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**List of DOE Radiosotope
Customers with Summary of
Radiosotope Shipments,
FY 1985**

D. A. Baker

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August 1986

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U. S. Department of Energy
by Battelle Memorial Institute



PNL-5948

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**LIST OF DOE RADIOISOTOPE CUSTOMERS WITH
SUMMARY OF RADIOISOTOPE SHIPMENTS, FY 1985**

D. A. Baker

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August 1986

Prepared for
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Pacific Northwest Laboratory
Richland, Washington 99352

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Larry D. Williams

Authorizing Official

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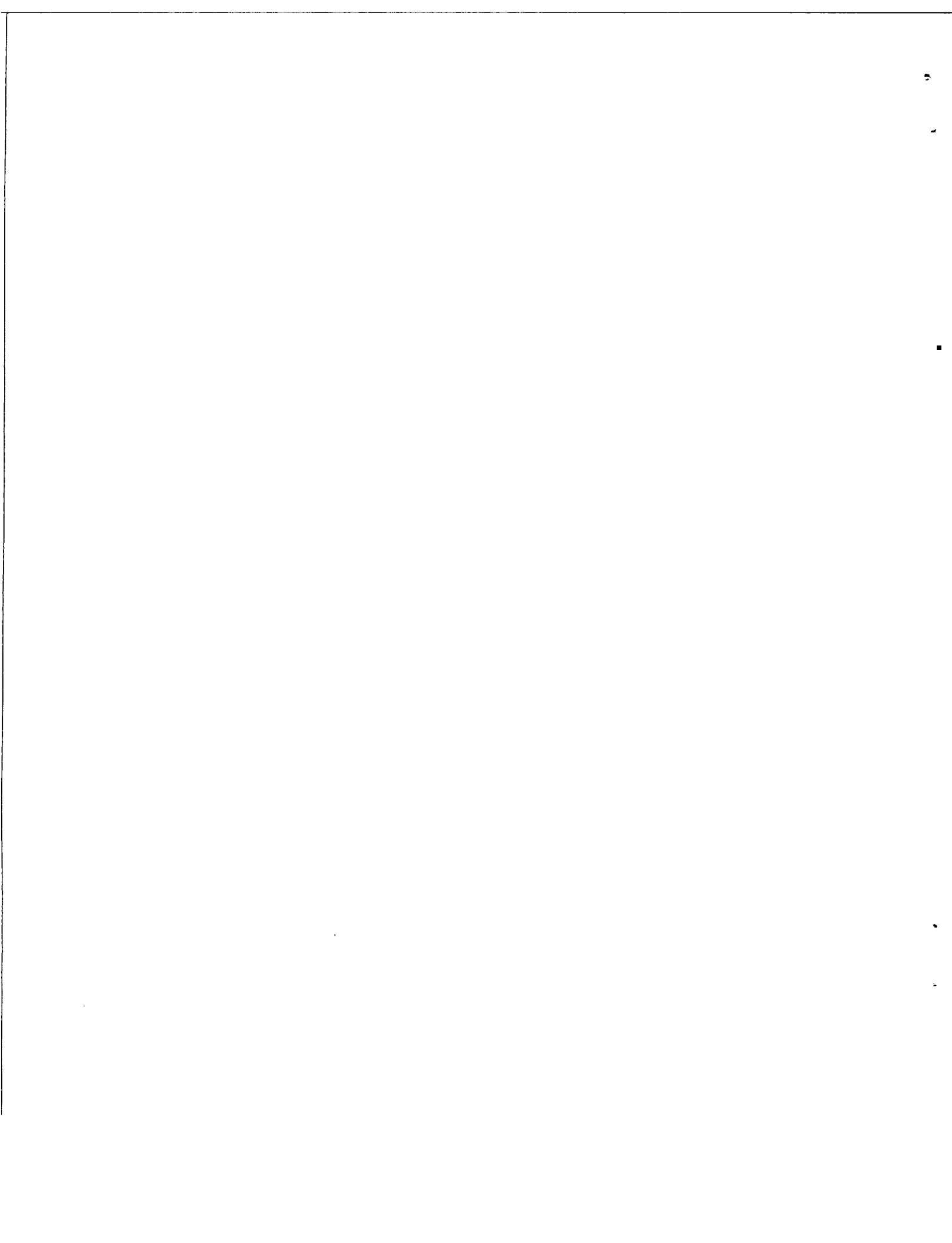
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ABSTRACT

This edition of the radioisotope customer list was prepared at the request of the Office of Health and Environmental Research (ER-73), Office of Energy Research, Department of Energy (DOE). This document describes radioisotope distribution from DOE facilities to private firms including foreign and other DOE facilities.

The information is divided into five sections: 1) isotope suppliers, facility contacts, and isotopes or services supplied; 2) customers, suppliers, and isotopes purchased; 3) isotopes purchased cross-referenced with customer numbers; 4) geographic locations of radioisotope customers; and 5) radioisotope sales and transfers - FY 1985.



ACKNOWLEDGMENTS

The compiler thanks the following laboratories and DOE Area Offices for their annual contributions from which this report is compiled:

Argonne National Laboratory
Brookhaven National Laboratory
Hanford Engineering Development Laboratory
Idaho National Engineering Laboratory/EG&G Idaho, Inc.
Los Alamos National Laboratory
Oak Ridge National Laboratory
Pacific Northwest Laboratory
Savannah River Plant/DOE
UNC Nuclear Industries, Inc.

PREVIOUS REPORTS

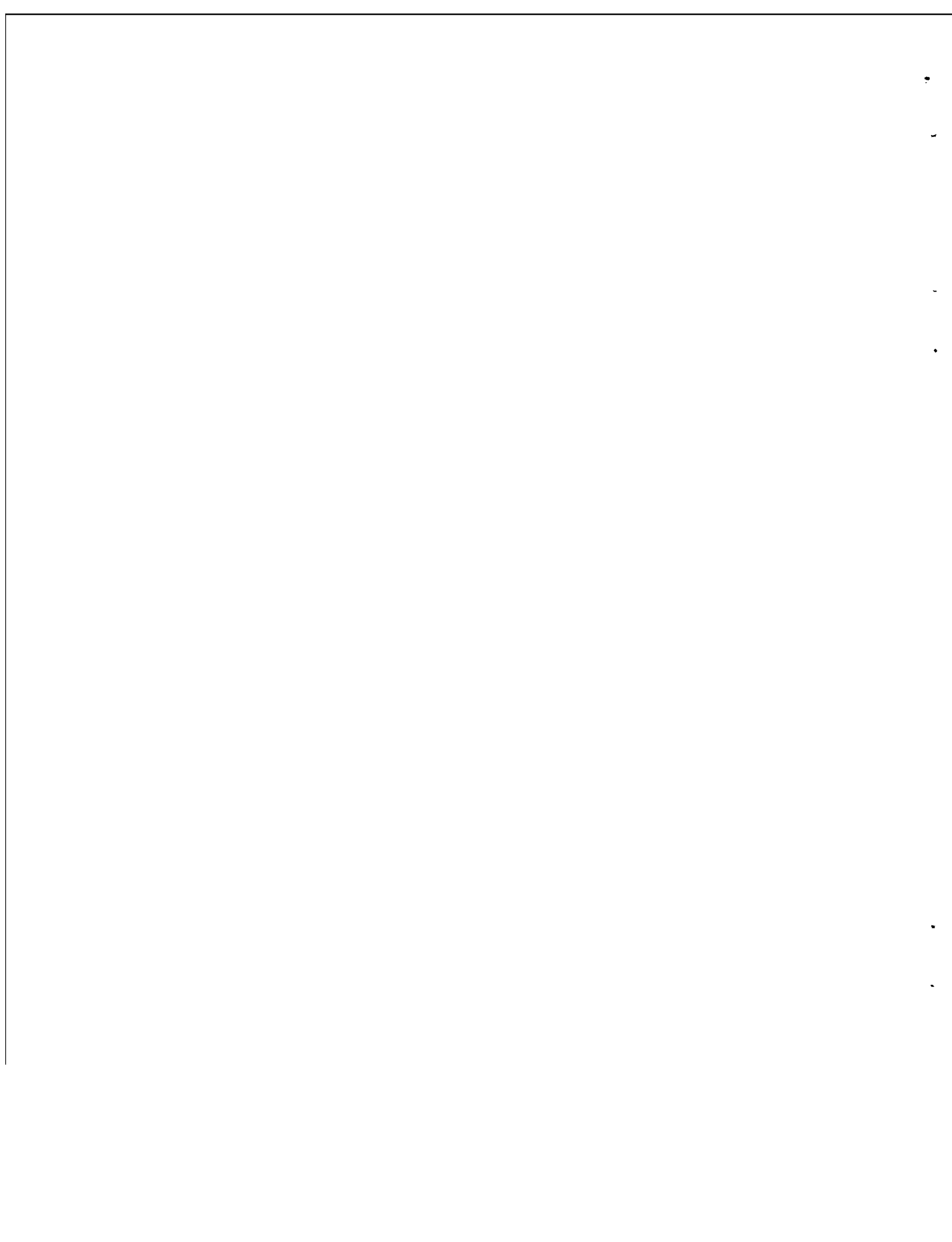
Previous reports in this series are:

TID-2160 (FY 1964)	ORNL-IIC-38 (FY 1971)	PNL-2930 (FY 1978)
ORNL-TIC-6 (FY 1965)	BNWL-1774 (FY 1972)	PNL-3274 (FY 1979)
ORNL-IIC-9 (FY 1966)	BNWL-1824 (FY 1973)	PNL-3839 (FY 1980)
ORNL-IIC-13 (FY 1967)	BNWL-1902 (FY 1974)	PNL-4177 (FY 1981)
ORNL-IIC-17 (FY 1968)	BNWL-1993 (FY 1975)	PNL-4759 (FY 1982)
ORNL-IIC-27 (FY 1969)	BNWL-2147 (FY 1976)	PNL-5126 (FY 1983)
ORNL-IIC-32 (FY 1970)	PNL-2572 (FY 1977)	PNL-5492 (FY 1984)

Similar reports covering DOE's stable isotopes' distribution programs have also been prepared and are available from the National Technical Information Center, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

"Stable Isotope Sales: Mound Facility Customer and Shipment Summary,"
FY 1979, MLM-2718; FY 1980, MLM-2843; FY 1981, MLM-2994; FY 1982,
MLM-3095; FY 1983, MLM-3234.

"Stable Isotope Customer List and Summary of Shipments,"
FY 1979, ORNL/TM-7214; FY 1980, ORNL/TM-7764; FY 1981, ORNL/TM-8302;
FY 1982, ORNL/TM-8704; FY 1983, ORNL/TM-8979; FY 1984, ORNL/TM-9430;
FY 1985, ORNL/TM-9866/R1.

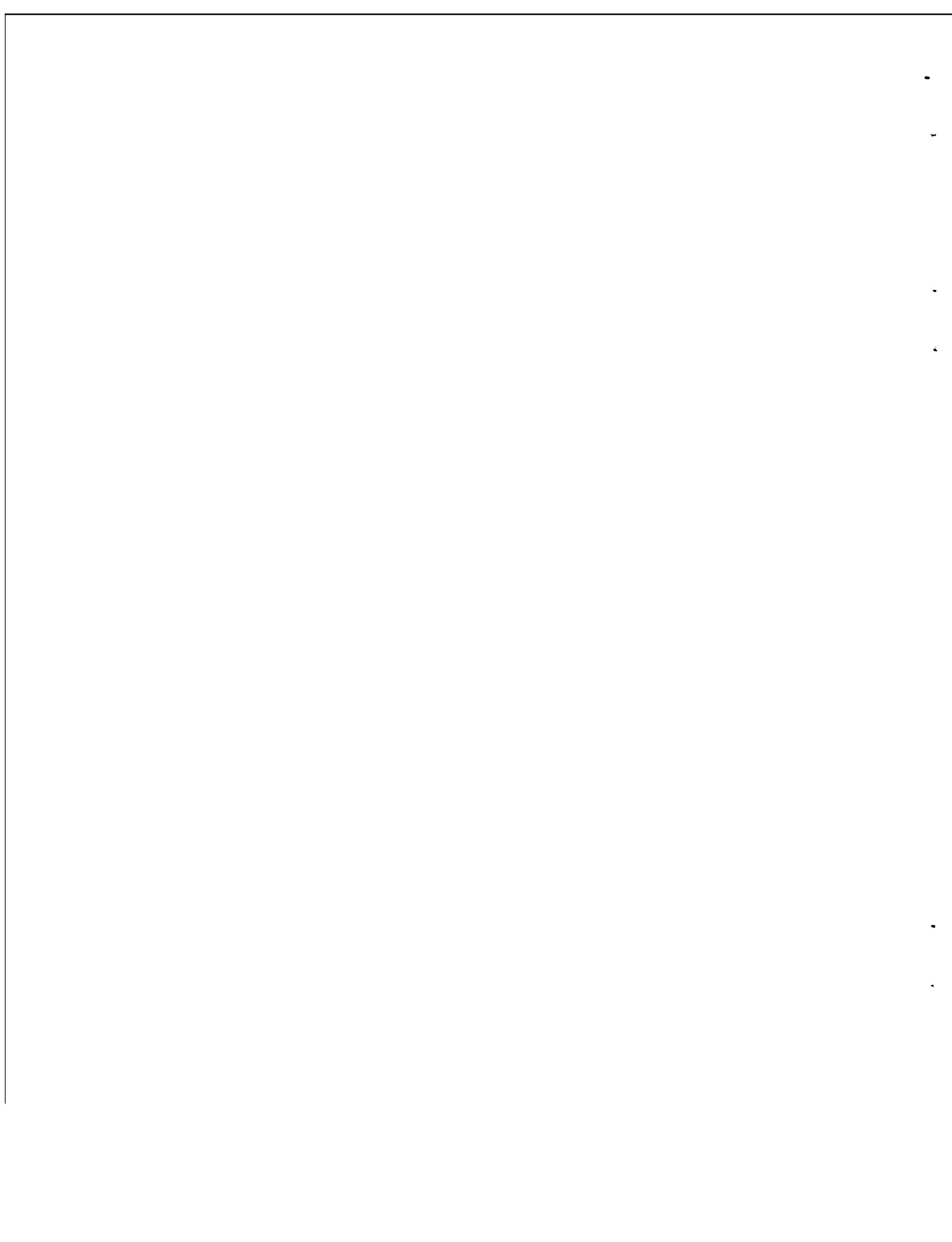


SUMMARY

This edition of the radioisotope customer list was prepared at the request of the Office of Health and Environmental Research (ER-73), Office of Energy Research, Department of Energy (DOE). This document lists DOE's radioisotope production and distribution activities by its facilities at Argonne National Laboratory, Brookhaven National Laboratory, Hanford Engineering Development Laboratory, Pacific Northwest Laboratory, Idaho Operations Office, Los Alamos National Laboratory, Oak Ridge National Laboratory, Savannah River Plant, and UNC Nuclear Industries, Inc.

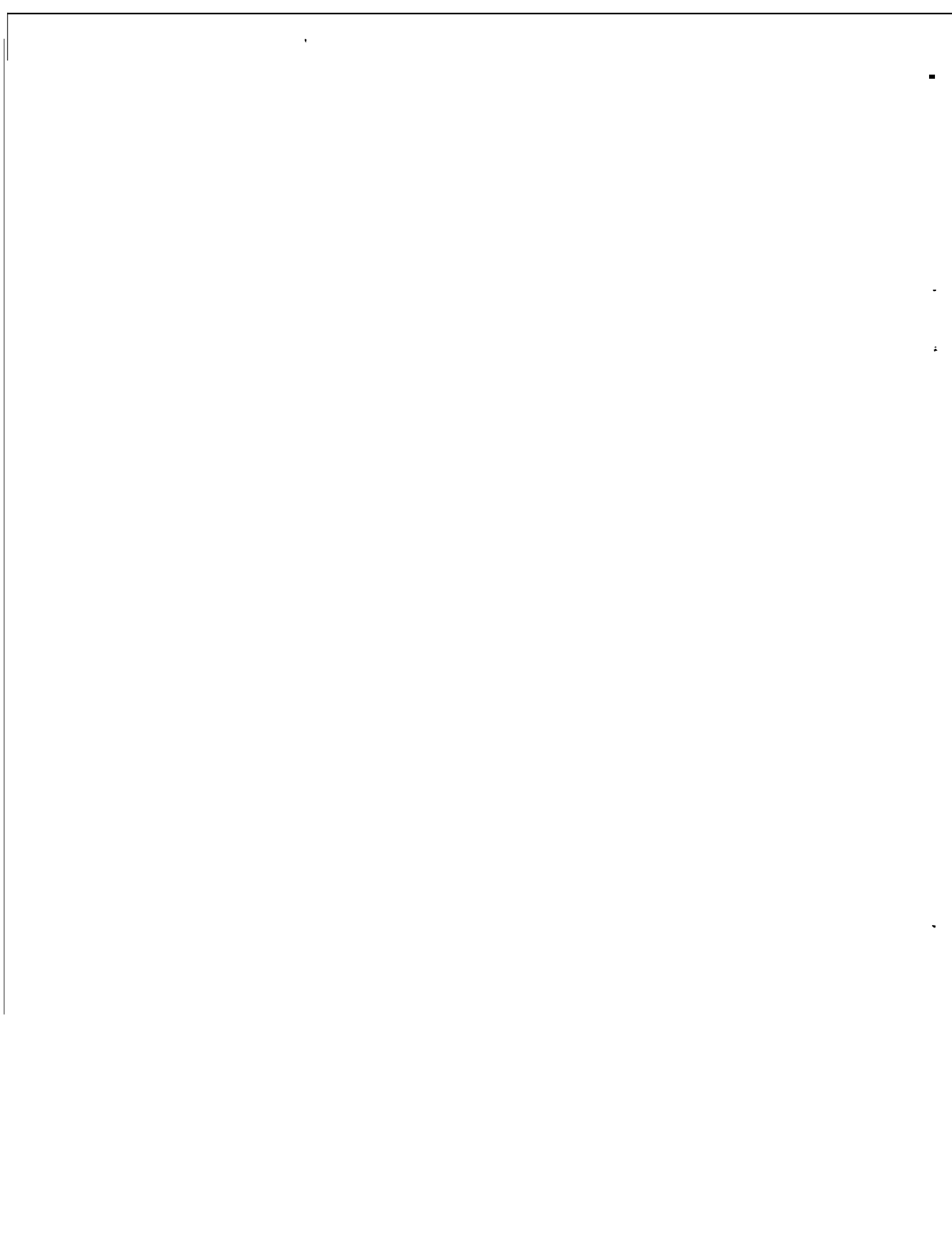
The information is divided into five sections:

1. Isotope Suppliers, Facility Contact, and Isotopes or Services Supplied. Table 1 lists suppliers of isotopes and the contact person for each DOE facility. If a reader needs more specific information about isotope sales or shipments for a particular facility, he or she should contact the person listed for that facility.
2. List of Customers, Suppliers, and Isotopes Purchased. Table 2 is an alphabetical list of domestic and foreign customers and their addresses. Each customer has a customer number that is used to cross-reference data in the other sections of the report. Isotope purchases for each customer are listed below each address along with the supplier code for the laboratory supplying the isotopes.
3. List of Isotopes Purchased Cross-Referenced to Customer Numbers. Table 3 lists the isotopes in alphabetical order and cross-references them to customer numbers. This section gives a quick reference of the number of customers purchasing a particular isotope.
4. Geographic Locations of Radioisotope Customers. Table 4 is an alphabetical list of states and foreign countries that cross-references customer numbers and indicates the geographical concentration of isotope users.
5. Radioisotope Sales and Transfers - FY 1985. Table 5 summarizes the 1985 radioisotope shipment activities of the DOE laboratory facilities listed in Table 1. The table alphabetically lists the isotopes with their suppliers (denoted by the first letter of their name). Data on shipments, quantities (including units of measure), and dollar values of each isotope are listed under domestic, foreign and DOE categories. The value of the radioisotopes sold in FY 1985 was \$11.4 million.



CONTENTS

ABSTRACT .	iii
ACKNOWLEDGMENTS	v
PREVIOUS REPORTS .	v
SUMMARY .	vi
LIST OF ABBREVIATIONS .	xi
1. ISOTOPE SUPPLIERS, FACILITY CONTACT, AND ISOTOPES OR SERVICES SUPPLIED .	1.1
2. LIST OF CUSTOMERS, SUPPLIERS, AND ISOTOPES PURCHASED .	2.1
3. LIST OF ISOTOPES PURCHASED CROSS-REFERENCED TO CUSTOMER NUMBERS .	3.1
4. GEOGRAPHIC LOCATIONS OF RADIOISOTOPE CUSTOMERS .	4.1
5. RADIOISOTOPE SALES AND TRANSFERS - FY 1985 .	5.1



LIST OF ABBREVIATIONS

AG-105	Silver-105	Ci	Curie
AL-26	Aluminum-26	CM-243	Curium-243
'AM-241	Americium-241	CM-244	Curium-244
AM-243	Americium-243	CM-248	Curium-248
AO	Administration only. No shipments made from site	CO-57	Cobalt-57
		CO-58	Cobalt-58
AT-211	Astatine-211	CO-60	Cobalt-60
AU-195	Gold-195	cs-137	Cesium-137
AU-198	Gold-198	CSI	Cyclotron Service Irradiations
B-11	Boron-11	CSI-B	Cyclotron Service Irradiations by Brookhaven
BA-140	Barium-140	CSI-L	Cyclotron Service Irradiations by LOS Alamos
BE-7	Beryllium-7		
BK-249	Berkelium-249	CU-65	Copper-65
BR-77	Bromine-77	DU	Depleted Uranium
BR-82	Bromine-82	E	Enriched
c-11	Carbon-11	ES-253	Einsteinium-253
C-14	Carbon-14	EU	Enriched Uranium
CA-47	Calcium-47	EU-152	Europium-152
CAP	Encapsulation	F-18	Fluorine-18
CD-109	Cadmium-109	FE-52	Iron-52
CE-139	Cerium-139	FE-55	Iron-55
CE-144	Cerium-144	FE-59	Iron-59
CF-249	Californium-249	FP	Fission Products
CF-252	Californium-252	g	gram

GA	Gallium-67	MS	Miscellaneous Services
GD-148	Gadolinium-148	NA-22	Sodium-22
GD-153	Gadolinium-153	NA-24	Sodium-24
GE-68	Germanium-68	NB-95	Niobium-95
H-3	Hydrogen-3 (trium)	NI-63	Nickel-63
HF-172	Hafnium-172	NP-237	Neptunium-237
HO-163	Holmium-163	NP-237H	High Purity NP-237
1-123	Iodine-123	NP-237O	Oxide of NP-237
I-129	Iodine-129	NU	Natural Uranium
1-131	Iodine-131	os-191	Osmium-191
IN-111	Indium-111	P-33	Phosphorus-33
IR-192	Iridium-192	PA-231	Protactinium-231
kCi	kilocurie	PD-109	Palladium-109
kg	kilogram	PM-147	Promethium-147
KR-85	Krypton-85	PO-208	Polonium-208
KR-85E	Enriched Krypton-85	PU-236	Plutonium-236
LU-172	Lutetium-172	PU-237	Plutonium-237
LU-173	Lutetium-173	PU-238	Plutonium-238
MCP	Miscellaneous Compound Preparations	PU-239	Plutonium-239
μ Ci	microcurie	PU-240	Plutonium-240
μ g	microgram	PU-241	Plutonium-241
mCi	millicurie	PU-242	Plutonium-242
mg	milligram	RB-81	Rubidium-81
MG-28	Magnesium-28	RB-83	Rubidium-83
MI	Miscellaneous Isotopes	RB-86	Rubidium-86
MIS	Miscellaneous Quantities	RSI	Reactor Service Irradiations

RU-97	Ruthenium-97	U-233	Uranium-233
RU-103	Ruthenium-103	U-234	Uranium-234
RU-106	Ruthenium-106	U-235	Uranium-235
RW	Withdrawn radioisotopes prepared under special approval	U-236	Uranium-236
		U-238	Uranium-238
SE-75	Selenium-75	V-48	Vanadium-48
SI-31	Silicon-31	v-54	Vanadium-54
SI-32	Silicon-32	XE-127	Xenon-127
SM-151	Samarium-151	Y-87	Yttrium-87
SN-117	Tin-117	Y-88	Yttrium-88
SP	Special Processing	ZN-65	Zinc-65
SR-82	Strontium-82	ZR-95	Zirconium-95
SR-89	Strontium-89		
SR-90	Strontium-90		
SS	Special Services		
TC-99	Technetium-99		
TE-128	Tellurium-128		
TH-229	Thorium-229		
TH-230	Thorium-230		
TH-232	Thorium-232		
TH-234	Thorium-234		
TI-44	Titanium-44		
TM-167	Thulium-167		
TM-170	Thulium-170		
TP	Target Preparations		
TB-158	Terbium-158		

1. ISOTOPE SUPPLIERS, FACILITY CONTACT, AND
ISOTOPES OR SERVICES SUPPLIED

TABLE 1. Isotope Suppliers , Facility Contact , and Isotopes or Services Supplied

<u>Isotope Supplier</u>	<u>Supplier Code</u>	<u>Facility Contact</u>	<u>Isotopes or Service</u>
Argonne National Laboratory	ANL	B. Z. Friddle Special Materials Division Argonne National Laboratory 9700 S. Cass Ave. Argonne, IL 60439 FIS 972-3425 Commercial (312) 972-3425	No isotopes sold directly. Isotopes produced counted in ORNL sales.
Brookhaven National Laboratory	BNL	K. S. Dahms Isotopes and Special Materials Group Brookhaven National Laboratory Upton, NY 11973 FIS 666-4051 Commercial (516) 282-4051	AT-211, AU-198, B-11, CO-57, CO-60, CS-137, CSI, CU-67, F-18, H-3, I-123, I-131, IN-111, MG-28, M , NA-22, NI-63, NP-237, OS-191, RSI, RU-97, TC-99, TE-128, U-238, XE-127
Hanford Engineering Development Laboratory	HEDL	W. R. Brooksher, Manager Safeguards and Security Westinghouse Hanford Company P.O. Box 1970 Richland, WA 99352 FIS 444-9927 Commercial (509) 376-9927	No isotopes produced in FY 1985
Idaho National Engineering Laboratory	INEL	J. T. Parks EG&G Idaho, Inc. Idaho National Engineering Laboratory P.O. Box 1625 Idaho Falls, ID 83415 FIS 583-4466 Commercial (208) 526-4466	RSI , CO-60

TABLE 1. (contd)

<u>Isotope Supplier</u>	<u>Supplier Code</u>	<u>Facility Contact</u>	<u>Isotopes or Service</u>
Los Alamos National Laboratory	LANL	K. E. Peterson Group INC-11, Mail Stop 5514 Los Alamos National Laboratory Los Alamos, NM 87545 FTS 843-4675 Commercial (505) 667-4675	AL-26, BE-7, CU-67, FE-52, GE-68, I-123, NA-22, SR-82, TI-44, XE-127, Y-88
Oak Ridge National Laboratory	ORNL	G. M. Carpenter Isotope Sales Oak Ridge National Laboratory P.O. Box X Oak Ridge, TN 37830 FTS 624-6984 Commercial (615) 575-6984	AM-241, AM-243, C-14, CAP, CE-144, CF-252, CM-244, CO-60, CS-137, CSI, EU-152, FE-55, GD-153, H-3, I-129, IR-192, KR-85, KR-85E, MCP, MG-28, MS, NB-95, NI-63, NP-237H, NP-2370, P-33, PA-231, PM-147, PU-236, PU-238, PU-239, PU-240, PU-241, PU-242, RU-103, RU-106, RW, SE-75, SM-151, SP, SR-89, SR-90, SS, TC-99, TH-229, TH-230, TH-232, TP, U-233, U-234, U-235, U-236, U-238, XE-127, ZR-95
Pacific Northwest Laboratory	PNL	O. P. Amacker Safety and Materials Management Pacific Northwest Laboratory P.O. Box 999 Richland, WA 99352 FTS 375-2804 Commercial (509) 375-2804	No isotopes produced in FY 1985

TABLE 1. (contd)

<u>Isotope Supplier</u>	<u>Supplier Code</u>	<u>Facility Contact</u>	<u>Isotopes or Service</u>
Savannah River Plant	SRP	G. A. Smithwick Process & Weapons Division Department of Energy P. O. Box A Aiken, SC 29801 FTS 239-2217 Commercial (803) 725-6211 Extension 2217	CF-252
UNC Nuclear Industries, Inc.	UNC	A. P. Larrick, Manager Chemistry & Waste Treatment Technology Operations Division UNC Nuclear Industries P. O. Box 490 Richland, WA 99352 FTS 444-7411 Commercial (509) 373-7411	TM-170

2. LIST OF CUSTOMERS' SUPPLIERS' AND ISOTOPES PURCHASED

TABLE 2. Alphabetical List of Customers, Suppliers, and Isotopes Purchased

<p>1 AT&T Technologies P.O. Box 1409 Lawrence, MA 01842</p> <p>ORNL: KR-85</p>	<p>9 Argonne National Laboratory 9700 South Cass Ave. Argonne, IL 60439</p> <p>LANL: GE-68 ORNL: CSI, H-3, SP, TP</p>
<p>2 AT&T Technologies Incorporated P.O. Box 105201 Atlanta, GA 30348</p> <p>ORNL: KR-85</p>	<p>10 Argonne National Laboratory P.O. Box 2528 Idaho Falls, ID 83401</p> <p>ORNL: 1-129, TP</p>
<p>3 Accu Ray Corporation 650 Ackerman Road P.O. Box 00248 Columbus, OH 43202</p> <p>ORNL: KR-85</p>	<p>11 Bemidji State University Bemidji, MN 56601</p> <p>ORNL: FE-55</p>
<p>4 Advanced Medical Systems, Inc. 621 Factory Row Geneva, OH 44041</p> <p>ORNL: CO-60, MCP, SR-90, SS</p>	<p>12 Benedict Nuclear Pharmaceuticals, Inc. 1313 Washington Avenue Golden, CO 80401</p> <p>LANL: 1-123</p>
<p>5 Advanced Micro Devices, Inc. P.O. Box 453 Sunnyvale, CA 94086</p> <p>ORNL: KR-85</p>	<p>13 Bicon Corp. 12345 Kinsman Road Newbury, OH 44065</p> <p>ORNL: CM-244, TP</p>
<p>6 Albert Einstein College of Medicine 1300 Morris Park Avenue Bronx, NY 10461</p> <p>LANL: CU-67 ORNL: CSI</p>	<p>14 Biosources, Limited 4-4 Bud Way Nashua, NH 03060</p> <p>ORNL: GD-153</p>
<p>7 Amersham Corporation Arlington Heights, IL 60005</p> <p>ORNL: CM-244, TP</p>	<p>15 Boston College Chestnut Hill, MA 02167</p> <p>ORNL: TC-99</p>
<p>8 Analytics Incorporated 1094 Hemphill Avenue Atlanta, GA 30318</p> <p>BNL: XE-127</p>	<p>16 Brigham & Women's Hospital 10 Vining Street Boston, MA 02115</p> <p>ORNL: GD-153</p>

TABLE 2. (contd)

17	Brookhaven National Laboratory Isotopes & Special Metals Group Upton, Long Island, NY 11973 LANL: XE-127 ORNL: CF-252, CSI, H-3, MIS, RU-103, SP, TP	24	Children's Medical Center 300 Longwood Avenue Boston, MA 02115 BNL: OS-191 ORNL: TC-99
18	California Institute of Technology 391 South Holliston Pasadena, CA 91125 ORNL: SP	25	Ciba Geigy Corporation 181 Passaic Avenue Summit, NJ 07901 BNL: MG-28 ORNL: MG-28 (AO)
19	California State University 800 North State College Fullerton, CA 92624 LANL: CU-67 ORNL: CSI	26	City of Hope Medical Center 1500 E. Duarte Road Duarte, CA 91010 ORNL: MCP
20	Calm VA-1 (525) P.O. Box 2971 Austin, TX 78769 ORNL: XE-127	27	Clarkson College of Technology Potsdam, NY 13673 ORNL: TP
21	Carnegie-Mellon University 5000 Forbes Pittsburgh, PA 15213 ORNL: CF-252, TP	28	Colgate Palmolive Research Center 909 River Road Piscataway, NJ 08854 ORNL: P-33
22	Case-Western Reserve University 2220 Circle Drive Cleveland, OH 44106 BNL: MG-28 ORNL: MG-28 (AO)	29	Colorado State University Fort Collins, CO 80521 ORNL: ZR-95
23	Chem-Nuclear Systems, Inc. 220 Stoneridge Drive Columbia, SC 29210 ORNL: CO-60, CS-137, SS	30	Columbia University 538 West 120 Street New York, NY 10027 BNL: CU-67 ORNL: CSI

TABLE 2. (contd)

31	Consolidated Controls Corp. P.O. Box 726 Springfield, VA 22150 ORNL: H-3, MCP	38	E. I. DuPont de Nemours & Company, Inc. Accounts Payable 549 Albany Street Boston, MA 02118 ORNL: CE-144, CS-137, CSI, GD-153, H-3, I-129, I-129 , KR-85, P-33, RU-106, RW, SS, TC-99, ZR-95
32	Continental Oil Company, Inc. Research and Development Department P.O. Box 1267 Ponca City, OK 74601 ORNL: SR-89	39	E. R. Squibb & Sons P.O. Box CN 5303 Princeton, NJ 08540 ORNL: CSI, GD-153
33	Cryogenic Rare Gas Laboratories, inc. 46 Liberty Street Newark, NJ 07103 ORNL: KR-85	40	E. I. DuPont de Nemours & Company, Inc. Savannah River Plant Aiken, SC 29801 BNL: H-3 ORNL: CF-252, I-129, MIS
34	Cyclotron Corporation 950 Gilman Street Berkeley, CA 94710 ORNL: H-3	41	E. R. Squibb & Sons Radio Pharmaceutical R & D Route 1 via Gate 125 New Brunswick, NJ 08901 LANL: SR-82
35	Detroit Edison Accounts Payable Department P.O. Box 1659 Detroit, MI 48231 ORNL: KR-85	42	EAL Corporation 2030 Wright Avenue Richmond, CA 94804 BNL: CS-137
36	Digital Equipment Corp. 100 Minuteman Road Andover, MA 01810 ORNL: KR-85	43	EEETech Electronics Energy and Technology Division of Beatrice Foods Co. 2352 Utah Avenue El Segundo, CA 90245 ORNL: KR-85
37	Duke University Durham, NC 27706 ORNL: H-3, TP		

TABLE 2. (contd)

44	EG&G Idaho, Inc. P.O. Box 1625 Idaho Falls, ID 83415 INEL: RSI ORNL: CE-144, MIS, RU-106 TP, U-238, ZR-95	51	Florida State University Tallahassee, FL 32306 ORNL: CE-144, MIS
45	East Carolina University Purchasing Department Greenville, NC 27834 ORNL: SR-89	52	Frontier Tech 1641 Burnett Drive Xenia, OH 45385 SRP: CF-252
46	Eberline Analytical Corp. P.O. Box 3874 Albuquerque, NM 87190 ORNL: PU-239, SP	53	G. E. Intersil Inc. 10710 North Tantau Avenue Cupertino, CA 95014 ORNL: KR-85
47	Edgerton, Germeshausen and Grier 6456 So. Escondido Avenue Las Vegas, NV 89101 ORNL: CM-244, CO-60, MCP, SR-89, SS, TP	54	GA Technologies P.O. Box 85608 San Diego, CA 92138 ORNL: CS-137, MCP, SR-90, SS
48	Environmental Processing, Inc. 1321 N. Plano Road Richardson, TX 75801 ORNL: KR-85	55	GPU Nuclear Corporation P.O. Box 1018 Reading, PA 19603 ORNL: KR-85, MCP
49	Fairchild MHS Division P.O. Box 5000 Puyallup, WA 98373 ORNL: KR-85	56	Gamma Industries, Inc. P.O. Box 2543 Baton Rouge, LA 70821 ORNL: IR-192, SS
50	Fairchild Camera & Instrument Corp. Linear Division P.O. Drawer 7282 Mt. View, CA 94042 ORNL: KR-85	57	General Electric Company Lynchburg, VA 24505 ORNL: KR-85
		58	General Electric Company Domestic Products Division Mail Code 399 175 Curtner Avenue San Jose, CA 95125 INEL: CO-60

TABLE 2. (contd)

59	<p>General Electric Company Vallecitos Nuclear Company Vallecitos Road Pleasanton, CA 94566</p> <p>INEL: RSI SRP: CF-252</p>	66	<p>Gulf Nuclear, Inc. 202 Medical Center Webster, TX 77598</p> <p>ORNL: AM-241, CS-137, GD-153, IR-192, MCP</p>
60	<p>General Electric Company P.O. Box 254 San Jose, CA 95103</p> <p>INEL: RSI ORNL: AM-241, CAP, CO-60, MCP, SS</p>	67	<p>Harris Semiconductor P.O. Box 883 Melbourne, FL 32901</p> <p>ORNL: KR-85</p>
61	<p>General Motors Corp. Frigidaire Division Dayton, OH 45501</p> <p>ORNL: KR-85</p>	68	<p>Harvard Medical School Shields Warren Laboratory 50 Binney Street Boston, MA 02115</p> <p>BNL: AT-211 ORNL: MCP</p>
62	<p>General Semiconductor, Inc. 2001 West 10th Place Tempe, AZ 85281</p> <p>ORNL: KR-85</p>	69	<p>Hershey Medical Center Health Physics Hershey, PA 17033</p> <p>BNL: 1-131</p>
63	<p>Genicom Corporation One General Electric Drive Waynesboro, VA 22980</p> <p>ORNL: KR-85</p>	70	<p>High Rel Burn-In 2326 Kruse Drive San Jose, CA 95131</p> <p>ORNL: KR-85</p>
64	<p>Georgia Institute of Technology Nuclear Research Center 225 North Avenue, N.W. Atlanta, GA 30332</p> <p>ORNL: TC-99</p>	71	<p>Hunter College 695 Park Avenue New York, NY 10021</p> <p>LANL: CU-67</p>
65	<p>Gollob Analytical Service Corporation 47 Industrial Road Berkeley Heights, NJ 07922</p> <p>ORNL: C-14, H-3, KR-85</p>	72	<p>Hybritech Incorporated 9850 Distribution Avenue San Diego, CA 92121</p> <p>ORNL: GD-153, SS</p>
		73	<p>BM Research Center Kitchawan Road, RT. 134 Yorktown, NY 10598</p> <p>ORNL: CSI, TP</p>

TABLE 2. (contd)

74	ICN Biochemicals, Inc. P.O. Box 19536 Irvine, CA 92714 ORNL: CS-137, H-3, RU-106, SE-75	81	Johns Hopkins Hospital Radiation Safety 615 North Wolfe Street Baltimore, MD 21205 LANL: CU-67 ORNL: CSI, SS
75	Industrial Nuclear Company 1124 Chess Drive Foster City, CA 94404 ORNL: IR-192	82	KMS Fusion, Inc. 3941 S. Research Park Drive P.O. Box 1567 Ann Arbor, MI 48106 ORNL: H-3
76	lotech, Incorporated 5995 South Syracuse Suite 201 Englewood, CO 80111 ORNL: SS	83	Kaman Instrumentation Corporation P.O. Box 7463 Colorado Springs, CO 80933 ORNL: TP
77	Iowa State University Ames Laboratory Ames, IA 5001.1 ORNL: NP-237, TP	84	Knolls Atomic Power Laboratory P.O. Box 1072 Schenectady, NY 12301 ORNL: SP
78	Isomedix Inc. 80 South Jefferson Road Whippany, NJ 07981 ORNL: MCP	85	Lamont-Doherty Geological Observatory Palisades, NY 10964 ORNL: SP, TH-230
79	Isotope Products Laboratories 404 South Luke Street Burbank, CA 91502 BNL: H-3 LANL: Y-88 ORNL: CF-252, CS-137, CSI, GD-153, I-129, KR-85, PU-236, PU-239, PU-241, RU-106, SP, TH-230, TP, U-233, U-235, ZR-95	86	Lawrence Livermore National Laboratory Box 808 Livermore, CA 94550 BNL: CO-57, NP-237 ORNL: MCP, MIS, PA-231, PM-147, SP, TP
80	Isovac Engineering Company 6220 San Fernando Road Glendale, CA 92104 ORNL: KR-85	87	Litton Industries Guidance and Control Systems 5500 Conoga Avenue Woodland Hills, CA 91367 ORNL: KR-85

TABLE 2. (contd)

88	Long Island Jewish Medical Center New Hyde Park, NY 11042 ORNL: GD-153	95	Massachusetts Institute of Technology Box 69 Cambridge, MA 02139 ORNL: I-129
89	Los Alamos National Laboratory P.O. Box 1663 Los Alamos, NM 87545 BNL: TE-128, U-238, XE-127 LANL: CU-67, TI-44, Y-88 ORNL: AM-243, I-129, MIS, SM-151, SP, SS, TP	96	McDonnell-Douglas Astronautics Company Western Division 5301 Bolsa Avenue Huntington Beach, CA 92647 ORNL: KR-85
90	Lovelace Biomedical and Environmental Research Inst. Building 9217, Area Y Kirtland, NM 87115 LANL: BE-7	97	Medical Research Foundation, Inc. 181 Upper Riverdale Road Riverdale, GA 30374 ORNL: SS
91	Lovelace Clinic 4800 Gibson Boulevard, S.E. Albuquerque, NM 87108 ORNL: CAP, CE-144, CS-137, CSI, SS	98	Mercer School of Medicine Finance Office 1550 College Street Macon, GA 31207 ORNL: SR-89
92	Mallinckrodt Nuclear P.O. Box 5840 St. Louis, MO 63134 ORNL: TC-99	99	Methodist Hospital 1604 N. Capital Avenue Indianapolis, IN 46202 BNL: XE-127 ORNL: XE-127 (AO)
93	Mallinckrodt, Inc. 2703 Wagner Place Maryland Heights, MO 63043 BNL: XE-127 ORNL: SE-75, XE-127 (AO)	100	Micra Corporation 120 Ricefield Lane Hauppauge, NY 11788 ORNL: KR-85
94	Martin Marietta Corporation East Sand Lake Road Orlando, FL 32855 ORNL: KR-85	101	Minnesota Mining Manufacturing Company P.O. Box 3121 St. Paul, MN 55101 ORNL: KR-85, NB-95, SS

TABLE 2. (contd)

102	Monolithic Memories Incorporated 1275 Mission College Boulevard Santa Clara, CA 95050 ORNL: KR-85	110	Neutron Products, Inc. P.O. Box 68 Mt. Ephraim Road Dickerson, MD 20753 INEL: CO-60, RSI ORNL: CO-60, RSI
103	Moravek Biochemicals, Inc. 577 Mercury Lane Brea, CA 92621 ORNL: H-3	111	New England Enzyme Center Radiotherapy 136 Harrison Avenue Boston, MA 02111 BNL: U-238
104	Motorola, Inc. 3501 Ed Bluestein Boulevard Austin, TX 78721 ORNL: KR-85	112	New England Nuclear Corporation Radiopharmaceutical Division 331 Treble Cove Road Billerica, MA 01862 LANL: GE-68, NA-22, Y-88
105	Motorola, Inc. 5005 East McDowell Road Phoenix, AZ 85008 ORNL: KR-85	113	New Jersey College of Medicine and Dentistry 200 Bergen Street Newark, NJ 07103 ORNL: CSI, MCP
106	Mount Sinai Hospital Fifth Avenue and 100th Street New York, NY 10029 BNL: AT-211 ORNL: MCP	114	New York Medical College Department of Microbiology Basic Science Building Valhalla, NY 10595 BNL: CU-67
107	National Semiconductor Corporation 2900 Semiconductor Drive Santa Clara, CA 95051 ORNL: KR-85	115	North Carolina Memorial Hospital Division of Nuclear Medicine 2nd Floor, Old Clinic Building Chapel Hill, NC 27514 BNL: XE-127 ORNL: XE-127 (AO)
108	National Semiconductor Corporation 5901 South Calle Santa Cruz Tucson, AZ 85706 ORNL: KR-85	116	North Carolina State University P.O. Box 5935 Raleigh, NC 27607 ORNL: TH-229
109	Naval Medical Command National Capitol Region Building 1, Tower 6 Bethesda, MD 20014 BNL: XE-127		

TABLE 2. (contd)

117	Northern Telecom Electronics, Inc. 1705 Wyatt Drive Santa Clara, CA 95054 ORNL: KR-85	125	Potter and Brumfield Princeton, IN 47570 ORNL: KR-85
118	Nuclear Pharmacy, Inc. P.O. Box 25141 Albuquerque, NM 87125 ORNL: MCP, SS	126	Precision Monolithics, Inc. 1500 Space Park Drive Santa Clara, CA 95050 ORNL: KR-85
119	Nuclear Radiation Development, Inc. 2937 Alt Boulevard Grand Island, NY 14072 ORNL: AM-241, CAP, H-3	127	Princeton University Plasma Physics Laboratory P.O. Box 451 Princeton, NJ 08544 ORNL: MIS
120	Nuclear Sources and Services P.O. Box 14023 Houston, TX 77021 ORNL: KR-85	128	Purdue University Pharmacy Annex Lafayette, IN 47907 ORNL: MCP
121	Nuclepore Corporation 7035 Commerce Circle Pleasanton, CA 94566 ORNL: TP, U-235	129	RCA Raritan, NJ 08869 ORNL: KR-85
122	Oak Ridge Associated Universities P.O. Box 117 Oak Ridge, TN 37830 LANL: GE-68 ORNL: CSI, MIS, SS	130	Raytheon Company 350 Ellis Street Mountain View, CA 94042 ORNL: KR-85
123	Oak Ridge National Laboratory P.O. Box X Oak Ridge, TN 37830 BNL: H-3 LANL: CU-67	131	Raytheon Company 350 Lowell Street West Andover, MA 01810 ORNL: KR-85
124	Pacific Northwest Laboratory Battelle-Northwest P.O. Box 999 Richland, WA 99352 BNL: CO-60, CS-137 ORNL: MCP, TP UNC: TM-170	132	Reactor Experiments, Inc. 963 Terminal Way San Carlos, CA 94070 ORNL: NP-237, TH-232, TP, U-235, U-238

TABLE 2. (contd)

133	Redo Science, Inc. Education Instruments, Inc. 11 Robinson Lane Oxford, CT 06483	141	Science Applications 3 Choke Cherry Road Rockville, MD 20850
	ORNL: SR-90		ORNL: AM-243, TP
134	Rensselaer Polytechnic Institute 110 8th Street. Troy, NY 1218.1	142	Self Powered Lighting, Ltd. 8 Westchester Plaza Elmsford, NY 10523
	LANL: CU-67 ORNL: CSI		ORNL: H-3, SS
135	Reuter-Stokes, Inc. Edison Park 8499 Darrow Road Twinsburg, OH 44087	143	Shepherd and Associates, J. L. 1614 Victor Boulevard Glendale, CA 91201
	ORNL: TP, U-234, U-235		ORNL: CS-137, MCP
136	Rockwell Hanford Company P.O. Box 769 Richland, WA 99352	144	Signetics Corporation 1275 South 800 East Orem, UT 84057
	ORNL: CAP, CE-144, NP-237, KR-85		ORNL: KR-85
137	Rockwell International Atomics International Division Rocky Flats Plant P.O. Box 464 Golden, CO 80401	145	Signetics Incorporated 811 East Argues Avenue P.O. Box 3409 Sunnyvale, CA 94088-3409
	ORNL: SP		ORNL: KR-85
138	Rockwell International, Corp. P.O. Box 10462 Dallas, TX 75207	146	Siliconix, Inc. Mail Stop 60 2201 Laurelwood Road Santa Clara, CA 95054
	ORNL: KR-85		ORNL: KR-85
139	Safety Light Corporation 4150-A Old Berwick Road Bloomsburg, PA 17815	147	Sloan-Kettering Institute 425 East 68th Avenue New York, NY 10021
	ORNL: H-3, MCP, NI-63, PM-147		ORNL: MCP
140	Sandia Corporation P.O. Box 5800 Albuquerque, NM 87115	148	Solid State Scientific, Inc. 3900 Welsh Road Willow Grove, PA 19090
	ORNL: TP		ORNL: KR-85

TABLE 2. (contd)

149	Source Production and Equipment Company, Inc. 625 Oxley Street Kenner, LA 70062	156	Teledyne Wh Chang Albany Division of Teledyne Ind. Inc. P.O. Box 460 Albany, OR 97321
	ORNL: IR-192		ORNL: TP, U-233
150	Sperry Systems Management 310.1 Goddard Space Flight Center Greenbelt, MD 20771	157	Texas Instruments, Inc. Science Services Division P.O. Box 5012, Mail Stop 6 Dallas, TX 75222
	ORNL: KR-85		ORNL: KR-85
151	State University of New York at Stony Brook Research Foundation Stony Brook, NY 11790	158	The Medical College of Pennsylvania P.O. Box 18538 Philadelphia, PA 19129
	ORNL: XE-127		ORNL: SR-89, SS
152	State University of New York at Stony Brook University Hospital Stony Brook, NY 11794	159	Tracero Corporation 5763 Underwood Road Pasadena, TX 77507
	BNL: F-18, I-123		ORNL: KR-85
153	State University of New York 3435 Main Street Buffalo, NY 14214	160	Trio Tech International 2040 N. Lincoln Street Burbank, CA 91504
	ORNL: TC-99		ORNL: KR-85
154	Technical Operations South Avenue Burlington, MA 01803	161	U.S. Army Armed Forces Radiobiology Research Institute Defense Nuclear Agency Bethesda, MD 20014
	ORNL: IR-192		ORNL: SR-89
155	Teledyne Isotopes 123 Woodland Avenue Westwood, NJ 07675	162	U.S. Department of Agriculture Grand Forks Human Nutrition Research Center Box 7166 University Station Grand Forks, ND 58202
	BNL: CS-137, TC-99		LANL: CU-67

TABLE 2. (contd)

163	U.S. Department of Agriculture Radiological Safety Staff Room 226, B-001, BARC-West Beltsville, MD 20705 LANL: CU-67	170	U.S. Navy National Naval Medical Center Bethesda, MD 20014 ORNL: XE-127
164	U.S. Department of Agriculture Research Service P.O. Box 53326 New Orleans, LA 70150 ORNL: CSI	171	UNC Nuclear Industries P.O. Box 490 Richland, WA 99352 ORNL: MIS
165	U.S. Department of Energy 376 Hudson Street, 5th Floor New York, NY 10014 ORNL: CE-144	172	Union Carbide Corporation Nuclear Division Oak Ridge Gaseous Diffusion Plant P.O. Box P Oak Ridge, TN 37830 ORNL: SP, U-234
166	U.S. Geological Survey National Center, Room 1447-A 12201 Sunrise Valley Drive Reston, VA 22092 ORNL: CM-244	173	Union Carbide Corporation Nuclear Division Y-12 Plant P.O. Box Y Oak Ridge, TN 37830 ORNL: CF-252, GD-153, IR-192, MIS, SS
167	U.S. National Bureau of Standards Rec. Room, Bldg 301 Route 270, Quince Orchard Road Gaithersburg, MD 20878 LANL: AL-26	174	Union Carbide Corporation Nuclear Division Oak Ridge National Laboratory P.O. Box X Oak Ridge, TN 37830 ORNL: CO-60, CSI, EU-152, GD-153, IR-192, MCP, NI-63, NP-237, RU-106, SP, SR-89, SR-90, SS, TP
168	U.S. National Bureau of Standards Connecticut Avenue and Van Ness St. N.W. Washington, DC 20234 ORNL: CE-144, MIS, TP, U-238	175	Unit Process Assemblies, Inc. 53-15 37th Avenue Woodside, NY 11377 ORNL: SR-90
169	U.S. National Institute of Health 9000 Rockville Pike Bethesda, MD 20205 BNL: CO-60 ORNL: CSI, MCP	176	United States Air Force Kirtland Air Force Base Albuquerque, NM 87117 BNL: NA-22, TH-230

TABLE 2. (contd)

177	University of California 400 Sproul Hall Berkeley, CA 94720 ORNL: KR-85	184	University of Lowell 1 University Avenue Lowell, MA 01854 ORNL: TP, U-235
178	University of California Davis Medical Center 4301 X Street Sacramento, CA 95817 BNL: CU-67 LANL: CU-67	185	University of Lowell 11 Research Foundation 450 Aiken Street Lowell, MA 01845 ORNL: PU-239, TP
179	University of California Lawrence Berkeley Laboratory Berkeley, CA 94720 LANL: SR-82 ORNL: CSI, H-3, MIS, SP	186	University of Maryland College Park, MD 20742 ORNL: H-3, TP
180	University of Chicago Physical Science Department 1525 E. Hyde Park Boulevard Chicago, IL 60615 ORNL: CSI	187	University of Michigan N. University Building Ann Arbor, MI 48109 ORNL: AM-243
181	University of Chicago Radiation Protection Service HP11, Department 1034 5835 S. Cottage Grove Avenue Chicago, IL 60637 LANL: GE-68	188	University of Nebraska 511 Administration Lincoln, NE 68508 ORNL: RSI
182	University of Connecticut Physics Sciences Building Central Warehouse Storrs, CT 06268 BNL: MG-28	189	University of Nebraska Medical Center Nuclear Pharmacy 42nd and Dewey Street Omaha, NE 68105 LANL: FE-52 ORNL: CSI
183	University of Florida Gainesville, FL 32601 ORNL: PU-239, SP	190	University of New Mexico Los Alamos, NM 87545 LANL: CU-67
		191	University of North Carolina Chemistry Venable 045A Chapel Hill, NC 27514 BNL: MG-28 ORNL: MG-28 (AO)

TABLE 2. (contd)

192	University of Pennsylvania Cerebrovascular Research Center 36th Street & Hamilton Walk Philadelphia, PA 19104 BNL: F-18	199	V. A. Hospital Nuclear Medicine 1400 V.F.W. Parkway West Boxbury, MA 02132 BNL: XE-127
193	University of Rochester 575 Elmwood Avenue Rochester, NY 14726 ORNL: TP, U-235	200	V. A. Hospital and Medical Center Ann Arbor, MI 48104 ORNL: CSI
194	University of Southern California Accounts Payable P.O. Box 77967 Los Angeles, CA 90089 ORNL: MCP	201	Washington University Lindell and Skinker St. Louis, MO 63130 LANL: GE-68 ORNL: CSI
195	University of Texas at Dallas P.O. Box 30365 Dallas, TX 75230 ORNL: GD-153, SR-89	202	West Virginia University Physics Department P.O. Box 6023 Morgantown, WV 26506 BNL: H-3
196	University of Utah Purchasing Department Salt Lake City, UT 84112 ORNL: SP, U-233	203	Westinghouse Hanford Company P.O. Box 1970 Richland, WA 99352 ORNL: TP
197	University of Virginia Radiation Safety Officer RWMF, 124 - 11th Street, S.W. Charlottesville, VA 22903 BNL: XE-127 ORNL: XE-127 (AO)	204	Yale University 20 Ashmun Street New Haven, CT 06520 ORNL: TP
198	University of Wisconsin 750 University Avenue Madison, WI 53706 LANL: GE-68 ORNL: CSI	205	Yale University School of Medicine Section of Cardiology 87-LMP 333 Cedar Street New Haven, CT 06510 BNL: I-131, IN-111
		206	Zilog, Incorporated 10460 Bugg Road Cupertino, CA 95014 ORNL: KR-85

TABLE 2. (contd)

FOREIGN

AUSTRALIA

207 Australian AEC
Research Establishment
Lucas Heights, NSW

BNL: XE-127

208 Australian Atomic Energy
Commission
Private Mail Bag
Sutherland, 2232, NSW

ORNL: PA-231, TP, XE-127

209 Royal Children Hospital
Flemington Road
Parkville, Victoria 3052

LANL: CU-67

ORNL: CSI

AUSTRIA

210 International Atomic Energy Agency
Wagramerstrassa 5
P.O. Box 100
A-1400 Vienna

ORNL: TP, U-233

BELGIUM

211 Central Bureau for Nuclear Measure-
ments of the European Communities
B-2440 GEEL, Steenweg maar Retie

ORNL: PU-238, PU-241, TH-230,
TP, U-236

212 Katolieke Universiteit Leuven
Instituut Voor Kern-En
Stralingsfysika
Celestijnenaan 200 D
3030 Leuven

ORNL: I-129

213 Universite de Liege
Centre de Recherches du Cyclotron
Sart Tilman
B-4000 Liege 1

LANL: GE-68

BRAZIL

214 American Consulate
President Wilson 147
Rio de Janeiro

BNL: NI-63

215 Brazilian Center for Physical
Research
Rio de Janeiro

ORNL: GD-153

CANADA

216 Atomic Energy of Canada, Ltd.
Chalk River Nuclear Laboratories
Chalk River, Ontario KOJ 1J0

INEL: RSI

ORNL: H-3, KR-85, SP, U-233

217 Atomic Energy of Canada, Ltd.
4004 Westbrook Mall
Vancouver, B. C. V6T 2A8

BNL: XE-127

218 Atomic Energy of Canada, Ltd.
Radiochemical Company
413 March Road
P.O. Box 13500
Kanata, Ontario K2K 1X8

BNL: XE-127

LANL: GE-68

ORNL: CS-127, GD-153, IR-192,
MCP, SR-90, SS, XE-127 (AO)

TABLE 2. (contd)

219	Atomic Energy of Canada, Ltd. Whiteshell Nuclear Research Establishment Pinawa, Manitoba ORNL: CAP, NIP-237, TP, U-233	<u>FEDERAL REPUBLIC OF GERMANY</u>
220	Hospital for Sick Children Research Institute 555 University Avenue Toronto, Ontario M5G 1X8 ORNL: CSI	226 AEG-Telefunken Zentravelwaitung Westzone D8752 Grossweizhein Frankfurt am Main ORNL: TP, U-234
221	McMaster University Hamilton, Ontario ORNL: I-129	227 American Hoechst Corporation P.O. Box 2500 Somerville, NJ 08876 ORNL: KR-85
222	Scarborough General Hospital Nuclear Medicine 3050 Lawrence Avenue East Scarborough, Ontario, H1P 2V5 BNL: XE-127 ORNL: XE-127 (AO)	228 Buchler and Company Untermainkai 34 6 Frankfurt M. 1 ORNL: MCP, SR-90
223	TRIUMF Safety Group 4004 Westbrook Mal1 Vancouver, BC V6T-2A3 BNL: AU-198, U-238	229 Fachbereich Physik der TU-München Strahlenschutzabt. Z 62 James-Frank-Weg D-8046 Garching B. München ORNL: PU-242
224	University of Saskatchewan Animal & Poultry Science Saskatoon, Saskatchewan S7N 0W0 ORNL: CSI	230 Forschungsanstalt Karlsruhe Reaktorgelände D-7514 Leopoldshafen ORNL: TC-99
	<u>DENMARK</u>	231 Gesellschaft für Kernforschung mbH. Institute für Angewandte Reaktor Physik Weberstrasse 5 75 Karlsruhe ORNL: AM-243, ZR-95
225	Riso National Laboratory DK-4000 Roskilde ORNL: SS	232 Gesellschaft für Schwerionenforschung Planckstrasse 1 D-6100 Darmstadt ORNL: TH-232, TP, U-236

TABLE 2. (contd)

233	Kernforschungsanlage Jülich, GmbH. Postfach 1913 D-517 Jülich	240	Compagnie Oris Industrie B.P. 21 91190 Gif-Sur-Yvette
	ORNL: TC-99		ORNL: CSI
234	Max Planck Institute für Kernphysik Saupfercheckweg Heidelberg	241	Office Des Rayonnement Ionisant C/O Gondrand Roissy Airport
	ORNL: SP, U-238		LANL: GE-68
			<u>ITALY</u>
235	Osram GmbH LOG/TRE Postfach 90 06 20 8000 München 90	242	Instituto Nazionale de Fisica Nucleare Laboratori Nazionali di Legnaro Via Romea n. 4 35030 Legnaro Padova
	ORNL: KR-85		ORNL: CF-252, TP
236	Sektion Physik Der Universität München Technologisches Labor. 8046 Garching am Coulombwall 1		<u>JAPAN</u>
	ORNL: TP, U-233, U-235	243	Kyoto University Engineering Research Institute Kyoto
			ORNL: CAP, PU-239, TP, U-233, U-234, U-235
	<u>FINLAND</u>	244	Power Reactor and Nuclear Fuel Development 9-13, I-Chom. Akasaka Minator-ku Tokyo
237	Oriola Oy ProLab PL 8 SF-02101 Espoo		ORNL: SS
	ORNL: CS-237	245	Tohoku University Department of Physics Katahira Z Chrome Sendai
	<u>FRANCE</u>		BNL: B-11
238	CEA Department Des Radioelements B.P. No. 2 91190 Gif-Sur-Yvette		
	ORNL: CS-137, SR-90, ZR-95		
239	Center D-Etudes Nucleaires De Saclay Gif-sur-Yvette		
	SRP: CF-252		

TABLE 2. (contd)

MEXICO

246 Instituto Nacional de
Investigaciones N
Comercializacion de Radioisotopos
Providencia 1229, DF 03100

ORNL: KR-85

NETHERLANDS

247 FOM Werkgroep Kilb
c/o Kernfysisch Versneller Instituut
Zernikelaan 25
Groningen

ORNL: CM-244, TP

PHILIPPINES

248 Zilog Philippines, Inc.
8460 Dr. A. Sanatos Ave. Cor.
South Superhighway, Paranaque
Metro Manila

ORNL: KR-85

SOUTH AFRICA

249 South African Atomic Energy Board
Private Bag 256
Pretoria

ORNL: CF-252, TP

SWITZERLAND

250 Eidg. Institut: fur Reaktorforschung
Wurenlingen

ORNL: H-3, MCP, PM-147, TC-99

251 Schweizerisches Institut fur
Nuklearforschung
Neunbrunnenstrasse 85
8050 Zurich

ORNL: H-3

252 mb-Microtec, Inc.
Freiburgstrasse 624
CH-3172 Niederwangen/Berne

ORNL: H-3

UNITED KINGDOM

253 Amersham International, Ltd.
White Lion Road
Amersham
Buckinghamshire
HP7 9LL England

ORNL: CE-144, CM-244, GD-153,
H-3, I-129, KR-85, MCP,
PM-147, RW, SR-90, SS,
TC-99, ZR-95

SRP: CF-252

254 Brandhust Co., Ltd.
Wellington Road
High Wycombe, Bucks
HP12 3PS England

ORNL: H-3

255 Hammersmith Hospital
MRC Cyclotron Unit
Ducane Road
London, W12 OHS, England

LANL: SR-82

ORNL: CSI

256 Saunders Roe Developments, Ltd.
North Hyde Road
Hayes, Middlesex, England

ORNL: H-3

257 Semi-Conductor Devices, Ltd.
59-61 Wong Chuk Hang Road
Aberdeen, Hong Kong

ORNL: KR-85

TABLE 2. (contd)

258 Surelite Limited
Priors Court
Priors Haw Road
Weldon, Northants NN171J6
England

ORNL: H-3

259 UK Freight Forwarding Office
25 Broadway
New York, NY 10004

ORNL: CM-144, I-129, PU-239,
PU-240, PU-241, SP, TH-230,
TP, U-234, U-235, U-236,
U-238

3. LIST OF ISOTOPES PURCHASED CROSS-REFERENCED TO CUSTOMER NUMBERS

TABLE 3. Isotopes Purchased Cross-Referenced to Customer Numbers

Aluminum-26	167
Americium-241	60 66 119
Americium-243	89 141 187 231
Astatine-211	68 106
Beryllium-7	90
Boron-11	245
Californium-252	17 21 40 52 59 79 173 239 249 253
Carbon-14	65
Cerium-144	38 44 51 91 136 165 168 253
Cesium-137	23 38 42 54 66 74 79 91 124 143 155 238
Cobalt-57	86
Cobalt-60	4 23 47 58 60 110 110 124 169 174
Copper-67	6 19 30 71 81 89 114 123 134 162 163 178 178 190 209
Curium-244	7 13 47 166 247 253 259
Cyclotron Service Irradiations	6 9 17 19 30 38 39 73 79 81 91 113 122 134 164 169 174 179 180 189 198 200 201 209 220 224 240 255
Encapsulation	60 91 119 136 219 243
Europium-152	174
Fluorine-18	152 192
Gadolinium-153	14 16 38 39 66 72 79 88 173 174 195 215 218 253
Germanium-68	9 112 122 181 198 201 213 218 241
Gold-198	223
Indium-111	205
Iodine-123	12 152
Iodine-129	10 38 40 79 89 95 212 221 253 259

TABLE 3. (contd)

Iodine-131	69	205											
Iridium-192	56	66	75	149	154	173	174	218					
Iron-52	189												
Iron-55	11												
Krypton-85	1	2	3	5	33	35	36	38	43	48	40	50	53
	55	57	61	62	63	65	67	70	79	80	87	94	96
	1.00	101	102	104	105	107	108	117	120	125	126	129	130
	1.31	138	144	145	146	148	150	157	159	160	177	206	216
	227	235	246	248	253	257							
Magnesium-28	22	22	25	25	182	191	191						
Misc. Compounds	4	26	31	47	54	55	60	66	78	86	106	113	118
	124	128	139	143	147	169	174	194	218	228	250	253	
Misc. Quantities	17	40	44	51	86	89	122	127	168	171	173	179	
Neptunium-237	77	86	132	136	174	219							
Nickel-63	1.39	174	214										
Niobium-95	1.01												
Osmium-191	24												
Phosphorus-33	28	38											
Plutonium-236	79												
Plutonium-238	211												
Plutonium-239	46	79	183	185	243	259							
Plutonium-240	259												
Plutonium-241	79	211	259										
Plutonium-242	229												
Promethium-147	86	139	250	253									
Protactinium-231	86	208											
Radioisotopes Withdrawn	38	253											

TABLE 3. (contd)

Reactor Service Irradiations (RSI)	44	59	60	110	188	216								
Ruthenium-103	17													
Ruthenium-106	38	44	74	79	174									
Samarium-151	89													
Selenium-75	74	93												
Silicon-32	112	176												
Special Processing (SP)	9	17	18	46	79	84	85	86	89	137	172	174	179	
	196	216	234	259										
Special Services (SS)	4	23	38	47	54	56	60	72	76	81	91	97	101	
	118	122	142	158	173	174	218	225	244	253				
Strontium-82	41	179	255											
Strontium-89	4	32	45	47	98	158	161	174	195					
Strontium-90	54	133	174	175	218	228	238	253						
Target Prep.	7	9	10	13	17	21	27	37	44	47	73	77	79	
	83	86	89	121	124	132	135	140	141	156	168	174	183	
	184	185	186	193	203	204	208	210	211	219	226	232	236	
	242	243	247	249	253	259								
Technetium-99	15	24	38	64	92	153	155	230	233	250	253			
Tellurium-128	89													
Thorium-229	116													
Thorium-230	79	85	176	211	259									
Thorium-232	132	232												
Thorium-234	124													
Titanium-44	89													
Tritium	9	17	31	34	37	38	40	65	74	79	82	103	119	
	123	139	142	179	186	202	216	250	251	252	253	254	256	
	258													

TABLE 3. (contd)

Uranium-233	79	156	196	210	216	219	236	243					
Uranium-234	135	226	243	259									
Uranium-235	79	121	132	135	184	193	236	243	259				
Uranium-236	211	232	259										
Uranium-238	44	89	111	132	168	223	234	259					
Xenon-127	8	17	20	89	89	93	93	99	99	109	115	115	151
	170	197	197	199	207	208	217	218	218	222	222		
Yttrium-88	79	89	112										
Zirconium-95	29	38	44	79	136	231	238	253					

4. GEOGRAPHIC LOCATIONS OF RADIOISOTOPE CUSTOMERS

TABLE 4. Geographic Locations of Customers by Customer Number

DOMESTIC

Arizona	61	105	108															
California	5	18	19	26	34	42	43	50	53	54	58	59	60	70	72	74	75	
	79	80	86	87	96	102	103	107	117	121	126	130	132	143	145	146	160	
	177	178	179	194	206													
Colorado	12	29	76	83	137													
Connecticut	133	182	204	205														
District of Columbia	168																	
Florida	51	67	94	183														
Georgia	2	8	64	97	98													
Idaho	10	44																
Illinois	7	9	180	181														
Indiana	99	125	128															
Iowa	77																	
Louisiana	56	149	164															
Maryland	81	109	110	141	150	161	163	167	169	170	186							
Massachusetts	1	15	16	24	36	38	68	95	111	112	131	154	184	185	199			
Michigan	35	82	187	200														

TABLE 4. (contd)

Minnesota

11 101

Missouri

92 93 201

Nebraska

188 189

Nevada

47

New Hampshire

14

New Jersey

25 28 33 39 41 65 78 113 127 129 155

New Mexico

46 89 90 91 118 140 176 190

New York

6 17 27 30 71 73 84 88 100 106 114 119 134 142 147 151 152
153 165 175 193

North Carolina

37 45 115 116 191

North Dakota

162

Ohio

3 4 13 22 52 61 135

Oklahoma

32

Oregon

156

Pennsylvania

21 55 69 139 148 158 192

South Carolina

23 40

Tennessee

122 123 172 173 174

TABLE 4. (contd)

Texas
20 48 66 104 120 138 157 159 195

Utah
144 196

Virginia
31 57 63 166 197

Washington
49 124 136 171 203

West Virginia
202

Wisconsin
198

FOREIGN

AUSTRALIA
207 208 209

AUSTRIA
210

BELGIUM
211 212 213

BRAZIL
214 215

CANADA
216 217 218 219 220 221 222 223 224

DENMARK
225

FEDERAL REPUBLIC OF GERMANY
226 227 228 229 230 231 232 233 234 235 236

FINLAND
237

FRANCE
238 239 240 241

ITALY
242

TABLE 4. (contd)

JAPAN

243 244 245

MEXICO

246

NETHERLANDS

247

PHILIPPINES

248

SOUTH AFRICA

249

SWITZERLAND

250 251 252

UNITED KINGDOM

253 254 255 256 257 258 259

5. RADIOISOTOPE SALES AND TRANSFERS - FY 1985

TABLE 5. Radioisotope Sales and Transfers - FY 1985

Isotope	Supplier	Domestic				Foreign				DOE				Total			
		Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value
Aluminum-26	L	1	0.50	µCi	0	0	---	µCi	0	0	---	µCi	0	1	0.50	µCi	0
Americium-241	0	12	278.00	g	405782	0	---	g	0	0	---	g	0	12	278.00	g	405782
Americium-243	0	2	1.20	mg	200	1	---	mg	100	1	---	mg	0	4	1.20	mg	300
Astatine-211	B	7	13.50	mCi	0	0	---	mCi	0	0	---	mCi	0	7	13.50	mCi	0
Beryllium-7	L	0	---	mCi	0	0	---	mCi	0	2	150.00	mCi	3529	2	150.00	mCi	3529
Boron-11	B	0	---	mCi	0	1	---	mCi	0	0	---	mCi	0	1	---	mCi	0
Californium-252	0	6	3.60	µg	60	2	1.40	µg	20	0	7840.00	µg	0	8	7845.00	µg	80
Californium-252	S	2	5.08	mg	55370	4	27.04	mg	304630	0	---	mg	0	6	32.12	mg	360000
Carbon-14	0	1	300.00	mCi	750	0	---	mCi	0	0	---	mCi	0	1	300.00	mCi	750
Cerium-144	0	6	2505.00	mCi	16400	1	20.00	mCi	240	4	60.40	mCi	1080	11	2585.40	mCi	17720
Cesium-137	B	4	0.44	mCi	0	0	---	mCi	0	0	---	mCi	0	4	0.44	mCi	0
Cesium-137	0	14	41135.50	Ci	5683	14	297589.30	Ci	30937	0	---	Ci	0	28	338724.00	Ci	36620
Cobalt-57	B	1	3.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	3.00	mCi	0
Cobalt-60	B	2	91.00	µCi	0	0	---	µCi	0	0	---	µCi	0	2	91.00	pci	0
Cobalt-60	I	3	698954.00	Ci	349477	0	---	Ci	0	0	---	Ci	0	3	698954.00	Ci	349477
Cobalt-60	0	2	23743.00	Ci	107395	0	---	Ci	0	1	29680.00	Ci	90130	3	53423.00	Ci	197525
Copper-67	B	4	2738.00	µCi	0	0	---	µCi	0	0	---	µCi	0	4	2738.00	µCi	0
Copper-67	L	28	1076.81	mCi	3717	1	10.00	mCi	250	14	328.59	mCi	250	43	1414.59	mCi	4217
Curium-244	0	3	14.90	mg	1470	6	1501.00	mg	150160	2	---	mg	100	11	1516.50	mg	151730
CSI	B	12	360.00		0	0	---		0	0	---		0	12	360.00		0
CSI-B	0	2	535.00		12841	0	---		0	2	10.00		2130	4	545.00		14971
CSI-L	0	40	5732.00		155687	7	90.00		7875	14	600.00		15242	61	6422.00		178804
Encapsulation	0	5	723000.00		221993	1	---		262840	58	---		190598	64	723000.00		675431
Europium-152	0	0	---	mCi	0	0	---	mCi	0	1	10.00	mCi	414	1	10.00	mCi	414
Fluorine-18	B	6	122.00	mCi	0	0	---	mCi	0	0	---	mCi	0	6	122.50	mCi	0

51

TABLE 5. (contd)

Isotope	Supplier	Domestic				Foreign				DOE				Total			
		Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value
Cadmium-153	O	71	129.32	Ci	690182	23	33.52	Ci	180409	4	3.01	Ci	16390	98	165.85	Ci	886981
Cermerium-68	L	5	165.00	mCi	10362	3	80.00	mCi	5075	5	45.03	mCi	6690	13	290.03	mCi	22127
Gold-198	B	0	---	mCi	0	1	---	mCi	0	0	---	mCi	0	1	---	mCi	0
Indium-111	B	4	27.00	mCi	0	0	---	mCi	0	0	---	mCi	0	4	27.00	mCi	0
Iodine-123	B	1	3.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	3.80	mCi	0
Iodine-123	L	1	16.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	16.00	mCi	0
Iodine-129	O	9	3636.00	mg	21566	9	4380.00	mg	24280	4	1185.00	mg	7110	22	9201.00	mg	52956
Iodine-131	B	7	22.69	mCi	0	0	---	mCi	0	0	---	mCi	0	7	22.69	mCi	0
Iridium-192	O	135	544238.00	Ci	711429	1	4165.00	Ci	5414	5	1040.00	Ci	2418	141	549443.00	Ci	719261
Iron-52	L	2	441.73	mCi	2600	0	---	mCi	0	0	---	mCi	0	2	441.73	mCi	2600
Iron-55	O	1	80.00	mCi	300	0	---	mCi	0	0	---	mCi	0	1	80.00	mCi	300
Krypton-85	O	218	5005.56	Ci	368078	12	376.00	Ci	26491	0	---	Ci	0	230	5381.56	Ci	394569
Krypton-85E	O	10	562.00	Ci	191601	3	143.00	Ci	45290	0	---	Ci	0	13	705.00	Ci	236899
Magnesium-28	B	13	6.19	mCi	4400	0	---	mCi	0	0	---	mCi	0	8	6.19	mCi	4400
Magnesium-28	O	8	1300.00	mCi	4290	0	---	mCi	0	0	---	mCi	0	8	1300.00	mCi	4290
Misc. Compounds	O	14	11.20		3159	0	---		0	3	6.00		1482	17	17.20		4641
Misc. Isotopes	B	15	---		655	2	---		60	0	---		0	17	---		715
Misc. Services	O	2	---		440	0	---		0	11	---		29295	13	---		29735
Neptunium-237	B	1	44.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	44.00	mCi	0
Neptunium-237	O	1	200.00	mg	90	1	1000.00	mg	445	4	51250.00	mg	18445	6	52450.00	mg	18980
Neptunium-2370	O	0	---	mg	0	1	1000.00	mg	630	0	---	mg	0	1	1000.00	mg	630
Nickel-63	B	0	---	mCi	0	1	10.00	mCi	0	1	---	mCi	0	1	10.00	mCi	0
Nickel-63	O	0	---	mCi	0	29	20000.00	mCi	60000	1	0.50	mCi	200	30	20000.50	mCi	60200
Niobium-95	O	6	39.00	mCi	4355	0	---	mCi	0	0	---	mCi	0	6	39.00	mCi	4355

52

TABLE 5. (contd)

Isotope	Supplier	Domestic				Foreign				DOE				Total			
		Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value
Osmium-191	B	1	500.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	500.00	mCi	0
Phosphorus-33	0	6	1398.00	mCi	28724	0	---	mCi	0	0	---	mCi	0	6	1398.00	mCi	28724
Plutonium-236	0	1	---	µCi	2150	0	---	µCi	0	0	---	µCi	0	1	---	µCi	2150
Plutonium-238	0	0	---	mg	0	1	200.00	mg	890	0	---	mg	0	1	200.00	mg	890
Plutonium-239	0	4	415.00	mg	375	2	1010.00	mg	606	0	---	mg	0	6	1425.00	mg	981
Plutonium-240	0	0	---	mg	0	1	10.00	mg	30	0	---	mg	0	1	10.00	mg	30
Plutonium-241	0	1	0.50	mg	4	2	1010.00	mg	8080	0	---	mg	0	3	1010.50	mg	8084
Plutonium-242	0	0	---	mg	0	1	20.00	mg	317	0	---	mg	0	1	20.00	mg	317
Promethium-147	0	0	---	Ci	0	6	18203.00	Ci	80453	1	1085.00	Ci	3892	7	19288.00	Ci	84345
Protactinium-231	0	0	---	mg	0	1	5.00	mg	415	1	6.00	mg	287	2	11.00	mg	702
RW	0	1	7.00		210	3	600.00		18000	0	---		0	4	607.00		18210
Reactor Serv. I	B	24	---		10206	0	---		0	0	---		0	24	---		10206
Reactor Serv. I	0	3	-248000.00		408135	0	---		0	0	---		0	3	-248000.00		408135
Reactor Serv. I	I	4	---		0	1	---		0	0	---		0	5	---		0
Ruthenium-103	0	0	---	mCi	0	0	---	mCi	0	2	6.00	mCi	0	2	6.00	mCi	714
Ruthenium-106	0	11	57.70	mCi	6799	0	---	mCi	0	2	1.50	mCi	400	13	59.20	mCi	7199
Ruthenium-97	B	1	1.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	1.00	mCi	0
Samarium-151	0	0	---	g	0	0	---	g	0	1	1000.50	g	445	1	1000.50	g	445
Selenium-75	0	20	16394.70	mCi	15652	0	---	mCi	0	0	---	mCi	0	20	16394.70	mCi	15652
Sodium-22	B	1	---	mCi	0	0	---	mCi	0	0	---	mCi	0	1	---	mCi	0
Sodium-22	L	1	426.00	mCi	7054	0	---	mCi	0	0	---	mCi	0	1	426.00	mCi	7054
Special Proces.	0	1	2.00		2406	0	---		700	8	258.00		19568	9	260.00		22674

5.3

TABLE 5. (contd)

Isotope	Supplier	Domestic				Foreign				DOE				Total			
		Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value
Special Serv.	O	137	-4705.00		348713	3	---		126150	5	1.50		36076	145	-4704.00		510939
Strontium-82	L	7	2165.00	mCi	32038	1	200.00	mCi	0	2	400.00	mCi	6100	10	2765.00	mCi	38138
Strontium-89	O	12	29034.08	Ci	41644	0	---	Ci	0	0	-29680.00	Ci	-00040	12	-645.32	Ci	-46396
Strontium-90	O	4	350.00	Ci	600	13	5.00	Ci	600	1	---	Ci	0	18	355.00	Ci	1200
Target Prep.	O	7	---		144488	0	---		41525	16	---		80119	23	37.00		266132
Technetium-99	B	1	---	mCi	0	0	---	mCi	0	0	---	mCi	0	1	---	mCi	0
Technetium-99	O	20	87000.00	mg	5046	25	485000.00	mg	28214	0	---	mg	0	46	572000.00	mg	33260
Tellurium-128	B	1	5.00	mCi	0	0	---	mCi	0	0	---	mCi	0	1	5.00	mCi	0
Titanium-44	L	0	---	mCi	0	0	---	mCi	0	3	1.02	mCi	0	3	1.02	mCi	0
Thorium-229	O	1	---	µg	283	0	---	µg	0	0	---	µg	0	1	---	µg	283
Thorium-230	O	2	13.00	mg	302	2	630.00	mg	14647	0	---	mg	0	4	643.00	mg	14949
Thorium-232	O	2	250.00	mg	20	1	480000.00	mg	120	0	---	mg	0	3	480250.00	mg	140
Thulium-170	U	0	---	Ci	0	0	---	Ci	0	2	32.30	Ci	800	2	32.30	Ci	800
Tritium	B	4	3.60	Ci	0	0	---	Ci	0	0	---	Ci	0	4	3.60	Ci	0
Tritium	O	149	542191.00	Ci	600427	37	846188.00	Ci	960012	4	11708.00	Ci	8799	190	1400087.00	Ci	1569238
Uranium-233	O	2	220.00	mg	567	77	9306300.00	mg	3196174	1	25.00	mg	10	10	9306545.00	mg	3196751
Uranium-234	O	2	200.00	mg	8600	3	4110.00	mg	176730	1	6.00	mg	152	5	4316.00	mg	185482
Uranium-235	O	19	708950.10	mg	35110	4	3200.00	mg	430	0	---	mg	0	23	712150.10	mg	35540
Uranium-236	O	0	---	mg	0	3	5800.00	mg	2960	0	---	mg	0	3	5800.00	mg	2960
Uranium-238	B	5	301.90	mCi	0	1	0.01	mCi	0	0	---	mCi	0	6	301.91	mCi	0
Uranium-238	O	3	700.00	mg	31	1	200.00	mg	20	2	4000.00	mg	80	6	4900.00	mg	131

TABLE 5. (contd)

Isotope	Supplier	Domestic				Foreign				DOE				Total			
		Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value	Ship	Quantity	Unit	\$ Value
Xenon-127	B	19	12788.45	mCi	2468	10	1918.00	mCi	1534	0	---	mCi	0	29	14706.45	mCi	4002
Xenon-127	L	0	---	mCi	0	0	---	mCi	0	7	31660.00	mCi	40660	7	31660.00	mCi	40660
Xenon-127	0	12	9730.00	mCi	31975	3	365.00	mCi	1980	2	300.00	mCi	1370	17	10395.00	mCi	35325
Yttrium-88	L	10	1482.60	mCi	47703	0	---	mCi	0	9	575.10	mCi	0	19	2057.70	mCi	47703
Zirconium-95	0	4	315.00	mCi	7626	5	39.00	mCi	1145	1	25.00	mCi	800	10	379.00	mCi	9571
TOTAL		1189			5139688	262			5766886	209			497735	1660			11404309

Notes: Letters in second column indicate supplier by first letter of laboratory name (A = ANL, B = BNL, I = INEL, L = LANL, O = ORNL, S = SRP, U = UNC).

All isotopes shipped from LANL (CSI-L) and BNL (CSI-B) are billed from ORNL and included in Cyclotron Service irradiations.

All isotopes from BNL without dollar amounts are produced by chemical separation.

Negative quantities reflect credit for previous sales of isotopes shipped from ORNL.

Shipments of magnesium-28 and xenon-127 indicated from ORNL actually shipped from either BNL or LANL. ORNL only administers transaction.

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