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**CNWRA PROGRAM MANAGER'S PERIODIC REPORT
ON ACTIVITIES OF
THE CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES**

For The Fiscal Reporting Period

December 21, 1991 - January 17, 1992

PMPR No. 92-04

January 29, 1992

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**CNWRA PROGRAM MANAGER'S PERIODIC REPORT
ON ACTIVITIES OF THE
CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES**

TITLE: Center for Nuclear Waste
Regulatory Analyses

FIN: D1035-8

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CONTRACT NO: NRC-02-88-005

ESTIMATED BUDGET: \$42,550,000

SITE: 6220 Culebra Road
San Antonio, Texas

PERIOD OF PERFORMANCE: 10/26/87 - 10/26/92

PERIOD OF THIS REPORT: 12/21/91 - 01/17/92

1. SUMMARY

1.1 Technical Status

NMSS Element 1 - CNWRA Operations

NRC and Center management continued effective coordination meetings and conferences addressing a range of day-to-day and long-term management topics (Section 2). Topics of discussion included the ADP and Center Management Plans, and preparations for contract renewal.

The current status of Center staffing is indicated in the attached tables, which have been revised in accordance with the November 1991 Center Staffing Plan. Intensive recruitment efforts continued for the positions in material science, earth science, numerical analysis, computer science, and systems engineering.

Revisions to the ADP Plan continued, based on comments received from NRC. Revisions to the Center Five-Year Plan and Management Plan were completed and these documents were transmitted to NRC. Attention was turned to planning activities that must be accomplished in support of contract renewal. A decision on the need to modify the FY92-93 Operations and Project Plans will be made within the next one to two periods.

Quality Assurance activities continued to focus on implementation of the Center QA system (particularly in the area of quality planning), surveillances, review of technical operating procedures and development of quality assurance procedures, and QA indoctrination and training. Review and revision of personnel qualification forms was undertaken this period.

NMSS Element 2 - Waste Systems Engineering and Integration

Center staff continued to work with the NRC on the refinement of guidance for Compliance Determination Strategies (CDS) type selection and subsequent development of the CDSs in standard 'synopsis' format (Section 3). This activity included working with NRC staff on the development of the CDS procedure, as well as development of CDSs for Mining Regulations, Naturally Occurring Materials, Flooding, and Retrievability Regulatory Requirements, and review of draft CDSs. The Center continued the development of draft procedures and training materials for Compliance Determination Strategies and Methods, and draft interim guidance for development of Technical Review Components (TRCs).

The Center continued to participate in task force work concerning the relationships between the RR/REOP and Format and Content Regulatory Guide structures. These efforts are focused on resolution of the problems identified in Section 1.2 Major Problems in previous periods. Because closure on this matter is vital to the orderly conduct of work in both this and other Program Elements, it is receiving considerable staff and management attention.

Work also continued on refinement of the Repository Isolation Criteria (RIC) work plan and preparation of the final Repository Functional Analysis (RFA) report.

The Center continued development of Version 2.1 of PASS, which will include an Interactive Input Support Subsystem (IIS). Maintenance software for PASS is also under development.

Interactions continued with NRC staff on the Open Item Tracking System (OITS).

NMSS Element 3 - External Quality Assurance

Activities this period primarily involved planning, with no audits or surveillances being conducted (Section 4). Planning was accomplished for the Center to support NRC in revision of the Division of High-Level Waste Management (HLWM) Manual.

NMSS Element 4 - Geologic Setting

Staff supported NRC in preparation for its presentations which will be given to the NWTRB January 22-23, 1992, in Irvine, CA. (Section 5). Review of the DOE "Study Plan for Probability of Magmatic Disruption of the Repository" was completed and comments were transmitted to NRC in standard format.

Staff interactions with NRC continued on the development of suitable criteria for considering optional alternative requirements for the geologic subsystem.

The Natural Resources Assessment Methodology study continued with primary efforts related to development of the CDS for this Regulatory Requirement (see Sections 3 and 5).

Technical background studies continued on the potentially adverse conditions on flooding, natural resources, volcanic hazards, and tectonics. Limited work on Systematic Regulatory Analysis (SRA) also occurred on these subjects.

Work continued on development of methods for review of tectonic models, detailed evaluation of DOE cross sections of Yucca Mt., and integration of data into tectonic models. Efforts continued to obtain a copy of the Lawrence Livermore National Laboratory (LLNL) seismic analysis code.

The letter report entitled "Identification of Regulatory Requirements for the Systematic Regulatory Analysis of Issues Related to Volcanic and Magmatic Hazards in 10 CFR Part 60" was completed and transmitted to the NRC.

NMSS Element 5 - Engineered Barrier Systems

The work plan for the Substantially Complete Containment (SCC) example problem was commented on by NRC and Center staff, and incorporation of appropriate modifications began (Section 6). The revised plan will include a review of experience with buried structures and a review of the calculational algorithm for the example problem.

Documentation of the crevice corrosion model and its modification for use in the Iterative Performance Assessment (IPA) is underway.

Preparations for the glass leaching studies continued, including development of a procedure for use in the Product Consistency Test (PCT) round robin testing which will be conducted under the auspices of ASTM Subcommittee C.26-13. A check run was made with the recently completed apparatus.

NMSS Element 6 - Repository Design, Construction, and Operations

Center management staff met with the NRC January 14-15, 1992, and conducted a teleconference January 17, 1992, to review work accomplished to date and to plan for both reactive and proactive work that is pending (Section 7). The results will be documented in a separate meeting report.

Assessment of the two mine ventilation computer codes, which were procured by the Center staff for use in its repository design review activities, continued.

The Design Basis Accident (DBA) rulemaking effort continued with extensive interactions the week of January 15, 1992, and a briefing to the Director NMSS on January 17, 1992. The scope of the rulemaking was established and high-priority work is underway in this area. Development of the Repository Operational Criteria (ROC) Activity 3 continued, in an effort to develop and approach and schedule which would allow this work to proceed in parallel to support the DBA.

A literature review continued on the examination of the state-of-the-art in fully and partially coupled modeling of thermal-mechanical-hydrological-chemical processes relevant to repositories. The source code for the two-dimensional distinct element code UDEC was procured, so that necessary modifications can be made to support staff technical assistance, technical review, and research activities.

NMSS Element 7 - Performance Assessment

Three important papers were prepared and submitted for presentation at the International High-Level Waste Management conference in Las Vegas: "Deterministic and Probabilistic Performance Assessment Methods Applied to Radionuclide Migration Through Fractured Geologic Medium," "Occurrence of Metallic Phases in Spent Fuel: Significance for Source Term Predictions for High-Level Waste Disposal," and "Geochemical Model for C-14 Transport in Unsaturated Rock" (Section 8).

Preparations were completed for initiating work related to the elicitation of expert judgement; with a kick-off meeting planned for January 24, 1992. A brief letter report examining the possible use of "fuzzy" logic in dealing with semiquantitative information was prepared and submitted.

The approach to development of the CDS for 10 CFR 60.112 were discussed between NRC and CNWRA staffs.

A report on preliminary regional-scale hydrogeology modeling of the saturated zone in the vicinity of Yucca Mt. was completed and transmitted to NRC. This report considered a variety of scenarios which could hypothetically lead to changes in the groundwater level in the vicinity of the proposed repository site. Work continued in each of these areas, as well as on preparation of Part 2 of the report on sensitivity and uncertainty analysis.

A brief letter report was also prepared and submitted on the dose code DITTY. The report includes recommendations on further modifications to the code for use in IPA.

Research Project 1 - Overall Research

Laboratory experimentation continued in Building 57 and in other SwRI facilities on six Center research projects (Section 9). Modification of a room to support optical microscopy and related activities included requisition and installation of laboratory base and wall cabinets and coincidental changes to utilities.

Work continued in each of the Projects on the 1991 Research Annual Report. With the exceptions of the Overall, Seismic Rock Mechanics, and Integrated Waste Package Experiments Projects, all revised Project Plans and Task 1 of the new Plan on Volcanism have been approved. Efforts continue to obtain NRC comments and resolution of same on the remaining Plans, so that work can progress unimpeded.

Task 2 activities continued in several areas:

- Coordination continued regarding preparation and review of papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste;
- A call for papers was issued for the Symposium on the Scientific Basis for Nuclear Waste Management XVI to more than 2000 prospective participants;
- Preparation for a two-day workshop on the Use of Geochemical Modeling Software EQ3/6, which will be conducted February 25-26, 1992, commenced.

Internal Quality Assurance activities continued in accordance with the requirements of the Center Quality Assurance Manual and related implementing procedures. Surveillance of experimental activities and oversight of the technical review process are continuing focuses of attention, as is configuration management and control of scientific and engineering codes used in the conduct of research work.

Research Project 2 - Geochemistry

Experiments on the kinetics of analcime at 25 C were completed, and a kinetic, and thermodynamic interpretation of the data has been developed for presentation in the 1991 Research Annual Report. A new phase of experimentation was begun to study the precipitation of analcime by approaching equilibrium from the supersaturated condition. Thermodynamic evaluations of the previously derived isotherm data were also completed. Computer modeling and analysis of analcime dissolution data indicate that short-term rate

data are inappropriate for modeling long-term experimental results. Interpretation of solubility measurements yields a value of the standard state Gibbs free energy of formation of analcime in excellent agreement with the calorimetric value.

Research Project 3 - Thermohydrology

The first thermohydrologic experiment under Task 3 continued. Early examination of the movement of the dye tracer, which is being injected into the medium to help track the movement of liquid water, continues to indicate three-dimensional flow in the vicinity of the heater element in this two-dimensional geometry experiment. Analysis of data from Tests 5 and 6 also continued in support of several reports that are in preparation.

Laboratory determination of the moisture retention characteristics of the alumina beads used in these studies continued, with an aim of developing an adequate representation of the suction-pressure/saturation relationship for use in numerical and analytical models.

Planning for a project peer review, including development of a comprehensive report on results to date, continued. The due date for this report is February 17, 1992.

Research Project 4 - Seismic Rock Mechanics

Data collection continued from the 50 extensometers, two triaxial velocity gauges, eight closure point stations, four piezometers, and a hydrophone which were installed at the field experimental site at the Lucky Friday Mine. Most of the field data continues to be acquired remotely using a computer located in the Center offices in San Antonio. Significant rock displacements and hydrologic responses have been observed to date.

Laboratory direct shear testing of single joint rock specimens continued. Pseudostatic and step-velocity tests are being conducted. Data are being analyzed in the context of Coulomb, Barton-Bandis, and continuously yielding rock joint models.

The second benchmark analysis was initiated with the discrete element code DECICE.

Results of the studies to date will be presented to the U.S. National Committee for Rock Mechanics and the NWTRB, in two separate meetings next period.

Research Project 5 - Integrated Waste Package Experiments

Pitting repassivation potential tests continued using specimens of alloy 825 and 316L, with no dependence of repassivation potential on the amount of charge passed during pitting being observed. Potentiostatic tests on CDA-102 and CDA-715 continued to examine the initiation and growth of localized corrosion. The equipment was assembled for conducting tests under alternating wet and dry conditions.

Specimens of alloy 825 are undergoing short-term tests of intergranular corrosion susceptibility in accordance with ASTM A-262, Procedure C.

Research Project 6 - Stochastic Analysis of Large-Scale Flow and Transport in Unsaturated Fractured Rock

Task 2 work included initiation of work to consider introduction of auxiliary hydrodynamic models suitable for large-scale simulations of partially saturated flow in heterogeneous fractured rocks. Results from previously conducted simulations using BIGFLO were assembled.

Research Project 7 - Geochemical Analogs

Planning and preparation for additional field research at the Peña Blanca site was begun for a trip planned for early March 1992. This should occur coincident with the completion of mapping activities that will be conducted under the recently approved contract with I. Reyes of the University of Chihuahua, Mexico. Characterization of high-grade uranium ore from Peña Blanca continued with additional scanning electron microscopy, x-ray diffractometry, energy-dispersive spectrometry, and optical petrography. Several uranium minerals previously unreported from the Nopal I deposit were observed. Analytical results from Peña Blanca water samples were used for equilibrium calculations (EQ3). Calibration procedures for the gamma spectrometer system to be used in analyzing radioisotopes in samples of Peña Blanca rock were completed and preparation of rock samples for gamma spectroscopy was completed. Specimens were selected for further alpha auto-radiography and sample preparation commenced.

Research Project 9 - Sorption Modeling

Preparations were completed for experiments to study sorption of uranium on the zeolite mineral clinoptilolite. Initiation of these experiments will follow repair of the controlled-atmosphere glove box.

A detailed work plan for Cs sorption experiments was completed and submitted to SwRI radiation safety, and development of a similar plan for Sr began.

Thermodynamic data from the EQ3/EQ6 database were adapted for use in the MINTEQA2 database for Am, Pu, Tc, and Np. Reformatting of data for other key constituents continues. A preliminary version of the MINEQL/PSI radionuclide database was obtained from researchers in Switzerland and is being evaluated for use.

Research Project 10 - Performance Assessment

The paper on model validation was revised in response to external peer review comments in preparation for publication in *Advances in Water Resources*. In addition, the user's manual for the code PORFLOW was completed and is undergoing internal technical review and editing in preparation for publication.

Further work on the DCM-3 computer code has been deferred, pending completion of a Code Coupler that will link this code to NEFTRAN II.

Work continued on evaluation of the application of massively parallel computers to the solution of groundwater flow problems. Initial testing of a three-dimensional saturated flow solver were completed. Results will appear in the 1991 Research Annual Report.

The literature review on colloid transport continued, with a considerable body of literature having been reviewed at this time. Given the status of this work, the results will be documented in the next Research Quarterly report.

Simulations of the Las Cruces trench site continued using different conceptual models and different representations of hydraulic properties.

Research Project 11 - Volcanic Systems

Staff continued surveying, acquiring, compiling, and reading literature pertinent to conduct the Volcanism Research Project. A major meeting is planned for February 13, 1992, to discuss development and integration of activities in the areas of volcanism and tectonism.

LSSA Support - Development of Access Protocols for Technical Data

LSSA staff continued their evaluation of the overall outline for the access protocols plan. Current thoughts, which continue to be developed and discussed, call for development of a succession of draft reports and associated meetings which would lead to a final product.

Discussion were held regarding the "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)," which was transmitted to NRC December 18, 1991. The current critique indicates that additional information is needed to substantiate the conclusion of feasibility that was provided in the report.

Waste Solidification Systems

The Safety Evaluation Report based on the most current draft of the DOE Safety Analysis Report (SAR) on the Supernatant Treatment System, which was transmitted to NRC November 26, 1991, was forwarded to the DOE by NRC this period (Section 11).

Staff participated in an International Symposium on Above Ground Storage Tanks to gain technical insights into the types of problems that are encountered in this area, and possible application of technology and analysis methods to the underground storage tanks at West Valley.

1.2 Major Problems

NRC and CNWRA staff and management continued to aggressively address problems related to SRA which are impacting or soon will impact the planned conduct of work in support of the NRC. Joint NRC/CNWRA task forces continued to work effectively to address these problems. Approval of all or part of three Research Project Plans submitted in September

1991 continues to be awaited, due to unresolved issues. These issues, and the need for improved communications, will be addressed at the planned January 23-24, 1992, NRC/CNWRA Management Meeting.

1.3 Forecast for Next Period

Work will continue in accordance with the revised FY92-93 Operations Plans and Project Plans. Contract renewal activities will also be a focus of management staff efforts. Staffing will continue to be a high priority activity, within the constraints of funding. The Center ADP Plan will be revised based on comments received from NRC and will be transmitted next period. Implementation of Change 3 of Revision 2 of the Center Quality Assurance Manual will continue.

The conduct of Systematic Regulatory Analyses and the development of PASS will continue with an emphasis on completion and issuance of guidance on the selection of Compliance Determination Strategy types and development of Compliance Determination Strategies and Methods, participation in task force follow-up activities addressing the relationships of Sections 112 and 122 of 10 CFR Part 60, and restructuring and updating of the governing procedures for SRA. Work will continue on preparation of the RFA final report.

Demonstration and training on Version 2.0 of PASS will continue for Center and NRC staff, as appropriate. Prototyping of Version 2.1, Interactive Input Support Subsystem will continue. The Configuration Management and Control Manual for CNWRA computer systems will continue to be implemented as well as ongoing maintenance, optimization, and extensions to PASS Version 2.0. Work will continue on the Open Item Tracking System (OITS).

Center and QA staff professionals will continue to plan and coordinate upcoming audit observations. No Quality Assurance Observation Audits are planned for next period. Work will begin on Task 3 support to NRC.

The Geologic Setting Element activities will continue to focus on technical assistance in the potential regulatory guidance on Natural Resources Assessment Methodology, GWTT, and seismic hazard analysis, including assistance in the review and evaluation of key draft reports submitted in these areas. Staff will support joint NRC and CNWRA work on the SRA and will participate in technical exchange meetings, as requested.

The EBS Element will continue work on the SCC Technical Feasibility Assessment (TFA) study example problem under Task 2. Support of the IPA source term studies and review of ongoing wasteform studies will also continue. Testing of borosilicate waste form will commence, upon completion of required procedures.

Activities within the RDCO Element will include SRA work on mining regulations, coordination of ESF design with the repository design, waste retrievability, and thermal loads for repository design. In addition, work under ROC Activity 3 and the DBA rulemaking will continue in parallel, and support to revision of the TP on thermal loads and other precicensing activities will be provided (as requested by NRC).

Work on the various Phase 2 Iterative Performance Assessment activities will continue within the Performance Assessment Element, in accordance with the Operations Plan. SRA of the total system performance objective will also continue with a focus on preparation of a Compliance Determination Strategy and evaluation of 40 CFR Part 191.

Work will continue on all research projects, in accordance with the approved FY92-93 Project Plans. Work will continue on the 1991 Research Annual Report.

Within the LSSA Element, the Center will conduct Task 1 work related to document categories and access protocols. Additional work will be done on substantiating the conclusion of the Task 2 report "Feasibility of Priority Loading Schedule for LSS Documents." The Operations Plan will be revised accordingly.

Tasks 1 and 4 will be initiated in WSS.

1.4 Summary Financial Status

Table 1 below indicates the financial status of the Center in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Total commitments of the Center are \$291,161. The attached figures following each table display the estimated cumulative spending plan and the actual cumulative costs to date.

In addition, cumulative spending plans and actual cumulative costs to date are included for both the Division of High-Level Waste Management (HLW) (Table 3) and Office of Nuclear Regulatory Research Division of Engineering (RES) (Table 4) components of the Center program. These allow easy comparison of planned versus actual expenditures at the FIN level. (Note that since the LSSA project and WSS project are the only projects within their respective FINs, they are not repeated here.)

Total costs of the Center and for the HLW, RES, and WSS FINs are significantly under plan. Costs are somewhat over plan in two research projects and in the LSSA FIN. Detailed analyses of the cost variances of the individual Elements and Projects are presented in the corresponding Financial Status sections of this report. To summarize, the variances are due primarily to four factors: (i) assignments/approvals of work have not yet been received (particularly in Task 1 of HLW Elements), (ii) commensurate under-utilization of subcontractor and consultant staff in these activities, (iii) unresolved issues related to Systematic Regulatory Analysis have delayed certain activities in WSE&I and Task 2 of the technical Elements, and (iv) incomplete staffing in certain areas (note that although associated table shows the Center as fully staffed with respect to Plan, two staff members have not yet reported for work).

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 7,771,309
FY92 Funds Costed to Date (b)	\$ 2,836,038
FY92 Funds Uncosted (c)	\$ 4,935,271
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
(b) Actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

CENTER CORE STAFF - CURRENT PROFILE (01/17/92)

EXPERTISE/EXPERIENCE	
ADMINISTRATION	J. Latz, R. Adler, H. Garcia, P. Mackin, W. Patrick
CODE ANALYST	R. Martin
DATA BASE MANAGEMENT AND DATA PROCESS.	S. McFaddin
ELECTROCHEMISTRY	G. Cragnolino
ENGINEERING GEOLOGY/GEOLOGICAL ENGNG	
ENVIRONMENTAL SCIENCES	P. LaPlante
GEOCHEMISTRY	W. Murphy, R. Pabalan, E. Percy, J. Prikryl, D. Turner
GEOHYDROLOGY/HYDROGEOLOGY	R. Ababou, A. Bagtzoglou, R. Green, G. Wittmeyer
GEOLOGY	J. Russell, M. Miklas
HEALTH PHYSICS	J. Hageman
INFORMATION MANAGEMENT SYSTEMS	R. Johnson, R. Marshall
MATERIAL SCIENCES	P. Nair, H. Manaktala, N. Sridhar
MECHANICAL, INCLUDING DESIGN & FABRICATION	C. Tschoepe
MINING ENGINEERING	S-M. Hsiung
NUCLEAR ENGINEERING	H. Karimi
NUMERICAL MODELING/ANALYSIS	J. Walton (1/27/92)
PERFORMANCE ASSESSMENT	B. Sagar, R. Baca, B. Gureghian, R. Manteufel
QUALITY ASSURANCE	B. Mabrito, R. Brient
RADIOISOTOPE GEOCHEMISTRY	B. Leslie
REGULATORY ANALYSIS	S. Spector (Law)
ROCK MECHANICS	A. Chowdhury, M. Ahola
SEISMOLOGY	R. Hofmann
SPENT FUEL DEGRAD./SOURCE-TERM	
STRUCTURAL GEOLOGY/SEISMO-TECTONICS	G. Stirewalt, S. Young
SYSTEMS ENGINEERING	D.T. Romine
VOLCANOLOGY/IGNEOUS PROCESSES	

CENTER CORE STAFF - HIRING PROFILE AND STATUS (01/17/92)

EXPERTISE/EXPERIENCE	FISCAL YEAR										TOTAL REQ'D	OPEN THIS QTR
	FY92				FY93	FY94	FY95	FY96	FY97			
	1Q	2Q	3Q	4Q								
ADMINISTRATION	5	5	5	5	5	5	5	5	5	5	0	
CODE ANALYST (b) (a)	1	1	1	1	1	2	2	2	2	2	0	
DATA BASE MANAGEMENT AND DATA PROCESS. (f) (b)	2	2	2	2	2	2	2	2	2	2	1	
ELECTROCHEMISTRY	1	1	1	1	1	1	1	1	1	1	0	
ENGINEERING GEOLOGY/GEOLOGICAL ENGN						1	1	1	1	1	0	
ENVIRONMENTAL SCIENCES	1	1	1	1	1	1	1	1	1	1	0	
GEOCHEMISTRY	5	5	5	5	5	5	5	5	5	5	0	
GEOHYDROLOGY/HYDROGEOLOGY (b)	4	4	4	4	4	5	5	5	5	5	0	
GEOLOGY	2	2	2	2	2	2	2	2	2	2	0	
HEALTH PHYSICS	1	1	1	1	1	1	1	1	1	1	0	
INFORMATION MANAGEMENT SYSTEMS	2	2	2	2	2	2	2	2	2	2	0	
MATERIAL SCIENCES (b) (a)	3	4	4	4	4	4	4	4	4	4	1	
MECHANICAL, INCLUDING DESIGN & FABRICATION	1	1	1	1	1	1	1	1	1	1	0	
MINING ENGINEERING	1	1	1	1	1	1	1	1	1	1	0	
NUCLEAR ENGINEERING	1	1	1	1	1	1	1	1	1	1	0	
NUMERICAL MODELING/ANALYSIS (e)		1	1	1	1	1	1	1	1	1	-1	
PERFORMANCE ASSESSMENT (e) (g)	3	3	4	4	4	4	4	4	4	4	0	
QUALITY ASSURANCE	2	2	2	2	2	2	2	2	2	2	0	
RADIOISOTOPE GEOCHEMISTRY	1	1	1	1	1	1	1	1	1	1	0	
REGULATORY ANALYSIS	1	1	1	1	1	1	1	1	1	1	0	
ROCK MECHANICS (b)	2	2	2	2	3	3	3	3	3	3	0	
SEISMOLOGY	1	1	1	1	1	1	1	1	1	1	0	
SPENT FUEL DEGRAD./SOURCE-TERM					1	1	1	1	1	1	0	
STRUCTURAL GEOLOGY/SEISMO-TECTONICS (b)	2	2	2	2	3	3	3	3	3	3	0	
SYSTEMS ENGINEERING (f) (b) (a)	2	2	2	2	2	2	2	2	2	2	1	
VOLCANOLOGY/IGNEOUS PROCESSES (b) (a)					1	1	1	1	1	1	0	
TOTAL REQUIRED	44	46	47	47	51	54	54	54	54	54	2	

(a) Interview scheduled next period.

(b) Resumes being solicited.

(c) Offer made.

(d) Offer pending.

(e) Offer accepted.

(f) Position re-opened.

(g) Negative number indicates early hire.

Staffing Summary

	Professional	Support	Total
Current	44	15	59
Planned This Date	45	15	60
Planned End of FY92	47	16	63

3700-000

CENTER COMPOSITE

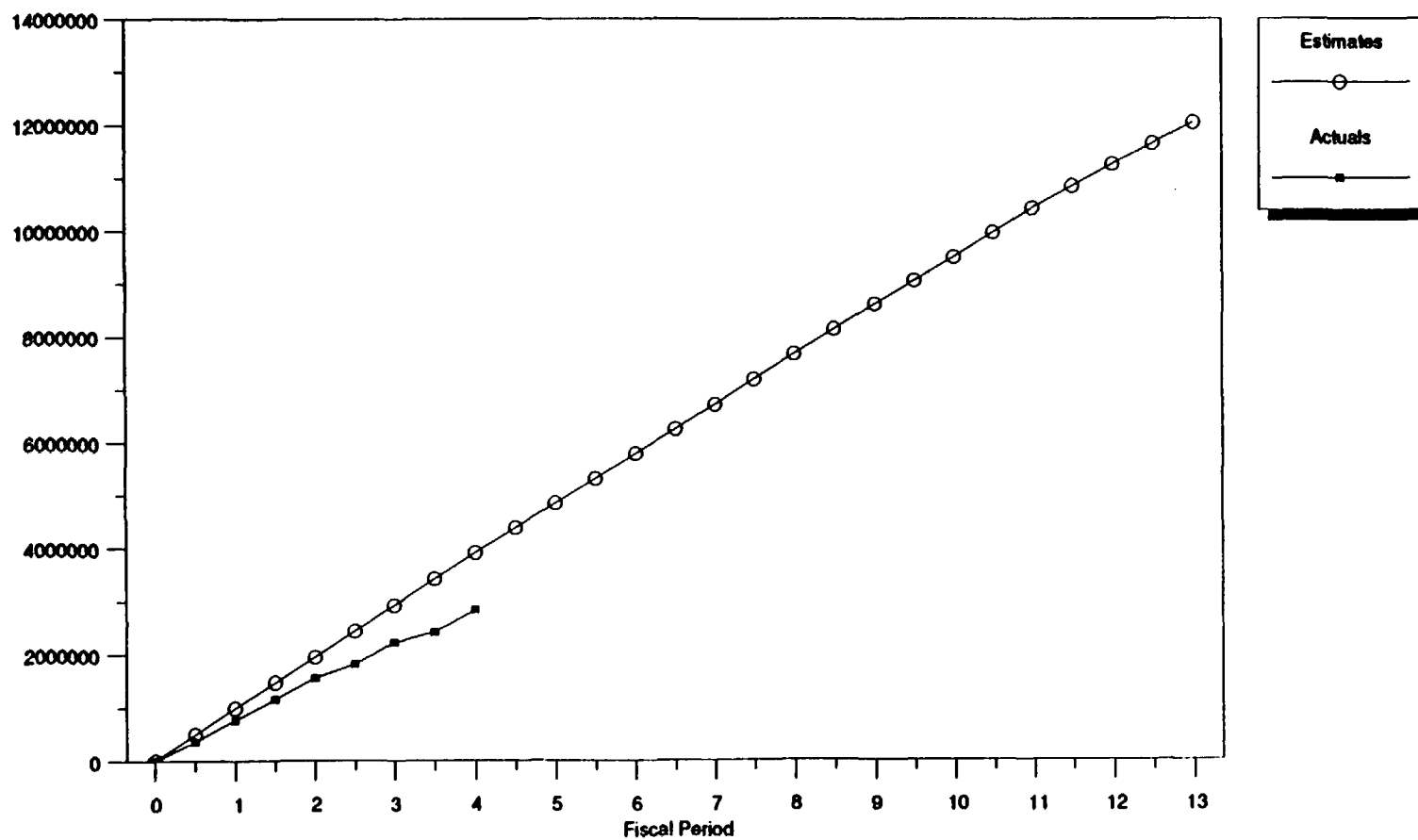
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	997202	948548	972653	994454	940242	925714	927085	958542	944143	887204	926782	835225	783419	3912857
ACT. PERIOD COST	771847	780672	874713	808807	0	0	0	0	0	0	0	0	0	2838039
VARIANCE, \$	225354	167875	297940	385648	0	0	0	0	0	0	0	0	0	1078818
VARIANCE, %	22.6	17.7	30.6	38.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.5
EST. FY CUMUL	997202	1945749	2918403	3912857	4853099	5778813	6705878	7662419	8606563	9493767	10420549	11255774	12039193	
ACTUAL FY CUMUL	771847	1552520	2227233	2838039	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.064	0.129	0.185	0.236	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	225354	393230	691170	1076818	0	0	0	0	0	0	0	0	0	
VARIANCE, %	22.6	20.2	23.7	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3700-000 Center Composite



3702

HLW

Element Status Cost Report

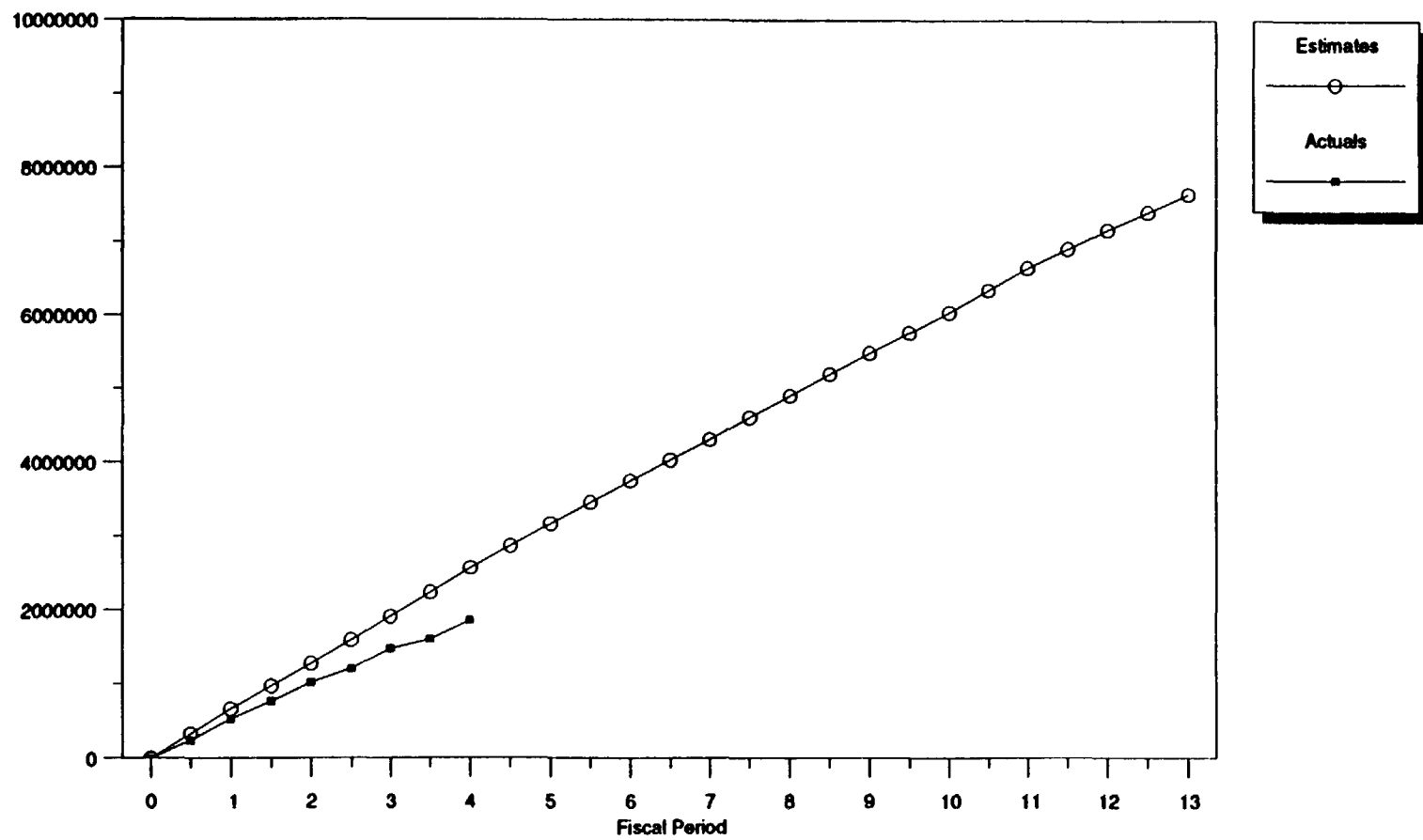
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	661121	612903	636530	658829	600518	580489	563517	593898	578710	549985	606810	520734	479678	2569383
ACT. PERIOD COST	528997	487028	459473	386036	0	0	0	0	0	0	0	0	0	1861534
VARIANCE, \$	132124	125875	177057	272793	0	0	0	0	0	0	0	0	0	707849
VARIANCE, %	20.0	20.5	27.8	41.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.5
EST. FY CUMUL	661121	1274024	1910554	2569383	3160901	3750390	4313908	4907808	5486515	6036501	6643311	7164045	7643723	
ACTUAL FY CUMUL	528997	1016025	1475498	1861534	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.069	0.133	0.193	0.244	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	132124	257999	435056	707849	0	0	0	0	0	0	0	0	0	
VARIANCE, %	20.0	20.3	22.8	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

1-15

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702 HLW



3704

RES

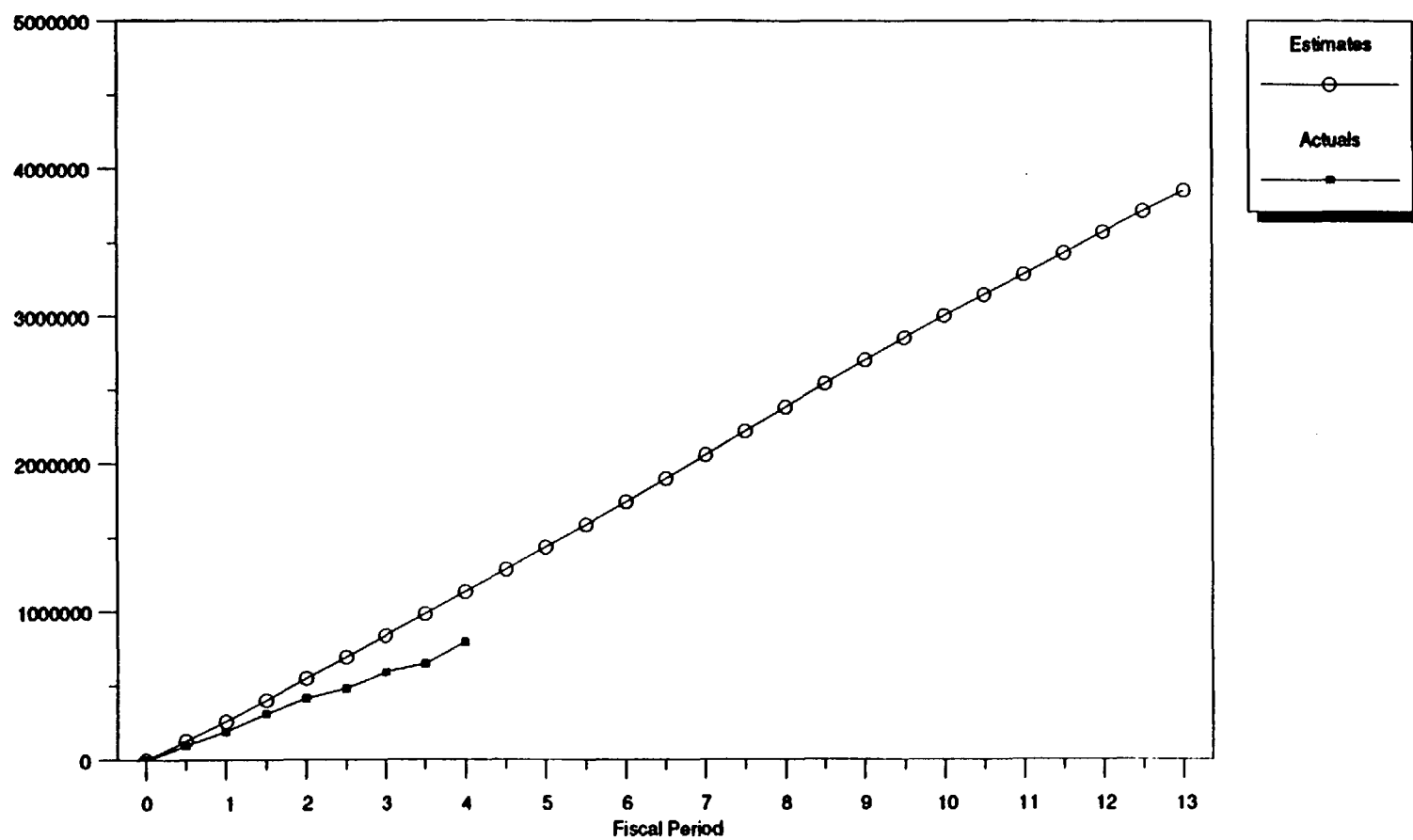
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	258166	289925	288722	286389	301264	305802	318784	324006	321204	298957	281299	289654	280777	1133183
ACT. PERIOD COST	193002	221970	170051	203444	0	0	0	0	0	0	0	0	0	794487
VARIANCE, \$	65164	67956	112671	92925	0	0	0	0	0	0	0	0	0	338716
VARIANCE, %	25.2	23.4	39.0	31.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.9
EST. FY CUMUL	258166	548092	836814	1133183	1434447	1740049	2058843	2382849	2704053	3003010	3284309	3573963	3854740	
ACTUAL FY CUMUL	193002	414972	581023	794487	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.050	0.108	0.153	0.206	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	65164	133119	245791	338716	0	0	0	0	0	0	0	0	0	
VARIANCE, %	25.2	24.3	29.4	29.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704 RES



2. CNWRA OPERATIONS

NRC Program Element Manager: Shirley L. Fortuna

NRC Project Officer: John T. Buckley (Task 5)

CNWRA Element Manager: Henry F. Garcia

Key Personnel: J. Latz, H. Garcia, R. Johnson, W. Patrick, R. Adler, B. Mabrito

Subcontractors/Consultants: Advisory Board Members: F. P. Cotter, A. P. Rollins, Jr.,
G. T. McBride, Jr., and P. T. Flawn

2.1 Technical Status

The tasks associated with this Element cover a variety of administrative functions, including the numerous management and staff activities described in the current Operations Plan. All projects and/or programs (i.e., management meetings and related discussions, selected internal training sessions, personnel recruitment, quality assurance activities, and development of various plans and programmatically related issues) are proceeding consistent with resource availability and time constraints.

Task 1 - Management Support and Planning

Effective coordination of work activities continued during this period. Center management participated in various management and technical meetings both telephonically and at the NRC's White Flint, Nicholson Lane, and Bethesda offices. Both the Five-Year and Center Management Plans were delivered on a timely basis. Administrative Procedure AP-003 relative to the development and presentation of meetings/trip reports was revised to accommodate more current informational requests. A Center-specific policy relative to the organizational and procedural aspects of peer reviews was introduced to provide clear guidance to Center staff initiating and/or participating in such activities. CNWRA management pursued further dialogue on issues affecting the receipt, conduct and progress of NRC-requested Center work as defined in the various Operations and Project Plans, and ad hoc requests. Moreover, discussions continued pursuant to the requirements for contract renewal.

The Center continued its input of various documents to the Technical Document Index and items into the Correspondence Control Index. The Center's Commitment Control Log has gained acceptance and utility among both the Center and NRC staff.

Interviews continued in an intense effort to secure the most qualified candidates for the remaining positions in the geosciences, laboratory materials scientist, code analyst, database management, and systems engineer. Specific openings and associated recruitment efforts are summarized in Section 1 of this report.

Task 2 - Develop and Sustain Technical and Analytical Capabilities

These activities are funded within Task 3 this fiscal year.

Task 3 - Staff Professional Development

Center staff attended and contributed to both SwRI and professional society sponsored training courses, conducive to their career development.

Task 4 - Operations Plan Development

The next revision of the Operations and Research Project Plans for FY92-93 is scheduled to begin at the end of Period 5 (early February), but the decision to pursue such revision will depend upon cost and schedule performance at that time. In light of the planned contract renewal effort, it may be necessary to defer consideration of such revisions.

Task 5 - Internal Quality Assurance

The periodic project status review meetings continue to take place between Principal Investigators and Center QA staff to consistently monitor progress of Center technical tasks and identify surveillance points. QA surveillance has been accomplished on research activities conducted by the Center, and surveillance reports continue to be maintained as QA records, as reported in Section 9. Monthly QA status reports are issued to all Center Directors, Element Managers, and Principal Investigators identifying the mandatory hold points and status of Center tasks. Center personnel qualification forms are being updated by the cognizant Center Director on an annual basis.

Center QA staff has updated the inventory of the Scientific/Engineering computer software documentation currently stored in a fireproof safe. Software summaries, copies of codes, and supporting documentation have been obtained for a number of codes. This process is continuing, with expectation that the files will be complete for the codes currently within the Center by the end of the next period.

2.2 Major Problems

As stated on the second page of Mr. Bernero's letter of January 17, 1992, concerning the Award Fee Determination Report, the Center concurs that improvements in communications will both facilitate and accelerate the maturation of the collegial interaction which supports the conduct of Operations and Project Plan work. The Center is working with NRC Program Management to identify additional opportunities for discussion and resolution of management issues in a single forum with appropriate management representation by the Office of Nuclear Materials Safety and Safeguards, the Office of Nuclear Regulatory Research and the Center for Nuclear Waste Regulatory Analyses.

2.3 Forecast for Next Period

The Center will continue to make the necessary preparations for contract renewal during FY92, especially in securing the development and presentation of planning data associated with the contract renewal proposal. A meeting on this subject and those management topics related to current issues affecting the Center is scheduled between cognizant NRC and Center staff for January 23-24, 1992. Contingent on the availability of sufficient funding, the Center's recruitment efforts will continue as positions in the geosciences, materials, systems engineering, and ADP areas which remain unfilled. The PMPR will be produced for the fifth period of FY92. Attendance at professional development events and participation in professional/technical society activities will be encouraged. Work will continue on the introduction of new information in the Technical Document and Correspondence Control Indexes.

The QA staff will continue to work with the Center Element Managers to ensure compliance with procedures affecting all products of the Center. Additionally, a timeframe for the Center annual audit will be established which will allow for the auditing of both technical and programmatic compliance levels of Center procedures and methods.

2.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in this Element are \$280. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are somewhat less than planned expenditures. This appears to be due primarily with underexpenditures associated with IMS work (including upgrading of the TDI and office automation features) which has been deferred to support accomplishment of higher priority LSSA work.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$1,497,608
FY92 Funds Costed to Date (b)	\$ 578,493
FY92 Funds Uncosted (c)	\$ 919,115
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
(b) Actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

3702-070

CNWRA OPS

Element Status Cost Report

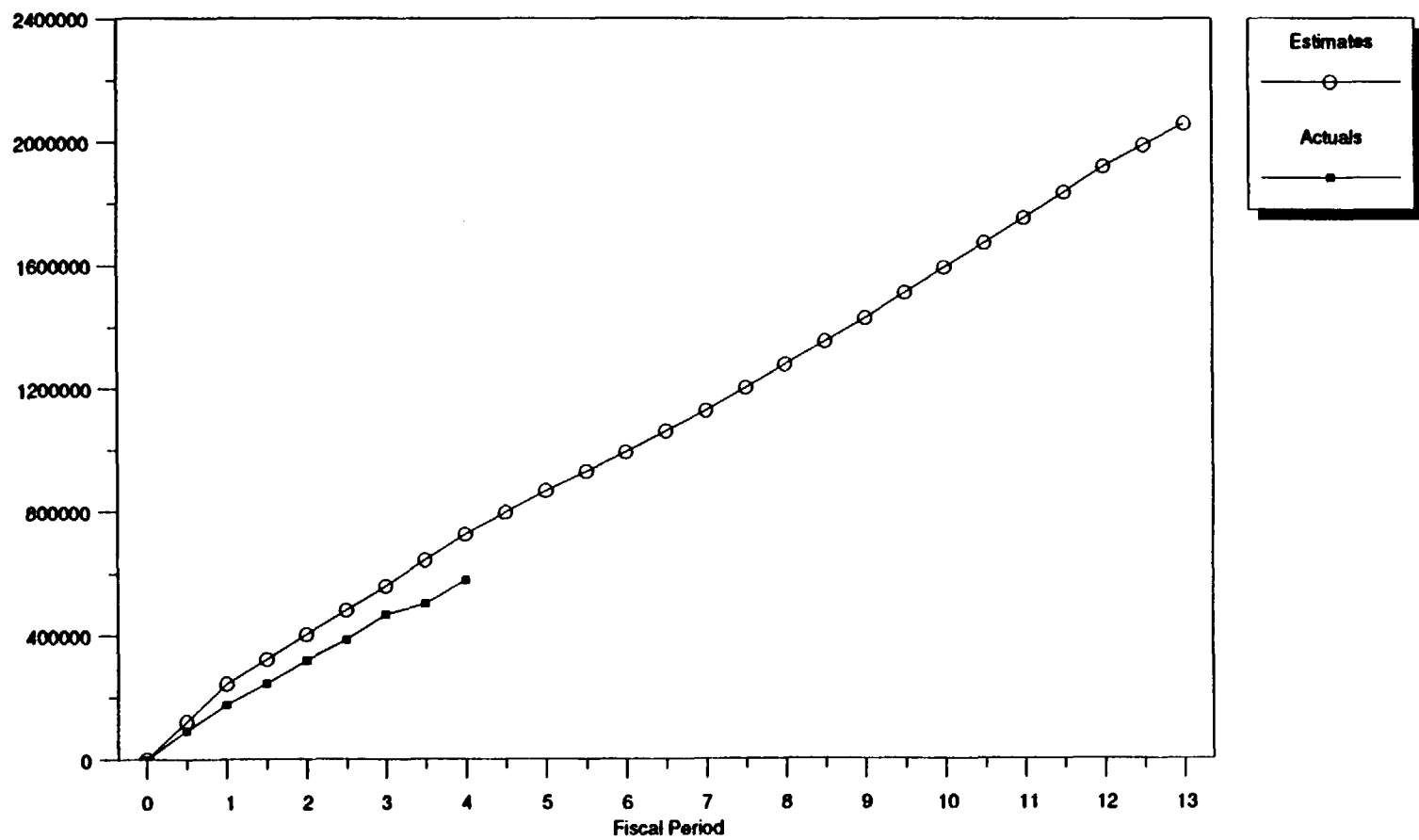
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	242873	159288	155476	160320	141118	125090	133892	149058	151718	162335	161702	167068	139374	728957
ACT. PERIOD COST	174818	142823	148900	111952	0	0	0	0	0	0	0	0	0	578493
VARIANCE, \$	68055	16465	6576	57368	0	0	0	0	0	0	0	0	0	148464
VARIANCE, %	28.0	10.3	4.2	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.4
EST. FY CUMUL	242873	402161	557637	728057	868074	993185	1127057	1277012	1428731	1591065	1752768	1919836	2059210	
ACTUAL FY CUMUL	174818	317641	466541	578493	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.085	0.154	0.227	0.281	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	68055	84520	91096	148464	0	0	0	0	0	0	0	0	0	
VARIANCE, %	28.0	21.0	16.3	20.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

2-4

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-070 COPS



3. WASTE SYSTEMS ENGINEERING AND INTEGRATION

NRC Program Element Manager: David Brooks

NRC Project Officer: Philip Altomare, (Tasks 1-2), Robert L. Johnson (Task 3)

CNWRA Element Manager: D. Ted Romine

Key Personnel: R. Adler, R. Johnson, P. LaPlante, J. Latz, P. Mackin, R. Marshall,
S. McFaddin, W. Patrick, S. Spector

Subcontractor/Consultant: J. Cooper

3.1 Technical Status

During this period, the major efforts of this Element included: (1) continuing development of Compliance Determination Strategies (CDS) for the Mining Regulations, Naturally Occurring Materials, Flooding, and Retrievability Regulatory Requirements (RR); (2) revision of the CDS procedure consistent with the development of the CDSs addressed in (1) above; (3) optimizing and extending features of PASS Version 2.0 based on lessons learned; (4) ongoing development of the maintenance module and Interactive Input Support Subsystem (IISS), and configuration control and documentation of PASS and the PADB; (5) continuing the preparation of a procedure for developing Compliance Determination Methods (CDM); (6) participation in an NRC/CNWRA task group established to resolve structural differences between the Format and Content Regulatory Guide (FCRG) and the RR/REOP structures, including implementation of NRC policy with respect to the relationship between the siting and design criteria and the performance objectives of 10 CFR Part 60; (7) refining a work plan for the Repository Isolation Criteria (RIC) study; (8) supporting preparation of the Center Five-Year Plan; and (9) beginning preparation of the final Repository Functional Analysis Report.

Task 1 - Statutory and Regulatory Analysis

WSE&I continued participation with the NRC in the development of CDS examples and subsequent refinement of a procedure for CDS preparation during this period. This process is utilizing the three selected example RRs (Mining Regulations, Naturally Occurring Materials, and Flooding). The development of an initial CDS-type selection for RR0002 (Retrievability) also continued during this period, but at lower priority than for the three examples associated with CDS procedure development. It is anticipated that the CDSs for the three example RRs will not be finalized until FCRG and RR/REOP structural issues are resolved and the RRs associated with these CDSs have been formally approved by the NRC.

Work continued on refinement of guidance and procedures for the next SRA structural levels (TRC and CDM).

A task force established to resolve SRA-related structural issues had its recommendation approved and commenced development of guidance to working groups which will implement those approved recommendations.

Staff continued discussions concerning the RIC Study content and approach pending a NRC decision on start date and began preparation of the final RFA Report including coordination of a revised format for the product of the analysis.

Task 2 - Program Architecture Development and Support System

Development of the prototype system for the Open Item Tracking System (OITS) continued.

Development of the prototype IISS continued. Initial hands-on use to obtain more specific design information will be conducted within the Center GS Element. The maintenance software development is proceeding for Version 2.0 of PASS and will be implemented in conjunction with the other SRA work being performed and the IISS. Completion of both of these subsystems of PASS will be dependent on the rescheduling of related SRA tasks.

Center and NRC staff performing specific SRA functions are being supported as necessary and upon request when using Version 2.0 of PASS the PADB information. A member of the Center staff from the Washington Technical Support Office is available part time to interact with the NRC staff for this purpose. This is also providing opportunities to optimize and extend specific input/output features of PASS V2.0.

Task 3 - Overall Review Strategy and License Application Review Plan

Activity on the Overall Review Strategy (ORS) is awaiting receipt of the draft document from the NRC. This activity is dependent upon resolving SRA-related structural issues.

Conducted initial work definition and planning for the Geotechnology Decision Study (3702-033-020) and the Uncertainty and URM subtasks (3702-031-030 and -040).

3.2 Major Problems

As noted in previous periods, the accomplishment of planned work not only for WSE&I, but for all Center Elements, is contingent upon the completion of several interrelated tasks, all of which are suffering delays. These include review, modification, and approval of the RR/REOP structure; approval of procedures for CDS and TRC development; and delineation and implementation of the NRC policy relative to the relationships between sections 60.112 and 60.122 of 10 CFR Part 60. A meeting is being planned to re-examine and reschedule the proactive tasks.

The active recruitment of a system engineer to fill an opening in WSE&I is continuing, as noted in Section 2.

3.3 Forecast for Next Period

Element activities during the next period will be focused on:

- Incorporation of the guidelines for CDS type selection and CDS development into a procedure for CDS preparation that is appropriate for NRC use;
- Participation in work groups which will be established to implement the recommendations from the task force established to resolve structural issues related to the FCRG and the RR/REOP structures;
- Completion of the Work Plan and commencement of work on the RIC;
- Finalizing the RFA Report based on a mutually agreeable analysis format;
- Continued optimization and extension of features in PASS Version 2.0;
- Continued prototyping of PASS Version 2.1, Interactive Input Support Subsystem;
- Continued implementation of software changes for PADB maintenance in PASS;
- Continued development of the OITS for NRC staff use;
- Anticipated receipt of an NRC draft of the Overall Review Strategy (ORS) Document to initiate Center participation in a task force to develop comments on this document.
- Initiation of the Geotechnology-Decision Study and the UN and URM subtasks.

3.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Outstanding commitments in the WSE&I Element are \$49,503. These are expected to be cleared during the next period. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Expenditures are approximately 21% under plan at this time. This underage is expected to be reduced when an open staff position in WSE&I is filled. Increased billing to WSE&I as a result of planned staff involvement in resolution of SRA-related structural issues will also help resolve the underage.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 1,051,485
FY92 Funds Costed to Date (b)	\$ 350,400
FY92 Funds Uncosted (c)	\$ 701,085
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES:

- (a) Authorized funds remaining after FY91 actual expenditures with fee.
- (b) Actual expenditures FY92 YTD without fee.
- (c) Difference between (a) and (b).

3702-030

WSE&I

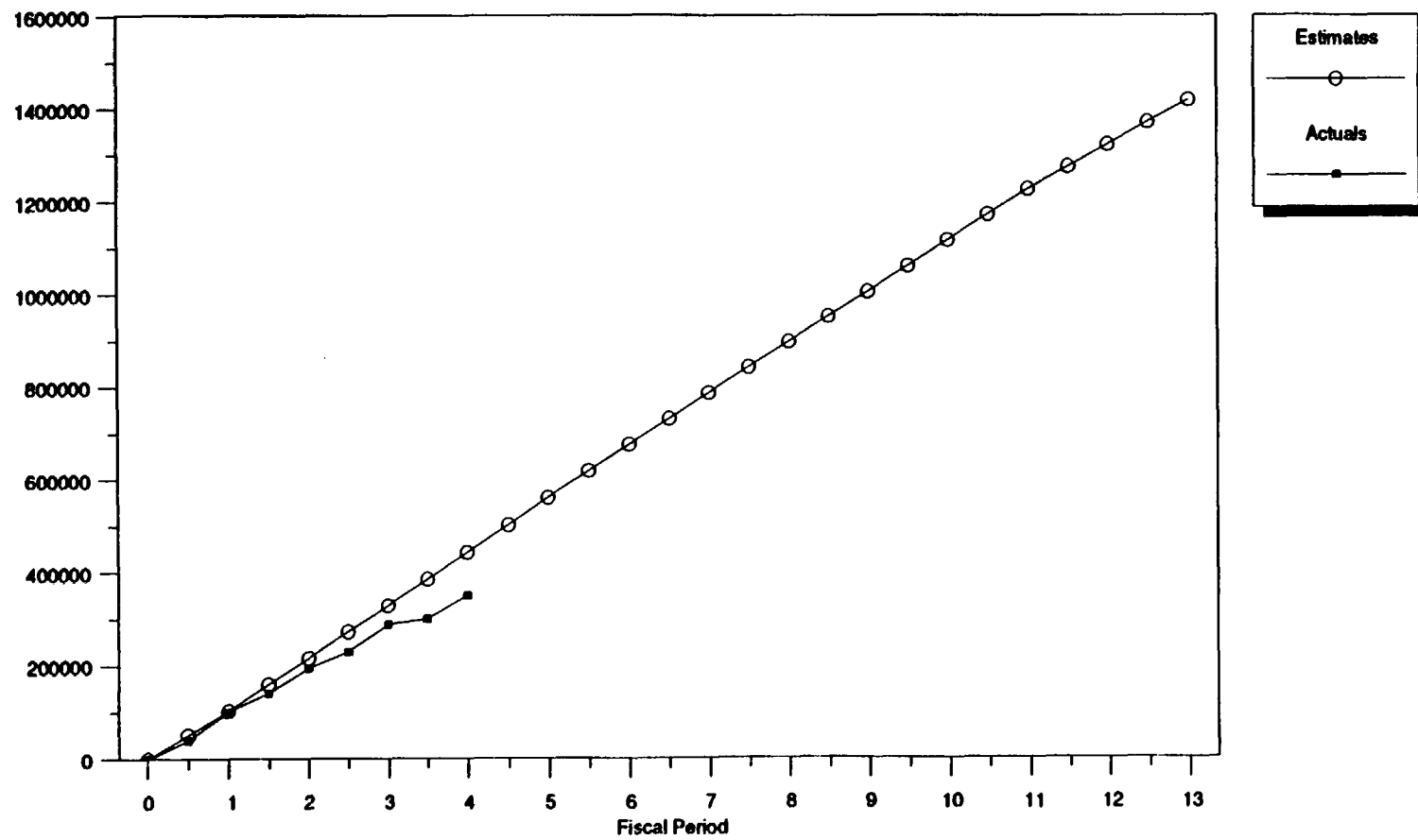
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	102510	112691	112406	114999	118961	114681	109831	110730	107588	110979	110917	96344	95811	442606
ACT. PERIOD COST	100333	92666	94252	83149	0	0	0	0	0	0	0	0	0	350400
VARIANCE, \$	2178	20025	18154	51849	0	0	0	0	0	0	0	0	0	92206
VARIANCE, %	2.1	17.8	16.2	45.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.8
EST. FY CUMUL	102510	215201	327608	442608	561567	676249	786079	896809	1004397	1115376	1226293	1322638	1418448	
ACTUAL FY CUMUL	100333	192999	287251	350400	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.071	0.136	0.203	0.247	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	2178	22202	40356	92206	0	0	0	0	0	0	0	0	0	
VARIANCE, %	2.1	10.3	12.3	20.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-030 WSE&I



4. QUALITY ASSURANCE

NRC Program Element Manager: Kenneth R. Hooks

CNWRA Element Manager: Bruce Mabrito

Key Personnel: B. Mabrito, R. Brient

Subcontractors/Consultants: None

4.1 Technical Status

Task 1 - DOE QA Site Characterization Audit Observations

During this period, discussions were held with NRC QA staff regarding the early CY92 DOE scheduled audits and other site characterization activities which will require NRC Center QA staff action.

Task 2 - Conduct QA On-Site Visits/Periodic Meetings

No activities were conducted within this task during this period.

Task 3 - Review and Update NRC QA Documents And Staff Technical Positions

During this period, arrangements were made to obtain funding to assist the NRC HLWM QA Section in revising its IQA Manual.

Task 4 - Review DOE QA Program Documents (Unfunded)

No activity this period.

4.2 Major Problems

None.

4.3 Forecast for Next Period

The Task 3 activity is planned to begin during Period 5 with a visit by a Center QA Staff member to NRC Headquarters, followed by additional assistance to HLWM QA and review of the finalized IQA Manual referenced above in Task 3. Center activities in other tasks will continue as directed by the NRC Program Element Manager for External QA, and as identified by the Center QA Director. At the present time, there are no DOE participant audits scheduled which will involve the Center during the next period. However, close contact will be maintained with the QA Program Element Manager to ensure prompt Center response is available should the NRC need personnel to be part of an NRC Audit Observation Team.

4.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of authorized funds established by the NRC. Table 2 displays planned and actual costs, without allowance for fee, to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are significantly less than planned. This reflects the fact that there have been postponements and changes in the DOE audit schedule which affect the NRC Audit Observation Team utilization. It is anticipated the EQA activities will increase in the second through fourth quarters of FY92.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$154,332
FY92 Funds Costed to Date (b)	\$ 27,390
FY92 Funds Uncosted (c)	\$126,942
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
(b) Actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

3702-040

QA

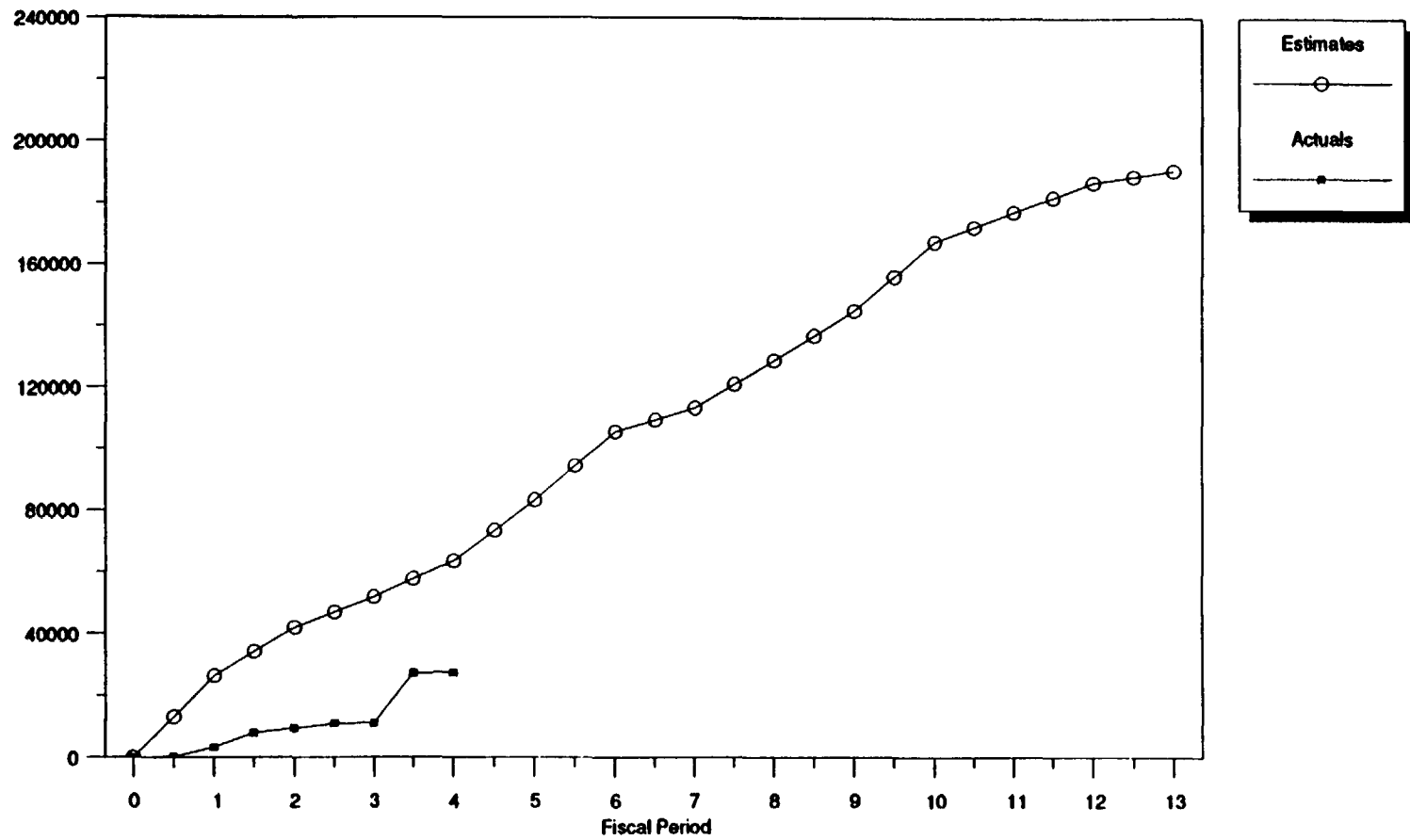
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	26256	15601	9081	11752	19781	22238	7647	15489	16097	22371	9777	9683	3830	83500
ACT. PERIOD COST	3224	6212	1099	16256	0	0	0	0	0	0	0	0	0	27390
VARIANCE, \$	23033	9389	8282	-4504	0	0	0	0	0	0	0	0	0	38201
VARIANCE, %	87.7	60.2	83.0	-38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	56.9
EST. FY CUMUL	26256	41857	51839	63590	83371	105607	113254	128744	144840	167213	176990	186673	190503	
ACTUAL FY CUMUL	3224	9435	11134	27390	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.017	0.050	0.058	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	23033	32422	40705	36201	0	0	0	0	0	0	0	0	0	
VARIANCE, %	87.7	77.5	78.5	56.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1901 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-040 QA



5. GEOLOGIC SETTING

NRC Program Element Manager: William Ford

CNWRA Element Manager: John L. Russell

Key Personnel: R. Green, R. Hofmann, B. Leslie, M. Miklas, W. Murphy, R. Pabalan,
E. Percy, J. Russell, G. Stirewalt, D. Turner, G. Wittmeyer, S. Young

Subcontractors/Consultants: None

5.1 Technical Status

General

On January 8, 1992, G. Stirewalt attended presentations at the NWTRB meetings in Arlington, VA, to obtain programmatic information at a briefing by the M&O Contractor on status of the Civilian Radioactive Waste Management Program.

Geologic Setting Program Element Interfaces With Other Center Activities

G. Stirewalt and W. Murphy participated in the December 10-11, 1991, IPA Team Meeting at White Flint to work on the development of scenarios related to tectonics and volcanism/magmatism. W. Murphy presented certain aspects of C-14 transport modeling which have been accomplished.

Center geoscientists conducted work for the Performance Assessment; Waste Systems Engineering and Integration; Engineered Barrier Systems; and Repository Design, Construction, and Operations Program Elements, promoting integration of technical input from the geosciences into technical assistance activities of the Center's other Program Elements, and in support of the Licensing Support System Administrator. Center geoscientists were also heavily involved with the conduct of geochemistry research performed in three Center research projects and a research project on Volcanism in the Basin and Range Province.

Task 1 - Prelicensing Activity

Subtask 1.1 - Review DOE's Site Characterization Plan (SCP) Progress Reports and Support NRC/DOE Prelicensing Technical Exchange Meetings

On January 10, 1992, at the request of P. Justus of the NRC, G. Stirewalt attended a dry run of presentations to be given to the NWTRB on January 22-23, 1992, at the Irvine, CA meetings. The presentations were entitled "Vulnerability of the Geologic Repository to Vibratory Ground Motion and Fault Displacement: Regulatory Perspective" by D. Gupta and "STP on Investigations to Identify Fault Displacement Hazards and Seismic Hazards at a Geologic Repository" by K. McConnell.

Subtask 1.2 - Review DOE's Study Plans

During this period, CNWRA review comments on DOE Study Plan 8.3.1.8.1.1 entitled "Study Plan for Probability of Magmatic Disruption of the Repository" were completed and transmitted to the NRC.

On January 15, 1992, G. Stirewalt met with P. Justus and J. Trapp at OWFN to discuss CNWRA review comments on DOE Study Plan 8.3.1.8.1.1. He provided them with supplementary notes outlining a thorough cross-walk between the comments and Points 1 and 2 of the NRC Technical Directive requesting CNWRA review of the study plan.

Subtask 1.3 - Detailed Technical Reviews

No activity occurred in this subtask during the reporting period. This subtask is held in reserve with no funding presently allocated for FY92. Work activity for this subtask is planned for FY93.

Subtask 1.4 - Support NRC in On-Site Visits

No activity occurred in this subtask during the reporting period. This subtask is held in reserve with no funding presently planned for FY92-93.

Task 2 - Regulatory and Technical Guidance Development

Subtask 2.1 - Systematic Regulatory Analysis and Assistance in the Development of Technical Positions, Staff Positions, and Related Regulatory Guidance

Subtask 2.1.1 - Systematic Regulatory Analysis and Assistance in Developing a Probabilistic Seismic Hazard Analysis Staff Position (Center Technical Leader - R. Hofmann)

During this period, Center staff initiated the computer-assisted search of NRC data sources to screen information on regulatory concepts concerned with seismicity. The information will be used to develop a report on regulatory history and intent for issues pertaining to seismicity.

The draft report forwarding RR's for this activity has been completed and Center internal review of the report was initiated.

Subtask 2.1.2 - Systematic Regulatory Analysis and Assistance in the Development of Hydrologic System Regulatory Guidance (Center Technical Leader - G. Wittmeyer)

No activity occurred on this Subtask during Period 3, consistent with the decision made February 20 and 21, 1991.

Subtask 2.1.3 - Systematic Regulatory Analysis and Assistance in the Preparation of Groundwater Travel Time/Disturbed Zone Rule Regulatory Guidance (Center Technical Leader - R. Green)

Comments by the Center staff on the selection of suitable criteria to be used to evaluate and establish optional requirements for the performance of the geologic setting subsystem have been provided to the members of the joint NRC and Center task team for review and discussion. Activity is continuing to reduce future potential difficulties concerning the merit of the qualifying criteria by providing supporting regulatory documentation for each of the criteria.

Subtask 2.1.4 - Systematic Regulatory Analysis and Assistance in the Development of Natural Resources Regulatory Guidance (Center Technical Leader - M. Miklas)

M. Miklas, B. Leslie, and J. Russell worked on the reevaluation of the CDS type selection for RR2018: PAC - Naturally Occurring Materials. The calculation and discussion of new "tests" of the response of the CCDF to a selected suite of drillholes at the Yucca Mountain proposed repository site was prepared to support CDS type selection decisions. M. Miklas and D. Turner completed the reworking of the text of Chapter 3 of the Natural Resources Options Paper which deals with the geologic bases for natural resource assessment at Yucca Mountain, Nevada as per NRC comments. New figures have been added and improvement of the original figures to accommodate NRC suggestions has been accomplished. M. Miklas, J. Russell, and D. Turner are supporting the IPA Phase 2 scenario development exercise to facilitate Center geologic input into the NRC performance assessment activities.

Subtask 2.1.5 - Systematic Regulatory Analysis and Assistance in the Development of Flooding Regulatory Guidance (Center Technical Leader - G. Wittmeyer)

G. Wittmeyer was selected to work in conjunction with Rex Wescott and Mike Lee from NMSS on performing a complete SRA of RR2002 on flooding of the repository due to changes made to the surface. To date, only a preliminary CDS type selection exercise for RR2002 has been completed by the SRA team, owing to the current state of uncertainty regarding the RR/REOP structure of SRA.

Subtask 2.1.6 - Systematic Regulatory Analysis and Assistance in the Development of Volcanic Hazards Regulatory Guidance (Center Technical Leader - G. Stirewalt)

During this period, Center staff continued the computer-assisted search of NRC data sources to screen information on regulatory concepts concerned with volcanism and magmatism. The information will be used to develop a report on regulatory history and intent for issues pertaining to volcanism and magmatism.

During this period, the letter report entitled "Identification of Regulatory Requirements for the Systematic Regulatory Analysis of Issues Related to Volcanic and Magmatic Hazards in 10 CFR Part 60" (Intermediate Milestone 3702-002-410-001 for the Volcanic/Magmatic Hazards Work Plan) was completed and transmitted to the NRC.

Subtask 2.1.7 - Systematic Regulatory Analysis and Assistance in the Development of Tectonics Regulatory Guidance (Center Technical Leader - S. Young)

Verbal comments were received from the NRC staff on the "Identification of RRs Pertinent to Tectonics" letter report submitted to NRC by the Center. NRC and Center Staff agreed to additions to the preliminary list of RRs related to tectonics. However, the RRs chosen for SRA work at this time remain RR2005 (Structural deformation, such as uplift, subsidence, folding, or faulting that may adversely affect the regional groundwater flow system), and RR2012 (Structural deformation such as uplift, subsidence, folding and faulting during the Quaternary Period).

Work on developing a proposed CDS LA review type and Compliance Determination Strategy for submission to NRC has been delayed and awaits finalizing the SRA "example" CDS for RR2018.

During this period, Center staff initiated the computer-assisted search of NRC data sources to screen information on regulatory concepts concerned with tectonism. The information will be used to develop a report on regulatory history and intent for issues pertaining to tectonics.

Subtask 2.1.8 - Systematic Regulatory Analysis and Assistance in the Development of Geochemical System Regulatory Guidance

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.1.9 - Systematic Regulatory Analysis and Assistance in the Development of Climatologic and Meteorological System

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.1.10 - Assistance in the Development of the Technical Basis of SRA Defined Regulatory Guidance

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.2 - Systematic Regulatory Analysis and Assistance in the Development of Rules and Amendments

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 2.3 - Preparation of Technical Input for Other Guidance Documents

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Task 3 - Analysis, Codes and Methods

Additions and enhancements to the Center's capability to conduct activities in this task include the modification of office space to provide a much larger and centralized scientific and engineering computing facility incorporating the Center's IRIS and SUN SPARC2 workstations and associated disk storage, digitizing tablet, film recorder, large (E size) plotter, and printers. The workstations and associated peripherals are linked to individual personal computers in Center staff member offices and to the Institute mainframe computers.

Subtask 3.1 - Groundwater Travel Time Analyses, Codes and Methods

The Center staff has continued development of objectives and preliminary computational options that may be used to perform groundwater travel time calculations for assessing methodologies that may provide information on the resolution of groundwater travel time issues.

Subtask 3.2 - Tectonic and Structural Geology Analyses, Codes and Methods

Work is continuing on development of methods for review of tectonic models, detailed evaluation of DOE cross section models of Yucca Mountain, integration of seismic reflection data into tectonic models, and development of alternative structural geologic/tectonic models. Work is currently focusing on development of a range of alternative solutions to the DOE cross section models of Yucca Mountain. Specifically, the depth range of possible low-angle detachment zones is being determined from refined interpretations of deformation of Yucca Mountain.

Subtask 3.3 - Probabilistic Fault Displacement and Seismic Hazard Analyses, Codes and Methods

Several telephone calls were made by R. Hofmann to LLNL and to Oak Ridge National Laboratory to facilitate obtaining the SEISM 1 code. ORNL is now dispensing HLW codes but they cannot find the SUN and CRAY versions of SEISM 1. The available CDC 7600 version would require considerable porting effort to be used on CNWRA computers. LLNL's local net has been made inaccessible for security reasons so using INTERNET to obtain the code is not a viable option. LLNL is currently planning to send copies of the code and documentation to CNWRA.

Subtask 3.4 - Geochemical Analyses

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 3.5 - Hydrological Analyses

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

Subtask 3.6 - Other Analyses, Codes and Methods

No activity occurred in this subtask during the reporting period. This subtask is held in reserve for potential future activity. No funding presently exists for this subtask.

5.2 Major Problems

NRC-CNWRA closure on the relationship between 10 CFR 60.112 and 60.122 and implementation into SRA activities in the GS Element must be formalized if the timely development of appropriate CDSs, TRCs, and CDMs is to occur. The development and reviews of CDSs and TRCs is dependent on the availability of accepted procedures for their development and improved definition of expected content. Task forces have been developed to address these concerns.

5.3 Forecast for Next Period

The Center staff will support the NRC staff review of the draft "Options Paper on Groundwater Travel Time as the Performance Measure of the Geologic Setting of a High-Level Radioactive Waste Geologic Repository" report, the draft "Options Paper Including Comments on an Acceptable Methodology for Assessment of the Natural Resources of a Proposed High-Level Waste Repository Site" and the "Probabilistic Fault Displacement and Seismic Hazard Analysis Literature Review." Staff will assist the NRC in obtaining closure on decisions which impact the development of the final reports on groundwater travel time and natural resources.

5.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments for this Element are \$2,708. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Spending is significantly under plan at this point. This results from less than anticipated expenditures for subcontractors and consultants which would support Task 1 work and delayed SRA work in Task 2.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 973,245
FY92 Funds Costed to Date (b)	\$ 232,144
FY92 Funds Uncosted (c)	\$ 741,101
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES:

- (a) Authorized funds remaining after FY91 actual expenditures with fee.
- (b) Actual expenditures FY92 YTD without fee.
- (c) Difference between (a) and (b).

3702-000 GS

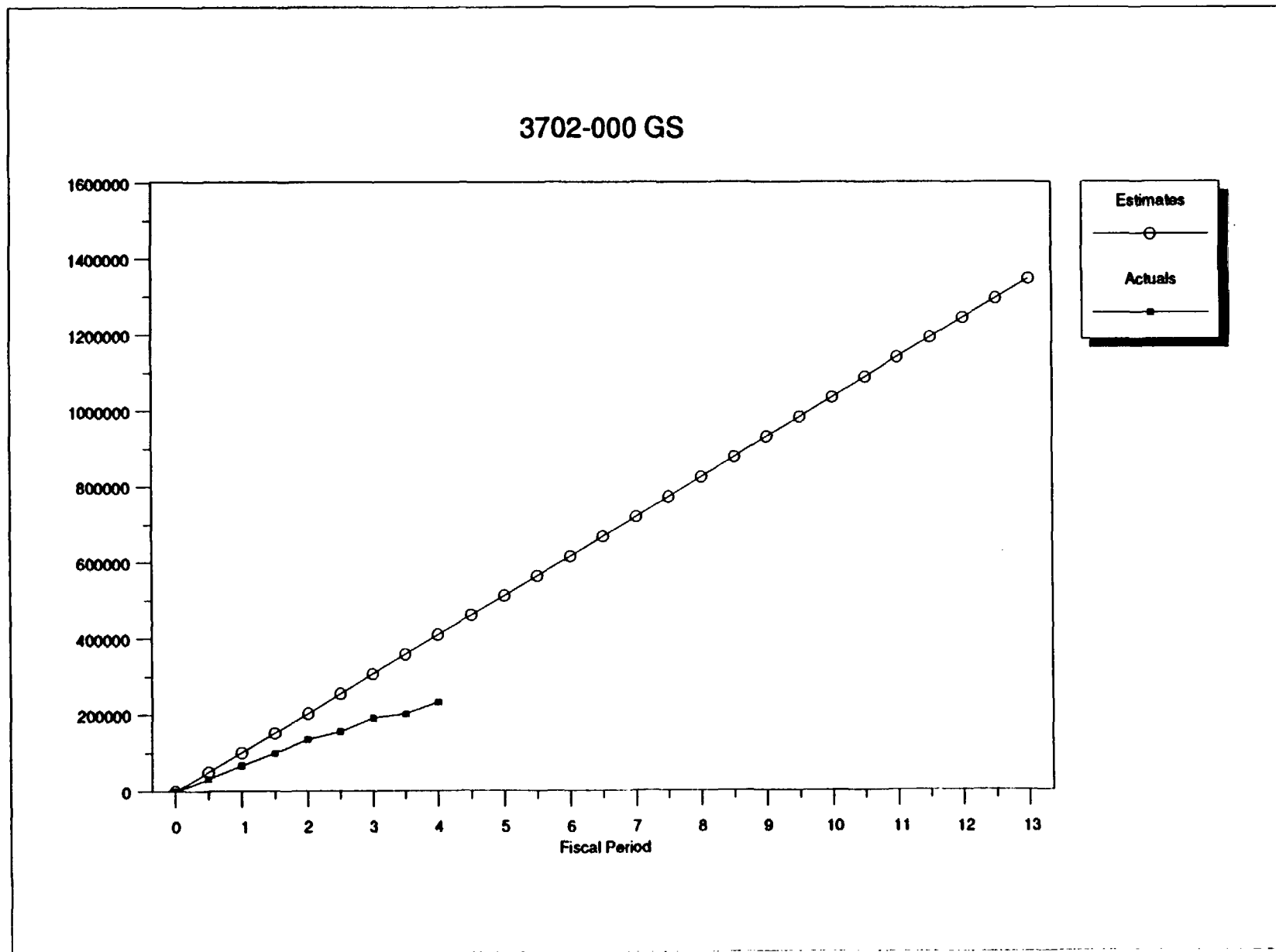
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	100415	102454	103348	102933	102774	103487	103855	104649	105034	104869	105473	104385	102748	409150
ACT. PERIOD COST	67019	67918	55816	41391	0	0	0	0	0	0	0	0	0	232144
VARIANCE, \$	33396	34536	47533	61541	0	0	0	0	0	0	0	0	0	177006
VARIANCE, %	33.3	33.7	46.0	59.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	43.3
EST. FY CUMUL	100415	202869	306217	409150	511924	615411	719086	823715	928749	1033618	1139091	1243476	1348222	
ACTUAL FY CUMUL	67019	134937	190753	232144	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.050	0.100	0.142	0.172	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	33396	67932	115464	177006	0	0	0	0	0	0	0	0	0	
VARIANCE, %	33.3	33.5	37.7	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

5-8

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1901 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.



6. ENGINEERED BARRIER SYSTEM

NRC Program Element Manager: Charles G. Interrante

NRC Project Officer: Kien C. Chang (Tasks 1 and 3)

CNWRA Element Manager: Prasad K. Nair

Key Personnel: G. Cragolino, H. Manaktala, P. Nair, W. Patrick,
N. Sridhar, E. Tschoepe, and Y. Wu

Subcontractors/Consultants: None

6.1 Technical Status

The EBS staff provided support to the RDCO and SRA activities this reporting period.

Professional Activities

- P. Nair reviewed and voted on several changes to ASTM E-10 standards. This is part of the E-10 main committee activity. The resolution of the negative votes will be evaluated at a E-10 and C-26 committee meeting in New Orleans on January 29-31, 1992.
- H. Manaktala continued to develop the sessions and review of papers for the Corrosion92 conference.

Task 1 - Prelicensing Activities

No planned activity this period.

Task 2 - Regulatory and Technical Guidance Development

The SCC example problem work plan in the Operations Plan was reviewed and modifications recommended by both NRC and Center staff. A revised plan will incorporate a review of experience with buried structures and a review of the calculational algorithm for the example problem.

As part of a management review of the status of the various milestones on January 17, 1992, a meeting of the management and technical staff is planned to outline the short-term and long-term strategy for the conduct of the work required to address the uncertainty in the "substantially complete containment" regulation. The meeting is expected to be scheduled to be held in the next four-week period.

Task 3 - Analysis Codes and Methods

The documentation of the crevice model developed as part of EBSPAC and the

subsequent modifications for use in the IPA project is underway. The Initiation Model for Occluded Cell Corrosion (IMOCC) will be documented according to the configuration control requirements at the Center.

This reporting period, the review comments on the draft procedures for conducting leaching tests on borosilicate glasses were incorporated. The procedures are to be issued in accordance with Center QA Manual requirements next period.

A leaching procedure 'check-run' was made during this reporting period. The 'check-run' included crushing borosilicate glass, fractionating the resultant powder according to the mesh size, weighing the powdered glass, cleaning the leaching vessel assembly, measuring and adding the leachant to the leaching vessel, assembling the leaching vessel, and exposing the glass sample to a 7-day leaching test in an air oven at 90°C. In this 'check-run', one gram of glass sample and 10 mL of leachant were used. The borosilicate glass sample used for the test was obtained from West Valley. Weight of the complete leaching test 'assembly' was recorded at the beginning of the test, after 1, and again after 7 days test duration. The measured weight loss was 0.1 wt.% of the leachant at the beginning of the test and 0.5 wt.% of the leachant at the end of the test—well within the 5 wt.% allowed by the Product Consistency Test (PCT) which is currently being developed into an ASTM Standard Test Method for leaching borosilicate glasses.

Work continued in the materials laboratory to calibrate the various pieces of equipment and instruments planned for use in the glass testing area.

6.2 Major Problems

None.

6.3 Forecast for Next Period

The Task 2 activities on the structure of implementing the SCC example problem will be reviewed in a joint NRC-Center meeting.

Preparation of the review report on the glass waste form will continue. Testing of the borosilicate glass will continue based on the developed test procedures.

6.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Expenditures for this Program Element are now below the planned target and are expected to be lower than planned for the next period as well. This is because the numerical analyst has not yet joined the staff and because of anticipated low activity due

to holidays and vacations planned by the staff. It is anticipated that the expenditures will be as planned in about two periods.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 474,460
FY92 Funds Costed to Date (b)	\$ 154,225
FY92 Funds Uncosted (c)	\$ 320,235
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES:

- (a) Authorized funds remaining after FY91 actual expenditures with fee.
- (b) Actual expenditures FY92 YTD without fee.
- (c) Difference between (a) and (b).

3702-010

EBS

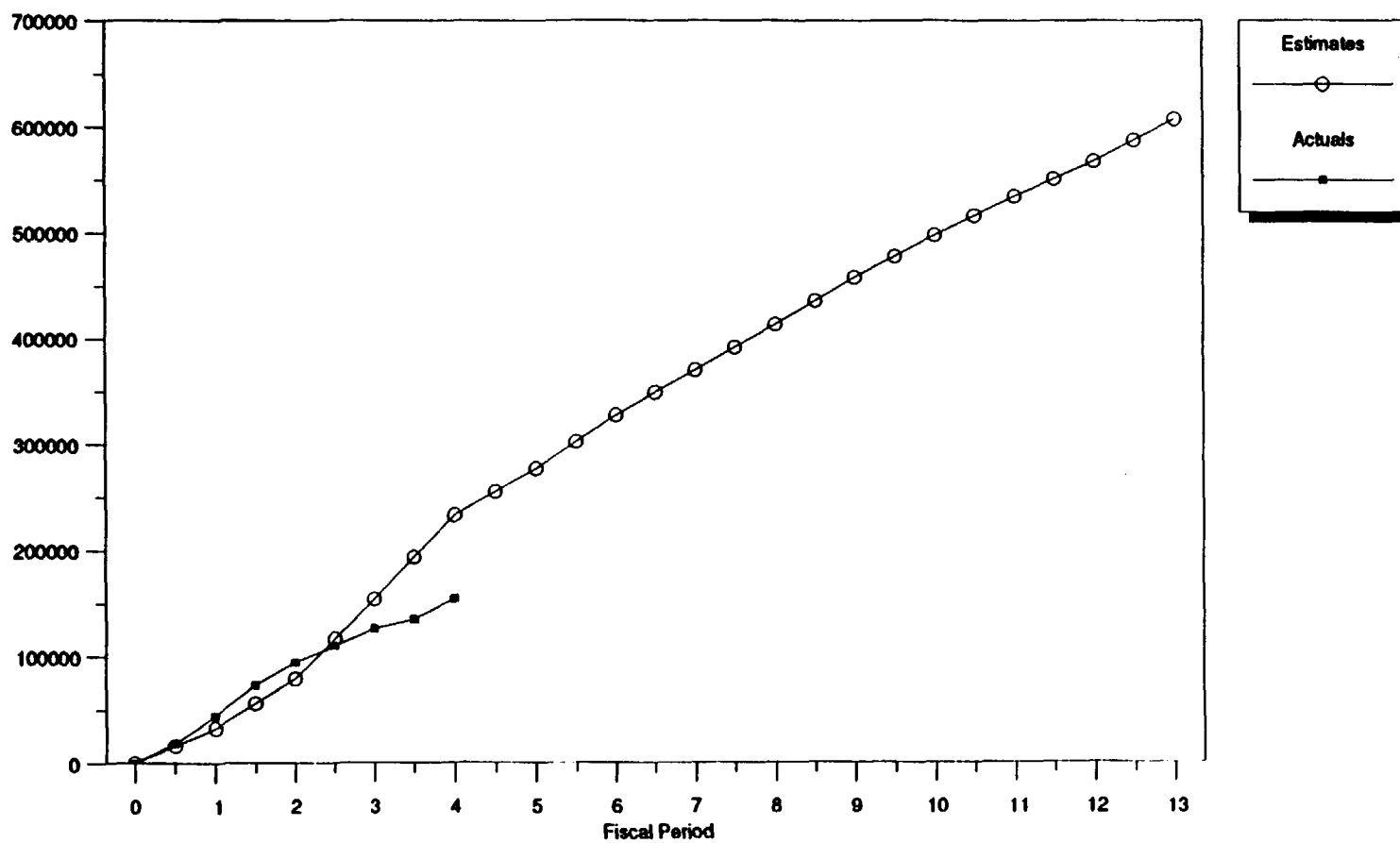
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	32587	46270	74042	79514	43685	50438	42270	43597	44179	40000	36596	33196	39635	233322
ACT. PERIOD COST	44050	50180	31852	28143	0	0	0	0	0	0	0	0	0	154225
VARIANCE, \$	-11463	-3900	43090	51370	0	0	0	0	0	0	0	0	0	79097
VARIANCE, %	-35.2	-8.4	57.5	64.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.9
EST. FY CUMUL	32587	78868	153008	233322	277007	327443	369713	413310	457489	497488	534085	567281	606915	
ACTUAL FY CUMUL	44050	94229	126081	154225	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.073	0.155	0.208	0.254	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	-11463	-15363	27726	79097	0	0	0	0	0	0	0	0	0	
VARIANCE, %	-35.2	-19.5	18.0	33.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-010 EBS



7. REPOSITORY DESIGN, CONSTRUCTION, AND OPERATIONS

NRC Program Element Manager: Mysore S. Nataraja

NRC Project Officers: Dinesh C. Gupta (Task 1)

CNWRA Element Manager: Asadul H. Chowdhury

Key Personnel: M. Ahola, A. Chowdhury, J. Daemen, J. Hageman, S. Hsiung, H. Karimi, L. Lorig, R. Manteufel, W. Patrick, E. Tschoepe

Subcontractors/Consultants: Itasca Consulting Group, Inc., J. Daemen, R. Field, T. Krauthammer, C. Shih

7.1 Technical Status

During reporting Period 4 of FY92, the RDCO staff performed activities for the RDCO, WSE&I, Waste Solidification System (WSS), Performance Assessment (PA), and CNWRA Operations Program Elements and Seismic Rock Mechanics Research Project. A. Chowdhury visited NRC Headquarters during January 14-15, 1992, to discuss the progress to date and future work on RDCO technical and research activities. A trip report will be submitted to NRC during the next reporting period. The meeting activities are briefly discussed under RDCO tasks and seismic rock mechanics research project.

Professional Activities

- J. Hageman attended the Midyear Symposium of the Health Physics Society at Detroit, Michigan, on January 11-13, 1992. He served as the Chairman of the Publications Committee and the Ad Hoc Committee on Centralized Publications and attended the technical sessions dealing with radioactive waste disposal and internal dosimetry.
- A. Chowdhury peer-reviewed a technical paper for an ASCE journal.

Task 1 - Prelicensing Activities

A. Chowdhury of CNWRA and M. Nataraja, B. Jagannath, and D. Gupta of NRC discussed the RDCO prelicensing activities on January 17, 1992. This discussion included the schedule for the review of Major Design Documents, Site Characterization Progress Report, and Study Plans. It was decided to review the Exploratory Studies Facility (ESF) Title I Design, Revision 1, subject to approval by NRC management. During this period, A. Chowdhury conducted Phase I review of the Site Characterization Progress Report, No. 4, October 1991. The findings of this Phase I review will be submitted to NRC during the next reporting period.

The capabilities and limitations of the underground ventilation computer programs "CLIMSIM" and "VNETPC" are being assessed by RDCO staff. These computer

programs will be used to review DOE's repository ventilation design, including ventilation design for the ESF Title I design.

Task 2 - Regulatory and Technical Guidance Development

The Design Basis Accident (DBA) rulemaking activity continued during this period. Several teleconferences were held with various NRC staff to discuss and revise the governing principles that will be used for DBA rulemaking activity. A DBA rulemaking meeting was held at NRC on January 15, 1992. A. Chowdhury and J. Hageman of CNWRA and M. Nataraja, M. Lee, B. Jagannath, J. Wolf, T. Clark, and F. Sturtz of NRC attended this meeting. The meeting resulted in a clear understanding of NRC's defense-in-depth practice that is applied to a nuclear facility that handles and stores HLW. This concept was utilized to come to an agreement between NRC and CNWRA staffs on the scope of DBA Rulemaking and to provide a briefing to the Director of NMSS on January 17, 1992. J. Hageman and B. Adler of the Center attended this briefing.

The review and revision of regulatory requirements (RRs) relevant to RDCO Program Element was initiated during this reporting period.

Task 3 - Analysis Codes and Methods

The literature review to prepare a state-of-the-art report on available numerical models and computer codes for fully or partially coupled thermal-hydrological-mechanical-chemical (THMC) processes continued. A computer search is being conducted to identify the numerical models and computer codes that have been published more than 1-1/2 years ago and a manual search is being done for those which have been published during the last 1-1/2 years. S. Hsiung, M. Ahola, R. Manteufel, D. Turner, and A. Chowdhury are carrying out this activity. The source code of the two-dimensional distinct element computer program UDEC has been procured by the Center using SwRI capital equipment funding. This code will be modified, as needed, to use in coupled THMC analysis.

Task 6 - Repository Operational Criteria Feasibility Studies

Work on the ROC Activity 3 has been primarily in support of the DBA rulemaking and in identification of specific terminology in 10 CFR Part 60 that may appear inconsistent with other referenced regulations (e.g., 10 CFR Part 20) or internally inconsistent. Identification of this potential inconsistent uses of terminology can be addressed in the planned DBA rulemaking. The acceptance criteria for the Activity 3 report for the ROC task will be completed and submitted to NRC as an intermediate milestone by January 27, 1992.

7.2 Major Problems

None.

7.3 Forecast for Next Period

Revision of RRs relevant to RDCO, technical position on thermal loads, DBA rulemaking,

literature review on existing coupled T-H-M-C numerical models, ROC Activity 3, and precicensing activities will continue during the next reporting period.

7.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and reported actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in the Element are \$89,755. The attached figure following Table 2 displays the estimated cumulative spending plan and the reported actual cumulative costs to date.

Costs incurred to date are less than planned. This is primarily due to continued delay in receiving scheduled study plan review and major design report review assignments from NRC for RDCO Task 1, and delay to start scheduled SRA work for RDCO Task 2, caused by RR/REOP issue resolution activity. Now that the work on the technical position on thermal load and the SRA work (including selection of RRs) will be carried out with an accelerated schedule, it is anticipated that these cost variances will be remedied during the next few periods.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 625,607
FY92 Funds Costed to Date (b)	\$ 239,167
FY92 Funds Uncosted (c)	\$ 386,440
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES: (a) Authorized funds remaining after FY91 reported actual expenditures with fee.
(b) Reported actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

3702-020

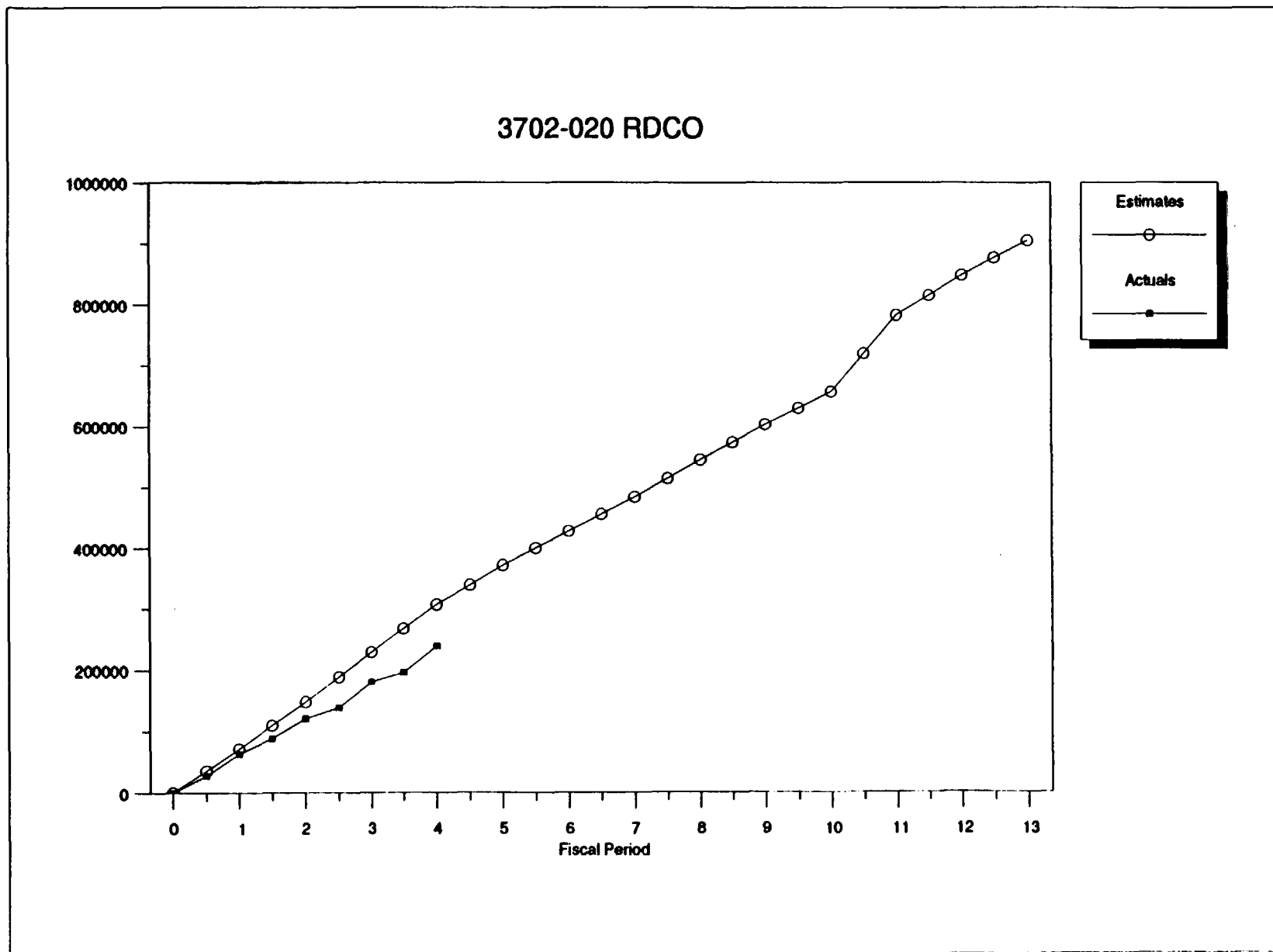
RDCO

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	71598	76282	81180	78049	64839	58151	55882	80707	68115	53794	125592	66056	57196	307109
ACT. PERIOD COST	63878	56570	50840	58879	0	0	0	0	0	0	0	0	0	239167
VARIANCE, \$	7720	19712	21340	19170	0	0	0	0	0	0	0	0	0	87942
VARIANCE, %	10.8	25.8	26.3	24.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.1
EST. FY CUMUL	71598	147880	229060	307109	371948	428099	483981	544688	602783	656577	782169	848225	905421	
ACTUAL FY CUMUL	63878	120447	180288	239167	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.071	0.133	0.109	0.264	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	7720	27433	48772	67942	0	0	0	0	0	0	0	0	0	
VARIANCE, %	10.8	18.6	21.3	22.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.



8. PERFORMANCE ASSESSMENT

NRC Program Element Manager: S. Coplan

NRC Project Officers: R. Neel (Tasks 1-4), N. Eisenberg (Task 5)

CNWRA Element Manager: Budhi Sagar

Key Personnel: R. Ababou, M. Ahola, A. Bagtzoglou, R. Green, A. Gureghian, R. Janetzke,
R. Manteufel, W. Murphy, G. Wittmeyer, Y. Wu

Subcontractors/Consultants: None

8.1 Technical Status

General Activities

The following papers based on Task 5 work were submitted to the forthcoming International HLW Management meeting in Las Vegas:

"Deterministic and Probabilistic Performance Assessment Methods Applied to Radionuclide Migration Through Fractured Geologic Medium" authored by A. B. Gureghian, Y.-T. Wu, and B. Sagar.

"Occurrence of Metallic Phases in Spent Fuel: Significance for Source Term Predictions for High-Level Waste Disposal" by E. C. Percy and H. K. Manaktala.

"Geochemical Model for C-14 Transport in Unsaturated Rock" by R. B. Codell and W. M. Murphy.

Task 1 - Prelicensing Reviews

No activity this period.

Task 2 - Regulatory and Technical Guidance Development

Subtask 2.1 - Systematic Regulatory Analysis of EPA Standard

Plans regarding development of the CDS for 10 CFR 60.112 were discussed. Mr. Coplan indicated that Jim Park will lead the team in this effort.

Subtask 2.2 - Rules and Amendment Support to Conform to the EPA Standard

No significant activity this period.

Subtask 2.3 - Implementing the EPA HLW Standard

No significant work this period.

Subtask 2.4 - Review and Continue Development of Guidance for Formal Use of Expert Judgment

A brief letter report dealing with preliminary investigation of possible use of Fuzzy Logic in dealing with semi-quantitative information obtained through expert elicitation was completed and submitted to NRC.

Dr. Robert Winkler of Duke University and Dr. Steve Hora of University of Hawaii were put under contract as consultants on the expert elicitation task. They will travel to the NRC offices for a meeting on January 24, 1992.

Task 5 - Iterative Performance Assessment

Dr. Sagar participated in an IPA coordinators meeting on January 16, 1992. Per the decision made in that meeting, he wrote a memo to all IPA team members to use standard FORTRAN 77 in coding of modules that are to be linked to the TPA code.

A report authored by M. Ahola and B. Sagar was completed and submitted to NRC. This report documents the modeling work done on the saturated zone at Yucca Mountain as one of the auxiliary analyses for IPA Phase 2. Further work is continuing on the same exercise to develop two parametric curves: one depicting a relation between the increase in recharge and the rise in water table, and the other a similar relation between increase of barrier permeability and water table rise. The hydrologic barrier under consideration here is the one that exists north of the Yucca Mountain Site.

A brief letter report detailing the modifications made to the dose code DITTY was completed and submitted to the NRC. In this report, recommendations for further modifications to DITTY were also made.

Work on the source term code is continuing. The waste package failure module is now complete. The waste dissolution and near-field transport module is under development.

Work also continued on completion of the second part of sensitivity/uncertainty report.

8.2 Major Problems

None.

8.3 Forecast for Next Period

Work on Task 2 and several of the Phase 2 Iterative Performance Assessment activities will continue as well as the work on the SRA of 40 CFR Part 191.

8.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments in this Element are \$3,780. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

The spending level is somewhat less than estimated in the revised Operations Plan. This results primarily from lower than expected levels of activity in Tasks 1 and 2. Task 5 expenditures are anticipated to accelerate as Phase 2 nears completion and final staff come on board.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 943,134
FY92 Funds Costed to Date (b)	\$ 279,715
FY92 Funds Uncosted (c)	\$ 663,419
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

- NOTES:
- (a) Authorized funds remaining after FY91 actual expenditures with fee.
 - (b) Actual expenditures FY92 YTD without fee.
 - (c) Difference between (a) and (b).

3702-060

PA

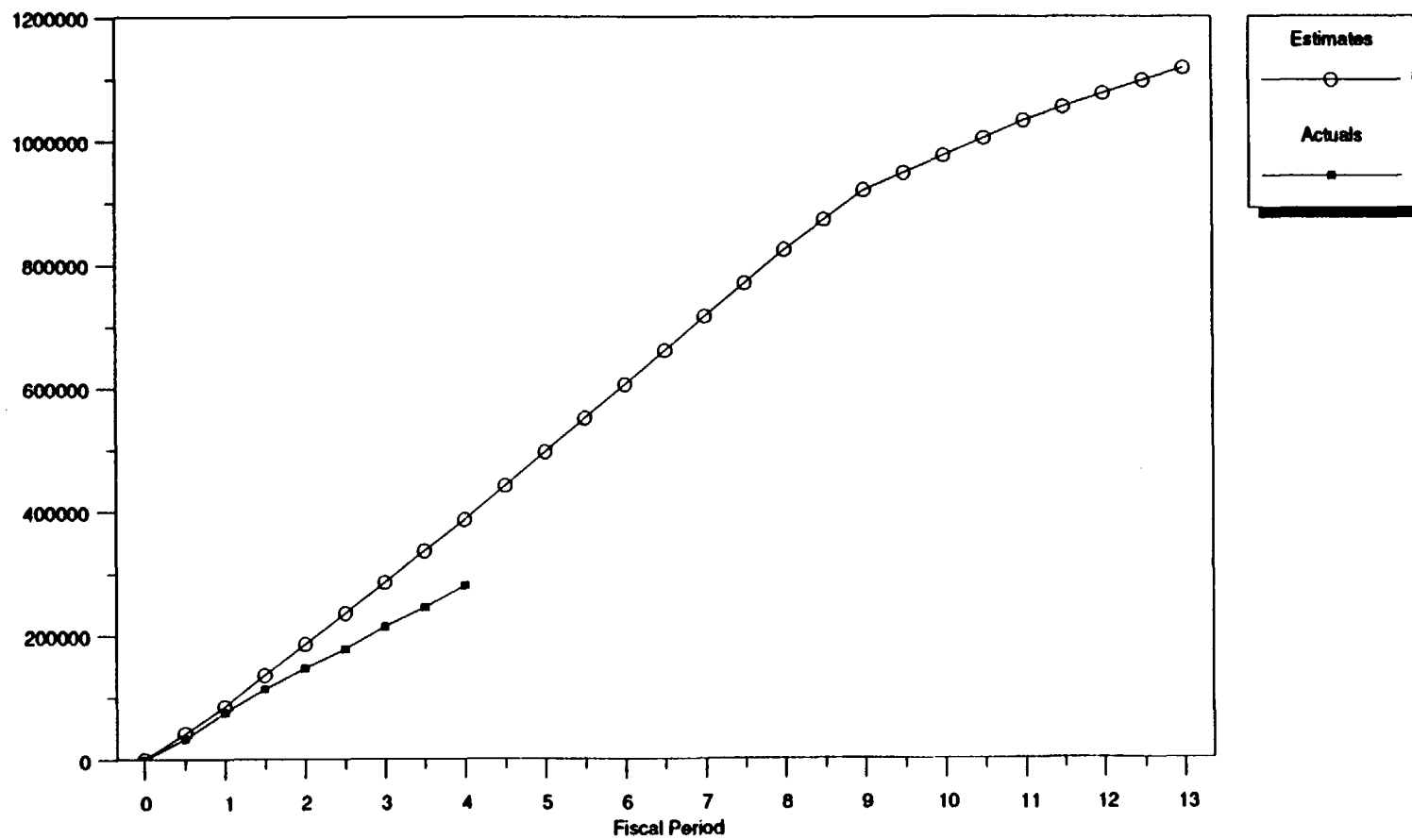
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	84881	100308	99197	102264	109360	108409	110380	108770	95979	55636	56752	44001	41087	386649
ACT. PERIOD COST	75676	70660	67114	66266	0	0	0	0	0	0	0	0	0	279715
VARIANCE, \$	9205	29648	32083	35998	0	0	0	0	0	0	0	0	0	106934
VARIANCE, %	10.8	29.6	32.3	35.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.7
EST. FY CUMUL	84881	185189	284386	386649	496010	604418	714778	823548	919527	975163	1031915	1075915	1117003	
ACTUAL FY CUMUL	75676	146336	213450	279715	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.068	0.131	0.191	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	9205	38853	70936	106934	0	0	0	0	0	0	0	0	0	
VARIANCE, %	10.8	21.0	24.9	27.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-060 PA



9. RESEARCH

NRC Program Element Manager:
John R. Randall

NRC Project Officer for Geochemistry Research Project: George F. Birchard

NRC Project Officer for Thermohydrology Research Project: Timothy S. Margulies

NRC Project Officer for Seismic Rock Mechanics Research Project: Jacob Philip

NRC Project Officer for Waste Package Experiments Research Project: Phillip R. Reed

NRC Project Officer for Geochemical Analogs Research Project: Linda A. Kovach

NRC Project Officer for Stochastic Analysis Research Project: Thomas Nicholson

NRC Project Officer for Sorption Modelling Research Project: George F. Birchard

NRC Project Officer for Performance Assessment Research: Timothy S. Margulies

NRC Project Officer for Volcanic Systems Research Project: Linda A. Kovach

Key Personnel: R. Ababou, M. Ahola, A. Bagtzoglou, A. Chowdhury, G. Cragolino, F. Dodge, R. Green, R. Hart, S. Hsiung, D. Kana, H. Manaktala, W. Murphy, P. Nair, R. Pabalan, E. Pearcy, J. Russell, N. Sridhar, G. Stirewalt, D. Turner, G. Wittmeyer and S. Young

Subcontractors/Consultants: Itasca, ABC, Inc., Ohio State University, University of Arizona, P. Goodell, I. Reyes

CNWRA Project Manager for Overall Research Project: Prasad K. Nair

CNWRA Project Manager for Geochemistry Research Project: John L. Russell

CNWRA Project Manager for Thermohydrology Research Project: Budhi Sagar

CNWRA Project Manager for Seismic Rock Mechanics Research Project: Asadul H. Chowdhury

CNWRA Project Manager for Integrated Waste Package Experiments Research Project: Prasad K. Nair

CNWRA Project Manager for Geochemical Analogs Research Project: John L. Russell

CNWRA Project Manager for Stochastic Analysis Research Project: Budhi Sagar

CNWRA Project Manager for Sorption Modelling Research Project: John L. Russell

CNWRA Project Manager for Performance Assessment Research: Budhi Sagar

CNWRA Project Manager for Volcanic Systems Research Project: Gerry Stirewalt

9.1 Technical Status

Staff continued work on preparation of the 1991 Annual Research Report. Modifications to Building 57 commenced to install an additional fume hood.

Research Project 1 - Overall Research Plan

In Task 2 of the Overall Research project, coordination continued for the preparation and review of contributed papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste.

The "Call for Papers" for the Materials Research Society's 'Symposium on the Scientific Basis for Nuclear Waste Management XVI', which will be held in Boston, Massachusetts, this year was prepared and issued. As of the end of the reporting period, a total of 2,119 copies were mailed to potential participants, whose names were taken from the MRS database. An additional list of about 650 names is being prepared from the list of participants in the Migration 1991 and MRS 1991 meetings. An estimated 30% of the mailings are to foreign countries.

Preparation of a two-day workshop on the Use of Geochemical Modeling Software EQ3/6 commenced, including identification and notification of workshop participants. The workshop will be conducted February 25-26, 1992.

No staff development activities were experienced during this period as reflected in the absence of any expenditures for Task 3.

Internal Quality Assurance activities conducted during the period included continued implementation of the Center Quality Assurance Manual and Operating Procedures. In particular, emphasis was placed on training and coordination with the Technical Staff for implementation of QAP-002, "Review of CNWRA Documents, Reports, Papers, and Presentation Materials;" QAP-014, "Documentation and Verification of Routine Calculations;" QAP-015, "Qualification of Existing Data," and TOP-018, "Configuration Management and Control of Scientific and Engineering Computer Codes." These efforts are most closely associated with preparation and review of the Center's Annual Research Report, as well as various contributions to technical meetings and journals.

Surveillance of experimental activities continued as well as consultation with Principal Investigators who are preparing for the initiation of their experimental activities. P.I.s were assisted in developing experimental procedures, identifying measurement parameters and calibration requirements, and with the use of Scientific Notebooks and documentation of experimental methods and activities.

All research project plans were revised and transmitted to NRC September 16, 1991, with the cost portions being revised November 22, 1991. The status of these Plans is as indicated in the following table.

PROJECT	TITLE	REVISED PLAN COMPLETION DATE	APPROVAL STATUS
Research 1	Overall Research Plan	09/16/91	Await Approval of Tasks 3 and 5
Research 2	Geochemistry	09/16/91	Approved
Research 3	Thermohydrology	09/16/91	Approved
Research 4	Seismic Rock Mechanics	09/16/91	Await Approval
Research 5	Integrated Waste Package	09/16/91	Await Approval
Research 6	Stochastic Analysis of Unsaturated Flow and Transport	09/16/91	Approved
Research 7	Geochemical Analog of Contaminant Transport	09/16/91	Approved
Research 8	Climatology/Recharge	TBD	TBD
Research 9	Sorption Modeling Mechanisms	09/16/91	Approved
Research 10	Performance Assessment	09/16/91	Approved
Research 11	Volcanic Systems	09/16/91	Task 1 Approved

Research Project 2 - Geochemistry

Experiments to study the kinetics of analcime dissolution at 25°C were completed. Equilibrium solubility studies on analcime are still ongoing, but initial results are available. The experimental data for these experiments and a kinetic and thermodynamic interpretation of these data are reported in the Center's annual report of research activities for FY91.

New experiments have been initiated to study the precipitation rate of analcime by approaching the equilibrium state from the supersaturated condition. These experiments are also designed to demonstrate reversibility of the dissolution reaction and to better constrain the equilibrium solubility of analcime. In addition, experiments to study phase equilibrium between analcime + clinoptilolite + aqueous-solutions were initiated by addition of clinoptilolite powder to the mixtures ACDTIB, ACDTIIB, and ACDTIIIB. Aqueous samples from these mixtures will be taken periodically for Si, Al, Na, and pH analyses.

Thermodynamic evaluation of previously derived isotherm data on NaCl/KCl and NaCl/CaCl₂ at total normalities of 0.5, 0.05, and 0.005 was completed, using models described previously in an MRS paper (Pabalan, 1991). This demonstrated the utility of thermodynamic models in describing and predicting ion exchange equilibria between the zeolite mineral clinoptilolite and aqueous solutions. Results of this modeling effort are reported in the Center's annual research report. In addition, experiments to evaluate the effect of anionic composition on ion exchange equilibria between aqueous solutions and the zeolite mineral clinoptilolite were completed for systems involving mixtures of NaNO₃/KNO₃, NaNO₃/Ca(NO₃)₂, and NaHCO₃/KHCO₃. Additional experiments involving mixed cations and mixed anions (e.g., Na/Ca/Cl/NO₃) will be initiated in the next

reporting period. Results from these experiments will provide further tests for the predictive ability of thermodynamic models. Furthermore, reverse ion exchange experiments have been initiated for the NaCl/KCl and NaCl/CaCl₂ systems to demonstrate reversibility of the ion exchange reactions.

Task 2 (modeling) work of the Geochemistry Research Project, was devoted exclusively to synthesis of analcime dissolution data and preparation of Chapter 2 of the annual research report. Mass and stoichiometry analyses of analcime dissolution data yield calculations of mass transfer as a function of time. The results have been interpreted using a theoretically derived rate equation leading to the discovery that sample reactivity varied significantly during the long-term experiments. Extrapolations of short-term experimental data appear to be inappropriate to modeling long-term experimental data, and are probably similarly inappropriate for modeling natural phenomena. Thermodynamic analysis of analcime solubility data allowed extraction of the standard state Gibbs free energy of formation. The tentative value is -3078 kJ/mole, which is in excellent agreement with the calorimetrically determined value reported in the literature. Input to the Center's annual report on research activities was completed and internal review of the draft manuscript was initiated.

Research Project 3 - Thermohydrology

The first thermohydrological experiment conducted as part of Task 3 is continuing. Dye injected into the media to permit tracking of the movement of liquid water has provided interesting results. Early results indicate that the dye has moved toward the heater element on the front side of the container near the points of injection. However, after approaching the heater element, the dye has apparently moved along the heater toward the back side of the container then downward toward the container bottom. If this is the actual liquid pathway, then it would appear that the new configuration in Test 7, in which a heater element is used in an attempt to simulate a line source in two-dimensional space, is demonstrating three-dimensional flow movement. These observations are being further evaluated at this time.

Laboratory determination of the moisture characteristic curve of the alumina test material used in Test 7 is continuing. The response in moisture retention to changes in pressure have been substantially slower than originally anticipated. Because accurate determination of this relationship is vital to several aspects of this project, caution is being exercised that sufficient time is allocated for full drainage of pores to occur at each pressure increment to insure that the suction pressure/moisture content relationship is correctly determined.

Analysis of data collected during Test 5 and 6 has continued. Results of these analyses will be included in the topical report, which will be the subject of formal peer review, and future annual and quarterly research reports.

Work on the interim summary report on this project, which will subject of a peer review, has continued. The report is due to NRC/RES on the revised date of February 17, 1992. Peer-Review members have not yet been selected.

Research Project 4 - Seismic Rock Mechanics Studies

The collection of instrumented field studies data from the Lucky Friday Mine, Mullan, Idaho, continued during this period. Significant cumulative displacement responses of rock and transient hydrologic response of water in fractured zones were observed. The responses from the extensometers and the piezometers are being retrieved through a personal computer at the Center which is connected to the data acquisition system computer located at the Lucky Friday Mine. The deformation response of the two tunnel openings continues to be measured manually. The data from the velocity gauges and the hydrophone are being collected by the macro-seismic data acquisition system of the U.S. Bureau of Mines, Spokane. A Blast Vibration Monitor continues to be used in parallel with the velocity gauges to check the calibration of the velocity gauges. The mechanical and hydrologic response data and seismic data are being analyzed and evaluated for inclusion in the 1991 Research Annual Report and for presentations at the meetings of the U.S. National Committee for Rock Mechanics and NWTRB at Irvine, California, on January 21-22, 1992, respectively.

The laboratory experimental work for direct shear tests of single jointed rock specimens continued during period 4. The pseudostatic direct shear test results of all the single jointed specimens tested to date are being analyzed to evaluate the parameters for three rock joint models: (i) Coulomb Model, (ii) Barton-Bandis Model, and (iii) Continuously-Yielding Model. The results of step velocity tests are being analyzed to evaluate the effect of shearing velocity on shear strength of rock joints.

The analysis of second benchmark problem using the discrete element code DECICE was initiated during this reporting period.

The source code of the two-dimensional distinct element computer program UDEC has been procured by the Center using SwRI capital equipment funding. This computer code is being used for DECOVALEX modeling work.

A. Chowdhury of CNWRA and J. Philip, M. Nataraja, B. Jagannath, and D. Gupta of NRC had a meeting at NRC to discuss the (i) on-going and future research in the Geotechnical Engineering/Rock Mechanics area, and (ii) future participation of Geotechnical/Rock Mechanics Staffs of NRC and CNWRA in near-field (coupled analysis, scenarios) component of Iterative Performance Assessment (IPA). NRC technical staff and management including M. Silberberg, R. Ballard, and W. Ott reviewed the draft presentation packages for presentation to U.S. National Committee for Rock Mechanics at NWTRB in Irvine, California. During this reporting period, A. Chowdhury peer-reviewed a technical paper for an ASCE Journal.

Research Project 5 - Integrated Waste Package Experiments

Task 1: Corrosion

The repassivation potential experiments on alloy 825 and 316L stainless steel are continuing. Thus far no dependence of repassivation potential on the amount of charge

passed during prior pitting has been noted. However, further experiments on varying the charge passed over a wider range will be performed.

Potentiostatic tests on CDA-102 and CDA-715 to examine the initiation and growth of localized corrosion will continue. In order to understand the results generated thus far, potential-pH diagrams need to be reviewed and developed for various bicarbonate, chloride, sulfate concentrations and temperatures. We will participate in the EQ3/EQ6 workshop (see Research Project 1) with this as one of the areas of future interest.

The equipment for wet-dry test is being assembled.

Task 2: Stress Corrosion Cracking

Slow strain rate tests have been started on CDA-102. We are awaiting more alloy 825 specimens before starting tests on this alloy. In the CDA-102, the area of interest will be whether stress corrosion cracking can be observed in high bicarbonate environments under potentiostatic conditions since prior localized corrosion experiments indicated formation and breakdown of passive films in this environment.

Task 3: Material Stability

Short-term thermal stability studies on alloy 825 are continuing. These are 10-day tests for each heat-treated condition.

A paper on the localized corrosion of copper-based alloy was written for the annual NACE conference.

Research Project 6 - Stochastic Analysis of Large-Scale Flow and Transport in Unsaturated Fractured Rock

The currently active task of the Stochastic Project is Task 2, where new activities were initiated in an effort to introduce auxiliary hydrodynamic models (effective flow models) suitable for large-scale simulations of partially saturated flow in heterogeneous fractured rocks. Specific activities of the project during the reporting period were focused in part on organizing and putting together of results from previously implemented numerical tests of the BIGFLO code, and in part on writing Chapter 6 of the 1991 Research Annual Report. Activities will re-focus on the important task of introducing effective hydrodynamic models suitable for large-scale unsaturated flow simulations in fractured porous media. One such model has already been developed and is being described in the Annual Report in preparation. Finally, related activities outside this project were the finalization and interpretation of 2-D unsaturated flow simulations for Iterative Performance Assessment of Yucca Mountain; the latter results are presently being assembled in a report.

Research Project 7 - Geochemical Analogs

The subcontract with I. Reyes of the University of Chihuahua to support the Geochemical

Natural Analog Project received final approval from SwRI and NRC management during this period. Work is expected to begin immediately; completion of mapping activities under the Reyes contract is anticipated by March 1992.

Planning and preparation for additional field research at the Peña Blanca site was begun for a trip planned for early March 1992. Activities during this trip are expected to include detailed sampling of ore and related rocks at the Nopal I deposit; quality assurance checks of maps completed under the Reyes contract; and meetings with representatives from the *Comision Nacional de Seguridad Nuclear y Salvaguardias*, the *Consejo Recursos Minerales*, and the *Fideicomiso de Fomento Minero*.

Characterization of high-grade uranium ore from Peña Blanca continued with additional scanning electron microscopy, x-ray diffractometry, energy-dispersive spectrometry, and optical petrography. Several uranium minerals previously unreported from the Nopal I deposit were observed. Sample preparation experiments for transmission electron microscopy continued. Analytical results from Peña Blanca water samples were used for equilibrium calculations (EQ3). Preparation of chemical reagents for U and Th isotopic analysis of fluid samples by alpha spectrometry was begun. Calibration procedures for the gamma spectrometer system to be used in analyzing radioisotopes in samples of Peña Blanca rock were completed. Preparation of Peña Blanca rock samples for gamma spectroscopy was completed. Selection of samples to be used in further alpha auto-radiography analyses was completed and preparation of samples was begun.

A major activity of Period 4 was the preparation of the 1991 Annual Research Report for the project.

Research Project 9 - Sorption Modeling

Preparation of experiments to study uranium sorption on the zeolite mineral clinoptilolite at 25°C and in nitrogen atmosphere [to keep out CO₂(g)] was completed. Initiation of the experiments was prevented when the observation window of the glove box cracked due to N₂(g) overpressure during the purging process. These experiments will be started as soon as the window has been replaced. Meanwhile, uranium sorption experiments under conditions open to the atmosphere was initiated at the end of the reporting period.

A detailed workplan of the Cs sorption experiments was submitted to the radiation safety office at SWRI for approval. An appropriate shielded storage facility for radioisotope spikes was obtained. A detailed workplan that requires approval by the radiation safety office at SWRI prior to initiation of the Sr adsorption experiments was developed.

Input to the Center's annual report on research activities was completed and submitted to the cognizant secretary for preparation of copies for technical review.

Thermodynamic data from the EQ3/EQ6 database on aqueous species, solids, and redox reactions have been adapted to the MINTQA2 database for Am, Pu, Tc, and Np. The data have been formatted and troubleshooting and preliminary testing of the data is underway. Data for U, Th, Ra, Cs, Sr, Sn, Zr, and Ru are currently being reformatted

for the MINTEQA2 database by Mr. T. Dietrick, a chemistry student from the University of Texas-San Antonio. In addition, a preliminary version of the MINEQL/PSI radionuclide database was obtained at the end of the reporting period from U. Berner of the Paul Scherrer Institut, Switzerland. A finalized version will be available in March, 1992. Commonalities between the MINTEQA2 and MINEQL codes may allow easy transfer of the data.

Research Project 10 - Performance Assessment

General Information

Dr. Gordon Wittmeyer plans to attend the next INTRAVAL meeting in Sydney, Australia from February 10-14, 1992. He will discuss aspects of model validation specific to performance measures.

The paper related to model validation authored by R. Ababou, B. Sagar, and G. Wittmeyer was revised in response to comments from external referees. This paper will be published in Advances in Water Resources.

Task 1 - Technology Transfer

This task has been completed.

Task 2 - Two-Phase Flow and Transport

A user's manual for PORFLOW has been completed. It is currently under internal review. Through a separate letter, we are requesting a new submittal date of February 24, 1992, for this document.

Task 3 - Evaluation and Modification of SNL Technology

No further progress has been made on this task. It may be recalled that testing and evaluation of the DCM3D code has been completed. For testing NEFTRAN II we are awaiting the completion of the Code Coupler that would link DCM3D and NEFTRAN II. Mr. Tim McCartin is investigating the best way to obtain the Code Coupler.

Task 4 - Identification of Phenomena Important to Repository Performance

Nothing to report in this period.

Task 5 - Incorporation of Existing Models into PA Methodology

Initial testing of a three-dimensional saturated flow solver on the Los Alamos (massively parallel) Connection Machine has been completed. The results obtained have been documented and these will be included in the 1991 Research Annual Report currently under production at the Center. The solvers are currently being extended to solve unsaturated flow problem.

Considerable literature on colloid transport has been collected and is being reviewed. A preliminary draft of the literature review has been written. However, it is not yet ready to be included in the 1991 Research Annual Report. We intend to report the literature review in the next Research Quarterly.

Task 7 - Methodology for Validation of Models

Simulations of the Las Cruces trench site continued with different conceptual models. An effort was made to study the effect of using different means of hydraulic properties to estimate their values at the cell interfaces. Results have been written up for inclusion in the 1991 Research Annual Report.

Research Project 11 - Volcanic Systems

During the reporting period, Center staff continued surveying, acquisition, compiling, and reading literature pertinent for conduct of the Volcanism Research Project. Ms. Joyce L. Foegelle, a geology graduate student at the University of Texas - San Antonio, continues to assist with surveying and compiling the literature sources.

Planning was initiated for a "brainstorming session" to bring together consultants in volcanism and tectonics for discussions about integration of activities to be undertaken by the Center in these two fields. All potential attendees outside of CNWRA have been contacted. The meetings are currently being planned for February 13, 1992, in San Antonio.

9.2 Major Problems

None.

9.3 Forecast for Next Period

Research activities will continue in accordance with the approved Project Plans.

9.4 Element Financial Status

Tables 1 through 9 below indicate the financial status of each Project in the context of "authorized" funds established by the NRC. The figures following the tables display planned and actual costs to date on both a per period and a cumulative basis, without allowance for fee. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. The aggregate commitments in the Research FIN total \$141,585.

The cumulative cost underrun in the Geochemistry Research Project at the end of Period 4 is down to approximately 10%, compared to 20% at the end of the previous period.

Increased activities in Task 2, which consisted of interpretation of completed analcime dissolution studies and thermodynamic data base evaluations, and in Task 4, which consisted of intensive efforts to prepare the 1991 Annual Research Report, resulted in decrease of the underrun.

The 18% cost underrun on the Thermohydrology Project is due to the delay in conducting a peer-review of the project. Costs will accelerate in the April-May timeframe as a result of peer-review activities.

Costs incurred to date on Seismic Rock Mechanics (SRM) Research project are less than planned. This is primarily due to the delay in starting the SRM Task 3 modeling work. Also, there is a time lag in receiving the bills from the subcontractor and the consultant. The cost variances will be remedied by accelerating the SRM Task 3 modeling activities during the remaining periods of FY92.

The cost variance in the IWPE Project is about \$31K (28%) under plan. This results from (i) delayed initiation of some task activities, while awaiting samples to be heat-treated and various pieces of glassware and equipment to be procured, and (ii) expending a significant amount of time in activities related to IPA and EBS. Equipment has been or will soon be received and we anticipate that other activities will be back on schedule starting next month.

The 32% cost underrun on the Stochastic Project results from the PI involvement on the IPA, Phase 2 work which must be completed by May 1992. His part of the IPA work is expected to be completed by the end of January 1992. We anticipate acceleration of work, including the initiation of Task 5 activities, so that by the end of April 1992, the project costs will be consistent with planned expenditures.

At the end of Period 4, the Natural Analog Project had recorded a variance of 9% over the spending plan, compared to a 27% overrun at the end of the previous period. This corrective trend in actual versus planned spending is expected to continue.

The Sorption Modeling Research Project ended Period 4 with an overrun of 39%, compared to 90% at the end of Period 3. The trend of the actual spending curve is likely to continue. It is therefore anticipated that the variance between actual and estimated costs will be minimal within two to three periods.

Because of delay in starting the work on Adaptive Grids and Colloid Transport, the PA Research Project is underspent by more than 30%. The work and associated expenditures are expected to accelerate with the addition of R. Baca, Manager of PA and HT, who will work on these two activities.

The cumulative cost variance in the Volcanism Research Project is approximately \$69K (86%) under plan at the end of Period 3. The variance resulted from (i) the lack of activity in Period 1 due to formal receipt by the Center late in Period 1 of NRC approval to initiate the project, (ii) greater than anticipated time required to begin utilization of consultants services, and (iii) reactive activities for NRC requiring more time than planned

for the Center principal investigators. Corrective actions include acquisition of a student employee to assist the principal investigators and acceleration of consultant activities in Periods 4 and 5.

Overall Research

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 179,019
FY92 Funds Costed to Date (b)	\$ 72,454
FY92 Funds Uncosted (c)	\$ 106,565
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Geochemistry

Table 2. Financial Status	
FY92 Funds Authorized (a)	\$ 117,765
FY92 Funds Costed to Date (b)	\$ 69,505
FY92 Funds Uncosted (c)	\$ 48,260
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Thermohydrology

Table 3. Financial Status	
FY92 Funds Authorized (a)	\$ 187,854
FY92 Funds Costed to Date (b)	\$ 97,211
FY92 Funds Uncosted (c)	\$ 90,643
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Seismic Rock Mechanics

Table 4. Financial Status	
FY92 Funds Authorized (a)	\$ 196,415
FY92 Funds Costed to Date (b)	\$ 67,264
FY92 Funds Uncosted (c)	\$ 129,151
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Integrated Waste Package

Table 5. Financial Status	
FY92 Funds Authorized (a)	\$ 227,699
FY92 Funds Costed to Date (b)	\$ 102,269
FY92 Funds Uncosted (c)	\$ 125,430
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Stochastic Analysis

Table 6. Financial Status	
FY92 Funds Authorized (a)	\$ 92,594
FY92 Funds Costed to Date (b)	\$ 43,074
FY92 Funds Uncosted (c)	\$ 49,520
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Geochemical Analogs

Table 7. Financial Status	
FY92 Funds Authorized (a)	\$ 171,623
FY92 Funds Costed to Date (b)	\$ 122,727
FY92 Funds Uncosted (c)	\$ 48,896
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Sorption

Table 8. Financial Status	
FY92 Funds Authorized (a)	\$ 146,004
FY92 Funds Costed to Date (b)	\$ 97,816
FY92 Funds Uncosted (c)	\$ 48,188
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Performance Assessment

Table 9. Financial Status	
FY92 Funds Authorized (a)	\$ 194,683
FY92 Funds Costed to Date (b)	\$ 85,099
FY92 Funds Uncosted (c)	\$ 109,584
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Volcanic Systems

Table 10. Financial Status	
FY92 Funds Authorized (a)	\$ 167,231
FY92 Funds Costed to Date (b)	\$ 37,047
FY92 Funds Uncosted (c)	\$ 130,184
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES:

(a)	Authorized funds remaining after FY91 actual expenditures with fee.
(b)	Actual expenditures FY92 YTD without fee.
(c)	Difference between (a) and (b).

3704-000

OVERALL

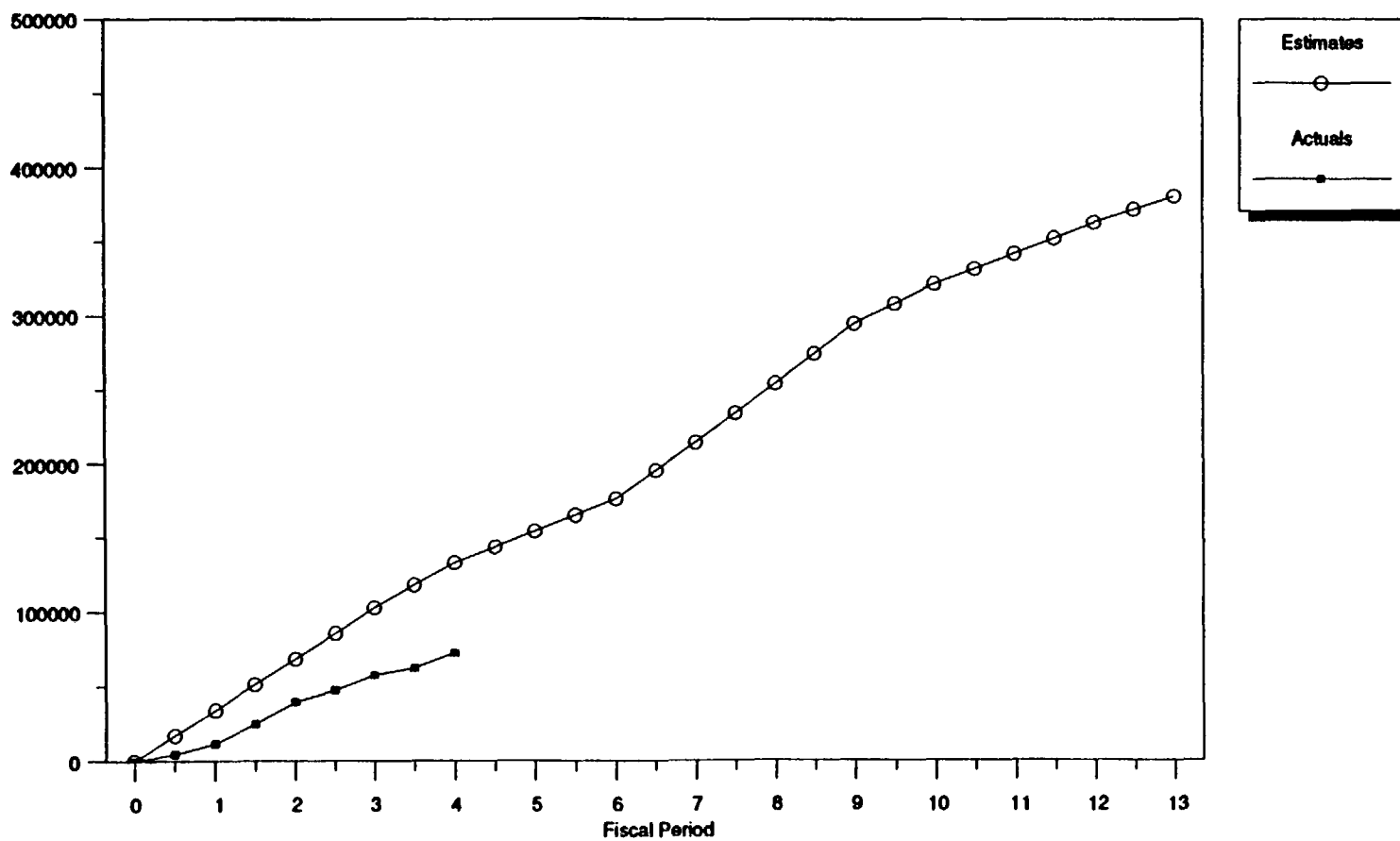
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	34021	34246	34451	30426	21480	21800	37825	39109	40152	27096	20435	20955	17825	133145
ACT. PERIOD COST	11699	27833	17908	15014	0	0	0	0	0	0	0	0	0	72454
VARIANCE, \$	22322	6413	16543	15411	0	0	0	0	0	0	0	0	0	60690
VARIANCE, %	65.6	18.7	48.0	50.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.6
EST. FY CUMUL	34021	68267	102719	133145	154624	176425	214250	254059	294211	321307	341742	362697	380522	
ACTUAL FY CUMUL	11699	39532	57440	72454	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.031	0.104	0.151	0.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	22322	28736	45279	60690	0	0	0	0	0	0	0	0	0	
VARIANCE, %	65.6	42.1	44.1	45.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-000 Overall Research



3704-010

GEOCHEM

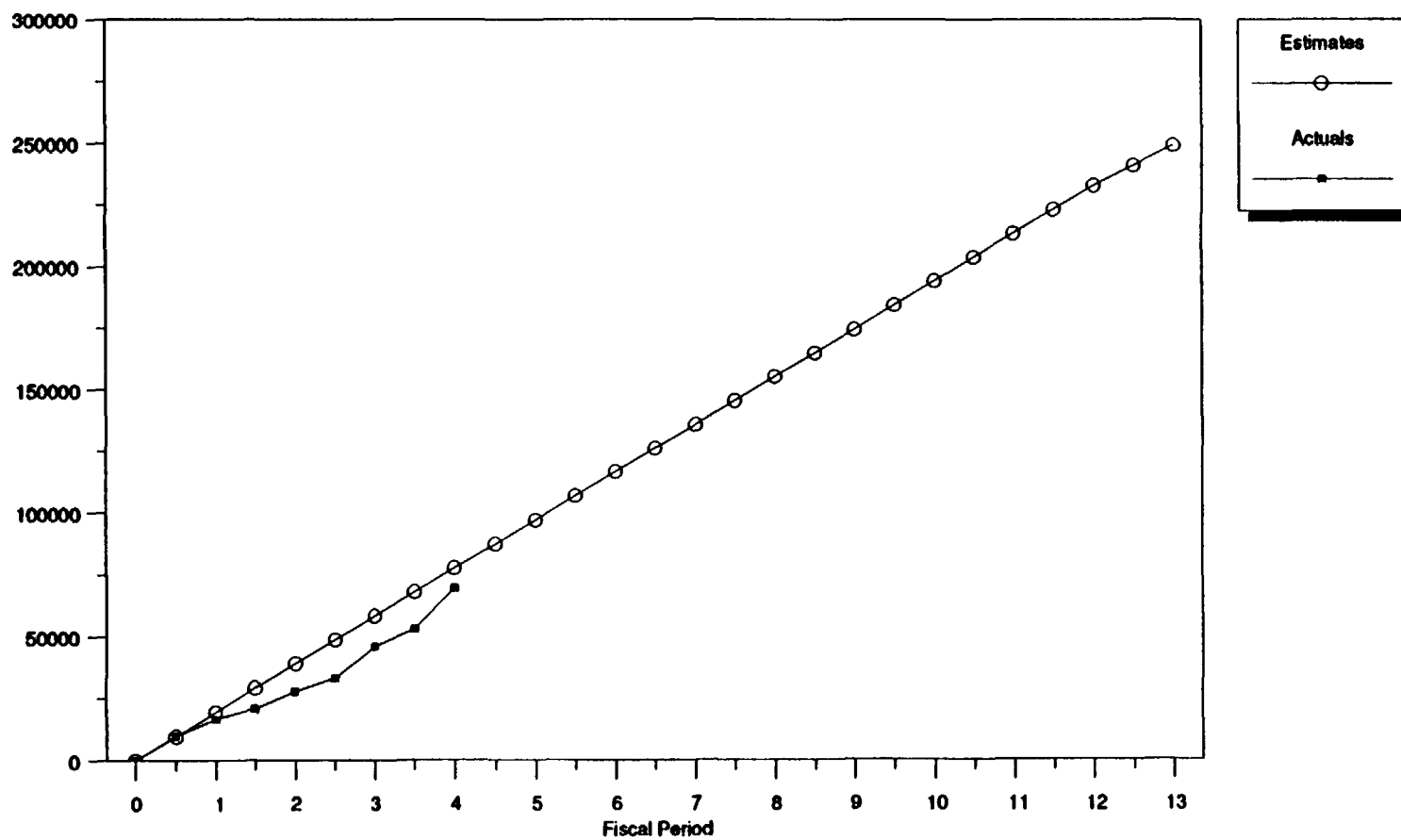
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	19371	19573	10210	19528	10337	10431	19170	19551	19128	19697	19307	19481	16217	77682
ACT. PERIOD COST	16663	11054	18091	23698	0	0	0	0	0	0	0	0	0	89505
VARIANCE, \$	2708	8519	1119	-4170	0	0	0	0	0	0	0	0	0	8177
VARIANCE, %	14.0	43.5	5.8	-21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5
EST. FY CUMUL	19371	38944	58154	77682	97019	116451	135620	155171	174299	193995	213303	232783	249000	
ACTUAL FY CUMUL	16663	27717	45807	69505	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.067	0.111	0.184	0.279	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	2708	11227	12346	8177	0	0	0	0	0	0	0	0	0	
VARIANCE, %	14.0	28.8	21.2	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-010 Geochemistry



3704-020

THERMO

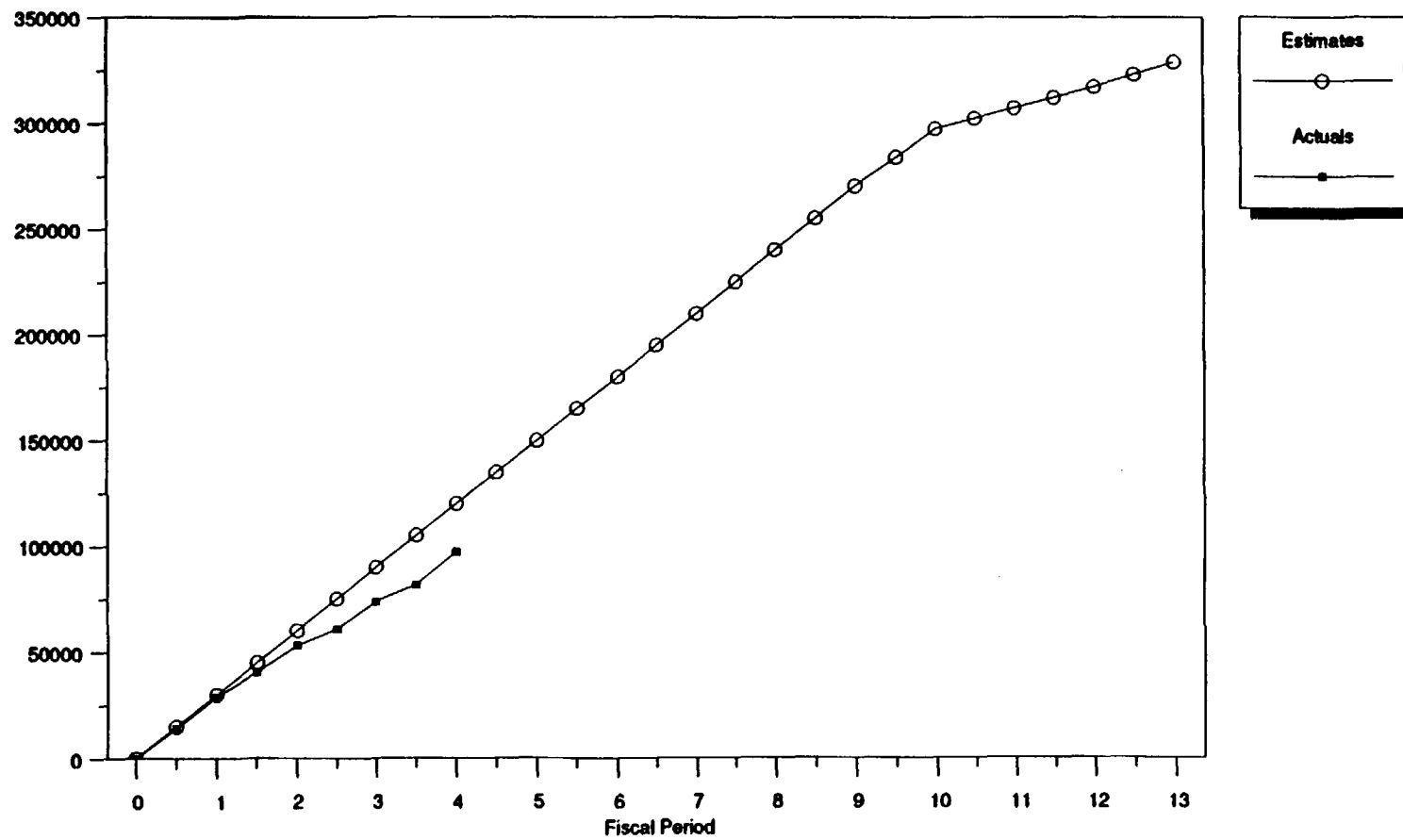
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	29952	30046	29902	30099	29902	30070	29877	30249	30095	27008	9844	10050	11751	119999
ACT. PERIOD COST	28901	24125	20523	23662	0	0	0	0	0	0	0	0	0	97211
VARIANCE, \$	1050	5921	9380	6437	0	0	0	0	0	0	0	0	0	22788
VARIANCE, %	3.5	19.7	31.4	21.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0
EST. FY CUMUL	29952	59998	89900	119999	149901	179971	209948	240007	270192	297200	307045	317094	328845	
ACTUAL FY CUMUL	28901	53026	73549	97211	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.088	0.161	0.224	0.296	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	1050	6971	16351	22788	0	0	0	0	0	0	0	0	0	
VARIANCE, %	3.5	11.6	18.2	19.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-020 Thermo



3704-030

SEISMIC

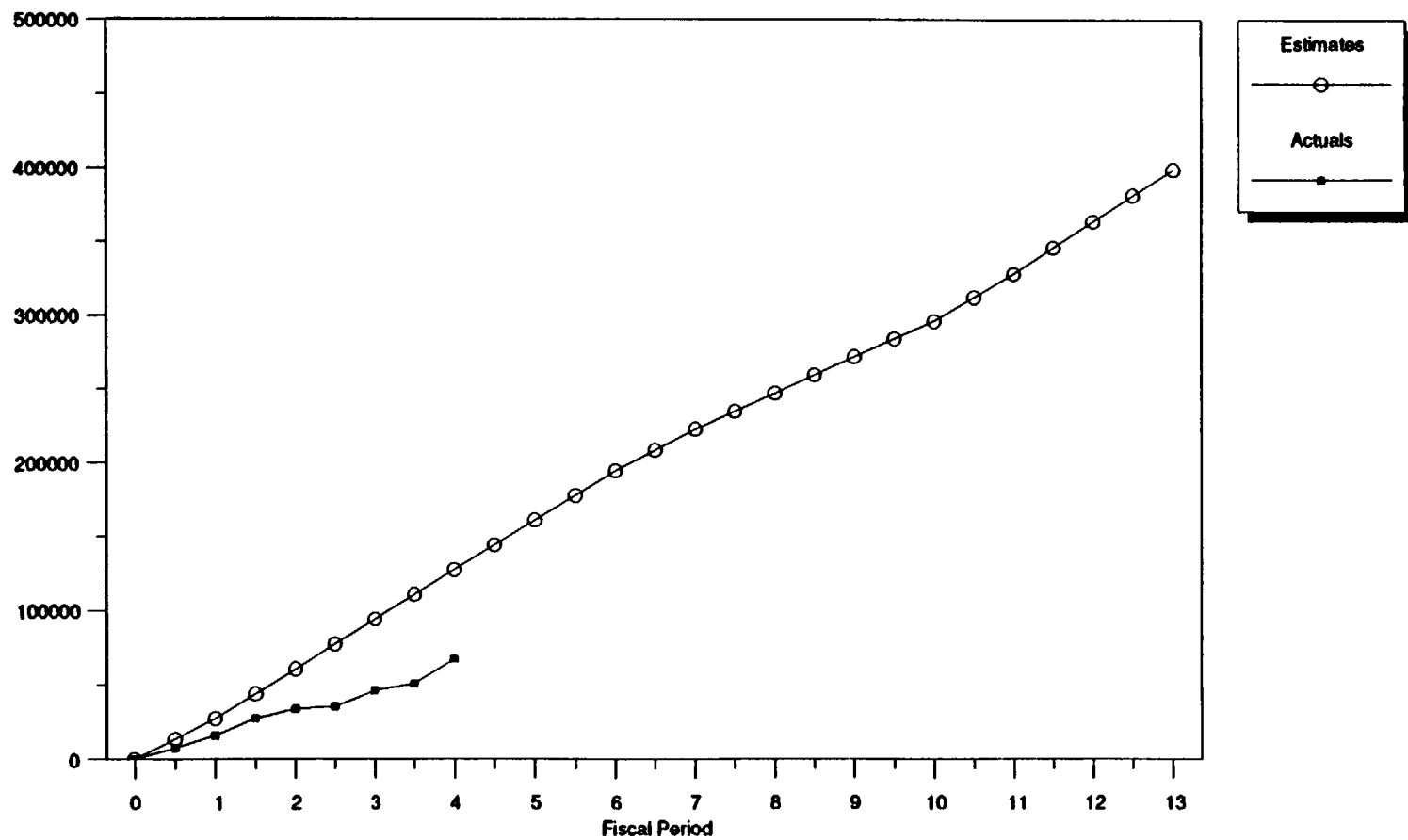
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	27307	33147	33511	33604	33511	33394	28314	24471	24663	23881	32220	35566	35033	127568
ACT. PERIOD COST	16132	17630	12178	21324	0	0	0	0	0	0	0	0	0	67264
VARIANCE, \$	11175	15516	21333	12280	0	0	0	0	0	0	0	0	0	60304
VARIANCE, %	40.9	46.8	63.7	36.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.3
EST. FY CUMUL	27307	60453	93964	127568	161079	194473	222787	247258	271921	295802	328022	363588	398620	
ACTUAL FY CUMUL	16132	33762	45940	67264	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.040	0.085	0.115	0.169	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	11175	26691	48024	60304	0	0	0	0	0	0	0	0	0	
VARIANCE, %	40.9	44.2	51.1	47.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-030 Seismic



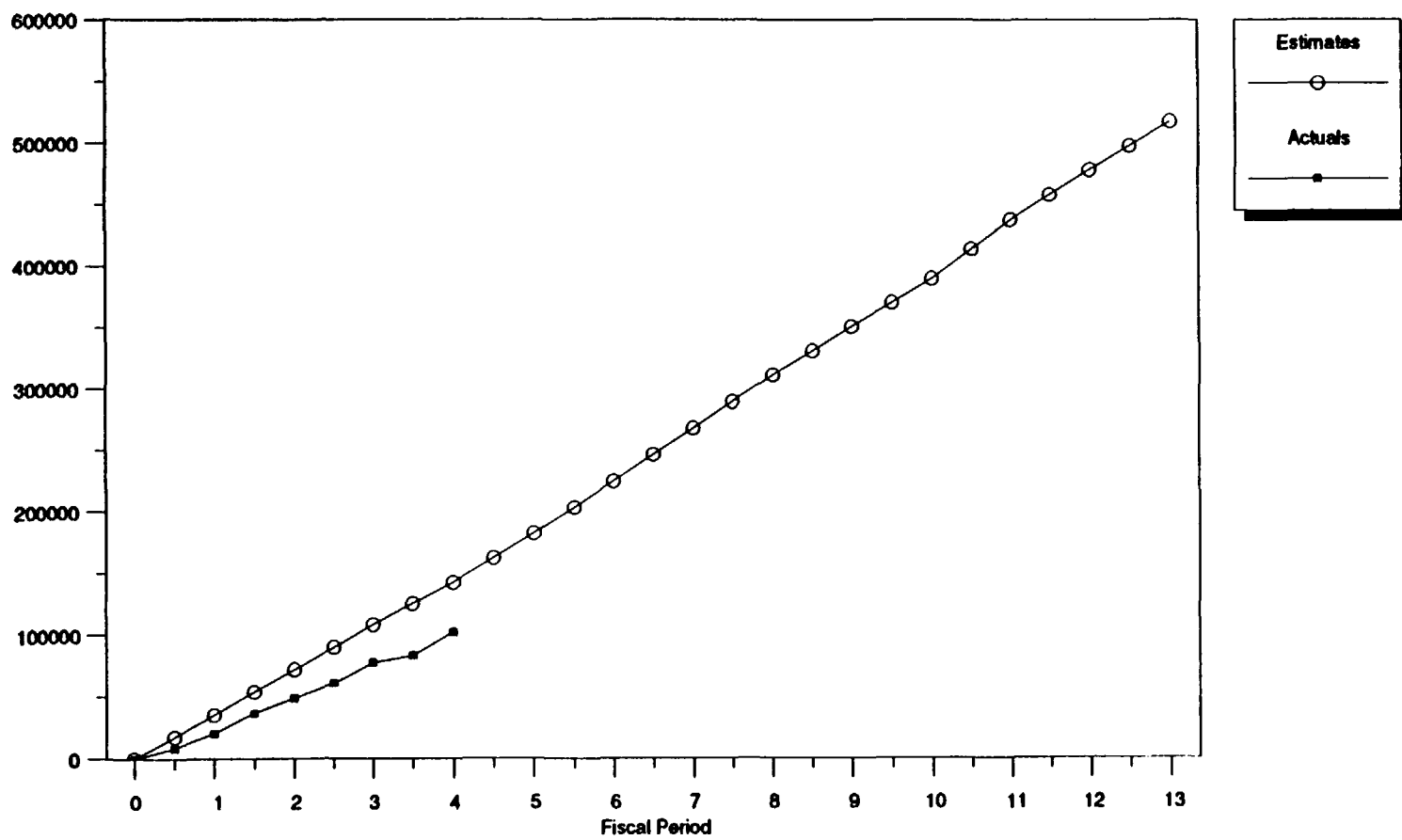
3704-040 INTEGR. WASTE PACKAGE E Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	35482	36645	30200	34208	39790	42340	43112	42002	39620	39115	47996	40443	39296	142505
ACT. PERIOD COST	20416	28590	20574	24690	0	0	0	0	0	0	0	0	0	102269
VARIANCE, \$	15066	8055	7626	9519	0	0	0	0	0	0	0	0	0	40236
VARIANCE, %	42.5	22.0	21.1	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.3
EST. FY CUMUL	35482	72127	108327	142595	182393	224742	267853	310746	350365	389481	437477	477920	517215	
ACTUAL FY CUMUL	20416	49006	77580	102269	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.039	0.095	0.150	0.198	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	15066	23121	30747	40326	0	0	0	0	0	0	0	0	0	
VARIANCE, %	42.5	32.1	28.4	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude Award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-040 IWPE



3704-050

STOCH MODELING

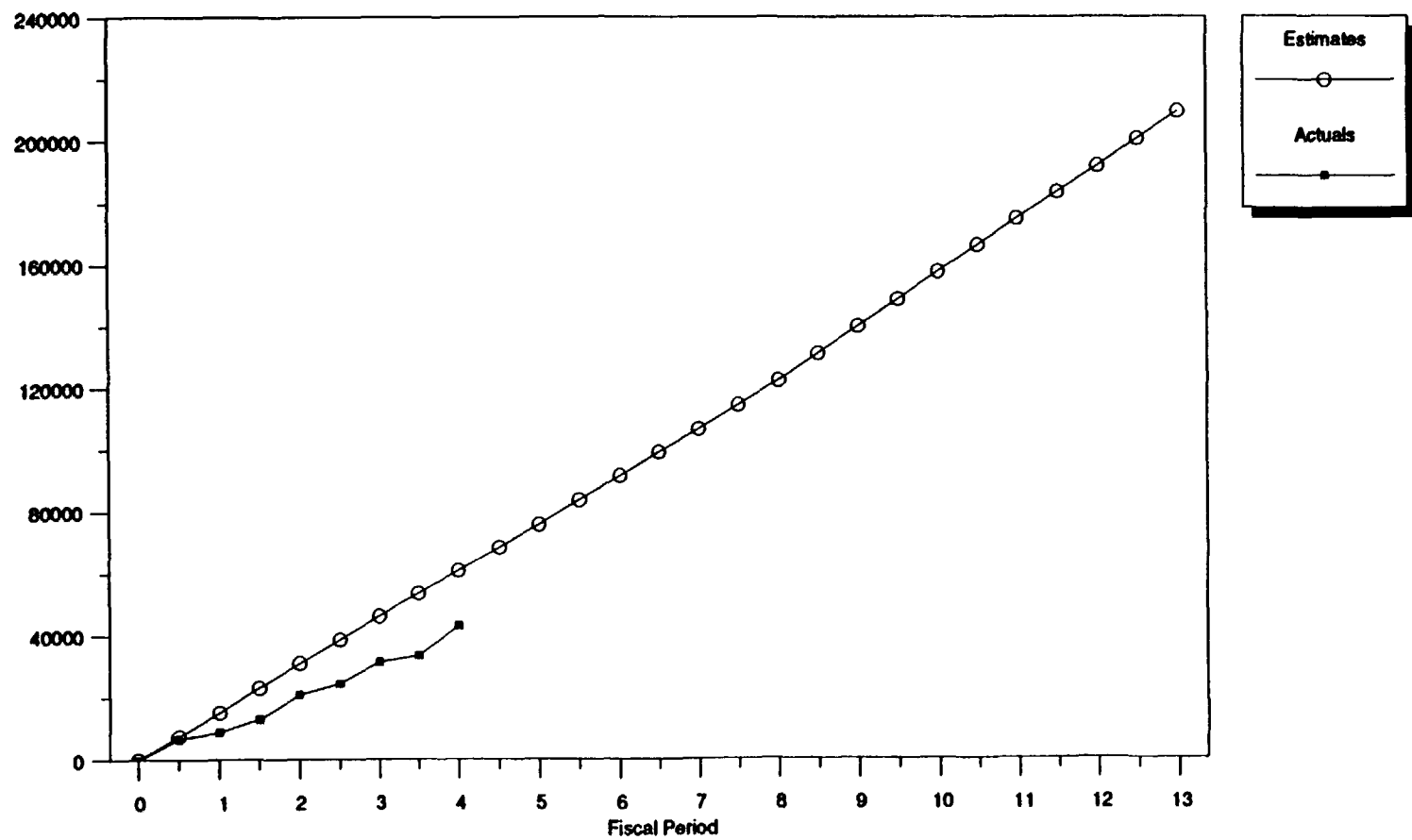
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	15050	15901	15018	14945	14783	15008	14988	15072	17473	17643	17380	16949	17691	80914
ACT. PERIOD COST	8807	12028	10381	11861	0	0	0	0	0	0	0	0	0	43074
VARIANCE, \$	6244	3876	4638	3083	0	0	0	0	0	0	0	0	0	17840
VARIANCE, %	41.5	24.4	30.9	20.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.3
EST. FY CUMUL	15050	30951	45970	60914	75677	91508	106554	122226	139698	157342	174722	191671	209362	
ACTUAL FY CUMUL	8807	20832	31213	43074	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.042	0.100	0.149	0.206	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	6244	10119	14757	17840	0	0	0	0	0	0	0	0	0	
VARIANCE, %	41.5	32.7	32.1	29.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-050 Stochastic



3704-060

GEOCHEMICAL ANALOGS

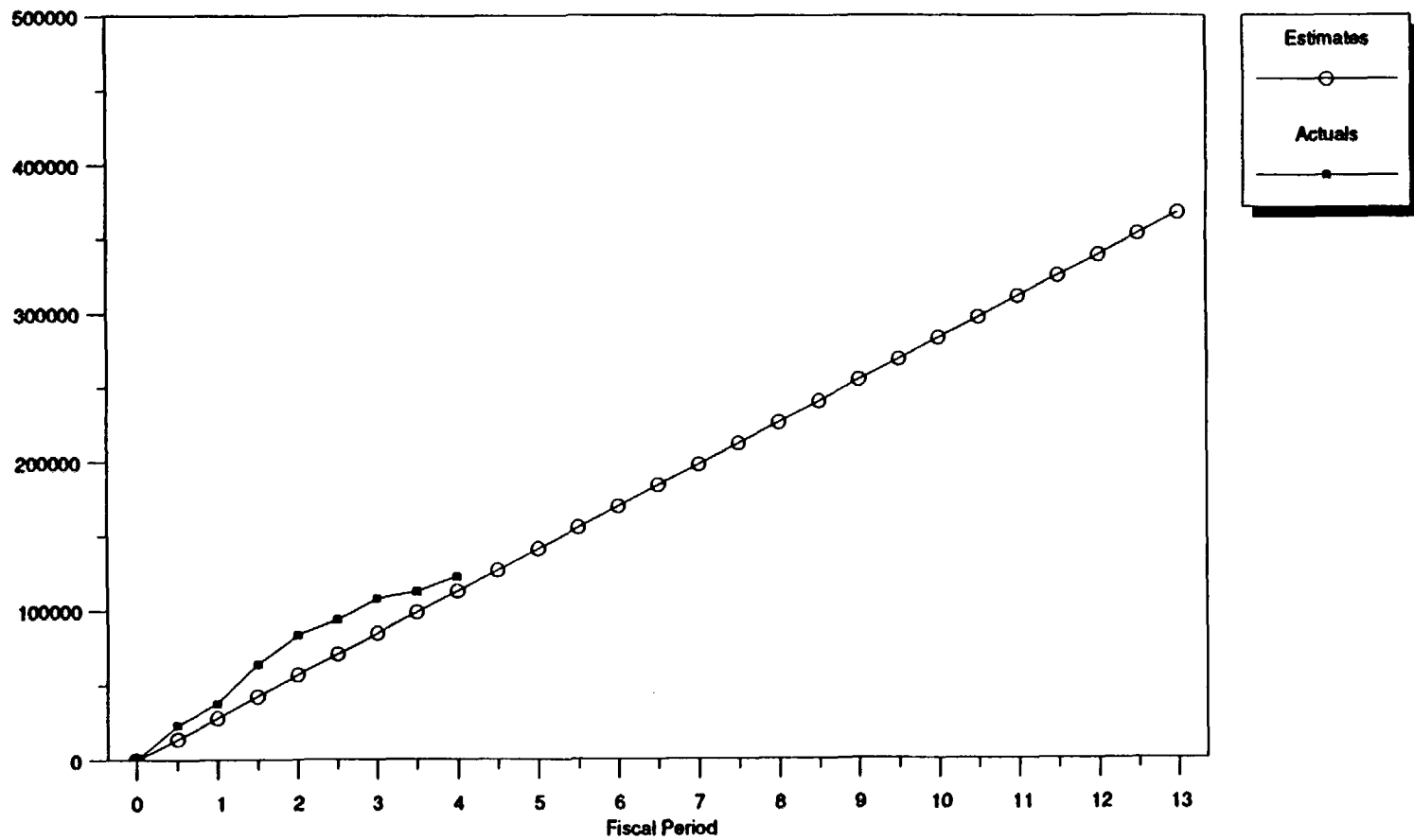
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	28006	28863	27970	28272	28319	28466	28091	28202	28443	28194	28165	28382	28197	112911
ACT. PERIOD COST	37625	45691	24536	14875	0	0	0	0	0	0	0	0	0	122727
VARIANCE, \$	-9619	-17027	3433	13397	0	0	0	0	0	0	0	0	0	-9816
VARIANCE, %	-34.3	-59.4	12.3	47.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-8.7
EST. FY CUMUL	28006	56869	84838	112911	141230	169695	197787	226079	254522	282717	310882	339264	367460	
ACTUAL FY CUMUL	37625	83315	107851	122727	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.102	0.227	0.294	0.334	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	-9619	-26646	-23213	-9816	0	0	0	0	0	0	0	0	0	
VARIANCE, %	-34.3	-47.0	-27.4	-8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-060 Analogs



3704-070

SORPTION MECHANISMS

Element Status Cost Report

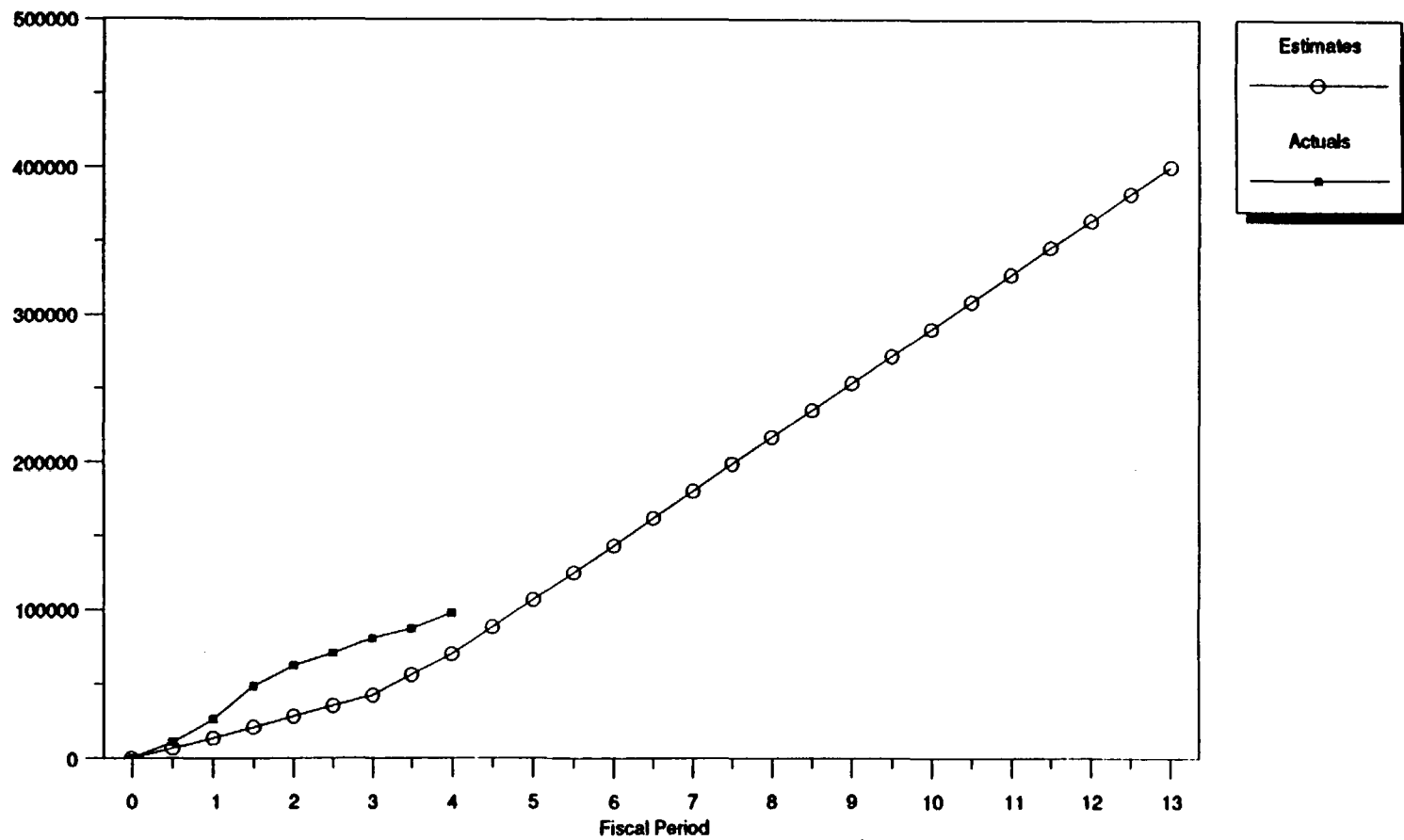
]	ITEM	]	1	2	3	4	5	6	7	8	9	10	11	12	13	]	TOTAL]
]	EST PERIOD COST	]	13733	14421	14264	27808	36734	36503	37029	36544	36664	36649	36955	36810	36576	]	70226]
]	ACT. PERIOD COST	]	26210	36022	18588	17017	0	0	0	0	0	0	0	0	0	]	97816]
]	VARIANCE, \$	]	-12477	-21600	-4304	10791	0	0	0	0	0	0	0	0	0	]	-27591]
]	VARIANCE, %	]	-90.9	-149.8	-30.2	38.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	]	-39.3]
]	EST. FY CUMUL	]	13733	28154	42418	70226	106960	143463	180492	217037	253701	290350	327305	364115	400691]]
]	ACTUAL FY CUMUL	]	26210	62232	80800	97816	0	0	0	0	0	0	0	0	0]]
]	PERCENT COMPLETE	]	0.065	0.155	0.202	0.244	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000]]
]	VARIANCE, \$	]	-12477	-34078	-38382	-27591	0	0	0	0	0	0	0	0	0]]
]	VARIANCE, %	]	-90.9	-121.0	-90.5	-39.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0]]

9-29

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-070 Sorption



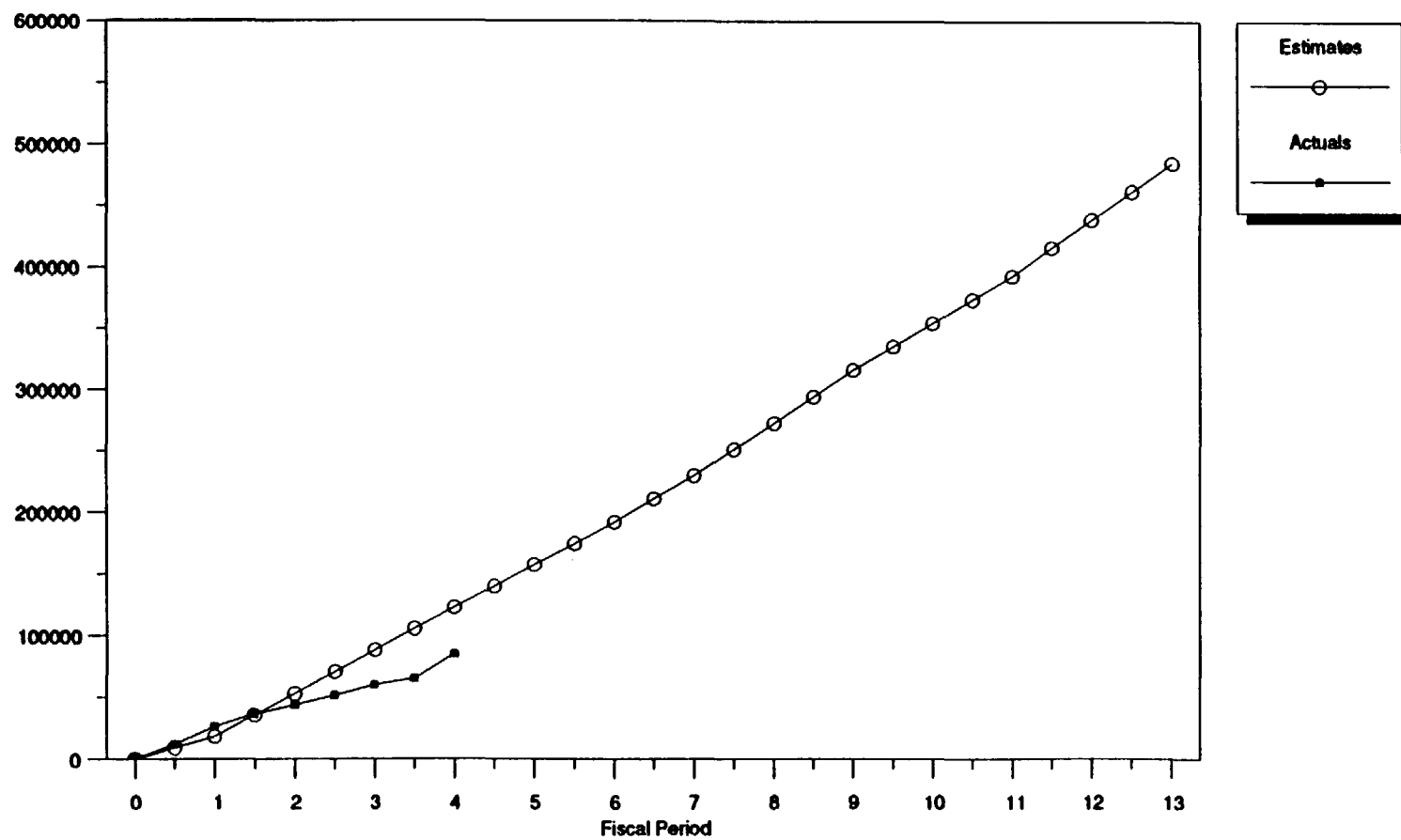
3704-110 PERFORMANCE ASSESSMENT Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	18156	34687	35224	34706	34868	34844	37885	43757	42330	38192	38410	46220	45745	122772
ACT. PERIOD COST	26550	17249	18267	25033	0	0	0	0	0	0	0	0	0	85099
VARIANCE, \$	-8395	17438	18957	9673	0	0	0	0	0	0	0	0	0	37673
VARIANCE, %	-46.2	50.3	53.8	27.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.7
EST. FY CUMUL	18156	52842	88066	122772	157439	192083	229968	273725	316055	354247	392657	438877	484622	
ACTUAL FY CUMUL	265	43799	60066	85099	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.055	0.090	0.124	0.176	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	-8395	9043	28000	37673	0	0	0	0	0	0	0	0	0	
VARIANCE, %	-46.2	17.1	31.8	30.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-110 Research PA



3704-120

VOLCANISM (REVIEW)

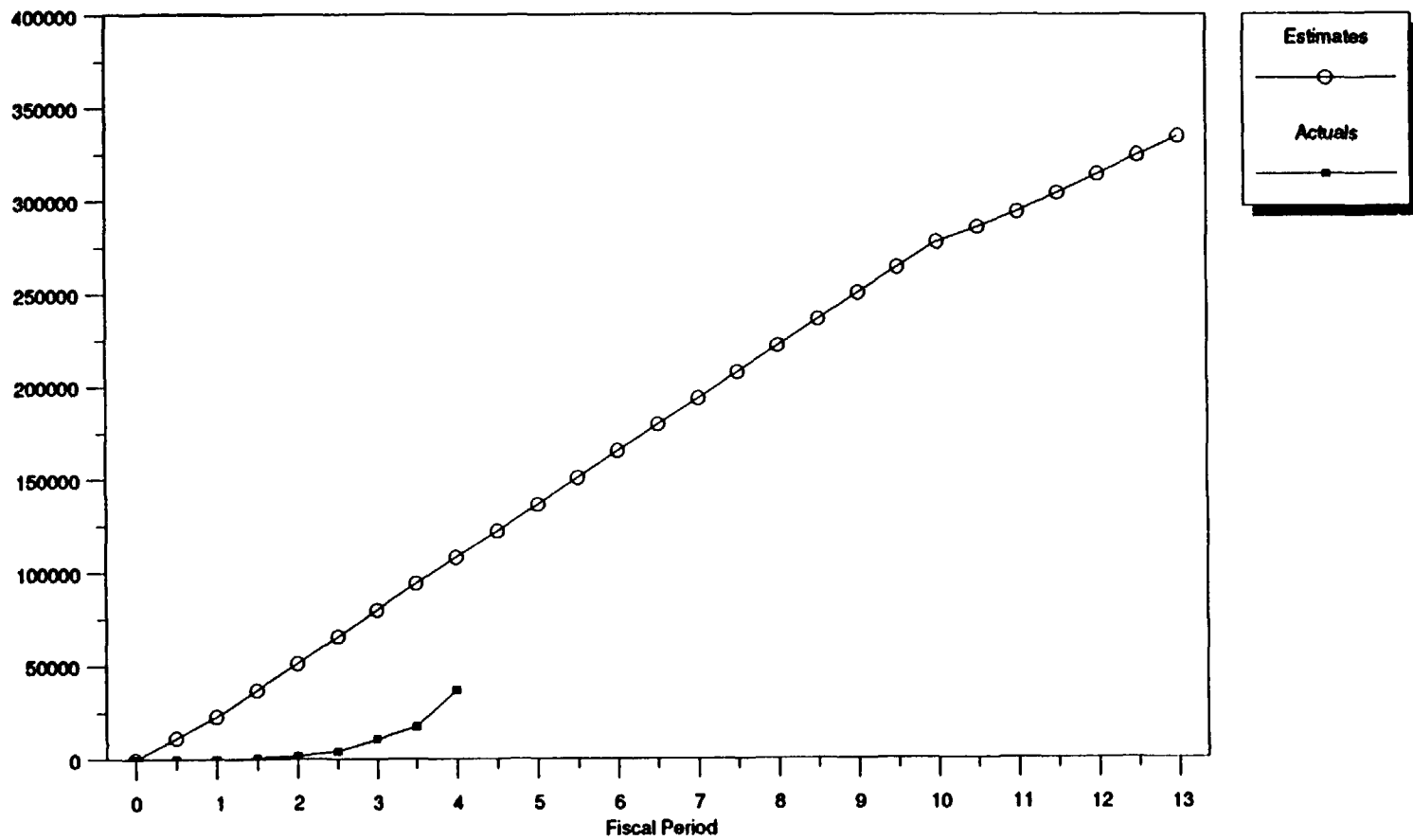
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	22811	28258	28693	28346	28361	28828	28223	28348	28439	27202	16183	20513	20286	108105
ACT. PERIOD COST	0	1750	9026	26270	0	0	0	0	0	0	0	0	0	37047
VARIANCE, \$	22811	26508	19667	2076	0	0	0	0	0	0	0	0	0	71059
VARIANCE, %	100.0	93.8	68.5	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.7
EST. FY CUMUL	22811	51067	79760	108105	136466	165205	193518	221864	240303	277506	293688	314181	334460	
ACTUAL FY CUMUL	0	1750	10777	37047	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.000	0.005	0.032	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	22811	49316	68983	71059	0	0	0	0	0	0	0	0	0	
VARIANCE, %	100.0	96.6	86.5	65.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3704-120 Volcanism



10. LICENSING SUPPORT SYSTEM ADMINISTRATOR

NRC Program Element Manager: Betsy Shelburne

CNWRA Element Manager: Rawley Johnson

Key Personnel: S. Young, R. Marshall

Subcontractor/Consultant: C. Acree (P.I.), J. Cooper

10.1 Technical Status

Task 1 - Development of Access Protocols to LSS Technical Data

The LSSA staff continued in its review of the overall outline the Center provided for an access protocols plan. In the process, the LSSA has determined that the plan should be a report and has discussed a proposal for completing the report with the Center. The proposal called for the Center to prepare a succession of draft reports, conduct meetings with all parties involved and make revisions as necessary in completing the final report. The Center visited with the LSSA staff and discussed the deliverables for this revised work plan for the access protocols report and will discuss a schedule by phone and then revise the Operations Plan for Task 1.

During the meeting with the LSSA, the Center also showed the LSSA samples of the work it is doing to describe the attributes of non-text-searchable material. The LSSA agreed that this effort looked promising and said that it will provide further comments by phone as the work continues. The Table of Contents (TOC) for a package and the items typically listed in a TOC will also be further defined.

Task 2 - Development of a Document Loading Plan (DLP): An Evaluation of the HLW Program Information and Development of a Priority Document Loading Schedule (PDLS)

The Center met with the LSSA to review their comments on the "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)". The LSSA does not believe that the subject report provides sufficient evidence to support its conclusion that an appropriate priority loading approach is feasible. However, it agreed with the Center that there was no reason to believe that it was, in fact, infeasible.

10.2 Major Problems

None to report.

10.3 Forecast for Next Period

Task 1 - Development of Access Protocols to LSS Technical Data

The Center staff will continue to define the attributes for the non-text-searchable materials and the TOC for packages. The outline for the access protocols report will be discussed further with the Center by the LSSA staff. Operations Plans and schedules will be revised and submitted to include the additional deliverables and meetings and review cycles with all of the participants on the LSSARP.

Task 2 - Development of a Document Loading Plan (DLP): An Evaluation of the HLW Program Information and Development of a Priority Document Loading Schedule (PDLS)

Based on a meeting with the LSSA, the Center was tasked to propose the next steps that should be taken in arriving at a more fully substantiated answer to the feasibility questions. This will lead to revisions in Task 2 of the Operations Plans which the Center will prepare and deliver. The CNWRA will do this.

10.4 Element Financial Status

Table 1 below indicates the financial status of this Element in the context of "authorized" funds established by the NRC. Table 2 displays planned and actual costs without allowance for fee to date on both a per period and a cumulative basis. Variances are shown on both a dollar and percentage basis. Commitments in this Element are \$2,550. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Costs incurred to date are somewhat higher than planned expenditures due to recent intensive work in Task 1. Attention will be given to adjusting the scope of efforts (and attendant expenditures) to available funding.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 244,264
FY92 Funds Costed to Date (b)	\$ 117,828
FY92 Funds Uncosted (c)	\$ 126,436
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES: (a) Authorized funds remaining after FY91 actual expenditures with fee.
(b) Actual expenditures FY92 YTD without fee.
(c) Difference between (a) and (b).

3705

LSSA

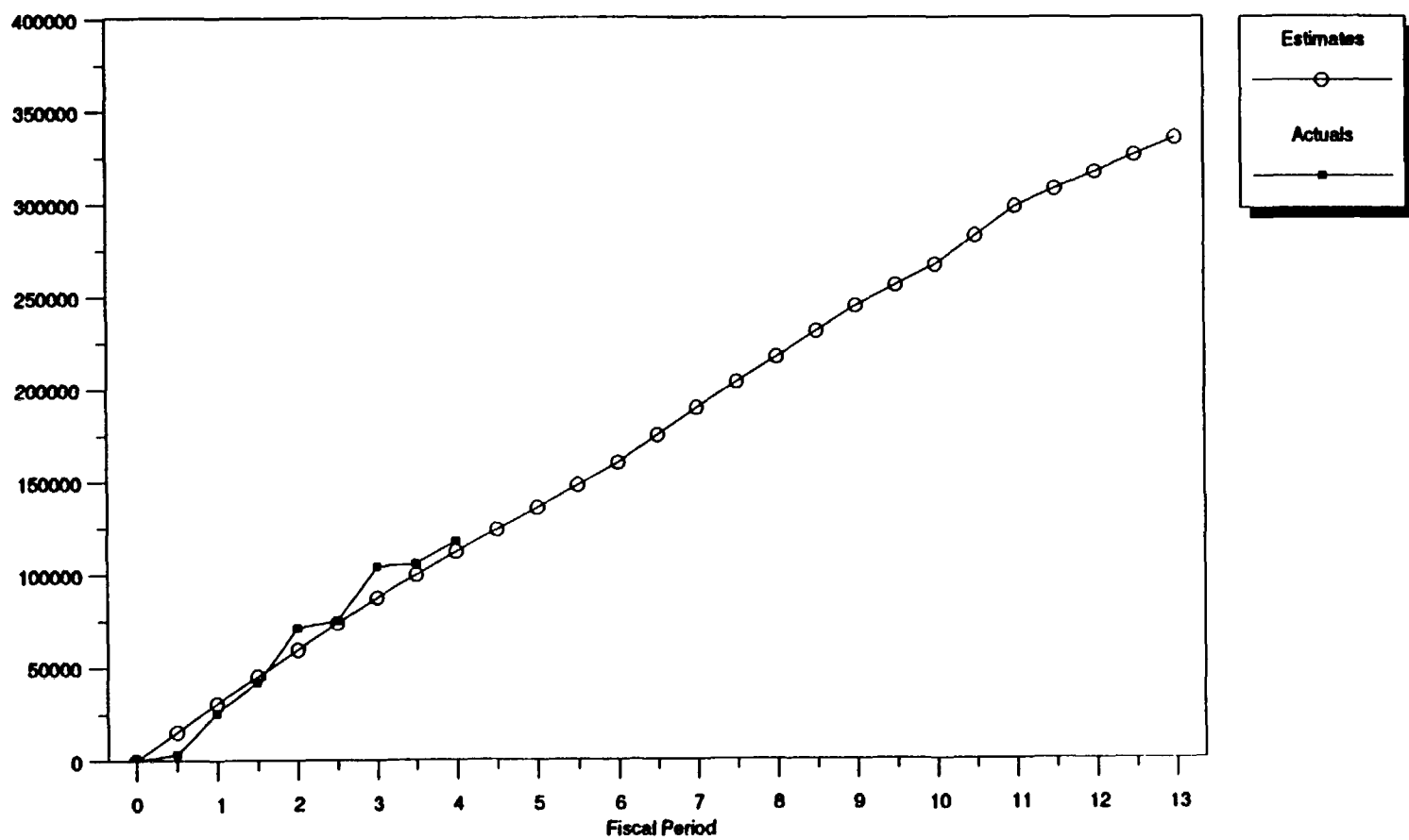
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	30505	28857	27804	24881	23771	23938	20512	27608	27491	21997	31599	18520	18533	112128
ACT. PERIOD COST	25660	45325	33134	13710	0	0	0	0	0	0	0	0	0	117828
VARIANCE, \$	4846	-16468	-5250	11171	0	0	0	0	0	0	0	0	0	-5701
VARIANCE, %	15.9	-57.1	-18.8	44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-5.1
EST. FY CUMUL	30505	59362	87247	112128	135898	159834	180347	216035	244425	266423	298022	316542	335075	
ACTUAL FY CUMUL	25660	70984	104118	117828	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.077	0.212	0.311	0.352	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	4846	-11622	-16872	-5701	0	0	0	0	0	0	0	0	0	
VARIANCE, %	15.9	-19.6	-19.3	-5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3705 LSSA



11. WASTE SOLIDIFICATION SYSTEMS

NRC Program Element Manager: Gary Comfort

CNWRA Element Manager: Prasad Nair

Key Personnel: A. Chowdhury, H. Karimi, H. Manaktala, E. Tschoepe

Subcontractor/Consultant: G. Lamping

11.1 Technical Status

Task 1 - Assessment of Vitrification Off-Gas Generation and Treatment

There are no significant reportable activities in this task for this period. The schedules for the Intermediate Milestones for this task are to be reestablished following the issue of the DOE's off-gas sample analysis report. There is no change of status this reporting period.

Task 2 - Sludge Mobilization and Mixing

The Safety Evaluation Report (SER) on the Safety Analysis Report (SAR) on the Supernatant Treatment System for the West Valley Demonstration Project (WVDP) submitted to the NRC on November 26, 1991, was reviewed and transmitted by the NRC to the DOE. All activities associated with this task are now complete.

Task 3 - Seismic Analysis of the Vitrification Facility

No reportable activity this period.

Task 4 - High-Level Waste Tank Storage

In developing information for this task, E. Tschoepe attended the International Symposium on Above Ground Storage Tanks in Houston, Texas, January 14-16, 1992. Storage tanks at West Valley (and at Savannah River) present problems similar to those described in the industry with respect to design, inspection, testing, and maintenance. Information gathered at the Symposium will be helpful in the future for interpreting DOE activities concerning tanks. The topic of this second such symposium was "Current Issues: Design, Operations, Maintenance, Inspection, and the Environment," and it was sponsored the Materials Technology Institute (MTI) of the Chemical Process Industries, Inc., and by the National Association of Corrosion Engineers (NACE). This Symposium provided an opportunity to discuss problems and technology with individuals from a broad spectrum of industry and to see state of the art equipment and techniques as they are being used in a variety of industries. The trade show which accompanied the symposium provided exposure to hardware which was described in a number of the technical presentations. A report detailing highlights of the Symposium will be issued within the next reporting period.

Task 5 - Environmental Issues

No planned activity this reporting period.

11.2 Major Problems

None.

11.3 Forecast for Next Period

Activities in Tasks 1 and 4 will be initiated and schedules will be developed with NRC Program Element Manager to support other planned Tasks.

11.4 Summary Financial Status

Table 1 below indicates the financial status of this Element in the context of authorized funds established by the NRC. Table 2 displays planned and actual costs to date, without allowance for fee, on both a per period and a cumulative basis. In addition, these data do not include commitments, and variances are shown on both a dollar and percentage basis. Commitments for the Element are \$1,000. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Delayed work in some tasks has resulted in significant under expenditures with respect to the plan.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 206,654
FY92 Funds Costed to Date (b)	\$ 62,210
FY92 Funds Uncosted (c)	\$ 144,444
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

NOTES:

- (a) Authorized funds remaining after FY91 actual expenditures with fee.
- (b) Actual expenditures FY92 YTD without fee.
- (c) Difference between (a) and (b).

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Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	47409	16862	10517	14375	14689	15887	15242	11049	16739	16265	7074	6316	4430	98163
ACT. PERIOD COST	24188	26350	8056	5617	0	0	0	0	0	0	0	0	0	62210
VARIANCE, \$	23220	-9487	13461	8758	0	0	0	0	0	0	0	0	0	35953
VARIANCE, %	49.0	-56.3	89.0	60.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6
EST. FY CUMUL	47409	64271	83788	98163	112852	128539	143781	154830	171569	187834	194908	201224	205654	
ACTUAL FY CUMUL	24188	50538	58594	62210	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.118	0.246	0.275	0.302	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	23220	13733	27195	35953	0	0	0	0	0	0	0	0	0	
VARIANCE, %	49.0	21.4	32.5	36.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from November 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

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