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**Lawrence Berkeley Laboratory
FY 1994 Site Development Plan**

April 15, 1994

Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

MASTER

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Mission

The Laboratory, established in 1931 by Ernest O. Lawrence as a single-purpose accelerator-based University research facility, has evolved into a multiprogram national laboratory with a mission to:

- Perform leading multidisciplinary research in the energy sciences, general sciences, and biosciences in a manner that ensures employee and public safety and the protection of the environment. The energy sciences include materials research, chemistry, earth science, and energy and environmental research. The general sciences include nuclear and high-energy physics and accelerator research. The biosciences include the life sciences and structural biology research.
- Develop and operate unique national experimental facilities for use by qualified investigators from throughout the world, including the Advanced Light Source, the 88-Inch Cyclotron, the National Center for Electron Microscopy, and the National Tritium Labeling Facility.
- Educate and train future generations of scientists and engineers. 440 graduate students pursue research at LBL with about 1,000 students receiving advanced degrees each year. Precollege programs are conducted for science educators and students.
- Foster productive relationships with industry. The Center for Advanced Materials, the Center for X-Ray Optics, and the California Institute for Energy Efficiency are examples of collaborations with industry. Technology transfer programs promote the application of research results.

Workload and Site Population

Program and Workload Areas. LBL programs are primarily supported by the DOE Office of Energy Research (54%). The largest programs are in Basic Energy Sciences, Nuclear Physics, High Energy Physics, and Health and Environmental Research. Energy Efficiency and Renewable Energy (9%) supports studies in building energy conservation, energy storage, and solar and geothermal energy. Other DOE-sponsored programs (16%) include environmental restoration and waste management, radioactive

waste disposal, and fossil energy. Work for other agencies and institutions (21%) is primarily for the National Institutes of Health, Department of Defense, state agencies, and private industry. Projected costs for FY 1994 are \$277 M.

Laboratory Population. In 1993, the Laboratory's employee population consisted of 3,595 full- and part-time employees, equating to 2600 full-time employees (see Fig. below).

Laboratory Population in 1993.

LBL maintains a register of official guests, updated monthly, which contains 1,533 registered guests at the end of 1993. About 600 of these guests were on site at any one time, so that total Laboratory population was close to 4,200. Of this total, 3,480 are located at the main site, 500 located in UC Berkeley Campus buildings, and 130 located in off-site leased buildings. The 20-Year Plan would allow additional growth up to a total Laboratory average daily population of 4,750, including 640 on the Campus.

Site and Regional Information

The 54-hectare (134-acre) Laboratory site, located within 478 hectares (1180 acres) of University of California land, is leased by DOE through a series of 50-year lease agreements. The Laboratory is in Alameda County (population 1,280,000), with the eastern section in the City of Oakland (370,000) and the western section in the City of Berkeley (103,000). Although the area is largely urban and is served by interstate highways and an extensive public transit system, the Laboratory site has hilly topography with areas of steep slopes and trees that give LBL a rural character.

- **Land Use and Topography.** The Laboratory is on a hillside with elevations between 150 and 300 meters (500 to 1,000 feet). The site is zoned governmental and institutional by the cities of Berkeley and Oakland. On all sides of the Laboratory is a buffer zone of University land. In addition, the SDP provides for landscape buffer zones between LBL facilities and the Laboratory boundary and includes guidelines to ensure compatibility with land use outside the University buffer zone.
- **Transportation Systems.** The Laboratory and the cities of Oakland and Berkeley are served by a network of public transit systems, three international airports (San Francisco, Oakland, and San Jose), two railroads, the Bay Area Rapid Transit system (BART), and a network of interstate freeways and state highways. In addition, LBL operates shuttle buses around the site and between the Laboratory, the Campus, and downtown Berkeley.
- **Public Utilities and Community Services.** LBL purchases most of its electricity from the Western Area Power Administration (WAPA). Gas is purchased from the Defense Fuel Supply Center (DFSC). Adequate capacity is expected for the foreseeable future. Electricity and gas are supplied over Pacific Gas & Electric (PG&E) transmission facilities. Water is supplied by the East Bay Municipal Utilities District. On-site storage and reservoirs adjacent to LBL provide water for anticipated emergency needs. The Utility District is currently expanding its supplies and storage capacity. The Laboratory provides its own fire protection service and participates in a mutual aid agreement with the University and the City of Berkeley. Several hospitals are nearby.
- **Condition of Buildings and Other Improvements.** LBL research and support activities are conducted in structures totaling 180,000 gsm (1.97 Mgsf) (see Fig. above). In FY 1993 the average age of the main-site buildings was 34 years. The inventory of

LBL 1992 Space Distribution.

building space, including current construction, is: Adequate—50,586 gsm (544,500 gsf); Substandard, can be made Adequate—82,479 gsm (887,800 gsf); and Substandard, cannot be made adequate—20,132 gsm (216,700 gsf).

- **Utilities.** LBL's utilities distribution systems (mechanical, electrical, and communications) are underground. Many portions were initially sized to serve large accelerators and can meet present and future requirements. Aged segments require rehabilitation to improve flexibility and reliability. Utility systems undergoing rehabilitation include natural gas, domestic water, cooling water, electrical power, sanitary sewer, compressed air, storm drainage, standby electricity, and alarm and security.
- **Circulation and Traffic.** LBL traffic circulates along an east-west central serpentine road, with north and south loops. Gates to the Laboratory are located at the ends of the central east-west road. These main roads were designed in the 1940s and early 1950s and no longer meet construction or safety standards. Nearly 7,000 vehicle trips per day are made to LBL, including 77 shuttle-bus trips off site and 102 on site. The off-site shuttles carry an average of about 1,400 passengers per day. Parking space is provided for 1,800 employee vehicles, with 2.0 employees per parking space.

Program Projections and Requirements

Mission Projections. LBL's research and support trends are assessed and described in the FY 1994–1999 Institutional Plan. The major changes in mission activity are in response to DOE's national programs in the Office of Basic Energy Sciences and the Office of Health and Environmental Research. In response to national needs for high-brightness synchrotron radiation facilities, LBL has completed construction of the Advanced Light Source. The Light Source provides the world's brightest beams of soft x-ray and ultraviolet light for use in materials science research, chemistry, biology, and other fields. The Light Source provides ports for up to 55 end stations, including use by up to 200 guests at any one time. LBL must provide the research and facilities infrastructure to support this user community.

LBL, in coordination with other national laboratories, has prepared conceptual designs for a Chemical Dynamics Research Laboratory for advanced studies in reaction science and combustion chemistry. Other future projects include improvements to the National Center for Electron Microscopy, and strengthened programs in the Center for Advanced Materials and in the life sciences.

Specifics on the new program and support facilities required are given below in the functional areas of the Master Plan and the Five-Year Construction Plan.

Energy Sciences. The scientific outlook for the Energy Sciences is affected by developments in many scientific fields, but especially research in energy supply and efficiency technologies and in chemistry, geology, materials science, and physics. New program-related projects represent approximately 70% of LBL's anticipated increase in personnel or approximately 80% of the added LBL building area. The Laboratory views the following future research trends as important:

- Energy-use research important to national energy security will emphasize advanced high-efficiency combustion, energy storage, electric lighting, energy-intensive chemical processes, and energy flows through walls and windows. Reducing reliance on natural gas and other fossil fuels can mitigate emissions

and waste disposal problems. Design of a new facility for support of building technologies is in process.

- Materials science research growth areas will support key materials of national interest, including materials with reduced dimensionality, high-temperature superconductors, semiconductors, composites, ceramics, light alloys, and polymers.
- Chemistry of inorganic and complex organic molecules will require advanced facilities using intense photon beams, nuclear magnetic resonance spectroscopy, and laser spectroscopy.
- Earth sciences research will include geophysical investigations of the continental crust and physical and chemical studies of geological materials, including petroleum and geothermal reservoirs, and processes involving the transport and transformation of chemicals in complex geological structures. LBL requires staging areas, laboratories, and complete facilities to meet these needs.

General Sciences. LBL's general sciences programs are developed in conjunction with the high-energy and nuclear physics communities and with Federal programs in fusion research. New program-related projects represent no planned net increase in building area. LBL's general sciences programs include the following developments:

- Nuclear physics research will emphasize techniques that probe or alter the state of nuclei to explore nucleonic, hadronic, and quark-gluon matter. The Gammasphere at the LBL 88-Inch Cyclotron is central to continued research in nuclear structure. The STAR experiment collaboration is being planned at the Relativistic Heavy Ion Collider under construction at Brookhaven National Laboratory, and experimental facilities for studying unstable nuclei within an isospin laboratory are being considered at LBL.
- LBL will continue its high-energy physics research programs at the Tevatron and is a partner in the recently funded B-Factory upgrade at the Positron-Electron Project at the Stanford Linear Accelerator.
- LBL will continue its leading research in developing heavy-ion prototype accelerators for fusion in support of a technology that

would ultimately employ accelerated beams of ions to ignite fusion fuel pellets. These research studies include Elise. (The fuel pellet research will be conducted by other laboratories.) The development of neutral-beam testing facilities to evaluate supplemental plasma heating will continue in support of the magnetic-fusion program for the International Thermonuclear Experimental Reactor.

Biosciences. The support for human genome research is expected to grow, requiring an expansion of life-sciences-related facilities, and specifically completion of the recently funded Human Genome Laboratory. In addition, LBL supports DOE's structural biology initiative through the Laboratory's instrumentation and mezzanine improvements at the Advanced Light Source (ALS), which will occupy existing buildings. New program-related projects represent approximately 10% of LBL's anticipated increase in personnel or approximately 20% of the added LBL building area. Programmatic growth areas are as follows:

- Physical mapping and eventual sequencing of the human genome will be emphasized, including human genome structure and expression, robotics, novel instrumentation, development of advanced computation techniques, and medical genetics.
- Structural biology research will be directed toward determining the relationship between the structure of biological macromolecules and their functions. The application of synchrotron radiation and advanced computational techniques will allow the determination of the three-dimensional structure of proteins and nucleic acids.
- Biomedical research will continue the application of advanced technology to study, diagnose, and treat human disease through innovations in positron emission tomography (PET), NMR, and charged-particle radiation therapy and radiosurgery. A Biomedical Isotope Facility is under construction at an existing building to advance PET research.
- Environmental and health-effects research will include atmospheric chemistry and transport, deposition, and ecological effects of combustion products. Studies of sources and transport of chemicals from the subsurface environment will cover contamination of groundwater, radon exposure, and other pollutants.

Laboratory Projected Resources and Workload. Laboratory operating costs are projected to increase from \$210 M in 1994 to \$234 M in 1999. Total Laboratory funding, including equipment and construction, is projected to increase from \$275 M in 1994 to \$299 M in 1999. Near-term workload increases are projected, based on the operating budgets of the ALS, human genome program, and initiatives associated with DOE's Division of Chemical Sciences.

Population Projections. The main-site population is projected to increase from 3,500 in FY 1994 to approximately 3,800 in FY 1999. The total projected Laboratory population will increase from 4,195 in FY 1994 to approximately 4,390 in FY 1999. The long-term projected growth at the site, identified in the 1994 LIFP, allows for an average daily main-site population of 4,100. The potential total Laboratory population (includes main site, Campus, and off-site areas) of 4,750 could be obtained within the 20-year master plan if national and regional programs require this growth.

Master Plan

Site planning at the Laboratory reflects long-range institutional goals and values based on the University's management of LBL to support DOE missions. The site development planning objectives are to:

- Evaluate future mission projections and anticipate DOE national research facility needs;
- Ensure a safe and healthful workplace in full compliance with building and fire codes;
- Protect the environment and buffer activities to enhance adjacent land uses;
- Protect the national investment in valuable government-owned research and support assets;
- Consolidate research and support services through proper siting of new buildings and maintenance of functional units;
- Improve access and communications within and to the Laboratory; and
- Promote cost reductions and energy conservation through efficiencies in building design and location, operations and maintenance, and parking and transportation.

Five LBL site master plan concepts accommodate the facilities improvement needs within existing geophysical, environmental, and operational conditions. They provide a basis for understanding and evaluating the more detailed elements of specific projects, planned locations, and other site improvement projections. The site planning concepts are to:

- Consolidate activities within seven functional planning areas to enhance efficiency and effectiveness and to provide specialized research facilities;
- Redevelop obsolete buildings and deteriorated infrastructure, eliminate temporary structures used for permanent functions, and improve building arrangements to increase safety and energy efficiency;
- Concentrate development along the east-west circulation and utilities axis to enhance transportation and service systems (e.g., develop off-road parking and improve pedestrian paths);

- Improve and maintain perimeter and internal buffer zones to screen noise-generating activities and minimize potential incompatibility between adjacent operations; and
- Provide off-site facilities for receiving, warehousing, and other support and research activities suitable for decentralization.

Design guidelines for site development have been developed to achieve specific improvements while respecting site constraints, and have provided coherence between buildings and their surroundings. These guidelines, described in more detail in the LIFP, address the following areas: safety considerations; utilities corridors; building mass, orientation, and exteriors; energy and operational efficiency; building use flexibility; circulation and parking; topography and grading; landscaping and open space; and guideline conformance review.

Facility and Land Requirements. If all the sites and buildings were developed in accordance with the 20-Year Plan, the result would be a net increase of approximately 40,000 gsm (0.4 Mgsf) to the existing main site of the Laboratory, for a total of approximately 190,000 gsm (2.0 Mgsf). For comparison, the 1993 total, including current construction, consisted of 150,000 gsm (1.62 Mgsf) at the main site (see table that follows). The 20-Year Plan increases provide for growth in life sciences, chemistry and materials sciences, conservation and renewable energy, earth sciences, and fossil-energy research. The SDP calls for the removal of 20,000 gsm (0.2 Mgsf) of buildings and the renovation of 70,000 gsm (0.8 Mgsf) of building space. Building sites are planned or reserved for 60,000 gsm (0.6 Mgsf) of new construction. As indicated in the Planning Analysis section, increases are primarily for programmatic purposes. Proposed general-purpose facilities replace existing obsolete facilities.

Future Land Use. 32 hectares (80 acres) of the site are currently in undeveloped open space. Some of the open space is within buffer zones where development is limited for a variety of reasons. If all projects identified in the 20-Year Plan were completed, 31 hectares (78 acres) would be retained as open space and buffer. The proportion of the LBL main site that has been improved with structures, utilities, or roads would

change from the current 38% to 42% (see table that follows). Nine buffer zones are described in the LIFP, with specific planning criteria identified.

Facility and Land Requirements		
	1993	20-Year Plan
Buildings	150,000 gsm (1.62 Mgsf)	190,000 gsm (2.0 Mgsf)
Undeveloped Land	32 hectares (80 acres)	31 hectares (78 acres)
Improvements (% of total land area)	38%	42%

Future Major Facility Locations and Functional Areas. The functional planning areas are groupings of related facilities that enhance work efficiency and effectiveness. Building clusters form the core of each functional area, with circulation access, service, and parking at the perimeter. The 20-Year Plan identifies changes to each of the functional planning areas to accommodate potential research activities and to conform to LIFP objectives, planning concepts, and design guidelines.

The natural constraints of the site coupled with the desirability of maintaining efficient programmatic development delineate the seven functional planning areas:

- *88-Inch Cyclotron Research Area*, located on a hillside terrace near the Main Gate, currently includes buildings totaling 4,810 gsm (51,800 gsf). The area is expected to continue to be dedicated to the operation of the 88-inch Cyclotron and required support facilities. A second floor addition to support users of the Gammasphere and other experiments is under construction.
- *Central Research and Administration Area* houses the LBL Director's Offices and the main offices for Administration, Planning and Development, Accelerator and Fusion Research, Earth Sciences, Energy and Environment, Engineering, Information and Computing Sciences, Nuclear Science, and Physics. The majority of LBL's light laboratories and support offices, as well as the cafeteria and reception center, are included within these complexes, with a total of 45,140 gsm (485,900 gsf) in building space. Current plans call for many building projects, including

additional floors for Buildings 50E and 50F, a new reception center, and the development of a conference facility. Projects in slope stabilization and in seismic rehabilitation of Building 90 are in progress.

- *Bevalac Accelerator Complex* currently includes 33,270 gsm (358,100 gsf) of building space. These facilities are located on three benches separated by steep slopes. Existing facilities include the Bevalac, heavy laboratory experimental areas, Biomedical Isotope Facility, staging areas, associated offices, and facilities for advanced accelerator research and development. The proposed Master Plan anticipates the reuse of buildings for accelerator facilities and experiments, including the Electric Induction Systems Experiment. This area already has an extensive array of support utilities, crane and hoisting equipment, and related resources. Proposed new experiments could be located in the existing Experimental Particle Hall, Building 51B, requiring little or no expansion of existing structures. Eventual decommissioning of the Bevatron and SuperHILAC accelerators and shielding is expected.
- *Light Source Research and Engineering Area* encompasses approximately 6 hectares (15 acres), with buildings currently totaling 33,940 gsm (397,600 gsf). Projects planned to utilize the ALS facility include the ALS Beamlines Initiative, the ALS Structural Biology Support Facility, the Chemical Dynamics Research Laboratory, and an ALS reception center. A special research facility zone has been established around the perimeter of the ALS to reserve areas for programs requiring the use of the ALS photon beams.
- *Shops and Support Facilities Area* includes 16,160 gsm (174,000 gsf) of building space in an area adjacent to the Laboratory's Grizzly Gate entrance. Uses currently include Craft, Construction, and Maintenance Shops; Supply Shops; Supply Services; Transportation and Motor Pool; Mechanical Shops; the Environment, Health and Safety Division; and the National Tritium Labeling Facility. The Hazardous Waste Handling Facility is being relocated from this area to the Life Sciences Research Area. Consolidation of support facilities will continue with the construction of

the Safety and Support Services Facility and a proposed Facilities Building.

- *Materials and Chemistry Research Area* includes the Materials and Molecular Research Laboratory, the National Center for Electron Microscopy, and the Surface Science and Catalysis Laboratory. Current building area totals 11,500 gsm (124,000 gsf). Plans include upgrades to the National Center for Electron Microscopy as well as a high bay addition to Building 62. All new development must take into account the visibility of this area from campus locations, including Strawberry Canyon below. The "Chicken Creek area" affords potential for additional facilities for research in cooperation with the UCB Campus.
- *Life Sciences Research Area* includes 4.4 hectares (11 acres) located in upper Strawberry Canyon in the easternmost portion of the LBL site, also known as the East Canyon. Existing buildings include the Cell and Molecular Biology Laboratory, the Laboratory for Cell Biology, the new Hazardous Waste Handling Facility (under construction), and the recently funded Human Genome Laboratory. Proposals for this area include expansion of the Life Sciences facilities, a parking structure, and an office/bridge structure to provide safe pedestrian passage between buildings.

Utilities Systems. Many of the utilities systems were initially installed during the 1940s and require upgrades or replacement to achieve improved levels of reliability and service capacity. Many systems have adequate capacity but require extensions or improvements to achieve

satisfactory performance and maintenance efficiency.

- *Electrical Utilities.* LBL's power-distribution system comprises a main 12-kV switching center at the Grizzly Utility Substation and 24 substations with 32 km of 12-kV cable. A six-phase electrical system rehabilitation and improvement program will install six 12-kV switching stations throughout the Laboratory site and replace five aged and obsolete substations and all of the underground 12-kV distribution cable.
- *Mechanical Utilities.* Mechanical utilities comprise domestic and cooling water, storm drains and sanitary sewers and natural gas, compressed-air, and vacuum systems. These utilities are up to 40 years old, and many are undersized for current Laboratory demands. The 10-Year and 20-Year Plans provide for the orderly replacement of these utilities.

Utilities and fuel usage.

Utility system	FY 1992 usage
Electricity	81,000 MWh
Natural gas	12.07 m ³ (130 million cu ft)
Domestic water	265 million L (70 million gallons)
Vehicle gasoline	326,670 L (86,300 gallons)
Diesel fuel	105,990 L (28,000 gallons)
Liquified petroleum gas	4,920 L (1,300 gallons)

Table 1

LAWRENCE BERKELEY LABORATORY CONSTRUCTION PLAN

FY 1996-FY 2000

Plan for Programmatic and General Purpose Facilities, Including Funded, Budgeted and Proposed Construction (FY BA, \$M)

FY	Project	Scope	TEC	Prior*	1996	1997	1998	1999	2000	2001	2002
FUNDED PROGRAM RELATED PROJECTS:											
94	Human Genome Laboratory (KIP)	3,809 gsm (41,000 gsf)	24.700	17.934	5.766	1.000					
	ALS Structural Biology Support Facilities	1,031 gsm (11,100 gsf)	7.900	5.282	2.618						
	SUBTOTAL - FUNDED PROGRAM RELATED		32.600	23.216	8.384	1.000					
FUNDED MEL-FS PROJECTS (KG):											
93	Fire & Safety Systems Upgrade Proj. Ph I		4.600	3.470	1.130						
	Hazardous Materials Safeguards, Ph. I		4.720	3.432	1.288						
	SUBTOTAL - FUNDED MEL-FS PROJECTS		9.320	6.902	2.418						
FUNDED ERWM PROJECTS:											
88	Hazardous Waste Handling Facility**	1,198 gsm (12,900 gsf)	12.625	12.454	0.171						
	SUBTOTAL - FUNDED ERWM PROJECTS		12.625	12.454	0.171						
	TOTAL FUNDED		54.545	42.572	10.973	1.000					
BUDGETED MEL-FS PROJECTS (KG)											
94/95	No new project starts in FY 1995										
	TOTAL FUNDED and BUDGETED		54.545	42.572	10.973	1.000					
PROPOSED PROGRAM RELATED PROJECTS:											
96	ALS Beamlines Initiative (KC)	1,877 gsm (20,200 gsf)	52.6		11.6	23.9	17.1				
	Elise (AT)	595 gsm (6,400 gsf)	20.2		5.0	5.4	5.6	4.2			
	Chemical Dynamics Research Laboratory (KC)	3,066 gsm (33,000 gsf)	61.9		7.8	18.4	17.7	11.8	6.2		
	NCEM Electron Beam Microchar Facility (KC)	900 gsm (10,000 gsf)	15.9		1.0	7.8	6.7	0.4			
	TOTAL - PROPOSED PROGRAM RELATED		150.6		25.4	55.5	47.1	16.4	6.2		
PROPOSED MEL-FS PROJECTS:											
96	Safety & Support Services Facility	2,990 gsm (32,200 gsf)	12.8		1.4	0.8	10.0	0.6			
	Upgrd of Site Mech Util, Ph II - Sewer Monit		8.4		1.0	3.6	3.7	0.1			
	Sanitary Sewer Restoration	1,036 m (3,400 ft)	2.4		0.4	1.6	0.4				
	Mechanical Equipment Replacement, Ph I		4.5		0.5	3.8	0.1	0.1			
97	Envir Monitoring & Industrial Hygiene Bldg	2,973 gsm (32,000 gsf)	24.9			4.0	9.0	7.0	4.9		
	Roadway Safety & Stabilization, Phase I		7.0			1.0	3.0	2.0	1.0		
	LBL Communcns Conduit Infrastruc Impvmts		3.8			0.6	2.0	1.0	0.2		
	Upgrade LBL Radio Communications System		4.7			0.7	2.3	1.0	0.7		
	Facilities Building	2,657 gsm (28,600 gsf)	16.5			2.5	6.0	4.5	3.5		
98	Medical Serv Asbestos Abatement & Rehab		3.2				0.3	2.1	0.8		
	Roof Replacements, Ph II		7.5				0.7	3.8	3.0		
	Elec Sys Rehab, Ph IV - BBC Swch Sta Replc		7.4				0.7	3.6	3.1		
	Old Town Parking Structure	3,252 gsm (35,000 gsf)	3.0				0.3	1.6	1.1		
99	Blackberry Canyon Parking Structure		23.0					3.5	7.0	7.0	5.5
	Admin Services Addn - Bldg 50E/F 2nd Fl	1,709 gsm (18,400 gsf)	9.4					1.4	3.0	3.0	2.0
	Fire & Safety Systems Upgrd Project, Ph II		5.7					0.9	2.4	2.4	
	Hazardous Materials Safeguards, Phase II		8.1					1.2	3.5	3.4	
00	Research Incubator Facility		13.8						1.8	6.0	6.0
	Technology Transfer Building		9.2						1.2	5.0	3.0
	Maintenance Bldg Replcmt, Ph I - Bldg 76	2,787 gsm (30,000 gsf)	6.5						0.6	3.1	2.8
	SUBTOTAL - PROPOSED MEL-FS PROJECTS		181.8		3.3	18.6	38.5	34.4	37.8	29.9	19.3
	TOTAL FUND, BUDGT & PROP MEL-FS PROJ		191.1	6.9	5.7	18.6	38.5	34.4	37.8	29.9	19.3

*Prior costs from previous years.

**Request \$171K in FY96 based on the recision of this amount in the FY93 Budget.

August 1993 escalation rates @ FY96 3.9%, FY97 3.8%, FY98 3.6%, FY99 and beyond 3.7%. Elise uses Feb 1994 escalation. Overhead @8.61% on TEC.

Overhead factor is subject to change.

Long-term projects also under consideration are IsoSpin Laboratory, National Biomedical Tracer Facility, Molecular Design Institute, and Building Technology Initiative.

4/12/94

Management Considerations

If LBL is to remain a forefront research institution, it must have resources to solve its facility-related problems. These problems stem from obsolete buildings, deteriorating utilities, and changes in scientific needs. Many LBL laboratories and shops were designed for temporary service during World War II. They are 30 to 50 years old and inadequate for today's technological demands and need improved safety, mechanical, electrical, and structural systems to meet current design standards and comply with building, fire, and safety codes. These management considerations outline needs and the proposed resolutions in the following areas:

- Upgrading or replacing deteriorated buildings and infrastructure
- Providing new research facilities
- Decommissioning and decontamination of the Bevalac

Upgrading and Replacing Deteriorated Buildings and Infrastructure. The proposed Safety and Support Services Facility (SSSF) has been the highest-priority MEL-FS project for many years. It would enable the EH&S Department, Central Stores and Materiel Management, and Electronics Engineering to move from temporary trailers and substandard and obsolete buildings into space near allied operations. Although the SSSF was funded in FY93, these funds were subsequently rescinded.

New state and local environmental protection measures require LBL to monitor sanitary sewer discharge for hazardous waste. Being over 50 years old, unreliable and costly to operate and maintain, sections of the sanitary sewer show signs of imminent leakage or failure. Some underground utilities and cooling towers were replaced by the Upgrade of Site Mechanical Utilities Project—Phase I. However, funds withdrawn from the proposed second phase of this project has impacted LBL's ability to meet new regulations.

In recent years, LBL has carried out regular seismic reevaluation of buildings and nonstructural elements. The current Building 90 Seismic Rehabilitation Project is a direct result of this process. LBL is currently proposing \$250K per year to remedy known deficiencies in the

seismic anchorage of emergency generators, boilers, and associated piping. It was recently discovered that Building 77 has settled, weakening the building and decreasing the safe capacity of two cranes. To address these problems LBL is proposing the Building 77 Seismic and Settlement Remediation Project for FY96 funding.

As LBL's highest-priority projects, the SSSF and Upgrade of Site Mechanical Utilities, Phase II - Sewer Monitoring await funding, the backlog of facilities needing upgrade grows. Stopgap repairs then become necessary, through diversion of GPP funds, to prevent secondary deterioration and degradation of mission support capabilities. The proposed Five-Year Plan (FY 1996 through FY 2000) for facilities modernization will require budget authority of over \$180 million for total implementation. Full modernization of the main site requires a 20-year investment program. Continued delay in correcting these problems will result in worsening conditions as well as an increasing backlog of substandard facilities.

Providing New Research Facilities. New programmatic facilities and upgrade of existing facilities are necessary to keep pace with new mission requirements. Continued funding is needed for two bioscience facility projects, the Human Genome Laboratory and ALS Structural Biology Support Facilities. Proposed programmatic facilities projects include the ALS Beamlines Initiative, which will use the ALS for research in the biosciences and energy sciences; the Chemical Dynamics Research Laboratory, a national facility for chemical sciences research using laser and synchrotron radiation; Elise, an inertial confinement fusion energy research facility; and expansion of the National Center for Electron Microscopy. These and other key initiatives are described in detail in the LBL Institutional Plan.

Decommissioning and Decontamination of Buildings 51 and 71. Changes in the national program for nuclear physics resulted in shutdown of the Bevalac in FY 1993. The Bevalac sites at Buildings 51 and 71 represent 15% of usable space, central and prime real estate at LBL. Therefore timely implementation of a Bevalac decontamination and decommissioning (D&D) plan is needed to restore this area. In consultation with the DOE Oakland Operations Office, the Office of Energy Research, and the

Environmental Restoration and Waste Management, LBL has prepared the following D&D proposals:

- *Surplus Facilities Inventory Assessment (SFIA; EM-60, 40) Program.* This broad-scope proposal would clear surplus portions of the site for beneficial reuse by DOE and LBL. The primary scope of work comprises D&D of the Bevalac accelerators and associated shielding and equipment.
- *Return on Investment (ROI; EM-352) Program.* This proposal would minimize waste through beneficial reuse of Bevalac shielding blocks at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory. By significantly reducing the volume of material to be disposed, DOE would achieve major cost savings, because the bulk of projected SFIA costs are for waste burial at the Hanford site.
- *D&D Characterization Technology Center (EM-50).* As described in a Technical Task Plan, this proposal would identify, evaluate, demonstrate, validate, and apply advanced and innovative techniques for rapid characterization of activated materials. This Center will use the Bevalac as a demonstration site available to other DOE contractors and industry, creating an important national and international capability for economical D&D of surplus facilities.
- *Inactive Surplus Facilities Program (I&SP; OER).* This proposal is for cleanup, cleanout, removal, and reuse of non-activated Bevalac space previously used to support Bevalac operations. This work would complement the other D&D proposals and will not interfere with access to the D&D zone of the Bevalac accelerators.

General Plant Projects (GPPs). Funding to date has been inadequate to meet the Laboratory

needs within a timely schedule. This program has a significant backlog of projects, exceeding \$30 M. Roughly one quarter of this backlog is for environment, health, and safety needs and one-half is for general improvements and replacements. Increasing GPP funding to \$6 M annually would ensure the success of the Laboratory's safety rehabilitation program and help reduce the current backlog of projects over the next five years.

General Purpose Equipment (GPE). Essential support equipment has been funded through DOE. LBL's Five-Year GPE Plan identifies needs based on a range of criteria, including environment, safety, and health; legal requirements; failed, worn, inefficient, or obsolete equipment; substandard performance; or increased workload and demand. The current funding level of \$1.7 M/year is minimally adequate to meet the Laboratory needs. Currently there is a \$19 M equipment backlog for environmental monitoring and fire safety, physical-plant maintenance, mechanical and electrical shops, transportation, and data processing and communications. Consolidated GPE management at the level of the OER facilitates the implementation of an integrated and longer range GPE plan.

Conclusion. These management issues directly relate to LBL's ability to carry out its mission. If LBL is to be a location of choice for leading research programs, it must undertake a broad-based renewal of the facilities and infrastructure which support present and future research programs. The 5-Year Plan given in Table 1 addresses the most pressing needs. Only after these needs have been met can LBL turn to the task of realizing the long-range goals stated in the Institutional Plan and Vision 2000.

Appendix: LBL Maps

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Map 2. LBL Current Land Use Plan.

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