

SUPPLEMENTAL AGREEMENT
BETWEEN
ARIZONA BOARD OF REGENTS
AND
THE U. S. NUCLEAR REGULATORY COMMISSION

THIS SUPPLEMENTAL AGREEMENT, effective the 1st day of June , 1980, by and between the UNITED STATES OF AMERICA (hereinafter referred to as the "Government"), as represented by the UNITED STATES NUCLEAR REGULATORY COMMISSION (hereinafter referred to as the "Commission"), and ARIZONA BOARD OF REGENTS (hereinafter referred to as the "Contractor"),

WITNESSETH THAT:

WHEREAS, the parties desire to modify Contract No. NRC-04-78-272 as hereinafter provided, and this supplemental agreement is authorized by law, including the Energy Reorganization Act of 1974, as amended, and the Atomic Energy Act of 1954, as amended.

NOW, THEREFORE, said contract is hereby modified as follows:

1. Appendix A, attached to this supplemental agreement and made a part hereof, provides for the research to be performed by the Contractor during the contract period specified therein.
2. In Article II - The Period of Performance, the date " May 31, 1983 " is substituted for the date " June 14, 1980 ".
3. In Article III - Consideration, the sum "\$ 334,785.46" is substituted for the sum "\$185,148.46".

IN WITNESS WHEREOF, the parties have executed this document.

UNITED STATES OF AMERICA

BY: 

Kellogg V. Morton, Chief
Research Contracts Branch
Division of Contracts
U. S. Nuclear Regulatory Commission

ARIZONA BOARD OF REGENTS

BY: 

SHERWOOD E. CARR
Treasurer & Contracting Officer
(title)

I, James T. Wheeler, certify that I am the
(attester)

Director of Sponsored Projects Services of the Contractor named under this
(title)

document; that Sherwood E. Carr who signed this
(signatory)

document on behalf of said Contractor was then Treasurer and Contracting Officer

of said Contractor; that this document was duly signed for and on behalf of

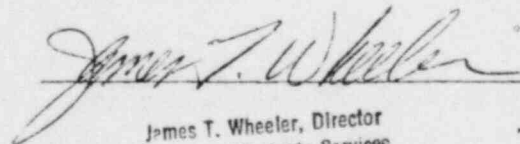
said Contractor by authority of its governing body and is within the scope

of its legal powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of said

Contractor.

(SEAL)



James T. Wheeler, Director
Sponsored Projects Services

CONTRACTOR: ARIZONA BOARD OF REGENTS

APPENDIX A

For the Contract period June 1, 1980 through May 31, 1983

Article A-I RESEARCH TO BE PERFORMED BY CONTRACTOR

- (a) The unclassified Scope of Work under this contract entitled, "Confirmatory Research Related to Dating of Ground Water" is as follows:

REPORTS

Progress reports shall be submitted semi-annually. An annual topical report shall be submitted at the end of each of the three (3) periods of work. A final report shall be submitted upon completion of the contract performance.

June 1, 1980 through May 31, 1981:

- 1) The literature search begun in the first year of the research will be continued.
- 2) Calculations of subsurface production of ^{14}C and ^3H will be rechecked and extended. The possibility of the subsurface origin of Argon-39 will be evaluated.
- 3) A gas-sample separator will be completed so that noble gases can be gathered for use in the helium-accumulation dating.
- 4) The estimating of dates from temperature during ground water recharge to the hydrologic system will be made possible by the noble gas determinations. Further theoretical work on calculating paleotemperatures will be made.
- 5) Ground water from several aquifers will be sampled for helium, krypton and xenon; and for stable and unstable radionuclides.
- 6) Laboratory analyses will be done on the water samples for standard parameters, noble gases, and for such ratios as oxygen-18/oxygen-16, carbon-13/carbon-12, and deuterium/hydrogen.
- 7) Diffusion of gases from dense rock into the limited amounts of water present in fractures may represent a source of error in calculated dates. Known equations will be used to calculate situations in which such errors are significant.
- 8) Results of all the tasks of this year and the previous year will be drawn together to make a final interpretation of the useful methods of dating.

June 1, 1981 through May 31, 1982:

The work planned for this year will be to analyze and interpret natural concentrations of noble gases and their isotopic ratios as they apply to geochemical history. This will be a continuance of tasks 3-5 under the previous year's tasks. This will include principal field investigations, analysis and interpretation of the field data.

June 1, 1982 through May 31, 1983:

The emphasis in the planned research for this year will be in interpretation and confirmation of field data obtained in the previous work done in this project. Data will be examined in light of the theoretical expectations developed in previous work. A final report will summarize the important findings of the project and relate project results of the dating technology to regulatory criteria.

- (b) The Principal Investigator expects to devote the following approximate amount(s) of time to the contract work:

S. N. Davis: June 1, 1980 through May 31, 1982: 10% of his time during the 2 academic years and 1½ man months during the two years of vacation periods.

June 1, 1982 through May 31, 1983: 10% of his time during the academic year and ½ man-months during vacation period.

ARTICLE A-II WAYS AND MEANS OF PERFORMANCE

- (a) Items for which support will be provided as indicated in A-III, below

(1) Salaries and Wages	\$ <u>213,194.00</u>
(2) Equipment to be purchased or fabricated by the Contractor	\$ <u>7,000.00</u>

June 1, 1980 through May 31, 1981: None

June 1, 1981 through May 31, 1982:

In Excess of \$1,000.00:

1. Vacuum Pump Replacements for GC-MS
2. Counter for Determination of Radon in Water
3. Gas Separator and Trap System

June 1, 1982 through May 31, 1983: None

- (3) Travel
- (i) Domestic \$ 22,400.00
 - (ii) Foreign \$ -0-
- (4) Other direct costs including benefits
- (5) Indirect costs based on a predetermined rate of 43 percent applicable to direct costs excluding equipment.

(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 costs and fringe benefits contributed by Contractor but excluded from computation of Support Cost and from consideration in proportioning costs:

NONE

Article A-III

The total estimated cost of items under A-II(a) above for the contract period stated in this Appendix A is \$469,807.00 ; the Commission will pay 100 percent of the actual costs of these items incurred during the contract period stated in this Appendix A, subject to the provisions of Article III and Article B-XXVIII. The estimated NRC Support Cost for the contract period stated in this Appendix A is \$469,807.00 .

The estimated NRC Support Cost is funded as follows:

- (a) Estimated unexpended balance from prior period(s) \$ -0-
- (b) New funds for the current period \$ 149,637.00
- (c) New Funds to be provided in FY 81, subject to their availability. \$ 175,740.00
- (d) New Funds to be provided in FY 82, subject to their availability. \$ 144,430.00
- (e) The new funds being added in A-III(b) constitute the basis for advance payments provided under Article B-X.