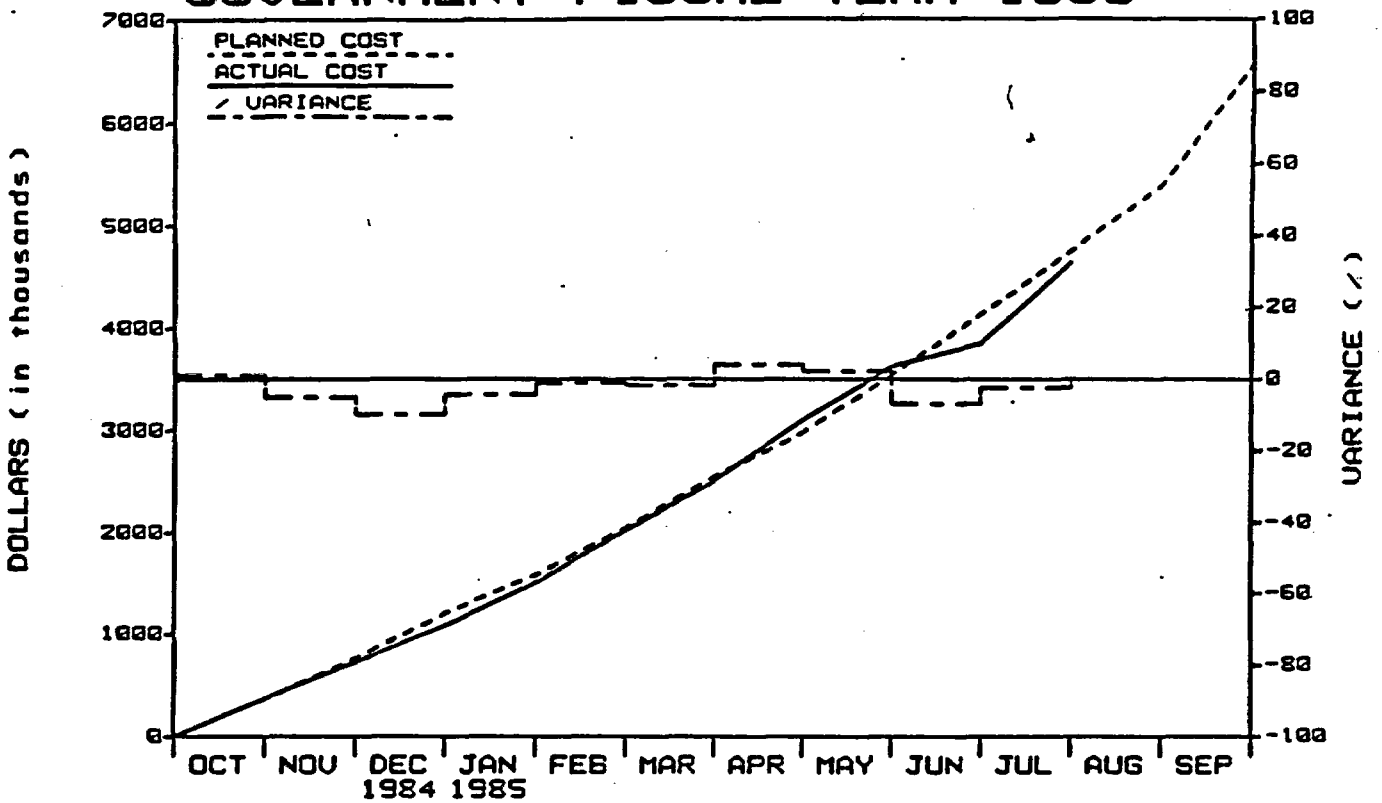
With all the unanticipated meetings and the impending QA audit, it will be difficult for Los Alamos to expend any time in August in support of the ESF design effort.

Milestone M026 (NRC/DOE ES Design Workshop) is scheduled for August 27-28, 1985. Milestone M248 (Complete resolution of NRC issues on ES shaft design and construction) is dependent on this milestone. No completion date is available.

Milestone M665 (Submit ESTP Rev. 2 to WMPO/NV) has been delayed because of delays in completed Rev. 1. It is now scheduled for January 1986.

Some personnel continue to be diverted to other NNWSI Project activities; this is delaying instrument evaluations that support test plan development.

WBS X.2.6 EXPLORATORY SHAFT
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	366	762	1194	1573	2042	2546	2978	3542	4130	4747	5384	6555
COST (X1000)	370	724	1076	1504	2020	2502	3095	3619	3846	4635	0	0
VARIANCE (X1000)	-4	38	118	69	22	44	-117	-77	284	112	0	0
/ VARIANCE	1	-5	-10	-4	-1	-2	4	2	-7	-2	0	0

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M666	LANL	12.6	Issue Exploratory Shaft Test Plan												△

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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

Staff efforts continued to focus on analysis of the results of post-test thermomechanical calculations and reporting on the results of post-test laboratory and field studies.

Geological Investigations

Revisions and corrections were completed for a report on the results of in situ deformability measurements at the SFT-C. This report documents nearly 250 deformability measurements which show the effects of loading direction, heat, proximity to major geologic features, and the general spatial variability of the deformability throughout the region of the test. These complexities have been addressed by developing models for subsets of the data and using an appropriate variety of statistical analyses to test the validity of the models and the significance of the observed effects. Because of the sophistication of the analyses, an additional review of the report by a statistician has been undertaken. It is anticipated that this review will be completed in early August so the report can be submitted for publication services.

The report entitled, "Mineralogic and Petrologic Investigation of Post-Test Core Samples from the SFT-C" has been distributed as UCRL-53625.

The report entitled, "Heater Test 1, Climax Stock Granite, Nevada" has been distributed as UCRL-53496.

Post-Test Instrumentation Evaluations

Following WMPO programmatic review, final revisions are being made to a draft report on laboratory evaluations of the repeatability and hysteresis response of the USBM overcore gauge. This study shows that the hysteresis, which appears to be very large when the gauge is calibrated with the standard fixture, is on the order of a few percent of the gauge output for typical ranges of displacement experienced in overcore tests in hard rocks.

Post-Test Calculations

A draft report summarizing the results of recently completed ADINA/ADINAT calculations of the thermomechanical response of the SFT-C was written. The calculations use ranges of deformability and in situ stress values to assess how well the rock mechanical response was modeled with the input data obtained from both pretest and post-test measurements at the site. Informal review of the document identified several additional data analyses and presentations which would clarify the analyses and strengthen the conclusions of the report. Necessary changes are nearly complete.

Work continued on analyses of geomechanical data that were acquired during the three-year heating phase and six-month cooling phase of the SFT-C. Data plots, which were prepared earlier, were analyzed to determine trends that are indicative of rock mass behavior during the different phases of the test. Preliminary analyses were completed and report writing is in progress.

In a continuing effort to improve the quality of agreement between measured and calculated energy removal, several techniques for estimating heat transfer properties that are important to modeling energy removal in a ventilation airstream are being examined. Techniques identified to date are under continuing development in the mining industry where the rock mass at great depth significantly heats the ventilation airstream, leading to a need to air condition deep hot mines.

Data Management

Work began on a draft report which will serve the dual purposes of documenting the data reduction procedures used on the SFT-C and releasing the entire data set to the technical community. The report will describe the complete data management system: data receipt and verification activities, processing algorithms, storage and archiving procedures, and plotting and listing functions.

E-MAD

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

Fuel assembly B02 was removed from storage to repeat post-test characterization photography of designated surface areas, in accordance with a Consolidated Procedure prepared for the operation.

Drafts of an operational plan, for fuel assembly B02 fuel rod work, and a Technical Operations Procedure, for replacing two fuel rods which were removed prior to the Fuel Temperature Test were prepared.

Gas and full volume samples were taken from the seal-welded canisters containing fuel assemblies D46 and D47. The D46 canister was cut open, in preparation for fuel characterization on August 1. D47 activities are scheduled for August 2 and 5. Decanisterization and characterization of the last fuel assembly remaining in a seal-welded canister (B41) is tentatively scheduled for the week of August 5.

Integrity monitoring of all fuel assemblies being stored in unwelded canisters was completed. During this reporting period, the unwelded temporary canisters containing fuel assemblies D09, D22, and D34 were retrieved from storage, the fuel assemblies removed from the canisters, contamination swipe samples taken from the fuel surfaces, and the fuel assemblies returned to storage in their canisters.

Post-storage characterization has been completed on fuel assembly D40. The fueled canister was retrieved from storage and cut open; the fuel assembly was removed, visually inspected, videotaped, and photographed. Contamination swipe samples were taken from the fuel surfaces and the interior of the cut canister. The fuel was stored in the Hot Bay lag storage pit in a temporary unwelded canister.

PLANNED WORK

In August staff efforts will focus on analysis of geomechanical data obtained at the SFT-C. Revisions to a draft report on thermomechanical analyses will be completed. Depending upon the demands of other NNWSI Project activities, a draft report on post-test thermal calculations and comparisons with temperature data will be prepared.

"Instrumentation Report No. 3: Performance and Reliability of Instrumentation Deployed for the SFT-C" is expected to be distributed next month.

The B02 fuel rods removed prior to Metal Cask Simulation Test will be replaced.

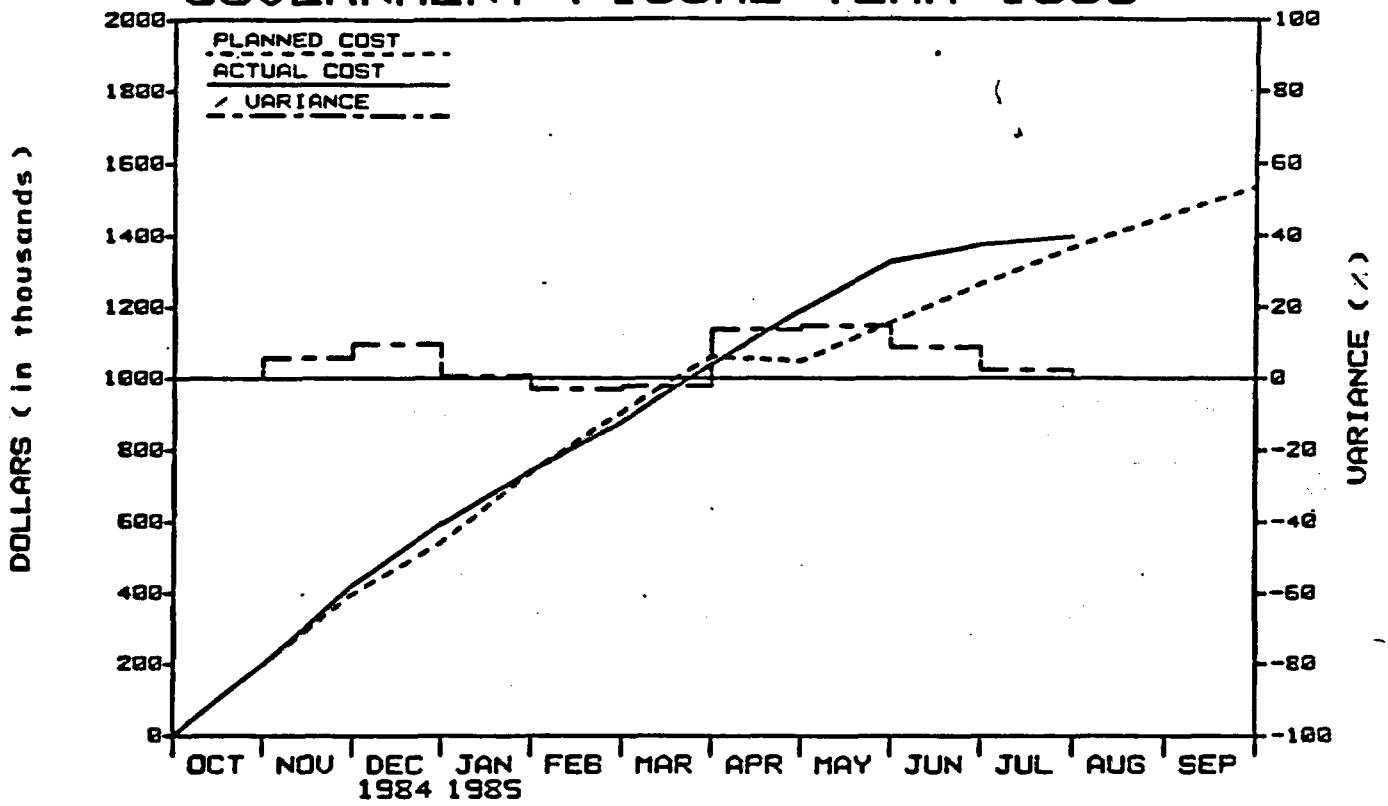
Post-storage characterization of all fuel assemblies in weld-sealed canisters will be completed.

Decay heat rate measurement of fuel assembly D34 will be performed.

PROBLEM AREAS

None.

WBS X.2.7 TEST FACILITIES
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	197	397	543	737	907	1061	1048	1157	1265	1365	1452	1535
COST (X1000)	197	420	595	742	879	1038	1191	1328	1374	1396	0	0
VARIANCE (X1000)	0	-23	-52	-5	28	23	-143	-171	-109	-31	0	0
% VARIANCE	0	6	10	1	-3	-2	14	15	9	2	0	0

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M708	LLNL	1.2.7	Final Report on the SFT-C												△

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

X.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.

X.2.9 PROGRAM MANAGEMENT

OBJECTIVE

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

Project Monitoring System

The NNWSI Project Cost Variance Report; the T&MSS Project cost reports; the Funding Overview, Budget Baseline, and Level 1 milestones data for the NNWSI Project Monthly Progress Report for June, and the financial data for the June MSA Report were completed.

Performance Measurement Data System (PMDS)

System development continued of the Performance Measurement Data System (PMDS). The cost account structure and work packages were completed for the fourth quarter trial-run. BLWS data for all of FY 85, BCWP, and ACWP data through June were successfully loaded into the PMDS data base. The Cost Performance Report (CPR), Cost Plan (by cost account and WBS), Work Package Budget with milestones, Cost Account Budget Report, and Work Package Earned Value Report were obtained as output reports from the system.

The WBS was modified to include the letter "X" as a position holder until the OCRWM WBS identifier for the OGR Program is determined. This allows for the correct number of characters to be maintained in the NNWSI Project WBS and should minimize confusion when refering to a WBS level. Copies were distributed to participants.

The WBS Dictionary was baselined during July. Copies will be forwarded to participants in early August 1985. Any additional changes will require CCB action as with any baselined document.

An updated list of NNWSI Project Baselined Milestones that reflects CCB approved changes through June 27, 1985, was distributed to participants.

A policy statement on transportation was baselined during July. A new binder for Policy, Program, and Project Guidance documents is being prepared and will be distributed as a controlled document during August 1985.

Project Control

A summary booklet of USGS investigations was initiated by SAIC/Golden. Originally, this booklet was to identify the nomenclature associated with planning activities. The booklet was to summarize the names used for the various levels of activity, to summarize the USGS investigations and to establish a standard set of titles used to identify these activities. However, the booklet has the added advantage of defining a structure suitable for the earned value system. The geology part of the booklet has been completed and the hydrology part will be completed in early August.

The preparation of the USGS Project Plan was initiated this month by SAIC/Golden. An outline was developed for the plan to include Site Technical Plans, Project Management Plans, Regulatory and Institution Plans, and QA Plans. The outline was reviewed and is being modified for distribution in early August.

Status was completed on all USGS activities through June 26, 1985. These updates, based on interviews with Principal Investigators, were completed for Topographic Analysis, Heat Flow, and Future Climates. Because of lag time, approximately three weeks is required before these updates are cleaned up and ready for submission to the PIs.

The FY 85 Status Report was initiated this month. The report was rearranged based on an outline prepared for FY 85 investigations. This phase of the task will be reviewed over the next couple of weeks. Once verified, input for FY 85 work efforts will be summarized for inclusion into the report so that each fiscal year Status Report will be a running compilation of previous effects as well.

ESI, the DOE contractor selected to participate in developing an operational records management system with SAIC and the USGS, will develop the USGS pilot records management system software, and will plan for future activities in these areas. A presentation was prepared by ESI to update NNWSI Project participants on the pilot installation activities and plan to date, and to discuss implementation of each participant's records management system. Work continues to be closely coordinated with ESI in developing a database system by providing such items as sample records, updated document title lists, and records types by categories.

Quality Assurance

The final draft (Draft 3.0) of SOP 03-03 "Software Quality Assurance" was completed and will be submitted to WMPO approximately August 5 for distribution to the participating organizations for their review and comments.

The NNWSI Project QA Plan and four SOPs (02-01, 02-02, 03-01, and 15-01) are being revised. The revised documents will be sent to WMPO for review by August 15, 1985.

The first draft of the QA Manual was completed by SAIC/Golden and reviewed with the USGS management. Modifications were made and copies sent to the NNWSI Project QA office for review and comment.

The software QA committee met in Denver, CO, on July 29, 1985, to consider revisions to NNWSI-SOP-03-02, the software QA procedure. The committee reviewed NNWSI-SOP-03-02 and completed the final draft, which will be sent to WMPO for distribution to the appropriate participants for review and comment. The committee recommended that the draft SOP also be sent to NRC for review and comment.

The SNL QA coordinator met with management and QA representatives of BNI and PBQD, major subcontractors involved with the conceptual design of the repository surface and subsurface facilities. Discussions focused on details of contractor QA plans on roles and functions of contractor QA personnel and on the contractors' programs and capabilities.

The status of the unissued Project-wide implementing procedures (SOPs) are as follows:

NNWSI-SOP-17-01, QA Records Management

Work is proceeding on schedule at USGS/Denver on the development of a QA records management pilot system. Two working sessions between USGS and ESI were completed and several more sessions have been scheduled.

NNWSI-SOP-03-02, Quality Assurance Software

A committee meeting was held on July 29 in Denver to review the final draft of the procedure. Although invited, the NRC was not represented at the meeting. The committee finalized the draft and submitted it to WMPO for review suggesting that it also be reviewed by the NNWSI Project participants, DOE/HQ, and NRC.

NNWSI-SOP-03-03, Non-NNWSI Project QA Plan Data or Interpretation Acceptance

A final draft of the procedure will be submitted to WMPO for review and approval by August 9, 1985.

NNWSI Project Audits

Status of FY 85 audits is as follows:

85-1 WMPO Internal - Audits & Surveillances

The audit was conducted on April 10 and 11, 1985. Three audit findings and two observations were reported. The findings are presently being resolved.

85-2 WMPO Internal - Organization and Training

The audit was conducted on May 1 and 2, 1985. Three audit findings and two observations were reported. The findings are presently being resolved.

85-3 WMPO Internal - NCR and CAR

The audit was conducted on May 8 and 9, 1985. One audit finding and three observations were reported. The finding is being resolved.

85-4 WMPO Internal - Document Control and Records

The audit was conducted on May 22, 1985. There were three observations reported that do not require a response. The audit is closed.

85-5 WMPO Internal - Document Review

The audit was conducted on May 23 and 30, 1985. There was one observation reported that does not require a response. The audit is closed.

85-6 The LLNL audit was conducted on July 9-11. There was one observation reported that does not require a response. The audit is closed.

85-7 The WTSD-Westinghouse audit is to take place October 8-10, 1985. A letter of notification has been sent and audit plans have been written.

The status of reviews is as follows:

LLNL — The LLNL QAPP and procedures received by WMPO to date have been reviewed and approved.

USGS — The USGS provided the QASC with a draft copy of their revised QAPP and procedures and a meeting was held on July 25 to discuss their proposed approach to implement the plan. The QASC subsequently provided the USGS with detailed comments to be incorporated prior to formal submittal of the plan to WMPO for review and approval. This informal approach to comment resolution should expedite the approval cycle.

Los Alamos — At the rquest of Los Alamos QA personnel responsible for NNWSI Project QA activities, a meeting was held on July 14 in Los Alamos. The purpose was to discuss the WMPO comments on their QAPP and to establish an informal channel for comment resolution prior to formal submittal of their revised QAPP in August 1985.

Westinghouse — The QAPP and QA procedures that have been recevied by WMPO have been reviewed and approved.

REECo — There has been no response to the WMPO letter requesting REECo to revise the completion dates for submittal of their QAPP and procedures.

SNL — The WMPO comments to the SNL QAPP and procedures were sent to SNL on June 6, 1985. There has been no response from SNL to data. The QASC will follow up.

F&S — A meeting was held with F&S on June 19, 1985, to resolve the open items that were a result of the QAPP and QAP review conducted by WMPO. The open issues were discussed and most were resolved; however, the issue of performance of Level I activities will be reviewed by F&S management. The subject of a time table was also discussed. A request was made that a more favorable time table be established by F&S for submittal of revisions to their QAPP and procedurs which would allow WMPO enough time to review and approve them prior to the close of FY 85.

SAIC-T&MSS — The QAPP and QA procedures that have been received by WMPO have been reviewed and approved.

H&N — H&N submitted a letter on June 14, 1985, which provided commitment dates for various portions of their QAPP and implementing procedures. These dates would appear to be unacceptable if the NNWSI Project exploratory shaft activities remain on schedule.

PLANNED WORK

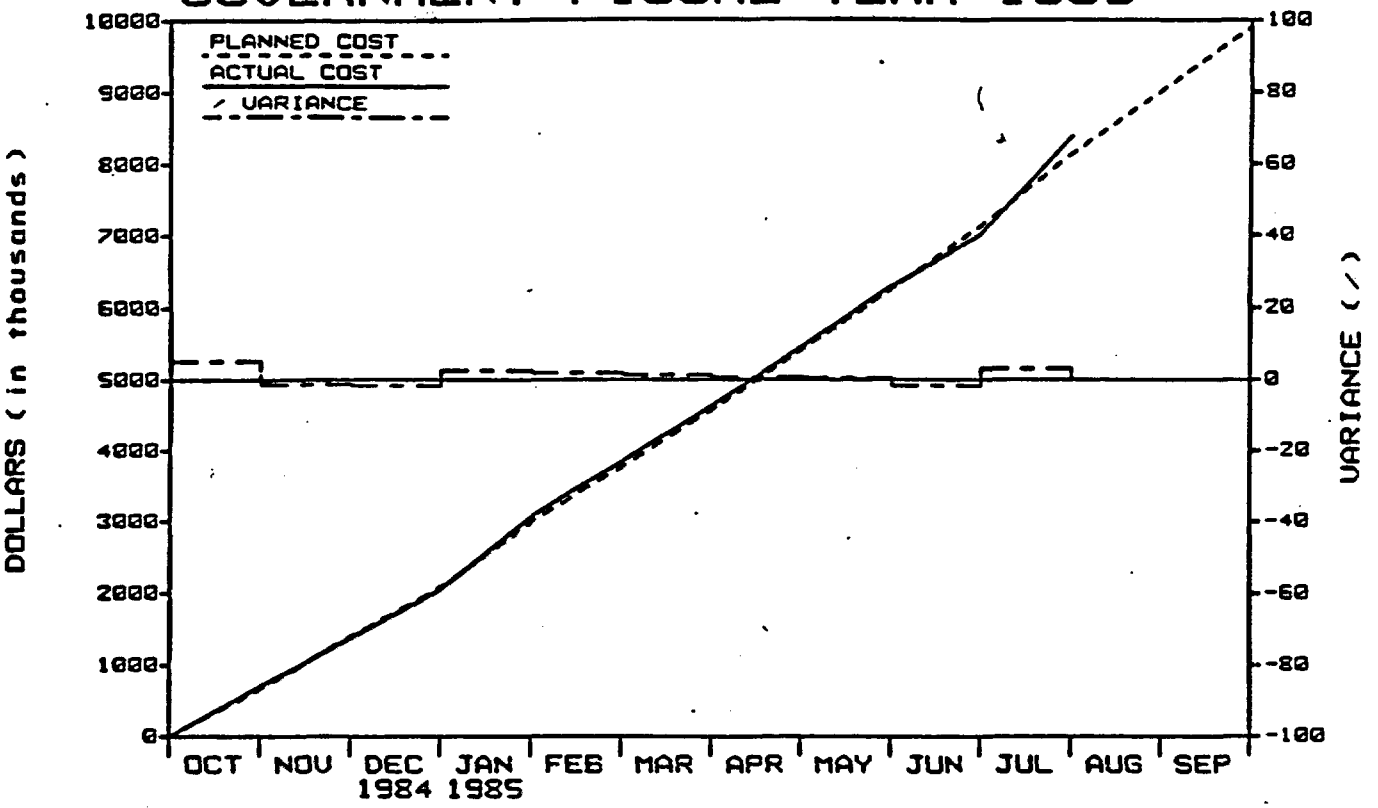
A new due date for final approval has been established as August 2, 1985 for the comments on the Draft Project Management Plan (PMP). All of the revised organization charts have been received and will be used in the final PMP.

Revisions to SNL Energy Programs Instructions and QA Procedures will be generated in response to WMPO comments on the SNL NNWSI Project QAPP and associated QA procedures.

PROBLEM AREAS

An audit team from WMPO visited the LLNL-NNWSI Project offices and laboratories to perform an audit on July 9. After one day of inteview and evaluation of objective evidence the audit was suspended because the recently approved QAPP for NNWSI Project work at LLNL had not been sufficiently implemented. (Official approval of the QAPP was received on July 8). The findings that were discussed during the Exit Meeting pertained to inconsistencies between the LLNL QAPP and the WMPO QA Plan.

WBS X.2.9 PROJECT MANAGEMENT
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	663	1397	2086	2985	3764	4579	5415	6260	7136	8147	9022	9905
COST (X1000)	698	1380	2052	3061	3835	4635	5453	6293	7018	8390	0	0
VARIANCE (X1000)	-35	17	34	-76	-71	-56	-38	-33	118	-243	0	0
/ VARIANCE	5	-1	-2	3	2	1	1	1	-2	3	0	0

MILE-STONE	RESP. AGENCY	WBS	MILESTONE DESCRIPTION	O	N	D	J	F	M	A	M	J	J	A	S
M901	SAIC	1.2.9	Submit FY 1985 NNWSI Project Plan to DOE/HQ						▲						
M915	SAIC	1.2.9	Submit NVO-196-18 (Rev. 2) to DOE/HQ		▲										
M907	SAIC	1.2.9	Draft Project Management Plan						△						

△ PLANNED MILESTONE COMPLETION DATE
▲ COMPLETED AS SCHEDULED

◇ REVISED MILESTONE COMPLETION DATE
◆ COMPLETED AS REVISED

U.S. DEPARTMENT OF ENERGY

OCRWM OGR

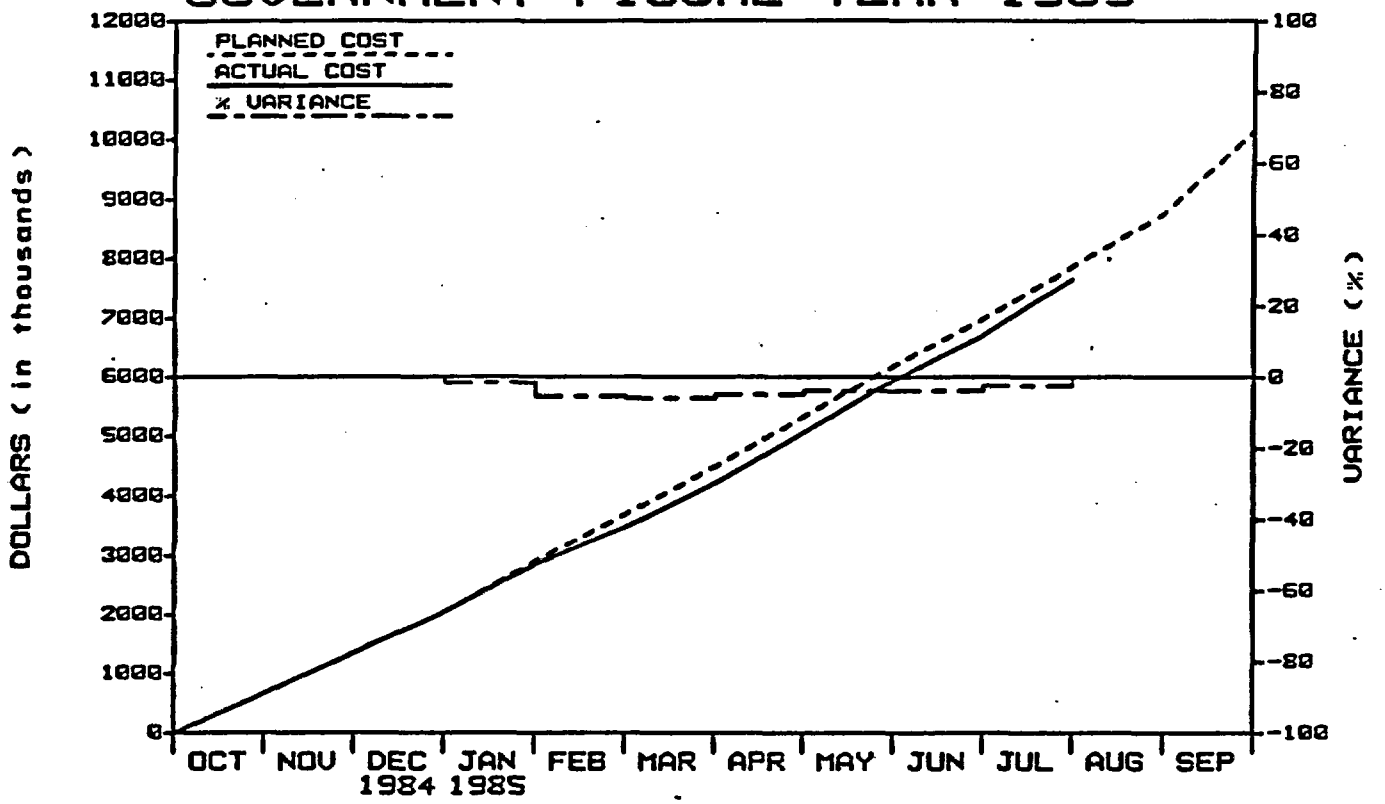
Nevada Nuclear Waste Storage Investigations PROJECT

YUCCA MOUNTAIN

PARTICIPANT

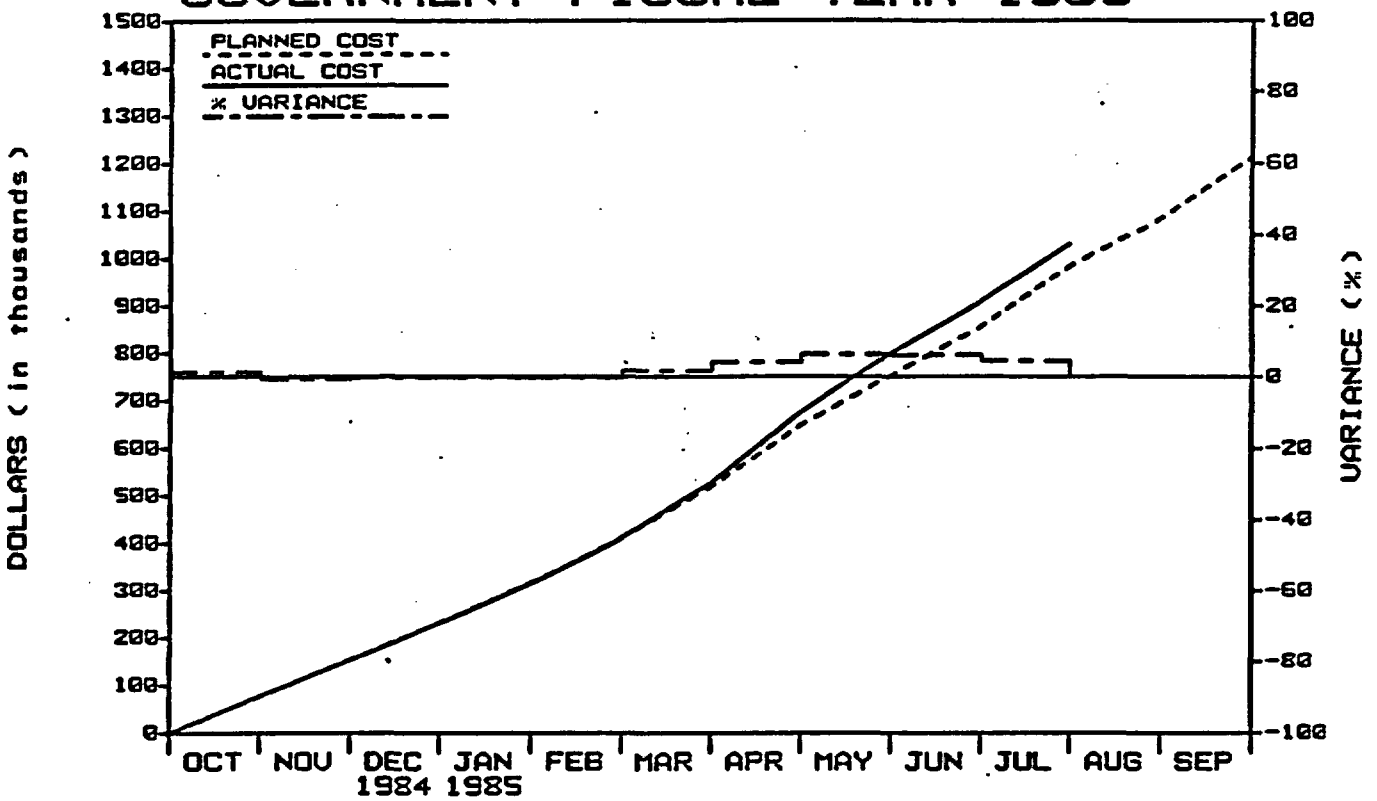
BUDGET vs COST

LOS ALAMOS NATIONAL LABORATORY
GOVERNMENT FISCAL YEAR 1985



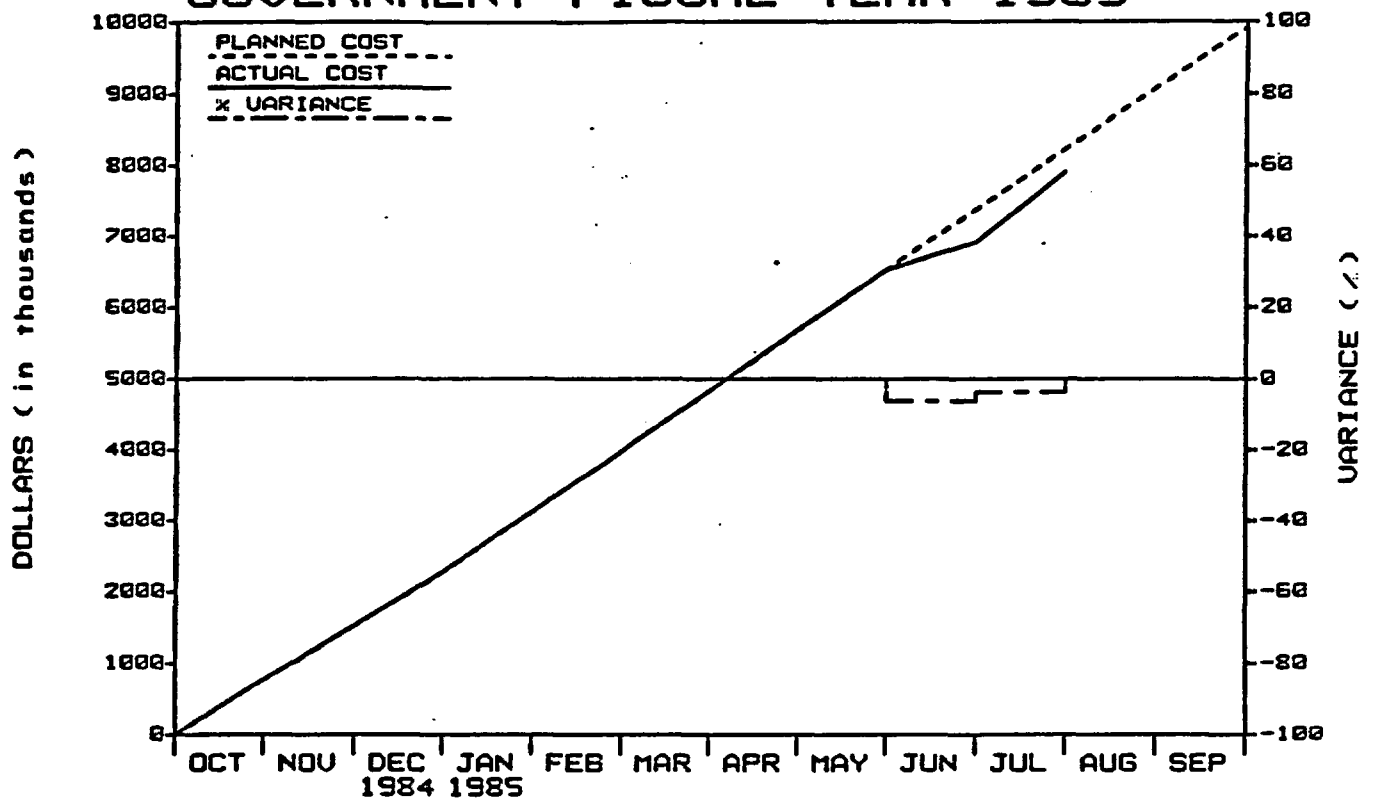
PLAN (X1000)	656	1354	2039	2892	3678	4491	5328	6187	6983	7859	8741	10130
COST (X1000)	656	1354	2039	2842	3471	4213	5060	5941	6700	7652	0	0
VARIANCE (X1000)	0	0	0	50	207	278	268	246	283	207	0	0
% VARIANCE	0	0	0	-2	-6	-6	-5	-4	-4	-3	0	0

FENIX & SCISSON, INC
GOVERNMENT FISCAL YEAR 1985



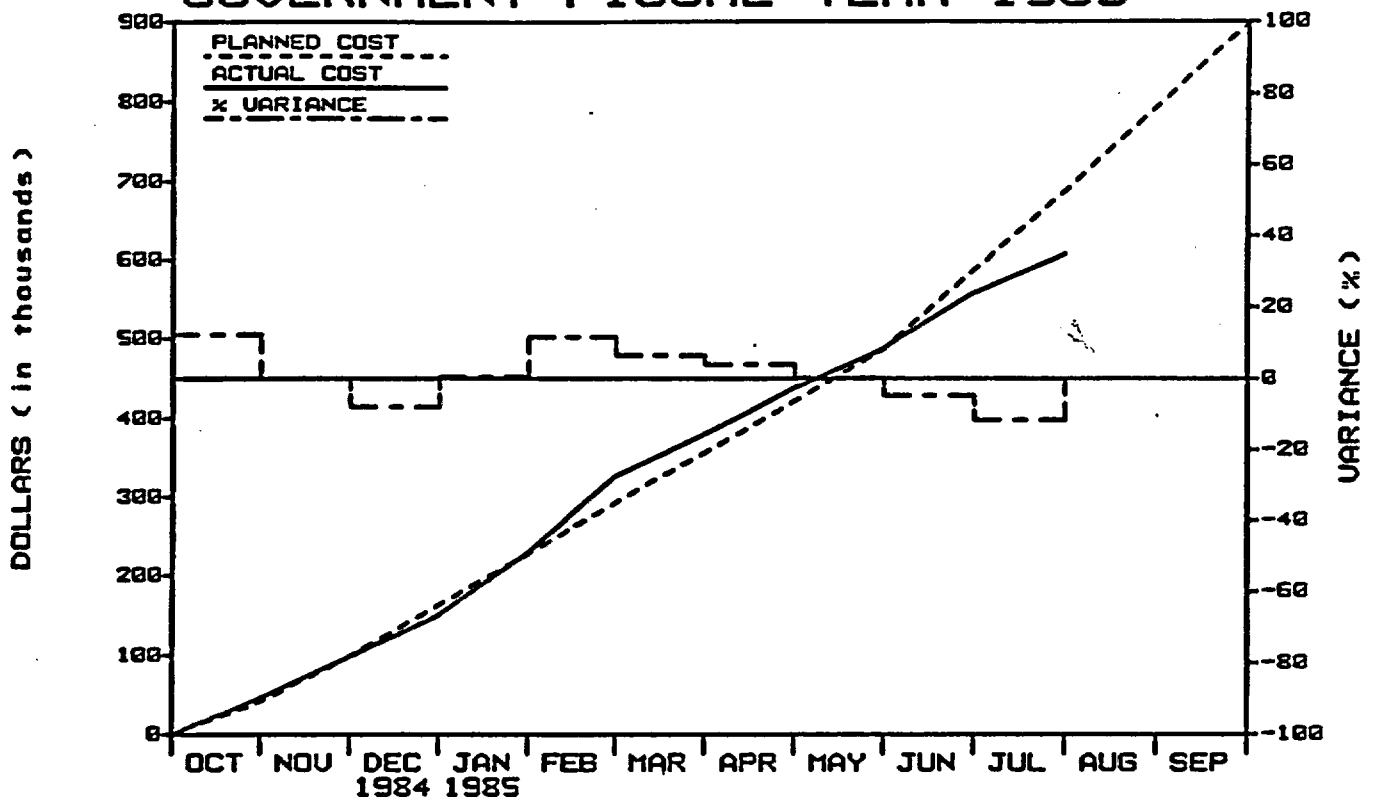
PLAN (X1000)	76	154	232	317	412	519	649	753	857	984	1083	1212
COST (X1000)	77	153	231	316	410	527	676	800	909	1029	0	0
VARIANCE (X1000)	-1	1	1	1	2	-8	-27	-47	-52	-45	0	0
% VARIANCE	1	-1	0	0	0	2	4	6	6	5	0	0

U. S. GEOLOGICAL SURVEY
GOVERNMENT FISCAL YEAR 1985



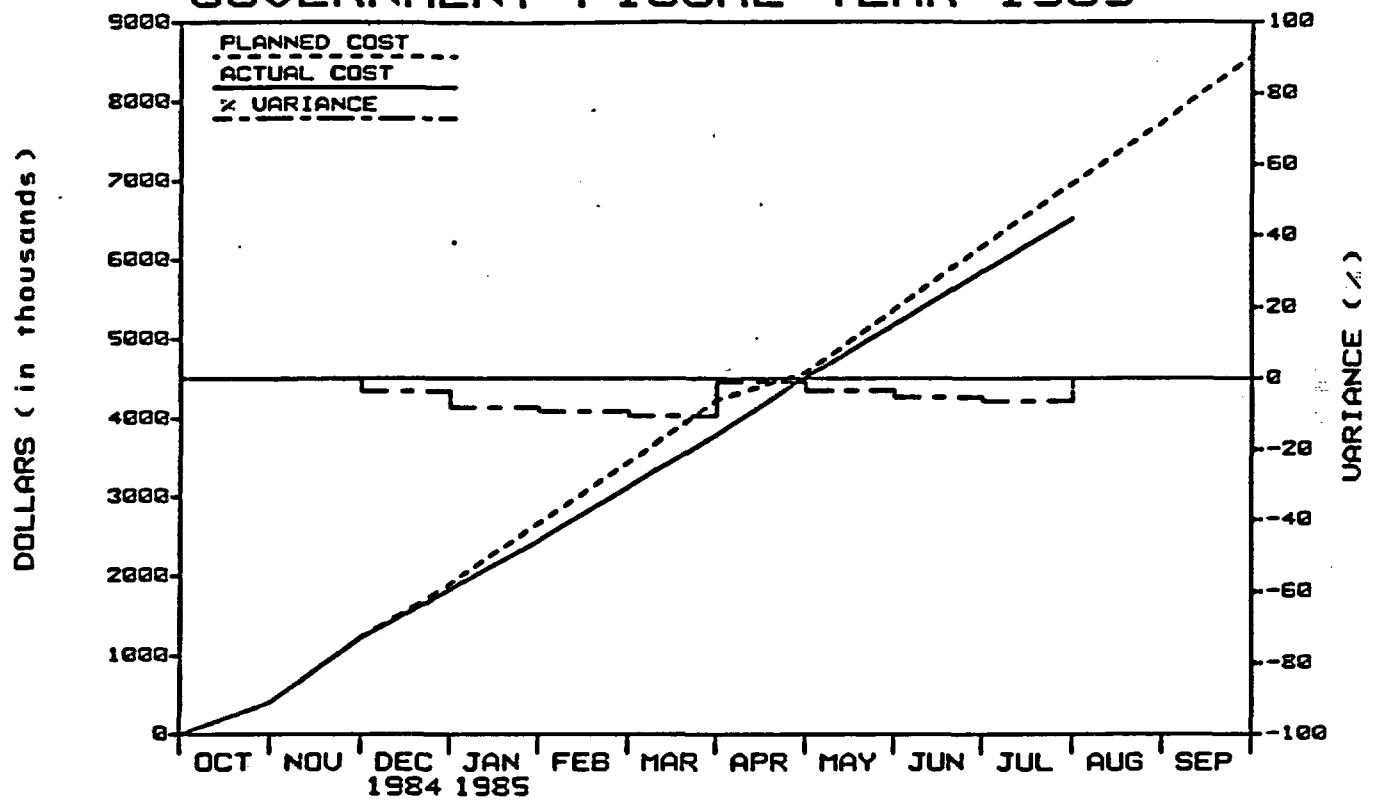
PLAN (X1000)	760	1520	2277	3125	3986	4830	5680	6525	7378	8226	9075	9922
COST (X1000)	760	1520	2277	3125	3986	4830	5680	6525	6911	7910	0	0
VARIANCE (X1000)	0	0	0	0	0	0	0	0	467	316	0	0
% VARIANCE	0	0	0	0	0	0	0	0	-6	-4	0	0

HOLMES & NARVER
GOVERNMENT FISCAL YEAR 1985



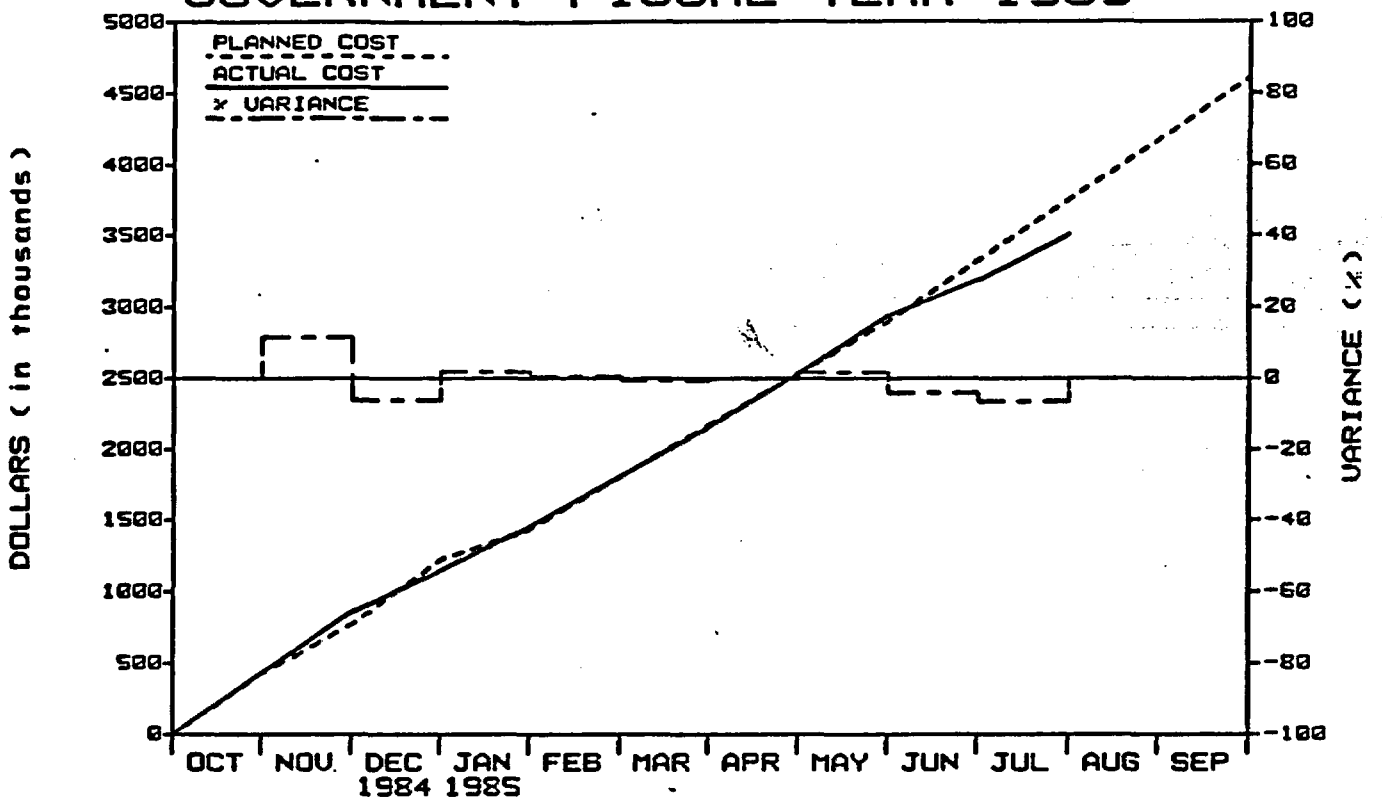
PLAN (X1000)	41	99	164	228	293	357	422	487	587	687	793	898
COST (X1000)	46	99	151	229	327	380	439	488	558	607	0	0
VARIANCE (X1000)	-5	0	13	-1	-34	-23	-17	-1	29	80	0	0
% VARIANCE	12	0	-8	0	12	6	4	0	-5	-12	0	0

LAWRENCE LIVERMORE NATIONAL LABORATORY
GOVERNMENT FISCAL YEAR 1985



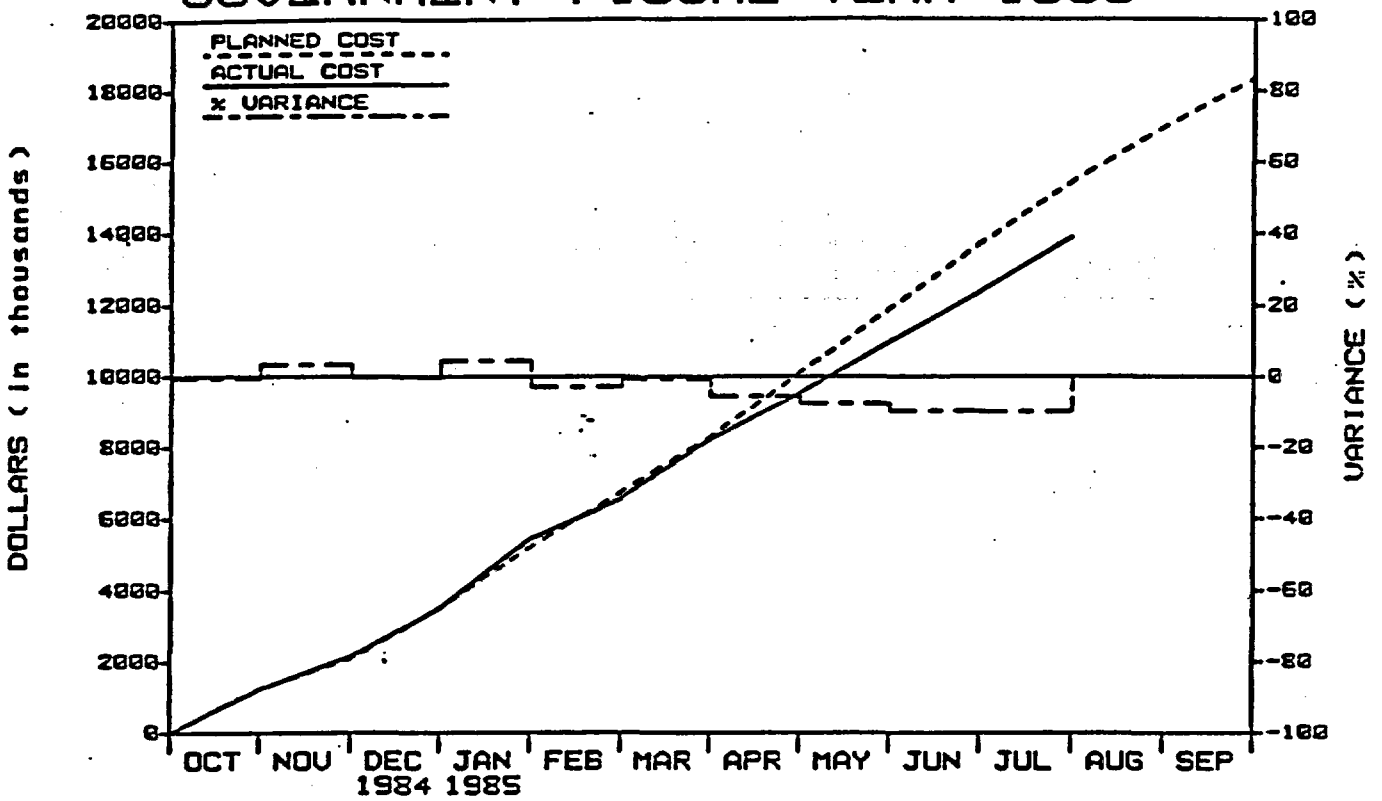
PLAN (x1000)	404	1229	1899	2655	3429	4230	4580	5372	6166	6955	7731	8565
COST (x1000)	404	1226	1829	2437	3113	3785	4526	5190	5843	6514	0	0
VARIANCE (x1000)	0	3	70	218	316	445	54	182	323	441	0.	0
% VARIANCE	0	0	-4	-8	-9	-11	-1	-3	-5	-6	0	0

REECO
GOVERNMENT FISCAL YEAR 1985



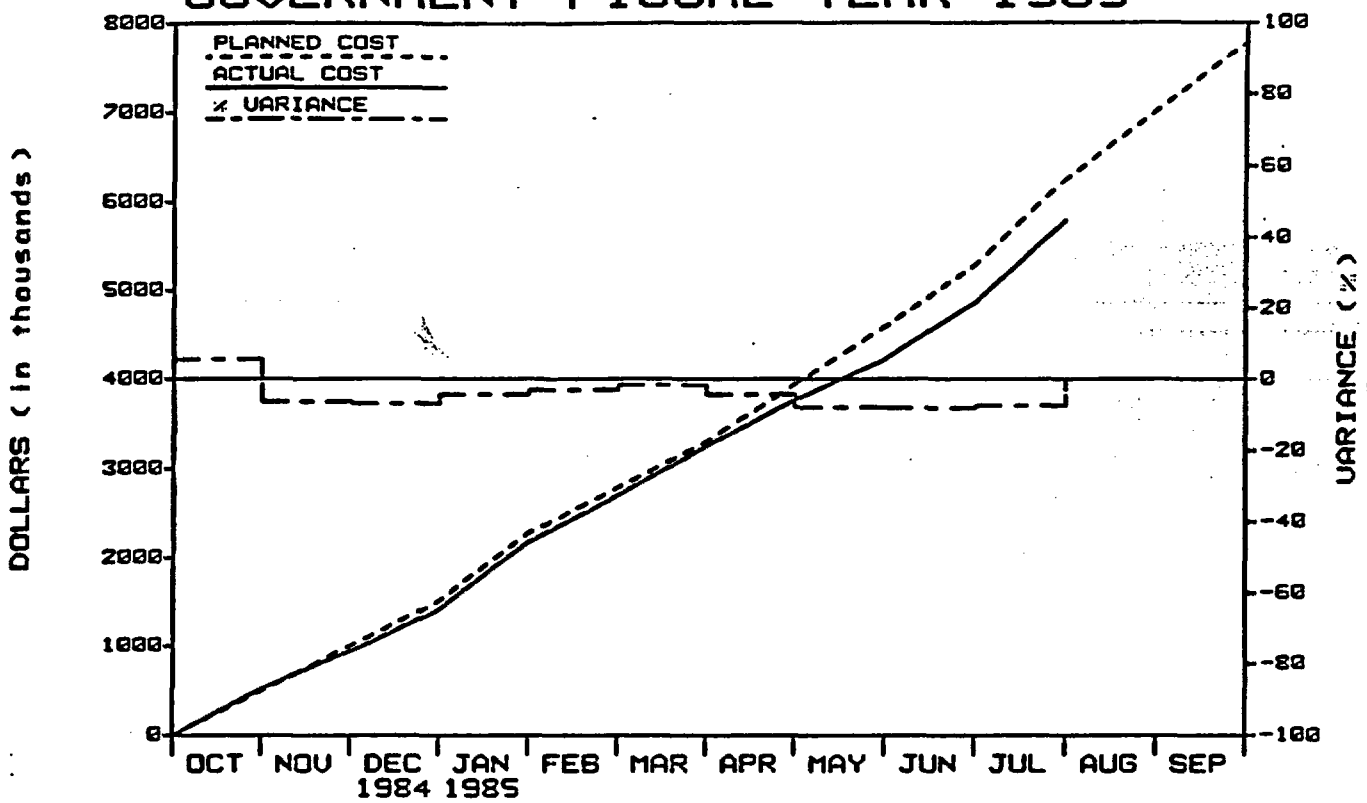
PLAN (X1000)	426	772	1222	1430	1802	2174	2538	2895	3325	3749	4172	4608
COST (X1000)	426	861	1148	1454	1812	2159	2533	2939	3184	3502	0	0
VARIANCE (X1000)	0	-89	74	-24	-10	15	5	-44	141	247	0	0
% VARIANCE	0	12	-6	2	1	-1	0	2	-4	-7	0	0

SANDIA NATIONAL LABORATORIES
GOVERNMENT FISCAL YEAR 1985



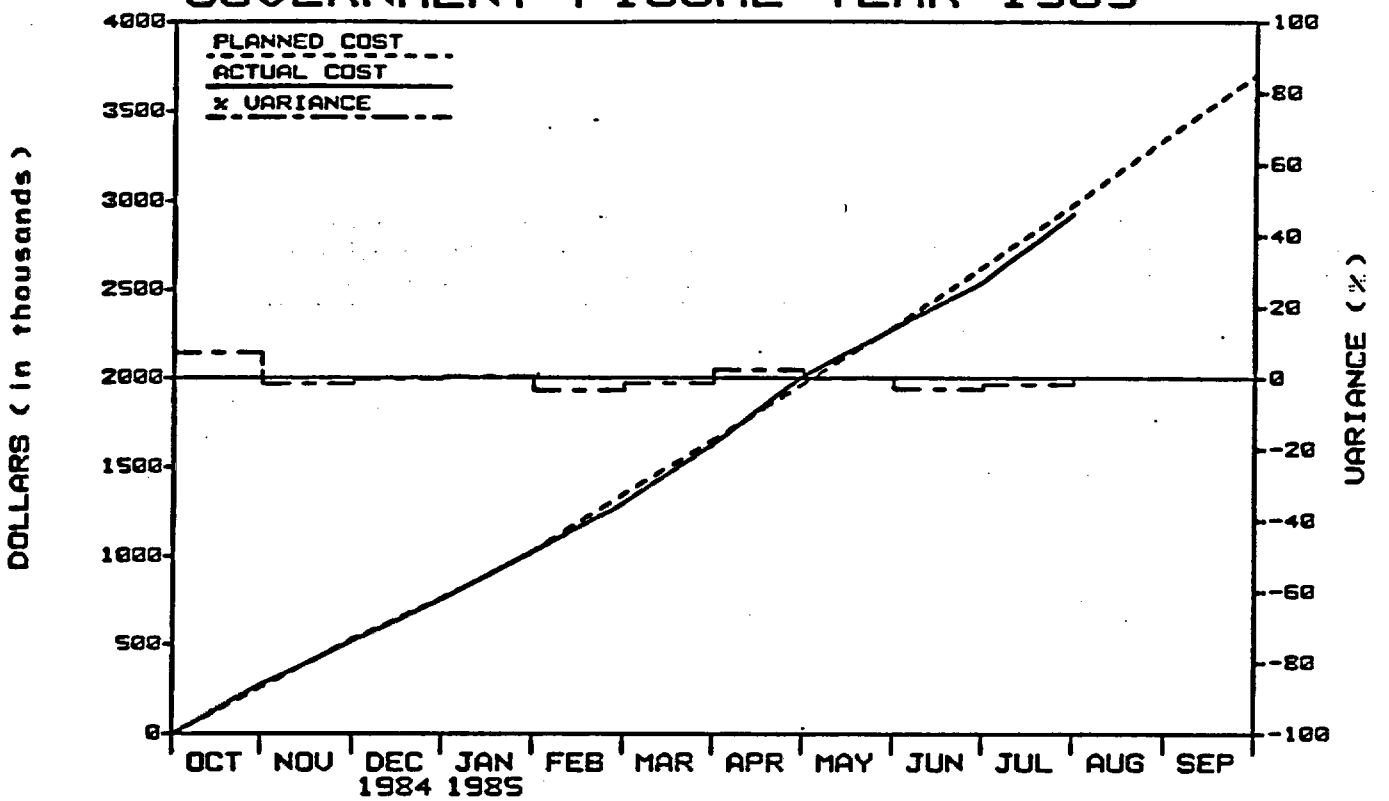
PLAN (x1000)	1240	2091	3527	5197	6736	8289	10115	11898	13722	15429	16976	18334
COST (x1000)	1230	2160	3511	5435	6546	8209	9544	10987	12380	13887	0	0
VARIANCE (x1000)	10	-69	16	-238	190	80	571	911	1342	1542	0	0
% VARIANCE	-1	3	0	5	-3	-1	-6	-8	-10	-10	0	0

SCIENCE APPLICATIONS INT'L CORP.
GOVERNMENT FISCAL YEAR 1985



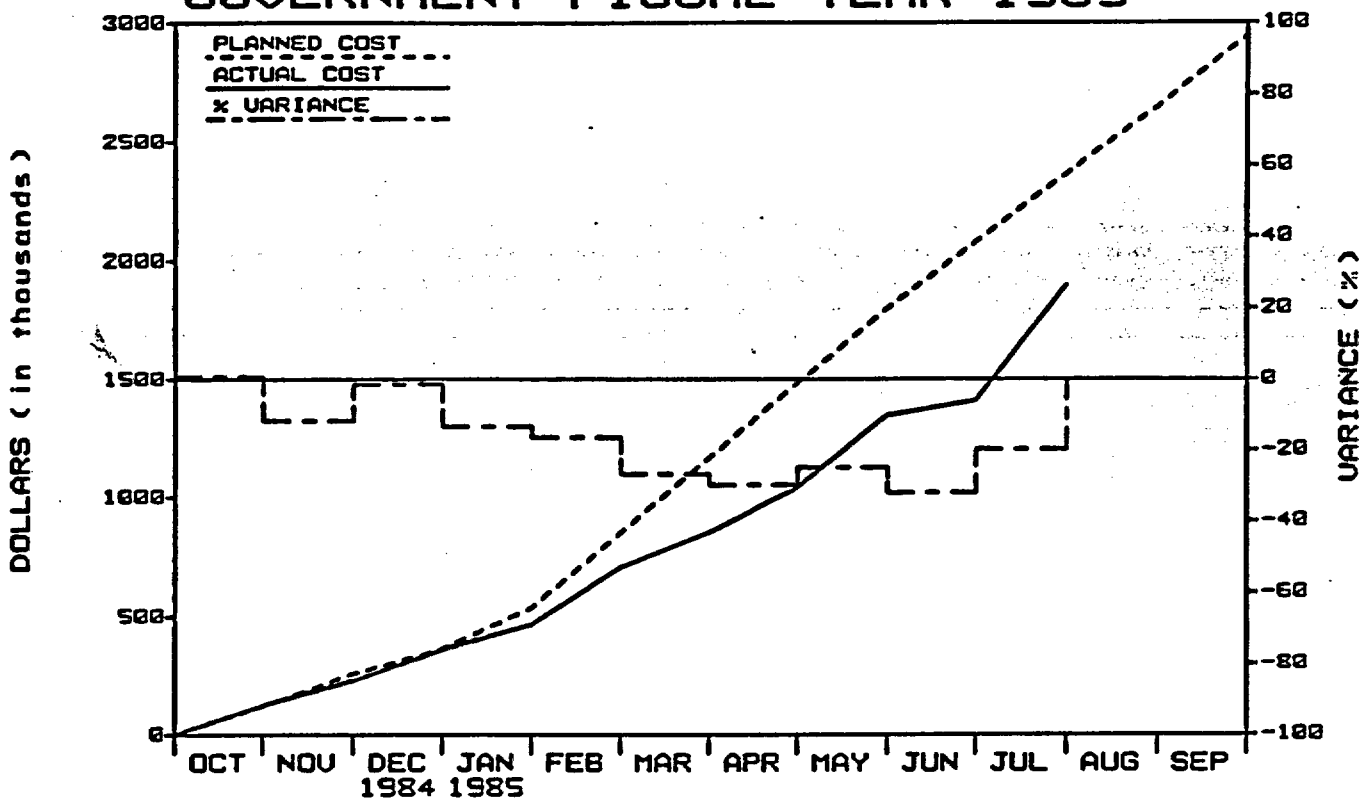
PLAN (X1000)	492	1005	1512	2276	2786	3298	3939	4588	5293	6253	7008	7775
COST (X1000)	519	942	1408	2177	2703	3246	3768	4222	4864	5790	0	0
VARIANCE (X1000)	-27	63	104	99	83	52	171	366	429	463	0	0
% VARIANCE	5	-6	-7	-4	-3	-2	-4	-8	-8	-7	0	0

E-MAD
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	255	533	764	1024	1346	1649	1966	2285	2627	2975	3342	3700
COST (X1000)	273	524	761	1028	1296	1624	2009	2279	2543	2921	0	0
VARIANCE (X1000)	-18	9	3	-4	50	25	-43	6	84	54	0	0
% VARIANCE	7	-2	0	0	-4	-2	2	0	-3	-2	0	0

MISCELLANEOUS CONTRACTORS
GOVERNMENT FISCAL YEAR 1985



PLAN (X1000)	122	258	366	536	851	1167	1483	1799	2078	2363	2647	2946
COST (X1000)	123	228	361	463	709	854	1040	1348	1410	1896	0	0
VARIANCE (X1000)	-1	30	5	73	142	313	443	451	668	467	0	0
% VARIANCE	1	-12	-1	-14	-17	-27	-30	-25	-32	-20	0	0

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 01 Oct 1984 TO 30 Sep 1985
Run Date: 22 August 1985

MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL
Complete Report on Volcanic Hazards Analysis	X.2.3.6.1.A	Blanchard	1	LANL	M356	B	28 Sep 84 22 Jan 85
Implementation of Meteorological Monitoring Plan	X.2.3.6.1.T	Blanchard	1	SAIC	M364	B	01 Jun 85
Start Repository Advanced Conceptual Design	X.2.4.1.S	Skousen	1	SNL	N430	B	30 Sep 85
NNWSI Project Site Specific Repository Design Concepts Report	X.2.4.1.S	Skousen	1	SNL	N432	B	30 Sep 85
NNWSI Project Design Study: MRS - Repository Interface Task Force	X.2.4.1.S	Skousen	1	SNL	R014	B	16 Aug 85
Seal Development Plan for Repository to OCRWM for Review	X.2.4.2.3.1.S	Skousen	1	SNL	M447	B	12 Nov 84 17 Dec 84
Draft Environmental Assessment (Camera ready)	X.2.5.3.1.T	Blanchard	1	SAIC	M502	B	30 Nov 84 29 Nov 84
EA Comment/Response Document	X.2.5.3.1.T	Blanchard	1	SAIC	M503	B	30 May 85
Final Environmental Assessment	X.2.5.3.1.T	Blanchard	1	SAIC	M504	B	20 Jun 85
NNWSI Project References for EA Complete	X.2.5.3.1.T	Blanchard	1	SAIC	M523	B	01 Aug 84 06 Mar 85
Issue Draft Revised Definitive Design for the First and Second Shafts, Subsurface Facilities, and Underground Service System for the ESF	X.2.6.1.1.A	Irby	1	LANL	M023	B	29 Apr 85 29 Apr 85

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 01 Oct 1984 TO 30 Sep 1985
Run Date: 22 August 1985

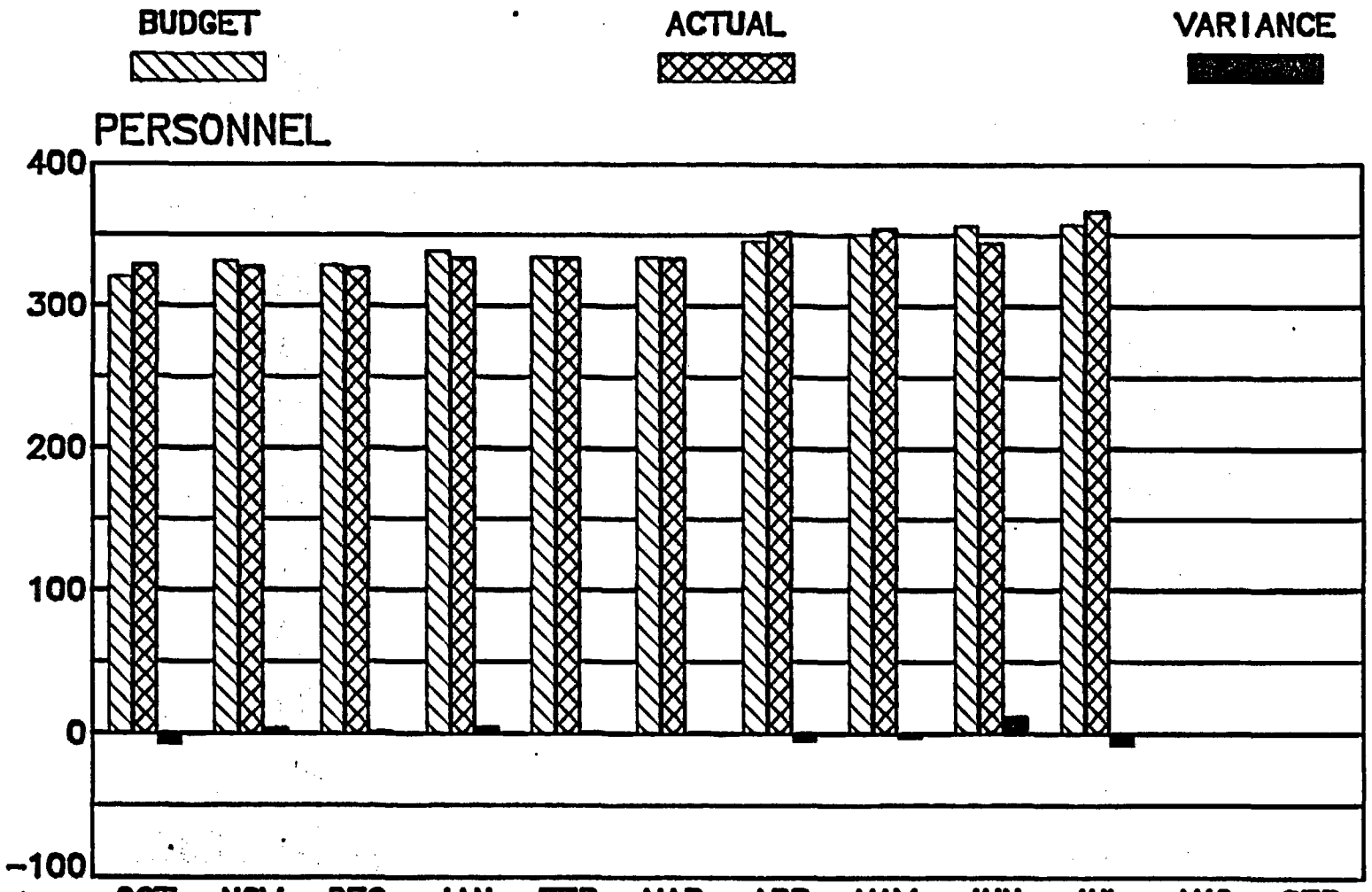
MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL
Annual PASS Program Interaction - (Letter Report)	X.2.1.1.S	Blanchard	1	SNL	M277	B	30 Sep 85
Performance Assessment Plan	X.2.1.1.S	Blanchard	1	SNL	N113	B	30 Sep 85
Yucca Mountain Mined Geologic Disposal System Description (System Requirements)	X.2.1.2.1.S	Witherill	1	SNL	M120	B	30 Jul 85
Establish Interim Product Specifications	X.2.2.3.1.L	Valentine	1	LLNL	M250	B	30 Aug 84 12 Apr 85
Input to DOE/HQ Report to Congress on Copper for Waste Packages	X.2.2.3.2.L	Valentine	1	LLNL	M222	B	01 Aug 85
Complete Waste Package Conceptual Design Criteria	X.2.2.4.L	Valentine	1	LLNL	M231	B	15 Jun 85 17 Jun 85
Initiate Waste Package Advanced Conceptual Design	X.2.2.4.L	Valentine	1	LLNL	M233	B	30 Jun 85
Pre-Closure Analysis of Selected Conceptual Designs	X.2.2.4.L	Valentine	1	LLNL	M251	B	28 Sep 84 20 Dec 84
Progress Report on 3-Dimensional Mineralogic Model of Yucca Mountain	X.2.3.2.A	Blanchard	1	LANL	M355	B	31 Aug 84 10 Oct 84
Weapons Test Seismic Report	X.2.3.2.2.4.S	Blanchard	1	WMPO	M357	B	15 Jan 85 14 Jun 85
Letter Report on Groundwater Chemistry Along Flow Paths	X.2.3.4.1.1.A	Blanchard	1	LANL	M354	B	30 Aug 84 14 Feb 85

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS
LEVEL 1 MILESTONES IN A TIME WINDOW OF 01 Oct 1984 TO 30 Sep 1985
Run Date: 22 August 1985

MILESTONE DESCRIPTION	WBS NO.	WMPO RESP	LEVEL	RESP ORG	MILESTONE	BASELINED	HQ PLANNED HQ ACTUAL
Issue Exploratory Shaft Test Plan (ESTP) (NVO-244)	X.2.6.9.1.A	Witherill	1	LANL	M666	B	27 Sep 85
Complete Decision Analysis on Use of Climax Facility	X.2.7.1.L	Kunich	1	LLNL	M706	B	15 Oct 84 06 Jul 84
Final Report on the SFT-C	X.2.7.2.1.L	Valentine	1	LLNL	M708	B	30 Sep 85
Draft Project Management Plan	X.2.9.1.T	Kunich	1	WMPO	M907	B	29 Mar 85
Submit FY 85 NNWSI Project Plan to DOE/HQ for Approval	X.2.9.1.1.T	Vieth	1	SAIC	M901	B	15 Mar 85 09 Jan 85
Submit NVO-196-18 (Rev. 2) NNWSI Project Quality Assurance Program Plan and Implementing Procedures to DOE/HQ for Approval	X.2.9.3.T	Blaylock	1	SAIC	M915	B	30 Nov 84 30 Nov 84

NO. MILESTONES IN THIS REPORT: 28

- NNWSI PROJECT STAFFING -
FISCAL YEAR 1985



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
B	321	332	329	339	335	335	346	351	357	358		
A	329	328	327	334	334	334	352	355	345	367		
V	-8	4	2	5	1	1	-6	-4	12	-9		