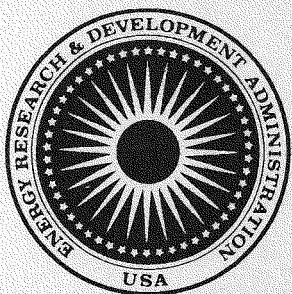


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URANIUM EXPLORATION EXPENDITURES IN 1976 AND PLANS FOR 1977-78

MAY 1977

MASTER



UNITED STATES ENERGY RESEARCH AND
DEVELOPMENT ADMINISTRATION
GRAND JUNCTION OFFICE, GRAND JUNCTION, COLORADO

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CONTENTS

	<u>Page</u>
INTRODUCTION AND SUMMARY	1
1976 LAND HOLDINGS	2
1976 LAND ACQUISITIONS	2
Acquisition Costs	3
1976 SURFACE DRILLING	5
Drilling Costs	5
OTHER DOMESTIC EXPLORATION EXPENDITURES IN 1976 . . .	7
PLANNED 1977 AND 1978 U. S. EXPLORATION ACTIVITIES . .	7
COMPARISON OF PLANNED vs. ACTUAL ACTIVITIES	9
DOMESTIC EXPLORATION FOR NON-SANDSTONE DEPOSITS AND IN NON-ESTABLISHED AREAS	9
FOREIGN PARTICIPATION IN DOMESTIC EXPLORATION	10
FOREIGN URANIUM EXPLORATION BY U. S. COMPANIES	10
AERIAL RADIOMETRIC EXPLORATION, 1972-76	10
SOLUTION MINING PRODUCTION DRILLING, 1976	11
LIST OF COMPANIES FURNISHING DATA FOR SURVEY	12

LIST OF ILLUSTRATIONS

Cumulative Percentage of Land Acquisitions in terms of Cost Per Acre	4
Cumulative Percentage of Total Surface Drilling in terms of Cost Per Foot	6
History and Forecast of Surface Drilling	8

U. S. URANIUM INDUSTRY'S EXPLORATION EXPENDITURES
IN 1976 AND PLANS FOR 1977-78

U. S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
May 1977

INTRODUCTION AND SUMMARY

A survey of actual and planned uranium exploration activities was made by the Grand Junction Office of the U. S. Energy Research and Development Administration. This work is part of an overall program to evaluate future supplies of nuclear fuel.

The survey covered:

1. Land acquired in 1976 for exploration and cost of acquisition.
2. 1976 surface drilling footage and cost.
3. All other exploration expenditures in 1976.
4. Estimates of 1977-78 exploration activities and costs.
5. Exploration for non-sandstone deposits.
6. Exploration in non-established areas.
7. Foreign uranium exploration expenditures by U.S. companies.
8. Foreign participation in exploration activities in the United States.
9. Aerial radiometric exploration activities in the United States, 1972-76.
10. Solution mining production drilling during 1976.

This report presents a compilation of data from the replies of 108 companies.* Table I summarizes the results of this year's survey as compared with data for the previous ten year period.

Total surface drilling, as reported on questionnaires, was 34.8 million feet in 1976, a 37 percent increase over 1975. The footage reported for 1976 was the largest reported to date. The previous peak year for drilling was 1969, for which 29.9 million feet were reported. Total exploration expenditures for 1976 were \$170.7 million, which included \$13.9 million for land acquisition, \$109.0 million for surface drilling, and \$47.8 million for other related exploration activities. The total expenditures reported for 1976 is also a record high, surpassing the previous record of \$122 million reported for 1975.

*See page 12 for list of survey respondents.

The industry's planned exploration expenditures are \$236 million in 1977 and \$251 million in 1978. These plans include 49.2 million feet of surface exploration and development drilling in 1977 and 47.9 million feet in 1978, increases of 41 percent and 38 percent, respectively, over actual 1976 drilling.

TABLE I
SUMMARY OF DOMESTIC EXPLORATION ACTIVITIES

		Total for Millions	1966-75	Reported for 1976	Estimated for 1977	Estimated for 1978
Land Acquired	Acres		30.82	4.75		
	Dollars		104.38	13.89		
Surface Drilling	Feet		179.69	34.80	49.2	47.9
	Dollars		283.44	108.97		
Other Exploration Expenditures	Dollars		147.66	47.79		
Total Expenditures	Dollars		535.48	170.65	236.2	251.4

1976 LAND HOLDINGS

As of December 31, 1976, 96 companies reported holdings of 14.95 million acres for uranium exploration. This compares with 11.84 million acres held as of December 31, 1975.

1976 LAND ACQUISITIONS

Acquisitions of 4.75 million acres in the United States were reported by 81 companies. The total cost was \$13.89 million.

Types of land holdings and acquisitions include fee land, mineral fee, leases, patented and unpatented claims, and options to purchase mineral fee. The costs of all such acquisitions were included. Land acquired or held for production of uranium from known commercial uranium deposits is not included. Table II summarizes land acquisitions from 1966 through 1976.

TABLE II
LAND ACQUIRED FOR URANIUM EXPLORATION

<u>Acquired During</u>	<u>Millions of</u>	
	<u>Acres</u>	<u>Dollars</u>
1966-74	26.73	87.68
1975	3.48	16.70
1976	4.75	<u>13.89</u>
Total Cost		118.27
Additional lands acquired during 1966-75 for which no costs were provided:		<u>0.61</u>
Total Acquisitions		<u>35.57</u>

Acquisition Costs

Acquisition costs during 1976 ranged from less than 10 cents per acre to more than \$200 per acre, with an average cost of \$2.92 per acre. Figure 1 shows the cumulative percentage of acreage acquired in terms of cost per acre.

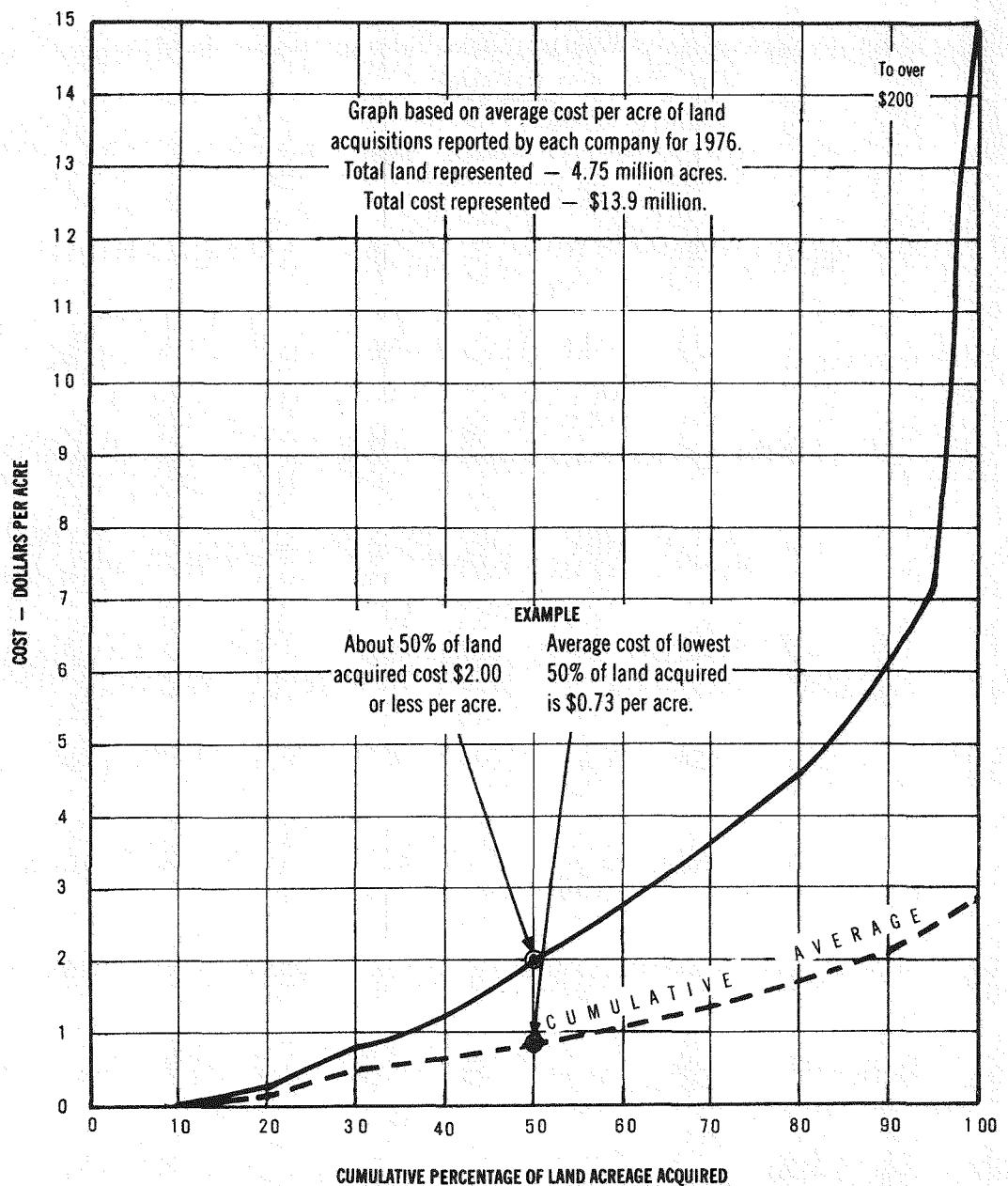


Figure 1. Cumulative percentage of land acquired for uranium exploration in terms of cost per acre.

1976 SURFACE DRILLING

Ninety-seven of the 108 companies responding to the survey reported 34.80 million feet of surface drilling at a cost of \$108.97 million. This represents a 37% increase in footage over 1975 and a 48% increase in expenditures. The footages and costs reported for 1976 are greater than for any previous year. Surface drilling activities are summarized in Table III.

TABLE III
SUMMARY OF SURFACE DRILLING

<u>Category of Drilling</u>		<u>Millions of</u>	
		<u>Feet</u>	<u>Dollars</u>
A. Exploration			
1966-74		106.58	159.4
1975		15.69	51.9
1976		20.36	70.7
B. Development			
1966-74		35.12	36.5
1975		9.73	21.9
1976		14.44	38.3
C. Exploration and development reported together, 1966-72		<u>12.57</u>	<u>13.7</u>
Totals Reported, 1966-76		<u>214.49</u>	<u>392.4</u>

Exploration drilling includes (a) drilling in search for new ore deposits or extensions to known deposits, and (b) drilling at the location of a discovery up to the time the company decides sufficient ore reserves are present to justify commercial exploitation.

Development drilling includes all drilling of an ore deposit to determine more precisely size, grade, and configuration subsequent to the time that commercial exploitation is deemed feasible.

Drilling Costs

Surface drilling costs include drilling, drill roads, site preparation, geological and other technical support, sampling and drill hole logging. These costs ranged from \$1 to over \$25 per foot. The average cost was \$3.13 per foot. This represents an 8% increase over the 1975 average of \$2.90 per foot. Figure 2 shows the cumulative percentage of total surface drilling in terms of cost per foot of drilling.

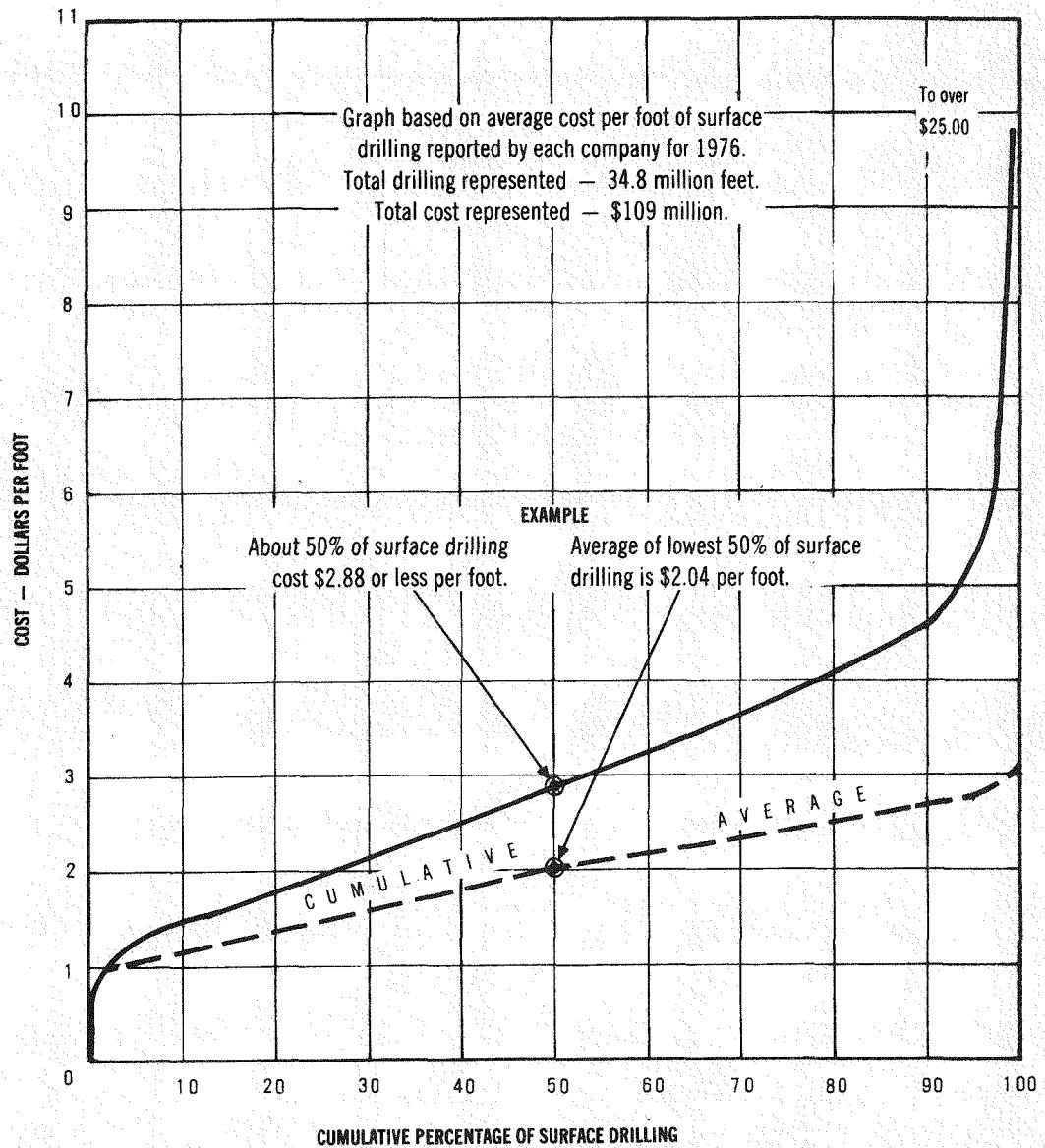


Figure 2. Cumulative percentage of surface drilling in terms of cost per foot.

OTHER DOMESTIC EXPLORATION EXPENDITURES IN 1976

Table IV lists all other costs directly associated with the company's uranium exploration effort. Included are expenditures for geological and geophysical investigations and research, costs incurred by field personnel during exploration, and overhead and administrative charges specifically associated with supervising and supporting exploration activities. The overhead and administrative charges reported do not include internal corporate charges such as director's salaries that are not directly associated with a company's exploration effort.

TABLE IV

OTHER EXPLORATION EXPENDITURES

<u>Period</u>	<u>Expenditures, Millions of Dollars</u>
1966-74*	116.1
1975	31.5
1976	<u>47.8</u>
Total Reported, 1966-76	195.4

PLANNED 1977 AND 1978 U. S. EXPLORATION ACTIVITIES

Ninety-seven of the 108 responding companies reported plans for 1977, and 80 of these companies reported plans for 1978. Table V lists total estimated drilling footage and exploration costs.

TABLE V
PLANNED EXPLORATION EXPENDITURES

<u>Calendar Year</u>	<u>Millions of Feet of Drilling</u>		<u>Millions of Dollars</u>
	<u>Explor.</u>	<u>Develop.</u>	<u>Total Explor. Costs</u>
1977	28.7	20.5	49.2
1978	30.4	17.5	47.9

Figure 3 shows the record of past drilling activities related to plans for 1977 and 1978.

*This total also includes some drilling costs which a few companies in the past listed under this category. Less than two percent of the total cost for the period is involved.

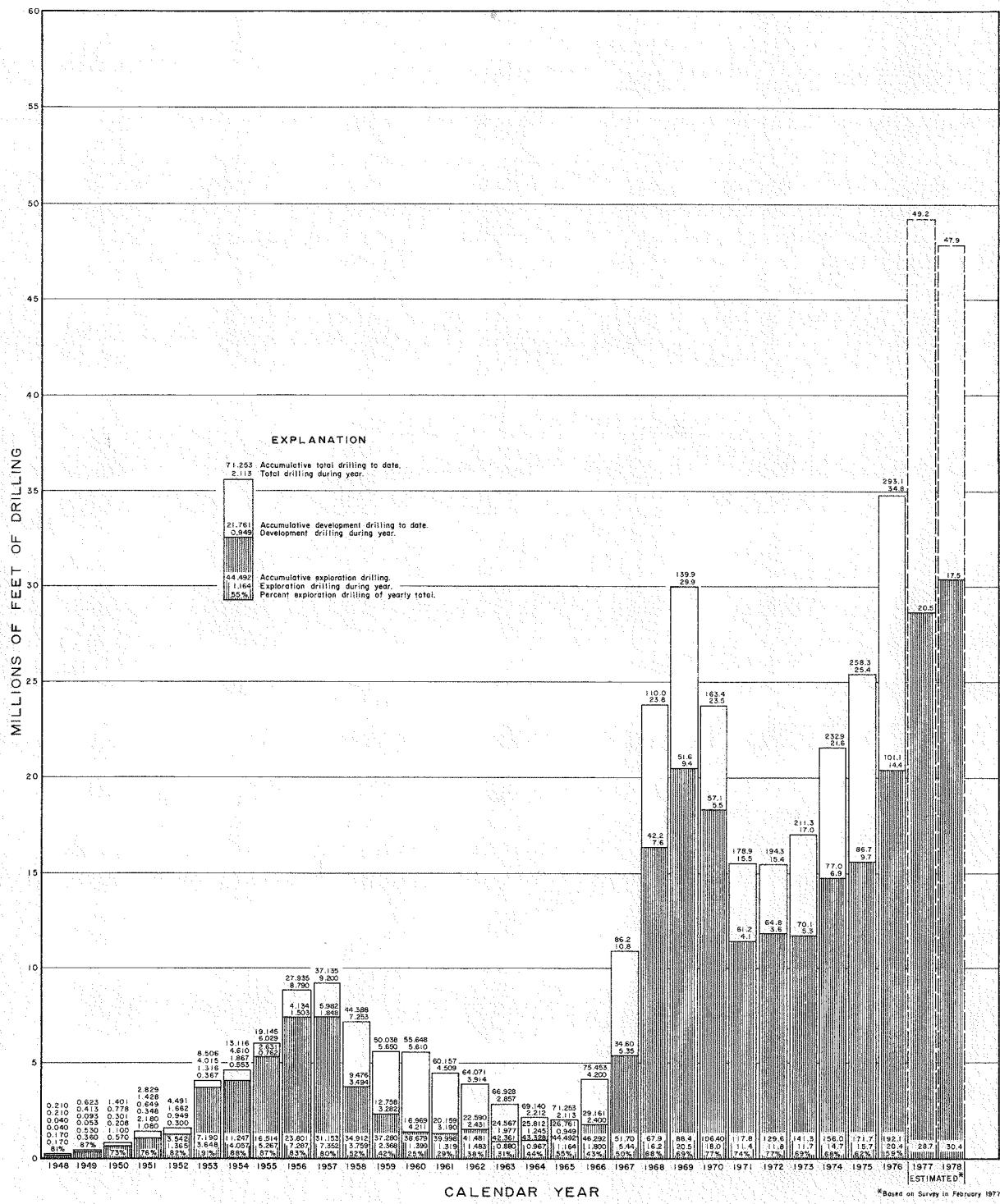


Figure 3. History of U.S. uranium exploration, 1948 thru 1978.

COMPARISON OF PLANNED vs. ACTUAL ACTIVITIES

Table VI shows a comparison of actual uranium exploration activities with footages and costs based on surveys during the past three years.

TABLE VI

PLANNED vs. ACTUAL EXPENDITURES

	<u>Planned for 1975</u> (1975 Survey)	<u>Reported for 1975</u>	<u>Planned for 1976</u> (1976 Survey)	<u>Reported for 1976</u>
Millions of feet of Drilling	27.8	25.4		34.9 34.8
Total cost, Millions of Dollars	109.0	122.0		156.9 170.7

DOMESTIC EXPLORATION FOR NON-SANDSTONE DEPOSITS AND IN NON-ESTABLISHED AREAS

Table VII is a summary of reported activities and plans for exploration efforts in non-sandstone geologic environments and/or in geographic areas outside the Colorado Plateau, Wyoming Basins and Texas Gulf Coast Provinces.

TABLE VII

PERCENTAGE OF TOTAL EXPLORATION COSTS FOR NON-SANDSTONE DEPOSITS AND IN NON-ESTABLISHED AREAS

	<u>No. of Companies</u>	<u>Non-Sandstone Exploration</u>	<u>No. Companies</u>	<u>Exploration in Non-Established Areas</u>
1974	39	16.3	45	19.1
1975	39	11.1	45	19.2
1976	51	16.7	53	23.2
1977 (Planned)	60	16.8	64	22.8
1978 (Planned)	46	17.7	51	25.9

FOREIGN PARTICIPATION IN DOMESTIC EXPLORATION

Fifteen companies reported that foreign interests provided full or partial funding of their 1976 exploration activities. The total foreign increment amounted to \$13.18 million, or about 8 percent of the \$171 million total domestic exploration expenditures reported for 1976.

FOREIGN URANIUM EXPLORATION BY U. S. COMPANIES

U. S. companies reported that they expended \$18.8 million in foreign countries in 1976. This is a substantial increase over the \$5.10 million reported for 1975. Total foreign expenditures of \$30.07 million were reported for 1966-75.

Table VIII lists 1976 expenditures for foreign uranium exploration ventures and planned expenditures for 1977 and 1978.

TABLE VIII

FOREIGN URANIUM EXPLORATION EXPENDITURES (Expenditures and plans in millions of dollars)

<u>Year</u>	<u>Africa</u>	<u>Canada</u>	<u>Australia</u>	<u>Others*</u>	<u>Total</u>
1975	2.66	1.00	1.34	0.10	5.10
1976	4.36	2.60	1.97	9.87	18.80
1977 (Planned)	7.11	3.90	1.95	12.48	25.44
1978 (Planned)	5.37	4.50	1.40	17.85	29.12

AERIAL RADIOMETRIC EXPLORATION, 1972-1976

This year a new item was added to the exploration survey to obtain an estimate of the aerial radiometric exploration effort of private companies over the past 5 years. Although data are known to be incomplete 30 companies reported flying a total distance of 910,000 line miles. Gamma spectrometry was utilized for 57 percent of these line miles while gross-gamma was used for the remaining 43 percent. The flight line spacings reported by 24 companies normally ranged between 1/4 and 1 mile, the weighted average being 0.67 miles. According to the response of 25 companies, the western U.S. was the most heavily flown area, although some activity was also reported for the eastern part of the conterminous U.S. and Alaska.

*Includes expenditures for which countries were not specified in the survey responses.

SOLUTION MINING PRODUCTION DRILLING

Although solution mining is not an exploration activity, a new question was added to this year's survey to complete our data on uranium surface drilling activities. Solution mining drilling is exclusively for solution mining production, and is subsequent to the initial development drilling which identifies the size, grade, and configuration of a solution mining deposit. Pattern development and monitor wells are included.

Ten companies reported 350,000 feet of solution mining drilling in 1976 at a cost of \$1.83 million; an average cost of \$5.20 per foot.

LIST OF COMPANIES FURNISHING DATA FOR SURVEY

ERDA acknowledges the excellent support of individuals and companies of the uranium industry in submitting data in response to questionnaires for this study:

ADOBE OIL & GAS CORP. AND VIPONT MINING CO.	MINERALS RECOVERY CORP.
AGIP MINING CO., INC.	MINEX CORP.
AMERICAN COPPER & NICKEL CO., INC.	MOBIL OIL CORP.
AMERICAN NUCLEAR CORP.	NEWMONT MINING CORP.
AMINOIL USA, INC.	NEWPARK RESOURCES, INC.
THE ANACONDA CO.	NORTH AMERICAN MINING & MINERALS CO.
ANSCHUTZ URANIUM CORP.	NUBETH JOINT VENTURE
ASHLAND EXPLORATION, INC.	NUCLEAR DYNAMICS, INC.
ATLANTIC RICHFIELD CO.	NUCLEAR EXPLORATION & DEVELOPMENT CO.
ATLAS MINERALS	occidental MINERALS CORP.
BENNET PETROLEUM CORP.	PAYNE, KIBBE & ASSOCIATES
BOKUM RESOURCES CORP.	PHILLIPS PETROLEUM CO.
Brooks MINERALS INC.	PIONEER NUCLEAR, INC.
WALTER BUCHANON	PIONEER URAVAN, INC.
BUTTES GAS & OIL CO.	POLARIS RESOURCES, INC.
CHEVRON RESOURCES CO.	POWER RESOURCES CORP.
CITIES SERVICE MINERALS CO.	PUBLIC SERVICE COMPANY OF OKLAHOMA
THE CLEVELAND-CLIFFS IRON CO.	RAJAH VENTURES LTD.
CONTINENTAL OIL CO.	RAMPART EXPLORATION CORP.
COTTER CORP.	RANCHERS EXPLORATION AND DEVELOPMENT CORP.
CYPRUS MINES CORP.	RESERVE OIL & MINERALS CORP.
DAWN MINING CO.	RESOURCE ASSOCIATES OF ALASKA
W. S. DAWSON AND TRUCHAS LTD.	RIOAMEX
DENISON MINES (U.S.) INC.	DAVID S. ROBERTSON & ASSOCIATES LTD.
JOSEPH DESLOGE, JR. AND E. V. REINHARDT	ROCKY MOUNTAIN ENERGY CO.
DUVAL CORP.	SABINE PRODUCTION CO.
ENERGY FUELS NUCLEAR, INC.	SANTA MARIA MINING CO.
ENERGY RESERVES GROUP, INC.	RALPH SCHAUSS & ASSOCIATES
ENERGY URANIUM CO.	SCHUMACHER-LLOYD VENTURES
ENSEARCH EXPLORATION INC.	SOHIO PETROLEUM CO.
EXXON COMPANY, U.S.A AND EXXON CORP.	SPECOMP SERVICES, INC.
FARRIS MINES	SUNEDCO
FEDERAL RESOURCES CORP.	TENNESSEE VALLEY AUTHORITY
FELMONT OIL CORP.	TONTON EXPLORATION DRILLING CO., INC.
RALPH FOSTER & SONS	TEXACO, INC.
FOUR CORNERS EXPLORATION CO.	TEXASGULF, INC.
FRAMCO-FROMINCO-UREX, INC.	TODILTO EXPLORATION AND DEVELOPMENT CORP.
GATES AND FOX CO., INC.	TWENTIETH CENTURY ENERGY INC.
GENERAL ELECTRIC CO.	UNION CARBIDE CORP. AND UNION CARBIDE EXPLORATION CORP.
GETTY OIL CO.	UNITED NUCLEAR CORP.
GROTH MINERALS CORP. AND CHEROKEE EXPLORATION, INC.	UNITED NUCLEAR-HOMESTAKE PARTNERS
GULF MINERAL RESOURCES CO.	U. S. ENERGY CORP.
SPENST M. HANSEN AND ASSOCIATES, INC.	URANERZ U.S.A., INC.
HECLA MINING COMPANY	URANGESELLSCHAFT USA, INC.
HOMESTAKE MINING CO.	URANIA EXPLORATION, INC.
IDAHO MINING CORP.	URANIUM SUPPLY SERVICES CORP.
INCE MINING CO.	UTAH POWER & LIGHT CO.
INTERCONTINENTAL ENERGY CORP.	VIRGINIA NUCLEAR, INC.
INTERNATIONAL MINERALS & CHEMICAL CORP.	WEBB RESOURCES, INC.
KERADAMEX, INC.	WESTERN NUCLEAR, INC.
KERR MC GEE RESOURCES CORP.	WOLD NUCLEAR CO.
LUCKY MC URANIUM CORP.	WYOMING MINERAL CORP.
MINATOME CORP.	
MINERAL ENERGY, INC.	
MINERALS ENGINEERING CO.	
MINERALS EXPLORATION CO.	