#### UNIVERSITY OF UTAH RESEARCH INSTITUTE

EARTH SCIENCE LABORATORY 420 CHIPETA WAY, SUITE 120 SALT LAKE CITY, UTAH 84108 TELEPHONE 801-581-5283

## MEMORANDUM

2 August 1982

Cal

TO: Susan Prestwich, Program Manager Department of Energy/DGE 550 2nd Street Idaho Falls, ID

FROM: Carl A. Ruscetta, Technical Program Coordinator

SUBJECT: State Coupled Resource Assessment Program Review of Kansas Final Report and Deliverables Status Contract DE-A**5**07-79ET 27204, Mods. 001 thru 006

A copy of the final Project Report for the subject contract work was received at ESL on July 26, 1982 and has been reviewed with respect to the satisfaction of deliverable requirements.

This final report consists of Volume I, Text (3 sections) and Volume II, Appendices (5 sections). A copy of the Title, Index, Introduction and Abstract pages of the report are attached to this letter, together with the updated contract summary.

Please note that the Ks geothermal map, printing bid opening was on July 30 and printing and distribution is expected to be completed by early September, 1982. The completion of Dr. David Blackwell's work (SMU subcontract; Task 4 Mod 005) is expected to be completed in July and August, 1982, and the results added to the geothermal gradient data base prior to the contract completion date of September 20, 1982. Geothermal Map distribution and the addition of the final Blackwell data will essentially complete the subject contract requirements.

A. Ruscetta

CAR:gm enclosures cc: Don Steeples ASSESSMENT OF THE GEOTHERMAL RESOURCES OF KANSAS

VOLUME I - TEXT FINAL REPORT

Submitted to the Geothermal Division of the U.S. Department of Energy ٠

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Don W. Steeples and Sandra A. Stavnes, editors Don W. Steeples, Principle Investigator Kansas Geological Survey Lawrence, Kansas

June, 1982

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KS FINAL REPORT

CHECK TOPICS AGAINST CONTRACT DELIVERABLES.

# INTRODUCTION

The purpose of this research is to provide a regional assessment of the geothermal energy potential for Kansas, using both of geological and geophysical information. In addition to evaluation of low temperature geothermal resource areas for the state, information obtained on the geology of the Precambrian basement rocks may provide the basis for future geological and geophysical studies for the Midcontinent.

#### METHOD OF INVESTIGATION

This report includes the following regional geological and geophysical studies:

- 1a establishment of a geothermal gradient data base from approximately 45,000 bottom hole temperatures recorded from well logs and interpretation of this data in terms of regional geology,
- 1b establishment and interpretation of a second data base of geothermal gradients from thermal logging data from 144 "holes of opportunity" in the state under the auspices of Dr. Don Steeples and Sandra Stavnes of the Kansas Geological Survey,
- 2 detailed evaluation of heat flow and geothermal potential for Kansas on the basis of data from nine holes carried out under the auspices of Dr. David Blackwell and John Steele of Southern Methodist University,
- 3 development of a thermal conductivity probe that could be used both in situ and in the laboratory by Dr. Marios Sophocleous and Mitchell Hall of the Kansas Geological Survey,
- 4 aquisition and analyses of aeromagnetic and gravity (southeastern Kansas) data for Kansas carried out under the auspices of Dr. Harold Yarger and George Lam (gravity) of the Kansas Geological Survey,
- 5 paleomagnetic investigation of two Precambrian basement cores from KGS-USGS observation holes located in northeastern Kansas carried out under the auspices of Dr. Ken Kodama of Lehigh University,
- 6 evaluation of the silica geothermometer technique with special consideration for the postulated heat flow anomaly in northwestern Kansas (Swanberg and Morgan, 1979) carried out under the auspices of Dr. Don Whittemore and Nelda Roehl of the Kansas Geological Survey.

Abstracts for these studies follow:

GEOTHERMAL GRADIENT VALUES FOR KANSAS FROM BOTTOM HOLE TEMPERATURES AND THERMAL LOGGING DATA

A United States Department of Energy sponsored geothermal resource survey for the State of Kansas was undertaken in 1979. This paper is a partial summary of that survey. The purpose of this study was to investigate the subsurface temperature distribution for the state and to explain any geographic variation observed.

Geothermal gradient values are extrapolated from bottom hole temperatures recorded on oil and gas well logs. These gradients are used to delineate general geothermal trends which were examined in the field by thermal logging. The results of the thermal logging indicate that geothermal gradients for the state range from 25  $^{\circ}$ C/Km to 55  $^{\circ}$ C/Km.

Variations in the geothermal gradient data for Kansas appear to be controlled by:

- 1) topography of the crystalline basement surface
- 2) variations in rates of heat production in the crystalline basement, presumably, but not necessarily, resulting from variations in basement rock type
- 3) variation in thermal conductivity in the sedimentary section.
- 4) possible convection eastward and upward from the Denver-Julesberg Basin.

The effects of factor 1 are most evident statewide (i.e., thousands of square miles) whereas those for factors 2, 3 and 4 are evident over smaller areas for which factor 1 is essentially invariant.

-2-

### HEAT FLOW AND GEOTHERMAL POTENTIAL OF KANSAS

Temperature, thermal conductivity measurements and heat flow values are presented for four holes originally drilled for water resources investigations by the U.S. and Kansas Geological Surveys. These holes cut most of the sedimentary section and were cased and allowed to reach temperature equilib-Several types of geophysical logs were also run for these holes. rium. Temperature data from an additional five wells are also presented. Temperature gradients in the sedimentary section vary over a large range (over 4:1), and there are significantly different temperatures at the same depth in different portions of the state. Temperatures as high as 34°C occur at a depth of 500 m in the south-central portion of the state and 28°C or lower in other parts of the state. In addition to cuttings measurements, thermal conductivities were estimated from geophysical well log parameters; the results are useful and more use of the technique is suggested. Using these results geophysical well logs can be used to predict temperatures as a function of depth in areas for which no temperatures are available if heat flow is assumed. The extreme variation in gradients observed in the holes occur because of the large contrast in thermal conductivity values. Shale thermal conductivity values appear to have been overestimated in the past and the Paleozoic shales in Kansas have thermal conductivity values of about 1.18 + 0.03  $Wm^{-1}K^{-1}$ . On the high side, evaporite and dolomite units have thermal conductivities of over 4  $Wm^{-1}K^{-1}$ . In spite of the large variations of gradient the heat flow values throughout the holes do not vary more than 10 per cent and any water flow effects which might be present due to the lateral motion on any of the aquifers are less than 10 per cent. The best estimates for heat flow

-3-

in the four holes come from the carbonate units below the base of the Pennsylvanian and the values range from 48 mWm<sup>-2</sup> to 62 mWm<sup>-2</sup>. Two of the holes were drilled to basement and correlation of the heat flow with the basement radioactivity suggests that the heat flow-heat production line postulated for the Midcontinent by Roy et al (1968a) applies to these data. Because of the low thermal conductivity of the shales the radiogenic pluton concept should apply to the Midcontinent. Thus if very radioactive plutons can be identified, much higher temperatures may occur in the sedimentary section than has been thought possible in the past. However, the past overestimation of shale conductivity values suggests that some previous high heat flow values in the Midcontinent are probably not correct and the high gradients are merely due instead to normal heat flow and very low thermal conductivity values. In spite of its presence in the Midcontinent region there could be significant use of geothermal energy in Kansas for space heating, thermal assistance and heat pump applications because the temperatures in the sedimentary section in much of Kansas are in excess of 40°C.

# DEVELOPMENT OF A LOW COST THERMAL CONDUCTIVITY PROBE

Low cost thermal conductivity probes were developed that could be used <u>in situ</u> and in the laboratory. These cylindrical type probes were calibrated by comparing thermal conductivity measurements obtained in Ottawa sand to those available for Ottawa sand in the literature. Cylindrical probes are most suited for soft rock thermal conductivity measurements where the probe can be inserted into the sediments with little effort. However, it was found that reliable measurements were obtained in the laboratory from dolomite core from the Arbuckle Group. A hole was drilled in the center of the core the

-4-

diameter of the probe and the probe was inserted. Thermal conductivity measurements obtained were compatible with those obtained by Blackwell and Steele (Chapter 3, this report) for similar dolomite samples from the Arbuckle Group in Kansas.

# REGIONAL INTERPRETATION OF KANSAS AEROMAGNETIC DATA

The Kansas Geological Survey has completed a 72,000 line kilometer aeromagnetic survey of the state. The total intensity magnetic field contour map, along with spectrally filtered versions, provide a better understanding of basement composition and paleotectonics within the state.

The magnetic data indicate that the southern part of the Proterozoic Central North American Rift System (CNARS) does not terminate in central Kansas but continues along a southeastern trend to at least the Oklahoma border. Some of the current seismicity within the state appears to be correlated with reactivated faults within CNARS.

There are indications of a distinct (paleoplate?) boundary between the 1600-1700 m.y. old mesozonal granitic terrane to the north and the 1400 m.y. old epizonal granitic terrane to the south.

There are numerous highly magnetic shallow granitic plutons, several known from drilling to be 1350 m.y. old, embedded in the older granitic crust in northeastern Kansas.

## PALEOMAGNETIC RESULTS FROM THE OSAWATOMIE CORE AND BIG SPRINGS CORE, KANSAS

Paleomagnetic studies of nine independently oriented samples from a core drilled into the Precambrian basement rocks at an aeromagnetic high near Osawatomie, Kansas and four samples from a basement core drilled at

-5-

a separate aeromagnetic high near Big Springs, Kansas suggest that these rocks are magnetic enough to produce the observed total field anomalies. The characteristic directions derived from Zijderveld plots of the alternating field demagnetization data have inclinations (Osawatomie I =  $-20.5^{\circ}$ , Big Springs I =  $51.5^{\circ}$ ) which agree reasonably well with the radiometric ages (1355 m.y.b.p.) for these rocks based on Irving and McGlynn's (1976) apparent polar wander path for the North American Precambrian. The difference in mean inclinations for the two cores, however, does suggest that there may be a 50-80 m.y. difference in the cooling age of the two intrusive bodies. Steep NRM inclinations in most of the Osawatomie samples and some of the Big Springs samples suggest the presence of an IRM in the rocks which may have been acquired during drilling. This could indicate that the <u>in situ</u> NRM intensity for the Osawatomie core may be less than the measured NRM intensity by a factor of two.

### GRAVITY MEASUREMENTS IN KANSAS

Approximately 16,000 new gravity measurements have been taken in Kansas in recent years. The average spacing in eastern Kansas is one mile east-west by four miles north-south and in western Kansas is one mile eastwest by two miles north-south. Bouger gravity maps of the first 6000 points reveal numerous basement related anomalies not apparent in the earlier statewide Bouger gravity map (Woolard, 1958). A new gravity map of entire eastern Kansas will be completed by fall, 1982. Approximately 15,000 additional measurements will be taken in western Kansas during the next two years with a new map expected in 1984. These new data are proving very useful in the study of basement lithology and tectonics.

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GEOTHERMAL MAPPING OF WESTERN KANSAS BASED ON CHEMICAL GEOTHERMOMETERS

Geothermal temperatures were computed from five chemical geothermometers for approximately 1,200 irrigation well waters from the broad, unconsolidated aquifers in the western two-thirds of Kansas. The chalcedony and Na-K-Ca geothermometers gave the most reasonable temperatures, although ranging widely between 3-88°C. Higher temperatures computed from both equations were distributed throughout northwestern Kansas and extended into the west-central part of the state. Quartz and Na/K geothermometer temperatures were unreasonably high and many temperatures from a Na-K-Ca geothermometer modified for carbon dioxide were below  $0^{\circ}C$ . The correlation between chalcedony geothermometer temperature and subsurface temperatures at 300 meters derived from thermal logging of boreholes is statistically highly significant; the correlation coefficient is 0.68. However, the geochemistry of sediments in the aquifers, which are less than 200 meters in depth, is probably a much more important control on dissolved silica and cation concentrations than temperatures underneath the aquifers. The Pliocene strata of the Ogallala aquifer generally contain a greater percentage of volcanic ash than the Pleistocene sediments across Kansas. Larger deposits of silicified rock cemented with opal, (derived from ash leaching), occur more frequently in the northern part than elsewhere in the Ogallala Formation of western Kansas. The greater volumes of ash and opal, (containing silica more soluble than chalcedony and quartz), give rise to the higher silica concentrations in groundwaters of northwest and parts of west-central Kansas. Leaching

-7-

of the potassium-rich ash and feldspar in the Ogallala aquifer could also explain a similar distribution of higher ratios of dissolved potassium to higher total dissolved solids.

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# ASSESSMENT OF THE GEOTHERMAL RESOURCES OF KANSAS

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# VOLUME II - APPENDICES FINAL REPORT

Submitted to the Geothermal Division of the U.S. Department of Energy

Don W. Steeples and Sandra A. Stavnes, editors Don W. Steeples, Principle Investigator Kansas Geological Survey Lawrence, Kansas

June, 1982

VOLUME II - APPENDICES TABLE OF CONTENTS

PAGE

# KANSAS GEOLOGICAL SURVEY

### Office of the Director

Environmental Geology and Geophysics Section 913-864-4991

1930 Avenue "A", Campus West The University of Kansas Lawrence, Kansas 66044 913-864-3965

November 18, 1982

Carl Ruscetta University of Utah Research Institute 420 Chipeta Way, Suite 120 Salt Lake City, Utah 84108

Dear Carl:

Enclosed is Dave Blackwell's final report for his subcontract on our contract #DE-AS07-79ET27204.

As per your memo of 2 August 1982 to Susan Prestwich, this completes our contractural obligation. We will continue to send you updated versions of maps and publications related to geothermal energy.

Thank you for your assistance and cooperation on this project for the past couple or three years. It has immensely enhanced our knowledge of Kansas geological, geophysical, and geothermal attributes.

Singerely,

Don W. Steeples, Chief Environmental Geology Geophysics Section

DWS:ep Enc.

cc: Susan Prestwich Leon Lehr Marshall Reed Carolyn Hallenbeck

# TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

by

David D. Blackwell

and

John L. Steele

Department of Geological Sciences Southern Methodist University Dallas, Texas 75275

Final Report for Kansas State Agency Contract #949

November, 1982

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## TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

Precise temperature logs were made in seven deep holes in the state of Kansas and one deep hole in Oklahoma near the southwestern corner of Kansas for this contract. Equipment used consisted of a semi-conductor temperature sensor logging tool connected electrically to the surface and recorded digitally. The precision of the temperature recording is approximately  $\pm 0.001^{\circ}$ C and the accuracy is  $\pm 0.1^{\circ}$ C. The temperatures were digitized at either 1 or 0.5 meter intervals.

The locations of the holes which were logged are shown in Figure 1 along with holes which were logged during a previous contract (Blackwell and Steele, 1981). The data from the previous contract have been discussed in some detail and heat flow values calculated. The purpose of this contract was to obtain additional supplemental deep temperature logs. These logs were obtained in shutin oil wells so there is not an extensive data base of logs and cuttings available as was the case with the four USGS Water Resources Division holes which were the primary focus of the study by Blackwell and Steele (1981). Temperature-depth plots and .5 meter interval gradient plots for the holes which were logged are shown in Figure 3-10. The detailed data digitized at .5 meter intervals can be obtained from either the Kansas Geological Survey, University of Kansas, 1930 Avenue A<sub>1</sub>, Campus West, Lawrence, Kansas, or SMU Geothermal Laboratory, Southern Methodist University, Dallas, Texas 75275.

In order to give some estimation of the subsurface temperatures in Kansas, temperatures at a depth of 500 meters from the deep holes were contoured as shown in Figure 2. There are two areas of higher temperature: the southeastern part of the state and the northwestern part of the state. These temperature variations are related to the lithologic section present in each place and not to subsurface fluid motions. Whether or not there are variations in the contribution from basement radioactivity to the surface heat flow and temperatures has not yet been deciphered as there is not enough data on either the heat flow or the basement to make such an assessment. The high gradients in the southeastern part of the state are in the area where the Pennsylvanian section is thick. The Pennsylvanian section is composed of a sequence of thin limestone and much more abundant shales with some lignite and sand. The lignite and shale have low thermal conductivities and thus for an average heat flow, higher than average gradients. In the Paleozoic rocks below the Pennsylvanian, gradients decrease drastically because the thermal conductivity of the predominantly limestone and dolomite section is much higher so the higher gradients characteristic of the upper 500 meters will not persist all the way to the basement. In areas where the Pennsylvanian is thin or is buried beneath a thick Permian section, the temperatures at 500 meters are somewhat lower. The Pennsylvanian section is thin in the extreme eastern part of the state whereas it is deeply buried in most of the central part of the state. The Permian section is predominatly sand and evaporites with only a minor amount of shale. The mean gradients are quite low because of the very high thermal conductivity of the sand and evaporitic rocks. In the far western part of the state, the temperatures increase to the highest values seen because of the presence of the low conductivity Cretaceous shale sequence. Temperatures in the Dakota aquifer in this part of the state will be in the order of 40° to 50°C. Below the Cretaceous section the thick sequence of Permian rocks will have fairly low gradients so temperatures will not increase as rapidly. Below the Permian rocks, high gradient will occur again in the underlying Pennsylvanian rocks. So temperatures in the lower Paleozoic carbonate aquifers of western Kansas may be well above those required for low temperature applications. However, the great depth of these carbonate aquifers may make exploitation not cost effective.

# Reference

Blackwell, D.D. and J.L. Steele, Heat flow and geothermal potential of Kansas, USDOE Report, 69, 69 p., 1981.



FIGURE 1. Index map of sites of published heat flow values (solid circles), sites of holes discussed in Blackwell and Steele (open circles), and sites of holes logged for this contract (X's).

# TEMPERATURES AT 500 METERS

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FIGURE 2. Isotherms at 500 meters. Temperatures are in °C.









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FIGURE 5



FIGURE 6



FIGURE 7

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TASK	PERCENT COMPLETE	PRESENT ACTIVITY	REMARKS
Geothermal Resources Map for Kansas	' 98	Final corrections on proof.	Final revision sent to NOAA in April, 1982.
<i>Log temperatures in holes</i>	75	Reducing data.	Blackwell will log several holes greater than 400 meters deep, in July.
Geothermal assessment for Kansas: Final Report	60 done done	Components of final report: 1. Blackwell and Steele (Heat Flow and geothermal potential for Kansas) 2. Kodama (Paleomagnetic re- sults from Qsawatomie core and Big Springs core, Kansas)	Expected completion date in early June, 1982.
	done done	3. Whittemore (Geochemical analysis of water in western Kansas) 4. Yarger (Interpretation of aeromagnetic data for Kansas) 5. Stavnes (Portion of thesis including geothermal gradient data from bottom hole temper- atures and logging)	Expected completion by middle of May, 1982. Wh Finel Report
	døne done	<ul> <li>6. Yarger (Interpretation of gravity data. Technical and report in preparation).</li> <li>7. Sophocleous (Development of a low-cost thermal conductivity probe).</li> <li>8. Introduction and Regional Geology.</li> </ul>	Expected completion by middle of May, 1982. IN Final Report
5-13-82		9. Assessment and prognosis.	7/29 Final report recid.
			7/26182 and Reviewed

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#### UNIVERSITY OF UTAH RESEARCH INSTITUTE

EARTH SCIENCE LABORATORY 420 CHIPETA WAY, SUITE 120 SALT LAKE CITY, UTAH 84108 TELEPHONE 801-581-5283

#### MEMORANDUM

December 14, 1982

TO: Susan Prestwich, Program Manager

FROM: Carl A. Ruscetta, Technical Program Coordinator

SUBJECT: State Coupled Low-Temperature Resource Assessment Program Completion of Deliverables Requirements - Kansas State Team Contract DE-AS07-79ET27024, Mods 001 thru 006.

Enclosed is the updated contract summary for the referenced Kansas contract. A copy of the transmittal letter and cover page of a report, "Temperature Logs of Deep Holes in Kansas" by D. D. Blackwell and J. L. Steele is also enclosed. This report describes work done on sub-contract for the Kansas Geological Survey in connection with the DOE state-coupled program, and it represents the final deliverable due on the Kansas contract. The final project report for the subject contract was received at ESL on July 26, 1982 (see C. Ruscetta letter of August 2, 1982 to S. Prestwich). The Kansas geothermal map was printed and distributed during September, 1982.

In my opinion, all requirements of DOE contract DE-AS-07-79ET27024 with the Kansas Geological Survey have been met in a fully satisfactory manner.

CAR:jp

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enclosure

cc: D. Foley

# TEMPERATURE LOGS OF DEEP HOLES IN KANSAS

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by

David D. Blackwell

and

John L. Steele

Department of Geological Sciences Southern Methodist University Dallas, Texas 75275

Final Report for Kansas State Agency Contract #949

November, 1982

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# KANSAS GEOLOGICAL SURVEY

## Office of the Director

Environmental Geology and Geophysics Section 913-864-4991

1930 Avenue "A", Campus West The University of Kansas Lawrence, Kansas 66044 913-864-3965

November 18, 1982

Carl Ruscetta University of Utah Research Institute 420 Chipeta Way, Suite 120 Salt Lake City, Utah 84108

Dear Carl:

Enclosed is Dave Blackwell's final report for his subcontract on our contract #DE-AS07-79ET27204.

As per your memo of 2 August 1982 to Susan Prestwich, this completes our contractural obligation. We will continue to send you updated versions of maps and publications related to geothermal energy.

Thank you for your assistance and cooperation on this project for the past couple or three years. It has immensely enhanced our knowledge of Kansas geological, geophysical, and geothermal attributes.

Singerely, Don W. Steeples, Whief

Environmental Geology Geophysics Section

DWS:ep Enc.

cc: Susan Prestwich Leon Lehr Marshall Reed Carolyn Hallenbeck

STATE: Kansas						
ORGANIZATION:	Kansas Geolog	ical Survey		PHONE:	913-864-	4991
PRINCIPAL INVEST	LIGATOR/CONTAG	CT: Don Stee	eples/Sandy Sta	avnes		
	E ACOZ ZOETOZ		DATE	0.16.17		······
CONTRACT NO.: D	E-ASU/-/9E12/	204	UAIE:	≈ 8/6//	9	
EST. COMPLETION	: 3/31/80	(	ORIGINAL AMOUN	T OBLIGAT	TED DOE:_	\$85,642
				CONT	RACTOR:_	6,251
					TOTAL:	\$91,893
MODIFICATIONS:					AMOUNT	-
NUMBER	DATE	DESCRIPT	TION	DOE		CONTRACTOR.
001 4/1/80:	N.C.T.E. to 8	3/30/80				
002 4/1/80:	T.E. to 3/31/	81. Add Tas	ks	\$123.8	35	
003 7/8/80:	List Governme	ent Propery (	\$34,960)	_		
004 4/10/81:	N.C.T.E. to f	5/15/81.		-		
005 9/22/81:	Add Tasks. 1	<b>I.E.to</b> 6/30/8	2. Inc. Funds	\$164,0	09	\$22,301
006 5/5/82:	N.C.T.E. to S	9/20/82				
			TOTALS	\$373,4	86	\$22,301
					\$395,78	37
				<u> </u>		· .

# DELIVERABLE STATUS:

TASK NO.	DESCRIPTION	DATE DUE	RECEIVED
1A/Mod 0:	Revise and Update KS Geoth. Grad. Map	3/31/80	6/15/82
B/Mod O:	Conduct Aeromag. Survey. Northwest KS.	3/31/80	11
C/Mod 0:	Correlate major geol. feature w/geoth. anomalies	<ul> <li>3/31/80</li> </ul>	11
D/Mod 0:	Design/Construct thermal conductivity probes	3/31/80	11
2 /Mod 0:	Coop. w/USGS-2 research holes into Arbuckle		
	Formation Basement - assess hydroth, potential	3/31/80	
1/Mod 2:	Statewide Thermal Gradient Map	3/31/81	11
_2/Mod 2:	Statewide Contour Map - Aeromag Study interprete	d. 3/31/81	8
3/Mod 2:	Gravity Survey 2-3000 points. Southeastern KS.	3/31/81	11
4/Mod 2:	Tabulate Geochem, data, Analyze new samples	3/31/81	11
5/Mod 2:	Provide Data to GEOTHERM	3/31/81	11
6/Mod 2:	Reports per DOE Form CF-537		
Mod 4 N	.C.T.E. to	- 6/15/81	11
(Cont'd or	n P. 2)		
	CONTRACT COMPLETION D	ATE:	

TOTAL FUNDS EXPENDED DOE:

CONTRACTOR:\_\_\_\_\_

TOT	ΛL	
101		•

STATE: Kansas

# DELIVERABLES STATUS (CONT'D)

TASK NO.

DESCRIPTION

DATE DUE DATE RECEIVED

1/Mod 5: Thermal Gradient Studies: Log wells in

Southwestern and Northwestern KS. 6/30/82 6/15/82 Gravity Surveys: Northwestern corner KS 2/Mod 5: and extention of FY80 work in Southcentral KS. 6/30/82 11 Survey Geochemical Data on file. Complete 3/Mod 5: FY80 analysis. 6/30/82 11 Coop. with SMU: Temp. meas. on holes too deep 4/Mod 5: for KS equipment. Complete HT Flow/Grad. work. 6/30/82 See below 5/Mod 5: Geothermal User Map w/NOAA Assistance See below 6/30/82

Final Report: "Assessment of the Geothermal Resources of Kansas" Volume I, Text (3 Sections) and Volume II - Appendices (5 sections), Steeples, D.A. and Stavnes, S.A., Editors, Kansas Geological Survey, Lawrence, KS, June, 1982. Received June 15, 1982, at ESL and DOE/Idaho Falls, ID.

KS Geothermal Map, Task 5 Mod 005, Bid Opening 7/30/82. To be printed and distributed early September 1982. Map printed and distributed Sept. 1, 1982

Map printed and distributed Sept. 1, 1982 Task 4 Mod 005: Blackwell work (SMU Sub-contract) to be completed July and August 1982 and added to data base prior to 9/20/82 contract completion date. Report received Dec. 1, 1982

All deliverable requirements satisified 12/1/82

C. A. Ruscetta

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KANSAS

COPY COMPLETE FILE

12/7/81. NEED MOD 004 Copy ALSO OF JUN 30 82 Z MOD 5 NExtension to COMPLETION 06-30-82 NCTE TO 09-20-82 MOD 006

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MP 28 1979



Lite M. S. S. Kana

Kansas Geological Survey University of Kansas 103 Avenue, "A", Campus West Lawrence, Kansas 66044

Attention: Don W. Steeples

Subject: SUBCONTRACTING FOR HEAT FLOW MEASUREMENTS - SRC NO. DE-AS07-79ET27204

#### Gentlemen:

This confirms September 10, 1979 telephone discussions regarding the subcontracting of the heat flow measurements for the recovery and analysis of core from two deep boreholes in Kansas. We noted in your original proposal that this work was to be performed by Dr. David Blackwell of the Southern Methodist University and DOE's acceptance of your unsolicited proposal was in part based on heat flow measurement as proposed. Any deviation from this proposal must have DOE's prior approval. You are reminded that Article A-II, Paragraph (d) requires submission of all subcontracts and consultant agreements to DOE for review and approval.

Very truly yours,

# Original Signed by J. P. Anderson

J. P. Anderson, Chief Contract Administration Branch Contracts Management Division

bcc: L. L. Mink

CNB CAB KRHastings:ak RTNelson RD LLMink CAB JPAnderson

# RECEIVED

AUG 7 1979

GEOTHERMAL ENERGY BRANCH

# AES - (373

bcc w/encl: L. L. Mink J. P. Anderson Mary Parks

Kansas Geological Survey University of Kansas 103 Avenue "A", Campus West Lawrence, Kansas 66044

Attention: Don W. Steeples

Subject: SPECIAL RESEARCH CONTRACT NO. DE-AS07-79ET27204

Gentleman:

We are enclosing three copies of the subject contract which have been signed on behalf of DOE. If satisfactory to you, please have the three copies signed by an authorized official of the University, have this signature witnessed by two persons, affix your legal seal, and return two fully executed copies to this office. The third fully executed copy is for your retention.

All consultant agreements and subcontracts must be submitted to this office for review and approval prior to execution.

In accordance with applicable statutes and DOE regulations (41 CFR 9-9.109-6), the University has the right to request within 30 days of the effective date of this contract an advance waiver of all or any part of the rights of the United States in subject inventions.

Please complete two copies of the attached Form DOE 538 and return to this office for submission to the Oak Ridge Technical Information Center. Reports should be numbered in accordance with the attached instructions.

J. P. Anderson, Chief of the Contract Administration Branch, and his designee, R. T. Nelson, will administer this contract, and all questions should be directed to Mrs. Nelson on telephone 208-526-1498.

Very truly yours, Control a product by Real Concepting

Nick C. Aquilina, Assistant Manager for Administration

Enclosures: As stated

CNB KRHastings:mh LDAnderson 8/2/79 CAB JPAnderson CMD/AMA NCAquilina

#### CONTRACT BETWEEN

#### KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

#### AND

#### THE DEPARTMENT OF ENERGY

THIS AGREEMENT, entered into the day of 1979 by and between the UNITED STATES OF AMERICA (hereinafter called the "Government"), acting through the DEPARTMENT OF ENERGY (hereinafter called "DOE"), and KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS (hereinafter called the "Contractor") an organization of the State of Kansas, with its principal office at Lawrence, Kansas 66044;

#### WITNESSETH THAT:

WHEREAS, DOE desires to have the Contractor perform certain research work, as hereinafter provided; and

WHEREAS, this contract is authorized by Section 302(c)(5) of the Federal Property and Administrative Services Act of 1949, as amended, and the Department of Energy Organization Act of 1977 (Public Law 95-91), and other applicable laws;

NOW, THEREFORE, the parties hereto agree as follows:

#### ARTICLE I - THE RESEARCH TO BE PERFORMED

A. The Contractor shall, to the best of its ability, furnish personne facilities, equipment, materials, supplies, and services, except such as are furnished by the Government, necessary for the performance of the research provided for in Appendix A hereto, and shall perform the research and report thereon pursuant to the provisions of this contract. It is understood that Appendix A, a guide to the performance of this contract, may be deviated from by the Contractor subject to the specific requirements of this contract.

B. This work shall be conducted under the direction of Don W. Steeples or such other member(s) of the Contractor's staff as may be mutually satisfactory to the parties.

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### ARTICLE II - THE PERIOD OF PERFORMANCE

No Augle,

The period of performance under this contract shall commence on the "entered into" date and expire on March 31, 1980. Performance may be extended for additional periods by the mutual written agreement of the parties.

#### ARTICLE III - CONSIDERATION

A. In full consideration of the Contractor's performance hereunder, DOE shall furnish the equipment, supplies, materials, and services, if any, listed in Article A-II B., and pay the Contractor the sum of Eighty-Five Thousand Six Hundred Forty-Two Dollars (\$85,642.00) [\$65,642 for Task A-1(a)(1) and \$20,000 for Task A-1(a)(2)], hereinafter called the "Support Ceiling," which sum shall be subject to adjustment as hereinafter provided. The Contractor will pay direct labor, fringe benefits and applicable indirect costs for full-time Kansas Geological Survey staff for Task A-1(a)(1). DOE will pay all other costs of performance of Task A-1(a)(1) and of Task A-1(a)(2) as identified in Article A-II.

B. Payments to the Contractor shall equal the "Cumulative Support Cost" of the performance of this contract, as the term "Cumulative Support Cost" is defined in Article B-V of Appendix B; Provided, however, and notwithstanding any other provisions of this contract, that the Government's monetary liability under this contract shall not exceed the Support Ceiling specified in paragraph A. above. DOE shall not pay more than the Support Ceiling or an amount equal to the Cumulative Support Cost, whichever is less. The Contractor shall be obligated to perform under this contract throughout the agreed-upon period of performance, and to bear all costs which DOE has not agreed to pay; Provided, however, that the Contractor shall have the right to cease to perform the research provided for in this contract, upon written notice to DOE to that effect, at any time when or after the Cumulative Support Ceiling.

C. The Support Ceiling specified in paragraph A. above, may be increased unilaterally by DOE by written notice to the Contractor and may be increased or decreased by written agreement of the parties (whether or not by formal modification to this contract). In the event the stated period of contract performance is extended, the Support Ceiling may be revised to reflect any increased DOE support for the extended period or periods.

D. Upon termination, or expiration of the total period of performance, the Contractor shall promptly refund to DOE (or make such disposition as DOE may in writing direct) any sums paid by DOE to the Contractor under this contract, through direct payment or under letter of credit, in excess of the Cumulative Support Cost incurred in performance under the contract.

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## ARTICLE IV - GOVERNMENT PROPERTY

The following items of property procured or fabricated by the Contractor are hereby listed as "Government property":

Intelligent Graphics Terminal10,000Borehole Thermal Logger5,000\$15,000

## ARTICLE V - ADDITIONAL CONTRACT PROVISIONS

Appendix B attached hereto and made a part hereof, sets forth additional general contract provisions of this contract.

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the day and year first above written.

THE UNITED STATES OF AMERICA

BY THE DEPARTMENT OF ENERGY

By

J, P. Anderson, Chief, Contract Administration Branch Contracts Management Division Idaho Operations Office Contracting Officer

-3-

\_\_\_\_\_

KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

Witnesses as to signature of Contractors:

(Name Typed)

Title

(Business Address)

Ву \_\_\_\_\_

(Signature)

Name (typed)

(Address)

(Signature)

Name (typed)

(Address)

I, \_\_\_\_\_\_, certify that I am the \_\_\_\_\_\_\_ of the Contractor named under this document, that \_\_\_\_\_\_\_, who signed this document on behalf of the Contractor, was then \_\_\_\_\_\_\_, duly signed for and in behalf of said Contractor; that said document was governing body, and is within the scope of its legal powers.

. IN WITNESS WHEREOF, I have hereunto affixed my signature and the seal of

said Contractor this \_\_\_\_\_ day of \_\_\_\_\_ 1979.

(SEAL)

071279

-4-

CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

re Aug 's, 1929 APPENDIX A

For the contract period from the "entered into" date through March 31, 1980.

#### Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

(a) The scope of work under this contract is unclassified, and the Contractor under this contract with the Department of Energy will perform research consisting of the following:

- (1) Assess the geothermal resources of Kansas by:
  - A. Revising and updating the geothermal gradient map of Kansas;
  - B. Conducting an aeromagnetic survey of Northwest Kansas;
  - C. Conducting a preliminary correlation of major geologic features with geothermal anomalies; and
  - D. Designing and constructing thermal conductivity probes.
- (2) Cooperate with the USGS to drill and core two research holes into basement to analyze the hydrothermal potential of the Arbuckle Formation in Kansas.

Article A-II - WAYS AND MEANS OF PERFORMANCE

(a) The items to be supported and source of support include the following:

Task $A-1(a)(1)$	DOE	Contractor	Total
Salaries	\$ 6,000	\$ 3,634	\$ 9,634
Fringe Benefits			
17% salaries, 7%			
summer, 0.5% school			
year	342	618	960
Indirect cost @ 55% of salaries	3,300	1,999	5,299
Travel	3,500		3,500
Van - mileage @ 20¢/mi	3,500		3,500
Equipment:			
Borehole Thermal Logger	5,000		5,000
Intelligent Graphics Terminal	10,000		10,000

# Contract No. DE-AS07-79ET27204 Appendix A, Page 2

## Article A-II - WAYS AND MEANS OF PERFORMANCE (Cont'd)

Task $A-l(a)(l)$ (Cont'd)	DOE	Contractor	<u>Total</u>
Expendable parts and componen temperature and heat flow	ts of		
apparatus	\$ 5,000		\$ 5,000
Subcontracts:			
Aeromagnetic survey	25,000		25,000
Geothermal Data Points	<u>6,000</u> \$65,642	\$ 6,251	<u>6,000</u> \$71,893
<u>Task A-1(a)(2)</u>			
Subcontracts:			
Douglas County hole:			
Rig time	\$ 1,500		\$1,500
Contractual coring Summer County hole:	2,750		2,750
Rig time	3,000		3,000
Contractual coring	2,750		2,750
Heat flow measurements	<u>10,000</u> \$20,000	چه دلین منه منطقه این را ب منه دلین منه	<u>10,000</u> \$20,000
TOTAL	\$ <u>85,642</u>	\$ <u>6,251</u>	\$ <u>91,893</u>

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

#### None

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

#### None

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

#### Article A-III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix A is \$85,642.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in

Contract No. DE-AS07-79ET27204 Appendix A, Page 3

## Article A-III - FUNDING (Cont'd)

this Appendix A, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix is \$85,642.00.

The estimated DOE Support Cost is funded as follows:

(a) Estimated unexpended balance from prior period(s) \$ -0-

(b) New funds for the current period

\$85,642.00

#### Article A-IV - ADMINISTRATION AND REPORTS

 (a) Principal Investigator - Don W. Steeples Kansas Geological Survey University of Kansas Lawrence, Kansas Telephone: (913) 864-4991
 Technical Administrator - Dr. Leland L. Mink (DOE's Project Manager) DOE-ID Energy & Technology Division Resource Definition Branch Telephone: (208) 526-0638

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to the Technical Administrator in accordance with Appendix D, DOE Form CR-537, which is made a part hereof by this reference.

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ACORESSEES:	NO. OF REPORT COPIES	SPECIAL INSTRUCTIONS
Dr. Gerald P. Brophy Program Manager DOE/Division of Geothermal Energy M/S 3122C, 20 Massachusetts Avenue, NW Washington, D.C. 20545		1 1
S. M. Hansen, Chief Management Coordination Branch DOE/Div. of Program Resource Management M/S 404, 600 E. Street, NW Washington, D.C. 20545		1 1
L. L. Mink, Resource Engineer Resource Definition Branch Energy and Technology Division U.S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, Idaho 83401	2 2 2	2 10
Judith A. Florance Geothermal/EES Support Section Division of Resource Management M/S 3122C U.S. Department of Energy Washington, D.C. 20545		

CENERAL SERVICES ADMINISTRATION AMENDER T OF SOLICI	TATION/MODIFICATE OF CONTRACT
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Department of Energy	
Idaho Operations Office	File M. 2.21
550 Second Street	
Idaho Falls, ID 83401	6005 L
NAME AND ADDRESS	AMENDMENT OF
Kansas Geological Survey	DATED(See black 9)
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Goder 103 Avenue "A", Campus West	CONTRACT/ORDER NO. DE-AS07-79E127204
Lawrence, Kansas 60044	8/15/79
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or ener, previded such telegram or letter makes reference to the solicitation and this am	andmont, and is received prior to the opening hour and date specified.
0 ACCOUNTING AND APPROPRIATION DATA (1/ required)	
THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS	
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Modification No. A002 (Cont'd) Supplemental Agreement to Contract No. DE-AS07-79ET27204

(c) <u>ARTICLE III - CONSIDERATION</u>, paragraph A. is hereby revised to increase the contract Support Ceiling by One Hundred Twenty-Three Thousand Eight Hundred Thirty-Five Dollars (\$123,835.00) to a new total Support Ceiling of Two Hundred Nine Thousand Four Hundred Seventy-Seven Dollars (\$209,477.00).

#### (d) ARTICLE IV - GOVERNMENT PROPERTY is revised to read as follows:

"The following items of property procured or fabricated by the Contractor are hereby listed as 'Government property':

Intelligent Graphics Terminal	\$10,000
Borehole Thermal Logger	5,000
Gravimeter	20,000
	\$35,000"

(e) <u>ARTICLE VI</u> - <u>DATE OF INCURRENCE OF COSTS</u> is hereby added to the contract work added by this Supplemental Agreement:

#### "ARTICLE VI - DATE OF INCURRENCE OF COSTS

The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed \$37,500 on or after April 1, 1980, which, if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

Modification No. A002 (Cont'd) Contract No. DE-AS07-79ET27204

# CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

#### APPENDIX A1

For the contract period April 1, 1980 through March 31, 1981

#### Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

1.

(a) The scope of work under this modification is unclassified, and the Contractor under this modification will perform research consisting of the following:

- (1) Thermal Gradient Map Data accumulated during FY'79 will be field checked for accuracy and finalized for the production of a State-wide thermal gradient map. "Holes-of-Opportunity" will be measured for heat flow and thermal gradients throughout this modification period.
- (2) <u>Aeromagnetic Studies</u> Data collected during FY'79 will undergo data reduction, and a State-wide contour map will
   be produced. A report of the preliminary interpretation of the aeromagnetics for Western Kansas will be completed.
- (3) <u>Gravity Survey</u> A gravity survey consisting of 2,000 -3,000 points will be conducted in Southeastern Kansas over an area of approximately 10,000 square miles. These data will be reduced and contoured at the 1 milligal level on a preliminary map of the study area. Preliminary interpretations of the gravity data will be presented in the final report for this work.
- (4) <u>Geochemistry</u> A tabulation of existing geochemical information will be performed. Emphasis will be placed on the extraction of useful information for the geothermal assessment in the State. Additional water samples will be collected, where attainable, and analysed during this period. A preliminary interpretation of the State-wide geochemical expression, as it relates to the location of geothermal resources, will be produced.
- (5) <u>USGS GEOTHERM</u> File This file will be updated on all significant geothermal information of the State of Kansas.
  - (6) <u>Reporting Requirements</u> Reports will be prepared and submitted in accordance with DOE Form CF-537, which is attached.

# Article A-II'- WAYS AND MEANS OF PERFORMANCE

(a)	Items	to	Ъe	supported	and	source	of	support	include	the	following:
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	DOE	KGS	Total
(1) Salaries, Wages and Benefits			
Steeples - 10% FTE - 1 yr. Yarger - 10% FTE - 1 yr. Sophocleous - 10% FTE - 1 yr. Macfarlane - 10% FTE - 1 yr. Spitz - 10% FTE - 1 yr. Rothe - 2 months FTE	\$ 4,450	\$ 2,400 2,400 2,000 1,700 2,400	
Grad. Res. Asst. (geology) """ (computation) """ (heat flow) """ (magnetics) """ (gravity)	6,000 6,000 6,000 6,000 6,000		
Electronics Technician Student hourly, summer gravity survey	7,500 2,000		
Benefits (17% professionals, 7% GRA summer, 0.5% GRA school yr.)	2,059	1,853	
Subtotal	\$46,009	\$12,753	\$58,762
(2) <u>Computation</u>			
Aeromagnetic data processing Gravity data processing Thermal map data processing	\$ 8,000 1,000 3,000		
Subtotal	\$12,000		12,000
(3) <u>Capital Equipment</u>			
Gravimeter	\$20,000		
Subtotal	\$20,000		\$20,000

Article	A-II	WAYS AND MEANS OF PERFORMANCE (Cont'd	)		
	*		DOE	KGS	<u>Total</u>
	(4)	Travel			
		Mileage at 20¢/mi (gravity and heat flow surveys) In-State per diem (\$28/day) Out-of-State (transportation + \$38-\$50/day)	\$ 5,000 4,480 <u>4,000</u>		
		Subtotal	\$ 13,480		\$ 13,480
	(5)	Miscellaneous			
		Maintenance supplies, expendable materials, repairs Publication	\$2,000 2,000		
		repairs	2,000		
		Subtotal	\$6,000		6,000
	(6)	Indirect Costs (calculated at 34% of Total, except capital equip-			
		ment item)	\$ 26,346		26,346
		TOTAL	\$123,835	\$12,753	\$136,588

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

#### None

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

#### None

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

Article A-III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix Al is \$123,835.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in this Appendix Al, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix Al is \$123,835.00.

The estimated DOE Support Cost is funded as follows:

(a) Estimated unexpended balance from prior period(s) \$ -0-

(b) New funds for the current period \$123,835.00

# Article A-IV - ADMINISTRATION AND REPORTS

(a)	Principal Investigator -	Don W. Steeples Kansas Geological Survey University of Kansas Lawrence, Kansas 66044 Telephone: (913) 864-4991
	Technical Administrator - (DOE's Project Manager)	Margaret A. Widmayer DOE-ID Energy & Technology Division Resource Definition Branch Telephone: (208) 526-1466

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to the Technical Administrator in accordance with the attached DOE Form CR-537.

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SSUED BY	CODE	6. ADMINISTERED BY (If other th	un bioch s)	CODE	
U. S. Department of Idaho Operations Of	fice			•	
550 Second Street				, M. 2	
Idaho Falls, Idaho	8340T				
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			DATED 0/1	<u>)//9</u> (See bla	ek 11)
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AMERIDMENT/MODIFICAT	ION NO.	2. EFFECTIVE DATE	J. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. (If upplica	hle)
M004	CODE		A ADMINISTERED BY (If other than block a	CODE	
U. S. Departm Idaho Operati 550 Second Si Idaho Falls.	nent of Energy ions Office treet Idaho 83401	L			
CONTRACTOR	CODE	FACI	LITY CODE		****
NAME AND ADDRESS				IDMENT OF	
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Street, city,	nsas Geological ivencity of Kans	Survey	DATE	D (See block	9) 70570700
and ZIP 10	3 Avenue "A" Can	npus West	CON CON	FICATION OF UE-ASU/-	/9E12/204
Lav	vrence, Kansas (	56044	1	8-15-79	
				D (See block	11)
9 THIS BLOCK APPLIES ON	LY TO AMENDMENTS OF SOLI		······································		······································
Otterars must acknowlede	solicitation is amended as set for a receipt of this amendment pri	rm in block 12. The h ior to the hour and date	our and date specified for receipt of Offers is i specified in the solicitation, or as amended, by one	of the following methods:	
fatility signing and returnin	ngcopies of this amenda	nent; (b) By ocknowledgir	ng receipt of this amendment on each copy of th	e offer submitted; or (c) By separate	letter at telegram
which includes a reference DATE SPECIFIED MAY RE	te to the solicitation and among SULT IN REJECTION OF YOUR	oment numbers. FAILURE OFFER, If, by virtue a	E OF YOUR ACKNOWLEDGEMENT TO BE RECEIV f this amendment you desire to change an offer al	ED AT THE ISSUING OFFICE PRIOR T ready submitted, such change may be	made by telegran
or letter, provided such to	elegram or letter makes reference	te to the solicitation and	this amendment, and is received prior to the open	ing hour and date specified.	
ACCOUNTING AND AF	A CONTRACTOR DATA (1) FEQUI	((C))			
1 THIS BLOCK APPLIES OF	NLY TO MODIFICATIONS OF	CONTRACTS/ORDERS			
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ED. PROC. REG. (41 CFR) 1-16.101	ENDMENT OF SO	LICITATION/MODIFIC	ATION OF CON	ITRACT 1 2
AMENDMENT/MODIFICATION NO. A005	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUES 07-81ET27204.505	T NO. 4. PROJEC	T NO. (If applicable)
Source of Energy of Energy daho Operations Office 50 Second Street daho Falls, Idaho 83401	о <i>D</i> ЕУ	6. ADMINISTERED BY ( If other the	m block 5)	CODE
CONTRACTOR CODE NAME AND ADDRESS Kansas Geolog University of dreet, city, unty, state, do 21p de // Lawrence, Kan Dissipation of the solicitation of the solicitation of the above numbered solicitation is amended as Offerors must acknowledge receipt of this amended and returningcopies of this of which includes a reference to the solicitation and DATE SPECIFIED MAY RESULT IN REJECTION OF ACCOUNTING AND APPROPRIATION DATA (((	FACIL ical Survey Kansas ", Campus West sas 66044 * SOLICITATIONS a set forth in black 12. The hor out prior to the hour and date su senandment numbers. FAILURE "FOUR OFFER. If, by virtue of forence to the solicitation and th recovered.	UTY CODE	8. AMENDMENT OF SOLICITATION NO DATED MODIFICATION OF CONTRACT/ORDER NO CONTRACT/ORDER NO B-15-79 DATED ers is extended is r ed, by one of the offer submitted BE RECEIVED AT THE ISSUIN on offer already submitted, bit to the opening hour and date	
THIS BLOCK APPLIES ONLY TO MODIFICATIONS         (a)       This Change Order is issued pursuant to The Changes set forth in block 12 are me         (b)       The above numbered contract/order is n         (c)       X         This Supplemental Agreement is entered It modifies the above numbered contract a         DESCRIPTION       OF AMENDMENT/MODIFICATION	to OF CONTRACTS/ORDERS	e/onder. No changes (such as changes in payin Public Law 95-91,	and other app and other app	etc.) set forth in plack 12.
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Modification No. A005 Supplemental Agreement to Contract No. DE-AS07-79ET27204 Page 2 of 2

- (c) <u>Article III CONSIDERATION</u>, paragraph A. is hereby revised to increase the contract Support Ceiling by One Hundred Sixty-Four Thousand Nine Dollars (\$164,009.00) to a new total Support Ceiling of Three Hundred Seventy-Three Thousand Four Hundred Eighty-Six Dollars (\$373,486.00).
- (d) Article IV GOVERNMENT PROPERTY is revised to add the following:

40 Mbyte Disc Drive for Tektronix 4052 Digitizer Table for Tektronix 4052

(e) <u>Article VII</u> - <u>DATE OF INCURRENCE OF COSTS</u> is hereby added to the contract work added by this Supplemental Agreement:

"Article VII - DATE OF INCURRENCE OF COSTS

The Contractor shall be entitled to reimbursement for costs incurred in an amount not to exceed \$75,000 on or after May 7, 1981, which, if incurred after this modification had been entered into, would have been reimbursable under the provisions of this modification."

Modification No. A005 (Cont'd) Contract No. DE-AS07-79ET27204

## CONTRACTOR: KANSAS GEOLOGICAL SURVEY, UNIVERSITY OF KANSAS

#### APPENDIX A5

For the contract period April 1, 1981 through June 30, 1982.

Article A-1 - RESEARCH TO BE PERFORMED BY CONTRACTOR

(a) The scope of work under this modification is unclassified, and the Contractor under this modification will perform research consisting of the following:

# Task 1 - Thermal Gradient Studies

Wells in southwestern and northeastern Kansas will be logged for thermal gradient data to add to the data base for the thermal gradient work for the state. Once these measurements have been collected, the thermal gradient work for the state will be essentially complete. All gradient information will be published on maps showing temperatures throughout the state at a depth of 300 meters below the surface. Maps showing temperatures at the tops or bottoms of at least two pertinent geologic formations will also be produced. A geothermal interpretation of the data base will be developed and included in the final report.

#### Task 2 - Gravity Surveys

Gravity surveys will be conducted in two areas of the state. The first area will include approximately 10,000 square miles in the northwestern corner of Kansas. The second area will be an extention of FY 1980 gravity work in the southcentral portion of the state. Up to ten thousand square miles of gravity data will be collected in the second area. All available gravity data will be incorporated in a preliminary gravity map for the state. A preliminary interpretation of the gravity data will be part of the final report.

#### Task 3 - Geochemistry Survey

Water quality data for Kansas is on file with the Kansas Geological Survey and the United States Geological Survey. An examination of exiting data will be performed to extract useful geochemistry information for potential geothermal aquifers in the state. Results of the geochemistry survey will be presented in the final report. Chemical analyses of samples obtained during the drilling project in FY 1980 will be completed and findings will be reported in discussions of the drilling project results.

# Task 4 - Southern Methodist University Subcontract

Heat flow determinations and temperature gradient measurements will be obtained for holes too deep for the equipment used by the Kansas Geological Survey. This work will be performed on an "as needed" basis through a subcontract with Southern Methodist University. All data and interpretations will be incorporated into the geothermal data base for the state.

# Task 5 - Geothermal Map of Kansas

All pertinent geothermal data for the state of Kansas will be used to produce a geothermal map of the state. The contractor will be responsible for the technical accuracy and completeness of the data sets; graphical depiction and coordination of the map production will be accomplished by coordination with NOAA.

NOF

KUS

Total

#### Article II - WAYS AND MEANS OF PERFORMANCE

(a) Items to be supported and sources of support include the following:

		DOL	1100	Total
(ŀ)	Salaries, Wages, and Benefits Sophoscleous 10% FTE - 1 yr. Steeples 10% FTE - 1 yr. Yarger 10% FTE - 1 yr. Whittemore 10% FTE - 1 yr.		\$2,300 2,700 2,700 2,700	•
	Rothe 3 mo. FTE	\$ 7,200	-,	
	Grad. Res. Asst. (Heat Flow, 1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.).	8,453		
	Grad. Res. Asst. (Gravity, 1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.).	8,453		
	Grad. Res. Asst. (Geochem., 1/2-time 10-1/2 mo.).	4,550		
	Two Grad. Res. Assts. (Programming and data processing)	16,906		
	Electronics Technician (1/2-time 10-1/2 mo.; Full-time 4-1/2 mo.).	10,503		
	Student hourly (gravity survey, heat flow, Summer)	6,500		
	Benefits (19% Professionals, 7% GRA Summer, 0.5% GRA School Year	3,398	1,975	
	Subtotal	\$ 55,990	\$12,375	\$ 78,366

		DOE	KGS	Total
(2)	Computation Geothermal gradient data	3,000		
	Gravity data processing	4,000		
	Subtotal	\$ 7,000		
(3)	Travel Mileage @ 21¢/mi. (gravity, heat flow surveys) In-state per diem (\$32/day) Out-of-state (transportation + \$38-\$60/day)	9,000 12,480 <u>4,000</u>		
	Subtotal	\$ 25,480		
(4)	Miscellaneous Maintenance supplies, expendable materials,	3,000		
•	Publication · Geochemistry lab supplies	4,000 2,000		
	Heat Flow subcontract Blackwell	5,000		
	Subtotal	\$ 14,000		
	Total Less Indirect Costs	\$112,470		
(5)	Indirect Costs Calculated 0 37% of total items above	41,614		
	Total	\$154,084	\$12,376	\$166,460
(6)	Capital Equipment 40 Mbyte disc drive for Tektronix 4052 microcomputer	5,750	5,750	
	Digitizer table for Tektronic 4052 microcomputer	4,175	4,175	
	Subtotal	\$ 9,925	\$ 9,925	\$ 19,850
	Total	\$164,009	\$22,301	\$186,310

(b) Items, if any, significant to the performance of this contract, but excluded from computation of Support Cost and from consideration in proportioning costs:

None.

(c) Time or effort of Principal Investigator(s) including indirect cost and fringe benefits contributed by the Contractor but excluded from computation of Support Cost and consideration in proportioning costs:

\$22,301.

(d) All subcontracts and consultant agreements require the review and written approval of the Contracting Officer.

## Article III - FUNDING

The total estimated cost of items under A-II(a) above, for the contract period stated in this Appendix A5 of 164,009.00; DOE will pay actual costs of the items in A-II(a) above incurred during the contract period stated in this Appendix A5, subject to the provisions of Article III and Article B-V. The estimated DOE Support Cost for the contract period stated in this Appendix A5 is 164,009.00.

The estimated DOE Support Cost is funded as follows:

- (a) Estimated unexpended balance from prior period(s) \$ -0-
- (b) New funds for the current period \$154,009

#### Article A-IV - ADMINISTRATION AND REPORTS

(a)	Principal Investigator -	Don W. Steeples Kansas Geological Survey University of Kansas Lawrence, Kansas 66044 Telephone: (913) 864-4991
	Technical Administrator - (DOE's Project Manager)	Dr. L. L. Mink DOE-ID Energy and Technology Division Resource Definition Branch Telephone: (208) 525-0638

The Principal Investigator shall be responsible for directing the work within the scope of Article A-I above as outlined in discussions and in periodic letters from the Technical Administrator.

(b) The Principal Investigator is responsible for the preparation and submission of reports to in accordance with the attached DOE Form CR-537.

# U. S. DEPARTMENT OF ENERGY REPORTING REQUIREMENTS CHECKLIST

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DOE Form CR-537 (1-78)	(See Instru	ctions on Reverse)	FORM APPROVED OMB NO. 38R-0190
1. IDENTIFICATION Geothermal Resource Assessment in Kansas	e .	2. OBLIGATION INSTRUMENT: Modification to Contract No. DE-AS07-79ET27204	on No. A005
3. REPORTING REQUIREMENTS	•	han gan - i _n	
A. PROJECT MANAGEMENT	Frequency	B. TECHNICAL INFORMATION REPORTING	Frequency
1. 🗖 Management Plan		1. I Notice of Energy RD&D Project (SSIE)	
2. 🗇 Milestone Schedule & Status Report		2. 🔲 Technical Progress Report	
3. 🗆 Cost Plan		3. 🖄 Topical Report	A
4. 🗆 Manpower Plan		4. 🖄 Final Technical Report	Y
5. CI Contract Management Summary Report	M	C. PMS/MINI-PMS	
6. 2 Project Status Report	111	1. Cost Performance Report	
7. Cost Management Report		Errmat 1 WBS	
8. 🗆 Manpower Management Report			
9. Conference Record		Format 3 Baseline	
10. 🗆 Hot Line Report		Format 5 Problem Analysis	
		2. Cost/Schedule Status Beport	
		3. A Management Control System Description	
-		4. Summary System Description	
	}	5. 🗇 WBS Dictionary	
FREQUENCY CODES: A - As Required		Q – Quarterly	
C – Contract Change		S - Semi-Annually	
- Final (End of Cont	tract/	X — Mandatory for Delivery with Prop	osais/Bid
0 – One Time (Soon A	fter Contract	Award)	l de la constante de
<ul> <li>4. SPECIAL INSTRUCTIONS</li> <li>A.5., A.6 Copies are due within</li> <li>B.3 Submit in draft after After DOE approval is "Penert Distribution."</li> </ul>	fifteen completi received	days after end of the calendar month on of work as indicated in Statement , submit copies as required on attac	n. : of Work. :hed
B.4 Submit 2 copies in dra term. After DOE appro camera-ready copy.	aft forty oval is r	-five days prior to completion date eceived, submit in final including o	of contract one
term. After DOE appro camera-ready copy.	oval is r	eceived, submit in final including o	ne
5. ATTACHED HEREWITH:			
🖾 Report Distribution List		a	:
WBS/Reporting Category			

#### PURPOSE

A checklist to identify and communicate additional reporting requirements which are not otherwise<sup>#</sup> set forth in the General Purpose clauses of DOE contracts and agreements. It will be included as part of the contract or agreement. This form will be completed for each proposed contract or agreement and can be modified as required in Special Instructions to adapt it to a specific situation.

#### INSTRUCTIONS

*Item 1* — Enter the title as indicated in the Procurement Request, Interagency Agreement, or initiating memorandum.

Item 2 — Enter the identification number of the Procurement Request or Interagency Agreement, the date of the memorandum, and contract number after award.

Item 3 — Check spaces to indicate plans and reports required. For each reporting requirement checked, indicate frequency of delivery in column provided using one of the frequency codes shown.

- 3.A.1 Management Plan The contractor's plan to manage the effort described in the statement of work or similar document. It will contain management methodologies, control systems, and procedures he will use. Includes milestones and other planning schedules, organizational identification and descriptions, and special and critical plans, such as test plans, plans for handling of Government owned property. Work breakdown structures, key personnel identification, and methods for monitoring progress toward objectives may be required.
- 3.A.2 Milestone Schedule and Status Report The contractor's milestone schedule for all work breakdown structure items, line items, or deliverables specified in the contract. Updated periodically (usually monthly) with status, progress toward completion, and percent completion of each line item and of the total contract.
- 3.A.3 Cost Plan A baseline plan for incurring costs on a contract or agreement to measure progress in terms of cost; update and forecast contract fund requirements; plan funding changes; and develop fund requirements and budget estimates.
- 3.A.4 Manpower Plan A baseline plan to allocate manpower to each reporting category identified in the contract or agreement.
- 3.A.5 Contract Management Summary Report A single-page graphic presentation of integrated cost, major milestones, and manpower for rapid visual analysis and trend forecasting.
- 3.A.6 Project Status Report A periodic report to communicate to DOE management an assessment of contract status, to explain variances and problems, and to discuss any other areas of concern or achievements.
- 3.A.7 Cost Management Report A periodic report of the status of costs compared to the Cost Plan. Data is used to: report actual and projected accrued costs; evaluate performance against plan; identify actual and potential problem areas; construct cost experience for projects and budgeting efforts; and, to verify the reasonableness of contractors' invoices.
- 3.A.8 Manpower Management Report A periodic report of the status of actual and projected manpower expenditure against the Manpower Plan. Data is used to evaluate performance against plan; identify actual and potential problem areas; and to construct manpower experience for projections and planning efforts.
- 3.A.9 Conference Record Documentation of the contractor's understanding of significant decisions, direction or redirection or required actions resulting from any meeting with DOE representatives.
  - 3.A.10 Hot Line Report A hardcopy report by the fastest means available, (TWX, etc) documenting critical problems, emergency situations, and important technical breakthroughs.

- 3.B.1 Notice of Energy R&D Project A formatted, two-page report to provide information on unclassified DOE R&D projects for dissemination to the scientific, technical, and industrial communities and to the public. Also provides information to the Smithsonian Scientific Information Exchange.
- 3.8.2 Technical Progress Report A formal, structured technical report, submitted periodically to communicate project results for dissemination to Government agencies, the scientific, technical and industrial communities and the public.
- 3.B.3 Topical Report A special technical report prepared when a project has reached a point at which a major milestone or a significant phase has been completed, when unexpected results have been achieved, when it is logical to summarize results achieved, or when a new scientific or technological finding is deemed to warrant prompt publication.
- 3.B.4 Final Technical Report Technical Progress Report reporting final results of DOE supported RD&D and scientific projects.
- 3.C PMS/Mini-PMS
- 1) Cost Performance Report (PMS Application)

Format 1 – Reports current period and cumulative budget, actual costs and earned value data by work breakdown structure elements. Identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.

Format 2 - Reports current period and cumulative budget, actual costs, and earned value data by contractor functional elements,

Format 3 - Provides periodic updating to the established performance measurement baseline. Incorporates authorized contract changes and internal re-planning into the performance measurement baseline.

measurement baseline. Format 5 – Provides a narrative analysis of con-

tract variances.

- 2) Cost/Schedule Report (Mini-PMS Application)— Periodic, usually monthly, report of cumulative oudget, actual costs and earned value by summary work breakdown structure elements. Identifies cost and schedule variances and provides contractor's estimate to complete comparisons to budgets.
- System Description (PMS Application) Contractor's description of the management control system to be used in performing contract work. Must address all elements of the PMS criteria.
- Summary System Description (Mini-PMS Application) – Contractor's summarized description of the management control system to be used in performing contract work.
- 5) WBS Dictionary Lists and defines work breakdown structure. For more detailed instructions see PMS Manual.

Frequency Codes — Each code must have an identified time period (i.e., As Required -3 days after event occurrence). These time periods are suggested in the solicitation and negotiated at contract award.

ltem 4 – Identify any special reporting requirements not indicated in Item 3 and/or qualifiers to those selected. (Use additional sheets as necessary.)

/tem 5 - Check appropriate blocks.

Report Distribution List — A comprehensive informative listing of reports by frequency of submission, addresses and number of copies for each addressee.

Reporting Categories (level of detail) – An identification by WBS level of task elements for which reporting will be required by DOE.

tem 6 – Signature of person or persons preparing the checklist and the date prepared. Preparation is by person or persons responsible for preparation of Procurement Request or Statement of Work.

ltam 7 — Signature of the person reviewing the checklist and date reviewed.

U.S. DE ID F-129 (Rev. 08-79) Ref. DOE 13302 (use with DOE CR-537)	D OPER T DIS	RATION TRIBU	J⊦ 12 ( 11			ST									
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Addressees					Nu	mbe	of	Repo	rt C	opie	5				
<ul> <li>U. S. Department of Energy Idaho Operations Office</li> <li>550 Second Street</li> <li>Idaho Falls, Idaho 83401</li> <li>Attn: L. L. Mink, Chief Geothermal Energy Branch</li> <li>Attn: Nell W. Fraser, Director Contracts Management Division</li> <li>Attn: E. G. Jones, Director Financial Management Division</li> </ul>			2	2					2	12					•
U. S. Department of Energy, DGE MS 3344, Federal Building 12th and Penn. N.W. Washington, DC 20461 Duncan Foley UURI 420 Chipeta Way, Suite 120 Salt Lake City, UT 84108			1	1					1						
Special Instructions															

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# UNIFORM DOE CONTRACTOR SCIENTIFIC, TECHNICAL AND ENGINEERING REPORT NUMBERING SYSTEM

Effective with the implementation of the Procurement/Contract numbering system as shown in the example below, the following guidelines are established for identifying scientific and technical reports (progress, interim, final topical, etc.) conference papers, proceedings, theses, and translations.

- 1. All DOE contractors now applying uniquely identifying codes and systems approved by TIC are to continue using such codes and systems.
- 2. DOE Field Office codes such as ALO, IDO, COO, HCP, NVO, ORO, RLO, SAN, and SRO: and program codes such as FE, DSE, etc., are no longer approved for use by contractors.
- 3. Contractors having no approved unique codes are to number information products as shown below. All contractors in this category should create unique report numbers by (a) identifying the report with a DOE code, (b) selecting the final seven characters from the applicable contract number (two alphabetic and five numerals), and (c) adding suffix numbers sequentially for each report generated under the contract. For new contracts, the sequential number should begin with 1. For existing contracts the established sequence should continue. Slash marks and hyphens should be applied as shown in the examples.

Examples: Report numbers generated from contract number DE-AC03-79ET01834.M001:

DOE/ET/01834-1; DOE/ET/01834-2; DOE/ET/01834-3; etc.

- Note: It is essential that both the final five-digit numeral and the two preceeding alphabetical characters be extracted from the contract number as shown. The modification number, if any, normally shown as M001, etc., following the basic five-digit number is <u>NOT</u> used in the report number.
- Reports issued in more than one binding, or reissued as revisions or later editions, are to be identified by adding the following aditional suffixes to the basic number: Rev. - Revision; Vol. -Volume; Pt. - part: Add. - Addenda; Ed. - Edition, etc.

Examples: DOE/ET-01834-1 Rev. DOE/ET/01834-1 Rev. 2

> DOE/ET-01834-1 Pt. 1 DOE/ET/01834-1 Pt. 2

It is intended that report numbers be structured exactly as specified in the examples insofar as possible. If modification to this basic format is essential, it is to be approved through normal channels before being used.

Section Section

MAY 11 1982

Kansas Geological Survey University of Kansas 103 Avenue "A" Compusidest Lewrence, Kansas 66044

ATTENTION: Opm M. Steeples

SUBJEET: MODIFICATION NO. NOOS TO CONTRACT NO. DE-ASO7-79ET27204 Gentlemen:

Enclosed for your retention and files is one fully executed copy of

the subject modification.

Very truly yours,

Original Signed By: Kent R. Hastings

Kent R. Hastings Contracting Officer RAD Contracts Brench Contracts Management Division

Enclosure

bor: Earl Jones, W/encl Sue Prestwich, W/encl Janet Grefts, W/encl Carl Ruscetta, UGRI, M/encl-



		COLICITAT	ON MODIFICATION	OF CONTRACT	PAGE O
GENERAL SERVICES ADMINISTRATION FED. PROC. REG. (41 CFR) 1-16.101 1. AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DAT		ON/PURCHASE REQUEST NO.	4, PROJECT NO. (If anh	licable)
M006		07-82	ET27204.501		
5. ISSUED BY CO U. S. Department of Energy Idaho Operations Office 550 Second Street Idaho Falls, Idaho 83401	DDE	6. ADMINIS	ERED BY (If other than block 5)	CODE	
7. CONTRACTOR CODE	E.	ACILITY CODE	8.		
NAME AND ADDRESS		-		DMENT OF TATION NO	
Kansas Geologic	al Survev			(C. 11	
(Street, city, University of K county, state, 103 Avenue "A"	ansas Campus West			ICATION OF DE-ASO7	<sup>7</sup> -79ET272(
( <i>ade</i> ) Lawrence, Kansa	s 66044				
		-	DATEC	8/15/79(See blo	ock 11)
9 THIS BLOCK APPLIES ONLY TO AMENDMENTS OF The above numbered solicitation is amended as a Offerors must acknowledge receipt of this amendme (a) By signing and returningcopies of this ar which includes a reference to the solicitation and c DATE SPECIFIED MAY RESULT IN REJECTION OF 1	SOLICITATIONS set forth in block 12. Th nt prior to the hour and d mendment; (b) By acknowle smendment numbers. FAIL (OUR OFFER. If, by virtu	he hour and date sp date specified in the edging receipt of thi LURE OF YOUR ACI we of this amendme	ecified for receipt of Offers is ex solicitation, or as amended, by one o s amendment on each copy of the (NOWLEDGEMENT TO BE RECEIVED It you desire to change an offer alre	tended, is not extended. f the following methods: offer submitted; or (c) By separ D AT THE ISSUING OFFICE PRIO ady submitted, such change may	ate letter or teleg R TO THE HOUR A be made by teleg
10. ACCOUNTING AND APPROPRIATION DATA (1)	required)				
(a) This Change Order is issued pursuant to .	UP CONTRACTS/ORDERS	<b>)</b>			
The Changes set forth in block 12 are mad	e to the above numbered o	contract/order.			
(b) The above numbered contract/order is mo	dified to reflect the admin	histrative changes (su	ch as changes in paying office, app	opriation data, etc.) set forth in	block 12
		. Articl	e II of the Contr	act	DIOCK 12.
<ul> <li>(c)  This Supplemental Agreement is entered i</li> <li>It modifies the above numbered contract as</li> </ul>	nto pursuant to authority a set forth in block 12.	Articl	e II of the Contr	act.	
(c) This Supplemental Agreement is entered i It modifies the above numbered contract as 12. DESCRIPTION OF AMENDMENT/MODIFICATION	nto pursuant to authority o set forth in block 12.	Articl	e II of the Contr	act.	
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<ul> <li>(c) This Supplemental Agreement is entered in the modifies the above numbered contract as 12. DESCRIPTION OF AMENDMENT/MODIFICATION</li> <li><u>ARTICLE II - THE PERIOD</u> term through September</li> <li>term through September</li> </ul>	he document referenced in	n block 8, as heretof FFEROR IS REQUIRE	e II of the Contr beby amended to ex pre changed, remain unchanged and D TO SIGN THIS DOCUMENT AND UNITED STATES OF AMERICA	n full force and effect.	t :t :ssuing office
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<ul> <li>(c) This Supplemental Agreement is entered in the modifies the above numbered contract as 12. DESCRIPTION OF AMENDMENT/MODIFICATION</li> <li><u>ARTICLE II - THE PERIOD</u> term through September</li> <li><u>Except as provided herein, all terms and conditions of the term through September</u></li> <li><u>CONTRACTOR/OFFEROR IS NOT REQUIRED</u> TO SIGN THIS DOCUMENT</li> <li>NAME OF CONTRACTOR/OFFEROR</li> <li><u>Signature of person a</u></li> <li><u>Signature of person a</u></li> </ul>	he document referenced in CONTRACTOR/OF CONTRACTOR/OF 16. DAT	n block 8, as heretof FFEROR IS REQUIRE FFEROR IS REQUIRE 17 BY TE SIGNED   18	e II of the Contr reby amended to ex pre changed, remain unchanged and D TO SIGN THIS DOCUMENT AND UNITED STATES OF AMERICA (Sign NAME OF CONTRACTING OFFICE	n full force and effect. RETURN COPIES TO Driginal Signed By: Kent R. Hastings ature of Contracting Officer) R (Type or print)	t t issuing office

and the second second

DOE FORM PR-799A (TEST) 30 AUGUST 1978

# U. S. DEPARTMENT OF ENERGY

PROCUREMENT/FINANCIAL ASSISTANCE REQUEST - AUTHORIZATION

Mod DE-ASO7-79ET2720

1. тоСТПЪ		
2. FROM INITIATING OFFICE	17 GEother	mal
	ł	
3. INITIAL: [ X] UPDATE: [ ]	4. PROCUREMENT:	FINANCIAL ASSISTANCE:
5. PR NUMBER:	6. PR CORRECTION	LETTER: _ 7. RELATED PR NUMBER:
CTION IDENTIFICATION	0	
8. TITLE: KANS Ma	AS KESCURCE A	SESSMENT DE-AS07-79ET 2 2004 No Cast Sime Extension
	<u></u>	
9. UNSOLICITED PROPOSAL NO:	10.PROJECT /	NO: 11. CFDA NO:
12. PRODUCT OR SERVICE:* 1	3. SUPPORT SERVICES: YES	[ ] NO [ ] 14. CONSULTANT AWARD: YES [ ] NO [
5. CONTROLLED DELIVERABLE:*	16. REPORT/DRAWING	REQ: YES [ ] NO [ ] IF YES, ATTACH DETAILS.
17. CLASSIFICATION OF MATERIALS/V		SSIFIED C-CONFIDENTIAL S-SECRET T-TOP SECRET
18. GOVERNMENT PROPERTY: F-	- FURNISHED P-PURCHASI	ED N-NOT INVOLVED IF CODE F OR P. ATTACH DETAILS.
AWARD PLANNING		
19. AWARD AS ORDER UNDER BIN		
20. DESIRED AWARD DATE:	21. KIND OF AWARD	ACTION: * $IQ$ 22. TYPE OF AWARD: * $\mathcal{T}$ ATTACH DETAIL
	TEAR	24 TYPE SOLICITATION INSTRUMENT: *
S. F MOLT-TEAR AWARD, INDICAR		
JUSTIFICATION. REF: DOE-PR 9-3.	.805.51 BF 9-4.909(1),	
7 FOR A E SHOW ESTIMATED CONST		3-OTHER 4-NONE
	RUCTION COST IN DOLLARS:	
WARDEE		
IWARDEE	OF SOURCES BEEN ATTACHE	D? YES [ ] NO [ ] IF NON-COMPETITIVE, COMPLETE 28-
IF COMPETITIVE, HAS LIST 16 COMPETITIVE, HAS LIST 28. NAME: <u>KANSAS Gredogic</u>	OF SOURCES BEEN ATTACHE	D? YES [ ] NO [ ] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: 1930 ave A'' Computer West
IWARDEE IF COMPETITIVE, HAS LIST 18. NAME: <u>KANSAS Googic</u> 10. DIVISION: <u>KANSAS GOOGIC</u> 11. COCOMAR	OF SOURCES BEEN ATTACHE AL_SURVEY2 AUSAS	D? YES [] NO [] IF NON-COMPETITIVE. COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> - Lower Ka 6044
WARDEE IF COMPETITIVE, HAS LIST 18. NAME: KANSAS GEOGGIC. 10. DIVISION: LANIV of KA 1. GOCO/LAB: A - GOCO/LAB	OF SOURCES BEEN ATTACHE AL SURVEY 24 AN SAS B - GOCO/NON-LAB C	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> 
INANCIAL AWARD VALUE	OF SOURCES BEEN ATTACHE AL_SURVEY2 B - GOCO/NON-LAB C	D? YES [ ] NO [ ] IF NON-COMPETITIVE, COMPLETE 28- P. ADDRESS: <u>1930 ave "A" Computer West</u> <u>Lawrence</u> , <u>Ka</u> <u>66044</u> - NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER
IF COMPETITIVE, HAS LIST IF COMPETITIVE, HA	OF SOURCES BEEN ATTACHE AL_SURVEY2 B - GOCO/NON-LAB C- DLLAR AMOUNT	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> 
INANCIAL AWARD VALUE	OF SOURCES BEEN ATTACHE A SURVEY 24 202 SAS B - GOCO/NON-LAB C- DILLAR AMOUNT - Q -	D? YES [] NO [] IF NON-COMPETITIVE. COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> 
IWARDEE       IF COMPETITIVE, HAS LIST         18. NAME:       KANSAS & GOGALA         10. DIVISION:       IMANUL of KARA         11. GOCO/LAB:       A - GOCO/LAB         INANCIAL       AWARD VALUE         22. GOV'T SHARE	OF SOURCES BEEN ATTACHE A SHEVEY 24 B - GOCO/NON-LAB C DILLAR AMOUNT	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> <u>Generalized</u> NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER 45. NAME: <u>SMPCEStwich</u> 46. SIGNATURE: <u>Semerativich</u>
IWARDEE       IF COMPETITIVE, HAS LIST         18. NAME:       KANSAS (A Solgan, Competitive, HAS LIST)         10. DIVISION:       IVANUL of Competitive, HAS LIST         10. DIVISION:       IVANUL of Competitive, HAS LIST         10. DIVISION:       IVANUL of Competitive, HAS LIST         11. GOCO/LAB:       A - GOCO/LAB         12. GOV'T SHARE       DO         13. TOTAL       IVANUL, LOAN, O         14. CONSIDERATION IN KIND, LOAN, O       CUARANTEE DATA REPORTED ON	OF SOURCES BEEN ATTACHE A SURVEY 24 A SAS B - GOCO/NON-LAB C DLLAR AMOUNT C	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> <u>Computer Ka</u> 66044 - NON-GOCO/LAB D - NOT APPLICABLE <u>PROJECT MANAGER</u> 45. NAME: <u>SMPCEStwich</u> 46. SIGNATURE: <u>Confectorich</u> 47. DATE: 5582 (8. OSELICE CODE)
IF COMPETITIVE, HAS LIST         IF COMPET	OF SOURCES BEEN ATTACHE A SURVEY 24 2025AS B - GOCO/NON-LAB C DILLAR AMOUNT 	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 Auc</u> "A" <u>Computer West</u> <u>Computer</u> , <u>Ka</u> <u>66044</u> - NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER 45. NAME: <u>SM_PCEStulch</u> 46. SIGNATURE: <u>MANAGER</u> 47. DATE: <u>SKI</u> <u>582</u> 48. OFFICE CODE:
IF COMPETITIVE, HAS LIST         18. NAME:       IF COMPETITIVE, HAS LIST         10. DIVISION:       IF COMPETITIVE, HAS LIST         10. DIVISION:       IF COMPETITIVE, HAS LIST         11. GOCO/LAB:       IF COMPETITIVE, HAS LIST         12. GOV/LAB:       IF COMPETITIVE, HAS LIST         13. GOCO/LAB:       IF COMPETITIVE, HAS LIST         14. GOCO/LAB:       IF COMPETITIVE, HAS LIST         15. GOV'T SHARE       IF COMPETITION IN KIND, LOAN, OF GUARANTEE DATA REPORTED ON GUARANTEE	OF SOURCES BEEN ATTACHE AL_SURVEY2 B-GOCO/NON-LAB C DLLAR AMOUNT 	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Computer West</u> <u>Guarance</u> , <u>Ka</u> <u>66044</u> - NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER 45. NAME: <u>SMPCEStwick</u> 46. SIGNATURE: <u>48. OFFICE CODE</u> 47. DATE: <u>SAT YEAR</u> 48. OFFICE CODE: 49. FTS TELEPHONE NUMBER:
IWARDEE       IF COMPETITIVE, HAS LIST         18. NAME:       JANSAS Gradian         18. NAME:       JANSAS Gradian         10. DIVISION:       IANIL of Long         11. GOCO/LAB:       A - GOCO/LAB         INANCIAL       AWARD VALUE         32. GOV'T SHARE       DO         33. TOTAL       GUARANTEE DATA REPORTED ON         GUARANTEE DATA REPORTED ON       Store and	OF SOURCES BEEN ATTACHE A SURVEY 24 2025AS B - GOCO/NON-LAB C DLLAR AMOUNT 	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 Gue "A" Computitud</u> <u>Guarance</u> , Ka. 66044 - NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER 45. NAME: <u>SM. PCE Sturich</u> 46. SIGNATURE: <u>MARATINE</u> 46. SIGNATURE: <u>48. OFFICE CODE</u> 47. DATE: <u>SEE</u> 48. OFFICE CODE: 49. FTS TELEPHONE NUMBER: <u>PROGRAM OFFICIAL</u>
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IWARDEE       IF COMPETITIVE, HAS LIST         18. NAME:       KANSAS       Socogic         28. NAME:       KANSAS       Socogic         20. DIVISION:       IVANUL of       Kansulation         20. DIVISION:       IVANUL of       Kansulation         20. DIVISION:       IVANUL of       Kansulation         21. GOCO/LAB:       A - GOCO/LAB         22. GOV'T SHARE       DO         33. TOTAL       DO         34. CONSIDERATION IN KIND, LOAN, OF       GUARANTEE DATA REPORTED ON         35. PROJECT PERIOD:       FROM         36.       37.         36.       37.         37.       38         B&R NUMBER       FUND	OF SOURCES BEEN ATTACHE AL_SURVEY2 B-GOCO/NON-LAB C- DILLAR AMOUNT 	D? YES [] NO [] IF NON-COMPETITIVE, COMPLETE 28- 9. ADDRESS: <u>1930 ave "A" Compare West</u> <u>General Ka</u> <u>60044</u> - NON-GOCO/LAB D - NOT APPLICABLE PROJECT MANAGER 45. NAME: <u>SMPCEStwich</u> 46. SIGNATURE: <u>48. OFFICE CODE</u> 47. DATE: <u>SE2</u> 48. OFFICE CODE: 49. FTS TELEPHONE NUMBER: <u>PROGRAM OFFICIAL</u> 50. NAME: <u>REWOOD</u> 51. SIGNATURE:
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# KANSAS GEOLOGICAL SURVEY

Environmental Geology Section

1930 Avenue "A", Campus West The University of Kansas Lawrence, Kansas 66044 913-864-4991

April 19, 1982

Ms. Susan Prestwich DOE/DGE 550 2nd Street Idaho Falls, Idaho 83401

Dear Susan:

This letter will confirm our conversation of 7 April in Salt Lake City. I respectfully request a no-cost time extension from 30 June '82 to 20 September '82 for our contract DE-AS0779 ET27204. The reasons for this request are:

- 1. Dr. David Blackwell needs some extra time as per attached letter.
- 2. We have fallen behind in digitizing gravity station locations because of hardware problems with our digitizer.

Thank you for your consideration.

Sincenely Don W. Steeples

Principal Investigator Chief, Environmental Geology and Geophysics Section

DWS:ep

cc: Dr. David Blackwell, SMU Carolyn Hallenbeck, KU

RECEIVED

APR 2 2 1982

ADVANCED TECHNOLOGY



April 13, 1982

Dr. Don Steeples Kansas Geological Survey 1930 Ave. "A," Campus West University of Kansas Lawrence, Kansas 66044

Dear Don:

This letter is to formally request an extension of our contract with the state of Kansas (#949) to do geothermal studies in deep wells in Kansas. I would like to extend this contract through the 31st of August, 1982, with no additional increase in funding level. This extension will allow us time to obtain logs during the summer and to properly complete the report.

I sent to you on Friday copies of 4 logs that we obtained during our first logging run. These included a deep hole in the Oklahoma Panhandle, one in western Kansas and 2 holes in central Kansas. For some reason we weren't able to get below 1050 meters in the Salinas hole, which is very disappointing. I hope the hole hasn't plugged there as we still don't have any measurements for the bottom couple hundred meters of the hole. From looking at Sandy's thesis, there are several holes that are fairly deep and which we would like to log this summer. I will make a list of these holes and maybe you can send them to her so we can find out if any of these holes might still be available for logging this summer. We will be in the field to do the logging during the month of July.

Sincerely yours,

- or David D. Blackwell Professor of Geophysics

DDB/eg