

# **The Economic Impact of the Department of Energy on the State of New Mexico Fiscal Year 1998**

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## 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 1998.

## 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 Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL made certain we obtained the detailed, but unpublished data needed for our research.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. From each of the DOE-integrated contractor and DOE operations offices, we thank the budget officials who provided budget and expenditure data in a timely fashion.

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## EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) contributes substantially to the New Mexico economy. Economic benefits arising from the various activities and functions of the Department, mainly the Albuquerque Operations Office (AL) and its contractors, have accrued to the state on a continuing basis for more than 50 years. DOE facility locations in New Mexico are shown in Figure 1.

DOE provided funding of just over \$3.0 billion in Fiscal Year (FY) 1998 for its New Mexico offices and contractors. This also includes grants, community assistance, and expenditures by out-of-state DOE offices and DOE Headquarters. Econometric modeling techniques were used to estimate indirect and induced effects of this funding. The reference periods for these statistics are FY 1997 (October 1, 1996, through September 30, 1997), and FY 1998 (October 1, 1997, through September 30, 1998). Total impacts represent direct, indirect, and induced effects. The multipliers used to determine impacts result from the inter-industry, input-output (I/O) models developed jointly by economists at the DOE/AL and New Mexico State University (NMSU).

As Table 1 indicates, the total economic activity resulting from this initial infusion of just over

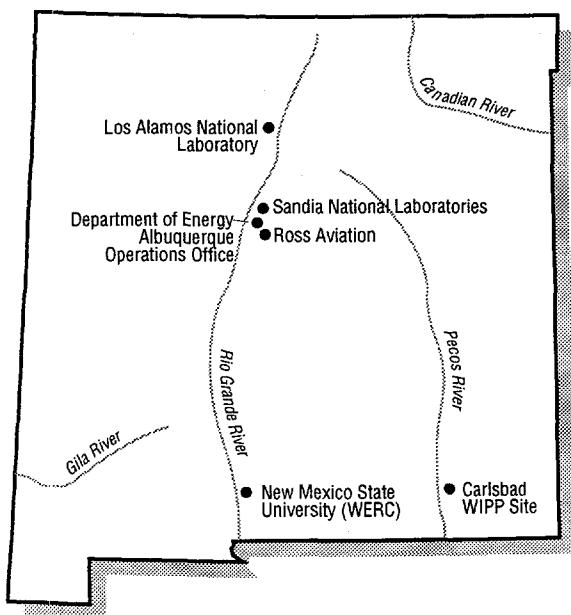
\$3.0 billion in New Mexico for FY 1998 was about \$10.2 billion. The total personal income impact was about \$2.9 billion. The DOE employment for FY 1998 was 20,214 and the indirect and induced effect was 52,239 jobs for a total impact of 72,453 jobs.

As Table 2 indicates, from the FY 1998 funding of \$3.0 billion, DOE/New Mexico instate organizations and activities spent about \$2.1 billion in FY 1998 for salaries and wages, materials and services, capital equipment, and construction in New Mexico. Out-of-state purchases and salaries for those living elsewhere amounted to about \$936 million. The employment figure of 20,214 includes major on-site subcontractors for both Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL).

In FY 1997, the total impact of DOE on the state was less than in 1998. Also, in FY 1997 the economic activity resulting from the initial infusion of over \$2.9 billion in New Mexico was \$9.9 billion (Table 1). The total personal income impact was just under \$2.8 billion. The DOE employment for FY 1997 was 19,705 and the indirect and induced effect was 49,964 jobs, for a total impact of 69,669 jobs in FY 1997.

DOE/New Mexico expenditures have increased each year from FY 1985 through FY 1990. Expenditures then decreased slightly in FY 1991, rose again from FY 1992 through FY 1994 and then decreased slightly in FY 1995, and remained at about \$2.1 billion through FY 1998 (Figure 2). This upward trend has now leveled and the future funding levels will depend on national needs for the types of research and development carried out at the two national laboratories and other variables related to Congressional budget decisions. The past long-term increases shown in Figure 2 also highlight the ability of New Mexico's infrastructure and business community to meet the needs of the laboratories with local products and services.

The decreasing percentages of DOE impacts relative to the state economy results from two basic factors: 1) the amount of funding to New Mexico through DOE is leveling or declining slightly; and 2) the overall state economy is continuing to grow making DOE's contribution a lesser part.



**Figure 1. DOE Facilities in New Mexico.**

**Table 1. DOE New Mexico's Influence on New Mexico's Economy, FY 1997 and FY 1998.**

Economic Measure	FY 1998			DOE as % of State	
	Revised FY 1997 DOE New Mexico (a)	DOE/ New Mexico	Total State		
----billions of dollars----					
<b>Economic Activity</b>					
Direct Expenditures	2.94	3.01			
Indirect and Induced	6.92	7.22			
Total Economic Activity	9.86	10.24	96.5	10.6	
Economic Activity Multiplier	3.36	3.39			
<b>Personal Income</b>					
Gross Labor Costs	1.25	1.32			
Net Wage and Salaries	1.18	1.21			
Indirect and Induced	1.61	1.68			
Total Personal Income	2.79	2.89	34.6	8.4	
Personal Income Multiplier	2.36	2.39			
<b>Employment</b>					
Direct	19,705	20,214			
Indirect and Induced (a)	49,964	52,239			
Total Employment	69,669	72,453	831,052	8.7	
Employment Multiplier	3.54	3.58			

a. FY 1997 results based on FY 1998 econometric model and revised expenditures and employment.

b. BEA May 1999

c. New Mexico Department of Labor, Table C, March, 1999.

The economic data support the following conclusions:

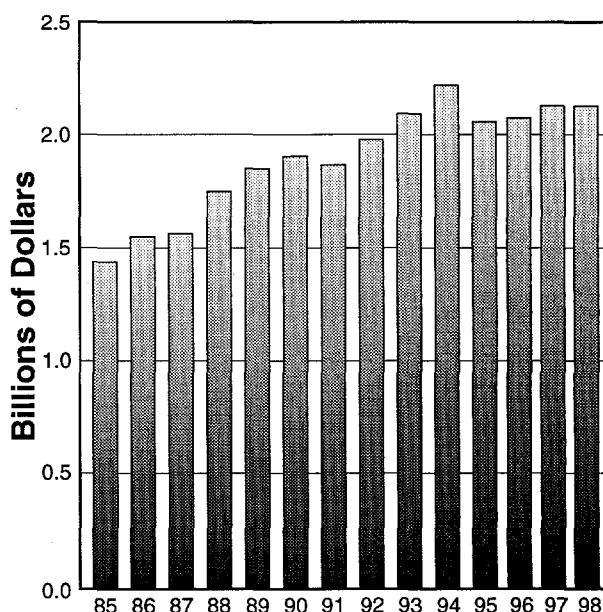
- DOE/New Mexico funding accounts for approximately one-fourth of all federal expenditures in New Mexico.
- The total economic impact of DOE's New Mexico funding of \$3.0 billion was slightly over \$10.2 billion in FY 1998. This is just under 11 percent of the state's economic activity or more than one of every ten dollars of economic activity statewide. The FY 1997 impact was \$9.9 billion, based on slightly more than \$2.9 billion in operating and capital budgets for DOE's operations in New Mexico. The FY 1997 impact was about 11 percent of the total economic activity in the state.
- In FY 1998, about 69 percent (\$2.1 billion) of the total DOE/New Mexico budget of over \$3.0 billion was spent in New Mexico for goods, services, and salaries.
- In FY 1998, expenditures in New Mexico had a 3.39 multiplier effect on the statewide economy. For every \$100 expended by DOE, another \$239 of additional economic activity was generated.
- DOE/New Mexico funding of \$3.0 billion is equivalent to nearly \$1,740 for each resident. The direct spending in New Mexico of \$2.1 billion is equivalent to about \$1,200 for each resident.

**Table 2. DOE New Mexico Funding, Instate Expenditures, and Employment By Major Entity in New Mexico, FY 1997 and FY 1998.**

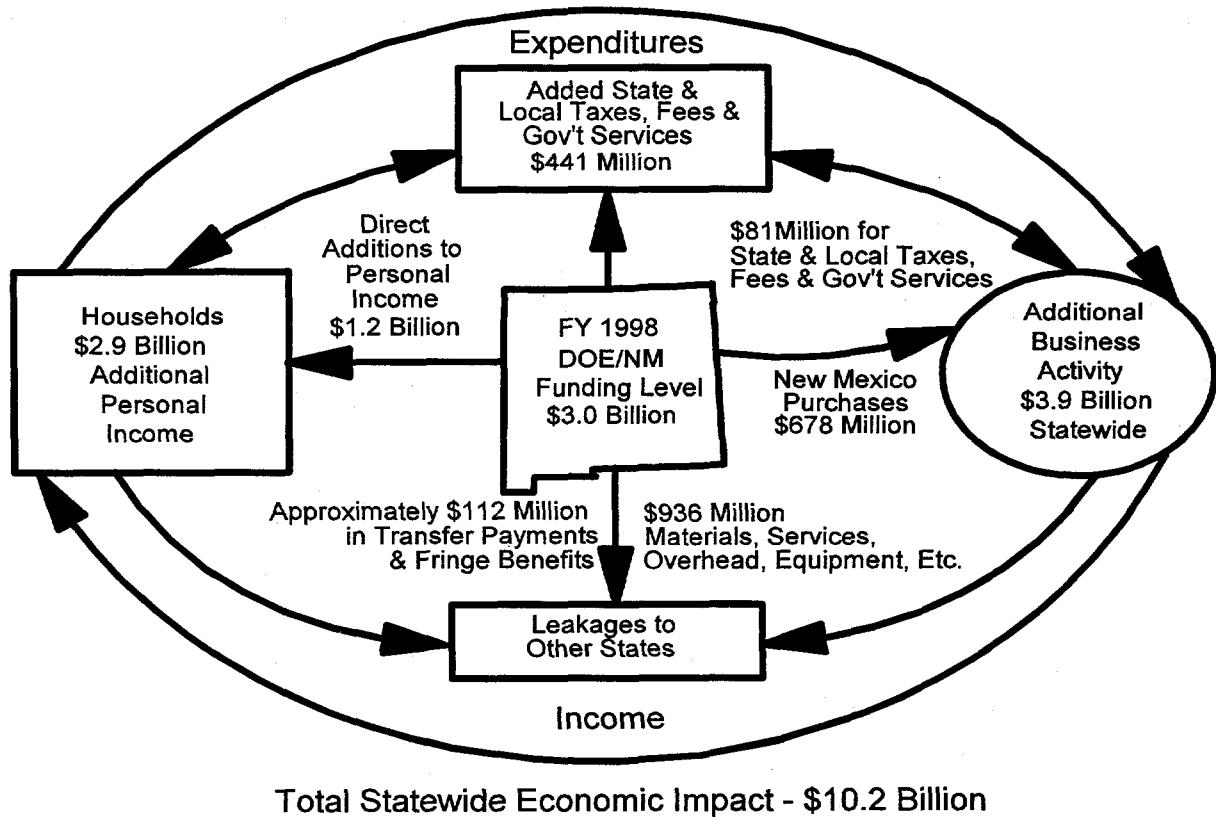
	FY 1997 (revised)			FY 1998		
	New Mexico Funding	Instate Expenditures	New Mexico Employment	New Mexico Funding	Instate Expenditures	New Mexico Employment
	-- millions of dollars--				-- millions of dollars--	
Lockheed Martin (SNL) <sup>a</sup>	1,375.0	854.9	7,196	1404.9	852.5	7,237
Univ. of Calif. (LANL)	1,143.0	865.1	8,461	1206.5	867.5	8,931
DOE Albuquerque Ops. Office	138.2	138.2	1,016	137.8	137.8	960
Johnson Controls (LANL)	76.9	70.5	1,435	90.4	72.7	1,381
Westinghouse (WIPP)	89.7	75.8	635	86.8	75.1	627
PT-LA (LANL)	29.4	26.1	392	30.6	22.0	453
AlliedSignal	30.8	22.5	287	23.1	20.5	329
Ross Aviation	11.4	6.2	78	9.4	5.8	74
Other US DOE Offices	13.9	13.9	16	9.2	9.2	23
DOE Nevada Ops. Office	8.7	8.7	72	6.2	6.2	98
Other Contractors	5.7	5.7	9	2.6	2.6	39
M-K Ferguson	3.7	3.7	49	2.5	2.5	34
DOE Oak Ridge Ops. Office	3.2	3.2	9	3.1	3.1	13
DOE Idaho Ops. Office	3.0	3.0	1	2.6	2.6	1
Jacobs Engineering	4.8	3.3	49	1.8	1.5	14
<b>TOTAL</b>	<b>2,937.4</b>	<b>2,100.8</b>	<b>19,705</b>	<b>3,017.5</b>	<b>2,081.6</b>	<b>20,214</b>

<sup>a</sup>Lockheed Martin instate expenditures and employment were revised to more accurately reflect New Mexico expenditures and jobs.

- DOE operations statewide directly added over \$1.2 billion to total personal income in 1998 (Figure 3). The income multiplier effect generated nearly \$1.7 billion additional personal income for a total impact of slightly under \$2.9 billion, or about 8 percent of the estimated \$34.6 billion from all sources statewide. In short, about one of every \$12 in personal income generated in the state is directly or indirectly attributable to DOE activities.
- Total DOE/New Mexico direct employment in 1998 was 20,214 jobs, resulting in a statewide impact of just under 72,500 jobs. Due to the multiplier effect of 3.58, another 258 additional jobs were supported for each 100 direct DOE/NM jobs. Total jobs supported are about 9 percent of all employment or one of every 11 jobs in the state. In FY 1997, the statewide impact on employment was about 69,700 jobs using an employment multiplier of 3.54.



**Figure 2. DOE Expenditures in New Mexico, FY 1985-1998.**



**Figure 3. DOE Economic Impact on New Mexico, FY 1998.**

- DOE facility and project contractors paid nearly \$81 million in taxes, fees, and enterprise charges to mainly state and local government entities. Total revenue effects (state and local), as a result of DOE operations, accounted for \$441 million in revenues from government taxes, fees, and enterprise charges (Figure 3).
- DOE offices and contractors spent about \$678 million for goods and services (including construction) in New Mexico for FY 1998. These expenditures generated business activity of about \$3.9 billion (Figure 3).

## INTRODUCTION

The U.S. Department of Energy (DOE) provides a major source of economic benefits in New Mexico, second only to the activities of the U.S. Department of Defense. The agency's far-reaching economic influence within the state is the focus of this report. Economic benefits arising from the various activities and functions of both the Department and its contractors have accrued to the state continuously for over 50 years.

For several years, DOE/Albuquerque Operations Office (AL) and New Mexico State University (NMSU) have maintained inter-industry, input-output modeling capabilities to assess DOE's impacts on the state of New Mexico and the other substate regions most directly impacted by DOE activities. One of the major uses of input-output techniques is to assess the effects of developments initiated outside the economy such as Federal DOE monies that flow into the state, on an economy.

The information on which the models are based is updated periodically to ensure the most accurate depiction possible of the economy for the period of reference. For this report, the reference periods are Fiscal Year (FY) 1997 (October 1, 1996, through September 30, 1997), and FY 1998 (October 1, 1997, through September 30, 1998). Total impact represents both direct and indirect impacts (responding by business), including induced (responding by households) effects. The standard multipliers used in determining impacts result from the inter-industry, input-output models uniquely developed for New Mexico.

This report includes seven main sections: (1) Introduction; (2) Profile of DOE Activities in New Mexico; (3) DOE Expenditure Patterns; (4) Measuring DOE/New Mexico's Economic Impact; (5) Technology Transfer within the Federal Labs funded by DOE/New Mexico; (6) Glossary of Terms; and (7) Technical Appendix containing a description of the model.

## PROFILE OF DOE ACTIVITIES IN NEW MEXICO

### Albuquerque Operations Office

In FY 1998 AL was the largest of the eight DOE operations offices. Although some of the current AL activities can be traced to 1943 and the Manhattan Engineer District operations at Los Alamos, civilian control was established in 1946 through the DOE predecessor, the Atomic Energy Commission (AEC). For over 50 years the DOE and its predecessor agencies, the AEC and the Energy Research and Development Administration, have been an important economic activity in the state. The current AL Headquarters complex is located on Kirtland Air Force Base (KAFB), Albuquerque, New Mexico, as the result of a move from Los Alamos in April 1956.

The missions of DOE and AL have increased over the years and continue to change with new Arms Control Treaties and increased emphasis on solving problems of national concern. However, as was the case in 1946, the predominant function of AL is the design, development, production, maintenance, and retirement of the nation's nuclear weapons. Performing this mission and other assigned missions in a safe and environmentally acceptable manner is a primary concern to AL and its contractors.

In addition to AL's nuclear weapons role in national defense, the operations office is also responsible for various non-weapons activities such as extensive energy and environmental research programs, selected energy conservation efforts, the Waste Isolation Pilot Plant (WIPP), and the nationwide Uranium Mill Tailings Remedial Action (UMTRA) Project.

AL had a staff of about 1,299 in FY 1998. Of these, 960 were located in New Mexico. The remaining out-of-state employees were located in three area offices, one project office, and two transportation safeguard sections. AL is responsible for selected DOE operations in Colorado, California, Missouri, Tennessee, and Texas. AL also has activities in Utah, Arizona, Nevada, and South Carolina, but does not maintain an official office in these states. Facilities for which AL is responsible include two major laboratories, two production plants, a

training academy, and a test site, Tonopah Test Range (TTR). TTR is located in Nevada and operated through Sandia National Laboratories. Nationwide, AL and its operating contractors employ approximately 21,235 people.

AL's integrated management and operating (M&O) contractors include the University of California (LANL), Lockheed Martin (SNL), Mason and Hanger-Silas Mason Co., Inc. (Pantex Plant near Amarillo, Texas), and Allied Signal (Kansas City Plant-Missouri). Other major contractors include: Westinghouse Electric Corporation (WIPP); Jacobs Engineering and MK Ferguson (UMTRA Project); Chem-Nuclear GeoTech, Grand Junction Projects Office; and Ross Aviation (air transportation services). Most of the facilities and projects for which AL is responsible are located in New Mexico.

## **Los Alamos National Laboratory**

### **History**

LANL was established in 1943 as the Wartime Project Y of the Manhattan Engineering District with responsibility for developing the first nuclear weapon. During the cold-war era, Los Alamos became a multidiscipline, multiprogram Laboratory applying capabilities from its original weapons mission to national security and civilian security needs. In this post cold-war era, the Laboratory continues its scientific role in national security as a steward of the enduring stockpile. It applies scientific capabilities to the reduction of threats from weapons of mass destruction and to civilian security threats.

### **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 1998, the Laboratory had approximately 8,931 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 1998 operating budget was \$1.3 billion. Principal activities are as follows: Defense Programs 53 percent, Nonproliferation and National Security 9 percent, Materials Disposition 12 percent, Environmental Restoration and Waste Management 12 percent, Energy Research 5 percent, Nuclear Energy 1 percent, Energy Efficiency and Renewable Energy 1 percent, other DOE 2 percent, and Work for Others 15 percent.

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

Because of topographical, environmental, operational, and buffering constraints, only about 30 percent 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.

LANL 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.

The Laboratory, DOE, and the Los Alamos Economic Development Corporation (LAEDC), with support from the county of Los Alamos, is pursuing the development of a research and development park. The park is proposed to be developed on about 44 acres of land directly north of the Laboratory's main area. This land and park are intended to provide a physical location for private industry to develop facilities that will allow and foster scientific and technological exchange between private industry and the Laboratory.

### **Mission and Capabilities**

The Laboratory's core mission is to enhance global security by ensuring safety and confidence in the U.S. nuclear weapons stockpile, by developing technical solutions to reduce the threat

of weapons of mass destruction, and by improving the environmental and nuclear materials legacy of the cold war.

In addition, the Laboratory applies its scientific and engineering capabilities to assist the nation in addressing energy, environment, infrastructure, and biological security problems. For example, the high-performance computing capability and related competencies 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 an array of disciplines and capabilities with highly specialized facilities and unique operations expertise.

LANL supports DOE complex-wide initiatives in all four of DOE's business areas: National Security, Science and Technology, Energy Resources, and Environmental Quality. In addition, it performs work for other federal agencies, and works with U.S. industry that is synergistic with its core mission.

### **Major Nuclear Facilities**

Plutonium Facility—the Nation's only full-service operating plutonium facility.

Weapons Engineering Tritium Facility—state-of-the-art tritium research and development facility.

Critical Experiments Facility—national resource for critical-assembly training and nuclear data measurements.

Chemistry and Metallurgy Research Facility—facilities for plutonium metallurgy, advanced chemical diagnostics, and nuclear and radiochemistry.

### **Major Experimental Facilities**

Neutron Science Center—national user facility includes one of the world's most powerful proton linear accelerators and the proton storage ring.

Materials Science Laboratory—specialized laboratory that provides experiments in high-temperature superconductivity, materials modification, and materials analysis.

Dual-Axis Radiographic Hydrotest Facility—premier three-dimensional hydrotest center; expected to begin operations in 1999.

National High Magnetic Field Laboratory—unique facility that will produce 100-tesla magnetic fields for periods lasting up to 10 milliseconds (1000 times longer than anywhere else in the world).

### **Major Research Facilities**

Advanced Computing Laboratory—new facility to provide resources for advances in high-performance computing; Strategic Computing Complex—TeraOp computing and simulation (construction begins in 1999).

Health Research Laboratory—contains the *Center for Human Genome Studies*, biological research, molecular biology, biochemistry, and 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;
- Developed VELA Satellite for 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 Sn 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);

Blue Mountain standard speed test ran at 1.6 teraOps. (1998);

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 chromosome 16, measurement of neutrino mass, computer modeling of global ocean temperatures. Detection of ionic pulsed-pairs of radio impulses by an instrument aboard a satellite, new milestones in high temperature superconductivity and materials processing, Advanced Recovery and Integrated Extraction System (ARIES) for Plutonium, characterization of the earth's changing magnetic field and the spin-rate of the earth's core, detection of lunar ice, and detection of evidence for a super-massive black hole.

### **Future Prospects**

LANL will continue its roles in science-based stockpile stewardship and in nonproliferation and counter-proliferation. The Laboratory has been designated as the preferred location to manufacture nuclear weapon pits on a small scale. High performance computing, with its associated capabilities, is expected to address additional complex civilian security problems.

### **Sandia National Laboratories**

#### **History**

SNL was established in 1949 to provide the engineering design, production, assembly, and field testing of non-nuclear components of nuclear bombs. SNL evolved into an engineering

research and development laboratory by the early 1960s. During the 1970s, it became a multi-program national laboratory with responsibilities in national security, energy, and environmental research and development. SNL is operated for the U.S. Department of Energy by Sandia Corporation, a Lockheed Martin Company.

#### **Background**

SNL's executive management offices and larger laboratory complex are located on Kirtland Air Force Base at the southeastern edge of Albuquerque, New Mexico. This site, referred to as SNL/New Mexico, is composed of five technical areas and an outdoor testing field covering 17,750 acres. This location benefits from its proximity to other major defense laboratories and testing facilities and the emerging high-technology industrial climate in the Rio Grande research corridor. Another SNL complex in Livermore, California occupies 413 acres at the eastern edge of the San Francisco Bay area. SNL also operates test facilities in Nevada and Hawaii. At the end of Fiscal Year 1998 SNL provided 7,237 jobs in New Mexico and had a budget of approximately \$1.4 billion.

#### **Missions and Capabilities**

SNL has responsibility for the engineering development of all United States nuclear weapons and for systems integration of the nuclear weapons with their delivery vehicles. National security programs and defense-related environmental programs for the Department of Energy constitute approximately 65 percent of SNL's work. Responsibilities include the design, certification, and assessment of the non-nuclear subsystems of nuclear weapons; safety, security, reliability, and use-control; work associated with the production and dismantlement of nuclear weapons; surveillance and support of weapons in stockpile, environmental restoration and waste management related to the nuclear weapons complex; and work in nuclear intelligence, nonproliferation, and treaty verification technologies. Approximately ten percent of SNL's work supports Department of Energy missions in energy science, research, and development. About 25 percent of SNL's work is for other government agencies, particularly the Department of Defense, in programs where SNL's unique

competencies (based from mission responsibilities) can add value.

### **Recent Achievements**

During Fiscal Year 1998, SNL:

- Retrofitted the existing B83-0 strategic bomb;
- Provided safety upgrades for the B61-3, -4, and -10 bombs;
- Retrofitted the B61 as an earth-penetrator (9B61-11) to replace the B53;
- Conducted a fire safety assessment of the W80 weapon;
- Provided neutron generator tubes;
- Developed a prototype microelectromechanical system lock;
- Developed a new vertical-cavity surface-emitting laser (VCSEL)-based detonator stronglink monitor prototype;
- Developed compliance monitors for the Comprehensive Test Ban Treaty.
- Upgraded nuclear security in the former Soviet Union;
- Developed COMRAD, a hand-held device to detect x- and gamma-rays to characterize and monitor radioactive materials;
- Demonstrated electron tunneling quantum transistors up to ten times faster than existing transistors;
- Developed new thin films for chemical warfare and microelectronics applications;
- Earned Environmental Protection Agency certification for the Waste Isolation Pilot Plant;
- Restarted the Annular Core Research Reactor to produce medical isotopes;
- Developed an explosives-detection portal for the Federal Aviation Administration;
- Nondestructively disabled the Unabomber's last bomb;
- Set a new record on the Z-Accelerator for temperature (290 terawatts) and x-ray output (applications include testing radiation effects on components); and

- Used the teraflops computer to model the impact of a 1.4-kilometer asteroid striking the Atlantic Ocean near New York City.

### **Future Prospects**

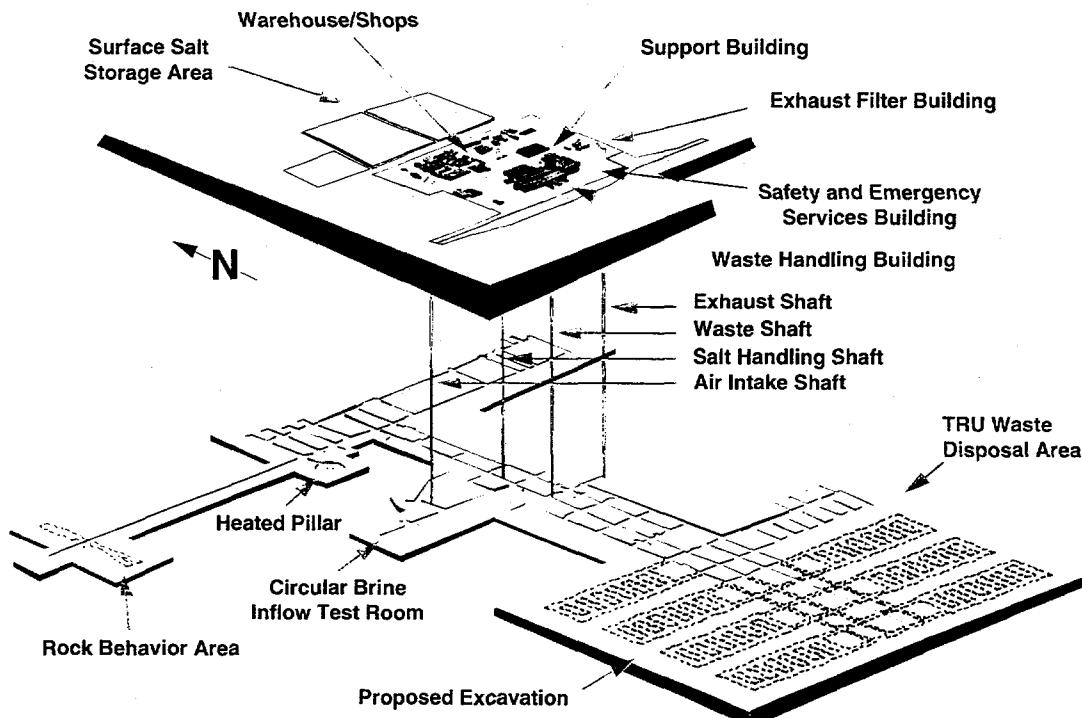
Funding for defense programs has stabilized as the laboratory focuses on stockpile stewardship and management in the absence of new weapon development programs. Programs in nonproliferation, arms control, and global nuclear materials management are increasingly important. Energy programs are merging with the broader mission for the security of critical infrastructures. Environmental cleanup activities will continue with modest change. SNL will increasingly focus on core competencies for defense programs activities.

## **Waste Isolation Pilot Plant**

### **History**

WIPP was authorized and funded by the U.S. DOE National Security and Military Applications of Nuclear Energy Authorization Act of 1980 or Public Law 96-164 as authorized by Congress, which provided for a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from defense activities. The WIPP site was chosen through a selection process that started in the 1950s. DOE/AL was given the responsibility for managing the disposal of defense-generated transuranic (TRU) waste in a deep geological repository.

Construction of the surface structures and underground mines was completed, site data collected, and a Final Safety Analysis Report was published in 1990. The WIPP Land Withdrawal Act of 1992 identified the regulatory and institutional prerequisites for reaching a disposal decision. This act was amended in September 1996 to recognize changes in test strategy, delete duplicative requirements, and establish congressional consensus that WIPP should open by November 1997. These changes were incorporated in an update Final Safety Analysis Report, January 1998. DOE established the Carlsbad Area Office (CAO) in 1993 to assume responsibility for the WIPP and the National Transuranic Program.



**Figure 4. Waste Isolation Pilot Plant Layout.**

## Background

WIPP is located 26 miles east of Carlsbad in Eddy County, New Mexico, with fewer than 30 people living within a 10 miles radius of WIPP. The WIPP repository is an underground mine located 2,150 feet below the surface in the Salado Formation (Figure 4), a 2,000-foot thick salt bed that extends laterally for 36,000 square miles. The WIPP site covers 10,240 acres, of which 12 acres have been mined underground for conducting scientific experiments and another 15 acres mined for waste disposal. A total of 100 acres, in eight separate blocks, will be mined to hold waste. Approximately 250 surface acres are fenced and surrounded by a 10,000-acre buffer zone available for recreation use or grazing leases. WIPP is operated for DOE by Westinghouse Waste Isolation Division. During FY 1998, 976 WIPP- related jobs [including CAO, Westinghouse, SNL, the CAO Technical Assistance Contractor (CTAC), and other contractors] were supported by the CAO. The total CAO budget for FY 1998 was approximately \$142 million in New Mexico.

## Mission and Capabilities

The mission of the CAO is to protect human health and the environment by providing for safe disposal of transuranic waste by establishing an effective system for management of transuranic waste from generation to disposal. The WIPP facility serves as a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from U.S. defense activities and programs. The WIPP facility is exempted from regulation by the Nuclear Regulatory Commission. The WIPP facility is a critical component for TRU waste disposal within the DOE vision to clean up the DOE Weapons Complex by the year 2006.

The decision to dispose of waste at WIPP will be made by the Secretary of Energy, and is based on a thorough evaluation of repository and system performance, including: operational excellence, transportation, packaging, characterization, and certification. It will also be based on informed public participation and institutional and regulatory acceptance.

## Achievements

During FY 1998, the CAO and its contractors achieved the following:

### Strength, Weakness, Opportunity, and Threat (SWOT) Analysis

- Committed \$300,000 to support a SWOT Analysis concerning the economic impact of WIPP on Carlsbad. The study will help the City make long-term plans to help ensure economic diversity and growth.
- Transferred the Energy Training Internet Hub (En-Train) World Wide Web site to TTC for operation in 1998. Free, public access is provided to extensive training and technical materials created at DOE locations, offering proven, best-of-class training, one-stop access to free materials, immediate download and a variety of training formats.

### Geographical Information System (GIS)

- Provided financial and human resource support the development of a county-wide GIS. Startup support from CAO included \$250,000.

### Advanced Manufacturing and Innovation Training Center (AM&ITC)

- Provided financial and human resource support for the continued development of the AM&ITC, a center offering training, education, and business incubation and expansion opportunities in Southeastern New Mexico. Start-up support in FY 1996, included \$1.96 million from the CAO, as well as CAO and contractor oversight of operations. Continued support for expanded regional services in FY 1997, and FY 1998, included AM&ITC training and education for workers from WIPP-spinoff businesses and displaced workers in the mining industry. Since program inception, the AM&ITC has trained over 1,270 students. Space has been leased at the AM&ITC to New Mexico State University-Carlsbad, Sandia National Laboratories, Westinghouse, Nuclear Filter Technologies, and Mobile Characterization Services.

### Southeast New Mexico National Environmental Technology and Training Center (TTC)

- Provided a total of \$1.5 million financial support to the TTC during the three-year period FY 1996-98. The TTC now operates self-sufficiently. The center

supports National Transuranic Waste (TRU) Program training needs as well as regional environment, safety and health training. From FY 1996-98, the TTC conducted a total of 427 courses, training approximately 6,200 students. Clients have included Battelle, LLNL, SNL, EPA and a variety of Carlsbad area businesses.

- Transferred the Energy Training Internet Hub (En-Train) World Wide Web site to TTC for operation in 1998. Free, public access is provided to extensive training and technical materials created at DOE locations, offering proven, best-of-class training, one-stop access to free materials, immediate download and a variety of training formats.

### Technology Transfer

- Since inception of the CAO Technology Transfer Program in 1995, the investment of \$50,000 per year has resulted in more than 8,000 transfers of CAO-developed soft technology, such as training materials, technical documents, surveys, and assessment instruments to U.S. organizations. Recipients include educational institutions, governmental agencies, non-profit groups, and businesses. Annual surveys of transfer recipients demonstrated \$138 million in private sector economic impact and 1,400 jobs created or retained. More than 95 percent of transfers are conducted electronically via e-mail and the Internet, with one-day cycle time. Clients have included Harvard and Yale Universities, MIT, Motorola, Hewlett-Packard, Dell Computer, the United Nations, City of Phoenix, State of New York and NASA.

### Other Economic Development Initiatives

- During FY 1998, the CAO continued to support training of more than 200 teachers, students and non-profit workers in writing grant proposals to support grassroots economic development. Recipients of grant training report that the training has helped them secure over \$114 million in grants.
- Continued a project with the Carlsbad Department of Development and TTC, to start a spin-off training products business. CAO supported development of a business

plan to create a training products business for the manufacturing field. CAO continues to identify other products and services with spin-off potential from WIPP.

- Provided design and writing consultation for Carlsbad Department of Development marketing materials, volunteer assistance to survey 215 area businesses for a business retention and expansion project, compilation of a geographic information system database, and survey development, analysis and tabulation for economic development and educational organizations.
- Served in a variety of community and business development efforts, including the United Way, Carlsbad Main Street Project, Downtown Business Association, Rotary International, the Carlsbad Museum and Art Center, Carlsbad Chamber of Commerce, and Carlsbad Department of Development. Provided management development and team-building seminars to area businesses and public education.

### **Future Prospects**

- Continued support and development of spin-off businesses from WIPP products and services that fulfill identified needs in Southeastern New Mexico. These efforts support the development of Southeastern New Mexico as an international "lessons-learned center" for passing on knowledge, skills and abilities to others.
- Creating synergy for systematic expansion of regional economic prosperity by working with a variety of business and community development efforts that include local economic developers, Downtown Main Street projects, educational development, and business recruitment and retention.

### **Uranium Mill Tailings Remedial Action Project**

#### **History**

Uranium ore has been mined in significant quantities for more than 40 years. Initially, the ore was mined by private companies for federal government use in national defense programs.

After the 1950s, uranium was also needed as fuel for nuclear power plants.

When the mills shut down, they left behind large piles of uranium mill tailings, the sand-like material that remains after uranium has been extracted from the ore. Tailings contain 85 percent of the radioactivity present in the unprocessed uranium ore and small concentrations of naturally occurring materials that radioactively decay to radium and produce radon, a radioactive gas.

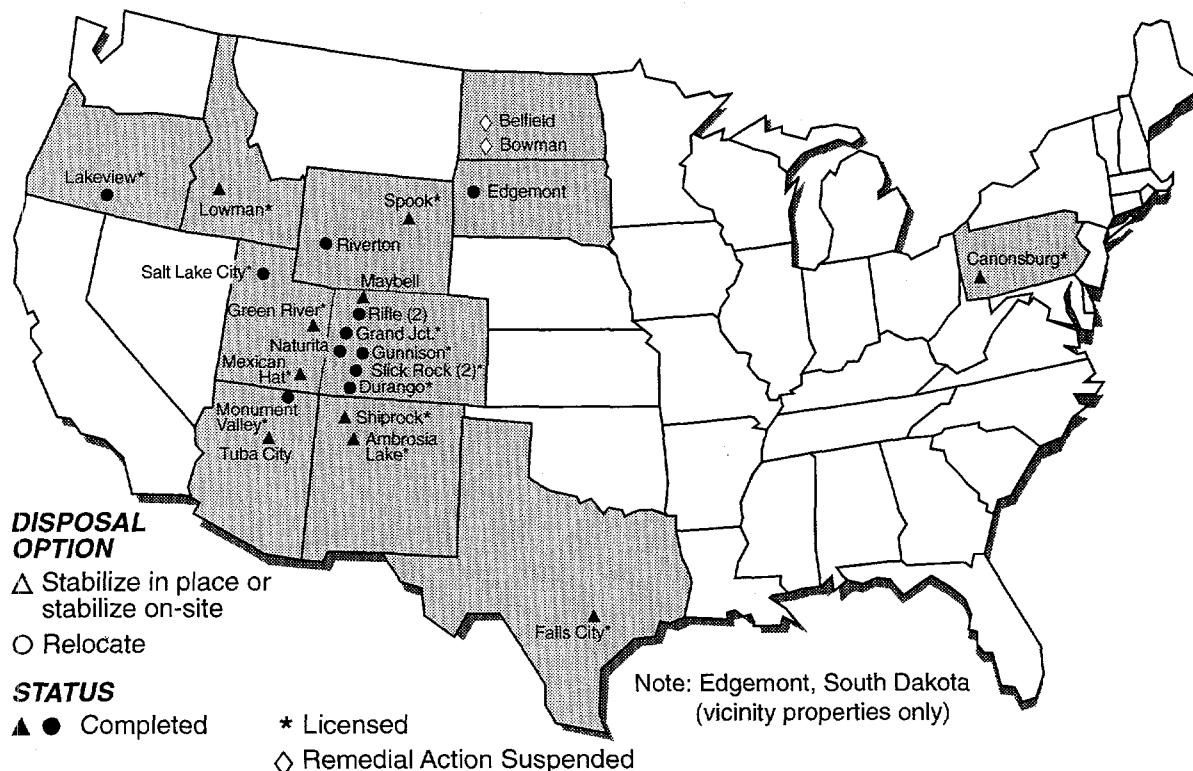
Levels of human exposure to radioactive materials from the piles are low; however, in some cases, tailings were used as construction materials before the potential health hazards of the tailings were recognized. In homes or other structures containing tailings, the radon gas can concentrate in enclosed spaces. The purpose of remedial action is to minimize or eliminate potential health hazards resulting from exposure of the public to residual radioactive materials at the former processing sites and at contaminated properties.

After determining that uranium mill tailings might pose a public health hazard, Congress passed Public Law 95-604, "The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978," to clean up all inactive uranium mill sites that had been abandoned by the late-1960s. DOE was given the responsibility for stabilizing and controlling the tailings at 24 inactive sites in a safe and environmentally sound manner in accordance with EPA standards. The UMTRA Project Office was established in 1979 as part of the Albuquerque Operations Office.

#### **Background**

The UMTRA Surface Remediation Project is located in Albuquerque, New Mexico, and is managed by a small federal staff. Jacobs Engineering Group Inc., is the technical assistance contractor for the project, providing technical and management support to DOE. In FY 1998, Jacob's staff had been reduced to 6 by year's end. Construction management support is provided by the remedial action contractor, MK-Ferguson Company, and its subcontractors, with staff levels of 30-40 at the end of September 1998.

The former processing sites being remediated by this project are located near Shiprock and



**Figure 5. UMTRA Project Sites.**

Ambrosia Lake, New Mexico; Salt Lake City, Green River, and Mexican Hat, Utah; Canonsburg, Pennsylvania; Durango, Slick Rock (two sites), Gunnison, Naturita, Grand Junction, Rifle (two sites), and Maybell, Colorado; Tuba City and Monument Valley, Arizona; Spook (Converse County) and Riverton, Wyoming; Lakeview, Oregon; Lowman, Idaho; Belfield and Bowman, North Dakota; and Falls City, Texas (Figure 5).

In July 1997, DOE determined that cleanup was not required at the two UMTRA sites at Belfield and Bowman, ND. This action was taken at the request of the state of North Dakota because of minimal public support, limited state funding and the very small risk to the public and the environment. This reduced the number of UMTRA sites from 24 to 22.

#### Mission and Capabilities

DOE/AL has been assigned responsibility for managing this nationwide project. The work involves eliminating or minimizing potential health hazards from uranium decay products by providing remedial action at the 22 designated inactive, privately owned, uranium milling and processing sites, and approximately 8,156 associated vicinity properties around the nation. Most of these sites met the requirements of the

Atomic Energy Act of 1954 before abandonment, but do not meet current U.S. Environmental Protection Agency (EPA) standards. The 1988 amendments to Public Law 95-604 also directed the DOE to conduct cleanup of ground water resources affected by contamination from UMTRA Project sites. Responsibility for the ground water cleanup was moved from Albuquerque to DOE's Grand Junction Office (GJO) in Grand Junction, Colorado, on October 1, 1995.

#### Achievements

- DOE's Cost Reduction/ Productivity Improvement Program (CR/PIP). UMTRA team people have saved \$77 million since the CR/PIP began in 1988.
- Work was completed at the last two sites of Naturita and Maybell, Colorado in FY 1998. All 22 sites are now complete.
- Obtained National Regulatory Commission (NRC) licensing of three sites through the end of FY 1998: Green River, Utah; Slick Rock, Colorado; and Ambrosia Lake, New Mexico. At the end of FY 1998, 16 sites (including Burrell, PA) were licensed by NRC. Burrell was not an original site but in close proximity to Canonsburg. It was completed and

licensed along with 15 original sites. The Grand Junction, CO site will be licensed when the site is officially closed, possibly as late as 2023. The Naturita and Maybell, CO sites will be licensed in FY 1999. With the two Rifle, CO sites being combined into one site; a similar combining at Slick Rock, CO; Riverton, WY site disposed of in a Title II site; and Monument Valley, AZ site being combined with the Mexican Hat, UT site; the number of UMTRA sites licensed at the close of FY 1999, will be 18 (including Burrell, PA, 15 original sites plus Naturita and Maybell, CO sites).

- Completed all vicinity properties eligible for remedial action under the UMTRA Project. These properties are residences, private businesses and open lands where uranium tailings were used as construction materials.
- Congress passed a bill extending the authority of the Secretary of Energy to perform UMTRA remedial actions by two fiscal years through September 30, 1998.

### **Future Prospects**

As the world's largest materials management project ever undertaken to reduce or eliminate risk to the general public from exposure to potentially hazardous radioactive materials, the UMTRA Project has encapsulated and isolated almost one-fourth of all uranium mill tailings generated in the United States by the time cleanup was completed in September 1998. This amounts to more than 42 million cubic yards of material!

### **Other DOE Activities in New Mexico**

#### **National Atomic Museum**

The congressionally chartered National Atomic Museum is operated for the Department of Energy, by Sandia National Laboratories. The museum's mission is to preserve and exhibit to the public the history of the nuclear age. Exhibits focus on nuclear defense but also include peacetime uses of nuclear energy and nuclear science. Tours are provided to organized groups on a scheduled basis. The museum also maintains a library and photographic archives. In FY 1998, 70,000 guests visited the museum.

### **Ross Aviation**

Ross Aviation, Inc., is AL's support service contractor providing air cargo and passenger service. It utilizes base facilities located on KAFB, Albuquerque, New Mexico. All aircraft operate in support of the air service contract to the DOE and the aircraft are government owned. Services supported by Ross Aviation, Inc., include cargo transports between production plants, national laboratories, test sites, and military facilities, and provides on demand special passenger and cargo flights. The AL fleet of aircraft is maintained by Ross Aviation under the provisions of its FAA repair station certificate.

Ross Aviation, Inc., operates from a facility contiguous to the Albuquerque International Airport. The contractor employs approximately 74 people and has an annual operating budget of about \$9.4 million. The AL fleet consists of three DC-9 jet transport, two DHC-6 Twin Otter turboprop airplanes, one B200C King Air turboprop, and one LR-35A Learjet. The size and mix of the fleet is adjusted in response to DOE mission requirements.

### **Nonproliferation and National Security Institute**

The DOE Nonproliferation and National Security Institute, operated by Wackenhut Services Incorporated (WSI), is located on Kirtland Air Force Base in Albuquerque. The award-winning Institute (formerly the Safeguards and Security Central Training Academy) has evolved into a far-reaching "umbrella" training organization that now comprises three academies: the Safeguards and Security Academy, the Nonproliferation and Arms Control Academy, and the Emergency Management Academy.

Since its inception, the Institute has provided standardized, efficient, and effective training for federal and contractor personnel throughout DOE's safeguards and security community and, in recent years, has dramatically expanded the scope of its student base to include other federal agencies as well as international, state and local government agencies. One example of this broadened scope is the Institute's recent partnership with the Bernalillo County Sheriffs Department. This unique partnership, which allows cost-effective mutual use of training facilities and services, saves millions of taxpayer

dollars because of its immediate and direct benefits to the citizens of the county and state as well as the federal government.

The training curriculum encompasses more than 110 courses in these disciplines: firearms, tactics, weapons of mass destruction, and critical infrastructure; nuclear materials control and accountability; leadership, supervision, and program planning; and personnel, operations, and information security. The Institute pioneered a technology-supported distance learning process for DOE that has become a model for government and private-sector organizations to emulate. Each year, more than 50 outside agencies visit the Institutes' Albuquerque campus to learn more about how to use technology-supported learning to serve their students at a distance.

Recognized by the American Council on Education for excellence in course design and delivery, the Institute has also won two Vice Presidential "Hammer" Awards for quality and innovations in government, Quality New Mexico's prestigious "Roadrunner" Award, and recognition as DOE's first Training Center of Excellence.

Known for its ability to train *anyone* in *anything*, *anywhere*, and at *anytime*, the Nonproliferation and National Security Institute continues to broaden its customer base by using technology-supported learning as its cornerstone, while continuing to provide quality training services that are "high touch" as well as "high tech."

The AL Transportation Safeguards Division conducts extensive training for special Agents (Couriers) in a remote site on KAFB and Ft. Chaffee, AR. The Transportation Safeguards Training Center (TSTC) utilizes two primary contractors (Star Mountain, Inc. and AlliedSignal Inc.) to provide services. FY 1998, federal jobs for this program are approximately 13; contractors employ approximately 49.

#### **Albuquerque Operations Office Support Contractors**

In addition to the contractors that manage and operate several facilities and projects for DOE in New Mexico, the Operations Office uses other contractors for technical, management and administrative support services. AL currently has

over 30 support service contracts—68 percent are minority-owned small and disadvantaged businesses (commonly referred to as 8(a) firms). The FY 1998 expenditure for support services was approximately \$38 million, which included management and operation of the DOE Nonproliferation and National Security Institute. Major contractors supporting the New Mexico activities provide specialized technical and management support, special studies, and analysis, training, medical services, facilities maintenance, custodial, and administrative services. Core areas supported include national security; science and technology management; environmental management; environmental, safety, and health; and business practices.

#### **DOE EXPENDITURE PATTERNS**

The term DOE/New Mexico is used to describe the funding to and expenditures of AL, all DOE/AL contractors, and other DOE offices expending money in the state. The type of model used was an input/output (I/O) model, reflecting the fact that the model related the level of activity within an economic system to the level of demands for its outputs or products.

Tables 3 and 4 are summaries of Appendix Tables 9, 10, 11, and 12. The expenditure patterns (production functions) of DOE in New Mexico, as shown in column 38 of Table 14, were derived as follows: New Mexico expenditures and operating budgets for FY 1997 (Table 3) and FY 1998 (Table 4) were collected from DOE contractors in New Mexico; for DOE contractors not in New Mexico, only amounts expended in New Mexico were collected; total expenditures in New Mexico during FY 1997, and FY 1998 were also collected from AL and other DOE operations offices.

The two largest DOE contractors in New Mexico are LANL and SNL. To compare the two laboratories, the on-site maintenance and security contractors at LANL need to be included with the LANL figures. In FY 1997, LANL, with the two contractors, was funded at slightly more than \$1.2 billion and SNL at slightly less than \$1.4 billion.

In FY 1998, the LANL budget increased to over \$1.3 billion while SNL increased to slightly more than \$1.4 billion. Total expenditures in New

**Table 3. DOE New Mexico Expenditures (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1997.**

Sector	US DOE/AL	SNL(b)	LANL(c)	WIPP(d)	UMTRA(e)	Other Support Contractors(f)	Other DOE Offices(g)	Total
1. Livestock & Livestock Products								
2. Other Agricultural Products				10				10
3. Forestry & Fishery Products		9						9
4. Agriculture, Forestry & Fishery Services		280						280
5. Mining, Crude Petroleum & Natural Gas		211	1,801					2,012
6. Construction	5,215	24,355	15,788	2,298				47,657
7. Ordnance & Chemical Manufacturing			99					99
8. Food & Kindred Products Manufacturing			205					205
9. Textiles Products & Apparel Manufacturing		16	23					39
10. Lumber & Wood Products Manufacturing			136					136
11. Paper & Publishing Manufacturing		236	222					458
12. Petroleum Refining & Products Manufacturing		(1)	448			483		929
13. Glass, Stone & Clay Products Manufacturing		14	482					496
14. Primary & Fabricated Metals Manufacturing		2,318	4,809	569		2,749		10,445
15. Computer, Office & Service Equipment Mfg.		16,439	6,119			186	8	22,752
16. Electrical Equipment Manufacturing		1,323	1,859	105		785		4,071
17. Scientific Instruments Manufacturing		923	208			11	83	1,225
18. All Other Manufacturing		413	163					751
19. Motor Freight Transportation & Warehousing		289	(5)	23	6			315
20. All Other Transportation		19	108	2,177				123
21. Communication	2,482	6,844	2,179	764	1	113	194	12,577
22. Electric & Gas Utilities	725	13,694	21,511	1,142	7	158	123	37,360
23. Water & Other Utilities	13	231	34	3		14	17	313
24. Wholesale Trade		24,382	51,223	8,690				84,295
25. Retail Trade	1,460	39,522	78,639	1,548	133	5,079	2,802	129,184
26. Finance, Insurance & Real Estate		1,972	861	347	448	415	897	4,940
27. Hotel Restaurant & Other Personal Services		840	514		6		837	2,197
28. Data Processing & Computer Services		29,802	74,987	321	11		40	105,161
29. Management & Consulting Services		27,075	15,092	296	28	696	1,502	44,688
30. Engineering, Architecture & Surveying Services		17,930	33,689	4,304	1,018	77	2,627	59,645
31. Other Business Services	20,016	56,296	25,519	9,171	169	2,267	10,248	123,685
32. Automobile & Other Repair Services		4,035	3,103	35	7	149	100	7,429
33. Amusement, Recreation & Video Services		869	293					1,162
34. Health, Education & Social Services		14,612	6,757		15	22	150	21,556
35. Government Services	4	10,104	2,066	29	7		336	12,545
36. Local Government		4,546	17,327	1,859	1,988	356	439	129
37. State Government		6,820	26,786	3,011	2,970	648	1,190	988
38. United States Department of Energy(a)								
39. Households	96,942	515,699	607,870	38,999	4,112	20,338		1,283,961
Total New Mexico Expenditures	138,223	854,865	961,682	75,778	6,973	35,172	28,829	2,101,521
Total Operating and Capital Budget	138,223	1,375,012	1,249,262	89,678	8,511	48,721	28,829	2,938,235

\*Totals may not add due to rounding

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

b. Includes Lockheed Martin (SNL)

c. Includes University of California (LANL), PT-LA and Johnson Controls

d. Includes Westinghouse

e. Includes Jacobs Engineering Group and M-K Ferguson Co

f. Includes Martin Marietta Specialty Components, Inc., Mason & Hanger Silas Mason Co., Inc., Pantex, MACTEC-ERS, and WASTREN and other contractors

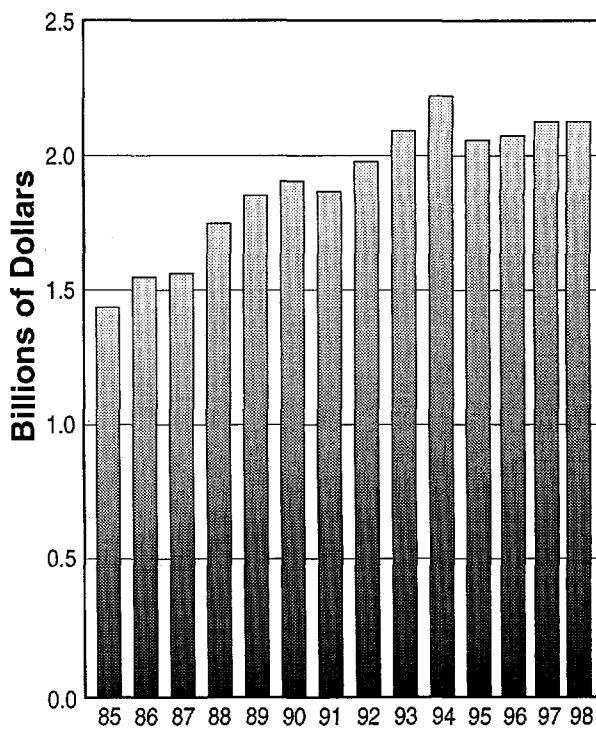
g. Includes Idaho, Nevada, Oak Ridge and other Operations Offices

Mexico, in FY 1998, were slightly more than \$962 million at LANL (including the two on-site contractors) and \$852 million at SNL as compared to slightly more than \$962 million and \$855 million, respectively, in FY 1997. Other DOE contractors in New Mexico include: Ross Aviation, Jacobs Engineering Group, Inc., MK-Ferguson Company (UMTRA), Johnson Controls (LANL), Westinghouse Electric(WIPP), and AlliedSignal. Each contractor assigned their instate expenditures to one of 37 industrial sectors as summarized in Tables 3 and 4 and detailed in Appendix Tables 9-12.

DOE contractors not in New Mexico reported only their expenditures in New Mexico. These included: M&H-SM Co., Inc. (the Pantex Plant in Texas), MACTEC-ERS and WASTREN. Tables 3 and 4 present total New Mexico expenditures by sector for DOE contractors and field offices. The last column in Table 4 also presents total DOE/New Mexico expenditures (the sum of the instate expenses of DOE/AL, the instate contractors, and the expenditures in New Mexico by out-of-state contractors and field offices). DOE expenditures in New Mexico for the FY 1985-1998 period are summarized in Figure 6. The instate spending from the DOE/ New Mexico total has increased steadily since 1985, to \$2.2 billion expended in FY 1994 and then decreased to less than \$2.1 billion in FY 1995 and remained at about \$2.1 billion through FY 1998.

Total DOE/New Mexico instate expenditures (the initial responding of total operating and capital budgets) amounted to over \$2.1 billion, or about 72 percent of the total budget in FY 1997 (Table 3). In FY 1998, instate expenditures were about 70 percent (\$2.1 billion) of the total DOE/New Mexico budget of over \$3.0 billion (Table 4). As a result, slightly less than \$936 million went to out-of-state purchases and salaries for those living elsewhere. SNL accounted for about 59 percent of the out-of-state spending, mainly because of a significant effort at Livermore, California. LANL accounted for another 36 percent, and others the remaining 5 percent.

The FY 1997 and FY 1998 New Mexico funding, instate expenditures, and employment by major entity (excluding combined major



**Figure 6. DOE Expenditures in New Mexico, FY 1985-1998.**

on-site contractor effects) are presented in Table 5. In FY 1998, Lockheed Martin (SNL) had funding and instate expenditures of over \$1.4 billion and \$852.5 million, respectively. University of California (LANL not including maintenance and security contractors) followed with \$1.2 billion funding and \$867.5 million instate spending. DOE/AL was third with \$137.8 million in funding and instate spending.

DOE/New Mexico expenditures by major sectors in FY 1998, were personnel (\$1.3 billion), services (\$328 million), trade (\$203 million), government (\$81 million), construction (\$41 million), manufacturing (\$41 million), and other sectors (\$63 million) (Table 6). Nearly 64 percent of expenditures in New Mexico went for salaries, wages, and benefits.

Salaries and wages (without benefit costs) accounted for over 51 percent of total expenditures (Figure 7). Salaries and wages (including fringe benefits) increased by about \$32 million between FY 1997 and FY 1998 (Table 6).

In FY 1998, about 16 percent of the DOE/New Mexico expenditures went for services, 10 percent for trade, about 4 percent for government, 3 percent for other sectors, 2 percent for construction, and 2 percent for manufacturing (Figure 7).

**Table 4. DOE New Mexico Expenditure (in thousands of dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1998.**

Sector	US DOE/AL	SNL(b)	LANL(c)	WIPP(d)	UMTRA(e)	Other Support Contractors(f)	Other DOE Offices(g)	Total FY 98
1. Livestock & Livestock Products								
2. Other Agricultural Products				80				80
3. Forestry & Fishery Products								
4. Agriculture, Forestry & Fishery Services		44		7				51
5. Mining, Crude Petroleum & Natural Gas		25		664				689
6. Construction	2,666	17,089	20,334	1,186		105	30	41,408
7. Ordnance & Chemical Manufacturing		2		340				342
8. Food & Kindred Products Manufacturing				169				169
9. Textiles Products & Apparel Manufacturing		12	50	48				110
10. Lumber & Wood Products Manufacturing			568	4				572
11. Paper & Publishing Manufacturing		651	91			1		743
12. Petroleum Refining & Products Mfg.			310			240		550
13. Glass, Stone & Clay Mfg.		144	55			0		199
14. Primary & Fabricated Metals Manufacturing		2,655	8,123	614		971		12,362
15. Computer, Office & Service Equipment Mfg.		11,413	2,950	112		143		14,618
16. Electrical Equipment Manufacturing		4,724	2,541	13				7,278
17. Scientific Instruments Manufacturing		3,655	96	6				3,757
18. All Other Manufacturing		478	120					598
19. Motor Freight Transportation & Warehousing		241	1	488	6			736
20. All Other Transportation		7	66	488			118	679
21. Communication	2,606	7,931	2,723	805	2	117		14,183
22. Electric & Gas Utilities	575	14,667	24,036	2,464	5	161		41,909
23. Water & Other Utilities	10	648	29	248		10		944
24. Wholesale Trade		19,904	59,233	8,290				87,427
25. Retail Trade	1,533	42,532	68,814	541	68	207	1,993	115,688
26. Finance, Insurance & Real Estate		1,652	1,815	201	380	68		4,115
27. Hotel Restaurant & Other Personal Services		681	881	51	4	39	1,366	3,022
28. Data Processing & Computer Services		24,749	33,954	1,122	75		17	59,918
29. Management & Consulting Services		20,502	14,471	671		79	1,151	36,874
30. Engineering, Architecture & Surveying Svcs.		18,348	48,733	2,602	437	546	3,735	74,401
31. Other Business Services	21,017	69,599	21,573	8,837	91	1,466	2,169	124,751
32. Automobile & Other Repair Services		5,563	3,662	2	3	2		9,233
33. Amusement, Recreation & Video Services		764	312	8				1,085
34. Health, Education & Social Services		11,295	6,594	1,193	3	8	37	19,130
35. Government Services	4	5,047	8,560		4		358	13,973
36. Local Government	5,460	18,369	723	1,978	1	505	296	27,331
37. State Government	7,540	26,026	1,367	2,731	1	1,327	263	39,255
38. United States Department of Energy (a)								
39. Households	96,362	523,059	628,205	40,358	2,985	22,899	9,648	1,323,517
Total New Mexico Expenditures	137,773	852,476	962,250	75,061	4,063	28,893	21,181	2,081,697
Total Operating and Capital Budget	137,773	1,404,890	1,327,449	86,768	4,377	35,081	21,199	3,017,536

\*Totals may not add due to rounding

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

b. Includes Lockheed Martin (SNL)

c. Includes University of California (LANL), PT-LA and Johnson Controls

d. Includes Westinghouse

e. Includes Jacobs Engineering Group and M-K Ferguson Co

f. Includes Mason & Hanger Silas Mason Co., Inc., Pantex, MACTEC-ERS, and WASTREN and other contractors

g. Includes Idaho, Nevada, Oak Ridge and other Operations Offices

**Table 5. DOE New Mexico's Funding, Instate Expenditures, and Employment by Major Entity in New Mexico, FY 1997 and FY 1998.**

	FY 1997 (revised)			FY 1998		
	New Mexico Funding	Instate Expenditures	New Mexico Employment	New Mexico Funding	Instate Expenditures	New Mexico Employment
	--- millions of dollars ---		jobs	--- millions of dollars ---		jobs
Lockheed Martin (SNL)(a)	1,375.0	854.9	7,196	1404.9	852.5	7,237
Univ. of Calif. (LANL)	1,143.0	865.1	8,461	1206.5	867.5	8,931
DOE Albuquerque Ops. Office	138.2	138.2	1,016	137.8	137.8	960
Johnson Controls (LANL)	76.9	70.5	1,435	90.4	72.7	1,381
Westinghouse (WIPP)	89.7	75.8	635	86.8	75.1	627
PT-LA (LANL)	29.4	26.1	392	30.6	22.0	453
AlliedSignal	30.8	22.5	287	23.1	20.5	329
Ross Aviation	11.4	6.2	78	9.4	5.8	74
Other US DOE Offices	13.9	13.9	16	9.2	9.2	23
DOE Nevada Ops. Office	8.7	8.7	72	6.2	6.2	98
DOE Oak Ridge Ops. Office	3.2	3.2	9	3.1	3.1	13
DOE Idaho Ops. Office	3.0	3.0	1	2.6	2.6	1
Other Contractors	5.7	5.7	9	2.6	2.6	39
M-K Ferguson	3.7	3.7	49	2.5	2.5	34
Jacobs Engineering	4.8	3.3	49	1.8	1.5	14
<b>TOTAL</b>	<b>2,938.2</b>	<b>2,100.8</b>	<b>19,705</b>	<b>3,017.5</b>	<b>2,081.6</b>	<b>20,214</b>

<sup>a</sup>Lockheed Martin instate expenditures and employment were revised to more accurately reflect New Mexico expenditures and jobs.

The number of jobs increased from 19,705 in FY 1997 to 20,214 in FY 1998, for a net increase of 509 jobs (Table 5). The greatest increase occurred in the operation of LANL with an increase of 470 jobs. SNL had an increase of 41 jobs, AlliedSignal Aerospace with an increase of 42 jobs, other contractors with an increase of 30 jobs, DOE Nevada with an increase of 26 jobs, Oak Ridge with an increase of 4 jobs, and other DOE Operations Offices with an increase of 7 jobs. All other organizations had decreased employment between FY 1997 and FY 1998. DOE/AL had the largest decrease with 56 fewer employees.

The largest number of jobs as a result of DOE/AL funding for FY 1998 was at LANL which had 8,931 employees, followed by SNL with 7,237, Johnson Controls Inc. with 1,381, and DOE/AL with 960 (Table 5). These four entities comprised about 92 percent of the total

jobs funded by DOE/AL in FY 1998 in New Mexico.

### MEASURING DOE/NEW MEXICO'S ECONOMIC IMPACT

The analysis of DOE/New Mexico'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 AL, all DOE/AL contractors, and other DOE offices expending money in the state. As previously stated, the term DOE/New Mexico is used to describe all of these entities.

One useful product of the I/O modeling technique is multipliers. Three multipliers—the first related to general economic activity, the second to income, and the third to employment—

**Table 6. DOE New Mexico's Expenditures in New Mexico by Major Sector, FY 1997 and FY 1998.**

Sector	FY-1997		FY-1998	
	thousands of dollars	(Percent)	thousands of dollars	(Percent)
I. Personnel				
A. Salaries & Wages	1,047,679	49.9	1,066,835	51.2
B. Benefits	243,730	11.6	256,682	12.3
Total	1,291,409	61.5	1,323,517	63.6
II. Construction	47,657	2.3	41,408	2.0
III. Manufacturing	41,607	2.0	41,298	2.0
IV. Trade	213,479	10.2	203,115	9.8
V. Services	365,524	17.4	328,414	15.8
VI. Government				
A. Local Government	26,644	1.3	27,331	1.3
B. State Government	42,414	2.0	39,255	1.9
C. Government Services	12,545	0.6	13,973	0.7
Total	81,603	3.9	80,560	3.9
VII. Other Sectors				
A. Agriculture	298	0.0	131	0.0
B. Mining	2,012	0.1	689	0.0
C. T.C.U.(a)	52,992	2.5	58,451	2.8
D. F.I.R.E.(b)	4,940	0.2	4,115	0.2
Total	60,242	2.9	63,386	3.0
<b>TOTAL EXPENDITURES</b>	<b>2,101,521</b>	<b>100.0</b>	<b>2,081,697</b>	<b>100.0</b>

\*Totals may not add due to rounding.

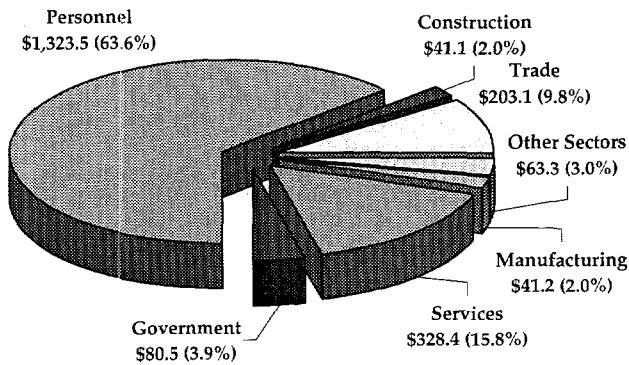
a. Transportation, communication, and utilities.

b. Finance, Insurance, Real Estate.

provide the information needed to estimate DOE's statewide impact. The activity multiplier identifies the extent to which an activity such as DOE relies directly and indirectly on the state economy to provide it with the materials, services, and labor required 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 effects (household).

## ECONOMIC IMPACT OF DOE

The flow diagram (Figure 8) charts the movement of DOE expenditures. DOE expenditures for salaries and purchases go to households, statewide businesses, and other regions outside the state of New Mexico. This injection of money affects economic activity directly—that is, the effect precisely equals the amount allocated to DOE/New Mexico. Caution should be exercised when comparing economic impacts between FY 1997 and FY 1998 with prior years published in reports by Lansford et al. (1998, 1997, 1996, 1995 and 1994), Adcock et al. (1994 and 1992), Adcock and Lansford (1991), Adcock and Lansford (1990), and Adcock et al. (1989). The state and local tax coefficients and expenditure patterns



**Figure 7. DOE Expenditures (in millions of dollars) in New Mexico, by Major Sector, FY 1998.**

were updated to FY 1992 levels, and the I/O model was also revised to better reflect the impact of local and state taxes. The I/O model was rebased for the FY 1998. FY 1997 analysis was revised using the new model. The fringe benefits coefficients in the I/O model were updated. In addition, some corrections in expenditures were made for FY 1997 in SNL.

Also, caution should be exercised when comparing economic impacts among FY 1991 to FY 1995 with fiscal years prior to FY 1991 because new technical information was released by the BEA Department of Commerce. I/O models were used to estimate the impacts. New technical information released by the BEA, U.S. Department of Commerce in 1998, again was incorporated in the FY 1997 and FY 1998 I/O models presented in this report.

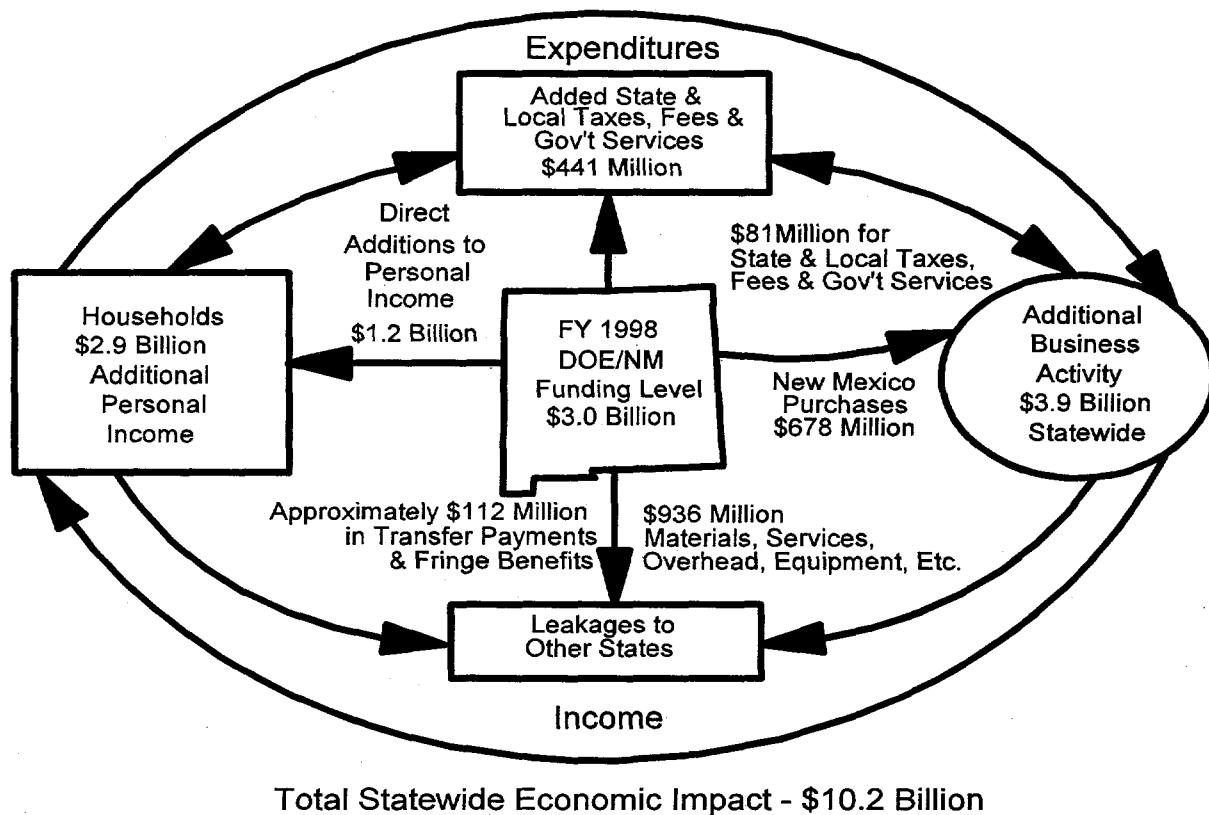
Households and businesses affected by DOE/New Mexico respond much of the money they receive in the state, creating an indirect (business) and induced (household) effect. In turn, businesses buy from other local firms and

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. The indirect effects become smaller and smaller as continued responding and leakage to other areas outside the state occur.

Initial spending by DOE/New Mexico generated substantial first-round impacts on households (net) and business: over \$1.2 billion and \$679 million, respectively for FY 1998 (Figure 8). Payments to state and local governments for taxes, services, and fees amounted to \$81 million in additional revenues. A large portion (\$936 million) of the initial spending flowed out of state. Responding by instate businesses and purchases by households and state and local government eventually brought the total private business impacts to \$3.9 billion. This does not include New Mexico private businesses that are M&O contractors, or their major on-site contractors that receive funding directly from DOE as identified elsewhere in this report. Also, responding activity will continue to add to personal income and government revenues; thus, total personal income increased to slightly less than \$2.9 billion and state and local government tax revenues and government services and fees expanded to \$441 million as a result of direct, indirect, and induced effects.

### Overall Impact

No official figure exists for total economic activity in the state. For FY 1998, an estimate of the total state economic activity is \$96.5 billion. Table 7 gives, in billions of dollars, the direct, indirect and induced, and total economic activity impact of DOE/AL on the state of New Mexico. The total impact of \$10.2 billion in economic activity generated by DOE/AL accounted for about 11 percent or more than \$1 of every \$10 of economic activity statewide of the estimated \$96.5 billion total economic activity in the state (Table 7). Thus, DOE/AL is an important economic factor in the state of New Mexico. DOE/New Mexico directly added over \$3.0 billion to the total economy in FY 1998 and over \$2.9 billion in FY 1997. The economic activity multiplier



**Figure 8. DOE Economic Impact on New Mexico, FY 1998.**

measures 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 DOE/New Mexico for FY 1998 was 3.39. This indicates that for every \$1 spent by DOE/AL and contractors, another \$2.39 was generated in the state for a total impact of \$3.39 in FY 1998. The economic activity multiplier for FY 1997 was 3.36 for a total economic impact of \$9.9 billion on the state of New Mexico. This also represented about 11 percent of the total state economic activity.

Appendix Table 16 gives the indirect economic impacts on private and public sectors for FY 1998. The retail trade sector received the greatest volume of indirect economic impacts, about 17 percent of the total indirect impacts. Other sectors with large indirect impacts were FIRE (14 percent), other business services (7 percent), health, education and social services (5 percent), wholesale trade (5 percent), electric and gas utilities (5 percent), hotel restaurant (5 percent), construction (4 percent) and

automobile and other repair services (4 percent).

#### Impact on Income

Personal income is the money that goes to individuals—money that will be spent for expenses such as groceries, cars and gasoline, mortgage payments, children's braces, clothing and 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.

Income multipliers measure the indirect and induced effects of new income generated from payment to labor by DOE/New Mexico. The income multiplier was 2.39 for FY 1998 (Table 7) and 2.36 for FY 1997. In FY 1998, for every \$1 of personal income from DOE/New Mexico for labor, another \$1.39 was generated in the state.

Application of the income multiplier of 2.39 to the direct net personal income figure of nearly \$1.2 billion (92 percent of wages, salaries and benefits) yields a total impact of slightly less

**Table 7. DOE New Mexico's Influence on New Mexico's Economy, FY 1997 and FY 1998.**

Economic Measure	FY 1998			
	Revised FY 1997 DOE New Mexico(a)	DOE/ New Mexico	Total State	DOE as % of State
----billions of dollars----				
<b>Economic Activity</b>				
Direct Expenditures	2.94	3.01		
Indirect and Induced	6.92	7.22		
Total Economic Activity	9.86	10.24	96.5	10.6
Economic Activity Multiplier	3.36	3.39		
<b>Personal Income</b>				
Gross Labor Costs	1.25	1.32		
Net Wage and Salaries	1.18	1.21		
Indirect and Induced	1.61	1.68		
Total Personal Income	2.79	2.89	34.6(b)	8.4
Personal Income Multiplier	2.36	2.39		
<b>Employment</b>				
Direct	19,705	20,214		
Indirect and Induced	49,964	52,239		
Total Employment	69,669	72,453	831,052(c)	8.7
Employment Multiplier	3.54	3.58		

a. FY 1997 results based on FY 1998 econometric model and revised expenditures and employment.

b. BEA May 1999

c. New Mexico Department of Labor, Table C, March, 1999.

than \$2.9 billion income created in the state by DOE/New Mexico activity. This compared to a total impact of slightly less than \$2.8 billion in FY 1997. In 1998, the BEA estimated the total personal income in the state of New Mexico was \$34.6 billion (Table 7). DOE/New Mexico activities in the state accounted for about 8 percent of the estimated \$34.6 billion total personal income generated in the state.

### Impact on Employment

Beside the dollars-and-cents impact, DOE/AL affects statewide employment. In addition to the average of 20,214 full-time jobs created by DOE/New Mexico in FY 1998, other jobs are supported by needs for goods and services, and by responses from individuals and businesses. Firms filling those needs have their own employees who in turn spend money with other

firms who must consequently hire people. In addition, each individual employee needs goods and services, and helps support other jobs—for waitresses, mechanics, clerks, lawyers, nurses, and so on.

The employment multipliers measure the number of indirect and induced jobs supported, on the average, by DOE/New Mexico. Employment multipliers were estimated to be 3.58 for FY 1998 and 3.54 for FY 1997: For every 100 jobs created by DOE/AL in New Mexico, another 258 jobs were supported in the state in FY 1998 and 254 jobs in FY 1997. This translates to a total impact of about 69,700 jobs in FY 1997 and 72,500 jobs in FY 1998. The 72,500 jobs created or supported by DOE/New Mexico accounted for about 9 percent of total employment in the state for FY 1998 (Table 7) and for FY 1997.

Table 16 in the Appendix shows the DOE/New Mexico indirect employment impact on private and public sectors for FY 1998. The more labor-intensive sectors received a greater indirect employment impact. Retail trade has the largest indirect impact, about 29 percent. Other sectors with large indirect employment impacts include lodging and personal services (11 percent), finance, insurance and real estate (FIRE) (9 percent), local and state government (9 percent), health and social services (7 percent), wholesale trade (5 percent), and other business service (6 percent). About one of every 9 jobs in the state was directly or indirectly supported by DOE/ New Mexico for FY 1998.

### TECHNOLOGY TRANSFER

SNL/New Mexico and LANL have had a significant effect on the state of New Mexico through technology transfer. Organized and built as a result of atomic research begun in New Mexico in 1943, these laboratories have under-gone many changes, especially in the types of scientific research and engineering programs carried out at the facilities. The primary mission of both laboratories remains the same—ensuring the nation has a reliable nuclear deterrent. However, over the years, other programs of a complementary nature or of particular national interest have been added—research on alternate energy sources, arms control and verification technologies, radiation-hardened components and semiconductors, advanced materials research, laser applications, and defense-related non-nuclear research, to name just a few.

Almost from their inception, the laboratories have engaged in some type of technology transfer. Both have used traditional methods of disseminating results of unclassified research, such as meetings with industrial groups, publishing technical papers, presentations to professional organizations, articles in trade and professional journals, and daily responses to inquiries by individuals and industries. But with the recent emergence of a new threat to our national security—the declining competitiveness of key U.S. industries in world markets--transferring technology from the

national laboratories to the private sector has taken on important new dimensions. Growing public awareness of the dangers of this decline has prompted efforts to improve the nation's competitiveness by tapping the national laboratories to support U.S. industry. These efforts were strengthened by passage of the National Competitiveness Technology Transfer Act of 1989, which clearly identifies technology transfer as a mission of DOE's defense program laboratories. The Act grants the laboratories authority for pursuing cooperative relationships with industry, universities, and state and local governments more aggressively for the purpose of developing and transferring laboratory-developed technologies to the private sector. All DOE laboratories are developing new, more aggressive technology transfer programs to meet this new responsibility.

Technology transfer is a major effort directed nationwide, but the location of AL, LANL, and SNL in New Mexico, provides a proximity advantage to the state. Both laboratories and AL are active with the state government's efforts to achieve "high-tech" economic development. The manager of AL, the director of LANL, and the president of SNL are members of the Governor's Science and Technology Advisory Council that advises the Governor on high-tech development policy issues. Loaned executives from SNL and LANL serve as special assistants to the secretary of New Mexico's Economic Development Department. Without doubt, the technology transfer programs of the national laboratories provide economic and social benefits to the state of New Mexico, as well as to the nation.

### Los Alamos National Laboratory

At LANL, the Civilian and Industrial Technology Program Office (CITPO) is responsible for energy technology programs. CITPO serves as the single point of contact for linking the Laboratory's scientific, technical, and business resources with private companies, universities, and federal and non-federal government agencies. CITPO is also home to the Laboratory's Technology Commercialization Office (TCO) which was formed specifically to strengthen Northern New Mexico businesses, improve the regional

infrastructure, and stimulate overall regional economic growth. CITPO offers industrial and other partners access to LANL's capabilities through a variety of agreements: Cooperative Research and Development Agreements (CRADA), Licensing, Technical Assistance, User Facility, Funds-in, and Staff Member Exchange.

### **Partnership Agreements**

#### *Cooperative Research and Development Agreements (CRADAs)*

A CRADA is an industry-driven collaboration that involves the sharing of research and development costs, personnel, and equipment. Since 1991, LANL has executed more than 270 CRADAs. During FY 1998, the Laboratory participated in ten CRADAs with New Mexico companies alone.

#### *Licensing Agreements*

Through licensing agreements, partners are allowed to use and market Laboratory technologies—e.g., products, processes, and software codes—that are ready for use without further Laboratory development. The Laboratory currently has 33 active licensing agreements with New Mexico companies or agencies. Six of those agreements were initiated during FY 1998.

#### *Technical Assistance Agreements*

Technical assistance agreements allow small business partners to benefit from the technical expertise of LANL staff members. During FY 1998, 16 New Mexico companies benefited from technical assistance agreements with the Laboratory.

#### *User Facility Agreements*

LANL has over 60 staffed user facilities that allow industry, universities, and other government agencies to benefit from the Laboratory's unique experimental resources. Among them are the Polymers and Coatings Facility, the Nondestructive Testing and Evaluation Facility, the Virtual Laboratory Testbed, the Plastics Engineering Facility, the Fuel Cell Facility, and the Neutron Scattering Center. These experimental facilities allow non-laboratory researchers to fabricate, calibrate, test, and evaluate their own products

and processes. The Laboratory has executed more than 70 user facility agreements, and during FY 1998, three New Mexico companies benefited from LANL user facilities.

### *Funds-In Agreements*

Through funds-in agreements, nonfederal partners can contract with the Laboratory to have specific R&D performed. The partner reimburses the Laboratory for its efforts, and the work must rely on a capability unique to LANL to avoid direct competition with the private sector. During FY 1998, LANL entered into 65 funds-in agreements and 6 of those were with New Mexico businesses or organizations.

### **TeleMed**

The Northern New Mexico Rural Telemedicine Project, which involves more than one of the agreements above, is one example of a continuing Laboratory partnership that is improving local communities. TeleMed is an Internet-based medical information management system; that allows participating rural clinics to electronically share immunization, medication, and other patient records. Under this project, sixteen rural clinics and two hospitals have gained or are gaining the ability to share medical information securely over the Internet.

Many key players have contributed to the success of the Telemed partnership. The Northern New Mexico Community College (NNMCC) and LANL share the leadership of the project: NNMCC for overall project management and LANL for software development and technical management. Clinical partners include Las Clinicas del Norte (three clinics), Health Care Centers of Northern New Mexico (thirteen clinics), Española Medical Center, and Los Alamos Medical Center. Corporate partners include Citizen 1, Dallas Semiconductor, FileNet, Global Science and Technology, HubLink, Information Assets Management, and Intel. A number of agencies and individuals have also played key roles in supporting the project, including U.S. Senators Jeff Bingaman and Pete Domenici, the New Mexico Department of Health, the Los Alamos and Rio Arriba County Governments, the UNM School of Medicine, Presbyterian Healthcare System, and the U.S. Departments of Commerce, Energy, and the Army. The

combined support of these contributors has brought \$1 million to the Telemed project.

### **Regional Business Initiatives: The Technology Commercialization Office**

The Technology Commercialization Office (TCO), which is part of the Civilian and Industrial Technology Program Office, focuses on nurturing new business start-ups (usually based on transferred Laboratory technologies), attracting entrepreneurs, creating job opportunities, and attracting business and capital to the Northern New Mexico region. TCO's ultimate goal is to use the Laboratory's technical and business expertise to improve the region's economic base and bring about a higher quality of life for people living in Northern New Mexico. Assistance for existing or emerging regional small businesses is available through TCO's network of regional and national consultants who provide advice in business planning, market analysis, financing, contract and business law, and other key business skills. Several times a year, TCO brings many of these experts together for local entrepreneurial workshops to encourage the commercialization of Laboratory technologies.

#### *Entrepreneurial Training and Development*

TCO offers a series of entrepreneurial training workshops as part of an initiative to encourage entrepreneurship and high-tech business growth in the northern New Mexico region. Held approximately three times each calendar year, workshop subject matter varies and has included financing, marketing, growth strategies, and business plans for high-tech ventures. Each workshop draws approximately 150 participants from Los Alamos and its surrounding communities. TCO's client base consists of Laboratory-affiliated entrepreneurs and businesses as well as non-related high-tech companies in the region. These workshops are rotated around the northern New Mexico region to make them more accessible to the entire target audience.

In FY 1998, TCO sponsored two workshops. The first workshop was held in Los Alamos and focused on business plan fundamentals. Over 130 participants attended. The second workshop, which was held in Taos and attracted 150 participants, focused on forming, financing,

and growing high-tech ventures. The importance of these workshops is twofold. Each is designed to provide participants with a strong base of information relevant to the high-tech business start-up process. In addition, the workshops provide a networking forum for entrepreneurs, technologists, investors, service providers, and community leaders.

TCO also sponsors a monthly luncheon called "Innovator's Forum." This gathering highlights a featured speaker each month and provides an additional networking opportunity for individuals interested in improving New Mexico's economic development through the creation of new high-tech businesses.

#### *Regional Infrastructure Initiatives*

TCO has been actively involved in the development of the Northern New Mexico infrastructure by helping to define infrastructure requirements, and by becoming directly involved with creating or enhancing existing infrastructure components that will eventually lead to new jobs and a larger and more diverse economy. The Laboratory is accomplishing this objective by using its technical base to help regional communities identify infrastructure issues; by supporting spin-out businesses based on Laboratory technologies; and by leveraging our major subcontracts for the creation of new jobs through self-sustaining business development. TCO is not only promoting the creation of new businesses in the region, but also working aggressively to ensure that established regional companies stay in Northern New Mexico. To that end, TCO is supporting incubator programs, providing no-fee business consulting, and identifying potential sources of investment capital to serve regional companies at all levels of capital requirements.

#### *The New Los Alamos Research Park*

Specific examples of regional initiatives being supported by the Laboratory include the creation of the newly founded Los Alamos Research Park. The park will be located adjacent to the main technical areas of the Laboratory. It is designed to create or attract technology-based businesses which engage in primary research and development activities, either independently or in collaboration with the Laboratory. The Los Alamos Research Park

will create new jobs at many different levels. The park covers approximately 45 acres, will include about 300,000 square feet of office and light laboratory space, and will hold nearly 1,800 employees. The first building is projected to be ready for occupancy by December 1999.

#### *Improving the Telecommunication Infrastructure*

The Laboratory, through the Technology Commercialization Office, has also been heavily involved in the upgrade of the region's telecommunication infrastructure to support new and existing business development. The strategy for the Laboratory is to partner with the local exchange carriers--GTE Telephone, and US West Communications--as well as with the state of New Mexico Radio Communications Bureau and the New Mexico National Guard, to look for ways to leverage resources so that faster and more efficient telecommunication capabilities are brought into the area. The objective is to spread electronic commerce capabilities, like the Internet, that will allow for business development and expansion across Northern New Mexico. To date, new capabilities have been deployed for Internet connectivity in regional school districts, businesses, medical facilities, and government agencies. Also, plans are in place for the deployment of a regional optical-fiber backbone that will further expand telecommunication capabilities in the region.

#### *Regional Water Management*

Managing water, both fresh and waste water, has become a key challenge for New Mexico. The Laboratory has responded by providing technical support to the Governor's Blue Ribbon Task Force to develop a new water law and policy for the state. The Laboratory is also providing technical assistance to surrounding local communities that need new ways to balance a growing population with limited water resources and the contamination in rural communities from high nitrate ground levels. TCO directly participates in the regional water planning process being funded and sponsored by the Interstate Stream Commission, and is involved in the Sustainable Communities Project that focuses on educating the public and

fostering environmental sustainability skills in the day-to-day living habits of Northern New Mexicans.

#### **Business Development: Small Business and Entrepreneurial Initiatives**

The Small Business Initiative (SBI) has been funded by DOE Defense Programs Headquarters since FY1993 to provide small businesses access to the technical expertise of DOE National Laboratories. Since FY1996, LANL's SBI has focused the majority of its funds on business development in North-Central New Mexico. The Laboratory works in a variety of ways with the small business sector. The SBI North-Central New Mexico Economic Impact Program supports an average of 10 development projects with regional small businesses yearly. The program has recently benefited two regional companies—Chama Valley Productions and HYTEC.

#### *Chama Valley Productions*

Chama Valley Productions produces rockfall mitigation systems—fences along highways designed to catch falling rocks. Santa Fe and Chama businesspeople have collaborated to establish a better system than what was available from the major international competitor, a Swiss-based company. High-speed photography available at LANL allowed Chama Valley Productions to analyze the properties of tumbling rocks and thus measure the strength and capabilities of various rockwall fence designs. The knowledge gained from these tests has provided Chama Valley with a competitive edge as they now compete for contracts all over the world. The company has three full-time employees and hires additional staff when contracts are received.

#### *HYTEC*

HYTEC of Los Alamos is a full-service engineering design and consulting firm begun in 1994. The firm provides complete design-cycle services to customers such as the National Science Foundation, Caltech, MIT, National Institute of Standards, and NASA. Additionally, HYTEC builds state-of-the-art experimental facilities and is developing unique non-destructive evaluation technologies and instruments. HYTEC has been a Laboratory

partner on two valuable research and development projects which have been of particular benefit to the DOE Nuclear Weapons Mission. One project involved the development of TV holography which provides rapid, precise, full field-of-view, non-contact shape change measurement for the characterization of nuclear weapons parts. Two other DOE facilities, Pantex and the Kansas City Plant, are taking advantage of this enhanced system under development at HYTEC, and the company has attracted new business because of this unique capability. A second partnership with LANL helped HYTEC develop the complex software needed to make computed tomography systems more user friendly. This technology will enhance LANL's ability to pursue its stockpile surveillance mission by having an easy-to-use, multiple energy x-ray or neutron tomographic system.

#### *Limited Term Use of Laboratory Property*

LANL is also helping New Mexico small businesses through its "TULIP" program, which allows companies to borrow, free of charge, specialized Laboratory equipment for research and development purposes. Computer hardware and software, and equipment needed by the Laboratory to fulfill its mission are not available under this program.

#### **Sandia National Laboratories**

SNL has had a significant effect on the state of New Mexico through technology partnerships. Organized and built as a result of atomic research that began in New Mexico in 1942, SNL has under-gone many changes, especially in the types of scientific research and engineering programs carried out at the facilities.

SNL's primary mission remains ensuring that the nation has a reliable nuclear deterrent, but over the years other programs of a complementary nature or of particular national interest have been added -- research of alternate energy sources, arms control and verification technologies, radiation-hardened components and semiconductors, advanced materials research, laser applications, and defense-related non-nuclear research, to name just a few.

SNL has a long history of successful partnerships with the private sector and academia, whether through relatively simple technical assistance arrangements with small businesses or collaborative technology development with one or more large companies or a consortium.

SNL's history of transferring technologies developed in weapons and energy programs to the civilian industrial sector predates the legislative mandate for technology transfer by more than three decades. Long before SNL and other similar laboratories were charged by the National Competitiveness Technology Transfer Act of 1989 to "enhance United States competitiveness in both domestic and international markets" by partnering with private-sector companies. SNL had learned that teamwork with industry is a smart business practice. SNL has participated in many hundreds of projects that have produced impressive benefits to the industry partners and to SNL, enhancing its ability to meet its DOE mission obligations.

In all of its partnering activities, SNL is committed to protecting national security interests, providing fairness of opportunity, creating lasting value to the taxpayer, and adhering to the highest ethical standards to avoid even the appearance of conflicts of interest.

Many New Mexico companies will find SNL's Small Business Program (described below) of special interest.

#### **Sandia's Small Business Program**

To make its resources more easily available to small businesses, Sandia has established a Small Business Program. The Small Business Program represents two specific emphases of technology partnering. First, it addresses the responsibilities of the national labs to the regions in which they reside—as these are called out in the National Competitiveness Technology Transfer Act of 1989 and in SNL's operating contract with DOE. Second, the Small Business Program supports the defense programs mission at SNL by involving small business in defense programs related projects. SNL seeks to apply its technological resources through the Small

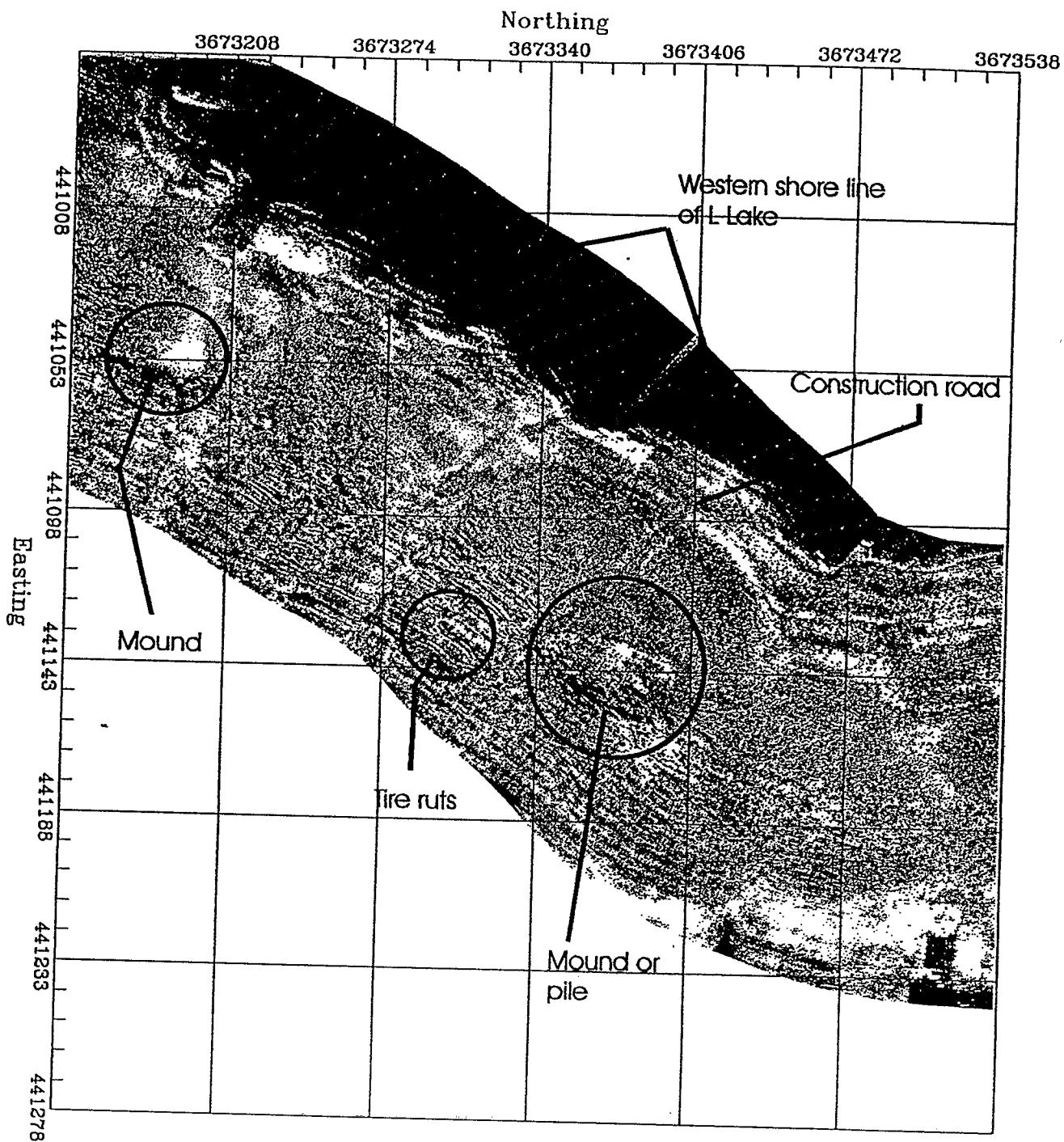


Figure 22. Sonar images of two mounds near the start of survey line SL06.  
Interpreted tire ruts are also visible.

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#### **4.2 Pickup and Delivery Container**

In earlier times, convenient pickup and delivery to people's homes was an integral part of many business services (i.e., the laundry man, the ice man, the milk man, the grocery man, etc.). However, "times have changed"; and crime, demographics, and economics have all combined to make home delivery less and less viable. Even those firms which specialize in delivery are too many times limited to: a) leaving a package exposed on the doorstep; b) taking it to the neighbor who also may not be home; or c) taking it back to the depot.

In addition to the wash process, Garment Care is pursuing a new system to enhance pickup and delivery to consumers. Called the "*Smart Box*," this container will either be integrated into a home or mounted adjacent to it. The "*Smart Box*" will be tied to all forms of electronic communication, enabling convenient and efficient distribution of laundry, groceries, and other goods. Initial requirements have been determined; and expertise in the fields of communication, climate control, and security is being sought to help develop and advance this system.

Community Colleges, and Technology Ventures Corporation.

A nonprofit organization established in 1993 by Martin Marietta (now Lockheed Martin) Technology Ventures, is an important contributor in the formation of new businesses built on leading-edge technologies developed at Department of Energy Laboratories, and in the expansion of existing businesses. It also assists in obtaining funding for many of its client companies. Among Technology Ventures' clients are a number of companies that were founded on technologies developed at SNL: Quantum Manufacturing, Inc.; Boissiere Engineering & Applied Robotics, Inc.; ATTIIN, Inc.; JEC Technologies, Inc.; Micro-Optical Devices, Inc.; MuSE Technologies, Inc.; and Silicon MicroDevices, Inc.

## GLOSSARY OF TERMS

<b>ACL</b>	Advanced Computing Laboratory	<b>STC</b>	Superconducting Technology Center
<b>AEC</b>	Atomic Energy Commission	<b>TCO</b>	Technology Commercialization Office
<b>AL</b>	Albuquerque Operations Office	<b>TELEMED</b>	Northen New Mexico Rural Telemedicine Project
<b>BEA</b>	Bureau of Economic Analysis, U.S. Department of Commerce	<b>TRANSAX</b>	Transportation Accident Exercise
<b>CAO</b>	Carlsbad Area Office	<b>TRU</b>	Transuranic
<b>CITPO</b>	Civilian Industrial Technology Program Office	<b>TSTC</b>	Transportation Safeguards Training Center
<b>CRADA</b>	Cooperative Research and Development Agreement	<b>TTR</b>	Tonopah Test Range
<b>DOE</b>	Department of Energy	<b>UMTRA</b>	Uranium Mill Tailings Remedial Actions
<b>DOE/AL</b>	Department of Energy, Albuquerque Operations Office	<b>UNM</b>	University of New Mexico
<b>ELQ</b>	Employment Location Quotient	<b>WERC</b>	Waste-Management Education Research Consortium
<b>EPA</b>	Environmental Protection Agency	<b>WIPP</b>	Waste Isolation Pilot Plant
<b>EQRC</b>	Electronics Quality/Reliability Center	<b>WSI</b>	Wackenhut Services Inc.
<b>ES</b>	Employment Security	<b>WTAC</b>	Waste Isolation Pilot Project
<b>FAA</b>	Federal Aviation Administration	<b>XLQ</b>	Technical Assistance Contractor
<b>FIRE</b>	Finance, Insurance, and Real Estate		Output Location Quotient
<b>FW</b>	Factor Weights		
<b>FY</b>	Fiscal Year		
<b>GOCO</b>	Government-Owned and Contractor Operated		
<b>ITRI</b>	Inhalation Toxicology Research Institute		
<b>KAFB</b>	Kirtland Air Force Base		
<b>LANL</b>	Los Alamos National Laboratory		
<b>M&amp;H-SM Co., Inc.</b>	Mason and Hanger-Silas Mason Co., Inc.		
<b>MSHA</b>	Mine Safety Health Administration		
<b>M&amp;O</b>	Management and Operating		
<b>NCMS</b>	National Center for Manufacturing Sciences		
<b>NIST</b>	National Institute of Standards and Technology		
<b>NMSU</b>	New Mexico State University		
<b>PT-LA</b>	Protection Technology - Los Alamos		
<b>R&amp;D</b>	Research and Development		
<b>SCIAD</b>	Sandia's Science Advisor		
<b>SIC</b>	Standard Industrial Classification		
<b>SNL</b>	Sandia National Laboratories		

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## APPENDIX

### REGIONAL INPUT-OUTPUT MODELING TECHNIQUE

#### Input-Output Model Flow Diagram

Figure 9 is a visual representation of the steps involved in the regional input-output modeling process. Industry input-output tables for the U.S. for 1997, the most recent year available, were obtained from the Interindustry Economics Division of the BEA within the U.S. Department of Commerce. This national data provided the initial input in the form of the latest national direct requirements matrix of 490 private and public input-output sectors.

A regional model sector plan of 37 local regional sectors, not including DOE and households sectors, was developed from the 490 national sectors. Sector delineation was based on the following aspects of the state's economy:

- (1) major industries or commodity groups,
- (2) unique industries that appear to influence the level of economic activity significantly, and
- (3) sector interactions thought to be important for later policy evaluation.

As a result of obtaining the BEA 1992 base year I/O model, the DOE/NMSU I/O model was

updated from a 1987 base year to a 1992 base year for the FY 1997 and FY 1998 analysis. The revised I/O model used the same number of economic sectors (37) as the 1982 and 1987 based I/O models. The economic sectors were restructured to better reflect economic activity in the state of New Mexico; therefore, the results of the 1992 based I/O model are not comparable with the results from the 1977, 1982, and 1987 based I/O models. Compared to the previous DOE/NMSU I/O model agriculture, mining, and construction sectors were not changed. The 11 manufacturing sectors were redefined to 12 sectors by breaking computers, office and service equipment out of rubber, plastics, and miscellaneous manufacturing (sector 18). The new manufacturing sectors are ordnance and chemical; food and kindred products; textiles and apparel; lumber and wood products; paper and publishing; petroleum, refining and products; glass, stone, and clay products; primary fabrication and metal; computer, office, and service equipment; electrical equipment; scientific instruments; and all other (sectors 7-18). Transportation, Communications and Utilities (TCU) was left unchanged with five sectors. Trade was left unchanged with 2 sectors: wholesale and retail. FIRE sectors were combined into one sector (sector 26). The service sectors

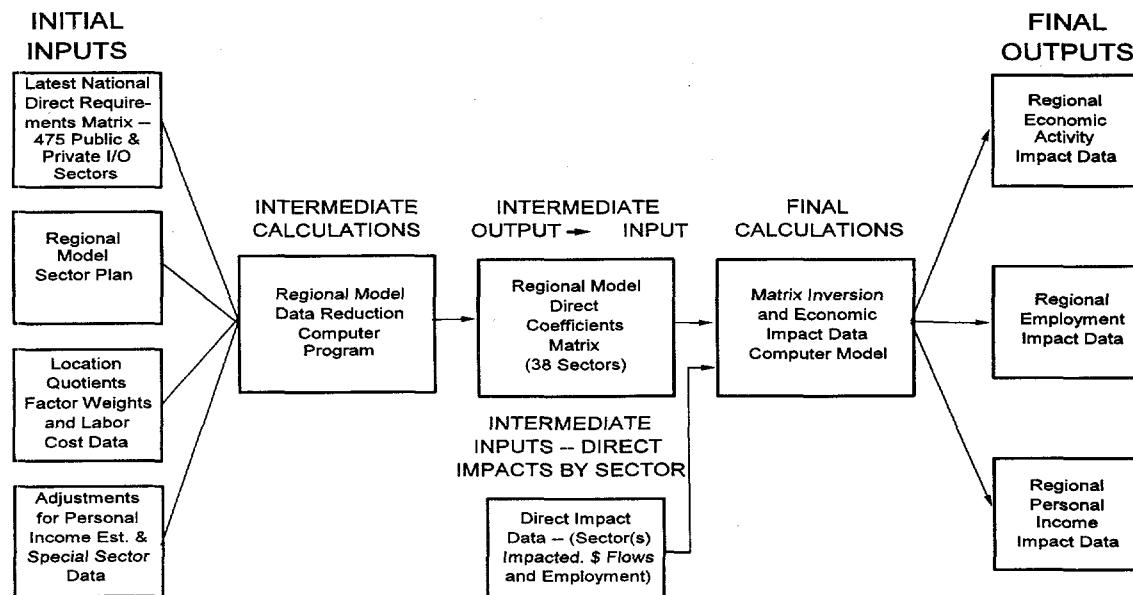


Figure 9. Input-Output Model Flow Diagram.

were also left unchanged with eight separate sectors (sectors 27-34): lodging and personal services; data and computer processing; management consulting; engineering; other business; automobile and other repair; amusements, recreation and videos; health, education, and social; and government services (sector 35).

Collapsing the 490 national sectors into 37 regional sectors required the calculation of location quotients and factor weights for the 490 national sectors from employment and output data. Application of location quotients on a row-by-row basis and factor weights on a column-by-column basis to the national direct coefficients matrix and summing within sectors, results in the aggregation of the 490-by-490 national to a 37-by-37 regional/state matrix. Location quotients adjust the level of purchasing of inputs from the national level to a regional level.

Calculating special sector data, including both the DOE/New Mexico (sector 38) and households (sector 39) resulted in 39 sectors, as shown in subsequent tables throughout the report. The DOE/New Mexico expenditure pattern, or in-state production function, was developed by contacting appropriate individuals in organizations designated as contractors or operations offices (DOE/New Mexico) for total operating and capital budget information and the pertinent breakdown of expenditures into the 39 sectors. Direct coefficients for column 38 (DOE/New Mexico) were simply dollar amounts in various sectors divided by the total operating and capital budget. In Row 38 output coefficients do not exist because DOE/New Mexico does not produce output for in-state consumption directly. In order to calculate Type II multipliers, the household sector must be included in the processing sector. Column coefficients for personal consumption expenditures and row coefficients for labor costs were calculated from the national use table.

The intermediate and final modeling processes involves the model calculating a regional direct coefficients matrix, a regional direct, indirect, and induced coefficients matrix (through matrix inversion), Type II economic activity multipliers, and appropriate output that allow easy hand calculation of Type II income and employment multipliers.

### **Location Quotients, Factor Weights, Average Wages**

Location quotients adjust the level of input purchasing in the national coefficients table to create a regional coefficients table. The two types of location quotients used in this analysis were the employment location quotient and output location quotient. Both types of location quotients assess the importance of an industry in a region with its relative importance in the nation. The employment location quotient uses employment figures, while the output location quotient uses dollar volume of output.

A location quotient equal to 1 indicates the region is producing its domestic needs specific to that industry. A location quotient less than 1 implies the region is not producing its domestic needs in relation to the industry, and therefore, part of the industry-specific consumption of that region is imported. A location quotient greater than 1 implies the region is producing goods for export. At least two assumptions are necessary for this technique to be viable: (1) consumption patterns are fairly similar for the nation and the region; and (2) imports are small relative to total production. Reference 1 gives an excellent overview of location quotients.

Location quotients were calculated for the state of New Mexico using 1997 employment data for all sectors except agriculture. Output location quotients were calculated for the agriculture sectors using 1996 cash receipts and value of production data. Again, the national technical coefficients are from 1992. In using 1996-1997 data to derive a coefficients matrix for the state, it is assumed the production process did not change significantly between 1992 and the 1997 time period, and the techniques of production in the state of New Mexico for 1997 are similar to those in the U.S. for 1992.

The Employment Location Quotient (ELQ) is defined as:

$$ELQ = (e_i/e)/(E_i/E)$$

where

ELQ is defined as the employment location quotient,

$e_i$  is the regional employment in the  $i$ th industry

- e is the total employment in the region,
- $E_i$  is the national employment in the  $i$ th industry, and
- E is the total national employment.

The Output Location Quotient (XLQ) is defined as:

$$XLQ = (x_i/x)/(X_i/X)$$

where

XLQ is defined as the dollar output location quotient,

$x_i$  is the dollar output of the  $i$ th industry in the region,

$x$  is the dollar output of all industry in the region,

$X_i$  is the dollar output nationally of the  $i$ th industry, and

$X$  is the total dollar output of all industry in the nation.

The output location quotient was used in this study for the agriculture sectors only, because data on employment in those sectors was incomplete.

#### **Calculation of Employment Location Quotients, Industry Specific Average Wages, and Coefficient Combining Factor Weights**

Employment location quotients, factor weights, and average wages (for all sectors except agriculture) were obtained from the New Mexico Department of Labor in Albuquerque for this study. The ES-202 report gives 1st quarter data on the number of employees, number of firms, and total wages paid, sorted by the four-digit Standard Industrial Classification (SIC) code number for the state.

Calculation of location quotients proceeded as follows. Each of the 490 sectors of the national data was numbered consecutively for identification. Using the ES-202 state employment data and the SIC codes corresponding to each of the 490 national sectors, the number of specific industry employees ( $e_i$ ), as well as total wages (for calculation of average wages), were noted for each appropriate sector. National employment for each SIC code was also noted ( $E_i$ ). Derivation of location quotients was  $(e_i/E_i)/\text{constant}$  (the

constant is the total employment in the state divided by total employment in the nation).

Employment data were also used to derive factor weights, which were calculated from the proportional employment (output for agriculture) of each of the 490 sectors relative to the state model sector plan. Factor weights are defined as follows:

where

$F_{W_{ij}}$  is the factor weight for the national sector contained in the  $j$ th regional (state) sector,

$i$  is a national sector (1, ..., 490),

$j$  is a regional sector (1, ..., 35) Sectors 36 through 39 are calculated separately and added to the regional model in a later step after the national matrix has been reduced.

$k$  is the set of all national sectors contributing to regional sector  $j$ .

$e_i$  is the regional employment in national sector  $I$ ,

$e_k$  is the regional employment in national sector  $I$  that is a member of set  $k$ .

In other words, the factor weight,  $F_{W_{ij}}$ , is the fraction of regional employment (output for agriculture) in national sector  $I$  relative to total regional employment in all national sectors contributing to regional sector  $j$ . Factor weights are used in two ways: (1) to calculate each aggregated sector's average wage. (Each sector's average wage was multiplied by its factor weight and summed for the aggregate,) and (2) to aggregate the  $490 \times 490$  national matrix to a  $39 \times 39$  regional matrix within the model.

One shortcoming of using employment location quotients is that the only data available was covered employment. The ES-202 report "summarizes employment and wage data for workers covered by state unemployment insurance laws and for civilian workers covered by the program of Unemployment Compensation for Federal Employees." Therefore, certain services (such as real estate and domestic servants) may not be completely covered, and small "mom and pop" businesses (especially in the agriculture sector) were excluded.

Also, all construction sectors at the national level were identified by the two-digit SIC codes 15-17. Construction sectors were therefore not differentiable. Thus, all were aggregated into one construction sector at the state level and the appropriate location quotient was calculated for the aggregated sector.

### Calculation of Output Location Quotients

Output location quotients were calculated for both sectors 1 and 2. Regional sector 1 (livestock and livestock products) includes these national sectors; dairy farm products, poultry and eggs, meat animals, and miscellaneous livestock. Regional sector 2 (other agricultural products) includes these national sectors; cotton, food grains, feed grains, grass seeds, tobacco, fruits, tree nuts, vegetables, sugar crops, miscellaneous crops, oil-bearing crops, forest products, and greenhouse and nursery products. To calculate the output location quotients for the two regional agricultural sectors, the following formula was used:

$$XLQ = (x_i/X_i)/(x/X) \text{ [see previous notation]}$$

Cash receipts and value of production data were used for the dollar output portion of the output location quotient equation. Cash receipts data were available for all agricultural sectors at the regional level. Value of production data were used for agricultural sectors at the national level if cash receipts data were not available. Value of production, as applied to crops, is derived by multiplying production by the estimated season average price received by farmers for that portion of the commodity actually sold. Thus, cash receipts data for each agricultural sector were added for the region to give  $x_i$  and cash receipts and value of production data for the U.S. were used for  $X_i$ . Each sector's composition was checked for consistency between regional and national levels.

The denominator of the output location quotient equation,  $(x/X)$ , is the dollar output of all industry in the region divided by the total dollar output of all industry in the nation. Output of all industry for the region is not available; thus, personal income was used as a proxy to provide a relative size for both  $x$  and  $X$ .

Factor weights for each agricultural sector were calculated in a manner similar to that described

above for other sectors that used employment data. Dollar output for each agricultural sector was divided by the total dollar output for the corresponding aggregated sector.

Factor weights for the agricultural sectors were used only in the aggregation of sectors in the national matrix to the two agricultural sectors in the state matrix. Average weekly earnings for agriculture for crops, livestock, and forestry were obtained from "Covered Employment and Wages," Quarterly Report, First Quarter, 1997, New Mexico Employment Security Department, Economic Research and Analysis Bureau, Albuquerque, New Mexico. Annual wages were derived by multiplying the weighted average weekly earnings by 52.

### STATE AND LOCAL GOVERNMENT IMPACTS

During January and February, 1993, an extensive study of state and local government taxes impacting New Mexico businesses was completed. The overall objective of this study was to estimate the direct tax and expenditure patterns coefficients for local and state governments for the current 1987-based DOE/NMSU I/O model. All possible avenues of state and local taxation and expenditures within the state of New Mexico were examined. Taxes imposed on businesses and individuals, and fees paid annually imposed on businesses and professionals were the avenues investigated during the data collection process.

In the tax study, an effort was made to examine all possible avenues of state and local taxation on businesses operating within the state of New Mexico. It is important to note that with approximately 100 communities, nearly 90 school districts, numerous special taxing districts, 33 counties, and the state authority, the actual taxes (or tax rates) affecting a particular business will vary by location throughout the state. The tax study results are therefore averages considering all levied taxes. There were about 15 significant tax categories, with the major ones being; gross receipts tax, property tax, personal income tax, corporate income tax, gasoline tax, oil and gas taxes (several), etc. To estimate the economic impact of taxes, it is important not only to categorize the taxing entities (state or local

government), but to also know which governmental unit is the final recipient of the collected taxes. For example, the state collects the gross receipts tax but sends to the local government units their portion of the collection. Thus, gross receipts tax revenues must be divided between the two in accordance with final disbursement. Also, it must be noted the taxed entity is not the one we may commonly think it is. Consider the gross receipts tax that the consumer pays on groceries, clothing, medicine, and other purchases: while the consumer pays the tax initially, the reporting entity is the business that collects the tax from the consumer. Therefore, the gross receipts tax is a business tax even though we may feel it is largely levied on individuals. The tax impacts are estimated for the reporting units, which may be either businesses or individuals.

The results of the tax study are incorporated into the "Production Function" of each of the economic model sectors defined in this report. These results show the incidence of state and local government taxes on businesses varies from a low of 0.8 percent (milling, planning, and structural wood products, and motor freight transportation and warehousing) to a high of about 11 percent (petroleum refining and products) of a business's dollar volume activity. The DOE and its direct contractors pay 2.4 percent of the cost of services rendered in-state and local government taxes. Individuals pay an average of 1.7 percent of each dollar earned (income tax, property tax, etc.).

Including the payment of state and local government taxes by businesses and individuals into the economic impact model results in a higher percentage of activity being captured by the model. Thus the multiplier effects with taxes included are greater but more representative of the actual impact of the DOE on New Mexico. The state and local government impacts are being updated and are being used in the FY 1998 analysis.

## DOE/NEW MEXICO EXPENDITURE PATTERNS

The expenditure pattern (production function) of DOE/New Mexico was derived as follows:

Regional expenditures as well as operating and capital budgets for FY 1997 and FY 1998 were collected from DOE/AL contractors in the state. For DOE/AL contractors not in the state, only amounts expended in the state were collected. Total expenditures in the state during FY 1997, and FY 1998 were also collected for the DOE/AL and other DOE Offices that spend money in New Mexico. The expenditure information was obtained by each of the 39 model sectors, to the extent possible (because smaller contractors and field offices could not provide a detailed breakdown).

## MODEL RESULTS

Tables 9 and 10 for FY 1997 and Tables 11 and 12 for FY 1998 are the data received from the various elements of DOE/New Mexico. These data were summarized in Tables 4 and 5 in the previous section.

The input-output modeling process results in the following output: (1) a direct coefficient matrix, and (2) a direct, indirect, and induced coefficient matrix. From these matrices, various multipliers for economic activity and income and employment can be derived.

## COEFFICIENTS

The Direct Coefficients (expenditures) in the DOE/New Mexico column (sector 38) constitute the DOE/New Mexico in-state production function (Table 13). These were calculated by dividing each in-state expenditure in sectors 1 through 39 of the input-output tables by the FY 1998 DOE/New Mexico total expenditures (Tables 11 and 12).

The direct coefficient matrix shows the amount of input (from New Mexico) required for each industry from all industries to produce one dollar's worth of output (Table 14). The direct, indirect, and induced coefficient matrix identifies the total impact generated from a \$1 increase in the activity of a specific industry (Table 15).

As discussed below, the regional modeling technique employed for the DOE Economic Studies produces a direct coefficients matrix that contains three state and local government sectors—one for government services (enterprise) and one each for state and local non-service (non-enterprise) activities. A review of the national modeling techniques employed by the BEA, strongly indicates that state and local government tax (non-enterprise) supported activities for a state like New Mexico are under represented. Such “under representation” will create an upward bias in the regional model results when New Mexico government sectors, calculated from an empirical study, are added to the direct coefficients matrix. To neutralize this upward bias, the direct coefficients for sectors 1 through 34 (private sectors), sector 35 (government services), and sector 39 (households or labor costs) have been proportionally adjusted. These adjustments were made relative to the state and local tax coefficients for each of the 37 affected sectors in the regional model. The adjustments will assure there is no upward bias in the model as a result of adding empirically derived state and local tax coefficients to the average production function for industries represented in each of the I/O model sectors, and that the regional model direct coefficients matrix does not contain a column (production function representation) that sums to more than 1. Fringe benefits are used to compute total unit labor costs i.e. cost per employee. The I/O model for the FY 1998 and FY 1997 analysis was revised. The fringe benefit coefficients in the I/O model were updated.

### MULTIPLIERS

The Type I multiplier takes into account only direct and indirect changes resulting from an increase of \$1 in the output of an industry. In this case, households (the induced effect) are excluded from the impact calculation. The Type II activity multiplier is a more realistic measure because it takes into account direct and indirect effects plus induced effects resulting from including households.

These additional induced effects include household income generation through payments for labor services as well as the associated consumer spending.

One of the major uses of input-output information is to assess the effect on an economy of developments initiated from outside the economy (exogenous changes on New Mexico). The most important items derived from an input-output model are the multipliers. Three of the most frequently used types of multipliers estimate the effects of the exogenously induced changes on (1) outputs of sectors in the economy, (2) income earned by households, and (3) employment, in physical terms, that is expected to be generated due to changes in output. The notion of multipliers rests upon the difference between the initial effect of an exogenous change in demand and the total effects of that change.

The Type II economic activity (output) multiplier measures the volume of activity generated among various sectors of a region due to a \$1 exogenous change in a sector. For example, the economic activity multiplier for DOE in 1998, is 3.39 (Table 8). This number is close to the column sum (3.36) of sector 38-DOE, in the direct, indirect, and induced coefficient matrix. The column sum differs only by the adjustment for fringe benefit losses to out-of-state entities and the addition of interests, rents, and dividends not directly calculated by the matrix portion of the model.

**Table 8. Type II Multipliers for DOE/New Mexico, FY 1997 and FY 1998.**

Year	Economic Activity	Income	Employment
FY 1997	3.36	2.36	3.54
FY 1998	3.39	2.39	3.58

A multiplier of 3.39 for FY 1998, indicates that for every \$1 spent by DOE on materials, labor, benefits, equipment, services, etc., another \$2.39 is generated in the state for a total impact of \$3.39.

Income multipliers measure the indirect and induced effects associated with new income generated from payments to labor at DOE Offices and GOCO Facilities. In the model, these Type II multipliers are derived by dividing the net direct, indirect, and induced income impacts generated by the model, and by direct net salaries and wages (mainly, net income not including transfer payments). The income multiplier for FY 1998

was estimated to be 2.39 compared to 2.36 for FY 1997. A multiplier of 2.39 for FY 1998 indicates that for every \$1 of income generated by DOE/New Mexico for labor and another \$1.39 is generated in the state for a total impact of \$2.39.

Employment multipliers measure the number of indirect and induced jobs supported, on average, relative to one employee of DOE/New Mexico. In the model, these Type II multipliers are derived by dividing the total employment impact generated by the model by direct employment figures. For DOE, the employment multiplier is 3.58 in 1998 (Table 8). This multiplier indicates that for every 100 jobs that are created by DOE, another 258 jobs are supported in the state.

Table 16 gives the DOE indirect employment impact, using Type II multipliers for FY 1998, by sector. The labor-intensive sectors obviously have a greater indirect employment impact. The retail trade sector has the largest indirect employment impact at 29 percent of the total. Other sectors with large indirect employment impact include lodging and personal services (11 percent), FIRE (9 percent), local and state government (9 percent), health, education and social services (7 percent), other business services (6 percent), and wholesale trade (5 percent).

The income multiplier is lower than the employment multiplier for both FY 1997 and FY 1998 because many of the jobs created directly by DOE pay above-average wages compared to sectors where DOE's indirect impact is large in terms of employment—such as retail and service sectors. However, such sectors tend to generate a great deal of economic activity throughout the state.

Table 9. DOE New Mexico Expenditures (in dollars) by Sector and Operating Budget, Contractors, FY 1997.

Sector	University of California (LANL)(a)	Johnson Control, Inc. (LANL)	Protection Technology Los Alamos (b) (LANL)	Lockheed Martin (SNL)	Westinghouse Electric (WIPP)	Jacob's Engineer Group, Inc. (UMTRA)	M-K Ferguson Company, Inc. (UMTRA)	ROSS Aviation Inc.	Allied Aerospace	Other Contractors in NM (c)	Total Expenditures by Contractors in New Mexico
1. Livestock & Livestock Products											9,537
2. Other Agricultural Products	9,537										8,805
3. Forestry & Fishery Products			8,805								279,723
4. Agriculture, Forestry & Fishery Services				279,723							2,012,050
5. Mining, Crude Petroleum & Natural Gas	1,801,304				210,746						42,441,313
6. Construction	15,788,016			24,354,962		2,298,335					99,241
7. Ordnance & Chemical Manufacturing		99,151			90						205,035
8. Food & Kindred Products Manufacturing	205,035										39,124
9. Textiles Products & Apparel Manufacturing	22,770			16,354							135,895
10. Lumber & Wood Products Manufacturing	135,595			300							458,206
11. Paper & Publishing Manufacturing	221,855			236,351							929,439
12. Petroleum Refining & Products Manufacturing	448,268			(1,442)							495,904
13. Glass, Stone & Clay Products Manufacturing	481,921			13,983							10,444,756
14. Primary & Fabricated Metals Manufacturing	4,808,717			2,318,190	569,038						185,962
15. Computer, Office & Service Equipment Manuf.	6,118,809			16,439,809							22,743,580
16. Electrical Equipment Manufacturing	1,858,624			1,322,693	105,112						785,053
17. Scientific Instruments Manufacturing	207,680			823,406							10,542
18. All Other Manufacturing	163,072			413,154							1,141,628
19. Motor Freight Transportation & Warehousing	(5,142)			289,393	22,674						578,226
20. All Other Transportation	107,892			19,022	2,177,248						313,305
21. Communication	1,573,043	606,026		6,843,822	764,034		1,335		10,693	102,671	9,901,624
22. Electric & Gas Utilities	21,511,000			13,694,396	1,141,998			7,255	29,200	128,820	36,512,769
23. Water & Other Utilities	15,741		18,719	231,409	2,737				6,678	7,577	282,861
24. Wholesale Trade	51,223,160			24,381,969	8,690,124						84,295,253
25. Retail Trade	78,638,710			39,522,373	1,548,177		22,924	110,468	345,502	212,774	4,520,863
26. Finance, Insurance & Real Estate	455,429	405,403		1,972,382	347,012		116,461	332,287	84,123	330,734	124,921,791
27. Hotel Restaurant & Other Personal Services	422,976	91,193		840,254			5,264	865			4,042,831
28. Data Processing & Computer Services	74,742,584	244,826		29,801,559	320,947		10,890				1,360,552
29. Management & Consulting Services	15,092,128			27,074,858	295,841		5,315	22,275	106,398		105,120,806
30. Engineering, Architecture & Surveying Service	33,689,405			17,930,261	4,303,678		989,830	28,241		76,580	43,185,916
31. Other Business Services	25,618,588			56,296,219	9,170,640		61,828	106,664	5,049	1,420,339	57,017,995
32. Automobile & Other Repair Services	1,033,721	2,069,158		4,035,273	35,089		2,649	4,144	27,374	121,972	93,421,671
33. Amusement, Recreation & Video Services	293,131			868,568			380				7,329,380
34. Health, Education & Social Services	5,008,600	1,748,566		14,611,527			3,962	10,776		22,284	1,182,079
35. Government Services	2,066,152			10,103,724	28,600		7,124				21,405,715
36. Local Government	849,626	360,653	648,800	17,326,532	1,987,862		226,185	128,841	23,871	412,590	12,205,600
37. State Government	615,247	1,422,613	973,200	26,785,799	2,968,794		372,926	275,504	35,806	1,128,604	21,968,268
38. United States Department of Energy (d)											2,308
39. Households	519,862,000	63,532,220	24,478,000	515,699,224	38,998,794		1,450,930	2,661,157	4,971,010	14,794,239	573,092
Total New Mexico Expenditures	865,084,445	70,499,377	26,098,000	854,864,688	75,777,532		3,283,003	3,690,157	6,150,601	22,467,268	6,553,787
Total Operating and Capital Budget	1,142,972,382	76,872,262	28,417,000	1,375,011,764	89,678,000		4,821,212	3,690,157	11,412,766	30,753,987	6,553,787
Number of Employees	8,461	1,435	392	7,196	635		49	49	78	287	9
											18,591

a. The LANL Total Operating and Capital Budget has been adjusted to account for contracts to Johnson Control, Inc., Protection Technology - Los Alamos and other NM DOE management & operating contracts.

b. Expenditures by PTLA with the exception salaries and wages are included in LANL's Total Operating and Capital Budget.

c. Includes Martin Marietta Specialty Components, Inc., Mason & Hanger-Silas Mason Co., Inc., Pantex, Wastren, Inc., TRW-TESS and MACTEC-ERS.

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

Table 10. DOE New Mexico Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1997.

Sector	USDOE Albuquerque Operation Offic	USDOE Idaho Operation Offic	USDOE Nevada Operation Office	USDOE Oak Ridge Operation Offic	Other USDOE Operation Offices	Total Expenditures by DOE Offices	Expenditures by Contractors	Expenditures by DOE in NM
1. Livestock & Livestock Products						9,537	9,537	
2. Other Agricultural Products						8,805	8,805	
3. Forestry & Fishery Products						279,723	279,723	
4. Agric., Forestry & Fishery Services						2,012,050	2,012,050	
5. Mining, Crude Petroleum & Natural Gas						42,441,313	47,656,577	
6. Construction	5,215,264				5,215,264	99,241	99,241	
7. Ordnance & Chemical Manufacturing						205,035	205,035	
8. Food & Kindred Products Manufacturing						39,124	39,124	
9. Textiles Products & Apparel Manufacturing						135,895	135,895	
10. Lumber & Wood Products Manufacturing						458,206	458,206	
11. Paper & Publishing Manufacturing						929,439	929,439	
12. Petroleum Refining & Products Manufacturing						495,904	495,904	
13. Glass, Stone & Clay Products Manufacturing						10,444,756	10,444,756	
14. Primary & Fabricated Metals Manufacturing					8,217	22,743,580	22,751,797	
15. Computer, Office & Service Equipment Manufacturing						4,071,482	4,071,482	
16. Electrical Equipment Manufacturing						1,141,628	1,225,033	
17. Scientific Instruments Manufacturing					83,405	83,405		
18. All Other Manufacturing			175,000			175,000	576,226	751,226
19. Motor Freight Transportation & Warehousing			2,000			2,000	313,305	315,305
20. All Other Transportation			109,249		13,658	122,907	2,304,260	2,427,167
21. Communication	2,481,929		193,618			2,675,547	9,901,624	12,577,171
22. Electric & Gas Utilities	724,810		122,519			847,329	36,512,769	37,360,098
23. Water & Other Utilities	12,887		16,785			29,672	282,861	312,533
24. Wholesale Trade							84,295,253	84,295,253
25. Retail Trade	1,459,959	203,809	200,000	2,289,741	108,225	4,261,734	124,921,791	129,183,525
26. Finance, Insurance & Real Estate			897,272			897,272	4,042,831	4,940,103
27. Hotel Restaurant & Other Personal Services			630,283	46,440	160,034	836,757	1,360,552	2,197,309
28. Data Processing & Computer Services		40,188				40,188	105,120,806	105,160,994
29. Management & Consulting Services						1,502,221	43,185,916	44,688,137
30. Engineering, Architecture & Surveying Services		2,626,553				2,626,553	57,017,995	59,644,548
31. Other Business Services	20,015,868			41,516	10,206,270	30,263,654	93,421,671	123,685,325
32. Automobile & Other Repair Services			100,000			100,000	7,329,380	7,429,380
33. Amusement, Recreation & Video Services							1,162,079	1,162,079
34. Health, Education & Social Services			138,000	12,050		150,050	21,405,715	21,555,765
35. Government Services	3,874		2,000	322,790	10,792	339,456	12,205,600	12,545,056
36. Local Government	4,546,467		129,210	70		4,675,747	21,968,268	26,644,015
37. State Government	6,819,700	5,093	882,800	13,923	86,492	7,808,008	34,605,572	42,413,580
38. United States Department of Energy (a)								
39. Household	96,942,060	121,972	5,104,931	492,253	1,729,796	104,391,012	1,187,018,666	1,291,409,678
<b>Total New Mexico Expenditures</b>	<b>138,222,818</b>	<b>2,997,615</b>	<b>8,703,667</b>	<b>3,218,783</b>	<b>13,909,110</b>	<b>167,051,993</b>	<b>1,934,468,858</b>	<b>2,101,520,851</b>
<b>Total Operating and Capital Budget</b>	<b>138,222,818</b>	<b>2,997,615</b>	<b>8,703,667</b>	<b>3,218,783</b>	<b>13,909,110</b>	<b>167,051,993</b>	<b>2,771,183,317</b>	<b>2,938,235,310</b>
<b>Number of Employees</b>	<b>1,016</b>	<b>1</b>	<b>72</b>	<b>9</b>	<b>16</b>	<b>1,114</b>	<b>18,591</b>	<b>19,705</b>

Table 11. DOE New Mexico Expenditures (in dollars) by Sector and Operating Budget, Contractors, FY 1998.

Sector	University of California (LANL)(a)	Johnson Control, Inc. (LANL)	Protection Technology Los Alamos (LANL)(b)	Lockheed Martin (SNL)	Westinghouse Electric (WIPP)	Jacob's Enginee Group, Inc. (UMT) (UMTRA)	M-K Ferguson Company, Inc. (UMTRA)	ROSS Aviation Inc.	Allied Signal Aerospace	Other Contractors(c)	Total Expenditures by Contractors in New Mexico
1. Livestock & Livestock Products											80,000
2. Other Agricultural Products	80,000										80,000
3. Forestry & Fishery Products											50,850
4. Agriculture, Forestry & Fishery Services	6,843			44,007							688,953
5. Mining, Crude Petroleum & Natural Gas	664,409			24,544							38,712,542
6. Construction	20,333,745			17,088,596	1,185,691					104,510	341,755
7. Ordnance & Chemical Manufacturing	339,500			2,255							169,442
8. Food & Kindred Products Manufacturing	169,442										109,790
9. Textiles Products & Apparel Manufacturing	49,868			11,620	48,302						572,270
10. Lumber & Wood Products Manufacturing	567,967				4,303						742,761
11. Paper & Publishing Manufacturing	91,248			650,593						920	550,118
12. Petroleum Refining & Products Manufacturing	310,206				190				239,722		198,581
13. Glass, Stone & Clay Products Manufacturing	54,747			143,651	182						12,361,624
14. Primary & Fabricated Metals Manufacturing	8,122,518			2,654,464	613,745					970,897	14,618,204
15. Computer, Office & Service Equipment Manuf.	2,950,340			11,413,252	112,041						7,278,186
16. Electrical Equipment Manufacturing	2,541,132			4,724,351	12,703						3,757,293
17. Scientific Instruments Manufacturing	96,106			3,655,169	6,018						597,737
18. All Other Manufacturing	119,568				478,169						735,915
19. Motor Freight Transportation & Warehousing	815				241,498	487,802	5,800				560,653
20. All Other Transportation	65,860				6,795	487,999					11,576,841
21. Communication	1,911,885	810,692		7,930,798	804,716	1,500		9,161	108,089		41,333,836
22. Electric & Gas Utilities	21,233,460	2,802,953		14,666,951	2,464,024			5,351	29,067	132,030	934,147
23. Water & Other Utilities	9,525	19,759		647,637	247,677				6,700	2,849	87,426,556
24. Wholesale Trade	59,232,520			19,903,758	8,290,279						112,162,736
25. Retail Trade	68,813,746			42,532,238	540,800	13,000	55,492	185,720		21,739	4,114,625
26. Finance, Insurance & Real Estate	1,374,736	439,951		1,652,006	200,591	136,936	242,815	67,591			1,656,259
27. Hotel Restaurant & Other Personal Services	800,797	80,545		681,309	51,402	3,500		88		38,618	59,900,357
28. Data Processing & Computer Services	33,714,951	239,318		24,749,423	1,122,158	74,508			79,247		35,723,588
29. Management & Consulting Services	14,471,482			20,502,358	670,501						101,565,822
30. Engineering, Architecture & Surveying Service	48,732,854			18,347,967	2,602,272	436,973			365,413	180,626	70,666,105
31. Other Business Services	21,572,966			69,598,606	8,837,364	34,655	56,417	9,764	1,456,050		9,233,345
32. Automobile & Other Repair Services	1,414,145	2,248,112		5,563,326	2,380	1,800	1,425			2,157	1,084,517
33. Amusement, Recreation & Video Services	312,252			764,355	7,876		33				19,092,859
34. Health, Education & Social Services	4,757,588	1,836,142		11,294,668	1,192,784	2,400	794		8,283		13,611,050
35. Government Services	8,559,837			5,047,413		3,800					21,575,489
36. Local Government	387,159	336,003		18,368,556	1,977,638	700	35	34,182	471,215		31,451,988
37. State Government	903,371	464,004		26,026,101	2,731,025	135	691	54,443	1,272,064	154	
38. United States Department of Energy (d)											
39. Households	542,695,238	63,467,504	22,042,451	523,058,982	40,358,289	817,238	2,167,306	5,054,220	15,496,747	2,348,464	1,217,506,439
Total New Mexico Expenditures	867,462,826	72,744,983	22,042,451	852,475,617	75,060,753	1,532,945	2,530,447	5,778,100	20,523,355	2,591,758	1,922,743,235
Total Operating and Capital Budget	1,206,486,093	90,353,696	30,609,219	1,404,890,396	86,768,324	1,846,287	2,530,447	9,409,264	23,079,489	2,591,758	2,858,564,973
Number of Employees	8,931	1,381	453	7,237	627	14	34	74	329	39	19,119

a. The LANL Total Operating and Capital Budget has been adjusted to account for contracts to Johnson Control, Inc., Protection Technology - Los Alamos and other NM DOE management & operating contracts.

b. Expenditures by PTLA with the exception salaries and wages are included in LANL's Total Operating and Capital Budget.

c. Includes Mason & Hanger-Silas Mason Co., Inc., Pantex, Wastren, Inc, TRW-TESS and MACTEC-ERS.

d. Any transfer of money for services or products between specified activities is counted only in the a 859,907,521

Table 12. DOE New Mexico Expenditures (in dollars) by Sector and Total Operating Budget, US DOE Offices and Total Expenditures, FY 1998.

04/28/99

Sector	USDOE Albuquerque Operation Offic	USDOE Idaho Operation Offic	USDOE Nevada Operation Offic	USDOE Oak Ridge Operation Offic	Other USDOE Operation Offic	Total Expenditures by DOE Offices	Total Expenditures by Contractors	Total Expenditures by DOE In NM
1. Livestock & Livestock Products								
2. Other Agricultural Products						80,000	80,000	80,000
3. Forestry & Fishery Products						50,850	50,850	50,850
4. Agric., Forestry & Fishery Services						688,953	688,953	688,953
5. Mining, Crude Petroleum & Natural Gas								
6. Construction	2,665,953		30,000		2,695,953	38,712,542	41,408,495	
7. Ordnance & Chemical Manufacturing						341,755	341,755	341,755
8. Food & Kindred Products Manufacturing						169,442	169,442	169,442
9. Textiles Products & Apparel Manufacturing						109,790	109,790	109,790
10. Lumber & Wood Products Manufacturing						572,270	572,270	572,270
11. Paper & Publishing Manufacturing						742,761	742,761	742,761
12. Petroleum Refining & Products Manufacturing						550,118	550,118	550,118
13. Glass, Stone & Clay Products Manufacturing						198,581	198,581	198,581
14. Primary & Fabricated Metals Manufacturing						12,361,624	12,361,624	12,361,624
15. Computer, Office & Service Equipment Manuf.						14,618,204	14,618,204	14,618,204
16. Electrical Equipment Manufacturing				52		7,278,186	7,278,238	7,278,238
17. Scientific Instruments Manufacturing						3,757,293	3,757,293	3,757,293
18. All Other Manufacturing						597,737	597,737	597,737
19. Motor Freight Transportation & Warehousing						735,915	735,915	735,915
20. All Other Transportation					118,490	118,490	560,653	679,143
21. Communication	2,606,025					2,606,025	11,576,841	14,182,866
22. Electric & Gas Utilities	2,040,032					2,040,032	41,333,836	43,373,868
23. Water & Other Utilities	51,567					51,567	934,147	985,714
24. Wholesale Trade							87,426,556	87,426,556
25. Retail Trade	1,532,957	594,465		1,186,384	211,740	3,525,546	112,162,736	115,688,282
26. Finance, Insurance & Real Estate							4,114,625	4,114,625
27. Hotel Restaurant & Other Personal Services				647,256	718,655	1,365,911	1,656,259	3,022,170
28. Data Processing & Computer Services				15,200	2,155	17,355	59,900,357	59,917,712
29. Management & Consulting Services					1,150,746	1,150,746	35,723,588	36,874,334
30. Engineering, Architecture & Surveying Services		1,801,674			1,933,202	3,734,876	70,666,105	74,400,981
31. Other Business Services	21,016,661		615,000	72,763	1,480,882	23,185,306	101,565,822	124,751,128
32. Automobile & Other Repair Services							9,233,345	9,233,345
33. Amusement, Recreation & Video Services							1,084,517	1,084,517
34. Health, Education & Social Services				36,798		36,798	19,092,859	19,129,657
35. Government Services	4,067			358,306		362,373	13,611,050	13,973,423
36. Local Government	5,460,000		229,680	8,749	57,189	5,755,618	21,575,489	27,331,107
37. State Government	7,540,000		166,320	18,008	78,975	7,803,303	31,451,988	39,255,292
38. United States Department of Energy (a)								
39. Household	96,361,646	220,084	5,187,289	768,953	3,472,105	106,010,076	1,217,506,439	1,323,516,515
Total New Mexico Expenditures	139,278,908	2,616,223	6,228,289	3,112,469	9,224,140	160,460,028	1,922,743,235	2,083,203,263
Total Operating and Capital Budget	139,278,908	2,616,223	6,246,000	3,112,469	9,224,140	160,477,739	2,858,564,973	3,019,042,712
Number of Employees	960	1	98	13	23	1,095	19,119	20,214

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

**Table 13. DOE New Mexico Direct Coefficients, FY 1998**

Sector	Direct Coefficients
1. Livestock and Livestock Products	0.000000
2. Other Agricultural Products	0.000027
3. Forestry and Fishery Products	0.000000
4. Agricultural, Forestry, and Fishery Services	0.000017
5. Mining, Crude Petroleum, and Natural Gas	0.000228
6. Construction	0.013723
7. Ordnance and Chemical Manufacturing	0.000113
8. Food and Kindred Products Manufacturing	0.000056
9. Textile Products and Apparel Manufacturing	0.000036
10. Lumber and Wood Products Manufacturing	0.000190
11. Paper and Publishing Manufacturing	0.000246
12. Petroleum Refining and Products Manufacturing	0.000182
13. Glass, Stone and Clay Products Manufacturing	0.000066
14. Primary and Fabricated Metals Manufacturing	0.004097
15. Computer, Office and Service Equipment Manufacturing	0.004844
16. Electrical Equipment Manufacturing	0.002412
17. Scientific Instruments Manufacturing	0.001245
18. All Other Manufacturing	0.000198
19. Motor Freight Transportation and Warehousing	0.000244
20. All Other Transportation	0.000225
21. Communication	0.004700
22. Electric and Gas Utilities	0.013888
23. Water and Other Utilities	0.000313
24. Wholesale Trade	0.028973
25. Retail Trade	0.038339
26. Finance, Insurance and Real Estate	0.001364
27. Hotel Restaurant and Other Personal Services	0.001002
28. Data Processing and Computer Services	0.019857
29. Management and Consulting Services	0.012220
30. Engineering, Architecture and Surveying Services	0.024656
31. Other Business Services	0.041342
32. Automobile and Other Repair Services	0.003060
33. Amusement, Recreation and Video Services	0.000359
34. Health, Education and Social Services	0.006339
35. Government Services	0.004631
36. Local Government	0.009057
37. State Government	0.013009
38. United States Department of Energy	0.000000
39. Household	0.438608
Total New Mexico Expenditures	0.689866
Total Operating and Capital Budget	1.000000

**Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998.**

		INDUSTRY PURCHASING									
		1	2	3	4	5	6	7	8	9	10
Livestock and Livestock Products	1	0.18554	0.00003	0.00715	0.00001	0.00000	0.00000	0.00005	0.08209	0.00053	0.00000
Other Agricultural Products	2	0.25768	0.01568	0.00000	0.10817	0.00000	0.00146	0.00193	0.02420	0.00371	0.00000
Forestry and Fishery Products	3	0.00000	0.00000	0.01771	0.00006	0.00000	0.00000	0.00009	0.00008	0.00137	0.00813
Agricultural, Forestry, and Fishery Services	4	0.00002	0.00008	0.00069	0.00000	0.00025	0.00237	0.00042	0.00028	0.00010	0.00042
Mining, Crude Petroleum, and Natural Gas	5	0.00005	0.00099	0.00000	0.00000	0.13636	0.00510	0.01184	0.00041	0.00023	0.00009
Construction	6	0.01139	0.01104	0.00446	0.00670	0.01563	0.00345	0.00711	0.00447	0.00416	0.00337
Ordnance & Chemical Manufacturing	7	0.00274	0.01391	0.00072	0.00105	0.00321	0.00527	0.03853	0.00146	0.00293	0.00197
Food and kindred Products	8	0.04571	0.00000	0.01239	0.00000	0.00000	0.00000	0.00192	0.05589	0.00000	0.00000
Textile Products and Apparel	9	0.00000	0.00000	0.00000	0.00000	0.00005	0.00004	0.00000	0.00000	0.11693	0.00105
Lumber and Wood Products	10	0.00020	0.00017	0.00000	0.00000	0.00021	0.02669	0.00001	0.00006	0.00001	0.12318
Paper and Publishing	11	0.00015	0.00204	0.00002	0.00025	0.00010	0.00070	0.00261	0.00897	0.00082	0.00107
Petroleum Refining and Products	12	0.00530	0.01902	0.00307	0.00755	0.01115	0.01169	0.01293	0.00270	0.00208	0.00553
Glass, Stone and Clay Products	13	0.00000	0.00118	0.00000	0.00000	0.00182	0.04382	0.00179	0.00002	0.00028	0.00458
Primary and Fabricated Metals	14	0.00099	0.00186	0.00106	0.00014	0.00468	0.01869	0.00286	0.00085	0.00056	0.00734
Computer, Office and Service equipment	15	0.00000	0.00000	0.00001	0.00001	0.00000	0.00037	0.00001	0.00001	0.00000	0.00001
Electrical Equipment	16	0.00005	0.00005	0.00000	0.00020	0.00053	0.00941	0.00004	0.00004	0.00000	0.00063
I Scientific Instruments	17	0.00000	0.00000	0.00167	0.00033	0.00011	0.00176	0.00036	0.00002	0.00000	0.00016
N All Other Manufacturing	18	0.00034	0.00074	0.00024	0.00013	0.00027	0.00315	0.00409	0.00883	0.01047	0.00394
D Transportation and Warehousing	19	0.01879	0.00913	0.00167	0.00705	0.00544	0.01460	0.02551	0.01436	0.00754	0.02597
U All Other Transportation	20	0.01244	0.00336	0.00390	0.01672	0.00709	0.00362	0.01300	0.00933	0.00528	0.01059
S Communication	21	0.00247	0.00216	0.00066	0.00450	0.00166	0.00343	0.00262	0.00157	0.00183	0.00217
T Electric and Gas Utilities	22	0.01445	0.01129	0.00125	0.00025	0.04595	0.00306	0.02067	0.01207	0.01399	0.01379
R Water and Other Utilities	23	0.00106	0.00504	0.00209	0.00000	0.00048	0.00074	0.00433	0.00116	0.00039	0.00124
Y Wholesale Trade	24	0.05288	0.05014	0.00960	0.02371	0.01468	0.02881	0.05125	0.05770	0.04122	0.07496
Retail Trade	25	0.00000	0.00000	0.00237	0.00038	0.00136	0.02964	0.00084	0.00260	0.00021	0.00112
S Finance, Insurance and Real Estate	26	0.06155	0.08011	0.00940	0.01877	0.01043	0.01308	0.01177	0.01118	0.01516	0.01421
E Hotel Restaurant and Other Personal Services	27	0.00033	0.00038	0.00393	0.00204	0.00407	0.00206	0.00510	0.00478	0.00630	0.00528
L Data Processing and Computer Services	28	0.00035	0.00034	0.00096	0.00035	0.00091	0.00044	0.00172	0.00102	0.00093	0.00124
L Management and Consulting Services	29	0.00000	0.00000	0.00153	0.00354	0.00125	0.00847	0.00429	0.00176	0.00157	0.00265
I Engineering and Related Services	30	0.00000	0.00000	0.00000	0.00006	0.00771	0.05649	0.00692	0.00020	0.00016	0.00051
N Other Business Services	31	0.00189	0.00370	0.03623	0.02750	0.00962	0.01388	0.03399	0.02753	0.04822	0.01368
G Automobile and Other Repair Services	32	0.00636	0.01196	0.01408	0.01478	0.00277	0.01092	0.00939	0.00806	0.00519	0.00799
Amusements, Recreation and Video Services	33	0.00000	0.00000	0.00007	0.00022	0.00013	0.00006	0.00036	0.00050	0.00024	0.00013
Health, Education and Social Services	34	0.00058	0.00058	0.00086	0.00060	0.00066	0.00013	0.00093	0.00060	0.00065	0.00109
Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Local Government	36	0.00756	0.00745	0.01936	0.01097	0.01370	0.02218	0.01329	0.00885	0.01034	0.00955
State Government	37	0.00854	0.00843	0.20093	0.01130	0.10790	0.03098	0.01526	0.01528	0.01024	0.00889
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.05384	0.09066	0.07127	0.34170	0.17679	0.30410	0.21301	0.13411	0.25279	0.26625
*** Column Sums ***		0.75326	0.35153	0.42935	0.60906	0.58698	0.68067	0.52083	0.50304	0.56644	0.62275

**Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998 (continued).**

		INDUSTRY PURCHASING									
		11	12	13	14	15	16	17	18	19	20
Livestock and Livestock Products	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000
Other Agricultural Products	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00011	0.00000	0.00000
Forestry and Fishery Products	3	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00000	0.00005	0.00000	0.00000
Agricultural, Forestry, and Fishery Services	4	0.00040	0.00013	0.00054	0.00034	0.00025	0.00087	0.00043	0.00027	0.00001	0.00000
Mining, Crude Petroleum, and Natural Gas	5	0.00022	0.50230	0.06106	0.06452	0.00009	0.00005	0.00035	0.00037	0.00000	0.00021
Construction	6	0.00648	0.00735	0.00677	0.00565	0.00676	0.01477	0.00642	0.00618	0.00390	0.00412
Ordnance & Chemical Manufacturing	7	0.00120	0.00629	0.00703	0.00482	0.00030	0.00419	0.00119	0.00419	0.00026	0.00091
Food and kindred Products	8	0.00000	0.00007	0.00000	0.00000	0.00000	0.00000	0.00017	0.00001	0.00000	0.00071
Textile Products and Apparel	9	0.00002	0.00000	0.00000	0.00001	0.00001	0.00000	0.00079	0.00136	0.00002	0.00034
Lumber and Wood Products	10	0.00100	0.00001	0.00129	0.00020	0.00006	0.00003	0.00013	0.00195	0.00002	0.00004
Paper and Publishing	11	0.05145	0.00014	0.00293	0.00039	0.00054	0.00070	0.00159	0.00100	0.00104	0.00155
Petroleum Refining and Products	12	0.00229	0.08432	0.01017	0.00276	0.00078	0.00084	0.00134	0.00323	0.04575	0.07400
Glass, Stone and Clay Products	13	0.00001	0.00007	0.11451	0.00085	0.00002	0.00067	0.00393	0.00155	0.00002	0.00041
Primary and Fabricated Metals	14	0.00148	0.00075	0.00358	0.11694	0.01326	0.01703	0.01324	0.01643	0.00077	0.00152
Computer, Office and Service equipment	15	0.00011	0.00000	0.00001	0.00000	0.02500	0.00047	0.00144	0.00016	0.00001	0.00001
Electrical Equipment	16	0.00004	0.00001	0.00001	0.00468	0.18595	0.13062	0.08534	0.00593	0.00033	0.00174
I Scientific Instruments	17	0.00099	0.00014	0.00011	0.00009	0.00152	0.00004	0.01693	0.00373	0.00011	0.00009
N All Other Manufacturing	18	0.00203	0.00088	0.00134	0.00196	0.00416	0.00238	0.00410	0.07812	0.00050	0.01213
D Transportation and Warehousing	19	0.01405	0.00500	0.07046	0.01271	0.00283	0.00429	0.00490	0.01070	0.15252	0.00589
U All Other Transportation	20	0.00797	0.03290	0.01812	0.00814	0.00614	0.00662	0.00507	0.00616	0.01630	0.07654
S Communication	21	0.00453	0.00109	0.00275	0.00301	0.00334	0.00384	0.00457	0.00289	0.01160	0.01535
T Electric and Gas Utilities	22	0.01086	0.08903	0.03634	0.01738	0.00664	0.01487	0.00854	0.01030	0.00689	0.00392
R Water and Other Utilities	23	0.00078	0.00278	0.00150	0.00130	0.00089	0.00108	0.00060	0.00110	0.01243	0.00202
Y Wholesale Trade	24	0.02633	0.03732	0.03518	0.04665	0.09252	0.04597	0.03293	0.05253	0.02849	0.02536
Retail Trade	25	0.00070	0.00018	0.00135	0.00024	0.00030	0.00028	0.00064	0.00065	0.00437	0.00281
S Finance, Insurance and Real Estate	26	0.01671	0.00961	0.01449	0.01495	0.01729	0.01771	0.01588	0.01574	0.02947	0.03145
E Hotel Restaurant and Other Personal Services	27	0.00490	0.00200	0.00541	0.00527	0.00494	0.00529	0.00538	0.00540	0.00641	0.00902
L Data Processing and Computer Services	28	0.00217	0.00133	0.00203	0.00156	0.00422	0.00410	0.00412	0.00276	0.00169	0.01889
L Management and Consulting Services	29	0.00278	0.00175	0.00201	0.00206	0.00228	0.00303	0.01166	0.00368	0.00494	0.00488
I Engineering and Related Services	30	0.00018	0.00221	0.00076	0.00126	0.00060	0.00352	0.00228	0.00122	0.00003	0.00033
N Other Business Services	31	0.03259	0.00798	0.01326	0.01627	0.01926	0.02679	0.02743	0.02027	0.01652	0.03477
G Automobile and Other Repair Services	32	0.00926	0.00883	0.01608	0.00786	0.00466	0.01350	0.00578	0.00963	0.05915	0.01093
Amusements, Recreation and Video Services	33	0.00029	0.00010	0.00012	0.00012	0.00027	0.00028	0.00030	0.00024	0.00028	0.00029
Health, Education and Social Services	34	0.00077	0.00035	0.00061	0.00076	0.00073	0.00145	0.00274	0.00143	0.00078	0.00122
Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Local Government	36	0.02130	0.01341	0.01080	0.01137	0.01298	0.01381	0.00808	0.01298	0.00800	0.01209
State Government	37	0.02889	0.01545	0.01102	0.01199	0.01282	0.01614	0.00638	0.01282	0.03340	0.01322
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.32173	0.03888	0.32043	0.30217	0.31175	0.34732	0.26902	0.37181	0.37181	0.39879
*** Column Sums ***		0.57450	0.87265	0.77208	0.66830	0.74318	0.70255	0.55369	0.66698	0.81781	0.76557

**Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998 (continued).**

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		INDUSTRY PURCHASING									
		21	22	23	24	25	26	27	28	29	30
Livestock and Livestock Products	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00000	0.00079	0.00000
Other Agricultural Products	2	0.00000	0.00000	0.00000	0.00008	0.00000	0.00001	0.00401	0.00001	0.00000	0.00001
Forestry and Fishery Products	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Agricultural, Forestry, and Fishery Services	4	0.00016	0.00005	0.00000	0.00046	0.00097	0.00149	0.00138	0.00044	0.00042	0.00012
Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.19908	0.00000	0.00003	0.00001	0.00000	0.00003	0.00000	0.00000	0.00001
Construction	6	0.02935	0.07489	0.09521	0.00402	0.00908	0.01537	0.01057	0.00254	0.00458	0.00139
Ordnance & Chemical Manufacturing	7	0.00022	0.00065	0.00865	0.00022	0.00005	0.00007	0.00033	0.00004	0.00246	0.00001
Food and kindred Products	8	0.00000	0.00000	0.00000	0.00049	0.00001	0.00000	0.06583	0.00000	0.00034	0.00000
Textile Products and Apparel	9	0.00031	0.00001	0.00000	0.00098	0.00007	0.00000	0.00065	0.00000	0.00018	0.00000
Lumber and Wood Products	10	0.00004	0.00002	0.00337	0.00035	0.00009	0.00008	0.00005	0.00008	0.00009	0.00014
Paper and Publishing	11	0.00132	0.00017	0.00034	0.00630	0.00366	0.00205	0.00163	0.00400	0.00389	0.00130
Petroleum Refining and Products	12	0.00093	0.01027	0.03082	0.00549	0.00482	0.00083	0.00261	0.00084	0.00290	0.00040
Glass, Stone and Clay Products	13	0.00003	0.00002	0.00126	0.00008	0.00001	0.00020	0.00110	0.00002	0.00293	0.00009
Primary and Fabricated Metals	14	0.00042	0.00095	0.00061	0.00180	0.00049	0.00016	0.00018	0.00020	0.00173	0.00048
Computer, Office and Service equipment	15	0.00034	0.00029	0.00002	0.00011	0.00004	0.00016	0.00002	0.01081	0.00045	0.00005
Electrical Equipment	16	0.00985	0.00031	0.00030	0.00514	0.00048	0.00017	0.00009	0.03682	0.01709	0.00009
I Scientific Instruments	17	0.00009	0.00050	0.03017	0.00016	0.00011	0.00015	0.00005	0.00059	0.00035	0.00021
N All Other Manufacturing	18	0.00077	0.00018	0.00571	0.00157	0.00152	0.00078	0.00299	0.00061	0.00099	0.00060
D Transportation and Warehousing	19	0.00114	0.00208	0.00582	0.00347	0.00233	0.00570	0.00666	0.00133	0.00551	0.00412
U All Other Transportation	20	0.00355	0.02130	0.00535	0.00548	0.00355	0.00421	0.00717	0.00475	0.00742	0.00214
S Communication	21	0.09890	0.00127	0.01962	0.01360	0.00858	0.00962	0.00577	0.01861	0.01132	0.00620
T Electric and Gas Utilities	22	0.00461	0.07453	0.02784	0.00980	0.02310	0.00671	0.02730	0.00359	0.00700	0.00492
R Water and Other Utilities	23	0.00113	0.00073	0.06085	0.00155	0.00304	0.00293	0.00714	0.00034	0.00085	0.00059
Y Wholesale Trade	24	0.00654	0.00838	0.02666	0.02308	0.00416	0.00310	0.0314	0.02159	0.01062	0.00184
Retail Trade	25	0.00029	0.00037	0.00739	0.00246	0.00346	0.00039	0.00139	0.00023	0.00081	0.00018
S Finance, Insurance and Real Estate	26	0.02194	0.02018	0.01838	0.03717	0.08326	0.12936	0.06105	0.03568	0.04161	0.03896
E Hotel Restaurant and Other Personal Services	27	0.00454	0.00345	0.00419	0.00554	0.00693	0.00538	0.01716	0.00465	0.00990	0.00471
L Data Processing and Computer Services	28	0.00815	0.00491	0.00210	0.00795	0.00387	0.01046	0.00209	0.04747	0.01786	0.00915
L Management and Consulting Services	29	0.00379	0.00171	0.00433	0.01115	0.00560	0.01333	0.00845	0.00543	0.03526	0.03178
I Engineering and Related Services	30	0.01036	0.00409	0.00103	0.00062	0.00021	0.00237	0.00001	0.00043	0.02397	0.06367
N Other Business Services	31	0.03644	0.02222	0.04011	0.04412	0.05479	0.04485	0.03230	0.03816	0.05124	0.13544
G Automobile and Other Repair Services	32	0.01175	0.00261	0.00684	0.01348	0.01116	0.01191	0.01161	0.01122	0.01118	0.00425
Amusements, Recreation and Video Services	33	0.08422	0.00020	0.00014	0.00080	0.00058	0.00034	0.00434	0.00027	0.00053	0.00014
Health, Education and Social Services	34	0.00127	0.00095	0.00053	0.00177	0.00078	0.00137	0.00164	0.00218	0.00160	0.00187
Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Local Government	36	0.02595	0.02215	0.02512	0.01471	0.02379	0.02179	0.02688	0.02225	0.02534	0.02308
State Government	37	0.03919	0.03084	0.03640	0.05183	0.03354	0.11227	0.03849	0.03052	0.03578	0.03293
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.38183	0.09370	0.19831	0.39283	0.39626	0.26520	0.33224	0.39713	0.39713	0.39713
*** Column Sums ***		0.78943	0.60306	0.66747	0.66867	0.69039	0.67279	0.71641	0.70282	0.73414	0.76800

**Table 14. Direct Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998 (continued).**

		INDUSTRY PURCHASING									
		31	32	33	34	35	36	37	38	39	*Row Sums*
Livestock and Livestock Products	1	0.00001	0.00000	0.00040	0.00003	0.00000	0.00151	0.00290	0.00000	0.00270	0.28385
Other Agricultural Products	2	0.00001	0.00000	0.00104	0.00030	0.00000	0.00143	0.00273	0.00003	0.00424	0.42685
Forestry and Fishery Products	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00073	0.00145	0.00000	0.00017	0.02987
Agricultural, Forestry, and Fishery Services	4	0.00032	0.00040	0.00242	0.00129	0.00015	0.00084	0.00161	0.00002	0.00013	0.02055
Mining, Crude Petroleum, and Natural Gas	5	0.00000	0.00001	0.00001	0.00002	0.11223	0.00000	0.00000	0.00023	0.00010	1.09601
Construction	6	0.00160	0.00280	0.00965	0.01214	0.10703	0.08996	0.16832	0.01372	0.00340	0.79581
Ordnance & Chemical Manufacturing	7	0.00008	0.00134	0.00159	0.00391	0.01529	0.00174	0.00028	0.00011	0.00000	0.13923
Food and Kindred Products	8	0.00000	0.00000	0.00344	0.00507	0.00000	0.00568	0.01043	0.00006	0.02022	0.22842
Textile Products and Apparel	9	0.00020	0.00065	0.00048	0.00067	0.00000	0.00087	0.00121	0.00004	0.00419	0.13111
Lumber and Wood Products	10	0.00013	0.00009	0.00023	0.00044	0.00000	0.00000	0.00000	0.00019	0.00002	0.16064
Paper and Publishing	11	0.00474	0.00124	0.00156	0.01043	0.00041	0.01831	0.00532	0.00025	0.00190	0.14687
Petroleum Refining and Products	12	0.00278	0.00890	0.00288	0.00288	0.09404	0.00998	0.00671	0.00018	0.01674	0.51150
Glass, Stone and Clay Products	13	0.00013	0.00116	0.00002	0.00073	0.00000	0.00142	0.00235	0.00007	0.00025	0.18738
Primary and Fabricated Metals	14	0.00048	0.00249	0.00031	0.00039	0.00265	0.01605	0.00195	0.00410	0.00025	0.25975
Computer, Office and Service equipment	15	0.00028	0.00032	0.00002	0.00020	0.00000	0.00065	0.00000	0.00484	0.00988	0.05612
Electrical Equipment	16	0.00227	0.00620	0.00043	0.00052	0.00000	0.00710	0.00323	0.00241	0.00059	0.51868
I Scientific Instruments	17	0.00048	0.00058	0.00018	0.00395	0.00000	0.00600	0.00065	0.00125	0.00005	0.07367
N All Other Manufacturing	18	0.00096	0.00591	0.00170	0.00296	0.00004	0.00754	0.00294	0.00020	0.00136	0.17913
D Transportation and Warehousing	19	0.00227	0.00523	0.00200	0.00327	0.00459	0.00944	0.00061	0.00024	0.00261	0.48184
U All Other Transportation	20	0.00366	0.00531	0.00266	0.00449	0.04218	0.01170	0.01687	0.00022	0.00492	0.42621
S Communication	21	0.01128	0.00797	0.00731	0.00815	0.00305	0.02956	0.01998	0.00470	0.01684	0.37837
T Electric and Gas Utilities	22	0.00343	0.00914	0.01942	0.01073	0.01988	0.01845	0.02022	0.01389	0.03040	0.67652
R Water and Other Utilities	23	0.00050	0.00264	0.00281	0.00287	0.00199	0.00386	0.00643	0.00031	0.00369	0.14526
Y Wholesale Trade	24	0.00590	0.02434	0.01132	0.01350	0.01038	0.00835	0.01133	0.02897	0.02514	1.10655
Retail Trade	25	0.00093	0.00559	0.00097	0.00118	0.00000	0.01504	0.01753	0.03834	0.21406	0.36067
S Finance, Insurance and Real Estate	26	0.03966	0.05324	0.05703	0.07916	0.01472	0.07003	0.07244	0.00136	0.12181	1.42602
E Hotel Restaurant and Other Personal Services	27	0.00534	0.00984	0.00505	0.00878	0.00008	0.02603	0.01159	0.00100	0.06177	0.28424
L Data Processing and Computer Services	28	0.00863	0.00235	0.00282	0.00616	0.01325	0.01562	0.00696	0.01986	0.00311	0.24389
L Management and Consulting Services	29	0.01335	0.00809	0.00785	0.01562	0.00214	0.01952	0.01170	0.01222	0.00000	0.27544
I Engineering and Related Services	30	0.00022	0.00009	0.00000	0.00019	0.00245	0.01692	0.00954	0.02466	0.00000	0.24527
N Other Business Services	31	0.04627	0.02698	0.04658	0.04491	0.01383	0.01822	0.01312	0.04134	0.00311	1.18538
G Automobile and Other Repair Services	32	0.00889	0.01570	0.01379	0.01127	0.00358	0.01302	0.00980	0.00306	0.03517	0.44746
Amusements, Recreation and Video Services	33	0.00107	0.00026	0.07360	0.00154	0.00000	0.00781	0.00348	0.00036	0.02161	0.20528
Health, Education and Social Services	34	0.00216	0.00196	0.00157	0.01279	0.00046	0.01996	0.01669	0.00634	0.06099	0.15438
Government Services	35	0.00000	0.00000	0.00000	0.00000	0.00000	0.00903	0.00322	0.00463	0.01507	0.03195
Local Government	36	0.02273	0.02453	0.02576	0.02668	0.00000	0.00000	0.00000	0.01106	0.00749	0.59741
State Government	37	0.03234	0.03440	0.05215	0.03949	0.00000	0.00000	0.00000	0.01770	0.00256	1.20032
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.34695	0.21971	0.31840	0.51886	0.40719	0.41233	0.41423	0.43861	0.02075	11.30701
*** Column Sums ***		0.57002	0.48948	0.67743	0.85558	0.87160	0.89470	0.87781	0.69656	0.71729	

**Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998.**

		INDUSTRY PURCHASING									
		1	2	3	4	5	6	7	8	9	10
Livestock and Livestock Products	1	1.23706	0.00245	0.01431	0.00482	0.00466	0.00559	0.00431	0.11049	0.00509	0.00489
Other Agricultural Products	2	0.32824	1.01878	0.00758	0.11546	0.00537	0.00819	0.00686	0.05800	0.00949	0.00562
Forestry and Fishery Products	3	0.00023	0.00017	1.01851	0.00033	0.00042	0.00060	0.00034	0.00030	0.00182	0.00971
Agricultural, Forestry, and Fishery Services	4	0.00108	0.00084	0.00185	1.00107	0.00151	0.00372	0.00139	0.00112	0.00109	0.00157
Mining, Crude Petroleum, and Natural Gas	5	0.03470	0.03144	0.02168	0.03219	1.20469	0.05033	0.05199	0.02560	0.02853	0.03574
Construction	6	0.04828	0.03356	0.06086	0.03830	0.07041	1.04477	0.03849	0.03213	0.03382	0.03645
Ordnance & Chemical Manufacturing	7	0.00976	0.01587	0.00229	0.00426	0.00573	0.00802	1.04176	0.00394	0.00495	0.00405
Food and Kindred Products	8	0.07342	0.01026	0.02934	0.02077	0.01921	0.02391	0.01954	1.07829	0.01896	0.02098
Textile Products and Apparel	9	0.00255	0.00190	0.00263	0.00380	0.00342	0.00443	0.00317	0.00255	1.13583	0.00518
Lumber and Wood Products	10	0.00201	0.00138	0.00201	0.00138	0.00260	0.03213	0.00140	0.00128	0.00125	1.14183
Paper and Publishing	11	0.00624	0.00565	0.00538	0.00606	0.00577	0.00783	0.00806	0.01458	0.00631	0.00723
Petroleum Refining and Products	12	0.03304	0.03407	0.02028	0.03372	0.03606	0.04023	0.03639	0.02193	0.02310	0.03154
Glass, Stone and Clay Products	13	0.00358	0.00360	0.00418	0.00290	0.00699	0.05301	0.00485	0.00235	0.00284	0.00859
Primary and Fabricated Metals	14	0.00535	0.00448	0.00489	0.00353	0.01027	0.02594	0.00666	0.00403	0.00385	0.01288
Computer, Office and Service equipment	15	0.00486	0.00366	0.00469	0.00757	0.00641	0.00896	0.00620	0.00489	0.00674	0.00748
Electrical Equipment	16	0.00487	0.00349	0.00528	0.00575	0.00641	0.01784	0.00529	0.00444	0.00517	0.00672
I Scientific Instruments	17	0.00096	0.00079	0.00281	0.00133	0.00126	0.00308	0.00147	0.00088	0.00098	0.00127
N All Other Manufacturing	18	0.00460	0.00319	0.00392	0.00417	0.00429	0.00827	0.00818	0.01322	0.01632	0.00889
D Transportation and Warehousing	19	0.03992	0.01729	0.00963	0.01821	0.01667	0.03331	0.03963	0.02780	0.01823	0.04450
U All Other Transportation	20	0.03040	0.01280	0.01740	0.03156	0.02453	0.02187	0.02775	0.02274	0.01872	0.02749
S Communication	21	0.02419	0.01694	0.02202	0.02998	0.02630	0.03373	0.02521	0.02053	0.02504	0.02841
T Electric and Gas Utilities	22	0.05594	0.03760	0.03359	0.04378	0.09833	0.05693	0.06140	0.04559	0.05469	0.06009
R Water and Other Utilities	23	0.00834	0.00916	0.00771	0.00669	0.00680	0.00836	0.01042	0.00626	0.00603	0.00806
Y Wholesale Trade	24	0.11393	0.07270	0.03821	0.06474	0.05155	0.07628	0.08644	0.09669	0.07979	0.12391
Retail Trade	25	0.10173	0.07652	0.10363	0.15871	0.13766	0.20936	0.13012	0.10469	0.14094	0.15741
S Finance, Insurance and Real Estate	26	0.22403	0.17210	0.12748	0.18292	0.15522	0.19728	0.14473	0.13100	0.15768	0.17220
E Hotel Restaurant and Other Personal Services	27	0.03629	0.02694	0.03949	0.05453	0.05091	0.06311	0.04916	0.04001	0.05415	0.05839
L Data Processing and Computer Services	28	0.00961	0.00678	0.00946	0.01015	0.01083	0.01264	0.01091	0.00878	0.01016	0.01160
L Management and Consulting Services	29	0.01013	0.00729	0.01194	0.01360	0.01246	0.02293	0.01436	0.01019	0.01143	0.01373
I Engineering and Related Services	30	0.00624	0.00455	0.00828	0.00563	0.01844	0.06766	0.01340	0.00483	0.00526	0.00623
N Other Business Services	31	0.04405	0.03230	0.07095	0.06954	0.05249	0.07346	0.07552	0.06317	0.09437	0.06045
G Automobile and Other Repair Services	32	0.04158	0.03343	0.04123	0.05395	0.03732	0.05683	0.04351	0.03703	0.04026	0.04906
Amusements, Recreation and Video Services	33	0.01394	0.01035	0.01403	0.02101	0.01825	0.02376	0.01755	0.01419	0.01871	0.02060
Health, Education and Social Services	34	0.03194	0.02390	0.03363	0.04808	0.04284	0.05458	0.04002	0.03167	0.04307	0.04815
Government Services	35	0.00735	0.00553	0.00771	0.01138	0.01000	0.01304	0.00933	0.00737	0.01013	0.01122
Local Government	36	0.03501	0.02456	0.03910	0.03780	0.04097	0.05537	0.03815	0.03056	0.03617	0.03820
State Government	37	0.06838	0.04922	0.24229	0.06354	0.17438	0.09474	0.06558	0.05869	0.05967	0.06677
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.45242	0.34187	0.43614	0.71861	0.60197	0.81164	0.58245	0.45822	0.63793	0.70709
*** Column Sums ***		3.15625	2.15740	2.52639	2.93180	2.98341	3.33373	2.73196	2.60005	2.82858	3.06416

**Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998 (continued).**

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		INDUSTRY PURCHASING									
		11	12	13	14	15	16	17	18	19	20
Livestock and Livestock Products	1	0.00500	0.00456	0.00597	0.00522	0.00587	0.00577	0.00452	0.00568	0.00668	0.00645
Other Agricultural Products	2	0.00580	0.00530	0.00698	0.00608	0.00683	0.00679	0.00527	0.00671	0.00770	0.00740
Forestry and Fishery Products	3	0.00033	0.00039	0.00037	0.00030	0.00033	0.00033	0.00025	0.00038	0.00040	0.00036
Agricultural, Forestry, and Fishery Services	4	0.00154	0.00154	0.00197	0.00157	0.00178	0.00230	0.00153	0.00153	0.00156	0.00145
Mining, Crude Petroleum, and Natural Gas	5	0.03069	0.69950	0.13457	0.12078	0.03504	0.03665	0.02881	0.03659	0.07333	0.08743
Construction	6	0.04227	0.07343	0.05273	0.04410	0.04858	0.05533	0.03669	0.04291	0.05437	0.04811
Ordnance & Chemical Manufacturing	7	0.00292	0.01135	0.01072	0.00769	0.00323	0.00701	0.00327	0.00666	0.00311	0.00380
Food and Kindred Products	8	0.02151	0.01909	0.02588	0.02260	0.02546	0.02501	0.01977	0.02459	0.02880	0.02854
Textile Products and Apparel	9	0.00390	0.00342	0.00469	0.00411	0.00468	0.00455	0.00445	0.00614	0.00524	0.00541
Lumber and Wood Products	10	0.00268	0.00263	0.00354	0.00184	0.00183	0.00197	0.00147	0.00396	0.00201	0.00182
Paper and Publishing	11	1.06020	0.00636	0.01052	0.00663	0.00797	0.00767	0.00712	0.00776	0.00899	0.00919
Petroleum Refining and Products	12	0.02617	1.12653	0.04754	0.02952	0.02821	0.02790	0.02248	0.03029	0.09136	0.11677
Glass, Stone and Clay Products	13	0.00304	0.00619	1.13324	0.00440	0.00365	0.00466	0.00724	0.00507	0.00411	0.00413
Primary and Fabricated Metals	14	0.00529	0.00905	0.00933	1.13657	0.02372	0.02626	0.02025	0.02406	0.00572	0.00652
Computer, Office and Service equipment	15	0.00780	0.00646	0.00929	0.00809	1.03495	0.00959	0.00864	0.00908	0.01027	0.01014
Electrical Equipment	16	0.00600	0.00679	0.00713	0.01222	0.22690	1.15741	0.10583	0.01446	0.00861	0.01046
I Scientific Instruments	17	0.00218	0.00158	0.00150	0.00125	0.00287	0.00131	1.01819	0.00530	0.00199	0.00155
N All Other Manufacturing	18	0.00633	0.00589	0.00677	0.00664	0.00991	0.00763	0.00837	1.08927	0.00651	0.01926
D Transportation and Warehousing	19	0.02643	0.02093	0.10589	0.02718	0.01550	0.01684	0.01522	0.02433	1.19276	0.01983
U All Other Transportation	20	0.02292	0.06152	0.04219	0.02549	0.02447	0.02417	0.01874	0.02284	0.04145	1.10354
S Communication	21	0.03105	0.02821	0.03545	0.03083	0.03552	0.03461	0.02881	0.03246	0.04992	0.05122
T Electric and Gas Utilities	22	0.05492	0.17867	0.10275	0.07074	0.06163	0.06825	0.05005	0.06134	0.07349	0.06960
R Water and Other Utilities	23	0.00728	0.00996	0.01064	0.00834	0.00861	0.00857	0.00643	0.00845	0.02428	0.01058
Y Wholesale Trade	24	0.06419	0.08804	0.08935	0.09338	0.14985	0.09666	0.07248	0.10026	0.08587	0.07833
Retail Trade	25	0.16139	0.13668	0.19589	0.16955	0.19187	0.18873	0.14772	0.18616	0.22001	0.20993
S Finance, Insurance and Real Estate	26	0.17623	0.16564	0.21112	0.18427	0.21066	0.20526	0.16283	0.19767	0.25154	0.24000
E Hotel Restaurant and Other Personal Services	27	0.05871	0.05198	0.07164	0.06259	0.06998	0.06866	0.05497	0.06740	0.07959	0.07887
L Data Processing and Computer Services	28	0.01242	0.01359	0.01487	0.01245	0.01754	0.01651	0.01404	0.01432	0.01578	0.03425
L Management and Consulting Services	29	0.01356	0.01486	0.01537	0.01348	0.01584	0.01586	0.02210	0.01576	0.02038	0.01890
I Engineering and Related Services	30	0.00641	0.01749	0.00922	0.00860	0.00843	0.01166	0.00834	0.00784	0.00856	0.00839
N Other Business Services	31	0.07715	0.06265	0.07015	0.06509	0.07869	0.08200	0.07126	0.07126	0.07950	0.09477
G Automobile and Other Repair Services	32	0.04873	0.04723	0.07025	0.05030	0.05389	0.06062	0.04268	0.05508	0.12216	0.06227
Amusements, Recreation and Video Services	33	0.02158	0.01848	0.02553	0.02229	0.02550	0.02499	0.01977	0.02440	0.02940	0.02866
Health, Education and Social Services	34	0.04928	0.04272	0.05902	0.05174	0.05859	0.05818	0.04703	0.05714	0.06558	0.06351
Government Services	35	0.01166	0.00997	0.01394	0.01218	0.01378	0.01355	0.01055	0.01333	0.01544	0.01488
Local Government	36	0.04899	0.05254	0.04750	0.04242	0.04858	0.04760	0.03472	0.04462	0.04794	0.04991
State Government	37	0.08198	0.14409	0.08957	0.07852	0.08069	0.08001	0.05674	0.07340	0.11603	0.08893
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.72656	0.59937	0.87759	0.76608	0.86813	0.85332	0.66743	0.84209	0.97081	0.93876
*** Column Sums ***		2.93510	3.75466	3.63067	3.21514	3.50955	3.36420	2.85606	3.24056	3.83126	3.63392

**Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE, State of New Mexico, FY 1998 (continued).**

		INDUSTRY PURCHASING									
		21	22	23	24	25	26	27	28	29	30
Livestock and Livestock Products	1	0.00680	0.00382	0.00490	0.00607	0.00605	0.00587	0.01305	0.00617	0.00747	0.00658
Other Agricultural Products	2	0.00795	0.00453	0.00582	0.00708	0.00709	0.00690	0.01460	0.00717	0.00774	0.00757
Forestry and Fishery Products	3	0.00042	0.00032	0.00039	0.00038	0.00037	0.00048	0.00038	0.00037	0.00039	0.00039
Agricultural, Forestry, and Fishery Services	4	0.00199	0.00128	0.00146	0.00185	0.00244	0.00314	0.00285	0.00189	0.00193	0.00163
Mining, Crude Petroleum, and Natural Gas	5	0.03649	0.28379	0.05785	0.03637	0.03952	0.03166	0.03952	0.03246	0.03668	0.03421
Construction	6	0.08145	0.12156	0.14470	0.04871	0.05454	0.07272	0.05758	0.04566	0.05049	0.04686
Ordnance & Chemical Manufacturing	7	0.00271	0.00354	0.01227	0.00218	0.00204	0.00210	0.00264	0.00212	0.00478	0.00205
Food and kindred Products	8	0.02911	0.01606	0.02087	0.02625	0.02602	0.02440	0.09564	0.02655	0.02822	0.02815
Textile Products and Apparel	9	0.00559	0.00286	0.00380	0.00574	0.00472	0.00430	0.00520	0.00480	0.00514	0.00507
Lumber and Wood Products	10	0.00281	0.00395	0.00874	0.00213	0.00201	0.00255	0.00210	0.00172	0.00190	0.00185
Paper and Publishing	11	0.00961	0.00535	0.00694	0.01370	0.01108	0.00959	0.00963	0.01170	0.01196	0.00968
Petroleum Refining and Products	12	0.03129	0.03563	0.06095	0.03283	0.03241	0.02689	0.03055	0.02826	0.03224	0.02944
Glass, Stone and Clay Products	13	0.00532	0.00744	0.00994	0.00366	0.00386	0.00517	0.00528	0.00342	0.00712	0.00371
Primary and Fabricated Metals	14	0.00592	0.00756	0.00764	0.00611	0.00479	0.00484	0.00474	0.00530	0.00676	0.00485
Computer, Office and Service equipment	15	0.01075	0.00587	0.00745	0.00934	0.00934	0.00860	0.00879	0.02119	0.01051	0.01029
Electrical Equipment	16	0.02085	0.00657	0.01112	0.01332	0.00767	0.00804	0.00726	0.05409	0.02857	0.00863
I Scientific Instruments	17	0.00167	0.00173	0.03408	0.00146	0.00155	0.00163	0.00164	0.00196	0.00180	0.00169
N All Other Manufacturing	18	0.00647	0.00417	0.01137	0.00646	0.00645	0.00576	0.00880	0.00566	0.00628	0.00579
D Transportation and Warehousing	19	0.01411	0.01372	0.02001	0.01486	0.01400	0.01819	0.02059	0.01271	0.01878	0.01688
U All Other Transportation	20	0.02252	0.03938	0.02340	0.02254	0.02084	0.02200	0.02562	0.02200	0.02597	0.02021
S Communication	21	1.14480	0.02327	0.05015	0.04595	0.04096	0.04251	0.03742	0.05319	0.04640	0.04208
T Electric and Gas Utilities	22	0.06403	1.12796	0.08028	0.06188	0.07680	0.05647	0.08109	0.05664	0.06275	0.06074
R Water and Other Utilities	23	0.00994	0.00617	1.07151	0.00922	0.01094	0.01104	0.01537	0.00808	0.00907	0.00884
Y Wholesale Trade	24	0.05673	0.04442	0.07202	1.06650	0.04731	0.04472	0.08122	0.06927	0.05819	0.04815
Retail Trade	25	0.21602	0.11799	0.16389	0.19391	1.19712	0.17584	0.18492	0.19953	0.20619	0.21113
S Finance, Insurance and Real Estate	26	0.24269	0.14858	0.18133	0.22962	0.28352	1.32716	0.25422	0.23565	0.25072	0.25548
E Hotel Restaurant and Other Personal Services	27	0.07707	0.04446	0.05718	0.06941	0.07174	0.06525	1.07947	0.07137	0.07908	0.07580
L Data Processing and Computer Services	28	0.02301	0.01470	0.01358	0.02055	0.01682	0.02437	0.01484	1.06243	0.03269	0.02454
L Management and Consulting Services	29	0.01964	0.01261	0.01795	0.02434	0.01937	0.02883	0.02233	0.01889	1.05124	0.04998
I Engineering and Related Services	30	0.02209	0.01785	0.01487	0.00829	0.00828	0.01266	0.00836	0.00795	0.03435	1.07633
N Other Business Services	31	0.10312	0.06455	0.09330	0.09690	0.10951	0.10121	0.08833	0.09420	0.11315	0.20554
G Automobile and Other Repair Services	32	0.06539	0.03371	0.04757	0.05947	0.05783	0.05661	0.05770	0.05952	0.06130	0.05535
Amusements, Recreation and Video Services	33	0.12873	0.01576	0.02246	0.02697	0.02658	0.02452	0.02926	0.02799	0.02841	0.02830
Health, Education and Social Services	34	0.06653	0.03671	0.04746	0.05967	0.05933	0.05549	0.05731	0.06245	0.06382	0.06590
Government Services	35	0.01563	0.00852	0.01122	0.01385	0.01405	0.01288	0.01334	0.01444	0.01491	0.01531
Local Government	36	0.06703	0.05072	0.05868	0.04735	0.05778	0.05526	0.06084	0.05684	0.06189	0.06174
State Government	37	0.11663	0.10590	0.10073	0.11560	0.10321	0.18484	0.10751	0.09676	0.10608	0.10599
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Households	39	0.97193	0.51247	0.68797	0.86570	0.87553	0.78180	0.82588	0.90354	0.92956	0.95615
*** Column Sums ***		3.71485	2.95550	3.24585	3.27618	3.33348	3.32627	3.37590	3.39392	3.50455	3.59289

**Table 15. Direct, Indirect, and Induced Coefficients, Input-Output Tables, US DOE,  
State of New Mexico, FY 1998 (continued).**

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		INDUSTRY PURCHASING										
		31	32	33	34	35	36	37	38	39	*Row Sums*	
Livestock and Livestock Products	1	0.00519	0.00416	0.00665	0.00825	0.00659	0.00972	0.01170	0.00620	0.01030	1.58493	
Other Agricultural Products	2	0.00599	0.00483	0.00834	0.00958	0.00784	0.01086	0.01283	0.00719	0.01189	1.78423	
Forestry and Fishery Products	3	0.00032	0.00028	0.00039	0.00046	0.00040	0.00114	0.00189	0.00034	0.00047	1.04547	
Agricultural, Forestry, and Fishery Services	4	0.00150	0.00146	0.00402	0.00310	0.00188	0.00279	0.00366	0.00139	0.00188	1.07411	
Mining, Crude Petroleum, and Natural Gas	5	0.02837	0.03005	0.03624	0.04316	0.23930	0.05394	0.05048	0.03631	0.04898	3.99563	
Construction	6	0.03832	0.03717	0.05725	0.06602	0.15591	0.13914	0.21577	0.05347	0.04965	3.47253	
Ordnance & Chemical Manufacturing	7	0.00171	0.00296	0.00375	0.00660	0.01999	0.00521	0.00387	0.00215	0.00261	1.24569	
Food and kindred Products	8	0.02221	0.01796	0.02829	0.03846	0.02840	0.03841	0.04192	0.02671	0.04476	2.16434	
Textile Products and Apparel	9	0.00420	0.00390	0.00493	0.00668	0.00520	0.00659	0.00685	0.00492	0.00820	1.31074	
Lumber and Wood Products	10	0.00152	0.00143	0.00227	0.00284	0.00506	0.00460	0.00691	0.00209	0.00184	1.26935	
Paper and Publishing	11	0.01117	0.00667	0.00885	0.02011	0.00791	0.02785	0.01394	0.00756	0.00980	1.41865	
Petroleum Refining and Products	12	0.02579	0.02901	0.02908	0.03722	0.14058	0.04682	0.04298	0.02813	0.04333	2.62055	
Glass, Stone and Clay Products	13	0.00303	0.00405	0.00402	0.00556	0.00933	0.00992	0.01465	0.00380	0.00388	1.38179	
Primary and Fabricated Metals	14	0.00402	0.00628	0.00469	0.00571	0.01057	0.02499	0.01027	0.00879	0.00459	1.48708	
Computer, Office and Service equipment	15	0.00829	0.00652	0.00861	0.01205	0.01055	0.01205	0.01108	0.01496	0.01672	1.37871	
Electrical Equipment	16	0.00913	0.01260	0.00752	0.01006	0.00909	0.01917	0.01392	0.01191	0.00928	1.88987	
I Scientific Instruments	17	0.00163	0.00170	0.00162	0.00580	0.00160	0.00793	0.00262	0.00255	0.00163	1.12882	
N All Other Manufacturing	18	0.00509	0.01001	0.00669	0.00930	0.00618	0.01446	0.00956	0.00494	0.00673	1.38182	
D Transportation and Warehousing	19	0.01188	0.01451	0.01339	0.01817	0.02187	0.02762	0.01808	0.01129	0.01525	2.04600	
U All Other Transportation	20	0.01786	0.01827	0.01955	0.02568	0.06978	0.03438	0.03896	0.01689	0.02327	2.13170	
S Communication	21	0.03914	0.03124	0.03872	0.04834	0.03802	0.07049	0.05888	0.03702	0.04711	2.54612	
T Electric and Gas Utilities	22	0.04735	0.04691	0.07135	0.07670	0.09868	0.08554	0.08512	0.06835	0.08391	3.73196	
R Water and Other Utilities	23	0.00699	0.00836	0.01056	0.01272	0.01093	0.01367	0.01600	0.00794	0.01172	1.44004	
Y Wholesale Trade	24	0.04246	0.05603	0.05358	0.06881	0.07010	0.06797	0.07002	0.07415	0.06792	3.88221	
Retail Trade	25	0.16635	0.13455	0.18052	0.24758	0.22024	0.25013	0.25070	0.24262	0.35041	8.03836	
S Finance, Insurance and Real Estate	26	0.20624	0.19148	0.24817	0.32888	0.22946	0.31207	0.30871	0.20079	0.31261	9.41723	
E Hotel Restaurant and Other Personal Services	27	0.06062	0.05390	0.06585	0.09095	0.07307	0.10461	0.08826	0.06854	0.11223	3.54624	
L Data Processing and Computer Services	28	0.01968	0.01178	0.01534	0.02213	0.02775	0.03196	0.02222	0.03316	0.01640	1.71464	
L Management and Consulting Services	29	0.02486	0.01842	0.02184	0.03267	0.01684	0.03737	0.02904	0.02593	0.01562	1.78191	
I Engineering and Related Services	30	0.00668	0.00615	0.00832	0.01005	0.01836	0.03213	0.02836	0.03379	0.00768	1.59801	
N Other Business Services	31	1.09153	0.06679	0.10194	0.11254	0.07611	0.09156	0.08318	0.09926	0.07137	4.25292	
G Automobile and Other Repair Services	32	0.04842	1.04833	0.05862	0.07021	0.05765	0.07184	0.06713	0.05103	0.07612	3.15119	
Amusements, Recreation and Video Services	33	0.02373	0.01806	1.10363	0.03430	0.02814	0.04144	0.03515	0.02702	0.04378	2.12720	
Health, Education and Social Services	34	0.05223	0.04137	0.05630	1.08721	0.06553	0.08994	0.08525	0.06756	0.10350	3.17422	
Government Services	35	0.01203	0.00945	0.01310	0.01783	1.01552	0.02565	0.01954	0.01928	0.02491	1.51380	
Local Government	36	0.05070	0.04869	0.05957	0.06860	0.04229	1.04573	0.04483	0.04550	0.04713	2.87188	
State Government	37	0.08702	0.08430	0.12035	0.12329	0.09397	0.08945	1.08768	0.08133	0.08655	4.83041	
United States Department of Energy	38	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	1.00000	
Households	39	0.74918	0.57997	0.80772	1.11557	0.98471	1.05624	1.03733	0.92741	1.60653	31.03366	
*** Column Sums ***		2.94243	2.66961	3.29163	3.90316	3.92540	4.01540	3.94935	3.36226	3.40054		

**Table 16. Indirect Volume and Employment Impacts by Sector, US DOE,  
State of New Mexico, FY 1998**

Section	Volume		Employment	
	(\$000)	%	Jobs	%
1. Livestock and Livestock Products	18700.	0.4	49.	0.1
2. Other Agricultural Products	21687.	0.5	121.	0.2
3. Forestry and Fishery Products	1031.	0.0	4.	0.0
4. Agricultural, Forestry, and Fishery Services	4201.	0.1	88.	0.2
5. Mining, Crude Petroleum, and Natural Gas	109569.	2.5	372.	0.7
6. Construction	161349.	3.7	1820.	3.5
7. Ordnance and Chemical Manufacturing	6502.	0.2	38.	0.1
8. Food and Kindred Products Manufacturing	80595.	1.9	407.	0.8
9. Textile Products and Apparel Manufacturing	14837.	0.3	159.	0.3
10. Lumber and Wood Products Manufacturing	6312.	0.1	67.	0.1
11. Paper and Publishing Manufacturing	22813.	0.5	259.	0.5
12. Petroleum Refining and Products Manufacturing	84894.	2.0	56.	0.1
13. Glass, Stone and Clay Products Manufacturing	11472.	0.3	113.	0.2
14. Primary and Fabricated Metals Manufacturing	26527.	0.6	231.	0.4
15. Computer, Office and Service Equipment Mfg.	45131.	1.0	265.	0.5
16. Electrical Equipment Manufacturing	35941.	0.8	183.	0.3
17. Scientific Instruments Manufacturing	7702.	0.2	46.	0.1
18. All Other Manufacturing	14892.	0.3	158.	0.3
19. Motor Freight Transportation and Warehousing	34056.	0.8	463.	0.9
20. All Other Transportation	50965.	1.2	614.	1.2
21. Communication	111700.	2.6	952.	1.8
22. Electric and Gas Utilities	206237.	4.8	294.	0.6
23. Water and Other Utilities	23952.	0.6	111.	0.2
24. Wholesale Trade	223761.	5.2	2587.	5.0
25. Retail Trade	732104.	16.9	14872.	28.5
26. Finance, Insurance and Real Estate	605905.	14.0	4680.	9.0
27. Hotel Restaurant and Other Personal Services	206832.	4.8	5890.	11.3
28. Data Processing and Computer Services	100071.	2.3	896.	1.7
29. Management and Consulting Services	78251.	1.8	484.	0.9
30. Engineering, Architecture and Surveying Services	101956.	2.4	839.	1.6
31. Other Business Services	299517.	6.9	2947.	5.6
32. Automobile and Other Repair Services	153972.	3.6	1426.	2.7
33. Amusement, Recreation and Video Services	81543.	1.9	1702.	3.3
34. Health, Education and Social Services	203855.	4.7	3772.	7.2
TOTAL Private Sector	3888833.	89.8	46964.	89.9
35. Government Services	58178.	1.3	627.	1.2
36. Local Government	137306.	3.2	1809.	3.5
37. State Government	245405.	5.7	2839.	5.4
TOTAL Public Sector	440888.	10.2	5275.	10.1
TOTAL Private and Public Sectors	4329721.	100.	52239.	100.

Totals may not add due to rounding

**Table 17. Indirect Volume and Employment Impacts by Major Sector, US DOE,  
State of New Mexico, FY 1998**

Section	Volume (\$000)	Employment Jobs
1. Agriculture	45619.	261.8
2. Mining	109569.	372.2
3. Construction	161349.	1819.7
4. Manufacturing	357616.	1980.8
5. Transportation, Communication, Utilities	426910.	2434.3
6. Wholesale and Retail Trade	955866.	17458.9
7. Finance, Insurance and Real Estate	605905.	4680.4
8. Other Services and Education	1225998.	17956.3
9. Local, State, and Other Government Services	440888.	5275.0
<b>TOTAL</b>	<b>4329721</b>	<b>52239.3</b>

Totals may not add due to rounding

**Table 18. Income and Jobs Impact, US DOE, State of New Mexico, FY 1998**

Section	Income (\$000)	Employment Jobs
Direct Salaries and Wages	1211353.	20214.
Indirect Salaries and Wages	1132153.	46964.
Interest, Dividends, and Rents	383950.	n/a
Total Private Sector	2727456.	67178.
Total Public Sector	167283.	5275.
Transfer Payments	( 0.)	n/a
Net Impact	2894739.	72453.

**Table 19. Type II Multipliers, US DOE, State of New Mexico, FY 1998**

	Economic Activity (\$000)	Income (\$000)	Jobs
Direct Impacts	3017536.	1211353.	20214.
Indirect and Induced Impacts	7224460.	1683386.	52239.
Total Impacts	10241995.	2894739.	72453.
Type II Multipliers	3.39	2.39	3.58