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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
October 28, 1989 - November 24, 1989
PMPR No. 90-02

December 8, 1989

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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: 10/28/89 - 11/24/89

1. SUMMARY

1.1 Technical Status

NMSS Element 1 - CNWRA Operations

Revisions of the Division of High Level Waste Operations Plans and Overall Research Project Plan continued in response to comments received during the preceding period and discussions regarding the requested changes. Revisions to these Plans will be completed during Period 3 (Section 2).

An informative meeting with the Center's Advisory Board in conjunction with a site tour of Yucca Mountain conducted by Mr. P. Presholt was held November 20 and 21, 1989.

The current status of Center staffing is indicated in the attached tables which reflect changes that are being made to the Staffing Plan in accordance with the Operations Plans. A third geochemist was added to the staff this period.

Revision of the CNWRA Staffing Plan neared completion at the end of this Period.

Quality Assurance activities focused on three areas: (a) changes and comment resolution on the Operations Plans, (b) implementation of the key PA development guidance documents TOP-001-02 and TOP-001-03, and (c) review of several technical products within the Elements (see accomplishments of those Elements).

NMSS Element 2 - Waste Systems Engineering and Integration

Documentation on the Regulatory Requirements dealing with "Adverse Condition--Erosion" and "Substantially Complete Containment" was completed and transmitted to the NRC in support of Program Architecture baselining (Section 3). Center staff participated in a kick-off meeting at White Flint on the review of TOP-001-02, which is also part of the baselining activity.

Identification of Regulatory and Institutional Uncertainties in the remainder of 10 CFR Part 60 continued at an accelerated pace. An outline for the deliverable "Identification and Evaluation of Regulatory and Institutional Uncertainties in 10 CFR Part 60" was provided to and discussed with the NRC.

The 1989 version of 10 CFR Part 60 continued to be loaded into the PASS database. Preparation of the requirements document for Version 2.0 of PASS continued.

The procedure for Task Control and Project Management (AP-009) was completed and distributed to staff. Key interface points were established between the CNWRA Operations Plans and NRC Division Operating Plan.

Support activities related to the Technical Positions on Thermal Load and Retrievability, as well as the Regulatory Requirements concerning "Substantially Complete Containment" and "Adverse Condition--Geochemical Processes", continued.

NMSS Element 3 - External Quality Assurance

Staff worked on input to the report on the Los Alamos National Laboratory Observation Audit (Section 4).

NMSS Element 4 - Geologic Setting

Staff and consultants participated in the October 31-November 2, 1989, DOE-NRC Technical Exchange Meeting on Tectonic Models (Section 5).

Geologic Setting Element activities included work on Steps 1, 3, 4, and 7 of the Natural Resources technical position. The schedule for milestones and deliverables was revised in accordance with the Operations Plans and staff availability.

Background information for technical positions pertaining to radionuclide sorption was obtained through participation in the Migration '89 meeting. Pertinent information on a hydrologic methods technical position and the ground water travel time rulemaking was obtained by participation in the INTRAVAL meeting.

NMSS Element 5 - Engineered Barrier Systems

EBS Element staff participated in the West Valley Vittrification Qualification Run SF-12 Information/Demonstration Meeting, October 31 - November 1, 1989 (Section 6). A trip report has been prepared.

Activities related to the potential rulemaking on "Substantially Complete Containment" continued. A draft of the "Elements of Proof" report was completed and is undergoing internal CNWRA review. A. Journal (Stanford), L. Abramson (NRC), and J. Wu met at the Center to discuss progress and approaches being used in preparation of the "Uncertainty Evaluation Methodology" report.

Acquisition, tailoring, and installation of thermal analysis and ancillary codes (including TOPAZ3D, INGRID, FACET, and TAURUS) continued.

NMSS Element 6 - Special Projects

Development of background information relevant to the License Application Review Strategy (LARS) and the Environmental Impact Review Strategy (EIRS) continued (Chapter 7). An analysis of interfaces between environmental statutes and the EIS review was begun, and the NRC role in EIS review is being summarized.

NMSS Element 7 - Repository Design, Construction, and Operations

RDCO Element staff participated in a visit to the Yucca Mt. site and surrounding areas, including the G-Tunnel testing complex (Section 8).

Planning was conducted for the technical position on waste retrievability. Extensive support was provided to conduct related regulatory analysis (Program Architecture) activities under the WSE&I Element.

NMSS Element 8 - Performance Assessment

Work continued on the performance assessment review strategy (PARS) tasks. Letter reports on the statutory and regulatory bases for performance assessment, and options for conducting performance assessment review were completed (Chapter 9).

The quarterly review of FIN All65 and pertinent briefings on performance assessment were attended. Reviews of SNL documents were begun.

Three versions of the TOUGH transport code were acquired and installed on the VAX-7800 at SwRI.

NMSS Element 9 - Transportation Risk Study

Additional databases on low-level radioactive wastes and spent

commercial nuclear fuel shipments were identified and incorporated into the computer database (Section 10).

"Bugs" that were identified in running the NUREG-0170 data file through RADTRAN III were corrected.

Responses to NRC comments on Chapter 2 of the TRS are being prepared. Problems identified in an initial analysis of scenarios for normal transportation have been corrected, as noted above.

Research Project 1 - Overall Research

Revisions to the Overall Research Plan for Fiscal Years 1990 and 1991, were prepared, based on comments received on the draft Plan, for a planned submission to the NRC on December 4, 1989.

Presentations of the results of each research project were given for Dr. W. Ott and Dr. L. Shao of the NRC staff on November 16. The also visited the research facilities that are being used in the conduct of these projects.

Research Project 2 - Geochemistry

The annual milestone report for the experimental task titled "Progress in experimental studies on the thermodynamic and ion exchange properties of clinoptilolite" was completed. It summarizes the theoretical background for the experimental studies, the data generated in sample characterization, and procedures for experimental work.

Staff attended the Second International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere (Monterey, Calif., November, 6-10, 1989) where W. Murphy gave a presentation titled "Kinetic calculations of nonisothermal gas-water-rock interactions in hydrologically unsaturated tuff." A trip report for this meeting was prepared.

Research Project 3 - Thermohydrology

The Task 2 preliminary report of the work performed to date on the Separate Effects Experiments was completed and submitted to NRC.

Staff attended the INTRAVAL meeting held November, 14-16, 1989, at Lawrence Berkeley Laboratory (LBL) where R. Ababou made a presentation on a stochastic simulation of unsaturated flow from a strip source, as applied to the Las Cruces trench study.

Research Project 4 - Seismic Rock Mechanics

A technical report for the completed qualification study of the two-dimensional distinct element code UDEC against closed-form solutions is under preparation for submission to NRC during the next reporting period. Qualification study of the two-dimensional finite element code HONDO continued during this period.

A proposal is being prepared to conduct instrumented field studies at the Lucky Friday Mine for (a) dynamic effects on underground openings, and (b) seismic effects on the groundwater.

Effort for acquisition of jointed welded tuff specimens from the Apache Leap Site, Arizona continued during this reporting period.

The seismic rock mechanics experimental apparatus and instrumentation techniques continued to be tested for various ranges of vertical and horizontal loads using concrete blocks as test specimens.

Research Project 5 - Integrated Waste Package Experiments

Electrochemical testing continued to study the limitations of the test methods currently under use by the research community. A preliminary draft summary of the key technical comments by the Peer Reviewers of the IWPE Project Plan was completed.

1.2 Major Problems

Resolution of the problem relative to the large volume of the PMPR and the effort committed to its preparation continues to elude the NRC Program Management and the Center. A deliberate effort will be made by all concerned parties to bring this matter to a successful resolution during Period 3.

1.3 Forecast for Next Period

Revisions of the Division of High Level Waste Operations Plans and the Overall Research Project Plan will be completed during the next period. The Center Staffing Plan will be revised and issued next period and preparation of the Center ADP and Management Plans will be undertaken. Staffing will continue to be a high priority activity. Recruitment efforts will be conducted by Center staff and management at the ANS and AGU meetings in San Francisco. Implementation of Revision 1 of the Center Quality Assurance Manual will continue and Revision 2 is under development. Emphasis will continue on the oversight of the Program Architecture development and review, and preliminary research project activities.

Development of the Program Architecture and PASS will continue with a focus on the deliverable concerning the Regulatory and Institutional Uncertainties in 10 CFR Part 60. Interactions with the NRC concerning "baselining" the Program Architecture will continue. Primary training of Center and support staff in the new procedures will continue. The requirements document for Version 2.0 of PASS will be completed and submitted.

Center and SwRI quality assurance professionals will complete work on inputs to the report on the Audit Observation of Los Alamos National Laboratory. The Center QA Director will attend the NRC/DOE QA bi-monthly meeting at White Flint and the NRC QA meeting on DOE contractor QA programs next period.

The Geologic Setting Element activities will focus on technical assistance on the Natural Resources Technical Position, and preparation of plans for the commencement of work on various other TPs. Staff will support the DOE/NRC Technical Exchange Meeting on Tectonics. Acquisition and equipping of facilities in which to perform GS technical work will continue next period.

The EBS Element will conduct technical assistance work related to the Regulatory Requirement "Substantially Complete Containment." Draft reports on both the Elements of Proof and the Uncertainty Evaluation Methodology should be completed. Activities will continue regarding EBS performance assessment. A staff member will attend the XIII Annual Symposium on the Scientific Basis for Nuclear Waste Management.

Activities in the SP Element will focus on the LARS and EIRS.

Activities within the RDCO Element will be related primarily to technical positions on retrievability and thermal loads.

Work on the Performance Assessment Review Strategy, including response to comments on two letter reports, will continue in accordance with the Operations Plan. Review of SNL documents and preparation of work plans for Task 2 and Task 5 activities will continue.

The Transportation Risk Study staff will continue the RADTRAN analyses and sensitivity analyses. Responses to comments on Chapters 2 and 3 of the TRS will be completed.

Work will continue in the Geochemistry, Thermohydrologics, Seismic Rock Mechanics, and Integrated Waste Package Experiments Projects in accordance with approved plans. Work will commence on approved portions of the Stochastic Modeling and Geochemical Natural Analogs Projects. Preliminary revisions to the IWPE Project Plan will be prepared and discussed with the NRC.

1.4 Summary Financial Status

Table 1, below, indicates the financial status of the overall Center program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$51,010. Similar data are presented for each Element/Project in the respective sections of this periodic report. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 844,470
b) FY90 Funds Allocated	\$2,108,000
c) Total FY90 Funds Available	\$2,952,470
Funds Costed to Date	\$ 996,986
Funds Uncosted	\$1,955,484
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

CENTER CORE STAFF -- HIRING PROFILE

EXPERTISE/EXPERIENCE	FY 88	FY 89	FY 90				FY 91	FY 92	TOTAL REQUIRED	CURRENTLY OPEN (1ST QTR)
			1Q	2Q	3Q	4Q				
ADMINISTRATION	5	5	5	5	5	5	5	5	5	0
DATA BASE MANAGEMENT AND DATA PROCESSING	1	2	2	2	2	2	2	2	2	0
ELECTROCHEMISTRY			1	1	1	1	1	1	1	0
ENGINEERING GEOLOGY/GEOLOGICAL ENGINEERING (b)				1	1	1	1	1	1	0
GEOCHEMISTRY (b) (a)	2	2	3	5	5	5	5	5	5	0
GEOHYDROLOGY (b) (a)		2	2	4	4	4	4	4	4	0
GEOLOGY	1	1	2	2	2	2	2	2	2	0
GEOMORPHOLOGY (b) (a)				1	1	1	1	1	1	0
GEOSTATISTICS (b) (a)				1	1	1	1	1	1	0
HEALTH PHYSICS	1	1	1	1	1	1	1	1	1	0
INFORMATION MANAGEMENT SYSTEMS	2	2	2	2	2	2	2	2	2	0
MATERIAL SCIENCES	2	2	3	3	3	3	3	3	3	0
MECHANICAL, INCLUDING DESIGN & FABRICATION			1	1	1	1	1	1	1	0
METEOR/CLIMATOLOGY (b) (a)				1	1	1	1	1	1	0
MINING ENGINEERING	1	1	1	1	1	1	1	1	1	0
NUMERICAL MODELING (b)			1	1	1	1	1	1	1	1
PERFORMANCE ASSESSMENT (b) (a)		1	2	3	3	4	4	4	4	1
QUALITY ASSURANCE	1	2	2	2	2	2	2	2	2	0
RADIOCHEMISTRY (b)				1	1	1	1	1	1	0
REGULATORY AND POLICY ANALYSIS (f) (d)	2	3	3	3	3	3	3	3	3	1
RELIABILITY	1	1	1	1	1	1	1	1	1	0
ROCK MECHANICS (b) (d)		1	2	3	3	3	3	3	3	1
STRUCTURAL GEOLOGY (b) (a) (d)				1	1	1	1	1	1	0
SYSTEMS ENGINEERING (b)	1	1	1	2	2	2	2	2	2	0
TRANSPORTATION	1	1	1	1	1	1	1	1	1	0
VOLCANOLOGY/IGNEOUS GEOLOGY (b) (a)				1	1	1	1	1	1	0
TOTAL REQUIRED	21	28	36	50	50	51	51	51	51	4

Notes:

- (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	32	8	40
Planned This Date	33	8	41
Planned End of FY90	51	9	60

CENTER CORE STAFF -- CURRENT PROFILE (11/24/89)

EXPERTISE/EXPERIENCE	
ADMINISTRATION	J. Latz, R. Adler, H. Garcia, W. Patrick, A. Whiting
DATA BASE MANAGEMENT AND DATA PROCESSING	S. McFaddin, M. Pape
ELECTROCHEMISTRY	N. Sridhar
ENGINEERING GEOLOGY/GEOLOGICAL ENGINEERING	
GEOCHEMISTRY	W. Murphy, R. Pabalan, E. Percy
GEOHYDROLOGY	R. Ababou, R. Green
GEOLOGY	J. Russell, M. Miklas
GEOMORPHOLOGY	
GEOSTATISTICS	
HEALTH PHYSICS	J. Hageman
INFORMATION MANAGEMENT SYSTEMS	R. Johnson, R. Marshall
MATERIAL SCIENCES	P. Nair, H. Manaktala, G. Cragnolino
MATERIALS, INCLUDING DESIGN & FABRICATION	C. Tschoepe
METEOR/CLIMATOLOGY	
MINING ENGINEERING	S-M. Hsiung
NUMERICAL MODELING	
PERFORMANCE ASSESSMENT	B. Sagar
QUALITY ASSURANCE	B. Mabrito, R. Brient
RADIOCHEMISTRY	
REGULATORY AND POLICY ANALYSIS	P. LaPlante, S. Spector
RELIABILITY	J. Wu
ROCK MECHANICS	A. Chowdhury
STRUCTURAL GEOLOGY	
SYSTEMS ENGINEERING	D. T. Romine
TRANSPORTATION	R. Weiner
VOLCANOLOGY/IGNEOUS GEOLOGY	

3700-000 CENTER COMPOSITE

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	657552	790803	724865	669336	679551	726529	665479	683266	701019	709231	718850	699631	702318	9128429
ACTUAL PERIOD COST	481422	515564	0	0	0	0	0	0	0	0	0	0	0	996986
VARIANCE, \$	176130	275239	724865	669336	679551	726529	665479	683266	701019	709231	718850	699631	702318	8131444
VARIANCE, %	26.8	34.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.1
EST. FY CUMUL COST	657552	1448354	2173220	2842556	3522106	4248636	4914114	5597380	6298399	7007630	7726480	8426111	9128429	
ACTUAL FY CUMUL COST	481422	996986	996986	996986	996986	996986	996986	996986	996986	996986	996986	996986	996986	
PERCENT COMPLETE, %	0.053	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	0.109	
VARIANCE, \$	176130	451369	1176234	1845570	2525121	3251650	3917129	4600394	5301413	6010644	6729495	7429126	8131444	
VARIANCE, %	26.8	31.2	54.1	64.9	71.7	76.5	79.7	82.2	84.2	85.8	87.1	88.2	89.1	

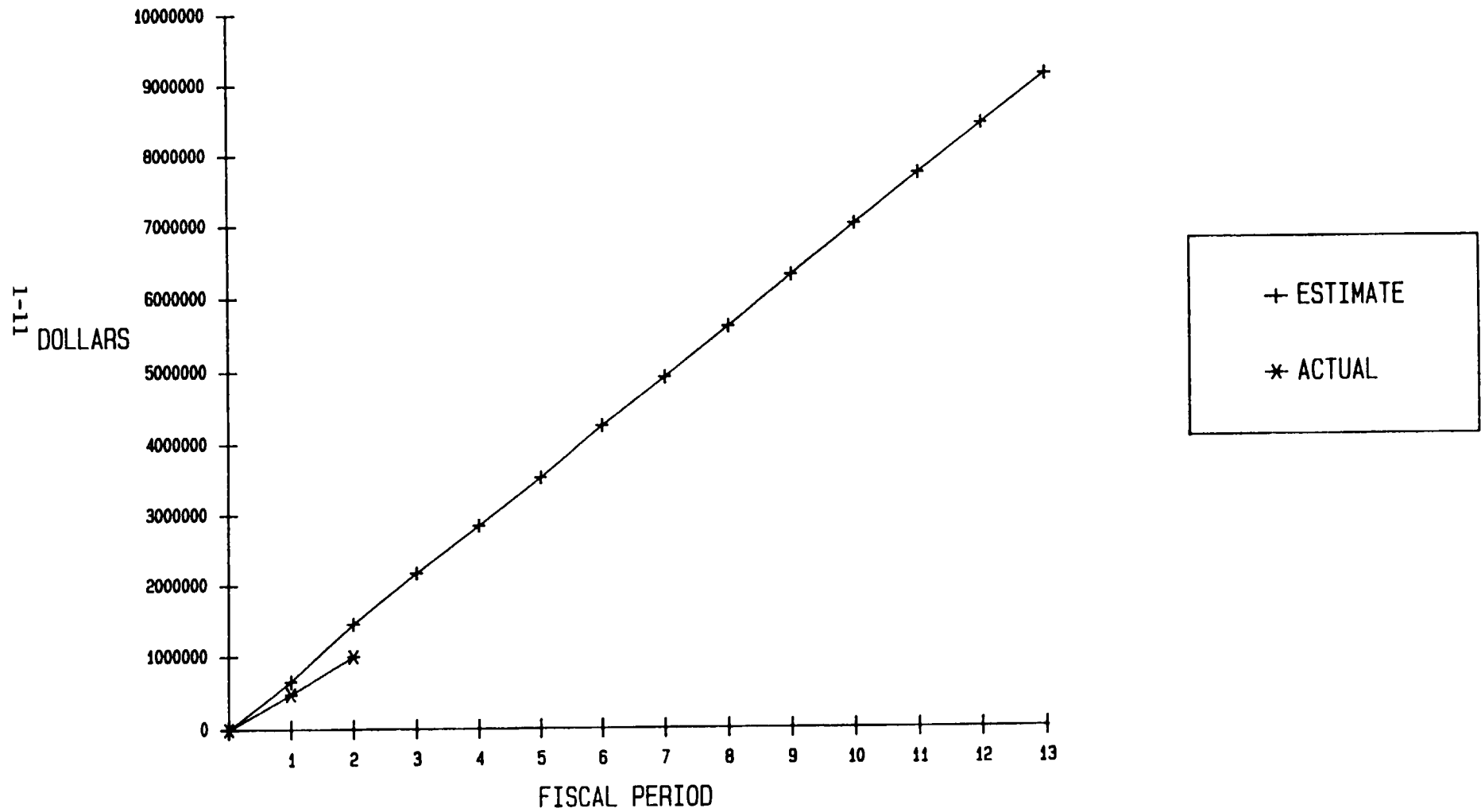
1-10

NOTES:

1. All Estimated and actual costs exclude award fee.
 2. Estimates are taken from September 1989 Draft Operations Plan
- TRS Estimates are taken from the Year 2 Project Plan submitted on 04/04/89 (Revision 1).

3700-000 CENTER COMPOSITE - FY 90

Estimate vs. Actual



2. CNWRA OPERATIONS

NRC Program Element Manager: Shirley L. Fortuna

NRC Project Officers: None Assigned

CNWRA Subelement Manager: Henry F. Garcia

Key Personnel: J.E. Latz, H.F. Garcia, A. Whiting, R. Johnson,
W.C. Patrick, B. Mabrito

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

2.1 Technical Status

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

Task 1 - Management and Technical Support

The level of Center management meeting attendance continues to occupy a significant portion of Center resources as the cognizant NRC management personnel request the physical and/or telephonic presence of Center management staff at these meetings. An informative meeting with the Center's Advisory Board in conjunction with a site tour of Yucca Mountain conducted by Mr. P. Presholt was held November 20 and 21, 1989. The Center is reviewing its administrative policies and procedures to address the various issues and concerns which arise regarding management of the Center. The Program Manager's Periodic Report (PMPR) will continue to be produced, under a revised format, in accordance with the established schedule.

Task 2 - Develop and Sustain Technical and Analytical Capabilities

The Center is maintaining its input of various documents into the Technical Document Index. A member of the IMS staff attended an OS/2 seminar this period.

Task 3 - Staffing Activities

One geochemist position has been filled during this period. The geosciences staff, led by Dr. J. Russell, has been very active in recruitment activities, especially at technical society meetings. The Center neared completion of the revised Staffing Plan.

Task 4 - Operations Plans and Five Year Plan Development

Efforts proceed on the analyses of strategic issues and the development of the Center Five-Year Plan. The development of final operations plans continued during this period.

Task 5 - CNWRA Internal QA

The development of the Center Quality Assurance System continued, with additional COI activities consuming time allocated to this task. Center products are being reviewed by cognizant Center QA personnel. QA work on Center Research programs continued.

2.2 Major Problems

Resolution of the problem relative to the large volume of the PMPR and the effort committed to its preparation continues to elude the NRC Program Management and the Center. A deliberate effort will be made by all concerned parties to bring this matter to a successful resolution during Period 3.

2.3 Forecast for Next Period

Revision of the Division of High Level Waste Operations Plan and Overall Research Project Plan for FY90-91 will be completed. A draft of the Center's ADP Plan will be prepared. The PMPR will be produced for the third period. A sustained, heightened level of focused activity will characterize the Center's recruitment efforts. Cognizant Center and NRC personnel will pursue the identification of strategic issues which will provide programmatically relevant information to be incorporated into the development of the Center's Five-Year Plan. The Center's QA staff will maintain their review of applicable reports, plans or other documents, and sustain their coordination efforts in COI matters.

2.4 Element Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$6,915. Spending is on target for the established budgets. No changes to budget or schedule are recommended at this time.

Prior Year Funds Uncosted	\$ -0-
FY 90 Funds Allocated	\$ 419,879
Total FY 90 Funds Available	\$ 419,879
Funds Costed to Date	\$ 334,966
Funds Uncosted	\$ 84,913
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report.
- c) Sum of (a) and (b).
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-070

CNWRA OPS

Element Status Cost Report

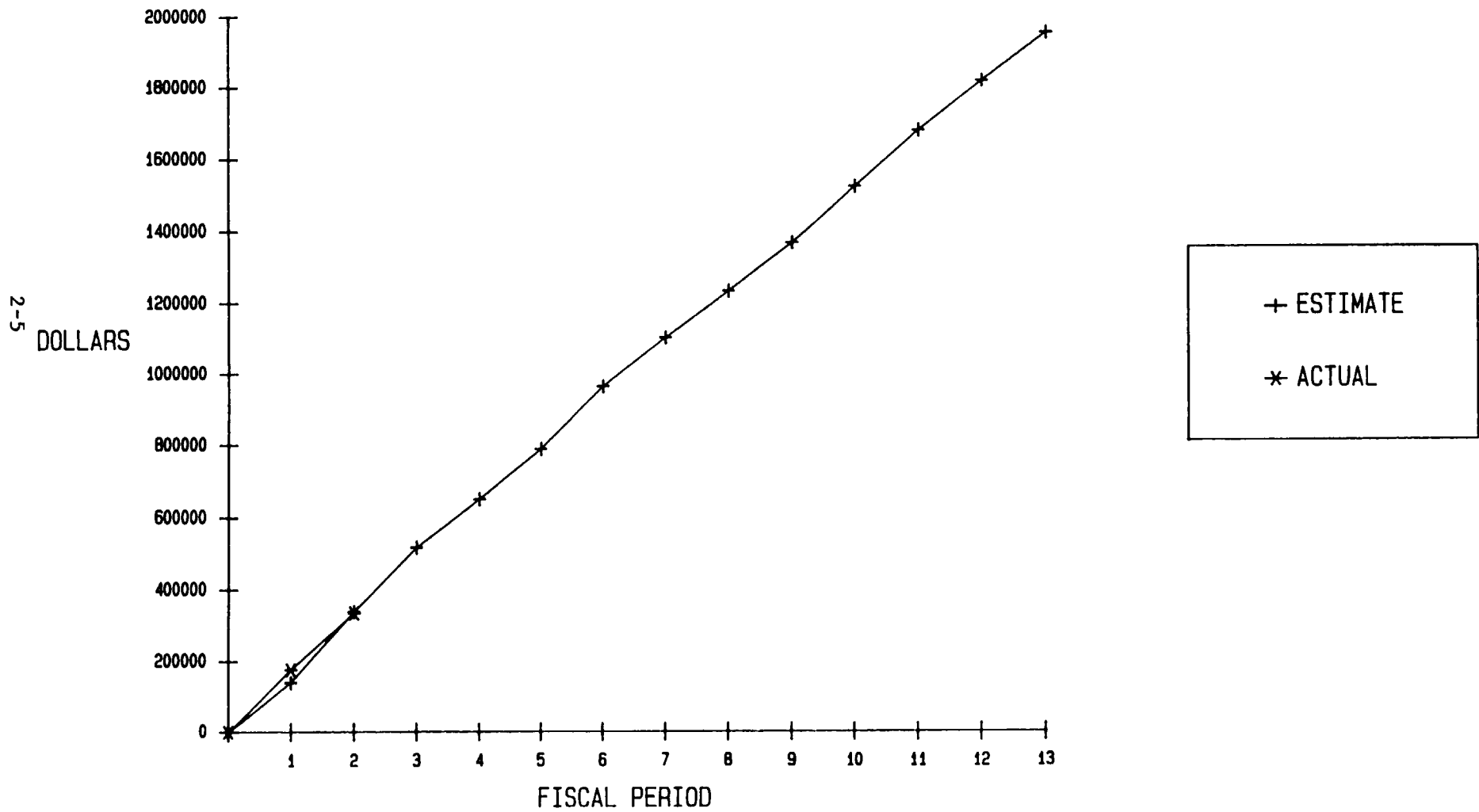
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	140713	198121	178713	133643	137487	175201	138081	131358	134454	155737	156011	138507	136492	1954517
ACTUAL PERIOD COST	176916	158050	0	0	0	0	0	0	0	0	0	0	0	334966
VARIANCE, \$	-36203	40071	178713	133643	137487	175201	138081	131358	134454	155737	156011	138507	136492	1619551
VARIANCE, %	-25.7	20.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.9
EST. FY CUMUL COST	140713	338834	517546	651189	788676	963877	1101958	1233316	1367770	1523507	1679518	1818025	1954517	
ACTUAL FY CUMUL COST	176916	334966	334966	334966	334966	334966	334966	334966	334966	334966	334966	334966	334966	
PERCENT COMPLETE, %	0.091	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	
VARIANCE, \$	-36203	3868	182580	316223	453710	628911	766992	898350	1032804	1188541	1344552	1483059	1619551	
VARIANCE, %	-25.7	1.1	35.3	48.6	57.5	65.2	69.6	72.8	75.5	78.0	80.1	81.6	82.9	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-070 CNWRA OPS - FY 90

Estimate vs. Actual



3. WASTE SYSTEMS ENGINEERING AND INTEGRATION

NRC Program Element Manager: Philip M. Altomare

NRC Project Officer for
Program Architecture: Michael P. Lee

CNWRA Element Manager: Allen R. Whiting

Key Personnel: R. Adler, R. Johnson, J. Latz, W. Patrick, A. Whiting,
T. Romine

Subcontractors/Consultants: None

3.1 Technical Status

Major efforts in support of revising, finalizing and integrating the Draft Operations Plans were continued during this period.

Task 1 - Statutory and Regulatory Analysis

Major emphasis this period included finalizing and submitting copies of draft and final two Regulatory Requirement Topics (RRT's) "Erosion" and "Substantially Complete Containment" for "baselining" the Program Architecture (reference letter from A. Whiting to P. Altomare dated November 2, 1989). The two submittals reflected copies of the completed Program Architecture data input formats and synopses of the contents. These are to be reviewed by the NRC and finalized along with the review and finalization of TOP-001-02 Rev. 1 by the end of the year.

The NRC internal review of the above documents was initiated by a memorandum from Phil Altomare to the staff dated November 13, 1989. A kick-off meeting for the review of the TOP-001-02 was conducted by Phil Altomare with Center attendance at the White Flint offices of the NRC on November 16, 1989. Preliminary comments were received by the Center at the end of this period and additional comments are anticipated from the NRC reviewers during the next reporting periods.

Discussion of the Program Architecture deliverable, "Identification and Evaluation of Regulatory and Institutional Uncertainties in 10 CFR Part 60" was held in a teleconference between NRC and Center staff on November 16, 1989. During the teleconference reference was made to the outline for the deliverable represented in the November 15, 1989, letter from A. Whiting to P. Altomare. In general, it appeared satisfactory with minor modifications with a final definition of the extent and date of the deliverable to be confirmed by the Center early in December as requested by P. Altomare's letter of November 20, 1989, to A. Whiting on the subject, "Report on 10 CFR Part 60 Regulatory and Institutional Uncertainties." Also, a meeting was scheduled for December 14, 1989, for the Center to brief the NRC on the "Erosion" and

"Substantially Complete Containment" Regulatory Requirements used to "baseline" the Program Architecture.

Work continued on identification of the remaining Regulatory and Institutional Uncertainties in 10 CFR Part 60 and the regulations incorporated by reference consistent with the deliverable discussed above. Training of additional regulatory analysts related to the TOP-001-02 Rev. 1 was continued this period. Also, work was pursued to develop a "functional" system evaluation analysis to determine the "sufficiency" of 10 CFR Part 60.

During this period work was initiated on the development of TOP-001-05 "Procedure for Attribute Analysis."

Throughout this period the above effort was supported by PASS and other user systems maintained and serviced by the IMS staff.

Task 2 - Program Architecture Development and Support System

During this period the 1989 revisions to the 10 CFR Part 60 regulations were loaded into the PASS. The design of Version 2.0 and preparation of a Requirements Definition Report as well as a PASS users manual were continued throughout this period.

Initial discussions were held with NRC staff regarding the implementation of OS/2 and the PASS development for Versions 2.0 and 3.0.

Training on the use of the PASS and PADB was provided for Center and contractor staff.

Task 3 - HLWM Program Analysis and Integration

During this period, work was completed on developing the Center's procedure AP-009 for Task Control and Project Management, with controlled copy distribution made to the Center staff on November 21, 1989. Also developed were the key milestone interface points for technical positions and rulemaking efforts of the Center to be coincident with the NRC Operations Plan Schedules (reference teleconference between W. Patrick [CNWRA] and R. Johnson [NRC] dated October 19, 1989).

Task 4 - RDCO Related Program Architecture Development for Technical Positions and Rulemaking Basis

A Program Architecture and database training based on TOP-001-02 Rev. 1 was conducted at the Center on November 7, 1989. L. Lorig of Itasca attended this training session. The Program Architecture activities on thermal loads included the preparation of a draft on Technical Review Components, Compliance Determination Methods, and Information Requirements. T. Brandshaug of Itasca will visit the Center on December 7, 1989, to work on Program Architecture and scoping of technical position on thermal loads. Identification of

Regulatory and Institutional Uncertainties of 10 CFR Part 60 relevant to RDCO continued during this reporting period.

Task 5 - GS Related Program Architecture Development for Technical Positions and Rulemaking Basis

A low-level activity was continued this period on the Adverse Geochemical Processes Regulatory Requirement Topic (RRT).

Task 6 - EBS Related Program Architecture Development for Technical Positions and Rulemaking Basis

Activity continued this period in conjunction with the SCC Regulatory Requirement.

Task 7 - Special Projects Related Program Architecture Development

No activity was initiated this period.

Task 8 - Performance Assessment Program Architecture Development for Technical Positions and Rulemaking Basis

No activity was initiated this period.

3.2 Major Problems

None.

3.3 Forecast for Next Period

Element activities during the next period will be focused on:

- o Finalizing the Operations Plans.
- o Finalizing the "baselining" of Program Architecture.
- o Continuing the review of 10 CFR Part 60 and incorporated by reference regulations for defining the regulatory and institutional uncertainties in support of the December deliverable.
- o Finalizing the definition of the December deliverable.
- o Continuing development of a Technical Operating Procedure TOP-001-05 "Procedure for Attribute Analysis."
- o Submitting the Requirements Definition Report on Version 2.0 of the PASS.
- o Continued PADB training of Center and contractor staff on Version 2.0 and preparation of PASS Users Manual for Version 1.0.
- o Continued loading of 1989 revisions of regulations.
- o Submission of the Center Task Control and Project Management Procedure (AP-009) to the NRC.

- o Continued effort in developing the "what" must be proven portions of those RRT's that are the statutory and regulatory basis for the Rulemakings and Technical Positions being worked by RDCO, GS, EBS, and PA Elements, consistent with the schedules reflected in the Center and Division Operations Plans.

3.4 Element Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$2,693. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 67,658
b) FY90 Funds Allocated	\$ 419,258
c) Total FY90 Funds Available	\$ 486,916
 Funds Costed to Date	 \$ 278,123
Funds Uncosted	\$ 208,793
 Recommended Adjustment to Complete (+/-)	 \$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-030

WSE&I

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	112865	181601	162590	163849	171634	160558	145964	130761	137264	154709	148767	149756	122271	1942589
ACTUAL PERIOD COST	129467	148656	0	0	0	0	0	0	0	0	0	0	0	278123
VARIANCE, \$	-16602	32945	162590	163849	171634	160558	145964	130761	137264	154709	148767	149756	122271	1664466
VARIANCE, %	-14.7	18.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	85.7
EST. FY CUMUL COST	112865	294465	457055	620904	792537	953095	1099060	1229820	1367085	1521794	1670561	1820317	1942589	
ACTUAL FY CUMUL COST	129467	278123	278123	278123	278123	278123	278123	278123	278123	278123	278123	278123	278123	
PERCENT COMPLETE, %	0.067	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	
VARIANCE, \$	-16602	16343	178932	342781	514415	674972	820937	951698	1088962	1243671	1392438	1542194	1664466	
VARIANCE, %	-14.7	5.5	39.1	55.2	64.9	70.8	74.7	77.4	79.7	81.7	83.4	84.7	85.7	

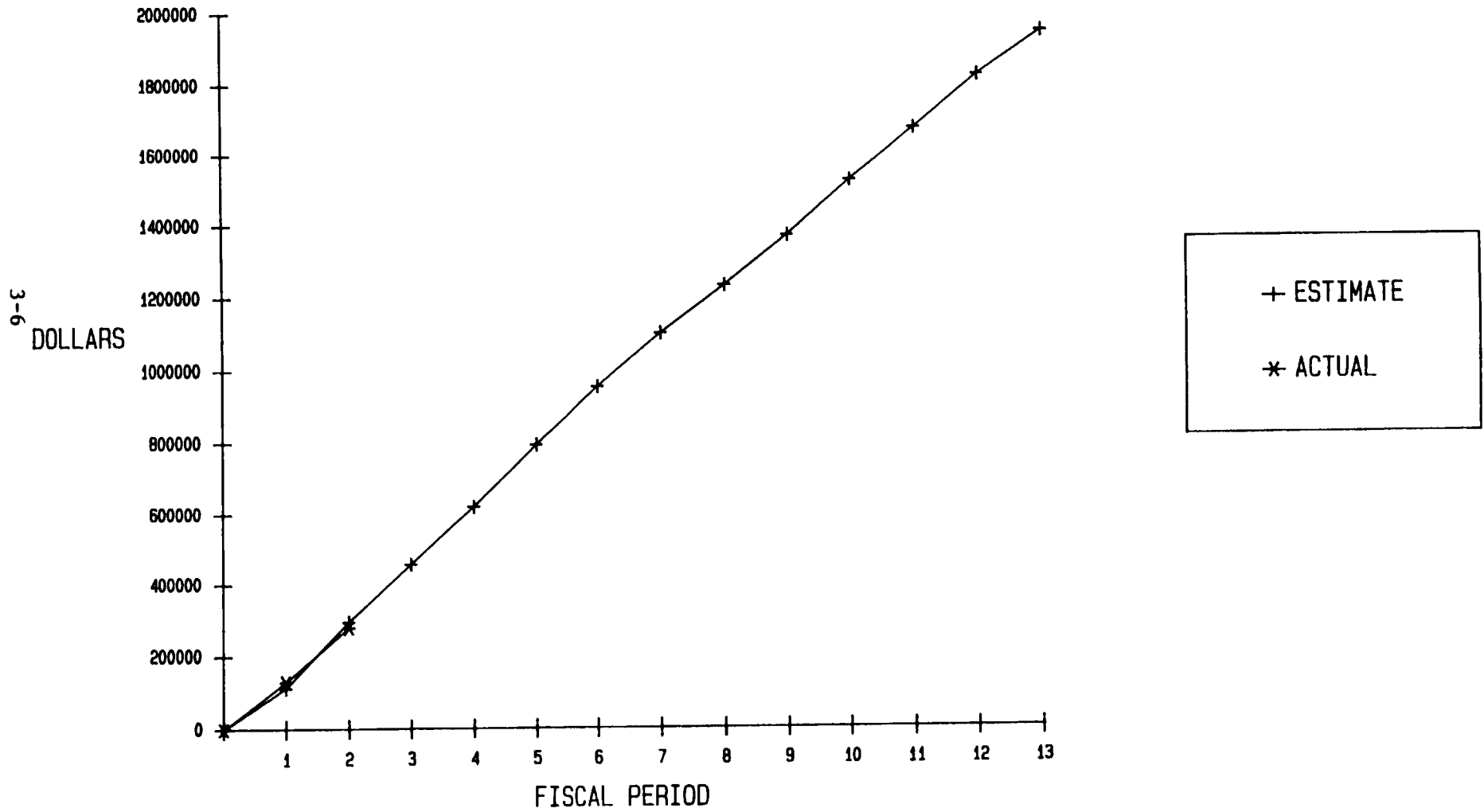
3-5

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-030 WSE&I - FY 90

Estimate vs. Actual



4. QUALITY ASSURANCE

NRC Program Element Manager: Mark S. Delligatti

NRC Project Officer for External QA Task: James E. Kennedy

CNWRA Element Manager: Bruce E. Mabrito

Key Personnel: Bruce E. Mabrito, Robert D. Brient, Thomas C. Trbovich,
Robert E. Engelhardt, Michael R. Gonzalez

Subcontractors/Consultant: William M. Bland, Jr., P.E., John H. Doyle

4.1 Technical Status

The major work activity during this period was the development of the External QA Program Element and Task 5 input to the Center FY90 and FY91 Operations Plans following guidelines provided by the NRC.

Task 1 - Audit DOE QA Program for Site Characterization

The Center Director of Quality Assurance continued oversight of this phase of this Element, reviewing Audit Observation Reports written by the NRC and reviewing input provided by personnel working for the Center on NRC Audit Observation Teams.

Mr. Michael R. Gonzalez initiated preparation of his input to the Los Alamos Audit Observation Team report.

Task 2 - Conduct Quality Assurance On-Site Visits

Discussions have taken place with the NRC QA staff on the best approach and most efficient manner to make QA on-site visits beneficial. These discussions have taken place during the periodic teleconferencing meetings amongst the NRC QA staff and Center QA personnel.

Task 3 - Update QA Review Plan and Staff Technical Positions (Unfunded)

No activity this period.

Task 4 - Review Management Control Documents and QA Plan Revisions (Unfunded)

No activity this period.

4.2. Major Problems

None.

4.3 Forecast for Next Period

Activities will focus on input to the Los Alamos National

Laboratory Audit Observation Team report which will be sent to Mr. Kennedy for inclusion into the final NRC document.

It is expected that an on-site visit by the NRC will take place in the second quarter of FY90, and Center QA personnel may be involved with that task.

4.4 Element Financial Status

Table 1 below, indicates the financial status of this Element in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and a cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$810. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 101,100
b) FY90 Funds Allocated	\$ 30,111
c) Total FY90 Funds Available	\$ 131,211
Funds Costed to Date	\$ 7,021
Funds Uncosted	\$ 124,190
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-040

QA

Element Status Cost Report

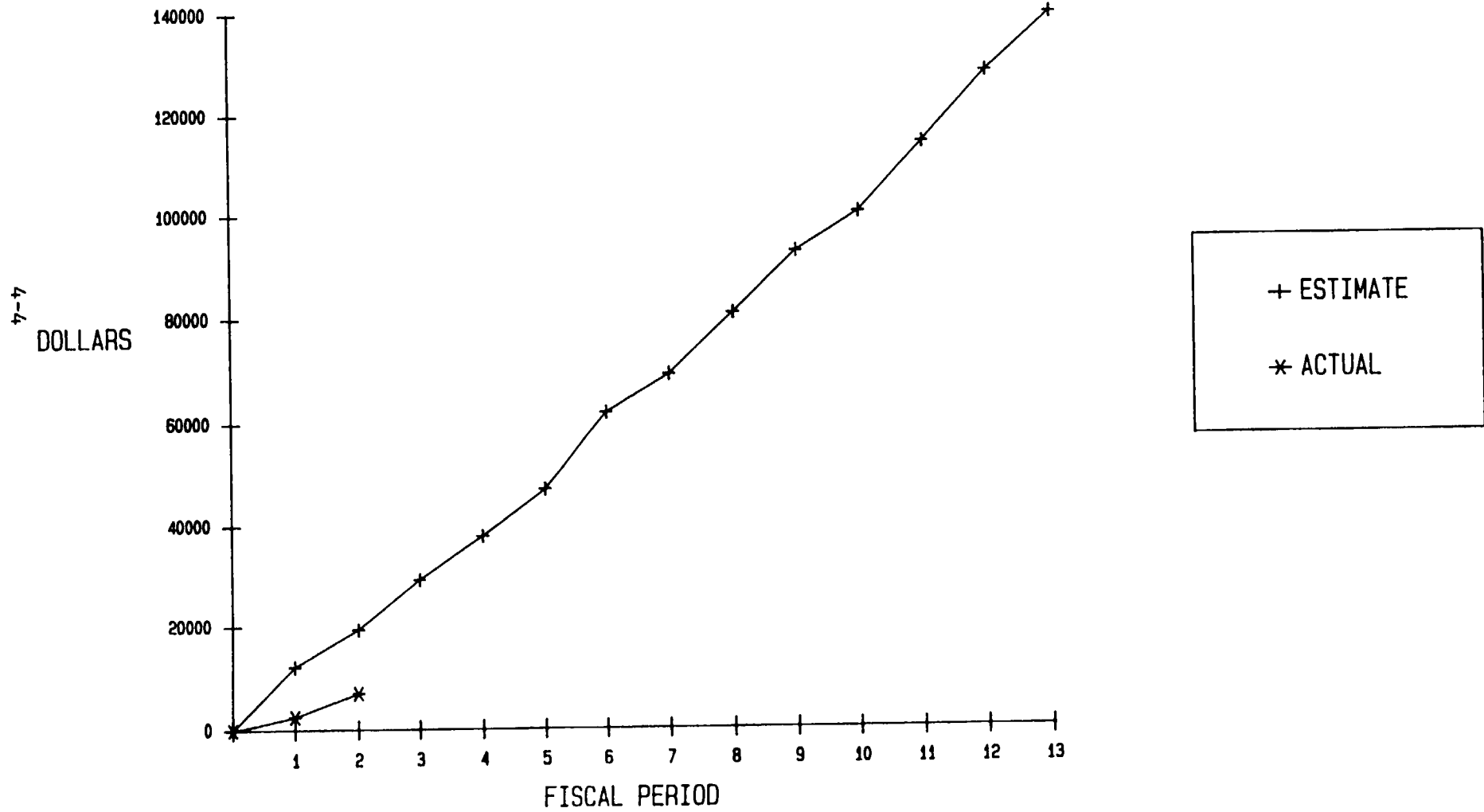
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	12139	7263	9892	8615	9221	14801	7252	11544	11862	7723	13786	14051	11366	139513
ACTUAL PERIOD COST	2549	4472	0	0	0	0	0	0	0	0	0	0	0	7021
VARIANCE, \$	9589	2791	9892	8615	9221	14801	7252	11544	11862	7723	13786	14051	11366	132492
VARIANCE, %	79.0	38.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0
EST. FY CUMUL COST	12139	19402	29293	37908	47129	61930	69182	80725	92588	100311	114097	128148	139513	
ACTUAL FY CUMUL COST	2549	7021	7021	7021	7021	7021	7021	7021	7021	7021	7021	7021	7021	
PERCENT COMPLETE, %	0.018	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	0.050	
VARIANCE, \$	9589	12381	22272	30887	40108	54908	62161	73704	85566	93289	107076	121126	132492	
VARIANCE, %	79.0	63.8	76.0	81.5	85.1	88.7	89.9	91.3	92.4	93.0	93.8	94.5	95.0	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-040 QA - FY 90

Estimate vs. Actual



5. GEOLOGIC SETTING

NRC Program Element Manager: David Brooks

NRC Project Officer for Task 1: John Trapp

NRC Project Officer for Tasks 2 and 4: Tin Mo

NRC Project Officer for Subtask 4.1: William Ford

NRC Project Officer for Task 3: Jeff Pohle

CNWSA Element Manager: John L. Russell

Key Personnel: M. Board, A. Brown, R. Hart, M. Logsdon, L. Lorig,
J. Russell, W. Murphy, R. Pabalan, M. Miklas, R. Ababou
R. Green

Subcontractors/consultants: Itasca Consulting Group, Inc., Adrian Brown
Consultants, Inc.

5.1 Technical Status

In addition to those activities discussed below, other major work activities during the period were the development of the Geologic Setting Program Element components of the Center's FY90 and FY91 Operations Plans and recruitment of technical staff. These activities are reported in the Overall Center Operations Program Element.

Task 1 - Prelicensing Activity

During Period 2, three individuals (W. Murphy, W. Leeman, and L. McKague) represented the Center at the October 31 - November 2 NRC-DOE Technical Exchange Meeting and field trip on Tectonics Models.

Task 2 - Regulatory and Technical Guidance Development

Technical assistance work was conducted to support the development of the Natural Resources Technical Position. The work was performed by the Center, including its subcontractors, Itasca Consulting Group, Inc., Adrian Brown Consultants, Inc., and by R. Wright, a consultant to the Center. Work was accomplished on Steps 1, 3, 4, and 7 of the technical direction from the NRC to the Center. Technical assistance support of the development of a Natural Resources Assessment Methodology Technical Position proceeded. A rescheduling of the milestones and deliverables was accomplished and was included in the FY90-91 Operations Plans.

Acquisition of background information for technical positions pertaining to radionuclide sorption was obtained by participating in the Migration '89 meeting in Monterrey, California. Participation in an INTRAVAL meeting at the University of

California - Berkeley provided valuable background for development of regulatory guidance associated with the Hydrologic Methods in Unsaturated Media Technical Position and the Groundwater Travel Time/Disturbed Zone Rule.

Task 3 - Analysis, Codes, and Methods

No activity. This task is held in reserve for potential future activity. No funding presently exists for this task.

Task 4 - Review Plan Preparation

No activity. This task is held in reserve for potential future activity. No funding presently exists for this task.

Task 5 - Support Development and Maintenance of Program Architecture

This task is reported by the Waste Systems Engineering and Integration Program Element.

5.2 Major Problems

None.

5.3 Forecast for Next Period

The Center will provide technical assistance to the NRC through participation in the Tectonic Models Technical Exchange Meeting and field trip at Denver during November 28 and 29.

5.4 Element Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$3,585. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 152,013
b) FY90 Funds Allocated	\$ 261,433
c) Total FY90 Funds Available	\$ 413,446
Funds Costed to Date	\$ 32,625
Funds Uncosted	\$ 380,821
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-000

GS

Element Status Cost Report

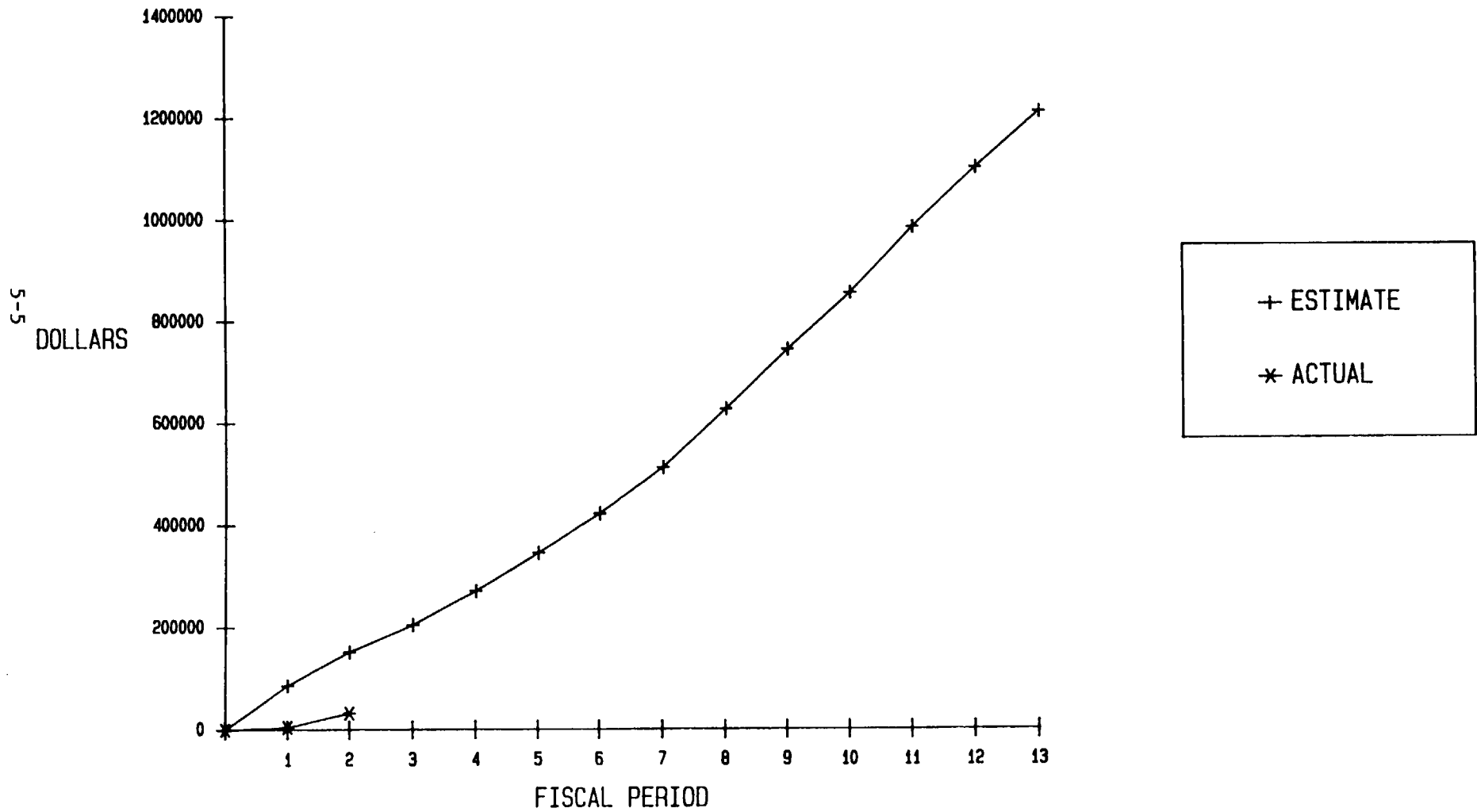
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	86956	65597	52228	66451	74610	76227	89411	114906	116869	111008	129603	117059	110230	1211154
ACTUAL PERIOD COST	4921	27704	0	0	0	0	0	0	0	0	0	0	0	32625
VARIANCE, \$	82035	37893	52228	66451	74610	76227	89411	114906	116869	111008	129603	117059	110230	1178530
VARIANCE, %	94.3	57.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	97.3
EST. FY CUMUL COST	86956	152553	204780	271231	345841	422068	511479	626385	743255	854262	983866	1100925	1211154	
ACTUAL FY CUMUL COST	4921	32625	32625	32625	32625	32625	32625	32625	32625	32625	32625	32625	32625	
PERCENT COMPLETE, %	0.004	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	
VARIANCE, \$	82035	119928	172156	238606	313216	389444	478855	593761	710630	821637	951241	1068300	1178530	
VARIANCE, %	94.3	78.6	84.1	88.0	90.6	92.3	93.6	94.8	95.6	96.2	96.7	97.0	97.3	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-000 GS - FY 90

Estimate vs. Actual



6. ENGINEERED BARRIER SYSTEM

NRC Program Element Manager: Jerome R. Pearring

NRC Project Officer for Tasks 1-4: Kien C. Chang

CNWRA Element Manager: Prasad K. Nair

Key Personnel: H Manaktala, P. Nair, W. Patrick, E. Tschoepe
A. Whiting, Y. Wu

Subcontractors/Consultants: Systems Support, Inc.

6.1 Technical Status

During this reporting period the modifications to the FY90 and FY91 EBS Program Element Operations Plan were completed.

Task 1 - Prelicensing Activities

H. Manaktala participated in the West Valley Vitrification Qualification Run SF-12 Information/Demonstration Meeting at the West Valley Nuclear Services Company, Inc. in West Valley, New York, October 31 - November 1, 1989. The meeting was organized to allow the participants to observe (from the control room) the vitrification process as it will be used for radioactive waste. The meeting/demonstration was attended by the DOE, NRC, their contractors, and consultants. Those present from the NRC included J. Bunting, M. Lee, D. Hurt, J. Schiffgens, and R. Weller. Following the meeting/ demonstration the NRC feedback, in terms of concerns and comments, was provided to the DOE/WVNS via a conference call among: Messrs J. Bunting, R. Weller, M. Lee, and J. Schiffgens (NRC), P. Nair and H. Manaktala (CNWRA), B. Adams (NRC Consultant), and Messrs E. Maestas, W. Bixby, W. Stringfield, and Ms. D. Lege (DOE/WVNS). The comments and concerns covered a wide range of topics, related to the glass wasteform, including waste composition, in-process slurry composition verification, leachability/durability testing, relation between leachability of non-radioactive and radioactive vitrified wasteforms, and fabrication of the monoliths. These have been documented in a separate detailed NRC Trip Report prepared by M. Lee of the NRC.

Task 2 - Regulatory and Technical Guidance Development

The major activity under this task for the first three periods of FY-90 is the feasibility study being conducted for the Substantially Complete Containment (SCC) rulemaking. The SCC activity has two major reports under preparation.

(A) Elements of Proof Report

A draft report entitled, "Elements of Proof to Demonstrate Substantially Complete Containment of HLW within the Waste

Package", was prepared by H. Manaktala and is undergoing internal review. The report is intended to provide highlights of the technical and scientific data/information needs in major areas that need to be addressed by the DOE in order to demonstrate that the waste package will provide "substantially complete containment (SCC)" of its radioactive inventory for a period of 300 to 1,000 years. A copy of the revised draft report is expected to be released for peer review during the next reporting period. The tentative list of peers identified include: Prof. R. Stout of the Lehigh University, Dr. John Weeks of the Brookhaven National Laboratory, and Dr. M. Streicher- an independent Consultant.

The draft SCC report has been prepared according to a format agreed to with the NRC-NMSS. Each 'mini-chapter' on a subject is structured to provide a **Statement** (a short introduction and background of the subject), one or more **Concern(s)** (connection between the subject and the concerns in the context of a deep geologic repository), **Basis** [justification for the concern(s)], and **References** (to provide more detailed information on the subject of the 'mini-chapter' to the reader). In recognition of the possibility that other geologic repository sites, having different characteristics may be considered in the future, the present report does not emphasize the Yucca Mountain repository environment or the candidate canister materials specially chosen for the proposed Yucca Mountain repository. However, it is planned to supplement the contents of the referenced report with several examples of specific areas of concern as they would apply to the first deep geologic repository in the Yucca Mountain, Nevada, during the oral presentation at the technical workshop on the subject in January 1990.

The report is divided into four main sections dealing with introduction to the topic of the report, the concept of the elements of proof, the technical considerations, and the conclusions. A major portion of the 83-page draft report is devoted to the section dealing with technical considerations covering five broad areas: repository environment, materials, materials/environment interactions, performance assessment, and materials and fabrication process specifications and inspection criteria.

The technical and scientific information needs identified are intentionally of a higher-order, i.e., they do not specifically identify the tests or data generation, reduction, and analyses techniques that are absolutely essential or uniquely required or would be acceptable from repository licensing point of view. However, examples are provided to indicate some of the types of tests and techniques that could be considered relevant to the HLW package for a deep geologic repository. The technical consideration, described in this report, for demonstrating the ability of a waste package to provide "substantially complete containment (SCC)" for a period of 300-1,000 years will undergo NRC technical staff reviews and an independent peer review at a technical workshop tentatively scheduled for January 1990 which

will be open to the DOE, the State of Nevada, the NRC, other interested parties, and the public. These reviews, evaluations, recommendations, suggestions, and the NRC technical staff deliberations will provide the technical information needed to support a recommendation regarding whether and to what extent it is feasible to incorporate more specific and quantitative criteria into 10 CFR Part 60 to reduce uncertainties associated with the term "substantially complete containment (SCC)".

(B) Uncertainty Evaluation Methodology Report

Efforts continued toward the review and the development of uncertainty evaluation methodologies that are applicable to the waste package performance assessment. A report discussion meeting, attended by A. Journel (Stanford), L. Abramson (NRC), Y. Wu and P. Nair was held in the Center on October 17, 1989 to discuss those written reports contributed by the project team. The topics include the process modeling sequence, the probabilistic distribution approach, the bounding approach, the scenario approach, the expert judgement approach, the sensitivity analysis approach, the Bayesian geostatistics, and the alternative quantitative waste package reliability goal. The information is being consolidated for the report related to potential rulemaking regarding "substantially complete containment."

Task 3 - Analysis Codes and Methods

The acquisition, tailoring and installation of the thermal model TOPAZ3D, and its ancillary codes INGRID (mesh generator), FACET (view factor calculator for radiative heat transfer), and TAURUS (post processor), are in process. The software - codes and manual - is being obtained from the National Energy Software Center.

Task 4 - Review Plan Preparation

No currently planned activities

Task 5 - Support Development and Maintenance of Program Architecture

This task is reported by the Waste Systems Engineering and Integration Program Element.

6.2 Problems

None.

6.3 Forecast for Next Period

The revised EBS FY90 and FY91 Operations Plan will be submitted.

A staff member will participate in the XIII Annual Symposium on the Scientific Basis for Nuclear Waste Management sponsored by the

Materials Research Society. Review the ongoing wasteform studies will continue.

Development of preliminary draft materials for the Elements of Proof and Uncertainty Evaluation Methodology Reports will be completed.

The review of mechanistic modelling and the development of thermal modelling capability will be initiated.

6.4 Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$4,731. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 140,584
b) FY90 Funds Allocated	\$ 115,372
c) Total FY90 Funds Available	\$ 255,956
Funds Costed to Date	\$ 58,630
Funds Uncosted	\$ 197,326
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-010

EBS

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	65915	70137	42960	37039	45348	42744	43598	39883	33398	32934	32828	27937	20219	534940
ACTUAL PERIOD COST	25455	33175	0	0	0	0	0	0	0	0	0	0	0	58630
VARIANCE, \$	40460	36962	42960	37039	45348	42744	43598	39883	33398	32934	32828	27937	20219	476310
VARIANCE, %	61.4	52.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	89.0
EST. FY CUMUL COST	65915	136052	179012	216052	261400	304144	347742	387625	421023	453956	486784	514721	534940	
ACTUAL FY CUMUL COST	25455	58630	58630	58630	58630	58630	58630	58630	58630	58630	58630	58630	58630	
PERCENT COMPLETE, %	0.048	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	
VARIANCE, \$	40460	77422	120382	157422	202770	245514	289112	328994	362392	395326	428154	456091	476310	
VARIANCE, %	61.4	56.9	67.2	72.9	77.6	80.7	83.1	84.9	86.1	87.1	88.0	88.6	89.0	

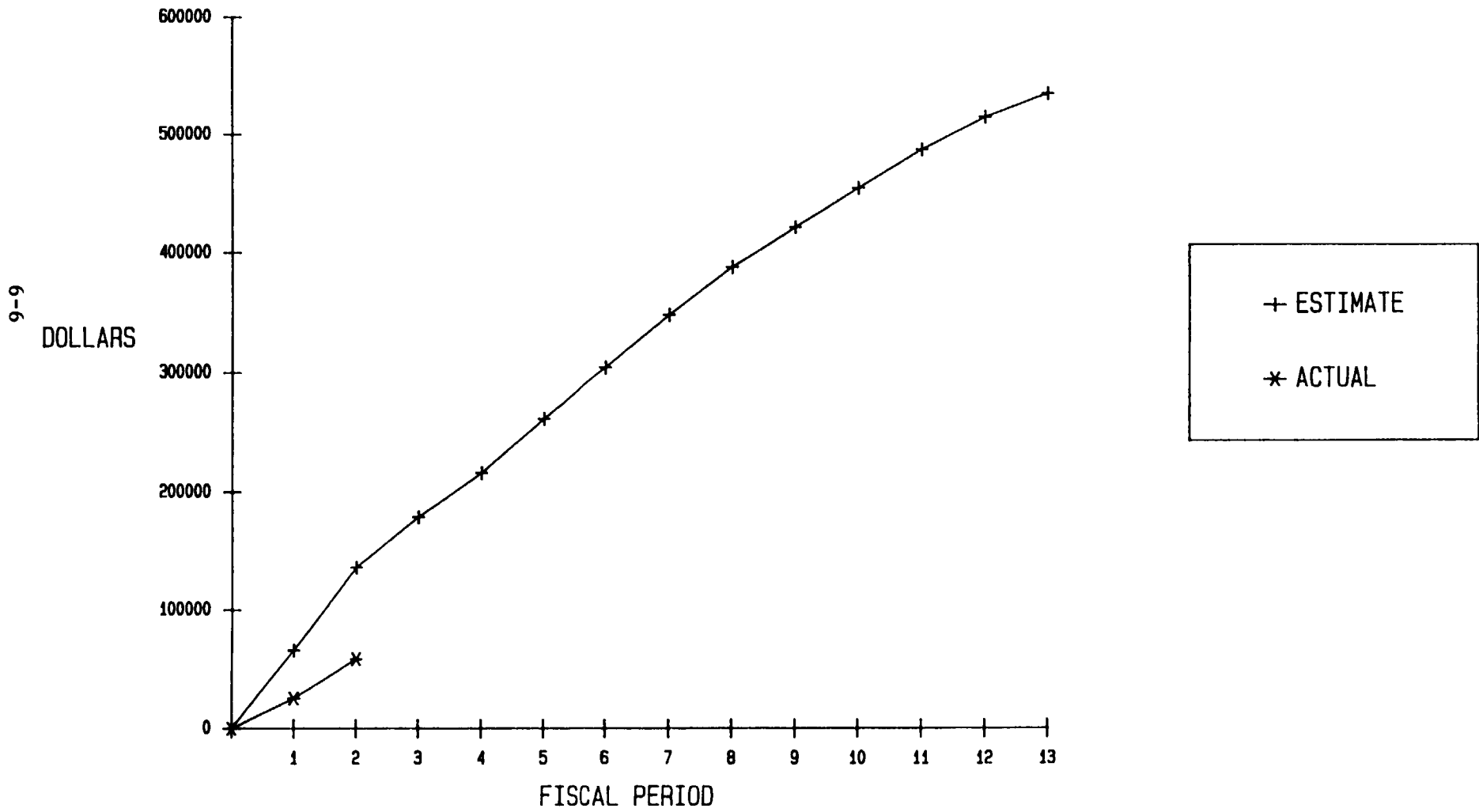
5-9

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-010 EBS - FY 90

Estimate vs. Actual



7. SPECIAL PROJECTS ELEMENT

NRC Program Element Manager: Mark S. Delligatti

NRC Project Officers: Robert L. Johnson, Julia A. Corrado

CNWSA Subelement Manager: John P. Hageman

Key Personnel: J. Hageman, S. Spector, R. Weiner, P. LaPlante

Subcontractors/Consultants:

7.1 Technical Status

Task 1 - Prelicensing Support

The primary work on the License Application Review Strategy (LARS) has been in developing a preliminary draft outline of the LARS and further clarification of specific agenda items for strategy planning meetings. The LARS preliminary draft outline was submitted to the NRC Element Manager and Project Officer for their review.

Background documentation relevant to the Environmental Impact Review Strategy (EIRS) continues. The National Environmental Impact Act NEPA (42 USCS 4321-4370) with amendments and interpretive notes and decisions is being reviewed, and a brief summary of NEPA notes related to EIRS is being compiled. Also, the proposed and final rulemaking changes to 10 CFR Parts 2, 51 and 60 (53 FR 16131 and 54 FR 27864) pertinent to EIRS, DOE's Draft Environment Program Overview, DOE/RW-0207 December 1988 and Draft Environmental Regulatory Compliance Plan for Site Characterization of the Yucca Mountain Site, DOE/RW-0177, January 1988 are being reviewed to help define the EIRS. S. Spector has begun an analysis of the environmental related statutes that interface with EIS review. The NRC role in EIS review, as taken from the proposed and final rule changes to 10 CFR Part 2, 51, and 60, is being summarized.

7.2 Major Problems

None this period.

7.3 Forecast for Next Period

Strategy meetings and teleconferences on the LARS outline and agenda items are planned. A brief synopsis of the ideas and suggestions discussed during the planned meeting will be informally forwarded to the Project Officer, Robert Johnson.

7.4 Element Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and

"allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 101,648
b) FY90 Funds Allocated	\$ 77,844
c) Total FY90 Funds Available	\$ 179,492
 Funds Costed to Date	 \$ 26,038
Funds Uncosted	\$ 153,454
 Recommended Adjustment to Complete (+/-)	 \$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-050

SP

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	28252	20585	23006	19573	26054	26565	22781	28568	33472	29108	26011	36127	40717	360819
ACTUAL PERIOD COST	9087	16951	0	0	0	0	0	0	0	0	0	0	0	26038
VARIANCE, \$	19165	3634	23006	19573	26054	26565	22781	28568	33472	29108	26011	36127	40717	334781
VARIANCE, %	67.8	17.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.8
EST. FY CUMUL COST	28252	48837	71843	91415	117469	144035	166815	195383	228856	257964	283975	320102	360819	
ACTUAL FY CUMUL COST	9087	26038	26038	26038	26038	26038	26038	26038	26038	26038	26038	26038	26038	
PERCENT COMPLETE, %	0.025	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	
VARIANCE, \$	19165	22799	45805	65377	91431	117997	140777	169345	202818	231926	257937	294063	334781	
VARIANCE, %	67.8	46.7	63.8	71.5	77.8	81.9	84.4	86.7	88.6	89.9	90.8	91.9	92.8	

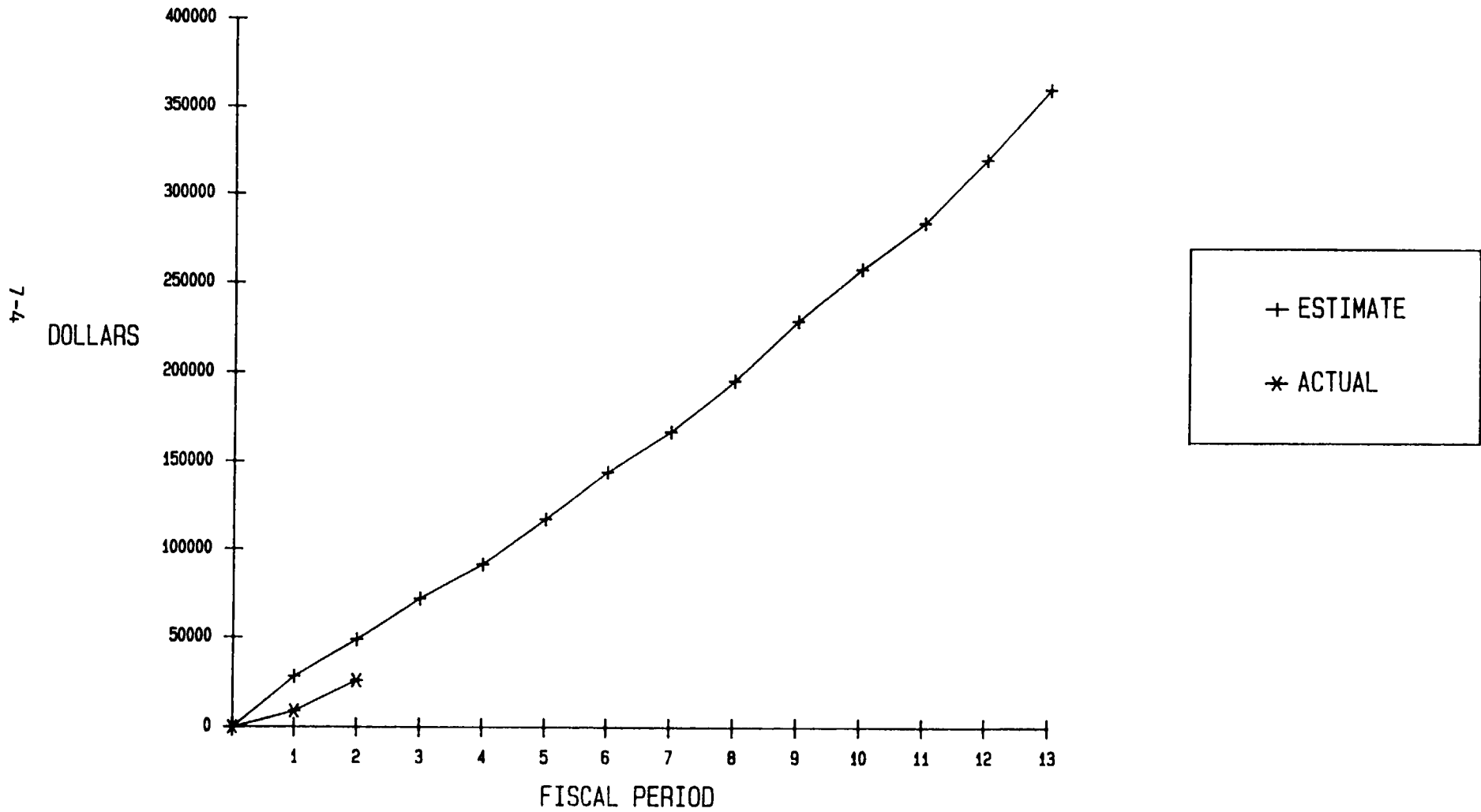
7-3

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-050 SP - FY 90

Estimate vs. Actual



3. REPOSITORY DESIGN, CONSTRUCTION, AND OPERATIONS

NRC Program Element Manager: Jerome R. Pearring

NRC Project Officer for Tasks 1-4: John Buckley

CNWRA Element Manager: Asadul H. Chowdhury

Key Personnel: A. Chowdhury, S. Hsiung, L. Lorig, T. Brandshaug,
J. Daemen

Subcontractors/consultants: Itasca

8.1 Technical Status

Task 1 - Prelicensing Activities

During this reporting period, A. Chowdhury, along with the Advisory Board and senior management of the Center visited the proposed repository site at Yucca Mountain. This site visit on November 20, 1989, was conducted by P. Prestholt, NRC's on-site representative and included a tour of "G" tunnel, surface facility location, exploratory shaft location, DOE's sample management facility, and one weapon test location at the Nevada Test Site (NTS).

Task 2 - Regulatory and Technical Guidance Development

Planning activities for the development of a technical position on waste retrievability have been carried out during this reporting period. A. Chowdhury and S. Hsiung of the Center staff, and L. Lorig of Itasca performed these activities.

Task 3 - Analysis Codes and Methods

Not funded in FY90.

Task 4 - Review Plan Preparation

Not funded in FY90.

Task 5 - Support Development and Maintenance of Program
Architecture

This activity is reported on in the WSE&I Element report.

8.2 Major Problems

None.

8.3 Forecast for Next Period

Program Architecture activities on thermal loads and waste retrievability, and technical position work on thermal loads will continue during the next reporting period. A. Chowdhury (CNWRA),

S. Hsiung (CNWRA), T. Brandshaug (Itasca), and L. Lorig (Itasca), will perform these activities.

During the next period, RDCO Program Element will perform work on the Center Five-Year Plan and Uncertainty Analysis for 10 CFR Part 60 requirements.

8.4 Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2, displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$800. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$ 126,073
b) FY90 Funds Allocated	\$ 92,430
c) Total FY90 Funds Available	\$ 218,503
Funds Costed to Date	\$ 15,687
Funds Uncosted	\$ 202,816
Recommended Adjustment to Complete (+/-)	\$ -0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-020 RDCO

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	41951	42260	41961	38293	31783	31931	35447	29907	27313	22511	29708	29452	25607	428125
ACTUAL PERIOD COST	8976	6710	0	0	0	0	0	0	0	0	0	0	0	15687
VARIANCE, \$	32974	35549	41961	38293	31783	31931	35447	29907	27313	22511	29708	29452	25607	412438
VARIANCE, %	78.6	84.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.3
EST. FY CUMUL COST	41951	84210	126171	164465	196248	228179	263627	293534	320847	343358	373066	402518	428125	
ACTUAL FY CUMUL COST	8976	15687	15687	15687	15687	15687	15687	15687	15687	15687	15687	15687	15687	
PERCENT COMPLETE, %	0.021	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	
VARIANCE, \$	32974	68524	110485	148778	180561	212493	247940	277847	305160	327672	357379	386831	412438	
VARIANCE, %	78.6	81.4	87.6	90.5	92.0	93.1	94.0	94.7	95.1	95.4	95.8	96.1	96.3	

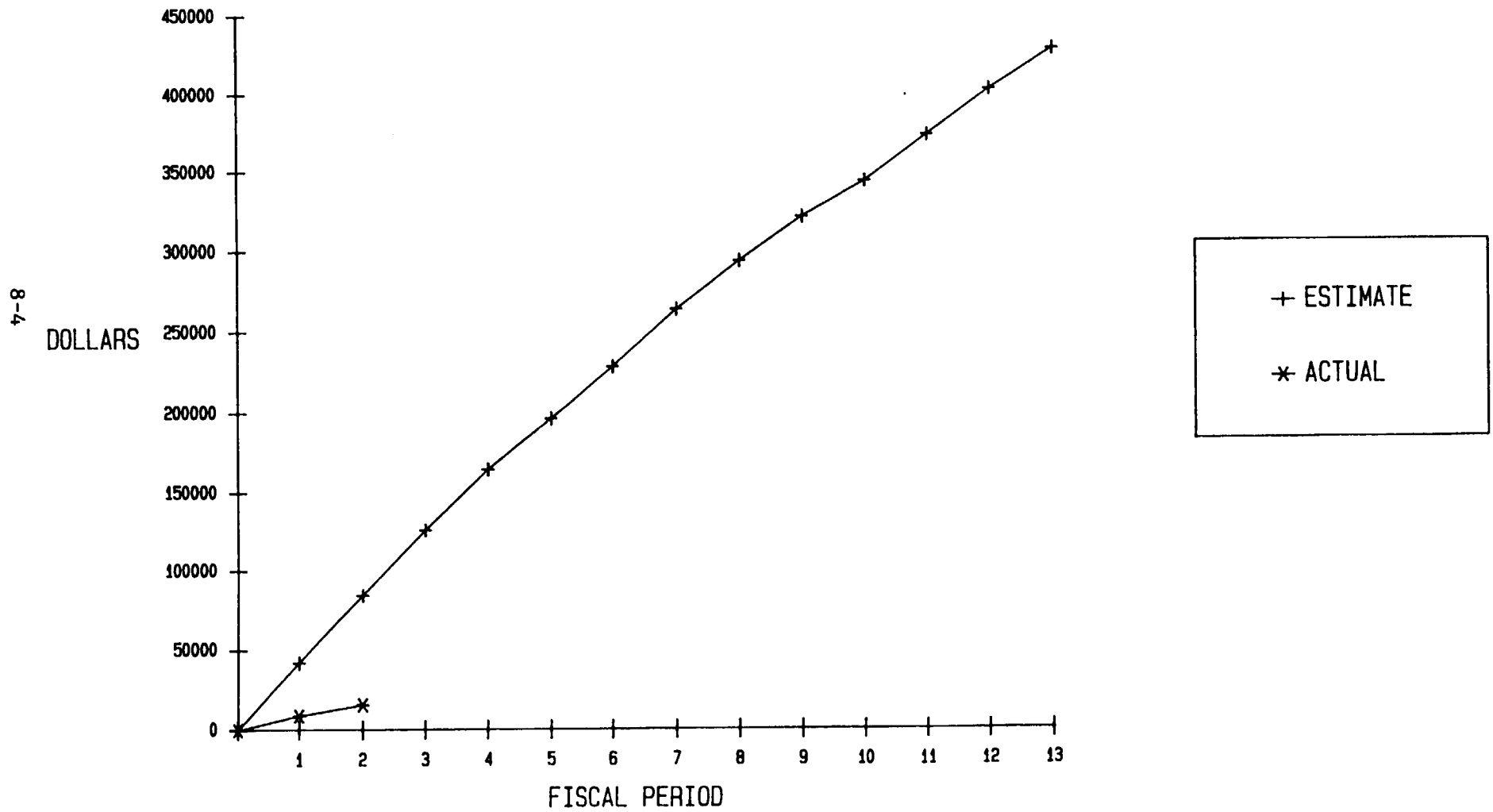
8-3

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-020 RDCO - FY 90

Estimate vs. Actual



9. PERFORMANCE ASSESSMENT

NRC Program Element Manager: Pauline Brooks

NRC Project Officers: None Assigned

CNWRA Element Manager: Ruth F. Weiner

Key Personnel: R. Green, J. Hageman

Subcontractors/Consultants: R. Fields

9.1 Technical Status

The final draft of the Operations Plan for Performance Assessment was in preparation this period.

Task 1 - Prelicensing Reviews

No activity this period.

Task 2 - Regulatory and Technical Guidance Development

Subtask 2.1 - Conforming Amendment to the EPA Standard

No activity this period.

Subtask 2.2 - Implementing the EPA Standard

R. Weiner attended the briefing to the Nuclear Regulatory Commission on the EPA standard.

Subtask 2.3 - Development of a Methodology for Scenario Identification and Evaluation

R. Weiner participated in the quarterly review meeting of Sandia National Laboratory (SNL) contract FIN All65. Review of SNL documents related to this Subtask have begun.

Subtask 2.4 - Development of Guidance for Evaluating Data and Parameter Uncertainty

Review of SNL documents related to this Subtask have begun.

Subtask 2.5 - Development of Guidance for Verification and Validation of Computer Programs Used in Performance Assessment

Review of SNL documents related to this Subtask have begun.

Subtask 2.6 - Development of Guidance for Formal Use of Expert Judgment

The SNL report on formal use of expert judgment was received and review comments are in preparation.

Subtask 2.8 - Design Basis Accident Dose Limit Rulemaking

J. Hageman discussed activities on this Subtask with R. Neel: no further Center activity is apparently needed until Research issues the draft proposed rule changes. It is estimated that this draft will be issued in December.

Task 4 - Review Plan Preparation

Subtask 4.2 - Performance Assessment Review Strategy

NRC comment is pending on the letter reports: (1) "Statutory Basis for Performance Assessment Review and Identification of Requirements for Performance Assessment in 10 CFR Part 60" and (2) "Policy Options for a Performance Assessment Review Strategy."

Task 5 - Iterative Performance Assessment

R. Green has acquired the three versions of the TOUGH transport code for the Center: the version used at Lawrence Livermore National Laboratory (LLNL), the version adapted by Tim McCartin of NRC/RES, and the original version created by K. Pruess of Lawrence Berkeley Laboratory (LBL). The original version has been installed on the Institute VAX-7800.

R. Ababou and R. Green attended the INTRAVAL meeting at LBL.

9.2 Major Problems

None.

9.3 Forecast for Next Period

R. Weiner will meet with P. Brooks, S. Coplan, D. Fehringer and other NMSS staff to discuss further revision of, and work on, Task 4. Review of SNL documents produced under FIN All65, on techniques for determining probabilities, techniques for evaluating scenarios, and formal use of expert judgment, will continue. It is also anticipated that most work plans for Task 2 and one for Task 5 will be substantially completed during this period.

J. Hageman will meet with R. Neel and M. Fleishman after Research issues the proposed rule changes.

9.4 Subelement Financial Status

Table 1 below, indicates the financial status of this Element in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and a cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$2,104. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

a) Prior Year Funds Uncosted \$ -0-
b) FY90 Funds Allocated \$ 147,673
c) Total FY90 Funds Available \$ 147,673

Funds Costed to Date \$ 36,126
Funds Uncosted \$ 111,547

Recommended Adjustment to \$ -0-
Complete (+/-)

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3702-060

PA

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	50673	49527	49705	49822	56358	62611	45675	56920	60311	51962	50768	40802	59047	684182
ACTUAL PERIOD COST	17497	18629	0	0	0	0	0	0	0	0	0	0	0	36126
VARIANCE, \$	33176	30899	49705	49822	56358	62611	45675	56920	60311	51962	50768	40802	59047	648056
VARIANCE, %	65.5	62.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.7
EST. FY CUMUL COST	50673	100201	149906	199728	256086	318697	364372	421292	481603	533565	584333	625135	684182	
ACTUAL FY CUMUL COST	17497	36126	36126	36126	36126	36126	36126	36126	36126	36126	36126	36126	36126	
PERCENT COMPLETE, %	0.026	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053	
VARIANCE, \$	33176	64075	113780	163602	219961	282572	328246	385166	445477	497439	548208	589009	648056	
VARIANCE, %	65.5	63.9	75.9	81.9	85.9	88.7	90.1	91.4	92.5	93.2	93.8	94.2	94.7	

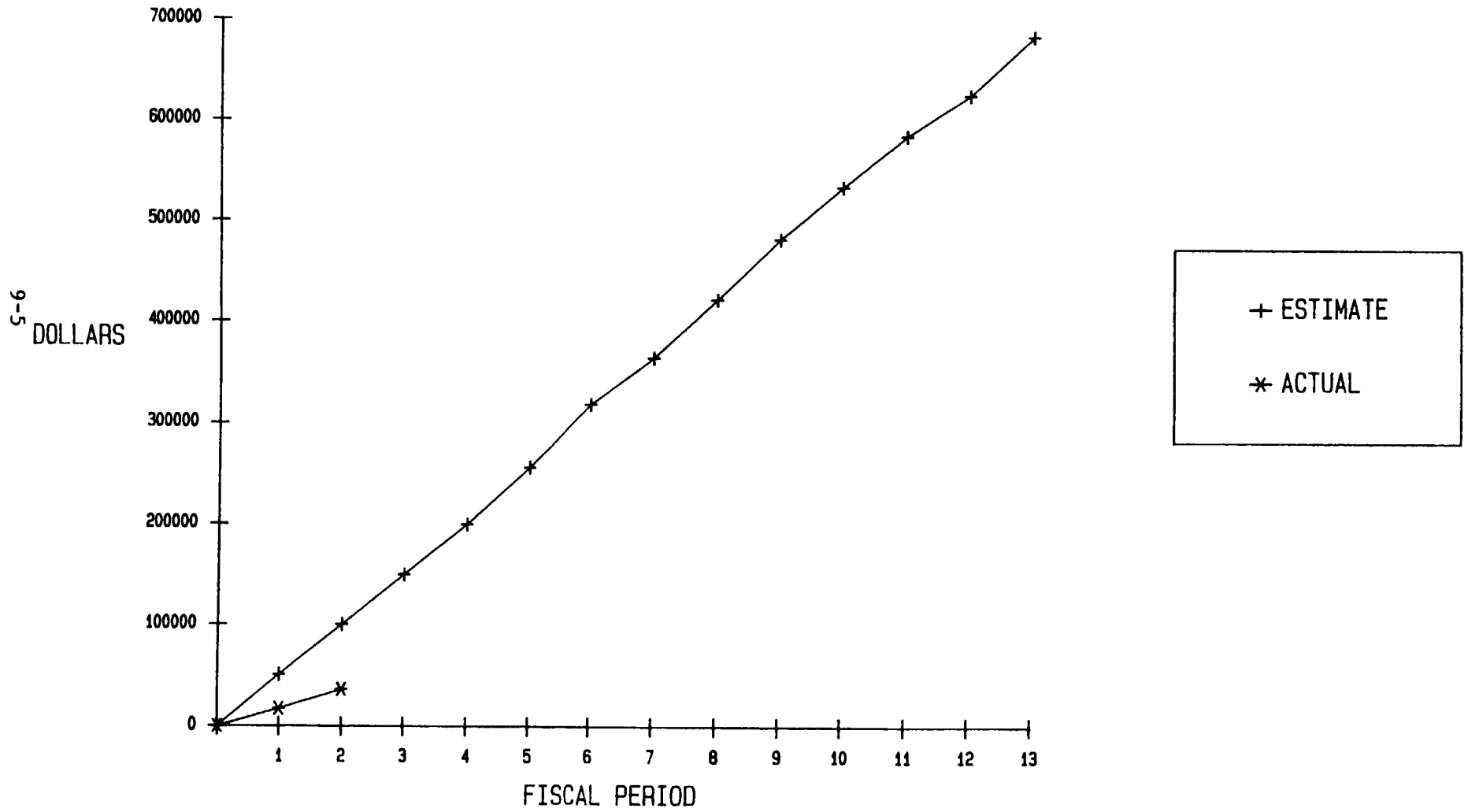
7-9

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3702-060 PA - FY 90

Estimate vs. Actual



10. TRANSPORTATION RISK STUDY

NRC Program Element Manager: John Cook

NRC Program Subelement Manager: Russell R. Rentschler

CNWSA Subelement Manager: John P. Hageman

Key Personnel: R. Weiner (P.I.), P. LaPlante, J. Buckingham (SwRI)

Subcontractor/Consultant: A. Greenberg

10.1 Technical Status

Task 1 - Completion of Overview and Scoping

R. Weiner met several times with J. Cook to discuss the entire program. CNWSA management were briefed on the status of the TRS. The information and resources regarding transportation continues to be augmented and updated on a regular basis.

Task 2 - Evaluation and Assessment of Data, Models, and Codes - Recommendations and Uncertainty and Sensitivity Analysis

Subtask 2.1 - Evaluation of Data and Databases

Two additional databases have been identified: the low-level radioactive waste database from the Conference of Radiation Protection Officers and a database of spent commercial nuclear fuel shipments from NAS. These have been entered into the computer. Both of these databases are for years not covered by the SAND84-7174 database.

J. Buckingham has elucidated some of the distances for shipments in the SAND84-7174 database, and their use in scenarios is being investigated.

Subtask 2.2 - Evaluation of Models and Codes

P. La Plante and R. Weiner found and corrected the "bugs" which occurred in running the input deck from NUREG-0170 through RADTRAN III. Rerun of this input deck awaits the changeover from RADTRAN III to RADTRAN 4.0, which is presently underway, but should be complete by 1 December 1989. The accumulated data has been sorted and input decks are being compiled.

Subtask 2.3 - Uncertainty and Sensitivity Analysis

No activity this period.

Task 3 - Analysis of Regulations Governing Radioactive Materials Transportation

Responses to NRC comments on the preliminary draft of Chapter 2 of the TRS (the analysis of transportation regulations) are being prepared.

Task 4 - Discussion and Analysis of Transportation Alternatives

It was determined that the material for Chapter 6 "Alternative Analyses" will be included in Chapters 4 and 5. This change was discussed with the Subelement Project Manager.

Task 5 - Analyses of Radiological Effects of Radioactive Materials Transportation

Subtask 5.1 - Radiological Effects and Risk Analysis of Normal Transportation

An initial analysis of scenarios for normal (incident-free) transportation was performed, using the dose calculations done in NUREG-0170 with scenarios developed from the SAND84-7174 database. Preliminary results have been explained and the problem in the input deck identified.

This initial comparison is being made in order to compare doses from more current data with NUREG-0170 doses if the same model is used. Interpretation of these data and further dose calculations, are underway.

Subtask 5.2 - Radiological Effects and Risk Analysis of Transportation Accidents

R. Weiner has begun to scope the material for Chapter 5.

Subtask 5.3 - Security and Safeguards Considerations

A. Greenberg has begun work on revision of the material presented in Chapter 7 of NUREG-0170.

Subtask 5.4 - Radiation Dose and Risk Analysis

Construction of scenarios for representative shipments continues.

Task 6 - Analysis of Non-Radiological Impacts of Radioactive Materials Transportation, and Consideration of Human Factors

No action to date. Consideration of Human Factors is unfunded.

10.2 Major Problems

None.

10.3 Forecast for Next Period

R. Weiner and P. LaPlante will continue the RADTRAN analysis of representative shipments. It is anticipated that there will be risk results to report at the end of the next period. J. Buckingham will continue the sensitivity analysis during the coming periods. Response to NRC comments on Chapters 2 and 3 will be completed during the coming period.

10.4 Subelement Financial Status

Table 1, below, indicates the financial status of this Element in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. These data do not include commitments in the amount of \$1,001.

Table 1. Financial Status

a) Prior Year Funds Uncosted	\$	12,936
b) FY90 Funds Allocated	\$	84,000
c) Total FY90 Funds Available	\$	96,936
Funds Costed to Date	\$	21,535
Funds Uncosted	\$	75,401
Recommended Adjustment to Complete (+/-)	\$	-0-

See the enclosed Element Status Cost Report.

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3703-000

TRS

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	15235	15035	16369	15601	21213	21154	24456	22411	23887	22559	22554	27844	29871	278189
ACTUAL PERIOD COST	9382	12154	0	0	0	0	0	0	0	0	0	0	0	21535
VARIANCE, \$	5853	2881	16369	15601	21213	21154	24456	22411	23887	22559	22554	27844	29871	256654
VARIANCE, %	38.4	19.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.3
EST. FY CUMUL COST	15235	30270	46639	62240	83453	104607	129063	151474	175361	197920	220474	248318	278189	
ACTUAL FY CUMUL COST	9382	21535	21535	21535	21535	21535	21535	21535	21535	21535	21535	21535	21535	
PERCENT COMPLETE, %	0.034	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	
VARIANCE, \$	5853	8735	25104	40705	61918	83072	107528	129939	153826	176385	198939	226783	256654	
VARIANCE, %	38.4	28.9	53.8	65.4	74.2	79.4	83.3	85.8	87.7	89.1	90.2	91.3	92.3	

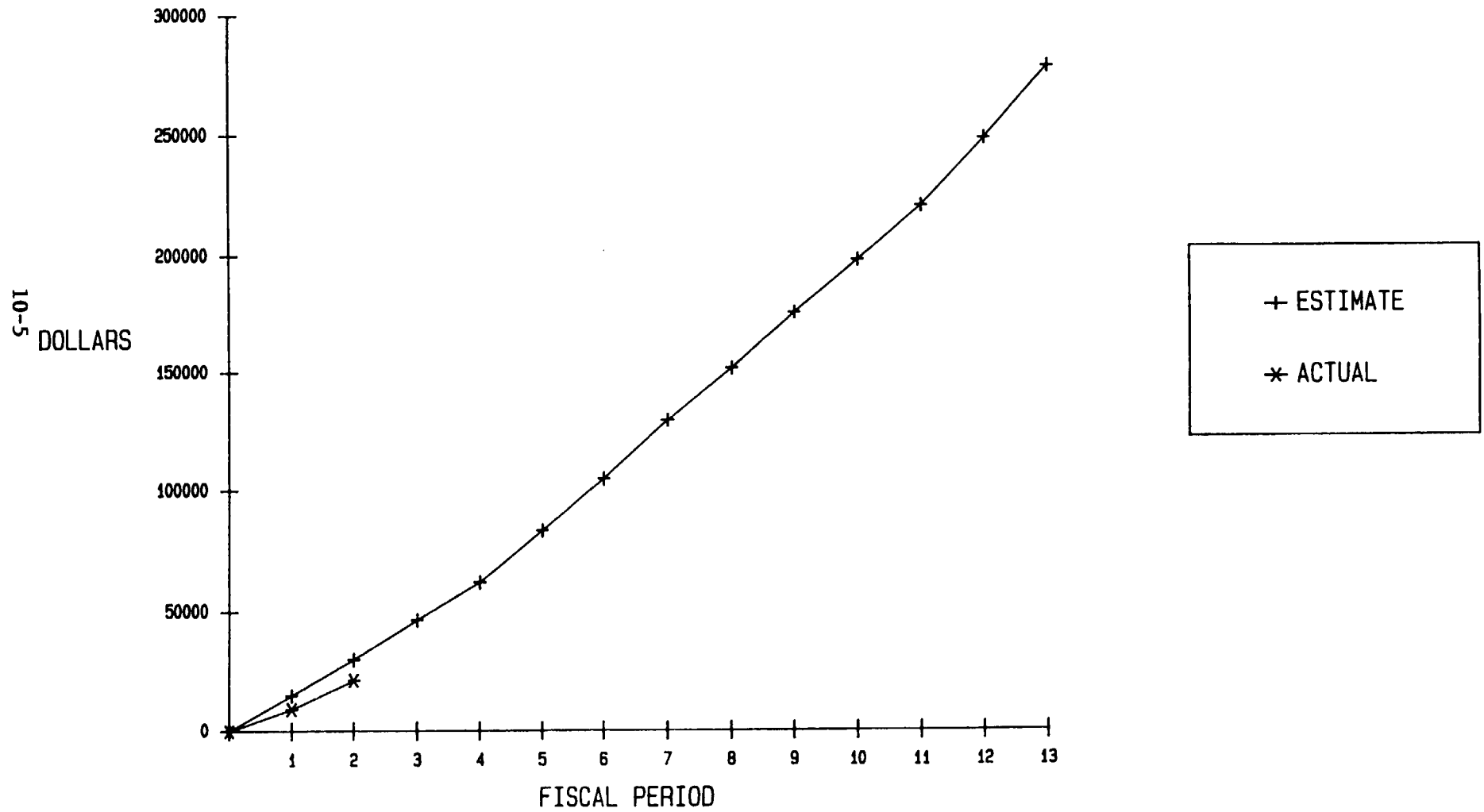
7-10

NOTES:

1. All Estimated and actual costs exclude award fee.
2. TRS Estimates are taken from the Year 2 Project Plan submitted on 04/04/89 (Revision 1).

3703-000 TRS - FY 90

Estimate vs. Actual



11. RESEARCH

NRC Program Element Manager: William R. Ott

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

NRC Project Officer for
Thermohydrology Research Project: Linda A. Kovach

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

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

CNWRA Project Manager for
Overall Research Project: Prasad Nair

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

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

CNWRA Project Manager for
Seismic Rock Mechanics Research Project: Asad Chowdhury

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

Key Personnel: B. Brady, F. Dodge, C. Freitas, S. Hsiung, D. Kana,
M. Lewis, F. Lyle, H. Manaktala, W. Murphy, P. Nair,
R. Pabalan, J. Russell, B. Vanzant, A. Chowdhury,
R. Ababou, R. Green

Subcontractors/Consultants: Itasca, ABC, Inc., Ohio State University,
University of Arizona, University of Texas-
San Antonio

11.1 Technical Status

Laboratory experiments for three Center Research Projects continued to be carried out in Building 57. The experimental facilities for the Seismic/Rock Mechanics project are set up in the high bay area within the Engineering and Material Sciences Division's Building 128. Currently the test facility is in operation.

Research Project 1 - Overall Research Plan

Revisions to the Overall Research Plan for Fiscal Years 1990 and 1991, were prepared for submission to the NRC on December 4, 1989. The status of the Project Plans as identified in the Overall Research Project Plan, is shown below.

<u>Project</u>	<u>Title</u>	<u>Revised Plan Completion Date</u>	<u>Approval Status</u>
Res. 1-Overall Research Plan		11/30/89	Pending Approval
Res. 2-Geochemistry		01/13/89	Approved
Res. 3-Thermohydrology		05/12/89	Approved
Res. 4-Seismic Rock Mechanics		10/30/89	Submitted to NRC
Res. 5-Integrated Waste Package		12/30/88	Revision planned
Res. 6-Stochastic Analysis of Unsaturated Flow and Transport		10/26/89	Draft Plan submitted
Res. 7-Geochemical Analog of Contaminant Transport		10/5/89	Draft Plan submitted
Res. 8-Long Term Climatological Effects on Ground-Water Recharge and Site Hydrology		SOW received	Project Plan development pending

A draft agenda for a workshop on natural analogs prepared by Dr. Kovach and the NRC staff was reviewed and informal comments were given to Dr. Kovach.

Presentations of the results of each research project were given for Dr. W. Ott and Dr. L. Shao of the NRC staff on November 16. They also visited the research facilities that are being used in the conduct of these projects.

Research Project 2 - Geochemistry

The annual milestone report for the experimental task was submitted in Period 2. The report titled "Progress in experimental studies on the thermodynamic and ion exchange properties of clinoptilolite" summarizes the theoretical background for the experimental studies, the data generated in sample characterization, and procedures for experimental work. Review comments received from George Birchard (NRC program manager) on both modeling and experimental milestone reports are being evaluated.

W. Murphy and R. Pabalan attended the Second International Conference on Chemistry and Migration Behavior of Actinides and Fission Products in the Geosphere (Monterey, Calif., Nov. 6-10, 1989). W. Murphy gave a presentation titled "Kinetic calculations of nonisothermal gas-water-rock interactions in hydrologically unsaturated tuff." R. Pabalan and W. Murphy prepared a trip report for this meeting.

Research Project 3 - Thermohydrology

The Task 2 preliminary report of the work performed to date on the Separate Effects Experiments was completed and submitted to NRC. A summary of the evaluation of the various apparatus, methodologies and techniques used to visualize and monitor flow and transport in a partially-saturated medium is contained in the preliminary

report. A summary of visualization and flow experiments completed to date is also included. The report concludes with a recommendation for the level of effort required to complete the task.

A group consisting of R. Green, R. Ababou and F. Dodge attended the INTRAVAL meeting held Nov 14-16 at Lawrence Berkeley Laboratory (LBL). R. Ababou made a presentation of a stochastic simulation of unsaturated flow from a strip source as applied to the Las Cruces trench study. The research currently being performed at LBL and Lawrence Livermore National Laboratory (LLNL) was presented to Tom Nicholson of NRC-RES and the above mentioned group. Present from LBL during these informal talks were K. Pruess, J. Long, C. Tsang and T. Narasimhan. Present from LLNL were J. Nitao and T. Buscheck. There was considerable discussion at both of these sessions regarding the use of TOUGH and other potential computer models and the capabilities of these models to represent flow and/or transport in unsaturated fractured rock under non-isothermal conditions.

J. Russell and R. Green visited G-tunnel at the Nevada Test Site. The various flow and transport experiments being conducted in G-tunnel by USGS, LBL, Sandia National Laboratory (SNL) and LLNL were observed during this visit.

Research Project 4 - Seismic Rock Mechanics Studies

The major activities related to the Seismic Rock Mechanics Research Project that took place during this reporting period include: (i) a conference call meeting of the seismic rock mechanics research group, (ii) the qualification study of computer codes, (iii) instrumented field study effort, (iv) the tuff specimens acquisition effort, and (v) seismic rock mechanics experimental apparatus and instrumentation development and calibration.

A conference call meeting of the seismic rock mechanics research group (A. Chowdhury, S. Hsiung, B. Brady, D. Kana, D. Schiedt) was held on November 13, 1989. This meeting reviewed the activities outlined in items (ii) through (v). This included technical discussions on large-core drilling techniques for collection of tuff specimens from Apache Leap Site, Arizona; instrumented field studies at the Lucky Friday Mine, Idaho; calibration technique for instrument of seismic rock mechanics experimental apparatus, and code qualification studies.

A technical report for the completed qualification study of the two-dimensional distinct element code UDEC against closed-form solutions is under preparation for submission to NRC during the next reporting period. Qualification study of the two-dimensional finite element code HONDO continued during this period.

A trip report for the visit of the Lucky Friday Mine, Idaho has been submitted to the NRC during this reporting period. A field study project proposal is being prepared for submission to the

Lucky Friday Mine for consideration to permit the Center to conduct instrumented field studies at the Lucky Friday Mine for (a) dynamic effects on underground openings, and (b) seismic effects on the groundwater.

Effort for acquisition of jointed welded tuff specimens from the Apache Leap Site, Arizona continued during this reporting period. S. Hsiung (CNWRA), J. Daemen (Univ. of Arizona), and C. Hirschi (Boyles Bros. Drilling Co.) will visit the Apache Leap Site on November 28, 1989, to identify and select the locations for drilling holes for collection of tuff specimens.

The seismic rock mechanics experimental apparatus and instrumentation techniques continued to be tested for various ranges of vertical and horizontal loads using concrete blocks as test specimens. A Technical Operating Procedure for these experiments and a report on the design, construction, instrumentation, and calibration of the experimental apparatus are in preparation.

Research Project 5 - Integrated Waste Package Experiments

During this reporting period the electrochemical testing continued on a limited scale. The testing continued to study the limitations of the test methods currently under use by the research community. A preliminary draft summary of the key technical comments by the Peer Reviewers of the IWPE Project Plan was completed. The comments were divided into five major categories, Degradation Mechanisms, Test Methods, Predictive Methodologies, Materials Examined, and Other Items. The Center plans to propose modifications to the current IWPE plan to reflect the Peer suggestions and the need for focused testing to support material degradation modelling.

11.2 Major Problems

None.

11.3 Forecast for Next Period

Preliminary revisions to the IWPE project plan will be discussed with NRC staff.

11.4 Element Financial Status

Table 1, below, indicates the financial status of the Element/Subelement program in the context of "ceiling" and "allotted" funds established by the NRC. Table 2 displays planned and actual costs to date on both a per period and cumulative basis. In addition, variances are shown on both a dollar and percentage basis. There are outstanding subcontractor commitments totalling \$28,371 related to these projects. The attached figure displays the estimated cumulative spending plan and the actual cumulative costs to date.

Table 1. Financial Status

Overall

a) Prior Year Funds Uncosted	\$ 13,319
b) FY90 Funds Allocated	\$ 74,677
c) Total FY90 Funds Available	\$ 87,996

Funds Costed to Date	\$ 25,288
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Funds Uncosted	\$ 62,708
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Recommended Adjustment to Complete (+/-)	\$ -0-
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Geochemistry

a) Prior Year Funds Uncosted	\$ 36,929
b) FY90 Funds Allocated	\$ 70,904
c) Total FY90 Funds Available	\$ 107,833

Funds Costed to Date	\$ 34,060
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Funds Uncosted	\$ 73,773
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Recommended Adjustment to Complete (+/-)	\$ -0-
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Thermohydrology

a) Prior Year Funds Uncosted	\$ 10,306
b) FY90 Funds Allocated	\$ 73,604
c) Total FY90 Funds Available	\$ 83,910

Funds Costed to Date	\$ 46,177
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Funds Uncosted	\$ 37,733
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Recommended Adjustment to Complete (+/-)	\$ -0-
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Seismic Rock Mechanics

a) Prior Year Funds Uncosted	\$ 34,857
b) FY90 Funds Allocated	\$ 105,311
c) Total FY90 Funds Available	\$ 140,168

Funds Costed to Date	\$ 65,257
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Funds Uncosted	\$ 74,911
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Recommended Adjustment to Complete (+/-)	\$ -0-
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Integrated Waste Package

a) Prior Year Funds Uncosted	\$ 47,047
b) FY90 Funds Allocated	\$ 135,504
c) Total FY90 Funds Available	\$ 182,551

Funds Costed to Date	\$ 15,453
Funds Uncosted	\$ 167,098

Recommended Adjustment to	\$ -0-
Complete (+/-)	

Notes:

- a) The current unspent amount from previous portions of each FIN.
- b) See "Total Contract Amount" in corresponding element page of the "Project Status Report."
- c) Sum of (a) and (b)
- d) Prior year Funds Uncosted, stated in the PMPR for Period 1 as "(a) Prior Year Funds Uncosted" reflects the expenditure of monies from this category of funding for those commitments outstanding in FY89 under the then current Elements/Projects.

3704-000 OVERALL

Element Status Cost Report

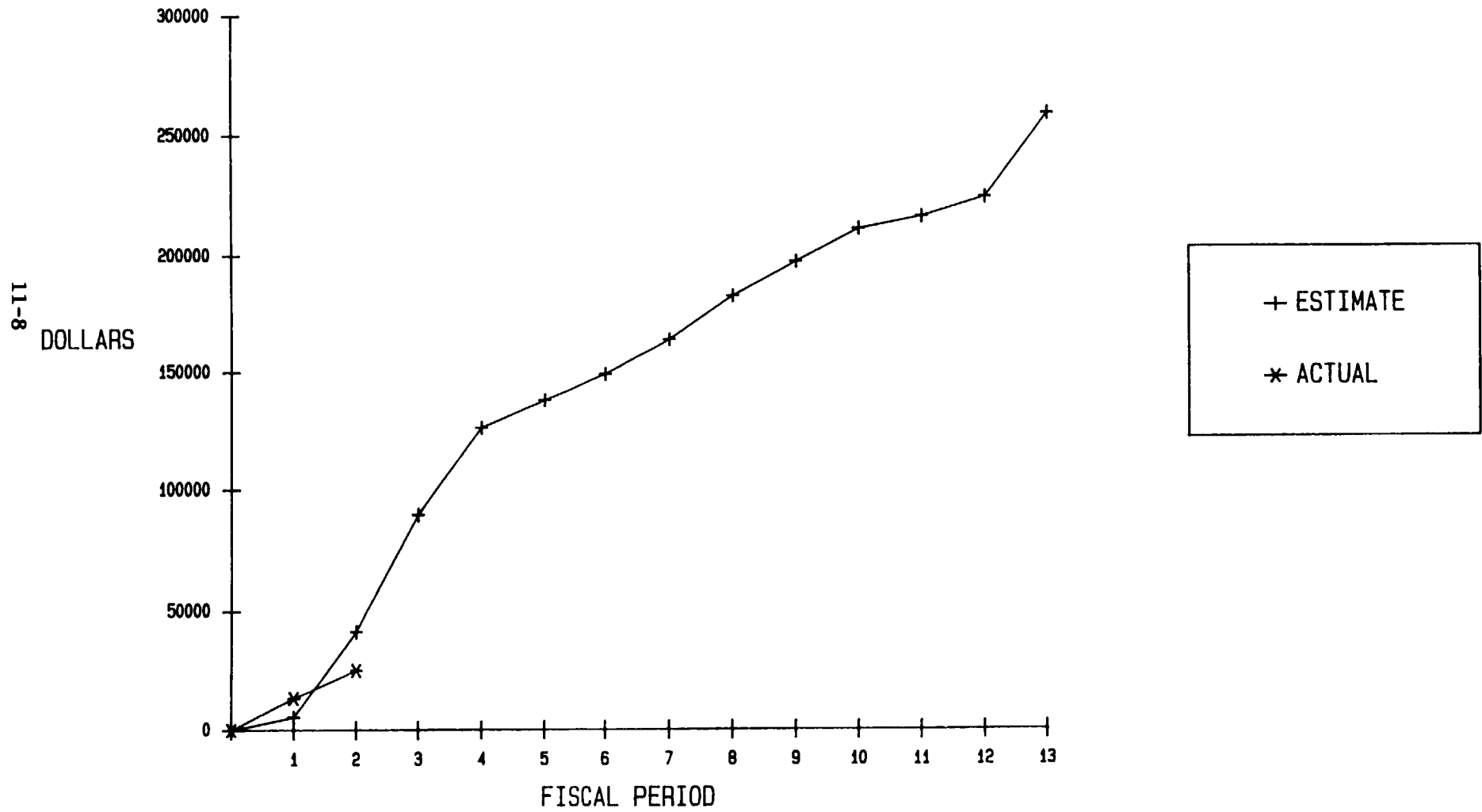
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	5491	36066	48114	36359	11733	11185	14787	18746	14624	13949	5076	8067	34459	258654
ACTUAL PERIOD COST	13507	11781	0	0	0	0	0	0	0	0	0	0	0	25288
VARIANCE, \$	-8016	24285	48114	36359	11733	11185	14787	18746	14624	13949	5076	8067	34459	233366
VARIANCE, %	-146.0	67.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.2
EST. FY CUMUL COST	5491	41557	89670	126030	137762	148947	163734	182480	197104	211053	216129	224195	258654	
ACTUAL FY CUMUL COST	13507	25288	25288	25288	25288	25288	25288	25288	25288	25288	25288	25288	25288	
PERCENT COMPLETE, %	0.052	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	0.098	
VARIANCE, \$	-8016	16268	64382	100741	112474	123659	138446	157192	171816	185765	190840	198907	233366	
VARIANCE, %	-146.0	39.1	71.8	79.9	81.6	83.0	84.6	86.1	87.2	88.0	88.3	88.7	90.2	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3704-000 OVERALL - FY 90

Estimate vs. Actual



3704-010

GEOCHEM

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	18219	19041	19041	17041	17041	19041	19041	18928	18928	18928	20928	18928	20684	245789
ACTUAL PERIOD COST	19634	14425	0	0	0	0	0	0	0	0	0	0	0	34060
VARIANCE, \$	-1415	4616	19041	17041	17041	19041	19041	18928	18928	18928	20928	18928	20684	211729
VARIANCE, %	-7.8	24.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	86.1
EST. FY CUMUL COST	18219	37260	56301	73341	90382	109423	128464	147392	166320	185249	206177	225105	245789	
ACTUAL FY CUMUL COST	19634	34060	34060	34060	34060	34060	34060	34060	34060	34060	34060	34060	34060	
PERCENT COMPLETE, %	0.080	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	0.139	
VARIANCE, \$	-1415	3200	22241	39282	56323	75363	94404	113332	132261	151189	172117	191046	211729	
VARIANCE, %	-7.8	8.6	39.5	53.6	62.3	68.9	73.5	76.9	79.5	81.6	83.5	84.9	86.1	

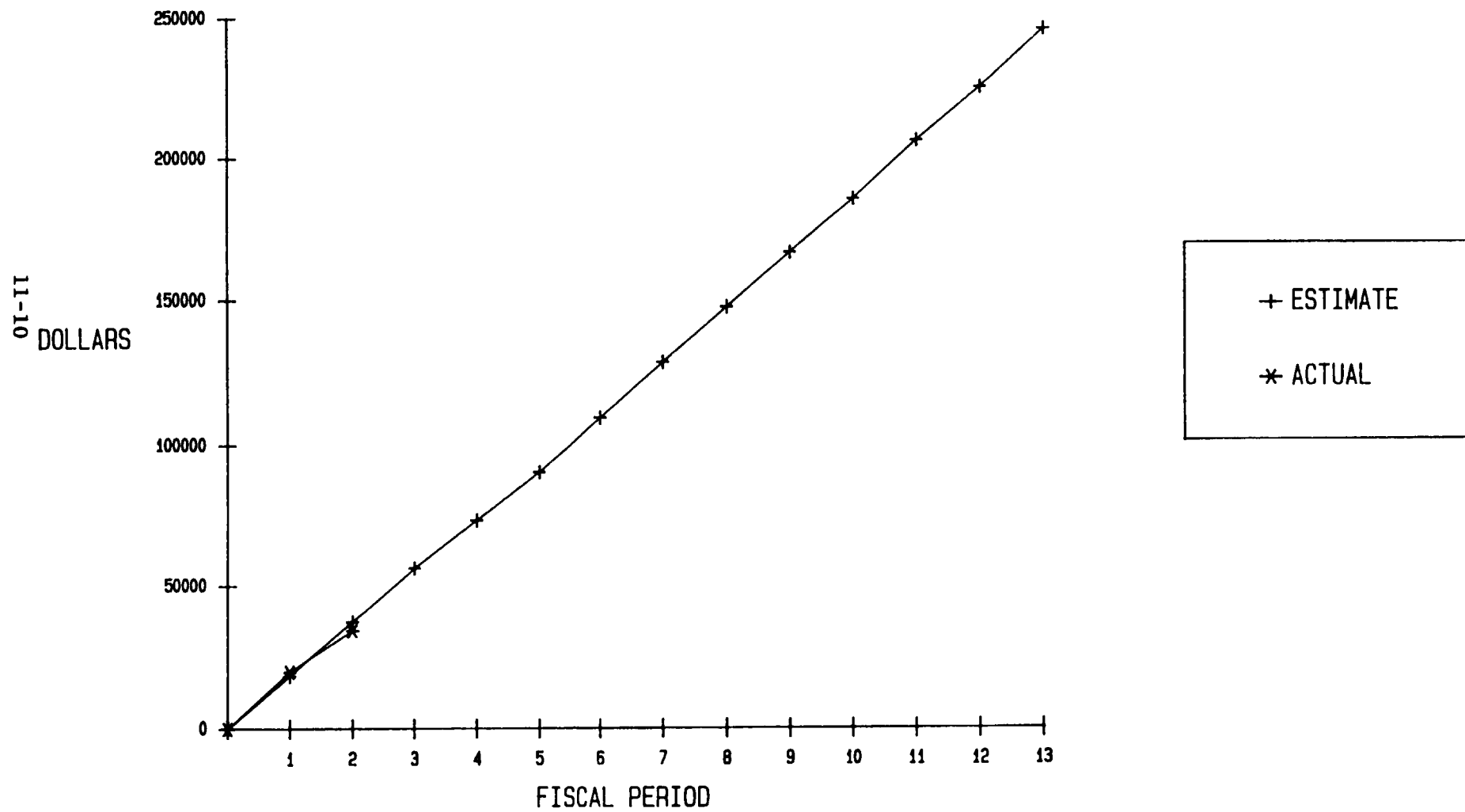
6-II

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3704-010 GEOCHEM - FY 90

Estimate vs. Actual



3704-020

THERMO

Element Status Cost Report

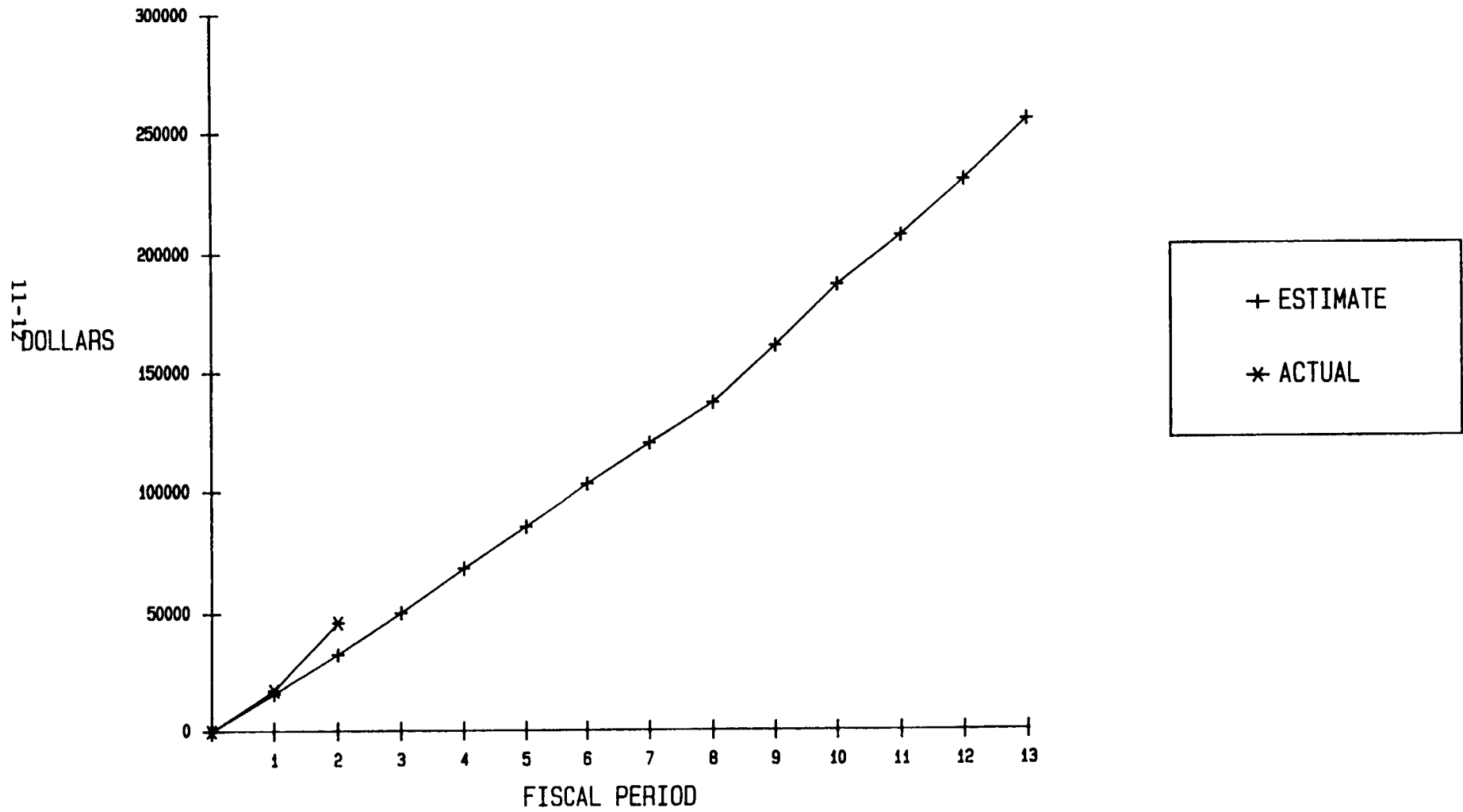
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	15938	16795	17511	18272	17067	17442	16982	17020	23977	25583	20807	22964	24971	255328
ACTUAL PERIOD COST	17324	28853	0	0	0	0	0	0	0	0	0	0	0	46177
VARIANCE, \$	-1386	-12058	17511	18272	17067	17442	16982	17020	23977	25583	20807	22964	24971	209151
VARIANCE, %	-8.7	-71.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	81.9
EST. FY CUMUL COST	15938	32733	50243	68516	85582	103024	120006	137026	161003	186586	207394	230357	255328	
ACTUAL FY CUMUL COST	17324	46177	46177	46177	46177	46177	46177	46177	46177	46177	46177	46177	46177	
PERCENT COMPLETE, %	0.068	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	0.181	
VARIANCE, \$	-1386	-13445	4066	22338	39405	56847	73829	90849	114826	140409	161216	184180	209151	
VARIANCE, %	-8.7	-41.1	8.1	32.6	46.0	55.2	61.5	66.3	71.3	75.3	77.7	80.0	81.9	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3704-020 THERMO - FY 90

Estimate vs. Actual



3704-030 SEISMIC

Element Status Cost Report

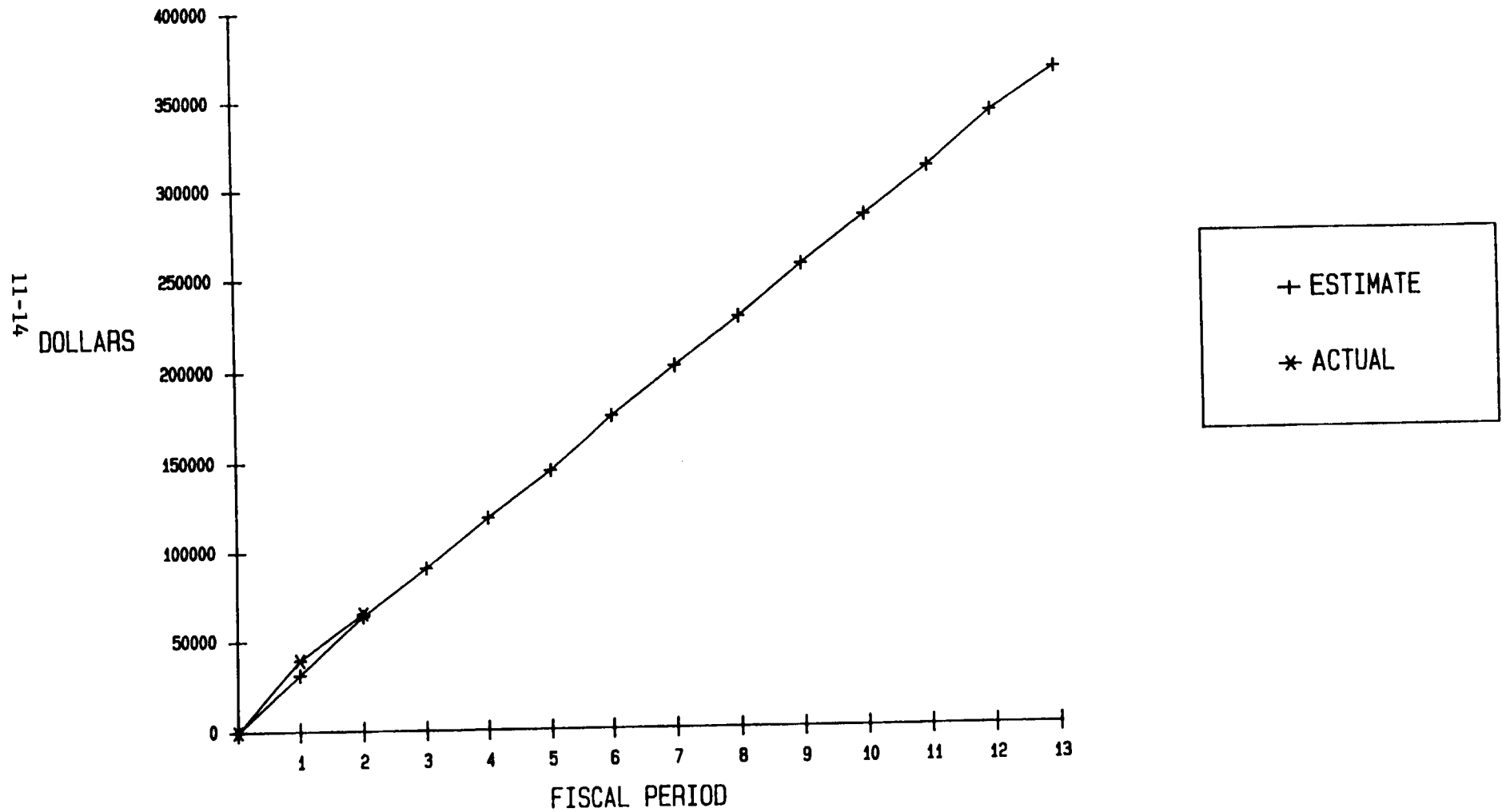
ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	31113	32745	26748	27748	25973	30038	26860	26172	28516	27376	26860	30995	23984	365127
ACTUAL PERIOD COST	39249	26008	0	0	0	0	0	0	0	0	0	0	0	65257
VARIANCE, \$	-8136	6737	26748	27748	25973	30038	26860	26172	28516	27376	26860	30995	23984	299871
VARIANCE, %	-26.1	20.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	82.1
EST. FY CUMUL COST	31113	63858	90606	118353	144326	174365	201225	227396	255912	283289	310149	341144	365127	
ACTUAL FY CUMUL COST	39249	65257	65257	65257	65257	65257	65257	65257	65257	65257	65257	65257	65257	
PERCENT COMPLETE, %	0.107	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	
VARIANCE, \$	-8136	-1398	25349	53097	79070	109108	135968	162140	190656	218032	244892	275887	299871	
VARIANCE, %	-26.1	-2.2	28.0	44.9	54.8	62.6	67.6	71.3	74.5	77.0	79.0	80.9	82.1	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

3704-030 SEISMIC - FY 90

Estimate vs. Actual



3704-040

WASTE PACKAGE

Element Status Cost Report

ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	TOTAL
ESTIMATED PERIOD COST	32092	36030	36030	37030	34030	37030	35143	36143	36143	35143	35143	37143	42401	469503
ACTUAL PERIOD COST	7456	7996	0	0	0	0	0	0	0	0	0	0	0	15453
VARIANCE, \$	24636	28034	36030	37030	34030	37030	35143	36143	36143	35143	35143	37143	42401	454050
VARIANCE, %	76.8	77.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	96.7
EST. FY CUMUL COST	32092	68122	104153	141183	175214	212244	247387	283530	319673	354816	389959	427102	469503	
ACTUAL FY CUMUL COST	7456	15453	15453	15453	15453	15453	15453	15453	15453	15453	15453	15453	15453	
PERCENT COMPLETE, %	0.016	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	
VARIANCE, \$	24636	52670	88700	125731	159761	196791	231934	268077	304220	339363	374506	411649	454050	
VARIANCE, %	76.8	77.3	85.2	89.1	91.2	92.7	93.8	94.5	95.2	95.6	96.0	96.4	96.7	

NOTES:

1. All Estimated and actual costs exclude award fee.
2. Estimates are taken from September 1989 Draft Operations Plan

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3704-040 WASTE PACKAGE - FY 90

Estimate vs. Actual

