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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

November 23, 1991 - December 20, 1991

PMPR No. 92-03

January 3, 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: 11/23/91 - 12/20/91

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.

Management staff participated in and made presentations at the Nuclear Safety Research Review Committee (NSRRC) and Center Review Group (CRG) meetings this period.

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. Recruitment activities were conducted in the earth sciences at the American Geophysical Union meeting in December. R. Baca accepted a position as Manager of Performance Assessment and Hydrologic Transport and J. Walton accepted a position as Numerical Analyst.

Revisions to both the ADP Plan and the Center Five-Year Plan are in progress, based on comments received from NRC. Revisions commenced on the Center Management Plan, with a scheduled January 10, 1992, completion date.

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. Response to the internal audit of Center activities was completed.

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 related to the "roll up" of design and siting criteria into the performance objectives and in a broad examination of the compatibility of 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 revision of the Repository Isolation Criteria (RIC) work plan.

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

Interactions continued with NRC staff on the Open Item Tracking System (OITS) and a Requirements Definition was completed and transmitted to NRC.

NMSS Element 3 - External Quality Assurance

The Technical Specialist Audit Training Course, which was originally designed by NRC to meet the needs of its Division of High Level Waste Management, was conducted at the Center by Science Applications International Corporation (SAIC) (Section 4). Training was provided to 19 staff members, including five NRC staff members.

NMSS Element 4 - Geologic Setting

Staff supported NRC in its presentations to the ACNW (in both the workshop and formal meeting) on the draft Staff Technical Position (STP) "Investigations to Identify Fault Displacement and Seismic Hazards at a Geologic Repository" and initiated review of the DOE "Study Plan for Probability of Magmatic Disruption of the Repository" (Section 5).

The report "Probabilistic Fault Displacement and Seismic Hazard Analysis Literature Review, Analysis and Uncertainty in Methodologies" (CNWRA 91-013) was completed and transmitted to NRC in final form.

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).

Limited, preliminary work on Systematic Regulatory Analysis (SRA) and related background studies continued the potentially adverse conditions on flooding, natural resources, volcanic hazards, and tectonics.

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. Initial efforts to obtain a copy of the Lawrence Livermore National Laboratory (LLNL) seismic analysis code were unsuccessful, so plans were made to directly download the code from LLNL.

NMSS Element 5 - Engineered Barrier Systems

NRC and Center staff met December 19-20, 1991, to review the plans and status of activities

in the EBS Element related to the EBS Performance Assessment Code (EBSPAC) development (Section 6). Staff also presented and discussed the failure path diagrams which are being developed at part of the example problem related to substantially complete containment (SCC).

The crevice corrosion model was exercised over a range of input variables, and a parametric equation was developed and transmitted for use in the IPA Phase 2 work. The buckling model was also coded and transmitted to the IPA team.

Preparation of the literature review report on waste form degradation and radionuclide release commenced. Procedures for use in the Product Consistency Test (PCT) round robin testing which will be conducted under the auspices of ASTM Subcommittee C.26-13 were prepared and submitted for internal review.

NMSS Element 6 - Repository Design, Construction, and Operations

Staff attended "Technical Specialist Audit Training" in preparation for potential future support work in this area (Section 4).

Two mine ventilation computer codes were procured to be used by staff in its repository design review activities (Section 7).

The Design Basis Accident (DBA) rulemaking effort continued with review and comment on the March 20, 1990, draft rulemaking on this topic. A number of telephone conferences were used to discuss concepts and principles related to the design of items that are classified as "important to safety" versus those that are not.

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. Plans were completed to procure the source code for UDEC, so that necessary modifications can be made to support staff technical assistance, technical review, and research activities.

Activity 3 Repository Operational Criteria (ROC) studies continued this period with a focus on compilation of regulatory provisions in 10 CFR Parts 20, 50, 60, 72, and 100 which may support specific concepts that are proposed for the DBA rulemaking.

NMSS Element 7 - Performance Assessment

Preparations continued for initiating work related to the elicitation of expert judgement, including development of subcontractor relationships to support this effort (Section 8).

Initial efforts were begun on development of the CDS for 10 CFR 60.112.

Staff participated in the IPA Phase 2 review meeting, presenting the results of work on the Total System Code, the source term code REFRE (Release From Repository), migration and

release of carbon-14, and regional-scale hydrogeology modeling of the saturated zone in the vicinity of Yucca Mt. Work continued in each of these areas, as well as on preparation of Part 2 of the report on sensitivity and uncertainty analysis.

A.B. Gureghian presented two papers on sensitivity and uncertainty analyses at the AGU winter meeting which was held in San Francisco December 9-13, 1991, and assisted in recruitment efforts while there.

Research Project 1 - Overall Research

Laboratory experimentation continued in Building 57 and in other SwRI facilities on six Center research projects (Section 9). Expansion of the facility to include eight offices for professionals and technicians who are extensively involved in laboratory studies was completed and the facility was occupied the first week of December.

Directions were sent to the staff on preparation of 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 the new Plan on Volcanism were approved.

Coordination continued regarding preparation of papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste.

A white paper was prepared and submitted which outlines the Center's recommended approach to addressing the effects of climatic changes on repository site hydrology.

Research Project 2 - Geochemistry

Analcime dissolution kinetics experiments continued, with geochemical modeling being used to interpret the results. Experiments are also underway to evaluate the effect of anionic composition on ion exchange equilibria between aqueous solutions and the zeolite mineral clinoptilolite. An error was discovered in the handbook table of analytical integral solutions; consequently, reevaluation of previous kinetic interpretations of analcime dissolution data will be required.

The paper "Experimental Study of Analcime: Dissolution Rate, Stoichiometry, and Solubility at 25° C" was accepted for presentation at the Water-Rock Interactions Conference.

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, indicates three-dimensional flow in this two-dimensional geometry experiment.

Moisture retention characteristics of the alumina beads used in these studies continued to be analyzed, 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.

One benchmark analysis was completed with the discrete element code DECICE and two analyses were completed with the finite element code SPECTROM-331.

A paper, jointly authored by NRC and Center staff, was prepared for presentation at the 1992 International High-Level Radioactive Waste Management Conference.

Research Project 5 - Integrated Waste Package Experiments

Pitting repassivation potential tests continued using specimens of alloy 825. The full-factorial potentiodynamic polarization experiments on oxygen-free copper and copper nickel alloy were completed. The results are being analyzed and summarized for presentation at the annual corrosion conference. Longer term (several days) potentiostatic studies have commenced.

Specimens of alloy 825 are being tested for intergranular corrosion susceptibility in accordance with ASTM A-262, Procedure C.

The new Project Officer met with staff at the Center, and a joint RES/NMSS/CNWRA meeting was held in Washington December 19, 1991, to discuss the status of the project and future directions for the work.

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

Task 2 work focused on completion of a paper on model validation, which will be published in a refereed journal. The study develops procedures which are applicable to both intermediate (trench) and large (repository) scales.

Research Project 7 - Geochemical Analogs

Staff met with Professor Phillipe Ildefonse of the University of Paris to discuss his work related to the Peña Blanca site. The camera-ready version of the paper "Source-term constraints for the proposed repository at Yucca Mountain, Nevada, derived from the natural

analog at Peña Blanca, Mexico," which was presented at the Materials Research Society Symposium on the Scientific Basis for Nuclear Waste Management, was prepared. An abstract on "Modeling Water-Rock Interactions Using Uranium-Series Isotopes: A Critical Assessment" was prepared and accepted for presentation at the Water-Rock Interactions Conference.

Characterization of the ore and host rock from the Peña Blanca site continued, including scanning electron microscopy, x-ray diffractometry, energy dispersive spectrometry, and optical petrography.

Research Project 9 - Sorption Modeling

The report "Effects of Variable Hydrologic Saturation on Sorption Modeling for High-Level Waste Performance Assessment: A Literature Review" was completed and transmitted to NRC December 19, 1991.

The work plan on Hydrogeochemical Modeling, which was revised based on NRC staff comments was approved.

Experiments on the kinetics of uranium sorption on the zeolite mineral clinoptilolite continued. Uranium analyses were completed using polarography. Two test series indicate that carbonate complexation of uranium effectively prevents sorption of uranium on the zeolite. Procedures are being developed to conduct future studies in a glove box where atmospheric carbon dioxide can be excluded from the test environment.

An abstract on "Experimental Study of U⁶⁺ Sorption on the Zeolite Mineral Clinoptilolite" was prepared and accepted for presentation at the Water-Rock Interactions Conference.

Research Project 10 - Performance Assessment

A.B. Gureghian presented two papers at the AGU winter meeting and attended a one-day meeting on INTRAVAL at Lawrence Berkeley National Laboratory.

The results of tests on the DCM-3 computer code were discussed at the IPA meeting in Washington, with the earlier Center recommendation regarding evaluation of the validity of the dual porosity approach being reiterated.

Work continued on evaluation of the application of massively parallel computers to the solution of groundwater flow problems. Initial efforts are to solve a 250,000 node saturated-flow problem using a conjugate gradient method.

Literature review on colloid transport continued. Results will be documented in the next Research Quarterly report.

Results of a second set of Las Cruces trench experimental results, which were recently assembled for simulation, were submitted to Dr. R. Hills at New Mexico State University for evaluation and comparison with the results of other researchers.

Research Project 11 - Volcanic Systems

The survey of literature pertinent to volcanism in the Basin and Range was ongoing this period.

LSSA Support - Development of Access Protocols for Technical Data

Preparations continued for presentations to the DOE and LSSARP on the user scenarios contained in the report "Alternative Ways of Making Packaged Documentary Materials Accessible within the Licensing Support System," which was transmitted to NRC September 27, 1991 (Section 10). Work began on development of the attributes of three broad categories of documents which are to be included in the LSS.

The "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)" was completed and transmitted to NRC December 18, 1991.

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 was completed and transmitted to NRC November 26, 1991 (Section 11). NRC staff and the Center Element Manager met December 12, 1991, to discuss the report, and plans for modifying and issuing it.

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.

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 and Five-Year Plan will be revised based on comments received from NRC, with the latter being transmitted January 10, 1992. The revised Center Management Plan is also scheduled for completion January 10, 1992. 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, and a work plan for the associated Repository Isolation Criteria study will be completed.

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.

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. 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 wastefrom studies will also continue. Testing of borosilicate waste form is planned to commence, pending 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, work under ROC Activity 3, the DBA rulemaking, and prelicensing support (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 commence on the 1991 Research Annual Report.

Within the LSSA Element, the Center will conduct Task 1 work related to document categories and access protocols. Plans will continue for presentations to the DOE and LSSARP on the user scenarios and LSS access protocols. Work will also continue on the Task 2 report "Feasibility of Priority Loading Schedule for LSS Documents."

Task 2 will be closed out and activities in Task 1 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 \$335,112. 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)	\$ 2,227,233
FY92 Funds Uncosted (c)	\$ 5,544,076
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 (12/20/91)

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, B. Gureghian, R. Manteufel, R. Baca (12/30/91)
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 (12/20/91)

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	0
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) (g)		1	1	1	1	1	1	1	1	1	-1
PERFORMANCE ASSESSMENT (e) (g)	3	3	4	4	4	4	4	4	4	4	-1
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	0

(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	14	58
Planned This Date	44	14	58
Planned End of FY92	47	16	63

3700-000

CENTER COMPOSITE

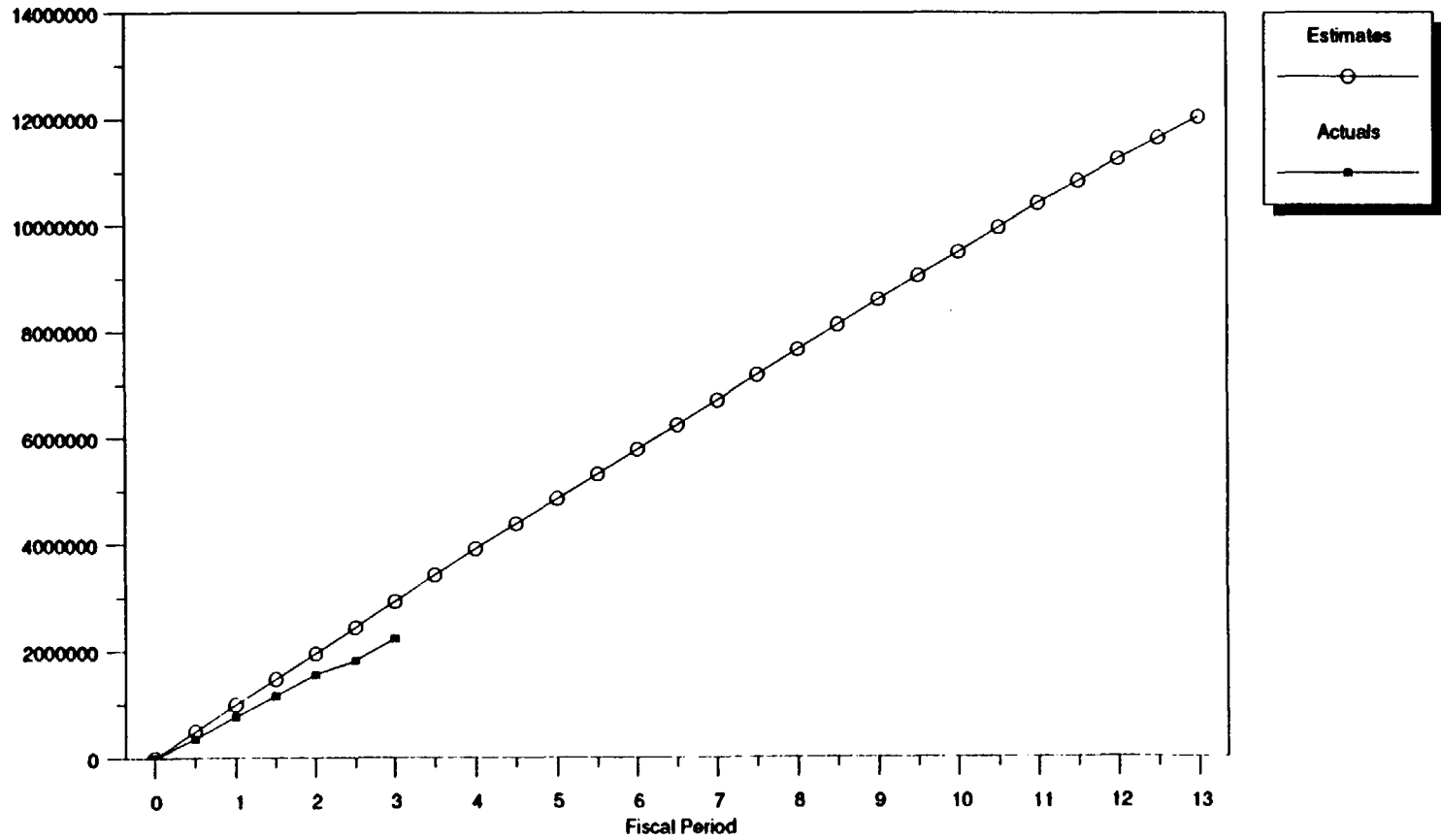
Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST. PERIOD COST]	997202	948548	972653	994454	940242	925714	927065	956542	944143	887204	926782	835225	783419	2918403
] ACT. PERIOD COST]	771847	780672	674713	0	0	0	0	0	0	0	0	0	0	2227233
] VARIANCE, \$]	225354	167875	297940	0	0	0	0	0	0	0	0	0	0	691170
] VARIANCE, %]	22.6	17.7	30.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.7
] EST. FY CUMUL]	997202	1945749	2918403	3912857	4853099	5778813	6705878	7662419	8606563	9493767	10420549	11255774	12039193	
] ACTUAL FY CUMUL]	771847	1552520	2227233	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.064	0.129	0.185	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	225354	393230	691170	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	22.6	20.2	23.7	0.0	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.

3700-000 Center Composite



3702

HLW

Element Status Cost Report

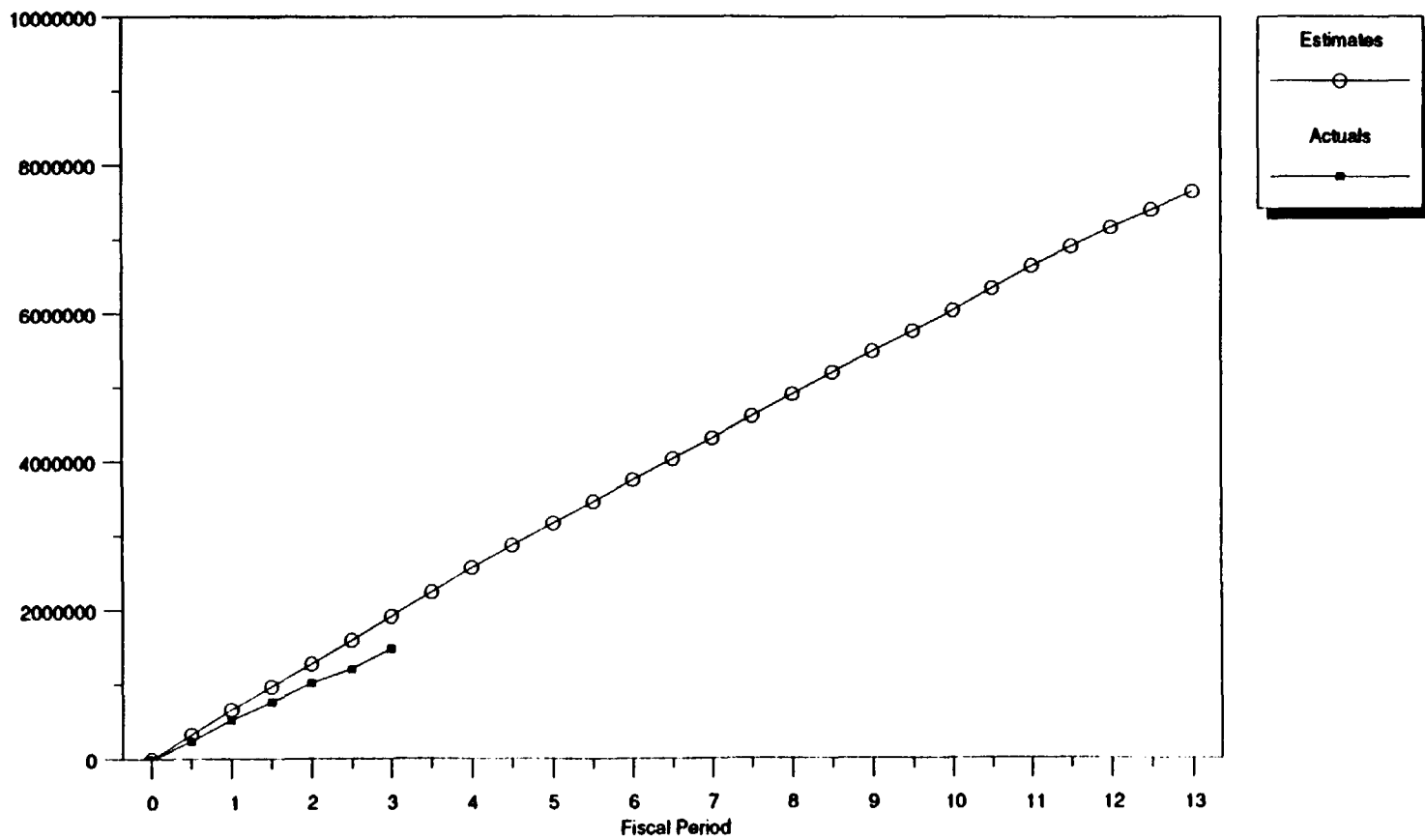
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST PERIOD COST]	661121	612903	636530	858829	600518	580489	563517	593898	578710	549985	606810	520734	479678	1910554
] ACT. PERIOD COST]	528997	487028	459473	0	0	0	0	0	0	0	0	0	0	1475498
] VARIANCE, \$]	132124	125875	177057	0	0	0	0	0	0	0	0	0	0	435056
] VARIANCE, %]	20.0	20.5	27.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.8
] EST. FY CUMUL]	661121	1274024	1910554	2569383	3169901	3750390	4313908	4907806	5486515	6036501	6643311	7164045	7643723	
] ACTUAL FY CUMUL]	528997	1016025	1475498	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.069	0.133	0.193	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	132124	257999	435056	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	20.0	20.3	22.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

1-14

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

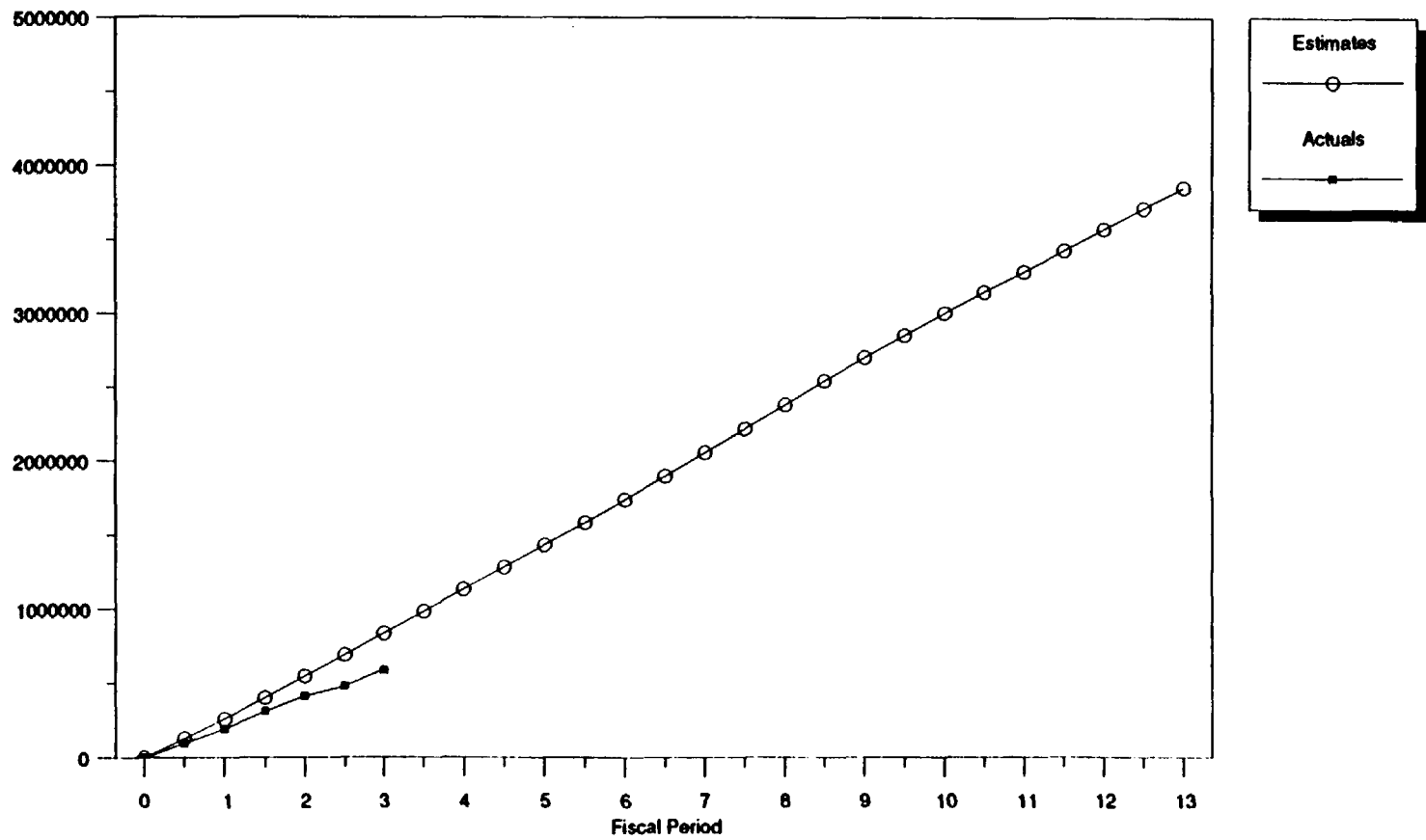
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST PERIOD COST]	258166	289925	288722	296369	301264	305802	318794	324008	321204	298957	281299	289654	280777	836814
] ACT. PERIOD COST]	193002	221970	176051	0	0	0	0	0	0	0	0	0	0	591023
] VARIANCE, \$]	65164	67956	112671	0	0	0	0	0	0	0	0	0	0	245791
] VARIANCE, %]	25.2	23.4	39.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.4
] EST. FY CUMUL]	258166	548092	836814	1133183	1434447	1740049	2058843	2382849	2704053	3093010	3284309	3573963	3854740	
] ACTUAL FY CUMUL]	193002	414972	591023	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.050	0.108	0.153	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	65164	133119	245791	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	25.2	24.3	29.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

I-16

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: James T. Conway (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. CNWRA management and certain professional staff, participated in the NSRRC, CRG, ADP, and Five-Year Plan meetings in White Flint and other ad hoc management meetings in San Antonio. Further clarification was provided by NRC representatives relative to the presentation of contract renewal information and data.

The Center continued its input of various documents to the Technical Document Index and items into the Correspondence Control Index. Significant effort by Center technical staff have realized a more current Commitment Control Log. Center staff attended and contributed to both SwRI and professional society sponsored training courses, conducive to their career development.

The Center is responding pursuant to the additional guidance on the development and presentation of its Five-Year Plan and Center Management Plan on the scheduled date.

Task 2 - Develop and Sustain Technical and Analytical Capabilities

These activities are funded within Task 1 this fiscal year.

Task 3 - Staff Professional Development

Robert Baca accepted the position of Manager, Performance Assessment and Hydrologic Transport, and Dr. John Walton accepted the position of Numerical Analyst in the Engineered Barrier Systems (EBS) Element. 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.

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.

Task 5 - Internal Quality Assurance

The final actions regarding the annual Center quality assurance audit have been taken and at the present time there are no outstanding uncorrected nonconformances in the Center's QA program.

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. 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 QA staff has started the inventory process of the computer software tapes and documentation currently stored in a fireproof safe. The IMS staff had previously maintained control of the software and documentation and a decision was made to have the computer software handled and maintained as a QA Record.

2.2 Major Problems

None for this Period.

2.3 Forecast for Next Period

The Center will continue to make the necessary preparations for contract renewal during FY92, especially in the modification and presentation of the various planning documents. A meeting on this subject and related management topics was held between cognizant NRC and Center staff on December 10-11, 1991. 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 fourth 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 \$1,200. 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)	\$ 466,541
FY92 Funds Uncosted (c)	\$1,031,067
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

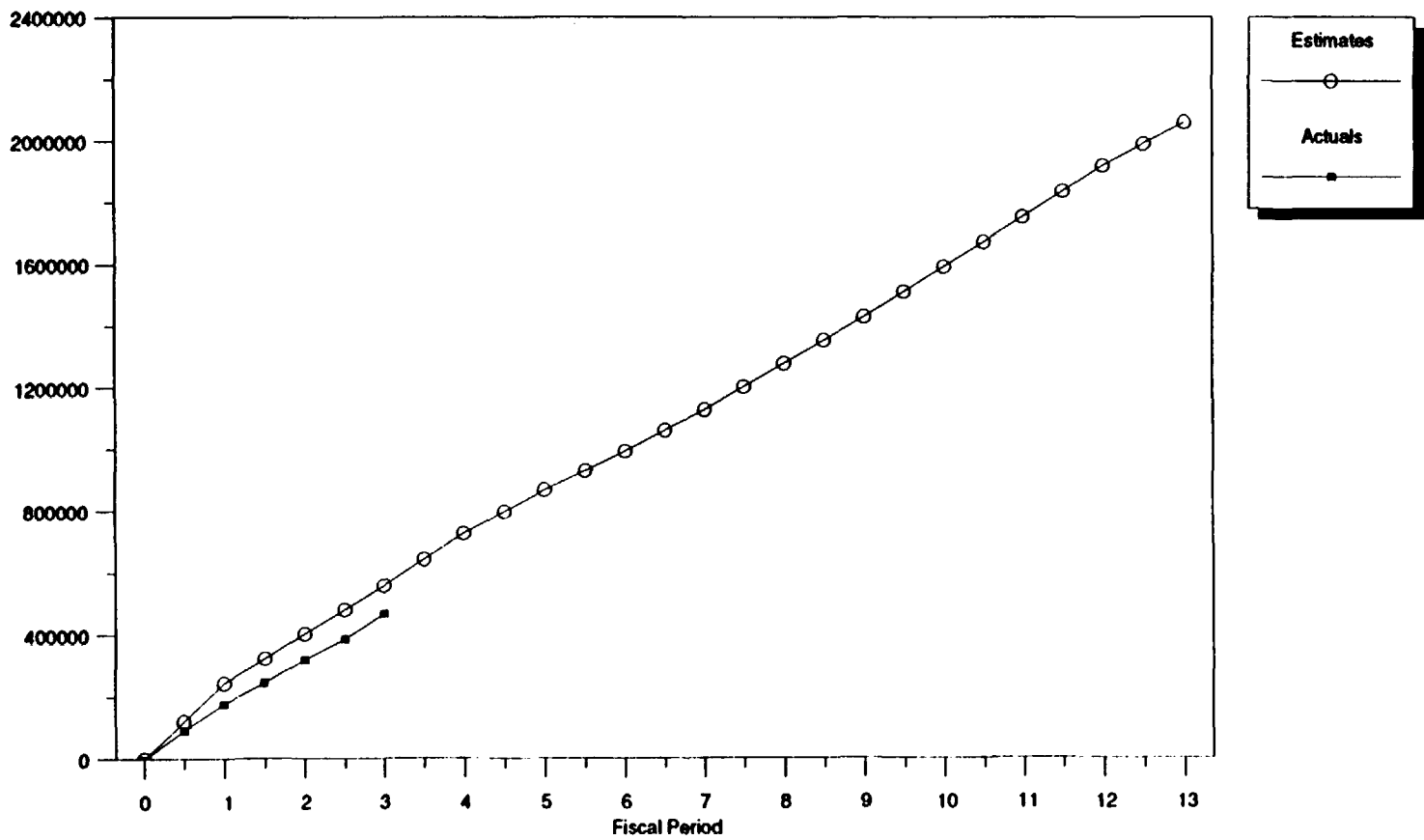
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST PERIOD COST]	242873	159288	155478	169320	141118	125090	133892	149956	151718	162335	161702	167068	139374	557637
] ACT. PERIOD COST]	174818	142823	148900	0	0	0	0	0	0	0	0	0	0	466541
] VARIANCE, \$]	68055	16465	6578	0	0	0	0	0	0	0	0	0	0	91096
] VARIANCE, %]	28.0	10.3	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.3
] EST. FY CUMUL]	242873	402161	557637	726957	868074	993165	1127057	1277012	1428731	1591065	1752768	1919836	2059210	
] ACTUAL FY CUMUL]	174818	317641	466541	0	0	0	0	0	0	0	0	0	0	0
] PERCENT COMPLETE]	0.085	0.154	0.227	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
] VARIANCE, \$]	68055	84520	91096	0	0	0	0	0	0	0	0	0	0	0
] VARIANCE, %]	28.0	21.0	16.3	0.0	0.0	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) submittal of draft interim guidance for a Technical Review Component (TRC) development procedure; (7) 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, and implementation of "roll-up"; (8) refining a work plan for the Repository Isolation Criteria (RIC) study; and (9) submitting the requirements definition for the Open Item Tracking System (OITS).

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. 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 submitted its recommendations for review and approval by NRC and Center management. These issues included correlating the FCRG and RR/REOP structures and implementation of NRC policy with respect to roll-up.

Task 2 - Program Architecture Development and Support System

Development of the prototype IISS is continuing at the Center. Initial hands-on use to obtain more specific design information will be conducted within the Center GS Element.

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 has been made available part time to the NRC staff for this purpose. This is also providing opportunities to optimize and extend specific input/output features of PASS V2.0.

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.

The Center completed the Requirements Definition for the Open Item Tracking System (OITS) with the NRC coordinator.

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.

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; definition of techniques for providing compatibility between the FCRG and RR/REOP structures; 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. Recommendations for resolution of structural related issues have been submitted to NRC and Center management for review and approval.

The active recruitment of a system engineer to fill an opening in WSE&I is continuing.

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 Repository Isolation Criteria (RIC) study;
- Finalizing the Repository Functional Analysis (RFA) report upon completion of the RIC-associated review;
- 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.

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 \$50,761. The attached figure following Table 2 displays the estimated cumulative spending plan and the actual cumulative costs to date.

Expenditures are approximately 12% 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)	\$ 287,251
FY92 Funds Uncosted (c)	\$ 764,234
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

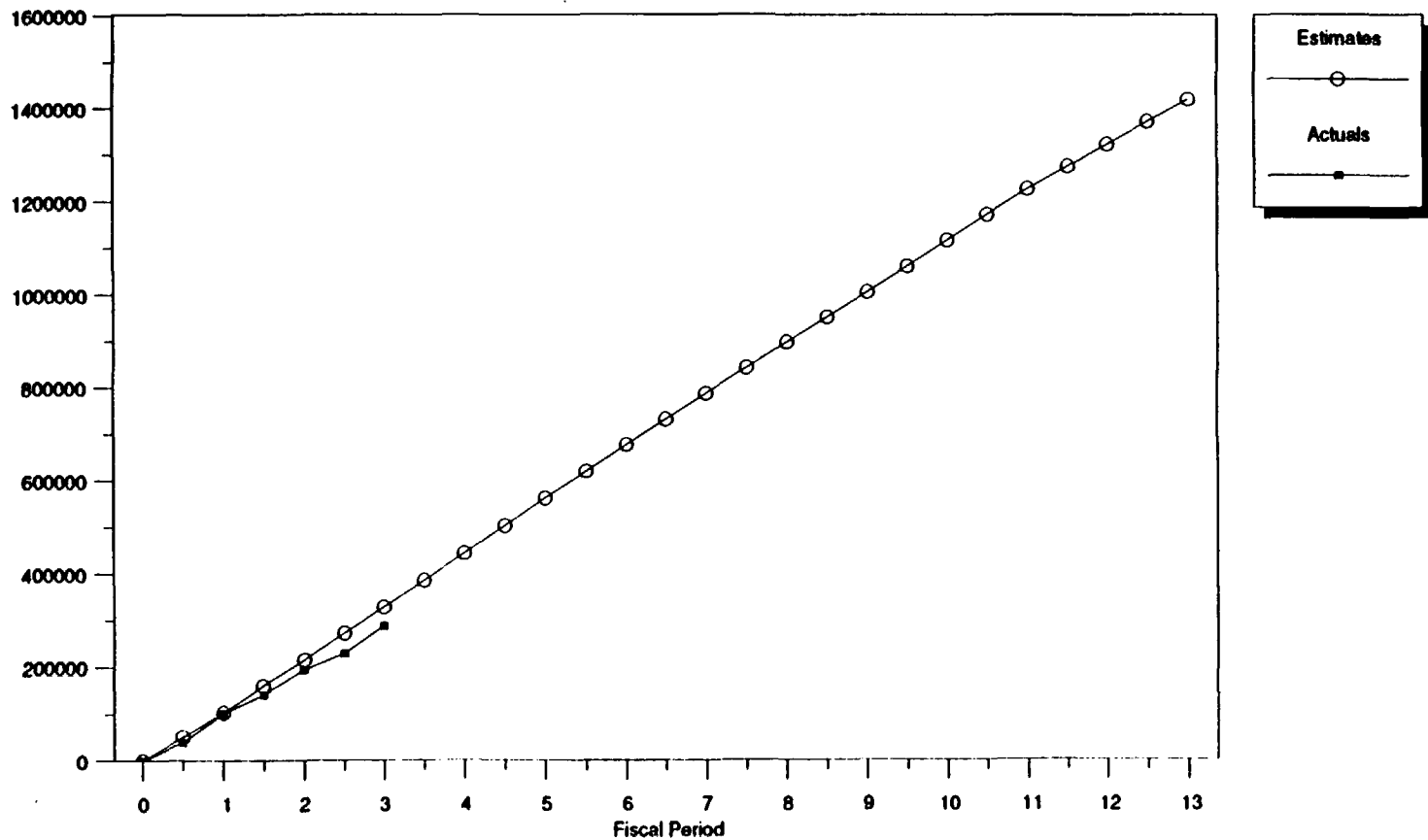
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	102510	112691	112406	114999	118961	114681	109831	110730	107588	110979	110917	96344	95811	327608
ACT. PERIOD COST	100333	92666	94252	0	0	0	0	0	0	0	0	0	0	287251
VARIANCE, \$	2178	20025	18154	0	0	0	0	0	0	0	0	0	0	40356
VARIANCE, %	2.1	17.8	16.2	0.0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

3-5

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

CNWSA 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, the Technical Specialist Audit Training Course, originally designed to meet NRC Division of HLW needs, was taught by Messrs. J. Lefman and C. Williams of Science Applications International Corporation. The training course presented at the Center, similar to two previous classes given at NRC offices in Washington, D.C., was specifically tailored to prepare technical staff for auditing and observations of audits. Due to conflicts with Center staff schedules, the Center was not able to completely fill the class and offered a limited number of slots to the NRC. A total of 19 personnel attended the class, including five NRC personnel. Also this period, discussions were held with NRC QA staff regarding the early FY92 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 (Unfunded)

No activity this period.

Task 4 - Review DOE QA Program Documents (Unfunded)

No activity this period.

4.2 Major Problems

None.

4.3 Forecast for Next Period

Center activities in this area 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. There is the possibility of a Center QA staff member attending a Readiness Review of a QA Program section next period.

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. Commitments for this Element are \$16,000. 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)	\$ 11,134
FY92 Funds Uncosted (c)	\$143,198
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

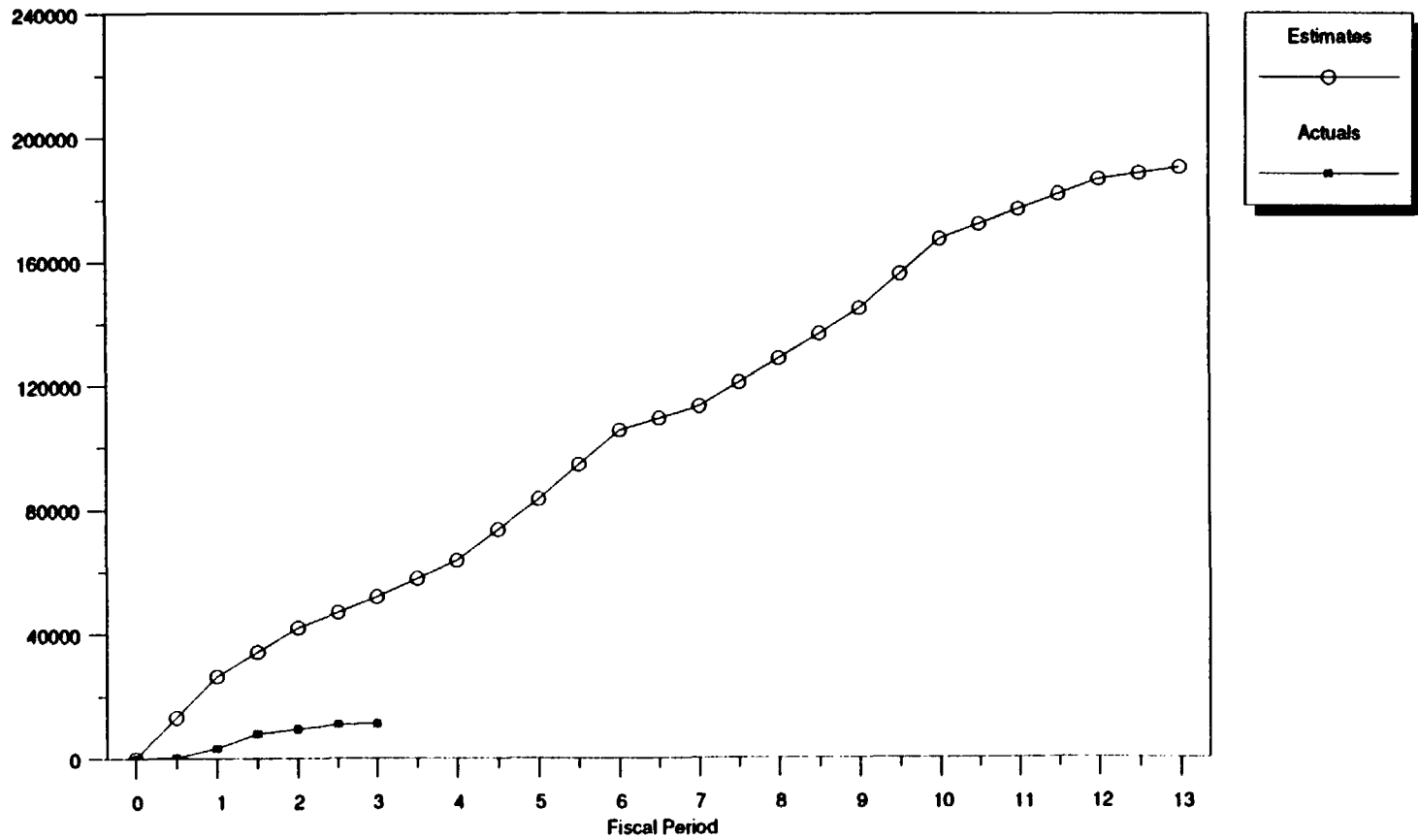
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	26256	15601	9981	11752	19781	22236	7647	15489	16097	22373	9777	9683	3830	51839
ACT. PERIOD COST	3224	6212	1699	0	0	0	0	0	0	0	0	0	0	11134
VARIANCE, \$	23033	9389	8282	0	0	0	0	0	0	0	0	0	0	40705
VARIANCE, %	87.7	60.2	83.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.5
EST. FY CUMUL	26256	41857	51839	63590	83371	105607	113254	128744	144840	167213	176990	186673	190503	
ACTUAL FY CUMUL	3224	9435	11134	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.017	0.050	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	23033	32422	40705	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	87.7	77.5	78.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

4-3

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.

3702-040 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

G. Stirewalt participated in the weekly (reactive) NRC Yucca Mountain team meeting at OWFN on December 4, 1991, as a representative of CNWRA and the GS Program Element.

R. Hofmann, D. Turner, and M. Miklas participated in a three day technical staff audit training course conducted by SAIC in preparation for their potential involvement with NRC technical audits of DOE activities.

Geologic Setting Program Element Interfaces With Other Center Activities

G. Stirewalt and W. Murphy participated in the December 10-11 IPA Team Meeting to obtain background on the development of scenarios related to tectonics and volcanism/magmatism and to present certain aspects of C-14 transport modeling which have been accomplished. The meeting was held at One White Flint North in Rockville, Maryland.

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

Center staff members on December 9, 1991, conducted reviews of the draft view-graphs on the STP entitled "Investigations to Identify Fault Displacement and Seismic Hazards

at a Geologic Repository", which were being prepared by NRC staff for the December 17-18 presentation to the ACNW.

Subtask 1.2 - Review DOE's Study Plans

During this period, the Center initiated review of the DOE study plan entitled "Probability of Magmatic Disruption of the Repository" (DOE Study Plan 8.3.1.8.1.1, Rev 0, effective date September 20, 1990). Center review comments on this study plan are due to the NRC in January 1992.

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)

Work was completed on the PFD and SHA Literature Review report (CNWRA 91-013) for NMSS and transmitted to NRC on November 27, 1991. The work was comprised of incorporating comments originating from the formal Center review of the document and informal comments by the NRC staff. The addition of more material requested by reviewers and the formal internal review by the Center was also accomplished. Several telephone conversations with the cognizant NRC staff discussing the subtask work also took place.

On December 6, 1991, J. Russell, R. Hofmann, G. Stirewalt, and S. Young participated in a conference call with NRC staff to discuss the resolution of Center comments on the Staff Technical Position (STP) entitled "Investigations to Identify Fault Displacement and Seismic Hazards at a Geologic Repository." This conference call was in preparation for the NRC's presentation to the ACNW on this STP on December 17-18. R. Hofmann discussed Center comments with NRC staff concerning their faulting and earthquake investigations STP on December 16, 1991, at One White Flint North, Rockville, Maryland. G. Stirewalt and R. Hofmann attended on December 17, 1991, the ACNW workshop discussion on the STP entitled "Investigations to Identify Fault Displacement and Seismic Hazards at a Geologic Repository." On the morning of December 18, they

both also attended the NRC presentation on this STP at the 38th ACNW meeting. Both the workshop and the meeting were held at the Phillips Building in Bethesda, Maryland.

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)

Efforts 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 sub-system have continued. These efforts have included discussions with NRC staff who are participants on the joint NRC and Center task team assigned to the GWTT issue. Attempts are being made 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)

The Center conducted work involving the evaluation and review of the CDS for naturally occurring materials. M. Miklas travelled to White Flint to work with the NRC staff on the CDS for RR2018 - Naturally Occurring Materials and to facilitate the development of generic guidance on the development of CDS procedures. Discussions with the NRC PA staff necessitated a reevaluation of the License Application review type selection. M. Miklas also expended a major effort as a member of the Structural Task Force considering the relationship of the RR/REOP structure and the Format and Content Regulatory Guide (see Chapter 3).

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, the Center continued the computer-assisted search of NRC data sources to provide information related to regulatory history and intent in the development of regulatory concepts concerning volcanism and magmatism.

During this period, a review of the RR's related to volcanism and magmatism was initiated to provide the basis for the content of the January 1992 letter report deliverable which will present the RRs 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 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 further 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 continues on developing a proposed CDS LA review type for submission to NRC (due February 3, 1992). Work also continues on developing a Compliance Determination Strategy (due May 4, 1992).

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

Attempts were made by R. Hofmann to download a seismic hazard analysis code from NRC's Sun Workstation at White Flint on December 16, 1991. However, the main SUN hard drive, was found to be inoperable and repairs were recommended. Arrangements were made with NRC and LLNL staff to directly download the code from LLNL via INTERNET. Documentation will be obtained from Oak Ridge National Laboratory or will be copied by Center Washington staff from NRC documents at One White Flint North in Rockville, Maryland.

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 \$22,653. 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 work in Task 2.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 973,245
FY92 Funds Costed to Date (b)	\$ 190,753
FY92 Funds Uncosted (c)	\$ 782,492
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

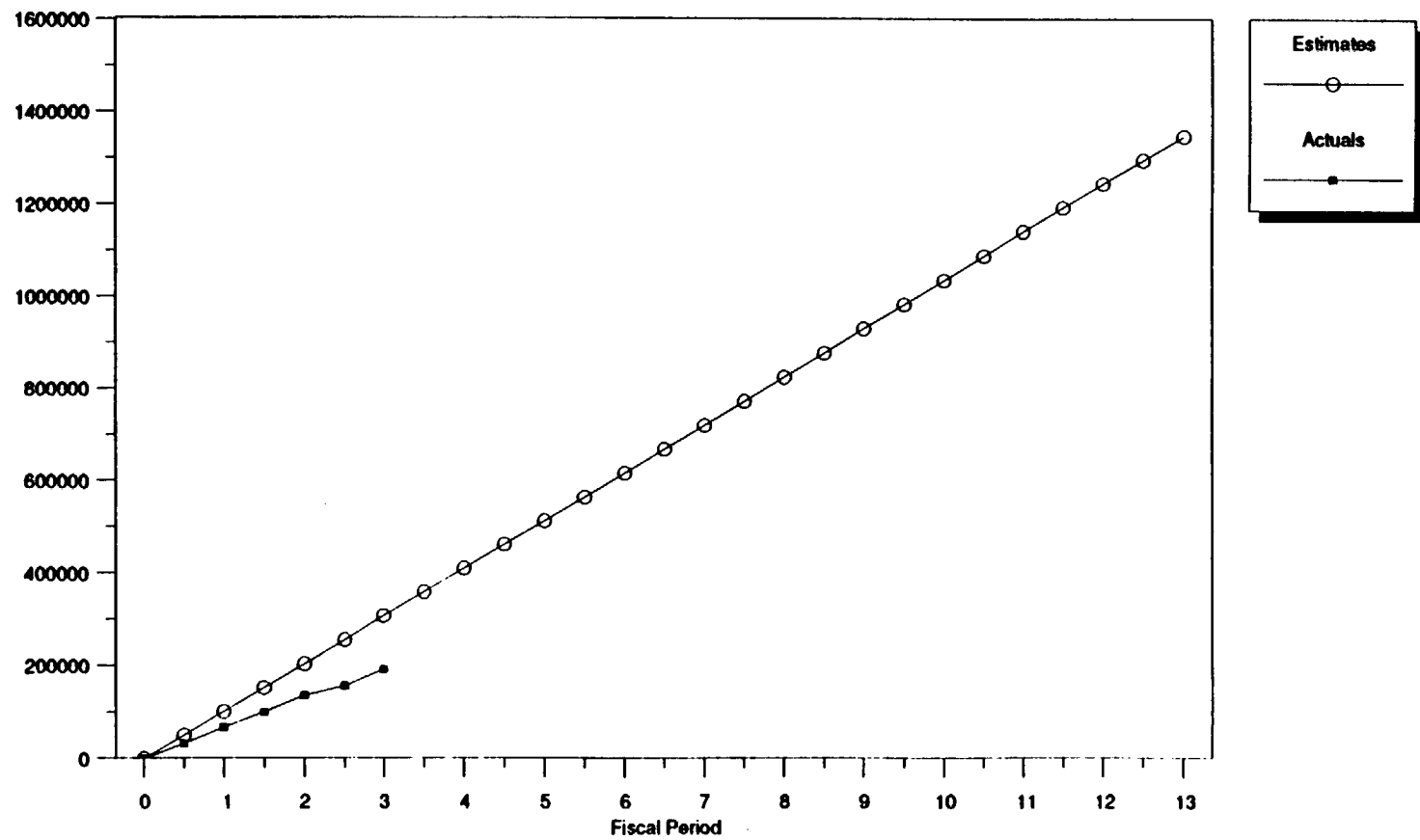
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST PERIOD COST]	100415	102454	103348	102933	102774	103487	103655	104649	105034	104869	105473	104385	102746	306217
] ACT. PERIOD COST]	67019	67918	55816	0	0	0	0	0	0	0	0	0	0	190753
] VARIANCE, \$]	33396	34536	47533	0	0	0	0	0	0	0	0	0	0	115464
] VARIANCE, %]	33.3	33.7	46.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.7
] EST. FY CUMUL]	100415	202869	306217	409150	511924	615411	719066	823715	928749	1033618	1139091	1243476	1346222	
] ACTUAL FY CUMUL]	67019	134937	190753	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.050	0.100	0.142	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	33396	67932	115464	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	33.3	33.5	37.7	0.0	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 1991 Operations Plan or Project Plan.
3. TOTAL column reflects YTD total.

3702-000 GS



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. Cragnolino, H. Manaktala, P. Nair, W. Patrick,
N. Sridhar, E. Tschoepe, and Y. Wu

Subcontractors/Consultants: None

6.1 Technical Status

The EBS staff continued to provide support to the ongoing IPA 2 activities, SRA work, and other Center Elements during this reporting period.

Professional Activities

- H. Manaktala attended a Pyroprocessing Waste Form Information meeting held in Oak Ridge, Tennessee, December 10-11, 1991. The meeting was hosted by Oak Ridge National Laboratory, Argonne National Laboratory, and the Nuclear Engineering/Actinide Recycle Program of the DOE. The meeting was attended by 28 participants from industry and national laboratories. The proposed waste forms for disposal of high-level wastes generated during pyroprocessing of light water reactor and integral fast reactor fuels were reviewed and discussed. H. Manaktala also took the opportunity to visit the Oak Ridge National Laboratories and tour the hot cell facilities. The laboratory appears to have the necessary facilities for conducting potential spent fuel tests.

Other Activities

- P. Nair and N. Sridhar attended the IPA workshop held at the NRC White Flint offices on December 10, 1991. At the workshop, N. Sridhar presented the EBS Element input to the source term activity of the IPA project. The input included a module combining the crevice corrosion initiation model, crevice corrosion propagation model, and a buckling failure model.

Task 1 - Prelicensing Activities

No planned activity this period.

Task 2 - Regulatory and Technical Guidance Development

Failure path diagrams were developed as part of the SCC example program. These were then presented to NMSS staff on December 19, 1991, for discussion and comments.

Their comments are being incorporated in the further development of the failure path diagram.

Task 3 - Analysis Codes and Methods

The crevice corrosion model was exercised for several combinations of input variables. The results provided the bases for the development of a parametric equation that could be used for the ongoing IPA activities. The simplified parametric equation and the buckling models were computer coded and submitted to the IPA project. The documentation of the results of the crevice corrosion effort was prepared as part of a paper to be published in the proceedings of a conference on long-term life prediction.

Examination of available models or approaches to various other container material degradation modes is underway.

A meeting was held on December 19-20, 1991, at the NRC White Flint Offices to discuss the scope of the planned updates on the EBSPAC Developmental Plan. The meeting participants included R. Ballard, R. Weller, and C. Interrante from the NRC and P. Nair from the Center. The first update (due January 22, 1992) will address the various models to be developed under the EBSPAC project. The second update (tentatively planned for March 1992) will address the nature and structure of the subsystem code such that it is compatible with the system code being developed under the PA Program Element. The timing of these deliverables will allow the Center's new staff member to provide input to the future code development aspects of EBSPAC.

Writing on the review report on the glass waste form was initiated. This includes the assessment of variables that are anticipated to control the degradation and release of radionuclides from the vitrified waste forms in a geological repository.

The three procedures for preparing glass samples, conducting leaching tests, and analyzing leachant were reviewed at the Center and the comments are being currently resolved.

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.

Preparation of the review report on the glass waste form will continue. Testing of the borosilicate glass will be initiated 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. Commitments for this Element are \$2,724. 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 two to three periods.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 474,460
FY92 Funds Costed to Date (b)	\$ 126,081
FY92 Funds Uncosted (c)	\$ 348,379
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

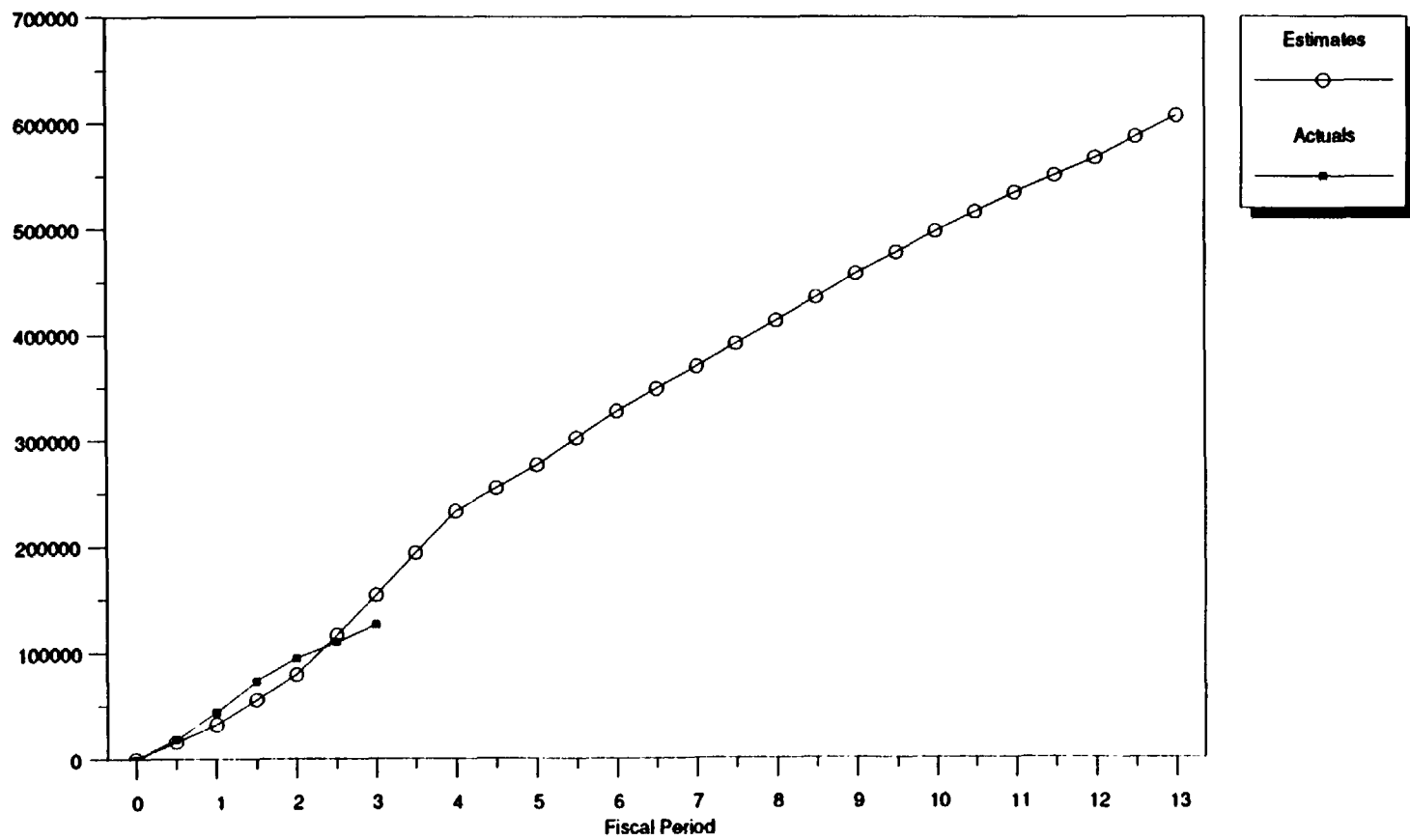
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST PERIOD COST]	32587	46279	74942	79514	43685	50436	42270	43597	44179	40000	36596	33196	39635	153808
] ACT. PERIOD COST]	44050	50180	31852	0	0	0	0	0	0	0	0	0	0	126081
] VARIANCE, \$]	-11463	-3900	43090	0	0	0	0	0	0	0	0	0	0	27726
] VARIANCE, %]	-35.2	-8.4	57.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
] EST. FY CUMUL]	32587	78866	153808	233322	277007	327443	369713	413310	457489	497488	534085	567281	606915	
] ACTUAL FY CUMUL]	44050	94229	126081	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.073	0.155	0.208	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	-11463	-15363	27726	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	-35.2	-19.5	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

4-9

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 3 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. B. Jagannath, D. Gupta, and R. Carlson visited the Center during this reporting period. The RDCO staff participated with the NRC staff to prepare the camera-ready manuscripts of two papers: (i) NRC's Geotechnical Engineering Research Needs for the High-Level Waste Repository Program, and (ii) An Approach for Thermal Load Considerations in a Repository Design Methodology. These papers are for presentation at the 1992 International High-Level Radioactive Waste Management Conference in Las Vegas, and the 33rd U.S. Symposium on Rock Mechanics in Santa Fe, respectively.

Professional Activities

- A. Chowdhury attended a short course on "Quality Assurance for Project Managers" offered by the Staff Development Office of Southwest Research Institute on December 4, 1991.

Task 1 - Prelicensing Activities

S. Hsiung, M. Ahola, and H. Karimi attended a short course on "Technical Specialist Audit Training" offered at CNWRA by Science Applications International Corporation (SAIC) on December 3-5, 1991. This course will be useful for both auditing and observation auditing DOE's repository program technical activities. A trip report on S. Hsiung's attendance at the NWTRB meeting at Seattle, Washington, on November 12-13, 1991, was submitted to NRC on December 17, 1991. The executable version of a set of underground ventilation computer programs "CLIMSIM" and "VNETPC" were procured by the Center from Mine Ventilation Services, Inc. These computer programs will be useful to review DOE's repository ventilation 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. Work continued based on the latest version of governing principles to review and revise NRC's proposed DBA rule "Additional Preclosure Regulatory Requirements for High-Level Waste Geologic Repositories," dated March 2, 1990.

The NRC and Center staff met on December 5-6, 1991, to form the working group and review the RR/REOP structure for RR0050-Site Characterization. R. Carlson, D. Gupta, and B. Jagannath of NRC and A. Chowdhury, S. Hsiung, H. Karimi, J. Hageman, R. Manteufel, and E. Tschoepe of CNWRA attended this meeting.

The RDCO staff participated in various SRA related activities, including selection of the Center's technical staff for NRC-CNWRA working groups for reviewing, modifying, and approving the RRs relevant to RDCO program element.

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 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 is in the process of being 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

The ROC Activity 3 continued during this period. This included further progress on preparing a compilation of regulations from 10 CFR Parts 20, 50, 60, 72, and 100 for specific concepts on ROC topics related to the Design Basis Accident (DBA) rulemaking. These specific citations will be compared to help refine any potential repository operational criteria that may be needed for 10 CFR Part 60 to comprehensively address the criteria needed for the DBA rulemaking. The Center is awaiting informal comment from NRC on the draft acceptance criteria for the ROC Activity 3 report that was submitted to NRC on October 24, 1991.

7.2 Major Problems

None.

7.3 Forecast for Next Period

Work on the selection 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 prelicensing 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 \$87,082. 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)	\$ 180,288
FY92 Funds Uncosted (c)	\$ 445,319
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

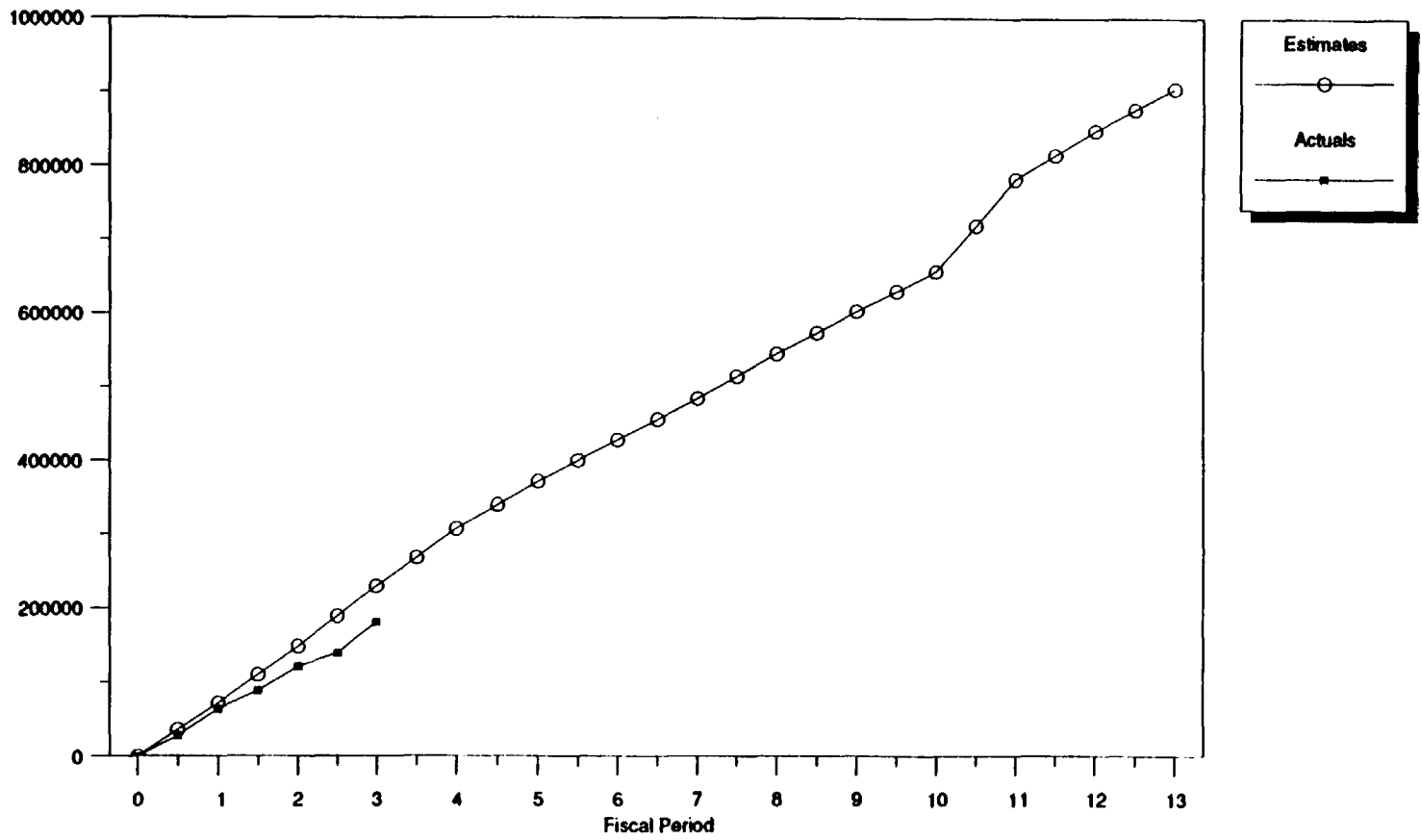
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST. PERIOD COST	71598	76282	81180	78049	64839	58151	55862	60707	58115	53794	125592	66056	57196	229060
ACT. PERIOD COST	63878	56570	59840	0	0	0	0	0	0	0	0	0	0	180288
VARIANCE, \$	7720	19712	21340	0	0	0	0	0	0	0	0	0	0	48772
VARIANCE, %	10.8	25.8	26.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3
EST. FY CUMUL	71598	147880	229060	307109	371948	428099	483961	544668	602783	656577	782169	848225	905421	
ACTUAL FY CUMUL	63878	120447	180288	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.071	0.133	0.199	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	7720	27433	48772	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	10.8	18.6	21.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

7-4

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.

3702-020 RDCO



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

Dr. A. Berge Gureghian attended the Winter meeting of the American Geophysical Union in San Francisco from December 9-13, 1991. Based on the work done for Task 5, he presented two papers related to sensitivity/uncertainty analyses. It may be noted that in the AGU meetings, full written papers are not required.

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.

Dr. Sagar participated in various discussions regarding the relationship between requirements of 60.112 and 60.122. The final determination of this relationship will influence the CDS significantly.

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.

The Center Conflict of Interest (COI) Committee found Dr. Winkler of Duke University to be free of conflict as far as his consulting services to the Center are concerned. The COI for Dr. Hora of University of Hawaii awaits some clarifications from him.

Further progress was made in developing an example for the application of fuzzy logic to soft information.

Task 5 - Iterative Performance Assessment

M. Ahola, W. Murphy, R. Janetzke, N. Sridhar, J. Wu, and B. Sagar attended the technical meeting on IPA at NRC Offices in White Flint. Status of all the work in IPA Phase 2 was reviewed. M. Ahola presented his auxiliary analysis on regional modeling of saturated flow and W. Murphy discussed migration of carbon-14 in the far-field. The status of the Total System Code and the Source Term Code was also discussed.

While in Washington, R. Janetzke worked with Rex Wescott on developing links to his gas transport module with the Total System Code. He also assisted R. Neel with the dose code DITTY.

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 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 \$9,299. 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)	\$ 213,450
FY92 Funds Uncosted (c)	\$ 729,684
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

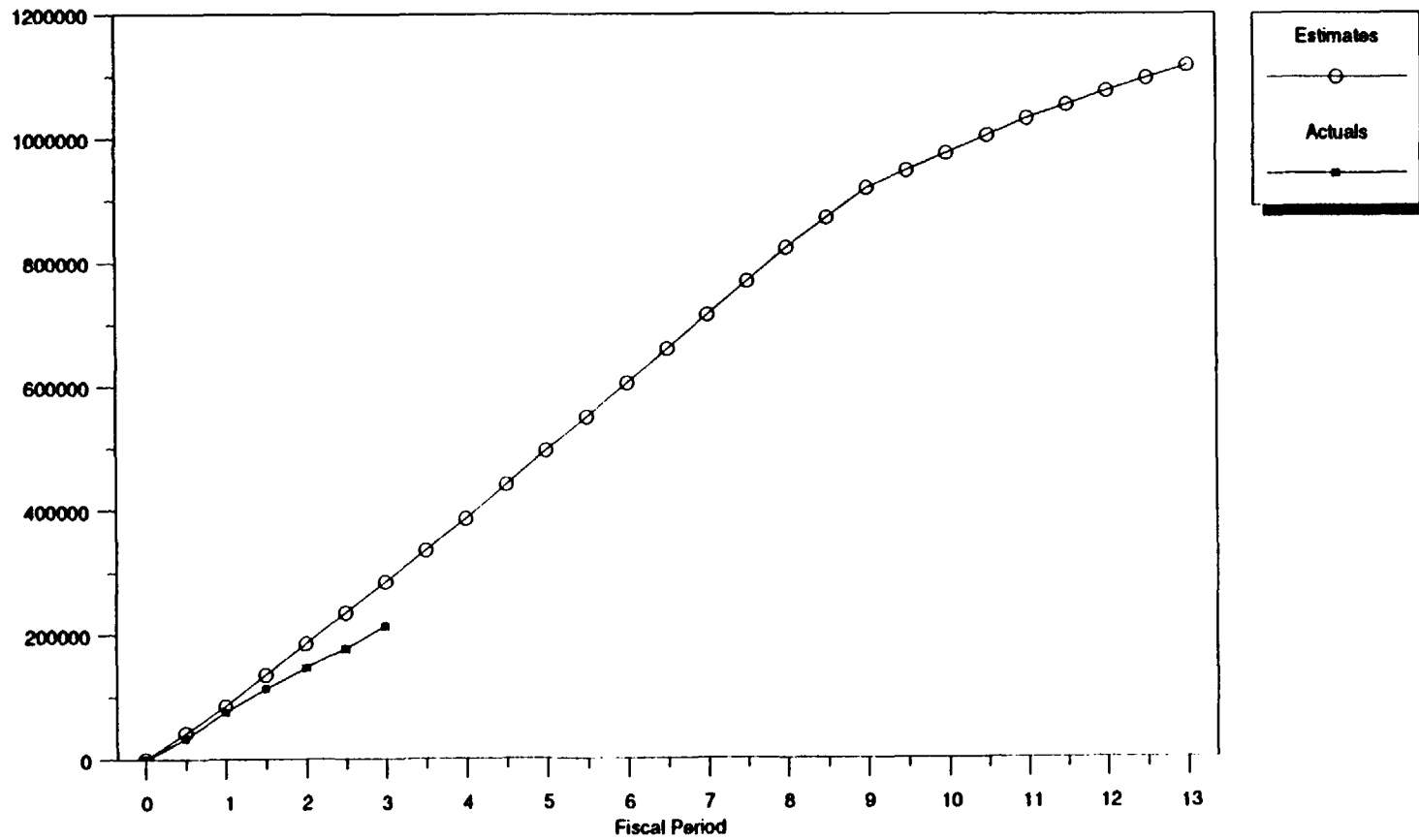
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	84881	100308	99197	102264	109360	108409	110360	108770	95979	55636	56752	44001	41087	284386
ACT. PERIOD COST	75676	70660	87114	0	0	0	0	0	0	0	0	0	0	213450
VARIANCE, \$	9205	29648	32083	0	0	0	0	0	0	0	0	0	0	70936
VARIANCE, %	10.8	29.6	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.9
EST. FY CUMUL	84881	185189	284386	386649	496010	604418	714778	823548	919527	975163	1031915	1075915	1117003	
ACTUAL FY CUMUL	75676	146336	213450	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.068	0.131	0.191	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	9205	38853	70936	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	10.8	21.0	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

4-8

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

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

Key Personnel: R. Ababou, M. Ahola, A. Bagtzoglou, A. Chowdhury, G. Cragnolino, 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, J. Altamirano

9.1 Technical Status

Directions were sent to staff regarding preparation of the 1991 Annual Research Report. Modifications to Building 57 were completed to provide offices for staff engaged in laboratory investigations, and the building was occupied the first week of December.

Research Project 1 - Overall Research Plan

In the Overall Research project, coordination was provided for the preparation of contributed papers for the proceedings of the 1991 Workshop on the Role of Natural Analogs in the Geologic Disposal of Nuclear Waste.

A white paper outlining the approach the Center would use to address the effects of climatic change on repository site hydrology was submitted to the NRC staff during this reporting period.

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 below.

PROJECT	TITLE	REVISED PLAN COMPLETION DATE	APPROVAL STATUS
Research 1	Overall Research Plan	09/16/91	Await Approval
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	Approved

Research Project 2 - Geochemistry

Experiments to study the kinetics of analcime dissolution at 25°C continued. The mixtures ACDTIA, ACDTIIA, and ACDTIIIA only had enough aqueous solutions left for one set of samples, which was taken for chemical analysis of pH and Si, Al, and Na concentrations. One set of samples were also taken from the mixtures ACDTIB, ACDTIIB, and ACDTIIB. Si and Al concentrations were determined using UV-Vis

spectrophotometry, and Na was analyzed using an ion selective electrode. In addition, an initial set of samples was taken from the analcime solubility experiments, which were started during Period 1. A summary and a kinetic and thermodynamic interpretation of the experimental data will be reported in the Center's annual report of research activities.

The paper "Experimental Study of Analcime: Dissolution Rate, Stoichiometry, and Solubility at 25°C," was accepted for oral presentation at the Water-Rock Interactions Conference which will be held next year in Park City, Utah.

Experiments to evaluate the effect of anionic composition on ion exchange equilibria between aqueous solutions and the zeolite mineral clinoptilolite continued. Aqueous samples for chemical analysis were taken from experiments involving mixtures of $\text{NaNO}_3/\text{KNO}_3$ and $\text{NaNO}_3/\text{Ca}(\text{NO}_3)_2$. Additional experiments using NaHCO_3 and KHCO_3 will be initiated next period. Thermodynamic evaluation of previously derived isotherm data on NaCl/KCl and $\text{NaCl}/\text{CaCl}_2$ at total normalities of 0.5, 0.05, and 0.005 was initiated, using models described previously in an MRS paper (Pabalan, 1991). The models will be used to predict isotherms in the $\text{NaNO}_3/\text{KNO}_3$, $\text{NaNO}_3/\text{Ca}(\text{NO}_3)_2$, and $\text{NaHCO}_3/\text{KHCO}_3$ systems, which will be compared with experimentally derived values. Results will be reported in the Center's quarterly report of research activities.

Geochemical modeling activities focused on evaluation of literature data for the thermodynamic properties of analcime and development of a theoretical model for analcime dissolution kinetics. Discovery of an error in the table of analytical integral solutions in the Handbook of Chemistry and Physics, which was used in previous data interpretations, will require a reevaluation of the kinetic interpretation of analcime dissolution experimental data discussed above. An evaluation was performed of the steps required to bring the EQ3/6 computer software into compliance with CNWRA TOP-018.

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 point 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 be 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 to inclusion in the 1991 Research Annual Report.

The laboratory experimental work for direct shear tests of single jointed rock specimens continued during period 3. 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 one benchmark problem using the discrete element code DECICE and two benchmark problems using the finite element code SPECTROM-331 have been performed.

The Seismic Rock Mechanics research staff participated with the NRC staff to prepare the camera-ready manuscripts of two papers: (i) NRC's Geotechnical Engineering Research Needs for the High-Level Waste Repository Program, and (ii) An Approach for Thermal Load Considerations in a Repository Methodology. These papers are for presentation at the 1992 International High-Level Radioactive Waste Management Conference in Las Vegas, and the 33rd U.S. Symposium on Rock Mechanics in Santa Fe, respectively.

The source code of the two-dimensional distinct element computer program UDEC is in the process of being procured by the Center using SwRI capital equipment funding. This computer code will be available at the Center during the next reporting period and will be used for DECOVALEX modeling work. The Center is awaiting authorization by NRC contracts for DECOVALEX work.

Research Project 5 - Integrated Waste Package Experiments

Task 1: Corrosion

Pitting protection (repassivation potential) validity tests on alloy 825, using the multi-channel potentiostat and the Workbench PC™ data acquisition program, are continuing.

The full-factorial, potentiodynamic, polarization experiments on Oxygen-free copper and copper-nickel alloy have been completed. Following these tests, additional experiments to study the effect of temperature and bicarbonate concentrations were conducted mainly on copper-nickel alloy. These results are being assembled for a paper which will be presented in the annual corrosion conference in Nashville in April 1992. The data indicate that the localized corrosion in these alloys is not deep, tends to broaden with time, and tends to diminish at higher temperature. No localized corrosion has been observed at 95°C. The Cu-Ni alloy is, in general, more resistant to localized corrosion than the oxygen-free copper.

Following the potentiodynamic experiments, potentiostatic tests are being conducted where the samples are polarized to a constant potential of 0.5V vs. Saturated Calomel Electrode in a 8500 ppm bicarbonate solution, then chloride or sulfate is added to monitor the changes in corrosion rate (current density) with time over a few days. These tests corroborate the beneficial effect of higher temperature. Additionally, after an initial increase in current due to localized corrosion, the samples tend to "repassivate" as the corrosion products grow laterally. These longer-term experiments are continuing.

Task 2: Stress Corrosion Cracking

No reportable activity this period.

Task 3: Materials Stability

Samples of Incoloy alloy 825 are being tested after heat treatment for intergranular corrosion susceptibility in accordance with ASTM A-262, Procedure C.

Dr. M. McNeil, the new IWPE NRC Project Officer, visited the Center on December 12, 1991, to discuss the IWPE program activities and to plan future directions for this program.

Discussions were held among NMSS, RES, and CNWRA at Washington on December 19, 1991, to review the future directions of the IWPE program. It was recognized that the scope of the materials testing program may change in FY93 if DOE modifies its SCP waste package strategy. For the present, the focus on alloy 825, CDA 715, and Hastelloy C-22 will continue. Additional consulting in the area of microbiologically influenced corrosion (MIC) was identified for future considerations.

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 during the reporting period were focused on finalizing a paper on Model Validation, to be published in a refereed journal, as part of a broader investigation of verification procedures for variably saturated flow and transport models (this is a joint effort involving both the Stochastic Research Project and the Performance Assessment Research Project). Like the previously reported study on geostatistical estimation, simulation, and kriging, this study on model validation develops procedures that are applicable in principle to both intermediate and 'large-scale' sites, e.g. experimental sites used for model validation purposes (Las Cruces trench), as well as actual or proposed waste disposal sites (Yucca Mountain). Future activities will re-focus on the important task of introducing effective hydrodynamic models suitable for large-scale unsaturated flow simulations in fractured porous media.

Research Project 7 - Geochemical Analogs

Professor Phillippe Ildefonse of the University of Paris visited the Center on November 25-26 for technical exchange concerning the Nopal I deposit at Peña Blanca, Mexico. Discussions were held on the mineralogy, geology, structure, isotope systematics, genesis, and evolution of the Nopal I deposit. Results of a review of previously published mathematical models of uranium series isotope data from analog sites were discussed with respect to performance assessment needs during a seminar at the Center entitled Application of U-Series Disequilibrium Measurements to Natural Analog Studies presented by B.W. Leslie.

The final, camera-ready, version of a paper by W.M. Murphy and E.C. Percy entitled "Source-term constraints for the proposed repository at Yucca Mountain, Nevada, derived from the natural analog at Peña Blanca, Mexico" was prepared and submitted for publication in the 1991 Materials Research Society Scientific Basis for Nuclear Waste Management proceedings volume. An abstract authored by B.W. Leslie entitled "Modeling Water-Rock Interactions Using Uranium-Series Isotopes: A Critical Assessment", which addresses attempts to model uranium-series data from analog sites, was accepted for presentation at the Water-Rock Interactions Conference which will be held next year in Park City, Utah.

Calibration procedures for the gamma spectrometer system to be used in analyzing radioisotopes in samples of Peña Blanca rock were developed. Preparation of Peña Blanca rock samples for gamma spectroscopy was initiated. Preparation of fluids from the September 1991 samples for U and Th isotopic analysis was begun. Characterization of high-grade uranium ore from Peña Blanca continued with additional scanning electron microscopy, x-ray diffractometry, energy-dispersive spectrometry, and optical petrography. Sample preparation experiments for transmission electron microscopy continued. Preparation of a subcontract with I. Reyes of the University of Chihuahua to support the

Geochemical Natural Analog Project continued; additional supporting information for the subcontract was obtained in response to an NRC request.

Research Project 9 - Sorption Modeling

Experiments to study the kinetics of uranium sorption on the zeolite mineral clinoptilolite at 25°C and atmospheric pCO₂ continued. Uranium analyses of samples from experiment IC (initial pH=9, initial ΣU=25 and 50 ppm) using polarographic methods were completed. The results indicate that the concentration of uranium in solution remained constant with time within analytical uncertainty. These results are consistent with the IB experiments, which had initial ΣU=1000 ppm, and appear to indicate that carbonate complexation of uranium effectively prevents sorption of uranium on the zeolite material. Procedures are being developed to conduct the experiments in a glove box to keep out atmospheric CO₂(g) and prevent the formation of uranium carbonate complexes.

Detailed experiments to evaluate the importance of ion exchange between Na⁺ and H⁺ were completed. In addition, experiments to investigate the kinetics of ion exchange between UO₂²⁺ in solution and the H⁺-form of clinoptilolite were also completed. Analysis of uranium concentrations are being conducted using polarography. Results of the above experiments will be reported in the Center's quarterly report of research activities.

Subtask 1.2 was completed with the submission of "Effects of Variable Hydrologic Saturation on Sorption Modeling for High-Level Waste Performance Assessment: A Literature Review" to NRC on December 19, 1990.

NRC approval has been received for the work plan for Task 2-Hydrogeochemical Modeling of Radionuclide Transport.

A detailed workplan that requires approval by the radiation safety office at SWRI prior to initiation of the Cs sorption experiments was developed. Methods to be used in calibration of the NaI detector that will be used in the Cs sorption experiments were completed. Efforts to obtain a Texas State license for the use of U and Pu isotopes for future sorption experiments continued.

The papers "Experimental Study of U⁶⁺ Sorption on the Zeolite Mineral Clinoptilolite" and "Modeling Water-Rock Interactions Using Uranium-Series Isotopes: A Critical Assessment" were accepted for presentation at the Water-Rock Interactions Conference which will be held next year in Park City, Utah.

Research Project 10 - Performance Assessment

General Information

Dr. Berge Gureghian attended the AGU meeting in San Francisco from December 9-14, 1991. In addition to presenting two papers based on work done for the Iterative

Performance Assessment, he also attended a one day meeting of INTRAVAL at the Lawrence Berkeley National Laboratory.

Task 1 - Technology Transfer

This task has been completed.

Task 2 - Two-Phase Flow and Transport

Dr. Sagar completed plans to visit Dr. Runchal in Los Angeles to work on the documentation of the PORFLO3 code next period.

Task 3 - Evaluation and Modification of SNL Technology

Tests on the DCM-3 computer code were discussed in the IPA meeting at NRC offices in White Flint. The recommendation made in the most recent Research Quarterly that the validity of the dual porosity approach to flow in fractured media needed to be tested experimentally was reiterated in the meeting. Tim McCartin indicated that he will discuss this issue with other staff at the NRC.

Task 4 - Identification of Phenomena Important to Repository Performance

A report written by Renner Hofmann on Seismic Analysis is being reviewed to determine whether material for defining seismic scenario for performance assessment may be extracted.

Task 5 - Incorporation of Existing Models into PA Methodology

Further progress was made on parallel computations. Initially, a three-dimensional code for saturated flow using a conjugate gradient method has been developed. Initially an effort to solve a problem with 250,000 nodes was made. Further testing and eventually development of an unsaturated code is desired.

Considerable literature on colloid transport has been collected and is being reviewed. We intend to report the literature review in the next Research Quarterly.

Task 7 - Methodology for Validation of Models

Data for the second set of experiments at the Las Cruces trench site have been assembled for simulation. Results of these simulations have been submitted to Dr. Richard Hill at the University of New Mexico. Dr. Hill will compare these results to those submitted by other investigators. A few more simulations, which will also be submitted to Dr. Hill, are being performed with different 'conceptual' models.

Research Project 11 - Volcanic Systems

During this period, the Center continued with survey and reading of literature pertinent

for the Volcanism Research Project. Ms. Joyce L. Foegelle, a geology graduate student at the University of Texas - San Antonio working under Dr. Alan Morris, was hired to assist with the literature survey.

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 \$144,343.

The cumulative cost underrun of approximately 20% in the Geochemistry Research Project at the end of Period 3 is due primarily to less than planned spending in Tasks 2 and 4, modeling and preparation of quarterly and annual reports. Research efforts in the modeling task during Period 4 have increased with interpretation of completed analcime dissolution studies and thermodynamic data base evaluations, and resultant decrease of the underrun should occur. Intensive effort to prepare the 1991 Annual Research Report will also correct the underrun in Task 4.

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 3, the Natural Analog Project had recorded a variance of 27% (\$23K) over plan. This variance was principally a result of one-time laboratory set-up of costs which were incurred during Periods 1 and 2. In addition, materials and supplies required to conduct laboratory and field investigations ordered during the last two periods of FY91 were not received and charged on the project until FY92. Period 3 actual costs were 12% (\$3K) beneath the estimated costs. This corrective trend in cumulative costs is likely to continue.

At the end of Period 3, the Sorption Modeling Research Project had recorded a variance of 90% (\$38K) above plan. About one-third of this variance (\$13K) is due to materials and supplies required to conduct sorption experiments which were ordered during the last two periods of FY91 but which were not received until FY92. Total cost of materials and supplies incurred in FY92 Periods 1 to 3 was \$16K, versus the planned cost of \$3K. The remaining portion can be attributed to labor costs due to the early initiation of sorption experiments. 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)	\$ 57,440
FY92 Funds Uncosted (c)	\$ 121,579
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)	\$ 45,807
FY92 Funds Uncosted (c)	\$ 71,958
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)	\$ 73,549
FY92 Funds Uncosted (c)	\$ 114,305
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)	\$ 45,940
FY92 Funds Uncosted (c)	\$ 150,475
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)	\$ 77,580
FY92 Funds Uncosted (c)	\$ 150,119
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)	\$ 31,213
FY92 Funds Uncosted (c)	\$ 61,381
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)	\$ 107,851
FY92 Funds Uncosted (c)	\$ 63,772
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)	\$ 80,800
FY92 Funds Uncosted (c)	\$ 65,204
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)	\$ 60,066
FY92 Funds Uncosted (c)	\$ 134,617
Recommended Adjustment to Complete (+/-)	\$ -0-
See the enclosed Element Status Cost Report	

Volcanic Systems

Table 9. Financial Status	
FY92 Funds Authorized (a)	\$ 167,231
FY92 Funds Costed to Date (b)	\$ 10,777
FY92 Funds Uncosted (c)	\$ 156,454
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

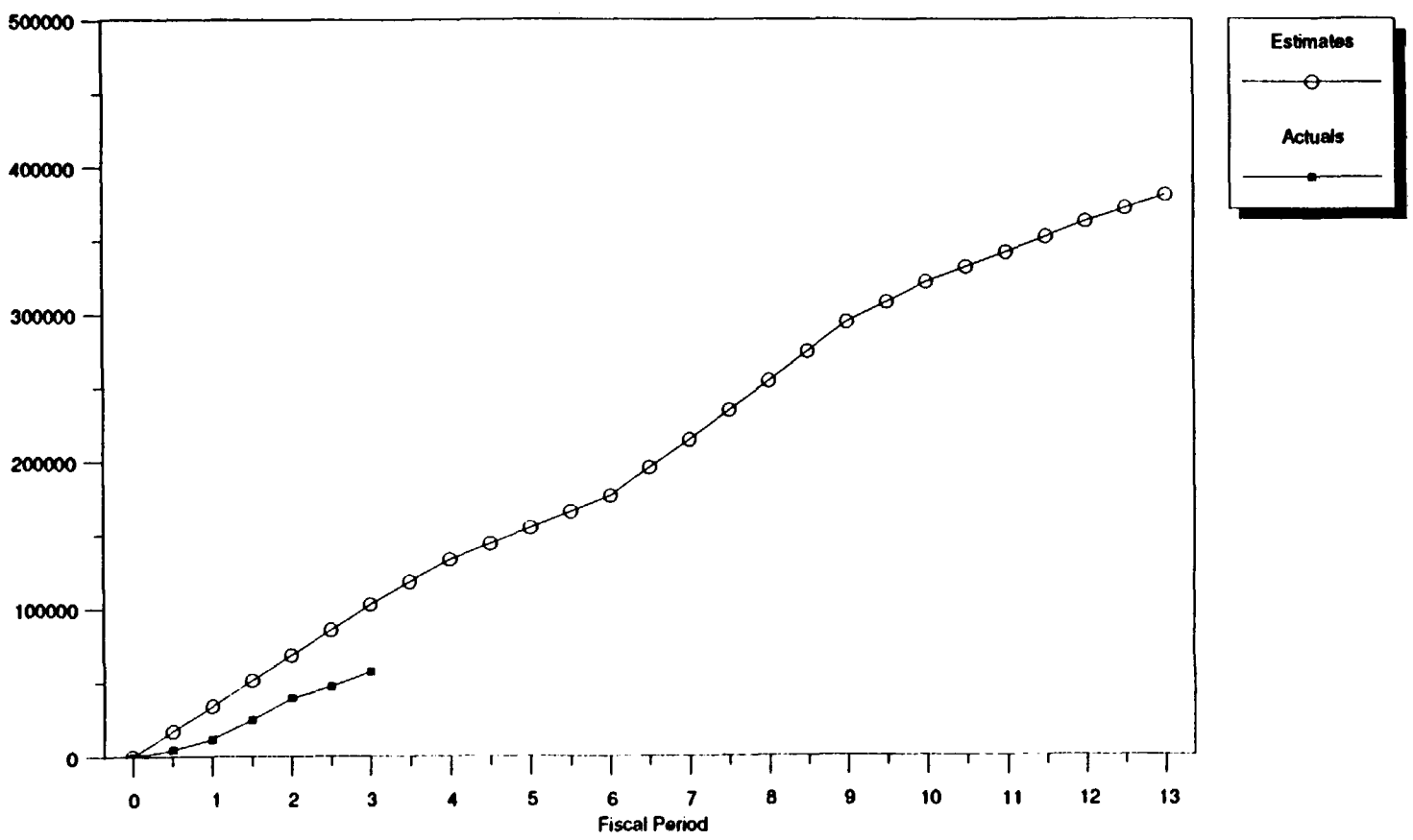
Element Status Cost Report

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	39809	40152	27096	20435	20955	17825	102719
] ACT. PERIOD COST]	11699	27833	17908	0	0	0	0	0	0	0	0	0	0	57440
] VARIANCE, \$]	22322	6413	16543	0	0	0	0	0	0	0	0	0	0	45279
] VARIANCE, %]	65.6	18.7	48.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.1
] EST. FY CUMUL]	34021	68267	102719	133145	154624	176425	214250	254059	294211	321307	341742	362697	380522	
] ACTUAL FY CUMUL]	11699	39532	57440	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.031	0.104	0.151	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	22322	28736	45279	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	65.6	42.1	44.1	0.0	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.

3704-000 Overall Research



3704-010

GEOCHEM

Element Status Cost Report

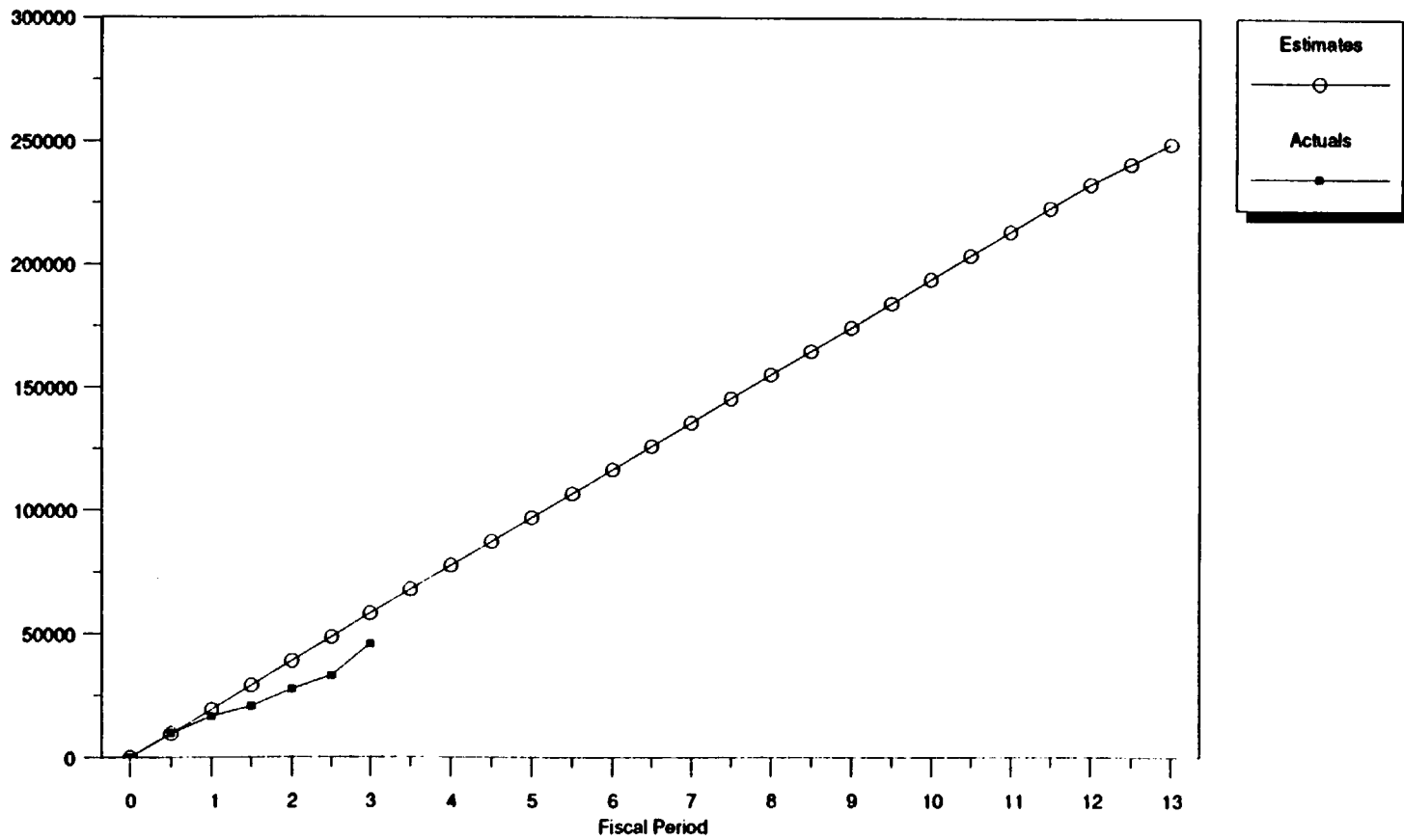
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST. PERIOD COST	19371	19573	19210	19528	19337	19431	19170	19551	19128	19697	19307	19481	18217	58154
ACT. PERIOD COST	16600	11054	18091	0	0	0	0	0	0	0	0	0	0	45807
VARIANCE, \$	2708	8519	1119	0	0	0	0	0	0	0	0	0	0	12346
VARIANCE, %	14.0	43.5	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2
EST. FY CUMUL	19371	38944	58154	77682	97019	116451	135620	155171	174299	193995	213303	232783	249000	
ACTUAL FY CUMUL	16663	27717	45807	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.067	0.111	0.184	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	2708	11227	12346	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	14.0	28.8	21.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-17

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

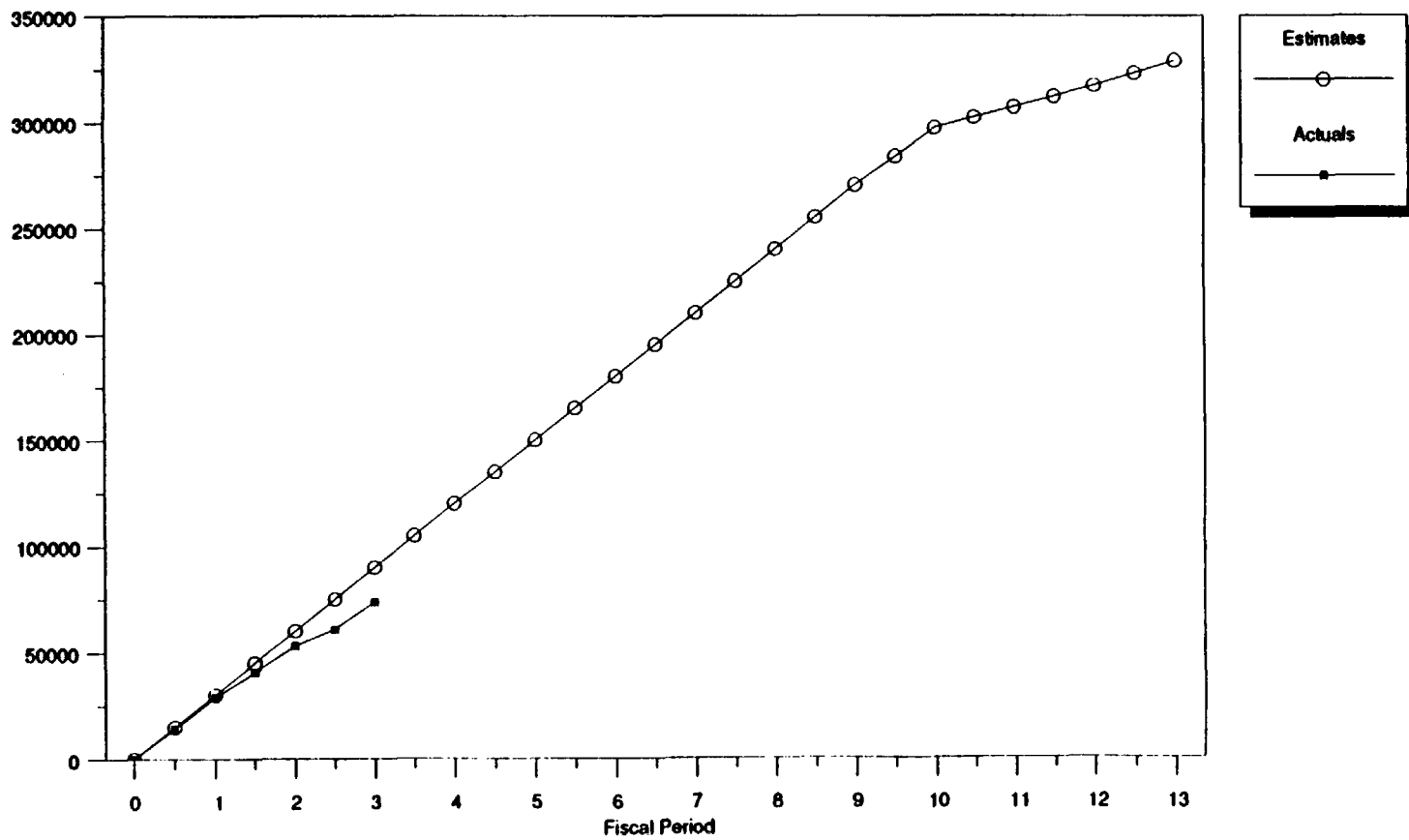
Element Status Cost Report

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	89900
] ACT. PERIOD COST]	28901	24125	20523	0	0	0	0	0	0	0	0	0	0	73549
] VARIANCE, \$]	1050	5921	9380	0	0	0	0	0	0	0	0	0	0	16351
] VARIANCE, %]	3.5	19.7	31.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.2
] EST. FY CUMUL]	29952	59998	89900	119999	149901	179971	209848	240097	270192	297200	307045	317094	328845	
] ACTUAL FY CUMUL]	28901	53026	73549	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.088	0.161	0.224	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	1050	6971	16351	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	3.5	11.6	18.2	0.0	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

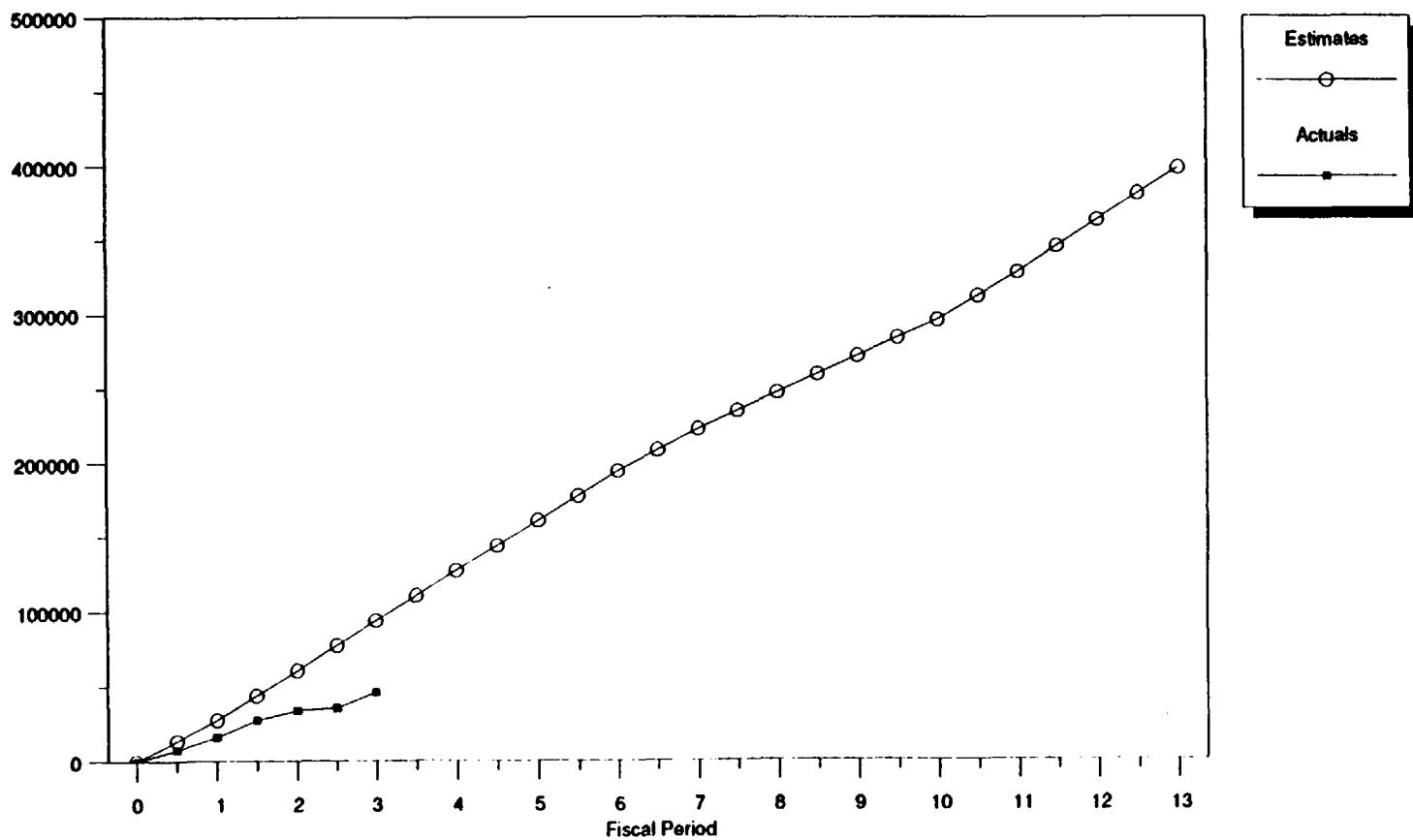
ITFM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	27307	33147	33511	33604	33511	33394	28314	24471	24663	23881	32220	35566	35033	93964
ACT. PERIOD COST	16132	17630	12178	0	0	0	0	0	0	0	0	0	0	45940
VARIANCE, \$	11175	15516	21333	0	0	0	0	0	0	0	0	0	0	48024
VARIANCE, %	40.9	46.8	63.7	0.0	0.0	0.0	0.0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

9-21

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

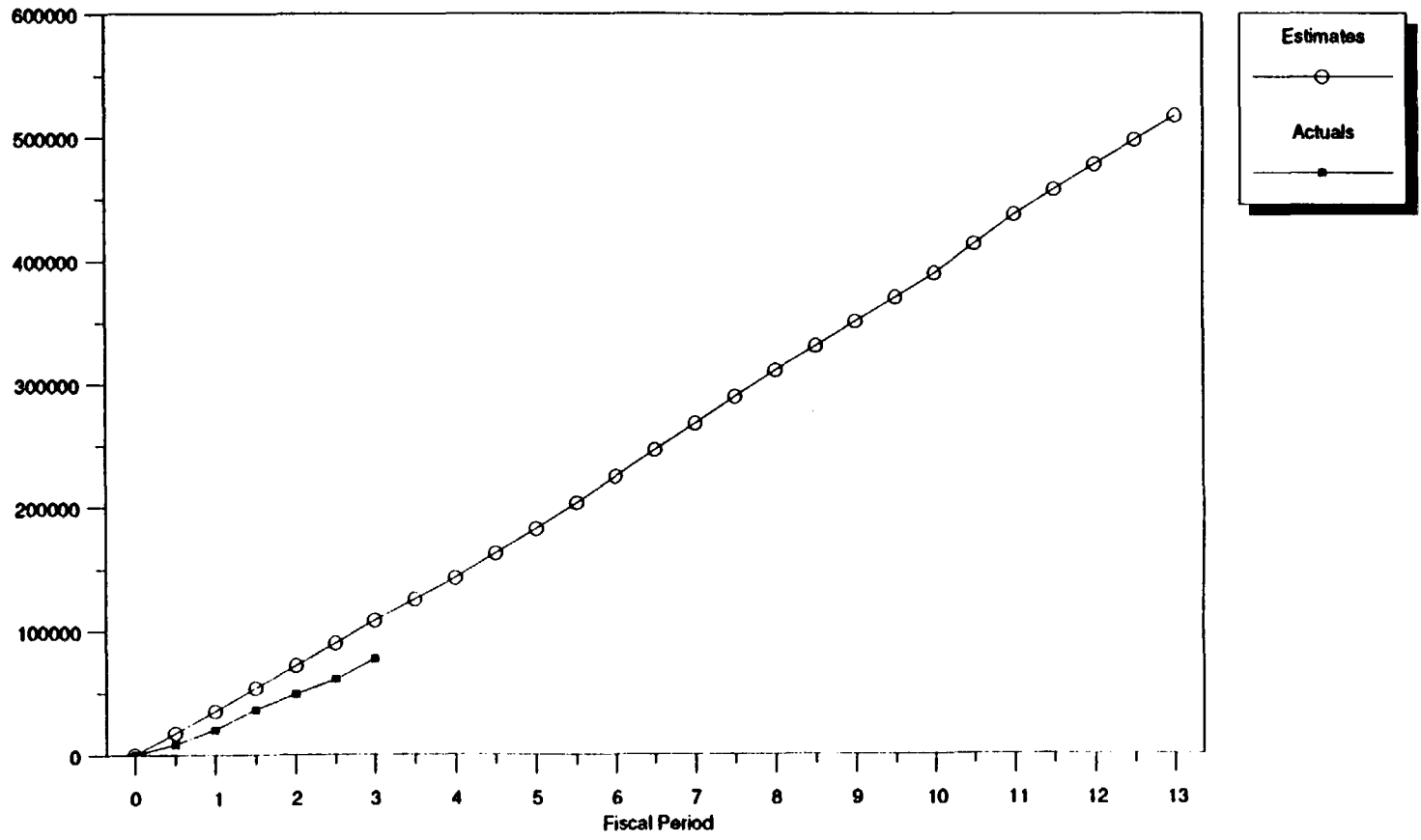
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST. PERIOD COST]	35482	36645	36200	34268	39798	42349	43112	42892	39620	39115	47996	40443	39296	108327
] ACT. PERIOD COST]	20416	28590	28574	0	0	0	0	0	0	0	0	0	0	77580
] VARIANCE, \$]	15066	8055	7626	0	0	0	0	0	0	0	0	0	0	30747
] VARIANCE, %]	42.5	22.0	21.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.4
] EST. FY CUMUL]	35482	72127	108327	142595	182393	224742	267853	310746	350365	389481	437477	477920	517215	
] ACTUAL FY CUMUL]	20416	49006	77580	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.039	0.095	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	15066	23121	30747	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	42.5	32.1	28.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-23

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

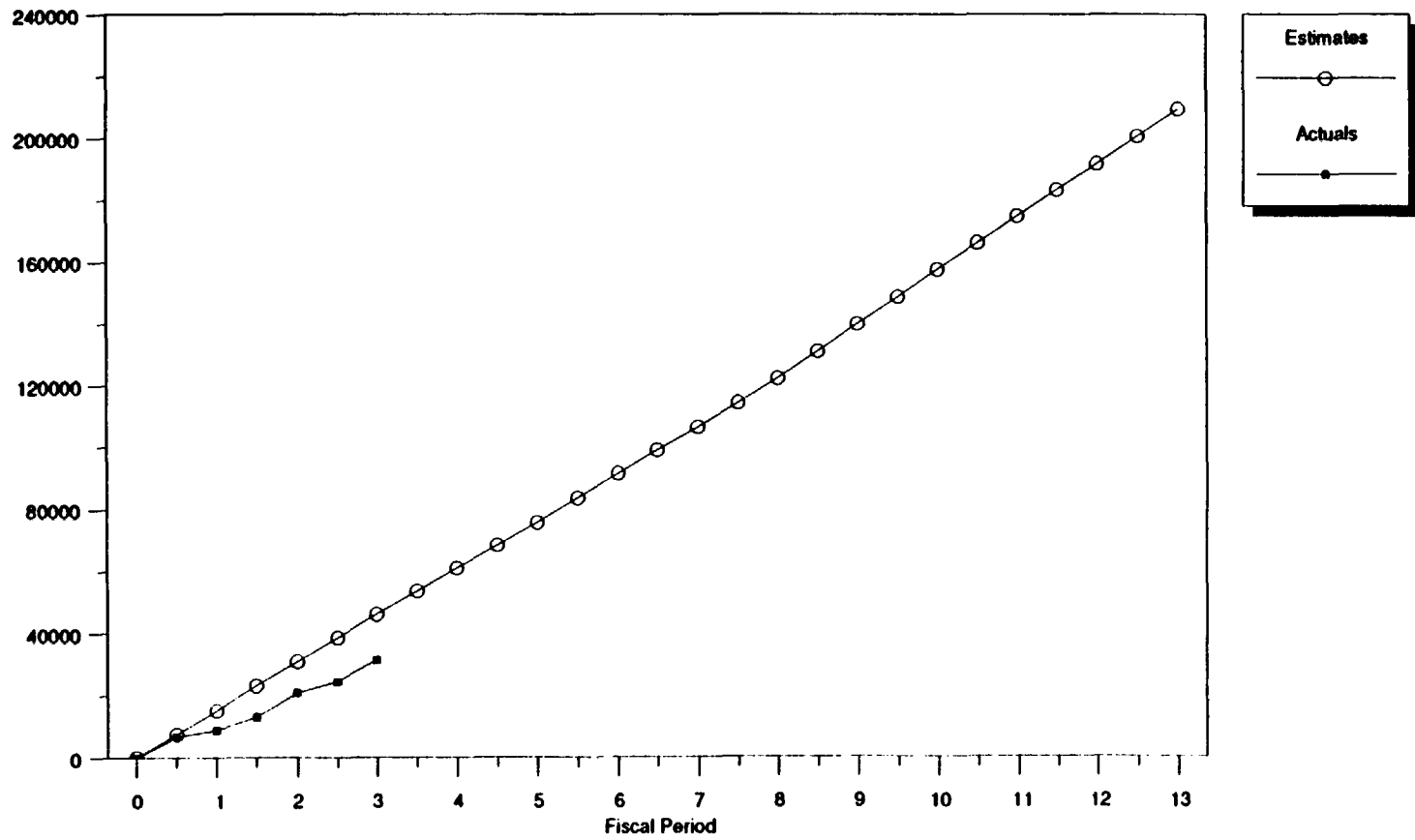
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	15050	15901	15018	14945	14763	15888	14988	15672	17473	17643	17380	16949	17891	45970
ACT. PERIOD COST	8807	12028	10381	0	0	0	0	0	0	0	0	0	0	31213
VARIANCE, \$	6244	3878	4638	0	0	0	0	0	0	0	0	0	0	14757
VARIANCE, %	41.5	24.4	30.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.1
EST. FY CUMUL	15050	30951	45970	60914	75677	91566	106554	122226	139698	157342	174722	191671	209362	
ACTUAL FY CUMUL	8807	20832	31213	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.042	0.100	0.149	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	6244	10119	14757	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	41.5	32.7	32.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-25

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

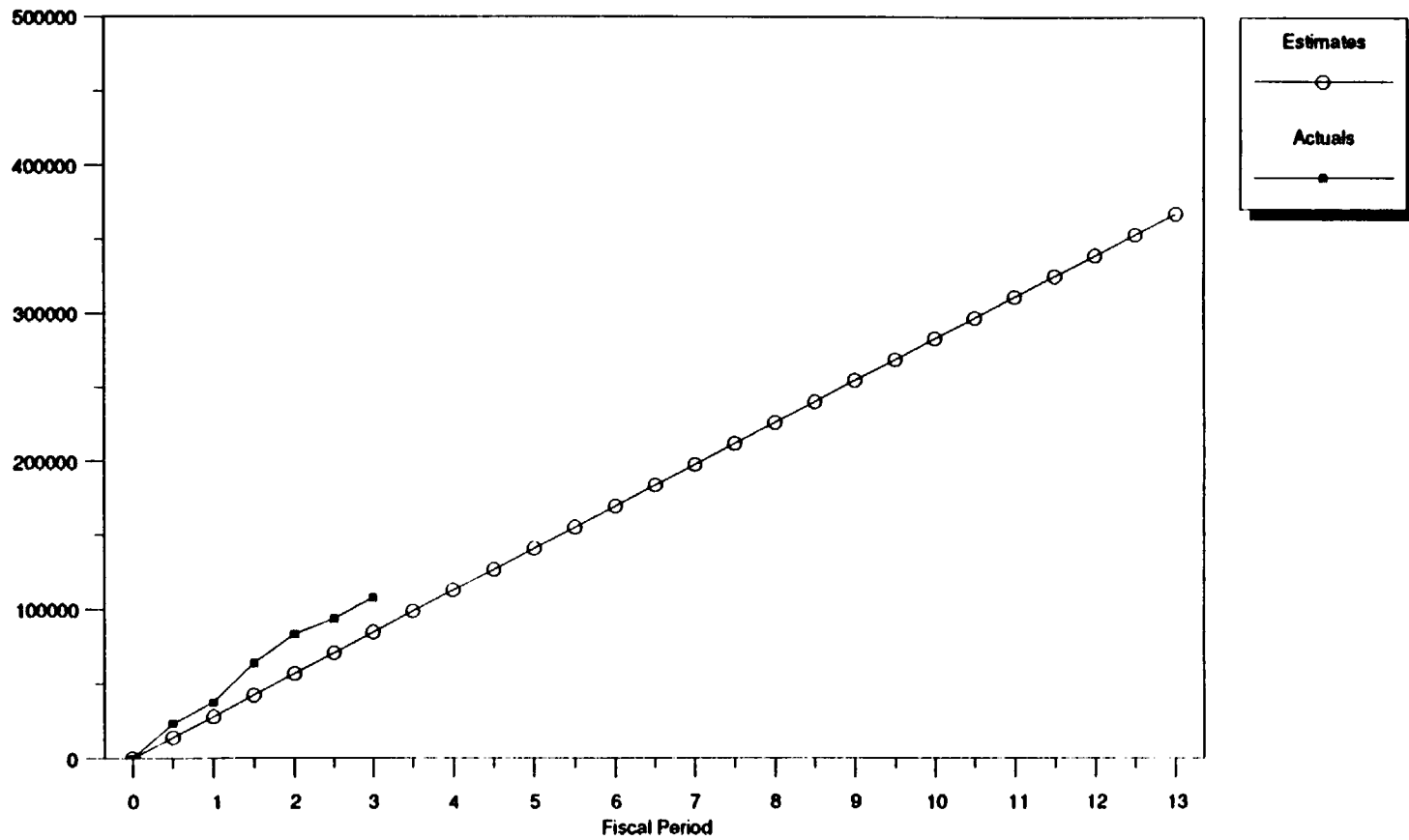
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST. PERIOD COST]	28006	28663	27970	28272	28319	28466	28091	28292	28443	28194	28165	28382	28197	84638
] ACT. PERIOD COST]	37625	45591	24536	0	0	0	0	0	0	0	0	0	0	107851
] VARIANCE, \$]	-9619	-17027	3433	0	0	0	0	0	0	0	0	0	0	-23213
] VARIANCE, %]	-34.3	-59.4	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-27.4
] EST. FY CUMUL]	28006	56669	84638	112911	141230	169695	197787	226079	254522	282717	310882	339264	367460	
] ACTUAL FY CUMUL]	37625	83315	107851	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.102	0.227	0.294	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	-9619	-26646	-23213	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	-34.3	-47.0	-27.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-27

NOTES:

1. 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

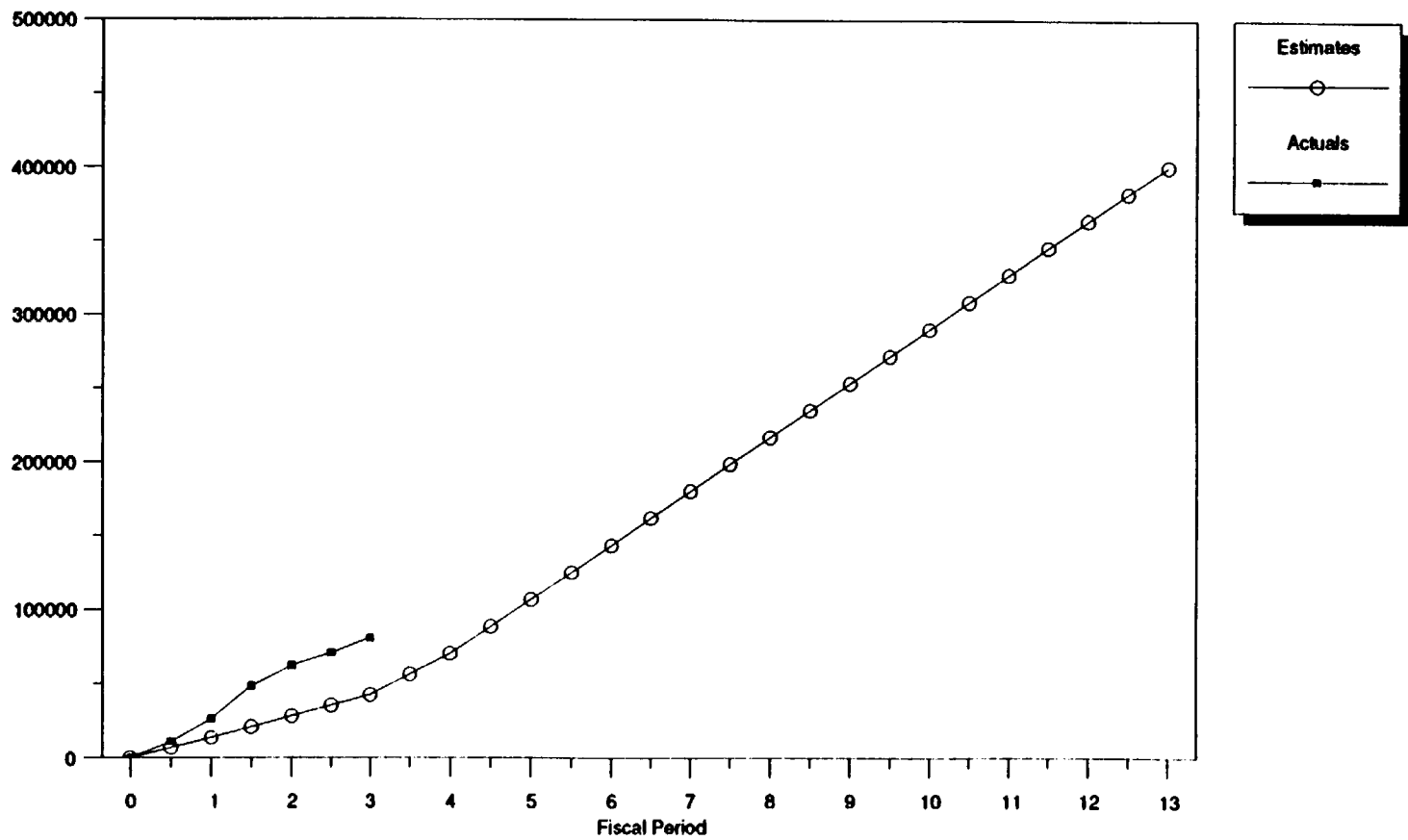
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST. PERIOD COST	13733	14421	14264	27808	36734	36503	37029	36544	36664	36649	36955	36810	36576	42418
ACT. PERIOD COST	26210	36022	18568	0	0	0	0	0	0	0	0	0	0	80800
VARIANCE, \$	-12477	-21600	-4304	0	0	0	0	0	0	0	0	0	0	-38382
VARIANCE, %	-90.9	-149.8	-30.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-90.5
EST. FY CUMUL	13733	28154	42418	70226	106960	143463	180492	217037	253701	290350	327305	364115	400691	
ACTUAL FY CUMUL	26210	62232	80800	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.065	0.155	0.202	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	-12477	-34078	-38382	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	-90.9	-121.0	-90.5	0.0	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

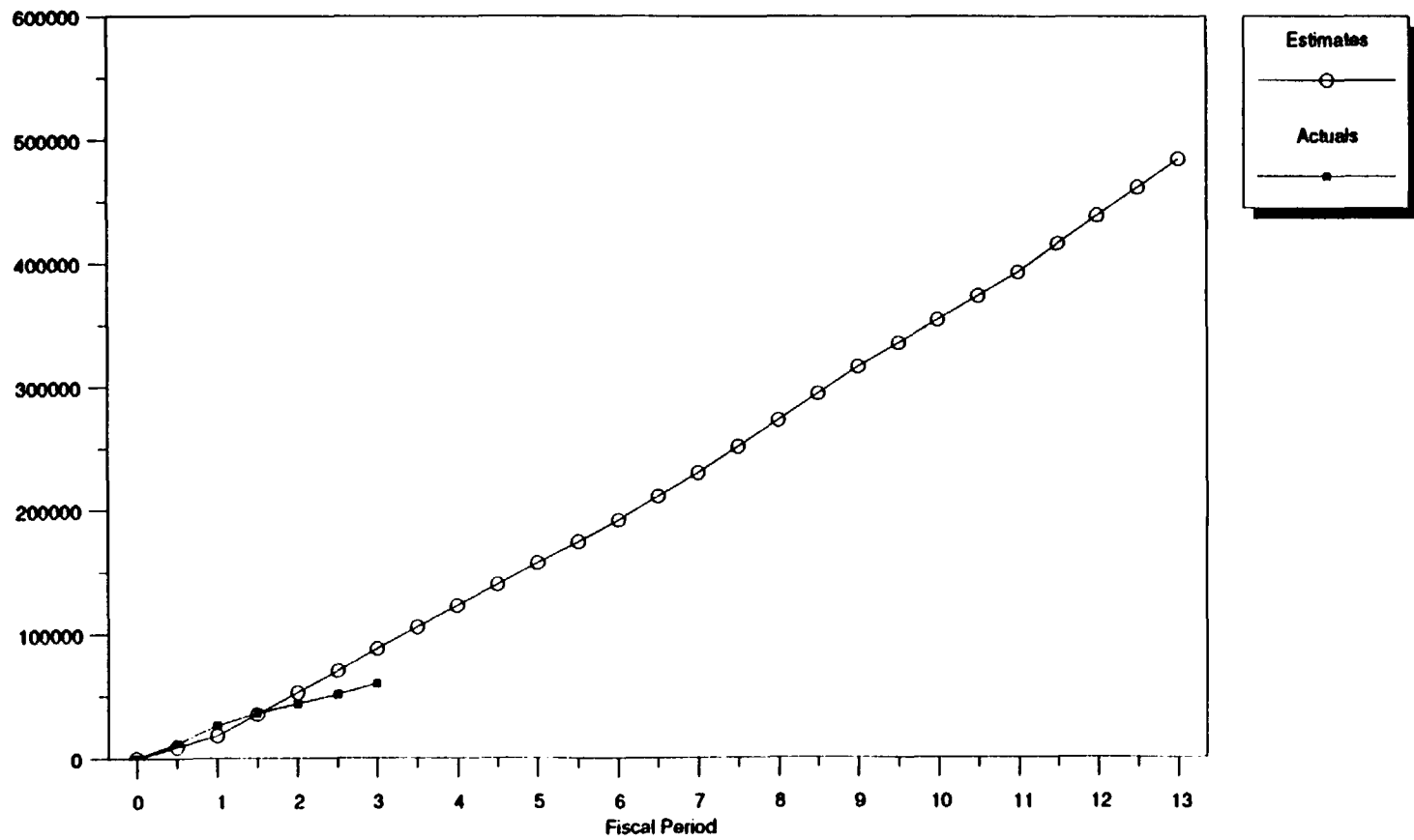
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	18156	34687	35224	34706	34668	34644	37885	43757	42330	38192	38410	46220	45745	88066
ACT. PERIOD COST	26550	17249	16267	0	0	0	0	0	0	0	0	0	0	60066
VARIANCE, \$	-8395	17438	18957	0	0	0	0	0	0	0	0	0	0	28000
VARIANCE, %	-46.2	50.3	53.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8
EST. FY CUMUL	18156	52842	88066	122772	157439	192083	229969	273725	316055	354247	392657	438877	484622	
ACTUAL FY CUMUL	26550	43799	60066	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.055	0.090	0.124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	-8395	9043	28000	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	-46.2	17.1	31.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-31

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

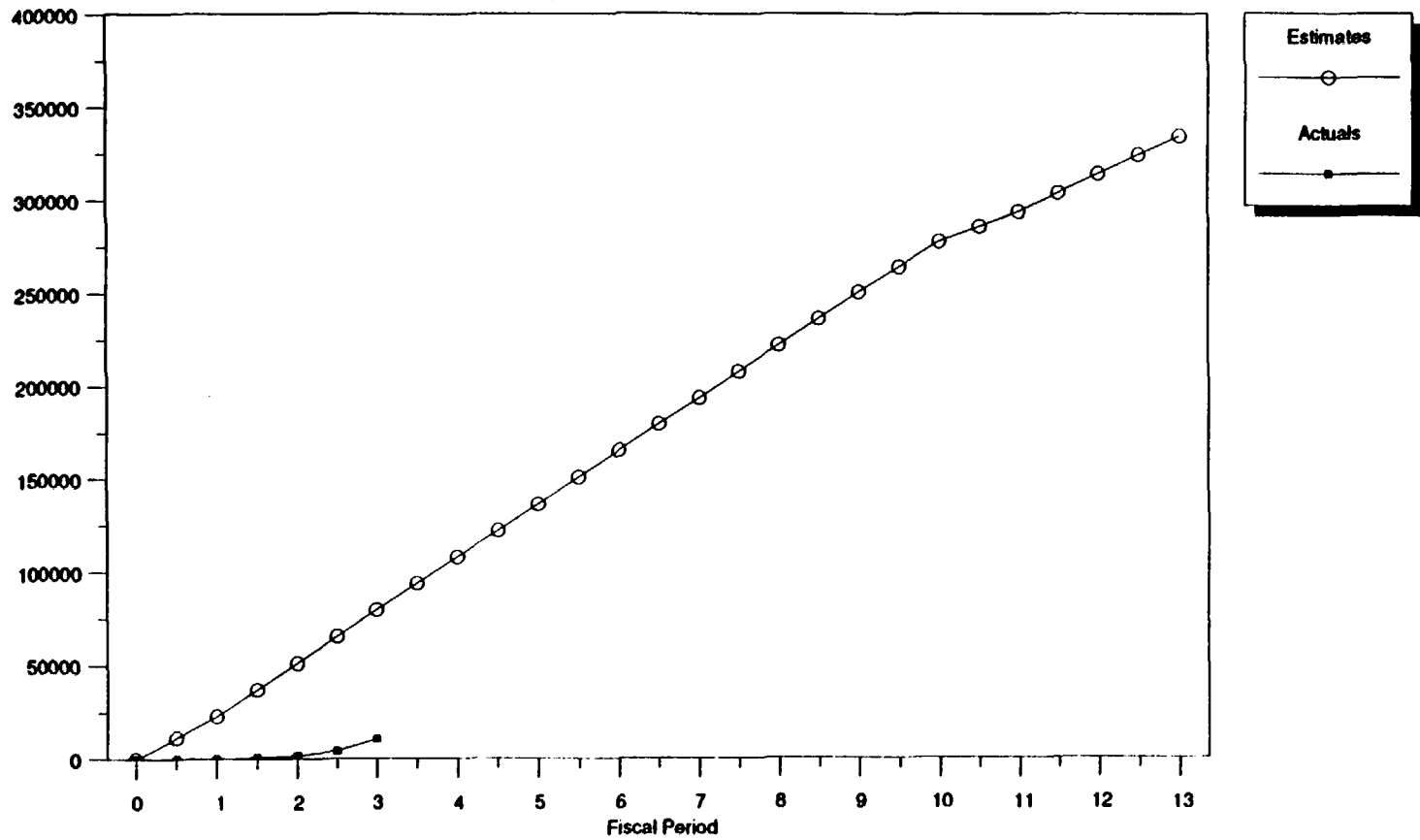
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
] EST. PERIOD COST]	22811	28258	28693	28346	28361	28828	28223	28346	28439	27202	16163	20513	20286	79760
] ACT. PERIOD COST]	0	1750	9026	0	0	0	0	0	0	0	0	0	0	10777
] VARIANCE, \$]	22811	26508	19667	0	0	0	0	0	0	0	0	0	0	68983
] VARIANCE, %]	100.0	93.8	88.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86.5
] EST. FY CUMUL]	22811	51067	79760	108105	136466	165295	193518	221864	250303	277506	293668	314181	334468	
] ACTUAL FY CUMUL]	0	1750	10777	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.000	0.005	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	22811	49316	68983	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	100.0	96.6	86.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

9-33

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

Following the presentation to the NRC staff on the recommendations in the Center's report on "Alternative Ways of Making Packaged Documentary Materials Accessible Within the Licensing Support System," the Center is discussing specific direction with the LSSA for follow-on presentations to the DOE and LSSARP. The LSSA staff is reviewing the overall outline the Center provided for access protocols. Meanwhile, the Center has been directed to work on descriptions of the attributes for the following three broad categories of documents: (1) machine-dependent, non-scannable documentary materials such as tapes and large maps, (2) stand-alone handwritten/graphics documentary materials that require a header, and (3) the Table of Contents (TOC) for a package and the items typically in a TOC. The attributes for each type of documentary material will be developed by soliciting input from the appropriate Center technical staff.

The LSSA office is working on a revised schedule for the work in Task 1 and will be discussing it with the Center during the next period.

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 "Preliminary Report on the Feasibility of Priority Loading of the Licensing Support System (LSS)" was rescheduled for delivery on December 18, 1991. It was decided with Ms. Betsy Shelburne that rather than simply referencing and summarizing specific related information, such as the HLW schedule and assumptions, they would be included, even though the size of the report is increased significantly. The report was completed and submitted on schedule and the Center awaits the results of the LSSA review and comments.

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 describe the attributes for the document categories. The outline for the access protocols will be discussed further with the LSSA staff. Planning for revising the schedule and establishing dates for the access protocols report and the DOE and LSSARP presentations will be done.

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 will discuss the review and comments by the LSSA staff on the "Preliminary Report for the Feasibility of Priority Loading of the LSS" with the LSSA and plan appropriate actions.

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 \$1,050. 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)	\$ 104,118
FY92 Funds Uncosted (c)	\$ 140,146
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

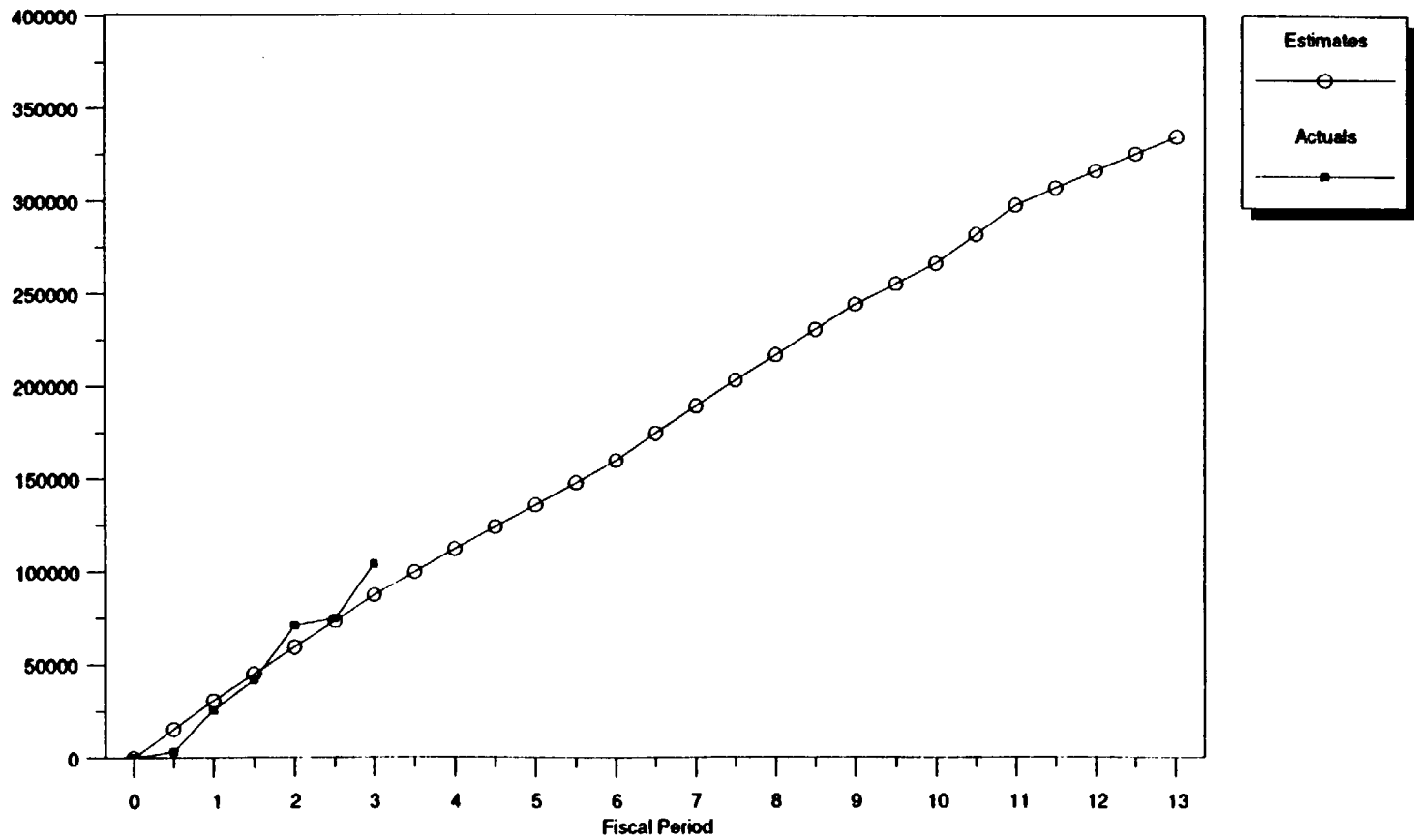
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
EST PERIOD COST	30505	28857	27884	24881	23771	23936	29512	27588	27491	21997	31599	18520	18533	87247
ACT. PERIOD COST	25660	45325	33134	0	0	0	0	0	0	0	0	0	0	104118
VARIANCE, \$	4846	-16468	-5250	0	0	0	0	0	0	0	0	0	0	-16872
VARIANCE, %	15.9	-57.1	-18.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-19.3
EST. FY CUMUL	30505	59362	87247	112128	135898	159834	189347	216935	244425	266423	298022	316542	335075	
ACTUAL FY CUMUL	25660	70984	104118	0	0	0	0	0	0	0	0	0	0	
PERCENT COMPLETE	0.077	0.212	0.311	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
VARIANCE, \$	4846	-11622	-16872	0	0	0	0	0	0	0	0	0	0	
VARIANCE, %	15.9	-19.6	-19.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

10-3

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

The Program Element Operations Plan on Waste Solidification Systems for FY92-93 was approved with minor modifications by the NRC on November 15, 1991. There are five tasks as part of the WSS Operations Plan.

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. The changes will be reviewed in the next 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) was prepared and submitted to the NRC on November 26, 1991.

As noted in the previous reports, Safety Evaluation Reports (SERs) have been written with respect to the Supernatant Treatment System (STS) and the Liquid Waste Treatment System (LWTS), which are discussed in Volumes III and IV of the DOE's Safety Analysis Report, respectively. The Safety Analysis Report Volume III concerning the Supernatant Treatment System has been significantly revised since the time of issue of NRC's SER on the STS to incorporate comments submitted by DOE's Technical Review Group for Safety Analysis Reports and expanded to include aspects of the Sludge Mobilization Wash System (SMWS). The SER prepared by the Center concludes that the modifications and the SMWS operations as presented in the SAR provide adequate protection for the public radiological health and safety. The issues evaluated include the site boundary doses from gaseous effluents from the sludge and from abnormal and accident conditions, the solubility and levels of plutonium and strontium in the wash solution, the potential for corrosion of Tank 8D-2, the installation of sludge mobilization pumps, and the use of titanium-coated zeolite to remove plutonium.

A preliminary review of the contents of the STS SER was conducted by T. Clark and G. Comfort of the NRC, and P. Nair (Center) on December 12, 1991. In the review, the format and the approach to the SER were discussed. Plans were made for issuing the SER

after minor modifications by the NRC staff. The activities under this task are now completed and the task will be closed out early next period.

Task 3 - Seismic Analysis of the Vitrification Facility

No reportable activity this period. Activities in this task will resume after the completion of Task 2 SER work.

Task 4 - High-Level Waste Tank Storage

No activity this period.

Task 5 - Environmental Issues

No planned activity this reporting period.

11.2 Major Problems

None.

11.3 Forecast for Next Period

Close out Task 2. Initiate activities in Task 1 and develop schedules 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. 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 underexpenditures with respect to the plan.

Table 1. Financial Status	
FY92 Funds Authorized (a)	\$ 206,654
FY92 Funds Costed to Date (b)	\$ 56,594
FY92 Funds Uncosted (c)	\$ 150,060
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	19517	14375	14689	15687	15242	11049	16739	16265	7074	6316	4430	83788
] ACT. PERIOD COST]	24188	26350	6056	0	0	0	0	0	0	0	0	0	0	56594
] VARIANCE, \$]	23220	-9487	13461	0	0	0	0	0	0	0	0	0	0	27195
] VARIANCE, %]	49.0	-56.3	69.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5
] EST. FY CUMUL]	47409	64271	83788	98163	112852	128539	143781	154830	171569	187834	194908	201224	205654	
] ACTUAL FY CUMUL]	24188	50538	56594	0	0	0	0	0	0	0	0	0	0	
] PERCENT COMPLETE]	0.118	0.246	0.275	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
] VARIANCE, \$]	23220	13733	27195	0	0	0	0	0	0	0	0	0	0	
] VARIANCE, %]	49.0	21.4	32.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

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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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