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Ten-Year Site Plan

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Executive Summary

Berkeley Lab Mission

Ernest Orlando Lawrence Berkeley National Laboratory is one of 16 U.S. Department of Energy (DOE) National Laboratories. About two-thirds of the Laboratory's present research supports the missions of the DOE Office of Science (SC). Much of the balance involves work for other federal and state agencies. The Laboratory has an annual budget of nearly $575 million (FY 2004) and employs a staff of about 4,400 (average daily population), including more than eight hundred students. Berkeley Lab is a research campus operated by the University of California (UC) under contract to DOE. Like the Chancellors of the UC academic campuses, the Director of Berkeley Lab is appointed by the UC Regents.

An internationally recognized leader in science and engineering research for more than 70 years, Berkeley Lab conducts unclassified research across a wide range of scientific disciplines, with key efforts in fundamental studies of the universe and matter; quantitative, structural, and synthetic biology; nanosciences; new energy systems and environmental solutions; and the use of integrated computing as a tool for discovery.

Berkeley Lab scientists work on independent research projects as well as in collaboration with faculty from academic campuses and scientists from other research institutions. Four of the Laboratory's unique and powerful scientific facilities, and their associated expertise, are made available to others as DOE national user facilities. These include the Advanced Light Source (ALS), ESNet (Energy Sciences Network), National Center for Electron Microscopy (NCEM), and the National Energy Research Scientific Computing (NERSC) Center.

Berkeley Lab's mission is to find answers to highly challenging scientific questions of national significance. The Laboratory conducts key elements of DOE's research missions in science, energy, and the environment, supporting these missions by:

- Performing leading multidisciplinary research in the computing sciences, physical sciences, energy sciences, biosciences, and general sciences, while ensuring employee and public safety and environmental protection.
- Developing and operating unique national experimental facilities for qualified investigators.
- Educating and training future generations of scientists and engineers to help attain national science goals.
- Transferring knowledge and technological innovation to the marketplace, and fostering productive relationships between Berkeley Lab's research programs, universities, and industry.

Throughout its history (see Appendix A), the Laboratory has focused on reaching a deeper understanding of our world while achieving discoveries that improve and enrich lives at a local, national, and global scale. Berkeley Lab transformed the way scientists work together and understand the world around us through innovations in the tools and methods for conducting scientific research. Such innovation continues to this day.

Mission Drivers and Constraints

The scientific drivers and buildings identified in Berkeley Lab's infrastructure planning advance DOE missions and the Office of Science programs, principally for the Offices of Basic Energy Sciences, Biological and Environmental Research, High Energy Physics, Nuclear Physics, Advanced Scientific Computing Research, and Fusion Energy Sciences. In addition, technology advancements made by the Laboratory support the Energy Efficiency and Renewable Energy Programs and the Office of Civilian Radioactive Waste Management and other elements of DOE. The programmatic drivers and research facility needs that must be incorporated into the planning for Berkeley Lab and for DOE are summarized in this and following sections.

Berkeley Lab expects to develop the site to:

- Stimulate and foster a collaborative, world-class scientific work environment that attracts and retains highly qualified professionals.
- Accommodate flexible, state-of-the-art facilities and infrastructure appropriate to Berkeley Lab's research roles for DOE.
- Support the growing user community at the Laboratory's scientific facilities.
- Promote its unique setting and outdoor spaces to maximize opportunities.
- Welcome users, visitors, and neighbors in an enabling, efficient, safe, and attractive manner.

Berkeley Lab's scientific missions have changed since the first facilities were constructed on the current site for the 184-Inch Cyclotron and, later, the Manhattan Project in the early 1940s. The challenge to the Laboratory in achieving its current multiprogram Office of Science mission is that more than 70 percent or 1.2 million gsf of the Laboratory's total current space was constructed prior to 1970, when the Laboratory was a single-purpose Atomic Energy Commission facility.

Vision of the 21st Century Laboratory

Modern, effective, and efficient physical infrastructure is critical to maintaining the capabilities of Berkeley Lab, as well as other multiprogram laboratories, and to serve the users of the specialized instrumentation at the laboratories. This infrastructure and specialized instrumentation has provided first-of-a-kind enabling discoveries and technologies that drive national science and technology advances.

Berkeley Lab has prepared this Ten-Year Site Plan (TYSP) to document the actions and resources required to sustain Berkeley Lab's contributions to DOE's mission. It was developed using information from many sources (see Appendix K) that was then compiled by Facilities Planning and reviewed by all levels of Laboratory management. It can be used as a tool to prioritize and guide infrastructure and facility developments to advance the natural and multidisciplinary sciences that have been a key to the nation's prosperity.

The TYSP identifies existing and anticipated infrastructure deficiencies, and it proposes actions that can be taken to address these deficiencies before they have an adverse effect on employee safety or a negative impact on the science that is at the core of the Laboratory mission. Strategic investments in the renewal of the scientific and support infrastructure are essential for Berkeley Lab to provide a safe, modern workplace in order to meet its mission and program obligations.

The priorities established in this TYSP are based on the science mission and program benefits; the urgency and timing of scientific demand, including the adequacy of existing facilities to satisfy interim needs and avoid risks of program failure; and the potential for improving working conditions and efficiency. The collective strategy and priorities are based on continuing scientific program evaluation and planning, facilities conditions and siting assessments, and a determination of the consequent priorities for facilities planning. Complementary to this planning is the evaluation of projects with a risk-prioritization matrix to assure that program, environmental, safety, and security risks are considered in establishing priorities.

Laboratory Agenda

Science today is on the threshold of major discoveries across a broad range of disciplines, promising to advance human knowledge and improve health, environmental protection, and our economy. Berkeley Lab is well positioned to address these national challenges over the coming decades and will continue to be a vibrant and evolving organization. As a result of research at Berkeley Lab, future generations may see cures for diseases, new and potentially inexhaustible energy sources that may reduce global greenhouse gas levels, and have a better understanding of the origin and future of the universe.

The Science Vision for Berkeley Lab is to provide scientific leadership that gains revolutionary technical knowledge to benefit the nation and the people of the world. Berkeley Lab planning focuses our resources on the most promising research activities. Our Science Strategic Goals stretch the limits of scientific capability. We desire no less than to harness the power of the living world, design a new generation of materials forged at atomic scale, discover the origins of matter and the universe, and provide powerful research facilities that make new science possible. Through computational science of scale, we will deliver new discoveries at extreme frontiers not possible through experimentation and theory alone. We will work with the Office of Science to refine and further Science Strategic Goals of great scope and impact. The "stretch" Science Strategic Goals and key results proposed by Berkeley Lab include:

- **Discover and understand the composition of matter and energy in the universe through particle astrophysics, accelerator science, and detector science.**

  Berkeley Lab scientists have discovered a host of fundamental particles and characteristics of the universe. These discoveries include the accelerating expansion of the universe, indicating that a preponderance of energy in the universe is "dark" and unobserved. This dark energy, which powers the universe's accelerating expansion, is now one of science's greatest mysteries. Berkeley Lab will pursue an understanding of the composition of matter and energy in the universe, and of the mysteries of mass, the neutrino, and the evolution of the early universe, through both theory and such experiments as a space-based dark energy probe, innovative detectors, and advanced accelerator systems.

  To support the scientific programs needed to achieve this goal, the Laboratory must have adequate office space, clean rooms, fabrication space, and assembly areas. The Laboratory must upgrade fundamentally sound research and infrastructure facilities during the term of this TYSP to ensure that these facilities continue to meet exacting research requirements.

- **Design new generations of materials and chemical reaction systems with tailored functions and properties.**

  The growth of the economy over the last half century owes much to steady advances in materials sciences, chemical sciences, and biotechnology. Scientists are now in the early stages of manipulating materials systems at the molecular scale and understanding the behavior of large assemblies of interacting components. These advances will bring a new generation of efficient technologies, cleaner, sustainable production methods to protect the environment, and energy security. The next stage of innovation is Berkeley Lab's Molecular Foundry, which is scheduled to open in 2007 as a national user facility for collaborative nanoscience research. At the National Center for Electron Microscopy, new electron microscopes will provide a very high level of atomic resolution and support dynamic studies. These new initiatives will benefit from complementary chemical physics research into the mechanisms of chemical reactions and related studies of catalysis, atomic physics, photochemistry, theoretical chemistry, and actinide and combustion chemistry.

Modern research laboratories will be required to achieve these materials sciences and chemistry research goals. Some portions of the current chemical and materials sciences infrastructure were constructed several decades ago and must be replaced or upgraded. Additional laboratory space in proximity to the Advance Light Source and Molecular Foundry must also be provided.

- **Understand living systems and develop further capabilities in quantitative biology.**

  Berkeley Lab's bioscience research program probes the detailed mechanisms and systems by which living systems develop, survive, repair themselves, and function in different environments, with emphasis on benefiting health, improving energy security, and restoring the environment. Berkeley Lab's integrated approach will leverage its scientific, engineering, mathematical, and computing resources. The combination of high-throughput robotic systems for genomics, gene expression, and structural biology with new tools for understanding molecular machines and their structure will open new avenues of research in the biological sciences. The ability to understand cell repair systems, to differentiate genomic and environmental causes of cell dysfunction, and to screen causal factors and combinations of intervention agents will lead to medical breakthroughs, such as the prevention of cancer and other diseases. Biological research will include advanced quantitative modeling, microbial genomics, low-dose radiation studies, DNA repair, nuclear medicine, and functional imaging. Environmental research studies include global climate change research; ocean, terrestrial, and geological sequestration studies; and natural and accelerated bioremediation studies.

  Adequate, modern biological research laboratories will be required to achieve these goals and strengthen related scientific programs. Substantial parts of the current life sciences infrastructure were constructed four decades ago and must be replaced or upgraded. Additional laboratory space is needed in proximity to related biological research activities, forming a cluster of laboratories.

- **Achieve research breakthroughs using soft x-ray and ultrafast science tools.**

  Soft-x-ray and intermediate x-ray spectroscopy have had a major impact on many fields, advancing our knowledge of the reaction mechanisms of atmospheric pollutants, the structure of advanced magnetic storage media, the chemical reactivity of surfaces, and the mechanisms of superconductivity. X-ray studies may yield new approaches to hydrogen research and energy production, and explain the processes of photosynthesis, air pollution, and the dynamics of living and nonliving systems. Advances in soft x-ray and intermediate x-ray research will take place at the ALS, where planned upgrades will greatly increase brightness, and beam lifetime and stability. An intense infrared radiation source is planned within the ALS building that will enable new infrared science and technology applications. New laser and accelerator based tools will open up an era of ultrafast science, revealing heretofore unobservable electron- and proton-based interactions that underlie the chemistry of all phenomena. The international user community conducting experiments at these facilities is also expected to grow substantially.

  To achieve these x-ray science research goals, new facilities need to be constructed. Extensive planning is underway for experimental instruments, user support, and user dormitories to facilitate the experimental program and reduce user time spent traveling to and from the Laboratory. Experimental facilities are planned for location in the Laboratory's central area, adjacent to existing laboratories and support infrastructure.

- **Enable dramatic discoveries through advanced computing.**

  Computational modeling makes it possible for science to explore virtual worlds such as the interior of stars, or study the properties of materials that don't yet exist. Increasingly, computational science is central to every scientific discipline that is critical to the DOE Office of Science. Already, computational modeling has had a tremendous impact on people's lives and on society. It has enabled weather prediction, climate change analysis, design of advanced materials, and the data analysis that made the assembly of the human genome possible. Berkeley Lab has joined with other laboratories and industry to develop a new generation of computing capability that will address DOE scientific needs such as high-resolution climate-change models, nanoscience, new fusion demonstration and simulation projects, and the mystery of dark energy. The effort will be coupled to high-speed data communications provided by the Energy Sciences Network (ESnet), which is operated by the Laboratory for DOE.

  New computer machine room and research office space is required to achieve these computational science goals. The current machine room is housed in leased office space in Oakland, and the long-term goal is to relocate the facility to the main Laboratory site and provide for the space, power and infrastructure necessary for anticipated upgrades. Additional machine room floor is also needed to address the growing needs for servers and computer clusters serving scientific and business needs. Existing utilities core capacities at the Laboratory are fully adequate to support a relocated computing facility.

- **Develop new energy systems and environmental solutions through advanced research and technology development.**

  To achieve this goal, the Laboratory will provide the science for secure and reliable supplies of energy, including sustainable solar energy conversion to liquid and gaseous fuels, and the solar-based production electricity and other forms of clean energy. The Laboratory will develop technologies to modernize and reduce public energy consumption, and better understand and reduce the global consequences of energy use, including carbon-free and carbon neutral technologies. Consumer products and energy-efficiency analysis tools developed at the Laboratory have saved billions of dollars in annual energy costs, and future research on conservation technology offers real prospects of further energy savings. The Laboratory will look for ways to use fossil fuels more efficiently and will also pursue the concept of heavy-ion fusion, increasingly viewed as practical, in the effort to harness fusion energy for a carbon-free source of energy. The Laboratory will also work to advance our understanding of carbon sequestration as a way to mitigate the potential effects of global greenhouse gases, including innovative concepts such as sequestering carbon while improving the recovery of petroleum reservoirs.

  To fully address these energy and environmental goals, additional space for research programs is required, including research office space and laboratories. This effort requires an energy efficiency and electricity reliability laboratory for research toward the nation's goal of energy security. The Laboratory is also prepared to design a facility for advanced inertial confinement fusion and experimental facilities for scientific understanding of beams and plasmas, and work through the engineering issues of heavy-ion fusion.

During the planning period covered by the TYSP, the Laboratory's budget is expected to grow from current levels to approximately $750M, an average growth rate of 3% per year.

Berkeley Lab Planning Process and Organization

The Laboratory maintains both strategic/institutional and capital/infrastructure planning initiatives regarding its facilities. Strategic/institutional planning initiatives are led by the Office of Planning and Strategic Development, while capital/infrastructure planning initiatives are led by the Facilities Division. These interrelated planning processes are documented in three primary documents: the Institutional Plan, the Ten Year Site Plan, and the Maintenance Plan.

The Office of Planning and Strategic Development is responsible for Institutional planning and preparation of the Laboratory's Institutional Plan. It is through the Institutional Planning Process that the Laboratory's strategic goals and objectives are refined and communicated to the broader Laboratory community.   The Institutional Planning process involves two annual planning retreats and an annual review of each research divisions programs and planning.

Facilities Planning is responsible for capital asset and infrastructure planning including preparation off the TYSP. To ensure that this planning is both inclusive and accurate, the Facilities Division Director participates in the Institutional Planning processes with his peers, the Facilities Division obtains reports on the Institutional Planning processes, and Institutional Planning and Facilities Planning staff coordinates on a monthly basis. It is through this process that future project needs are identified, vetted and forwarded for review and prioritization by the Laboratory management.

Berkeley Lab Long-Range Development Plan

Within the University of California system, each campus and Laboratory periodically prepares a Long Range Development Plan (LRDP) to guide the future physical development of the facility. The LRDP identifies the physical development needed to enable the Laboratory to achieve its scientific objectives during a planning period of approximately two-decades. The LRDP outlines the anticipated growth and provides a land use map and guidance that will be used in the siting of new facilities. Through a revised Long Range Development Plan (LRDP), Berkeley Lab leadership is now articulating a vision of a 21st Century research campus that physically achieves facility design standards that attract and retain world-class researchers.

A scientific infrastructure, capable of supporting emerging science missions, is an essential component for success at Berkeley Lab. As a preferred place for scientists to work, the Laboratory must adapt and develop facilities to meet the high expectations of modern science. The LRDP provides for the space and facilities necessary to meet the needs of near-term and next-generation research.

Berkeley Lab's LRDP was last updated in 1987. A revised LRDP, along with its accompanying Environmental Impact Report (EIR), is currently being prepared. These documents will provide a planning framework for Berkeley Lab for the early decades of the 21st Century. The LRDP will also outline a framework that will sustain development and scientific facilities over additional decades. Laboratory planners use the LRDP to site and design physical improvements and to plan for necessary infrastructure, transportation and physical services. The UC Regents refer to the LRDP and EIR as they consider the design and environmental impacts of specific major capital project proposals. The LRDP also provides another opportunity to communicate with the larger community regarding the Laboratory's research mission and future direction.

The LRDP provides a comprehensive physical framework for implementing the Laboratory's mission, presenting a long-term vision of the totality of the Laboratory's research and facilities needs. It describes Berkeley Lab's scientific objectives for the early decades of the 21st century, and identifies the physical alterations of facilities on the Laboratory's main "Hill" campus that are required to support these objectives. Continued use of space on the University of California, Berkeley (UCB) campus, and of leased space in the larger region, also receives full consideration.

Traditionally, the Laboratory has developed in an incremental manner. This development pattern has proceeded under a design framework that emphasized function, and while the Laboratory was primarily focused on physics, there was a common understanding of building design and the associated pedestrian routes. Today, Berkeley Lab is a multiprogram campus hosting research in a wide variety of fields. The needs and vision of various research organizations differ, and there is a new need to implement a coherent community-wide design framework that is flexible enough to accommodate various types of scientific facilities.

The 1987 development plan laid out a series of "functional planning areas", a planning framework that was useful during the initial phases of conversion to a full-fledged multiprogram laboratory. This approach allowed developing programs to locate space that could be adapted to meet their needs, and to develop research centers at these locations. This is a form of overlay zoning.

The new development plan seeks to build upon this base to establish a set of topographically based "Intellectual Centers," readily identifiable areas that are prime for development. It is anticipated that this model will allow divisions that are currently fragmented at locations across the site to develop mini-campuses and co-locate programs.

A new set of design guidelines will also bring forward 21st century public spaces of a caliber typically associated with a top-flight research facility and of UC in general. This approach is consistent with the Laboratory's sustainability objectives as it concentrates development and allows for greater density in developed areas, rather than a pattern of low-rise, low-density structures. The Laboratory's new design standards echo existing standards and ensure that buildings are designed to be seen among the trees and valleys of the site.

The LRDP will establish a growth profile for the early decades of the 21st century, and a siting and design framework for new facilities. It provides guidance to ensure that overall development is orderly and consistent with the Laboratory's commitments to first-order scientific excellence and achievement, effectively serves the growth of an overall scientific community, establishes a coherent and unified campus environment, and achieves the Laboratory's sustainability and community-relations objectives.

Site Development Planning

Berkeley Lab maintains an active site and facilities planning program that documents the key issues and current/future plans for facilities management and improvement. With issuance of DOE Order 430.1B, "Real Property Asset Management," (RPAM) in September 2003, new requirements were established for development and maintenance of a Ten-Year Site Plan (TYSP) for all DOE sites. Those requirements define the comprehensive nature of the planning process requested by DOE, with the TYSP required to provide:

- an assessment of the current status of the site's real property assets,
- an explanation of how those assets will be used to support strategic goals,
- the priorities of projects and activities required to meet mission needs,
- cost projections for the prior year plus ten additional fiscal years for the site's proposed land and facilities management plan,
- identification of critical real property asset issues affecting the site's ability to complete its mission.

The Laboratory’s formal land-use plan is documented in the 1987 LRDP, which is currently being revised. It is anticipated that the UC Regents will approve both the LRDP and its accompanying EIR late in calendar year 2005. The areas covered by the revised LRDP are shown in Appendix M2, “Land Use Zones”.

Near-term and next-generation research initiatives are reviewed annually by the Laboratory Directorate. Each research division meets with the Laboratory Director and other executive staff to review its research program. Current research and new initiatives are discussed and prioritized. All division heads then meet with the Laboratory Director and other executive staff to discuss the overall research program and establish overall priorities. Significant new initiatives, and changes to current programs, are then recorded in the Laboratory’s annual Institutional Plan, which is sent to the Department of Energy’s Office of Science for review and agreement.

The Facilities Division uses the Institutional Plan as a guide in planning future renewal and development initiatives, and to validate that the vision expressed in the current LRDP and TYSP continues to be aligned with the vision of the research divisions. The Facilities Division identifies near-term project needs and initiates appropriate site development, planning, project programming, infrastructure reviews, and/or construction processes to ensure that appropriate project initiatives are advanced for funding and implemented in a timely manner. The Facilities Division also works with other support divisions to identify and plan necessary infrastructure modernization and upgrade projects.

Space Management

The Laboratory Director has the ultimate authority for space management at the Laboratory. The Laboratory Director may delegate the implementation of policy and the authority to allocate space in all Berkeley Lab–managed property to the Deputy Director for Operations (DDO), assisted by the Facilities Planning staff.

The Laboratory's policy on space management is to maximize the use of this asset in a planned, judicious, and cost-effective manner while minimizing disruption of activities. In order to implement this policy, Laboratory organizations are given stewardship responsibility for certain portions of the Laboratory’s space. These stewardship assignments will be periodically reviewed and adjusted by Laboratory management to ensure that, to the extent possible, the appropriate amount and type of space is made available for new and expanding activities.

Each division is responsible for effective utilization of space for which it is steward. When a division has new space needs, it is responsible for examining all possibilities to meet this need within its existing allocations before submitting a request for additional space to Facilities Planning. Any modifications made to a room configuration, including change of use, must be approved by Facilities Planning for compliance with applicable building codes and consistency with Laboratory-wide plans.

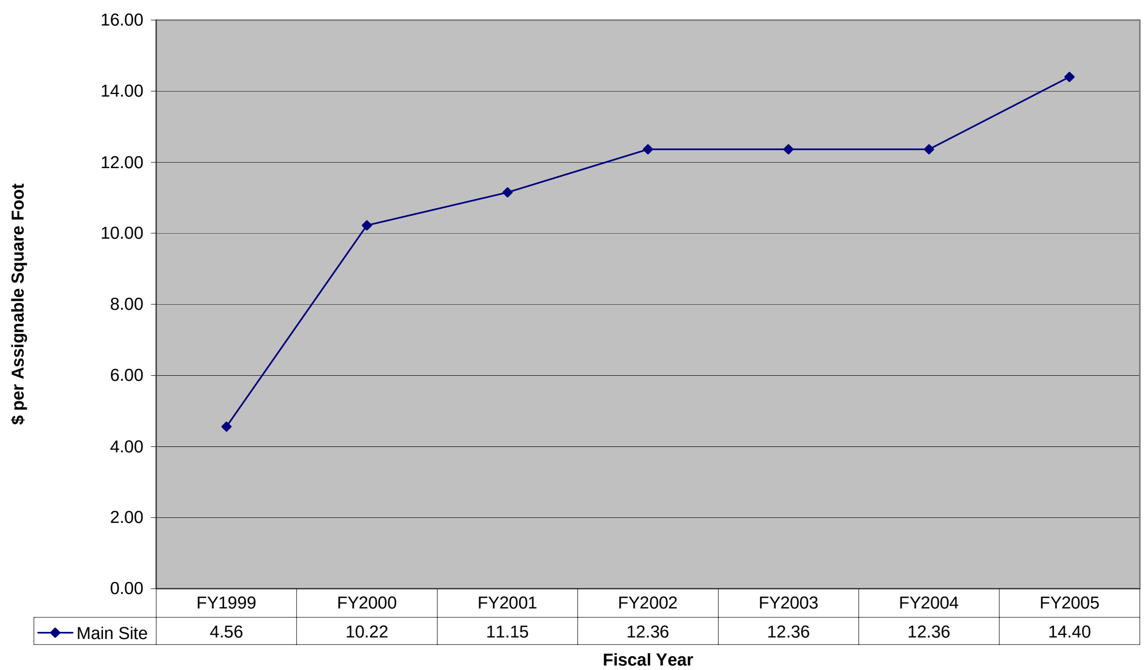
Facilities Planning works with each Division Deputy or designee to assist in achieving optimal utilization and solving additional space needs. The Division Deputy or designee serves as the primary point of contact for the division's space information, is authorized by the Division Director to act for the division in day to day space activities, and ensures that Facilities Planning staff are invited to attend relevant portions of division meetings and reviews.

Metrics for evaluating effective utilization of space will be proposed by the Laboratory Space Planning Committee and approved by the Laboratory Director, Deputy Directors for Research and Operations.

An annual space audit will be conducted by the Facilities Division to ensure that divisional stewardship responsibilities are being carried out effectively. The results of the audit will be presented to the Laboratory Director. When evidence of poor space utilization is identified, the Division will be asked develop and implement a plan for better utilization. If sufficient improvements are not made, the Division will be asked to relinquish their stewardship responsibility for underutilized space.

Allocation of costs associated with space will be charged directly to the project utilizing the space, consistent with the Cost Accounting Standards of the Laboratory. With the exception of approximately 8,000 assignable square feet of animal care facility space and 24,000 assignable square feet of space on the UCB Campus, all space is currently recharged at a rate of $12.36 per assignable square foot per year. Chart 1 shows the recent trends in the space charge rate.

Chart 1
Space Charge for Main Site Space



The following are guidelines for space allocation:

- Research functions have priority for space over support operations.
- Laboratories should be used for the purposes for which they were designed (e.g., wet laboratories should be used for wet-laboratory-based research). Converting laboratory space to office space should be avoided.
- In buildings containing both offices and laboratories, groups with laboratory space in the building have priority for office space. If research programs depend on a major facility (e.g., the Advanced Light Source, the 88-Inch Cyclotron, electron microscopes), programs using the facility have priority for adjacent office and laboratory space.
- Office space is allocated to be generally equitable among the divisions. "Equitable" means that roughly the same quantity and quality amount of floor area should be provided for people, including students, of approximate equal rank. This approach accounts for program size and funding in a reasonable way. For cost effectiveness and maximum utilization, the Laboratory encourages open and shared office space.
- Space in the stewardship of a Division should be contiguous or as nearly so as can reasonably be achieved. The number of different Divisions occupying a single building should be kept to a minimum, if possible.
- When possible, researchers should also be placed in the “Research Cluster” with which they are most closely aligned.

Use of FIMS in Planning

The Laboratory utilizes the Facilities Information Management System (FIMS) to record key data that is used by the Laboratory and DOE locations to summarize and analyze data regarding the Laboratory’s real property inventory. Key data elements tracked in FIMS and used in the planning process include the following:

Asset Acquisition and Inventory

- Land leases
- DOE Owned Buildings
- Building Leases
- Capitalized improvements to existing real property and new acquisitions are recorded when completed.

Maintenance and Recapitalization

- Results of condition assessments for every facility are reflected in deferred, actual and required maintenance costs, deficiency data, and inspection dates.
- Rehabilitation and improvement costs, which are updated annually for buildings and other structures and facilities.
- Effective utilization of assets
- Modernization Planning Indicator

Disposition of Real Property

- Facilities planned to be replaced and facilities planned for demolition without replacement are indicated as excess.
- Demolitions in progress.
- Disposed asset records are archived in FIMS per DOE reporting requirements.

The accuracy and completeness of FIMS entries is evaluated at least annually by self-assessment and a formal validation by DOE-BSO and Berkeley Lab Facilities Planning and Plant Operations personnel. Where appropriate, program staff is included to validate the use and occupancy of the facility, deficiencies, and utilization/deficiency categorization.

Berkeley Lab Land Use

Existing Conditions, Future Uses, and Issues

Berkeley Lab is located approximately 1 mile east of San Francisco Bay on the slopes of the Coast Range within 1,183 acres of contiguous UC land. Most of the Laboratory's main-site buildings are owned by DOE and were constructed on University land under long-term arrangement with the federal government. The Laboratory's 203 acre site is in Alameda County, with the western portion of the site in the City of Berkeley and the eastern portion in the City of Oakland.

The DOE's occupancy of the earliest buildings constructed by UC and DOE on UC Regents' land was established through an Occupancy Agreement between DOE and UC. Subsequent major buildings have been constructed using Parcel Leases. The majority of the Parcel Leases were for an initial period of 50 years. Those that have passed the initial expiration date have been extended, through prime contract negotiations, to expire following the termination of the prime contract. A Parcel Lease map of Berkeley Lab is included as Appendix M1.

DOE has made the commitment that all of its land and facilities will be managed as valuable national resources, with uses that support the Department's critical missions, stimulate the economy, and protect the environment (DOE Policy 430.1, July 9, 1996). Land use planning for Berkeley Lab identifies and prioritizes needs for stewardship and preservation of natural assets and resources to meet the requirements of existing and future scientific facilities, environmental research, education, and other uses compatible with DOE land use guidelines.

Physical Characteristics and Natural Resources

Land Forms and Geology

Berkeley Lab's Hill site is located in the lower and mid elevations of the Oakland/Berkeley hills, a range that is approximately one mile east of the San Francisco Bay. The 203-acre site is situated on south- and west-facing slopes, at elevations ranging from 490 to 1,100 feet above sea level. More than two-thirds of the site is within Strawberry Canyon and has a south-facing orientation. The balance of the Laboratory is west-facing and is located on the outer face of the Oakland/Berkeley hills, oriented toward the San Francisco Bay. The site's slopes provide dramatic views of the bay; the Golden Gate; the cities of San Francisco, Oakland, and Berkeley; and portions of Strawberry Canyon. These views, and the inclusion of wooded and grassland areas within the developed Laboratory site, are memorable and valued characteristics of the Laboratory.

The Oakland/Berkeley hills site has many ridges, draws, terraces, and occasional outcroppings. The dominant land form is characterized by ridges and draws. Most of the Laboratory site is underlain by complex sedimentary and volcanic rock that has been folded and faulted since the Cretaceous period. In general, the bedrock has produced a colluvial cover a few feet thick over the entire site. Natural rock outcrops are few, although there are rock exposures in cut slopes. The major geologic unit consists of sandstones, siltstones, claystones, and conglomerates of relatively low strength and hardness. These rock formations are blanketed by clay soils. The Hayward Fault is located immediately to the west of the Laboratory site. Accordingly, the Laboratory ensures that appropriate seismic standards are met in all construction projects

Climate

Berkeley Lab has a Mediterranean climate with cool, dry summers and relatively warm, wet winters. The proximity of the Pacific Ocean, with the marine air that flows through the Golden Gate, moderates local weather, keeping seasonal temperature variations small. The mean summer and winter temperatures are 62° F and 51° F, respectively. Generally, comfortable outdoor conditions prevail throughout the year, although occasional hard freezes can occur during mid winter.

Relative humidity ranges from 85 to 90 percent in the early morning, when ocean fog often affects the site, to 65 to 75 percent in the afternoon. Annual insolation ranges from 65 to 75 percent of what's theoretically available, and the average daytime cloudiness is about the same in summer and winter. Winds are generally cool and light, less than 10 miles per hour, blowing from the east in the morning and from the west in the afternoon. In late spring and summer, ocean fog often flows across San Francisco Bay to envelop Berkeley Lab during morning and evening hours.

About 95 percent of the Laboratory's average annual rainfall of 25 inches occurs from October through April. Rainfall intensities are seldom greater than one-quarter inch per hour, and thunderstorms, hail, and snow are rare. Precipitation in the area is highly variable; periods of drought of several years' duration are not uncommon, as are abnormally wet winters. Therefore, the Laboratory landscape consists generally of native and naturalized plants and the Laboratory's storm water management system is designed to accommodate variable storm events.

Land Use Planning and Priorities

The Laboratory strives to maximize beneficial use of all building assets. Accordingly, operations and maintenance functions are the foundation of the site planning process for buildings. When missions change and/or it is determined that a building can no longer serve the intended mission, the Laboratory considers if the building could be upgraded or adapted for reuse to serve another mission need. The Laboratory has a consistent history of modernization and adaptive reuse.

When a building cannot be reasonably upgraded or adapted for another use, the building is tagged for demolition and the site for redevelopment. As most buildings in the immediate area of each other were developed to serve common or similar mission needs, the Laboratory also considers the status of adjacent buildings when a building is under consideration for demolition. In this manner, the Laboratory is able to consider how areas of the site can best be redeveloped when individual buildings are reaching the end of their useful lives at slightly different points.

The new LRDP identifies two large-scale redevelopment areas: the former Building 51 accelerator complex, and a collection of smaller structures adjacent to the ALS, dubbed "Old Town".

The most significant facility no longer serving DOE programs is the Bevatron, which encompasses 7.5 percent of the Laboratory's space and occupies a central location that could again serve priority DOE missions.

A major and active user facility, the ALS is also an example of adaptive reuse since it was originally constructed in 1939 to house the 184" cyclotron and enlarged and upgraded in the early 1990's to house the Advanced Light Source. However, the adjacent buildings date from the World War II era. While they have been extensively adapted over time, they are no longer suitable for modern science. Moreover, these buildings together create a large redevelopment site that can accommodate a significant amount of the Laboratory's growth.

Under the new LRDP it is anticipated that new buildings will be constructed in the following preferential order:

(1) on redevelopment sites,
(2) between or adjacent to existing buildings,
(3) on sites more distant from existing buildings but served by utilities
(4) and, if no other site meets mission needs, on sites remote from buildings and utilities.

Consistent with the Laboratory's research missions and accomplishments, the Laboratory intends that each building project—upgrade, reuse, or new construction—contributes to the Laboratory's objective of being a model of sustainability. Building projects will incorporate daylighting technologies, cool roofs, and other environmental cooling strategies; energy conserving and supply technologies; and contribute to the management of storm-water quality and flows.

Similarly, it is the Laboratory's intent that onsite buildings continue to be set among trees, making most Laboratory buildings less noticeable from off site; buildings will be sited otherwise only when a Laboratory mission requires that a building be set apart from the Laboratory's tree clusters, for example, a Laboratory building that requires solar access to support research.

Hill-Site Land Use

From its earliest days, development at the Hill site has gravitated to distinct, relatively level terraces and knolls. The slopes surrounding these development centers provide a unique setting that integrates rustic landscape and development.

These developed terraces and knolls are one of the defining features of the site and naturally follow the dominant slope of the site. On the Hill site, the developed areas have a wide range of sizes, development intensities, and uses. The greatest density of both development and activities is concentrated in two adjacent areas: the Building 50 complex and the area surrounding the ALS. Centered between these two major areas are the Cafeteria and the Cafeteria Commons, the social center of the Laboratory. However, it is the domed ALS Building, located on a plateau that marks the divide between the western and southern slopes of the site, which is the historical center of the Laboratory. Other developed areas on the site tend to have a more moderate density and are separated by steep slopes and rustic landscape.

Berkeley Lab has a long history of providing leading research talent with the highly specialized instrumentation and facilities needed to address the nation's scientific challenges. The historical perspective presented earlier highlights the progression of the Laboratory's science and the development necessary to support its evolving scientific mission. Much of the Laboratory's existing character can be attributed to this pattern of disjointed incremental growth. However, the inevitable constraints that result from long-term disjointed incremental growth, in combination with those of the unique site, present the following important challenges for the future development of the Laboratory:

- Limited options for expansion of existing facilities.
- Overlap of dissimilar site utilization.
- Limited parking and increased demand for space competing for valuable real estate.
- Outdated facilities that do not meet structural and life-safety codes.
- Older facilities that adapt poorly to changes in program needs and constrain research activities.
- Unrealized potential to foster interaction and collaboration.
- Lack of discernible and cohesive identity and image.
- The Laboratory's existing developed area is defined by buildings, roads, utility infrastructure, and environmental monitoring stations.

In general, the Laboratory is maintained in a research park setting. This attractive form of landscape is consistent with the Laboratory's fire-safe vegetation-management measures that keep trees pruned, and grass below the trees mown or grazed annually. Most Laboratory buildings are not visible from the community below or from the neighborhoods to the north and south. Views of Berkeley Lab from off site are of woodlands and other landscaped areas, with occasional partial views of buildings. Views from the Laboratory to the cityscape, bay, and hillsides have been carefully maintained to allow a number of new "through the trees" view corridors.

Land Use Zones

It is impossible to anticipate all specific facilities requirements for research programs that will be developed to address emerging scientific missions. Moreover, federal funding programs for buildings are subject to change. Therefore, specific facility siting and design decisions are not made for all future buildings at this time. Three land use zones (see map in Appendix M2) have been established to guide development and policies that direct the form of new buildings. The performance-based land use plan allows or restricts development within three primary zones:

Intellectual Center/Development Land Use Zone

This area encompasses the portion of the Berkeley Lab hill site that has generally been developed; developed areas include both impervious and pervious surfaces and this Land Use Zone constitutes approximately 70 percent of the 203-acre Lab site. Further development of laboratory, office, and functional support spaces, utilities, and other associated structures, is anticipated in this zone. The LRDP promotes development on infill sites and locations adjacent to existing buildings to the extent possible in order to maximize efficient use of available sites, use existing infrastructure, consolidate research activities, and abide by sustainable development practices.

All vegetation in this land use zone is managed on an annual basis to allow buildings to survive a firestorm similar to the 1991 Oakland/Berkeley Hills Fire. Fuel management in this zone is particularly important because most structural damage results from firebrands rather than the main fire front. This zone will have managed woodland, roadways, parking, and other landscape features arranged to support the Intellectual Center development framework and address community and sustainability responsibilities. Final building locations will be identified through a siting process that considers the design criteria of this LRDP, including mission needs, appropriate Intellectual Center development opportunities, site constraints, impacts on the surrounding area, visibility and views, and funding.

Vegetation Management Land Use Zones

These areas, accounting for approximately 27 percent of the Lab site, are landscape zones that separate the Laboratory from adjacent residential properties. Vegetation in this zone includes both native and non-native trees. From offsite viewpoints, these areas are generally visually compatible with the larger landscape. It is anticipated that development in these areas would be limited to environmental monitoring structures and other small structures, fencing, necessary utility lines and associated utility structures, pedestrian trails, and access roadways.

All vegetation within this zone is annually managed to reduce the intensity of a Diablo-wind[1]-driven fire, so that flame intensity and heat will decrease as it approaches Laboratory buildings, eliminating the risk for serious damage. Vegetation management also takes into consideration urban forestry, the value of onsite landscape features in the area of the Intellectual Centers, and view shed values.

Limited Management Land Use Zones:

These are areas where wild land fire risks do not require annual maintenance, two of the areas contain annual streams and vegetation that is riparian or generally contains a high moisture content, the third area is beyond the risk zone for any Laboratory structure and the topography restricts use of this area for fire suppression. Laboratory expects to carry out work only infrequently within the Limited Management Areas. Laboratory staff would enter to service and periodically adjust utility lines and monitoring stations, and to periodically perform work to control selected invasive plants and remove fallen trees. Special care would be taken in planning and executing any work performed in these areas. On the outer perimeter of these zones, the Lab would remove ground-level plant material that would allow a wind-driven fire to move into the tree canopy, causing serious damage to these Limited Management Areas. Under the LRDP, it is anticipated that no building construction, general vegetation, or fire risk management work would be undertaken in these areas. Limited Management Areas constitute approximately 3 percent of the site.

Landscape Management

The Laboratory's landscape consists generally of native and non-native grasslands, planted woodlands of naturalized trees, and some native Oak/Bay woodland areas, a landscape that is similar to much of its Oakland/Berkeley hills region. Ornamental plantings have been located immediately adjacent to buildings. The Laboratory has worked to support native plants and reduce the presence of many invasive exotic plants. As part of its vegetation-management program, Berkeley Lab has effectively removed a number of invasive exotic plants from the site, including French broom, artichoke thistle, Cape ivy, and pampas grass.

The Laboratory's vegetation-maintenance program addresses the risk of structural damage from periodic wild land fires that occur in this region. Berkeley Lab's program, which is based on analysis and computer modeling of fire behavior in this area, uses the natural succession of native plant communities as a guide. Under this program the Laboratory's vegetation is maintained annually so that a serious wild land fire in the area will "lay down" as it reaches the

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[1] Diablo wind is a regional term for the foehn wind that often occurs in the San Francisco Bay Area. The term is often used because many of the winds originate off of nearby Mount Diablo. A **foehn wind** occurs when a deep layer of prevailing wind is forced over a mountain range. As the wind moves upslope, it expands and cools, causing water vapor to precipitate out. This dehydrated air then passes over the crest and begins to move downslope. As the wind descends to lower levels on the leeward side of the mountains, the air heats as it comes under greater atmospheric pressure creating strong, gusty, warm and dry winds. Foehn winds can raise temperatures as much as 30°C (50°F) in just a matter of hours. Winds of this type are called "snow-eaters" for their ability to make snow vanish. This ability is based on not only the high temperature, but also the low relative humidity of the air mass.

Laboratory with its reduced fuels, and as the fire approaches buildings it will not achieve the requirements of building combustion – in other words the Laboratory's buildings will survive a fire. This maintenance program has a second benefit as it will allow regional firefighters to focus on suppression under conditions that are safe for ground-based forces, and they can suppress the fire before it advances beyond the Laboratory site. Berkeley Lab also works to maintain a wooded and savanna character in the areas surrounding buildings and roads. Ornamental species are generally restricted to public spaces and courtyards and to areas adjacent to buildings. The site does not have any known rare, threatened, or endangered species.

The vegetation management program integrates wild land-fire risk management, horticultural, view, and aesthetic factors in a single comprehensive vegetation- management package, covering both the developed and the undeveloped portions of the site. The program integrates native-plant cultivation, maintenance of a park-like setting, reforestation to improve the long-term health and screening value of tree stands, and ornamental landscaping of courtyards, pathways, and other outdoor areas frequented by employees and visitors. This comprehensive approach eliminates duplicative work and ensures that overall program values are maintained.

The Laboratory performs only "defensible space" management techniques in the area of one building, Building 73, as the design of this structure makes it particularly susceptible to wild land fire. This structure is also immediately adjacent to a horticultural management area maintained by UC Berkeley, and is surrounded by a grove of redwood trees. Accordingly, ambitious vegetation management would be required on the adjacent lands to provide any level of reasonable protection.

Land Management and Operational Uses

The following sections address Berkeley Lab's need to consolidate similar research functions, and to better utilize and integrate developed sites.

Hill Town/Intellectual Center Development Framework

The Laboratory's current use of "functional planning areas started the Lab co-location of similar research functions, but it has neither allowed the Lab to fully realize this objective nor has it effectively served to define "campus-like" clusters of buildings and other facilities. To accomplish this objective at the hill site, the Laboratory proposes a new development framework, one that prioritizes siting of new projects in "clusters" at locations that are largely defined by the topography of the site. These clusters of development, termed "Intellectual Centers", will be surrounded by landscaped areas with trees. The effect will be similar to the hill-towns of Italy but with much more extensive landscaping. At Berkeley Lab the buildings will be seen as being within the landscape, and off-site views of the Lab will show buildings among trees. The evolution to Intellectual Centers allows modern interdisciplinary sciences to be appropriately developed using a common set of design guidelines at a hill site.

Intellectual Centers will have a wide range of sizes, development intensities, and uses. Yet each Center will focus on a central campus-like space, or "commons," rather than filling out to strictly defined boundaries. The Centers will incorporate existing buildings that can continue to serve the mission and provide sites from new modern buildings that will grow to define each Center. The Centers will have discernable pedestrian paths and outdoor discussion areas, and will be served by shuttle stops and parking structures that are convenient but not central to the Center. This pattern will allow the Laboratory to develop a casual campus style, consistent with world-class science, within the rustic landscape that is its defining characteristic.

Underlying the Intellectual Center concept is a commitment to construct new research buildings, and to demolish and replace buildings that do not address mission needs effectively. This program element is intended to address both current fragmentation in research groups, and new mission requirements. This approach is also consistent with the Laboratory's commitment to sustainable building design. The Laboratory site will continue to serve as an illustrative example of how development and nature can coexist; how buildings can fit and fold into terrain and also relate to land slope; how variations in slope, exposure, and plantings across the site can become a part of the overall fabric of the campus; how circulation can be integrated into the plan in order to avoid another conventional research park; and how to continue to build upon a unique social and scientific community.

New development offers the opportunity, especially within redevelopment zones, to reassign existing uses and configure new, more efficient development patterns. Furthermore, development of new flexible facilities will allow sufficient space for critical uses such as utilities and service yards, vehicular and pedestrian circulation, and outdoor interactivity space.

This approach also specifically allows for development beyond the time frame of this development plan, as each building site is to be effectively use and footprints will be established in a manner that future buildings, pathways, stairs, utility corridors and service entries can be coordinated. The benefits of this development strategy are**:**

- New projects will emphasize building groupings that define public space rather than building units as freestanding and sometimes disjointed objects.
- The development framework represents sustainability principles, maximizes use of all assets, continues to place buildings in a larger context of trees and hillsides, and is consistent with urban forestry principles and maintenance of healthy stands of trees.
- Establishment of a separation between public space at the core and service yards at the rear of buildings.
- Concentrating public and service uses into separate and distinct zones will improve both operational efficiency and opportunities for staff interaction.
- Opportunities for future expansion are optimized

The commons areas will link building entries in each cluster, creating a place of connection between people, landscape, and facilities. But space alone will not ensure human congregation and interaction. Social activity depends upon many things, including the physical attributes of buildings and their interfaces with outdoor spaces. Planning principles provide strategies to identify the kinds of elements, arrangements, and adjacencies that will foster interaction within the clusters. Sustainable design goals and strategies, as well as maintaining a safe and secure workplace, are central to the development of these guidelines.

Safety, Security, and Emergency Planning

The Laboratory works to assure that its personnel and visitors are safe and that its assets are properly protected for its Office of Science mission and operational requirements. Berkeley Lab has been working with DOE's Office of Science and Berkeley Site Office to assure that effective and well-tailored security measures are provided for this site which has no classified information and serve the nation's scientific community. The Laboratory has provided briefings and information on this topic to the germane Office of Science and DOE support offices, the Laboratory Operations Board, and the University of California Office of the President's Laboratory Security Panel. Berkeley Lab is fully committed to an effective security program that is commensurate and aligned with its Office of Science mission as a Tier III laboratory. Berkeley Lab management seeks to reinforce effective line management and to be held accountable for security performance that is aligned with security risks.

Lab policy, and federal law, requires that all staff, participating guests, visitors, and others who perform work at, or for, Berkeley Lab must receive appropriate training necessary to protect their health and perform work in a safe and environmentally sound manner. This training must include information regarding job hazards, possible health effects, and required work practices and procedures. The Environmental, Health, and Safety Training Program has been designed to meet the requirements of DOE and all other federal, state, and local regulatory agencies.

Buffer zones around hazardous areas are identified with highly visible signage, and individuals are encouraged to report unsafe conditions. Public entry is prohibited and strictly controlled in areas where radioactive materials or radiation-producing devices may be in use. General Employee Radiological Training (GERT) is required for employees and guests prior to unescorted access into these areas.

Compliance and Monitoring

Berkeley Lab is situated within the larger Strawberry Creek watershed. Most of the site is within the Strawberry Canyon portion of this watershed, an approximately 1,000-acre area that had largely been grass and brush land prior to the 1940s. Storm-water flows from the Laboratory site are managed as part of a UC-designed system that was implemented after the extreme storm of 1962. The University worked with the Laboratory and the larger community to make improvements to both the north- and south-fork flows that addressed flooding risks. This system has now operated effectively for over 30 years.

Across the site, water table depths vary from three meters (ten feet) to more than 27 meters (90 feet). During winter, groundwater levels and hydrostatic pressure increase. The Laboratory has installed a system of monitoring wells and hydraugers to maintain slope stability in the years when the water table is at higher elevations.

The Laboratory’s Environmental, Health, and Safety Division operates an extensive water-quality management program, and validates the effectiveness of its work with monitoring at outflow points. These monitoring reports are reviewed in public processes with state and regional agencies and are made available to the public.

Wildlife Management

Wildlife that frequents the Laboratory site is typical of wildlife in disturbed (e.g., previously grazed) areas that have a Mediterranean climate and are located in mid-latitude California. More than 120 species of birds, mammals, and reptiles/amphibians are thought to exist on the site. The most abundant large mammal is the Columbian black-tailed deer. A portion of the site is within a 407,000-acre zone that was included by the United States Fish and Wildlife Service as critical habitat for the Alameda whip snake, a federal- and state-listed threatened species. This designation was vacated by a federal court in May 2003. Although no Alameda whip snake sightings have been reported on or in the vicinity of the Berkeley Lab site, the Laboratory continues to take appropriate precautions during its construction projects.

Public Access

Berkeley Lab’s Hill site typically restricts public access through access-control restrictions. Visitors are required to register with the Site Access Office, and parking permits are required for anyone driving a vehicle onto Laboratory grounds. Unrestricted access is only allowed during the Berkeley Lab Open House, which is held every two years.

Contaminated Areas and Remediation

Berkeley Lab has an active environmental restoration program to identify and clean up areas of soil and groundwater contamination at its site. The program is being conducted under the requirements of the Resource Conservation and Recovery Act's Corrective Action Program and under the oversight of the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC). Final corrective measures have been proposed for 4 areas of soil contamination and 11 areas of groundwater contamination. Final corrective measure are currently being reviewed by DTSC and approval is expected in 2005. DOE's Office of Environmental Management (EM) funds the environmental restoration activities and it is planned that this funding will continue through the end of FY06.

Following completion of the DOE EM project the site will be transferred to the DOE Office of Science for the implementation of Long Term Stewardship (LTS) activities in FY07. LTS activities will include regular groundwater sampling from wells that are part of the current groundwater monitoring network and the following general corrective measures:

- Extraction and treatment of contaminated groundwater and reinjection of the treated water to flush contaminants from the subsurface.
- Capture and treatment of contaminated water in storm drain lines and subdrains
- Capture and treatment of contaminated hydrauger effluent
- Monitored natural attenuation

Cultural and Historic Resources

In 1987, a historical evaluation considered the original cyclotron building (Building 6) a "highly significant landmark," marking an important episode in scientific research and the development of the UC Berkeley campus. The report concluded that internal and external building changes could be made if the original visual quality of the building was retained. Reuse of the structure for the Advanced Light Source (ALS) followed the report's guidelines for modifications and retained the building's original visual character. Refer to "Appendix A: Scientific History of Berkeley Lab," for more information.

Land and Ecosystem Stewardship Activities

Consistent with the Laboratory's research missions and accomplishments, the Laboratory intends that each project contribute to the Laboratory's objective of being a model of sustainability. The Laboratory is actively working to both conserve energy and to implement onsite renewable and environmentally appropriate sources of energy. For example, the Laboratory is actively examining its options to install additional solar thermal collectors and solar electric panels on rooftops and walls of onsite buildings, including parking structures, where adequate solar access is available and the installations are aesthetically acceptable. The Laboratory is also investigating how it can install fuel- cell technologies to replace standby generators and other site-specific sources.

The Laboratory manages its larger landscape consistent with wild land fire safety principles and urban forestry principles. The Laboratory also operates an effective and compliant air and water resource management program.

Berkeley Lab is committed to the use of state-of-the-art building design standards that improve storm water management, are consistent with site conditions and industry standard document.

Berkeley Lab Facilities and Infrastructure

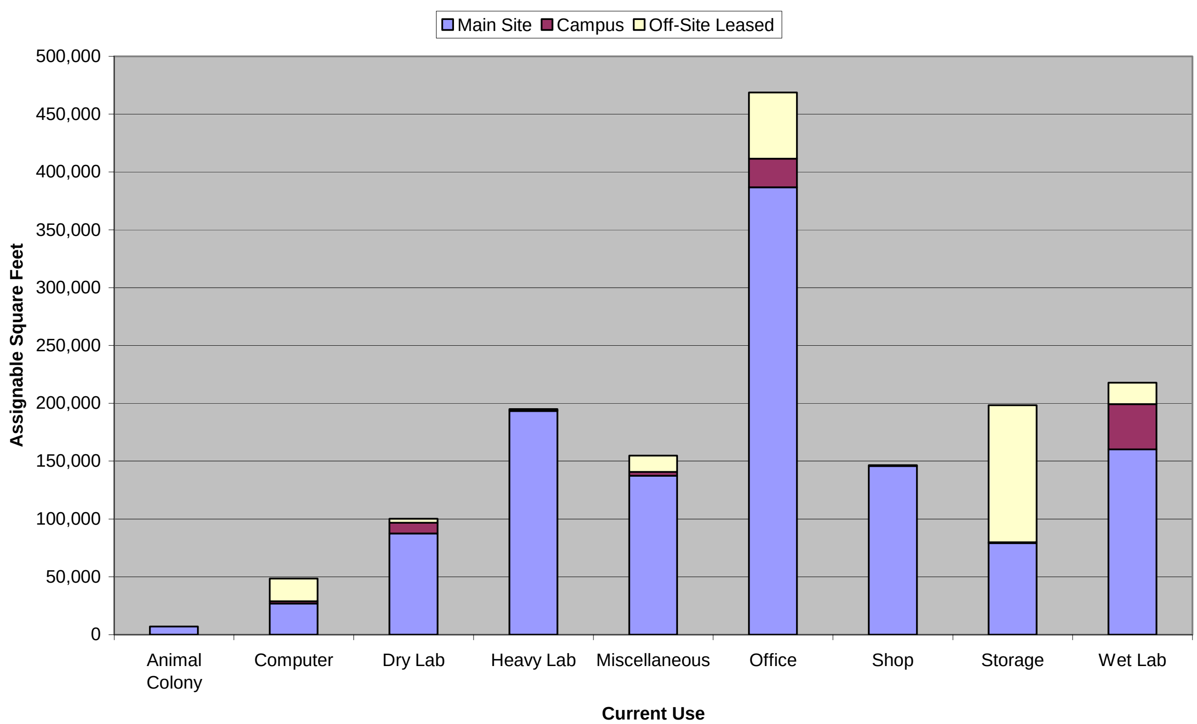
Existing Conditions, Future Uses, and Issues

Hill Site, UC Berkeley Campus, and Offsite Leases

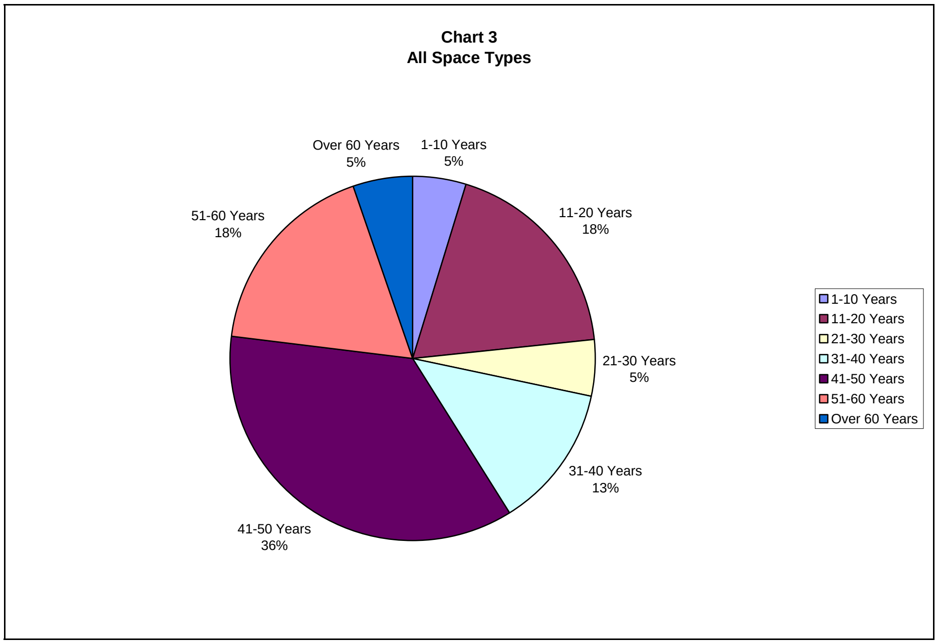
Berkeley Lab operations take place on its 203-acre Hill site, on the UC Berkeley campus, and in leased space in Berkeley, Oakland, and Walnut Creek, California. Most of the Laboratory's scientific, administrative, and support programs are housed on the Hill, where Berkeley Lab currently occupies approximately 1.70 million gross square feet in 107 buildings and 50 trailers. There are no non-SC facilities at Berkeley Lab.

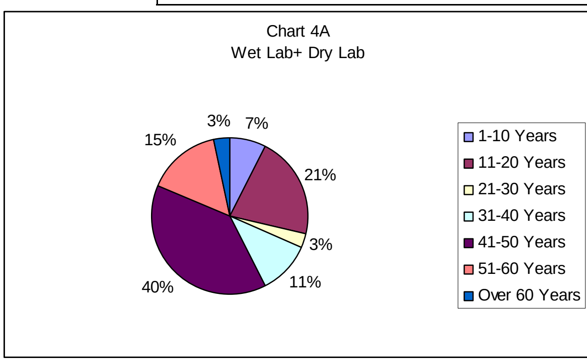
As illustrated in Chart 2, Berkeley Lab, a multidisciplinary national laboratory, accommodates a wide range of research and support activities**.** The majority of the Laboratory's buildings contain multipurpose lab and office space whose primary function is to support the research divisions. Advanced and specialized research facilities, like the ALS and NCEM, serve specific programmatic needs. The latter are typically dedicated national user facilities and must also provide visiting research teams with supplemental lab and office space. Support services necessary to maintain and operate the Laboratory occupy a diverse range of facilities, from administrative offices to high-bay engineering shops, utility equipment structures, and an onsite firehouse.

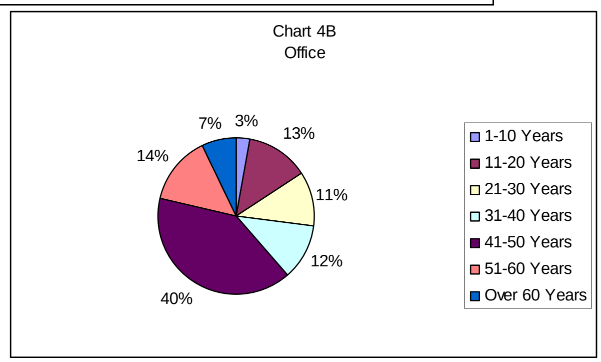
Chart 2
Berkeley Lab Space Types



Almost 20 percent Berkeley Lab's main site buildings are over 50 years old, an age beyond the effective lifespan of research buildings. As illustrated on Chart 3, these buildings comprise over 23% of the assignable area of the main site. Charts 4A and 4B illustrate the age of the most critically needed space types. Since many of these buildings were built as temporary facilities, their outdated condition is more pronounced than their age would suggest. Many of Berkeley Lab's scientific goals and programs are constrained by these conditions.







The vast majority of the 72,000 net square feet of space currently occupied by the Laboratory on the UCB campus is in two buildings that were constructed with the direct support of Berkeley Lab: Donner Laboratory, which the Donner Foundation funded to further the life sciences work of Ernest and John Lawrence; and Calvin Laboratory, constructed to carry forward the biosciences work of Berkeley Lab Nobelist Melvin Calvin.

Approximately 59,000 net square feet of space directly to the west of the UCB campus is currently leased for administrative service functions. This downtown space is served by the Berkeley Lab shuttle bus system, which provides a direct connection to the main Hill site. The Laboratory also leases a shipping-and-receiving facility in an offsite industrial area. Materials are consolidated at this location and transported by truck to the Hill once or twice a day.

Offsite leased space houses research functions if dictated by the type of work or by the Laboratory's overall space needs. For example, the Laboratory operates the Joint Genome Laboratory's Production Genomics Facility, jointly with other DOE laboratories, in Walnut Creek, CA; a Washington, D.C.; office for Energy and Environment program development, and the Oakland (CA) Scientific Facility, housing computing equipment and staff. There is also a leased telecommuting center in Livermore, CA. Negotiations are currently being finalized to add an additional 9,450 rentable square feet at the Joint Genome Institute (390 N. Wiget) and to lease 72,000 rentable square feet at 717 Potter Street, Berkeley, to house a joint UCB/Berkeley Lab biosciences development center

Appendix B contains details on Berkeley Lab buildings, trailers, and leased buildings. Appendix C details the breakdown of space, by usage type, in each of those facilities. Appendix M4 shows the location of currently leased property.

Justification of Proposed Lease

The proposed joint lease of 72,000 rentable square feet at 717 Potter Street is the only lease of 10,000 rentable square feet or greater that is presently being considered. Lawrence Berkeley National Laboratory (LBNL) and the University of California Berkeley (UCB) are experiencing unprecedented growth in their biological research programs, especially in the areas of synthetic biology (which includes the DOE funded Genomes to Life Program), cell and molecular biology, low-dose radiation biology, cancer research, and other multidisciplinary quantitative biology. Currently funded programs have exceeded both institutions' ability to provide sufficient, quality laboratory space and newly awarded grants. The current limitations on space impedes the ability to recruit and retain talented scientists and successfully conduct DOE research and complementary research sponsored by the National Institutes of Health and other sponsors. These organizations greatly benefit from DOE's unique multidisciplinary research capability that brings together biologists, chemists, engineers, computing scientists and other technical skills.

The rental space will primarily be used for the Office of Biological and Environmental Research activity and complementary National Institutes of Health research. This OEBR work includes: GTL: Genomics research involving the study of molecular machines and computational biology; research on novel microscopies for studying biological molecules; analyzing and engineering biological systems; molecular, cellular and multi-cellular response to ionizing radiation and the environment; predictive models of cellular systems. The NIH related work is primarily related to immortal and tumorigenic cell systems and cancer biology closely allied with the biological mechanisms and cellulular respose research sponsored by OBER.

LBNL's current Biosciences Divisions' 1,050 employees occupy approximately 229,000 gross square feet, an average of 218 gross square feet per person. This office/lab occupancy density figure is considerably lower than the typical 250 gross square foot per person <u>office only</u> standard and is far lower than local private biotech research and development occupancy rates of 400 gross square feet per person. (NOTE: The Joint Genome Institute located in a remote leased facility and managed in part by LBNL is not included in these figures.)

In addition to the overcrowding, the Biosciences effort is scattered throughout 14 buildings on the main site, 10 buildings on the UCB campus, and 2 off-site buildings. One of the off-site buildings houses the divisions' administrative offices, making them the only divisions whose administrative staff is separated from their on-site research staff.

Additionally, much of the space occupied by the Biosciences Divisions is substandard. Building 74 is rated as "poor" on the UC seismic scale. Both Donner and Calvin Laboratories, which are UCB buildings occupied solely by LBNL, have serious electrical and HVAC deficiencies. These three buildings, which comprise approximately 45% of LBNL's Biosciences portfolio, could fail at any time causing a serious disruption to the accomplishment of the Laboratory's missions.

The space at 717 Potter will offer a solution to many of these problems by providing space for a joint LBNL/UCB biotech center.

Replacement Plant Value

At the beginning of FY2004 Berkeley Lab's legacy RPV data in FIMS was $821,000,000. During the course of the year OECM agreed that site preparation costs and other costs included in the Berkeley Lab legacy data was inappropriate but they rejected that Lab's methodology in calculating those costs. As a result of their rejection of the Berkeley Lab process $99,000,000 in costs were added back into the Berkeley Lab RPV, raising it to $920,000,000.

Berkeley Lab has now abandoned its original legacy approach to calculate the RPV and is currently in the approval request process for recalculating the Lab's RPV using VFA software. The adjusted RPV for Berkeley Lab when approved will be in the range of $630,000,000. The results of this new approach track closely with the overall values generated by the current approved RPV process now available in FIMS. Given this close correlation between these two processes Berkeley Lab is using the $630,000,000 RPV for its FY2005 MII planning and funding. Table 1 summarizes the total RPV using each of the three methods. Please see Appendix D for a building by building comparison of legacy vs. VFA calculated RPVs.

Table 1
Comparison of FIMS vs. VFA vs. Legacy RPV's

RPV Comparisons	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
TOTAL All Active Buildings	420,445,106	387,636,966	661,373,257
TOTAL Op Excess After 2006	20,020,816	20,586,454	35,645,596
TOTAL Real Property Trailers	9,153,092	9,153,092	10,773,446
TOTAL Conventional OSF's	209,920,895	209,920,895	209,920,895
TOTAL for MII Calculation	**659,539,909**	**627,297,407**	**917,713,194**

The current FIMS process and the proposed CostWorks process are similar to the methodology used by VFA in calculating the RPVs. The significant difference between the current FIMS method and the VFA method is that FIMS uses building models based upon "similar-use replacement facilities" and the "replacement-in-kind facilities" to calculate buildings' RPVs. Utilizing the replacement-in-kind method more accurately identifies the building and its specific building components and equipment. The VFA process uses this methodology while the current FIMS process does not.

Off-Setting Space Status

Through a previously approved Secretarial Waiver, proposed Bevatron demolition project, and other planned demolitions, Berkeley Lab has identified sufficient offsetting space for all new construction except the proposed Ultrafast Science Facility, tentatively scheduled for occupancy in FY 2013. Although additional demolition options will be explored, it is not clear where the approximately 60,000 gsf of space that needs to be demolished to allow construction of this facility can be found on the main site.

It is also assumed that the two alternatively financed projects included in this TYSP, and any other similarly financed projects to be completed in the future, will be treated in the same manner as either UCB space or leased facilities. Neither of these classes of building is currently covered by the offsetting space requirement.

Details are contained in Appendix E

Seismic Safety of Buildings and Infrastructure

Berkeley Lab is located in very close proximity to the active Hayward Fault and has, therefore, embarked on a two-year program to re-evaluate the seismic adequacy of all major facilities. As deficiencies are found, corrective action plans are developed and funding for upgrades is requested. In the few instances where buildings have been rated as “very poor” on the UC seismic safety rating scale, those buildings have been vacated until upgrades have been made.

Asset Utilization

Even though all Berkeley Lab assets are 100% utilized, with the exception of the Bevatron complex and the accelerator portion of Building 71, Berkeley Lab's overall average AUI[2] is currently 0.920 as derived from the data in FIMS. The rating assigned to the AUI of 0.920 is "Adequate." Our goal is to improve the AUI as excess facilities are eliminated and consolidation increases the space utilization rate of our remaining facilities.

Maintenance and Operations

The Laboratory is formulating integrated plans for long-range capital improvements and operating expenditures. The operating expenses for maintenance include physical plant maintenance and noncapital alterations related to maintenance. Maintenance can be effectively managed by establishing priorities for maintenance projects and by replacing obsolete and high-maintenance-cost facilities with modern facilities and equipment. Laboratory management is directing its efforts toward rehabilitation of buildings with DOE Office of Science SLI funds. Increased DOE support would allow the maintenance and infrastructure backlogs to be effectively reduced within the next ten years. The use of noncapital funds could then be efficiently allocated to maintain essential building and equipment investments.

Condition Assessment Program

Since FY1999, Berkeley Lab has been conducting a robust condition assessment program. Under the direction of Plant Operations, annual inspections and evaluations are conducted by highly qualified outside consultants who advise Plant Operations on the maintained condition of buildings and major subsystems. Plant Operations then reviews and prioritizes the inspection findings in five-year and ten-year maintenance plans.

Requirement

Under a DOE requirement by the Statement of Federal Financial Accounting Standards (SFFAS) No.6, Accounting for Property, Plant, and Equipment (PP&E), guide for Deferred Maintenance Reporting Requirements, Lawrence Berkeley National Laboratory (Berkeley Lab) was directed, under a five-year plan, to inspect at least twenty percent of all real property every year. The goal of the inspections was to establish a baseline of current facility conditions, and develop a 5-year maintenance/repair plan without the influence of budgetary or operational constraints.

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[2] The Asset Utilization Index (AUI) is the Department of Energy's corporate measure of facilities and land holdings against requirements. The index reflects the outcome from real property acquisition and disposal policy, planning, and resource decisions. The index is the ratio of the area of operating facilities, justified through annual utilization surveys (numerator), to the area of all operational and excess facilities without a funded disposition plan

Applied Management Engineering Inc. (AME)

Starting in FY 1999 the facility condition assessment was accomplished by Applied Management Engineering Inc, (AME) by an on-site visual inspection of each building. AME Inspection teams performed Facility Condition Assessment of 134 facilities over a five-year period from 1999 through 2003 at the Berkeley Lab site. The assessments were performed at the component and system level with emphasis placed on identifying deficiencies, cyclic maintenance and long range replacement (capital renewal) needs. Berkeley Lab personnel provided additional background (floor plans and AutoCAD drawings) and historical information on facility systems conditions and performance.

The assessment was accomplished by separating the facilities into tiers.

Tier 1 - Large Buildings
Tier 2 - Small Buildings and Trailers
Tier 3 - Storage Containers

Inspection teams assessed civil, structural, roof components, electrical, and mechanical in each of the Tier 1, 2 and 3 facilities. Utilizing their extensive experience and knowledge, each team member was responsible for collecting deficiencies, including the establishment of priorities, locations, quantities, and descriptions. The inspectors entered their information into a database called Facility Condition Information System (FCIS). The database assigned costs then compiled and sorted the data. The inspectors validated the deficiency costs.

Vanderweil Facility Advisor, Inc. (VFA)

In FY2003 the Berkeley Lab Facilities Division conducted a pilot assessment and software project with Vanderweil Facility Advisor Inc, (VFA) the leading provider of Web-based facilities and capital asset management solutions and software. Berkeley Lab contracted VFA to perform a detailed facility condition assessment, provide training on VFA's assessment methodology and deliver VFA facility software, the central Web-based platform of VFA's capital planning and management solutions (CPMS) tools for six- (6) buildings with a combined total of approximately 150,000 square feet. The outcome of the pilot was extremely successful and the decision was made to retain VFA in FY2004 to perform detailed condition assessment on 343,891 square feet (twenty percent) of real property integrating VFA's software and assessment methodology into Berkeley Lab's existing facility management program.

This process is enabling the Facilities Division to capture and quantify the Lab's deferred maintenance backlog efficiently and effectively. VFA's software including VFA facility and AssetFusion VFA's integration with MAXIMO, the Facilities Division Work Management System, gains access to versatile and extensive capabilities for reporting and modeling, improving the accuracy of building cost estimates, estimating time to failure and optimal period to take action, and improves the quality of the information gathered. Facilities will also use the software to develop reports that demonstrate the exponential growth of potential deferred maintenance costs over time.

Plans for FY2005 include VFA performing detailed condition assessment on 429,394 square feet of real property, AME data importing into VFA facility, and implementation of AssetFusion.

Five-Year Sustainment Plan

Maintenance requirements and actions forecasted for the next five-years are identified through Condition Assessment Inspection and by in-house experts. They are then prioritized, reviewed, and the plan is approved annually. Annually maintenance project candidates are assessed during the planning process by the condition and the consequences of failure of the asset to determine the priority and planning year of the project. Requirements not accomplished during that year are reported to the DOE as Deferred Maintenance.

Currently Facilities uses MAXIMO as its Work Management System (WMS). Preventive, Predictive, Corrective, and Emergency Maintenance work is performed using MAXIMO to keep Berkeley Lab equipment running efficiently. PM's are used to plan for regular maintenance work by planning the labor, material, and tool needs of our regularly scheduled maintenance and inspection work orders. Preventive, Corrective, and Emergency Maintenance work hours are track monthly to determine the pro-activeness of our Maintenance program.

In the near future Corrective and Emergency Maintenance work will be analyzed using Reliability Centered Maintenance (RCM) and the Failure Modes Effects and Criticality Analysis (FMECA) processes. RCM is a systematic way of identifying failure modes within equipment and determining appropriate maintenance tasks to combat the failures. The FMECA is the heart of the RCM process. This systematic approach when coupled with plant information about plant failures, costs, safety impacts, environmental impacts, and operational criticality will allow Facilities Plant Operations to set appropriate tasks and maintenance intervals to generate a strategy that is optimized to the needs of our business.

For a completely integrated Asset Management Solution, links between our Work Management System, MAXIMO, and our Capital Planning and Management System, VFA facility, is required to provide a total picture of associated projected and actual cost for routine/preventive maintenance, repair, capital renewal, and multi-year capital requirements. The integration of the two systems involves more than data synchronization. The solution encompasses an organization's total business process, an approach in which to properly manage our facilities assets in a more proactive manner (as opposed to reactive maintenance). The program will provide a solid knowledge of the deficiencies that must be corrected. Currently this knowledge is spread out among many different individuals and departments. The lack of a centralized repository of facilities deficiencies information has resulted in renovation/repair projects that may have omitted critical deficiencies. These omissions must later be corrected, usually at significantly higher costs. When all of the deficiencies have been consolidated, it is far more difficult to omit critical items from the design of on-going renovation projects. This would also be useful tool for organizing and prioritizing all deficiency corrective measures using standardized criteria.

A process of generating project scopes and consistent budget estimates, would greatly improve the accuracy of forecasting future capital renewal and maintenance needs. Without the centralized (and complete) deficiency database, only projects planned for the immediate future typically have any supporting cost and / or prioritization information. The lack of detailed information on longer-range projects makes forecasting maintenance budget needs extremely difficult. This difficulty in forecasting results for future budget requirements creates budgets based on historical expenditures as opposed to what is actually needed. The information would be valuable at the DOE HQ level for assessing funding requirements.

Also a facility condition index (FCI) value should be used which is simply the cost required to correct all deficiencies in a building divided by the total replacement cost of that building. This FCI value is a useful tool for comparing the relative condition of all buildings. This tool will be useful in determining which buildings or systems should be considered for major renovations or up-grades, and to assure that funding sources have been identified for each project to help assure that each deficiency is properly addressed. Altogether this would be a powerful tool useful in the development of a five-year or longer capital renewal model that shows the needs versus available funding and the resultant FCI.

Management of Deferred Maintenance

Deferred Maintenance Backlog is identified through Condition Assessment Inspection and by in-house experts then prioritized, reviewed, and planned based on funding. Annually maintenance project candidates are assessed during the planning process by the condition and the consequences of failure of the asset based on the Strategic Value to the Berkeley Lab Mission determining the priority. Maintenance projects are funded through a combination of overhead and recharge funding. Overhead is used to fund the backlog reduction and non-cap maintenance projects. The remaining maintenance projects are funded through electrical recharge funds and portions of Capital projects. Throughout the year numerous other small Maintenance projects are funded through ongoing maintenance funds as needed. Year end excess funds are also used for deferred maintenance reduction.

At this time we are projecting an increase in deferred maintenance backlog based on the DOE definition of deferred maintenance and reporting requirements, the continuing condition assessment process, deterioration, inflation factors, and lifecycle capital renewal needs. Increased maintenance investment will be made into facilities in a manner that addresses high priority issues and to help prevent further backlog growth. Much of our deferred maintenance is in buildings that are substandard and in which we have no intent to reduce deferred maintenance by applying extra maintenance funds. Until substandard buildings are demolished or recapitalized, the deferred maintenance backlog will not shrink appreciably. Increased DOE support would allow the maintenance and infrastructure backlogs to be effectively reduced. The use of non-capital funds could be efficiently allocated to maintain essential building and equipment investments. If the deferred maintenance list is retired by large blocks of funding, it will keep the list from growing. These large blocks of funding can come in the form of increased capital project funds (GPP or GPE), demolition funds (SLI or Program), or major recapitalization projects (SLI or Programmatic LIP)

Annually maintenance project candidates are reviewed during the planning process, the condition of the asset, and the consequences of failure of the asset are assessed to determine the planning year of the project.

Table 2 represents the model that is applied to determine the optional FY for project planning. Projects with a cell value of “0” are given immediate attention. Those with a cell value of “1” are planned for the next budget year and then prioritized within that year. The cell values “2”, “3”, “4” and “5” indicate out-year planning. Mission critical projects not accomplished during that year are considered and reported to the DOE as Deferred Maintenance

Table 2
Consequences of Failure Table

Condition	Consequences of Failure: Critical	High	Medium	Low
Failing/Failed	0	0	1	2
Poor	0	1	2	3
Fair	1	1	3	4
Adequate	1	2	4	5
Good				
Excellent				

LEGEND

Cell	Plan	Cell	Plan
0	FY NOW		
1	FY +1	4	FY +4
2	FY +2	5	FY +5
3	FY +3		No Plan

Throughout the Laboratory's history, buildings have been constructed using the most common and cost-effective methods available at any given time. The result is a range of construction types as diverse as their use and age. Many of the buildings in the oldest portion of the Laboratory were intended to be temporary. Still in service today, these buildings are uninsulated metal panel structures with expanses of single-pane glass windows. There are also wood-frame buildings with corrugated composite siding, such as Building 64, and sturdy cast-in-place concrete structures, such as the landmark Building 50 complex. Approximately 4.4% of the space on the Hill is located in temporary trailers.

All usable space is fully committed to the scientific mission, and maintenance and administrative actions ensure that scientific needs are addressed. However, mission requirements are difficult to achieve in buildings with infrastructure systems designed to support Laboratory practices of the 1940s and 1950s. Modern standards for cleanliness and temperature control, and expectations of microscale tolerances, are particularly challenging in older buildings, yet much of the work now being performed demands an environment that can accommodate scientific standards. Building system upgrades are required in some buildings. In other instances, the buildings are not structurally satisfactory; some small buildings are condemned, and other buildings have occupancy limitations. Also of concern are buildings that were designed specifically for specialized functions that are no longer being conducted and that cannot be cost-effectively adapted for other uses. Use of unsatisfactory space is costly and requires reliance on administrative controls to ensure that operational safety requirements continue to be attained.

Many of the smaller, older structures are not cost effective to upgrade, and need to be replaced in order to better address mission needs. In some cases, there is an additional benefit, as these smaller World War II–era structures occupy prime sites that can efficiently accommodate four- and five-story buildings. Increasing the user density at these prime locations will also improve overall operating and scientific efficiencies.

Building Modernization

Annually, the Facilities Planning Group, with input from Laboratory management, reviews the mission need for each main site building and off-site leased facility. Among the factors reviewed are:

- the prospects of continued funding for the program or programs currently occupying the building,
- the possibility and ease of conversion the building for reuse for projected new programs,
- and the overall condition of the building (using both ACI and TSCI).

The results of this evaluation are translated into the Modernization Planning Indicator (MPI), which is recorded in FIMS. The MPI indicates one of the following for each building and OSF:

1. asset to be replaced by another new facility
2. asset to be demolished without replacement,
3. asset to continue to operate.

Appendix F contains the MPI listing each Berkeley Lab asset.

Rehabilitation and Improvement Cost

As discussed in the Operations and Maintenance section that follows, a major indicator of building conditions is the Facilities Condition Index (FCI), which is defined as dollars of deferred maintenance for a building, trailer, or utility system divided by the Replacement Plant Value (RPV) for that building, trailer, or utility system. The Asset Condition Index (ACI) is simply 1 minus the FCI. While the ACI provides an accurate representation of the maintained state of an asset, it may not provide a complete picture of the asset's condition.

The life-cycle status of each of the various subsystems comprising the asset needs to be determined and evaluated along with code deficiencies and other "non-maintenance" considerations in order to complete the condition analysis. This evaluation develops a Rehabilitation and Improvement Cost (RIC) which, for buildings and trailers, Berkeley Lab currently utilizes an analysis tool patterned after the RS Means methodology used by FIMS for RPV calculation. Appendix G contains a more detailed explanation of this process and the calculation of the Total Summary Condition Index (TSCI). Utility Systems are similarly evaluated and the appropriate percentage from Appendix G, Table 4, is applied to determine the RIC.

A significant part of VFA's detailed condition assessment of our assets is the preparation of life-cycle based renewal information and code deficiencies. As more experience is gained with the VFA assessment and methodologies, it is anticipated that their actual inspection and evaluation data will replace the current, more qualitative, RIC calculation method.

Overall Condition of Berkeley Lab Buildings (Using ACI and TSCI Descriptors)

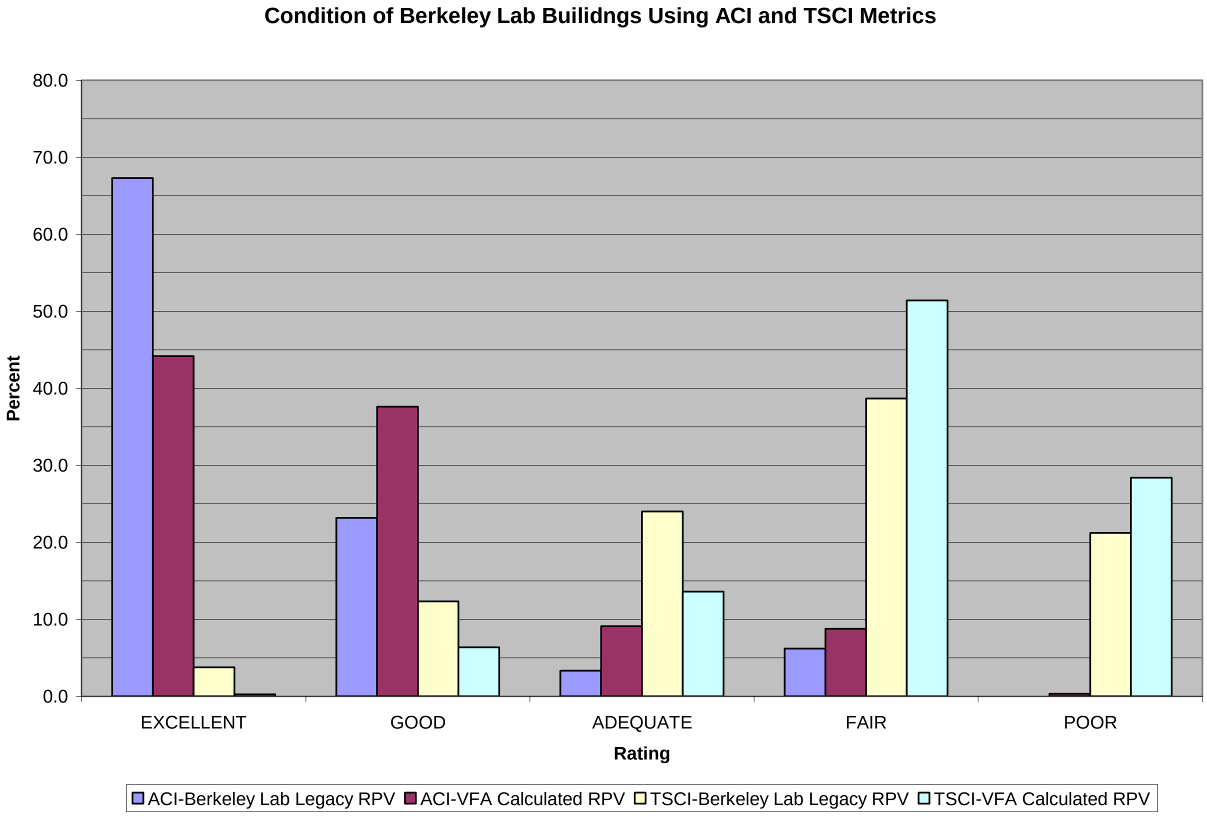


Table 3 summarizes ACI and TSCI calculations made by using Berkeley Lab Legacy RPVs. The ACI figures on that table show that 93.8% of Berkeley Lab's gross building area is rated "adequate" or better, with 67.3% being rated "excellent". TSCI calculations made using the same RPVs show that 40.1% of Berkeley Lab's gross building area is rated "adequate" or better, with 3.8% being rated "excellent".

Table 3
ACI and TSCI Using Berkeley Lab Legacy RPV

	Asset Condition Index		Total Summary Condition Index	
Descriptor	Gross Square Feet	Percent	Gross Square Feet	Percent
EXCELLENT	1,108,861	67.3	62,207	3.8
GOOD	381,818	23.2	203,197	12.3
ADEQUATE	54,979	3.3	395,613	24.0
FAIR	102,286	6.2	637,126	38.7
POOR	0	0.0	349,801	21.2

Table 4 summarizes ACI and TSCI calculation made by using VFA calculated RPVs, which we believe are a more accurate representation of a building's current maintainable value. This table shows that 90.9% of Berkeley Lab's gross building area has an ACI ranking of "adequate" or better, but the percentage ranked as "excellent" drops to 44.2%. From a TSCI standpoint, only 20.2% of Berkeley Lab's gross building area is rated "adequate" or better, with only 0.2% being rated as "excellent".

Table 4
ACI and TSCI Using VFA Calculated RPV

	Asset Condition Index		Total Summary Condition Index	
Descriptor	Gross Square Feet	Percent	Gross Square Feet	Percent
EXCELLENT	727,817	44.2	4,090	0.2
GOOD	619,835	37.6	104,810	6.4
ADEQUATE	150,377	9.1	224,179	13.6
FAIR	144,524	8.8	847,154	51.4
POOR	5,391	0.3	467,711	28.4

A cursory analysis of these figures reveals that an ACI that more closely resembles the true condition of Berkeley Lab's assets is derived by using the VFA calculated RPVs. The TSCI ratings for the current year are still being calculated but early indications are that the condition of those buildings for which VFA has given us a cost will be much more accurately represented.

Appendix H contains the RIC and TSCI for all applicable Berkeley Lab assets.

Infrastructure Modernization

The Laboratory's operations require a complex and extensive network of utility systems. These utility systems are owned and maintained by Berkeley Lab within the management boundary. Larger aggregate utility suppliers—municipal, regional, and federal—provide service up to the management boundary. The Laboratory also works to effectively use utility resources and has implemented significant conservation programs over past decades. The Laboratory will continue with resource conservation efforts and will add emphasis to onsite generation of energy and "green" design.

The Laboratory designates utility corridors and seeks to locate new lines within existing corridors whenever possible. Further development of the utility systems will make use of the utility corridors whenever possible. The Laboratory sustains a significant investment program to rehabilitate and replace utilities. Permanently installed Laboratory utility systems are generally located underground, and will be in the future.

Expansion and renovation of the utility system is not primarily driven by new growth. Since the1987 LRDP, Berkeley Lab has grown almost 25 percent while attaining a 40 percent decrease in water use (due to conservation measures and the installation of water conserving and efficient equipment). Expansion and renovation of the utility system is driven primarily by research needs. Increasingly rigorous environmental standards, along with new state and federal regulations, are also anticipated to require system upgrades. To ensure reliability after a major seismic event, meticulous study will be given to locations where the utilities cross the earthquake faults.

Even though Berkeley Lab has grown in both physical size and in population, carefully targeted investments in conservation over the past 20 years have enabled Berkeley Lab to reduce its total water demand from the East Bay Municipal Utilities District (EBMUD). The Laboratory's water is supplied continuously from two sources: the primary water source is EBMUD's Shasta Reservoir, which supplies the Laboratory's high-pressure fire and domestic system; the secondary water source is EBMUD's Berkeley View tank, connected to Berkeley Lab by EBMUD piping.

Berkeley Lab's *water distribution system* contains several backup secondary distribution loops and is valved to provide extensive control in case of emergency. The system normally operates by gravity flow, requiring no pumps or energy consumption for operation within the Laboratory.

Berkeley Lab has three 750-cubic-meter (200,000-gallon) fire protection storage tanks. One is located near Building 71 in the Central Research Area, another near Building 75 in the Grizzly Operations Support Area, and one more near Building 85 in the East Canyon area. Automatically starting diesel-powered pumps connected to the tanks at Buildings 71 and 75 will maintain a reliable flow for the fire protection system during emergencies. The tank at Building 85 will maintain reliable flow for fire protection during emergencies by gravity feed.

Sanitary sewer flow, concurrent with the reduction in water use, has also declined over the past 20 years. The western portion of Berkeley Lab's sanitary sewer system connects to the City of Berkeley sewer main on Hearst Avenue. South of the Laboratory, a second connection is made to the UCB campus on Centennial Drive and then onto the City of Berkeley system. The City of Berkeley sewer basins that take flow from Berkeley Lab are not identified as being constrained. The Laboratory's sewers are maintained in excellent condition, and the Laboratory is not a contributor to the regional wet weather flow issues. The Laboratory monitors its discharges for the presence of certain chemicals and radioactivity. From 1996 to 1997, this monitoring system was upgraded.

The south side sewer flow to the City of Berkeley sewer system at Centennial and Stadium Rim Road will be constrained when the Molecular Foundry comes online in 2006. Currently we are doing a sewer study of re-routing the sewer flow from Centennial Drive to the west side of campus via existing campus lines. This re-routing will need to occur around the same time that the Molecular Foundry comes online. In addition, the monitoring station at Strawberry Canyon (Building 13F) will need to upgraded.

The Berkeley Lab *storm drainage system* consists of a labwide system of several hundred inlets and 6 miles of underground piping. This system must handle large volumes of runoff during winter storms, diverting water from potentially unstable hillsides and preventing accumulations of water that could flood streets, buildings, and other Berkeley Lab facilities.

Widespread deterioration of the system's steel piping has degraded its effectiveness by permitting large quantities of water to leak out of the pipes and migrate through the trench bedding material, which is typically sand or rock. This permeable material allows the water to travel and accumulate at some distance from the point of the leak, saturating the ground. This can result in landslides and in the movement of known contaminant plumes into the ground water. Approximately two-thirds (2/3) of the existing metal storm drain piping needs to be replaced or given nonmetallic linings in order to prevent the potentially costly and environmentally harmful effects of uncontrolled storm runoff.

Natural gas to Berkeley Lab is supplied by the Defense Fuel Supply Center via the Pacific Gas and Electric Company (PG&E) distribution system. A 6-inch main on Hearst Avenue feeds the PG&E-owned meter station at the Laboratory's west entrance. The Hearst Avenue meter station contains one meter for gas supplied at an interruptible rate. PG&E main pressure is about 40 pounds per square inch (psi), reduced to 13 psi at the Hearst Avenue meter-station computerized system. The 13 psi distribution pressure is further reduced at various regulator stations to serve either a group of buildings or, in some cases, a single building. Building pressure is in the range of 0.25 to 1.25 psi. Earthquake shutoff valves have been installed at the entrance main, and outside major buildings, to reduce the possibility of explosions following a quake. The natural gas is principally used for space and water heating; there is no central heating plant at Berkeley Lab.

Electrical power at the Laboratory is purchased from the Western Area Power Administration and delivered via PG&E's transmission system. Onsite electricity is distributed underground at 12 kilovolts (kV) from the centrally located Grizzly Substation. A PG&E aerial 115 kV electrical power line traverses the eastern portion of the site. The PG&E supply system consists of two overhead 115 kV, 3-phase, 60 Hz transmission lines with a joint capacity of approximately 100 MW. Both transmission lines feed power from PG&E's Sobrante switching station to the Grizzly Substation on Berkeley Lab's site. The 12 kV distribution circuits are arranged in dual feed radial configuration.

Transportation, Circulation, and Parking

The Laboratory actively supports a wide range of employee and guest commuting options and, among employers outside central city locations, has one of the highest use rates for alternative transportation in the state, with over 40 percent of staff and guests using an option other than their cars. This ratio is particularly notable as the Laboratory is not served directly by the regional bus system and is located approximately one mile from a BART station. Berkeley Lab is committed to reducing the trips generated by its daily activities to reduce traffic congestion, consumption of natural resources, and the amount of land dedicated to parking. The Laboratory supports a mix of transportation alternatives through:

- Local shuttle system serving two nearby BART stations, numerous AC Transit stops, and connecting its Hill site, downtown leased spaces, and UCB buildings. All of the shuttle buses have bike racks.
- Vanpools and carpools for employees in remote locations
- Systems that support bicycle commuters
- Multiple secured points of entry for pedestrian access
- Program alternatives such as telecommuting
- On-going improvements to internal pedestrian path systems and shuttle stations.

The Hill site has two major circulation corridors, an upper and a lower roadway, and walkways that run east-west across the site. The upper and lower corridors run with the topographic contours and provide easy access between all buildings. The system consists of "upper" and "lower" primary traffic routes linked by several secondary roadways that provide, primarily, service and emergency access. Chamberlain Road and Macmillan Road make up the primary upper route; Lawrence and Alvarez roads form the lower route. Chamberlain Road was originally a two-way road, but it has been reduced to one way to allow space for approximately 70 roadside parking spaces. Connecting service roads and pathways link the major roadways and provide access to individual buildings.

Berkeley Lab's Hill site is a pedestrian environment. Although an extensive roadway and shuttle system provide access to all Laboratory facilities, it is the pedestrian walkway that is the backbone of the Hill-site circulation system. Pedestrians can easily access all Hill site facilities, parking, and shuttle stops along walkways that offer a variety of visual experiences**.** Views of the San Francisco Bay and the natural setting make the experience of walking across the Laboratory one of its greatest assets. Secondary networks of pathways weave through the wooded slopes, providing access for vegetation management and recreational uses. Locations where pedestrian path improvements are needed have been identified, prioritized, and will be addressed over the term of this TYSP.

Land suited for parking lots or roadside parking is in limited supply at the Laboratory. Parking space is provided in small surface lots, some with a stacked configuration, and alongside roadways. Trailers serving as temporary office and storage space have been placed in parking lots, further reducing available spaces. Currently, Berkeley Lab provides parking space for 2,048 vehicles and 254 government-owned vehicles stored on site for day use. The resulting persons-per-parking space ratio is 1.7:1.

Maximizing Research Productivity

All usable space is fully committed to the scientific mission, and maintenance and administrative actions ensure that scientific needs are addressed. However, the World War II–era buildings are not suitable for most modern research programs. Also of concern are buildings that were designed specifically for specialized functions that are no longer being conducted and that cannot be cost-effectively adapted for other uses. Use of unsatisfactory space is costly, and requires reliance on administrative controls to ensure that operational safety requirements continue to be attained. Over the next twelve months, Berkeley Lab intends to implement the proven LLNL FAaRS suitability assessment program to better evaluate the suitability of our buildings by using objective criteria.

Value Engineering

Value Engineering opportunities for all new projects will be performed. Value Engineering is an organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. These organized efforts can be performed by both LBNL in-house staff personnel and by contractor personnel.

The goal is to review all aspects of the project and develop ideas which will optimize scope and budget and reduce the overall cost, including design costs, initial direct construction costs, and life cycle costs, while maintaining or enhancing the quality of the project such as increased productivity, higher quality, durability and maintainability.

Demolition and Replacement

Surplus Facilities

Consistent DOE Operating Funding is at the base of the Laboratory's efforts to remove surplus facilities. These are facilities that were constructed to serve missions no longer supported by the DOE and which are not cost effective or suitable for adaptive reuse. These facilities are located at four "redevelopment" sites. Two of these sites require only the removal of abandoned accelerators and related equipment, as the buildings are fundamentally sound, and adaptive reuse is practical. The other two sites are full demolition projects and will allow for development of new modern research facilities. It is the Laboratory's intention to demolish these buildings prior to the identification of particular replacement buildings; at the same time, the Laboratory will upgrade utilities and roadways in order to create "plug-in" development sites within the central core of the Laboratory.

Long Term Stewardship

Once a facility is declared excess and becomes non-operational Berkeley Lab secures the facility by locking it tight, posting it and disconnecting all non-essential utilities and systems. In most instances the only remaining active systems are the fire alarm and fire sprinkler systems. Both fire systems continue receiving necessary maintenance and are monitored through a central control system. The facility is placed on a routine surveillance program where the exterior of the facility receives physical inspections on an on-going basis by the Plant Operations Department in the Facilities Division. The security of the interior of the excessed facility is managed by Lab Security in EH&S. This process continues until demolition occurs. The process of acquiring funding for the demolition of excess facilities is managed by the Design & Construction Department in the Facilities Division. When funds are secured the Design & Construction Department manages the demolition process of the excessed facility.

Demolition Plan

Over the next 20-years the Laboratory plans to demolish up to 500,000 gsf of Hill-site buildings that are:

- seismically poor and not cost effective to upgrade,
- are no longer suitable for modern science,
- are costly to maintain,
- and that make inefficient use of valuable building sites within the existing developed zone of Berkeley Lab.

Within the ten-year term of this TYSP, the Laboratory plans to demolish 215,295 gsf of Hill-site buildings with support from DOE.

This demolition/reconstruction program will allow the Laboratory to better use already developed lands within the Intellectual Centers, and to achieve improved scientific interactions, implement new design standards in the Intellectual Centers, and to achieve sustainability objectives in land use and building design. Two redevelopment areas have been identified, these areas comprise over half of all space to be demolished.

The **Bevatron Redevelopment Area** produces a 4.4 acre development site for modern new buildings. The Laboratory has proposed dismantling, decontaminating as required, and demolishing the Building 51 Bevatron Complex. The work includes removal of the accelerator, shielding, buildings, related structures, and surface foundation. This site would then be productively used to meet DOE's emerging scientific missions.

The abandoned Bevatron accelerator cannot be adaptively reused and should be removed. The Bevatron comprises 172,000 gsf of Laboratory space. Until recently, the Bevatron complex had been largely abandoned. DOE has now agreed to fund, pursuant to the completion of environmental documentation, a multi-year demolition program that will result in the accelerator and all related buildings being demolished by 2010/2011 at proposed funding levels.

The **"Old Town" Redevelopment Area** contains World War II–era buildings that are not suitable for modern science and are no longer fully functional. The average age of these scientific buildings is 55 years; they have served the mission well and are now slated for removal to make a large 5.5-acre site available for modern research structures. These buildings are typically small wooden structures, yet they occupy prime sites that can be redeveloped to accommodate larger modern research facilities in line with current and future DOE mission requirements.

The Laboratory proposes a retirement schedule for these structures that allows current building occupants to be relocated into more modern and appropriate space. The Laboratory proposes to reuse these building sites to construct modern multistory research facilities at these locations in order to seamlessly meet DOE's mission requirements for many decades. The proposed work includes demolition of Buildings 4, 5, 7, 14, 16, and 25 as well as smaller structures in the area, termination of utilities such that future projects can tap into the Laboratory's main infrastructure, and any required decontamination of the sites. The cost estimate is under review.

Disposition of Excess Nuclear and Hazardous Materials

Excess materials will be generated as a result of the building renovations and demolitions that are planned over the next ten years. As a result of the wide variety of research activities performed at Berkeley Lab, it is anticipated that a wide variety of hazardous materials – both chemical and radioactive – will be excessed. Berkeley Lab has developed a process that ensures the safe and orderly disposition of these materials. The Laboratory has implemented a hazard tracking system that maintains a permanent record of the chemical and radioactive hazards found within work areas. In addition, due to the historical usage of lead, asbestos, PCB equipment and radioactive materials and to the ages of the buildings at the Berkeley Lab site, all work areas are currently reviewed for the presence of these hazardous materials prior to building renovations or demolitions. From this information and in consultation with Berkeley Lab EH&S staff, the appropriate disposition pathways are determined.

Adaptive Reuse Plan

The Laboratory has always been a leader in adaptive reuse of existing structures, e.g. conversion of the 184" Cyclotron Building (Building 6) into the space to house the state-of-the-art Advanced Light Source. There are currently two major adaptive reuse opportunities at Berkeley Lab.

Building 71 Accelerator **-** 15,000 gross square feet of building space can be reclaimed for use. DOE operations at this accelerator ceased ten years ago, and the accelerator portion of this otherwise usable building has been unusable for this past decade. This project will remove the accelerator and related equipment so that this building can be reused for other mission purposes. It is estimated that this clearance effort would cost approximately $7 million and could be accomplished in approximately three years.

88-Inch Cyclotron Removal - 54,000 gross square feet of building space can be reclaimed for use. The Laboratory supports the continued operation of this accelerator facility. However, should DOE determine that it is no longer needed for its mission; the Laboratory seeks support from DOE to remove the accelerator and related equipment so that this building can be adapted for reuse to serve other mission purposes. The building has been surveyed and found to be in very good condition and, after removal of the accelerator and related equipment, is suitable for adaptive reuse for other DOE missions. It is expected that this clearance effort would cost approximately $19 million and could be accomplished in about four years. The Laboratory is exploring reuse options for this building, which is located on a prime site adjacent both to the main entrance to the Laboratory and to the very active Building 50 research complex.

Workforce Planning and Development

Achieving the Laboratory's scientific goals will require the diverse mix of talent, collaborative culture, advanced instruments, and dedicated research space that are Berkeley Lab's hallmark. The population and space growth allowed for in the long-range plans address these goals and ensure that these resources are in place to function as needed. These growth projections are consistent with historical trends.

The modest growth identified below is necessary for the Laboratory to meet the scientific goals it has set in conjunction with DOE. These scientific goals form the basis of the Laboratory development program and objectives described later in this document. Berkeley Lab planning objectives, land use, and development principles represent the best possible relationship among Berkeley Lab research, administrative, and public service goals; staff and user needs; site characteristics; and integration with the surrounding communities.

To address the mission needs identified above, it is projected that the Laboratory's average daily population (ADP) will grow from approximately 4,376 in 2003 to approximately 5,525 over the next twenty years. The ADP includes FTE's for all full-time employees plus 40 percent of the part-time guests and facility users. This population figure includes Laboratory personnel located on the main Hill site, the adjacent UC Berkeley campus, and in offsite leased space.

Long-term plans are to consolidate almost all staff who are located in offsite leased space to the main Hill site. This goal will probably not be fully achieved during the term of this TYSP. A handful of Laboratory personnel will remain at remote locations (Washington, DC, Walnut Creek, etc.) in numbers that are expected to remain roughly the same over the course of this Plan. The Laboratory's population on the UC Berkeley campus is projected to remain roughly the same as it is today.

As project funding limitations may make it impossible to bring all staff from offsite leased space, it is anticipated that use of leased space will rise and fall as buildings are demolished and constructed and as mission needs evolve. Berkeley Lab will also provide for continuous placement of staff in leased space in the general area on an as-needed basis.

The projected increase in building area on the Hill site during the term of this TYSP is 207,407 gsf, from approximately 1.70 million gsf in 2004 to approximately 1.91 million gsf. The increase will provide office, laboratory, and support space for the projected population growth and will relieve current space shortages, allowing fragmented research units to consolidate functions.

Berkeley Lab Facilities Resource Allocation and Performance Tracking

Capital Asset/Infrastructure Plan

Capital asset/infrastructure needs are identified through an annual "Unified Call" for construction projects. It is the primary method of project identification at the Laboratory. The "Unified Call" for construction projects (Non-Capital Alterations through Line Item Projects) is issued annually to all scientific and resource divisions. To ensure an open and inclusive planning process, the Facilities Division also accepts new construction project ideas through its Work Request Center. Any member of the Laboratory community can initiate a project request through the Work Request Center. When a proposed project could affect the relative ranking of any project on a scientific or resource division's "Call Response List," the project proposal is reviewed with the division involved.

The Facilities Division evaluates and prioritizes each of the project requests identified through the "Call," rating each using both the Capital Asset Management Process (CAMP) and Risk-Based Priority Matrix (RPM) rating systems. Project proposals are also reviewed for consistency with the Institutional Plan, the TYSP, and the Sitewide Environmental Impact Report (SEIR). Items that are not consistent with existing plans are noted. These notes are considered both during the project prioritization process and during the next revision process for the respective plan. The Facilities Division then breaks the list into sublists according to their funding category (e.g., Non-Capital Alterations, General Plant Project, General Plant Equipment, and Line Item

Project). These sublists become the "Planning Lists." Each funding category list is then reviewed by the Project Coordination Committee.

The Project Coordination Committee is facilitated by the Facilities Division and consists of representatives from each of the Laboratory's research areas, each resource organization and the Office of Planning and Strategic Development. The Committee informs all resource divisions of upcoming projects and allows for advance coordination when required, and provides a broad-based review of CAMP and RPM ratings. The Project Coordination Committee may bring forth new information regarding any project, or request further examination to ensure each project is appropriately rated. From the Committee review, a recommended list of prioritized projects is compiled. This in turn is submitted for collective review to the Facilities Manager and the Director of the Environment, Health and Safety Division, who in turn advises the Deputy Laboratory Director for Operations regarding preparation of a final list. The final list is submitted to the Director's Action Committee for final review and approval. All lists include a "below-the-line" listing of high-priority items for which funds are not available. If additional funds become available, then the highest ranked project(s) on the "below the line" list is moved up and funded. Projects not funded are periodically reviewed with the proposing division during the year, and may be resubmitted for funding during the next Unified Call. The "Call" also provides the Laboratory with insight regarding future space and building requirements.

Master Plan for Site Development

The Laboratory's Ten-Year Site Plan is based upon the strategic scientific vision of the Laboratory and the specific infrastructure and facility requirements of the researchers. The Laboratory plans for three types of projects in order to address the site-development requirements of these research missions in an integrated and highly cost-effective manner:

- Appropriate facility and infrastructure upgrades coupled with preventive maintenance and an active space-management program.
- Programmed demolition of surplus facilities and facilities that, in the near term, will be unable to meet mission requirements in a cost-effective manner.
- Construction of specific new buildings and the infrastructure required to support mission objectives.

The primary projects and resource requirements are described below.

New Buildings — Programmatic Funding

The Molecular Foundry

The Molecular Foundry Building will include state-of-the-art materials characterization, manipulation, and synthesis laboratories for studies of matter of nanometer dimensions. At this size, materials display unexpected properties that can be exploited in designing materials and devices with previously unattainable, but critically required, characteristics. These materials and devices will have a major impact on energy technologies and protection of the environment.

The Molecular Foundry will use Berkeley Lab's major user facilities—ALS, NCEM, and NERSC—for investigations of nanoscale materials and structures. These facilities will be instrumental in supporting the characterization, simulation, and theory functions that will be a critical part of this program.

The Molecular Foundry Building will be a new, six-story facility, sited between Buildings 66 and 72, with a total gross area of approximately 95,692 gross square feet. Laboratory and office space in the new facility will be designed to support highly interdisciplinary studies in nanostructures involving the collaboration of experts in materials science, physics, chemistry, biology, molecular biology, and engineering. Clean room laboratories with low vibration will be provided. The total estimated cost of this Line Item Project is $83.7 million. Construction is in progress.

Genomes to Life Facility

Berkeley Lab's efforts are directed towards an integrated program of environmental microbiology, functional genomic measurement, and computational analysis and modeling, to understand the basic biology of microbial systems and to restore contaminated environments.

The Berkeley Lab *Genomes to Life* (GTL) effort is working to establish high-throughput protein complex characterization, functional genomics and metabolomics, and computational facilities to build and test accurate predictive cell models of regulatory networks' responses to stress. To better understand and engineer microbial systems, and restore contaminated sites, advanced computational models of the organisms will be developed that agree with observations. The Laboratory is currently considering the facilities required to best apply the Laboratory's GTL strengths and capabilities to serving DOE and national needs in the era of systems biology.

Ultrafast Science Facility

The use of femtosecond optical lasers has revolutionized the study of many phenomena in solid-state physics, chemistry, and biology in the last 30 years. For example, invention of the mode-locked, continuous wave (cw) dye laser in 1971 enabled the direct observation of extremely short-lived transition states—intermediate conformations between reactant and product species that have, in some cases, a lifetime on a time scale of a vibrational period—100 femtoseconds or less. The scientific significance of transition-state chemistry was recognized with the award of the 1999 Nobel Prize in Chemistry to A.H. Zewail. Many other examples of the importance of femtosecond optical studies exist—from laser-driven, solid-solid phase transitions to the study of photochemistry in biological systems—and clearly this area has grown into one of the most dynamic in modern science.

Although great progress has been made with optical spectroscopy, which probes extended electronic states, the information most needed is the motion of atoms. This is where x-ray techniques excel. X-ray diffraction provides direct three-dimensional information, and x-ray absorption provides a radial distribution function of atomic positions. X-ray spectroscopy adds details of the electronic configuration necessary to build complete pictures of complex interactions. Combining these techniques with a 20 to 50 femtosecond x-ray source will revolutionize many of the fields in which ultrafast optical techniques are used. Since 1993, Berkeley Lab has worked toward becoming the worldwide leader in structural dynamics using x-rays. Several sources have been built at the ALS based on Thompson scattering and on the interaction of an intense laser beam with the ALS electron beam. These sources have been used to study a variety of dynamics, in particular the dynamics of ultrafast melting. While these studies have been successful in understanding solid-state dynamics in perfect single crystals, the U.S. scientific community will require a much more powerful broadband x-ray source in order to address the wide range of science currently studied using optical techniques.

Together with the Stanford Synchrotron Radiation Laboratory (SSRL) and two European light sources (BESSY, in Berlin, and the Swiss Light Source), Berkeley Lab sponsored a workshop in April 2002 that brought together the existing ultrafast optical community and the emerging ultrafast x-ray community. The time regime from 50 picoseconds to a few tens of femtoseconds was the core focus area for this workshop, which was intended to define scientific highlights and directions for the use of x-ray techniques, to promote cross-fertilization of ideas between the two communities, and to define the source characteristics required for particular classes of experiments. This workshop has led to a survey of the compelling scientific opportunities and an understanding of how the many possible x-ray sources [laser-based systems, slicing at synchrotrons, free electron lasers (FELs), ultrafast Linacs, energy-recirculating Linacs, etc.] best enable that science.

From these studies emerged the potential for a most compelling user facility for a broad range of ultrafast x-ray and laser science. The facility provides multiple tunable beamlines for simultaneous user groups, operating over a photon energy range of 20 eV to 12 keV, and with sophisticated laser and diagnostic systems. The facility provides an increase in flux of several orders of magnitude compared to our present ALS ultrafast laser-slicing beamline, and up to twenty simultaneously operating experimental stations. The proposed facility is based on several robustly developing new technologies:

(1) a high-brightness photogun to produce intense, short pulses of electrons,
(2) a superconducting Linac to boost electrons to high energy,
(3) a recirculator to direct electrons several times through the same Linac structure,
(4) radiofrequency “crab” cavities to kick the electron beam to produce a longitudinal tilting of the beam,
(5) optical pulse compression,
(6) cascaded harmonic generation in free-electron lasers, and
(7) multiple short-pulse laser systems with temporal and spatial profiling capabilities.

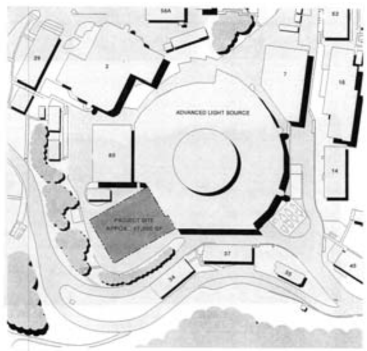
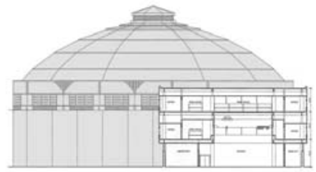
All of these technologies are well understood, and many are currently undergoing vigorous development. For example, the superconducting Linac is based on technology built for the Tera Electron Volt Energy Superconducting Linear Accelerator (TESLA) high-energy physics program in Hamburg, Germany, and is commercially available. Radiofrequency photoguns are in use at a number of laboratories developing FELs. By using an assembly of these technologies, Berkeley Lab can provide an ultrafast x-ray facility with unprecedented performance in the environment of a national user facility.

Berkeley Lab’s Accelerator and Fusion Research, Chemical Sciences, Materials Sciences, and Advanced Light Source Divisions have joined forces to produce a feasibility study report.

New Buildings — SLI Funding

General purpose facilities infrastructure is required to meet the needs of Berkeley Lab’s scientific programs and to conduct operational and administrative support. The following building project is an important element of the strategic plan.

User Support Building


The new User Support Building will provide critically needed modern research support space for users of the ALS and other national user facilities. The building will support research in all disciplines, including condensed matter physics, chemistry, materials, environmental and earth sciences, biology, atomic and molecular physics, plasma sciences, and nanosciences.

The new multi-user structure includes a high bay for assembly of experimental apparatus, as well as modern analytical laboratory and office space to support the projected 2,000+ scientific facility users. This space will support activities to prepare experiments and to address other critical but short-term high-activity work activities. Demolition of substandard space and improved productivity combine for a payback of approximately seven years. This new 30,000 gsf building will replace Building 10, a wooden 15,200 gsf structure constructed as a service building during World War II, and which contains structural and life-safety elements that restrict use. Building 10 cannot be cost-effectively upgraded to serve modern science requirements. The estimated cost is $21 million. This project is on track for a FY-2007 project start.

Existing Facilities—Upgrade and Adaptive Reuse Projects

Berkeley Lab has effective maintenance and space improvement programs that work to allow researchers to use building space and other assets for the maximum number of years.

GPP Funded Multiprogram Research-Driven Upgrades

Most Berkeley Lab buildings can continue to meet research mission requirements under this program, and the Resource Needs section of this report describes a number of GPP projects that are currently at the core of this ongoing effort. However, unless GPP funding levels are increased, and the Laboratory is given the ability to reprogram maintenance funds to permit appropriate upgrades when equipment is scheduled for replacement, this highly cost-effective program will not be able to accomplish the upgrades required for seamless mission performance, Additional Line Item Project funds will be required to address mission requirements. This latter option is far less attractive, as it does not support a seamless provision of research support services, and will require that maintenance dollars be used for short-life “like for like” replacements when research mission criteria clearly indicate that upgrades are appropriate. This approach does not serve the researchers well, and may prove to be particularly costly, if the short-life “like-for-like” replacements will be removed prior to the end of their useful life when line-item funds become available to accomplish the necessary upgrades.

Line-Item Funded Upgrades

A small number of existing buildings and sitewide utility systems are in fundamentally sound condition, but major elements of their operating systems are in need of major upgrades to incorporate modern utilities and address current codes. These utility systems and buildings are identified for major infrastructure upgrades using Line Item Project funds. These upgrades, which exceed the dollar cap for GPP funding, will extend the useful scientific lives for many more decades, at a fraction of the cost of new construction. The highest priority upgrade/rehabilitation projects are summarized below.

Building 77 Rehabilitation of Building Structure and Systems, Phase 2

Building 77 and the adjacent annex (77A) are multiprogram buildings that provide specialized technical services and assembly space. This project will correct mechanical, electrical, and architectural deficiencies in buildings 77 and 77A. Both buildings house machine shop and assembly operations and have a combined net area of 68,000 sf in which production of highly sophisticated research components for a variety of DOE research projects takes place. Recent and current work includes precision machining, fabrication and assembly of components for the ALS, the Dual Axis Radiographic Hydrodynamic Test (DAHRT) Facility, the Spallation Neutron Source (SNS), and the ATLAS Detector. Infrastructure systems installed by this project include heating, ventilation, and air conditioning (HVAC), power distribution, lighting, and noise absorption materials.

The improvements are necessary to satisfy urgent demands for high levels of cleanliness, temperature, and humidity control, and OSHA and reliability requirements. Phase II was funded at $13.36 million as a FY-2003 project start.

Seismic and Structural Safety Upgrades of Buildings, Phase 1

Unacceptably high life-safety risks have been identified in recent seismic safety evaluations of Buildings 50, 72, 74 and 76. These buildings are occupied by over 600 personnel in the National Center for Electron Microscopy, Life Sciences Division, Facilities Division, Physics Division and Laboratory Administration. Relocation of personnel to life-safe space is not possible because of Berkeley Lab's critical space shortage. This project will correct the following structural deficiencies:

> Building 50: Reduces unacceptably high seismic demand capacity ratios in concrete spandrel beams and shear walls, reinforces a column supporting a discontinuous shear wall and rehabilitates inadequately anchored non-structural elements.
>
> Building 72: Resolves an existing discontinuous roof diaphragm and provides for a complete load path for seismic forces.
>
> Building 74: Strengthens vertical bracing, eliminates an inadequate seismic gap, resolves diaphragm discontinuities and a discontinuous shear wall, and retrofits a compromised shear wall.
>
> Building 76: Reduces unacceptably high seismic demand capacity ratios in concrete columns, reduces roof diaphragm flexibility and rehabilitates inadequate roof diaphragm connections.

The cost of these structural upgrades is approximately $7 Million. This project is planned for a FY2007 project start.

Seismic and Structural Safety Upgrades of Buildings, Phase 2

Berkeley Lab is conducting seismic performance evaluations on all of its buildings, and additional buildings are being identified with "Poor" or "Very Poor" seismic performance ratings. These buildings will require upgrades to improve their seismic resistance and reduce falling hazards so that they can be reclassified as "Good". This project will correct these deficiencies so that the buildings can be used for vitally necessary scientific programs and insure a safe working environment at Berkeley Lab.

Utility Infrastructure Modernization – West Corridors

Reliable and adequate utility services are fundamental to modern laboratory research. This project will address service deficiencies, and will comprehensively provide necessary reliability and capacity to support 21st Century science.

The project will address needs in the Laboratory's natural gas, sanitary sewer, storm sewer, communication and electrical distribution systems. Under this project, the utility corridors in the western area of the Laboratory will be improved to meet 21st century service and reliability requirements. These systems were first constructed in the late 1930's and have been incrementally modified to meet specific needs over the past six decades. This project will comprehensively upgrade the core utility distribution systems in this portion of the Laboratory and provide adequate and reliable services to research facilities in the 21st century.

This is the first phase of a two-phase project and will address needs in the western portion of the Laboratory. Phase two will address needs in the eastern area of the Laboratory. This project is currently under review and the TEC of this project is currently estimated at $20 million pending completion of that review.

Utility Infrastructure Modernization – East Corridors

This is the second phase of the two-phase project described above and will address needs in the eastern portion of the Laboratory, phase one will address needs in the western area of the Laboratory. This project is currently under review and the TEC of this project is currently estimated at $20 million pending completion of that review.

Existing Facilities — Information Technologies Infrastructure

The purpose of Berkeley Lab's information technology infrastructure is to provide Berkeley Lab with efficient, effective, and innovative information technologies and services to enable world-class science. The range of services provided encompasses virtually all areas of modern computing and communications technology with the exception of large-scale scientific computing.

Berkeley Lab's strategic plan for information technology (IT) infrastructure defines an integrated approach that builds on the substantial technology benefits that the Laboratory has realized during the past decade and incorporates the modern technologies necessary to remain at the forefront of scientific research.

There are a number of specific requirements driven by user needs and technological opportunities that demand new or improved services categorized in the following major areas:

- Modernize aging infrastructure to increase science and business productivity, including reinventing library services and enhancing scientific computing support, "productivity" tools, and network infrastructure.
- Improve the utility of administrative systems through development of an integrated information portal to support timely decision making at all levels of Berkeley Lab's operations.

- Improve the IT technical architecture to help assure that the Information Technology Services Division's resources are being directed in a consistent, cost-effective manner, and to help assure that Berkeley Lab is achieving maximum benefits from its IT investments.
- Establish and provide appropriate levels of protection, recovery, and continuity for all of the Berkeley Lab's critical IT systems and data.

The major infrastructure services are:

- Scientific computational services (e.g., midrange computing, visualization)
- Productivity services (e.g., email, desktop computing)
- Information services (e.g., information systems, library)
- Presentation services (e.g., publishing, conference tools)
- Protection (e.g., intrusion detection, firewalls, backups and archiving)
- Networking and telecommunications (e.g., networking, telephones, remote access)
- Service delivery architecture (e.g., technical architecture, cost recovery, ISSM)

The majority of activities in each of these areas are ongoing production services. The largest strategic challenge is sustaining the effectiveness and dealing with the growth of these services. Meeting this challenge is particularly difficult in view of the rapid technology advancements and obsolescence that characterize IT functions. This impacts both the need to enable Berkeley Lab to benefit from substantial ongoing improvements in computer and communications hardware and software, and the need to continually develop high-quality staff who remain up to date with this technology.

To meet these information technology needs, a significant short-term increase in funding for GPE projects is needed.

Alternative Financed Buildings

User Hostel

Berkeley Lab's ALS and NCEM are host to a growing number of users—more than 1,300 this year. Many other scientific visitors come to work with researchers in laboratories at other locations across the site, and although most computational scientists use NERSC Center facilities remotely, many meet with NERSC Center scientific and support staff.

In addition, beginning in 2007, the Molecular Foundry is expected to host hundreds of users annually. All of these users need dormitories in close proximity to their research to effectively and efficiently conduct their experimental and scientific programs. Working with UCOP and UCB, Berkeley Lab is developing the scope and approach for third-party support of a dormitory in order to meet these visiting users' short-term housing needs. A central "Civic Center" location—in close proximity to the ALS and a short walk to NCEM, the Molecular Foundry, and NERSC Center scientific staff—has been identified as an ideal location for the proposed User Hostel.

Theory and Computational Sciences Building

A pre-conceptual plan for the computer and office space required to meet these needs includes 40,000 gsf to accommodate a machine room for existing and next-generation supercomputers, storage systems, and support equipment; 10,000 gsf for the SCS program; and 90,000 gsf for offices, workstations, office support space, and conference rooms. This facility will enable cross-fertilization from physics, computing sciences, earth sciences and life sciences programs co-located in this building, increasing productivity in many programs.

Currently located at the Oakland Scientific Facility (OSF), NERSC occupies 19,000 gsf of computer floor and 15,000 gsf of staff offices. The NERSC strategic plan calls for a new system to be brought in every three years, while maintaining user access to the previous-generation system. This prevents downtime during the transition that would compromise mission needs. After CY2006, the OSF computer floor space will be full and unable to support new systems. NERSC will then need additional computer floor space to meet the expanded computational mission needs of the Office of Science. Also, NERSC must move to the main Berkeley Lab site to fully meet DOE Office of Advanced Scientific Computing Research security requirements. NERSC also must develop a new class of computational capability in the United States that is optimal for science and that creates a sustainable path towards petaflop per second performance.

Currently located in the Berkeley Lab Building 50B Room 1275, SCS currently occupies 5,600 square feet of computer floor. However, this computer floor space will be completely full by the end of 2005.Beginning in 2006 it will be necessary to convert a number of spaces in use by other functions to computer cluster space with adequate power and cooling equipment.

Energy Utility Infrastructure Projects

The Laboratory continues to operate an aggressive program aimed at managing utility costs in a responsible manner. The Facilities Division has managed the investment of over $18 million of Laboratory, utility, third-party, and Federal Energy Management Program (FEMP) funds to achieve a high degree of energy efficiency. This Facilities program works closely with DOE to identify lower-cost energy providers and assure reliable energy supply services. In FY 2003, the average cost of electricity to the researcher was 10.55 cents per kilowatt-hour at the main Hill site—attractive relative to the regional and national averages. The Laboratory is currently investigating options, including photovoltaics and hybrid cogeneration, which might allow it to cost effectively reduce peak electrical demand.

The Laboratory has also assured that researchers will not be subject to the rolling blackouts that may hit California in the future. By installing a two-megawatt standby generator in order to participate in the local utility's Optional Binding Mandatory Curtailment (OBMC) program, the Laboratory will operate using this generator rather than curtailing power use during rolling blackouts.

The Laboratory will continue to seek opportunities to improve its physical plant and reduce operating costs while also providing reliable service to the research community.

Sustainable Design

Berkeley Lab follows the Executive Order 13123 on "Greening of America" by promoting environmentally responsible design and construction. The environmental impact of new construction is reduced by paying attention to sensitive site development, water and energy conservation, indoor air quality, waste reduction, and environmentally responsible building materials that minimize environmental impact throughout their life cycle.

Green buildings provide a healthy and environmentally responsible workplace. It is Berkeley Lab's goal to qualify for a Leadership in Energy and Environmental Design (LEED) rating in design and construction of new buildings. The LEED Green Building Rating System is developed and administered by the U.S. Green Building Council.

Berkeley Lab has been widely recognized for its innovative and effective recycling and reuse programs, efforts that span all aspects of the Laboratory's operations. In addition to the conventional paper and metal recycling programs, laboratory chemicals are made available for reuse whenever this is proper, and former shielding blocks are reused within the DOE complex where possible. These programs are summarized in an annual performance measure report to DOE.

Parking Improvements

Current plans allow for the addition of 600 staff parking spaces over the next 20 years. This number represents a reduction in the Laboratory's parking inventory relative to population, adding spaces at a ratio of one space for every 1.83 additional ADP persons, one of the more aggressive commitments to alternative transportation modes among major employers in the region. Consolidation of parking spaces would allow for better management of the site, better emergency vehicle access, and even better management of nonpoint discharges.

Four sites are identified for parking structures, although the final sites may be somewhat different. Collectively, these structures could accommodate up to 1,800 vehicles and allow the Laboratory to consolidate and better manage automobiles on the site. These structures would not house research or support space, and are treated separately from the space calculation. In addition, five sites have been identified for development of surface lots, although the final sites may be somewhat different. These lots, in combination with the parking structures, will provide a better organized parking program for employees and guests, allow more efficient shuttle operations, eliminate one-lane/two-way roads and other situations that introduce traffic and fire suppression issues, and allow the Laboratory to implement its new design guidelines. These lots and structures will also allow the Laboratory to further improve its management of storm-water quality.

Performance Metrics and Change Indicators

Although qualitative measures can often best describe performance; such measures are difficult to benchmark. The following quantitative performance-based metrics are developed to address the use and condition of Laboratory assets relative to the research requirements.

Facilities Condition Index (FCI)

$$FCI = \frac{\$\text{deferred maintenance}}{\$\text{RPV}}$$

This widely used metric provides insight into the effectiveness of the maintenance program. This metric measures the relative cost of remedying maintenance deficiencies listed in the deferred maintenance backlog and conveys condition information.

Asset Condition Index (ACI):

ACI = 1- FCI and provides a declining scale matching the maintained condition of a building.

Deferred Maintenance (DM)

Deferred maintenance is defined as maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period. It specifically excludes major”like-in-kind” rehabs normally funded from General Plant Project/General Purpose Equipment (GPP/GPE) and line item projects.

Rehabilitation and Improvement Cost (RIC)

This indicator is defined as the total of all rehab and improvement costs, including needed function or capacity upgrades and the costs to bring the facility in compliance with all applicable building codes, such as Americans with Disability Act/Uniform Federal Accessibility Standards (ADA/UFAS) and Life Safety requirements, as well as the costs to make facilities suitable for planned mission needs. These costs are normally funded via GPP/GPE or line item funding, but could include large operating expense funded projects or Institutional General Plant Projects (IGPP). This metric provides insight into the overall management of facilities.

Total Summary Condition Index (TSCI)

TSCI = the sum of Deferred Maintenance (DM) plus Rehab and Improvement Costs (RIC) divided by the facility’s Replacement Plant Value (RPV).

Asset Utilization Index (AUI)

The Asset Utilization Index (AUI) is the Department of Energy's corporate measure of facilities and land holdings against requirements. The index reflects the outcome from real property acquisition and disposal policy, planning, and resource decisions. The index is the ratio of the area of operating facilities, justified through annual utilization surveys (numerator), to the area of all operational and excess facilities without a funded disposition plan

Ten-Year Site Plan Issues

Communication

A key element of the Laboratory’s strategic planning includes the strengthening of communications and involvement at all levels, both internal and external, in order to build trust with the public and Berkeley Lab employees. This emphasis parallels DOE’s goal to maintain a culture of openness, communication, and trust. Community relations has been an important element of Berkeley Lab strategic planning and is integral to the Operations Vision and strategic planning for FY 2003 and beyond. The Laboratory has taken many steps to enhance community interaction and understanding, including a fire services agreement with the City of Berkeley, and implementing a community-developed vegetation-management plan. An ongoing speakers’ bureau and tour program provides continued outreach to the breadth of community stakeholders. Berkeley Lab also participates in community-sponsored activities like science education and energy-use reduction programs, offering the Laboratory's expertise and in-kind support.

Communications with local government, regulatory agencies, citizens’ groups, schools and educational institutions, the news media, and other stakeholders require regular interactions between Berkeley Lab and community members. The purpose of these activities is to consider and respond to the interests of specific groups, including elected officials, opinion leaders, city staff, site neighbors, and employees. Activities have included briefings for elected officials, attendance at local community meetings, sponsorship of meetings with the public, speakers at local events and organizations, as well as tours of Berkeley Lab. In addition, through the

National Environmental Policy Act and California Environmental Quality Act (NEPA/CEQA), and other federal and state regulations requiring public involvement, Berkeley Lab works with these stakeholders to disseminate information and to solicit public commentary on relevant issues, including the environmental review process for proposed Berkeley Lab projects and actions. Berkeley Lab values its relations with local communities and is committed to an expanding outreach effort.

The Berkeley Lab Open House, a biannual event staged most recently in the fall of 2002, promotes the possibilities in science education and careers, the value of research, and the DOE missions to thousands of visitors and stakeholders in the Bay Area. Berkeley Lab employees make additional commitments to their communities through participation in numerous local councils, boards, and commissions, and through an annual charitable giving campaign.

Funding

The Resource Allocation Table in Appendix J lists the resource needs and candidate projects for the term of this TYSP. The following paragraphs describe the impacts of less than adequate funding and, if applicable, the amount of additional funding required to resolve our backlog of projects.

DOE-EM

DOE's Office of Environmental Management (EM) will terminate programmatic support of Berkeley Lab's Waste Management Program and Environmental Restoration Program in 2006. EM's decision has raised important questions for the Laboratory to examine: Will the Office of Science be able to afford long-term stewardship that is consistent with the commitments made to state and local regulatory agencies and to the public; in addition, if subsurface contamination is later found, would the Office of Science provide a funding remedy in currently inaccessible areas?

Science Lab Infrastructure (SLI) Support

Historically, SLI funding at Berkeley Lab has been an average of approximately $3.8 million per year. Over the period of fiscal years 1998– 2002, the funding level has been only slightly above this average level, at $4.2 million per year. The profile of funding has been irregular, including no new starts in fiscal years 1994, 1995, 1997, 2000, and 2004.

While Berkeley Lab's funding trend has increased slightly in actual dollars, this program has not been able to address pressing concerns at current funding levels. Moreover, we note that the SLI budget has been cut almost in half over the last 15 years. The impact of these cuts is even greater when the impacts of inflation are considered.

The SLI program is the only available strategic capital renewal program in the Office of Science for nonprogrammatic infrastructure. Funding levels should be increased or restored (corrected for inflation) in order to begin to achieve the infrastructure renewal needed at the multiprogram labs.

General Plant Projects (GPP)

GPP funds have been relatively flat ($3.3 million to $4.1 million in actual dollars) at Berkeley Lab since 1993. However, relative to FY 1993, in FY 2004 the purchasing power of these funds dropped some 32% to about $2.8 million due to inflation. This inflation-induced shortfall, caused by a flat funding scenario, has resulted in a serious backlog of mission-critical projects. GPP funding is extremely valuable to the Laboratory. Under DOE regulations, this type of funding is the only one the Laboratory can use to seamlessly upgrade facilities to meet evolving research requirements. These funds are critical to maximizing the utility of existing assets. A three-year increase of GPP funding to the $12–15 million range will allow the current backlogged priorities to be addressed, and consistent funding at $10.5 million per year would allow the Laboratory to continue to upgrade and reuse facilities to meet all scientific mission requirements. Without this increase, these projects would require 20+ years to complete, and the schedule for completion of the strategic plan would be negatively impacted.

General Purpose Equipment (GPE)

Institutional GPE funding has also been historically flat at Berkeley Lab, ranging from $1.87 million in FY 1993 to $1.95 million in FY 2002 to $1.64 million for the past two years. The actual spending power of these GPE dollars has declined approximately 32% during this period. The limited funding has severely restricted our ability to implement a reasonably full program of modernization and upgrades. To meet the research objectives outlined in this plan, and to recover from the inflation-induced shortfalls caused by the flat funding scenario, a short-term increase of GPE funding is needed.

Real Property Maintenance

As modernization efforts proceed to meet the current and future research needs at Berkeley Lab, it is expected that maintenance and operations costs will also rise. Currently, the Laboratory has been able to maintain existing old facilities with the funding provided; however, as expectations rise, the frequency and severity of complaints are expected to increase as the mismatch between obsolete and modern facilities increases. Additionally, as more modern buildings are provided with more sophisticated mechanical and electrical systems, it is expected that the associated maintenance costs will rise. The Congressionally mandated expenditure of 2% of the Laboratory’s RPV on maintenance is severely straining the Laboratory’s ability to be effective in all overhead funded activities.

Operating Funding

For budget purposes, the “noncap” base level at Berkeley Lab has remained at approximately $2.9 million for the past five years. Annually, $1.3 million is reserved for emergencies, laboratory-initiated relocations, minor seismic upgrades, and ES&H corrections, leaving $1.6 million for requested projects. This provides very little opportunity to address the over 300 needs totaling over $70 million that are currently unfunded in the Project Call Database. Among projects on the backlog are wild land fire management and seismic upgrades, both of which can only be partially funded each year; replacements of outdated electrical and mechanical systems that are outside of GPE scope; and numerous projects to improve the utilization or quality of our office and laboratory space, a significant problem due to the aging and overcrowding of our buildings.

Appendix A: Scientific History of Berkeley Lab

A Physicist from the East*:* *Little did UC Berkeley Physics Chairman Robert Birge know that, in 1928, when he recruited a promising young assistant professor from Yale named Ernest Lawrence, he would be getting a whole lot more than an outstanding campus academician. He acquired someone who would lead a scientific revolution.*

The 1920s was a time when UC President Robert Gordon Sproul undertook the task of developing UC Berkeley into a major research university. Physics was an important part of this effort. Lawrence brought with him a vision of a new accelerator-based science founded on large-scale research activities. When he invented the cyclotron in 1929— a particle accelerator that would be used to reveal the inner workings of the atom—he initiated a dramatic growth of the discipline and equally dramatic discoveries about the nature of matter that would follow over the next few decades.

Lawrence's vision began to be realized in August 1931, when he received President Sproul's backing to use a surplus campus building to develop cyclotrons larger than his 5-inch prototype. The UC Radiation Laboratory eventually evolved into a single-purpose federal facility, and finally into today's multiprogram, interdisciplinary research center that is Berkeley Lab. Lawrence would also become the first of nine Nobel laureates who would conduct their work at the Laboratory.

In its first decade, the Radiation Laboratory outgrew its original building, extending into other campus buildings such as Crocker Hall, which housed the historic 60-inch Cyclotron. At the same time, the scope of the Laboratory's research was expanding to include a wider range of disciplines. In 1936, for example, John Lawrence, Ernest's brother, started a biomedical research program. He was the first to treat a leukemia patient with a radioactive isotope of phosphorous and used particle beams for radiation therapy, establishing the Laboratory as the birthplace of nuclear medicine and a center of biophysics and imaging research.

The Laboratory moved off the UC Berkeley campus to its present location in 1940, when ground was broken on Charter Hill for a 184-Inch cyclotron. Designed by Arthur Brown, architect of San Francisco's City Hall and Coit Tower, the domed building—now home to the Advanced Light Source—is an East Bay Hills landmark. It reinforces the visual axis, created by UC Berkeley campus architect John Galen Howard, that runs west through campus and aligns with the Golden Gate Bridge across the bay.

During World War II, the Charter Hill site became crowded with a number of hastily constructed temporary buildings as the Laboratory responded to national defense needs, developing machines for the electromagnetic separation of uranium isotopes as part of the Manhattan Project. Later development on the Hill would feature the construction of permanent concrete and steel-frame structures.

The Laboratory's civilian research program began in 1947 under the sponsorship of the Atomic Energy Commission and quickly began fielding new, more powerful particle accelerators and a broader base of research programs. Luis Alvarez' proton linear accelerator and the first electron synchrotron, invented by Edwin McMillan, appeared in 1948. The Bevatron, which followed in 1954, became the nation's leading high-energy physics facility, achieving distinction in 1956 with the discovery of the antiproton. In 1958, the Heavy Ion Linear Accelerator (HILAC) came on line. It was later combined with the Bevatron to form the Bevalac, ushering in a new era of relativistic heavy-ion nuclear physics. The 88-Inch Cyclotron was completed in 1964 and remains in operation today as an important experimental facility in low-energy nuclear physics. During the 1950s and early 1960s, a number of permanent laboratory and office buildings were constructed to accommodate the growth in accelerator-related programs.

In the aftermath of the 1973 oil embargo, new research program growth targeted national energy supply and use. The Laboratory's population reached its high point in 1979 following the establishment of DOE, but no permanent buildings were constructed to accommodate this growth. Instead, temporary trailers were installed, existing spaces were adapted, and space was leased in Berkeley and Emeryville for research programs and support services.

By 1980, Berkeley Lab was a national laboratory with recognized expertise in a broad range of scientific areas, with high energy physics accounting for only 25 percent of the research, a dramatic change from the 75 percent it captured in 1970. With its research scope supporting DOE's science, energy, health, and environmental missions, as well as the scientific needs of other government agencies, the Laboratory emphasized energy, materials, and life sciences while maintaining historically important roles in high energy and nuclear physics. New national user facilities and modern research buildings were constructed. NCEM was completed in 1984, and the Surface Science and Catalysis, and Advanced Materials laboratories followed in 1988 and 1989, respectively. The ALS, which reused the renovated dome of the 184-Inch Cyclotron, was completed in 1993. The ALS, one of the world's brightest sources of x-ray and ultraviolet light, and NCEM serve scientists from around the world.

In the 1990s, DOE formulated plans for programs in genome sciences and computational sciences that built on Berkeley Lab's multidisciplinary capabilities. The Genome Sciences Building was completed in 1997 to serve DOE's national human genome program. In 1999, the Laboratory successfully adapted buildings in Walnut Creek to house the DOE Joint Genome Institute's (JGI) Production Sequencing Facility. Having successfully completed its sequencing task for the Human Genome Project, the three-laboratory JGI— composed of Berkeley along with Livermore and Los Alamos national labs— is now focused on efforts to sequence microbial genomes.

Berkeley Lab's computational sciences capability was greatly strengthened when the DOE National Energy Research Scientific Computing (NERSC) Center moved here in 1996, bringing with it one of the nation's most powerful unclassified supercomputers. NERSC enables sophisticated computer analysis of genomic, physics, materials science, and energy technology data, extending the reach of science to areas that had previously been inaccessible.

Appendix B: BERKELEY LAB BUILDINGS/TRAILERS

BUILDINGS

Building Number	Name	Gross Square Feet	Year Built	Age	Excess Year
002	Advanced Materials Lab	85,761	1988	16	
002A	Storage	182	1993	11	
004	ALS Support Facility	10,176	1944	60	2012
005	AFR	7,176	1950	54	2011
006	The ALS (Advanced Light Source)	118,573	1991	13	
007	ALS Support Facility	21,432	1943	61	
007A	Storage	128	1974	30	
010	ALS Support Facility	15,200	1944	60	2008
013A	Environmental Monitoring Station	76	1965	39	
013B	Environmental Monitoring Station	76	1965	39	
013C	Environmental Monitoring Station	76	1965	39	
013D	Environmental Monitoring Station	76	1965	39	
013E	Environmental Monitoring Station	68	1977	27	
013F	Environmental Monitoring Station	36	1965	39	
013H	Environmental Monitoring Station	90	1990	14	
014	ES LAB	4,201	1944	60	2007
016	AFR LAB	11,808	1943	61	2010
016A	Storage	339	1960	44	2010
017	EHS	2,222	1949	55	
025	ENG Shops	20,304	1947	57	2005
025A	ENG Shops	7,548	1963	41	2006
025B	Houses Waste Treatment Unit	360	1963	41	2005
026	Health Services, EH&S	10,563	1964	40	
027	ALS Support Facility	3,299	1948	56	
028	Radio Shelter Facility	544	2003	1	
033A	Strawberry Canyon Guard House	52	1965	39	
033B	Blackberry Canyon Guard House	94	1996	8	
033C	Grizzly Peak Guard House	80	1965	39	
034	ALS Chiller Building	5,163	1992	12	
036	Grizzly Substation	880	1989	15	
037	Utility Services Building	5,833	1987	17	
040	Storage	993	1947	57	2007
041	Communications Lab	995	1948	56	2007
043	Site Air Compressor/FD Emerg Gen	1,020	1979	25	
044	ENG	805	1956	48	2006
045	Fire Apparatus	3,342	1970	34	
046	AFR, EE, ENG, Printing	60,363	1949	55	
046A	ENG Division Offices	5,564	1977	27	
047	AFR	6,242	1957	47	
048	Fire Station, Emerg. Command Ctr.	6,622	1981	23	
050	AFR, PHY, Auditorium, Library	48,698	1943	61	

Building Number	Name	Gross Square Feet	Year Built	Age	Excess Year
050A	Directorate, PHY, NSD	66,477	1962	42	
050B	PHY, CSD	63,561	1967	37	
050C	CSD, NERSC	2,768	1980	24	
050D	CSD	4,959	1979	25	2005
050E	CSD	10,560	1984	20	
050F	CSD - ICS, NERSC	9,443	1985	19	
051	The Bevatron	96,566	1950	54	2005
051A	Bevatron	28,462	1958	46	2002
052	Cable Winding Facility	6,425	1943	61	2009
052A	Storage	516	1961	43	2009
053	EE, AFRD	6,944	1949	55	
054	Cafeteria	15,428	1950	54	
054A	Automated Teller	195	1982	22	
055	LS	19,048	1951	53	
055A	LS	1,535	1985	19	
055B	Emergency Generator Building	209	1987	17	
056	Biomed Isotope Facility	1,782	1976	28	
058	Heavy Ion Fusion	10,279	1950	54	
058A	Accelerator R&D Addition	12,653	1969	35	
060	Hibay Lab	3,615	1979	25	
061	Storage	323	1969	35	
062	MS, CH Lab	55,902	1965	39	
062B	Telephone Equip. Storage	169	1965	39	
063	EE	2,696	1963	41	
064	LS/ES	28,190	1951	53	
065	OFFICES	3,423	1952	52	
066	Ctr for Surface Sci. Catalysis	44,134	1987	17	
068	Upper Pump House	500	1979	25	
069	FACILITIES DEPT. OPERATIONS	20,709	1967	37	
070	NS, EE LAB	63,550	1955	49	
070A	NS, LS, CS, ES, ENG LAB	67,741	1961	43	
070B	Telephone Equip. Storage	382	1979	25	
071	ION BEAM TECH, CTR BEAM PHY	53,739	1956	48	
071A	Low Beta Lab	4,104	1964	40	
071B	CTR BEAM PHYS	6,892	1978	26	
071T	EETD Windows Test Facility	949	2003	1	
072	Nat'l Ctr for Electron Microscopy	5,352	1961	43	
072A	High Voltage Electron Microscopy	2,532	1980	24	
072B	Atomic Resolution Microscope	4,413	1984	20	
072C	NCEM	8,392	1984	20	
073	ATM AEROSOL RSCH	4,228	1961	43	
073A	Utility Equipment Building	403	1961	43	2003
074	LS LABS	45,382	1962	42	
074F	Dog Kennel	1,560	1996	8	

Building Number	Name	Gross Square Feet	Year Built	Age	Excess Year
075	EH&S Radiological Services	8,495	1961	43	
075A	EH&S	4,000	1987	17	
075C	Calibration Building	450	1979	25	
075D	Storage	1,895	1979	25	
076	FAC Shops	31,639	1964	40	
077	ENG Shops	68,937	1963	41	
077A	Composites Lab and Assembly Facility	12,118	1988	16	
077H	Utility Storage	576	1983	21	
078	Craft Stores	5,391	1966	38	
079	Metal Stores	4,564	1965	39	
080	ALS Support Facility	29,931	1954	50	
080A	ALS Support Facility	960	1977	27	
081	Chemical Storage	1,129	1968	36	
082	Lower Pump House	537	1981	23	
083	LS LAB	6,856	1979	25	
084	LS Human Genome Lab	55,031	1997	7	
084B	Utility Building	1,633	1997	7	
085	Hazardous Waste Handling Facility	15,405	1996	8	
085A	Storage Racks	885	1996	8	
088	88 CYCLOTRON	53,864	1960	44	
088D	Emergency Generator Building	265	1979	25	
090	DOE, EE, EHS, ES Offices	89,233	1960	44	

TRAILERS

Building Number	Name	Gross Square Feet	Year Built	Age	Excess Year
007C	Offices	479	1977	27	
010A	Telecommunications Equipment	242	1960	44	
029A	(vacant)	1,751	1978	26	2001
029B	(vacant)	1,440	1978	26	2001
029C	(vacant)	1,440	1978	26	2002
029D	(vacant)	276	1978	26	2001
031A	FA	623	1978	26	
031B	Storage	157	1965	39	
031C	Storage	157	1965	39	
044A	PHY	481	1979	25	2006
044B	ENG	1,441	1979	25	2006
046B	ENG	1,239	1979	25	
046C	AFR	1,029	1977	27	
046D	AFR	771	1984	20	
048A	Storage Container	320	1978	26	
051F	ES, EET	1,499	1979	25	2006
053B	AFR	519	1972	32	
062A	EE, MS	1,238	1978	26	

Building Number	Name	Gross Square Feet	Year Built	Age	Excess Year
064B	FAC	480	1977	27	
065A	Offices	1,453	1984	20	
065B	Offices	1,020	1983	21	
067B	EE: Mobl Window Therml Test Fac	1,238	1978	26	
067C	EE: Indoor Environment Lab	1,237	1978	26	2005
070E	Storage Container	432	1979	25	
070G	Storage	173	1979	25	
071C	Offices	511	1968	36	
071D	Offices	520	1970	34	
071E	Offices	513	1973	31	1995
071F	Offices	516	1974	30	
071G	Offices	517	1974	30	
071J	Offices	1,289	1978	26	
071K	Offices	474	1974	30	
071P	Offices	511	1981	23	
071Q	Restroom Trailer	357	1996	8	
075B	EH&S	4,640	1979	25	
075E	EH&S Offices	410	1978	26	
076K	FA Offices	371	1974	30	
076L	FA Offices	1,439	1977	27	
083A	LS Lab Trailer	507	1965	39	
085B	Offices	3,601	1996	8	
090B	Offices	1,443	1977	27	
090C	FA Offices	1,193	1977	27	
090F	FA Offices	2,462	1979	25	
090G	FA Offices	1,853	1978	26	
090H	FA Offices	1,849	1977	27	
090J	FA Offices	2,846	1978	26	
090K	FA Offices	2,846	1978	26	
090P	ES	2,129	1979	25	
090Q	Restroom Trailer	425	1978	26	
090R	Transformer Equipment	160	1979	25	

LEASED BUILDINGS

Building Number	Name	Gross Square Feet	Year Occupied	Lease Ends	Excess Year
100	Joint Genome Institute	26,720	1998	2008	N/A
100A	Joint Genome Institute Bioinformatics	9,450	2004	2008	N/A
400	Joint Genome Institute	29,886	1998	2008	N/A
500	Joint Genome Institute – Storage	4,700	2003	2008	N/A
903	Warehouse, Shipping, Receiving	120,780	1994	2006	N/A
933	User Apartments	5 units	1998	2006	N/A
937	Berkeley Tower Administrative Center	45,821	1999	2009	N/A
939	Satellite Administrative Center	11,500	2004	2006	N/A

Building Number	Name	Gross Square Feet	Year Occupied	Lease Ends	Excess Year
941	Satellite Administrative Center/Help Desk	9,450	2000	2005	N/A
943	Oakland Scientific Facility	54,202	2000	2010	N/A
962	Washington, DC Office (with Batelle)	4,820	2000	2007	N/A
965	Telecommute Center (Livermore, CA)	2,822	1996	2006	N/A

Appendix C: LABORATORY SPACE DISTRIBUTION

BUILDINGS

Building Number	Gross Square Feet	Year Built	Age	Excess Year	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
002	85,761	1988	16				5,941		2,226	16,132	1,632	1,221	21,813
002A	182	1993	11									182	
004	10,176	1944	60	2012					346	5,941		18	
005	7,176	1950	54	2011			1,492		21	2,280		447	1,079
006	118,573	1991	13			429	422	79,475	2,754	10,151		136	5,900
007	21,432	1943	61						1,345	8,481		8,179	
007A	128	1974	30									106	
010	15,200	1944	60	2008		509	519	723	160	2,474	6,178	340	1,792
013A	76	1965	39						67				
013B	76	1965	39						67				
013C	76	1965	39						67				
013D	76	1965	39						67				
013E	68	1977	27						60				
013F	36	1965	39						25				
013H	90	1990	14						78				
014	4,201	1944	60	2007			170		914	1,572		210	817
016	11,808	1943	61	2010			1,780	2,799	14	429	1,851	610	839
016A	339	1960	44	2010								319	
017	2,222	1949	55							263	1,651	186	
025	20,304	1947	57	2005			81		187	1,119	10,772	1,290	3,933
025A	7,548	1963	41	2006			108		563	1,218	3,921		
025B	360	1963	41	2005								322	
026	10,563	1964	40						2,353	2,733		658	1,331
027	3,299	1948	56				1,763	431		167	553	177	
028	544	2003	1						495				
033A	52	1965	39						44				
033B	94	1996	8						89				
033C	80	1965	39						68				
034	5,163	1992	12					673					
036	880	1989	15						839				
037	5,833	1987	17										
040	993	1947	57	2007								925	
041	995	1948	56	2007					140	182	332	273	
043	1,020	1979	25										
044	805	1956	48	2006						688			
045	3,342	1970	34						3,169				
046	60,363	1949	55			2,241	5,650		938	19,857	5,319	907	
046A	5,564	1977	27						72	3,747			
047	6,242	1957	47						24	4,366			
048	6,622	1981	23						2,024	1,983			
050	48,698	1943	61			133	4,529		8,631	18,916	873	212	771

Building Number	Gross Square Feet	Year Built	Age	Excess Year	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
050A	66,477	1962	42			3,058	2,769		4,448	26,617		308	
050B	63,561	1967	37			12,881	2,752		2,837	22,642		398	
050C	2,768	1980	24						64	1,947			
050D	4,959	1979	25	2005		119			48	3,268			
050E	10,560	1984	20			355				6,799		727	
050F	9,443	1985	19						1,008	4,785			
051	96,566	1950	54	2005			4,756	23,036	46,474	4,502	755	2,403	
051A	28,462	1958	46	2002				21,644	1,754			1,773	
052	6,425	1943	61	2009			173	4,422			292	636	
052A	516	1961	43	2009								489	
053	6,944	1949	55				133		17	795	5,097	355	
054	15,428	1950	54						11,343	99		838	
054A	195	1982	22						169				
055	19,048	1951	53			266	1,805		97	6,113	427	210	4,236
055A	1,535	1985	19				1,275					25	
055B	209	1987	17										
056	1,782	1976	28					540					771
058	10,279	1950	54						224	1,512	6,534	318	
058A	12,653	1969	35				4,085	6,586					
060	3,615	1979	25					3,494					
061	323	1969	35									286	
062	55,902	1965	39			101	2,922	2,251	2,335	7,785	5,210	677	14,479
062B	169	1965	39										
063	2,696	1963	41							117	2,390	103	
064	28,190	1951	53			175	3,841	2,269	440	5,760	793	1,300	5,479
065	3,423	1952	52						59	1,716			
066	44,134	1987	17				192		3,512	8,473		361	13,517
068	500	1979	25										
069	20,709	1967	37			290			1,515	6,306	131	7,490	
070	63,550	1955	49				7,356	307	1,838	13,364	433	1,179	19,928
070A	67,741	1961	43				7,890		1,163	11,335		661	23,489
070B	382	1979	25										
071	53,739	1956	48			2,135	2,901	14,937	3,580	10,962	2,725	1,092	
071A	4,104	1964	40					3,842		63			
071B	6,892	1978	26						59	2,017	2,517		
071T	949	2003	1				480						
072	5,352	1961	43				1,398		213	1,240			449
072A	2,532	1980	24					2,334					
072B	4,413	1984	20				70	3,673					
072C	8,392	1984	20			412	1,383		278	2,165		379	758
073	4,228	1961	43				1,029		30	1,465	393	233	191
073A	403	1961	43	2003				2,334					
074	45,382	1962	42		5,581	542	2,677		665	5,153		659	14,175
074F	1,560	1996	8		1,432								

Building Number	Gross Square Feet	Year Built	Age	Excess Year	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
075	8,495	1961	43			317	214		262	1,723		109	3,944
075A	4,000	1987	17				1,220					2,737	
075C	450	1979	25						92	3,374			
075D	1,895	1979	25				291					1,466	
076	31,639	1964	40				891		527	4,787	15,459	5,625	
077	68,937	1963	41						411	5,857	48,714	3,701	
077A	12,118	1988	16					2,487	1,256	76	7,482	23	
077H	576	1983	21								527		
078	5,391	1966	38									4,988	
079	4,564	1965	39							100	3,883	286	
080	29,931	1954	50			1,102	3,529	1,381	1,100	6,501	4,428	1,286	3,003
080A	960	1977	27							898			
081	1,129	1968	36									1,110	
082	537	1981	23										
083	6,856	1979	25				558		37	1,268		258	2,675
084	55,031	1997	7			138	3,600		2,144	6,706	308	557	11,340
084B	1,633	1997	7										
085	15,405	1996	8				769		4,825	960		301	2,124
085A	885	1996	8									834	
088	53,864	1960	44			320	204	16,742	690	10,798	4,095	3,018	1,269
088D	265	1979	25										
090	89,233	1960	44			903			5,370	52,900		1,193	

TRAILERS

Building Number	Gross Square Feet	Year Built	Age	Excess Year	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
007C	479	1977	27							384			
010A	242	1960	44										
029A	1,751	1978	26	2001									
029B	1,440	1978	26	2001									
029C	1,440	1978	26	2002									
029D	276	1978	26	2001									
031A	623	1978	26							560			
031B	157	1965	39									148	
031C	157	1965	39									148	
044A	481	1979	25	2006						438			
044B	1,441	1979	25	2006						1,137			
046B	1,239	1979	25							994			
046C	1,029	1977	27							733			
046D	771	1984	20							723			
048A	320	1978	26									296	
051F	1,499	1979	25	2006		449	925						
053B	519	1972	32							418			
062A	1,238	1978	26							1,032			

Building Number	Gross Square Feet	Year Built	Age	Excess Year	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
064B	480	1977	27							437			
065A	1,453	1984	20						129	1,011		9	
065B	1,020	1983	21							970			
067B	1,238	1978	26				473			580		134	
067C	1,237	1978	26	2005			1,186						
070E	432	1979	25									396	
070G	173	1979	25									157	
071C	511	1968	36							324			
071D	520	1970	34							489			
071E	513	1973	31	1995									
071F	516	1974	30							475			
071G	517	1974	30				470						
071J	1,289	1978	26							1,058			
071K	474	1974	30							439			
071P	511	1981	23							480			
071Q	357	1996	8										
075B	4,640	1979	25						92	3,374			
075E	410	1978	26							385			
076K	371	1974	30							292			
076L	1,439	1977	27							1,356			
083A	507	1965	39							279		185	
085B	3,601	1996	8						71	2,288		12	
090B	1,443	1977	27							1,160			
090C	1,193	1977	27							916			
090F	2,462	1979	25							1,824			
090G	1,853	1978	26						83	1,348			
090H	1,849	1977	27							1,428			
090J	2,846	1978	26							2,168			
090K	2,846	1978	26							2,078			
090P	2,129	1979	25							1,611			
090Q	425	1978	26										
090R	160	1979	25										

LEASED BUILDINGS

Building Number	Gross Square Feet	Year Occ.	Exp.	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
100	26,720	1998	2008		1,173	1,559		711	5,180		387	10,834
100A	9,450	2004	2008						6,300			
400	29,886	1998	2008		602	1,262	1,101	2,483	7,160		2,061	7,747
500	4,700	2003	2008								4,300	
903	120,780	1994	2006						2,335		115,290	
933	5 units	1998	2006					3,204				
937	45,821	1999	2009		739			382	25,042			
939	11,500	2004	2006					575	578			
941	9,450	2000	2005					285	4,601		180	

Building Number	Gross Square Feet	Year Occ.	Exp.	Animal Housing	Comp Room	Dry Lab	Heavy Lab	Misc	Office	Shop	Storage	Wet Lab
943	54,202	2000	2010		17,116	425		3,587	7,855		302	
962	4,820	2000	2007					2,409	3,296		253	
965	2,822	1996	2006					402	1,173			

Appendix D: REPLACEMENT PLANT VALUES

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
B	002	85,761	30,280,044	24,466,459	42,400,883
B	002A	182	47,631	47,631	56,920
B	006	118,565	41,865,132	36,991,184	64,003,238
B	007A	128	10,212	10,212	7,445
B	010	15,200	5,081,163	3,433,882	7,514,994
B	013A	76	12,998	12,998	42,728
B	013B	76	12,998	12,998	42,728
B	013C	76	12,998	12,998	42,728
B	013D	76	12,998	12,998	42,728
B	013E	68	11,630	11,630	38,230
B	013F	36	6,157	6,157	20,240
B	013H	90	15,392	15,392	50,599
B	017	2,222	386,977	449,794	694,924
B	026	10,563	1,897,744	2,386,868	5,303,049
B	027	3,299	574,545	890,728	1,389,271
B	033A	52	8,237	8,237	7,259
B	033B	94	14,891	14,891	13,122
B	033C	80	12,673	12,673	11,168
B	034	5,163	1,191,765	1,191,765	2,620,185
B	036	880	203,129	203,129	1,966,443
B	037	5,833	1,346,420	709,269	6,371,634
B	043	1,020	81,380	81,380	873,321
B	045	3,342	480,350	480,350	1,407,379
B	046	60,363	20,178,569	12,675,042	27,010,194
B	046A	5,564	890,761	890,761	2,083,523
B	047	6,242	850,171	1,502,715	2,711,331
B	048	6,622	951,789	951,789	2,074,010
T	048A	320	25,531	25,531	100,079
B	050	48,698	6,632,753	14,727,614	19,418,458
B	050A	66,477	21,002,328	19,562,129	32,872,661
B	050B	63,561	20,081,065	18,268,352	31,425,036
B	050C	2,768	443,139	443,139	1,284,962
B	050D	4,959	793,904	793,904	2,302,901
B	050E	10,560	1,690,589	1,690,589	4,420,928
B	050F	9,443	1,511,764	1,511,764	4,385,218
B	053	6,944	2,378,338	2,378,338	2,547,983
B	054	15,428	3,056,898	3,638,964	6,497,022
B	054A	195	40,476	40,476	81,553
B	055	19,048	6,281,308	4,561,741	9,407,586
B	055A	1,535	544,637	387,316	1,314,263

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
B	055B	209	16,675	16,675	147,934
B	056	1,782	629,179	629,179	4,399,793
B	058	10,279	2,565,242	2,829,536	5,082,015
B	058A	12,653	3,157,701	3,588,257	5,497,222
B	060	3,615	902,165	617,071	1,431,804
B	061	323	25,770	25,770	136,021
B	062	55,902	20,477,226	16,617,603	27,638,863
B	062B	169	13,484	13,484	23,592
B	063	2,696	469,528	469,528	989,251
B	064	28,190	10,002,160	6,713,282	12,240,084
B	065	3,423	548,000	548,000	1,329,380
B	066	44,134	16,166,539	11,453,495	21,820,181
B	068	500	39,892	78,488	156,374
B	069	20,709	2,820,602	4,201,900	6,784,310
B	070	63,550	23,278,732	17,545,069	31,368,674
B	070A	67,760	24,813,920	18,572,035	33,405,632
B	070B	382	30,478	30,478	119,469
B	071	52,612	16,977,964	19,173,748	29,446,417
B	071A	4,127	1,024,200	900,831	1,737,958
B	071B	7,062	1,746,298	1,722,386	3,491,506
B	072	5,352	1,889,656	1,362,940	2,646,069
B	072A	2,532	893,985	602,555	1,251,840
B	072B	4,413	1,558,119	1,050,188	1,480,208
B	072C	8,392	2,651,316	2,115,729	3,898,898
B	073	4,228	1,500,147	1,198,961	1,289,540
B	074	45,382	16,102,094	13,289,312	22,437,202
B	074F	1,560	124,464	160,786	283,563
B	075	8,495	3,111,768	2,471,751	3,995,981
B	075A	4,000	998,245	954,439	1,684,475
B	075C	450	158,884	158,884	122,337
B	075D	1,895	151,191	151,191	110,224
B	076	31,639	8,040,757	8,232,343	10,263,692
B	077	68,937	15,912,592	18,434,755	17,663,728
B	077A	10,862	2,507,254	2,507,254	4,574,193
B	077H	576	45,956	105,984	33,503
B	078	5,391	430,117	430,117	1,686,019
B	079	4,564	1,138,998	1,138,998	1,427,378
B	080	29,931	9,456,213	8,596,351	13,001,098
B	080A	960	153,690	153,690	359,357
B	081	1,129	90,077	90,077	353,091
B	082	537	42,844	83,931	459,778
B	083	6,995	2,481,912	2,481,912	3,458,381
B	084	55,031	19,525,678	16,439,575	27,207,740

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
B	084B	1,633	376,942	376,942	1,398,170
B	085	15,405	3,555,906	3,864,112	7,581,879
B	085A	885	70,609	70,609	276,781
B	088	53,864	19,018,018	17,097,330	26,848,124
B	088D	265	85,368	85,368	118,386
B	090	89,233	11,745,068	22,670,279	33,356,214
TOTAL All Active Buildings			**420,445,106**	**387,636,966**	**661,373,257**
B	004	10,176	1,385,989	2,342,112	3,809,187
B	005	7,176	2,267,141	1,994,848	3,547,868
B	007	21,432	2,919,076	4,449,018	7,918,382
B	014	4,201	731,635	996,295	1,824,784
B	016	11,808	5,366,736	3,270,932	5,405,268
B	016A	339	27,047	27,047	290,251
B	025	20,306	5,144,638	5,176,958	9,295,339
B	025B	360	28,722	28,722	112,589
B	040	993	252,362	252,362	202,403
B	041	995	252,870	252,870	372,459
B	052	6,425	1,603,432	1,754,122	2,705,689
B	052A	516	41,169	41,169	161,377
TOTAL Op Excess After 2006			**20,020,816**	**20,586,454**	**35,645,596**
T	007C	479	84,939	84,939	149,806
T	029A	1,751	310,496	310,496	655,453
T	029B	1,440	255,348	255,348	539,036
T	029C	1,440	255,348	255,348	539,036
T	029D	276	48,942	48,942	216,019
T	031A	623	110,473	110,473	87,109
T	044A	481	85,293	85,293	67,146
T	044B	1,441	255,525	255,525	201,160
T	046B	1,239	219,705	219,705	172,961
T	046C	1,029	182,467	182,467	143,646
T	046D	771	136,717	136,717	108,188
T	051F	1,499	529,259	529,259	468,808
T	062A	1,238	219,528	219,528	172,822
T	064B	480	85,116	85,116	67,007
T	065A	1,453	257,653	257,653	202,975
T	065B	1,020	180,871	180,871	142,389
T	067B	1,238	219,528	219,528	172,822
T	067C	1,237	219,351	219,351	172,682
T	071C	511	90,613	90,613	71,334
T	071D	520	92,209	92,209	72,591
T	071E	513	90,968	90,968	63,928
T	071G	517	91,677	91,677	72,172
T	071J	1,289	228,572	228,572	179,941

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
T	071P	511	90,613	90,613	71,474
T	075B	4,640	822,787	822,787	1,736,893
T	075E	410	72,703	72,703	23,848
T	076L	1,439	255,170	255,170	200,881
T	085B	3,601	638,546	638,546	1,348,713
T	090B	1,443	255,880	255,880	201,439
T	090C	1,193	211,548	211,548	166,540
T	090F	2,462	436,573	436,573	343,689
T	090G	1,853	328,583	328,583	258,674
T	090H	1,849	327,873	327,873	258,116
T	090J	2,846	504,666	504,666	397,294
T	090K	2,846	504,666	504,666	397,015
T	090P	2,129	377,524	377,524	297,203
T	090Q	425	75,363	75,363	332,639
TOTAL Real Property Trailers			**9,153,092**	**9,153,092**	**10,773,446**
O	005A		9,306	9,306	9,306
O	005B		22,335	22,335	22,335
O	017A		10,121	10,121	10,121
O	017B		7,562	7,562	7,562
O	027A		9,132	9,132	9,132
O	027B		9,132	9,132	9,132
O	030A		10,598	10,598	10,598
O	030B		10,598	10,598	10,598
O	030C		10,598	10,598	10,598
O	030D		10,598	10,598	10,598
O	030E		10,598	10,598	10,598
O	030F		10,598	10,598	10,598
O	030K		2,157	2,157	2,157
O	030L		2,157	2,157	2,157
O	030M		3,103	3,103	3,103
O	030N		567	567	567
O	030P		1,816	1,816	1,816
O	030Q		3,474	3,474	3,474
O	030R		6,623	6,623	6,623
O	030S		6,623	6,623	6,623
O	030T		10,863	10,863	10,863
O	030U		10,863	10,863	10,863
O	030V		2,611	2,611	2,611
O	030W		6,130	6,130	6,130
O	030X		1,816	1,816	1,816
O	031		2,550,299	2,550,299	2,550,299
O	031D		1,978	1,978	1,978
O	031E		10,863	10,863	10,863

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
O	031F		6,642	6,642	6,642
O	031G		10,863	10,863	10,863
O	031H		10,863	10,863	10,863
O	031J		10,863	10,863	10,863
O	031K		5,940	5,940	5,940
O	031M		1,893	1,893	1,893
O	058D		8,656	8,656	8,656
O	062C		4,177	4,177	4,177
O	062D		4,177	4,177	4,177
O	062E		22,141	22,141	22,141
O	062F		7,784	7,784	7,784
O	075F		11,523	11,523	11,523
O	075K		2,205	2,205	2,205
O	075L		2,205	2,205	2,205
O	075P		8,656	8,656	8,656
O	075R		8,656	8,656	8,656
O	075S		2,205	2,205	2,205
O	075V		8,656	8,656	8,656
O	075X		3,418	3,418	3,418
O	075Y		1,103	1,103	1,103
O	075Z		3,418	3,418	3,418
O	076A		9,305	9,305	9,305
O	076D		9,305	9,305	9,305
O	076H		9,305	9,305	9,305
O	076J		9,305	9,305	9,305
O	077J		100,315	100,315	100,315
O	077K		100,315	100,315	100,315
O	077L		100,315	100,315	100,315
O	077M		100,315	100,315	100,315
O	077N		100,315	100,315	100,315
O	077P		8,608	8,608	8,608
O	077Q		100,315	100,315	100,315
O	077R		100,315	100,315	100,315
O	077S		100,315	100,315	100,315
O	077T		1	1	1
O	085D		8,702	8,702	8,702
O	085E		7,774	7,774	7,774
O	085F		18,215	18,215	18,215
O	085G		18,215	18,215	18,215
O	085H		2,436	2,436	2,436
O	085J		22,392	22,392	22,392
O	085K		7,774	7,774	7,774
O	088B		63,504	63,504	63,504

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
O	088C		4,654	4,654	4,654
O	12KV SW ST A1 & A2		5,094,336	5,094,336	5,094,336
O	12KV SW ST A3 (6)		4,102,892	4,102,892	4,102,892
O	12KV SW ST A4-(35)		4,893,938	4,893,938	4,893,938
O	12KV SW ST A5 (66A)		4,799,012	4,799,012	4,799,012
O	12KV SW ST A6 (64C)		8,895,997	8,895,997	8,895,997
O	58B		4,362	4,362	4,362
O	58E		3,722	3,722	3,722
O	74D		9,132	9,132	9,132
O	83C		9,132	9,132	9,132
O	BRDG-VEH		921,748	921,748	921,748
O	CABLES ELEC (8939)		5,383,024	5,383,024	5,383,024
O	CABLS,ELEC,TERT		798,429	798,429	798,429
O	CABLS,UNDGD,VOICE		493,507	493,507	493,507
O	CT (34,37)		3,600,674	3,600,674	3,600,674
O	CURB & GUTTER		1,352,595	1,352,595	1,352,595
O	DIESEL GENERATOR		913,394	913,394	913,394
O	DRUM RACKS		433,251	433,251	433,251
O	DUCTBANK		24,977,118	24,977,118	24,977,118
O	EMERGENCY GENERATORS		7,744,377	7,744,377	7,744,377
O	ENERGY CONTROL SYS		9,789,869	9,789,869	9,789,869
O	FENCE		1,218,167	1,218,167	1,218,167
O	FIRE ALARM CABLES		5,787,540	5,787,540	5,787,540
O	GAS PUMP		11,115	11,115	11,115
O	GUARD RAILS		817,301	817,301	817,301
O	IPO 100-400 LSE		14,331,497	14,331,497	14,331,497
O	IPO 903-LSE		44,293	44,293	44,293
O	IPO 943-LSE		9,911,085	9,911,085	9,911,085
O	IPO-001		511,033	511,033	511,033
O	IPO-003		478,605	478,605	478,605
O	IPO-005		170,785	170,785	170,785
O	IPO-006		500,980	500,980	500,980
O	LOAD DOCK/PLATFORM		110,746	110,746	110,746
O	PAGING SYSTEM		9,872	9,872	9,872
O	PIP, COMP AIR		2,054,821	2,054,821	2,054,821
O	PIP, LCW		3,144,292	3,144,292	3,144,292
O	PIP, NAT GAS		2,152,989	2,152,989	2,152,989
O	PIP, OTHER		1,344,852	1,344,852	1,344,852
O	PIP, POTABLE		10,197,436	10,197,436	10,197,436
O	PKG, VEHIC		2,752,850	2,752,850	2,752,850
O	RADIO TOWER		1	1	1
O	RD-PRIMARY		4,104,244	4,104,244	4,104,244
O	RD-SEC		1,921,777	1,921,777	1,921,777

Type	Asset ID	Area (GSF)	FIMS Calc RPV	VFA Calc RPV	Legacy RPV
O	RET WALLS		4,123,533	4,123,533	4,123,533
O	SECUR ENTRY SYS		1,559,561	1,559,561	1,559,561
O	SEWAGE MONITER		1,352,498	1,352,498	1,352,498
O	SEWAGE PIPING		5,508,834	5,508,834	5,508,834
O	SIDEWLK		6,205,832	6,205,832	6,205,832
O	SITE/LANDSCPING		10,132,818	10,132,818	10,132,818
O	STORM DRAIN/PIPE		11,656,178	11,656,178	11,656,178
O	STREET LIGHTING		1,670,980	1,670,980	1,670,980
O	TANK, UST - 55		1	1	1
O	TANK, UST - 85		1	1	1
O	TANKS, AST-SITEWIDE		1	1	1
O	TANKS, UST - 2		1	1	1
O	TANKS, UST - 66		1	1	1
O	TANKS, UST - 76		319,583	319,583	319,583
O	TANKS, WATER		1,552,059	1,552,059	1,552,059
O	TELEPHONE SYS		12,213,207	12,213,207	12,213,207
O	UNIT SUBSTATIONS		3,277,373	3,277,373	3,277,373
O	WASTE TREATMT		650,461	650,461	650,461
TOTAL Conventional OSF's			**209,920,895**	**209,920,895**	**209,920,895**

Appendix E: OFFSETTING SPACE AT BERKELEY LAB

	New Construction	Demolition	Running Total
2002			
29		10,567	-10,567
51G		1,440	-12,007
51Q		2,977	-14,984
44D		205	-15,189
67D		130	-15,319
53A		192	-15,511
45A		128	-15,639
2002 Subtotal		15,639	
2003			
71H		1,424	-17,063
51N		645	-17,708
2003 Subtotal		2,069	
2004			
LEHR Space, Davis, CA		79,891	-97,599
51B		43,911	-141,510
51L		864	-142,374
2004 Subtotal		124,666	
2005			
Bldg. 64 Addition	1,200		-141,174
Bldg 72, Forefront Microscopes	850		-140,324
Bldg. 25		20,304	-160,628
Bldg 29D		276	-160,904
2005 Subtotal	2,050	20,580	
2006			
Animal Colony (near 85B)	11,500		-149,404
Utility Bldg (near 77)	1,750		-147,654
Molecular Foundry	95,692		-51,962
Bldg. 25A		7,548	-59,510
Bldg. 44		805	-60,315
Bldg. 44A		481	-60,796
Bldg. 44B		1,441	-62,237
51F		1,499	-63,736
Bldgs. 29A-29C		4,631	-68,367
73A		403	-68,770
2006 Subtotal	108,942	16,808	

	New Construction	Demolition	Running Total
2007			
Bldg. 14		4,201	-72,971
Bldg. 40		993	-73,964
Bldg. 41		995	-74,959
2007 Subtotal		6,189	
2008			
Bldg. 72 TEAM Microscope Space	850		-74,109
Bldg. 10		15,200	-89,309
2008 Subtotal	850	15,200	
2009			
User Support Building	30,000		-59,309
Bldg. 52		6,425	-65,734
Bldg. 52A		516	-66,250
2009 Subtotal		6,941	
2010			
Bldg. 16		11,808	-78,058
Bldg. 16A		339	-78,397
2010 Subtotal		12,147	
2011			
Bldg. 51		96,566	-174,963
Bldg. 51A		28,462	-203,425
Bldg. 5		7,176	-210,601
2011Subtotal		132,204	
2012			
GTL Facility	150,000		-60,601
Bldg. 4		10,176	-70,777
2012 Subtotal	150,000	10,176	
2013			
Ultrafast Science Facility	130,000		59,223
2013 Subtotal	130,000	0	

Appendix F: MODERNIZATION PLANNING INDICES

Type	ID	Excess Year	MPI	MPI Description
B	002		3	Continue to Operate
B	002A		3	Continue to Operate
B	004	2012	2	Demolish w-o Replace
B	005	2011	2	Demolish w-o Replace
B	006		3	Continue to Operate
B	007		3	Continue to Operate
B	007A		2	Demolish w-o Replace
B	010	2008	1	Replace with New
B	013A		3	Continue to Operate
B	013B		3	Continue to Operate
B	013C		3	Continue to Operate
B	013D		3	Continue to Operate
B	013E		3	Continue to Operate
B	013F		3	Continue to Operate
B	013H		3	Continue to Operate
B	014	2007	2	Demolish w-o Replace
B	016	2010	2	Demolish w-o Replace
B	016A	2010	2	Demolish w-o Replace
B	017		3	Continue to Operate
B	025	2005	2	Demolish w-o Replace
B	025A	2006	2	Demolish w-o Replace
B	025B	2005	2	Demolish w-o Replace
B	026		3	Continue to Operate
B	027		3	Continue to Operate
B	028		3	Continue to Operate
B	033A		1	Replace with New
B	033B		3	Continue to Operate
B	033C		1	Replace with New
B	034		3	Continue to Operate
B	036		3	Continue to Operate
B	037		3	Continue to Operate
B	040	2007	2	Demolish w-o Replace
B	041	2007	2	Demolish w-o Replace
B	043		3	Continue to Operate
B	044	2006	2	Demolish w-o Replace
B	045		3	Continue to Operate
B	046		3	Continue to Operate
B	046A		3	Continue to Operate
B	047		3	Continue to Operate
B	048		3	Continue to Operate
B	050		3	Continue to Operate
B	050A		3	Continue to Operate
B	050B		3	Continue to Operate
B	050C		3	Continue to Operate

Type	ID	Excess Year	MPI	MPI Description
B	050D	2005	2	Demolish w-o Replace
B	050E		3	Continue to Operate
B	050F		3	Continue to Operate
B	051	2005	2	Demolish w-o Replace
B	051A	2002	2	Demolish w-o Replace
B	052	2009	2	Demolish w-o Replace
B	052A	2009	2	Demolish w-o Replace
B	053		3	Continue to Operate
B	054		3	Continue to Operate
B	054A		3	Continue to Operate
B	055		3	Continue to Operate
B	055A		3	Continue to Operate
B	055B		3	Continue to Operate
B	056		3	Continue to Operate
B	058		3	Continue to Operate
B	058A		3	Continue to Operate
B	060		3	Continue to Operate
B	061		3	Continue to Operate
B	062		3	Continue to Operate
B	062B		3	Continue to Operate
B	063		3	Continue to Operate
B	064		3	Continue to Operate
B	065		3	Continue to Operate
B	066		3	Continue to Operate
B	068		3	Continue to Operate
B	069		3	Continue to Operate
B	070		3	Continue to Operate
B	070A		3	Continue to Operate
B	070B		3	Continue to Operate
B	071		3	Continue to Operate
B	071A		3	Continue to Operate
B	071B		3	Continue to Operate
B	071T		3	Continue to Operate
B	072		3	Continue to Operate
B	072A		3	Continue to Operate
B	072B		3	Continue to Operate
B	072C		3	Continue to Operate
B	073		3	Continue to Operate
B	073A	2003	2	Demolish w-o Replace
B	074		3	Continue to Operate
B	074F		3	Continue to Operate
B	075		3	Continue to Operate
B	075A		3	Continue to Operate
B	075C		3	Continue to Operate
B	075D		3	Continue to Operate
B	076		3	Continue to Operate
B	077		3	Continue to Operate

Type	ID	Excess Year	MPI	MPI Description
B	077A		3	Continue to Operate
B	077H		3	Continue to Operate
B	078		3	Continue to Operate
B	079		3	Continue to Operate
B	080		3	Continue to Operate
B	080A		3	Continue to Operate
B	081		3	Continue to Operate
B	082		3	Continue to Operate
B	083		3	Continue to Operate
B	084		3	Continue to Operate
B	084B		3	Continue to Operate
B	085		3	Continue to Operate
B	085A		3	Continue to Operate
B	088		3	Continue to Operate
B	088D		3	Continue to Operate
B	090		3	Continue to Operate
S	005A		3	Continue to Operate
S	005B		3	Continue to Operate
S	017A		3	Continue to Operate
S	017B		3	Continue to Operate
S	027A		3	Continue to Operate
S	027B		3	Continue to Operate
S	030A		3	Continue to Operate
S	030B		3	Continue to Operate
S	030C		3	Continue to Operate
S	030D		3	Continue to Operate
S	030E		3	Continue to Operate
S	030F		3	Continue to Operate
S	030K		3	Continue to Operate
S	030L		3	Continue to Operate
S	030M		3	Continue to Operate
S	030N		3	Continue to Operate
S	030P		3	Continue to Operate
S	030Q		3	Continue to Operate
S	030R		3	Continue to Operate
S	030S		3	Continue to Operate
S	030T		3	Continue to Operate
S	030U		3	Continue to Operate
S	030V		3	Continue to Operate
S	030W		3	Continue to Operate
S	030X		3	Continue to Operate
S	31		3	Continue to Operate
S	031D		3	Continue to Operate
S	031E		3	Continue to Operate
S	031F		3	Continue to Operate
S	031G		3	Continue to Operate
S	031H		3	Continue to Operate

Type	ID	Excess Year	MPI	MPI Description
S	031J		3	Continue to Operate
S	031K		3	Continue to Operate
S	031M		3	Continue to Operate
S	058D		3	Continue to Operate
S	062C		3	Continue to Operate
S	062D		3	Continue to Operate
S	062E		3	Continue to Operate
S	062F		3	Continue to Operate
S	075F		3	Continue to Operate
S	075K		3	Continue to Operate
S	075L		3	Continue to Operate
S	075P		3	Continue to Operate
S	075R		3	Continue to Operate
S	075S		3	Continue to Operate
S	075V		3	Continue to Operate
S	075X		3	Continue to Operate
S	075Y		3	Continue to Operate
S	075Z		3	Continue to Operate
S	076A		3	Continue to Operate
S	076D		3	Continue to Operate
S	076H		3	Continue to Operate
S	076J		3	Continue to Operate
S	077J		3	Continue to Operate
S	077K		3	Continue to Operate
S	077L		3	Continue to Operate
S	077M		3	Continue to Operate
S	077N		3	Continue to Operate
S	077P		3	Continue to Operate
S	077Q		3	Continue to Operate
S	077R		3	Continue to Operate
S	077S		3	Continue to Operate
S	077T		3	Continue to Operate
S	085D		3	Continue to Operate
S	085E		3	Continue to Operate
S	085F		3	Continue to Operate
S	085G		3	Continue to Operate
S	085H		3	Continue to Operate
S	085J		3	Continue to Operate
S	085K		3	Continue to Operate
S	088B		3	Continue to Operate
S	088C		3	Continue to Operate
S	12KV SW ST A1 & A2		3	Continue to Operate
S	12KV SW ST A3 (6)		3	Continue to Operate
S	12KV SW ST A4-(35)		3	Continue to Operate
S	12KV SW ST A5 (66A)		3	Continue to Operate
S	12KV SW ST A6 (64C)		3	Continue to Operate
S	13J		3	Continue to Operate

Type	ID	Excess Year	MPI	MPI Description
S	58B		3	Continue to Operate
S	58E		3	Continue to Operate
S	74D		3	Continue to Operate
S	83C		3	Continue to Operate
S	ACEL-88"		3	Continue to Operate
S	ACEL-ALS		3	Continue to Operate
S	ACEL-BIF - 56		3	Continue to Operate
S	ACEL-VDG2		3	Continue to Operate
S	BRDG-VEH		3	Continue to Operate
S	CABLES ELEC (8939)		3	Continue to Operate
S	CABLS,ELEC,TERT		3	Continue to Operate
S	CABLS,UNDGD,VOICE		3	Continue to Operate
S	CT (34,37)		3	Continue to Operate
S	CURB & GUTTER		3	Continue to Operate
S	DIESEL GENERATOR		3	Continue to Operate
S	DRUM RACKS		3	Continue to Operate
S	DUCTBANK		3	Continue to Operate
S	EMERGENCY GENERATORS		3	Continue to Operate
S	ENERGY CONTROL SYS		3	Continue to Operate
S	FENCE		3	Continue to Operate
S	FIRE ALARM CABLES		3	Continue to Operate
S	GAS PUMP		3	Continue to Operate
S	GUARD RAILS		3	Continue to Operate
S	IPO 100-400 LSE		3	Continue to Operate
S	IPO 903-LSE		3	Continue to Operate
S	IPO 943-LSE		3	Continue to Operate
S	IPO-001		3	Continue to Operate
S	IPO-003		3	Continue to Operate
S	IPO-005		3	Continue to Operate
S	IPO-006		3	Continue to Operate
S	LOAD DOCK/PLATFORM		2	Demolish w-o Replace
S	PAGING SYSTEM		3	Continue to Operate
S	PIP, COMP AIR		3	Continue to Operate
S	PIP, LCW		3	Continue to Operate
S	PIP, NAT GAS		3	Continue to Operate
S	PIP, OTHER		3	Continue to Operate
S	PIP, POTABLE		3	Continue to Operate
S	PIPING FROM 62 TO 72		3	Continue to Operate
S	PKG, VEHIC		3	Continue to Operate
S	RADIO TOWER		3	Continue to Operate
S	RD-PRIMARY		3	Continue to Operate
S	RD-SEC		3	Continue to Operate
S	RET WALLS		3	Continue to Operate
S	SECUR ENTRY SYS		3	Continue to Operate
S	SEWAGE MONITER		3	Continue to Operate
S	SEWAGE PIPING		3	Continue to Operate
S	SIDEWLK		3	Continue to Operate

Type	ID	Excess Year	MPI	MPI Description
S	SITE/LANDSCPING		3	Continue to Operate
S	STORM DRAIN/PIPE		3	Continue to Operate
S	STREET LIGHTING		3	Continue to Operate
S	TANK, UST - 55		3	Continue to Operate
S	TANK, UST - 85		3	Continue to Operate
S	TANKS, AST-SITEWIDE		3	Continue to Operate
S	TANKS, UST - 2		3	Continue to Operate
S	TANKS, UST - 76		3	Continue to Operate
S	TANKS, WATER		3	Continue to Operate
S	TELEPHONE SYS		3	Continue to Operate
S	UNIT SUBSTATIONS		3	Continue to Operate
S	WASTE TREATMT		3	Continue to Operate
S	WEATHER TOWER		3	Continue to Operate

Appendix G: RIC METHODOLOGY

A Building	***B*** RPV	***C*** Planned Usage Code	***D*** Model Description	***E*** Last Summary Condition	***F*** Last Suitability Index
Sample Building	21,340,375	741	Labs, Biology/ Enviornmental (50/50)	4	N/A

G Subsystem	***H*** Usage Model Percentage	***I*** New Const. To Renovation Converter	***J*** Replacement Value	***K*** Rehab and Improvement Assessment	***L*** Percentage from Table 4	***M*** Rehab and Improvement Cost Calculation	
Foundations	2.5	1.3	693,562	C	7.5	52,017	
Substructure	1.2	1.8	448,148	C	7.5	33,611	
Superstructure	7.4	2.0	3,158,376	F	100.0	3,158,376	
Exterior Closure	5.7	1.0	1,216,401			0	
Roofing	1.3	1.3	360,652	A	1.0	3,607	
Interior Construction	11.5	1.0	2,454,143	E	40.0	981,657	
Conveying	2.0	1.3	554,850	E	40.0	221,940	
Mechanical-Plumbing	8.8	1.7	3,192,520	D	17.5	558,691	
Mechanical-Fire Protection	1.2	1.7	435,344			77,000	
Mechanical-Heating	2.8	1.7	1,015,802	D	17.5	177,765	
Mechanical-Cooling	6.3	1.7	2,285,554	F	100.0	2,285,554	
Mechanical-Special Systems	0.4	1.7	145,115	E	40.0	58,046	
Electrical	31.1	1.8	11,946,342	E	40.0	4,778,537	
Special Construction	17.6	2.8	10,516,537	D	17.5	1,840,394	
SiteWork	0.2	2.5	106,702	A	1.0	1,067	
Total Rehab and Improvement Cost	100.0	N/A	N/A	N/A	N/A	14,228,261	
FY04 Deferred Maintenance						253,255	***N***
Rehab and Improvement Cost						13,975,006	***O***
Total Summary Condition Index						66.67%	***P***
Summary Condition						FAIL	***Q***

A. Building	Number or identifier from FIMS
B. RPV	Replacement Plant Value as entered in FIMS. Can be system generated or locally calculated per current FIMS guidance.
C. Usage Code	From FIMS. Determines percentages used in column ***H***
D. Model Description	Corresonds to Usage Code. Should be verified during inspection phase
E. Last Summary Condition Rating	From FIMS.
F. Last Suitability Index	From FIMS.
G. Subsystem	From FIMS RPV calculation algorithm (Derived from R. S. Means definitions)
H. Usage Model Percentage	From FIMS RPV calculation algorithm (Derived from R. S. Means definitions). Descriptions and percentages available through FIMS help screens. These percentages will vary among usage codes and may be adjusted to meet local conditions. All adjustments must be documented and made available for HQ inspection.

I. New Construction to Renovation Converter	Added factor (site specific to convert new costruction cost estimates to renovation cost estimates
J. Replacement Value	Building RPV (***B***) times Usage Model Percentage (***H***) to determine value of subsystem.
K. Condition Assessment	A through F rating, based on criteria contained in Table 3, determined during inspection by qualified personnel. Evaluation should be performed against requirement identified by Facilities Planning and O&M. Leave code blank to indicate amount in Column M is from actual estimate.
L. Rehab Cost Percentage	Percentage from Table 4 associated with the numerical Condition Assessment (***J***)
M. Total Rehab and Improvement Cost	Subsystem Replacement Value (***I***) times Rehab Cost Percentage (***K***). Provides numerical value of identified deficiencies, not their true repair cost. May be overwritten by actual estimated costs, where known.
N. Deferred Maintenance	O&M Supplied data based on condition assessment
O. Rehab and Improvement Cost	M-N. Data entered into FIMS for automatic calculation of TSCI which is defined as the sum of (Rehab and Improvement Cost [O] + Deferred Maintenance [N]) divided by RPV [B]
P. Summary Condition Index	Total Rehab and Improvement Cost/Replacement Plant Value
Q. Summary Condition	Descriptor from FIMS contained in Table 5

Table 3[3]
Condition Assessment Ratings for Rehab and Improvement Cost Calculation

Score	Rating	**Definition**
A	Excellent	Consistently meets all condition requirements for current use. Only routine maintenance required
B	Good	Routinely meets all condition requirements for current use. Minimal repair required.
C	Adequate	Operational. Minor repair, rehabilitation, or upgrade required. Non-compliance with code issues considered a "deviation from good management practices".
D	Fair	Unreliable. Often fails to meet all condition requirements for current use. Major repair, replacement, or upgrade required. Marginal non-compliance with codes having significant life-safety impact.
E	Poor	Highly Unreliable. Frequently fails to meet all condition requirements for current use. Replacement or upgrade urgently required. Major non-compliance with codes having significant life-safety impact but not involving significant fines or penalties or resulting in serious injury.
F	Fail	Routinely fails to meet all condition requirements for current use. Major non-compliance with codes having significant life-safety impact involving significant fines or penalties or resulting in serious injury.

Table 4
Conversion of Condition Assessment Ratings to Rehab and Improvement Cost Percents

Score	Rating	**Percentage to be applied to subsystem RPV**
A	Excellent	1.0
B	Good	3.5
C	Adequate	7.5
D	Fair	17.5
E	Poor	40.0
F	Fail	100.0

Table 5
Total Summary Condition Index Descriptors

0-2%	Excellent
2-5%	Good
5-10%	Adequate
10-25%	Fair
25-60%	Poor
60-100%	Fail[4]

[3] Tables 3, 4 and 5 are extracted from Condition and Suitability Assessment Model prepared for DOE SC by Berkeley Lab in May 2002.
[4] This category has been eliminated by the RPAM Order and the range for “Poor” has been extended to 75%

Appendix H: RIC and TSCI DETAILS

DETAILS USING BERKELEY LAB LEGACY RPVs

Building Number	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
002	85,761	725,001	1,811,695	2,536,696	42,400,883	1.7	98.3	EXCELLENT	6.0	94.0	ADEQUATE
002A	182	0	1,092	1,092	56,920	0.0	100.0	EXCELLENT	1.9	98.1	EXCELLENT
004	10,176	336,585	24,000	360,585	3,809,187	8.8	91.2	ADEQUATE	9.5	90.5	ADEQUATE
005	7,176	110,331	14,000	124,331	3,547,868	3.1	96.9	GOOD	3.5	96.5	GOOD
006	118,573	85,673	7,076,177	7,161,850	64,003,238	0.1	99.9	EXCELLENT	11.2	88.8	FAIR
007	21,432	321,277	2,180,092	2,501,369	7,918,382	4.1	95.9	GOOD	31.6	68.4	POOR
007A	128	1,195	5,120	6,315	7,445	16.1	83.9	FAIR	84.8	15.2	POOR
010	15,200	129,570	19,875,923	20,005,493	7,514,994	1.7	98.3	EXCELLENT	266.2	-166.2	POOR
013A	76	815	0	815	42,728	1.9	98.1	EXCELLENT	1.9	98.1	EXCELLENT
013B	76	815	0	815	42,728	1.9	98.1	EXCELLENT	1.9	98.1	EXCELLENT
013C	76	648	0	648	42,728	1.5	98.5	EXCELLENT	1.5	98.5	EXCELLENT
013D	76	1,381	0	1,381	42,728	3.2	96.8	GOOD	3.2	96.8	GOOD
013E	68	0	552	552	38,230	0.0	100.0	EXCELLENT	1.4	98.6	EXCELLENT
013F	36	0	641	641	20,240	0.0	100.0	EXCELLENT	3.2	96.8	GOOD
013H	90	0	731	731	50,599	0.0	100.0	EXCELLENT	1.4	98.6	EXCELLENT
014	4,201	77,383	11,000	88,383	1,824,784	4.2	95.8	GOOD	4.8	95.2	GOOD
016	11,808	218,847	17,000	235,847	5,405,268	4.0	96.0	GOOD	4.4	95.6	GOOD
016A	339	1,877	13,560	15,437	290,251	0.6	99.4	EXCELLENT	5.3	94.7	ADEQUATE
017	2,222	85,486	0	85,486	694,924	12.3	87.7	FAIR	12.3	87.7	FAIR
025	20,304	997,683	0	997,683	9,295,339	10.7	89.3	FAIR	10.7	89.3	FAIR
025A	7,548	56,100	15,000	71,100	2,974,108	1.9	98.1	EXCELLENT	2.4	97.6	GOOD
025B	360	0	14,400	14,400	112,589	0.0	100.0	EXCELLENT	12.8	87.2	FAIR
026	10,563	17,907	417,866	435,773	5,303,049	0.3	99.7	EXCELLENT	8.2	91.8	ADEQUATE
027	3,299	64,096	2,000	66,096	1,389,271	4.6	95.4	GOOD	4.8	95.2	GOOD
028	544	0	0	0	87,806	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
033A	52	1,252	11,504	12,756	7,259	17.2	82.8	FAIR	175.7	-75.7	POOR
033B	94	3,048	0	3,048	13,122	23.2	76.8	FAIR	23.2	76.8	FAIR
033C	80	1,339	11,737	13,076	11,168	12.0	88.0	FAIR	117.1	-17.1	POOR
034	5,163	206,191	0	206,191	2,620,185	7.9	92.1	ADEQUATE	7.9	92.1	ADEQUATE
036	880	616	117,767	118,383	1,966,443	0.0	100.0	EXCELLENT	6.0	94.0	ADEQUATE
037	5,833	20,810	300,512	321,322	6,371,634	0.3	99.7	EXCELLENT	5.0	95.0	ADEQUATE
040	993	39,212	39,720	78,932	202,403	19.4	80.6	FAIR	39.0	61.0	POOR
041	995	45,548	39,800	85,348	372,459	12.2	87.8	FAIR	22.9	77.1	FAIR
043	1,020	1,553	54,129	55,682	873,321	0.2	99.8	EXCELLENT	6.4	93.6	ADEQUATE
044	805	12,688	32,200	44,888	251,761	5.0	95.0	ADEQUATE	17.8	82.2	FAIR
045	3,342	10,400	78,814	89,214	1,407,379	0.7	99.3	EXCELLENT	6.3	93.7	ADEQUATE
046	60,363	411,080	13,573,772	13,984,852	27,010,194	1.5	98.5	EXCELLENT	51.8	48.2	POOR
046A	5,564	19,720	204,708	224,428	2,083,523	0.9	99.1	EXCELLENT	10.8	89.2	FAIR
047	6,242	96,771	8,000	104,771	2,711,331	3.6	96.4	GOOD	3.9	96.1	GOOD
048	6,622	41,517	118,193	159,710	2,074,010	2.0	98.0	GOOD	7.7	92.3	ADEQUATE
050	48,698	499,267	2,165,305	2,664,572	19,418,458	2.6	97.4	GOOD	13.7	86.3	FAIR

Building Number	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
050A	66,477	347,216	2,718,439	3,065,655	32,872,661	1.1	98.9	EXCELLENT	9.3	90.7	ADEQUATE
050B	63,561	325,423	7,623,296	7,948,719	31,425,036	1.0	99.0	EXCELLENT	25.3	74.7	POOR
050C	2,768	27,437	166,205	193,642	1,284,962	2.1	97.9	GOOD	15.1	84.9	FAIR
050D	4,959	8,568	897,044	905,612	2,302,901	0.4	99.6	EXCELLENT	39.3	60.7	POOR
050E	10,560	82,131	390,990	473,121	4,420,928	1.9	98.1	EXCELLENT	10.7	89.3	FAIR
050F	9,443	76,682	392,617	469,299	4,385,218	1.7	98.3	EXCELLENT	10.7	89.3	FAIR
051	96,566	129,738	41,040,550	41,170,288	42,113,781	0.3	99.7	EXCELLENT	97.8	2.2	POOR
051A	28,462	34,495	12,096,350	12,130,845	8,901,407	0.4	99.6	EXCELLENT	136.3	-36.3	POOR
052	6,425	48,406	14,000	62,406	2,705,689	1.8	98.2	EXCELLENT	2.3	97.7	GOOD
052A	516	2,530	20,640	23,170	161,377	1.6	98.4	EXCELLENT	14.4	85.6	FAIR
053	6,944	152,913	361,969	514,882	2,547,983	6.0	94.0	ADEQUATE	20.2	79.8	FAIR
054	15,428	145,017	1,186,540	1,331,557	6,497,022	2.2	97.8	GOOD	20.5	79.5	FAIR
054A	195	680	1,666	2,346	81,553	0.8	99.2	EXCELLENT	2.9	97.1	GOOD
055	19,048	980,157	41,000	1,021,157	9,407,586	10.4	89.6	FAIR	10.9	89.1	FAIR
055A	1,535	21,442	5,000	26,442	1,314,263	1.6	98.4	EXCELLENT	2.0	98.0	GOOD
055B	209	0	3,839	3,839	147,934	0.0	100.0	EXCELLENT	2.6	97.4	GOOD
056	1,782	1,889	187,568	189,457	4,399,793	0.0	100.0	EXCELLENT	4.3	95.7	GOOD
058	10,279	177,169	4,000	181,169	5,082,015	3.5	96.5	GOOD	3.6	96.4	GOOD
058A	12,653	521,067	0	521,067	5,497,222	9.5	90.5	ADEQUATE	9.5	90.5	ADEQUATE
060	3,615	46,088	3,000	49,088	1,431,804	3.2	96.8	GOOD	3.4	96.6	GOOD
061	323	5,609	60,608	66,217	136,021	4.1	95.9	GOOD	48.7	51.3	POOR
062	55,902	495,364	5,077,142	5,572,506	27,638,863	1.8	98.2	EXCELLENT	20.2	79.8	FAIR
062B	169	158	1,342	1,500	23,592	0.7	99.3	EXCELLENT	6.4	93.6	ADEQUATE
063	2,696	18,499	327,493	345,992	989,251	1.9	98.1	EXCELLENT	35.0	65.0	POOR
064	28,190	360,358	0	360,358	12,240,084	2.9	97.1	GOOD	2.9	97.1	GOOD
065	3,423	9,548	95,674	105,222	1,329,380	0.7	99.3	EXCELLENT	7.9	92.1	ADEQUATE
066	44,134	526,612	382,733	909,345	21,820,181	2.4	97.6	GOOD	4.2	95.8	GOOD
068	500	0	0	0	156,374	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
069	20,709	214,001	0	214,001	6,784,310	3.2	96.8	GOOD	3.2	96.8	GOOD
070	63,550	595,816	3,504,964	4,100,780	31,368,674	1.9	98.1	EXCELLENT	13.1	86.9	FAIR
070A	67,741	313,219	2,697,046	3,010,265	33,405,632	0.9	99.1	EXCELLENT	9.0	91.0	ADEQUATE
070B	382	0	7,594	7,594	119,469	0.0	100.0	EXCELLENT	6.4	93.6	ADEQUATE
071	53,739	3,497,345	90,000	3,587,345	29,446,417	11.9	88.1	FAIR	12.2	87.8	FAIR
071A	4,104	37,725	0	37,725	1,737,958	2.2	97.8	GOOD	2.2	97.8	GOOD
071B	6,892	56,599	15,000	71,599	3,491,506	1.6	98.4	EXCELLENT	2.1	97.9	GOOD
071T	949	0	1	1	143,385	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
072	5,352	151,996	8,000	159,996	2,646,069	5.7	94.3	ADEQUATE	6.0	94.0	ADEQUATE
072A	2,532	57,243	1,000	58,243	1,251,840	4.6	95.4	GOOD	4.7	95.3	GOOD
072B	4,413	50,560	1,000	51,560	1,480,208	3.4	96.6	GOOD	3.5	96.5	GOOD
072C	8,392	134,122	9,000	143,122	3,898,898	3.4	96.6	GOOD	3.7	96.3	GOOD
073	4,228	137,963	7,000	144,963	1,289,540	10.7	89.3	FAIR	11.2	88.8	FAIR
073A	403	18,501	16,120	34,621	126,037	14.7	85.3	FAIR	27.5	72.5	POOR
074	45,382	301,609	7,220,115	7,521,724	22,437,202	1.3	98.7	EXCELLENT	33.5	66.5	POOR
074F	1,560	0	0	0	283,563	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
075	8,495	339,935	7,000	346,935	3,995,981	8.5	91.5	ADEQUATE	8.7	91.3	ADEQUATE
075A	4,000	36,126	1,000	37,126	1,684,475	2.1	97.9	GOOD	2.2	97.8	GOOD

Building Number	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
075C	450	315	44,948	45,263	122,337	0.3	99.7	EXCELLENT	37.0	63.0	POOR
075D	1,895	1,733	75,800	77,533	110,224	1.6	98.4	EXCELLENT	70.3	29.7	POOR
076	31,639	23,348	1,813,889	1,837,237	10,263,692	0.2	99.8	EXCELLENT	17.9	82.1	FAIR
077	68,937	475,418	1,206,915	1,682,333	17,663,728	2.7	97.3	GOOD	9.5	90.5	ADEQUATE
077A	12,118	12,561	484,024	496,585	4,574,193	0.3	99.7	EXCELLENT	10.9	89.1	FAIR
077H	576	1,231	3,000	4,231	33,503	3.7	96.3	GOOD	12.6	87.4	FAIR
078	5,391	108,444	91,633	200,077	1,686,019	6.4	93.6	ADEQUATE	11.9	88.1	FAIR
079	4,564	21,932	151,360	173,292	1,427,378	1.5	98.5	EXCELLENT	12.1	87.9	FAIR
080	29,931	166,393	901,728	1,068,121	13,001,098	1.3	98.7	EXCELLENT	8.2	91.8	ADEQUATE
080A	960	4,932	21,482	26,414	359,357	1.4	98.6	EXCELLENT	7.4	92.6	ADEQUATE
081	1,129	4,392	21,015	25,407	353,091	1.2	98.8	EXCELLENT	7.2	92.8	ADEQUATE
082	537	0	0	0	459,778	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
083	6,856	23,119	2,136,415	2,159,534	3,458,381	0.7	99.3	EXCELLENT	62.4	37.6	POOR
084	55,031	2,754	490,019	492,773	27,207,740	0.0	100.0	EXCELLENT	1.8	98.2	EXCELLENT
084B	1,633	248	25,060	25,308	1,398,170	0.0	100.0	EXCELLENT	1.8	98.2	EXCELLENT
085	15,405	15,357	162,324	177,681	7,581,879	0.2	99.8	EXCELLENT	2.3	97.7	GOOD
085A	885	0	4,790	4,790	276,781	0.0	100.0	EXCELLENT	1.7	98.3	EXCELLENT
088	53,864	615,187	3,031,808	3,646,995	26,848,124	2.3	97.7	GOOD	13.6	86.4	FAIR
088D	265	0	7,742	7,742	118,386	0.0	100.0	EXCELLENT	6.5	93.5	ADEQUATE
090	89,233	370,166	3,354,881	3,725,047	33,356,214	1.1	98.9	EXCELLENT	11.2	88.8	FAIR

DETAILS USING VFA CALCULATED RPVs

Building Number	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
002	85,761	725,001	1,811,695	1,998,005	24,466,459	3.0	97.0	GOOD	10.4	89.6	FAIR
002A	182	0	1,092	494	47,631	0.0	100.0	EXCELLENT	2.3	97.7	GOOD
004	10,176	336,585	24,000	499,000	2,342,112	14.4	85.6	FAIR	15.4	84.6	FAIR
005	7,176	110,331	14,000	442,000	1,994,848	5.5	94.5	ADEQUATE	6.2	93.8	ADEQUATE
006	118,573	85,673	7,076,177	6,264,652	36,991,184	0.2	99.8	EXCELLENT	19.4	80.6	FAIR
007	21,432	321,277	2,180,092	5,512,592	4,449,018	7.2	92.8	ADEQUATE	56.2	43.8	POOR
007A	128	1,195	5,120	6,315	10,212	11.7	88.3	FAIR	61.8	38.2	POOR
010	15,200	129,570	19,875,923	7,514,994	3,433,882	3.8	96.2	GOOD	582.6	-482.6	POOR
013A	76	815	0	1,221	12,998	6.3	93.7	ADEQUATE	6.3	93.7	ADEQUATE
013B	76	815	0	1,432	12,998	6.3	93.7	ADEQUATE	6.3	93.7	ADEQUATE
013C	76	648	0	1,265	12,998	5.0	95.0	GOOD	5.0	95.0	GOOD
013D	76	1,381	0	1,998	12,998	10.6	89.4	FAIR	10.6	89.4	FAIR
013E	68	0	552	168	11,630	0.0	100.0	EXCELLENT	4.7	95.3	GOOD
013F	36	0	641	292	6,157	0.0	100.0	EXCELLENT	10.4	89.6	FAIR
013H	90	0	731	347	15,392	0.0	100.0	EXCELLENT	4.7	95.3	GOOD
014	4,201	77,383	11,000	361,000	996,295	7.8	92.2	ADEQUATE	8.9	91.1	ADEQUATE
016	11,808	218,847	17,000	804,000	3,270,932	6.7	93.3	ADEQUATE	7.2	92.8	ADEQUATE
016A	339	1,877	13,560	15,437	27,047	6.9	93.1	ADEQUATE	57.1	42.9	POOR
017	2,222	85,486	0	85,486	449,794	19.0	81.0	FAIR	19.0	81.0	FAIR
025	20,304	997,683	0	997,683	5,176,958	19.3	80.7	FAIR	19.3	80.7	FAIR
025A	7,548	56,100	15,000	388,000	2,974,108	1.9	98.1	EXCELLENT	2.4	97.6	GOOD

v	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
025B	360	0	14,400	14,400	28,722	0.0	100.0	EXCELLENT	50.1	49.9	POOR
026	10,563	17,907	417,866	499,997	2,386,868	0.8	99.2	EXCELLENT	18.3	81.7	FAIR
027	3,299	64,096	2,000	259,000	890,728	7.2	92.8	ADEQUATE	7.4	92.6	ADEQUATE
028	544	0	0	0	87,806	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
033A	52	1,252	11,504	7,259	8,237	15.2	84.8	FAIR	154.9	-54.9	POOR
033B	94	3,048	0	4,045	14,891	20.5	79.5	FAIR	20.5	79.5	FAIR
033C	80	1,339	11,737	11,168	12,673	10.6	89.4	FAIR	103.2	-3.2	POOR
034	5,163	206,191	0	366,230	1,191,765	17.3	82.7	FAIR	17.3	82.7	FAIR
036	880	616	117,767	40,589	203,129	0.3	99.7	EXCELLENT	58.3	41.7	POOR
037	5,833	20,810	300,512	334,045	709,269	2.9	97.1	GOOD	45.3	54.7	POOR
040	993	39,212	39,720	78,932	252,362	15.5	84.5	FAIR	31.3	68.7	POOR
041	995	45,548	39,800	85,348	252,870	18.0	82.0	FAIR	33.8	66.2	POOR
043	1,020	1,553	54,129	51,358	81,380	1.9	98.1	EXCELLENT	68.4	31.6	POOR
044	805	12,688	32,200	44,888	251,761	5.0	95.0	ADEQUATE	17.8	82.2	FAIR
045	3,342	10,400	78,814	88,756	480,350	2.2	97.8	GOOD	18.6	81.4	FAIR
046	60,363	411,080	13,573,772	13,457,814	12,675,042	3.2	96.8	GOOD	110.3	-10.3	POOR
046A	5,564	19,720	204,708	199,306	890,761	2.2	97.8	GOOD	25.2	74.8	POOR
047	6,242	96,771	8,000	398,000	1,502,715	6.4	93.6	ADEQUATE	7.0	93.0	ADEQUATE
048	6,622	41,517	118,193	278,351	951,789	4.4	95.6	GOOD	16.8	83.2	FAIR
050	48,698	499,267	2,165,305	3,996,174	14,727,614	3.4	96.6	GOOD	18.1	81.9	FAIR
050A	66,477	347,216	2,718,439	3,171,132	19,562,129	1.8	98.2	EXCELLENT	15.7	84.3	FAIR
050B	63,561	325,423	7,623,296	4,208,171	18,268,352	1.8	98.2	EXCELLENT	43.5	56.5	POOR
050C	2,768	27,437	166,205	99,789	443,139	6.2	93.8	ADEQUATE	43.7	56.3	POOR
050D	4,959	8,568	897,044	151,855	793,904	1.1	98.9	EXCELLENT	114.1	-14.1	POOR
050E	10,560	82,131	390,990	390,904	1,690,589	4.9	95.1	GOOD	28.0	72.0	POOR
050F	9,443	76,682	392,617	360,012	1,511,764	5.1	94.9	ADEQUATE	31.0	69.0	POOR
051	96,566	129,738	41,040,550	41,170,288	42,113,781	0.3	99.7	EXCELLENT	97.8	2.2	POOR
051A	28,462	34,495	12,096,350	8,901,407	8,901,407	0.4	99.6	EXCELLENT	136.3	-36.3	POOR
052	6,425	48,406	14,000	492,000	1,754,122	2.8	97.2	GOOD	3.6	96.4	GOOD
052A	516	2,530	20,640	23,170	41,169	6.1	93.9	ADEQUATE	56.3	43.7	POOR
053	6,944	152,913	361,969	759,660	2,378,338	6.4	93.6	ADEQUATE	21.6	78.4	FAIR
054	15,428	145,017	1,186,540	1,090,914	3,638,964	4.0	96.0	GOOD	36.6	63.4	POOR
054A	195	680	1,666	2,352	40,476	1.7	98.3	EXCELLENT	5.8	94.2	ADEQUATE
055	19,048	980,157	41,000	2,862,134	4,561,741	21.5	78.5	FAIR	22.4	77.6	FAIR
055A	1,535	21,442	5,000	36,000	387,316	5.5	94.5	ADEQUATE	6.8	93.2	ADEQUATE
055B	209	0	3,839	2,891	16,675	0.0	100.0	EXCELLENT	23.0	77.0	FAIR
056	1,782	1,889	187,568	130,169	629,179	0.3	99.7	EXCELLENT	30.1	69.9	POOR
058	10,279	177,169	4,000	384,000	2,829,536	6.3	93.7	ADEQUATE	6.4	93.6	ADEQUATE
058A	12,653	521,067	0	597,000	3,588,257	14.5	85.5	FAIR	14.5	85.5	FAIR
060	3,615	46,088	3,000	51,000	617,071	7.5	92.5	ADEQUATE	8.0	92.0	ADEQUATE
061	323	5,609	60,608	81,772	25,770	21.8	78.2	FAIR	257.0	-157.0	POOR
062	55,902	495,364	5,077,142	7,373,104	16,617,603	3.0	97.0	GOOD	33.5	66.5	POOR
062B	169	158	1,342	1,499	13,484	1.2	98.8	EXCELLENT	11.1	88.9	FAIR
063	2,696	18,499	327,493	482,749	469,528	3.9	96.1	GOOD	73.7	26.3	POOR
064	28,190	360,358	0	919,000	6,713,282	5.4	94.6	ADEQUATE	5.4	94.6	ADEQUATE

Building Number	Gross Square Feet	DM	RIC	DM+RIC	RPV	FCI	ACI	ACI Descriptor	TSCI	1-TSCI	TSCI Descriptor
065	3,423	9,548	95,674	204,659	548,000	1.7	98.3	EXCELLENT	19.2	80.8	FAIR
066	44,134	526,612	382,733	857,117	11,453,495	4.6	95.4	GOOD	7.9	92.1	ADEQUATE
068	500	0	0	3,000	78,488	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
069	20,709	214,001	0	546,000	4,201,900	5.1	94.9	ADEQUATE	5.1	94.9	ADEQUATE
070	63,550	595,816	3,504,964	4,119,504	17,545,069	3.4	96.6	GOOD	23.4	76.6	FAIR
070A	67,741	313,219	2,697,046	2,597,687	18,572,035	1.7	98.3	EXCELLENT	16.2	83.8	FAIR
070B	382	0	7,594	6,792	30,478	0.0	100.0	EXCELLENT	24.9	75.1	FAIR
071	53,739	3,497,345	90,000	4,152,000	19,173,748	18.2	81.8	FAIR	18.7	81.3	FAIR
071A	4,104	37,725	0	304,000	900,831	4.2	95.8	GOOD	4.2	95.8	GOOD
071B	6,892	56,599	15,000	399,000	1,722,386	3.3	96.7	GOOD	4.2	95.8	GOOD
071T	949	0	1	0	143,385	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
072	5,352	151,996	8,000	292,000	1,362,940	11.2	88.8	FAIR	11.7	88.3	FAIR
072A	2,532	57,243	1,000	79,000	602,555	9.5	90.5	ADEQUATE	9.7	90.3	ADEQUATE
072B	4,413	50,560	1,000	50,560	1,050,188	4.8	95.2	GOOD	4.9	95.1	GOOD
072C	8,392	134,122	9,000	261,000	2,115,729	6.3	93.7	ADEQUATE	6.8	93.2	ADEQUATE
073	4,228	137,963	7,000	295,000	1,198,961	11.5	88.5	FAIR	12.1	87.9	FAIR
073A	403	18,501	16,120	34,621	126,037	14.7	85.3	FAIR	27.5	72.5	POOR
074	45,382	301,609	7,220,115	14,146,175	13,289,312	2.3	97.7	GOOD	56.6	43.4	POOR
074F	1,560	0	0	0	160,786	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
075	8,495	339,935	7,000	441,000	2,471,751	13.8	86.2	FAIR	14.0	86.0	FAIR
075A	4,000	36,126	1,000	36,126	954,439	3.8	96.2	GOOD	3.9	96.1	GOOD
075C	450	315	44,948	73,809	158,884	0.2	99.8	EXCELLENT	28.5	71.5	POOR
075D	1,895	1,733	75,800	77,533	151,191	1.1	98.9	EXCELLENT	51.3	48.7	POOR
076	31,639	23,348	1,813,889	2,324,538	8,232,343	0.3	99.7	EXCELLENT	22.3	77.7	FAIR
077	68,937	475,418	1,206,915	2,495,341	18,434,755	2.6	97.4	GOOD	9.1	90.9	ADEQUATE
077A	12,118	12,561	484,024	511,364	2,507,254	0.5	99.5	EXCELLENT	19.8	80.2	FAIR
077H	576	1,231	3,000	27,000	105,984	1.2	98.8	EXCELLENT	4.0	96.0	GOOD
078	5,391	108,444	91,633	263,074	430,117	25.2	74.8	POOR	46.5	53.5	POOR
079	4,564	21,932	151,360	188,128	1,138,998	1.9	98.1	EXCELLENT	15.2	84.8	FAIR
080	29,931	166,393	901,728	1,040,602	8,596,351	1.9	98.1	EXCELLENT	12.4	87.6	FAIR
080A	960	4,932	21,482	20,850	153,690	3.2	96.8	GOOD	17.2	82.8	FAIR
081	1,129	4,392	21,015	23,591	90,077	4.9	95.1	GOOD	28.2	71.8	POOR
082	537	0	0	2,000	83,931	0.0	100.0	EXCELLENT	0.0	100.0	EXCELLENT
083	6,856	23,119	2,136,415	2,531,907	2,481,912	0.9	99.1	EXCELLENT	87.0	13.0	POOR
084	55,031	2,754	490,019	440,831	16,439,575	0.0	100.0	EXCELLENT	3.0	97.0	GOOD
084B	1,633	248	25,060	22,643	376,942	0.1	99.9	EXCELLENT	6.7	93.3	ADEQUATE
085	15,405	15,357	162,324	157,137	3,864,112	0.4	99.6	EXCELLENT	4.6	95.4	GOOD
085A	885	0	4,790	4,284	70,609	0.0	100.0	EXCELLENT	6.8	93.2	ADEQUATE
088	53,864	615,187	3,031,808	5,209,702	17,097,330	3.6	96.4	GOOD	21.3	78.7	FAIR
088D	265	0	7,742	6,924	85,368	0.0	100.0	EXCELLENT	9.1	90.9	ADEQUATE
090	89,233	370,166	3,354,881	9,679,928	22,670,279	1.6	98.4	EXCELLENT	16.4	83.6	FAIR

Appendix J: RESOURCES ALLOCATION TABLE

Project/Activity	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	PY 2004 ($M)	CY 2005 ($M)	BY 2006 ($M)	BY+1 2007 ($M)	BY+2 2008 ($M)	BY+3 2009 ($M)	BY+4 2010 ($M)	BY+5 2011 ($M)	BY+6 2012 ($M)	BY+7 2013 ($M)	BY+8 2014 ($M)
						"Constrained" funding prescribed.					Unconstrained funding permitted				
Program Related Projects:	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Molecular Foundry	BES	95,692		83.7	35.0	32.1	16.6								
Genomics: GTL Facility	BER	150,000		95.0							10.0	45.0	40.0		
Ultrafast Science Facility	BES	130,000		350.0							40.0	150.0	150.0	10.0	
Total Programmatic Line Item Projects:					35.0	32.1	16.6	0.0	0.0	0.0	50.0	195.0	190.0	10.0	0.0
Science Lab Infrastructure (SLI) Line Item Projects:	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Bldg. 77 Rehabilitation of Bldg. Structure & Systems, Phs 2	SC-82	1,750		13.4	2.1	4.8	4.8								
User Support Building	SC-82	30,000	15,200	21.0				2.0	5.7	13.0	0.3				
Seismic & Structural Safety Upgrades of Buildings Phase 1	SC-82			7.0				1.5	5.0	.5					
Seismic & Structural Safety Upgrades of Buildings Phase 2	SC-82			20.0						2.0	8.5	8.5	1.0		
Utility Infrastructure Modernization - West Corridors	SC-82			20.0								2.0	17.0	1.0	
Utility Infrastructure Modernization - East Corridors	SC-82			19.0										2.0	17.0
Total SLI Line Item Projects:					2.1	4.8	4.8	3.5	10.7	15.5	8.8	10.5	18.0	3.0	17.0
THIRD PARTY FUNDED CONSTRUCTION OF NEW BUILDINGS:				TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
User Hostel (23K gsf)				7.0		1.0	5.0	1.0							
Theory & Computational Sciences (140K gsf)				117.0		4.0	22.0	30.0	13.0	7.0	28.0	13.0			
Total Third Party Projects:						5.0	27.0	31.0	13.0	7.0	28.0	13.0	0.0	0.0	0.0
OPERATING FUNDING NEEDED FOR REMOVAL OF RETIRED FACILITIES (HEP):	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Removal of Accelerator Portion of Building 71	HEP			7.0			4.0	3.0							
Total Operating Funded Removal of Retired Facilities (Programmatic)							4.0	3.0							
OPERATING FUNDING NEEDED FOR REMOVAL OF RETIRED FACILITIES (SLI Program):	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Removal and Surface Site Remediation: Bevatron Complex	SC-82		126,527	85.9	1.5	1.4	11.0	14.0	14.0	14.0	14.0	16.0			
Removal and Surface Site Remediation: Building 25, 25B	SC-82		20,664	0.9		0.9									
Removal and Site Remediation: Buildings 25A, 44, 44A-B	SC-82		10,275	1.0			1.0								
Removal and Site Remediation: Buildings 14, 40, & 41	SC-82		6,189	2.0				1.0	1.0						
Removal and Site Remediation: Buildings 16, 16A, 52, & 52A	SC-82		19,088	3.0						1.0	2.0				
Removal and Site Remediation: Building 5	SC-82		7,176	3.0							1.0	2.0			
Removal and Site Remediation: Building 4	SC-82		10,176	3.0								1.0	2.0		
Total Operating Funded Removal of Retired Facilities (SLI):					1.5	2.3	12.0	15.0	15.0	15.0	17.0	19.0	2.0	0.0	0.0

Project/Activity						"Constrained" funding prescribed.					Unconstrained funding permitted				
					PY	CY	BY	BY+1	BY+2	BY+3	BY+4	BY+5	BY+6	BY+7	BY+8
GENERAL PLANT PROJECTS (HEP):	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
HVAC System Upgrade (90)	HEP			2.0	1.2										
Add Lab and Offices (64)	HEP	1,200		1.9	1.2										
Laboratory Renovations (62/66)	HEP			0.8	0.8										
Replace Strawberry Gate Shuttle Shelter (33A)	HEP			0.1	0.1										
Provide Tempered Air to Cave (72)	HEP			0.1	0.1										
Exterior Emergency Prep Loudspeaker System (Site)	HEP			0.5	0.2	0.3									
Install Lifting Device and Repair Dock Leveler (046-Dock)	HEP			0.1	0.1	0.8									
Exterior Ramp to Replace Wheelchair Lift (054)	HEP			0.1		0.1									
Wastewater Treatment Recycling System (077)	HEP			0.7		0.7									
Forefront Electronic Microscope Building Addition (072A)	HEP	850		0.7		0.7									
Relocate functions from 51F (051F)	HEP			0.5		0.5									
L'OASIS Research Support Area (071)	HEP			0.5		0.5									
Environmental Monitoring Sample Prep. and Equip. Storage Trailer (Site)	HEP			0.3		0.3									
Replace Shuttlebus Stops (067/072)	HEP			0.1		0.1									
Provide Secondary Fire Truck Access to the HWHF (Site)	HEP			0.1		0.1									
Relocate Laser Laboratory to Room 2263 (006)	HEP			0.9		0.9									
Reinstate one hour fire protection at top of walls (070A-2235)	HEP			0.1			0.1								
Electrical Power Upgrade (006)	HEP			0.1			0.1								
Add chilled Water Expansion Tank (034)	HEP			0.1			0.1								
Replace Animal Facility (074)	HEP	11,500		4.9			1.6	3.3							
Pre-USB project - Widen and Realign Road N (Site)	HEP			1.4			1.1	0.3							
Provide space for the TEAM microscope and user infrastructure (072)	HEP	850		4.9			1.0	3.2	0.7						
Magnet Test Facility Infrastructure Enhancements (058)	HEP			0.2					0.2						
Consolidate machine shops buildings 2 and 80 (002/080)	HEP			0.8					0.8						
Replace Sanitary Sewer Montitoring/Sampling Station (013F)	HEP			0.3					0.3						
Replace chiller unit in Bldg. 34 (034)	HEP			0.7					0.7						
Main Breaker (070)	HEP			0.1					0.1						
Replace Main Breaker (070A)	HEP			0.1					0.1						
Replace Centennial/Rimway Sewer Constriction (Site)	HEP			0.2					0.2						
Rehabilitate Space for Relocation of Gould Group from Building 71 (017)	HEP			0.2					0.2						
Gigabit Upgrade (Site)	HEP			2.7					0.5	0.5	0.5	0.5	0.5		
Telecommunication & Networking Conduit Installation (Site)	HEP			3.2					0.6	0.6	0.5	0.5	0.5	0.5	
Building 58A Extension (058A)	HEP	500		0.8					0.1	0.7					
Radioanalytical Counting Room Remediation (075/026/076)	HEP			0.8						0.8					
Field Facilities Upgrade - Room 163 (064)	HEP			0.1						0.1					
Make 2 MW Generator Connection Flexible to serve entire site (064C)	HEP			1.1						0.5	0.6				
Centennial Drive Sanitary Sewer Line Improvements (Site)	HEP			0.3						0.2	0.1				

Project/Activity						"Constrained" funding prescribed.					Unconstrained funding permitted				
					PY	CY	BY	BY+1	BY+2	BY+3	BY+4	BY+5	BY+6	BY+7	BY+8
GENERAL PLANT PROJECTS (HEP): - Continued	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Install Central Air Plant for Grizzly & Strawberry (Site)	HEP			2.0						0.9	1.1				
Building 70 Complex Exhaust System Upgrade (070)	HEP			2.7							2.7				
Improve and Expand Existing Vacuum System (070)	HEP			0.3							0.3				
Building 90 Office Reconfiguration (South End) (090)	HEP			3.9							3.9				
Facilities and EH&S moves (026/075/090)	HEP			2.1							1.0	1.1			
Upgrade HVAC System in Buildings 50 and 50A (050)	HEP			4.9								4.9			
Construct JDEM Control Room and Support Facilities (050)	HEP			0.8								0.8			
Storm Drain Piping Replacement (Site)	HEP			2.6								2.4	0.2		
Glen T. Seaborg Center - Upgrade room 70A-2229A-D (070A)	HEP			0.2									0.2		
Construct Medium Height Bay Research Building (Site)	HEP			4.5									4.5		
Replace First Floor Slab (062)	HEP			3.5									3.5		
Expand Parking Lots (Site)	HEP			0.2									0.1	0.1	
Construct Primary Shuttle Bus Transfer Station in (Site)	HEP			1.0									0.5	0.5	
CIG Renovation - Rooms 4413-4419 (070A)	HEP			1.0									0.8	0.2	
Building 70A Laboratory Upgrades (070A)	HEP			1.4										1.4	
Realignment of McMillan Road at Grizzly Gate (Site)	HEP			3.7										3.7	
Improve Fire Road on west and south sides of B 70A (Site)	HEP			1.0										1.0	
Chilled Water System Operation - 50 Complex (050)	HEP			0.4										0.4	
Sewer Monitoring Station for Campus Buildings abov (Site)	HEP			0.3										0.3	
Upgrade Civic Center Assembly Area (Site)	HEP			0.5										0.5	
Storm Sewer Upgrades (Site)	HEP			0.4										0.4	
Road Improvement and Parking Lot at B 58 (Site)	HEP			0.2										0.2	
Construct Parking Lot at Bldg. 71 (Site)	HEP			0.2										0.2	
Construct Parking Lot at Bldg. 74B (Site)	HEP			0.1										0.1	
Create Pedestrian Corridor Connecting Maint Floors (062/066/072)	HEP			2.4										0.9	1.5
Building 70 Laboratory Upgrades (070)	HEP			1.4											1.4
Building 54 Upgrade of Mechanical Systems (054)	HEP			3.1											3.1
Construct East Canyon Parking Lot and Access Road (Site)	HEP			4.1											4.1
Total General Plant Projects (HEP):					3.7	5.0	4.0	6.8	4.5	4.3	10.7	11.2	10.8	9.5	11.1

GENERAL PURPOSE EQUIPMENT (HEP):	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Administrative Computer Equipment Maintenance and Upgrades (Site)	HEP			7.9	0.8	0.8	0.3	0.8	0.4	0.8	0.8	0.8	0.8	0.8	0.8
Type 4 Wildlarnd Fire Engine (Site)	HEP			0.2	0.2										
Wire Bonder (77)	HEP			0.1	0.1										
Engineering Division Equipment Priorities (Site)	HEP			0.2	0.2										
Mobile Crane (Site)	HEP			0.4	0.4										
Machine guarding (Priority 1) – OSHA Audit Findings (Site)	HEP			0.4		0.4									

						"Constrained" funding prescribed.					Unconstrained funding permitted				
Project/Activity					PY	CY	BY	BY+1	BY+2	BY+3	BY+4	BY+5	BY+6	BY+7	BY+8
GENERAL PURPOSE EQUIPMENT (HEP): - Continued	Prog	Const (gsf)	Demo (gsf)	TEC ($M)	2004 ($M)	2005 ($M)	2006 ($M)	2007 ($M)	2008 ($M)	2009 ($M)	2010 ($M)	2011 ($M)	2012 ($M)	2013 ($M)	2014 ($M)
Replace Generator Battery Systems (10 gen) Ph 2 (Site)	HEP			0.1		0.1									
Orbital Tube Welder (Site)	HEP			0.1		0.1									
Replace SCADA Master Unit (076)	HEP			0.3		0.3									
Rehab Chilled Water System (ARU) (070)	HEP			0.2		0.2									
Purchase Portable Gamma Spectrometer (Site)	HEP			1.0			1.0								
Purchase Backhoe (Site)	HEP			0.1			0.1								
Replace chiller (050A/070)	HEP			0.1			0.1								
Evaluation & Cost for Remote Hand-Held Technology (Site)	HEP			0.2			0.1	0.1							
Chemical Polishing Machine (002/080)	HEP			0.1				0.1							
Replace electropolisher (058)	HEP			0.1				0.1							
Coordinate Measuring Machine upgrade in Room 158 (077)	HEP			0.1				0.1							
Machine Guarding (Priority 2) – OSHA Audit Findings (Site)	HEP			0.5				0.5							
Replace Dishwasher, 54-WA-002 (054)	HEP			0.1				0.1							
Vacuum Priming Oven (002/080)	HEP			0.1					0.1						
High Performance Pattern Generator (050A)	HEP			0.1					0.1						
Purchase Vibration Analysis Equipment (Site)	HEP			0.1					0.1						
Based Microwave Network Analyzer System (050A)	HEP			0.2					0.2						
Wire EDM (077)	HEP			0.4					0.4						
CNC CMM (in-process) (077)	HEP			0.1					0.1						
Reactive Ion Etching System (070A)	HEP			0.2					0.2						
Replace Patio Furniture (002)	HEP			0.1					0.1						
Purchase Truck Carrier (Auto Hauling) (Site)	HEP			0.1					0.1						
Digital Oscilloscope by LeCroy, Model LC584AL (025A)	HEP			0.1					0.1						
Tool Stacker (077)	HEP			0.1					0.1						
Replace Lead Acid Battery with Ni Cad type from Generators (Site)	HEP			0.2					0.2						
Unidentified Pririties (Site)	HEP			17.7			0.1	0.1	0.1	0.9	3.3	3.3	3.3	3.3	3.30
Total General Purpose Equipment (HEP):					1.7	1.9	1.7	1.9	2.3	1.7	4.1	4.1	4.1	4.1	4.10

Appendix K: Process for Plan Development/Requirement Crosswalk

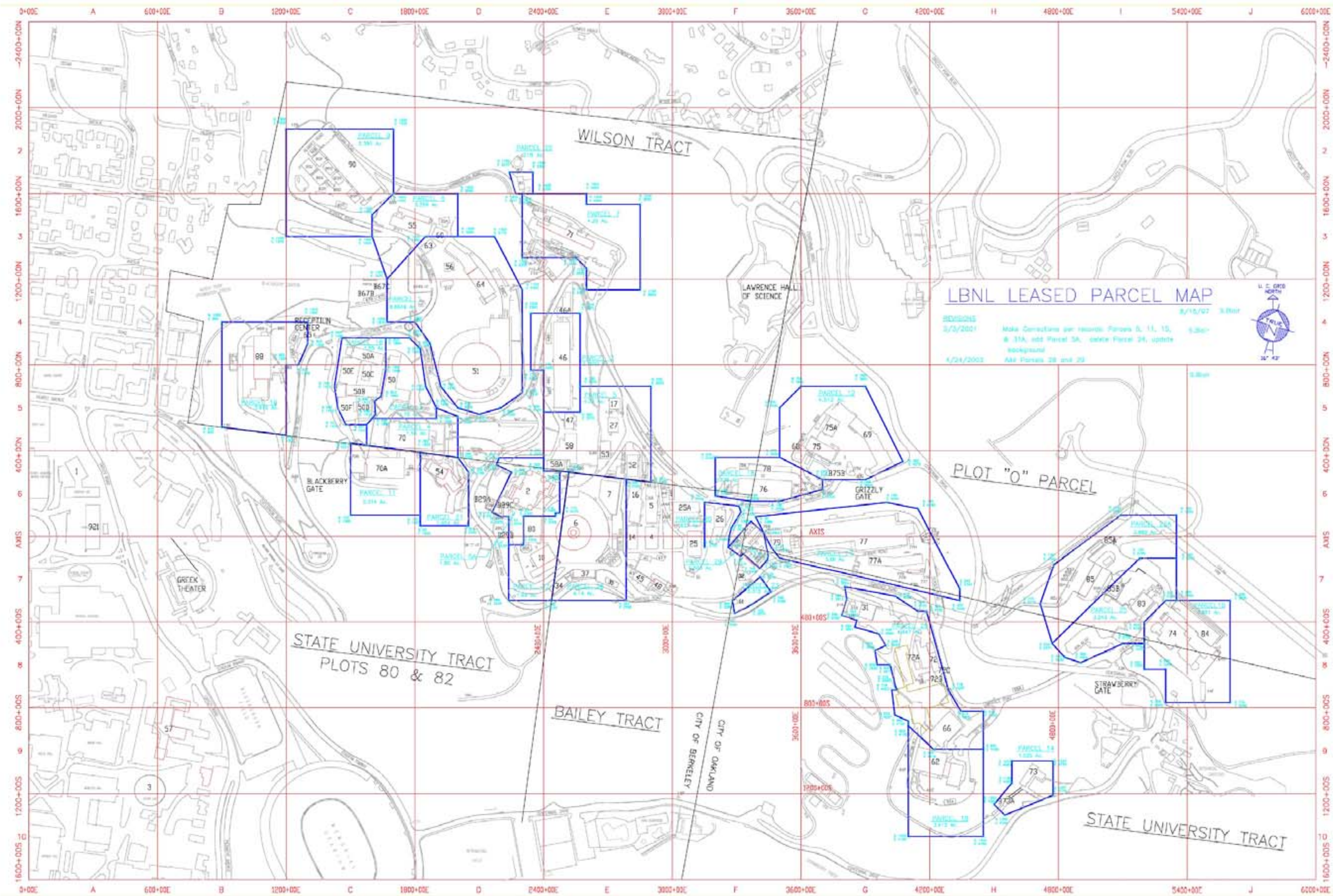
The Ten Year Site Plan was prepared by taking the guidance issued by Milton Johnson in his June 2, 2004 memo and assigning the various topics to those groups at Berkeley Lab having the requisite knowledge to provide the information requested. The following is a cross-walk matching the guidance to the TYSP section to the Berkeley Lab group preparing the TYSP section.

Topic	Sub-Topic	TYSP Reference	Prepared by
Site Summary	Site History	Appendix A	Facilities Site Planning
Site Summary	Location, acreage	Berkeley Lab Land Use	Facilities Site Planning
Site Summary	Number of Facilities, square footage	Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Site Summary	Total Operating Budget	Laboratory Agenda	Office of Planning and Strategic Development
Site Summary	Total Site Population	Workforce Planning and Development	Facilities Site Planning
Site Summary	Total RPV	Replacement Plant Value	Plant Operations and Facilities Space Planning
Site Summary	Summary for SC Facilities	Various places throughout document	Various
Site Summary	Non-SC Facilities	Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Site Summary	Aerial Picture	Front Cover	Facilities Site Planning
Site Summary	Laboratory Space Distribution	Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Site Summary	Laboratory Space Age Profiles	Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Mission	Identify Current and Likely Future Missions	Laboratory Agenda	Office of Planning and Strategic Development
Mission	Effect on Site's F&I	Laboratory Agenda	Office of Planning and Strategic Development and Facilities Site Planning
Mission	Major Trends in Staffing and User Levels	Workforce Planning and Development	Facilities Site Planning
Land Use Plans	Identify the latest plan, approval date, and schedule for update.	Berkeley Lab Long Range Development Plan	Facilities Site Planning
Facilities and Infrastructure	General Characteristics	Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Facilities and Infrastructure	Site Maps	Appendix M3 and Appendix M4	Facilities Site Planning
Facilities and Infrastructure	Strategic F&I Goals and Issues	Ten Year Site Plan Issues	Facilities Site Planning and Facilities Space Planning

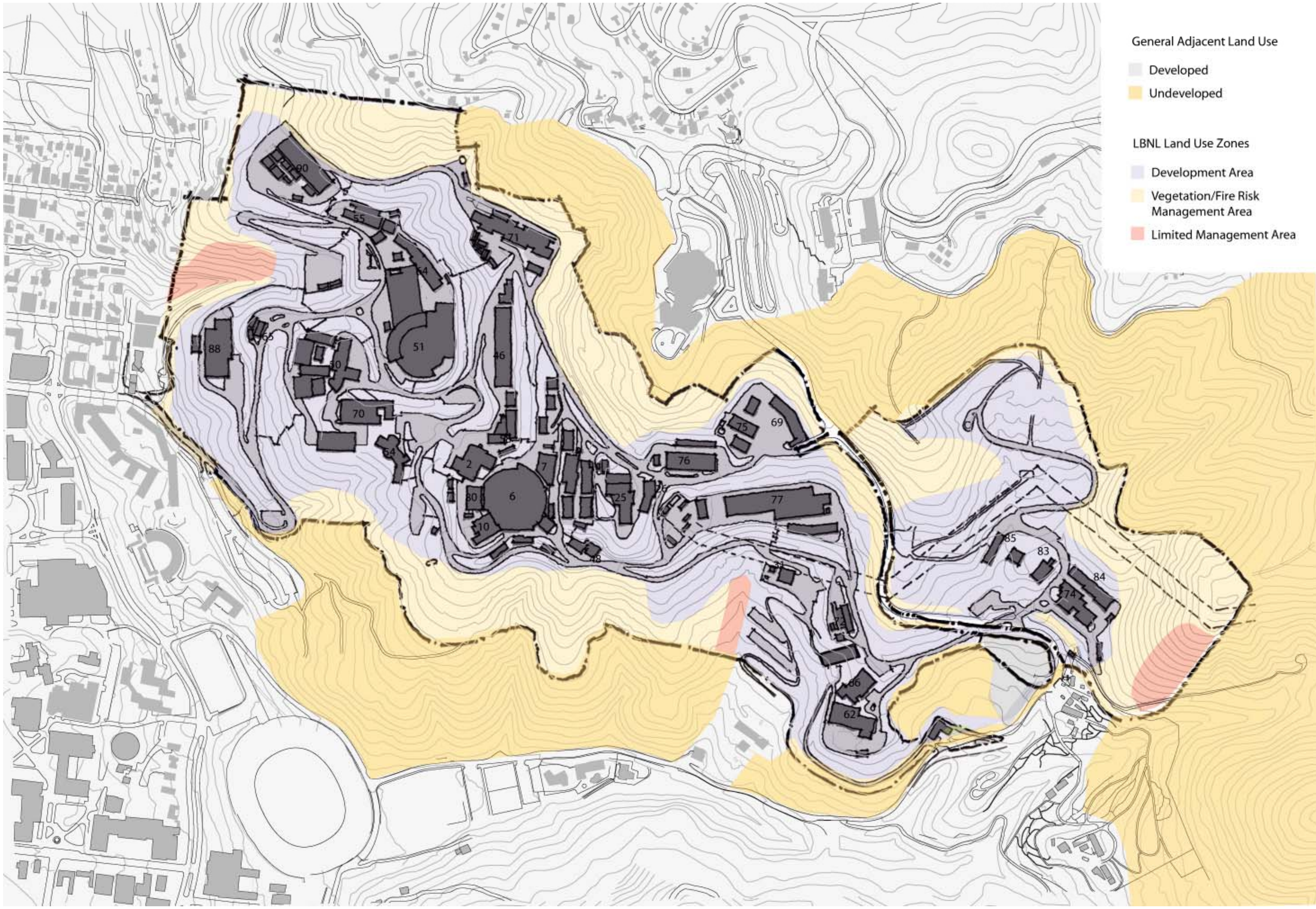
Topic	Sub-Topic	TYSP Reference	Prepared by
Facilities and Infrastructure	Condition Assessment Process	Condition Assessment Program	Plant Operations
Facilities and Infrastructure	Condition Overview	Overall Condition of Berkeley Lab Buildings	Facilities Space Planning and Plant Operations
Facilities Management, Space Management, and Utilization	Facilities Management and Space Management	Space Management	Facilities Space Planning
Facilities Management, Space Management, and Utilization	Utilization	Asset Utilization	Facilities Space Planning
Facilities Supporting Mission Activities		Modernization Capital Asset/Infrastructure Plan Master Plan for Site Development	Design and Construction Facilities Site Planning Office of Planning and Strategic Development
Site Utility Systems		Modernization	Design and Construction
Leasing		Berkeley Lab Facilities and Infrastructure	Facilities Space Planning
Land Management		Berkeley Lab Long Range Development Plan	Facilities Site Planning
Disposition		Demolition and Replacement	Facilities Site Planning Facilities Space Planning EH&S Division
Long Term Stewardship		Long Term Stewardship	Plant Operations
Future Liabilities Program		Contaminated Areas and Remediation	EH&S Division
SC Programmatic Activities		Modernization Capital Asset/Infrastructure Plan Master Plan for Site Development	Design and Construction Facilities Site Planning Office of Planning and Strategic Development
EM Facilities	There are none at Berkeley Lab		
Non-SC Facilities	There are none at Berkeley Lab		
Value Engineering		Value Engineering	Design and Construction
Mission Essential Facilities		Building Modernization	Facilities Site Planning and Facilities Space Planning

Topic	Sub-Topic	TYSP Reference	Prepared by
Five-year Sustainment Requirements		Five Year Sustainment Plan	Plant Operations
Topic	Sub-Topic	TYSP Reference	Prepared by
Maintenance Program for Nuclear Facilities	Not applicable to Berkeley Lab		
Management of Deferred Maintenance		Management of Deferred Maintenance	Plant Operations
Performance Indicators and Measures		Performance Metrics and Change Indicators	Facilities Space Planning
Process for Development of the Plan		Appendix K	Facilities Space Planning
FIMS		Use of FIMS in Planning	Facilities Space Planning
Summary of Resource Needs		Appendix J	Facilities Site Planning and Facilities Space Planning

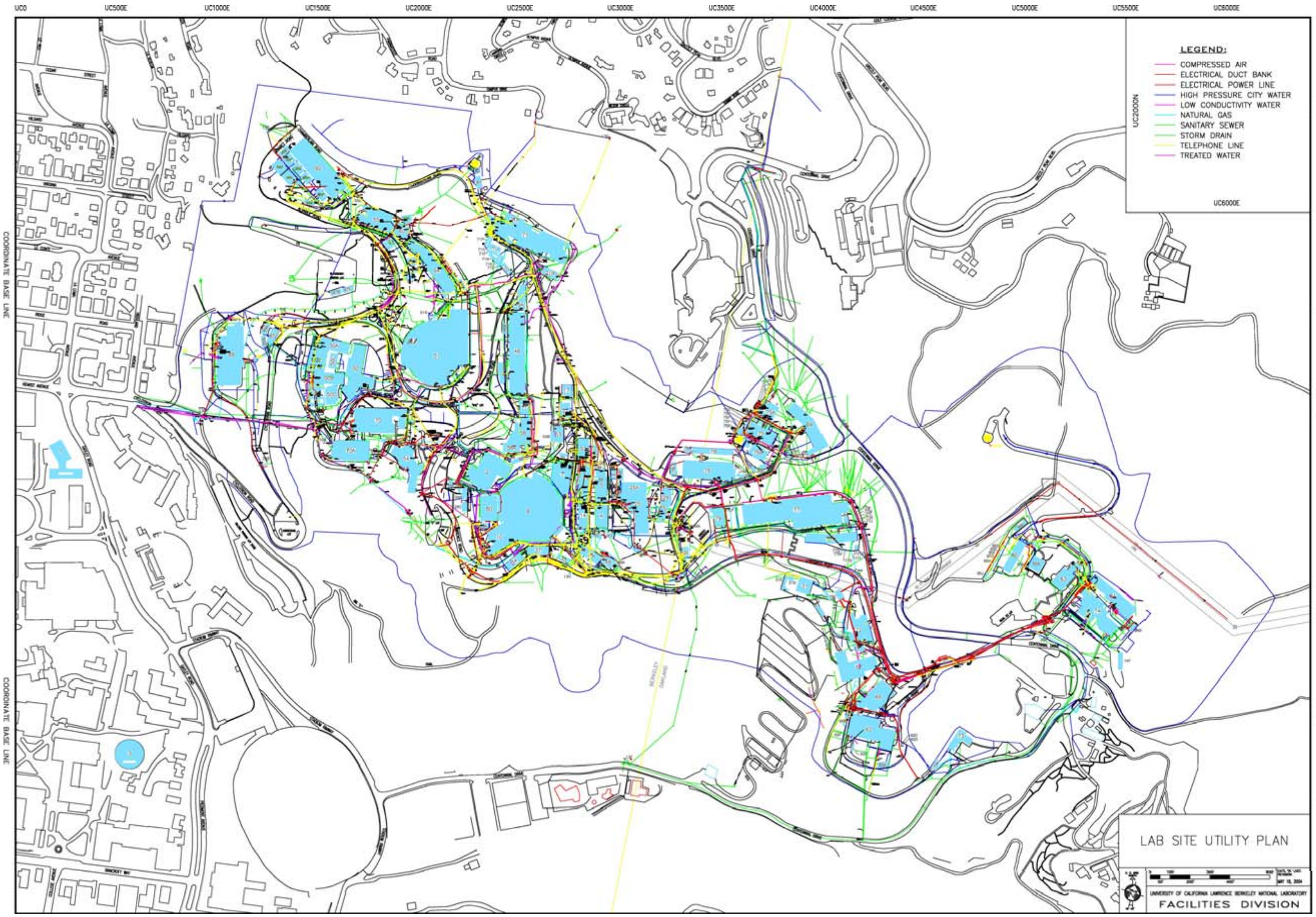
Appendix M1: PARCEL LEASE MAP



Appendix M2: LAND USE ZONES



Appendix M3: SITE UTILITY PLAN



Appendix M4: LOCATION OF LEASED FACILITIES