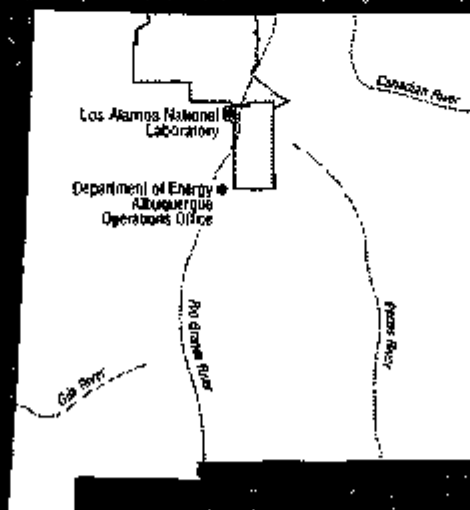


THE  
ECONOMIC IMPACT  
OF LOS ALAMOS NATIONAL LABORATORY  
ON NORTH-CENTRAL NEW MEXICO  
AND THE STATE OF NEW MEXICO

FISCAL YEAR 1997



Office of  
Technology and Site Programs  
Albuquerque Operations Office  
U.S. Department of Energy



In cooperation with:  
Agricultural Experiment Station  
College of Agriculture and Home Economics  
New Mexico State University

**The Economic Impact of  
Los Alamos National Laboratory  
on North-Central New Mexico and the  
State of New Mexico Fiscal Year 1997**

by DOE/AL--99001#23

**Robert R. Lansford, Professor  
Tommie G. Nielsen, Graduate Student  
Jane Schultz, Graduate Research Assistant  
Department of Agricultural Economics and Agricultural Business  
New Mexico Agricultural Experiment Station  
New Mexico State University  
Las Cruces, New Mexico**

and

**Larry D. Adcock, Economist  
Lucille M. Gentry, Program Analyst  
Institutional Management Team  
Laboratory Programs Division  
Office of Technology and Site Programs  
Albuquerque Operations Office  
U.S. Department of Energy  
Albuquerque, New Mexico**

and

**Shaul Ben-David  
Professor, Emeritus  
Department of Economics  
University of New Mexico  
Albuquerque, New Mexico**

and

**John Temple  
Consulting Economist  
Albuquerque, NM**

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

**MASTER**

May 29, 1998

## DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

## **DISCLAIMER**

**Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.**

## PREFACE

The Albuquerque Operations Office (AL) of the U.S. Department of Energy (DOE) is charged with managing laboratories, production plants, and energy programs in several locations throughout the United States, including New Mexico. Due to the significance of DOE activities in New Mexico, selected economic impact studies have been completed annually since the early 1980s. The types of activities that DOE/AL oversees are, for the most part, an outgrowth of atomic research that started in New Mexico in the 1940s. In New Mexico, activity that was once confined to "the Hill" (Los Alamos National Laboratory), northwest of Santa Fe, has become two national laboratories, a national waste repository, a national remedial action project, and several energy research and conservation programs.

The economic impact on New Mexico has grown over the years to a point where these activities provide tens of thousands of jobs and contribute billions of dollars to the state's economy. Therefore, it is appropriate that a report be provided periodically to the citizens of New Mexico describing the impact of DOE on the state. This report details activities for federal Fiscal Year 1997.



## ACKNOWLEDGMENTS

As is the case with studies of this type, many more people contribute to the effort than just the listed authors. The detailed information needed for the economic modeling and expenditure analysis could not have been obtained without the support of several individuals. Moreover, there are some who contribute but their contributions are not always acknowledged—to those individuals, we apologize.

The employment data by economic sector used in the regional model was obtained from the New Mexico Department of Labor (NMDOL). Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL made certain we obtained the detailed, but unpublished data needed for our research. Larry Blackwell, Chief, Economic Research and Analysis Bureau, NMDOL, also assisted the study team in obtaining the appropriate data. Importantly, this state government department has cooperated fully with our research efforts for several years and should be commended for their continuing efforts to participate in regional economic studies.

Luella Aragon, Staff Accountant, Albuquerque Financial Service Center, Department of Energy (DOE) Albuquerque Operations Office, contacted all the DOE agencies to obtain expenditure information for this study. We thank the LANL budget officials who provided budget and expenditure data in a timely fashion, specifically Allan Johnston and Tom Short. Also, we thank Jim Porter and Rita Spencer, LANL, who provided summarized achievements information.





## TABLE OF CONTENTS

INTRODUCTION .....	1
PROFILE OF LOS ALAMOS NATIONAL LABORATORY (LANL) .....	2
History .....	2
Background .....	2
Mission and Capabilities .....	2
Scientific Approach .....	2
Scientific Foundations .....	3
Major Facilities .....	3
Achievements .....	3
Future Prospects .....	4
ECONOMIC IMPACTS OF LANL ON NORTH-CENTRAL NEW MEXICO, FY 1997 .....	4
Funding .....	4
LANL Expenditure Patterns .....	5
Employment .....	5
Measuring the LANL Economic Impact on North-Central New Mexico .....	6
Economic Impact of LANL .....	6
Overall Impact .....	6
Impact on Income .....	8
Impact on Employment .....	8
CONCLUSIONS .....	8
ECONOMIC IMPACTS OF LANL ON THE STATE OF NEW MEXICO, FY 1997 .....	9
Funding .....	9
LANL Expenditure Patterns .....	9
Employment .....	10
Measuring LANL's Economic Impact on New Mexico .....	11
Economic Impact of LANL .....	11
Overall Impact .....	12
Impact on Income .....	13
Impact on Employment .....	13
CONCLUSIONS .....	13
REFERENCES .....	14
APPENDIX .....	16

## LIST OF TABLES

Table 1.	LANL Expenditures (in Dollars) in North-Central New Mexico by Sector and Total Operating Budget, FY 1997 .....	4
Table 2.	LANL Expenditures in North-Central New Mexico by Major Sector, FY 1997 .....	5
Table 3.	LANL Funding, In-Region Expenditures and Employment by Major in North-Central New Mexico, FY 1997. ....	6
Table 4.	LANL Regional Influence on North-Central New Mexico's Economy, FY 1997. ....	7
Table 5.	LANL Expenditures (in Dollars) in New Mexico by Sector and Total Operating Budget, FY 1997. ....	9
Table 6.	LANL Expenditures in New Mexico by Major Sector, FY 1997. ....	10
Table 7.	LANL Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1997 .....	11
Table 8.	LANL Influence on New Mexico's Economy, FY 1997 .....	12
Table 9.	LANL North-Central New Mexico I/O Model Direct Coefficients, FY 1997 ...	17
Table 10.	LANL Statewide New Mexico I/O Model Direct Coefficients, FY 1997 .....	18
Table 11.	LANL, North-Central New Mexico, FY 1997 Indirect Volume Employment Impacts by Subsector .....	19
Table 12.	LANL, Statewide New Mexico, FY 1997 Indirect Volume Employment Impacts by Subsector .....	20

## LIST OF FIGURES

Figure 1.	LANL Three County North-Central New Mexico Region. ....	1
Figure 2.	LANL Expenditures in North-Central New Mexico by Major Sector, FY 1997. ....	5
Figure 3.	LANL Economic Impact on North-Central New Mexico, FY 1997. ....	7
Figure 4.	LANL Expenditures in New Mexico by Major Sector, FY 1997. ....	10
Figure 5.	LANL Economic Impact on the State of New Mexico, FY 1997. ....	11

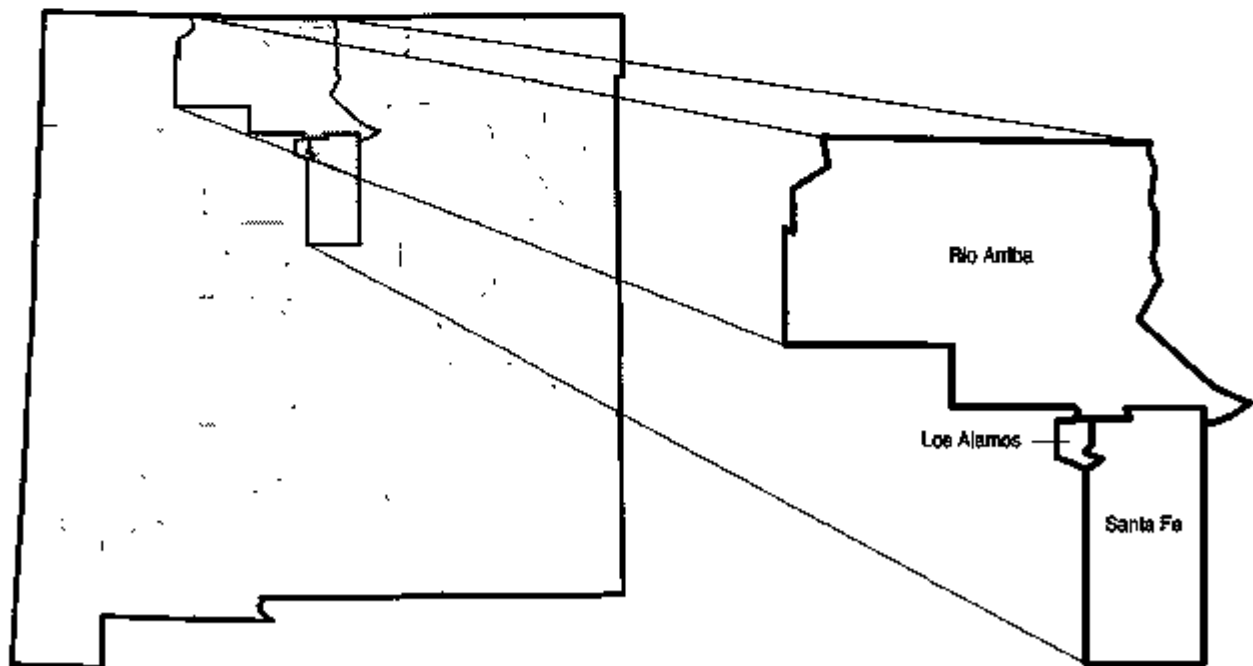
## INTRODUCTION

Los Alamos National Laboratory (LANL) is a multidisciplinary, multiprogram laboratory with a mission to enhance national military and economic security through science and technology. Its mission is to reduce the nuclear danger through stewardship of the nation's nuclear stockpile and through its nonproliferation and verification activities. An important secondary mission is to promote U.S. industrial competitiveness by working with U.S. companies in technology transfer and technology development partnerships. Los Alamos is involved in partnerships and collaborations with other federal agencies, with industry (including New Mexico businesses), and with universities worldwide.

For several years, the U.S. Department of Energy (DOE) Albuquerque Operations Office (AL) and New Mexico State University (NMSU) have maintained an inter-industry, input-output model that has the capability to assess the effect on an economy of developments initiated from outside the economy (exogenous changes on New Mexico)--federal LANL monies that flow into a region or state. This model will be used to assess economic, personal income, and employment impacts of LANL on north-central New Mexico (a three-county region consisting of Los Alamos, Santa Fe, and Rio Arriba Counties) and the state of New Mexico (Figure 1).

Caution should be exercised when comparing economic impacts between fiscal years prior to this report. The fringe benefits coefficients have been updated for the FY 1996 and FY 1997 economic impacts analysis. Prior to FY 1993 two different I/O base models were used to estimate the impacts. New technical information was released by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce in 1991 and in 1994 and was incorporated in FY 1991, FY 1993, and FY 1994 I/O models. Also in 1993, the state and local tax coefficients and expenditure patterns were updated from a 1986 study for the FY 1992 report. Further revised details about the input-output model can be found in "The Economic Impact of the Department of Energy on the State of New Mexico - FY 1997" report by Lansford, et al. (1998).

For this report, the reference period is FY 1997 (October 1, 1996, through September 30, 1997) and includes two major impact analysis: the impact of LANL activities on north-central New Mexico and the economic impacts of LANL on the state of New Mexico. Total impact represents both direct and indirect responding by business, including induced effects (responding by households). The standard multipliers used in determining impacts result from the inter-industry, input-output models



**Figure 1. LANL Three County North-Central New Mexico Region.**

developed for the three-county region and the state of New Mexico.

## **PROFILE OF LOS ALAMOS NATIONAL LABORATORY**

### **History**

Los Alamos National Laboratory was established in 1943 as the war-time Project Y of the Manhattan Engineering District with responsibility for developing the first nuclear weapon. It became a multi-discipline, multiprogram Laboratory applying capabilities developed from its original mission to national security and civilian needs during the cold-war era.

### **Background**

The Laboratory is located in Los Alamos County, New Mexico. The county covers 110 square miles and had a 1997 population of 18,275 (Bureau of the Census, 1997). The Laboratory is operated by the University of California for the U.S. Department of Energy under contract W-7406-ENG-36, and is an affirmative action/equal opportunity employer.

During 1997, the Laboratory had approximately 8,500 University of California employees, by headcount, (including full-time, part-time, paid and unpaid affiliate, visiting, and casual status) and an additional 1,800 contract employees, vendors, members of the protective guard force, and contractor personnel.

The 1997 operating budget was approximately \$1.2 billion. Principal activities are as follows Defense Programs 53%, Nonproliferation and National Security 9%, Environmental Restoration and Waste Management 12%, Energy Research 6%, Nuclear Energy 2%, Energy Efficiency and Renewable Energy 1%, other DOE 1%, Work for Others 16%.

Administrative, research, and maintenance facilities occupy more than 5.1 million occupiable square feet (of over 8 million gross square feet) of building space, of which 2.3% is leased (off site). The 34 technical areas are scattered over about 43 square miles (27,800 acres). They occupy about 39% of the total county area.

Because of topographic, environmental, operational, and buffering constraints, only about 30% of the 27,800 acres of DOE land is developable. The facilities, including buildings, infrastructure, and

capital equipment, have an estimated replacement cost of \$4.2 billion.

Los Alamos is involved in partnerships and collaborations with other federal agencies, with industry, and with over 230 universities worldwide. In addition, the Laboratory is committed to helping diversify the regional economy and enhance educational opportunities.

### **Mission and Capabilities**

The Laboratory's central mission is reducing the global nuclear danger, involving work in nuclear weapons and threat reduction. Stockpile stewardship is a major focus for Los Alamos in reducing the global nuclear danger. In an era when the size of the nuclear stockpile is being reduced and there is no longer an option of nuclear testing to certify the reliability and safety of the existing stockpile, computer modeling and simulation through the Accelerated Strategic Computing Initiative (ASCI) plays an increasingly important role in stockpile stewardship.

Los Alamos also applies its expertise to key conventional defense and civilian issues that are synergistic with the central mission and capabilities. For example, the high-performance computing capability and related competencies, as well as addressing national security area such as chemo-biological warfare and stockpile management, address national problems as wide ranging as epidemics, global warming, traffic patterns, and forest fires.

The Laboratory's strength derives from its ability to solve extremely complex problems that require the integration of scientific and technical expertise—an array of disciplines and diverse capabilities—with highly specialized facilities and unique operations expertise.

Los Alamos provides technical assistance to the weapons complex and supports such areas as energy and environmental technologies. It also emphasizes basic research that sustains existing programs and the DOE research mission, work for other federal agencies, and work with U.S. industry.

The Laboratory technical capabilities are clustered into eight core technical competencies. These are characterized by those that emphasize a scientific

approach and those that emphasize scientific foundations:

#### Scientific Approach

- Theory, modeling, and high-performance computing
- Complex experimentation and measurement
- Analysis and assessment

#### Scientific Foundations

- Nuclear weapons science and technology
- Nuclear and advanced materials
- Earth and environmental systems
- Bioscience and biotechnology
- Nuclear science, plasmas, and beams

#### Major Facilities

- *TA-55 Plutonium Facility.* The nation's only full-service operating plutonium facility. Weapons stockpile stewardship, pit surveillance and dismantlement, actinide research, NASA fuel projects, nuclear waste management and treatment.
- *Laboratory Data Communication Center (LDCC) plus Advanced Computing Laboratory (ACL).* Laboratory's central computing facility plus state-of-the-art ACL for advances in high-performance computing.
- *Neutron Science Center (LANSCE): National user-facility.* Includes the Lujan Neutron Scattering Center, the Weapons Neutron Research facility, one of the world's most powerful proton linear accelerator, and the proton storage ring. LANSCE supports advanced materials science, nuclear science, particle beam technology, nuclear weapons science, bioscience, and chemistry.
- *Chemistry and Metallurgy Research Facility (CMR).* plutonium metallurgy, advanced chemical diagnostics, nuclear and radiochemistry.
- *Materials Science Laboratory (MSL).* Materials R&D center and user facility, experiments in high-temperature superconductivity, materials modification and analysis, using ion beams and lasers.
- *Health Research Laboratory (HRL).* Center for Human Genome Studies, biological research, molecular biology, biochemistry, genetics.

#### Achievements

- Developed first nuclear weapons (1945),
- Demonstrated the ignition of thermonuclear fuel (1951),
- Tested first thermonuclear weapon (1952),
- Designed the majority of weapons in the nuclear stockpile and the first flash x-ray radiographic facility (1963) and holds responsibility for stewardship of the weapons,
- VELA satellite verification of atmospheric test-ban treaty (1963), and
- Major contributions to the development of large scale computers and computation and to nuclear reactor design:

MANIAC II computer (1956), IBM's STRETCH (1961), Cray computer (1976), Thinking Machines Corp. CM-2 (1989-90), Monte-Carlo method (1947) and the  $S_n$  discrete ordinates method (1953) for solving radiation transport computations, the particle-in-cell method of numerical fluid dynamics (1957), computer codes to analyze reactor safety (1979).

Achievement of criticality: uranium solution-fueled reactor (1944);

First plutonium-fueled reactor (1946); "Lady Godiva" critical assembly (1953); KIWI reactor (1960); and Phoebus reactor (1965); for nuclear-powered rocket program, and operation of UHTREX reactor (1969).

- Major contributions in fundamental science including:
  - Detection of neutrino (1956, 1995 Nobel Prize in physics), first demonstration of thermonuclear plasma in laboratory fusion studies (1958), use of high intensity LAMPF proton accelerator for nuclear studies (1972), discovery of heavy-fermion superconductor (1982).
- Recently:
  - Detection of single fluorescent molecules, first flow cytometer for sorting single biological cells, discovery of the human telomere, complete sequencing of

processing, and characterization of the earth's changing magnetic field and the spin-rate of the earth's core.

### Future Prospects

Los Alamos will continue its role in science-based stockpile stewardship. Although defense is expected to decrease; there may be an increase in the role in nonproliferation and counterproliferation. The Laboratory has been designated as the preferred location to manufacture nuclear weapon pits on a small scale. It has been assigned by DOE the responsibility to develop technology for accelerator-production of tritium.

## ECONOMIC IMPACTS OF LANL ON NORTH-CENTRAL NEW MEXICO,

FY 1997

### Funding

Throughout this chapter, funding to or expenditures by major on-site contractors or LANL will be referred to as "activities by LANL" for simplicity. The total LANL funding (operating and capital budget) in north-central New Mexico in FY 1997 was slightly over \$1.2 billion (Table 1). LANL regional (Los Alamos, Santa Fe, and Rio Arriba Counties) expenditures were \$829

**Table 1. LANL Expenditures (in dollars) in North-Central New Mexico by Sector and Total Operating Budget, FY 1997.**

Sector	University of California	Johnson Control, Inc.	Protection Technology Los Alamos	Total
1. Livestock & Livestock Products				
2. Other Agricultural Products				
3. Forestry & Fishery Products				
4. Agriculture, Forestry & Fishery Services				
5. Mining, Crude Petroleum & Natural Gas	1,091,159			1,091,159
6. Construction	11,552,304			11,552,304
7. Ordnance & Chemical Manufacturing	48,109			48,109
8. Food & Kindred Products				
9. Textiles Products & Apparel Manufacturing	205			205
10. Lumber & Wood Products Manufacturing	20,547			20,547
11. Paper & Publishing Manufacturing	766			766
12. Petroleum Refining & Products Manufacturing				
13. Glass, Stone & Clay Products Manufacturing	454,144			454,144
14. Primary & Fabricated Metals Manufacturing	2,640,599			2,640,599
15. Computer, Office & Service Equipment Manuf.	4,654,057			4,654,057
16. Electrical Equipment Manufacturing	801,381			801,381
17. Scientific Instruments Manufacturing	5,215			5,215
18. All Other Manufacturing				
19. Motor Freight Transportation & Warehousing	16,513			16,513
20. All Other Transportation	64,185			64,185
21. Communication	1,181,438	606,026		1,787,464
22. Electric & Gas Utilities	21,511,000			21,511,000
23. Water & Other Utilities	15,741	18,719		34,460
24. Wholesale Trade	16,810,882			16,810,882
25. Retail Trade	28,874,405			28,874,405
26. Finance, Insurance & Real Estate	919,351	405,403		1,324,754
27. Hotel Restaurant & Other Personal Services	422,976	91,193		514,169
28. Data Processing & Computer Services	63,929,621	244,824		64,174,447
29. Management & Consulting Services	11,072,584			11,072,584
30. Engineering, Architecture & Surveying Services	27,831,958			27,831,958
31. Other Business Services	10,538,618			10,538,618
32. Automobile & Other Repair Services	42,668	2,069,158		2,111,826
33. Amusement, Recreation & Video Services	152,950			152,950
34. Health, Education & Social Services	2,869,439	1,748,566		4,618,005
35. Government Services	293,274			293,274
36. Local Government	848,626	360,853	648,800	1,859,079
37. State Government	615,247	1,442,615	975,200	3,031,059
38. Los Alamos National Laboratory (a)				
39. Households	522,810,690	63,532,220	24,476,000	610,818,910
Total Regional Expenditures	732,059,674	79,519,377	26,098,000	837,677,051
Total Operating and Capital Budget	1,142,972,382	78,872,202	29,417,000	1,249,261,644

a. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.

Counties) expenditures were \$829 million in FY 1997 for salaries and wages, trade and services, capital equipment, and construction. University of California operating budget accounted for about 92 percent of the total north-central New Mexico budget; Johnson Controls funding accounted for 6 percent; and Protection Technologies accounted for about 2 percent.

#### LANL Expenditure Patterns

Total LANL regional expenditures (the initial respending of the total operating and capital budget) amounted to about \$829 million or about 66 percent of the total budget in FY 1997 (Table 1). The eight economic sectors accounting for the majority of LANL regional expenditures for FY 1997 were households (\$611 million), data processing and computer services (\$64 million), retail trade (\$29 million), engineering services (\$28 million), electric and gas utilities (\$22 million), wholesale trade (\$17 million), management and consulting services (\$11 million), and other business services (\$11 million). These sectors combined accounted for about 96 percent of total LANL regional expenditures (Table 1).

LANL expenditures by major sectors in north-central New Mexico for FY 1997 were personnel, (including benefits) (\$611 million), services (\$121 million), trade (\$46 million), other sectors (\$26 million), construction (\$12 million), manufacturing (\$9 million), and government (\$5 million) (Table 2). By far the largest LANL expenditure in north-central New Mexico was labor, 74 percent of the total regional expenditures. In FY 1997, 15 percent of the LANL expenditures went for services, 5 percent for trade, 3 percent for other sectors, one percent for government, one percent for construction and one percent for manufacturing (Figure 2).

#### Employment

LANL is managed and operated by the University of California with approximately 8,044 employees in the three-county region in FY 1997 (Table 3). Johnson Controls had 1,435 full-time employees in FY 1997 and Protection Technologies had 392 employees. The total number of jobs (all types of personnel) regionwide directly associated with LANL averaged 9,871 for FY 1997. Subcontractors averaged 1,800 employees.

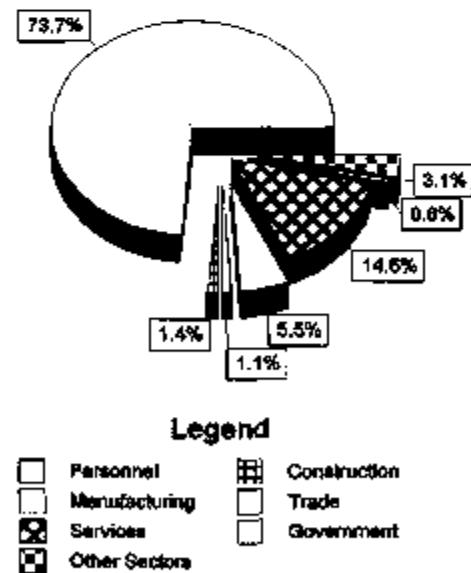
**Table 2. LANL Expenditures in North-Central New Mexico by Major Sector, FY 1997.**

Sector	FY 1997 thousands of dollars	(%)
I. Personnel		
A. Salaries & Wages	517,712	62.5
B. Benefits	93,107	11.2
Total	610,819	73.7
II. Construction	11,552	1.4
III. Manufacturing	8,623	1.1
IV. Trade	45,685	5.5
V. Services	121,015	14.6
VI. Government		
A. Local Government	1,859	0.2
B. State Government	3,031	0.4
C. Government Services	263	0.0
Total	5,153	0.6
VII. Other Sectors		
A. Agriculture	0	0.0
B. Mining	1,091	0.1
C. T.C.U. (a)	23,414	2.8
D. F.I.R.E. (b)	1,325	0.2
Total	25,830	3.1
<b>TOTAL EXPENDITURES*</b>	<b>828,677</b>	<b>100.0</b>

\*Totals may not add due to rounding

a. Transportation, Communications and Utilities

b. Finance, Insurance and Real Estate



**Figure 2. LANL Expenditures in North-Central New Mexico by Major Sector, FY 1997.**

**Table 3. LANL Funding, In-Region Expenditures and Employment by Major Entity in North-Central New Mexico, FY 1997.**

Entity	FY 1997		
	New Mexico Funding	Instate Expenditures	New Mexico Employment
	... -millions of dollars-		(jobs)
	***		
Univ. of California (LANL)	1,143.0	732.1	8,044
Johnson Controls (LANL)	76.9	70.5	1,435
PT-LA	29.4	26.1	392
Total	1,249.3	828.7	9,871

### Measuring the LANL Economic Impact on North-Central New Mexico

The analysis of the LANL's economic impact on north-central New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This analysis measures the impact generated by LANL and contractors expending money in the three north-central counties (Los Alamos, Santa Fe, and Rio Arriba) of New Mexico.

Several useful products of the I/O modeling technique are multipliers. Three multipliers (the first related to general economic activity, the second to income, and the third to employment) provide information needed to estimate LANL's impact. The activity multiplier identifies the extent to which an activity such as LANL relies directly and indirectly on the regional economy to provide it with the materials, services, and labor it requires to conduct its activities, and the extent to which respending by businesses and industries occurs in the region. Income and employment multipliers make possible the identification of not only the direct impacts of an activity on income and jobs but also the indirect (business) and induced (households) effects.

### Economic Impact of LANL

The flow diagram (Figure 3) charts the movement of monies spent by LANL. Expenditures for salaries and purchases go to households, regional businesses, and other regions (outside the three-county region of New Mexico). This injection of money affects economic activity directly: the effect equals the amount funded

for LANL efforts in north-central New Mexico (\$1.2 billion).

Households and businesses affected by LANL respend much of the money they receive in the three-county region, thus creating indirect (business) and induced (household) effects. In turn, businesses buy from other local firms and pay salaries to their employees, starting another round of spending. Every movement of money around the circle causes additional indirect (and induced) effects. However, some funds leak outside the region when purchases are made elsewhere and are not available for further local spending. Thus, indirect effects become smaller and smaller as continued respending occurs.

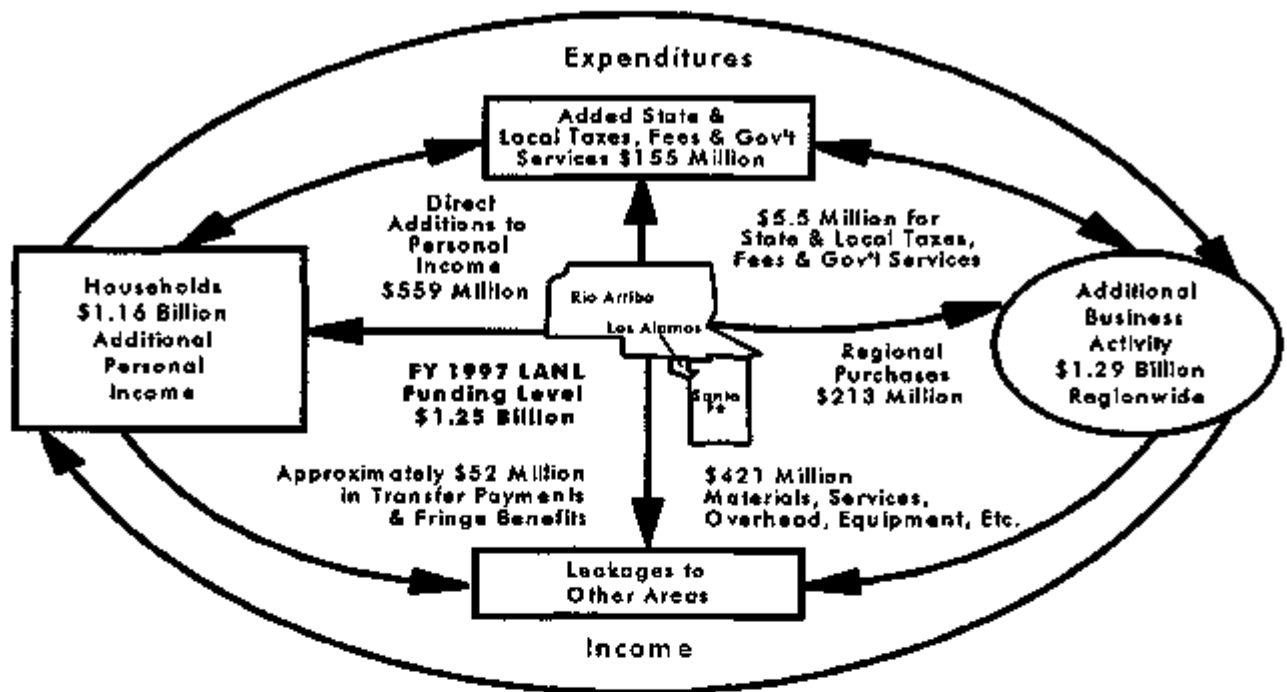
The initial spending by LANL generates substantial first-round impacts on households (net) and businesses (\$559 and \$213 million, respectively for FY 1997) in the three-county north-central region (Figure 3). This initial spending will provide government \$5 million in new revenues (mainly state and local government taxes, fees, and services). However, a large portion of the initial spending (\$421 million) and transfer payments, including fringe benefits costs to labor (\$52 million), flow out-of-state through leakages.

Respending by regional businesses and purchases by households and state and local government eventually brings the total private business impact to about \$1.4 billion. Also, respending activity will continue to add to personal income and government revenues so that total personal income will increase to \$1.2 billion, and state and local government tax revenues and government fees will expend \$155 million as a result of direct, indirect, and induced effects.

### Overall Impact

Using LANL's funding for its total operating and capital budget of \$1.2 billion, econometric modeling techniques were used to calculate the effects of this funding. As Table 4 indicates, the total increase in economic activity in New Mexico was \$3.9 billion from the initial infusion of \$1.2 billion. The economic activity multiplier measures the volume of activity generated among various sectors of a region as a result of a \$1 exogenous





Total Regional Economic Impact - \$3.86 Billion

Figure 3. LANL Economic Impact on North-Central New Mexico, FY 1997.

change in a sector. For example, the economic activity multiplier for LANL for FY 1997 was 3.09. This indicates that for every \$1 spent by LANL and its major on-site New Mexico contractors, another \$2.09 was generated in the region for a total impact of \$3.09 in FY 1997.

No official figure exists for total economic activity in the three-county north-central region; however, for the purposes of this study total economic activity in the three-county region is estimated at \$12.2 billion for 1997 (Table 4).

Applying the regional economic activity multiplier of 3.09 to the \$1.2 billion directly added to the regional economy results in the \$3.9 billion estimated total impact in FY 1997. This total impact of \$3.9 billion generated by LANL is about 32 percent of the estimated \$12.2 billion total economic activity in the region. Table 4 gives the direct, indirect, induced, and total economic activity impact of LANL on the region.

Table 11 in the Appendix gives LANL indirect economic impacts on private and public sectors for FY 1997. The retail trade sector received the greater volume of indirect private and public economic impacts, about 19 percent of the total estimated indirect economic impacts. Other sectors with large indirect economic

Table 4. LANL Regional Influence on North-Central New Mexico's Economy, FY 1997.

Economic Measure	FY 1997		LANL as % of Region
	LANL	Total Region	
--billions of dollars--			
<b>Economic Activity</b>			
Direct Expenditures	1.25		
Indirect and induced (a)	2.61		
<b>Total Economic Activity</b>	<b>3.86</b>	12.2	31.6
<b>Economic Activity Multiplier</b>	3.09		
<b>Personal Income</b>			
Gross Labor Costs	0.61		
Net Wages and Salaries	0.56		
Indirect and induced (a)	0.60		
<b>Total Personal Income</b>	<b>1.16</b>	3.8 (a)	31.0
<b>Personal Income Multiplier</b>	2.07		
-- number of employees --			
<b>Employment</b>			
Direct	9,871		
Indirect and Induced (a)	18,353		
<b>Total Employment</b>	<b>28,224</b>	93,046 (b)	30.3
<b>Employment Multiplier</b>	2.86		

a. BEA April 1997 preliminary.

b. New Mexico Department of Labor, Table C, April 1998.

impacts include finance, insurance and real estate (FIRE) (16 percent), hotel, restaurant, and other personal services (6 percent), state government (6 percent), health, education, and social services (5 percent), electric and gas utilities (5 percent) and other business services (4 percent).

#### Impact on Income

Personal income is money that goes to individuals that will be respent for purchases such as groceries, automobiles and gasoline, mortgage payments, medical, new shoes, taxes and savings. Most personal income consists of wages and salaries, although payments received as interest, rent, dividends, and social security benefits (payments to individuals) also count as personal income. Some of the fringe benefits and wages paid to employees are not counted in the current income stream (i.e., social security payments by employers and employees). In FY 1997, labor payments of \$611 million resulted in an estimated \$559 million in net additional personal income to the region.

Income multipliers measure the indirect and induced effects from new income generated from payment to labor by LANL. The income multiplier was 2.07 for FY 1997 (Table 4). This multiplier indicates that for every \$1 of personal income from LANL for labor, another \$1.07 is generated through indirect and induced effects, for a total impact on personal income of \$1.16 billion. Applying the income multiplier of 2.07 to the direct net personal income figure of \$559 million yields a total impact of \$1.16 billion for income in the region resulting from LANL activity.

In FY 1997, total personal income in north-central New Mexico was estimated at \$3.9 billion (Table 4). LANL activities in the north-central New Mexico region accounted for about 31 percent of total regional personal income in 1997.

#### Impact on Employment

Beside this dollars-and-cents impact, LANL affects regionwide employment. In addition to the average of 9,871 jobs created by LANL in FY 1997, other jobs are supported by the resulting needs for goods and services and respending by individuals and businesses. Firms filling those needs have their own employees and in turn, spend money with other firms who must also hire people. In addition, each individual employee needs goods and services and helps support other jobs such as waitresses, mechanics, clerks, lawyers, and nurses.

The employment multipliers measure the number of indirect and induced jobs supported, on the average, by LANL. The regional employment multiplier for LANL was estimated to be 2.86 in FY 1997 (Table 4). This indicates that for every 100 jobs created by LANL, another 186 jobs were supported in the region during FY 1997. This translated into, 28,224 jobs created or supported by LANL or about 30 percent of total employment in the region in FY 1997 (Table 4).

Table 11 in the Appendix gives the LANL indirect employment impact on private and public sectors for FY 1997. The more labor-intensive sectors received the greater indirect employment impact. The retail trade sector had the largest indirect impact of about 30 percent. Other sectors with a large indirect employment impact include FIRE (10 percent), hotel, restaurant and other personal services (13 percent), health, education and social services (8 percent), state government (6 percent) and data processing and computer (4 percent).

## CONCLUSIONS

In summary, LANL operations in north-central New Mexico have a significant and positive influence on the economy of north-central New Mexico. The total funding for LANL in north-central New Mexico was \$1.25 billion in FY 1997, yielding a total economic impact of about \$3.9 billion or about 31.6 percent of the total economic activity in the region.

Total personal income impact was \$1.16 billion in FY 1997 or over 30 percent of personal income derived in the three counties. The employment multiplier was 2.86 for the region, meaning that the 9,871 average employment level of FY 1997 supported a total impact of 28,224. In effect, nearly one of every 3 jobs in the region was created or supported by LANL. Approximately 80 percent of the jobs created indirectly by LANL in the region occurred in the trade, FIRE and services sectors.

## ECONOMIC IMPACTS OF LANL ON THE STATE OF NEW MEXICO,

FY 1997

### Funding

Throughout this chapter, funding to or expenditures by major on-site contractors or LANL offices will be referred to as activities by LANL for simplicity. The statewide total funding (operating and capital budget) for LANL for FY 1997 was \$1.25 billion (Table 5). LANL's New Mexico expenditures were just over \$1.0 billion in FY 1997 for salaries and wages, trade and services, capital equipment, and construction.

University of California budget accounted for 92 percent of the total New Mexico expenditures; Johnson Controls funding accounted for 6 percent; and Protection Technologies accounted for about 2 percent. The largest contractor supporting the LANL project in the state of New Mexico was Johnson Controls.

### LANL Expenditure Patterns

Total LANL instate expenditures (the initial respending of the total operating and capital budget) amounted to about 82 percent of the total budget in FY 1997 (Table 5). Johnson Controls total instate expenditures in New Mexico were \$70

**Table 5. LANL Expenditures (in dollars) in New Mexico by Sector and Total Operating Budget, FY 1997.**

Sector	University of California	Johnson Control, Inc.	Protection Technology Los Alamos	Total
1. Livestock & Livestock Products				9,537
2. Other Agricultural Products	9,537			9,537
3. Forestry & Fishery Products				
4. Agriculture, Forestry & Fishery Services				
5. Mining, Crude Petroleum & Natural Gas	1,801,304			1,801,304
6. Construction	15,788,016			15,788,016
7. Ordnance & Chemical Manufacturing	99,151			99,151
8. Food & Kindred Products	205,095			205,095
9. Textiles Products & Apparel Manufacturing	22,770			22,770
10. Lumber & Wood Products Manufacturing	135,595			135,595
11. Paper & Publishing Manufacturing	221,855			221,855
12. Petroleum Refining & Products Manufacturing	448,268			448,268
13. Glass, Stone & Clay Products Manufacturing	481,921			481,921
14. Primary & Fabricated Metals Manufacturing	4,808,717			4,808,717
15. Computer, Office & Service Equipment Manuf.	6,118,809			6,118,809
16. Electrical Equipment Manufacturing	1,858,424			1,858,424
17. Scientific Instruments Manufacturing	207,680			207,680
18. All Other Manufacturing	163,072			163,072
19. Motor Freight Transportation & Warehousing	(5,142)			(5,142)
20. All Other Transportation	107,992			107,992
21. Communication	1,578,043	606,026		2,179,069
22. Electric & Gas Utilities	21,511,000			21,511,000
23. Water & Other Utilities	15,741	18,719		34,460
24. Wholesale Trade	51,223,160			51,223,160
25. Retail Trade	78,638,710			78,638,710
26. Finance, Insurance & Real Estate	455,429			455,429
27. Hotel Restaurant & Other Personal Services	422,976			422,976
28. Data Processing & Computer Services	74,742,584			74,742,584
29. Management & Consulting Services	15,092,128			15,092,128
30. Engineering, Architecture & Surveying Services	33,689,405			33,689,405
31. Other Business Services	25,518,588			25,518,588
32. Automobile & Other Repair Services	1,033,721	2,069,158		3,102,879
33. Amusement, Recreation & Video Services	293,131			293,131
34. Health, Education & Social Services	5,008,600	1,748,566		6,757,166
35. Government Services	601,279			601,279
36. Local Government	849,626	380,653	848,800	1,859,079
37. State Government	615,247	1,442,613	973,200	3,031,059
38. Los Alamos National Laboratory (a)				
39. Households	<u>589,340,613</u>	<u>63,532,220</u>	<u>24,476,000</u>	<u>677,348,833</u>
Total New Mexico Expenditures	<u>933,098,185</u>	<u>69,777,955</u>	<u>26,098,000</u>	<u>1,028,974,140</u>
Total Operating and Capital Budget	<u>1,143,713,804</u>	<u>78,130,640</u>	<u>28,417,000</u>	<u>1,249,261,444</u>

a. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.

million. Actual LANL instate expenditures were \$1.0 billion in FY 1997 for salaries and wages, trade and services, capital equipment, and construction (Table 5).

Out-of-state purchases and salaries for those living elsewhere amounted to \$220 million. In addition, approximately \$57 million for transfer payments and some fringe benefit costs for instate labor costs leaked directly out of state.

The eight economic sectors accounting for the majority of LANL instate expenditures for FY 1997 were households (\$677 million), retail trade (\$79 million), data processing and computer services (\$75 million), wholesale trade (\$51 million), engineering, architecture, and surveying (\$34 million), other business services (\$26 million), electric and gas utilities (\$22 million), construction (\$16 million), and management and consulting (\$15 million). These sectors combined accounted for 97 percent of total instate LANL expenditures in FY 1997.

LANL expenditures by major sectors in New Mexico for FY 1997 were personnel including benefits (\$677 million), services (\$160 million), trade (\$130 million), other sectors (\$26 million), government (\$5 million), construction (\$16 million), and manufacturing (\$15 million) (Table 6). By far the largest expenditure by LANL in the state of New Mexico was labor (\$677 million), which is nearly 66 percent of the statewide expenditures (Table 6), or 52 percent of the total operating and capital budget for FY 1997. Salaries and wages (without benefit costs) accounted for almost 56 percent of the total instate expenditures. In FY 1997, about 16 percent of LANL expenditures went for services, 13 percent to trade, 2.5 percent to other sectors, and utilities, about 1.5 percent for construction, one percent for manufacturing, and 0.5 percent went to government (Figure 4).

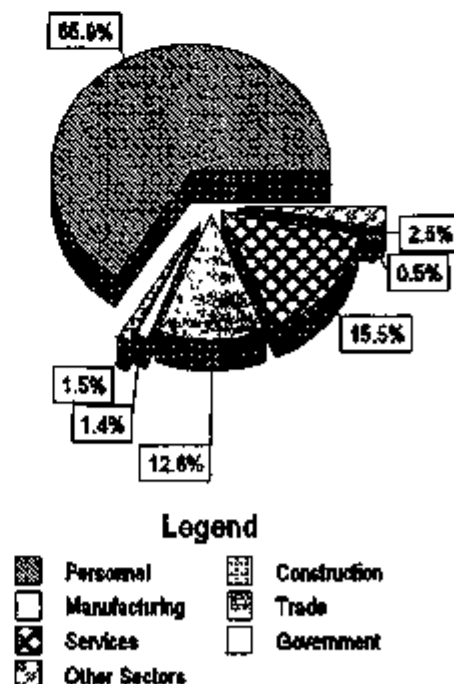
### Employment

LANL is managed and operated by the University of California, with approximately 8,461 full-time employees statewide in FY 1997. Johnson Controls had 1,435 full-time employees in FY 1997, and Protector Technologies had 392 employees each (Table 7). The total number of jobs (all types of personnel) statewide paid by the federal government or by contracts directly associated with LANL averaged 10,288 for FY 1997

**Table 6. LANL Expenditures in New Mexico by Major Sector, FY 1997.**

Sector	FY 1997 thousands of dollars	(%)
I. Personnel		
A. Salaries & Wages	374,458	55.8
B. Benefits	102,891	10.0
Total	677,349	65.8
II. Construction	15,788	1.5
III. Manufacturing	14,771	1.4
IV. Trade	129,862	12.6
V. Services	159,619	15.5
VI. Government		
A. Local Government	1,859	0.2
B. State Government	3,031	0.3
C. Government Services	601	0.1
Total	5,491	0.5
VII. Other Sectors		
A. Agriculture	10	0.0
B. Mining	1,801	0.2
C. T.C.U. (a)	23,827	2.3
D. F.I.R.E. (b)	455	0.0
Total	26,094	2.5
<b>TOTAL EXPENDITURES*</b>	<b>1,028,974</b>	<b>100.0</b>

\*Totals may not add due to rounding  
 a. Transportation, Communications and Utilities  
 b. Finance, Insurance and Real Estate



**Figure 4. LANL Expenditures in New Mexico by Major Sector, FY 1997.**

**Table 7. LANL Funding, Instate Expenditures and Employment by Major entity in New Mexico, FY 1997.**

Entity	FY 1997		New Mexico Employment (jobs)
	New Mexico Funding	Instate Expenditures	
	--- millions of dollars ---		
Univ. of California (LANL)	1,143.0	833.1	8,461
Johnson Controls (LANL)	76.0	66.8	1,435
PT-LA	29.4	25.1	392
<b>Total</b>	<b>1,249.3</b>	<b>1,029.0</b>	<b>10,288</b>

**Measuring LANL's Economic Impact on New Mexico**

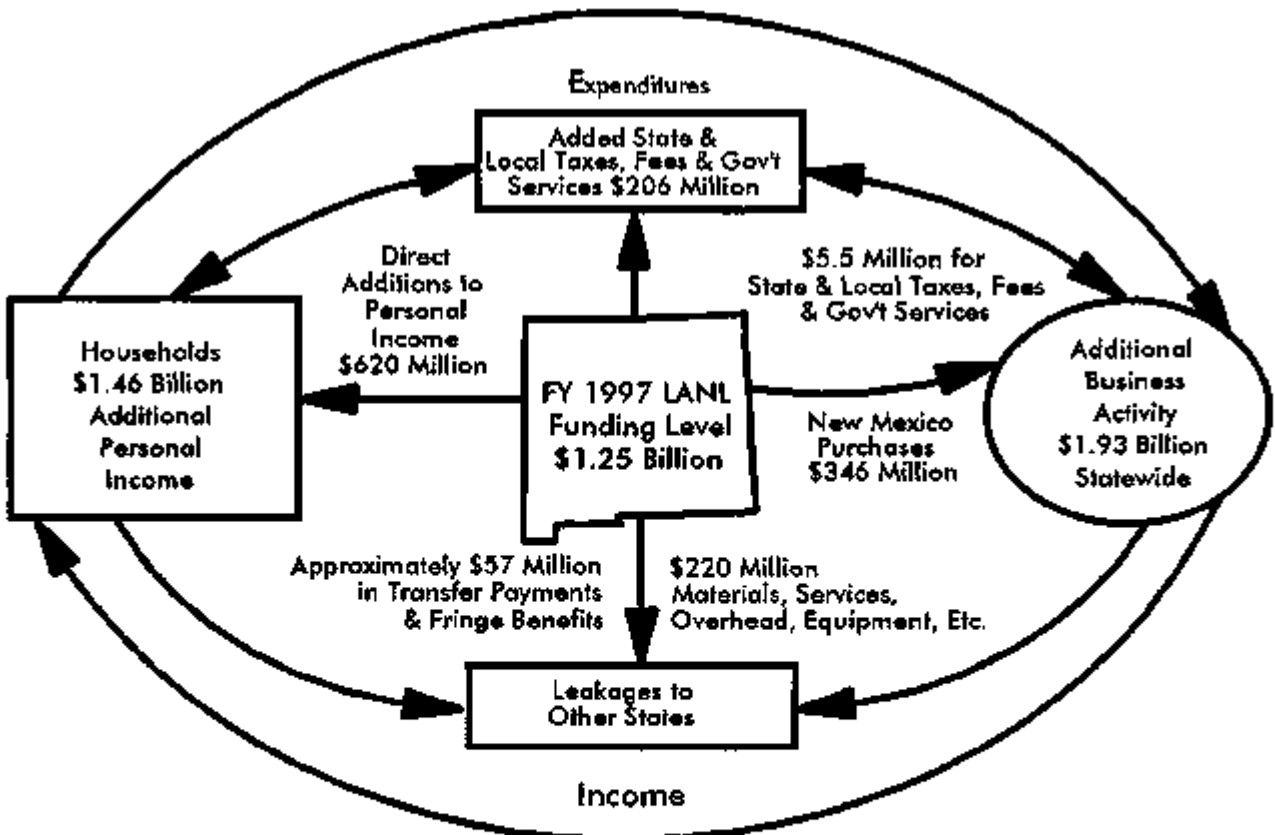
The analysis of LANL's economic impact on New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This analysis measures the impact generated by LANL, the DOE/AL contractor expending money in the state.

As previously stated, the term LANL is used to describe all these entities.

Several useful products of the I/O modeling technique are multipliers. Three multipliers—the first related to general economic activity, the second to income, and the third to employment—provide the information needed to estimate LANL's impact. The activity multiplier identifies the extent to which an activity such as LANL relies directly and indirectly on the state's economy to provide the materials, services, and labor it requires to conduct its activities, and the extent to which responding by businesses and industries occurs in the state. Income and employment multipliers make it possible to identify not only the direct impacts of an activity on income and jobs, but also the indirect (business) and induced (households) effects.

**Economic Impact of LANL**

The flow diagram (Figure 5) charts the movement of monies spent by LANL. Expenditures for salaries and purchases go to households, statewide



**Total Statewide Economic Impact - \$4.85 Billion**  
**Figure 5. LANL Economic Impact on the State of New Mexico, FY 1997.**

businesses, and other regions (outside the state of New Mexico). This injection of money affects economic activity directly, that is, the effect equals the amount allocated to LANL (\$1.25 billion).

Households and businesses affected by LANL spend much of the money they receive in the state, thus creating indirect (business) and induced (household) effects. In turn, businesses buy from other local firms and pay salaries to their employees, starting another round of spending. Every movement of money around the circle causes additional indirect (and induced) effects. However, some funds leak outside the region (state) when purchases are made elsewhere and are not available for further local spending. Thus, the indirect effects become smaller and smaller as continued spending occurs.

Initial spending by LANL generates substantial first-round impacts on households (net) and businesses: \$620 and \$346 million, respectively for FY 1997 (Figure 5). This initial spending will give government \$5 million in new revenues (mainly state and local government taxes, fees, and services); however, a large portion of the initial spending (\$220 million, plus \$57 million in transfer payments and some fringe benefit costs) flows out of state through leakages.

Responding by in-state businesses and purchases by households and state and local governments eventually bring the total private business impact to \$1.9 billion. Also, responding activity will continue to add to personal income and government revenues so that the total personal income effect will increase to almost \$1.5 billion, and state and local government tax revenues and government fees will expand \$206 million as a result of direct, indirect, and induced impacts.

#### Overall Impact

No official figure exists for total economic activity in the state; however, for this study, a 1997 estimate of \$91.2 billion is used (Table 8). While LANL is an important economic factor in north-central New Mexico, the economic impacts are important but less significant when measured on a statewide basis. LANL directly added \$1.2 billion to the total state economy in FY 1997. The estimated indirect (and induced) impact of \$3.6 billion brings the total impact to \$4.85 billion or over 5 percent of the estimated \$91.2 billion statewide total activity in 1997.

The estimated \$4.85 billion total economic impact in New Mexico from the initial infusion of \$1.25 billion

**Table 8. LANL State Influence on New Mexico's Economy, FY 1997.**

Economic Measure	FY 1997		
	LANL	Total State	LANL as % of State
----- billion of dollars -----			
<b>Economic Activity</b>			
Direct Expenditures	1.25		
Indirect and Induced (a)	3.60		
Total Economic Activity	4.85	91.2	5.3
<b>Economic Activity Multiplier</b>			
	3.88		
<b>Personal Income</b>			
Gross Labor Costs	0.68		
Net Wages and Salaries	0.62		
Indirect and Induced (a)	0.84		
Total Personal Income	1.46	33.9(a)	4.3
<b>Personal Income Multiplier</b>			
	2.35		
<b>Employment</b>			
Direct	10,288		
Indirect and Induced (a)	26,112		
Total Employment	36,400	920,469(b)	4.4
<b>Employment Multiplier</b>			
	3.54		

a. BEA April 1997 preliminary.

b. New Mexico Department of Labor, Table C, April 1998.

is derived from I/O modeling techniques employed in the study. The modeling process produces estimated impacts from which multipliers can be determined. The economic activity multipliers are used to measure the volume of activity generated among various sectors of a region as a result of a \$1 exogenous change in a sector.

For example, the economic activity multiplier for LANL for FY 1997 was 3.88. This indicates that for every \$1 spent by LANL or its major on-site contractors, another \$2.88 was generated, for a total impact of \$3.88 in FY 1997. Table 8 gives the direct, indirect, induced, and total economic activity impact of LANL on the state.

Appendix Table 12 gives LANL indirect economic impacts on private and public sectors for FY 1997. The retail trade sector received the greatest volume of indirect economic impacts, about 18 percent of the total estimated public and private sector volume of indirect impacts. Other sectors with large indirect impacts were FIRE (14 percent), hotel, restaurant and other personal services, wholesale trade, other business services, electric

and gas utilities, and health, education and social services (5 percent each).

### **Impact on Income**

Personal income is money that goes to individuals to be spent for items such as groceries, automobiles and gasoline, mortgage payments, medical, new shoes, taxes, and savings. Most personal income consists of wages and salaries, although payments received as interest, rent, dividends, and social security benefits (payments to individuals) also count as personal income. Some of the fringe benefits and wages paid to employees are not counted in the current income stream (i.e., social security payments by employers and employees). In FY 1997, labor payments of \$677 million resulted in an estimated \$620 million in net additional personal income.

Income multipliers measure the indirect and induced effects of new income generated from payment to labor by LANL. The income multiplier was 2.35 for FY 1997 (Table 8). Application of the income multiplier of 2.35 to the direct net personal income figure of \$620 million yields a total impact of nearly \$1.5 billion for income resulting from LANL activity. This multiplier indicates that for every \$1 of personal income from LANL for labor, another \$1.35 is generated through indirect and induced effects.

In FY 1997, total personal income in New Mexico was estimated at \$33.9 billion (Table 8). LANL activities in New Mexico accounted for over 4 percent of total personal income in 1997.

### **Impact on Employment**

Beside this dollars-and-cents impact, LANL affects statewide employment. In addition to the average of 10,288 mainly full-time jobs created by LANL in FY 1997, other jobs are supported by needs for goods and services and responding by individuals and businesses. Firms filling those needs have their own employees and, in turn, spend money with other firms who must also hire people. Additionally, each individual employee demand goods and services and therefore supports other jobs such as waitresses, mechanics, clerks, lawyers, and nurses.

Employment multipliers measure the number of indirect and induced jobs supported, on the average, by LANL. The employment multiplier for LANL was estimated to be 3.54 in FY 1997 (Table 8). This indicates that for every 100 jobs created by LANL, another 254 jobs

were supported in FY 1997. Considering the multiplier effect, 10,288 jobs translates into a total impact of 36,400 jobs created or supported by LANL or over 4 percent of total employment in the state in FY 1997 (see Table 8).

Table 12 in the Appendix gives LANL indirect employment impact on the private and public sectors for FY 1997. The more labor-intensive sectors received the greater indirect employment impact. The retail trade sector had the largest indirect impact, about 30 percent of the indirect impact. Other sectors with a large indirect employment impact include hotel, restaurant, and personal services (12 percent), FIRE (9 percent), and health and social services (7 percent) and wholesale trade (5 percent).

## **CONCLUSIONS**

In summary, LANL operations in New Mexico have a significant and positive influence on the economy of New Mexico. The funding for LANL in New Mexico, about \$1.25 billion in FY 1997, supported a total economic impact of \$4.85 billion or about 5 percent of total economic activity in the state.

Total personal income impacts were almost \$1.5 billion in FY 1997 or 4 percent of personal income derived in New Mexico. The employment multiplier was 3.54 for the state, meaning that the 10,288 average employment level in FY 1997 supported a total impact of 36,400. In effect, about one of every 23 jobs in the state was created or supported by LANL. Approximately 78 percent of the jobs created indirectly by LANL in the region occurred in the trade, FIRE, and services sectors.

## REFERENCES

- Adcock, Larry. "Effective Tax Rates for New Mexico, 1986." Los Alamos National Laboratory. Unpublished manuscript, Los Alamos, New Mexico.
- Adcock, L.D., T.M. Cohen, R.R. Lansford, D.J. Post, and S.L. Runyon, 1992. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1991." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Adcock, L.D., and R.R. Lansford, 1991. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1990." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Adcock, L.D., and R.R. Lansford, 1990. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1989." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Adcock, L.D., R.R. Lansford, and A. Turpin, 1989. "The Social and Economic Impact of the Department of Energy on the State of New Mexico, FY 1988." U.S. DOE Albuquerque, Albuquerque Operations Office, Report No. APD-89-2, Albuquerque, NM.
- Adcock, Larry and Larry Waldman, "A Non-Survey Technique for Constructing a Direct Requirements Regional Input-Output Table." Proceedings 1975 Conference of the Association for University and Business Research, Virginia, edited at Arizona State University, Tempe, Arizona.
- Carruthers, Garrey, K. Mitchell, and Thomas Williams, 1972. "An Inter-industry Model of the Economy of North-Central New Mexico," Agricultural Experiment Station Research Report 237, New Mexico State University, Las Cruces, New Mexico.
- Cohen, T.M., L.D. Adcock, and R.R. Lansford, 1992. "The Economic Impact of Los Alamos National Laboratory and Sandia National Laboratories on the State of New Mexico FY 1990." Agricultural Experiment Station, Technical Report 7, New Mexico State University, Las Cruces, NM.
- Lansford, R.R., L.D. Adcock, S. Ben-David L. M. Gentry, T.G. Nielsen, J. Schultz, and J. Temple, 1997. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1996." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, S. Ben-David L. M. Gentry, T.G. Nielsen, J. Schultz, and J. Temple, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central NM, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of the Department of Energy on the State of NM, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central NM, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central NM, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1996. "The Economic Impact of the Department of Energy on the State of NM, FY 1994." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1996. "The Economic Impact of Los Alamos National Laboratory on North-Central NM, FY 1994." US DOE



- Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1994. "The Economic Impact of the Department of Energy on the State of NM, FY 1993." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, S. Ben-David, and S.L. Runyon, 1993. "The Economic Impact of the Department of Energy on the State of New Mexico FY 1992." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1993. "The Economic Impact of Los Alamos National Laboratory on North-Central NM, FY 1994." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., J.A. Diemer, E.M. Jaramillo, A. Turpin, D. Williams, V. Devers, and L. Adcock, 1988. "The Social and Economic Impact of the Department of Energy on the State of New Mexico, FY 1987," Special Report 79, Agricultural Experiment Station, New Mexico State University, Las Cruces, New Mexico.
- Morris, Donald, Larry Adcock, Steven Booth, 1986. "Los Alamos National Laboratory: A Regional Economic Impact Study," Los Alamos National Laboratory Report LA-UR-3206, Los Alamos, New Mexico.
- New Mexico Department of Labor, April 1989. "New Mexico Labor Market, Annual Planning Report," Bureau of Economic Research and Analysis, University of New Mexico, Albuquerque, New Mexico.
- New Mexico Department of Labor, January 1991. "Covered Employment and Wages," Quarterly Report, Quarter 1989 and First Quarter 1990; Economic Research and Analysis Bureau, Albuquerque, New Mexico.
- New Mexico Department of Labor, April 1993. "Table A," Economic Research and Analysis Bureau, Albuquerque, New Mexico.
- New Mexico Department of Labor. "Report of Employment, Wages, and Contributions (Es-202)," Economic Research and Analysis Bureau, Albuquerque, New Mexico; unpublished information.
- Runyon, Shannon L, 1993. Effective Tax Rates for New Mexico by Economic Sector, M.S. thesis, New Mexico State University, Las Cruces, May.
- Sunwest Financial Services, Inc., 1992, "New Mexico Progress, Economic Review of 1991," in draft; Sunwest Financial Services, Inc. P.O. Box 25500, Albuquerque, NM 87125.
- Turpin, Annette, Larry Adcock, and Donna Williams, 1987. "The Economic Impact of the United States Department of Energy on the State of New Mexico Fiscal Years 1985 and 1986," Los Alamos National Laboratory Miscellaneous Report, Los Alamos, New Mexico.
- U.S. Department of Commerce, April 1, 1997. "New Mexico Population by Race and Ethnicity 1997," Bureau of the Census, PL-94-171.
- U.S. Department of Agriculture, 1997. "Agricultural Statistics 1996," U.S. Government Printing Office, Washington D.C.
- U.S. Department of Agriculture, 1997, "New Mexico Agricultural Statistics, 1996," New Mexico Agricultural Statistics Service, Las Cruces, New Mexico.
- U.S. Department of Agriculture, 1996, "New Mexico Agricultural Statistics, 1994," New Mexico Agricultural Statistics Service, Las Cruces, New Mexico.
- U.S. Department of Commerce, July 1991, "Benchmark Input-Output Accounts for the U.S. Economy, 1987," Survey of Current Business, Washington, D.C.
- U.S. Department of Commerce, 1986. "County Business Patterns of 1984, New Mexico," Bureau of the Census, CBP-84-33.

## APPENDIX

**Table 9. LANL North-Central New Mexico I/O Model Direct Coefficients, FY 1997.**

<b>Sector</b>	<b>Direct Coefficients</b>
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000000
3. Forestry & Fishery Products	0.000000
4. Agriculture, Forestry & Fishery Services	0.000000
5. Mining, Crude Petroleum & Natural Gas	0.000873
6. Construction	0.009247
7. Ordnance & Chemical Manufacturing	0.000039
8. Food & Kindred Products	0.000000
9. Textiles Products & Apparel Manufacturing	0.000000
10. Lumber & Wood Products Manufacturing	0.000016
11. Paper & Publishing Manufacturing	0.000001
12. Petroleum Refining & Products Manufacturing	0.000000
13. Glass, Stone & Clay Products Manufacturing	0.000364
14. Primary & Fabricated Metals Manufacturing	0.002114
15. Computer, Office & Service Equipment Manuf.	0.003725
16. Electrical Equipment Manufacturing	0.000641
17. Scientific Instruments Manufacturing	0.000003
18. All Other Manufacturing	0.000000
19. Motor Freight Transportation & Warehousing	0.000013
20. All Other Transportation	0.000051
21. Communication	0.001431
22. Electric & Gas Utilities	0.017219
23. Water & Other Utilities	0.000028
24. Wholesale Trade	0.013457
25. Retail Trade	0.023113
26. Finance, Insurance & Real Estate	0.001060
27. Hotel Restaurant & Other Personal Services	0.000412
28. Data Processing & Computer Services	0.051370
29. Management & Consulting Services	0.008863
30. Engineering, Architecture & Surveying Services	0.022279
31. Other Business Services	0.008436
32. Automobile & Other Repair Services	0.001690
33. Amusement, Recreation & Video Services	0.000122
34. Health, Education & Social Services	0.003697
35. Government Services	0.000211
36. Local Government	0.001488
37. State Government	0.002426
38. Los Alamos National Laboratory	0.000000
39. Households	0.488944
	0.000000
Total New Mexico Expenditures	0.663333
Total Operating and Capital Budget	1.000000

**Table 10. LANL State-wide New Mexico I/O Model Direct Coefficients, FY 1997.**

<b>Sector</b>	<b>Direct Coefficients</b>
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000008
3. Forestry & Fishery Products	0.000000
4. Agriculture, Forestry & Fishery Services	0.000000
5. Mining, Crude Petroleum & Natural Gas	0.001442
6. Construction	0.012638
7. Ordnance & Chemical Manufacturing	0.000079
8. Food & Kindred Products	0.000164
9. Textiles Products & Apparel Manufacturing	0.000018
10. Lumber & Wood Products Manufacturing	0.000109
11. Paper & Publishing Manufacturing	0.000178
12. Petroleum Refining & Products Manufacturing	0.000359
13. Glass, Stone & Clay Products Manufacturing	0.000386
14. Primary & Fabricated Metals Manufacturing	0.003849
15. Computer, Office & Service Equipment Manuf.	0.004898
16. Electrical Equipment Manufacturing	0.001488
17. Scientific Instruments Manufacturing	0.000166
18. All Other Manufacturing	0.000131
19. Motor Freight Transportation & Warehousing	(0.000004)
20. All Other Transportation	0.000086
21. Communication	0.001744
22. Electric & Gas Utilities	0.017219
23. Water & Other Utilities	0.000028
24. Wholesale Trade	0.041003
25. Retail Trade	0.062948
26. Finance, Insurance & Real Estate	0.000365
27. Hotel Restaurant & Other Personal Services	0.000339
28. Data Processing & Computer Services	0.059829
29. Management & Consulting Services	0.012081
30. Engineering, Architecture & Surveying Services	0.026967
31. Other Business Services	0.020427
32. Automobile & Other Repair Services	0.002484
33. Amusement, Recreation & Video Services	0.000235
34. Health, Education & Social Services	0.005409
35. Government Services	0.000481
36. Local Government	0.001488
37. State Government	0.002426
38. Sandia National Laboratories	0.000000
39. Households	0.542199
	0.000000
Total New Mexico Expenditures	0.823666
Total Operating and Capital Budget	1.000000

**Table 11. LANL, North-Central New Mexico, FY 1997, Indirect Volume Employment Impacts by Subsector.**

Sector	Volume		Employment	
	(\$000)	%	Jobs	%
1. Livestock and Livestock Products	4281.	0.3	11.	0.1
2. Other Agricultural Products	7463.	0.5	41.	0.2
3. Forestry and Fishery Products	395.	0.0	2.	0.0
4. Agricultural, Forestry, and Fishery Services	1730.	0.1	36.	0.2
5. Mining, Crude Petroleum, and Natural Gas	4644.	0.3	16.	0.1
6. Construction	55450.	3.8	625.	3.4
7. Ordnance & Chemical Manufacturing	278.	0.0	2.	0.0
8. Food and Kindred Products	26759.	1.8	135.	0.7
9. Textile Products and Apparel	5268.	0.4	56.	0.3
10. Lumber and Wood Products	1470.	0.1	16.	0.1
11. Paper and Publishing	6089.	0.4	69.	0.4
12. Petroleum Refining and Products	19822.	1.4	13.	0.1
13. Glass, Stone and Clay Products	2508.	0.2	25.	0.1
14. Primary and Fabricated Metals	4441.	0.3	39.	0.2
15. Computer, Office and Service equipment	15960.	1.1	94.	0.5
16. Electrical Equipment	2284.	0.2	12.	0.1
17. Scientific Instruments	856.	0.1	5.	0.0
18. All Other Manufacturing	2697.	0.2	29.	0.2
19. Transportation and Warehousing	5166.	0.4	70.	0.4
20. All Other Transportation	10140.	0.7	122.	0.7
21. Communication	32125.	2.2	274.	1.5
22. Electric and Gas Utilities	71973.	5.0	103.	0.6
23. Water and Other Utilities	8554.	0.6	40.	0.2
24. Wholesale Trade	54535.	3.8	630.	3.4
25. Retail Trade	274413.	18.9	5574.	30.4
26. Finance, Insurance and Real Estate	229657.	15.8	1774.	9.7
27. Hotel Restaurant and Other Personal Services	82939.	5.7	2362.	12.9
28. Data Processing and Computer Services	78668.	5.4	705.	3.8
29. Management and Consulting Services	25473.	1.8	158.	0.9
30. Engineering and Related Services	36944.	2.5	304.	1.7
31. Other Business Services	63742.	4.4	627.	3.4
32. Automobile and Other Repair Services	50624.	3.5	469.	2.6
33. Amusements, Recreation and Video Services	28755.	2.0	600.	3.3
34. Health, Education and Social Services	78398.	5.4	1451.	7.9
TOTAL Private Sector	1294501.	89.3	16487.	89.8
35. Government Services	17866.	1.2	193.	1.0
36. Local Government	50814.	3.5	669.	3.6
37. State Government	86750.	6.0	1004.	5.5
TOTAL Public Sector	155430.	10.7	1866.	10.2
TOTAL Private and Public Sectors	1449932.	100.0	18353.	100.0

Totals may not add due to rounding

**Table 12. LANL, State of New Mexico, FY 1997, Indirect Volume Employment Impacts by Subsector.**

Sector	Volume		Employment	
	(\$000)	%	Jobs	%
1. Livestock and Livestock Products	9220.	0.4	24.	0.1
2. Other Agricultural Products	10765.	0.5	60.	0.2
3. Forestry and Fishery Products	502.	0.0	2.	0.0
4. Agricultural, Forestry, and Fishery Services	2066.	0.1	43.	0.2
5. Mining, Crude Petroleum, and Natural Gas	55141.	2.6	187.	0.7
6. Construction	73941.	3.5	834.	3.2
7. Ordnance & Chemical Manufacturing	2903.	0.1	17.	0.1
8. Food and kindred Products	38959.	1.8	197.	0.8
9. Textile Products and Apparel	6767.	0.3	72.	0.3
10. Lumber and Wood Products	2577.	0.1	27.	0.1
11. Paper and Publishing	10227.	0.5	116.	0.4
12. Petroleum Refining and Products	41660.	1.9	28.	0.1
13. Glass, Stone and Clay Products	5683.	0.3	56.	0.2
14. Primary and Fabricated Metals	10906.	0.5	95.	0.4
15. Computer, Office and Service equipment	21679.	1.0	127.	0.5
16. Electrical Equipment	16689.	0.8	85.	0.3
17. Scientific Instruments	1823.	0.1	11.	0.0
18. All Other Manufacturing	6751.	0.3	72.	0.3
19. Transportation and Warehousing	15205.	0.7	207.	0.8
20. All Other Transportation	23799.	1.1	287.	1.1
21. Communication	48893.	2.3	417.	1.6
22. Electric and Gas Utilities	104014.	4.9	148.	0.6
23. Water and Other Utilities	11503.	0.5	53.	0.2
24. Wholesale Trade	115548.	5.4	1336.	5.1
25. Retail Trade	388680.	18.2	7896.	30.2
26. Finance, Insurance and Real Estate	301220.	14.1	2327.	8.9
27. Hotel Restaurant and Other Personal Services	106565.	5.0	3034.	11.6
28. Data Processing and Computer Services	95978.	4.5	860.	3.3
29. Management and Consulting Services	35020.	1.6	217.	0.8
30. Engineering and Related Services	46520.	2.2	383.	1.5
31. Other Business Services	108709.	5.1	1070.	4.1
32. Automobile and Other Repair Services	75122.	3.5	696.	2.7
33. Amusements, Recreation and Video Services	39353.	1.8	822.	3.1
34. Health, Education and Social Services	99086.	4.6	1834.	7.0
TOTAL Private Sector	1933471.	90.4	23637.	90.5
35. Government Services	22812.	1.1	246.	0.9
36. Local Government	65721.	3.1	866.	3.3
37. State Government	117854.	5.5	1363.	5.2
TOTAL Public Sector	206386.	9.6	2475.	9.5
TOTAL Private and Public Sectors	2139857.	100.0	26112.	100.0

Totals may not add due to rounding