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**Stable Isotope Sales: Mound Facility  
Customer and Shipment Summaries,  
FY 1981**

October 1, 1982

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**MOUND FACILITY**

Miamisburg, Ohio 45342

operated by

**MONSANTO RESEARCH CORPORATION**

a subsidiary of Monsanto Company

for the

**U. S. DEPARTMENT OF ENERGY**

Contract No. DE-AC04-76-DP00053

**Monsanto**

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FY 1981**

**Compiled by Albin H. Ruwe, Jr.**

**Issued: October 1, 1982**

**MASTER**

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## **Abstract**

A listing is given of Mound Facility's sales of stable isotopes of noble gases, carbon, oxygen, nitrogen, chlorine, and sulfur for Fiscal Year 1981. Purchasers are listed alphabetically and are divided into domestic and foreign groups. A cross-reference index by location is included for domestic customers. Cross-reference listings by isotope purchased are include for all customers.



## Introduction

This report is the fifteenth in a series on Mound Facility customers and sales of stable isotopes and covers Fiscal Year 1981. Isotope separation by thermal diffusion was begun at Mound Facility in the late 1950's. Distribution of helium-3 directly to customers was begun in 1960; in 1964 distribution of neon, argon, krypton, and xenon stable isotopes and carbon-13 was started. The distribution of carbon-12 and oxygen-16 was started in 1970. In 1972, 20% carbon-13 was made available to supply customer needs. In 1973 distribution of nitrogen-14, nitrogen-15, oxygen-17, and oxygen-18 was started. The distribution of sulfur-34 was started in 1975. Chlorine distribution commenced in 1976.

All the noble gas isotopes were isotopically enriched by thermal diffusion in cascaded columns. Carbon-13 and carbon-12 were enriched by carbon monoxide distillation. Carbon-13 enriched methane was enriched from 90% to 97% and 99% by a thermal diffusion column cascade. Carbon isotopes were originally produced by both Mound Facility and Los Alamos National Laboratory (LANL) and are now produced by LANL and distributed by Mound Facility. The isotopes of oxygen and nitrogen were enriched by nitric oxide distillation at Los Alamos National Laboratory for distribution by Mound Facility. Sulfur and chlorine isotopes were enriched by liquid thermal diffusion at Mound Facility.

This summary was compiled to present the sales of stable isotopes of the noble gases, carbon, oxygen, nitrogen, chlorine, and sulfur, which were produced for the Department of Energy at Mound Facility and Los Alamos National Laboratory for Fiscal Year 1981.

The customer tabulations are divided into the following sections:

- An alphabetical list of customers that is subdivided into domestic and foreign listings.
- An alphabetical list of states with cross references to customer numbers.
- An alphabetical list of isotopes with cross references to customer numbers.

The sales tabulations show total sales and furnishes the isotope, total number of shipments, total quantity, and the total value (including cylinder, packaging and handling) of isotope shipments in Fiscal Year 1981.

The available concentrations of the enriched isotopes have varied over a wide range. For example, xenon-124 has been enriched to 64%, whereas helium-3 has been enriched to 99.9996%.

The stable isotopes were distributed at enrichments noted in Table 1.

The stable isotopes of carbon, nitrogen, oxygen, chlorine, and sulfur were distributed in the forms shown in Table 2.

Helium-3 continued to be the major stable isotope in terms of volume and dollar sales of the numerous stable isotopes produced at Mound Facility. Information on enrichments, procurement, and prices may be obtained by contacting:

Monsanto Research Corporation  
Stable Isotope Sales  
Mound Facility  
Miamisubrg, Ohio 45342

Commercial telephone:  
513, 865-3501  
513, 865-3502

Federal Telecom:  
774-3501, 3502

Commercial teletype:  
TWX No. 810-473-2974



Table 1

Isotope	Enrichment, Mole %																					
	99.98	99.95	99.9	99.5	99	97	95	90	80	70	60	50	40	30	25	20	10	8	5	2	1	
Helium-3 <sup>a</sup>	X		X																			
Neon-20		X																				
Neon-21								X														
Neon-22			X							X												
Argon-36				X																		
Argon-38							X															
Argon-40		X																				
Krypton-78					X			X			X							X				
Krypton-80								X		X												
Krypton-82								X		X												
Krypton-83										X												
Krypton-84								X														
Krypton-86					X																	
Xenon-124													X			X		X				X
Xenon-126																					X	
Xenon-129									X	X												
Xenon-131								X	X	X												
Xenon-134												X										
Xenon-136					X			X	X													
Carbon-12		X	X																			
Carbon-13					X			X									X					
Nitrogen-14 <sup>b</sup>																						
Nitrogen-15					X						X											
Oxygen-16	X																					
Oxygen-17 <sup>c</sup>												X					X					
Oxygen-18 <sup>d</sup>								X									X	X				
Sulfur-34								X														
Chlorine-35								X														
Chlorine-37								X														

<sup>a</sup>Helium-3 also distributed at 99.9995% enrichment.

<sup>b</sup>Nitrogen-14 distributed at 99.99% enrichment.

<sup>c</sup>Oxygen-17 distributed at 20 to 55% enrichment.

<sup>d</sup>Oxygen-18 distributed at 90 to 99% enrichment and 5 to 10% enrichment.

Table 2

Compound	Isotope									
	C-12	C-13	N-14	N-15	O-16	O-17	O-18	S-34	Cl-35	Cl-37
Ammonia				X						
Ammonium nitrate			X							
Ammonium sulfate-solid				X						
Ammonium sulfate-solution			X							
Barium carbonate		X								
Carbon dioxide	X	X								
Carbon monoxide	X	X								
Carbon disulfide								X		
Elemental										
Carbon		X								
Nitrogen (gas)				X						
Oxygen (gas)					X	X	X			
Sulfur								X		
Methane		X								
Nitric acid				X						
Potassium nitrate				X						
Water					X	X	X			
Sodium chloride									X	X

## FY 1981 stable isotope customers

### Domestic

1. The Aerospace Corporation  
200 N. Douglas Street  
El Segundo, CA 90245  
O-18(O<sub>2</sub>, H<sub>2</sub>O)
2. Argonne National Laboratory  
9700 South Cass Avenue  
Argonne, IL 60439  
He-3, Kr-78, Xe-129, Cl-35(NaCl),  
Cl-37(NaCl), C-13(CO<sub>2</sub>), N-15(KNO<sub>3</sub>)
3. Arizona, University of  
P. O. Box 41030  
Tucson, AR 85717  
He-3, N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
4. Army, Department of  
Warehouse 335  
Ft. Belvoir, VA 22060  
C-13(CO, CO<sub>2</sub>)
5. Aura, Incorporated  
950 N. Cherry Avenue  
Tucson, AR 85726  
C-13(CH<sub>4</sub>)
6. R. J. Bambeck Company  
1000 Quail, Suite 120  
Newport Beach, CA 92660  
C-13(CO<sub>2</sub>)
7. Baylor College of Medicine  
1200 Moursund  
Houston, TX 77030  
O-17(H<sub>2</sub>O)
8. Bell Laboratories  
600 Mountain Avenue  
Murray Hill, NJ 07974  
He-3
9. Bio-Rad Laboratories  
2200 Wright Avenue  
Richmond, CA 94804  
C-13(BaCO<sub>3</sub>), N-15[(N<sub>2</sub>)(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
10. Boyce Thompson Institute  
Tower Road  
Ithaca, NY 14850  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
11. Brookhaven National Laboratory  
Upton, NY 11973  
Ar-36, Ar-38, He-3, O-18(H<sub>2</sub>O)
12. Brookhaven National Laboratory  
Associated Universities, Inc.  
Upton, NY 11973  
He-3
13. Brown University  
192 Thayer Street  
Providence, RI 02912  
C-13(CO)
14. C. W. Radiation  
140 Kifer Court  
Sunnyvale, CA 94086  
He-3
15. California Institute of Technology  
391 So. Holliston  
Pasadena, CA 91125  
He-3, Cl-35(NaCl), C-13(CO)
16. California, University of  
Davis, CA 95616  
He-3, O-18(H<sub>2</sub>O), N-14[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>],  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
17. California, University of  
Irvine, CA 92717  
O-18(H<sub>2</sub>O)
18. California, University of  
405 Hilgard Avenue  
Los Angeles, CA 90024  
O-18(H<sub>2</sub>O, O<sub>2</sub>), C-13(C), N-15(N<sub>2</sub>)
19. California, University of, San Diego  
3175 Miramar Road  
La Jolla, CA 92093  
He-3, Ne-20, O-18(H<sub>2</sub>O)
20. California, University of  
Lawrence Berkeley Laboratory  
One Cyclotron Road  
Berkeley, CA 94720  
O-17(H<sub>2</sub>O), S-34(S)
21. California, University of  
Lawrence Livermore National Laboratory  
700 East Avenue  
Livermore, CA 94550  
Ne-22, Kr-78
22. California, University of  
Los Alamos Scientific Laboratory  
Los Alamos, NM 87545  
He-3
23. Cambridge Isotope Laboratories  
141 Magazine Street  
Cambridge, MA 02139  
C-13(CO), N-15(NH<sub>3</sub>)
24. Case Western Reserve University  
Millis Science Center, Room 207N  
Cleveland, OH 44106  
O-17(H<sub>2</sub>O), O-18(O<sub>2</sub>)

25. Chicago, University of  
933 East 56th Street  
Chicago, IL 60637  
He-3, Kr-78, O-18(H<sub>2</sub>O)
26. Chicago, University of  
5641 S. Ingleside Avenue  
Chicago, IL 60637  
O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)
27. Cincinnati, University of  
Cincinnati, OH 45221  
S-34(CS<sub>2</sub>)
28. Cleveland State University  
1802 E. 25th Street  
Cleveland, OH 44114  
C-13(BaCO<sub>3</sub>)
29. Coca-Cola Company, The  
544 Luckie Street, N.W.  
Atlanta, GA 30313  
N-15(NH<sub>3</sub>)
30. Columbia University  
119th Street and Broadway  
New York, NY 10027  
C-13(CO), O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)
31. Connecticut, University of  
Department of Physics  
Storrs, CT 06268  
N-15(N<sub>2</sub>)
32. Cyclotron Corporation  
950 Gilman Street  
Berkeley, CA 94710  
O-18(O<sub>2</sub>)
33. Delaware, University of  
Newark, DE 19711  
He-3
34. Delaware, University of  
700 Pilottown Road  
Lewes, DE 19958  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
35. EG&G  
130 Robin Hill Road  
Goleta, CA 93017  
He-3
36. E. I. DuPont De Nemours & Company  
Savannah River Plant  
Aiken, SC 29808  
O-16(O<sub>2</sub>)
37. E. I. DuPont De Nemours & Company  
Wilmington, DE 19898  
O-18(O<sub>2</sub>)
38. Eastman Kodak Company  
Kodak Park Division  
Rochester, NY 14650  
Ne-20, C-13(CO)
39. Exxon Research & Engineering Company  
1600 E. Linden Avenue  
Bldg. 16, Rm A-158  
Linden, NJ 07036  
C-13(CO)
40. Florida, University of  
Gainesville, FL 32610  
C-13(BaCO<sub>3</sub>), N-15(KNO<sub>3</sub>, N<sub>2</sub>),  
O-18(H<sub>2</sub>O)
41. Furman University  
Greenville, SC 29613  
O-17(H<sub>2</sub>O)
42. General Atomic Company  
10955 John Jay Hopkins Drive  
San Diego, CA 92121  
He-3, Kr-86
43. Georgetown University  
37th and O Streets, N.W.  
Washington, DC 20057  
O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)
44. Georgia, University of  
Athens, GA 30602  
N-15(N<sub>2</sub>)
45. Georgia Institute of Technology  
Room 50, Knowles Bldg.  
Atlanta, GA 30332  
He-3
46. Graner International Corporation  
100 East 42nd Street  
New York, NY 10017  
N-15(N<sub>2</sub>)
47. Gruman Aerospace Corporation  
P. O. Box 54  
Hicksville, NY 11802  
He-3
48. Harvard University  
18 Oxford Street  
Cambridge, MA 02138  
O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)
49. Hawaii, University of  
Honolulu, HI 96822  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>], O-18(H<sub>2</sub>O)
50. Hewlett Packard  
1501 N. Page Mill Road  
Palo Alto, CA 94304  
O-18(O<sub>2</sub>)
51. Hughes Research Laboratories  
3011 Malibu Canyon Road  
Malibu, CA 90256  
Ne-21
52. Illinois, University of  
Central Receiving Station  
1609 South Oak Street  
Champaign, IL 61820  
C-13(CO), N-14(NH<sub>4</sub>NO<sub>3</sub>),  
O-16(O<sub>2</sub>), O-17(H<sub>2</sub>O, O<sub>2</sub>)

53. Illinois Medical Center, University of  
912 S. Paulina  
Chicago, IL 60612  
O-17(H<sub>2</sub>O)
54. Illinois, University of  
Department of Chemistry  
Urbana, IL 61801  
C-13(CO)
55. Indiana University  
1101 E. 17th Street  
Bloomington, IN 47405  
He-3, C-13(CO), O-18(H<sub>2</sub>O)
56. International Fertilizer Development  
Center  
P. O. Box 2040  
Muscle Shoals, AL 35660  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
57. Iowa State University  
239 Argonomy  
Ames, IA 50011  
N-15(KNO<sub>3</sub>)
58. Isotec, Incorporated  
7542 McEwen Road  
Centerville, OH 45459  
He-3, Ar-38, Kr-86, Cl-35(NaCl),  
Cl-37(NaCl), C-13(C, CO, CO<sub>2</sub>),  
N-15(N<sub>2</sub>, NH<sub>3</sub>, KNO<sub>3</sub>), O-17(O<sub>2</sub>),  
O-18(O<sub>2</sub>)
59. Isotope Labeling Corporation  
622 Route 10  
Whippany, NJ 07981  
Cl-35(NaCl), C-12(CO<sub>2</sub>), C-13(C,  
CO<sub>2</sub>), N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>], O-17(O<sub>2</sub>)
60. Jodon, Incorporated  
62 Enterprise Drive  
Ann Arbor, MI 48103  
He-3
61. Kentucky, University of  
Box 77-00056  
Lexington, KY 40506  
N-14(NH<sub>4</sub>NO<sub>3</sub>),  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
62. Kodak Park Division  
66 Eastman Avenue  
Rochester, NY 14650  
C-13(CO)
63. KOR Isotopes  
56 Rogers Street  
Cambridge, MA 02142  
C-13(BaCO<sub>3</sub>, CO, CO<sub>2</sub>),  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, NH<sub>3</sub>, HNO<sub>3</sub>]  
O-17(H<sub>2</sub>O)
64. Liquid Carbonic Corporation  
767 Industrial Road  
San Carlos, CA 94070  
C-13(CO)
65. Litton System, Guidance & Control  
5500 Canoga  
Woodland Hills, CA 91367  
Xe-129, Xe-131
66. LND, Incorporated  
3230 Lawson Blvd.  
Oceanside, NY 11572  
He-3
67. Marquette University  
Chemistry Department  
535 North 14th Street  
Milwaukee, WI 53233  
O-18(O<sub>2</sub>)
68. Massachusetts Institute of Technology  
6 Vassar Street  
Cambridge, MA 02139  
O-18(H<sub>2</sub>O)
69. Massachusetts Institute of Technology  
Lincoln Laboratory  
244 Wood Street  
Lexington, MA 02173  
C-13(CH<sub>4</sub>)
70. Matheson  
8870 Utica  
Cocamonga, CA 91730  
C-13(CO<sub>2</sub>, CH<sub>4</sub>)
71. Matheson  
932 Paterson Plank Road  
East Rutherford, NJ 07073  
He-3, Ar-40, Ne-20
72. Measurex Corporation  
One Results Way  
Cupertino, CA 05014  
C-13(CO<sub>2</sub>)
73. Medi-Physics, Incorporated  
5855 Christie Avenue  
Emergyville, CA 94608  
Kr-82
74. Medi-Physics, Incorporated  
900 Durham Avenue  
South Plainfield, NJ 07080  
Kr-82
75. Melles Griot  
435 S. Pacific Street  
San Marcos, CA 92069  
He-3, Ne-20, Ne-22
76. Miami, University of  
Coral Gables, FL 33124  
O-17(H<sub>2</sub>O)
77. Michigan, University of  
2455 Hayward Street  
Ann Arbor, MI 48109  
Ne-22, O-18(H<sub>2</sub>O)



78. Michigan State University  
1330 S. Harrison Road  
East Lansing, MI 48824  
He-3, N-14(NH<sub>4</sub>NO<sub>3</sub>)
79. Minnesota, University of  
Minneapolis, MN 55455  
O-18(H<sub>2</sub>O)
80. Missouri, University of  
General Service Bldg.  
Columbia, MO 65211  
He-3
81. Monsanto Company  
800 N. Lindbergh Road  
St. Louis, MO 63166  
C-13(CO), N-14(NH<sub>4</sub>NO<sub>3</sub>),  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
82. Mt. Sinai Hospital  
100 Street and 5th Avenue  
New York, NY 10029  
O-18(O<sub>2</sub>)
83. Mt. Sinai Medical Center  
Madison Avenue at 99th Street  
New York, NY 10029  
O-18(O<sub>2</sub>)
84. National Institute of Health  
Bethesda, MD 20205  
O-18(H<sub>2</sub>O)
85. Naval Research Laboratory  
4555 Overlook Avenue S.W.  
Washington, DC 20375  
He-3
86. Nebraska, University of  
Keim Hall, East Campus  
Lincoln, NE 68583  
N-14(NH<sub>4</sub>NO<sub>3</sub>), N-15(KNO<sub>3</sub>)
87. North Carolina State University  
Department of Soil Science  
Raleigh, NC 27605  
N-15(KNO<sub>3</sub>)
88. North Carolina, University of  
440 West Franklin Street  
Chapel Hill, NC 27514  
C-13(CO), O-18(H<sub>2</sub>O)
89. Northwestern University  
619 Clark Street  
Evanston, IL 60201  
C-13(CO)
90. Notre Dame, University of  
Notre Dame, IN 46556  
C-13(CO), S-34(CS<sub>2</sub>)
91. Occidental Research Corporation  
2100 S.E. Main Street  
Irvine, CA 92714  
C-13(CO)
92. Ohio State University, The  
Receiving Department  
2009 Millikin Road  
Columbus, OH 43210  
He-3, C-13(CO)
93. Oregon Graduate Center  
19600 N.W. Walker Road  
Beaverton, OR 97006  
O-18(H<sub>2</sub>O)
94. Oregon State University  
Department of Soil Science  
Corvallis, OR 97331  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
95. Pennsylvania State University  
308 Steidle Bldg.  
University Park, PA 16802  
O-18(O<sub>2</sub>)
96. Pennsylvania, University of  
Philadelphia, PA 19104  
O-17(H<sub>2</sub>O)
97. Pittsburgh, University of  
Terrace and De Soto Streets  
Pittsburgh, PA 15261  
He-3, O-18(O<sub>2</sub>)
98. Princeton University  
Washington Road  
Princeton, NJ 08544  
S-34(S)
99. Purdue University  
W. Lafayette, IN 47907  
He-3, C-13(CO<sub>2</sub>), O-17(H<sub>2</sub>O)
100. Raytheon Company  
430 Boston Post Road  
Wayland, MA 01778  
He-3
101. Rhode Island, University of  
S. Ferry Road  
Narragansett, RI 02882  
O-18(H<sub>2</sub>O)
102. Rhode Island, University of  
College of Pharmacy  
Kingston, RI 02881  
C-13(CO<sub>2</sub>)
103. Rice University  
P. O. Box 2666  
Houston, TX 77001  
C-13(CH<sub>4</sub>)
104. Rochester, University of  
Rochester, NY 14627  
O-18(H<sub>2</sub>O)
105. Rockwell International  
P. O. Box 3105  
Anaheim, CA 92803  
O-18(O<sub>2</sub>)

106. St. Jude Children's Research Hospital  
332 North Lauderdale  
Memphis, TN 38101  
O-17(H<sub>2</sub>O)
107. Sandia National Laboratories  
1515 Eubank Blvd. S.E.  
Albuquerque, NM 87123  
He-3, Ne-20, Kr-78, Xe-124,  
N-15(N<sub>2</sub>, NH<sub>3</sub>), O-18(H<sub>2</sub>O)
108. Smithsonian Observatory  
185 Alewife Book Parkway  
Cambridge, MA 02138  
O-16(H<sub>2</sub>O)
109. Stanford University  
Off Serra Street  
Stanford, CA 94305  
N-15(KNO<sub>3</sub>), O-16(O<sub>2</sub>), O-18(O<sub>2</sub>)
110. State University of New York  
at Stonybrook  
Stonybrook, NY 11794  
He-3
111. Stohler Isotope Chemicals, Inc.  
33A Jones Road  
Waltham, MA 02154  
Cl-37(NaCl), C-13[(BaCO<sub>3</sub>),  
C, CH<sub>4</sub>, CO<sub>2</sub>], N-15(NH<sub>3</sub>, HNO<sub>3</sub>,  
N<sub>2</sub>)
112. Sunyab Rec  
Helm Bldg - Amherst Campus  
Buffalo, NY 14260  
C-13(BaCO<sub>3</sub>)
113. Teledyne Isotopes  
50 Van Buren Street  
Westwood, NJ 07675  
C-13(CO<sub>2</sub>)
114. Texas A&M University  
College Station, TX 77843  
He-3, Ne-20, N-15(N<sub>2</sub>), O-18(O<sub>2</sub>)
115. Texas Instruments, Inc.  
13510 N. Central Expressway  
Dallas, TX 75243  
He-3, C-13(C)
116. Texas, University of  
at Arlington  
Arlington, TX 76019  
N-15(N<sub>2</sub>)
117. Texas, University of  
at Austin  
2200 Comal Street  
Austin, TX 78712  
N-15(NH<sub>3</sub>)
118. TRW  
3001 Aviation Blvd  
Manhattan Beach, CA 90266  
C-13(CO), O-18(H<sub>2</sub>O, O<sub>2</sub>)
119. Tuskegee Institute  
Department of Agricultural Sciences  
Tuskegee Institute, AL 36088  
N-14(NH<sub>4</sub>NO<sub>3</sub>)
120. Union Carbide Corporation  
12900 Snow Road  
Parma, OH 44102  
O-17(H<sub>2</sub>O)
121. Union Carbide Corporation  
ORNL Plant  
P. O. Box P  
Oak Ridge, TN 37830  
O-18(H<sub>2</sub>O)
122. Union Carbide Technical Center  
P. O. Box 8361  
South Charleston, WV 25303  
C-13(CO)
123. United Technologies Research Center  
Silver Lane  
East Hartford, CT 06108  
C-13(CO<sub>2</sub>)
124. USDA  
National Finance Center  
P. O. Box 60075  
New Orleans, LA 70160  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
125. USDA, SEA/AR  
Plant Science Bldg.  
Colorado State University  
Fort Collins, CO 80523  
N-15(KNO<sub>3</sub>)
126. USDA, SEA/AR, NCR  
136 Crop Research Bldg.  
University of Minnesota  
St. Paul, MN 55108  
N-15[N<sub>2</sub>, KNO<sub>3</sub>, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
127. USDA, SEA/AIR  
P. O. Box 555 Highway 53  
Watkinsville, GA 30677  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
128. USDA, SEA/AR, NER, AEQI  
Soil Nitrogen & Environmental  
Chemistry Laboratory  
Room 229, Bldg. 007, BARC-West  
Bettsville, MD 20715  
N-15(KNO<sub>3</sub>, NH<sub>3</sub>)
129. U.S.D.O.E.  
Cochran Mill Road  
Bruceton, PA 15236  
O-18(O<sub>2</sub>)
130. US Services (PROCHEM)  
19 Ox Bow Lane  
Summit, NJ 07901  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>], Cl-35(NaCl),  
Cl-37(NaCl)

131. Veterans Administration Medical Center  
508 Fulton Street  
Durham, NC 27705  
O-17(H<sub>2</sub>O)
132. Virginia Polytechnic Institute  
Davidson Hall  
Blacksburg, VA 24061  
O-17(H<sub>2</sub>O)
133. Washington State University  
Pullman, WA 99164  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>],  
O-17(H<sub>2</sub>O)
134. Washington University  
Lindell & Skinker Blvds.  
St. Louis, MO 63130  
Xe-131
135. Westinghouse Electric Corporation  
Westinghouse Circle  
Horseheads, NY 14845  
He-3
136. Wisconsin, University of  
750 University Avenue  
Madison, WI 53706  
He-3, C-12(BaCO<sub>3</sub>), C-13(CO<sub>2</sub>),  
N-14[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>],  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, N<sub>2</sub>], O-18(H<sub>2</sub>O)
137. Wisconsin, University of  
Milwaukee, WI 53201  
O-18(H<sub>2</sub>O, O<sub>2</sub>)
138. Wizard Laboratories  
1362 Monarch Lane  
Davis, CA 95615  
C-13(CO<sub>2</sub>)
139. Woods Hole Oceanographic Institution  
Receiving Department  
Woods Hole, MA 02543  
He-3, Ne-22
140. Xenonics Company, Inc.  
73 Frost Street  
Cambridge, MA 02140  
He-3
141. Xerox Corporation  
Palo Alto Research Center  
3333 Coyote Hill Road  
Palo Alto, CA 94304  
O-18(H<sub>2</sub>O, O<sub>2</sub>)
142. Yale University  
225 Prospect Street  
New Haven, CT 06511  
C-13(BaCO<sub>3</sub>)
143. Yale University  
260 Whitney Avenue  
New Haven, CT 06520  
He-3, O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)

## FY 1981 stable isotope customers

### Foreign

#### AUSTRALIA

144. Australian National University, The  
P. Box Box 4, A.C.T. 2600  
Canberra, Australia  
O-17(H<sub>2</sub>O), O-18(H<sub>2</sub>O)
145. CSIRO  
2nd Floor Caga Centre  
Akuna Street  
Canberra, A.C.T., Australia  
O-18(H<sub>2</sub>O)
146. CSIRO, Division of Wildlife Research  
P. Box 84  
Lyneham, A.C.T. 2602, Australia  
O-18(H<sub>2</sub>O)
147. La Trobe University  
Bundoora, Victoria 3038, Australia  
O-17(H<sub>2</sub>O)
148. State Stores Board  
231 Turbot Street  
Brisbane 4000, Australia  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]

#### BELGIUM

149. Ghent, University of  
Coupure 533  
9000 Gent, Belgium  
N-15(KNO<sub>3</sub>)
150. Instituut Kern-En Stralingsfysika  
Celestijnenlaan 200 D  
3030 Leuven, Belgium  
He-3
151. Katholieke Universiteit Leuven  
Voorkern En Stralingsfysika  
Celestijnenlaan 200 D  
3030 Heverlee, Belgium  
He-3

#### BRAZIL

152. Rio de Janeiro, Universidade Federal do  
Instituto de Fisica  
Cidade Universitaria Bloca A 3° Andar  
Caixa Postal 68020  
Rio de Janeiro 21941, RJ, Brazil  
He-3

#### CANADA

153. University of Alberta  
201 General Service Bldg  
Edmonton, Alberta, Canada  
He-3, O-18(H<sub>2</sub>O)
154. Atomic Energy of Canada Ltd.  
Research Company  
Chalk River, Ontario, Canada K0J 1J0  
Ne-21, N-15(N<sub>2</sub>), O-18(O<sub>2</sub>)
155. British Columbia, The University of  
TRIUMF  
Vancouver, B.C., V6T 2A3, Canada  
O-18(H<sub>2</sub>O)
156. Guelph, University of  
Guelph, Ontario, Canada  
N-15(N<sub>2</sub>)
157. Laval Universite-Quebec  
Cite Universitaire  
Quebec, Canada; G1K 7P4  
N-15(N<sub>2</sub>)
158. Manitoba, University of  
Winnipeg, Manitoba, Canada R3T 2N2  
Kr-84, N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
159. McGill University  
3610 University Street  
Montreal, P. Quebec H3A 2B2, Canada  
He-3
160. Memorial University of Newfoundland  
Chemistry Department  
St. John's, Newfoundland, Canada  
A1B 3X7  
C-13(CO)
161. Merck Frosst Labs.  
16711 Trans Canada Highway  
Kirkland, Quebec, Canada H9R 4P8  
C-13(CO, CO<sub>2</sub>), N-15(NH<sub>3</sub>)
162. Saskatchewan, University of  
Saskatoon, Sask., Canada S7N 0W0  
He-3
163. Simon Fraser University  
Burnaby, B.C., Canada V5A 1S6  
He-3



CHINA

164. Institute of Physics  
Chinese Academy of Sciences  
Beijing, China  
He-3

DENMARK

165. Niels Bohr Institute  
Tandem Accelerator Lab.  
Roskilde 4000, Denmark  
He-3
166. NOVO Industri A/S  
'Lab. lager'  
Novo Alle  
DK2880 Bagsvaerd, Denmark  
N-15(KNO<sub>3</sub>)
167. Riso National Lab.  
Isotope Division  
DK4000 Roskilde, Denmark  
N-15[(KNO<sub>3</sub>), N<sub>2</sub>]

ENGLAND

168. Bath, The University of  
School of Chemistry  
Claverton Downs, Bath, England BA2 7AY  
He-3, Ne-22, Ar-36, Kr-78, Xe-136
169. BOC Limited - Special Gases  
24 Deer Park Road  
London, England  
C-13(CH<sub>4</sub>, CO, CO<sub>2</sub>, C),  
O-17(H<sub>2</sub>O)
170. Nuclear Physics Laboratory  
Keble Road  
Oxford OX1 3RN, England  
Ar-36
171. Oxford, University of  
South Parks Road  
Oxford, OX1 3QR, England  
Xe-129, S-34(S)
172. Reading, The University of  
Department of Soil Science  
Reading, RG1 5AQ, England  
N-15[(KNO<sub>3</sub>), (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
173. Rothamsted Experimental Station  
S&PN Department  
Harpenden, Herts AL5 2JQ, England  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]
174. Science and Engineering Research  
Council  
Rutherford and Appleton Laboratories  
Chilton, Didcot, Oxon OX11 OX, England  
Cl-37(NaCl)

175. Southampton, The University of  
Southampton, SO9 5NA, England  
Cl-37(NaCl)

FRANCE

176. A. P. C.  
132, Route D'Espangne  
31053 Toulouse Cedex, France  
N-15(HNO<sub>3</sub>, KNO<sub>3</sub>)
177. CEA  
Office des Rayonnements Ionisants  
B. P. 21  
91190 Gig-Sur-Yvette, France  
Kr-78, Kr-84, C-13(CO, CO<sub>2</sub>)
178. Institut Max Von Laue  
Avenue des Martyrs  
38 Grenoble, France  
Ar-36
179. Institut de Recherches sur les Fruits  
et Agrumes (IRFA)  
B. P. 5035  
34032 Montpellier Cedex, France  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]

WEST GERMANY

180. Universitat Dortmund  
Anorganische Chemie  
4600 Dortmund, Den  
Otto-Hahn-Strabe, West Germany  
N-15(NH<sub>3</sub>)
181. Freie Universitat Berlin  
Institut fur Organische Chemie  
Takustrasse, 3  
1000 Berlin 33, West Germany  
C-13(BaCO<sub>3</sub>), N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]
182. Hahn-Meitner-Institut fur Kernforschung  
Ber Kern und Strahlenphysik  
Glienicke Str. 100, 1000 Berlin 39,  
West Germany  
Ne-22, Ar-36, C-13(CO), N-15(N<sub>2</sub>)
183. Heinz Lindenberg  
Berliner Handels-Kontor  
Heinz Lindenberg  
Post Fach 100750  
1000 Berlin, West Germany  
O-17(H<sub>2</sub>O)
184. Institut fur Anorganische and  
Analytische Chemie  
Fabeckstrasse 34-36  
1000 Berlin 33, West Germany  
Xe-129, C-13(BaCO<sub>3</sub>)

185. Institut fur Bodenkunde der  
Universitat Gottingen  
Von-Siebold-Strabe 4  
D-3400 Gottingen, West Germany  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, KNO<sub>3</sub>]

186. Institut fur Kernphysik  
August-Euler-Str 6  
6000 Frankfurt Am Main 90  
West Germany  
N-15(N<sub>2</sub>)

187. Isocommerz GMBH  
c/o Franz Kroll & Co.  
Flughafen Berlin-Tegel  
1000 Berlin 51  
West Germany  
O-17(H<sub>2</sub>O)

188. Max-Planck-Institute fur  
Medizinische Forschung  
Jahn-Strasse 29  
6900 Heidelberg, West Germany  
O-17(H<sub>2</sub>O)

189. Universitaet Muenster  
Institut fur Kernphysik  
Corrensstrasse  
44 Muenster 1, West Germany  
Ne-21

190. Munchen, der Universitat  
Technologisches Labor  
8046 Garching Am Coulombwall 1,  
West Germany  
C-13(C)

191. Regensburg, Universitat of  
der Kanzler  
Abteilung Einkauf  
Postfach  
D-8400 Regensburg, West Germany  
O-17(H<sub>2</sub>O)

#### INDIA

192. Directorate of Purchase and Stores  
Department of Atomic Energy  
Mohatta Bldg.  
Palton Road  
Bombay 400 001, India  
He-3

193. The Registrar  
Tata Institute of Fundamental Research  
Homi Bhabha Road  
Bombay 400 005, India  
He-3

#### ITALY

194. Facolta Di Scienze  
Istituto Di Chimica Generale Ed  
Inorgancia Della  
Universita Di Torino  
10125-Corso Massimo, D'Azeglio 48  
Italy  
C-13(CO)

#### JAPAN

195. Japan Radioisotope Association  
28-45 Hon-Komagome 2-chome  
Bunkyo-ku, Tokyo, Japan  
Nc-22, Kr-82, Kr-84

196. Takachiho Trading Co., Ltd.  
4-8, 1-chome, Hiroo, Shibuya-ku  
Tokyo, Japan  
He-3, Ne-20, Ne-22

197. Teisan K.K.  
Tokyo International Airport  
Tokyo, Japan  
He-3

198. Tomoe Shokai, Ltd.  
1-25 Minami Kamata 1-chome  
Ohta-ku, Tokyo, Japan  
He-3, Kr-78, Xe-124

#### THE NETHERLANDS

199. Nijmegen, University of  
Faculteit der Wiskunde en  
Natuurwetenschappen  
Toernooiveld  
6525 Ed Nijmegen, The Netherlands  
He-3

200. State University  
Physical Laboratory  
Princetonplein 5  
Utrecht, The Netherlands  
O-18(H<sub>2</sub>O)

201. Technische Hogeschool  
Ontvangst en Expedite  
Den Dolech 2  
5612 AZ Eindhoven, The Netherlands  
Kr-78

#### NEW ZEALAND

202. Auckland, University of  
Private Bag  
Auckland, New Zealand  
C-13(C)

203. Canterbury, University of  
Christchurch 1  
New Zealand  
He-3

204. University of Waikato  
Science Store  
Hamilton, New Zealand  
N-15[(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>]

NORWAY

205. Insituut for Energiteknikk  
OECD Halden Reactor Project  
P. O. Box 173  
N-1751 Halden, Norway  
He-3

SINGAPORE

206. Siemens Components PTE, LTD  
Blk. 8, Ayer Rajah Industrial Estate  
Singapore 0513  
Republic of Singapore  
He-3

SOUTH AFRICA

207. Air Products S.A. (Pty) Limited  
Jan Smuts Airport  
Johannesburg, South Africa  
He-3

SWITZERLAND

208. Laboratorium fur Kernphysik  
Eidg. Technische Hochschule  
Honggerberg CH-8093  
Zurich, Switzerland  
N-15(NH<sub>3</sub>)
209. Zurich, University  
Physikinstitut  
Schonberggasse 9  
CH-8001 Zurich, Switzerland  
C-13(C)

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Isotope	Domestic	Foreign
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## Stable Isotope Sales FY-1981

Isotope	Domestic			Foreign			DOE and Other Federal			Total		
	Ship-ments	Liters <sup>a</sup>	Dollars	Ship-ments	Liters <sup>a</sup>	Dollars	Ship-ments	Liters <sup>a</sup>	Dollars	Ship-ments	Liters <sup>a</sup>	Dollars
Argon-36	-	--	--	4	4.02	15,929	1	.010	188	5	4.030	16,117
Argon-38	2	.040	1,730	-	--	--	1	.010	380	3	.050	2,110
Argon-40	1	1.000	521	-	--	--	-	--	--	1	1.000	521
Carbon-12	4	16.000	277	-	--	--	1	3.000	96	5	19.000 <sup>b</sup>	373
Carbon-13	63	1601.247	98,675	25	2382.207	177,684	20	228.186	11,822	108	4211.640 <sup>b</sup>	288,181
Carbon-13, LANL <sup>d</sup>											2.000 <sup>b</sup>	
Carbon-13, LANL <sup>e</sup>											1061.600 <sup>b</sup>	
Chlorine-35	3	3.290	770	-	--	--	2	2.000	370	5	5.290 <sup>b</sup>	1,140
Chlorine-37	7	9.000	2,979	1	1.000	416	1	1.000	345	9	11.000 <sup>b</sup>	3,740
Helium-3	43	10540.677	1063,587	27	605.643	96,210	51	3251.340	285,320	121	14397.600	1445,117
Krypton-78	-	--	--	4	1.573	6,442	4	1.317	21,378	8	2.890	27,820
Krypton-82	2	3.000	22,350	1	.100	1,113	-	--	--	3	3.100	23,463
Krypton-84	1	2.000	14,900	3	2.000	2,638	-	--	--	4	4.000	17,538
Krypton-86	1	.500	591	-	--	--	2	4.000	2,507	3	4.500	3,098
Neon-20	2	1.680	509	-	--	--	4	5.000	520	6	6.680	1,029
Neon-21	1	.500	5,835	3	.890	10,272	-	--	--	4	1.390	16,107
Neon-22	1	3.120	750	5	15.510	4,751	3	271.000	18,808	9	288.630	24,309
Nitrogen-14	1	1.100	222	1	4.500	718	8	165.500	27,463	10	171.000 <sup>c</sup>	28,403
Nitrogen-15	49	783.499	79,054	31	909.840	87,458	34	1397.751	81,344	114	3091.090 <sup>b</sup>	247,856
Nitrogen-15, LANL <sup>d</sup>											4.000 <sup>b</sup>	
Nitrogen-15, LANL <sup>e</sup>											124.000 <sup>b</sup>	
Oxygen-16	-	--	--	-	--	--	7	30225.600	46,986	7	30225.600 <sup>b</sup>	46,986
Oxygen-16, LANL <sup>d</sup>											35.300 <sup>c</sup>	
Oxygen-17	10	38.925	13,928	7	25.810	8,865	25	63.325	17,712	42	128.060 <sup>b</sup>	40,505
Oxygen-17, LANL <sup>d</sup>											.400 <sup>b</sup>	
Oxygen-18	28	148.317	13,404	8	58.450	4,389	47	1105.613	60,394	83	1312.380 <sup>b</sup>	78,187
Oxygen-18, LANL <sup>d</sup>											48.100 <sup>b</sup>	
Oxygen-18, LANL <sup>e</sup>											28.200 <sup>b</sup>	
Sulfur-34	1	1.000	375	1	3.000	1,237	4	4.580	1,815	6	8.580 <sup>b</sup>	3,427
Xenon-124	-	--	--	-	--	--	1	.300	800	1	.300	800
Xenon-129	1	.200	1,035	2	1.250	6,482	1	1.000	3,585	4	2.450	11,102
Xenon-131	1	.400	4,502	-	--	--	1	.500	3,600	2	.900	8,102
Xenon-136	-	--	--	1	.010	192	-	--	--	1	.010	192
Mixture	4	84.000	16,997	3	8.150	15,143	1	3.420	125	8	95.570	32,265
TOTAL	226		1342,991	127		439,939	219		585,558	572		2368,488

<sup>a</sup> Grams or kilograms of isotope as noted.<sup>b</sup> Grams.<sup>c</sup> Kilograms.<sup>d</sup> Material used at Los Alamos National Laboratory (LANL).<sup>e</sup> Material furnished for joint interest research.



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