

**PROJECT PLAN FOR VOLCANIC SYSTEMS
OF THE BASIN AND RANGE**

Prepared for

**Nuclear Regulatory Commission
Contract NRC-02-93-005**

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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

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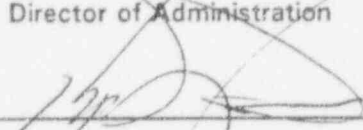
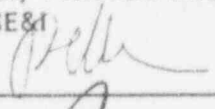
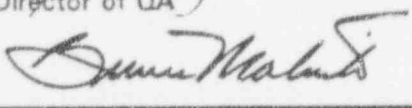
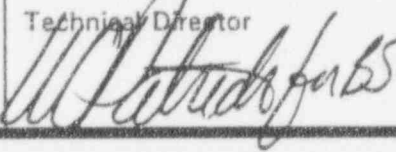
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EFFECTIVITY

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<u>Page No.</u>	<u>Change No.</u>	<u>Date Effective</u>
Title Page	6	03/15/94
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11 - 12A	6	03/15/94
13 - 13A	1	01/14/93
14	3	07/30/93
15	3	07/30/93
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**CENTER FOR NUCLEAR WASTE
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A-9 - A-15	4	09/25/93

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A well-organized compilation of data on volcanism and tectonics is essential to timely and effective development of regulatory guidance and to development of compliance determination and demonstration methods and technical review components. In Task 1 (Literature Review) of this project, the CNWRA staff will identify specific sources of pertinent data that may be dispersed throughout the DOE contractor system or widely disseminated in the literature. Task 2 (Data Compilation) will bring the key data together in an easily manageable database that will efficiently serve Task 4 modeling. Review of the literature, winnowing of the pertinent information, and compilation of this data into an easily accessible computer database will facilitate NRC analysis of alternative conceptual models of coupled volcanism and tectonics. Task 2 will take advantage of any organized databases that exist within the Yucca Mountain Project. However, the DOE is not presently considered to have an adequate database in this subject area, and one is not anticipated within a suitable timeframe for the development of effective guidance.

The database must facilitate the integration of large amounts of highly diverse geologic data in order to produce robust volcanic process models. A useful example of the type of model that needs to be developed involves the processes that control vent alignments in Basin and Range volcanic systems. Some of these alignments are regional in extent and are over 50 km in length. In addition, vent alignments are often on trend with regional structural features, but this relationship is poorly constrained. Several quantitative tools exist for statistical analysis of the development of vent alignments. These include two-point azimuth analysis and the Hough transform, both of which have significant implications for probability models. A comparison of recent work by Ho et al. (1991) and Crowe et al. (1992) clearly indicates that recognition of appropriate alignments and an understanding of their continuing development is critical to risk assessment. The database compilation will provide a straightforward means of evaluating various statistical methods for modeling spatial patterns in volcanism throughout the Basin and Range.

A persistent criticism of probability models developed to date to evaluate volcanic risk at the proposed repository site has been that these models have failed to incorporate known, or suspected, geological variations into risk assessment. One possible explanation for this lack of incorporation is that massive amounts of diverse geologic data are required to constrain volcanic processes. Systematic database development will be necessary to integrate the volcanological, geochemical, geological, and geophysical information necessary to constrain models quantitatively. For example, a first-order parent process in vent clustering within the Basin and Range may be one of partial melt generation, in which case comparison of geochemical and geochronological data between vent systems may provide insight into the likely longevity of active volcanic systems, such as Crater Flat. Tectonic control and consequent faulting may represent a second-order clustering process within the Basin and Range. Thus, structural and geophysical data must be integrated with geochronological and geochemical data to provide meaningful geological constraints on the development of vent alignments.

3.2.2.3 Activities

Existing databases will be reviewed to determine the best method and the most workable format for the computerized volcanic and tectonic database. (These databases include those of the National Geophysical Data Center, the National Technical Information Center, and the National Space Science Data Center.) A computerized data and information management system will be developed to allow efficient access to and display of compiled data, and the data will be compiled using this system.

Attendance at various meetings that have as a central topic the development and format of databases may be an activity for this task.

Results of this task will be presented in a technical report providing an overview of both the chosen data management system and the compiled database for volcanic and tectonic information from the Basin and Range Province. The report will contain a discussion about computerized compilation of the data, including descriptions of software and instructions for accessing and using the database.

3.2.3 Task 3: Critical Review of Compiled Volcanic and Tectonic Data for the Basin and Range Province

3.2.3.1 Objective

The objective of this task is to critically review the computerized compiled database produced from Task 2 for accuracy and completeness of data, including assessment of uncertainties related to collection of data, analytical methods, and assumptions made in existing models. A peer-review panel also will be convened to provide guidance on such matters at the data collection, modeling, and analog approaches used in this project and the closely related Field Volcanism Project.

3.2.3.2 Justification

Assessment of uncertainties and sources of uncertainties in the volcanic and tectonic database is critical for use of these data in alternative conceptual models that realistically represent the current volcanic/tectono-volcanic framework of the Basin and Range Province and the Yucca Mountain site region. Suitable models for analyzing volcanic processes and events cannot be prepared unless limitations imposed by uncertainties in the data are clearly understood and specified. Because the relationship between Basin and Range tectonics and volcanism is often highly subjective, a peer-review panel is needed to ensure that the proposed research will examine all volcano-tectonic models appropriate for the Basin and Range province. In addition, the peer-review panel will provide expert guidance on the focus and direction of the proposed research in this and the closely related Field Volcanism projects.

3.2.3.3 Activities

Methods for incorporating uncertainties into the database and into alternative conceptual models will be evaluated in this task. Existing conceptual models for volcanism and tectono-volcanism in the Basin and Range Province will be evaluated for suitability regarding how well they represent volcanic processes and events. These existing models will also be reviewed with due consideration for compatibility with the compiled database produced from Task 2. Because of the current controversy involving age dating of basaltic materials at the Lathrop Wells cone near Yucca Mountain (Champion, 1991; Turrin and Champion, 1991), special attention will be given to critical review of age determination techniques in relatively young tectono-volcanic terrains, with particular concern for specific limitations of each technique. Completion of Task 3 may result in some existing data or conceptual models being excluded from use in this research project, if it is determined that certain data or models have unacceptable uncertainties associated with them.

Results of this task will be presented in a technical report that provides an assessment of uncertainties in the database associated with collection of data, analytical methods, and assumptions made in existing models. The report will specifically address uncertainties in age determination techniques as applied to relatively young volcanic areas, and will indicate any conceptual models that may be suspect because of unacceptable uncertainties. Review of data and methods in the earlier tasks may alter the final approach used in the remaining tasks of this research project.

A panel of experts in the fields of Basin and Range volcanism, mafic eruption dynamics, and igneous petrology will be convened to review the research approaches in this project plan and the associated Volcanic Field Research Project Plan, accomplishments to date, and recommendations for future work. In addition, the peer-review panel will evaluate current volcano-tectonic models for the Basin and Range province and provide guidance as to which, if any, of these models have the resolution and accuracy necessary for application to the Yucca Mountain Region. The panel will also assess the applicability of analog volcanic studies in tectonic regions other than the Basin and Range province.

3.2.4 Task 4: Analysis of Database and Model Development

3.2.4.1 Objective

The objective of this task is to analyze the data from Task 3 for evidence of spatial and temporal correlations of Cenozoic (silicic and basaltic) magmatism/volcanism with extensional tectonism in the Basin and Range Province, determining if recognizable patterns of volcanism occur. Appropriate existing data will be incorporated into a coupled tectono-volcanic model (or models) for the Basin and Range Province.

3.2.4.2 Justification

Assessment to determine if Basin and Range Province volcanism occurs in any recognizable pattern in space and time is a singularly important step for addressing the issue of the likelihood of future renewed volcanism in the vicinity of Yucca Mountain and potential for disruption of a repository at that location. Understanding magmatic/volcanic processes and events, the spatial and temporal correlations

affecting these processes and events, and association of Cenozoic volcanism with extensional tectonics are key factors in the determination of the likelihood of future volcanism at or near Yucca Mountain. A coupled tectono-volcanic model (or models) for the Basin and Range Province will be one of the most useful tools that NRC staff can possess to review DOE information on likelihood of renewed volcanism. The coupled model(s) will be used to provide important input for development of credible tectono-volcanic scenarios for use in assessment of site performance through Iterative Performance Assessment.

Table 3-1 List of Deliverables and Completion Dates

Milestone Number	Milestone Type	Deliverable Description	Completion Date
122030	Major	Data Compilation/Software Report	01/15/94
123010	Intermediate	Age Dating Techniques Review Report	09/27/93
123020	Major	Data Review Results Report Including Uncertainties	1/15/95
124020	Major	Data Analysis/Model Development Report	4/25/95
125020-002	Major	Semi-Annual Report 1992 -- 2	02/12/93
125020-004	Major	Semi-Annual Report 1993 -- 1	08/13/93
125030-002	Intermediate	Semi-Annual Report 1993 -- 2	02/15/94
125030-004	Intermediate	Semi-Annual Report 1994 -- 1	08/12/94
125050	Intermediate	Peer Review Meeting on Volcanism	09/30/94
125040-002	Intermediate	Semi-Annual Report 1994 -- 2	02/17/95

4.5.3 Technical Interchange and Technology Transfer Meetings

Travel will be necessary for members of the research project team to meet with organizations or individuals possessing specific knowledge relevant to this research project. Travel in this category may be required to observe facilities and equipment, to become familiar with specific useful technical procedures, and to exchange technical ideas concerning concepts pertinent to the research project, including Appendix 7—type meetings with DOE subcontractors.

Table 4-1. Travel Requirements

Purpose/Destination	FY94	
	No. Trips	No. Man-days/Trip
TECHNICAL INTERCHANGE		
Geo-Logic Systems, Boulder	1	3
USGS Reston, Denver, Menlo Park	1	3
Washington, DC	1	1
San Antonio, TX	3	4
San Antonio, TX	1	5

Table A-1. Volcanism Estimated Spending Plan, FY94

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Center P1-4	612	408	612	612	406	612	408	408	612	408	612	408	612	5,737
Center P1-3	1,082	930	1,046	1,240	1,046	969	820	659	659	659	620	659	775	10,961
Center P1-2	1,859	1,887	1,856	2,289	1,887	1,794	1,392	1,454	1,361	1,454	1,361	1,454	1,299	21,345
Center P1-1	1,422	1,343	1,449	1,726	1,428	1,364	2,131	2,110	2,110	2,088	2,152	2,067	2,088	23,478
Center Tech	402	381	401	491	391	391	401	391	391	391	401	381	401	5,216
Center Clinical	319	329	318	401	318	329	318	318	329	318	318	329	318	4,263
Center Labor	5,694	5,277	5,683	6,759	5,478	5,459	5,271	5,340	5,461	5,319	5,465	5,297	5,494	71,997
Center Burden	2,488	2,306	2,483	2,954	2,394	2,385	2,303	2,334	2,387	2,324	2,388	2,315	2,401	31,463
Center Overhead	5,484	5,081	5,471	6,508	5,274	5,255	5,074	5,141	5,258	5,121	5,262	5,100	5,290	69,320
SwRI P1-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI P1-3	911	918	954	1,136	954	918	918	918	954	918	954	918	918	12,288
SwRI P1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI P1-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Labor	911	918	954	1,138	954	918	918	918	954	918	954	918	918	12,288
SwRI Burden	399	401	417	497	417	401	401	401	417	401	417	401	401	5,371
SwRI Overhead	1,519	1,529	1,591	1,896	1,591	1,529	1,529	1,529	1,591	1,529	1,591	1,529	1,529	20,484
ADP Services	292	728	292	757	811	209	728	291	724	728	292	728	292	6,872
Machine Shop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material/Supply	1,076	1,078	1,076	1,347	1,075	1,078	1,077	1,076	1,078	1,076	1,076	1,078	1,076	14,267
Quality Assur.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Report Services	415	413	416	519	413	416	415	416	413	415	416	413	416	5,497
Tphone & Tgram	2	1	2	2	2	1	2	2	1	2	2	1	2	22
Travel	0	0	0	1,242	0	0	7,419	0	0	1,242	0	0	0	9,903
Consultants	4,524	4,611	4,524	5,568	4,524	4,698	4,785	4,872	4,959	4,785	4,872	4,872	4,785	62,379
Clerk Prem Pay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Svcs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Est exd. CFC, Fee	22,806	22,343	22,910	29,187	22,934	22,349	29,922	22,319	23,243	23,859	22,735	22,653	22,604	309,863
Center CFC	359	333	358	426	345	344	332	337	344	335	344	334	346	4,538
SwRI CFC	104	105	109	130	109	105	105	105	109	105	109	105	105	1,401
Tot Estimate Cost	23,268	22,780	23,377	29,742	23,388	22,798	30,359	22,761	23,696	24,299	23,188	23,091	23,055	315,802
Fee	1,824	1,787	1,833	2,335	1,635	1,788	2,543	1,897	1,976	2,028	1,532	1,925	1,921	25,625
Tot Cost with Fee	25,092	24,567	25,209	32,077	25,022	24,586	32,902	24,658	25,672	26,327	25,121	25,017	24,976	341,427
% Completion	7.35%	7.20%	7.38%	9.40%	7.39%	7.29%	9.64%	7.22%	7.52%	7.71%	7.36%	7.33%	7.32%	100.00%
Cumulative Cost	25,092	49,659	74,869	106,946	132,169	156,754	189,657	214,314	239,986	266,313	291,434	316,451	341,427	
Cumul Completion	7.35%	14.54%	21.93%	31.32%	39.71%	45.91%	55.55%	62.77%	70.29%	78.00%	85.36%	92.68%	100.00%	

A-2

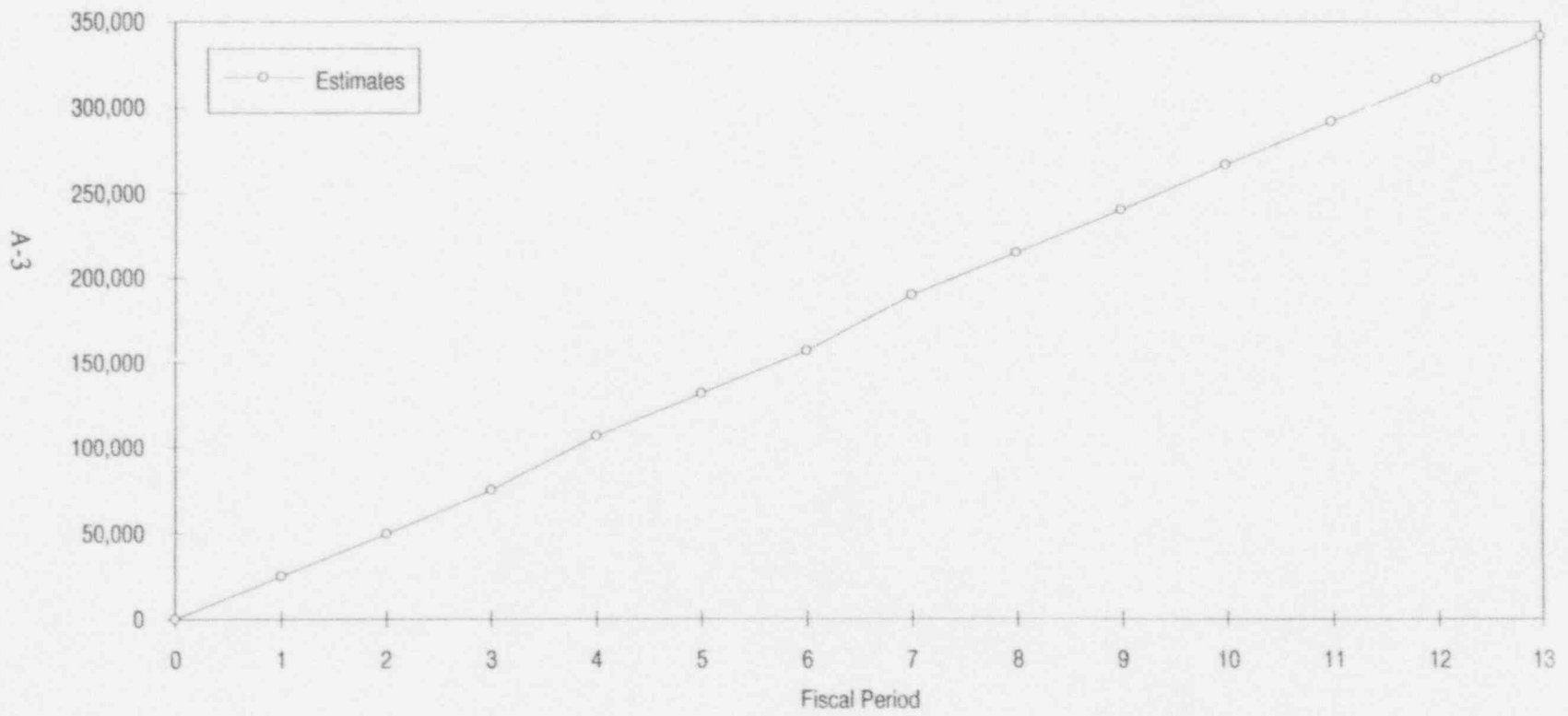


Figure A-1. Volcanism Estimated Spending Plan, FY94

Table A-2. Volcanism Estimated Labor Plan, FY94

	1	2	3	4	5	6	7	8	8	9	10	11	12	13	Total
Center Labor	12	8	12	12	8	12	8	8	8	12	8	12	8	12	132
Center PI-4	28	24	27	32	27	25	16	17	17	17	17	16	17	20	283
Center PI-3	60	61	60	74	61	58	45	47	44	44	47	44	47	42	680
Center PI-2	67	63	68	81	67	64	100	99	99	99	98	101	97	98	1,102
Center PI-1	40	38	40	49	36	39	40	39	39	39	39	40	38	40	500
Center Tech	31	32	31	39	31	32	31	31	31	32	31	31	32	31	415
Center Clerical	238	226	238	287	233	230	240	241	243	243	240	244	239	243	3,142
Total Center Labor															
SwRI Labor	1	2	3	4	5	6	7	8	9	10	11	12	13	Total	
SwRI PI-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SwRI PI-3	25	25	26	31	26	25	25	25	26	25	26	25	25	335	
SwRI PI-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SwRI PI-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total SwRI Labor	25	25	26	31	26	25	25	25	26	25	26	25	25	335	

Table A-3. Volcanism Task 2 Estimated Spending Plan, FY94

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Center P1-4	153	102	153	102	153	102	102	102	153	102	153	102	153	1,684
Center P1-3	77	39	77	77	77	39	0	0	0	0	0	0	0	387
Center P1-2	249	309	247	340	278	247	247	217	217	247	217	247	155	3,218
Center P1-1	467	469	490	554	469	469	469	469	469	448	480	469	469	6,221
Center Tech	291	281	291	361	291	291	291	291	291	291	291	291	291	3,812
Center Chemical	319	319	318	318	318	318	318	318	318	318	318	318	318	4,263
Center Labor	1,556	1,528	1,577	1,887	1,557	1,518	1,426	1,397	1,448	1,406	1,469	1,428	1,386	19,584
Center Burden	680	688	688	824	681	663	624	610	633	615	642	624	626	8,558
Center Overhead	1,499	1,472	1,519	1,816	1,499	1,461	1,374	1,345	1,394	1,354	1,414	1,375	1,334	18,856
SwRI P1-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI P1-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI P1-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI P1-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Labor	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Burden	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Overhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADP Services	83	0	83	0	83	0	515	0	83	0	83	0	83	1,013
Machine Shop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material/Supply	134	135	134	168	134	135	134	134	135	134	134	135	134	1,780
Quality Assur.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Report Services	52	51	52	65	51	52	52	52	51	52	52	51	52	685
Telephone & Togram	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Travel	0	0	0	0	0	0	1,522	0	0	0	0	0	0	1,522
Consultants	967	1,044	967	1,218	977	1,044	967	967	1,044	967	967	1,044	967	13,060
Cler Perm Pay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Svcs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Est matl. CFC, Fee	4,961	4,868	5,011	5,978	4,962	4,873	6,606	4,495	4,788	4,518	4,751	4,656	4,552	65,049
Center CFC	98	96	99	119	98	98	90	88	91	89	90	90	87	1,234
SwRI CFC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Estimate Cost	5,059	4,964	5,111	6,097	5,060	4,969	6,696	4,583	4,879	4,606	4,844	4,746	4,639	66,233
Fee	387	382	401	478	387	390	562	392	407	384	404	396	387	5,376
Total Cost with Fee	5,456	5,396	5,512	6,575	5,457	5,358	7,257	4,965	5,286	4,990	5,248	5,142	5,026	71,659
% Completion	7.40%	7.52%	7.69%	9.18%	7.62%	7.49%	10.13%	6.93%	7.36%	6.96%	7.32%	7.18%	7.01%	100.00%
Cumulative Cost	5,456	10,842	16,354	22,929	28,387	33,745	41,002	45,967	51,253	56,243	61,491	66,633	71,859	71,859
Cumulative Completion	7.40%	15.15%	22.82%	32.00%	39.61%	47.09%	57.22%	64.15%	71.52%	78.49%	85.81%	92.99%	100.00%	100.00%

Table A-4. Volcanism Task 3 Estimated Spending Plan, FY94

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Center PH-4	153	102	153	153	102	153	102	102	153	102	153	102	153	1,684
Center PH-3	193	155	194	194	194	155	0	0	0	0	0	0	0	1,084
Center PH-2	216	247	278	278	217	217	124	186	155	186	155	186	155	2,536
Center PH-1	212	192	213	256	213	192	916	938	916	916	916	916	874	7,671
Center Tech	111	100	110	130	100	110	110	100	110	100	110	100	110	1,405
Center Clinical	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Labor	885	797	887	1,011	806	827	1,252	1,326	1,334	1,304	1,334	1,354	1,292	14,379
Center Burden	387	348	388	442	361	361	547	579	583	570	583	570	565	6,264
Center Overhead	852	787	854	974	795	796	1,206	1,276	1,285	1,256	1,285	1,256	1,244	13,844
SwRI PH-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PH-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PH-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PH-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Labor	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Burden	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Overhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADP Services	0	0	0	432	0	0	0	0	0	432	0	0	0	864
Machine Shop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material/Supply	134	135	134	168	134	135	134	134	135	134	134	135	134	1,760
Quality Assur.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Report Services	52	51	52	65	51	52	52	52	51	52	52	51	52	685
Telephone & Tgram	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Travel	0	0	0	0	0	0	1,522	0	0	0	0	0	0	1,522
Consultants	967	1,044	967	1,218	967	1,044	1,305	1,305	1,305	1,305	1,305	1,305	1,218	15,225
Car Prem Pay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Svcs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Est excl. CFC, Fee	3,267	3,142	3,271	4,310	3,123	3,215	6,019	4,672	4,693	5,053	4,693	4,621	4,504	54,584
Center CFC	56	50	56	64	52	52	79	84	84	82	84	82	81	967
SwRI CFC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tot Estimate Cost	3,323	3,192	3,327	4,374	3,176	3,267	6,091	4,756	4,777	5,135	4,777	4,703	4,585	55,490
Fee	261	251	262	345	250	257	512	397	399	430	399	393	383	4,538
Tot Cost with Fee	3,585	3,443	3,589	4,718	3,425	3,524	6,603	5,153	5,176	5,565	5,176	5,096	4,968	60,029
% Completion	7.33%	5.74%	5.98%	7.21%	5.71%	5.87%	11.01%	8.58%	8.62%	9.27%	8.62%	8.49%	8.28%	100.00%
Cumulative Cost	3,585	7,028	10,617	15,335	18,761	22,285	29,894	34,047	38,223	44,789	49,964	55,060	60,029	60,029
Cumulative Completion	7.33%	11.71%	17.69%	25.59%	31.29%	37.12%	48.13%	56.72%	65.34%	74.61%	83.23%	91.72%	100.00%	100.00%

Table A-5. Volcanism Task 4 Estimated Spending Plan, FY94

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Center PI-4	153	102	153	102	153	102	153	102	153	102	153	102	153	1,684
Center PI-3	425	387	426	504	426	387	504	504	504	504	504	504	620	6,197
Center PI-2	961	867	969	1,144	969	867	1,144	773	742	742	742	742	742	11,044
Center PI-1	552	533	554	703	533	554	554	533	554	554	554	533	554	7,265
Center Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Chemical	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Labor	2,090	1,919	2,002	2,504	2,020	1,962	1,922	1,912	1,953	1,902	1,953	1,861	2,069	26,189
Center Burden	913	839	914	1,094	863	870	931	835	854	831	854	822	904	11,444
Center Overhead	2,013	1,848	2,014	2,411	1,945	1,917	1,831	1,841	1,890	1,831	1,890	1,811	1,992	25,216
SwRI PI-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PI-3	658	661	661	844	661	661	661	661	667	661	661	661	661	8,803
SwRI PI-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PI-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Labor	656	661	661	844	661	661	661	661	667	661	661	661	661	8,803
SwRI Burden	287	289	289	369	289	289	289	289	305	289	289	289	289	3,847
SwRI Overhead	1,094	1,101	1,101	1,407	1,101	1,151	1,101	1,101	1,162	1,101	1,101	1,101	1,101	14,675
ADP Services	209	728	209	325	728	209	213	291	641	296	209	728	209	4,965
Mechine Shop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material/Supply	453	453	452	567	452	453	453	453	453	453	452	453	453	6,000
Quality Assur.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Report Services	122	122	122	152	122	122	122	122	121	122	122	122	122	1,615
Telephone & Tigram	2	2	2	2	2	2	2	2	2	2	2	2	2	22
Travel	0	0	0	1,242	0	0	2,853	0	0	1,242	0	0	0	5,337
Consultants	1,566	1,566	1,566	1,914	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	1,566	20,706
Clear Prem Pay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Svcs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Est excl. CFC, Fee	9,405	9,526	9,422	12,832	9,768	9,181	11,824	9,072	9,633	10,296	9,089	9,434	9,368	128,650
Center CFC	132	121	132	158	127	126	120	120	123	120	123	119	130	1,651
SwRI CFC	75	75	75	96	75	75	75	75	80	75	75	75	75	1,004
Total Estimate Cost	9,611	9,722	9,629	13,086	9,970	9,382	12,019	9,268	9,836	10,481	9,287	9,628	9,574	131,504
Fee	752	752	754	1,027	781	734	1,005	771	819	875	773	802	796	10,651
Total Cost with Fee	10,364	10,485	10,383	14,113	10,752	10,116	13,024	10,039	10,655	11,356	10,060	10,430	10,370	142,156
% Completion	7.23%	7.36%	7.30%	9.93%	7.58%	7.12%	9.16%	7.06%	7.50%	8.00%	7.08%	7.34%	7.30%	100.00%
Cumulative Cost	10,364	20,849	31,232	45,344	56,096	66,212	79,236	86,275	99,930	111,297	121,356	131,786	142,156	
Current Completion	7.23%	14.67%	21.97%	31.90%	39.46%	46.58%	55.74%	62.80%	70.30%	78.29%	85.37%	92.70%	100.00%	

Table A-6. Volcanism Task 5 Estimated Spending Plan, FY94

	1	2	3	4	5	6	7	8	9	10	11	12	13	Total
Center PI-4	153	102	153	153	102	153	102	102	153	102	153	102	153	1,684
Center PI-3	387	349	349	465	349	387	116	155	155	116	155	155	155	3,293
Center PI-2	433	433	433	526	433	433	278	278	247	278	247	276	247	4,547
Center PI-1	191	149	192	213	192	149	192	170	170	170	192	149	192	2,322
Center Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Clerical	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Center Labor	1,163	1,033	1,127	1,357	1,076	1,123	688	706	726	706	709	685	747	11,844
Center Burden	508	451	492	593	470	491	301	308	317	308	310	299	327	5,176
Center Overhead	1,120	994	1,085	1,306	1,036	1,081	663	680	699	680	682	659	720	11,404
SwRI PI-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PI-3	255	257	294	294	294	257	257	257	257	257	294	257	257	3,485
SwRI PI-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI PI-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Tech	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SwRI Labor	255	257	294	294	294	257	257	257	257	257	294	257	257	3,485
SwRI Burden	112	112	128	128	128	112	112	112	112	112	128	112	112	1,523
SwRI Overhead	425	428	489	489	489	428	428	428	428	428	489	428	428	5,809
ADP Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machine Shop	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Material/Supply	355	355	356	444	355	355	356	355	355	355	356	355	355	4,707
Quality Assur.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Report Services	190	189	190	237	189	190	189	190	190	189	190	189	190	2,512
Tphone & Tgram	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Travel	0	0	0	0	0	0	1,522	0	0	0	0	0	0	1,522
Consultants	1,044	957	1,044	1,218	1,044	1,044	957	1,044	1,044	957	1,044	957	1,044	13,398
Old Prem Pay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary Svcs	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Est excl. CFC, Fee	5,173	4,777	5,205	6,067	5,080	5,061	5,474	4,080	4,129	3,992	4,202	3,941	4,180	61,381
Center CFC	73	65	71	86	68	71	43	44	46	44	45	43	47	746
SwRI CFC	29	29	33	33	33	29	29	29	29	29	33	29	29	397
Tot Estimate Cost	5,275	4,872	5,309	6,186	5,182	5,161	5,546	4,154	4,204	4,066	4,280	4,014	4,256	62,524
Fee	414	382	416	485	408	406	465	347	351	339	357	335	355	5,061
Tot Cost with Fee	5,689	5,254	5,726	6,671	5,588	5,567	6,012	4,501	4,555	4,406	4,637	4,349	4,611	67,585
% Completion	7.63%	7.77%	8.47%	9.87%	8.27%	8.27%	8.89%	6.66%	8.74%	6.52%	6.88%	6.43%	6.82%	100.00%
Cumulative Cost	5,689	10,943	16,669	23,339	28,928	34,515	40,526	45,027	49,582	53,987	58,624	62,973	67,585	
Cumul Completion	7.63%	16.19%	24.86%	34.53%	42.80%	51.07%	59.96%	66.62%	73.36%	79.88%	86.74%	93.18%	100.00%	

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