EA-1065; Environmental Assessment and (FONSI) for the Proposed Construction and Operation of a Genome Sequencing Facility in Building 64 at Lawrence Berkeley Laboratory Berkeley, California, April 1995

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1.0 INTRODUCTION

This document is an Environmental Assessment (EA) for a proposed project to modify 14,900 square feet of an existing building (Building 64) at Lawrence Berkeley Laboratory (LBL) to operate as a Genome Sequencing Facility. This EA addresses the potential environmental impacts from the proposed modifications to Building 64 and operation of the Genome Sequencing Facility.

2.0 PURPOSE AND NEED

One of the Department of Energy's (DOE) missions is to further human genome research. A primary goal of the DOE's Human Genome Program is the development and demonstration of technologies that will allow for the sequencing of the entire genome. To do this requires significant improvements in the sequencing approaches now used and the ability to scale up the DNA sequencing process from traditional levels to much larger volumes of operation. The Human

Genome Center at LBL has developed a Directed DNA (see Glossary, Section 7.0) Sequencing Strategy designed to outperform and supplant the current predominant method of large-scale sequencing. The approach makes use of the unique automation and information retrieval capabilities that are already present at LBL. In addition, difficulties in working with the human genome, which were inherent in the previous method, are overcome. Current laboratory space is inadequate to carry out DOE's mission.

3.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

The proposed action is to modify Building 64 to provide space and equipment allowing LBL to demonstrate that the Directed DNA Sequencing Strategy can be scaled up from the current level of 750,000 base pairs per year to a facility that produces over 6,000,000 base pairs per year, while still retaining its efficiency.

3.1 Proposed Action

3.1.1 Background of Location

The proposed location for the genome sequencing facility is within the existing Building 64 at LBL (Figure 1). The building was constructed during the early- to mid-1950s and originally served as an engineering support building for the Bevatron and later the Bevalac. Later it housed the Accelerator and Medical Physics Groups. Building 64 has been unoccupied since May 1993.

3.1.2 Renovation

Building 64 would be remodeled to provide 14,900 gross square feet (gsf) total and 9,700 net usable square feet (nsf) of space for the proposed project in the existing two-story portion of the building. (An additional 430 nsf of building space (over and above the 9,700 nsf) would remain unused by the proposed project.) Of the 9,700 nsf, 6,700 nsf would be sequencing production laboratory and equipment support space, and approximately 3,000 nsf would be office and employee support space. The remaining 5,200 sf would be devoted to a boiler room, entry area, lounge, janitors' closets, bathrooms, stairways, corridors, and walls. The modified space would have an occupancy capacity of 40 people. The site plan for the proposed renovations is shown in Figure 2 and the proposed layout of the facility is shown in Figures 3 and 4.

Proposed exterior improvements would include required sealing of abandoned and new utility penetrations, equipment pads, and site improvements required by the new HVAC equipment, and the addition of a new emergency exit stairway to provide required egress from the 2nd floor. The reuse of an existing mechanical equipment platform, framed into the existing roof, would be investigated. The air handler and chiller for the HVAC system would be located outdoors. The tentative location of the air handler is near the exterior wall of Room 120 and the chiller is planned to be located near the exterior wall of Room 132 (Figure 3). Roof-mounted exhaust fans would be provided for laboratory exhaust. Approximately 300 linear feet of trenching would be excavated and the exterior of the building would be penetrated to connect utilities.

Three new exhaust stacks would be installed and mounted on a new platform on the side of the building and would rise approximately 10 feet above the existing roofline.

Small amounts of asbestos-containing material that would be removed consists of tile flooring, asbestos insulation from water pipes, and waste material that would result from penetration of the building's outside wall transite panels for utility connections. Paint samples indicate a high lead content on all of the existing structural steel.

The proposed building modifications would be concentrated primarily on the interior of the building. The majority of

the laboratory space would be located on the first floor, with some space located on the second floor (see figures 3 and 4). The proposed laboratory improvements would consist of the installation of new vinyl flooring, laboratory benches and cabinets, laboratory equipment, and Information Computing Systems (ICS) and Ethernet communication outlets. Interior finishing would include installing partitions, walls, ceilings, and flooring. The existing heating system would be modified and a new heating, ventilation, and air conditioning (HVAC) system would be provided to laboratories. The existing boilers would be used to provide hot water for space heating. The existing hot water piping with asbestos insulation and existing convectors would be removed as required and new hot water distribution piping would be provided.

The existing toilet facilities on the first floor will require minor modifications in order to bring them up to code pertaining to access by disabled persons. Shower and eye wash emergency stations would be provided in the laboratories. A vacuum system with distribution piping would be provided in the laboratories. The tentative location of the vacuum pump is near the exterior wall of Room 132. The existing natural gas piping would be extended to the laboratories. Three new fume hoods would be installed.

The sprinkler system would be modified in accordance with the latest edition of NFPA for Ordinary Hazard, Group 2 Occupancy. The building fire alarm system would be modified as necessary to maintain compliance with the latest fire codes. The present electrical transformer has a rating of 150 kVA and would be reused to supply leads operating at the 208/120 volts level. A replacement 480V main switchboard and a 208/120V switch board would be provided.

3.1.3 Operation

The proposed project would provide light laboratories, equipment rooms, and office space for the conducting of large-scale DNA sequencing. Approximately 15 people would be relocated from Buildings 74 and 74B (Figure 1). An additional 25 personnel would occupy the proposed facility, depending upon level of funding. The proposed facility would provide biochemistry bench space, instrumentation areas and utilities for DNA sequencers [see Glossary], oligonucleotide synthesizers [see Glossary] to prime fragment analysis, and basic preparative and analytical equipment.

Laboratory activities that would be conducted in the proposed facility would consist of 1) DNA production, including growth of bacteria (*E. Coli*) containing cloned DNA segments, isolation of the cloned DNA by boiling the cells in the presence of a surfactant, and precipitation of the DNA with alcohol; and 2) DNA sequencing, including preparation of samples for sequencing, and analysis on DNA sequencers, oligonucleotide synthesizers to prepare primers used in Polymerase Chain Reaction (PCR) experiments. Activities in support of sequencing would include electrophoresis of DNA through agarose gels, and imaging and storage of the results in a computer data base; restriction enzyme analysis of the cloned DNA; PCR to assemble clones into a physical map to aid in analysis of the sequence data, and synthesis of oligonucleotide probes to support PCR techniques. Many of these tasks would be performed by custom or commercial bench-top robots and other automated processes. Efforts are underway to improve database designs to better manage the large amounts of DNA information and provide integrated database access and manipulations.

The laboratory work and programs conducted in the proposed facility include the storage, dispensing and/or use of hazardous chemicals. Special safety requirements include chemical fume hoods and approved storage cabinets for the control of chemicals. In addition, biological safety cabinets are provided for the control of biological materials. A list of chemicals that are anticipated to be used in the facility, including approximate monthly quantities, is provided as Attachment A.

3.2 Alternatives

3.2.1 No Action Alternative

Currently, genome sequencing activities are being conducted in Building 74, at a limited scale. Under the no action alternative, this research would continue to be conducted in the present location at the current level of effort, and no modified facility for genome sequencing would be constructed. The Directed DNA Sequencing Strategy developed at LBL to outperform and supplant the current predominant method of large scale sequencing would not be implemented.

Under this alternative the new research would be conducted at another institution and would not benefit from the techniques and expertise at LBL.

3.2.2 LBL Building 27 Alternative

The LBL Facilities Department Planning Section has reviewed potentially available space at LBL and identified Building 27 as an alternative site for the project. Building 27 is located in the central portion of LBL near the Advanced Light Source (Figure 1). It was constructed in 1957 and is used as a High Voltage Test Facility and Cable Shop.

3.2.3 LBL Building 53 Alternative

LBL Building 53 was also identified as a potential alternative onsite location for the Genome Sequencing Facility. Building 53 is located in the central portion of the LBL site. This building was constructed in 1949 and is used by the Magnetic Fusion Energy program.

3.2.4 LBL Multiple Locations Alternative

Under this alternative the expanded genome sequencing activities would be conducted in portions of LBL buildings 74, 62, 70, and 70A, displacing the activities currently taking place at those locations. Current programs at those locations would consequently be diminished.

3.2.5 Offsite Location Alternative

Under this alternative adequate space to house the Genome Sequencing Facility would be leased at the Richmond Field Station (RFS) from the University of California. The RFS is located approximately 7 miles northwest of the LBL site.

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Air Quality

4.1.1 Regional Conditions

LBL is located within the San Francisco Bay Area Air Quality Basin (Bay Area). The Bay Area Air Quality Management District (BAAQMD) has the authority to develop and enforce regulations to control ambient air quality in the Bay Area. Under California regulations, the Bay Area is considered a nonattainment area for state standards pertaining to ozone, carbon monoxide (CO), and particulate matter less than 10 microns in diameter (PM10). Under Federal regulations, the Bay Area has been designated as a "moderate" nonattainment area for ozone. BAAQMD has adopted a new source review (NSR) rule for nonattainment pollutants to conform with a goal of "no net increase" in these emissions. New or modified sources of air emissions at LBL are subject to lower applicable permitting thresholds under this more stringent rule.

4.1.2 LBL Air Emissions

Currently, LBL emits various criteria air pollutants, hazardous air pollutants (HAP), toxic air contaminants, and radionuclides. BAAQMD's regulations currently provide that bench-scale laboratory equipment and equipment used exclusively for chemical or physical analyses are exempt from permit requirements unless single criteria pollutant emissions exceed 150 pounds per day or HAP emissions exceed the BAAQMD threshold levels. Based on LBL's assessment of its actual air emissions, LBL is not considered a major source under the BAAQMD regulation that implements the new Federal requirements.

As designed in BAAQMD Regulation 2, Rule 6 ("Major Facility Review"), facilities with actual emissions less than 50 tons a year of regulated air pollutants (RAP) and/or 7 tons a year of any single HAP or 15 tons a year of combined HAPs shall not undergo a potential to emit major facility evaluation until 3 years after EPA approves Regulation 2, Rule 6. The latest facility-wide inventory of annual RAP air emissions is as follows: Carbon Monoxide 2 tons, Nitrogen oxides 9 tons, organic compounds 2.5 tons, particulate matter 1 ton, Class I ozone-depleting substances 3.3 tons (LBL, 1994a). This total of 17.8 tons is well below the 50-ton limit applicable to RAP emissions.

There are a number of existing HAP sources and HAP emissions at LBL. Existing sources that may emit HAPs at LBL include the following: boilers, cooling towers, cleaners and degreasers, chemical laboratories, fume hoods, and tanks. Annual HAP emissions from LBL include 1.6 tons of 1,1,1-trichloroethane and 9.5 tons of other hazardous air pollutants. including benzene, 1,4-dioxane, freon, toluene, and xylenes (LBL 1994a).

4.2 Hazardous and Biological Materials

Hazardous materials are stored and used for operations and research at LBL. Estimated quantities of hazardous materials at LBL for 1992 include 36.5 tons of hazardous solids, 174,000 gallons of hazardous liquids, and 2,195 tons of hazardous gases (LBL, 1992a). Use of hazardous materials at LBL requires special training to ensure protection of workers and the public.

4.3 Hazardous, Medical, and Non-hazardous Solid Waste

4.3.1 Hazardous and Medical Waste

LBL generated approximately 215 tons of hazardous waste (solid and liquid) in 1992, and 33,110 lbs. of medical waste in 1993 (LBL, 1992a; 1994a). Solid and liquid hazardous wastes are accumulated in satellite accumulation areas (SAAs). After accumulation, the wastes are either transferred to a 90-day waste storage area and then to LBL's Hazardous Waste Handling Facility (HWHF) (RCRA Part B Permit #CA4890008986), or are transferred directly to the HWHF. Collected hazardous wastes are stored at the HWHF facility in appropriate waste storage areas, based on waste types. Wastes are generally stored for no more than two months after they are received. LBL ships consolidated and appropriately packed hazardous waste to approved EPA and DOE off-site disposal facilities. Medical Wastes are accumulated onsite in waste accumulation areas (WAAs) or SAAs and then disposed of at offsite licensed medical waste disposal facilities. Medical waste is generated in about 120 different locations distributed over 15 buildings. A certified medical waste hauler picks up weekly at LBL. However, the pickup schedule varies from generator to generator.

4.3.2 Non-hazardous Solid Waste

In 1990, LBL generated 1300 tons of solid waste, consisting of 550 tons of office-type waste and 750 tons of construction and grounds waste. Approximately 500 tons of office-type waste were recycled. Solid office waste generated by LBL is taken to a private recycling service in Oakland. About 90 percent of the materials are reused; 10 percent (by volume) are baled and sent to Altamont Landfill in Livermore (LBL, 1992b). Construction and grounds waste are recycled whenever possible.

4.4 Hydrology and Water Quality

Because of its hillside location and moderate annual rainfall, surface runoff is a prevalent feature at LBL. A storm drain system, designed and installed in the 1960s, discharges into the North Fork Watershed on the north side of LBL and into the Strawberry Creek watershed on the south side. This system provides for runoff intensities expected in a 25-year maximum-intensity storm. The drainage facilities have proven to be adequate during previous heavy rains. No portion of the LBL site is within the 100-year flood plain designated by the Federal Emergency Management Agency (FEMA, 1982).

Highly complex groundwater flow conditions are present at LBL. The complex geologic development and structure of the Berkeley Hills have produced an underground structure which is difficult to model. The sedimentary rocks that underlie LBL have been deformed and truncated by faults and volcanic vent structures (Converse Consultants, 1984). The presence of year-round springs and variable water levels in observation wells indicate discontinuous and localized aquifers (SAIC, 1991).

LBL has carried out several surveys to determine the condition of the site's soils and groundwater with respect to contamination from past activities. Environmental studies, monitoring, and assessment indicate that the groundwater, soil, sediment, and biota at LBL have been contaminated with low levels of organic and radioactive substances due to past spills, leaks, accidents, or waste handling practices at LBL. LBL conducted a RCRA facility assessment (RFA) in 1992 for LBL to identify solid waste management units (SWMUs) or areas of concern (AOCs). The RFA, which has been completed, and the subsequent RCRA Facility Investigation (RFI), which is in progress, comply with corrective action program requirements found in 40 CFR, Part 258, Subpart F.

The RFI indicates that soil and groundwater contamination are present in the Building 64 area. Chlorinated hydrocarbons were identified in the soil and low concentrations of arsenic, barium, copper, and molybdenum were found in the groundwater (LBL, 1992c).

4.5 Geology, Soils, and Seismicity

LBL is sited on the on the west-facing slope of the Berkeley Hills, at elevations ranging from 500 ft to 1000 ft above mean sea level. Because of the hilly terrain, grading and filling has often been necessary at LBL to create suitable building sites. As a result, earth fills of up to several tens of feet thick are present in some of the original ravines and depressions. Most of these fills were mechanically compacted during placement, and have been satisfactory for foundation support.

LBL is located in a region of frequent seismic activity. The seismically active Hayward Fault, part of the San Andreas Fault system, developed as the Berkeley hills were uplifted. The Hayward Fault trends in a northwest-southeast direction along the base of the hills below LBL. The maximum credible earthquake postulated for the site would occur on the Hayward Fault and would have a Richter magnitude of 7.5 (LBL, 1986). Building 64 is not located within the zones designated by the State of California for seismic review under the Alquist-Priolo Special Studies Zones Act. The Act places special restrictions on certain construction within a zone. Building 64 is located approximately 1200 ft northeast of the Hayward Fault Zone.

To mitigate potential damage from seismic activity, LBL has had a comprehensive earthquake safety program in place since 1973. As required by University policy, Building 64 has been evaluated by a structural engineering consultant to assess the seismic risk inherent in the building. Building 64 has been determined to have a "fair" rating performance per the University Policy on Seismic Safety (Degenkolb Assoc. 1994), which means that performance during a major seismic disturbance is anticipated to result in structural and nonstructural damage and/or falling hazards that would represent a "low" life hazard (UC, 1988). (Appendix A of the University Policy on Seismic Safety defines 'falling hazards' as potential falling or sliding hazards such as interior and exterior building elements including parapets, ornamentation, chimneys, walls and partitions but excluding equipment, fixtures, ceilings, furniture and other contents.) This is because during a seismic event the integrity of building exits would be maintained, and occupants would be able to exit the building. This performance rating is based on a level of ground shaking that corresponds to a Modified Mercalli Scale intensity of IX at the site. Because this project will impose no additional gravity loads on the structure and will not reduce the building's lateral load carrying capacity, there are no DOE, University, or Uniform Building Code criteria that require compliance with the current seismic code.

A surface deposit in the Building 64 vicinity consists primarily of artificial fill. Undifferentiated Cretaceous sandstones and siltstones, the Orinda Formation, Moraga volcanics, and Quaternary landslide deposits also outcrop in the area (LBL, 1992c).

Building 64 abuts a steep hillside to the north, presenting the potential for slope instability and possible landslide. Nine hydraugers (horizontal drains) are located in the unstable zone of this hillside. The hydraugers drain subsurface water

from the slope and have successfully kept the factor of safety against sliding above 1.0, meaning that it is stable under static conditions.

The environmental and geotechnical engineering firm of Kleinfelder, Inc. examined the slope behind Building 64 in 1991 and found that past sliding on the slope has been effectively retained by the 3-foot-high concrete retaining wall along the slope behind the existing building (Kleinfelder, 1994). The retaining wall was constructed in 1951 as part of site preparation for Building 64. No surface evidence of distress to the walls, the rear building wall, the building floor, or the level paved roadway area behind the building was encountered. The proposed project consists of interior modifications to existing Building 64 and minor trenching for utilities. The slope and concrete retaining wall behind Building 64 will not be affected by the proposed project.

Soil sampling and boring performed in the vicinity of Building 64 has indicated that there are localized concentrations of chlorinated hydrocarbon, BTEX (benzene, toluene, ethyl benzene, and xylenes), and THC (total hydrocarbons) contamination. A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) performed in 1992 designated a Solid Waste Management Unit and two Areas of Concern near Building 64; however, the RFA determined that there is no ongoing release potential and no additional RCRA Facility Investigation work has been proposed for these areas.

4.6 Land Use

LBL is located in a highly urbanized region that extends from Vallejo in the north to San Jose in the south. Two cities within a 50-mile radius have a population greater than 500,000: San Francisco and San Jose. LBL is located in the hills within the cities of Oakland and Berkeley. Building 64 is located in Berkeley. LBL is sited on 130 acres of land owned by the University of California, on land leased to the DOE.

The University of California, as a state agency, and DOE, as a federal agency, are exempt from local zoning and planning regulations. However, the University and LBL cooperate with local agencies in planning matters of mutual concern.

4.7 Traffic and Parking

The primary access routes to LBL are Grizzly Peak Boulevard/Centennial Drive, University Avenue, Hearst Avenue, and Piedmont Avenue/Gayley Road. Access to LBL is provided by three sentry-controlled gates: Blackberry Canyon (main gate), Strawberry Canyon, and Grizzly Peak. More than 5,400 vehicles per day arrived at or departed LBL on a typical work day in 1992.

Traffic flow conditions in an urbanized area are often described through peak-hour level of service (LOS) analysis. Many of the existing LBL access routes have traffic backups and delays (LOS of "E" or "F") during peak traffic periods.

The supply of parking at LBL is limited. Parking demand exceeds the number of available spaces; however, LBL continues to meet the ratio of 1.7 employees to one parking space called for in the LBL's Long Range Development Plan (LBL 1987).

4.8 Utilities

LBL's onsite utility systems have sufficient capacity to meet present and future requirements for electrical power, natural gas, water, cooling, and waste management.

4.8.1 Electrical Power

Western Area Power Administration currently supplies electrical power to LBL and will continue to do so up to 11 MW. Above that amount, Pacific Gas and Electric will be LBL's supplier, which LBL anticipates will occur middle to

late FY94.

4.8.2 Natural Gas

Natural gas, provided by Defense Fund Supply Center, is used primarily for space and water heating and for equipment and experimental use in shops and laboratories. In 1993, natural gas usage at LBL, including offsite leased space, was 1,436,148 therms. Capacity is ample to meet anticipated demand for the foreseeable future (LBL, 1992b).

4.8.3 Water

LBL's water is supplied continuously from two sources. The primary water supply is the East Bay Municipal utility District's (EBMUD) Shasta Reservoir. A secondary source is EBMUD's Berkeley View tank, with a capacity of approximately 3 million gallons. The LBL system provides domestic water and fire-protection water to all LBL installations. It also supplies made-up water for cooling towers, irrigation water, and water for other miscellaneous uses. The onsite water distribution system is gravity fed. The system has sufficient capacity to meet the flow-rate and duration requirements for fire protection. There is no present restriction on the volume of water available from EBMUD, except the capacity of the existing on-site pipes (LBL, 1994a).

4.8.4 Sanitary Sewer

The sanitary sewer system at LBL is a gravity flow system that discharges through two monitoring stations, one located at Hearst Avenue and the other at Centennial Drive in Strawberry Canyon. Discharges are transported by the City of Berkeley sewer system to an EBMUD wastewater treatment plant.

LBL has three wastewater discharge permits issued by EBMUD: one for each of the outfalls at Hearst and Strawberry, one for the Building 77 Fixed Treatment Unit (FTU), and one for the Building 25 FTU. The City of Berkeley has instituted a 20-year program to upgrade their sanitary sewers (which receive wastewater from LBL). UC agreed to contribute $250,000 per year to the City of Berkeley for these sewer upgrades (LBL, 1992b).

The measured volume of wastewater (both sanitary and industrial sanitary) discharged into LBL's sanitary sewer system in 1991 was 125,000 gal per day (approximately 50 percent of water purchased from EBMUD during this period) (LBL, 1994a). Sewer and wastewater treatment capacity are anticipated to be sufficient to meet the foreseeable future demand.

4.8.5 Industrial Sanitary Sewage

Industrial sanitary sewage is combined with domestic wastewater and is discharged to East Bay Municipal Utility District through two monitoring stations. One is located at Hearst Avenue and the other is at Centennial Avenue in Strawberry Canyon. This wastewater effluent is sampled periodically and analyzed for radioactive materials, heavy metals, organics, and other contaminants to ensure compliance with discharge requirements imposed by DOE and the EBMUD (LBL, 1992b). EBMUD has ample capacity to meet anticipated demand for the foreseeable future.

4.9 Biological Resources

No federal or State rare, endangered, or threatened plant or animal species have been located or are expected to be present on the LBL site. No habitat in the vicinity of the project has been designated as critical habitat by the Secretary of the Interior pursuant to the Endangered Species Act of 1973.

4.10 Cultural Resources

All undeveloped land and proposed building locations within the LBL site were examined for cultural resources in support of the 1986 LBL Site Development Plan (LBL, 1986). No indications of archaeological resources were

identified within the LBL site. Recent verification of applicable Archaeological Resource Service data indicated that no new archaeological sites have been reported since 1982 (LBL, 1992b). LBL has recently initiated historic evaluations of existing buildings and equipment and consultation with the State Historic Preservation Officer.

4.11 Aesthetics

Steep hillside topography is the primary determinant of LBL's visual character. Level building sites are benched into hill slopes and individual buildings or aggregations of buildings are separated vertically from each other. Buildings that are located quite close together in plan view are seen as discrete elements in the landscape because of differences in elevation. Few buildings of the LBL site are visible from any distance. Because the most visible face of the site is its west face, the buildings are usually defined in the daytime by strong shadows and blend into the hillside because of their earth-tone colors.

4.12 Noise

Within the boundaries of LBL, the ambient noise environment is generated by vehicular traffic and building heating, ventilating and air-conditioning equipment. On-site noise levels are also raised when jet aircraft and general aviation aircraft pass overhead. Traffic to and from LBL also contributes to overall traffic noise in residential neighborhoods.

Ambient noise levels measured during the period from 1979 to 1991 ranged from 41 decibels (dB) [see Glossary] to 53 dB at distances of 100 to 2,400 feet from the site (LBL, 1992b). These noise levels are lower than in most of the City of Berkeley (City of Berkeley, 1977), where in September 1974, the most recent period for which noise measurements were made, levels measured over a 24-hour period at 42 sites were equal to or greater than 58 dB.

The nearest on-site noise receptor to Building 64 is Building 51B, which houses the External Particle Beam Hall, located immediately adjacent to Building 64. Buildings 56, 60, and 63 are also located within 100 feet of Building 64. The nearest off-site receptor is a residence located approximately 800 feet away.

5.0 POTENTIAL ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES

5.1 Proposed Action

5.1.1 Renovation

5.1.1.1 Air Quality

Renovation-related emissions at the Building 64 construction site would last for about eight months and would include suspended particulates, including PM10, volatile organic compounds (VOCs), and exhaust emissions (e.g. carbon monoxide and nitrogen oxides). Particulates would be generated from excavation activities associated with construction of equipment pads and platforms and trenching for electrical utilities. VOC emissions would result from minor asphalting and painting. Because site preparation activities (including excavation, asphalting, and painting) would take place over a one-month period, these emissions are considered to be minor and short term. In addition, construction contract specifications would require that during construction, exposed surfaces would be wetted as needed to reduce dust emissions. Exhaust emissions would be generated from construction equipment and motor vehicles traveling to and from the site.

5.1.1.2 Hazardous and Non-hazardous Solid Waste Management

The proposed renovation would include removal of interior partition walls, cabinets, sections of concrete slab, and miscellaneous other debris. These materials would be recycled, if possible, or landfilled at an approved facility. About

130 cubic yards of construction waste would be generated. Recycling or disposal of demolition waste would be the responsibility of the construction contractor. Asbestos-containing material is present in the existing exterior siding of Building 64, the hard pipe insulation, and tile flooring. Penetration, removal and disposal of asbestos would be conducted according to methods established by the EPA's Asbestos Hazards Emergency Response Act (AHERA) by AHERA-qualified personnel and comply with OSHA and BAAQMD requirements. Asbestos-containing material (ACM) which is considered friable would be removed by the contractor to the California Asbestos Monofill at Copperopolis, located in Calaveras County in the Sierras. Remaining capacity of this facility is approximately 61 years. ACM which is not friable and not considered hazardous would be disposed of at the same Class III landfill selected by the construction contractor for demolition debris disposal.

In addition, because lead-based paint is present on all of the building's structural steel, precautions would be taken to ensure that an air release of this material would not occur during building modification, in accordance with the LBL Lead Compliance Program and BAAQMD requirements (LBL, 1994b). Little or no welding of metal surfaces is anticipated in the proposed renovation work; however, where this occurs, lead would be removed by trained LBL personnel prior to the start of the construction contractor's work. Removal would be done by high-efficiency particulate air filter vacuuming or other appropriate methods. Interior surfaces containing paint on drywall that is suspected of containing lead would be prepared using alternative methods not involving sanding.

The proposed renovation activities would require the use of hazardous materials such as paints, thinners, and cleaning solvents. The small quantities of hazardous waste generated would be recycled or disposed of as described in Section 4.3.1.

Because of the very limited proposed grading and trenching activities, there is expected to be little or no need to dispose of excess soil. If there is a need to dispose of small amounts of excavated soils, samples would be collected and analyzed for contaminants to determine whether or not the excavated soils would be classified as hazardous waste. If so, the soils would be handled and disposed of in accordance with LBL policies and RCRA and Toxic Substances Control Act (TSCA) regulations for disposal of hazardous waste.

5.1.1.3 Hydrology and Water Quality

Because of the very small area where existing paving would be removed and replaced, construction activities are not expected to have an effect on hydrology as a result of erosion or to have an effect on groundwater recharge. No currently unpaved surfaces would be paved over. The LBL stormwater drainage facilities are adequate to handle storm water runoff from this area of LBL. Installation of new utilities to Building 64 would require trenching. To prevent erosion of excavated soil while the trench remains open, the soil would be stockpiled in a protected location, covered with plastic, and surrounded by hay bales.

5.1.1.4 Geology, Soils, and Seismicity

Proposed renovation activities are expected to have very minor effects on soils because only small areas would be disturbed by construction activities and all of the proposed construction area is currently paved. The project would have no impact on geological resources.

The primary hazards at Building 64 from a seismic event would be strong ground motion and various types of ground failure associated with that motion. Shelving, cabinets, bookcases, light fixtures, or other structural elements would be seismically secured to prevent injury or blockage of egress pathways. The LBL natural gas system is protected with seismically-activated automatic shutoff valves. During a seismic event, ground surface rupture is not expected to occur at LBL, because actual displacement would occur only along fault traces that are actively involved in the seismic event, none of which passes through the site.

It is possible that renewed slide movement could occur on the slope behind Building 64, especially if the slope were saturated at the same time that a major earthquake occurred in the Bay Area, and particularly if the earthquake were centered on the Hayward fault. However, based upon past performance of the slope, it appears that if such movement did occur, the existing restraining walls would be effective in restraining most of the movement. It is expected that, at

worst, slide debris might overtop the wall or the wall might rotate and be uplifted. It is unlikely that slide movement would have a sudden impact on the building, although it is possible that some debris might accumulate against the building.

5.1.1.5 Land Use

The proposed modifications to Building 64 would not involve the development of additional acreage. Building 64 is currently unoccupied. The area surrounding the building is paved and contains no natural features. Adjacent to Building 64 are developed areas containing LBL research facilities.

The proposed Building 64 modifications and use as a genome sequencing facility is consistent with institutional land uses designated for this area in the City of Berkeley General Plan (Berkeley, 1976), and is in general conformance with the LBL Long Range Development Plan, which designates the building as dedicated to accelerator research (LBL, 1987).

The proposed action does not conflict with either adopted environmental goals and plans of the region, or established recreational, educational, religious, and scientific uses of the area.

5.1.1.6 Traffic and Parking

During the proposed renovation, short-term traffic effects would include vehicle trips by workers to and from the site, and truck travel related to construction. During the estimated eight-month renovation period, an average of two to three round-trip truck trips per day would be needed. In addition, a materials staging area would be required near Building 64, which would temporarily displace approximately twelve parking spaces. During the proposed renovation, off-site areas will be provided for construction workers to park and be transported to the site. The effects of the proposed renovation on traffic and parking would be of minor severity and short duration.

5.1.1.7 Utilities and Services

During the construction phase, temporary electrical power (generally, 100 amp/110 volt) and water would be provided to the construction site through temporary connections to existing on-site distribution systems. This temporary consumption of water and electrical power during facility construction is expected to be minor.

5.1.1.8 Biological Resources

No rare, endangered, or threatened plant or animal species have been located at LBL and the site is not located within a flood plain.

5.1.1.9 Cultural Resources

Based on a 1986 archaeological survey, no archaeological resources have been identified within LBL (LBL, 1986). Building 64 was constructed in the 1950s and has been modified extensively over time. Therefore, it is unlikely that the building is historically significant.

5.1.1.10 Aesthetics

Building 64 is not easily visible from off-site areas and the proposed project would not add visibility to the building itself. The proposed project design indicates that three stacks would be required to accommodate the three fume hoods in the building that would require exhaust outlets. The stacks would rise 10 ft. above the Building 64 roofline. Other exterior modifications include installation of equipment in an existing roof well, preparation of equipment pads outside the building, and construction of platforms for the exhaust stacks. These modifications would not affect the visual quality of this portion of LBL.

5.1.1.11 Noise

The proposed modifications to Building 64 would generate noise at the building site during the construction period of about 8 months. Noise generated would be a result of materials delivery and operation of heavy equipment. These activities would cause noise levels to exceed ambient levels. Effects of construction noise would be noticed most by occupants of adjacent LBL buildings. LBL would not allow personnel located in these buildings to be exposed to levels at or exceeding the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) (i.e., 85 dBA [see Glossary] over an 8-hr day, 90 dBA over 4 hours, or 95 dBA over 2 hrs.) Because most construction activities would take place on the building's interior, outdoor construction activities would be minor, and Building 64 is located in the central portion of LBL, it is not anticipated that construction noise would affect off-site receptors, the nearest of which is approximately 800 feet away.

5.1.1.12 Human Health Effects

The potential for adverse health effects during renovation activities pertains to exposure of construction workers to hazardous substances. This issue is addressed in Section 5.1.1.2.

5.1.2 Operation

5.1.2.1 Air Quality

The proposed project would conform to applicable BAAQMD regulations, including those specific to emissions of ozone precursors (e.g., VOCs), carbon monoxide, PM10, and HAPs. In reviewing proposed projects, the BAAQMD typically considers a net increase of one percent over the county-wide emissions, or a net increase of 150 lbs./day as the thresholds of significance for carbon monoxide, VOCs, nitrogen oxides, sulfur oxides, and PM10. Because of the small quantities of chemicals projected to be used, the proposed project operations are expected to result in a slight increase in LBL emissions that would not approach the BAAQMD significance thresholds. However, the expected emissions may exceed other BAAQMD thresholds for permitting and standards of operation.

Potential air emissions from proposed project operations have been conservatively projected to increase in an amount proportionate to the increase in square footage of laboratory space. The proposed project would add approximately 6,500 nsf of laboratory space. The estimated annual emissions from the proposed project, without filtration, would be less than .37 percent of current emissions from existing LBL sources. Filtration of air emissions from the facility would not be needed.

Based on projected emissions, it is anticipated that BAAQMD would require formal permit review for the proposed project operation. In conjunction with the project design phase, the operations would be reviewed and any required permit applications would be submitted to the BAAQMD.

5.1.2.2 Human Health Effects

The hazardous materials expected to be used within the proposed Genome Sequencing Facility cover a wide range of chemicals common to biological research laboratories. They would be stored and used in small quantities (i.e., five-liter container or smaller) and would include: corrosive liquids; organic solvents; toxic compounds; flammable solids and liquids; carcinogenic solids and liquids; and solid and liquid irritants. A list of chemicals that are anticipated to be used in the proposed facility, and approximate monthly quantities is provided as Attachment A.

Hazardous materials would be stored in appropriate cabinets within the building (e.g., flammable cabinets). All sink drains where hazardous materials may be handled would be valve closed and would be opened only when all hazardous chemicals were removed from the sink and adjacent countertops. When necessary, personnel would wear appropriate protective clothing.

The proposed chemical laboratory operations would be bench-scale and would require fume hoods at locations where volatile chemicals would be used. Emissions of 13 chemicals used under normal operating conditions were modeled under a Preliminary Safety Analysis Document (PSAD) prepared for the proposed Human Genome Laboratory (LBL, 1993). That analysis is applicable to the proposed Building 64 project because the chemical inventory and proposed use of these chemicals is similar to the chemical inventory for the Human Genome Laboratory. Most of these chemicals in the same maximum quantities would be used in the genome sequencing facility. In the HGL PSAD it was determined that ground-level concentrations would be at least 3000 times lower than the TLV for occupational exposures (ACGIH, 1992) for these indicator substances. The TLV is the maximum limit suggested by the ACGIH where workers do not suffer any adverse health effects if exposed 8 hours per day for 40 hours per week. Non-occupational exposure limits are not available for these compounds.

Among the chemicals that would be used in the proposed Building 64 laboratory, 22 are not included in the Human Genome Laboratory chemical inventory (Table 3-3 of the PSAD). Based on the criteria used to select indicator chemicals for the Human Genome Laboratory PSAD (i.e., toxicity, quantity subject to release, releasability, and chemical incompatibility), 5 of the 22 chemicals were selected for additional safety analysis under normal genome sequencing facility operating conditions and under accident scenarios for this EA (SAIC, 1994). The five additional indicator chemicals are dichloromethane, sec-butanol, ether, glutaraldehyde, and isoamyl alcohol. Analysis indicates that all normal-release and accidental-release concentrations of the indicator chemicals would be below the ACGIH TLVs or other applicable comparison criteria (i.e., Emergency Response Planning Guidelines [ERPGs] or levels of concern [LOCs]). In most cases the concentrations would be thousands of times lower than the TLVs or comparison criteria and in many cases they would be millions of times lower than those threshold values.

Biological materials that would be used during operation of the proposed project include *Escherichia coli* (*E. coli*) and bacterial phages to transfer DNA fragments into various *E. coli* hosts. Bacterial phages, or bacteriophages, are viruses that only infect bacteria. Three bacteriophages will be used: lambda virus, M13 phage, and P1 phage. These bacteriophages cannot infect humans or animals, and thus represent no threat to human health and safety. *E. coli* would be the sole bacteria used as a viral host; this would be a continuation of current genome research at LBL and would merely represent a change in building location at which the activities occur. *E. Coli* is classified as a Class 2 agent: one that presents ordinary potential hazard. This class includes agents which may produce disease of varying degrees of severity from accidental inoculation or injection or other means of cutaneous penetration but which can usually be adequately and safely contained by ordinary laboratory techniques (U.S. Department of Health, Education and Welfare, 1974).

Personnel at the genome sequencing facility would practice standard laboratory safety procedures and adhere to safety standards contained in the *Biosafety in Microbiological and Biomedical Laboratories* guide prepared by the U.S. Department of Health and Human Services, National Institutes of Health, and the U.S. Center for Disease Control (U.S. Dept. of Health and Human Services, 1993). In addition, release of biohazardous agents to the environment would be minimized through the use of approved biological safety cabinets equipped with HEPA filtering devices.

5.1.2.3 Hazardous, Medical, and Non-hazardous Solid Waste Management

Hazardous and Medical Wastes

Proposed operations would generate approximately 1.5 tons of solid hazardous waste, 2.3 tons of liquid hazardous waste, and 2 tons of medical waste annually. This increase in waste generation would represent approximately 3 percent of the 1992 LBL total solid hazardous waste, 1 percent of the 1992 total liquid hazardous waste, and 12 percent of the 1993 LBL total medical waste. The increase in hazardous waste generation would not require additional waste storage space at the LBL HWHF. As indicated in Section 4.3.1, medical waste is not stored at the HWHF. The increase in both hazardous and medical wastes would not substantially affect current levels of waste transport or disposal. These numbers reflect the Life Sciences Division's ongoing and planned waste minimization efforts to date (see Waste Minimization discussion, below). These and new waste minimization/pollution prevention measures will continue to be implemented throughout the life of the project.

Wastes would be collected at their point of generation, transported to and stored in compatible groups at LBL's HWHF

(in the case of hazardous wastes), placed into approved shipping containers, and transported off site for recycling, treatment, or disposal. These wastes would be handled in accordance with applicable laws, regulations, and DOE orders. LBL routinely includes provisions in contract specifications requiring vendors to comply with pertinent regulatory requirements pertaining to biomedical and hazardous materials and wastes. To help reduce the potential for accidents and other problems associated with off-site transportation of these materials and wastes, LBL requires haulers to provide evidence that they are appropriately licensed to transport and/or recycle the particular type of waste off site. Prior to transporting waste, LBL would confirm that the receiving facility is licensed to receive the waste type.

LBL completed a Medical Waste Management Plan in 1993 in accordance with regulatory requirements. The Plan includes sections on training; emergency action; medical waste hauling, treatment and disposal; hazardous medical waste; radioactive medical waste; document control and record keeping; and program certification. The medical waste generated by the Genome Sequencing Facility would be picked up weekly by a certified medical waste hauler.

Waste Minimization

Waste minimization/pollution prevention efforts that would be implemented in proposed Building 64 operations include the following: 1) Formerly, a buffer solution that would be used in Building 64 was disposed of a hazardous waste. After analytical testing of the solution and discussions between LBL EH&S Division and the East Bay Municipal Utility District, agreement was reached that the buffer solution is non-hazardous and can be disposed to the sanitary sewer system. 2) Agarose gel is now dried and disposed of as non-hazardous solid waste rather than as hazardous waste. 3) proposed genome sequencing activities would use non-radioactive substitutes, such as fluorescent dyes, as tracers instead of previously used radioactive materials. 4) Life Sciences Division personnel in consultation with EH&S Division personnel would establish new procedures to be used in the proposed genome sequencing facility for the identification, sorting, and disposal of wastes that would reduce the volume of waste that must be disposed of as biomedical by approximately 75 percent.

Non-hazardous Solid Waste

Proposed project operations would generate non-hazardous solid waste, which would be recycled, if possible, or disposed of in a landfill. Proposed project operations would be expected to add less than 1 percent to current LBL-office-type waste generation, 90 percent (by volume) of which is recycled. This is less than the amount of office-type waste that was generated by this portion of Building 64 under its previous occupancy. Solid waste generated during project operations and maintenance activities would be the responsibility of LBL's waste management contractor. The contract for non-recyclable waste disposal is currently held by the Richmond Sanitary Landfill in Contra Costa County, which has approximately two years of remaining fill capacity. However, a new transfer station is being constructed to receive waste after closure of the landfill. It is anticipated that waste received at the transfer station would be transferred to Keller Canyon Landfill, also in Contra Costa County. This new state-of-the-art landfill has remaining permitted capacity of at least 30 years. In the past LBL has also let waste disposal contracts to the Altamont Landfill in Alameda County. This large landfill has recently opened a new Class II cell, which provides the facility with approximately 58 years of remaining capacity.

5.1.2.4 Hydrology and Water Quality

Proposed routine operations would not discharge effluents to the ground, but would discharge (when allowable) to the sanitary sewer system, or effluents would be disposed of as hazardous waste. No adverse impacts to hydrology or water quality would result from proposed project operations.

5.1.2.5 Traffic and Parking

The 40 personnel who would be accessing this portion of LBL would be less than the traffic generated by use of this portion of Building 64 during its previous occupancy. Traffic in and out of LBL during operation of the proposed project would remain below the goals set forth in the agreement with the City of Berkeley. Entrance via the Blackberry Canyon gate (Cyclotron Road) is expected to be a primary travel route for Building 64 employees. There is adequate parking in the vicinity of the building to meet the 1.7 employees per parking space established in the LBL Long Range

Development Plan (LBL, 1987). Plus there is an active carpool/vanpool program offering assistance throughout LBL.

5.1.2.6 Utilities and Services

Proposed project effects on the capacity of the sanitary sewer system would be minor; a maximum of 25 additional employees would be added to the existing LBL workforce, and the bench-scale chemistry laboratories would not use excessive amounts of water for fume hood operations. The estimated increase in water usage over current LBL levels is less than 1 percent. The proposed project would not use large amounts of electricity (it would require less than 630 MW-hr/yr. compared to a site usage of 80 GW-hr/yr.). It would require a small amount of natural gas (25 M Therms/yr. compared to site usage of 1.3 MM Therms/yr.), and would require little from limited resources such as law enforcement/security and the fire department. The levels of utilities and services required would be less than used by the portion of Building 64 during its previous occupancy.

5.1.2.7 Noise

The regular operations of the proposed project would produce little noise, the major sources of which would be heating/cooling equipment. Noise levels at a typical LBL laboratory are 55 dB (LBL, 1992b). Similar noise levels are anticipated for the proposed project. Noise levels are expected to be less than those associated with the previous use of the building which was a machine shop employing heavy machinery; therefore it is not anticipated that there would be an increase in the ambient noise level at on-site LBL receptors or at the nearest Berkeley residential neighborhood. If levels are greater than anticipated, noise controls would be installed in the vicinity of the equipment as needed; for example, sound baffles could be installed to reduce sound reflected off a nearby concrete retaining wall.

5.1.2.8 Cumulative Impacts

Traffic, Parking, and Noise

Minor, short-term construction-related impacts are anticipated in the areas of traffic, parking, and noise. Because no similar construction projects are expected in the same general vicinity of LBL during time of construction, these activities will not contribute to cumulative impacts.

Air Quality

As discussed in Section 4.1, LBL has BAAQMD permits to operate 40 stationary sources of criteria air pollutants. The proposed action would include chemical laboratory operations that would be bench-scale and include the handling of small quantities of various hazardous air pollutants in fume hoods. These operations may require a permit from the BAAQMD. Because the Bay Area does not meet emissions standards for carbon monoxide, ozone, and PM10, any project that creates new mobile and stationary emission sources would contribute to this nonattainment status. Although this may cause the BAAQMD to impose additional permit requirements, such as additional fume hoods or Best Available Control Technology, the nonattainment status is not expected to adversely impact implementation of the proposed action.

Threshold levels for individual HAPs also exist under BAAQMD regulations and policies. Construction and operation of the proposed genome sequencing facility in compliance with any appropriate emission control measures would provide a minor contribution to the regional air quality.

Waste

The proposed project would increase the quantity of various types of hazardous and non-hazardous wastes that are being generated at LBL. California lacks adequate disposal capacity to handle current or projected quantities of hazardous wastes generated within the state, and has embarked on a hazardous waste facility siting and development process to provide the needed disposal capacity. Until these facilities are developed, LBL and other California generators continue to rely on licensed hazardous waste treatment and disposal facilities located outside of California.

The increase in hazardous waste generated from the proposed project would represent approximately 3 percent of total LBL hazardous waste.

Currently, about 90 percent of the office-type solid waste generated at LBL is recycled, and only 10 percent (by volume) is baled and sent to a landfill. Despite the implementation of aggressive solid waste recycling and reduction programs, limited landfill space exists in the Bay Area and in many other regions in California. California has enacted recent legislation aimed at reducing solid waste by 25 percent by 1995 and 50 percent by the year 2000, coupled with a planning process designed to ensure adequate new solid waste disposal capacity. If the agencies charged with implementing the requirements of this solid waste planning system fail to do so, it is probable that shortfalls in solid waste disposal capacity will become acute within the foreseeable future (LBL, 1992b). The increase in solid waste generated from the proposed project would represent approximately .01 percent of total LBL solid waste.

5.2 No Action Alternative

As discussed in Section 3.5, under the no action alternative, human genome research would continue to be conducted in the present location at the current level of effort, and no modified facility for genome sequencing would be constructed. The Directed DNA Sequencing Strategy [see Glossary] developed at LBL to outperform and supplant the current predominant method of large-scale sequencing would not be implemented. Expanded human genome research activities would be conducted at another institution and would not benefit from the techniques and expertise at LBL. The no action alternative would have no effect on the environment above existing conditions. However, this alternative would adversely affect DOE's ability to fulfill one of the Human Genome Center missions at LBL. The potential environmental effects associated with project construction and operation identified for the proposed action would not occur under the no action alternative. Construction impacts include a short-term increase in noise and traffic levels and construction-related air quality impacts. Operational impacts to air quality and potential impacts to human health from use of hazardous and biological materials and handling and disposal of hazardous and biomedical wastes would not occur under the no action alternative. The incremental use of utilities and services also would not occur under the no action alternative.

5.3 LBL Building 27 Alternative

Location of genome sequencing activities in Building 27 would have the same environmental impacts as the proposed action because construction and operation activities would be the same as for the proposed action. Based on its age, Building 27 also likely contain asbestos that would have to be removed as part of building modifications. In addition, similar to Building 64, soil and groundwater contamination has been found in the vicinity of this building.

Modification of this building would incur a higher cost because it is currently occupied by other programs which would have to be relocated. Furthermore, the space is inadequate to accommodate the proposed research activities, and additional construction would be required to expand the existing building. This would result in an increase in short-term impacts to air quality, traffic and parking, and noise, with potential impacts relating to geology, hydrology, and water quality. Building 27 is better suited to uses associated with the nearby Advanced Light Source.

5.4 LBL Building 53 Alternative

The constraints on and environmental effects of the Building 53 alternative are similar to the Building 27 alternative. It would have the same environmental impacts as the proposed action and would likely contain asbestos that would have to be removed as part of building modifications. As with buildings 64 and 27, soil and groundwater contamination has been found in the vicinity of this building.

Modification of this building would incur a higher cost because it is currently occupied by other programs which would have to be relocated. In addition, Building 53 contains high-bay space used for heavy industrial assembly with higher floor load requirements and thus is better suited to other uses, such as those associated with the nearby Advanced Light Source (ALS). Genome sequencing does not require the heavy floor, loaders, and overhead cranes associated with this space. If the high-bay space were allocated to human genome research, new high-bay space would need to be

constructed elsewhere on the LBL site to accommodate ongoing needs for this type of assembly space for other programs, such as the ALS. In addition, use of the high-bay space for human genome research would result in much greater energy expenditures and utility costs associated with keeping the space heated during colder months.

5.5 LBL Multiple Locations Alternative

This alternative would result in greater energy expenditures and utility costs associated with running equipment at numerous locations. The nature of the genome sequencing research requires that certain equipment be immediately accessible; therefore, instead of teams sharing equipment in a single building, equipment would be required at each research location, dramatically increasing program costs. Splitting the researchers into fragmented groups rather than an integrated team would impair effective communication and would lead to a duplication of effort and other inefficiencies. In addition, the frequent face-to-face interactions that facilitate the continual development of improved sequencing methods would be retarded under this alternative.

5.6 Offsite Location Alternative

Implementation of this alternative would add additional daily commute trips to the local street and freeway system, marginally contributing to existing traffic congestion and resulting in additional air pollutant emissions. The additional traffic also may slightly decrease the LOS around UCB and LBL.

Use of an offsite location would impede communication with human genome researchers on the LBL site. The accessing of databases and transfer of data, both crucial to the project, would be much more cumbersome and expensive under this alternative. As with the LBL Multiple Locations alternative, the inability to freely interact face-to-face would be an even greater impediment under this alternative, due to the increased distance from LBL. With less effective and efficient communication, researchers at different locations would be more prone to duplicate efforts.

James M. Turner, Ph.D.
Acting Manager
Oakland Operations Office

6.0 PERSONS AND AGENCIES CONSULTED

No persons or agencies were consulted.

7.0 GLOSSARY

decibel (dB)
: A logarithmic measurement of amplitude, which is the difference between ambient air pressure and the peak pressure of a sound wave. Amplitude and frequency are the two characterizing parameters of sound, which is transmitted by pressure waves in the air.

dBA
: Adjusted or A-weighted decibel, an adjusted measurement of frequency that reflects the sensitivity of the human ear. The normal range of human hearing extends from about 0 dBA to about 140 dBA.

DNA (deoxyribonucleic acid)
: The molecular basis for heredity in many organisms, composed of various nucleic acids arrayed in a double helix held together by hydrogen bonds between purine and pyrimidine bases which project inward from two chains containing alternate links of deoxyribose and phosphate.

DNA sequencer
: An instrument used for determining the nucleotide sequence of DNA. Four different fluorescence dyes--each specific to one of the four different nucleotides in DNA--are used to label the DNA. The DNA is then separated by electrophoresis on thin polyacrylamide gels and the resulting lanes are scanned with an argon-ion laser causing fluorescence of the four dyes, each at a different wavelength. This fluorescence is monitored and used to

determine the nucleotide sequence

oligonucleotide synthesizer

An instrument used for the automated synthesis of synthetic ogligonucleotides using phosphoramidite chemistry. This instrument allows complete control of the synthesis chemistry for any user-specified sequence of nucleotides. Typical usage is the synthesis of oligonucleotides 15 5o 20 nucleotides in length that can be used as primer is polymerase chain reaction assays.

8.0 REFERENCES

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ATTACHMENT A : MONTHLY CHEMICAL INVENTORY

Building 64 Genome Sequencing Facility Monthly Chemical Inventory

U.S. Department of Energy (DOE) Finding of No Significant Impact for the Construction and Operation of a Genome Sequencing Facility in Building 64 at Lawrence Berkeley Laboratory, Berkeley, California

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The U.S. Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-1065, evaluating the proposed action to construct and operate a Genome Sequencing Facility at Lawrence Berkeley Laboratory (LBL). LBL is located in Berkeley, California and operated by the University of California (UC). The project consists of modification of 14,900 square feet of existing Building 64 and construction of laboratory and office space to house human genome sequencing and research on human genetics. This project would comprise one of five components of LBL's Genome Sequencing Initiative.

Based upon information and analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969. Therefore, an Environmental Impact Statement is not required.

DESCRIPTION OF THE PROPOSED ACTION:

The proposed action is to modify 14,900 square feet of LBL Building 64, to be used as a Genome Sequencing Facility. This facility would be part of DOE's Human Genome Program, dedicated to the sequencing of the entire human genome. The Genome Sequencing Facility would allow LBL to demonstrate that LBL's Directed DNA Sequencing Strategy can be scaled up from the current level of 750,000 base pairs per year to a facility that produces over 6,000,000 base pairs per year, while still retaining its efficiency. The facility would be occupied by a staff of approximately 40 scientists, approximately 15 of whom would be relocated from buildings 74 and 74B, resulting in a net increase of 25 persons at LBL.

ALTERNATIVES:

Five alternatives to the proposed action were considered: (1) no action, (2) an alternative on-site location (Building 27), (3) a second alternative on-site location (Building 53), (4) multiple locations on the LBL site (buildings 62, 70, 70A, and 74), and (5) an alternative off-site location (Richmond Field Station).

(1) Under the no action alternative, genome sequencing activities would continue to be conducted in Building 74 on a limited scale. No modified facility for expanded genome sequencing would be constructed. The Directed DNA Sequencing Strategy developed at LBL to outperform and supplant the current predominant method of large-scale

sequencing would not be implemented. Expanded human genome research activities would be conducted at another institution and would not benefit from the techniques and expertise at LBL. The no-action alternative would have no effect on the environment above existing conditions. However, this alternative would adversely affect DOE's ability to fulfill the Human Genome Project mission.

(2) The LBL Building 27 alternative consists of converting Building 27 from its current use as a High Voltage Test Facility and Cable Shop to office and laboratory space to house the Genome Sequencing Facility. This alternative would provide fewer square feet of operating space than the proposed action, and would not permit the full extent of sequencing activity that is the goal of the proposed action without the construction of an addition to the building. The potential for nearby groundwater contamination and for encountering asbestos during renovation is about the same for this alternative as for the proposed action. If an addition to the building were constructed to accommodate the proposed research and sequencing activities, the construction activities would result in an increase in short-term impacts to air quality, traffic and parking, and noise, with potential impacts relating to geology, hydrology, and air quality. In addition to the greater costs associated with construction, the Building 27 alternative would incur a higher cost than the proposed action because the building is currently occupied by other programs which would have to be relocated. The environmental effects associated with facility operations would be similar to the proposed action.

(3) Under the LBL Building 53 alternative, Building 53 would be converted from its current use by the Magnetic Fusion Energy program to office and laboratory space to house the Genome Sequencing Facility. As with the Building 27 alternative, asbestos would likely be encountered during renovation that would need to be removed. In addition, soil and groundwater contamination has been encountered in the vicinity of the building. This alternative would also incur a higher cost than the proposed action because the building is currently occupied by other programs which would have to be relocated. Building 53 contains high-bay space used for heavy industrial assembly, which includes heavy high-load floors and overhead cranes. If this space were allocated to human genome research, new high-bay space would need to be constructed elsewhere at LBL to accommodate ongoing needs for this type of assembly space for other programs, such as the Advanced Light Source. Although the operational effects of this alternative would in general be similar to the proposed action, use of the high-bay space for human genome research would result in much greater energy expenditures and utility costs associated with keeping the space heated during colder months.

(4) The Multiple Locations alternative would utilize portions of LBL buildings 62, 70, 70A, and 74 to house human genome research and sequencing activities, displacing the activities currently taking place at those locations. This alternative would result in greater energy expenditures and utility costs associated with running equipment at numerous locations. The nature of the genome sequencing research requires that certain equipment be immediately accessible; therefore, instead of teams sharing equipment in a single building, equipment would be required at each research location, dramatically increasing program costs. Splitting the researchers into fragmented groups rather than an integrated team would impair effective communication and would lead to a duplication of effort and other inefficiencies. In addition, the frequent face-to-face interactions that facilitate the continual development of improved sequencing methods would be retarded under this alternative.

(5) The alternative offsite location is at the University of California-owned Richmond Field Station (RFS) located approximately 7 miles northwest of the LBL site. Under this alternative, adequate space would be leased from the University of California to house all of the proposed Genome Sequencing Facility activities. Although the specific space that would be leased has not yet been identified, it is assumed that some renovation work would be required and that construction-related impacts could be similar to those of the proposed action. Operational impacts of the Offsite Location alternative would be greater than those of the proposed action because the need for researchers to frequently visit the LBL site would add additional daily commute trips to the local street and freeway system, marginally contributing to existing traffic congestion and resulting in additional air pollutant emissions. The additional traffic also may slightly decrease the Level of Service (LOS) around UCB and LBL.

Use of an offsite location would impede communication with human genome researchers on the LBL site. The accessing of databases and transfer of data, both crucial to the project, would be much more cumbersome and expensive under this alternative. As with the LBL Multiple Locations alternative, the inability to freely interact face-to-face would be an even greater impediment under this alternative, due to the increased distance from LBL. With less effective and efficient communication, researchers at different locations would be more prone to duplicate efforts.

Currently, hazardous materials are used at the RFS; however, biomedical wastes are not generated. Under this alternative, the relative increase in materials used and wastes generated would be greater than under the proposed action.

ENVIRONMENTAL IMPACTS:

Impacts from Renovation

Renovation activities are expected to generate increased noise levels and short-term vehicle exhaust and airborne particulates. The increased noise levels and air contaminants are not expected to pose a threat to human health because of the low levels that would be generated, the short duration of construction, and the measures that would be taken as a normal part of construction to ensure workers and the environment are protected (for example, ear protection for workers and spraying the ground surface with water to minimize the generation of dust). Short-term transportation effects would include trips by construction workers to and from the site. The effects to traffic and parking would be minor and of short duration.

Precautions would be taken to ensure that an air release of the lead-based paint present on all of the building's structural steel would not occur during building modification, in accordance with the LBL Lead Compliance Program and the Bay Area Air Quality Management District (BAAQMD) requirements. Removal of asbestos-containing material would be accomplished by qualified personnel following Federal and local regulatory requirements. Construction debris would be recycled, if possible, or disposed of in a sanitary landfill. Equipment would be recycled to the extent possible. The small quantities of hazardous wastes that would be generated during renovation activities (such as paint and solvents) would be recycled or disposed of in compliance with LBL standard procedures for handling and disposing hazardous wastes. Only a very limited amount of grading and excavation would be required, with little or no soil remaining for disposal. Samples would be collected of any soil to be disposed of and analyzed for contaminants to determine whether or not it would be classified as hazardous waste. If so, the soil would be handled and disposed of in accordance with LBL policies and regulations for disposal of hazardous waste.

Existing provisions of utilities, services, and energy at LBL are expected to be adequate for renovation activities. During renovation, temporary electrical power (generally, 100 amp/110 volt) and water would be provided to the project site through temporary connections to existing on-site distribution systems. The proposed action would have no impact on hydrology and water quality, geology, land use, visual quality, or sensitive biological or cultural resources.

Impacts from Operations

A wide range of chemicals common to biological research laboratories would be stored and used in small quantities (5-liter quantities or smaller). The estimated ground-level concentrations of 11 indicator chemicals chosen for safety analysis would be below the Threshold Limit Values (TLV) for occupational exposures. In most cases the concentrations would be thousands of times lower than the TLVs or comparison criteria and in many cases they would be millions of times lower than those threshold values.

Biological materials that would be used during operation of the proposed project include viruses and bacteria. The viruses that would be used infect only bacteria and would pose no threat to human health and safety. *Escherichia coli* (*E. coli*) would be the sole bacterium used as a viral host; this would be a continuation of current genome research at LBL and would merely represent a change in building location at which the activities occur. *E. Coli* is classified as a Class 2 agent: one that presents ordinary potential hazard. This class includes agents which may produce disease of varying degrees of severity from accidental inoculation or injection or other means of cutaneous penetration but which can usually be adequately and safely contained by ordinary laboratory techniques. Personnel at the genome sequencing facility would practice standard laboratory safety procedures and adhere to safety standards contained in the *Biosafety in Microbiological and Biomedical Laboratories* guide prepared by the U.S. Department of Health and Human Services, National Institutes of Health, and the U.S. Center for Disease Control. In addition, release of biohazardous agents to the environment would be minimized through the use of approved biological safety cabinets equipped with HEPA filtering devices.

Air Quality. Air emissions from operations would include ozone precursors, carbon monoxide, PM_{10}, and hazardous air pollutants (HAPs). Because of the small quantities of chemicals to be used, the proposed project operations are expected to result in a slight increase in LBL emissions that would not approach the BAAQMD thresholds of significance. However, the expected emissions may exceed other BAAQMD thresholds for permitting and standards of operation, and a formal permit review by BAAQMD is anticipated for project operations. The estimated annual emissions from the Genome Sequencing Facility would be less than 0.37 percent of current emissions from existing LBL sources.

Utilities, Services, and Energy. Proposed project operations are expected to result in a minor incremental increase in the use of water, gas, electricity, and the production of wastewater above existing levels. The estimated increase in water usage over current LBL levels is less than 1 percent. The proposed project would require less than 630 MW-hr/yr. of electricity, compared to a site usage of 80 GW-hr/yr. It would require 25 M Therms/yr. of natural gas, compared to site usage of 1.3 MM Therms/yr. Available levels of service are expected to be more than adequate for the proposed project. Other services, including communications, emergency notification, fire, and police are also expected to be adequate to support the proposed Genome Sequencing Facility.

Traffic, Circulation, Parking, and Noise. The 40 employees (25 new personnel) who would be accessing this portion of LBL would generate less daily traffic than the traffic generated by use of this portion of Building 64 during its previous occupancy. Daily trips at LBL would remain below the goals set forth in the agreement with the City of Berkeley, and LOS along access roads would not change. Adequate parking would be available to maintain the ratio of employees per parking space established in LBL's Long Range Development Plan. In addition, there is an active carpool/vanpool program offering assistance throughout LBL.

Operation of the proposed project would produce little noise, the major sources of which would be heating/cooling equipment. Noise levels at a typical LBL laboratory are 55 dB (LBL, 1992b). Similar noise levels are anticipated for the proposed project. Noise levels are expected to be less than those associated with the previous use of the building which was a machine shop employing heavy machinery; therefore, it is not anticipated that there would be an increase in the ambient noise level at the nearest Berkeley residential neighborhood. Traffic noise would not increase above current levels because of the small increase in vehicle trips per day.

Geology, Soils, and Seismicity. Operations of the proposed project are expected to have no effects on geology, soils, or seismicity.

Hydrology, Surface Water, and Water Quality. Proposed routine operations would not discharge effluents to the ground, but would discharge (when allowable) to the sanitary sewer system, or effluents would be disposed of as hazardous waste. No adverse impacts to hydrology or water quality would result from proposed project operations.

Waste Management. Hazardous, biomedical, and solid wastes would be generated during proposed Genome Sequencing Facility operations. Proposed operations would generate approximately 1.5 tons of solid hazardous waste, 2.3 tons of liquid hazardous waste, and 2 tons of medical waste annually. This increase in waste generation would represent approximately 3 percent of the 1992 LBL total solid hazardous waste, 1 percent of the 1992 total liquid hazardous waste, and 12 percent of the 1993 LBL total medical waste. Proposed project operations would generate non-hazardous solid waste, which would be recycled, if possible, or disposed of in a landfill. Proposed project operations would be expected to add less than 1 percent to current LBL-office-type waste generation, 90 percent (by volume) of which is recycled. This is less than the amount of office-type waste that was generated by this portion of Building 64 under its previous occupancy. These increases in waste generation would not require additional waste storage space nor substantially affect current levels of waste transport or disposal. Wastes would be handled, stored, and disposed using approved procedures by qualified LBL personnel in accordance with DOE orders and federal and State regulations.

Land Use, Sensitive Resources, and Aesthetics. Proposed project operations would have no effect on land use, sensitive resource, or aesthetics.

Cumulative Effects:

Potential cumulative effects are anticipated for regional air quality and waste generation. The San Francisco Bay Area does not meet emission standards (nonattainment status) for carbon monoxide, ozone precursors, and particulate matter less than 10 microns in size (PM_{10}). Construction and operation of the proposed project would provide a minor contribution to these emissions in the region. However, construction and operations of the proposed project would be in compliance with emission control measures.

The proposed project would increase the quantity of various types of hazardous and non-hazardous wastes that are being generated at LBL. California lacks adequate disposal capacity to handle current or projected quantities of hazardous wastes generated within the State. Therefore, at present, LBL and other California generators continue to rely on licensed hazardous waste disposal facilities located outside of California. There also exists a shortage of landfill space in the Bay Area and in many other regions of California and the contribution of solid waste from the proposed project would incrementally contribute to this shortage. Currently, about 90 percent of the office-type solid waste generated at LBL is recycled, and only about 10 percent is sent to a landfill. The increase in solid waste generated from the proposed project would represent approximately .01 percent of total LBL solid waste.

DETERMINATION

Based on the information and analysis in the EA, DOE has determined that the proposal to construct and operate the Genome Sequencing Facility does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969. Therefore, a Finding of No Significant Impact is made and an Environmental Impact Statement is not required.

PUBLIC AVAILABILITY

Copies of this EA (DOE/EA-1065) are available from:

Carl Schwab
U.S. Department of Energy
Berkeley Site Office
Lawrence Berkeley Laboratory
1 Cyclotron Road, Mail Stop 50B-3238
Berkeley, CA 94720
(510) 486-4298

For further information regarding the DOE NEPA process, contact:

Anthony J. Adduci
DOE/OAK NEPA Compliance Officer
U.S. Department of Energy
1301 Clay St.
Oakland, CA 94612
(510) 637-1807

Issued in Oakland, CA. this_____ day of _____, 1995.

James M. Turner, Ph.D.
Acting Manager
Oakland Operations Office