BERKELEY LAB

ECONOMIC IMPACT STUDY

Prepared for:

LAWRENCE BERKELEY
NATIONAL LABORATORY

JANUARY 2007

CBRE CONSULTING, INC.
Sedway Group

CBRE
CB RICHARD ELLIS

CBRE CONSULTING, INC.
Sedway Group

CBRE
CB RICHARD ELLIS

505 Montgomery Street, Suite 600
San Francisco, CA 94111

T 415 781 8900
F 415 733 5530

www.cbre.com/consulting

January 17, 2007

Ms. Therese Powell, Community Relations Officer
Lawrence Berkeley National Laboratory
One Cyclotron Rd., MS 65
Berkeley, CA 94720

Re: Lawrence Berkeley National Laboratory Economic Impact Study

Dear Ms. Powell:

CBRE Consulting is pleased to present this economic impact study for Lawrence Berkeley National Laboratory ("Berkeley Lab"). As requested, this study demonstrates Berkeley Lab's economic benefits to the City of Berkeley, the Bay Area region, and the State of California. It is also intended to be useful to Berkeley Lab in the process of preparing its Long Range Development Plan (LRDP).

On the following pages is a brief memorandum of findings. The summary briefly reviews the data collection process and includes output sheets from the Economic Impact Worksheets, highlighting the economic impact results.

It has been a pleasure working with you on this interesting project. Please call with questions or comments.

Sincerely,

Amy L. Herman, AICP
Senior Managing Director

Jonathan Kuperman
Director

Christine Church
Consultant

Enclosures

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I. SUMMARY OF FINDINGS

PURPOSE OF STUDY

CBRE Consulting was engaged to conduct an economic impact analysis demonstrating the benefits of Lawrence Berkeley National Laboratory ("Berkeley Lab" or "LBL") to the City of Berkeley, the Bay Area region, and the State of California. Such a study is designed to help Berkeley Lab understand and demonstrate its impacts on the local community, the surrounding region, and beyond. These impacts are many, but for the purpose of the study CBRE Consulting focused on job generation, wages, and local and regional spending. At the end of this report is an appendix that explains the study methodology and the various impact effects.

STUDY FINDINGS

The following table summarizes the findings of this study. It was determined that during its 2004 to 2005 fiscal year Berkeley Lab contributed nearly $100 million directly to the economy of Berkeley. Including indirect and induced spending, the contribution rises to almost $180 million. Total economic impact on California for the same period was estimated to exceed $730 million, and Berkeley Lab's gross economic impact on the global economy was estimated at well over $1 billion.

Table 1: Lawrence Berkeley Lab Total Spending, FY 2004-05

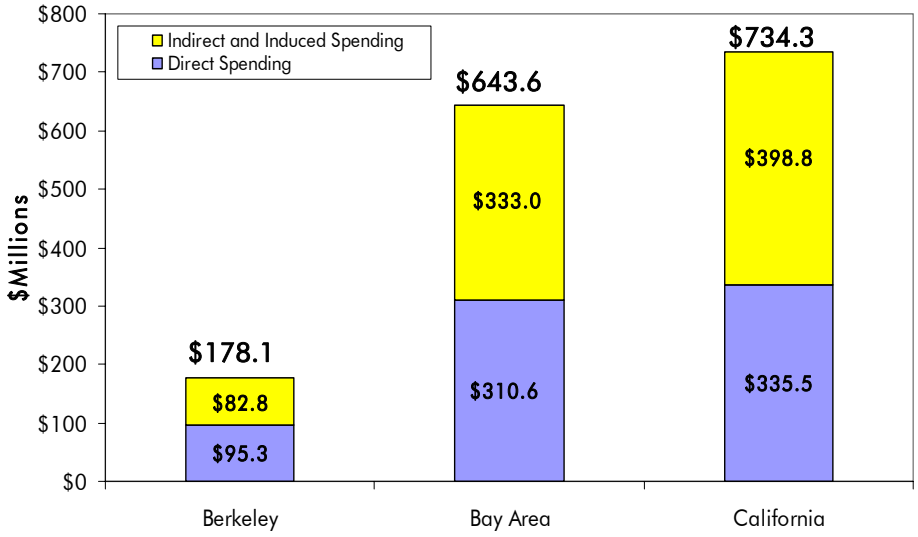
Spending by Geography	Direct Spending (1)	Multiplier (Weighted Average) (2)	Indirect and Induced Spending	Total Direct, Indirect, and Induced Spending (3)	Percentage of Total Impacts
City of Berkeley					
Purchasing	$9,753,791	0.1696	$1,654,487	$11,408,278	
Payroll	$52,850,279	1.3706	$72,435,216	$125,285,495	
Capital Expenditures	$32,653,349	0.2676	$8,738,147	$41,391,496	
Total:	$95,257,419	0.8695	$82,827,850	$178,085,269	17%
All Bay Area (4)					
Purchasing	$47,015,279	0.5170	$24,307,562	$71,322,841	
Payroll	$230,610,241	1.2441	$286,898,507	$517,508,748	
Capital Expenditures	$33,024,477	0.6606	$21,814,380	$54,838,857	
Total:	$310,649,997	1.0720	$333,020,449	$643,670,446	62%
All California					
Purchasing	$68,671,493	0.8979	$61,658,474	$130,329,967	
Payroll	$233,761,124	1.3050	$305,066,901	$538,828,025	
Capital Expenditures	$33,024,477	0.9722	$32,106,108	$65,130,585	
Total:	$335,457,094	1.1889	$398,831,483	$734,288,578	71%
All US/International					
Purchasing	$162,847,759	0.9289	$151,265,555	$314,113,314	
Payroll	$237,794,801	1.7405	$413,870,885	$651,665,686	
Capital Expenditures	$33,024,477	0.9722	$32,106,108	$65,130,585	
Total:	$433,667,037	1.3772	$597,242,548	$1,030,909,585	100%

Note: Figures may not total due to rounding.
(1) Spending and multiplier calculations are cumulative of all inclusive geographies.
(2) Multipliers are not additive.
(3) Total spending is equal to direct spending plus indirect and induced spending.
(4) All Bay Area includes the City of Berkeley.

Sources: LBL Office of Academic Planning and Budget; LBLOffice of Capital and Physical Planning; LBL Office of Design and Construction; LBL Accounting Services Office; and CBRE Consulting.

The findings from Table 1 are also graphically presented in Figure 1. From this, one can visually see that 62 percent of combined direct and indirect/induced spending occurred in the Bay Area, and 17 percent occurred in just the City of Berkeley.

**Figure 1: Total Spending Impacts,
Lawrence Berkeley National Lab, FY 2004-05**



A summary of Berkeley Lab's spending in FY 2004-05 is presented in Table 2, which highlights that total spending that equaled approximately $433.7 million, with $310.6 million occurring within the Bay Area.

Table 2: Lawrence Berkeley Lab Spending, FY 2004-05

Type of Expenditure	Total Spending	Bay Area Spending ($)	Bay Area Spending (%)
Salaries and Wages	$237,794,801	$230,610,241	97%
Goods & Services (1)	$162,847,759	$47,015,279	29%
Construction	$33,024,477	$33,024,477	100%
Total	**$433,667,037**	**$310,649,997**	**72%**

Note: Figures may not total due to rounding.

(1) Includes purchasing for goods and services, and subcontracts.

Sources: LBL Office of Academic Planning and Budget; LBL Office of Capital and Physical Planning; LBL Accounting Services Office; and CBRE Consulting.

Table 2 indicates that Berkeley Lab's spending in the Bay Area accounts for 72 percent of its total spending. Table 2 also indicates that a majority, or 97 percent, of payroll dollars went to Bay Area residents.

TRANSFER OF TECHNOLOGY

In addition to direct, indirect, and induced economic impacts from payroll, purchasing, and capital expenditures, Berkeley Lab also contributes significantly to economic development through the innovation of new technologies. Unlike typical federal investments in a community, such as a military base, a national laboratory provides the added economic benefit of licensing these new technologies to start-up companies as well as to existing companies – creating new companies and new jobs. Although this report does not calculate the full, multiplier impact of these new companies and jobs on the economy, the direct impact on job creation and capitalization is impressive and is growing.

Since 1990, Berkeley Lab technology has formed the basis for over 20 start-ups, creating approximately 1,000 new jobs in these companies alone. The technologies licensed by these start-ups reflect the mission of a national laboratory to tackle society's most difficult problems in medicine, energy, and the environment. A quick sampling of technologies licensed from Berkeley Lab includes genomics-related software, nanotechnology, drug development, x-ray imaging, materials sciences processing, biomolecular tagging, and energy-efficiency home improvements.

From a purely financial perspective, the impact of start-ups and other licensing agreements from Lab technology is significant. The market capitalization of the 20 plus start-up companies grew to over $2.5 billion in 2006. Additionally, licensing income to the Lab from new technologies grew from less than $500,000 in 1997 to more than $2.5 million in 2005. Approximately $800,000 of this licensing income was returned to the inventors.

GUEST RESEARCHERS

In the interest of conservatively estimating Berkeley Lab's total economic impact, CBRE Consulting did not include the significant potential spending by guest researchers. Approximately 2,500 researchers visit as guests each year, which equates to roughly two-thirds the number of Berkeley Lab employees. About 40 percent of these guest researchers are working at Berkeley Lab on an average day. While Berkeley Lab does not compensate them, these researchers unavoidably spend money in Berkeley and the surrounding area during their visit. This spending is directed at accommodations, food, transportation, and more.

II. PAYROLL AND EMPLOYMENT

Payroll and employment for Berkeley Lab have direct, indirect, and induced impacts on Berkeley. Labor covers full-time and part-time employees and includes employees in both research and non-research positions. Part-time employees also include those on variable schedules. All findings relate to FY 2004-05.

EMPLOYMENT (Table 3):

- Berkeley Lab had 2,684 full-time and 675 part-time employees in FY 2004-05.
- Total fiscal year payroll amounted to $237.8 million.
- 487 full-time and 255 part-time Berkeley Lab employees reside in the City of Berkeley.
- Payroll to employees residing in the City of Berkeley equaled $52.9 million.

Table 3: Lawrence Berkeley Lab Employees by Residence Location, FY 2004-05

Employees (1)	City of Berkeley		Bay Area		California		US + International (2)	
	FT	PT	FT	PT	FT	PT	FT	PT
Research	336	184	1,439	407	1,474	420	1,586	452
Non-Research	151	71	1,049	190	1,064	209	1,098	223
Total	**487**	**255**	**2,488**	**597**	**2,538**	**629**	**2,684**	**675**
Payroll	**$52,850,279**		**$230,610,241**		**$233,761,124**		**$237,794,801**	
Guest Employees (3)	233	113	636	297	686	331	868	423

Note: Figures may not total due to rounding. FT= full-time; PT=part-time.

(1) Employment figures reflect actual headcount, not full-time equivalents.

(2) US + International is the equivalent of all of California plus all remaining US and International employees.

(3) Guest employees are not paid by LBL, and therefore are not included in the LBL totals.

Sources: LBL Office of Academic Planning and Budget; and CBRE Consulting.

FULL-TIME EQUIVALENT EMPLOYMENT (Table 4):

- FTE employment in the City of Berkeley was 593.
- Bay Area FTE was 2,752.
- California FTE was 2,810.
- All US/International FTE was 2,977.

Table 4: Total FTE Jobs Produced by Lawrence Berkeley Lab Spending, FY 2004-05

Geography (1)	Direct Jobs (LBL Employment)	Direct Spending	Multiplier (2) (3)	Indirect and Induced Jobs (FTE) (4)	Total Direct & Indirect Jobs	Percent of Total California Jobs
City of Berkeley	593	$95,257,419	9.4688	902	1,495	16%
Bay Area	2,752	$310,649,997	12.9573	4,025	6,777	74%
California	2,810	$335,457,094	13.2205	4,435	7,245	79%
All US/International	2,977	$433,667,037	14.2479	6,179	9,156	100%

Note: Figures may not total due to rounding.

(1) Bay Area includes Berkeley. California includes Bay Area.

(2) Job multipliers are calculated per $1 million of spending.

(3) The Multiplier is equivalent to Indirect and Induced Jobs divided by the result of Direct Spending divided by one million.

(4) FTE was calculated by the Office of Academic Planning and Budget.

Sources: LBL Office of Academic Planning and Budget; LBL Office of Capital and Physical Planning; LBL Accounting Services; and CBRE Consulting

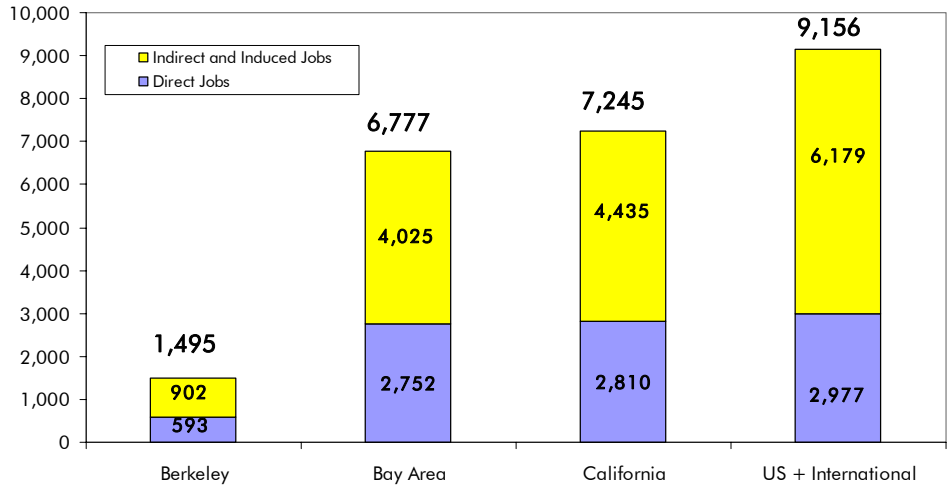
TOTAL INDIRECT AND INDUCED FULL-TIME EQUIVALENT JOBS (Table 4):

- City of Berkeley indirect and induced FTE jobs were estimated to equal 902.
- Indirect and induced FTE jobs in the Bay Area were estimated to equal 4,025.
- Indirect and induced FTE jobs in California were estimated to equal 4,435.
- Total FTE jobs resulting from direct, indirect, and induced spending across all geographies were estimated at 9,156.
-

TOTAL FTE DIRECT AND INDIRECT/INDUCED JOBS PRODUCED BY BERKELEY LAB SPENDING (Table 4 and Figure 2):

- Jobs resulting from Berkeley Lab's spending totaled 7,245 in California, including both direct and indirect/induced, comprising 79.1 percent of all jobs.
- 74 percent of the direct and indirect/induced FTE jobs were in the Bay Area, totaling 6,777 FTE jobs.
- 16 percent, or 1,495, direct and indirect/induced jobs were in the City of Berkeley.

Figure 2: Total Employment Impacts, Lawrence Berkeley Lab, FY 2004-05



III. PURCHASING AND CAPITAL EXPENDITURES

Purchasing for Berkeley Lab encompasses spending for goods and services and has direct, indirect, and induced impacts on the City of Berkeley. Capital expenditures include construction of new buildings, as well as tenant improvements such as retrofitting, demolition, and upgrading of facilities. All findings are presented for FY 2004-05.

The methodology for estimating indirect and induced economic impacts is based on estimates of direct Berkeley Lab purchasing in particular geographic areas. In order to estimate direct purchasing in this way, Berkeley Lab staff identified the addresses of all vendors and employees that received payment(s) from Berkeley Lab during the 2004-05 fiscal year.

DIRECT PURCHASING (Table 5)

- Direct purchasing in the City of Berkeley was approximately $9.8 million.
- Purchasing in the Bay Area totaled $47.0 million.
- Direct spending in all California by Berkeley Lab amounted to $68.7 million.
- Total direct purchasing exceeded $162.8 million.

Table 5: Lawrence Berkeley Lab Purchasing, FY 2004-05

Purchasing by Geography	Direct Spending (1)	Multiplier (Weighted Average) (2)	Indirect and Induced Spending	Total Direct, Indirect, and Induced Spending (3)
City of Berkeley	$9,753,791	0.1696	$1,654,487	$11,408,278
All Bay Area (4)	$47,015,279	0.5170	$24,307,562	$71,322,841
All California	$68,671,493	0.8979	$61,658,474	$130,329,967
All US/International	$162,847,759	0.9289	$151,265,555	$314,113,314

Note: Figures may not total due to rounding.

(1) Spending and multiplier calculations are cumulative of all inclusive geographies.

(2) Multipliers are not additive, and rounding may appear to distort the totals in this table.

(3) Total spending is equal to direct spending plus indirect and induced spending.

(4) All Bay Area includes the City of Berkeley.

Sources: LBL Office of Academic Planning and Budget; LBLOffice of Capital and Physical Planning; LBL Office of Design and Construction; LBL Accounting Services Office; and CBRE Consulting.

INDIRECT AND INDUCED PURCHASING (Table 5):

- Indirect and induced spending created in the City of Berkeley was estimated to equal $1.7 million.
- Bay Area indirect and induced spending was estimated to equal $24.3 million.
- Berkeley Lab indirect and induced spending in California was estimated to equal $61.7 million.
- Total Berkeley Lab indirect and induced spending equaled an estimated $151.3 million.

TOTAL DIRECT AND INDIRECT/INDUCED PURCHASING (Table 5):

- Direct and indirect/induced spending created in the City of Berkeley was estimated to equal $11.4 million.
- Bay Area direct and indirect/induced spending was estimated to equal $71.3 million.

- Berkeley Lab direct and indirect/induced spending in California was estimated to equal $130.3 million.
- Total Berkeley Lab direct and indirect/induced spending was $314.1 million.

MAJOR CAPITAL PROJECTS (Table 6):

- The largest single capital project was the construction of the Molecular Foundry Building, which cost $37.6 million.
- $1.6 million was spent on tenant improvements to the Potter Building.
- $1.2 million was spent on the renovation of the JGI Data Center.
- Capital projects totaled $48.8 million, of which $33.0 million was invoiced in FY 2004-05.

Table 6: Lawrence Berkeley Lab Major Capital Projects, FY 2004-05

Project	Expenditure	
B67 Molecular Foundry Building Construction	$37,626,257	
B977 Potter Building Tenant Improvements	1,606,796	
B400 JGI Data Center Renovation	1,166,579	
B64 Lab & Office Space Renovation	534,747	
Health & Safety Improvements Projects	465,028	
B51 Demolition Relocations	456,533	
B939 Tenant Improvements	436,171	
B943 Electrical System Upgrade for Computer	422,500	
SCADA Fiber Network System Installation	310,966	
All Others	5,822,469	
Total	**$48,848,046**	(1)
Total Capital Projectes invoiced in FY 2004-05	**$33,024,477**	

(1) Major capital projects are total project cost, and not the invoices for this fiscal year.

Sources: LBL Office of Capital and Physical Planning; and CBRE Consulting.

CAPITAL EXPENDITURES (Table 7):

- Berkeley Lab's capital expenditures resulted in an estimated $8.7 million of indirect and induced spending in Berkeley.
- The total economic impact on Berkeley of Berkeley Lab's capital expenditures was estimated to be $41.4 million.

Table 7: Lawrence Berkeley Lab Capital Expenditure, FY 2004-05

Expenditure by Geography	Direct Spending (1)	Multiplier (Weighted Average) (2)	Indirect and Induced Spending	Total Direct, Indirect, and Induced Spending (3)
City of Berkeley	$32,653,349	0.2676	$8,738,147	$41,391,496
All Bay Area (4)	$33,024,477	0.6606	$21,814,380	$54,838,857
All California	$33,024,477	0.9722	$32,106,108	$65,130,585
US + International	$33,024,477	0.9722	$32,106,108	$65,130,585

Note: Figures may not total due to rounding.

(1) Spending and multiplier calculations are cumulative of all inclusive geographies.

(2) Multipliers are not additive, and rounding may appear to distort the totals in this table.

(3) Total spending is equal to direct spending plus indirect and induced spending.

(4) All Bay Area includes the City of Berkeley.

Sources: LBL Office of Design and Construction; and CBRE Consulting.

IV. INCOME

By adding direct, indirect, and induced impacts, CBRE Consulting was able to get a clear picture of total Berkeley Lab income benefits to both the City of Berkeley and the Bay Area. Total direct and indirect/induced income generates a total personal income figure that is unique and separate from total spending.

This indirect and induced income can be thought of as income earned by non-Berkeley Lab employees, but as a consequence of Berkeley Lab's existence. Indirect and induced personal income is income in addition to the direct payroll of University faculty and staff. The indirect and induced personal income impacts are generated by the spending associated with Berkeley Lab payroll as well as goods and services purchases and capital expenditures. The estimated personal income multiplier associated with the Lab's total spending statewide was 0.71 in FY 2004-05, which indicates that $1 of Berkeley Lab spending generated $0.71 in personal income throughout the state. All findings are presented for FY 2004-05.

INDIRECT AND INDUCED INCOME FROM BERKELEY LAB SPENDING (Table 8):

- Of the total $303.7 million in indirect and induced income, $136.8 million is attributed to the Bay Area.
- Approximately $30.9 million in indirect and induced income is attributed to the City of Berkeley.

Table 8: Total Personal Income From Lawrence Berkeley Lab Spending, FY 2004-05

Geography	Direct Spending (1)	Multiplier (1) (2)	Indirect and Induced Income	Total Personal Income Generated	Percent of Total California Income Impacts
Berkeley	$95,257,419	0.32	$30,937,886	$83,788,165	15%
Bay Area	$310,649,997	0.44	$136,767,343	$367,377,584	68%
California	$335,457,094	0.71	$236,657,191	$470,418,315	87%
All US/International	$433,667,037	0.70	$303,758,376	$541,553,177	100%

Note: Figures may not total due to rounding.

(1) Spending and multiplier calculations are cumulative of all inclusive geographies. Direct spending includes payroll.

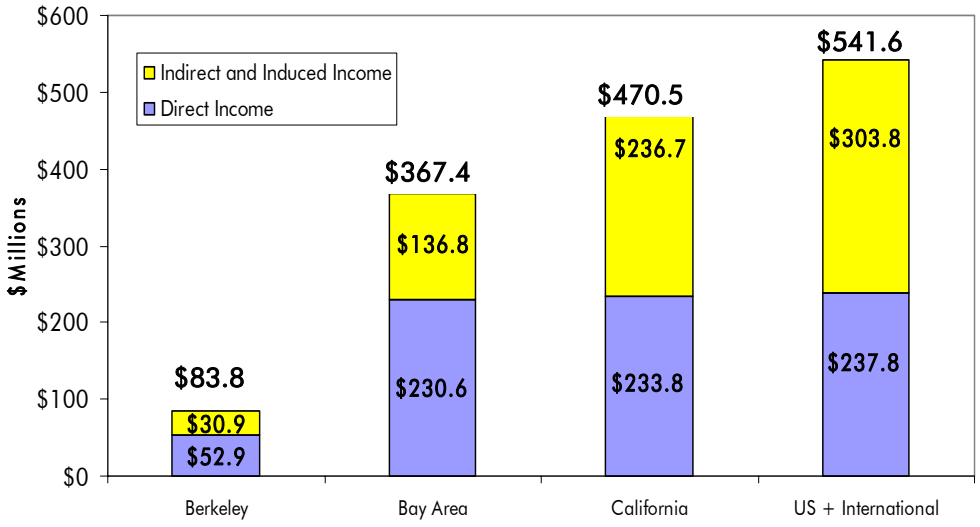
(2) Multiplier is equal to Indirect and Induced Income divided by Direct Spending.

Sources: LBL Office of Academic Planning and Budget; LBL Office of Capital and Physical Planning; LBL Accounting Services Office; and CBRE Consulting.

PERSONAL DIRECT AND INDIRECT/INDUCED INCOME GENERATED FROM BERKELEY LAB (Table 8 and Figure 3):

- Berkeley Lab spending generated a total of $541.6 million in personal income in FY 2004-05.
- 68 percent of the personal income generated by Berkeley Lab was in the Bay Area.
- 15 percent, or $83.8 million, of the personal income generated by Berkeley Lab was in the City of Berkeley.

Figure 3: Total Personal Income Impacts,
Lawrence Berkeley Lab, FY 2004-05



- The Lab generated a total of $367.4 in personal income in the Bay Area.
- A total of $470.4 million of personal income was generated in California by Berkeley Lab.

V. CONCLUSIONS

Berkeley Lab is responsible for millions of dollars of spending in the City of Berkeley, as well as employment and indirect increases in income. The overall benefits also include the transfer of technology in the nature of start-up companies and corresponding jobs, licensing income, and the resultant indirect and induced spending, jobs, and income effects of the technology transfer.

OVERALL BENEFITS TO THE CITY OF BERKELEY (Table 9):

- With overall direct and indirect/induced spending from Berkeley Lab, Berkeley residents and businesses gained $178.1 million dollars in FY 2004-05.
- In FY 2004-05 Berkeley Lab was responsible for 1,495 full-time equivalent jobs in the City of Berkeley.
- Berkeley Lab spending in FY 2004-05 led to $83.8 million in personal income in the City of Berkeley, $367.4 million in the Bay Area, and $470.4 million in California.
- Berkeley Lab spending resulted in total US and International spending of $1.0 billion, 9,156 full-time equivalent jobs, and income of $541.6 million.

Table 9: Lawrence Berkeley Lab Impacts By Geography, FY 2004-05

	Berkeley	Bay Area	California	US/International
Spending				
Direct	$95,257,419	$310,649,997	$335,457,094	$433,667,037
Indirect	$82,827,850	$333,020,449	$398,831,483	$597,242,548
Total Spending	$178,085,269	$643,670,446	$734,288,578	$1,030,909,585
Employment (FTE)				
Direct	593	2,752	2,810	2,977
Indirect	902	4,025	4,435	6,179
Total Jobs	1,495	6,777	7,245	9,156
Income				
Direct	$52,850,279	$230,610,241	$233,761,124	$237,794,801
Indirect	$30,937,886	$136,767,343	$236,657,191	$303,758,376
Total Income	$83,788,165	$367,377,584	$470,418,315	$541,553,177

Note: Figures may not total due to rounding.

Source: CBRE Consulting, Tables 1, 3, and 8.

With hundreds of millions of dollars spent in the City of Berkeley, almost 1,500 full-time jobs (equivalent), and over $80 million in personal income generated, Berkeley Lab has a direct positive impact on the City of Berkeley economy. Berkeley Lab acts as a vehicle for both non-research and high-paying research positions in the Berkeley economy. The prospect for graduate students as well as newly matriculated students from the University of California Berkeley to obtain higher paying research jobs is dramatically increased with the opportunities offered by Berkeley Lab. Berkeley Lab also acts as a catalyst for construction jobs, which will continue in the long term with new development and building improvements at Berkeley Lab.

APPENDIX: METHODOLOGY

STUDY METHODOLOGY

Data provided by Berkeley Lab were entered into a series of linked spreadsheets prepared by CBRE Consulting. The spreadsheets were developed in such a manner that they can be updated in the future by Berkeley Lab.

All data collected and analyzed pertained to the most recent fiscal year for which data were uniformly available from Berkeley Lab (fiscal year 2004 to 2005). Data from Berkeley Lab were generated for four geographic regions, as follows: City of Berkeley, Bay Area (nine-county), the State of California, and all US/International. The data included payroll, spending, and capital expenditures.

CBRE Consulting then analyzed and summarized the data to identify Berkeley Lab's direct impacts on the study geographies. CBRE Consulting quantified the associated indirect impacts (e.g., multiplier impacts). The multiplier impacts of these expenditures and jobs were estimated pursuant to the IMPLAN model for each study geography.[1]

CBRE Consulting developed a basic economic input model to aggregate the data in a meaningful fashion. The model was designed to be relatively automated so that Berkeley Lab can employ it in future years by entering its latest fiscal year data.

THE MULTIPLIER CONCEPT: INDIRECT AND INDUCED ECONOMIC IMPACTS

The impact of Berkeley Lab on the region's economy is greater than the total of Berkeley Lab's direct spending on salaries and wages, goods and services, and construction. The reason behind this is money spent by Berkeley Lab is spent again by the employees and local businesses that are its recipients. Employees use their salaries and wages to purchase from local businesses. Local businesses make their own purchases and hire employees, who also spend their salaries and wages in the local economy. The multiplier represents the number of times each dollar spent by the Berkeley Lab cycles through the relevant economy, generating additional income and jobs before it effectively leaves the system through savings, taxes, and expenditures made outside the region.

Economic multipliers are generated through the use of input-output models. These are statistical models that quantify relationships among industries. They examine the pattern of purchases by industries and the associated distribution of jobs and wages by industry. Input-output models identify, for example, all the industries from which a construction contractor purchases its supplies and in what proportion. In turn, the model then identifies the industries that are suppliers to these suppliers, or "second generation" suppliers. This continues until all major purchases are accounted for contributing to the construction contractor's original purchases. These original purchases are called the "direct sales." All other associated sales from within the supply chain are considered "indirect and induced sales." There are other indirect and induced effects associated with the contractor purchases. These include retail and other expenditures made by the construction workers paid to use the materials purchased by the construction contractor.

[1] The IMPLAN model is an input-output economic model designed to assess multipliers for different industry classifications.

The size of these indirect and induced effects depends upon the definition of the region being looked at as well as the nature of the economy within the region. A large region with a closed economy, which means that most needs are being met by industries located within the region, would keep many of the sales, earnings, and jobs impacts within the region. In a region like this, the multiplier effects would be relatively large, with a large share of the effects captured within the region. In contrast, a small region with an open economy, which means an economy with a limited array of producers providing goods and services, would leak sales to other regions. Because many purchases would be made from industries outside the local economy, the multiplier impacts on the local economy would be minimized.

THE IMPLAN MODEL

There are several input-output models commonly used by economists to estimate the preceding "multiplier" effects. Because of the difficulty of measuring multiplier effects, all of the models have limitations. Still, economists generally agree that the models can provide an approximate measure of the indirect and induced spending, total jobs, and personal income generated by a given amount of direct spending in a particular geographic area. To calculate the multiplier effects of Berkeley Lab's spending, CBRE Consulting used an input-output model developed by the U.S. Department of Agriculture known as IMPLAN (IMpact Analysis for PLANning). The IMPLAN model organizes the economy into 505 separate industries and has comprehensive data on every area of the United States. CBRE Consulting organized all appropriate Berkeley Lab purchasing and payroll into the IMPLAN industry classifications and used the 2002 IMPLAN multipliers for Berkeley, the Bay Area, California, and the US to calculate the total effect of Berkeley Lab's spending for its most recent fiscal year.

METHODOLOGY FOR ESTIMATING DIRECT, INDIRECT, AND INDUCED ECONOMIC IMPACTS

In conducting this analysis of Berkeley Lab's total spending impacts, CBRE Consulting worked with Berkeley Lab to limit the estimates of direct spending to those expenditures that could be identified as having occurred in a specific location. For example, the spending associated with a catered event on the Berkeley Lab campus is counted as direct spending in the location of the vendor providing the catering. On the other hand, the estimates of direct Berkeley Lab spending do not include spending that cannot be attributed to the location where the actual purchase or expenditure occurred. For example, the estimate of direct Berkeley Lab spending for the City of Berkeley does not include Berkeley Lab's reimbursement of a faculty member for a journal subscription, since the reimbursement itself does not reflect the actual location where the journal purchase took place.

There is another important note about the assumptions regarding the geography of impacts. Jobs are counted in the location of the employer, while payroll is assumed to reflect the home address of the employee. For example, for the 2004-05 fiscal year, all direct employment by Berkeley Lab occurs in the City of Berkeley, yet direct Berkeley lab payroll is broken down based on whether the employees live in the City of Berkeley, the Bay Area, or elsewhere in California.

The impact of Berkeley Lab payroll is analyzed differently than the impact of Berkeley Lab goods and services purchasing and capital expenditures. This is because Berkeley Lab's payroll is a direct expenditure of Berkeley Lab, but is also direct income to the residents who are Berkeley Lab employees. The full amount of Berkeley Lab's payroll is counted as direct income, based on employees' places of residence. However, the indirect spending, employment and income

impacts of Berkeley Lab's payroll are based on the spending of Berkeley Lab employees. Employee spending reflects an assumption, provided by IMPLAN, that employee disposable income is equal to 86 percent of earned income. However, this disposable income is not all spent within the location in which the employee lives. Therefore, it was necessary for CBRE Consulting to create assumptions for employee household spending patterns in the City of Berkeley and the surrounding geographies. These estimated "capture rates" are based on several factors, such as the distribution of retail and entertainment venues, the expectation that employees who do not live in Berkeley make expenditures there because of time spent at Berkeley Lab, and a baseline assumption that 30 percent of disposable household income is spent on housing (both rent and mortgage payments) within the employees' home geography. These geographically-specific capture rates were then applied to total disposable income and aggregated within their respective geographies to arrive at a total indirect impact of Berkeley Lab payroll expenditures. Induced spending, employment and income multipliers were then applied to the calculated indirect spending estimates in the same way that they were applied to goods and services purchasing and capital expenditures.

AUTOMATED ECONOMIC IMPACT WORKSHEETS

The model designed for Berkeley Lab is designed to update itself automatically. As long as the purchasing and payroll categories remain the same, the links in the model will update without any additional manipulation to the model. Directions for each sheet are located on the top of each page, and general instructions are included in the "Read Me" tab located at the beginning of the model.

ASSUMPTIONS AND GENERAL LIMITING CONDITIONS

CBRE Consulting, Inc./Sedway Group has made extensive efforts to confirm the accuracy and timeliness of the information contained in this study. Such information was compiled from a variety of sources, including interviews with government officials, review of City and County documents, and other third parties deemed to be reliable. Although CBRE Consulting, Inc./Sedway Group believes all information in this study is correct, it does not warrant the accuracy of such information and assumes no responsibility for inaccuracies in the information by third parties. We have no responsibility to update this report for events and circumstances occurring after the date of this report. Further, no guarantee is made as to the possible effect on development of present or future federal, state or local legislation, including any regarding environmental or ecological matters.

The accompanying projections and analyses are based on estimates and assumptions developed in connection with the study. In turn, these assumptions, and their relation to the projections, were developed using currently available economic data and other relevant information. It is the nature of forecasting, however, that some assumptions may not materialize, and unanticipated events and circumstances may occur. Therefore, actual results achieved during the projection period will likely vary from the projections, and some of the variations may be material to the conclusions of the analysis.

Contractual obligations do not include access to or ownership transfer of any electronic data processing files, programs or models completed directly for or as by-products of this research effort, unless explicitly so agreed as part of the contract.