DOE / EA - #1655

FINAL ENVIRONMENTAL ASSESSMENT FOR

THE BERKELEY LAB LASER ACCELERATOR (BELLA) LASER ACQUISITION, INSTALLATION AND USE FOR RESEARCH AND DEVELOPMENT

U.S. DEPARTMENT OF
ENERGY

September 4, 2009

U.S. DEPARTMENT OF ENERGY
FINDING OF NO SIGNIFICANT IMPACT FOR THE BERKELEY LAB LASER ACCELERATOR (BELLA) LASER ACQUISITION, INSTALLATION, AND USE FOR RESEARCH AND DEVELOPMENT

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

SUMMARY: The U.S. Department of Energy (DOE) has completed an Environmental Assessment (EA) (DOE/EA-1655) for the *Berkeley Lab Laser Accelerator (BELLA) Laser Acquisition, Installation, and Use for Research and Development at the Lawrence Berkeley National Laboratory.*

The ultimate goal of this undertaking is to support DOE's need to substantially reduce the size, cost, energy usage, and environmental impacts associated with future electron or positron accelerators.

Based on the results of the analysis reported in the EA, DOE has determined that the Proposed Action is not a major federal action that would significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not necessary, and DOE is issuing this Finding of No Significant Impact (FONSI).

PUBLIC AVAILABILITY: The EA and FONSI may be reviewed, and copies of the documents obtained, at the following website and/or location:

http://www.lbl.gov/Community/BELLA/

U. S. Department of Energy
Berkeley Site Office
Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90-1023
Berkeley, CA 94720
Phone (510) 486-7909

The EA and FONSI may also be reviewed at the City of Berkeley Public Library

Berkeley Public Library
Central Branch

2090 Kittredge
Berkeley, CA 94704

FURTHER INFORMATION ON NEPA PROCESS: For further information on the NEPA process, please contact:

Gary Hartman
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Phone (865) 576-0273

DESCRIPTION OF PROPOSED ACTION: The Proposed Action would create and operate an experimental facility for further advancing the development of laser-driven, plasma-based, particle beam accelerators. An existing, approximately 7,000 square-foot accelerator laboratory area inside Building 71 at Lawrence Berkeley National Laboratory (LBNL) would be modified to accommodate the new facility. A utility room and stairwell would be placed in an approximately 2,000 square-foot area of the Building 71 roof. The Berkeley Laboratory Laser Accelerator (BELLA) laser, laser plasma accelerator, ancillary equipment, and radiation shielding would be installed. The laser and laser plasma accelerator would be operated for research and development that would focus the laser system's laser beam pulses on the entry to a meter-long plasma channel (inside the laser plasma accelerator) to produce and accelerate an electron beam pulse to an energy level on the order of 10 giga electron-volts (GeV) within the meter length of the channel. The Proposed Action's unique attribute would be the comparatively short distance over which the laser plasma accelerator generates a 10 GeV electron beam.

ALTERNATIVES: The EA considered a No-Action Alternative, as well as several location and design alternatives. Assessment of the No-Action Alternative was used as a baseline to compare the impacts of the proposed action.

Other alternatives were considered but were rejected early in the process and were not assessed in the EA. These included four alternative BELLA locations in existing LBNL accelerator buildings that were considered but rejected because the buildings would need substantial upgrades, did not have available space, or were in the process of being demolished. The option of constructing a new building at LBNL for BELLA was rejected on grounds of larger cost and greater environmental impacts. Offsite

locations were rejected for the preceding reasons and because suitable accelerator facilities in the area are uncommon.

Three design alternatives were rejected due to higher cost, greater space requirements, and /or loss of existing research capabilities.

ENVIRONMENTAL IMPACTS: Installation of BELLA is essentially limited to modification of the internal structure of an existing building, with the exception of two small additions. Construction staging would take place on an existing paved area. As such, there would be no substantial effect on biological resources, aesthetics, noise, or air quality due either to BELLA construction, or operation. The reconstruction work would further enhance the seismic durability of the building structure. Operationally, BELLA would add an additional five to ten employees at the lab; this would cause minimal impacts to public services, utilities and traffic.

Potential environmental effects from radiation release generated by the operating laser accelerator system were addressed in the EA. DOE determines that project controls proposed for BELLA and analyzed in the EA are more than adequate to prevent exposure to the public or LBNL employees of radiation above the regulatory limits. The system and infrastructure would be designed to absorb the electron beam radiation to a level where a full-time worker positioned outside the experimental cave at the point of highest exposure would receive less than 20 percent of the radiation allowed by the regulatory limit over the course of the year. Safe operation would be achieved through limited access, engineered interlocks and safety controls preventing operation of the accelerator while the experimental cave was occupied. The west concrete cave wall would be three feet thick behind the electron beam termination and there would be an additional 16 inches of lead, 36 inches of steel, and another six feet of concrete to absorb the radiation and reduce exposure levels outside the experimental cave. The north and south walls and the roof would be 18 inches thick concrete. Active radiation monitors outside the shielding in the wall and roof would be installed to confirm the performance of the shielding. An existing radiation monitor outside Building 71 would also monitor radiation levels outside the building.

Contamination from past activities inside Building 71 has been investigated and the contamination in the areas affect by this action would be cleaned up as part of the Proposed Action. Contamination in the building includes asbestos in the structure, lead from lead paint, poly-chlorinated biphenyls (PCBs) from old electrical equipment, traces of

chemicals used in past experiments (such as beryllium) and low-level radioactivity resulting from past accelerator operations. Only 10 percent of the demolition waste would be expected to have some hazardous characteristics.

BELLA construction would involve excavation of soil, beneath building 71, up to 16 feet below floor level for installation of piers to support the experimental cave walls. Soil, and any groundwater that maybe encountered, would be tested for hazardous substances such as volatile organic compounds (VOCs), toxic metals, PCBs, gross alpha/beta radiation, and other specific radionuclides found inside the building. Existing contamination in groundwater and soil surrounding Building 71 is largely restricted to a plume of volatile organic solvents that is downgradient of the proposed BELLA construction site and under active remediation. This existing contamination and its remediation would not be affected by the BELLA project.

Laser safety at LBNL is governed by existing protocols developed from many past years of successful operations. The BELLA system would present no change in the risk of fire or explosion to the building or surrounding areas.

Other issues discussed in the EA included energy use (and consequent greenhouse gas emissions) for BELLA which would result in an increase of approximately one percent over the LBNL's annual electricity consumption, and less than one percent increase over the LBNL's annual natural gas consumption. This was not considered a significant impact.

DETERMINATION: Based on the findings of this FONSI, and after careful consideration of all public and agency comments, DOE has determined that the proposed development of BELLA does not constitute a major federal action that would significantly affect the quality of the human environmental with the context of NEPA. Therefore, preparation of an EIS is not required.

Issued at Berkeley, California, this 4th day of September 2009.

Aundra Richards, Site Office Manager
U.S. Department of Energy
Berkeley Site Office

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I. EXECUTIVE SUMMARY

The Proposed Action would create and operate an experimental facility for further advancing the development of laser-driven, plasma-based, particle beam accelerators. An existing, approximately 7,000-square-foot, accelerator laboratory area inside Building 71 at Lawrence Berkeley National Laboratory (LBNL) would be modified to accommodate the new facility. A utility room and stairwell would be placed in an approximately 2,000 SF area of the Building 71 roof. The Berkeley Laboratory Laser Accelerator (BELLA) laser, laser plasma accelerator, ancillary equipment, and radiation shielding would be installed. The laser and laser plasma accelerator would be operated for research and development that would focus the laser system's laser beam pulses on the entry to a meter-long plasma channel (inside the laser plasma accelerator) to produce and accelerate an electron beam pulse to an energy level on the order of 10 giga electron-volts[1] (GeV) within the meter length of the channel. The Proposed Action's unique attribute would be the comparatively short distance over which the laser plasma accelerator generates a 10 GeV electron beam. The ultimate goal of this undertaking is to support the Department of Energy's (DOE) need to substantially reduce the size, cost, energy usage, and environmental impacts associated with future electron or positron accelerators.

The Proposed Action, the acquisition and installation of the BELLA laser and laser plasma accelerator and the operation of the laser and laser plasma accelerator for research and development, is subject to environmental review under the National Environmental Policy Act (NEPA) and is the subject of this Environmental Assessment (EA).

This EA provides information and analysis that DOE may use to determine whether the Proposed Action would cause potentially significant, adverse effects to the environment. Proposed Action safety features are identified, such as radiation shielding and a monitoring/control system. This EA examines several other issues, including the following: potential hazards from laser operation; potential impacts to views from public or private properties; po-

[1] The electron-volt is a unit of energy. A 10 GeV pulse once per second has an average power level of one watt.

tential effects to existing energy and waste disposal capacities; potential noise and air quality impacts; and potential effects on cultural resources. Note: this EA analyzes the potential cumulative effects of the Proposed Action in conjunction with other known past, present, or future projects in the vicinity.

II. INTRODUCTION

II.A. Purpose and Need

The mission of the Department of Energy's High Energy Physics (HEP) program is to explore and discover the laws of nature as they apply to the basic constituents of matter and the forces between them. To enable these discoveries, HEP supports the development of particle accelerators at increasingly higher energies. These accelerators can provide intense energy beams for scientific and technological research to explore the properties of materials, probe the structure of atoms and molecules, study biological specimens, and investigate chemical reactions and manufacture microscopic machines. Recent advances at LBNL in the acceleration of particles in plasma have demonstrated an energy gain of one giga electron-volts (1 GeV) within a distance of 3 centimeters, which is several hundred times shorter than in conventional accelerators. This technology holds great promise for dramatic reduction of the size, cost, energy usage, and environmental impact of future accelerators, particularly high-energy electron-positron colliders. It could pave the way for future accelerators to be hundreds of times shorter and more compact than currently required while still producing electron beams with the same energy levels.

The Proposed Action is American Resource and Recovery Act (ARRA) funded and would create an experimental facility for further advancing the development of laser-driven plasma acceleration. It would produce laser light pulses to excite plasma with sufficient amplitude to accelerate electrons by 10 GeV or more in the distance of approximately 1 meter.

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III. PROPOSED ACTION AND ALTERNATIVES

III.A. Proposed Action

The Proposed Action is the acquisition and installation of the BELLA laser and laser plasma accelerator, and the operation of the laser and laser plasma accelerator for research and development. It would achieve the identified Purpose and Need. It would be funded by the DOE and operated and managed by the University of California (UC), under contract with the DOE.

III.A.1. Introduction

The Proposed Action, to acquire and install the BELLA laser and laser plasma accelerator and operate the laser and laser plasma accelerator for research and development, includes five primary components. These are:

1) Modifications to an existing building to house the laser and laser plasma accelerator systems (generally referred to as conventional facility work)
2) Construction of the laser system
3) Construction of the laser plasma accelerator system
4) Construction of ancillary systems to support the laser and laser plasma accelerator
5) Operation of the laser and laser plasma accelerator for research and development.

The Proposed Action's unique attribute would be the comparatively short distance over which the laser plasma accelerator generates a 10 GeV electron beam. The laser plasma accelerator would be approximately 1 meter in length. Similar systems employing the current accelerator technologies require path lengths of 300 meters or more to obtain the same energy level. For example, the 50 GeV Stanford linear accelerator is over 3,200 meters long. The Proposed Action would support the DOE's need to reduce the size, cost, energy usage, and environmental impact of future accelerators. Furthermore, on a worldwide scale, multiple accelerators are in operation that generate electron beam energies around or greater than 10 GeV and methods are established to ensure such accelerators do not result in adverse impacts.

Components 1 to 4 of the Proposed Action, modifications to the existing building and construction of the laser plasma accelerator system, would take

place during an approximately three-year period from 2009 to 2012. Component 5 of the Proposed Action, operation of the laser and laser plasma accelerator for research and development, would follow and continue for an indefinite period thereafter.

III.A.2. Location and Existing Conditions

The approximately 200-acre LBNL main site is located in the hills of the cities of Berkeley and Oakland, east of the San Francisco Bay. The Proposed Action would be located in Building 71. Building 71 is in the northwest portion of LBNL, within Blackberry Canyon and within the Berkeley City limit. The building location and surroundings are shown in Figures 1 and 2.

The Proposed Action would be housed in Building 71, originally built in 1957 to support nuclear physics research, and integrated into the existing LOASIS[2] Program laser research facilities. The approximately 9,000 SF Proposed Action construction area would be located mainly in existing space within the 53,700 SF, two-story building. Approximately 7,000 SF of interior space that currently comprises a highbay (for locating relatively tall equipment), dry laboratories, shops, and offices would be retrofitted to house the new BELLA research and development facility. The Proposed Action would also construct a stairwell and a Utility Room in an approximately 2,000 SF area on the roof of Building 71.

III.A.3. Proposed Characteristics/Components

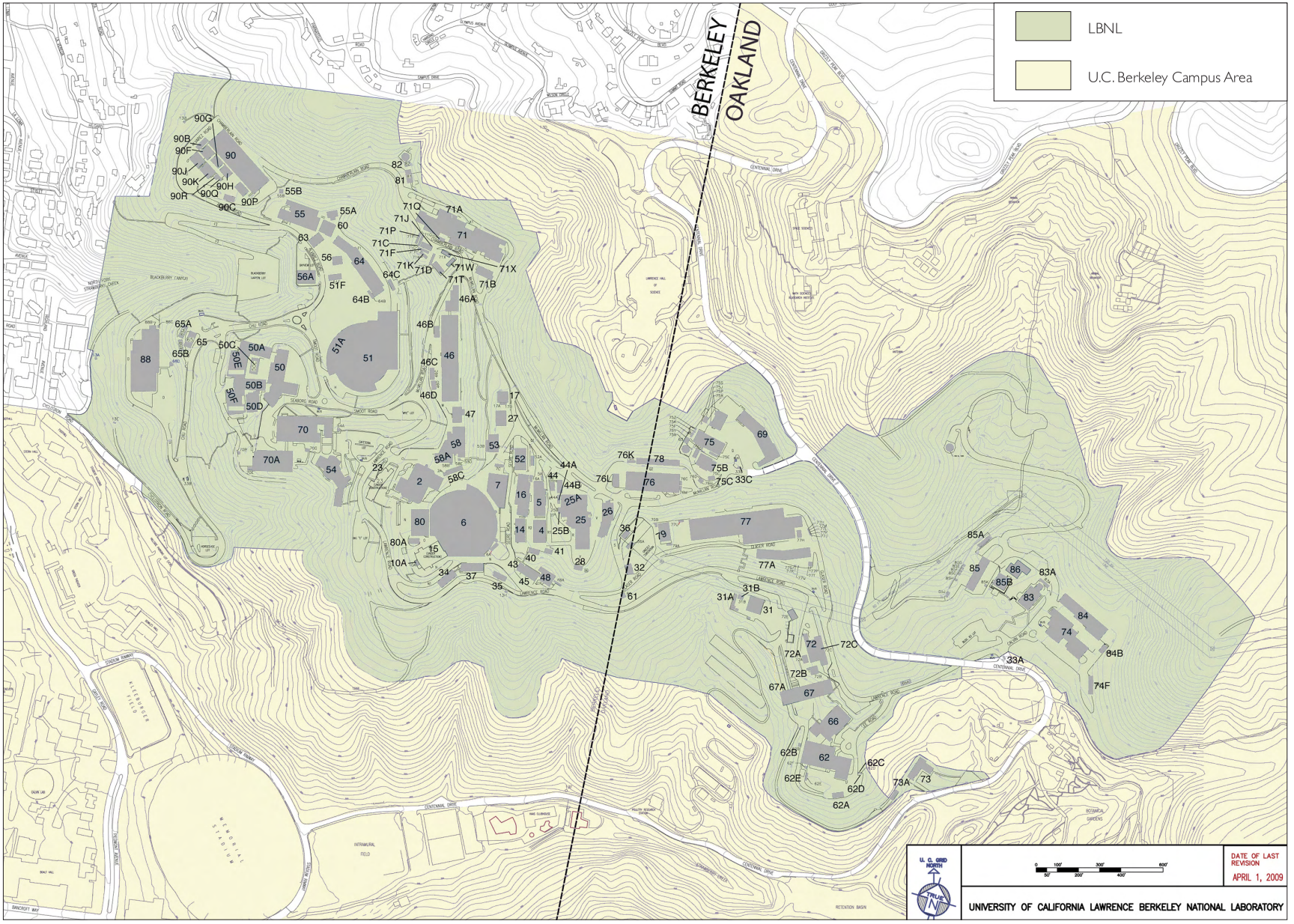
III.A.3.a. Conventional Facility Work

III.A.3.a.i. Room Designations

The Proposed Action includes the remodeling of space within Building 71 to provide the following new, or modified, facilities:

- A Laser Room, where the BELLA laser would be located;
- An Experimental Cave, where the laser plasma accelerator and beam dump would be located (by expanding an existing cave structure) ;
- A Control Room, to hold necessary equipment and staff for remote laser and accelerator operations;

[2] Lasers Optical Accelerator Systems Integrated Studies.



Source: Lawrence Berkeley National Laboratory Facilities Division, 2009

FIGURE 1

LOCATION OF BUILDING 71 IN LBNL SITE

FIGURE 2

AERIAL VIEW OF BUILDING 71 AND POSITION OF EXTERNAL MODIFICATIONS

- A Wipe-Down/Gowning Room, to provide space to prepare people and equipment prior to their entering the Laser Room;
- A Staging/Assembly Room, to provide space for the construction and outfitting of research equipment and components prior to moving them into the Laser Room;
- A Vestibule, to reduce the amount of dirt and debris entering the corridor leading to the Control and Wipe Down/Gowning Rooms;
- An Observation Room, Electronics Support Shop, and Optical Storage Facility, as additional support spaces;
- A new stairwell, to provide access between the ground floor operational spaces and the rooftop Utility Room;
- A Utility Room directly above the Laser Room, to house the laser system's power, cooling, and vacuum support modules. The Utility Room and stairwell represent the only expansion of Building 71 associated with the Proposed Action.

III.A.3.a.ii. Mechanical Systems

The Proposed Action would include the installation of new mechanical systems for heating, ventilating, air-conditioning (HVAC), and humidification/dehumidification. Most of the mechanical equipment would be located in the utility chase (interstitial space) between the ground floor ceiling and the roof of the building. Two or three new air handling units and their associated piping would be located on the Building 71 roof outside the Utility Room.

The existing Building 71 hot water, chilled water, and cooling tower water plants would provide the required HVAC heating and cooling water and laser chiller cooling water for the Proposed Action.

III.A.3.a.iii. Electrical and Instrumentation Systems

An extension of the existing electrical system would provide power to the Proposed Action components through a power distribution center and power outlets throughout the facility. Instrumentation includes systems that provide for controls, telecommunications, security, and safety.

- Power Distribution: Power distribution for the Proposed Action would occur through a new 480V, 1,200A circuit breaker installed in an existing spare space in the Building 71 switchgear panel, to feed all of the Proposed Action electrical loads. Feeders from the distribution panel bus fed by the new breaker would serve new mechanical loads, 480/277V panel loads, 480-208/120V transformers, and 208/120V breaker panel loads. The main electrical loads would be the laser system, air handling units, analytical equipment, and lighting.
- Security System: The existing LBNL access control system would be extended to include the Proposed Action exterior doors and designated interior doors. System components to be provided at each door would include a proximity card reader, an electric lock, and a local siren.
- Laser and Accelerator Interlock System: A safety interlock system would be installed at points of entry to the Laser Room to provide a safe environment in which to operate the laser system. In addition, an interlock system in an existing experimental cave would be modified to provide additional radiation hazard protection for personnel in the expanded Experimental Cave area.

III.A.3.b. Laser System

The laser system would be installed on optical tables in the Laser Room. Laser power, cooling, and vacuum pump modules would be installed above the Laser Room in the Utility Room. Pipe chases would be installed between the Utility Room and Laser Room to route power cables, piping for laser cooling, and vacuum hoses between the lasers and their support modules. The laser would feed the laser light pulses through an optical compressor to the final focus assembly that would be located in existing Experimental Cave 146A. The final focus assembly is considered part of the ancillary systems.

The laser system's peak power level would be approximately 1 petawatt ($1\ PW = 10^{15}\ W$) and it would be delivered to the final focus assembly in short duration (40 femtoseconds[3]) laser light pulses. Although each pulse is powerful, its short duration means that it has an average energy level equivalent to that drawn by a 40-watt light bulb.

[3] A femtosecond is 1 quadrillionth of a second, or $1/10^{15}$ of a second.

III.A.3.c. Laser Plasma Accelerator System

The final focus assembly would focus the laser light pulses on the laser plasma accelerator, which would be located in the expanded Experimental Cave where the electron beam would be generated. The pulses would be passed through a 10 micrometer diameter capillary tube filled with hydrogen to create plasma waves. The plasma waves would in turn collect free electrons and accelerate them, generating a 10 GeV electron beam. The capillary tube would itself be located within a 3 centimeter-diameter round by 1 meter long accelerator housing within an evacuated optical transport tubing. The laser plasma accelerator would be shaped similar to a common 3-foot-long fluorescent lamp.

A dipole magnet would be located downstream of the accelerator to measure the electron beam's energy level. Physical controls would maintain the electron beam within the optical transport to ensure its termination within a beam dump located at the west end of the Experimental Cave. The electron beam would have an average energy level equivalent to the power drawn by a 1-watt LED lamp.

III.A.3.d. Ancillary Systems

The laser light pulses would continue to the post-focus assembly.

Ancillary systems also would include a final focus diagnostic assembly located in the Laser Room and a post focus diagnostic assembly located in the Staging/Assembly Room. Ancillary systems would also include controls for operating the laser diagnostic systems as well as equipment and personnel protection systems located throughout the BELLA area.

III.A.4. Proposed Action Activities

Components 1 to 4 of the Proposed Action would take place during an approximately three-year period during 2009 to 2012. The duration of the construction period for Components 1 to 4 would take place over an approximately 18-month period, in the time framework 2010 to 2012, contingent upon funding and results of material sampling. Component 5 of the Proposed Action, operation of the laser and laser plasma accelerator for research

and development, would follow and continue for an indefinite period thereafter.

University of California staff at LBNL would manage the construction traffic for the BELLA and other similar activities at LBNL through the Site Construction Coordinator's Office. To avoid any adverse effects to local traffic from construction, truck traffic due to the Proposed Action and all other construction and demolition projects at LBNL would be restricted to aggregate levels below significance thresholds. Those significance thresholds have been determined in a recent traffic engineering analysis that focused on LBNL cumulative truck traffic.[4]

Apart from planning activities and actions to secure the site (e.g. locating and deactivating electrical lines as necessary), the main categories of Proposed Action activities would include the following:

- Clean-Out
- Removal of Hazardous Materials
- Demolition for New Construction
- New Construction
- Materials Disposition
- Staffing
- Research and Development Operations
- Decommissioning of the Proposed Action

Each of these Proposed Action activities is described in more detail below as well as in relevant sections in Chapter IV, Affected Environment and Environmental Consequences, of this document.

III.A.4.a.i. Clean-Out

The clean-out phase of the Proposed Action would entail removal of all non-hazardous equipment and materials that are not an integral part of the building structure. This includes all research, shops, and office apparatus, tools, components, furniture, and paperwork that can be relocated or completely removed safely and effectively. Photographs of existing rooms in Building 71

[4] Sam Tabibnia and Ryan McClain, Fehr & Peers Transportation Consultants. Personal memorandum written to Jeff Philliber, LBNL, May 22, 2009.

that will be re-structured to contain the BELLA research and development program are presented in Figure 3 and the locations of these rooms with respect to the existing building first floor plan are shown in Figure 4.

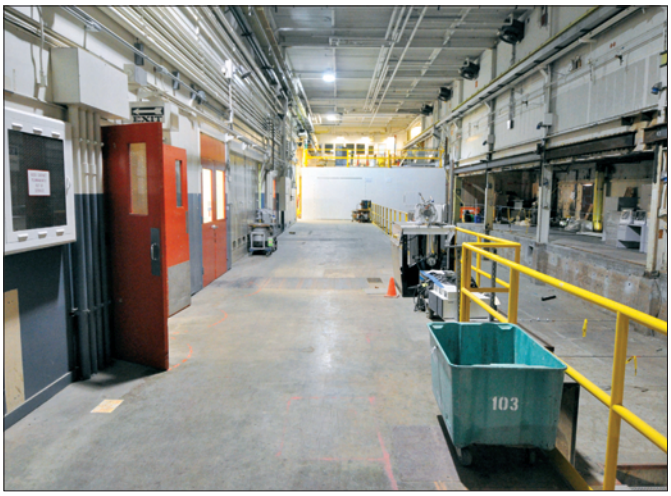
The active functions in this area that would be moved to different locations at LBNL include the Gould Research Group and LOASIS Electronics Support Shop. The Gould Research Group currently occupies approximately 1,500 square feet of space used occasionally for laser research, office, and equipment storage. This function would be moved elsewhere in Building 71 or to a different building to be determined. The LOASIS Electronics Support Shop occupies approximately 600 square feet of space used for assembly, testing, repair, and storage of electronics equipment. This function would be moved to a different location within the Proposed Action area. Equipment and materials remaining after the clean-out would be disposed of in accordance with LBNL recycling and excess materials policies and programs.

III.A.4.a.ii. Removal of Hazardous Materials

As part of the LBNL Environment, Health and Safety program, sampling and instrument surveys are conducted at various facilities, including Building 71, to characterize the types, locations, and degree of chemical or radiological contamination. Such monitoring would be continued at Building 71 during the Proposed Action. Potentially contaminated items would be screened and characterized based on their location and the associated degree of potential hazard. Other types of hazardous materials also could be encountered. For example, many surfaces to be demolished are painted with lead-containing paint. All disposable materials would be shipped by truck to previously identified and approved disposal sites. Trucks would be covered to prevent escape of dust or other material in accordance with LBNL standard operating procedures.

Approximately 10 percent of the shipments of materials generated by the Proposed Action would be expected to have some hazardous characteristics. Their selection and disposal, in line with LBNL Standard Operating Procedures, is discussed in more detail in Section IV.B.1, Hazards and Human Health.

A. Existing Room 195 to Become the Vestibule and Corridor



B. Existing Room 115 to Become the Experimental Cave

C. Existing Room 126 to Become the Staging Area and Assembly

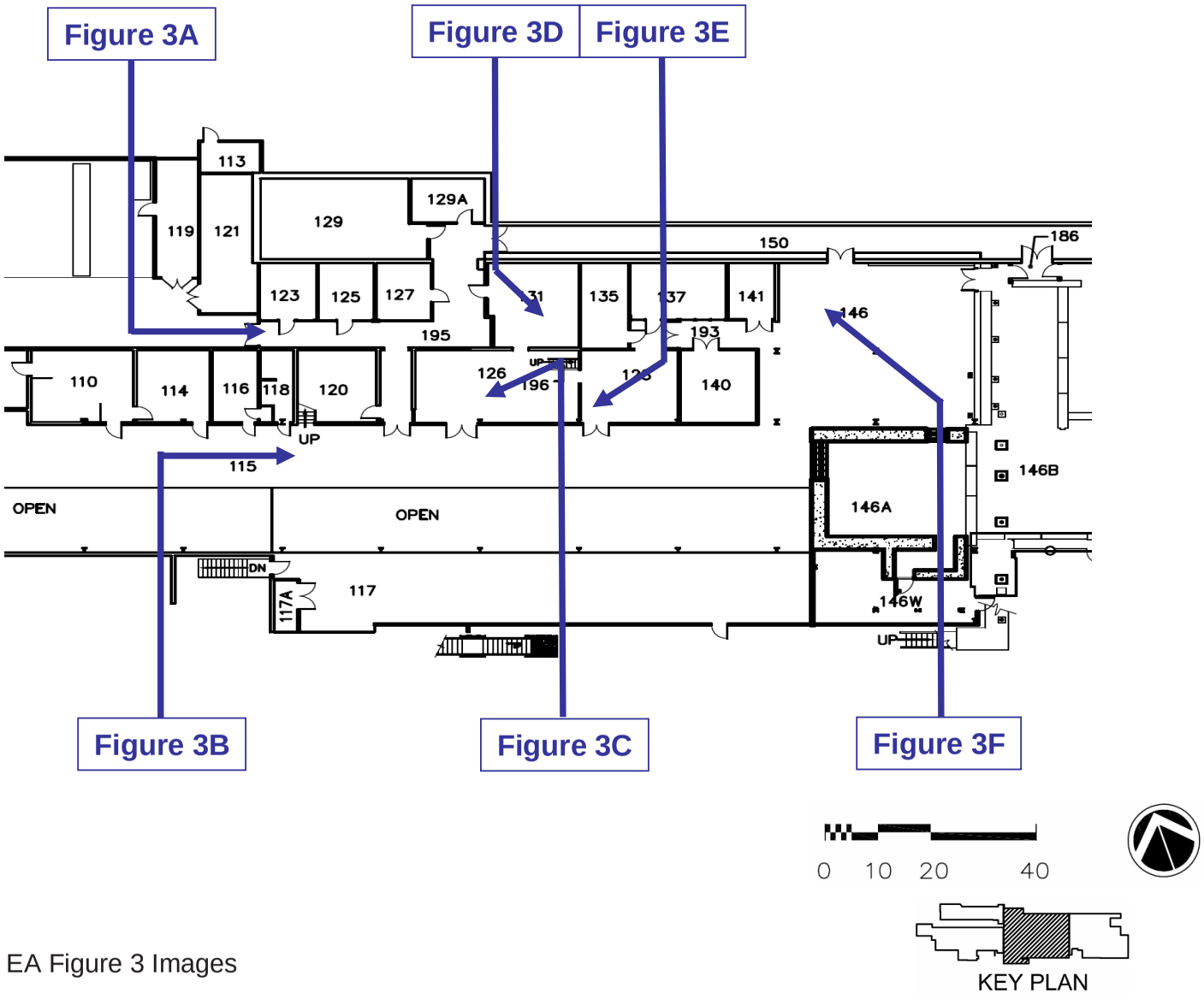
D. Existing Room 131 to Become the Wipe-down and Gowning Room

E. Existing Room 128 to Become Part of the Laser Room

F. Existing Room 146 to Become Part of the Laser Room

FIGURE 3

BUILDING 71 INTERIOR SHOWING LOCATIONS OF PROPOSED BELLA FACILITIES



Reference to BELLA EA Figure 3 Images

Source: LBNL

FIGURE 4

EXISTING PARTIAL FIRST FLOOR PLAN OF BUILDING 71

III.A.4.a.iii. Demolition for New Construction

Preparing Building 71 for the Proposed Action would require demolition of structural, non-structural, and mechanical systems. Demolition of all non-structural walls and selective demolition of concrete shear walls would occur within the designated area. Structural demolition would also include removal of two roof support columns and approximately 2,000 square feet of roof area to construct the Utility Room and a new stairwell. An all-new structural support system for the roof will be added during the New Construction phase. An existing shear wall would be demolished and replaced with a new shear wall designed to support the new Utility Room. Additionally, some existing slab-on-grade concrete floor would be demolished and soil removed to accommodate the new foundations for the concrete walls and ceiling of the Experimental Cave expansion. A Soil Management Plan is required for all excavations of soil at LBNL and would prescribe soil handling and sample collection procedures.

Mechanical systems and components requiring demolition would include all heating, ventilating, and air conditioning equipment, piping and ductwork, as well as fire and sprinkler process piping. Associated existing electrical equipment, panels, conduit, and wiring found throughout the area would also be demolished.

Systems and components would be disassembled using such means as pneumatic impact tools, saw cutting, and possibly torch cutting. The general sequence of demolition activities would be: (1) identification and isolation of building elements to be demolished; (2) removal of all hazardous materials; (3) demolition of the architectural, mechanical, electrical, and plumbing systems and components; and (4) segregation and disposal of the debris.

III.A.4.a.iv. New Construction

Construction of Proposed Action conventional facilities would begin approximately mid-2010 and end approximately late-2011 or 2012. Staging for construction would take place on the adjacent parking lot immediately west of Building 71.

The Proposed Action would require removal of approximately 100 cubic yards of soil to accommodate the footings of the Experimental Cave. New

structural support piles would reach a maximum of approximately 16 feet below floor level, all underneath the existing Building 71 footprint. The soil would be tested for the presence of contamination. If found to be contaminated, the soil would be kept in covered storage before being transferred to an appropriate off-site landfill. If found to be clean, some material could be stored on-site (provided space is available at that time) and used for dressing finished slopes and for use in landscaped areas. Clean soil in excess of requirements for on-site fill and landscaping would be hauled off-site to a landfill.

Groundwater entering the holes dug to form the structural support piles would be collected and tested for contaminants. If no contaminants are found, groundwater would be discharged to the storm drain. If contaminants are found, the groundwater would either be treated at the LBNL site and discharged to the sanitary sewer under the conditions of an existing East Bay Municipal Utility District permit or sent to an off-site facility that is permitted for disposing of contaminated groundwater.

The Proposed Action would not require the removal of any trees to accommodate construction activities. Additionally, no new impervious surface would result from the completion of the Proposed Action.

The construction of the Laser Room, Experimental Cave, Utility Room and all other support spaces included in the Proposed Action would involve standardized methods and materials and be performed in accordance with Standard LBNL specifications for code compliance, worker safety, and technical requirements.

On-site construction of the laser system, ancillary systems, and associated appurtenances would take place over an approximately year-long period, beginning approximately late-2011. The laser plasma accelerator system and the beam dump would be designed, built, and installed by LBNL scientific and engineering staff following laser system acceptance, beginning approximately late-2012.

III.A.4.a.v. Materials Disposition

The Proposed Action would include the removal of approximately 60 to 100 tons of reinforced concrete, structural steel, mechanical and electrical equipment, roofing, other building materials, and soil. The soil for removal would be excavated under a portion of Building 71's concrete building floor. Over 90 percent of the shipments of materials that would be generated by the Proposed Action would consist of non-hazardous debris and other items typical of building demolition proposed actions.

Approximately 100 total truck trips would be generated by the Proposed Action, based on the following approximations: 15 trips would transport concrete, soil, steel, and miscellaneous demolition debris for recycling and disposal (including one anticipated truck trip to a licensed hazardous waste disposal facility); 65 trips would transport construction materials to Building 71; and 20 trips would transport research and development equipment for the laser system, ancillary systems, and components associated with the accelerator. The combined truck trips would be temporary, with average weekly traffic during demolition, construction and the initial setup of the research and development equipment phases of the Proposed Action amounting to 1.5 trips per week. However, during the anticipated, one-week truck traffic peak period at construction mobilization, 1 truck trip per day is expected. On-site workers, who would number up to 30 per day, would be encouraged to carpool, although limited parking would be provided. In total, the generation of truck trips and traffic would be temporary, and occur at a level far below the significance threshold for LBNL-related traffic impacts.

All truck trips would follow prescribed truck routes and would comply with all relevant transportation and safety regulations and protocols. Low-level waste, hazardous waste removal, transport, and disposal would follow all applicable federal, state, and environment, health, and safety regulations and protocols.

III.A.4.a.vi. Staffing

Building 71 currently has approximately 60 occupants. Buildings 71, 71A, and 71B combined currently have approximately 75 occupants. When all of the 71-series trailers are included, the Building 71 Complex has approximately 120 occupants. Approximately 5 to 10 new staff and students would be added

to the LBNL employee population as a result of the Proposed Action. Staff would include scientific, technical, and administrative personnel and visiting scientists.

III.A.4.a.vii. Research and Development Operations

Proposed Action activities would include operation of the laser and the laser plasma accelerator for research and development. Prior to operations, LBNL will prepare, and DOE will review and approve, a Safety Analysis Document (SAD) and Accelerator Safety Envelope (ASE) in accordance with DOE Order 420.2B to ensure the facility's safe operation. Possible occupant exposure to hazards from radiation is discussed in Section IV.B.1 on Hazards and Human Health, including radiation exposure risk from the laser plasma accelerator.

III.A.4.a.viii. Decommissioning of the Proposed Action

Eventual decommissioning of the BELLA laser, laser plasma accelerator, and ancillary systems following the end of research and development at the facility may involve the removal of small amounts of low level radioactive waste which would be sent to an offsite DOE-approved disposal facility. All decommissioning and removal activities would follow all applicable Federal, State, and LBNL-specific regulations and protocols, and such activities would be overseen by appropriate Environment, Health, & Safety technical experts. Decommissioning and removal activities are expected to involve approximately the same level of activity (or less) than construction of the same Facilities under this Proposed Action.

III.B. Alternatives

In accordance with the National Environmental Policy Act (NEPA), Section 102 (2) (E), reasonable alternatives for the construction of the proposed project must be considered. These include a "No-Action Alternative" against which all the other alternatives and their impacts are compared. A discussion is also included on alternatives considered but rejected as infeasible.

III.B.1. No-Action Alternative

The "No-Action" Alternative would preclude efforts to build this experimental laser plasma accelerator system and would avoid any environmental consequences. This alternative would not meet the mission objective. If this technology is not developed it would not become an option to constructing and operating large, conventional accelerators to meet future needs.

III.B.2. Location Alternatives Considered but Rejected

Several alternatives for installing and operating the BELLA research and development program in other existing buildings that would be appropriate for use as an accelerator facility were considered. However, each of these options has its own drawbacks:

- Building 51, the former Bevatron accelerator location, is currently vacant and has historically housed accelerator work, but is not seismically safe. It is currently being demolished.
- Building 77 houses mission-critical engineering shops that would be displaced if BELLA were located there. Unlike Building 71, Building 77 was not originally built to house accelerators and lacks the proper building infrastructure, such as electrical capacity, that would be needed. In addition, this building currently is completing a major renovation designed to serve its intended engineering support function.
- Building 88 is the location of the 88-inch cyclotron, which is an active accelerator. However the building does not have adequate spare space for the Proposed Action.
- Building 25 currently is vacant and has historically housed accelerator work, but is not seismically safe. There are current plans for its demolition.

Environmental effects would in general be similar, if BELLA were built in any of these other buildings, as the construction would still be inside an existing building.

The option of constructing a new building for the Proposed Action was rejected on grounds of considerably greater cost. It also could be expected to

have greater environmental impacts due to extensive construction activities, including utility extensions, on land that currently is undeveloped.

Off-site locations such as leased space were also considered. These were rejected because vacant accelerator facilities in the area are uncommon, and a large perimeter around the building might have to be leased and secured to provide an equivalent amount of protection from potential risk of radiation exposure to the public.

III.B.3. Design Alternatives

The LOASIS group within the Accelerators and Fusion Research Division (AFRD) at LBNL has spearheaded the development of the Proposed Action starting in 2007. During that period, they investigated several laser plasma accelerator design alternatives to meet the mission objective.

The proposed configuration is a new high-repetition rate petawatt-class laser system that would be procured from private industry. This was found to have the lowest technical risk, the lowest initial cost, and the highest value in terms of resulting research capability for the expenditure. This alternative maintains all existing LOASIS research capabilities and provides a new tool to advance the scientific program for laser plasma accelerators for years to come. The following three alternative designs were considered and compared to the chosen design but rejected for the reasons described.

- A pump laser technology using Nd:glass instead of the conventional high-repetition rate Nd:YAG systems was explored. Up to ten of these systems would be needed and new technology would have to be developed to avoid damaging the laser amplifiers. The estimated cost of this alternative laser system is more than three times higher than the proposed configuration cost.
- A 10x scaling of an existing Chirped Pulse Amplifier system with off-the-shelf pump laser technology would require approximately 120 pump laser units. The optical layout, management of beam paths, and utility distribution of these pump lasers would result in an extremely complex, logistically unmanageable system, and would require a space about 4-times larger than the proposed laser system.

- Upgrading the existing TREX laser in Building 71 to the equivalent power output would result in approximately three years of down time for this system and prevent LOASIS from meeting mission-critical research commitments. Also, the existing TREX front-end is 14 years old and would need replacement to maintain reliability. Effectively, the cost savings would be minimal at best and the loss to research capabilities would be extensive.

As no reasonable design or location alternatives exist, this EA evaluates only a No-Action Alternative in addition to the Proposed Action.

IV. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

IV.A. Issues Determined not to Warrant Further Discussion

The Proposed Action, the acquisition and installation of the BELLA laser and laser plasma accelerator and the operation of the laser and laser plasma accelerator for research and development, would occur almost exclusively within existing Building 71. In general, issues concerning the installation are minor as the demolition and construction work is largely confined to the internal remodeling of an existing building which would restrict any environmental consequences. Most construction equipment would be located inside the building. Construction staging would take place on an existing paved area. The Proposed Action would therefore not measurably affect any biological resources (including wildlife and habitats, threatened or endangered species, surface water, wetlands, floodplains, rivers, forests, farmland or other natural resources) during construction or operation.

The Proposed Action would improve Building 71's ability to withstand a seismic event. The active Hayward Fault, a branch of the San Andreas Fault System, runs from northwest to southeast along the base of the hills at the western boundary of LBNL. The inactive Wildcat Fault traverses the site from north to south along the canyon at the Laboratory's eastern edge. Work completed in 2009 restored the seismic stability of the building to standards for safe occupancy and the conduct of operations.[5] The Proposed Action would further enhance the structural system supporting the Utility Room to meet current building codes for seismic stability.

A portion of the slope to the northeast of (but not adjacent to) the Proposed Action area is of "medium risk" for slope instability occurring at some point in the future. From time-to-time, there are small, shallow surface slides that deposit soil and rock on the roadway separating Building 71 from the hillsides to the north and east, but these cause no damage to the building. Deposits

[5] Categorical Exclusion (CX) Determination for Building 71 Seismic Improvement and Modifications, Lawrence Berkeley National Laboratory. LB-ER-08-4. December 7, 2007.

from these surface slides are easily removed and the vacated hillsides are typically filled in with retaining wall rock to prevent further erosion. As such, the hazards to Building 71 or the Proposed Action from soil and rock sliding off of the adjacent hillside are not considered substantial.

Relevant issues resulting from demolition/construction and operation of the equipment to conduct research and development activities are discussed further below. Information on existing environmental conditions is taken from the LBNL 2006 Long Range Development Plan (LRDP) and/or the LNBL 2006 LRDP Environmental Impact Report (EIR) except where otherwise stated.

High electric fields would be produced by the interaction of the laser with the plasma in the accelerator chamber/tube. The electrical fields are contained within a metal housing, a configuration known as a Faraday cage. The electromagnetic field outside the cage would be equivalent to the field generated by a 1-watt light bulb and should not be an issue of concern for personnel or the public.

There is no evidence or expectation that the BELLA Project would contribute to the EMF levels within Building 71 or the surrounding area. No new power lines are being constructed as part of the BELLA project. Electrical power for Building 71 is fed from LBNL's substation located southeast of the building, in the opposite direction from the nearest residences. The existing power lines serving Building 71 are underground. LBNL scientific apparatus is highly sensitive to electrical fields and distortion. To allow the instruments to operate successfully, the power distribution system is designed and constructed to prevent interference from ELF (extremely low frequency) electromagnetic fields, and harmonics. The project would therefore have sensing/tripping devices, grounding, and shielding in accordance with all applicable safety codes and standards. This would supply protection in excess of that necessary for protection of human health.

IV.B. Issues for Further Discussion

IV.B.1. Hazards and Human Health

The Proposed Action would present potential hazards during the demolition phase and from operation of the BELLA laser and laser plasma accelerator for research and development. These hazards have been identified and are equivalent to those encountered on other conventional construction projects and other accelerator operations at LBNL.

The Laboratory has policies and procedures to address and minimize such hazards. LBNL hazard prevention and mitigation policies and procedures are defined in the Laboratory's Health and Safety Manual, Publication-3000.[6] During demolition, any hazardous materials would be managed in accordance with LBNL Standard Specifications 026113-Excavation and Handling of Contaminated Material, 13281-Asbestos Abatement, and 13282-Lead Abatement. A licensed asbestos abatement professional would remove, and contain, any asbestos- and lead-containing materials, a process to be overseen by asbestos-certified LBNL staff. All hazardous and radioactive wastes will be disposed of by the LBNL Waste Management Group in accordance with LBNL procedures at properly licensed and permitted facilities.

IV.B.1.a. Prevention of Chemical and Radioactive Release During Demolition

A screening survey was conducted to determine if hazardous materials are present in the sections of Building 71 to be affected by the Proposed Action. This screening survey followed the LBNL Environment, Health and Safety (EHS) program sampling protocol for chemical and radiological contamination. Any radioactive materials were identified and classified following volumetric sampling and external radiation measurements using survey instrumentation and swipe samples, as appropriate, per DOE sampling protocol defined in DOE Order 5400.5 Radiation Protection of the Public and the Environment.

[6] http://www.lbl.gov/ehs/pub3000/ accessed May 19, 2009.

Surfaces that are newly-exposed during demolition and thus not screened in the original survey, such as the under-side of cabinetry, will be screened for chemical and radiological contamination. Any contamination discovered during demolition activities is anticipated to be localized and in trace quantities. Decontamination is not anticipated to involve any risk of releases to the environment.

The following hazardous materials are known or are likely to be present in the Proposed Action area:

- *Asbestos.* Building 71 was built at a time when asbestos was common in construction materials. Various types of lung cancer and other serious health problems are attributed to asbestos fibers, which may become airborne when disturbed. Inhalation of airborne fibers is the primary mode of asbestos entry into the body, making friable (easily crumbled) materials the greatest health threat. The screening survey has shown that the floor tiles, tiling mastic, and sheetrock compound in the area contain asbestos.
- *Lead.* The architectural and structural elements of Building 71 to be demolished as part of the Proposed Action, and any settled dust, are assumed to be coated with lead-based paint. Lead is a hazardous neurotoxin that accumulates in soft tissue over time and may cause serious blood and brain disorders. The sheet vinyl flooring is known to contain lead.
- Beryllium. Beryllium has a direct corrosive effect on tissue, and it is also capable of producing a chronic life-threatening allergic disease called berylliosis in susceptible persons. Beryllium was detected in an existing cabinet during the screening survey and was cleaned in accordance with LBNL standard procedures. The area has since been re-sampled and no beryllium found above acceptable levels requiring mitigation defined in the LBNL EH&S Manual PUB-3000.
- Poly-Chlorinated Biphenyls (PCBs). The demolition component of the Proposed Action would include removal of some existing Building 71 electrical equipment including transformers, switchgear, distribution panels, conduit, wiring, and lighting. The transformers and lighting bal-

lasts could contain PCBs which are known to cause cancer in animals and a variety of immune, reproductive, nervous, and endocrine system problems in humans. All known PCBs have been removed from Building 71, so the risk of encountering additional PCBs is very low.

♦ *Radioactive Materials.* The Building 71 complex housed the Super HILAC and associated support facilities. The Super HILAC has not been in operation since 1993. As a consequence of this historic operation, several instances of low-level surface radioactivity[7] have been detected on existing Building 71 equipment. This radioactivity includes the following:

- Americium-241 has been found in trace amounts on the outer surface of a 3-foot section of fire sprinkler piping and on legacy experimental equipment. Americium is a synthetic, radioactive element most commonly used as a source of ionizing radiation in household smoke detectors.
- Cesium-137 has been found in trace amounts on legacy experimental equipment and on the floor in the former experimental areas.
- Curium-244 is known to have been released in an incident in July, 1959, after which the building was closed for decontamination and contaminated parts of the structure removed.[8] Extensive sampling and surveys have been performed since that time, the most recent being in April 2009, and no additional Cm-244 contamination in excess of DOE-established release limits has been identified.

IV.B.1.b. Radiation from Laser Plasma Accelerator Operation and Radiation Monitoring Systems

The Proposed Action would accelerate electrons in a laser plasma accelerator to an energy level of 10 GeV. When the electron beam terminates in the beam dump, its energy would be converted to radiation in the form of gamma-rays, neutrons, and photomuons. The system and infrastructure would be designed to absorb the electron beam radiation to a level where a

[7] Lower than the radioactivity found in a common home smoke detector

[8] Summary of Radionuclide Investigations for LBNL Environmental Restoration Program, September 2003. Online at http://www.lbl.gov/ehs/erp/assets/pdfs/RadionuclidePDFfinal.pdf.

full-time worker positioned outside the Experimental cave at the point of highest exposure (next to the beam dump) would receive less than 20 percent of the radiation allowed by the regulatory limit over the course of the year. Since radiation levels diminish by a factor of four as distance from the source doubles, there is no foreseeable risk of radiation exposure above regulatory limits outside of Building 71 and the Laboratory site boundaries.

Several features of the system design would minimize personnel exposure to radiation. Limited access, engineered interlocks, and safety controls would prevent accelerator operation while the Experimental Cave was occupied. The Experimental Cave concrete wall would be 3 feet thick at the west end where the electron beam would terminate. There would be an additional 16 inches of lead, 36 inches of steel, and another 6 feet of concrete to absorb the radiation and reduce exposure levels outside the Experimental Cave for LBNL personnel in accordance with 10 CFR Part 835, *Occupational Radiation Protection*. The north and south walls and the roof that are perpendicular to the electron beam direction would be 18 inches thick. The Experimental Cave would be located directly above solid ground so human exposure to radiation below this room would not be possible.

Active radiation monitors outside the shielding (wall and roof) would be installed to confirm the performance of the shielding. There is already a radiation monitor outside Building 71, which is part of the LBNL system.[9] These features would ensure that radiation doses to workers and the general public are maintained below regulatory limits, which are 5 rem per year for trained radiation workers[10] and 100 mrem (0.1 rem) per year for members of the public.[11] The administrative procedures, shielding design, and monitoring/shutdown systems incorporated within the Proposed Action would ensure compliance with 10 CFR Part 835, *Occupational Radiation Protection* for radiation exposure and DOE Order 5400.5. LBNL's commitment is to use

[9] The location of the monitoring system is in the Site Environmental Report, available online at: http://www.lbl.gov/ehs/esg/Reports/tableforreports.htm.

[10] Title 10 CFR, Part 835-Occupational Radiation Protection.

[11] United States Department of Energy, Order 5400.5, Radiation Protection of the Public and the Environment.

As Low As Reasonably Achievable (ALARA) to ensure that doses to workers and the public are kept well below regulatory limits.

IV.B.1.c. Potential Eye Injuries from Laser Use

The hazard of greatest concern when using lasers of this type is eye safety. Exposure to direct or reflected beam can cause eye injury, skin burn, or ignition of clothing. The dangers would be reduced through use of optical shielding, physical beam controls, and administrative measures. Administrative measures include national standards, such as American National Standards Institute (ANSI) Z136.1, and procedures outlined in the EH&S Manual (Pub 3000, Chapter 16 – Lasers), as well as site-specific reviewed and approved operating procedures (an Activity Hazard Document). The Proposed Action would implement precautionary protocol with respect to eye safety, which would minimize human health risks.

IV.B.1.d. Fire and Explosion Risk from and to the Operating the Laser Accelerator

The risk of fire and/or explosion from operating the BELLA laser and laser plasma accelerator is essentially the same as that from any other piece of manufacturer-built electronic research equipment. The equipment is constructed to operate safely and to withstand repeated use and a variety of operating conditions. There would be no flammable material in the path of the laser beam or the electron beam. The fire sprinkler system serving the area which encompasses the Proposed Action would be upgraded to meet current fire safety codes. Consequently, there would be no change to the risk from fire and explosion as a result of the Proposed Action.

The proposed undertaking does not increase the likelihood, or the potential environmental consequences, of a wildland fire at LBNL. Extensive site-wide measures are in place at LBNL to minimize the risks associated with wildland fire, including: a vegetation management program; an on-site fire department; three 200,000-gallon water tanks for continuous fire-suppressive water pressure even in event of an earthquake; adherence to fire codes and sprinklerization in construction projects; inclusion of automated shut-off valves for natural gas lines; and emergency training and procedures for all on-site personnel. For further details, please refer to section 1.2.5 of the Site Environmental Re-

port[12] and Section IV.F of the LBNL 2006 Long Range Development Plan EIR. The goal of vegetation management is to minimize wildfire damage to structures. The purpose of these vegetation management (fuel reduction) efforts is to substantially reduce the intensity of any future fire storm. As a result, Laboratory buildings would more likely survive such a fire, and the lower-intensity fire conditions at the Laboratory would allow regional fire fighters to suppress the flame front so that it would not proceed to the west of the Laboratory. The above-mentioned fire protection measures are not affected by the individual or cumulative effects of the Proposed Action, which would take place within an existing building, bring about 5 to 10 new personnel to Building 71, and include the storage of only small amounts of cleaning solvents in the building.

IV.B.1.e. Compressed Gases and Cryogenics

The laboratory procures a wide variety of research-grade gases from commercial vendors on a regular basis. LOASIS would procure hydrogen in cylinders in this manner for the BELLA research program. Hydrogen is used to fill the laser plasma accelerator chamber. Liquid nitrogen is used in the laser. Compressed gases are routinely and safely employed at LBNL. The use of compressed gases is subject to the requirements of Pub 3000, Chapter 7, Pressure Safety & Cryogenics, and Chapter 13, Gases.

IV.B.1.f. Chemicals Used During Operation

The quantity of the following optical surface cleaning solvents stored for use during operations by the BELLA research and development program is anticipated to be less than 1 gallon each: methanol, ethanol, isopropyl alcohol, and acetone. Due to the limited quantities of these chemicals, there would be no adverse impacts related to toxic waste generated as a result of the Proposed Action.

IV.B.1.g. External Radioactive Sources Used During Operations

Operations during the Proposed Action would include the handling of small amounts of radioactive materials in sealed sources used for calibrating safety

[12] The latest report (2007) can be found online at: http://www.lbl.gov/ehs/esg/Reports/tableforreports.htm.

monitoring devices, the use of which is governed by LBNL standard operating procedures. Existing sealed sources currently used by the LOASIS program would be used for the Proposed Action operations. No new sealed sources are anticipated to be added to the building as a result of the Proposed Action. Also, no additional sources of radiation would be used in conjunction with the laser plasma accelerator. (For example, there would be no use of targets in the electron beam path.)

IV.B.2. Hydrology, Water Quality and Soil

Low levels (tens of micrograms per liter) of various volatile organic compounds (VOCs) are present in groundwater emanating in a historic plume from Building 71B. However, this is downgradient of the BELLA construction site.

Radioactive curium-244 was released to the environment accidentally in 1959 as a result of research activities being conducted within Building 71 at that time. Curium-244, which has a half-life of approximately 19 years, was found at very low levels (maximum activity of 2.6 pCi/g) in soil around the building during investigations in 2003. Analysis of groundwater samples taken from around Building 71 in 2003 did not detect measurable levels of curium-244. As a result, the DOE approved a No Further Action (NFA) status for the radiation release.[13] Approval of NFA status provides that no additional environmental investigations are required for this event under the Resource Conservation and Recovery Act-related corrective action process.

Holes dug to construct drilled piers to support the Experimental Cave walls and roof would reach a maximum of approximately 16 feet below floor level. A Soil Management Plan is required for all excavations of soil at LBNL and would describe soil handling and sample collection. For BELLA, the removed soil would be sampled and analyzed for hazardous substances such as: VOCs, toxic metals, PCBs, gross alpha/beta-radiation, curium-244, cesium-137, and americium-241. If found to have no more than naturally-occurring

[13] Summary of Radionuclide Investigations for LBNL Environmental Restoration Program, September 2003, online at http://www.lbl.gov/ehs/erp/assets/pdfs/RadionuclidePDFfinal.pdf.

radioactivity levels, the soil would be used at LBNL as needed or disposed of in an appropriately-licensed commercial landfill. If found to contain contamination above regulatory levels, the soil would be stored in a covered on-site area before being transported to appropriate offsite facilities.

IV.B.3. Energy Use and Greenhouse Gases

IV.B.3.a. Electricity

LBNL purchases electrical power from the Western Area Power Administration (WAPA), and it is delivered to LBNL by the Pacific Gas and Electric Company (PG&E). PG&E delivers electricity via the on-site Grizzly Substation through two overhead transmission lines with a total capacity of 100 Megawatts. A secondary source, the UC Berkeley's Hill Area Substation, provides power as a backup in the event of a power failure from the primary source. According to the LBNL Energy Manager, 70,458 megawatt hours (MWh) of electrical energy was consumed at LBNL in 2008 with a maximum demand of approximately 13 megawatts. The existing infrastructure would allow a maximum of 50 megawatts with complete system backup.

As a result of the Proposed Action additional electrical energy would be consumed by the laser system, chiller, air handling units, analytical equipment, the cooling tower, and lighting. In total, the new electrical energy usage is projected to range from 500,000 to 600,000 kilowatt hours per year, less than a one percent increase in the Laboratory's annual electrical consumption. As Building 71 was originally built to house accelerators, the building infrastructure is already suitable to handle loads five times greater than those that would be required for the Proposed Action. Therefore, the Proposed Action would not be expected to cause an adverse impact to the electrical supply and distribution system.

IV.B.3.b. Natural Gas

Natural gas for the Proposed Action would be used for space heating. Natural gas at LBNL is purchased from the Defense Fuel Supply Center and is delivered by PG&E through a 6-inch high-pressure pipe system. This system connects to the LBNL distribution system at a meter vault near the Laboratory's Blackberry Gate. The LBNL distribution system consists of 4- and 6-inch high pressure lines that are all equipped with earthquake emergency

shut-off valves and pressure reducing stations. In 2008, approximately 1.8 million therms of natural gas were consumed at LBNL. Additional natural gas usage as result of the Proposed Action is projected to range from 15,000 to 17,000 therms/year, less than a one percent increase in LBNL's annual natural gas consumption.

The existing supply and distribution infrastructure for natural gas would be adequate to accommodate the Proposed Action, and therefore DOE does not expect an adverse impact to the natural gas supply and distribution system.

IV.B.3.c. Renewable Energy Sources

Three percent of the energy at LBNL is purchased from green energy sources, as defined by DOE. In addition, approximately 20 percent of the purchased power at LBNL is generated by hydro-electric plants. There is a commitment at LBNL to increase the purchase of energy from green energy sources to 7.5 percent beginning in 2010 and into the foreseeable future.

IV.B.3.d. Greenhouse Gases from Energy Use

Greenhouse gas (GHG) emissions would be generated as a result of the additional electrical energy and natural gas consumption described above. New GHG emissions would total approximately 480 metric tons of carbon dioxide equivalents ($MTCO_2e$) annually according to DOE calculations.[14] This additional GHG emissions contribution would be less than a one percent increase over 2008 LBNL emissions of $MTCO_2e$ for electricity and natural gas. In addition, it represents 0.6 percent of comparable electricity and natural gas GHG emissions from neighboring UC Berkeley, emissions that totaled 71,913 $MTCO_2e$ in 2007.[15] This additional amount of GHG emissions that would result from the Proposed Action is not substantial relative to the amount of GHG emissions currently generated by LBNL, UC Berkeley and the surrounding region, and DOE does not expect an adverse impact to result.

[14] US Department of Energy EMS-4 (Energy Monitoring System).

[15] University of California, Berkeley, *UC Berkeley 2020 Long Range Development Plan Amendment and LRDP EIR Addendum to Address Climate Change*, June, 2009.

IV.B.4. Other Utilities

IV.B.4.a. Water

Water service at LBNL is distributed and supplied by the East Bay Municipal Utility District (EBMUD). Water enters through a gravity-fed, loop distribution system that enables water operations to continue through water system maintenance activities. In addition to this distribution system, three 200,000-gallon water tanks are maintained at LBNL to supply water in the case of an emergency. Less than 10 percent of the water capacity at LBNL was consumed in 2008.

The Proposed Action would increase water usage at LBNL by less than one percent with most of this consumption due to the operation of the cooling tower. There would also be a marginal increase in personal water demand as there would be a slight increase in new employees at LBNL resulting from the Proposed Action. Overall, the Proposed Action would not be expected to adversely affect water supply and distribution systems.

IV.B.4.b. Solid waste

The demolition phase of the Proposed Action would entail the removal of 60 to 100 tons of construction waste, including reinforced concrete, structural steel, mechanical and electrical equipment, roofing, other building materials, and soils. Approximately 10 percent of these materials is anticipated to have hazardous characteristics, and the disposal of these materials is discussed in Section IV.B.1, Hazards and Human Health, of this chapter.

The other 90 percent of the demolition materials would be disposed of by the contractor according to the standard operating procedures defined in LBNL Standard Specification Section 017419-Construction Waste Management. Prior to the start of demolition, landfills would be consulted to ensure that sufficient capacity is available to accept the amount of waste generated by the Proposed Action. DOE anticipates no adverse impacts to landfill capacity from disposal of the non-hazardous Proposed Action construction debris.

Non-hazardous items removed during demolition would be reused and recycled as much as practicable. Any active functioning equipment in Building 71

that would need to be removed would be relocated for future use. Equipment that is beyond its useful life would be disposed of according to the LBNL recycling and excess materials policies and programs. All recyclable materials, including metals, would be screened for hazardous materials pursuant to DOE specifications and delivered to appropriate recycling centers according to the LBNL standard operating procedures. The disposal of scrap metals would be subject to the DOE Metals Moratorium. Concrete may be sent to commercially operated locations throughout the region to be broken into rubble for use as fill in other construction projects and road building.

Non-recyclable, non-hazardous materials removed from the site would be segregated and taken to a landfill such as the Altamont Landfill in Livermore, California. The 80 to 100 cubic yards of soil that would be removed to construct the Experimental Cave drilled piers would be stockpiled at LBNL for use in dressing finished slopes and landscaping on-site if possible, or otherwise hauled to a landfill. The soil would first be tested as described in Section V.B.2, Hydrology, Water Quality and Soil.

Even if nothing were sent for recycling and reuse, the quantity of demolition materials and the soil would not be expected to substantially affect Altamont Landfill capacity. Therefore, the Proposed Action would not adversely impact solid waste disposal systems.

IV.B.4.c. Wastewater

The LBNL sanitary sewer system connects to the City of Berkeley's public sewer system and flows to the EBMUD treatment facility in Oakland, California. To do this, effluent from Building 71 flows through the sewer main on Hearst Avenue.[16] This connection is functioning within capacity.

The sewage system is at highest capacity during wet weather conditions, because ageing sewer infrastructure can collect stormwater runoff. Sanitary sewer infrastructure at LBNL has been replaced over the last 15 years and has reduced discharge volumes by 50 percent. The peak daily flow of wastewater

[16] Facilities Division, Lawrence Berkeley National Laboratory, University of California, 2006, *2006 Long Range Development Plan*, page 83.

from LBNL during wet weather was approximately 821,000 gallons per day (gpd) in 2006. The peak is anticipated to grow to 893,000 gpd by 2025, which is within the capacity of the existing wastewater system and leaves additional capacity for future growth.[17] Therefore, DOE would not expect the Proposed Action to adversely impact wastewater infrastructure and treatment capacity.

IV.B.5. Visual Quality

Building 71 is one of several buildings at the northwestern portion of the LBNL site (Figure 1). Surrounding land uses include residential uses to the north of the LBNL property line near Grizzly Peak Boulevard; and LBNL buildings to the south, east, and west, including the Bevatron, which is currently being demolished.

Building 71/71A is a complex of low-lying, grey, interconnected box-like structures (Figure 2). Building 71B is a separate structure south of 71/71A. A variety of trailers (Building 71 trailers) are located to the south of Building 71 and west of 71B. A one-lane paved road runs along the north of the building complex.

Building 71 sits on a plateau with a general downslope view. As shown in Figure 5, the Proposed Action site is surrounded by parking areas, roadways, other LBNL research structures, and an undeveloped hillside. The associated parking areas immediately west of Building 71 would be used as a staging area for construction. The area directly upslope from Building 71, to the north and east, is vegetated with tall trees, mostly clusters of Eucalyptus and some Oak trees, and grassland. Close-up views of the Building 71 roof (Figure 6) show corrugated metal, grey roofing materials, wooden stairs and metal piping.

Building 71 is located in a portion of Blackberry Canyon that is partially visible from nearby private single-family residences to the north. To the west of the Lab are residential neighborhoods, comprised of single- and multiple-

[17] Facilities Division, Lawrence Berkeley National Laboratory, University of California, 2006, *2006 Long Range Development Plan*, page 84.

FIGURE 5

VANTAGE POINTS OF BUILDING 71 ROOF MODIFICATIONS AND CONSTRUCTION STAGING AREA

A. Building 71 roof area to be altered

B. Building 71 roof area to west showing variety of existing roof structures

FIGURE 6

VIEWS OF BUILDING 71 ROOF

family homes. The nearest residences to the location of BELLA within Building 71 would be approximately 590 feet (180 meters) to the northwest on Campus Drive and Olympus Drive, with one structure as close as 570 feet (174 meters). The edge of the Lawrence Hall of Science parking lot would be approximately 728 feet (220 meters) to the east.

Views of Building 71 and the staging area would be available from medium-range distances (Figure 7) although, due to the topography and the presence of many large trees, there are limited and filtered public viewpoints of the Proposed Action site. Figure 5 marks vantage points 1 through 3 from the hillside above Building 71. A description of the views available from each vantage point is described below:

- Vantage Point 1 looks over the hillside from northwest of the Lawrence Hall of Science parking lot and provides limited views of the roof on Building 71, through and between clusters of trees.
- Vantage Point 2 offers limited views of the roof from the western edge of the plaza at the Lawrence Hall of Science.
- From Vantage Point 3 near Olympus Avenue, the line of sight of the roof and the staging area is blocked by a dense stand of existing eucalyptus trees and views are not therefore available.

Approximately 7,000 square feet of the existing 53,700-gross–square-foot two-story building interior space of Building 71 would be gutted and remodeled, leaving the footprint of the existing structure intact. The Proposed Action would result in two additional structures on the roof, the Utility Room and the stairwell, (Figure 2) and approximately two or three new rooftop air handling units. Construction activities affecting the roof would be temporary, lasting approximately three months. Although the equipment and Utility Room would slightly alter the appearance of the Building 71 roof, these features are not expected to substantially alter or degrade the existing viewshed.

The Utility Room would be approximately 60 feet long by 20 feet wide and 10 feet high. This height would be the same as the roofs to the south, east, and north to be consistent with the existing roof contours. The stairwell would be of varying height up to 10 feet. The Utility Room and stairwell

A. Vantage Point #1

C. Vantage Point #2

D. Vantage Point #3

FIGURE 7

VIEWS FROM SELECTED VANTAGE POINTS LOOKING TOWARDS BUILDING 71

would be built in the same architectural style and color as Building 71 in order to diminish its visual impact. The new rooftop mechanical equipment would be similar to existing equipment being demolished. These improvements would blend in with the existing roofing materials and the addition of these roof elements would not be expected to substantially change the existing viewshed or views of the building.

IV.B.6. Air Quality

The Bay Area as a whole does not meet State or federal ambient air quality standards for ground level ozone (O_3) or State standards for particulate matter (both particulate matter greater than 10 microns in diameter, or $PM_{10,}$ and particulate matter between 2.5 and 10 microns, or $PM_{2.5}$). Because of this, projects that would generate O_3 precursors, or considerable dust or other sources of particulates, are under increased agency scrutiny.

Demolition and construction included in the Proposed Action would be almost entirely within the existing building shell. Therefore the majority of the dust generated by demolition would be contained. An exception to this would be a period of around one week when a hole would be cut through the metal and concrete roof for the construction of the rooftop additions such as the Utility Room and stairwell. LBNL Standard Specification Section 024116 – Structure Demolition, would be enforced to restrict the amount of dust to minimal levels.

Ventilation air that is warmed in the process of maintaining temperature control would be exhausted from the Utility Room and from the rooftop HVAC air handlers serving the interior spaces. This is not expected to cause any adverse consequences and therefore the operational impacts to air quality would be minor.

Another source of emissions would be temporary diesel emissions from trucks traveling to and from the site during the construction period. As indicated in Section III.4.a.v, Materials Disposition, approximately 100 total truck trips would be generated by the Proposed Action. The combined truck trips would be temporary, with average weekly traffic during demolition, construction and the initial setup amounting to 1.5 trips per week, or less than

one trip per day. During the anticipated, one-week truck-traffic peak period at construction mobilization, one truck trip per day is expected.

The Laboratory considered the health impacts from air emissions exhausted from heavy-duty diesel powered vehicles traveling through the streets of Berkeley when it conducted its human health risk assessment for its 2006 LRDP and EIR. As part of this assessment, LBNL modeled its bus routes around campus and through downtown Berkeley for both existing conditions (i.e. year 2000) and future year LRDP conditions. The Laboratory's buses are in a comparable class of vehicles for emissions analysis purposes as trucks expected to visit the site during construction of the Proposed Action. The diesel particulate matter emissions from both types of vehicles are comparable and any differences are considered minor.[18] The ensuing risk results from the LBNL bus route modeling therefore serve as a reliable indicator of the risk that could be expected from construction vehicles traveling through Berkeley as well.

Two adjustments were made to the modeling to ensure that the outputs were useful in terms of assessing adverse health effects from diesel emissions. The first adjustment involved exposure duration. For the human health risk assessment, all off-site receptors, including sensitive receptors, were assumed to be exposed to the predicted diesel particulate matter concentrations for essentially 70 continuous years (i.e. 350 of 365 days each year). This follows standard industry risk assessment methodology. In the case of construction traffic for the Proposed Action, the exposure duration would be considerably less at 18 months, which is 2.1 percent of the 70-year time period.

The second adjustment relates to the daily activity level of heavy-duty diesel-powered vehicular traffic. The risk modeling of the Laboratory's bus route assumed approximately 100 round trips per day. Truck traffic estimates for the Proposed Action are one trip per day for a one-week peak period, but otherwise 1.5 truck trips per week, on average. Therefore, the volume of truck traffic during the 18 months of construction for the Proposed Action

[18] Emission estimates along the bus routes were derived using the California Air Resources Board's most recent EMFAC model.

would be approximately 1 percent of the volume that was modeled for the Lab's health risk assessment.

The maximum estimated risk under the 100 round trips a day scenario was approximately 25 in 1 million (.0025 percent). In that truck trip volume would be one percent or less of the volume modeled under the health risk assessment, the health impact due to diesel emissions would be much less than the cancer risk significance threshold of 10 in 1 million. In addition, these trips would be temporary in nature and would cease following completion of facility preparation activities. During ongoing operation and maintenance of the facility, truck trips to the site would be even fewer and limited to those required for maintenance and certain deliveries. As a result, diesel emissions from truck trips during construction would not be expected to cause adverse health effects.

IV.B.7. Noise

For construction and demolition projects at LBNL, the University voluntarily observes whether City of Berkeley and the City of Oakland noise ordinances would be exceeded. These noise ordinance limits identify the maximum permissible noise at receiving property lines, although these ordinances do not legally apply to LBNL. The closest houses in the City of Berkeley are in a residential area zoned R-1H for which the daytime noise level limit (7 a.m. to 11 p.m.) at the property line is 55 dBA[19] for stationary source, not to be exceeded for more than 30 minutes of any hour. The maximum acceptable noise level for mobile equipment, including construction vehicles that would travel to and from the Proposed Action site, is 75 dBA.

Proposed Action-generated construction noise levels would be at their maximum during the period of approximately one week when a hole would be cut through the metal and concrete deck of the roof for the construction of the rooftop additions. The work would usually be performed during business hours on weekdays. However, construction work might occasionally take

[19] The unit of measurement is A-weighted decibels, which de-emphasizes lower frequencies and over-emphasizes higher frequencies in a way that corresponds to the sensitivity of the human ear.

place during the weekend. Overall, the construction noise is expected to be well below the 55 dBA (and 75 dBA for mobile construction noise) specified by the City of Berkeley at the border fence between the UC Berkeley land and City of Berkeley residential neighborhood, and well within City of Oakland property-line noise limits.

The loudest conceivable exterior construction noise for BELLA – jack hammering – would reach approximately 88 decibels, and this activity would likely last for only a few hours in total. At the nearest residence, approximately 570 feet away, that sound level would be expected to attenuate to approximately 64 or fewer decibels. That would be well below the Berkeley Noise Ordinance R-1 threshold of 75 decibels for construction and demolition noise during normal business hours.

Building 71 already contains several external noise-producing fixtures, most notably the cooling towers and associated primary and secondary treated water pumps. In addition, rooftop, packaged air conditioning units operate as needed, and exhaust fans and built-up air handling units operate continuously to serve the HVAC needs of the building.

The 2006 LRDP EIR included a noise measurement of 60 dBA for the Leq[20] taken at Building 71 (not at the residential property line) in 2003-4. Assuming this noise level at the building, the noise measurement at the City of Berkeley property line nearest to Building 71, approximately 448 feet away, would be substantially lower and within the City of Berkeley property-line noise limit. The City of Oakland property line nearest to Building 71 is even farther away. Noise at the City of Oakland property line, assuming noise of 60 dBA at Building 71, would also be within the City of Oakland property line noise limit.

New sources of external noise associated with the Proposed Action would consist of air handling units on the roof and laser support equipment in the Utility Room. Inside the Utility Room, there would be rack-mounted laser

[20] Leq is the equivalent steady-state noise level over a one-hour period produced by the same noise energy as the variable noise levels during that period.

chillers and vacuum pumps. The Utility Room walls and roof would be metal on the exterior with insulation to minimize sound transfer to the environment. LBNL Standard Specifications require such equipment to have sound ratings that meet the Air Movement and Control Association (AMCA) Standard 301.

Operation of the BELLA laser and laser plasma accelerator usually would take place during normal business hours of 8 a.m. to 5 p.m., Monday to Friday. However, the new air handling units for the BELLA area would operate continuously. The existing chiller and cooling tower would operate as needed, which is anticipated to be primarily daytime both weekdays and weekends.

Noise levels at the border of LBNL with the City of Berkeley residential zone and the City of Oakland would be very similar to current levels. Based on distances of neighboring property lines, intervening terrain, and experience with other similar construction and operation activities in the Building 71 area, the maximum allowable noise of 75 dBA at the nearest property line for mobile equipment and of 55 dBA for stationary equipment is not expected to be exceeded.[21]

As previously stated in Section III.4.a.v, Materials Disposition, truck traffic associated with the Proposed Action is not expected to exceed more than one trip per day during the peak construction period. Otherwise, average weekly truck traffic during demolition, construction, and the initial setup of the research and development equipment phases would amount to 1.5 trips per week, or less than a single round trip per day. As previously stated, the applicable noise standard, as identified in the City of Berkeley Noise Ordinance, is 75 dBA at the nearest property line for mobile equipment. Due to the relatively limited volume of anticipated truck traffic and the mobile nature of the noise associated with passing trucks, applicable noise standards would not be exceeded.

[21] Berkeley Noise Ordinance, Section 13.40.070 of the Municipal Code.

Most BELLA laser operational noise would be contained within the building. Noise levels inside the building above those requiring hearing protection are not anticipated to be generated by the BELLA system. If noise levels were ever to reach a level at which hearing protection would be required, such protection would be supplied or efforts would be put into place to reduce the noise level. BELLA operations would comply with existing LBNL Hearing Safety rules, as outlined in Pub 3000, Chapter 4, Industrial Hygiene, Sec. 4.5.1, Hearing Conservation Program.

Based on the analysis above, the DOE does not expect the Proposed Action to result in substantially adverse noise effects.

IV.B.8. Traffic

The approximately 18-month construction period of the Proposed Action would result in temporary increases in traffic volumes on area roadways. This temporary increase is associated with the movement of construction workers and equipment used for construction truck trips (defined here as round-trips involving large hauling, flatbed, cement trucks, or similar). Truck traffic associated with the Proposed Action is not expected to exceed more than one trip per day during the peak construction mobilization period. Otherwise, average weekly truck traffic during demolition, construction, and the initial setup of the research and development equipment phases would amount to 1.5 trips per week, or less than a single trip per day. Accordingly, truck trips would tend to be spaced apart and few would occur on the same days. Finally, construction truck traffic for the Proposed Action would be closely monitored and managed by the Lab's Site Construction Coordinator, who would ensure that aggregate construction traffic at LBNL would stay below established significance threshold levels.[22]

Operation of the Proposed Action in Building 71 would result in 5 to 10 additional staff being added to the total Building 71/71A/71B population of 73. This additional new staff represents a minor portion of the 860-person increase in LBNL population that is analyzed in the 2006 LRDP and EIR (for

[22] Tabibnia, Sam and Ryan McClain, Fehr & Peers Transportation Consultants. Personal memorandum written to Jeff Philliber, LBNL, May 22, 2009.

2025 horizon year). Statistically, only about 60 percent of the LBNL employees drive to the main site in single-occupied vehicles. The new employees are expected to use other options such as vanpooling, carpooling, bicycling, or LBNL shuttles from a Bay Area Rapid Transit (BART) station at similar rates. These options are described by LBNL's Transportation Management Demand Plan. Parking issues resulting from the small increase in population have been adequately addressed in that plan. The increase in staff is therefore not expected to result in a noticeable increase in parking demand.

IV.B.9. Cultural Resources

Building 71 was built in phases from 1957 to 1974 to house the Heavy Ion Linear Accelerator (HILAC), Super-HILAC, and Bevelac particle accelerators, in succession, and their associated support facilities.[23] In 2007, the DOE determined that Building 71 was eligible for the National Register of Historic Places (National Register) because of the important role that the building had played in the nuclear physics and accelerator development and research activities at LBNL. In 2008, accelerator remnants and associated blocks were removed as part of seismic upgrades to the building.[24] This was performed in consultation with the California State Historic Preservation Officer (SHPO). As per agreement with the SHPO and the National Park Service, concurrently with the seismic upgrades, a Historic American Engineering Record (HAER)[25] with photo documentation was prepared. The HAER documentation took place during the facility retrofit due to the inaccessibility of the various HILAC components until the outer layers of the machine were removed. The final HAER was published in July 2009.

The last remnants of the Super HILAC, which were removed in 2008, represented the remaining (albeit largely incomplete) connection to the historically

[23] Historic American Engineering Record, University of California Radiation Laboratory, SuperHILAC, HAER No. CA-186-B, prepared by David Harvey, ENTRIX, Inc., April, 2009.

[24] Categorical Exclusion (CX) Determination for Building 71 Seismic Improvement and Modifications, Lawrence Berkeley National Laboratory. LB-ER-08-4. December 7, 2007.

[25] The same acronym, HAER is also used for Historic Architectural Evaluation Report.

significant elements of the building. With the HAER documentation and removal of those last remnants, Building 71 became available for renovation without negative impacts to cultural or historical resources.

IV.B.10. Intentional Destructive Acts

Intentional destructive acts such as sabotage and terrorism from internal or external sources are required to be considered in NEPA documents, according to interim guidance from the Office of NEPA Compliance Policy (part of the DOE Office of General Counsel).[26] Although the Proposed Action would take laser plasma accelerator capabilities beyond other facilities, it is the most recent development in a series of accelerator technology advances at LBNL going back to the 1950s. Operations during the Proposed Action would include the handling of small amounts of radioactive materials in sealed sources used for calibrating safety monitoring devices, the use of which is governed by LBNL standard operating procedures. Existing sealed sources used by the LOASIS program would also be used for the Proposed Action operations.

The Proposed Action is not expected to require security in addition to that already in place for the LBNL site. The entire LBNL site is fenced, and controlled access is available only at three entry gates. For safety reasons, LBNL laser laboratories are protected by a combination key and keypad access controller that only allows entry by personnel with laser safety training. If any laser room door opens without the appropriate key inserted or the correct access code being entered, the laser system within the room is shut down immediately. Access to the Laser Room included in the Proposed Action would be controlled in this manner. As there would be no change to the existing security system in place on the LBNL campus and at Building 71, DOE considers that the Proposed Action would present no change to the potential for intentional destructive acts.

IV.B.11. Socioeconomics and Environmental Justice

There would be a temporary increase in onsite labor during the construction of the Proposed Action; this activity would span a period of approximately 18

[26] Need to Consider Intentional Destructive Acts in NEPA Documents. Office of NEPA Policy and Compliance, Department of Energy, December 1, 2006.

months. Labor would likely be drawn from the local area at the discretion of subcontractors selected to perform the work. There is a substantial amount of construction in the local area and an adequate pool of labor is expected to be available for Proposed Action construction. Operational staff would be minimal (approximately 5 to 10 new employees) and most would likely be from local or regional origin. Therefore, impacts to the local population, services, and economy would not be expected.

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires agencies to identify and address disproportionately high and adverse human health or environmental effects its activities may have on minority and low-income populations. There would be no expected disproportionate adverse impacts on minority and economically disadvantaged populations in the local area, because no adverse environmental or socioeconomic impacts are expected from any aspects of the Proposed Action. In addition, residential areas nearest to the Building 71 Proposed Action site do not qualify as relatively low-income or minority neighborhoods.

IV.C. Environmental Consequences of the No-Action Alternative

Adopting the No-Action Alternative would result in Building 71 remaining in its current condition. The BELLA research and development program would not be located at LBNL. Further investigations and mitigation of remnant contamination on the internal structures of Building 71 would not proceed. There would be no demolition or construction and no noise or dust would be emitted. If the Proposed Action were not completed, there would be no radiation emitted from an electron beam developed by the BELLA laser plasma accelerator. However, the Building 71 space would be available for other uses – these would likely be related to accelerators. Future accelerators would be more likely to be become larger, not smaller, with increasingly greater environmental impacts.

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V. CUMULATIVE IMPACTS

Cumulative impacts consider the Proposed Action in combination with past, present, and anticipated future actions, and their combined impacts to the environment. To assess potential cumulative impacts, an inventory of planned, pending, and/or reasonably foreseeable Proposed Actions are considered in combination with the Proposed Action and past actions.

V.A.1. Construction Projects in the Vicinity of the Proposed Action

V.A.1.a. LBNL Projects

- **Seismic Phase 1**

The Seismic Phase 1 project will correct structural deficiencies in LBNL Buildings 50 and 74 in order to improve their performance in a seismic event and upgrade the seismic rating of the buildings from "Poor" to "Good."

Work is expected to span from January 2009 to March 2010.

- **Seismic Phase 2**

This project involves the demolition of multiple seismically unsafe buildings throughout the LBNL site, seismic stabilization of Building 85, modernization of Building 74 and construction of an approximately 43,000 gsf General Purpose Laboratory (GPL). The GPL will be safe and energy efficient, with approximately 60 percent office space and 40 percent wet chemistry lab facilities.

Construction of the Seismic Phase 2 project is intended to begin by 2010 and continue through 2015.

- **The User Support Building**

The three-story, approximately 30,000 gsf User Support Building (USB), will include assembly space, support laboratories and offices. An existing 16,038 gsf structure, Building 10, which housed approximately 24 full-time LBNL staff was demolished to create space for the USB. An Initial Study/Mitigated Negative Declaration was prepared and circulated in the fall 2006 and certified by the UC Regents in January, 2007. Demolition of Building 10 was com-

pleted in 2007. Construction of the USB was initiated in June 2008 and is expected to be complete by July 2011.

♦ **Building 51 and the Bevatron Demolition**

An EIR was certified in July 2007 for the demolition and removal of the Building 51 complex, including the Bevatron (a retired particle accelerator), and the concrete blocks and building shell surrounding it. This EIR was tiered from the 1987 LRDP EIR, as amended. Demolition commenced in August 2008 and is expected to continue through December 2011.

♦ **Building 77 Rehabilitation**

The Building 77 Rehabilitation will upgrade the mechanical and electrical systems in Building 77, a 68,500 square-foot, high-bay shop building. The Proposed Action will replace a 40-year-old mechanical system with new heating, ventilating and air conditioning systems to provide temperature control, which is required for precision fabrication and testing. This project is scheduled for completion in November 2009.

♦ **Building 6 Seismic Upgrade**

This project will seismically upgrade LBNL Building 6 Advanced Light Source (ALS) dome structure, as per the University of California (UC) seismic safety policy. The work will occur during annual, one month shut-down periods over the course of four years. The first phase was completed in 2007 and included the repair of five of 24 planned column bents. The second phase, in May 2008, included the repair of seven bents. Six bents each will be repaired in both May 2009 and May 2010.

V.A.1.b. University of California Projects

♦ **South Campus Integrated Projects**

In May 2006, UC Berkeley published a tiered, focused Draft EIR for the Southeast Campus Integrated Proposed Actions (SCIP). The SCIP EIR was certified on December 5, 2006. The SCIP EIR identified significant and unavoidable impacts in the areas of aesthetics, cultural resources, geology, noise, traffic, and utilities and service systems. In May 2007, a fault-rupture hazard investigation for the Student Athlete High Performance Center was prepared and released as an addendum to the EIR.

SCIP projects include seismic and program improvements to California Memorial Stadium, including a 158,000 gsf athletic training center; construction of a parking structure and sports field at the current site of Maxwell Family Field; construction of a 186,000 gsf building linking the Law and Business Schools, landscape improvements at the Southeast Campus and Piedmont Avenue; interior improvements at selected buildings at the School of Law and the Haas Business School; and renovation and restoration of four historic houses on Piedmont Avenue. Construction of the athletic training center, School of Law facilities, and retrofit of the Piedmont Avenue houses is underway.

♦ **Northeast Quadrant Science and Safety Projects**

The NEQSS projects entail demolition of 100,000 gsf of existing buildings and construction of 430,000 gsf of laboratory, office and classroom space. The Proposed Action would also include the addition of 140 parking spaces and add approximately 400 full-time equivalent (FTE) employees to the northeastern quadrant of the UC Berkeley campus. The projects are currently under construction.

♦ **The Computational Research and Theory Building**

As currently proposed, the 165,000 gsf Computational Research and Theory Building (CRT) building would be constructed near the Blackberry Gate entrance to the LBNL main site. It would provide high-end computing floor space and accompanying office space. CEQA review was completed and an EIR was circulated for public review in approximately mid-2007. The EIR was certified by the UC Regents in May 2008. Construction of the Proposed Action is currently on hold.

♦ **The Helios Research Facility**

The goal of the Helios Research Facility project is to accelerate the development of renewable and sustainable solar energy sources through various initiatives, such as the development of new materials for use in collectors, efficient processing steps, and energy handling. As originally proposed, the Helios Research Facility project would have been a four-story, up to 160,000 gross-square-foot laboratory constructed on the LBNL site. A Final EIR was

completed and certified for the Helios project, but it was later decertified by The Regents. The earlier plan to house all of the various Helios research endeavors in one building and as a single project has been replaced with plans to house these activities in two physically separate and independent buildings: one in downtown Berkeley (west site) and a smaller building at UC's LBNL site (east site).

East Site

This approximately 21,000 assignable square-foot building would be devoted to new photovoltaic and electrochemical solar-energy systems. Various sites on the LBNL campus are currently being evaluated for this project, all of which are served by existing roadways and utilities. Construction is currently anticipated to be from approximately 2011 to 2013.

West Site

This approximately 65,000 assignable square-foot building would house the Energy Biosciences Institute (EBI) and complementary bioengineering programs at 2151 Berkeley Way, adjacent to the UC Berkeley Campus Park. EBI's primary research objectives would include the development of a new generation of carbon-neutral biofuels, as well as a thorough examination of their potential environmental, social, and economic impacts. Construction is currently anticipated to be from approximately 2010 to 2013.

- **Guest House**

The Guest House is a 25,000 gsf facility that ranges in height from 2.5 to 4 stories. The facility, currently under construction, includes 60 guest rooms and associated spaces. The facility is located in the center of the LBNL main site between Buildings 2 and 54, with access via Lawrence Road. The Guest House will provide for short term accommodations for visitors. This project is scheduled for completion in August 2009.

V.B. Potential Cumulative Impacts

This section discusses the cumulative impacts from the Proposed Action and the projects listed above. Each of the issues considered in this analysis was determined to be affected in a minor way in the previous chapter. The analysis in Chapter IV supports the conclusion that the Proposed Action would

not affect biological resources, cultural resources, or result in greater risk of intentional destructive acts. An abbreviated discussion of these issues is included at the end of this section.

V.B.1. Hazards and Human Health

As discussed in Chapter IV, none of the potential hazards such as radiation produced from the accelerator, potential eye injuries from the laser, laser fire, or explosion risk, or chemical and radioactive releases during demolition are expected to result in adverse impacts. Accordingly, the Proposed Action would not be expected to have an adverse cumulative impact in combination with other LBNL or UC Berkeley projects.

Shielding using concrete, lead and steel, is described in Section IV.B.1.b of this EA. Shielding would be designed to meet the requirements of 10 CFR Part 835 and DOE Order 5400.5 to protect LBNL workers and the public. Monitors would measure the performance of the shielding and shut down the BELLA Laser Plasma Accelerator in the event that the shielding does not meet safety criteria.

LBNL's ongoing radiation monitoring program monitors the area outside Building 71 for accelerator-produced radiation. Monitoring results and the location of the monitors are published in the Site Environmental Reports.[27] LBNL's reports have consistently shown that the greatest gamma radiation dose to the public has been well below allowable limits. The BELLA project would install additional monitors inside the building as described in Final EA Section IV.B.1.b.

Building 71 houses the LOASIS program.[28] An environmental evaluation of LOASIS operations is beyond the scope of this EA except to the extent of the potential cumulative impacts if the BELLA project proceeds. The BELLA project would be integrated with LOASIS to the extent that they would share some staffing and equipment resources and would be located in the same

[27] The latest report (2007) can be found online at: http://www.lbl.gov/ehs/esg/Reports/tableforreports.htm.

[28] A description of LOASIS operations can be found at: http://www-afrd.lbl.gov/loasis.html.

building. The actual accelerator apparatus associated with each program would not be integrated. Each apparatus is either independently shielded with separate caves or would be independently shielded within separate caves and governed by individually designed safety protocols. The shielding provided by each cave ensures that any radiation outside the cave walls would be within the required limits at all times.

Because of the protection provided by each cave, the impact of operating all the accelerators at once would be indistinguishable from operating the accelerators separately. It is anticipated that BELLA would contribute no measurable radiation at the LBNL property boundaries, whether specifically or cumulatively with all other LBNL activities, including LOASIS.

V.B.2. Hydrology, Water Quality, and Soil

The Proposed Action would not be expected to add to cumulative hydrology, water quality, and soil impacts from the projects listed above. The Proposed Action would not add impervious surface area, which would have the potential to increase pollutant loading in storm water runoff, to the LBNL campus. Soil excavation, sampling, and analysis at Building 71 would be controlled by a Soil Management Plan as required by LBNL. If the excavated soil was found to contain contamination, the soil would be stored onsite prior to being moved to an appropriate off-site landfill. The Proposed Action would not have adverse hydrology, water quality, and soil impacts, and it would not be expected to contribute to an adverse cumulative impact.

V.B.3. Energy Use and Greenhouse Gases

The Proposed Action would not substantially add to cumulative energy use and GHG emissions. The Proposed Action would increase annual electricity consumption at LBNL by less than 1 percent. Usage of natural gas at LBNL would also increase by less than 1 percent as a result of this Proposed Action. Therefore, the effect of the Proposed Action would not substantially change LBNL energy consumption.

GHG emissions would be generated as a result of the additional electrical energy and natural gas consumption described above. New GHG emissions would total approximately 480 metric tons of carbon dioxide equivalents

($MTCO_2e$) annually according to DOE calculations. This additional GHG emissions contribution would be less than a one percent increase over LBNL's 2008 emissions of $MTCO_2e$ for electricity and natural gas. This additional amount of GHG emissions is very small relative to the amount of GHG emissions currently generated by LBNL and the surrounding region.

The Proposed Action would temporarily generate GHG emissions due to construction truck traffic. The largest project that would be under construction simultaneous to the Proposed Action would be the Building 51 demolition project. It is possible that the CRT project (near the main Blackberry gate), the Helios Research Facility, and the Seismic Phase 2 project would also have begun. As noted in Section V.B.8, construction traffic is monitored by LBNL to limit the number of construction trucks entering and leaving the Lab on a daily basis. Therefore, GHG emissions associated with construction trips for the Proposed Action would be limited by the number of trips allowed per day. In addition, since construction activity is limited to the construction period, potential GHG emissions are considered short-term and would not be expected to substantially contribute to long term effects.

Vehicle trips generated by the additional LBNL staff operating the Proposed Action would also contribute to GHG emissions. LBNL encourages the use of alternative transportation as a means of reducing vehicle trips made by employees and visitors. The existing LBNL shuttle system transports employees from the City of Berkeley and the UC Berkeley campus to numerous locations on the LBNL site. LBNL supplies bicycle racks on shuttle buses, outside of buildings, and at the entrances to open space areas for employees who bike to work and/or around the LBNL campus. LBNL also provides pedestrian trails, such as the existing pedestrian path that connects Building 71 with the rest of the main site.

Given the small increase of LBNL personnel associated with the Proposed Action, and the available multi-modal alternatives to the single occupancy vehicle, potential GHG emissions associated with vehicle trips made by new staff is considered very minor and would not be expected to contribute to an adverse cumulative impact related to GHG emissions.

V.B.4. Other Utilities and Service Systems

The Proposed Action demand for other utilities, such as water, solid waste transport, and wastewater, would not be expected to contribute to an adverse cumulative impact. The demand for utilities as a result of the Proposed Action is consistent with the marginally increasing demand projected in the 2006 LRDP and EIR.

With respect to water demand, the Proposed Action would constitute less than a one percent increase to the demand for the entire LBNL site,[29] which is not considered to be an adverse impact on the Lab's existing water infrastructure and water capacity. Furthermore, water demand for the Proposed Action is within the Lab's long-term use projections. These projections have been reviewed by the East Bay Municipal Utility District, which issued the Lab a 'will serve' letter in February 2006, confirming the District's ability to meet the Lab's long term demands. The solid waste resulting from demolition as a result of the Proposed Action is expected to be recycled and reused to the extent practicable, as with solid waste from all other LBNL projects, according to LBNL standard operating procedures. In addition, LBNL procedures require the demolition contractor to consult with receiving landfills prior to the start of demolition, to ensure that sufficient landfill capacity is available. LBNL peak wastewater discharge during wet weather is expected to increase by approximately 72,000 gpd by 2025, which is well within the capacity of the existing sanitary sewage disposal infrastructure. The additional wastewater generated by the Proposed Action, less than 1 percent of the overall LBNL wastewater discharge, would be a fraction of this increase and would not be expected to have an adverse impact on cumulative wastewater services.

In summary, the impacts to utilities by the Proposed Action are not considered to be substantial, and the Proposed Action would not contribute to an adverse cumulative impact.

V.B.5. Visual Quality

The Proposed Action's contribution to any cumulative impacts to the LBNL viewshed would be very minor, and likely not noticeable to off-site viewers.

[29] According to 2005 figures.

The Proposed Action would result in minor improvements on the roof of Building 71, which would be consistent with the roof's existing character. The improvements would not result in a change to the viewscape or to views of the building. While a significant cumulative impact to visual resources may arise from aggregate buildout of the LBNL site through 2025, as described in the 2006 LRDP and EIR, the Proposed Action would not be expected to contribute to such an adverse cumulative impact, especially because those cumulatively impacted areas are not considered to be near the Building 71 site.

V.B.6. Air Quality

The Proposed Action would not directly violate air quality standards or adversely affect air quality, nor would it be expected to result in any substantially cumulative air quality impacts. The Proposed Action would be consistent with the growth projections in 2006 LRDP and EIR, and it would neither conflict with nor obstruct implementation of the Bay Area 2005 Ozone Strategy, which is the most recently approved regional Clean Air Plan.

The Proposed Action would not violate any applicable air quality standard or contribute substantially to any existing or projected air quality violations. The Proposed Action would not result in a considerable net increase in any criteria pollutant for which the Proposed Action region is in non-attainment (federal and State), including O_3 and State PM_{10} and $PM_{2.5}$, or toxic air contaminant (TAC). Demolition and construction of the Proposed Action would occur almost entirely within the existing shell of Building 71, effectively containing any dust produced by demolition and construction. The exception would be the period of approximately one week when a hole would be cut through the metal and concrete roof of Building 71; however, LBNL Standard Operating Procedures would reduce the amount of dust to below significance standards as identified by the Bay Area Air Quality Management District (BAAQMD). Potential adverse effects from truck trip diesel emissions are discussed below in Section V.B.8. As concluded in that analysis, the volume of truck trips is such that no substantial adverse health effects would occur due to diesel emission exposure throughout the 18-month construction period.

In terms of operational emissions, Section IV.B.6 of this EA concludes that the heated air exhausted from the Utility Room and BELLA area air handling units would not cause any adverse impacts to air quality.

Given the preceding analysis, the DOE does not expect that the Proposed Action would result in any cumulatively considerable air quality impacts.

V.B.7. Noise

Construction-related noise from the Proposed Action has the potential to combine with noise from other construction projects to generate cumulative impacts. However, construction of the Proposed Action and other projects would be staggered over a period of several years and there would not be a point at which all were under construction concurrently. In addition, LBNL voluntarily observes the City of Berkeley Noise Ordinance, which regulates construction and demolition noise, and the City of Berkeley's General Plan Environmental Management Element, which is consistent with the City of Berkeley Municipal Code noise guidelines for determining the compatibility of various land uses with different noise environments.[30] Furthermore, various construction and demolition activities that might coincide with the Proposed Action are located throughout the LBNL main hill site, and thus are separated physically by intervening terrain and structures, which reduces or eliminates combined construction noise.

While the Proposed Action may result in some degree of noise impacts during the construction phase, this noise would not contribute adversely to an adverse cumulative impact. The highest level of noise would be limited to a period of approximately one week, when a hole would be cut through the metal and concrete deck of the roof. The interior construction noise would be of longer duration; however, the sound would be buffered by the existing shell of Building 71. In addition, the work would usually be performed on weekdays during normal work hours. The resulting noise is expected to be well below the 75 db standard established in the City of Berkeley Noise Ordinance for mobile sources. In addition, as determined in Section IV.B.7, due to the volume of truck trips and the mobile nature of noise from passing trucks, city ordinance threshold noise levels would not be exceeded because of

[30] LBNL General Requirements, Section 1.06(B), page 01010-5.

truck traffic. As a result, the construction noise would not be expected to contribute to an adverse, cumulative impact.

During the operational phase, the Proposed Action would not result in a substantial increase to noise in the area. Existing noise-producing equipment and new Building 71 equipment would contribute to the ambient noise level at the LBNL main site, however, the operational noise anticipated by the Proposed Action would be similar to existing noise levels. Consequently, the noise levels at the LBNL border with the City of Berkeley residential zone are expected to be very similar to current levels and the cumulative noise level is not expected to exceed the standards in the City of Berkeley Noise Ordinance. As a result, the Proposed Action would not be expected to produce an adverse, cumulative noise impact during operation.

V.B.8. Traffic

Construction traffic at LBNL is carefully monitored and controlled. A cumulative traffic study was completed in April 2009 which identified significance levels or thresholds for LBNL aggregate construction truck trips.[31] The Lab's Site Construction Coordinator oversees all construction truck trips at LBNL and ensures that all projects – including the Proposed Action – in combination would stay at or below these significance thresholds.

Operations activities in Building 71 included as part of the Proposed Action would be within cumulative traffic significance thresholds. The Proposed Action would bring an additional 5 to 10 new staff members to the LBNL site, each of whom may be eligible to receive a parking pass. Given the 860 new staff persons and the issuance of 500 new parking passes identified in the 2006 LRDP and EIR, the traffic generated by the new staff associated with the Proposed Action is considered relatively minor and not likely to cause an adverse impact.

As determined in the 2006 LRDP EIR, projected buildout of the LRDP, of which this Proposed Action would be a part, would contribute to a level of service (LOS) degradation at specified local intersections. As a result, three

[31] Tabibnia, Sam and Ryan McClain, Fehr & Peers Transportation Consultants. Personal memorandum written to Jeff Philliber, LBNL, May 22, 2009.

intersections would ultimately operate at an unacceptable level of service (LOS E or F) in 2025. The EIR identified this as a significant and unavoidable impact. Based on the proximity of the three intersections to LBNL entry/exit points, it is reasonably foreseeable that operational trips generated by the Proposed Action would use some or all of these intersections.

As previously indicated, the Proposed Action would bring 5 to 10 new staff to the LBNL site. Approximately 40 percent of LBNL staff use alternate modes of transportation to the single occupancy vehicle. Among this percentage, LBNL shuttle, bicycling, BART, and carpooling are the most commonly used modes of travel.[32] Based on this pattern and the multi-modal options that would be available to the 5 to 10 staff members, approximately 40 percent (2 to 4) of them would be expected to travel to and from LBNL by means other than the single-occupancy vehicle. Using a conservative, increased estimate, it can be expected that the Proposed Action would generate 12 daily round trips, including six AM peak hour trip, and six PM peak hour trips.

In relation to the intersection volumes that would be experienced at the three stressed intersections in 2025, six AM peak period trips and six PM peak period trips would not further degrade intersection level of service or even likely be noticeable to fellow motorists. Furthermore, it is not foreseen that all of these peak hour trips to and from LBNL would use the same routes or intersections due to the availability of three access gates and the varying trip origins and destinations. This distribution of trips among the street/intersection network would further reduce the potential impact on any one of the three intersections.

Therefore, although the trips generated by the Proposed Action could marginally contribute to degradation at three impacted intersections under the cumulative buildout scenario (in 2025), the number of peak hour trips would be very minor in proportion to the total number of trips utilizing those intersections. As a result, DOE expects that the Proposed Action and the Lab as a whole would fall below significance levels identified for cumulative traffic impacts.

[32] 2007 LBNL LRDP EIR, Transportation/Traffic Section, page IV.L-19.

V.B.9. Biological Resources

The Proposed Action would not affect biological resources, as discussed in the previous chapter. Therefore, the Proposed Action would not be expected to contribute to a cumulative biological resources impact when considered in conjunction with other projects on the LBNL main site or on the UC Berkeley campus.

V.B.10. Cultural Resources

The Proposed Action would not affect cultural resources, as discussed in the previous chapter. Therefore, the Proposed Action would not be expected to contribute to a cumulative cultural resources impact when considered in conjunction with other projects on the LBNL main site or on the UC Berkeley campus.

V.B.11. Intentional Destructive Acts

The Proposed Action would not adversely affect the potential for intentional destructive acts, as discussed in the previous chapter. Therefore, the Proposed Action would not be expected to contribute to a cumulative impact when considered in conjunction with other projects on the LBNL site or on the UC Berkeley campus.

V.B.12. Socioeconomics and Environmental Justice

The Proposed Action would be expected to cause impacts with regard to socioeconomics and "Environmental Justice," as discussed in the previous chapter. Therefore, the Proposed Action would not be expected to contribute to a cumulative impact when considered in conjunction with other projects on the LBNL site or on the UC Berkeley campus.

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VI. GLOSSARY OF TERMS AND ACRONYMS

VI.A. Glossary

accelerator: in physics and chemistry, an accelerator is a device that uses an electric or magnetic field to excite charged particles to move at high speeds. The Proposed Action would employ a laser plasma accelerator as describe below.

Bevatron: a retired particle accelerator once in service in Building 51 at Lawrence Berkeley National Laboratory.

Categorical Exclusion (CX): A level of environmental review under the National Environmental Protection Act for Proposed Actions that do not have a significant individual or cumulative effect of the environment.

Categorical Exemption (CE): A level of environmental review under the California Environmental Quality Act for Proposed Actions that do not have a significant individual or cumulative effect of the environment.

California Environmental Quality Act (CEQA): California State legislature that requires a written analysis of the potential environmental impacts of a development Proposed Action, including an assessment of alternative Proposed Action designs and a disclosure to the public about why the Proposed Action was approved.

cyclotron: A type of accelerator first developed by Ernest Lawrence at the University of California, Berkeley, in 1929. The cyclotron uses a perpendicular magnetic field that causes particles to form a spiral and re-encounter the accelerating voltage multiple times.

Environmental Impact Report (EIR): A report required of general plans by the California Environmental Quality Act and which assesses all the environmental characteristics of an area and determines what effects or impacts will result if the area is altered or disturbed by a Proposed Action. (See "California Environmental Quality Act.")

electron beam: a stream of electrons which would be produced in the laser plasma accelerator.

positron: the anti-particle or counterpart of an electron

gamma-rays: high energy radiation created by the collision of charged subatomic particles.

Laser Plasma Accelerator: A capillary tube (similar in shape to a common 3-foot-long T12 fluorescent lamp) made of sapphire, approximately 1 meter in length by 2 to 3 centimeters in outer diameter and 300-600 micrometers in internal diameter filled with plasma. When the BELLA laser light pulses are focused on the entry to the plasma channel, an electron beam with an energy level of 10 GeV would be generated.

National Environmental Protection Act (NEPA): a federal law very similar to CEQA which requires its own environmental review process.

neutrons: a subatomic particle with no electric charge.

optical compressor: a device that uses optical components to compress light pulses in time, thereby increasing the peak power level of the light pulses. This is a passive device, i.e. uses no electricity or other external energy sources.

photomuons: high energy photon pairs

plasma wakefield: An oscillatory charge separation wave of electrons and ions in an ionized medium that results in electric fields that can be used to accelerate electrons.

radiation: energy that is emitted by electrons as they propagate through magnetic fields or material. It is absorbed by suitable material such as concrete, lead, and steel.

radioactive: a mass with an unstable atomic nucleus or nuclei.

Soil Management Plan: To be developed by a Proposed Action proponent for the purposes of abiding by LBNL institutional controls when a Proposed Action involves the distribution, removal, and/or disposal of soil.

structural/non-structural: weight bearing/ non-weight bearing.

therms (thm): a non-SI unit of heat energy commonly used to measure natural gas and equal to 1,000 British thermal units.

VI.B. Acronyms

ADA: Americans with Disabilities Act

AFRD: Accelerators & Fusion Research Division

ALARA: As Low As Reasonably Achievable

AHU: Air handling unit

ALS: Advanced light source

AMCA: Air Movement and Control Association

ANSI: American National Standards Institute

BAAQMD: Bay Area Air Quality Management District

BART: Bay Area Rapid Transit

BELLA: BErkeley Lab Laser Accelerator

CEQA: California Environmental Quality Act

CRT: Computational Research and Theory Building

DOE: United States Department of Energy

EA: Environmental Assessment

EBMUD: East Bay Municipal Utilities District

EH&S: Environment, Health & Safety Department

EIR: Environmental Impact Report

FFU: Fan filter units

FTE: Full-time equivalent

GeV: Electron-Volts

gpd: Gallons per day

GPL: General Purpose Laboratory

GHG: Greenhouse gas

HAER: Historic American Engineering Record

HEP: Department of High Energy Physics

HEPA filter: High Efficiency Particulate Air filter

HILAC: Heavy Ion Linear Accelerator

HILAC: Heavy Ion Linear Accelerator

HVAC system: Heating, venting and air conditioning system

HWHF: Hazardous Waste Handling Facility

LBNL LRDP EIR: Lawrence Berkeley National Laboratory Long Range Development Plan Environmental Impact Report

LBNL: Lawrence Berkeley National Laboratory

Leq: Leq is the equivalent steady-state noise level over a one-hour period produced by the same noise energy as the variable noise levels during that period

$MTCO_{2e}$: Metric tons of carbon dioxide equivalents

MUA: Outside air make-up unit

MWh: Megawatt hours

NEPA: The National Environmental Protection Act

NFA: No Further Action

O_3: The molecular formula for the element Ozone

PG&E: Pacific Gas and Electric Company

PM_{10}: Particulate matter 10 microns or less in diameter

$PM_{2.5}$: Particulate matter 2.5 microns or less in diameter

SCIP: Southeast Campus Integrated Proposed Actions

SHPO: California State Historic Preservation Officer

TAC: Toxic air contaminant

UC: University of California

USB: User Support Building

VOC: volatile organic compound

WAPA: Western Area Power Administration

VII. Report Preparers

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APPENDICES

A. Updates and Clarifications made to EA

B. Comments Received

C. Responses to Comments Table

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APPENDIX A

UPDATES AND CLARIFICATIONS MADE TO DRAFT EA IN PREPARATION OF FINAL EA

APPENDIX A: UPDATES AND CLARIFICATIONS

Changes made to the Final EA from the Draft EA consist of the following types:

- Minor typos, re-phrasing of sentences for clarification, and some repagination.
- Heading style to outline numbering system to reflect the hierarchy of sections.
- Section re-numbering following insertion of new Section IV.B.1.e Compressed Gases and Cryogenics.
- Figure re-numbering following insertion of new Figure 4.
- Edits that change the sense or substance of text. These are listed below. ~~Strikethrough~~ is used to indicate text deleted. Double underline refers to text inserted.

III PROPOSED ACTION AND ALTERNATIVES

III.A.3.a.i Room Designations

The Utility Room would be constructed directly above the Laser Room and house the laser system's power, cooling, and vacuum support modules. The Utility Room and stairwell represent the only expansion of ~~operational area~~ Building 71 associated with the Proposed Action.

III.A.3.b Laser System

The laser system would be installed on optical tables in the Laser Room. ~~The laser system's peak power level would be approximately 1 petawatt (1 PW = 10^{15} W).~~ Laser power, cooling, and vacuum pump modules would be installed above the Laser Room in the Utility Room. Pipe chases would be installed between the Utility Room and Laser Room to route power cables, piping for laser cooling, and vacuum hoses between the lasers and their support modules. The laser would feed the laser light pulses through an optical compressor to the final focus assembly that would be located in existing Ex-

perimental Cave 146A. ~~This system would deliver to the final focus assembly short duration (40 femtoseconds[3]) laser light pulses with an average energy level equivalent to that drawn by a 40 watt light bulb.~~ ~~(~~The final focus assembly is considered part of the ancillary systems.~~)~~

The laser system's peak power level would be approximately 1 petawatt (1 PW = 10^{15} W) and it would be delivered to the final focus assembly in short duration (40 femtoseconds[7]) laser light pulses. Although each pulse is powerful, its short duration means that it has an average energy level equivalent to that drawn by a 40-watt light bulb.

III.A.3.c Laser Plasma Accelerator System

Edits were made as follows and the footnote was inserted in the main text.

The final focus assembly would focus the laser light pulses on the laser plasma accelerator, which would be located in the expanded Experimental Cave where the electron beam would be generated. ~~The laser plasma accelerator would be approximately 1 meter in length by 3 centimeters in diameter,[4] and would generate a 10 GeV electron beam.~~ The pulses would be passed through a 10 micrometer diameter capillary tube filled with hydrogen to create plasma waves. The plasma waves would in turn collect free electrons and accelerate them, generating a 10 GeV electron beam. The capillary tube would itself be located within a 3 centimeter-diameter round by 1 meter long accelerator housing within an evacuated optical transport tubing. The laser plasma accelerator would be shaped similar to a common 3-foot-long fluorescent lamp.

III.A.iv.i Clean-Out

Photographs of existing rooms in Building 71 that will be re-structured to contain the BELLA research and development program are presented in Fig-

[3] A femtosecond is 1 quadrillionth of a second, or $1/10^{15}$ of a second.

ure 3. and the locations of these rooms with respect to the existing building first floor plan are shown in Figure 4.

IV AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

IV.A Issues Determined Not To Warrant Further Discussion

The following text was added to the end of the section:

High electric fields would be produced by the interaction of the laser with the plasma in the accelerator chamber/tube. The electrical fields are contained within a metal housing, a configuration known as a Faraday cage. The electromagnetic field outside the cage would be equivalent to the field generated by a 1-watt light bulb and should not be an issue of concern for personnel or the public.

There is no evidence or expectation that the BELLA Project would contribute to the EMF levels within Building 71 or the surrounding area. No new power lines are being constructed as part of the BELLA project. Electrical power for Building 71 is fed from LBNL's substation located southeast of the building, in the opposite direction from the nearest residences. The existing power lines serving Building 71 are underground. LBNL scientific apparatus is highly sensitive to electrical fields and distortion. To allow the instruments to operate successfully, the power distribution system is designed and constructed to prevent interference from ELF (extremely low frequency) electromagnetic fields, and harmonics. The project would therefore have sensing/tripping devices, grounding, and shielding in accordance with all applicable safety codes and standards. This would supply protection in excess of that necessary for protection of human health.

IV.B.1 Hazards and Human Health

The Proposed Action would present potential hazards during the demolition phase and from operation of the BELLA laser and laser plasma accelerator for research and development. These hazards have been identified and are ~~the~~

~~same as~~ equivalent to those encountered on other conventional construction projects and other accelerator operations at LBNL.

The Laboratory has policies and procedures to address and minimize such hazards. LBNL hazard prevention and mitigation policies and procedures are defined in the Laboratory's Health and Safety Manual, Publication-3000.[8] During demolition, any hazardous materials would be ~~handled~~ managed in accordance with LBNL Standard Specifications 026113-Excavation and Handling of Contaminated Material, ~~02820~~13281-Asbestos Abatement, and ~~02830~~13282-Lead Abatement. A licensed asbestos abatement professional would remove, and contain, asbestos- and lead-containing materials, a process to be overseen by asbestos-certified LBNL staff. ~~Radioactive waste would be transported to the LBNL Hazardous Waste Handling Facility (HWHF) in Building 85 and disposed of in accordance with LBNL Publication 3092, Guidelines for Waste Generators to Meet HWWF Acceptance Requirements for Hazardous, Radioactive, and Mixed Wastes at Berkeley Lab.~~ All hazardous and radioactive wastes will be disposed of by the LBNL Waste Management Group in accordance with LBNL procedures at properly licensed and permitted facilities.

IV.B.1.a Prevention of Chemical and Radioactive Release During Demolition

IV.B.1.b Radiation ~~Produced by Operating~~ from Laser Plasma Accelerator Operation and Radiation Monitoring Systems

The north and south walls and the roof that are perpendicular to the electron beam direction would be 18 inches thick. The Experimental Cave would be located directly above solid ground so human exposure to radiation below this room would not be possible.

Active radiation monitors outside the shielding (wall and roof) would be installed to confirm the performance of the shielding. ~~The Experimental Cave would be located directly above solid ground so human exposure to radiation~~

[8] http://www.lbl.gov/ehs/pub3000/ accessed May 19, 2009.

~~below this room would not be possible.~~ There is already a radiation monitor outside Building 71, which is part of the LBNL system.[9]

IV.B.1.d Fire and Explosion Risk from and to the Operating the Laser Accelerator

The following text was inserted after the last paragraph:

The proposed undertaking does not increase the likelihood, or the potential environmental consequences, of a wildland fire at LBNL. Extensive site-wide measures are in place at LBNL to minimize the risks associated with wildland fire, including: a vegetation management program; an on-site fire department; three 200,000-gallon water tanks for continuous fire-suppressive water pressure even in event of an earthquake; adherence to fire codes and sprinklerization in construction projects; inclusion of automated shut-off valves for natural gas lines; and emergency training and procedures for all on-site personnel. For further details, please refer to section 1.2.5 of the Site Environmental Report[12] and Section IV.F of the LBNL 2006 Long Range Development Plan EIR. The goal of vegetation management is to minimize wildfire damage to structures. The purpose of these vegetation management (fuel reduction) efforts is to substantially reduce the intensity of any future fire storm. As a result, Laboratory buildings would more likely survive such a fire, and the lower-intensity fire conditions at the Laboratory would allow regional fire fighters to suppress the flame front so that it would not proceed to the west of the Laboratory. The above-mentioned fire protection measures are not affected by the individual or cumulative effects of the Proposed Action, which would take place within an existing building, bring about 5 to 10 new personnel to Building 71, and include the storage of only small amounts of cleaning solvents in the building.

This section was added to the Final EA:

IV.B.1.e Compressed Gases and Cryogenics

[9] The location of the monitoring system is in the Site Environmental Report, available online at: http://www.lbl.gov/ ehs/esg/Reports/tableforreports.htm.

The laboratory procures a wide variety of research-grade gases from commercial vendors on a regular basis. LOASIS would procure hydrogen in cylinders in this manner for the BELLA research program. Hydrogen is used to fill the laser plasma accelerator chamber. Liquid nitrogen is used in the laser. Compressed gases are routinely and safely employed at LBNL. The use of compressed gases is subject to the requirements of Pub 3000, Chapter 7, Pressure Safety & Cryogenics, and Chapter 13, Gases.

IV.B.2. Hydrology, Water Quality and Soil

Text formerly footnoted was inserted in the main document with one qualification.

As a result, the DOE approved a No Further Action (NFA) status for the radiation release.[4] Approval of NFA status provides that no additional environmental investigations are required for this event under the Resource Conservation and Recovery Act-related corrective action process.

IV.B.4.b Solid Waste

DOE anticipates no adverse impacts to landfill capacity from disposal of non-hazardous Proposed Action construction debris.

Non-hazardous ~~I~~items removed during demolition would be reused and recycled as much as practicable.

[4] Summary of Radionuclide Investigations for LBNL Environmental Restoration Program, September 2003. Online at http://www.lbl.gov/ehs/erp/assets/pdfs/RadionuclidePDFfinal.pdf. Approval of NFA status provides that no additional environmental investigations are required for this event under the Resource Conservation and Recovery Act (RCRA) corrective action process.

Non-recyclable, non-hazardous materials removed from the site would be segregated and taken to a landfill such as the Altamont Landfill in Livermore, California.

IV.B.5. Visual Quality

Building 71 is located in a portion of Blackberry Canyon that is partially visible from nearby private single-family residences to the north. To the west of the Lab are residential neighborhoods, comprised of single- and multiple-family homes. ~~The nearest residences to Building 71 are approximately 448 feet to the west and north. The Lawrence Hall of Science is approximately 516 feet to the east.~~ The nearest residences to the location of BELLA within Building 71 would be approximately 590 feet (180 meters) to the northwest on Campus Drive and Olympus Drive, with one structure as close as 570 feet (174 meters). The edge of the Lawrence Hall of Science parking lot would be approximately 728 feet (220 meters) to the east.

Views of Building 71 and the staging area would be available from ~~short~~medium-range distances (Figure ~~6~~10) although, ...

From Vantage Point 3 near Olympus Avenue, ~~potential views~~ the line of sight of the roof and the staging area ~~are buffered~~ is blocked by a dense stand of existing eucalyptus trees and views are therefore not available.

IV.B.7. Noise

Paragraphs have been moved around to improve the flow of information but not to change the sense of the text. The following paragraph was inserted.

The loudest conceivable exterior construction noise for BELLA – jack hammering – would reach approximately 88 decibels, and this activity would likely last for only a few hours in total. At the nearest residence, approximately 570 feet away, that sound level would be expected to attenuate to approximately 64 or fewer decibels. That would be well below the Berkeley Noise Ordinance R-1 threshold of 75 decibels for construction and demolition noise during normal business hours.

Building 71 already contains several external noise-producing fixtures...

New sources of external noise associated with the Proposed Action ...

The following paragraph was inserted at the end of the section.
Most BELLA laser operational noise would be contained within the building. Noise levels inside the building above those requiring hearing protection are not anticipated to be generated by the BELLA system. If noise levels were ever to reach a level at which hearing protection would be required, such protection would be supplied or efforts would be put into place to reduce the noise level. BELLA operations would comply with existing LBNL Hearing Safety rules, as outlined in Pub 3000, Chapter 4, Industrial Hygiene, Sec. 4.5.1, Hearing Conservation Program.

Based on the analysis above, the DOE does not expect the Proposed Action to result in substantially adverse noise effects.

IV.B.9. Cultural Resources
The final HAER ~~is due to be~~ was published in July 2009.

V CUMULATIVE IMPACTS

V.A.1.b University of California Projects
The Helios Research Facility
The goal of ~~As currently proposed,~~ the Helios Research Facility project ~~would be a four-story, 120,000 to 160,000 gsf laboratory constructed just south of LBNL Buildings 66 and 62. The goal of the Helios Research Facility project~~ is to accelerate the development of renewable and sustainable solar energy sources ~~by developing~~ through various initiatives, such as the development of new materials for use in collectors, efficient processing steps and energy handling. As originally proposed, the Helios Research Facility project would have been a four-story, up to 160,000 gross-square-foot laboratory constructed on the LBNL site. ~~CEQA review has been conducted and the Final~~

~~EIR has been completed.~~ A Final EIR was completed and certified for the Helios project, but it was later decertified by The Regents. The earlier plan to house all of the various Helios research endeavors in one building and as a single project has been replaced with plans to house these activities in two physically separate and independent buildings: one in downtown Berkeley (west site) and a smaller building at UC's LBNL site (east site).

East Site
This approximately 21,000 assignable square-foot building would be devoted to new photovoltaic and electrochemical solar-energy systems. Various sites on the LBNL campus are currently being evaluated for this project, all of which are served by existing roadways and utilities. Construction is currently anticipated to be from approximately 2011 to 2013.

West Site
This approximately 65,000 assignable square-foot building would house the Energy Biosciences Institute (EBI) and complementary bioengineering programs at 2151 Berkeley Way, adjacent to the UC Berkeley Campus Park. EBI's primary research objectives would include the development of a new generation of carbon-neutral biofuels, as well as a thorough examination of their potential environmental, social, and economic impacts. Construction is currently anticipated to be from approximately 2010 to 2013.

V.B.1 Hazards and Human Health
The following text was inserted after the first paragraph:
Shielding using concrete, lead and steel, is described in Section IV.B.1.b of this EA. Shielding would be designed to meet the requirements of 10 CFR Part 835 and DOE Order 5400.5 to protect LBNL workers and the public. Monitors would measure the performance of the shielding and shut down the BELLA Laser Plasma Accelerator in the event that the shielding does not meet safety criteria.

LBNL's ongoing radiation monitoring program monitors the area outside Building 71 for accelerator-produced radiation. Monitoring results and the location of the monitors are published in the Site Environmental Reports.[27] LBNL's reports have consistently shown that the greatest gamma radiation

dose to the public has been well below allowable limits. The BELLA project would install additional monitors inside the building as described in Final EA Section IV.B.1.b.

Building 71 houses the LOASIS program.[28] An environmental evaluation of LOASIS operations is beyond the scope of this EA except to the extent of the potential cumulative impacts if the BELLA project proceeds. The BELLA project would be integrated with LOASIS to the extent that they would share some staffing and equipment resources and would be located in the same building. The actual accelerator apparatus associated with each program would not be integrated. Each apparatus is either independently shielded with separate caves or would be independently shielded within separate caves and governed by individually designed safety protocols. The shielding provided by each cave ensures that any radiation outside the cave walls would be within the required limits at all times.

Because of the protection provided by each cave, the impact of operating all the accelerators at once would be indistinguishable from operating the accelerators separately. It is anticipated that BELLA would contribute no measurable radiation at the LBNL property boundaries, whether specifically or cumulatively with all other LBNL activities, including LOASIS.

V.B.6 Air Quality

Potential adverse effects from truck trip diesel emissions are discussed below ~~previously analyzed~~ in Section V.B.8 ~~Section IV (6) of this document~~. As concluded in that analysis, the volume of truck trips is such that no substantial adverse health effects would ~~not~~ occur due to diesel emission exposure throughout the 18-month construction period.

V.B.8 Traffic

Operations activities in Building 71 included as part of the Proposed Action would be within cumulative traffic significance thresholds.

APPENDIX B

COMMENTS RECEIVED ON DRAFT EA

Abbott, Kim

From: Arlene Merryman [ocelot9@att.net]
Sent: Friday, July 17, 2009 9:44 AM
To: Abbott, Kim
Cc: Abbott, Kim
Subject: Delay Installation of High Energy Laser

CONCERNED CITIZENS Request the following:

Delay of High Energy laser accelerator installation, Notification of all Neighbors within a mile, Further study of radiation Effects, An Environmental Impact Report easily accessible online.

Arlene Merryman - Phone: 510-849-0721
Concerned Citizen

AM-1
AM-2
AM-3
AM-4

Committee to Minimize Toxic Waste

REC'D JUL 2 1 2009

Kim Abbott, NEPA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS 90-R1023
Berkeley, CA 94720

July 16, 2009

Subject: Comments on U.S. Department of Energy (DOE) Environmental Assessment (EA) for The Berkeley Lab Laser Accelerator (BELLA) (DOE/EA # 1655)

Dear Mr. Abbott,

The Project Description for the above referenced project/proposed action is entirely inadequate, incomplete and deficient. It completely excludes the description of the already operating LOASIS (Laser Optical Accelerator Systems Integrated Studies) Program's Laser Research Facilities at the Lawrence Berkeley National Laboratory (LBNL), into which the proposed High Energy Plasma Laser Accelerator (BELLA) will be integrated.

According to an article in the Daily Californian, July 6, 2009, issue: "The new accelerator (BELLA) will replace the lab's current device, which has a chamber that is only 3.3 centimeters long...The current device can charge the particles to 1 billion electron volts..."(Attachment 1) CMTW-1

Furthermore, in April of 2008, Berkeley Lab's News Center included a feature article titled:"BELLA: The Next Stage in Laser Wakefield Acceleration", describing how "For over a year, the LOASIS group, led by Wim Leemans, of Berkeley Lab's Accelerator and Fusion Research Division (AFRD), has held the world record for laser-wakefield acceleration, accelerating high-quality electron beams to energies exceeding 1 GeV (1 billion electron volts)". (Attachment 2)

In summary, the BELLA EA failed to analyze the impacts/cumulative impacts of the LOASIS program, already in operation in Building 71 (B71), of which the BELLA accelerator is proposed to be a part.

The EA failed to provide a comprehensive floor plan of B71, to clearly show all the existing spaces that currently house the LOASIS program facilities, and how and where the proposed BELLA accelerator will fit in. On page 13 of the EA there are only 6 random photographs of rooms (195, 115, 126, 131, 128, 146), without any coherent plan to show how they relate to the rest of the building, and the LOASIS program projects. In addition, the EA failed to provide a cross section of B71, to show the same, i.e. the relationship of the new BELLA apparatus to the existing LOASIS and other project facilities in B71, the proposed new roof level addition for new utilities, the locations for radiation and EMF (Electromagnetic Field) monitoring devices, the shielding areas for the accelerators and beam dump areas etc. CMTW-2

1.

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Berkeley, California Monday, July 6, 2009 www.dailycal.org

NEWS

PARTICLE ACCELERATOR: Scientists are building a small, powerful model.

SEE PAGE 2

RESEARCH & IDEAS

Scientists Work on New Particle Accelerator

by **Paul Edison**
Contributing Writer

While a surfer might feel the rush of riding some of the Pacific Ocean's largest waves, scientists from Lawrence Berkeley National Laboratory are feeling the same excitement in the lab, but on a much smaller scale.

Researchers at the Berkeley Lab plan to use microscopic waves to charge and accelerate some of the smallest particles in the universe.

The process will take place in the lab's "table-top" Berkeley Lab Laser Accelerator, a device that is planned to be built by fall 2009 and will replace the lab's current, smaller accelerator.

While the particles will be accelerated in a tube that is only one meter long, scientists said the process for getting the particles up to speed is far from simple.

The scientists must first charge a chamber of atomic gas through which the particles will travel.

A laser beam will then puncture the gas and cause a "wake" that will accelerate and charge the particle that follows the beam, said Paul Preuss, a member of the communications department for the lab.

In an online video, project leader Wim Leemans compared the acceleration process to a surfer catching a wave behind a passing motorboat.

"Laser poles excite the wake in the plasma and electrons surf this wake and therefore reach very high energy," Leemans said in the video.

He said that the plasma would produce "a thousand times bigger electric field than (a) conventional accelerator."

The new accelerator will replace the lab's current device, which has a chamber that is only 3.3 centimeters long and does not charge the particle as much, Preuss said.

The current device can charge the particles to 1 billion electron volts. Researchers said they hope that the new accelerator will charge the particles to 10 billion electron volts.

Charging the particles to 10 billion electron volts would be a major achievement given that the particles will only be charged over one meter, Preuss said.

Sami Tantawi, an associate professor of particle physics and astrophysics at Stanford University, said an effective compact accelerator would increase accessibility to particle accelerators and could hugely impact the scientific community.

"Using these tools are extremely expensive," he said. "People wait in line, sometimes for years to use them: pharmaceutical companies, engineering and archaeological researches, you name it."

John Fox, a consulting professor for applied physics at Stanford University, said the project could be successful and has the ability to revolutionize physics in college classrooms.

"If the accelerator facility gets smaller, it would become less expensive," he said. "It will open up research in new areas."

Contact Paul Edison at pedison@dailycal.org.

3

2.

ATTACHMENT 1.

ATTACHMENT 2. (3 PAGES)

April 2008

BELLA: The Next Stage in Laser Wakefield Acceleration

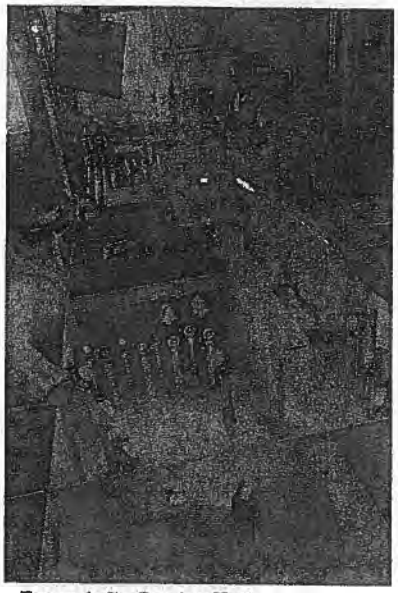
Contact: Paul Preuss, paul_preuss@lbl.gov

For over a year, the LOASIS group led by Wim Leemans, of Berkeley Lab's Accelerator and Fusion Research Division (AFRD), has held the world record for laser-wakefield acceleration, accelerating high-quality electron beams to energies exceeding 1 GeV, a billion electron volts, in a distance of just three centimeters. Now Leemans and his colleagues are poised to achieve energies an order of magnitude higher still, with BELLA, the BErkeley Lab Laser Accelerator.

"The first step for BELLA is to develop a 10-GeV laser-wakefield accelerator module," says Leemans. "With it we'll be able to address some of the most interesting scientific questions recently posed by the National Academies—everything from cosmology to extreme physics. How do the natural accelerators in the cosmos work? Is the theory of quantum electrodynamics adequate at the highest energies? We'll also get answers to exciting practical questions about using lasers to build the high-energy particle colliders of the future."

The energy an accelerator adds to a particle for each unit of distance it travels is called the accelerating gradient; electron and positron machines like the proposed International Linear Collider (ILC), plus other accelerators now in the planning stage, will add 25 million volts each meter. With that kind of gradient—strong for a conventional accelerator—beam energies of 250 GeV, needed to achieve the ILC's goal of smashing electrons and positrons together at center-of-mass energies of half a trillion electron volts, will require a linear collider at least 30 kilometers long.

But with billion-electron-volt beams in just three centimeters—so short that laser-wakefield acceleration has sometimes been called "tabletop" acceleration—Leemans's LOASIS group (LOASIS stands for Laser Optics and Accelerator Systems Integrated Studies) has already demonstrated an accelerating gradient a thousand times greater.



From left, Csaba Toth, Joseph Wallig, and Wim Leemans of the LOASIS group work with the 40-terawatt laser. (Photo Roy Kaltschmidt)

BELLA's 10-GeV accelerator module will provide powerful, intense electron beams with pulses as short as a femtosecond (a quadrillionth of a second, 1×10^{-15} sec) for research in materials science, life sciences, physics, and chemistry—an extraordinary facility in its own right—but that's just the beginning. By stringing a hundred or so of BELLA's 10-GeV modules together, intense colliding beams of electrons and positrons with center-of-mass energies of 1 TeV, a trillion electron volts, or more, could be created in just a few hundred meters. That's twice the energy of a conventional 30-kilometer collider—if not exactly on a tabletop, still in only about the dimensions of a typical sports arena.

The science that a 10-GeV BELLA module will be able to explore stretches the imagination. An electron accelerated in a very strong electric field can gain energy equivalent to its own rest mass while moving the distance of its Compton wavelength: that means moving the electron just 2.4 trillionths of a meter (2.4×10^{-12} m) in an electric field of 30 quintillion volts per meter (3×10^{18} V/m), the so-called Schwinger limit. Imagine a runner whose mass doubles with every six feet he or she runs!

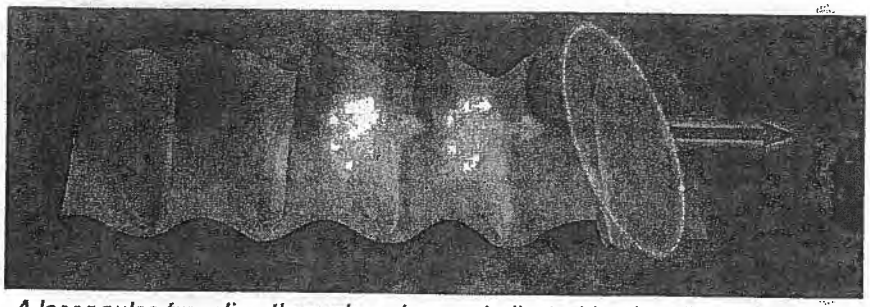
In a vacuum, electron-positron pairs are always blinking into and out of existence as virtual particles; usually they don't stick around long. But a field strong enough to exceed the Schwinger limit can create stable particles from nothing, which is known as "boiling" or "snapping" the vacuum. Indirect, proof-of-principle experiments have been done with conventional accelerators, but vastly stronger fields could be produced by bouncing a petawatt laser beam (a quadrillion watts, 10^{15} W) off a 10-GeV electron beam accelerated by BELLA.

With this kind of power, conditions like those inside an exploding star could be recreated; cosmology would come into the laboratory.

continued

What it will take

Laser-wakefield acceleration begins with a plasma—a state of matter in which positively and negatively charged particles are dissociated, typically protons (hydrogen nuclei) and electrons. A laser pulse driven through the plasma creates a wake that traps some of the free electrons and carries them along like surfers riding a wave. But sooner or later, when the electrons outrun the wake, acceleration stops.



A laser pulse traveling through a plasma, indicated by the ellipse at right, accelerates bunches of free electrons (center) in its wake.

To lengthen this so-called "dephasing length" requires a more tenuous plasma and a laser beam collimated over a longer distance. Most experimenters have tried to achieve this by using a large laser spot size, which requires a much more powerful laser for a relatively modest gain in acceleration.

The LOASIS group, by contrast, developed the method of drilling a long focusing channel through the plasma, thin at the center, dense at the walls—a plasma channel with focusing geometry analogous to the optical fibers used in long-range communications. A laser drive pulse is sent through this channel to form a wake that can maintain its accelerating power over fairly long distances, and for a long enough time to generate multi-GeV electron beams.

BELLA's research and development will begin with facilities already in place at the LOASIS laboratory, where record-breaking 1-Gev electron beams were created using a 40-terawatt laser (40 TW, or 40 trillion watts) and a three-centimeter capillary carved in a block of sapphire. High-quality beams were created by first filling the capillary with hydrogen gas, then discharging a 1-joule capacitor through it to turn the gas to plasma and form the focusing channel guide, and finally by sending the 40-TW laser's drive pulse through the channel to accelerate free electron bunches.

The challenges for BELLA include devising a way to stage accelerating modules so that accelerated electron bunches from each stage are passed to the next for added acceleration. This in turn requires controlled, periodic, rapid plasma formation via discharge and laser-pulse injection into each stage. The LOASIS capillary-discharge technology will be extended to create plasma focusing channels up to tens of centimeters in length. Progress also requires diagnostic techniques and powerful computer simulations for fine-scale characterization and modeling of the beams.

To achieve BELLA's main objective of 10-GeV electrons, a new and much more powerful laser will have to be put in place, a state-of-the-art laser that can fire a 40-joule pulse in a brief 40 femtoseconds, then build up to fire again and again, once every second, a repetition rate of one hertz (1 Hz). Such a laser will have an average power of 40 W and a peak power of a quadrillion watts—a petawatt, 1 PW.

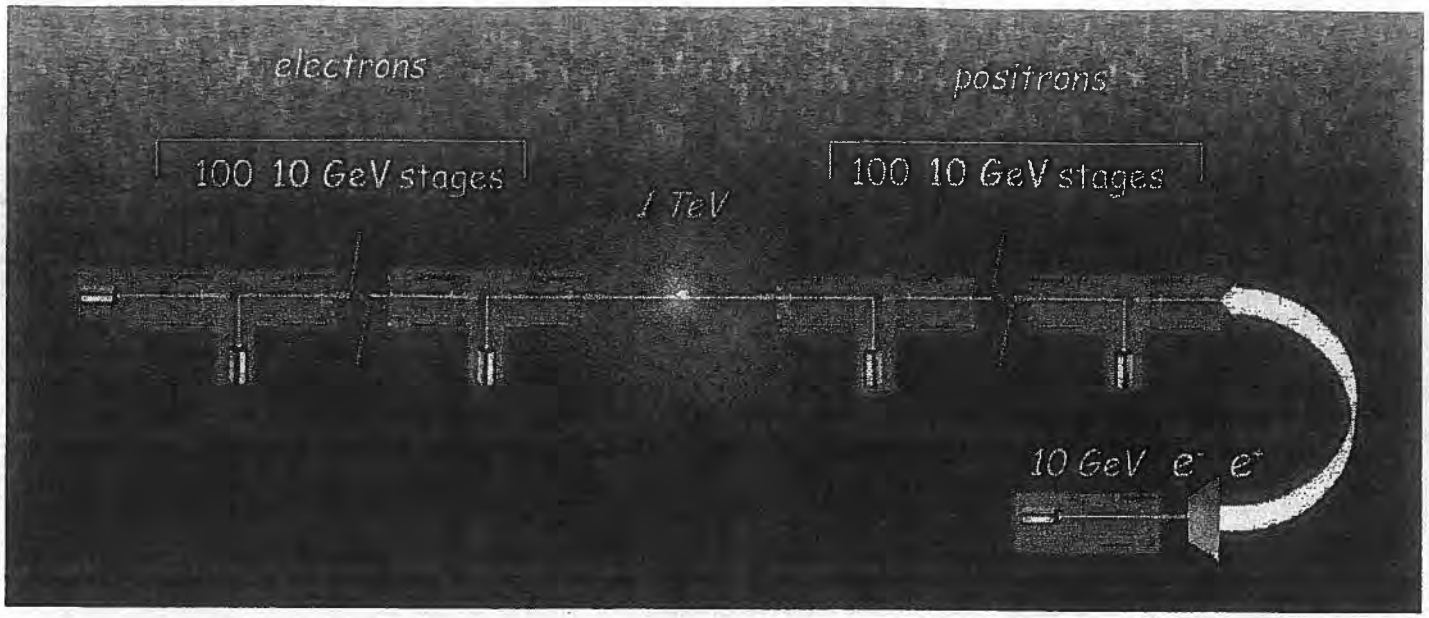
"Since the time we designed and built the LOASIS 40-TW laser ourselves, there has been a revolution in the field of laser technology," Leemans says. "Advances are now driven by commercial companies, and by military requirements, and we have been talking with two companies who want to build a laser for BELLA under our supervision."

Given Berkeley Lab's already substantial commitment to LOASIS, BELLA initially needs only modest funding for additional staff and equipment. In addition, sections of the HILAC and SuperHILAC accelerators for which Building 71 was built (and which now houses the LOASIS laboratory) must be removed and the building seismically retrofitted to prepare for the BELLA infrastructure. Completing BELLA will require a 1-Hz, 1-PW laser—the highest average power (40 W) petawatt-class laser in the world.

"With the support of DOE, which has already given its approval of BELLA's mission need, we plan to have a 10-GeV acceleration module in place and working within five years," Leemans says. "This will provide a unique user facility for scientists who need advanced light sources and free-electron lasers. Meanwhile, we'll be on the way to designing a new generation of powerful accelerators and colliders based on laser-wakefield acceleration technology. BELLA will help insure that the unique science DOE has made possible through its leadership in advanced accelerator research will go forward into the future with laser-based technologies."

The BELLA project will be carried out by the LOASIS Program staff led by Wim Leemans, presently including Eric Esarey, William Fawley, Cameron Geddes, Anthony Gonsalves, Nicholas Matlis, Estelle Cormier-Michel, Dmitriy Panasenko, Carl Schroeder, and Csaba Toth of AFRD, with Donald Syversrud and Nathan Ybarrolaza of Engineering and support from AFRD's Olivia Wong and Martha Condon. BELLA will involve collaboration with Berkeley Lab's Physics, Engineering, Advanced Light Source, and National Energy Research Scientific Computing Center Divisions, with academic institutions including Oxford University, the University of Colorado, the University of Nevada at Reno, and the University of Texas at Austin, with other DOE laboratories including the Lawrence Livermore National Laboratory, and with private industry.

continued



A collider with 100 or so 10-GeV stages in each beam could accelerate electrons in one beam and positrons in the other to center-of-mass energies of 1 TeV or more in just a few hundred meters.

Additional information

For more about LOASIS, visit http://loasis.lbl.gov/main.html.

For more about the world record laser-wakefield accelerator, one billion electron volts in three centimeters, go to http://www.lbl.gov/Science-Articles/Archive/AFRD-GeV-beams.html.

For more about "Dream Beams," the first high-energy, high-quality beams from a laser-wakefield accelerator, go to http://www.lbl.gov/Science-Articles/Archive/AFRD-laser-wakefield.html.

None of the LOASIS program projects' Environmental Impacts have ever been circulated for Public Review and Comment in the past. These projects include, but are not limited to the LOASIS 40-terawatt laser (40 TW, or 40 trillion watts) project. When was it built? Where is it exactly located in B71? What is the direction of the beam? What is the location of the beam dump? How extensive, and what kind of shielding is in place for the LOASIS 40-TW laser? How is direct, ionizing radiation and EMF radiation being monitored outside the building? Will the BELLA 10 GeV (10 billion electron volt) laser accelerator operate at the same time with the LOASIS 40-TW laser? What are the cumulative impacts of these 2 accelerators? How many other projects are housed in B71, LOASIS or otherwise? What are their cumulative impacts added to BELLA and the LOASIS 40-TW laser? CMTW-3

The April 2008 Berkeley Lab BELLA article referred to the ultimate end goal of the BELLA project, i.e. the "stringing of a hundred or so of BELLA's 10-GeV modules together" and creating "intense colliding beams of electrons and positrons with center-of-mass energies of 1 TeV, a trillion electron volts, or more, within just a few hundred meters. That's twice the energy of a conventional 30-kilometer collider... about the size of a typical sports arena." CMTW-4

What indeed is the proposed location for the 100 BELLA facility? Is the stringing of 100 BELLAs proposed to be done at LBNL? Is the Stanford Linear Accelerator Complex (SLAC) a candidate? What will the programmatic Environmental Review documents be for the 100 BELLA project? When will they be circulated for public review and comment? CMTW-5
What are the 2 companies currently considered for the construction of the BELLA laser? CMTW-6

Please provide detailed answers to all the questions above.

A more detailed and careful analysis of the Affected Environment and Environmental Consequences section of the EA must be prepared, otherwise it is deemed inadequate, incomplete and deficient. CMTW-7

The EA failed to analyze and describe in detail the many natural and man-made hazards present at the site of B71. The building itself was previously deemed seismically unsafe. It is located in a known landslide area, which is crisscrossed by several earthquake faults; the University Fault and the Lawrence Hall of Science Fault Complex, according to a 1984 Converse Consultants Report. The North Fork of the Strawberry Creek is present at the site, as well as many of the springs of the Strawberry Creek Watershed. Springs usually indicate the presence of earthquake faults. The EA also failed to consider the fact that B71 and the entire LBNL site is in the Hayward Earthquake Fault Zone, considered one of the most dangerous in the country. Indeed experts predict that the Hayward Fault is ripe for a catastrophic earthquake at any time! CMTW-8

The Strawberry Creek Watershed and its Canyons are in a high risk wildland fire zone as well, fact not addressed in the EA. Also excluded was the fact that the Canyon lands of the LBNL site are habitat for Endangered Species! CMTW-9 CMTW-10

6.

The EA also failed to analyze the legacy contamination created by past operations of the HILAC accelerator, the SuperHILAC and the BEVALAC, all associated with B71. The groundwater and soil in the area are contaminated by Volatile Organic Compounds (VOCs), Freon, radioactive Curium 244 and tritium, according to LBNL's Site Restoration Program Reports. CMTW-11

As part of our comment letter, we are submitting a Report by Laurel Collins, Geomorphologist of Watershed Sciences, titled:

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA (Attachment 3). CMTW-12

Sections on Chemical and Hazardous Contamination, Drainage Network Mapping, Fault Mapping, Landslide Mapping, Plume Monitoring Sites, Zones of Concern for Potential Plume Migration, Radioactive Contamination and Future Development and Site Conditions cover all the areas that the EA mostly ignored. (See also website: www.cmtwberkeley.org)

We ask that all the concerns expressed above will be analyzed in detail in a forthcoming EIS (Environmental Impact Statement) and an EIR (Environmental Impact Report under the California Environmental Quality Act/CEQA). CMTW-13

Operating accelerators produce a variety of radiation fields, including neutrons, gamma rays, muons and other radiations. This accelerator is no different. The 10 billion electron-volt, Petawatt-class laser accelerator BELLA is 60% more powerful than LBNL's Bevatron accelerator, now in the process of being demolished, which reached 6.2 GeV as reported by Franke and Greenhouse ("Review of Radiological Monitoring at LBNL: Final Report", City of Berkeley, 2001) CMTW-14

The Franke and Greenhouse Report also revealed that in the past 800 mrem/y radiation doses, measured at the Olympus Gate monitoring station (located between homes and B71), exceeded the then allowed annual dose of 500 mrem/y by 60%, despite of all of the massive shielding, built around the Bevatron. (Attachment 4, pages 36-39, 45)

The BELLA EA fails to consider and analyze any kind of monitoring at LBNL's Olympus Gate monitoring station, and to our surprise we discovered that the station no longer appears on LBNL's Site Environmental Report maps, and that the station now, surrounded by vegetation, seems abandoned. This is especially troubling, in view of the Franke and Greenhouse Report and the statements in the EA, that BELLA is proposed to be located just 138 meters (448 feet) from the residential neighborhood of Northeast Berkeley, and 159 meters (516 feet) from the Lawrence Hall of Science, a children's school and museum! (Attachment 5, A and B). CMTW-15

7.

ATTACHMENT 3.
(53 PAGES)

ATTACHMENT H. (6 PAGES)

Review of Radiological Monitoring at LBNL

Final Report

Bernd Franke and Anthony Greenhouse

Prepared under Contract with the City of Berkeley

August 23, 2001

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C Historical exposures (1997 and earlier)

C.1 What exposures to neutron and gamma radiation resulted from LBNL operations?

Approach
Review of historical data on neutron and gamma exposures

Findings
At early times neutron exposures of employees (as well as possible offsite exposures) were significant. Professor E. O. Lawrence himself requested that the Physiology Dept. at U. C. Berkeley look into the possible harmful effects of neutrons after finding the at the building which housed one of his cyclotrons had become activated by neutrons. Lawrence et al began construction of the 184 Inch Synchrocyclotron in 1940, the magnet of which was used in his "Calutron" experiments to enrich uranium for use in atomic bomb research. This site was on the "hill", and separate from his earlier cyclotron research on the Berkeley Campus proper. The hill site became the Lawrence Berkeley Laboratory. The accelerators at Lawrence's labs were used primarily for research in high-energy physics, but also for radiation biology, medical research, atomic physics, heavy radionuclide production and research (Heilbron (1981)), and very high intensity photon sources.

The Atomic Energy Commission (AEC), followed by the Energy Research and Development Administration (ERDA), and then the Department of Energy (DOE) maintained regulatory statutes for public protection against radiation-related injury. The AEC protection limits were first established in the 1940s. Later, AEC Manual Chapter 0524 became the reference. The DOE retained Chapter 0524 until 10CFR835 came into effect.

The calculation and/or measurement of radiation doses are called dosimetry. The International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection and Measurements (NCRP), and the International Commission on Radiation Units and Measurements (ICRU) provide guidance on the units and measurement techniques used for protection of personnel.

One of the most recent reports is ICRP Publication Number 60, 1990, Recommendations of the International Commission on Radiological Protection", ICRP (1990). This report recommends that the "equivalent dose", Ht, equals the absorbed dose, Dt, times a radiation weighting factor, wt. The weighting factor has changed over the years, primarily for neutron radiation for a number of reasons, but primarily because of better knowledge of the effects of that radiation on the health risks that exposure to it engenders. Neutrons of energies between 0.1 and 2 MeV have the highest weighting factor of 20, meaning that neutrons within this energy region are twenty times a damaging per unit absorbed dose as are typical gamma rays or ortho-voltage x-rays. These radiations as well as beta rays from radioactive materials are considered to be the least harmful per unit absorbed dose. The variation in weighting factors over the years, as well as the range of weighting factors can produce factors of at least two fold variations in the allowable dose from broad-spectrum neutron sources such as accelerators. Recommendations in ICRU Report 57 (ICRU (1998)) suggest further that the ISO and ROT conversion coefficients be used for environmental dose estimates since they best satisfy the uncertainty about he

positions and activities of the general public near high-energy accelerators. Thus conditions of exposure as well as the risks attendant to them have become better defined over the years, allowing for more accurate assessments of neutron and other radiation doses.

Operating **accelerators** produce a variety of radiation fields outside of the biological shielding which is intended to protect personnel from radiation exposures. These are primarily neutrons, gamma rays, muons, and other radiations of which neutrons have the highest intensity, and are the most damaging from a health risk point of view.

Personal neutron exposures were monitored as part of the personal dosimetry program at LBNL from ~1959 to the present. During the mid-1980ies it was determined that personal monitoring for neutrons was no longer required for individuals who did not work around the Laboratory's accelerators.

The Laboratory's environmental monitoring reports were reviewed for periods from 1960 to 1976 (LBNL, 1960 to 1977). During this time the Bevatron accelerated protons and other light ions to energies, which reached 6.2 GeV, the maximum endpoint energy for protons. Neutron production was incidental to the acceleration of light ions, and because of their lack of electrical charge, they penetrated the thick concrete shielding to produce exposures in persons both on-site and off-site. In fact, there was no roof shielding during the early period of Bevatron operation. The spectrum of these neutrons was best described by the function 1/E, where E is the neutron energy. Superimposed on this l/E spectrum were the contributions from sky shine and evaporation neutrons from interactions of protons with iron in the magnet structures. One can derive a neutron field through thick shielding for a proton beam at 6.4 GeV such that the neutron spectrum would extend from "thermal" energies (average of 2.5 E–8 MeV) to 6.4 E3 MeV. From the Olympus Gate monitoring station the Bevatron looked like a point source producing a neutron field described by 1/E up to 6.4E3 MeV. "Sky shine" neutrons resulted from high-energy neutrons escaping the shielding in a roughly vertical direction, and interacting with molecules of air, resulting in their being scattered back to the ground at substantially reduced energies (≤10 MeV). The sky shine neutron spectrum declined as roughly 1/r from the Bevatron, whereas the direct neutron spectrum declined as $1/r^2$, where r is the distance from the Bevatron.

An early environmental report (1971) contained data that neutron doses exceeded the allowed annual dose prescribed by the Atomic Energy Commission. This limit was 500 mrem/y, while the dose reported at the Olympus Gate was 800 mrem/y. This dose was verified during a meeting with LBNL representatives last year. However, an LBNL report was published soon after that meeting which raised issues regarding conversion of neutron spectra to dose. That report made a credible case for reducing the earlier reported doses by a factor of at least two (2). A description of the rationale used in the report follows.

Radiation doses calculated for any of a variety of recipient conditions could vary a great deal. No attempt was made to calculate doses to persons beyond the site boundary, but rather to keep the boundary doses within acceptable limits.

The best estimate of the impact of neutrons on the environment is a description of the neutron spectrum as a function of energy (the differential energy spectrum). Issues relating to exposure of persons to that neutron field may have a profound effect on the description of radiation dose and consequent health risk from that exposure. For example, the dose itself can be calculated for persons facing the source (AP), away from the source (PA), laterally from the side of the

body (LAT), rotating with respect to the source (ROT), or exposed to an isotropic source (ISO), ICRP (1997) and ICRU (1998). Additionally, shielding may be provided by a housing structure, for instance. These issues combined with the uncertainty associated with residency times can force a dramatic impact on dose estimates in the public sector. Hence, the decision about minimizing the dose at the site boundary was made.

More recently, and likely in response to inquiries made by these authors, R. H. Thomas, et al, published a document, Thomas (2001), which negated the high neutron doses previously mentioned. This was largely due to reinterpretation of neutron fluence-to-dose information at the site boundary. The neutron fluences as functions of neutron energy previously referred to apparently did not result in doses in excess of those required by the (then) AEC for protection of the general public.

Also, Donahue et al published in draft a report in which the neuron spectra at the Olympus Gate Environmental Monitoring Station (OGEMS) were mathematically generated by Monte Carlo techniques in a computer. The normalized spectra were then multiplied by the measured spectra at the OGEMS, and these results compared with the high neutron dose reported in the 1972 Environmental Monitoring Report. The result, when the newer technique (ICRU, 1998) was used to estimate doses, verified that the earlier reported dose was a factor of 2 too high (Donahue, 2000). The complexity of the Bevatron prevented a completely independent estimate of environmental dose using the Donohue technique.

As noted above, the originally reported exposures were in excess of the dose limit of 500 mrem per year set in AEC Manual Chapter 0524, dated February 1, 1958. It appears that LBNL was subject to AEC Manual Chapter 0524 regulations since the laboratory was an AEC contractor. The Manual chapter 0524-02 paragraph 2 states that existing facilities can apply for a conversion period not to exceed five years if a request is made by an appropriate AEC official. IFEU has asked the LBNL to supply a written copy of the request if it was made at the timely response to this request, LBNL has provided documentation from 1958 and 1959 demonstrating than Berkeley Lab developed shielding plans for the Bevatron to meet the new limits. Whether or not this provides evidence of an application in agreement with the provisions set in manual chapter 0524-02 paragraph 2 states appears to be a legal question that IFEU has been unable to resolve.

In addition to the above, the issue of **relative biological effectiveness (RBE)** of neutron radiation has been evaluated by various researchers in cytogenetic experiments. For example, human lymphocytes were exposed to a mixture of neutron and gamma radiation and the increase of dicentric chromosome aberration in cultured cells was determined (Heimers, 1999). Heimers concludes that "[t]he high RBE values of 96 and 113 respectively found in the present study indicate that the weighting factors for neutrons recommended by ICRP 60 (1990) are probably not conservative. Occupational exposure to neutrons may be more harmful than comparatively low values of physical measurements suggest". It is recommended that the validity and relevance of this finding should be assessed in the review of neutron exposures from LBNL.

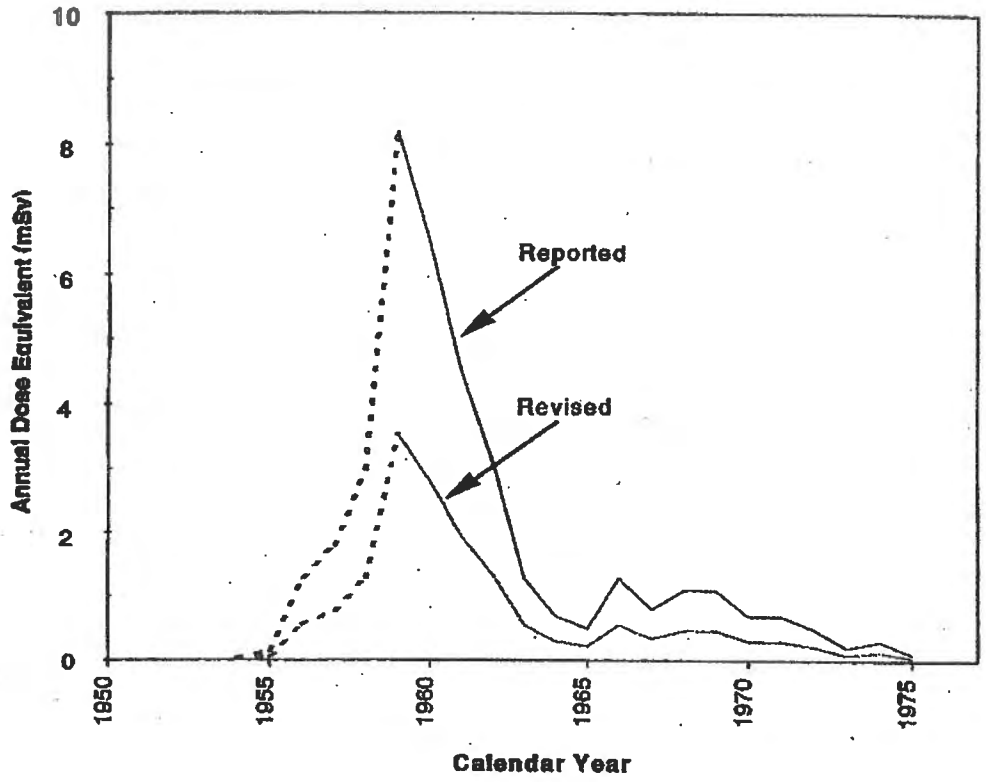

Figure 14. Comparison of reported dose equivalents for 1959-1975 with revised dose equivalents (Thomas et al., 2000)

Conclusions and recommendations

Neutron and gamma doses at various locations at the LBNL site boundary were substantially larger than today. Based on available data, maximum exposures have exceeded 500 mrem/yr using the historical conversion factors. Using current conversion factors for neutron doses, cumulative dose rates at the Olympus Gate station were greater than 2,000 mrem. It is recommended to estimate doses to the nearest residents including the contribution of all LBNL sources and pathways while taking uncertainties in monitoring data, conversion factors and other parameters into account. A recent paper (Heimers, 1999) presents cytogenetic data that suggests that neutron radiation may have a higher relative biological effectiveness (RBE) than is reflected in currently used radiation weighting factors. This paper and other data on the RBE of neutrons should be reviewed further.

D Risk related questions

D.1 What is the potential health risk from past exposures?

Approach
Comparison of historical doses with doses at other sites

Findings
The calculated dose for continued residence at the Olympus Gate stations as estimated from data in Thomas et al. (2000) was about 2 rem CEDE. Doses for real individuals were smaller than 2 rem because a 100% residency at the Olympus Gate was hardly realistic. On the other hand, the uncertainty in the underlying raw data and the contribution from other radionuclides should be properly evaluated before accepting the Olympus Gate data by Thomas as an upper limit estimate for all residents near the LBNL site. Compared to other sites, doses in the LBNL vicinity are considered to be significant as the comparison of selected data in Table 7 shows. The comparison is difficult since the methodology of dose calculations and the selected scenarios are not identical. Despite these limitations, the data indicates that considerable attention has focused on the reconstruction of radiation doses at sites where exposures were similar to those at LBNL. While doses at the Hanford and Fernald sites were larger than those at LBNL, doses from releases at Rocky Flats Plant, Colorado were comparable or less.

Table 7. Maximum scenario radiation doses from past activities at selected locations

DOE Facility	Dose estimates (CEDE)	Remarks	Source
Lawrence Berkeley National Laboratory, CA	~ 2 rem	for continuous residence at Olympus Gate	Thomas et al., 2000
Rocky Flats, CO	maximum dose: < 1 rem	resulting from 1957 fire to	RAC (1999)
Nevada Test Site Fallout in Utah	average ~0.8 rem maximum: 4 rem	dose to 1,177 people diagnosed with leukemia	Lloyd et al. (1990)
Feeds Material Production Plant, Fernald OH	28 rem	realistic maximum inhalation exposure[a)]	Till et al. (1998)
Hanford WA, Site	2 to 105 rem[b)] (95% confidence interval)	maximum scenario: females born in 1945 living from Richland on a goat milk diet	Hoffman (1999)

a) Scenario 1, 38 years of exposure, mean dose value
b) weighting factor of 0.05 for conversion of thyroid doses to CEDE

Conclusions and recommendations
Radiation doses from past operations at LBNL were comparable to those at locations where considerable efforts were undertaken to reconstruct exposures to members of the public. In light of uncertainties regarding the magnitude and relative biological effectiveness of neutron exposures and the contribution from other radionuclides and non-radioactive pollutants, an in-depth review is recommended. A prerequisite for the risk assessment process involves dose reconstructions for past LBNL operations.

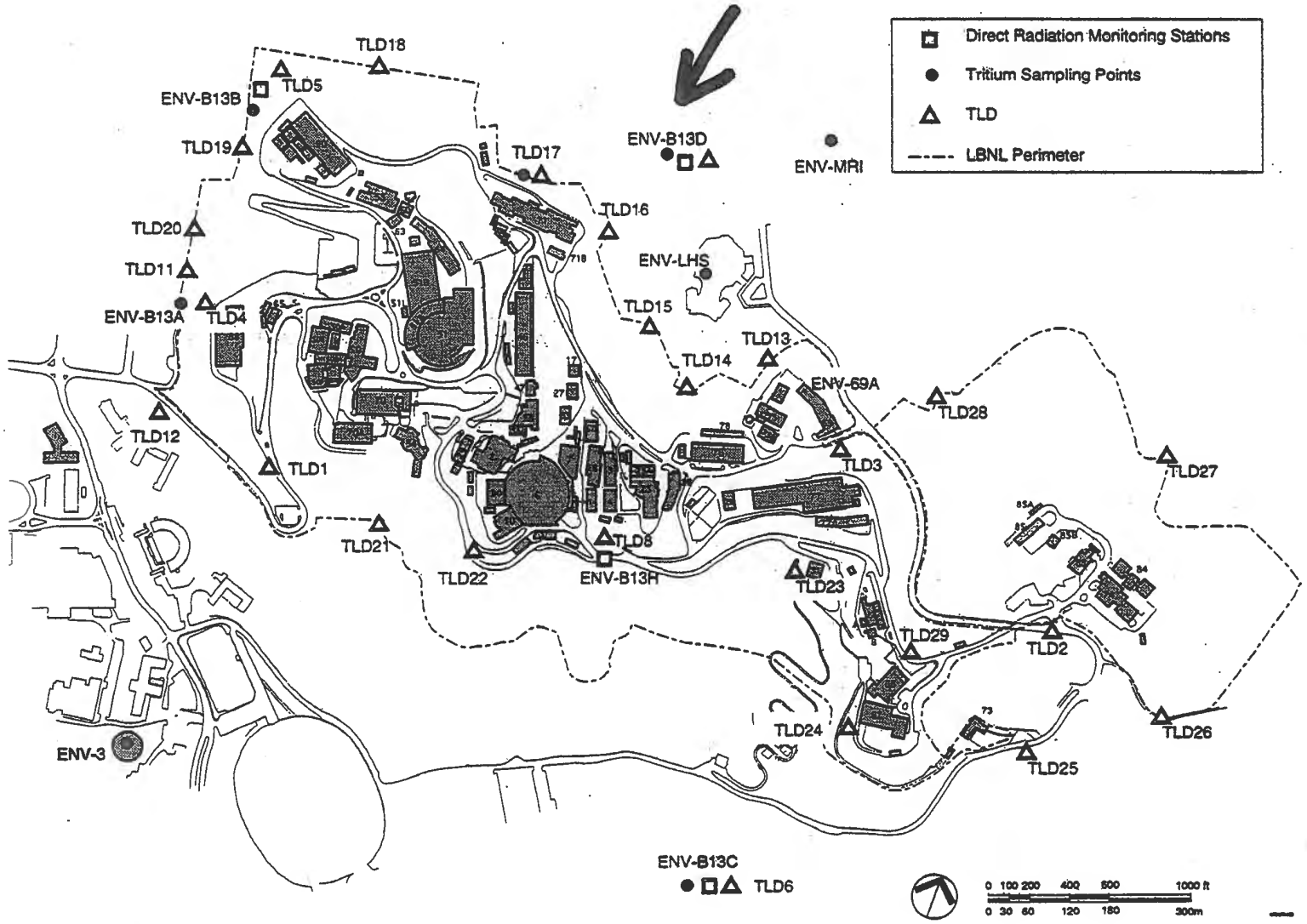

Figure 11-1. Environmental Radiological Monitoring Stations

16 5.

ATTACHMENT 5.A.

MONITORING STATION ENV-B13D MISSING!

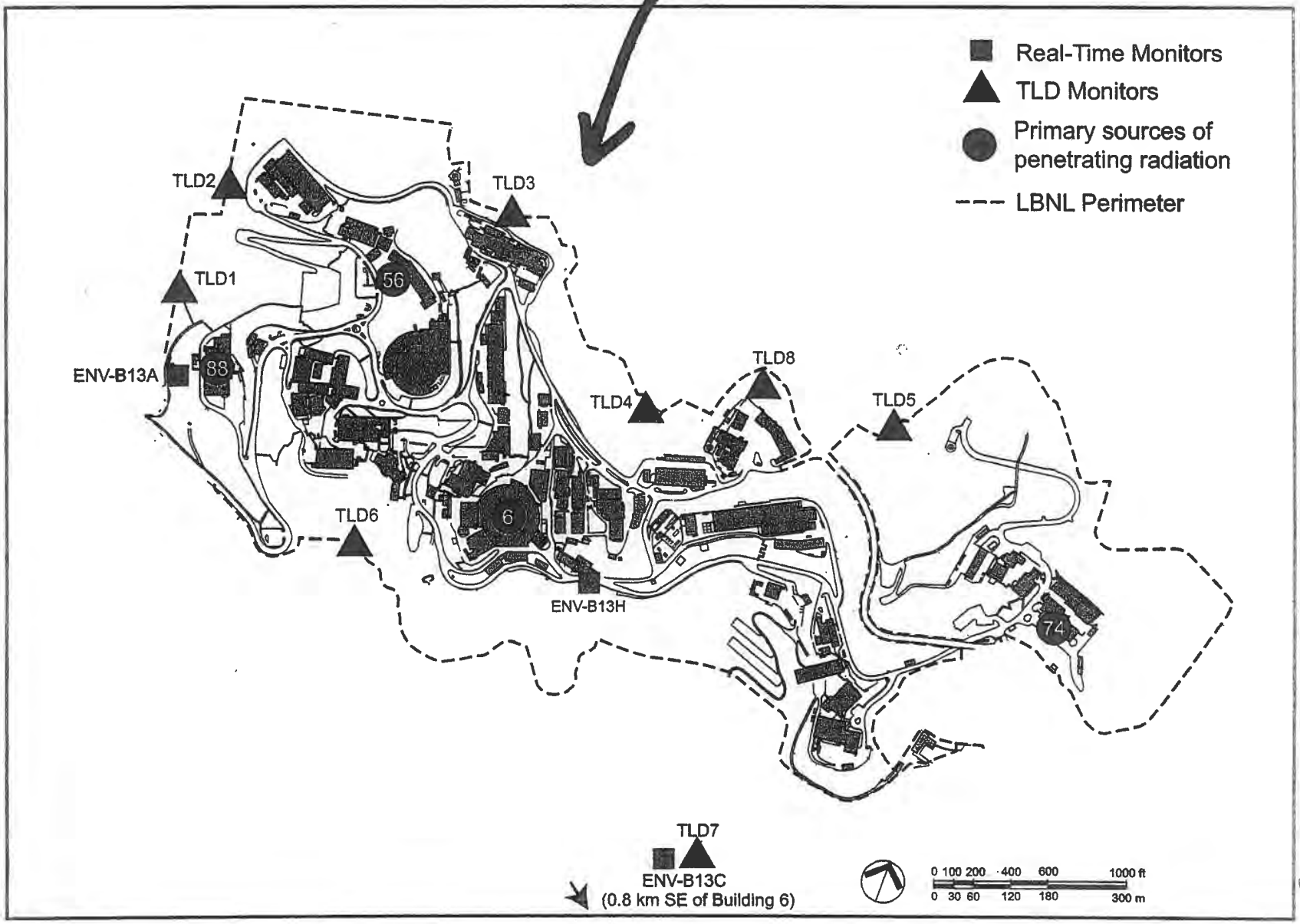

Figure 4-8 Environmental Penetrating Radiation Monitoring Stations

A more detailed and careful analysis of the Proposed Action and Alternatives section of the EA must be prepared, otherwise it is deemed inadequate and incomplete. CMTW-16

Indeed, what is meant by the following statement on page 20; regarding the siting of BELLA; " Off-site locations such as leased space were considered...but rejected because vacant accelerator facilities in the area are uncommon, and a large perimeter around the building might have to be leased and secured to provide an equivalent amount of protection from potential risk of radiation exposure to the public." CMTW-17

First, the BELLA apparatus is described to be 1 meter long, so it does not require much space! Secondly, nowhere in the EA are there discussions about the dose of radiation the public might receive at the current proposed location. What is the actual size of a "large perimeter around the building" to protect the public from the risk of radiation exposure? Is it 100 meters, 200 meters, 300 meters? According to the EA the closest home is just 138 meters away. Which specific residence is the measurement to? and measured from where? Please, describe in detail. CMTW-18

Has anyone at LBNL informed the unsuspecting home owners on Campus Drive, whose bedrooms, decks and backyards directly look into B71, specifically into the western part of the building where the beam dump is to be located? CMTW-19
Have you asked if these home owners would like to have direct radiation monitoring stations in their back yards? CMTW-20 Has a comprehensive Safety Analysis Document been prepared and finalized? What is the location of the MEI (Maximally Exposed Individual, for the purposes of the SAD calculations)? Is it again a child at the Lawrence Hall of Science, a mere 159 meters away, or a home owner, just behind B71? There must be an open, transparent discussion of the risks potentially facing the MEIs, during normal operations, during a variety of accidental situations, not excluding an earthquake, landslide or wildland firestorm, such as what occurred in 1991 in the Berkeley-Oakland Hills, just a quarter mile from LBNL. CMTW-21

Also on page 20, there is a discussion regarding the "Upgrading of the existing TREX laser in Building 71, to the equivalent power output... would result in approximately three years of down time for this system and prevent LOASIS from meeting mission-critical research commitments. Also, the existing TREX front-end is 14 years old and would need replacement to maintain reliability." Please describe the location of TREX, what is the direction of the beam? what is the quality of the shielding around TREX? CMTW-22 Has it been operating for the last 14 years, without anyone in the community knowing? CMTW-23 Where is the beam dump area? Please show in detail within a floor plan and a cross section! CMTW-24 How and where is the potential radiation exposure from TREX being measured? Where are those data for the public to review? How long has the monitoring for TREX radiation been going on and why are the data not included in LBNL's annual Site Environmental Reports? CMTW-25

17.

The NEPA EA process did not provide for a public hearing. Concerned members of the community petitioned city commissions to invite Wim Leemans, the director of the BELLA project to give a presentation, so the public could ask questions.

Indeed on July 9, 2009 the City's Community Environmental Advisory Commission held an one hour meeting, which included 2 power point presentations, one by Mr. Leemans and the second one by Mr. Lockhart, from the facilities division. There was no opportunity for the public to ask questions. After the meeting LBNL's Community Relations Officer physically blocked my conversation with Mr. Leemans, regarding questions I had about a Daily Californian article about the project, and screamed: "Don't tell her anything, you don't have to tell her anything!" **CMTW-26**

When we later requested to receive printouts of the powerpoint presentation, Mr. Abbott of DOE flatly denied our request. (Attachment 6.) We therefore ask that those powerpoint presentation graphics be included as an addendum to the responses to comments document, as they illustrated details of the project and building better than anything in the EA. Furthermore, it was curious to witness how desparately DOE and LBNL want to keep everything about this project so secret. WHY? * **CMTW-27**

The question I wanted to ask is the following: What is the atomic gas mentioned in the Daily Californian July 6, 2009 article: " The scientists must first charge a chamber of atomic gas through which the particles will travel". In an other article, the chamber was filled with hydrogen. Does the hydrogen at some point become radioactive? What is radioactive hydrogen? What are the constituents of the end product, plasma? **CMTW-28**

Mr. Leemans presentation also alluded to the LOASIS program laser projects, in addition to TREX and BELLA, he also described GODZILLA and CHIHUAHUA. What are they? Where are they located?? Please, describe in detail! **CMTW-29**

Finally in another Daily Californian (March 30, 2009) article, in which Mr. Leemans states: "Because the high-energy laser system produces a large electric field, it can be built at a smaller scale than normal-sized accelerators while producing the same amount of energy." How is this large electric field contained? How is the EMF measured? What is the extent of the EMF? Please, describe in detail. (Attachment 7) **CMTW-30**

The EA failed to analyze the continued and cumulative impacts of LBNL operations upon the residential neighborhoods of Panoramic Hill to the south and the Campus-Olympus-Wilson Circle neighborhoods to the NE. The EA must include detailed analysis pertaining to the fact that LBNL OPERATES IN A RESIDENTIAL NEIGHBORHOOD, WITHOUT ANY BUFFER ZONE!, i.e. alternatives, such as off-loading LBNL facilities (LOASIS/BELLA) from the hill site must be considered! **CMTW-31**

* Especially since the entire project is funded with our taxpayer monies under the Federal Stimulus Bill, ARRA (American Recovery and Reinvestment Act). **CMTW-32**

18.

ATTACHMENT 6.

From: "Abbott, Kim" <Kim.Abbott@bso.science.doe.gov>
Subject: Draft BELLA Environmental Assessment Presentations to the Berkeley
Date: July 15, 2009 2:56:36 PM PDT
To: <cathmark@earthlink.net>
Cc: "Jeff Philliber" <JGPhilliber@lbl.gov>, "Mark J Chekal-Bain" <MJChekal@lbl.gov>

Mr. McDonald:

The slides that were shown at the July 9 CEAC meeting were simply illustrative and were intended to assist the CEAC in conceptualizing some of the speakers' points. The slides are not intended to be viewed out of context with those oral presentations. More information about BELLA and other acceleration science and programs is available on our website. http://www-afrd.lbl.gov/loasis.html and at http://newscenter.lbl.gov/press-releases/2009/06/25/bella-accelerating-electrons/. We appreciate your interest in the BELLA project and look forward to receiving any comments you may have on the BELLA Environmental Assessment. The draft EA is available on line at http://www.lbl.gov/community/BELLA/. Copies of the draft EA are also available in the main Berkeley Public Library. If you wish to comment on the draft EA please mail your comments to Kim Abbott, National Environmental Policy Act Document Manager, U.S. Department of Energy, Berkeley Site Office, One Cyclotron Road, M/S 90- R1023, Berkeley, CA 94720 or send them via e-mail to kim.abbott@bso.science.doe.gov. Comments must be received before 5 p.m. on July 18, 2009.

Respectfully,

Kim Abbott
Dept. of Energy
Office of Science
Berkeley Site Office
(510) 486-7909

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THE DAILY CALIFORNIAN

Berkeley, California Monday, March 30, 2009 www.dailycal.org

21

20.

RESEARCH & IDEAS

Lawrence Berkeley Lab Gains Federal Funds

by **Christine Chen**
Contributing Writer

Lawrence Berkeley National Laboratory will receive $115 million as part of President Barack Obama's American Recovery and Reinvestment Act, as announced by Secretary of Energy and former director of the lab Steven Chu last week.

The funding comes from a portion of the $787 billion act Obama signed in February aimed to move research forward at major science institutions, while creating new jobs at the same time.

"Most of these projects (being funded by the act) have to do with infrastructure upgrades, and a number of those have been approved, but we have not received any of the money yet," said Jeff Miller, a spokesperson for the lab.

Among the projects that will be funded is the construction of a lab and office building for the Advanced Light Source synchrotron, a soft X-ray light source used by scientists to learn more about atomic structure.

About $14.3 million will go toward constructing a building next to the synchrotron as well as toward the ongoing project of demolishing the Bevatron, an older particle accelerator, to make room for new science buildings.

Another $1.5 million will go toward maintenance for the synchrotron, which is an open facility used by two thousand scientists and industries per year, said Roger Falcone, director of the synchrotron and a UC Berkeley professor of physics. The lab will need to hire about three dozen extra construction workers, he said.

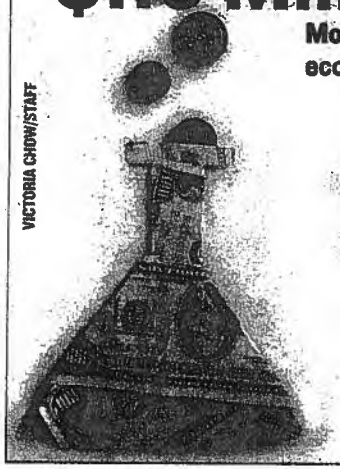
"This will accelerate the completion of the project and fulfill the other half of the requirement of stimulus funding, which is to create jobs, so it provides additional work for the construction field," Falcone said. "It will accelerate the process, which will make the research happen sooner."

Another proposed project at the lab is the Berkeley Lab Laser Accelerator, which scientists anticipate will receive $19 million. The money could

>> LAB: PAGE 2

$115 Million

Money the lab will receive from the economic stimulus bill



VICTORIA CHOW/STAFF

Projects the money will fund include:

- Construction for the Advanced Light Source synchrotron
- Demolition of the Bevatron
- Completion of the Berkeley Lab Laser Accelerator

SOURCE/LAWRENCE BERKELEY NATIONAL LABORATORY

LAB: Funding May Help Create New Jobs

FROM FRONT

potentially fund 50 to 60 new employees to do technical work on the laser system.

Because the high-energy laser system produces a large electric field, it can be built at a smaller scale than normal-sized accelerators while producing the same amount of energy, said Wim Leemans, director of the project. He said while the project received high ratings among scientists, there wasn't enough funding available to build it until recently.

"We were afraid we would lose our leadership in this area, and now we're back in the position so we can maintain the lead," Leemans said. "They told us that we would have gotten money about two years from now, but they would have to spread the project out more years than we wanted. Now, with the (act), we can do it on a much faster timescale, so it allows us be competitive with the rest of the world."

ATTACHMENT 7.

And lastly issues related to LBNL's energy consumption, contribution to our local environment's greenhouse gas emissions etc. please, accept my comments to ⟶ the UC Berkeley 2020 Long Range Development Plan (LRDP) Amendment and 2020 LRDP Environmental Impact Report (EIR) Addendum to address Climate Change, as comments to be considered and responded to as part of the BELLA EA process. CMTW-33

Also as part of our comments I am enclosing a Daily Californian article of June 1, 2009, titled Climate Plan Needs More Analysis, addressing concerns about LBNL's energy consumption, generation of radioactive, hazardous, and bio-hazardous medical waste etc. Also included LBNL's contribution of diesel particulate matter from the fleet of aging diesel busses and from the continuous hauling of demolition debris from the hill via downtown for years to come. Please respond to all the LBNL related sections of the enclosed comment letter and the 2 attached articles. (Attachment 8, 4 pages) CMTW-34

In conclusion, naming this apparatus BELLA is contrived and misleading. Call it what it is: a High Energy Plasma Laser Accelerator, i.e. HEPLA. There is nothing bella about it! CMTW-35

Based on the concerns expressed above, we ask that a full blown EIS be prepared under NEPA and an EIR under the California Environmental Quality Act (CEQA). We need a Public Hearing on the project, including the entire LOASIS program. CMTW-36

Sincerely,

Pamela Sihvola
CMTW
P.O. Box 9646
Berkeley, CA 94709

PS. All the "attachments" are an integral part of this comment letter, and should be considered as such, including the 53 pages of the Collins Strawberry Canyon Report. CMTW-37

PPS. The most egregious omission of the BELLA EA is the following: In 2005 the National Academy of Sciences Panel: BEIR VII, Committee on Biological Effects of Ionizing Radiation determined that there is NO SAFE DOSE OF IONIZING RADIATION, NO EXPOSURE LEVEL BELOW WHICH DOSAGE IS HARMLESS! CMTW-38

Please, make this BEIR VII finding a part of this process, include it as one of the guiding principles! (Attachment 9.) CMTW-39

21.

ATTACHMENT 8.
(4 PAGES)

Committee to Minimize Toxic Waste

Emily Marthinsen
Assistant Vice Chancellor
Physical and Environmental Planning
Capital Projects
300 A&E Building, # 1382
University of California, Berkeley
Berkeley, CA 94720-1382

July 3, 2009

Subject: Comments on UC Berkeley 2020 Long Range Development Plan (LRDP) Amendment and 2020 LRDP Environmental Impact Report (EIR) Addendum to address Climate Change

Dear Ms. Marthinsen,

The above referenced documents, addressing UCB's contributions to climate change, are inadequate and deficient because they do not set goals for greenhouse gas (GHG) emissions reductions that equal or exceed those of its host city, the City of Berkeley.

UCB and the Department of Energy's (DOE) Lawrence Berkeley National Laboratory (LBNL), managed by UC for the DOE and located on land leased from the UC Regents, and all the other real estate leased to UCB and LBNL equal at least one quarter (¼) of the land area of the entire City of Berkeley. And yet, these two entities, UCB and LBNL have not been able to join the City of Berkeley in a compresensive, transparent way and address their contributions to GHG emissions in <u>one</u> cohesive Climate Action Plan.

On June 2, 2009, the Berkeley City Council unanimously adopted a version of the Climate Action Plan (CAP), that aims to reduce Berkeley's GHG emissions by 80% by 2050. (See attachments 1A and 1B) UCB's strategy is "a feasibility study...and a target of reducing GHG emissions on campus to 1990 levels by 2014." (Chancellor Birgeneau's congressional testimony of April3, 2008)

UCB's GHG emissions were 205,994.00 metric tons of CO2 (MTCO2e) in 2007, which equals over 35% what the City of Berkeley emitted in 2005 (i.e. 576,000.00 MTCO2e). Furthermore, UCB's GHG emissions in 1990 were 165,000.00 MTCO2e, thus the "feasibility study" goal is <u>less</u> than a 20% reduction from the 2007 (p.30) levels to reach the 1990 levels (Figure 1.) Two paragraphs (p.29) were dedicated to LBNL, but <u>NO</u> GHG emissions data were provided.Please, update the LBNL section with the most recent, comprehensive GHG emissions data.

(1., 22.

ATTACHMENT 1A

THE DAILY CALIFORNIAN
Berkeley, California Thursday, June 4, 2009 www.dailycal.org
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City Adopts Final Version Of Climate Action Plan

by **Genevieve Head-Gordon**
Contributing Writer

The Berkeley City Council unanimously adopted the finalized version of the Climate Action Plan at Tuesday night's meeting.

The amended 20-year Climate Action Plan—which has been in the works since Berkeley voters passed Measure G in 2007—aims to reduce Berkeley's greenhouse gas emissions by 80 percent by 2050.

According to Councilmember Susan Wengraf, the adopted plan contains all the suggested amendments from the months of deliberation, except for the third clause—which calls for the rezoning of residential neighborhoods to accommodate more small stores.

Councilmember Max Anderson said he believes these neighborhoods should accommodate small stores because they can be vital in the city's economy.

"I can't support the clause on small mom and pop stores," he said. "In some parts of the city, corner stores serve as an important function."

Implementing the plan will cost $3 million in its first year, with the funds already allotted from the general fund. The plan will return to the council every year for revisions that address advances in science and progress on current projects, according to Councilmember Gordon Wozniak.

According to Mayor Tom Bates, the plan was recognized by the United Nations as the "best in North America."

"It has showed the way and it is now being used as a model for other cities," Bates said at the State of the City luncheon on Tuesday.

Despite such recognition, opponents of the plan argue that it lacks an environmental impact report, which assesses the potential environmental impacts resulting from approval, construction and operation of projects.

"The plan even admits itself that it ignores the environmental consequences, in spite of studies," said Shirley Dean, Berkeley resident and former Berkeley mayor. "We need (a report)."

Other residents also said the plan is not complete because it does not include UC Berkeley and the Lawrence Berkeley National Laboratory's environmental impacts.

"It is incredulous that the city has proceeded with its Climate Action Plan without any consideration of UC Berkeley and the (lab's) climate change impacts on Berkeley," said Berkeley resident Pamela Sihvola, reading from a prepared statement that also ran as an opinion column in The Daily Californian on Monday. "Without them, the plan is incomplete, a mere piecemeal implementation to fill only some sort of superficial PR purpose."

However most residents expressed excitement about the plan's potential for the city.

"This is Berkeley's chance to be a leader in the U.S. on climate action policy," said Pepper Yelton, who serves on the city's energy commission. "There will always be reasons to delay policy action on climate change but the plan has done a good job in trying to minimize costs and maximize benefits."

Contact Genevieve Head-Gordon at gheadgordon@dailycal.org.

(2.13.

THE DAILY CALIFORNIAN

Established 1871. Independent Student Press Since 1971.

Berkeley, California Monday, June 1, 2009 www.dailycal.org

Climate Plan Needs More Analysis

by **Pamela Silvola**

Berkeley's Climate Action Plan (CAP) and current CEQA (California Environmental Quality Act) Negative Declaration documents are absurd. They completely ignore a quarter of the city's land area that is occupied by the University of California (UC) and the Lawrence Berkeley National Laboratory (LBNL).

It is incredulous that the city has proceeded with its Climate Action Plan without any consideration of UC and LBNL's climate change impacts on Berkeley!

These impacts must be analyzed and included in the city's Environmental Impact Report (EIR) for the CAP. Without them, the CAP is incomplete, a mere piecemeal implementation to fill only some sort of superficial public relations purpose.

Indeed, in a recent court action a judge ruled, in response to a case filed by members of the group, Save Strawberry Canyon, that LBNL must recirculate their Climate Change Impact Analysis in the Long Range Development Plan EIR.

Lawrence Lab, a high energy user nuclear-industrial complex with already many accelerators, has plans to further increase its energy consumption by building yet another high energy accelerator!

The proposed high energy plasma laser accelerator (HEPLA) is expected to accelerate electron beams to energies in the order of 10 billion electron-volts. What will the annual energy consumption of this new facility be, in addition to LBNL's approximately half dozen other accelerators? This information must be made a part of the city's action plan.

It should start with the highest energy consumers, UC Berkeley and LBNL, the biggest contributors to the city's greenhouse gas emissions (GHG) load, who pay no property taxes, rather than burdening the residential property tax payers. Furthermore, under the California Medical Waste Management Act, LBNL is a large-quantity generator of bio-hazardous medical waste.

It also generates, in huge quantities, radioactive and hazardous waste and mixed waste (both radioactive and hazardous), often shipped to other counties and states! Berkeley Lab, a federal facility, could be a leader in the city's "Zero Waste to Landfills By 2050 Vision."

Instead, it is gearing up to dump hundreds, if not thousands, of tons of radioactive and hazardous debris from the demolition of the Bevatron accelerator, and other such projects, to landfills nearby and in other states.

Why hasn't Berkeley's CAP CEQA documents analyzed the impact of UC/LBNL's dozens of diesel buses, constantly circling around the city, campus, LBNL and downtown, which spew tons of diesel particulate matter/GHGs in the air? What is UC's and the Department of Energy LBNL's contribution annually to the City of Berkeley's GHG emissions in metric tons of CO_2?

Berkeley's Climate Action Plan must have a full blown EIR under CEQA, including a very careful analysis of the climate change impacts of all the hundreds of buildings and facilities belonging to UC, the Department of Energy and LBNL, which are located in the impact zone for the City of Berkeley.

Pamela Silvola is a Berkeley resident. Reply to opinion@dailycal.org.

25

ATTACHMENT 18

In a recent Environmental Assessment (EA), for DOE's proposed High Energy Plasma Laser Accelerator ("BELLA"), to be located at LBNL, under heading: Energy Use and Greenhouse Gases, LBNL's electrical energy consumption in 2008 was reported to have been 70,458 MEGAwatt hours (MWh), to that the new Laser Accelerator will add 500,000 to 600,000 KILOwatt hours (KWh) per year.

For comparison, LBNL's annual electrical energy consumption equals that of some 23,000 to 25,000 Berkeley households combined!

LBNL's annual natural gas consumption in 2008 was 1,800,000 therms. (BELLA EA, page 31). No conversions to MTCO2e, were provided, however, "BELLA's" contribution to LBNL's annual GHG emissions load (for electricity and natural gas alone) was reported to be 480 MTCO2e, which "would be less than one percent increase over 2008 LBNL emissions", which could thus be in the 50,000 MTCO2e range.

The third leg of the GHG emissions stool is transportation. LBNL's employee transportation is a huge GHG emissions contributor, including 100 diesel shuttle bus roundtrips a day to and from the hill site, i.e. some 73,000 one-way trips annually in addition to the hundreds of private cars driven by staff and employees daily to the Lab and the projected thousands of additional truck trips during the major demolitions (Bevatron) and new construction. UCB elected to exclude all construction generated GHG emissions from the annual calculations.

Since the release of the UCB climate change amendments, the City of Berkeley adopted a Climate Action Plan (exclusive of UCB and LBNL impacts), therefore we ask that sections dealing with the City of Berkeley's CAP (p.18) be correctly updated. Also, as previously stated, the LBNL section (p.29) must be updated and expanded to include the most recent GHG emissions data from all sources, including transportation (diesel and gasoline fueled), and that UCB include construction related GHG emissions in the annual inventories, at least for the 2020 LRDP time frame.

In summary, it is critical that there is at least one comprehensive baseline document, that takes into account all GHG emissions within the geography of the City of Berkeley, including all UCB and LBNL facilities in the eastern part of the Strawberry Canyon, within the Berkeley impact zone. When properly updated and supplemented, this UCB 2020 LRDP amendment and EIR addendum could serve that worthwhile purpose for the entire community.

Sincerely,

Pamela Sihvola
CMTW
P.O. Box 9646
Berkeley, CA 94709

ATTACHMENT 9.

NO SAFE DOSE OF IONIZING RADIATION

June 2005 finding of the
National Academy of Sciences Panel: BEIR VII,
Committee on Biological Effects of Ionizing Radiation

Even lower radiation poses risk, panel says

No exposure level found below which dosage is harmless

By H. Josef Hebert
ASSOCIATED PRESS

WASHINGTON — The preponderance of scientific evidence shows that even very low doses of radiation pose a risk of cancer or other health problems and there is no threshold below which exposure can be viewed as harmless, a panel of prominent scientists concluded Wednesday.

The finding by the National Academy of Sciences panel is viewed as critical because it addresses radiation amounts commonly used in medical treatment and is likely also to influence radiation levels the government will allow at abandoned nuclear sites.

The nuclear industry, as well as some independent scientists, have argued that there is a threshold of very low-level radiation at which exposure is not harmful, or possibly even beneficial. They said current risk modeling may exaggerate the health impact.

The panel, after five years of study, rejected that claim.

"The scientific research base shows that there is no threshold of exposure below which low levels of ionized radiation can be demonstrated to be harmless or beneficial," said Richard R. Monson, the panel chairman and a professor of epidemiology at Harvard's School of Public Health.

The committee gave support to the "linear, no threshold" model that is currently the generally acceptable approach to radiation risk assessment. This approach assumes that the health risks from radiation exposure decline as the dose levels decline, but that each unit of radiation — no matter how small — still is assumed to cause cancer.

"It is unlikely that there is a threshold below which cancers are not induced," said the report, although it added that at low doses "the number of radiation-induced cancers will be small." And it said cancers from such low-dose exposures may take many years to develop.

The panel, formally known as the Committee on Biological Effects of Ionizing Radiation, or BEIR, generally supported previous cancer risk estimates — the last one by an earlier BEIR group in 1990.

Contrary to assertions that risks from exposure to low-level radiation may have been overstated, the panel said "the availability of new and more extensive data have strengthened confidence in these (earlier) estimates."

The committee examined doses of radiation of up to 100 millisievert, a measurement of radiation energy deposited in a living tissue. A single chest X-ray accounts for 0.1 millisievert, average background radiation 3 millisievert a year and a whole body CT scan delivers 10 millisievert.

The committee estimated that 1 out of 100 people would probably develop solid cancer or leukemia from an exposure of 100 millisievert of radiation over a lifetime with half of those cases being fatal.

The report noted that exposure from a whole body CT scan is much higher than the usual X-ray, and it raised concerns about the frequency in which such medical diagnostics should be used.

THURSDAY, JUNE 30, 2005 415-777-1111 75 CENTS

Attention: Kim Abbott, NEPA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS 90-R1023
Berkeley CA 94720

RE: Lawrence Berkeley National Laboratory Draft Environmental Assessment
DOE / EA - #1655 June 18, 2009

Project Title: BELLA Laser Acquisition, Installation, and Use for Research and Development

Project Location: One Cyclotron Road, Berkeley CA 94720

Public Comments as follows Submitted by:
Ms. Mary Rose Kaczorowski, Chair
Citizens for Science Accountability & Safety
P.O. Box 14146
Berkeley CA 94712

July 18, 2009

Introduction

1a
.One of the primary differences between NEPA and CEQA is the way significance is determined and later discussed in environmental documents. Under NEPA, significance is used to determine whether an EIS, or some lower level of documentation, will be required. NEPA requires that when an EIS is prepared it must be determined if the proposed federal action (project) *as a whole* has the potential to "significantly affect the quality of the human environment." The determination of significance is based on context and intensity. We also know that several problem areas that are not sufficiently mentioned or addressed in this BELLA Draft Environmental Assessment
We also know there is uncertainty because this EA acknowledges that there is uncertainty and ambiguity.

CSAS-1

1b

The BELLA Draft Environmental Assessment also does not adequately describe or address actual containment. Buildings are also seismically unsafe and are within close proximity to a residential neighborhood (approx. 138 meters) and near a popular Area for bicycling, running and in close proximity to a Science Educational Facility that includes a high volume of school children and visitors Weekdays and weekends.

CSAS-2

1c

Measured Radiation Levels of BELLA's operations are not adequately addressed with BELLA's (a new experiment regime) integration with the already up and running LOASIS (Laser Optics & Accelerator Systems Integrated Studies) project regime. The bigger picture of these and other integrated projects with BELLA have never been analyzed in this. The high voltage power supplies, capacitors and high-current switching devices are also not adequately discussed in relationship to the laser mechanics and their location. CSAS-3

DISCUSSION OF ISSUES

2a
Questions on Radiation and Aggregate Hazardous Pollution
The Proposed Action, the acquisition and installation of the BELLA laser and Laser plasma accelerator and the operation of the laser and laser plasma accelerator for research and development, supports the development of particle accelerators at increasingly higher energies. These accelerators are experimenting with and will be providing intense energy beams in the probing of
and changing the structure of atoms and molecules and chemical reactions. In addition radiation (nuclear and non-nuclear pollution) Draft Environmental Assessment.

As based in the following abstract brief:
"The excited transverse current component with its frequency at the electron plasma frequency serves as a radiation source to generate electromagnetic waves both in the front and the real side vacuum regions of the plasma layer. It has been found that the electromagnetic radiation fields increase with both increasing plasma density and increasing laser amplitude. "[Source: LONG LI, BAIWEN LI, S. ISHIGURO & M. SONG; Journal of Plasma Physics (2006), 72: 1303-1307 Cambridge University Press © 2006 Cambridge University Press]

Nuclear Pollution in the aggregate is mentioned but there is no adequate proof that the shielding will protects the highly populated local neighborhood and visitors to the Lawrence Hall of Science. CSAS-4
(See page 27 of Draft Environmental Assessment Sec. IV B 1b)

3. Non-Beam Hazards

In addition to the direct hazards to the eye and skin from the laser beam itself, it is also important to address other hazards associated with the use of lasers. These non-beam hazards, in some cases, can be life threatening, e.g. electrocution, fire, and asphyxiation. Table 1 indicates some of the potential non-beam hazards associated with laser usage. Because of the diversity of these hazards, the employment of safety and/or industrial hygiene personnel to effect the hazard evaluations may be necessary. CSAS-5

For manufacturers of laser products, the standard of principal importance is the regulation of the Center for Devices and Radiological Health (CDRH), Food and Drug Administration (FDA) which regulates product performance. All laser products in the USA must be certified by the manufacturer as meeting certain product performance (safety) standards, and each laser must bear a label indicating compliance with the standard and denoting the laser hazard classification. The manufacturer of lasers and laser products is required to certify that the laser is designated as one of four general classes, or risk categories, and label it accordingly. This allows the use of standardized safety measures to reduce or eliminate accidents depending on the class of the laser or laser system being used.

CSAS-5 (cont.)

Have the BELLA LOASIS laser devices or systems been certified, if so which class of laser or system is being used? It

4. Hazards

Because it is very concentrated and can travel over long distances, laser light can be harmful. Accidental exposure to a high-powered laser light can cause severe skin burns and permanent eye damage as well as ignition of fire and explosions.

It appears that The BELLA project will be using *Class 3 and or 4.*
A Class 4 laser or laser systems are any that exceeds the output limits (Accessible Emission Limits, AEL's) of a Class 3 device. As would be expected, these lasers may be either a fire or skin hazard or a diffuse reflection hazard. Very stringent control measures are required for a Class 4 laser or laser system. For lasers with wavelengths > 1400 nm, large area exposures to the skin can result in dryness and even heat stress. Lasers can present a serious hazard to the eyes and skin. High power lasers can produce a fire hazard. There are other associated hazards inherent with certain laser systems such as electrical, chemical, air contaminants, compressed gases, and cryogenics.

CSAS-6

5. Gamma Rays and Ionizing radiation

Ionizing radiation is found in particle accelerators. It is invisible and undetectable by human senses, so instruments such as are required to detect its presence. Gammas require thicker shielding. The damage they includes burns and also cancer, through mutations. Some radioactive elements also bioaccumulate. As a form of ionizing radiation, gamma rays can cause serious damage when absorbed by living tissue, and they are therefore a health hazard. Gamma rays compete with neutrons as the most dangerous form of ionizing radiation emitted by something such as a nuclear explosion because they are highly penetrating, highly energetic ionizing radiation.

CSAS-7

Gamma rays have the shortest wavelength of all waves in the electromagnetic spectrum, and therefore have the greatest ability to penetrate through any gap, even a subatomic one, in what might otherwise be an effective shield.

Because of their high energy, gamma photons travel at the speed of light and can cover hundreds to thousands of meters in air before spending their energy. They can pass through many kinds of materials, including human tissue.
Where is this discussed in the Draft Environmental Assessment?

CSAS-7 (Cont.)

6. Shielding & Protections

Question: What if the shielding does not work? How will we know if the shielding will work?...especially when there will be utilization of pure or mixed chemicals and wastes that will be produced. These direct impacts from when the laser system is engaged (turned on) include Gamma Rays , Radiation and associated sub atomic phenomenon that must be monitored. How can this be monitored for protection of the public and workers when these experiments could exceed regulatory exposure limits and especially when such "pollution" has not yet been able to be measured due to it unprecedented structure.
Yes—there are theoretical calculations—but these are based on computations and not the real time nature of this new frontier that BELLA will be opening the doors to.

CSAS-8

According to the U.S. EPA publication: Understanding Radiation in Your Life, Your World discussion of Gamma Rays:

> " Although they are generally classified as an external hazard; gamma emitting radionuclides can also be inhaled, or ingested with water or food, and cause exposures to organs inside the body. Depending on the radionuclide, they may be retained in tissue, or cleared via the urine or feces…
>
> ***Does the way a person is exposed to gamma or x-rays matter?*** Both direct (external) and internal exposure to gamma rays or X-rays are of concern. Gamma rays can travel much farther than alpha or beta particles and have enough energy to pass entirely through the body, potentially exposing all organs. A large portion of gamma radiation largely passes through the body without interacting with tissue--the body is mostly empty space at the atomic level and gamma rays are vanishingly small in size. X-rays behave in a similar way, but have slightly lower energy. By contrast, alpha and beta particles inside the body lose all their energy by colliding with tissue and causing damage.
>
> Gamma rays can ionize atoms in tissue directly or cause what are known as "secondary ionizations." Ionizations are caused when energy is transferred from gamma rays to atomic particles such as electrons (which are essentially the same as beta particles). These energized particles then interact with tissue to form ions through secondary ionizations. Because gamma rays are photons and thus interact less frequently with matter than alpha and beta particles,

they are more penetrating and the damage they cause can occur much farther into tissue (that is, farther from the source of radiation).

Health Effects of Gamma Radiation

How can gamma radiation affect people's health?

Because of the gamma ray's penetrating power and ability to travel great distances, it is considered the primary hazard to the general population during most radiological emergencies. In fact, when the term "radiation sickness" is used to describe the effects of large exposures in short time periods, the most severe damage almost certainly results from gamma radiation.

CSAS-8

It might be necessary to examine the design of the shielding material and the Pb filter in the gamma rays spectrum analysis.

7. Cryogenic Liquids

The use of cryogenic coolants with laser systems can cause skin burns, displacement of oxygen in poor ventilated areas and explosions because of bad connections. Where is the discussion of Cryogenic Liquids, their use, storage and integration?

CSAS-9

8. Non-Beam Hazards-Laser Generated Air Contaminants (LGAC)

The following are not adequately addressed in this Environmental Assessment

• Air contaminants may be generated when certain Class 3b and Class 4 laser beams interact with matter. LGAC may be gaseous or particulate and can, under certain conditions, pose occupational concern.

• When the target irradiance reaches a given threshold, approximately 10e7 Wcm^2 target materials including plastics, composites, metals, and tissues, may liberate toxic and noxious airborne contaminants.

CSAS-10

• LGAC include metallic fumes and dust, metallic oxide fumes, chemical and gaseous vapors, and biological fragments

• To prevent personnel from inhaling the LGAC and to prevent the release of LGAC to the environment, how will the exhaust be contained and mitigated?

9. Non-Beam Hazards-Compressed Gases

• The use of compressed gases is common in the laser laboratory. Some lasers use both pure gases and gas mixtures as the lasing media.
• The high pressure of the gas translates into substantial potential energy stored in the cylinder. If this pressure is released in an uncontrolled manner (such as broken nozzle) the cylinder can become an unguided missile.
How will compressed gas cylinders be properly restrained to prevent damage to the nozzle or regulator.

CSAS-11

• If Non-Beam Hazards-Compressed Gases leak, depending on the gas, it may be toxic, corrosive, flammable, etc.

How will this be controlled and monitored?

10. Non-Beam Hazards-Noise

• Some laser systems create significant levels of noise in the laser laboratory.
• Noise generated by the laser system that is at 90 decibels or higher requires hearing protection.

CSAS-12

Where is the noise survey in this Environmental Assessment?
[source: Laser Institute of America, Laser Safety Bulletin, LIA Laser Safety Committee]

11. a.
BELLA Integration and Cumulative Impacts

According to the article (see attached) that appeared in The Berkeley Lab , a Lawrence Berkeley National Laboratory publication April 2008 Article by Paul Preuss: BELLA: The Next Stage in Laser Wakefield Acceleration –

> "BELLA's research and development will begin with facilities already in place at the LOASIS laboratory, where record-breaking 1-Gev electron beams were created using a 40-terawatt laser (40 TW, or 40 trillion watts) and a three-centimeter capillary carved in a block of sapphire. High-quality beams were created by first filling the capillary with hydrogen gas, then discharging a 1-joule capacitor through it to turn the gas to plasma and form the focusing channel guide, and finally by sending the 40-TW laser's drive pulse through the channel to accelerate free electron bunches.

The challenges for BELLA include devising a way to stage accelerating modules so that accelerated electron bunches from each stage are passed to the next for added acceleration. This in turn requires controlled, periodic, rapid plasma formation via discharge and laser-pulse injection into each stage.....BELLA's 10-GeV accelerator module will provide powerful, intense electron beams with pulses as short as a femtosecond (a quadrillionth of a second, 1 x 10-15 sec) for research in materials science, life sciences, physics, and chemistry — an extraordinary facility in its own right — but that's just the beginning. By stringing a hundred or so of BELLA's 10-GeV modules together, intense colliding beams of electrons and positrons with center-of-mass energies of 1 TeV, a trillion electron volts, or more, could be created in just a few hundred meters. That's twice the energy of a conventional 30-kilometer collider — if not exactly on a tabletop, still in only about the dimensions of a typical sports arena.

The science that a 10-GeV BELLA module will be able to explore stretches the imagination. An electron accelerated in a very strong electric field can gain energy equivalent to its own rest mass while moving the distance of its Compton wavelength: that means moving the electron just 2.4 trillionths of a meter (2.4 x 10-12 m) in an electric field of 30 quintillion volts per meter (3 x 1018 V/m), the so-called Schwinger limit. Imagine a runner whose mass doubles with every six feet he or she runs! " and etc.

11.b

The Proposed Action would be housed in Building 71, originally built in 1957 to support nuclear physics research, and BELLA will be integrated into the existing LOASIS Program and laser research facilities. The Lasers, Optical Accelerator Systems Integrated Studies (LOASIS) is a core program within the Accelerator and Fusion Research Division of the Lawrence Berkeley National Laboratory. The ongoing research in the LOASIS program is centered around a state-of-the-art short pulse, high intensity Ti:sapphire laser system (two amplifiers operating at < 40 fs, 10 Hz, >10 TW at present and one at >60 TW, 10 Hz) equipped with diagnostics, radiation shielded target rooms and a remote control room. CSAS-13

(See "GeV electron beams from a cm-scale accelerator," by W. P. Leemans, B. Nagler, A. J. Gonsalves, Cs. Toth, K. Nakamura, C.G.R. Geddes, E. Esarey, C.B. Schroeder, and S.M. Hooker, appears in the October 2006 issue of Nature Physics.).

11c Defintions and Descriptions of Integration

How will BELLA be integrated into LOASIS ? This relationship of the two regimes is not adequately described nor defined. LOASIS is not described.

CSAS-13 (cont.)

What does integrate mean? Where is the LOASIS in building 71 in relation to the six rooms empty rooms (pictured in the Draft Environmental Assessment) designated for BELLA ? What other research regime are and will be going on in Building 71 and what are the cumulative impacts of issues expressed within this public comment document?

This Draft Environmental Assessment) does not discuss the cumulative impacts of this unprecedented integration of BELLA and LOASIS which is purely experimental with unknown impacts yet to be discovered. There are many articles citing that the BELLA regime and associated plasma wakefield accelerators experiments have much more planned than a single 10 meter beam pulse. The Draft Environmental Assessment) does not at all mention the additional stringing of hundreds of BELLAS together.

CSAS-14

Building 71, formerly called HILAC/Super Hilac /Bevalc (see Appendices E of LBNL's Long Range Development Plan Draft EIR Jan. 22 2007) . This building is contaminated by previous operations. The 6 empty rooms designated for BELLA as described in the Draft Environmental Assessment are not discussed in relation to existing contamination by research activities currently ongoing in Building 71 and there is not a clear relation to where these rooms are in the building

CSAS-15

8

12. Safety Component Procurement Inspection Criteria.

This **Draft Environmental Assessment** document does not address:
A Corrective Action Plan that provides, for each finding or deficiency addressed, a thorough analysis of the underlying causal factors to determine whether systemic program weaknesses exist, steps to address the cause(s) of the finding, detailed descriptions of the corrective action(s) to resolve each finding and prevent recurrence, and a general outline for the conduct of the proposed independent corrective action effectiveness review.

CSAS-16

For each corrective action, the document needs to show the responsible person(s) and organizations, the date of action initiation, key milestones, the date of expected completion of the action, how actions will be tracked to closure, deliverable(s) that will signify completion, and the mechanism(s) for verifying closure.

13. CEQA/NEPA

CEQA does require identifying each "significant effect on the environment" resulting from this project and its associated experimental (named and unnamed) regimes and ways to mitigate each significant effect. A significant effect on any environmental resource triggers the preparation of an EIR..
This all then begs the question as to how effective this **Draft Environmental Assessment** can be in assessing the value of certainty in regards to answering CEQA's requirements.

CSAS-17

This **Draft Environmental Assessment** does not prove a careful balancing of benefit versus risk.
This **Draft Environmental Assessment** also does not provide for a full and complete discovery of harm Rather then defend various investments (research, monetary, patent, etc.) based interests this **Draft Environmental Assessment** a draft EIR/EIS needs to specifically prove that there will be "no harm" and also that the precautionary principle is utilized.

CSAS-18

Specifically there is no existing proof or peer reviewed scientific studies available to confirm that no harm to local populations (human and the environment) will be avoided when BELLA and associated plasma wakefield accelerators, and the smashing of subatomic particles (such as electrons or protons together at high energies in new experimental ways using toxic gases or chemicals) will occur in real time not in the theoretical abstract.

CSAS-19

Given that there are still technical issues to be resolved as discussed in international Plasma Wavelength research literature. This **plan as described in the Draft Environmental Assessment** does not meet the requirements pursuant to the California

CSAS-20

Environmental Quality Act (CEQA) which utilizes the environmental analysis prepared by a Federal agency under the National Environmental Policy Act (NEPA). CSAS-20 (cont.)

Careful independent scientific scrutiny of the potential harm is required. CSAS-21

This plan pursuant to the California Environmental Quality Act (CEQA) while utilizing the environmental analysis prepared by a Federal agency under the National Environmental Policy Act (NEPA) still require multiple Draft Environmental Assessments. There are clearly several projects and separate projects integrated herein and several joint EIS/EIR's under CEQA are required. CSAS-22

NEPA requires, as part of the discussion of each alternative, discussion of mitigation measures **and growth inducing impacts**. CSAS-23

CEQA requires a separate discussion of these issues, focusing on the project. CEQA specifically allows the use of an EIS in place of an EIR when the EIS meets all substantive requirements of CEQA (Section 21083.5 and Guidelines Section 15221). An EIS typically places equal emphasis on the project and alternatives. CEQA, however, emphasizes the project and relates the discussions of significant effects, cumulative effects, and growth inducing impacts directly to that project. CSAS-24

The details in this EA are not sufficient in regards to examination of the plan's significant effects, cumulative effects, and growth-inducing impacts.
Guidelines Section 15221 states that a separate discussion of mitigation measures and growth-inducing impacts will need to be "added, supplemented, or identified before the EIS can be used as an EIR." CSAS-25

13. a Baseline Conditions:
A fundamental question in this environmental analysis is what baseline conditions should be used for determining whether the BELLA plan will result in significant environmental effects. Should the potential impacts of the reuse aspects of this plan only be analyzed relative to the past uses and cumulative impact of past uses or in the context (i.e., cumulative impact etc.) of the higher level of activity which will occur? CSAS-26

No hazardous material or waste can be included in a baseline, nor can water quality issues. This Draft Environmental Assessment does not ensure that the public, as well as responsible and trustee agencies are given ample opportunity to consider and discuss any proposed baselines.

Further Discussion of considerable growth inducing impacts are also needed. CSAS-27

14. Merits of The Department of Energy's National Laboratories Handling of Wastes and Concern For Public Health

Abbott, Kim

From: Mary Rose Kaczorowski [mrkaczorowski@gmail.com]
Sent: Tuesday, July 21, 2009 4:03 PM
To: Abbott, Kim; kvabbott@lbl.gov
Subject: Fwd: NEW REPLACEMENT Corrected Page 11 Section 14. is included in this attachment
Attachments: DRAFT DOE _EA_ #1655 Public Comments_Ms. Mary Rose Kaczorowski.doc

---------- Forwarded message ----------
From: **Mary Rose Kaczorowski** <mrkaczorowski@gmail.com>
Date: Mon, Jul 20, 2009 at 6:33 PM
Subject: Re: NEW REPLACEMENT Corrected Page 11 Section 14. is included in this attachment
To: kim.abbott@bso.science.doe.gov

On Mon, Jul 20, 2009 at 6:27 PM, Mary Rose Kaczorowski <mrkaczorowski@gmail.com> wrote:
Dear Kim Abbott

I hope you can print out page 11 of this attachment with all Corrected items (last page is Page 11 Section 14). Then please replace it with the paper copy and email that I sent you this past weekend.

Typos and corrected Spelling of John W. Gofman's name etc. are now on this draft of my Page 11 Section 14. as included in this attachment.
Thank You
Mary Rose Kaczorowski 510-459-9448

On Sat, Jul 18, 2009 at 3:46 PM, Mary Rose Kaczorowski <mrkaczorowski@gmail.com> wrote:
I have just mailed by post the attached draft. Can you print out this version and replace it with my version that arrives in the mail?
You can then attached the last page with my signature on it (of the paper copy that arrives in the Mail) with the paper copy of articles etc. attachments .
Thank You
Mary Rose Kaczorowski
510459-9448

--
Where, after all, do universal human rights begin? In small places, close to home...[in] the world of the individual person; the neighborhood he lives in; the school or college he attends; the factory, farm, or office where he works. Such are the places where every man, woman, and child seeks equal justice, equal opportunity, equal dignity without discrimination. Unless these rights have meaning there, they have little meaning anywhere. Without concerted citizen action to uphold them close to home, we shall look in vain for progress in the larger world.

—Eleanor Roosevelt

14. Merits of the Department of Energy's National Laboratories Handling of Wastes and Concern for Public Health

CSAS-28

I would like to end with submitting into the record for consideration re: this Draft Environmental Assessment a document that is applicable testimony on the merits of The Department of Energy's National Laboratories by John W. Gofman, M.D., Ph.D. Professor Emeritus, UC Berkeley Dept. of Molecular and Cell Biology. He is the author of several books and more than a hundred scientific papers in peer-reviewed journals in the field of nuclear and physical chemistry and the biological effects of radiation with especial reference to causation of cancer and hereditary injury. In the early 1960's the Atomic Energy Commission asked John W. Gofman, to establish a Biomedical Research Division at the Lawrence Livermore National Laboratory for the purposes of evaluating the health effects of all type of nuclear activities. For Gofman, the public health was an issue of prime importance and should be as well in this BELLA regime.

Please see attached: Permit Modification for Lawrence Berkeley National Laboratory By John W. Gofman, M.D., Ph.D.

Please also see several attached articles supporting my statements herein.

A1

TO:
Alfred Wong
Calif. Envir. Protection Agency
Dept. of Toxic Substances Control
700 Heinz Ave., Suite 200, Berkeley CA 94710

FROM:
John W. Gofman, M.D., Ph.D.
Professor Emeritus, UCB Dept. of Molecular and Cell Biology
Post Office Box 421993, San Francisco CA 94142
Tel: 415-776-8299. Fax: 415-664-1933

John W. Gofman, M.D. March 14, 1996

RE: Permit Modifications for Lawrence Berkeley Natl. Laboratory - LBNL

By way of introduction, I should say that I earned my Ph.D. at UC Berkeley in 1942 in nuclear/physical chemistry. I am co-holder with Glenn Seaborg and Raymond Stoughton of the patent for the slow and fast neutron fissionability of uranium-233, with its application to production of nuclear power or nuclear weapons. For the Manhattan Project, I led the group which irradiated a ton of uranyl nitrate by placing it around the Berkeley cyclotron, and then reduced that ton to a half cc of liquid containing 1.2 milligrams of plutonium, urgently requested by J. Robert Oppenheimer for some measurements at Los Alamos.

I am also a physician, and after the war, I led the group at the Donner Lab on campus which discovered the diverse lipoproteins involved in heart disease. In 1963, I was invited by the Atomic Energy Commission to establish its Biomedical Research Division at the Lawrence LIVERMORE National Labororatory, and I did. Since retirement, I have written five books about the health effects of ionizing radiation.

In short, I am no enemy of physicial and biomedical research, nor am I an opponent of using radioisotopes in research. I have used many myself. But the privilege of doing interesting and beneficial research with the help of radioisotopes and other dangerous substances, must be very tightly linked to the duty to take the utmost care to protect public health from those substances. Even small releases into the environment contribute to the nation's total pollution. If the totality of nuclear pollution matters biologically --- and it does --- then citizens must oppose each small contribution to that totality.

Unfortunately, the track-record of the Dept. of Energy's National Laboratories often reflects a disgusting disregard for public health. Thus, the citizens of Berkeley, Oakland, and the whole Bay Area, need to behave with a high level of suspicion about the past and proposed handling of radioactive substances and "mixed waste" at the LBNL.

Radioactive vs. Non-Radioactive Waste: Curies, Not Volume

Atom for atom, radioactive isotopes of ANY element are more dangerous, biologically, than than non-radioactive isotopes of the same element. Radioactive species have BOTH a chemical and radiation behavior. Moreover, the radioactive species which emit gamma rays (such as cobalt-60) can do their damage to people without ever getting inhaled or ingested --- they can do it from a distance.

When a radioactive species has 40 ion atoms decaying every

A2

second into some other isotope, it is called one curie of that species. 37 billion atoms of non-radioactive hydrogen or carbon are not a chemical hazard at all, but a single curie of either H-3 or carbon-14 (which means that 37 billion atoms are decaying per second) would be a rapidly lethal amount inside any human body.

This example is provided to illustrate the nonsense of setting limits on the VOLUME of either "mixed waste" or pure radioactive materials and waste at LBNL. Curies are what matters, biologically, not volume. It is time to re-assess all earlier permits based on limiting volume rather than curies.

"Radioisotope Inventory at LBNL - December 19, 1995"

CESIUM-137: According to the list prepared by LBNL's Glenn Garabedian, the "Radioisotope Inventory at LBNL - December 19, 1995" included cesium-137, a radioisotope with a radioactive half-life of 30 years. It was a prominent pollutant after the Chernobyl accident. Indeed, areas were indefinitely evacuated where cesium-137 fallout levels exceeded 40 curies per square kilometer. According to the December 19, 1995 list, the LBNL inventory was 1,062 curies. California citizens have a RIGHT to know what could happen to it in a firestorm.

PLUTONIUM-238: This isotope is also on the LBNL December 1995 inventory. It has a radioactive half-life of about 88 years. If a fire gets it airborne as small particles of plutonium-oxide, it becomes "fallout" which can be inhaled. Lung cancer is the principal hazard. A "ballpark" estimate for non-smokers is that 3 millionths of 1 curie (3 micro-curies) deposited in the lung will cause a lung-cancer. According to the LBNL inventory list, there were about 215 full curies of plutonium at the Lab. California citizens have a RIGHT to know what could happen to it in a firestorm.

COBALT-60: This isotope, also on the inventory list, has a radioactive half-life of about 5.3 years. Each atom which decays emits an extremely powerful gamma ray --- which means it (like cesium) can irradiate people from the ground and from the foliage, without ever being inhaled or ingested. According to the December 19, 1995 inventory, there were about 5,800 curies at the Lab --- lots more than the cesium.

HYDROGEN-3, TRITIUM: Tritium, with a radioactive half-life of about 12.3 years, combines with oxygen to make radioactive water. Because tritium is a beta-emitter without any gamma radiation, tritiated water must get inside the body to do its biological damage --- and it can do plenty, there. According to the LBNL list, there were about 10,000 curies at the Lab, December 19, 1995.

A Little Humility about Such Poisons: Whose Needs Come First

Citizens of California would be crazy not to insist, even belatedly, on CREDIBLE proof that the radioactive and "mixed" inventory at LBNL will remain contained --- not only during routine operations, but also through earthquakes, mudslides, and especially FIRE --- such as the terrible conflagration which might have consumed the Lab just a few years ago. Can a good hot fire and its wind lift and then drop the radioactive and chemical poisons as "fallout?" I am astonished to be told that this question seems not to have been answered in a straight-forward, persuasive manner yet.

A3

It is not clear to me what part of the Lab's TOTAL radioactive inventory is in current lab usage, what part is now stored as "waste," and what part is stored as "mixed waste." Since irradiated cells neither know nor care whether their abuse comes from pure or mixed sources, citizens have a right to credible assurance that ALL THREE TYPES of sources are completely contained, under routine and under extreme conditions.

"Credible assurance" can not be obtained from anyone with a conflict of interest --- like the Lab itself or DOE. It would be ridiculous for the Lab to tell the public and its state and local officials, "Just trust us," and it would be the purest arrogance to tell the public "it's none of your business." The public always has a HUGE stake in the proper handling of hazardous wastes, both radioactive and non-radioactive. People who operate facilities with the POTENTIAL to pollute need the humility and goodwill to recognize that the public has every right to impose pre-emptive measures for self-defense against such poisons BEFORE they escape.

This is especially unarguable when the potential pollutant is radioactive, since it is clear that there is NO threshold dose-level (no safe dose, no risk-free dose) of ionizing radiation. Thus, nuclear pollution, in the aggregate, causes premeditated random murder.

It is high time that potential and current pollution from the Lab should receive very close public scrutiny. The first step is to postpone any EXPANSION of the total on-site inventory (either pure or mixed), until citizen-watchdogs are funded by the state, or by the cities of Berkeley and Oakland, to hire some independent, credible evaluation of the routine and worst-case health hazards. (NOTE: I am not a candidate for such work.)

Clearly, the past Environmental Impact Reports are an inadequate basis for permits, if they never dealt realistically with routine radioactive emissions or firestorm consequences. The track-record of the DOE laboratories as polluters and stone-wallers is so bad that (unfortunately) extreme caution has become appropriate --- instead of a routine expansion of toxic waste generation at LBNL.

I was a personal friend and colleague of Ernest O. Lawrence, and I feel that I honor his memory and his devotion to health and to public service when I say: I am in favor of research proceeding at the LBNL --- provided that the Lab meets the demands of the public for protection, not vice versa. With enough goodwill, the needs of the Lab and the public can BOTH be met, but the needs of the public come first. Let us never forget that the Lab's justification for EXISTENCE is service to the public.

♦ ♦ ♦ ♦ ♦

2 Attachments:

Bio + CV
4-pager, "What Is Factually Wrong with This Belief: 'Harm from Low-Dose Radiation Is Just Hypothetical --- Not Proven'."

B-1

From left to right, Joe Harkins, Kathy Johnescu, and Jim Krupnick.
Photo by Roy Kaltschmidt, CSO

from risk management to personnel issues, and innovation in that we used a two-phased contracting method, called Construction Manager/General Contractor, that's been used by the University of California system but never before by DOE."

The Secretary's Excellence in Acquisition Award is given to an individual or team that implemented ideas, methods or processes that led to measurable improvements in acquisition management.

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Berkeley Lab View

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Flea Market is now online at www.lbl.gov/fleamarket

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Here Comes BELLA: The BErkeley Lab Laser Acceleration Project

BY PAUL PREUSS

The LOASIS group led by Wim Leemans, of Berkeley Lab's Accelerator and Fusion Research Division (AFRD), holds the world record for laser-wakefield acceleration, having accelerated high-quality electron beams to energies exceeding 1 GeV, a billion electron volts, in a distance of just three centimeters. That's an accelerating gradient a thousand times greater than some of the most advanced conventional accelerators on the drawing boards.

Now Leemans and his colleagues are poised to achieve energies an order of magnitude higher still, with BELLA, the BErkeley Lab Laser Accelerator.

"The first step for BELLA is to develop a 10-GeV laser-wakefield accelerator module," says Leemans. "With it we'll get answers to exciting practical questions about using lasers to build the high-energy particle colliders of the future."

A hundred or so of BELLA's 10-GeV modules strung together could create intense colliding beams of electrons and positrons with center-of-mass energies of a trillion electron volts in just a few hundred meters. That's twice the energy of the proposed International Linear Collider, 30 kilometers long using conventional technology, in about the dimensions of a typical sports arena.

Leemans says, "With BELLA we'll also be able to address some of the most interesting scientific questions — everything from cosmology to extreme physics. The science that a 10-GeV BELLA module will be able to explore stretches the imagination."

B-3

For example, in a vacuum, electron-positron pairs are always blinking into and out of existence as virtual particles. An electric field strong enough to exceed the Schwinger limit (30 quintillion volts per meter) could "boil" or "snap" the vacuum, creating stable particles from nothing. Such fields could be produced by bouncing a petawatt (quadrillion watt) laser beam off a 10-GeV electron beam accelerated by BELLA.

This kind of power could create conditions like those inside an exploding star; cosmology would come into the laboratory.

What it will take

Laser-wakefield acceleration begins with a plasma — a state of matter in which positively and negatively charged particles like protons and electrons are dissociated. A laser pulse driven through the plasma creates a wake that traps some of the free electrons and carries them along like surfers riding a wave.

LOASIS lab: at left, Csaba Toth, at right front, Wim Leemans, and Joseph Wallig at rear

The LOASIS Program staff as of November, 2007: (back row) Eric Esarey, Cameron Geddes, Donald Syversrud, Michael Bakeman, Nathan Ybarrolaza; (middle row) Ken Barat, Csaba Toth, Wim Leemans, Carl Schroeder, Estelle Cormier-Michel, Chen Lin, Dmitriy Panasenko, Martha Condon; (front row)

When the electrons outrun the wake, acceleration stops. For a longer ride the LOASIS group developed the method of drilling a long focusing channel through the plasma, thin at the center, dense at the walls, analogous to the optical fibers used for long-range communications. A laser wake in the channel can maintain its accelerating power far enough and long enough to generate multi-GeV electron beams.

LOASIS created its record-breaking beams using a 40-terawatt (40 trillion watts, 40TW) laser and a three-centimeter capillary carved in a block of titanium sapphire crystal. The capillary was filled with hydrogen gas; the discharge of a 1-joule capacitor turned the gas to plasma and formed the focusing channel guide; an instant later the laser pulse accelerated free electron bunches through the channel.

BELLA will extend the LOASIS capillary-discharge technology to create channels up to tens of centimeters in length. Modules will be staged so that

C1

April 2008

BELLA: The Next Stage in Laser Wakefield Acceleration

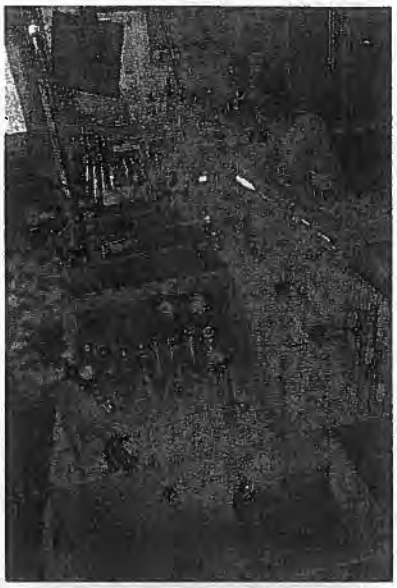
Contact: Paul Preuss, paul_preuss@lbl.gov

For over a year, the LOASIS group led by Wim Leemans, of Berkeley Lab's Accelerator and Fusion Research Division (AFRD), has held the world record for laser-wakefield acceleration, accelerating high-quality electron beams to energies exceeding 1 GeV, a billion electron volts, in a distance of just three centimeters. Now Leemans and his colleagues are poised to achieve energies an order of magnitude higher still, with BELLA, the BErkeley Lab Laser Accelerator.

"The first step for BELLA is to develop a 10-GeV laser-wakefield accelerator module," says Leemans. "With it we'll be able to address some of the most interesting scientific questions recently posed by the National Academies—everything from cosmology to extreme physics. How do the natural accelerators in the cosmos work? Is the theory of quantum electrodynamics adequate at the highest energies? We'll also get answers to exciting practical questions about using lasers to build the high-energy particle colliders of the future."

The energy an accelerator adds to a particle for each unit of distance it travels is called the accelerating gradient; electron and positron machines like the proposed International Linear Collider (ILC), plus other accelerators now in the planning stage, will add 25 million volts each meter. With that kind of gradient—strong for a conventional accelerator—beam energies of 250 GeV, needed to achieve the ILC's goal of smashing electrons and positrons together at center-of-mass energies of half a trillion electron volts, will require a linear collider at least 30 kilometers long.

But with billion-electron-volt beams in just three centimeters—so short that laser-wakefield acceleration has sometimes been called "tabletop" acceleration—Leemans's LOASIS group (LOASIS stands for Laser Optics and Accelerator Systems Integrated Studies) has already demonstrated an accelerating gradient a thousand times greater.



From left, Csaba Toth, Joseph Wallig, and Wim Leemans of the LOASIS group work with the 40-terawatt laser.
(Photo Roy Kaltschmidt)

BELLA's 10-GeV accelerator module will provide powerful, intense electron beams with pulses as short as a femtosecond (a quadrillionth of a second, 1×10^{-15} sec) for research in materials science, life sciences, physics, and chemistry—an extraordinary facility in its own right—but that's just the beginning. By stringing a hundred or so of BELLA's 10-GeV modules together, intense colliding beams of electrons and positrons with center-of-mass energies of 1 TeV, a trillion electron volts, or more, could be created in just a few hundred meters. That's twice the energy of a conventional 30-kilometer collider—if not exactly on a tabletop, still in only about the dimensions of a typical sports arena.

The science that a 10-GeV BELLA module will be able to explore stretches the imagination. An electron accelerated in a very strong electric field can gain energy equivalent to its own rest mass while moving the distance of its Compton wavelength: that means moving the electron just 2.4 trillionths of a meter (2.4×10^{-12} m) in an electric field of 30 quintillion volts per meter (3×10^{18} V/m), the so-called Schwinger limit. Imagine a runner whose mass doubles with every six feet he or she runs!

In a vacuum, electron-positron pairs are always blinking into and out of existence as virtual particles; usually they don't stick around long. But a field strong enough to exceed the Schwinger limit can create stable particles from nothing, which is known as "boiling" or "snapping" the vacuum. Indirect, proof-of-principle experiments have been done with conventional accelerators, but vastly stronger fields could be produced by bouncing a petawatt laser beam (a quadrillion watts, 10^{15} W) off a 10-GeV electron beam accelerated by BELLA.

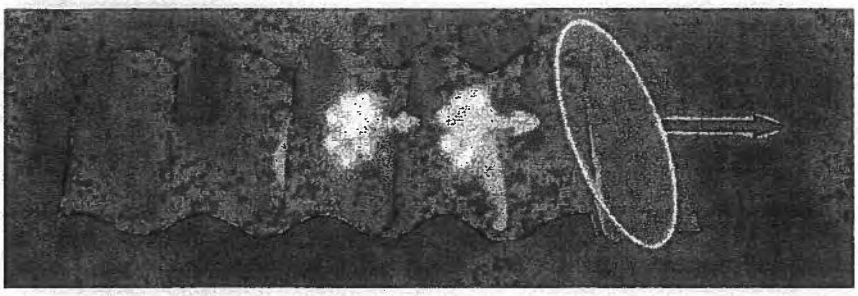
With this kind of power, conditions like those inside an exploding star could be recreated; cosmology would come into the laboratory.

continued

C2

What it will take

Laser-wakefield acceleration begins with a plasma—a state of matter in which positively and negatively charged particles are dissociated, typically protons (hydrogen nuclei) and electrons. A laser pulse driven through the plasma creates a wake that traps some of the free electrons and carries them along like surfers riding a wave. But sooner or later, when the electrons outrun the wake, acceleration stops.



A laser pulse traveling through a plasma, indicated by the ellipse at right, accelerates bunches of free electrons (center) in its wake.

To lengthen this so-called "dephasing length" requires a more tenuous plasma and a laser beam collimated over a longer distance. Most experimenters have tried to achieve this by using a large laser spot size, which requires a much more powerful laser for a relatively modest gain in acceleration.

The LOASIS group, by contrast, developed the method of drilling a long focusing channel through the plasma, thin at the center, dense at the walls—a plasma channel with focusing geometry analogous to the optical fibers used in long-range communications. A laser drive pulse is sent through this channel to form a wake that can maintain its accelerating power over fairly long distances, and for a long enough time to generate multi-GeV electron beams.

BELLA's research and development will begin with facilities already in place at the LOASIS laboratory, where record-breaking 1-Gev electron beams were created using a 40-terawatt laser (40 TW, or 40 trillion watts) and a three-centimeter capillary carved in a block of sapphire. High-quality beams were created by first filling the capillary with hydrogen gas, then discharging a 1-joule capacitor through it to turn the gas to plasma and form the focusing channel guide, and finally by sending the 40-TW laser's drive pulse through the channel to accelerate free electron bunches.

The challenges for BELLA include devising a way to stage accelerating modules so that accelerated electron bunches from each stage are passed to the next for added acceleration. This in turn requires controlled, periodic, rapid plasma formation via discharge and laser-pulse injection into each stage. The LOASIS capillary-discharge technology will be extended to create plasma focusing channels up to tens of centimeters in length. Progress also requires diagnostic techniques and powerful computer simulations for fine-scale characterization and modeling of the beams.

To achieve BELLA's main objective of 10-GeV electrons, a new and much more powerful laser will have to be put in place, a state-of-the-art laser that can fire a 40-joule pulse in a brief 40 femtoseconds, then build up to fire again and again, once every second, a repetition rate of one hertz (1 Hz). Such a laser will have an average power of 40 W and a peak power of a quadrillion watts—a petawatt, 1 PW.

"Since the time we designed and built the LOASIS 40-TW laser ourselves, there has been a revolution in the field of laser technology," Leemans says. "Advances are now driven by commercial companies, and by military requirements, and we have been talking with two companies who want to build a laser for BELLA under our supervision."

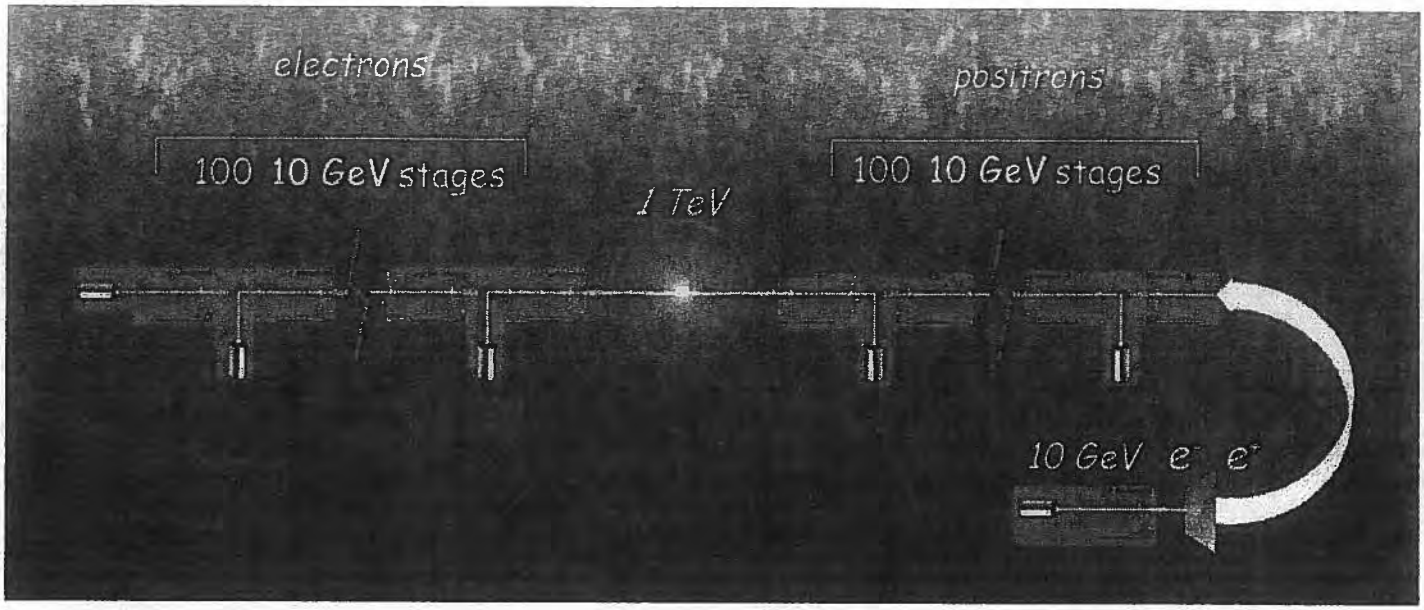
Given Berkeley Lab's already substantial commitment to LOASIS, BELLA initially needs only modest funding for additional staff and equipment. In addition, sections of the HILAC and SuperHILAC accelerators for which Building 71 was built (and which now houses the LOASIS laboratory) must be removed and the building seismically retrofitted to prepare for the BELLA infrastructure. Completing BELLA will require a 1-Hz, 1-PW laser—the highest average power (40 W) petawatt-class laser in the world.

"With the support of DOE, which has already given its approval of BELLA's mission need, we plan to have a 10-GeV acceleration module in place and working within five years," Leemans says. "This will provide a unique user facility for scientists who need advanced light sources and free-electron lasers. Meanwhile, we'll be on the way to designing a new generation of powerful accelerators and colliders based on laser-wakefield acceleration technology. BELLA will help insure that the unique science DOE has made possible through its leadership in advanced accelerator research will go forward into the future with laser-based technologies."

The BELLA project will be carried out by the LOASIS Program staff led by Wim Leemans, presently including Eric Esarey, William Fawley, Cameron Geddes, Anthony Gonsalves, Nicholas Matlis, Estelle Cormier-Michel, Dmitriy Panasenko, Carl Schroeder, and Csaba Toth of AFRD, with Donald Syversrud and Nathan Ybarrolaza of Engineering and support from AFRD's Olivia Wong and Martha Condon. BELLA will involve collaboration with Berkeley Lab's Physics, Engineering, Advanced Light Source, and National Energy Research Scientific Computing Center Divisions, with academic institutions including Oxford University, the University of Colorado, the University of Nevada at Reno, and the University of Texas at Austin, with other DOE laboratories including the Lawrence Livermore National Laboratory, and with private industry.

continued

C3



A collider with 100 or so 10-GeV stages in each beam could accelerate electrons in one beam and positrons in the other to center-of-mass energies of 1 TeV or more in just a few hundred meters.

Additional information

For more about LOASIS, visit http://loasis.lbl.gov/main.html.

For more about the world record laser-wakefield accelerator, one billion electron volts in three centimeters, go to http://www.lbl.gov/Science-Articles/Archive/AFRD-GeV-beams.html.

For more about "Dream Beams," the first high-energy, high-quality beams from a laser-wakefield accelerator, go to http://www.lbl.gov/Science-Articles/Archive/AFRD-laser-wakefield.html.

This is from April 2008 and goes into detail about the scope of BELLA. I'm glad I found it, having noted in reading the EA that the current proposal is experimental. This talks about the bigger picture.

http://www.lbl.gov/publicinfo/newscenter/features/2008/apr/af-bella.html

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THE DAILY CALIFORNIAN

Berkeley, California | Monday, July 6, 2009 | www.dailycal.org

-D-

NEWS

PARTICLE ACCELERATOR: Scientists are building a small, powerful model.

SEE PAGE 2

RESEARCH & IDEAS

Scientists Work on New Particle Accelerator

by **Paul Edison**
Contributing Writer

While a surfer might feel the rush of riding some of the Pacific Ocean's largest waves, scientists from Lawrence Berkeley National Laboratory are feeling the same excitement in the lab, but on a much smaller scale.

Researchers at the Berkeley Lab plan to use microscopic waves to charge and accelerate some of the smallest particles in the universe.

The process will take place in the lab's "table-top" Berkeley Lab Laser Accelerator, a device that is planned to be built by fall 2009 and will replace the lab's current, smaller accelerator.

While the particles will be accelerated in a tube that is only one meter long, scientists said the process for getting the particles up to speed is far from simple.

The scientists must first charge a chamber of atomic gas through which the particles will travel.

A laser beam will then puncture the gas and cause a "wake" that will accelerate and charge the particle that follows the beam, said Paul Preuss, a member of the communications department for the lab.

In an online video, project leader Wim Leemans compared the acceleration process to a surfer catching a wave behind a passing motorboat.

"Laser poles excite the wake in the plasma and electrons surf this wake and therefore reach very high energy," Leemans said in the video.

He said that the plasma would produce "a thousand times bigger electric field than (a) conventional accelerator."

The new accelerator will replace the lab's current device, which has a chamber that is only 3.3 centimeters long and does not charge the particle as much, Preuss said.

The current device can charge the particles to 1 billion electron volts. Researchers said they hope that the new accelerator will charge the particles to 10 billion electron volts.

Charging the particles to 10 billion electron volts would be a major achievement given that the particles will only be charged over one meter, Preuss said.

Sami Tantawi, an associate professor of particle physics and astrophysics at Stanford University, said an effective compact accelerator would increase accessibility to particle accelerators and could hugely impact the scientific community.

"Using these tools are extremely expensive," he said. "People wait in line, sometimes for years to use them: pharmaceutical companies, engineering and archaeological researches, you name it."

John Fox, a consulting professor for applied physics at Stanford University, said the project could be successful and has the ability to revolutionize physics in college classrooms.

"If the accelerator facility gets smaller, it would become less expensive," he said. "It will open up research in new areas."

Contact Paul Edison at pedison@dailycal.org.

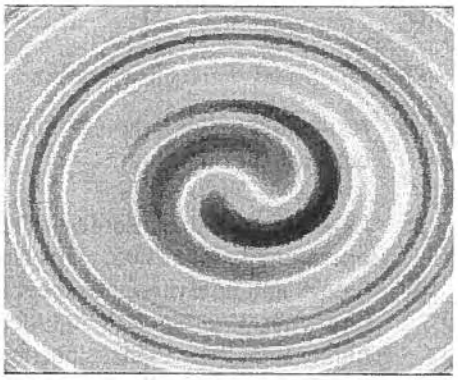
49

Abbott, Kim

From: handyman@sfo.com
Sent: Friday, July 17, 2009 7:11 PM
To: Abbott, Kim
Subject: BELLA EIR Comments
Attachments: bella eir ltr.pdf

Attached are comments for the BELLA Environmental Impact Report

DAN MATTSON
360 GRAND AVE. #292
OAKLAND, CA 94610
510-658-2819 VOICE/FAX
WWW.DANMATTSON.NET



July 17, 2009

Kim Abbott, NEPA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS 90-R1023
Berkeley, CA 94720
kim.abbott@bso.science.doe.gov

Dear Mr. Abbott,

This letter is to address citizen concerns about the proposed remodeling at LBNL to accommodate BELLA, and the operation of BELLA as well. We rely on the draft environmental assessment (EA) for BELLA, the April 2008 LBNL News Center story on BELLA, LOASIS history, and the DOE LBNL FY 2005 Annual Performance Evaluation & Appraisal (http://www.lbl.gov/DIR/OIA/assets/docs/OCA/OCA_ContractPerform/PEAR05_Annual_AP_B.pdf) dated Jan. 30, 2006 for background for this letter. We appreciate that the transparency exists in the US that these documents can be found online.

DM-1

We have two areas of concern as detailed below, the dismissal of environmental justice concerns found in the draft EA, as well as general concern regarding increases in electromagnetic fields, from power frequency to microwave, that may occur in the vicinity of LBNL.

We start with this quote from the EPA environmental justice web page, followed by a quote from the BELLA draft EA.

> Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. EPA has this goal for all communities and persons across this Nation. It will be achieved when everyone enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work. http://www.epa.gov/oecaerth/environmentaljustice/
>
> Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires agencies to identify and address disproportionately high and adverse human health or environmental effects its activities may have on minority and low-income populations. There would be no expected disproportionate adverse impacts on minority and economically disadvantaged populations in the local area, because no adverse environmental or socioeconomic impacts are expected from any aspects of the Proposed Action. In addition, residential areas nearest to the Building 71 Proposed Action site do not qualify as relatively lowincome or minority neighborhoods. http://www.lbl.gov/Community/BELLA/assets/BELLA_Draft%20EA_6-18.pdf

DM-2

It is apparent that EPA and DOE have somewhat different ideas about environmental justice. We focus in particular on the last sentence of the EPA paragraph, "... equal access to the decision-making process to have a healthy environment in which to live, learn, and work." Given that LBNL is in the vicinity of

residential neighborhoods, Lawrence Hall of Science, the Botanical Gardens and public hiking trails, our concern is of merit. DM-2 (cont.)

LOASIS has been a subject of research since 1993, with a BELLA prototype Laser Accelerator operational since 2005. This has come about with little or no public input, no environmental impact report, and no oversight except DOE and perhaps a few Senators and Congressmen. BELLA takes this high-energy research to an order of magnitude greater power output and with plans to go very much higher than that. This is pushing the envelope of electromagnetic science to the very edge even while a candid scientist will admit the theory, the basic theory of electromagnetism and by extension light and photonics, is not fully understood. Given the legacy of 130 years or more of environmental health problems that have resulted from for profit application of scientific research, we believe it is shortsighted to be as dismissive of possible public health and environmental impacts as the BELLA EA seems to be. DM-3

At minimum, respect for democratic process demands a much more thorough vetting of this technology and its potential for being a hazard in a densely populated area. We request that such presentation include public hearings. DM-4

We also have concerns about increases in electromagnetic fields (emf) from BELLA that could impact members of the public living near or making use of the above-mentioned facilities near LBNL. Specifically these concerns include:

•Direct emanation of elf from the facility or from the power lines that feed the facility out to at least 100 yards.

•Harmonic distortion, e.g. 180 hz/triplans feeding back into the distribution system or the ground system such that fields might extend hundreds of yards from the facility. DM-5

•Dirty power, e.g. direct and harmonic emf emanation from switching power supplies and other such loads that produce fundamental frequencies and harmonics in the range from 10-12khz to 100khz and beyond to several Mhz.

•RF radiation, especially digitally modulated microwave signals, that produces a sustained field strength of .1 μw or greater in the vicinity of the lab.

As a part of the EIR process we request that DOE/LBNL conduct a comprehensive pre-BELLA electromagnetic field survey of the upper canyon area, accompanied by a third-party independent expert and community members.

We commend the DOE for wishing to conduct its high-energy physics research with less energy intensive equipment. We also strongly believe that this specific work should have greater public exposure with more detail about possible risks to the public. The draft EA confines its concern almost entirely to LBNL staff. DM-6

Thanks for your attention,

Dan Mattson

Dan Mattson
For Citizens for Science Accountability and Safety, Berkeley

I would like to end with submitting into the record for consideration re: this Draft Environmental Assessment a document that is applicable testimony on the merits of The Department of Energy's National Laboratories by John W. Gofan, M.D., Ph.D. Professor Emeritus, UC Berkeley Dept. of Molecular and Cell Biology. He ids the author of several books and more than a hundred scientific papers in peer-reviewed journals in the field of nuclear and physical chemistry and the biological effects of radiation with especial reference to causation of cancer and hereditary injury. In the early 1960's the Atomic Energy Commission asked John W. Gofan, to establish a Biomedical Research Division at the Lawrence Livermore National Laboratory for the purposes of evaluating the health effects of all type of nuclear activities. For Gofman – the public health was an issue of prime importance and should be as well in this BELLA Regime.

Please see attached : Permit Modification for Lawrence Berkeley National Laboratory By John W. Gofan, M.D., Ph.D.

~~Please also see other attached article supporting by statements herein.~~

This is a matter of strong importance to the health & Welfare of the citizen of Berkeley and the surrounding area. Therefore we need a thorough ~~EA~~ E.I.S.!!

As a therapist & environmental activist, I am concerned about the impact on people & our environment

Barbara Hall MFT CDVC

DP-1

Note: The rest of this letter is duplicated in CSAS comments

EAST BAY
MUNICIPAL UTILITY DISTRICT

July 16, 2009

Kim Abbott
NEPA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS 90-R1023
Berkeley, CA 94720

Re: Notice of Availability of a Draft Environmental Assessment – BELLA Laser Acquisition, Installation, and Use for Research and Development, Lawrence Berkeley National Laboratory, Berkeley

Dear Ms. Abbott:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Draft Environmental Assessment for the BELLA Laser Acquisition, Installation, and Use for Research and Development at the Lawrence Berkeley National Laboratory (LBNL), Berkeley. EBMUD has the following comments.

The existing LBNL facilities are currently served by EBMUD's Shasta and Berkeley View Pressure Zones. If additional water service is needed, the project sponsor should contact EBMUD's New Business Office and request a water service estimate to determine costs and conditions for providing additional water service to the existing parcels. Engineering and installation of water services requires substantial lead-time, which should be provided for in the project sponsor's development schedule. **EBMUD-1**

If you have any questions concerning this response, please contact David J. Rehnstrom, Senior Civil Engineer, Water Service Planning at (510) 287-1365.

Sincerely,

William R. Kirkpatrick
Manager of Water Distribution Planning

WRK:TRM:djr
sb09_147.doc

375 ELEVENTH STREET • OAKLAND • CA 94607-4240 • TOLL FREE 1-866-40-EBMUD

GENE C. BERNARDI
9 Arden Road
Berkeley, CA 94704

REC'D JUL 2 0 2009

July 16, 2009.

LBNL Director
% Kim Abbott
1 Cyclotron Rd.
MS 90-1023
Berkeley, CA. 94720.

Request and
Comments on EA for
BELLA laser accelerator.

Dear Director,

This is to request that you extend the comment period on the EA for the BELLA laser accelerator. I received notice re: this project on June 23, 2009, Not even the 30 days presumably allotted for comment. Furthermore, it was then several days or more before I received the EA. + other materials, pertinent. GB-1

Please include the enclosed articles as a part of my comments: "Lab Snookers Council Over Tiny Laser accelerator's Big Wallop", "Coming soon to ~~Town~~ a neighborhood Near You!" and "Laser-Powered Accelerator Plan Gets Boost From Recovery Act." all in The Berkeley Daily Planet, July 16-22, 2009 GB-2

Please also answer these questions: (1) Who are the two companies who want to build a laser for BELLA under your supervision? (2) What are the military requirements driving the advances in the field of laser technology? (See Berkeley Lab, NEWS CENTER: Feature Stories, April 2008) (3) Why is our tax money being spent to create "conditions like those inside an exploding star" in a laboratory? GB-3

Sincerely Gene Bernardi

JULY 16-22, 2009

THE BERKELEY DAILY PLANET

Volume 11, Issue 16 DAILY ONLINE, WEEKLY IN PRINT $2 Donation Requested

Laser-Powered Accelerator Plan Gets Boost From Recovery Act

By RICHARD BRENNEMAN

A strangely colored beam pouring out a quadrillion watts of peak power spewing out subatomic particles juiced up by a ten-billion-electronic-volt laser plasma accelerator housed in a facility dubbed the "experimental cave"?

While it may sound like Dr. Frankenstein's lab, Lawrence Berkeley National Laboratory (LBNL) officials are calling it BELLA—short for Berkeley Lab Laser Accelerator and not for that Lugosi guy who played Dracula, though he, too, lurked in dark, cavernous places.

To be built with the help of $20 million in funding from the Obama administration's American Resource and Recovery Act, the project is part of the lab's $115.8 million in Recovery Act funding awarded the lab in March by former LBNL director and now Secretary of Energy Steven Chu.

The total cost of the laser facility will be $28 million, with the balance of funding also coming from Department of Energy accounts.

Designed to replace vastly larger particle accelerators used in the study of the fundamental properties of matter, the research equipment will be housed in an existing structure, Building 71, on the northern edge of the lab's campus.

Construction of Building 71 was begun in 1957 to house the lab's Heavy Ion Linear Accelerator (HILAC), according to the environmental assessment released by the lab to cover the BELLA project.

The Department of Energy in 2007 listed the structure as eligible for inclusion in the National Register of Historic Places "because of the important role that the building had played in the nuclear physics and accelerator development" at the lab, according to the environmental assessment.

But the removal in 2008 of the last equipment used in the HILAC experiments represent-

Continued on Page Twenty-One

Laser-Powered Accelerator Plan Gets Boost From Recovery Act

Continued from Page One

ed the disappearance of the building's last remaining historic elements, the environmental assessment concluded.

Unmentioned is the fact that building interiors are expressly excluded from the city of Berkeley's Landmarks Preservation Ordinance, which evaluates buildings solely on their exteriors and precludes designating interiors.

Likewise, interiors aren't mentioned in the criteria for designating an official California state landmark, which include:

- Association "with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States."
- A connection with "the lives of persons important to local, California or national history."
- Embodiment of "the distinctive characteristics of a type, period, region or method of construction or [that] represents the work of a master or possesses high artistic values."
- Documentation that the site "has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation."

To be considered for designation, structures need only meet one of the four criteria, according to the state Office of Historic Preservation (http://ohp.parks.ca.gov).

Neither the city nor state landmarks laws are mentioned in the environmental assessment, which was prepared by a Community & Environment, which also prepared the environmental analysis for the university's controversial Long Range Development Plan 2020.

The city has designated landmarks on the UC Berkeley campus and at LBNL, but the sites are outside the city's official jurisdiction, though sometimes at least within the state's purview. The BELLA itself is exclusively a federal project, and LBNL's status as a federal lab operated under contract by the university adds to the legal complications of the environmental review process.

"The Proposed Action would not affect cultural resources," the environmental assessment states, though the assessment also notes that the project would make one significant alteration to the building's exterior—a 2,000-square-foot rooftop structure housing a utility room and stairwell.

While the lab's project review has been conducted under the National Environmental Protection Act (NEPA), project critics like Pamela Shivola and Mark McDonald of the Committee to Minimize Toxic Waste said at least a preliminary review—a document formally entitled an initial study—should be conducted under the California Environmental Quality Act (CEQA).

In a June 10 letter, Shivola told city Planning and Development Director Dan Marks that a broader review was needed because of the site's "proximity to residential neighborhoods ... and the Lawrence Hall of Science, a children's school and a museum just a few hundred yards away."

"This is very important," Shivola told a Commission meeting.

In addition to the lab's relative nearness to residences and places where children congregate, McDonald and Shivola point to the area's seismic faults, and the predictions of state and federal geologists that the Bay Area's next major shaker is most likely to come from the nearby Hayward Fault, which runs directly beneath Memorial Stadium.

The heart of the new facility is the experimental cave, from which much of the equipment mentioned in the environmental assessment has already been removed. The environmental assessment notes that, of an estimated 100 truckloads of material involved in the project, one will be filled with hazardous material destined for a licensed waste facility.

"Most of the material will be what you find in any old building, including asbestos and lead," said LBNL spokesperson Paul Preuss, though some traces of other hazards might be present, including possible spills of small quantities of radioactive materials.

The environmental assessment acknowledges that "several instances of low-level surface radioactivity have been detected in Building 71 equipment," include americium-241, cesium-137 and curium-244, as well as subsequently cleaned-up traces of beryllium and PCBs.

Experiments will be conducted by new equipment surrounded by heavy radiation shielding, including three-foot-thick concrete walls plus "an additional 16 inches of lead, 36 inches of steel and another six feet of concrete to absorb the radiation and reduce exposure levels."

states that the beam will produce subatomic gamma rays, neutrons and photomuons, and that even workers standing near the beam's terminus—the point of most potential exposure—would receive less than a fifth of the allowable exposure level over the course of the year.

But McDonald is skeptical, noting that federally set levels of radiation have changed over the years. He also cites a 2001 city-commissioned review of radiological monitoring at the lab prepared by researchers at the Institute for Energy and Environmental Research in Heidelberg, Germany.

That report concluded that radiation levels from lab accelerators had exceeded permissible levels 40 years ago at the lab's border at the Olympic Gate monitoring station.

Preuss and the environmental assessment both insist that the new accelerator won't emit unsafe levels of radiation.

The new accelerator will produce a beam about a million times more powerful than that emitted by the last-generation television's cathode ray tube, he said, "so you definitely would not want to stand right in front of it."

But, "energetic as they are, none of the electrons in BELLA's hair-thin beam are going to get out of the experimental area," he said, "and no one can get through the interlocked doors when it's on—it will shut down if anybody tries."

The device also stops abruptly in the event of an earthquake, Preuss said.

In addition, the device, which is a mere three feet long, isn't expected to irradiate other materials in the cave.

McDonald and Shivola remain skeptical.

The environmental assessment is avail-

COMMENTARY

Opinions expressed in Daily Planet commentary and letters to the editor are those of the authors and do not necessarily reflect the views of the Daily Planet or its staff.

Lab Snookers Council Over Tiny Laser Accelerator's Big Wallop

By GENE BERNARDI

With its typical modus operandi, the Lawrence Berkeley National Laboratory (LBNL) mailed the BELLA High Energy Laser Accelerator environmental assessment notification such that it was received circa June 23, when many concerned citizens are vacationing. (Look for next lab environmental assessment at Christmastime!) The notice stipulated that the cut-off date for public comment is July 18, just 25 days after receipt of notice. Furthermore, the lab sent a contingent to lobby councilmembers prior to the July 7 meeting at which this proposed High Energy Laser Accelerator was on the agenda. The agenda recommendation was that residents near the project be notified, the comment period be extended, and that city staff comment on the project.

Lab public relations personnel mollified our council "representatives" by emphasizing the size of the BELLA laser and laser plasma accelerator. They did not mention that what is so unique about the small size of the accelerator is the fact that, although only one meter in length, it will generate 10 billion electron volts (GeV) as much energy generated by current accelerators of 300 meters. Ten billion electron volts (10 GeV) is 60 percent more powerful than the lab's Bevatron accelerator which reached 6.2 GeV. (See Franke and Greenhouse, "Review of Radiological Monitoring of NBNL: Final Report" City of Berkeley, 2001, p.37)

The Lab's making hay over the 450 notices they sent out means little when the individual households located within less than one-tenth of a mile (138m) of Building 71 (to house the accelerator) and all schools and parents, potential visitors to the Lawrence Hall of Science just one-tenth of a mile (159m) from Building 71, have not each been notified of the project: an accelerator which converts energy to radiation in the form of gamma-rays, neutrons and photomuons. This flies in the face of the Precautionary Principle and surely does not allow for informed consent or dissent.

If the tiny "nano" BELLA accelerator is nothing to worry about, why will the Experimental Cave in which it will be housed have a "concrete wall...three feet thick at the west end where the electron beam would terminate... and an additional 16 inches of lead, 36 inches of steel, and another six feet of concrete to absorb radiation to reduce exposure levels outside the Experimental Cave for LBNL personnel..." (p.27, US Department of Energy environmental assessment, June 18). Please note: employees are allowed a higher exposure level than the general public. Is the exposure level for the general public at or below that which is allowed? Do you want to be exposed at all? The hazard of greatest concern is eye injury (p.28, Ibid); also skin burn and ignition of worker's clothing.

How is it that the majority of our so-called representatives, the city councilmembers, voted that the city staff not study and comment on the environmental assessment for the proposed BELLA Laser accelerator, a radiation producing project next to Berkeley residents' homes and not call upon the lab to mail notices to these homes?

Is it respectful, to say nothing of cost effective, for commissioners, members of the public and city councilmembers to spend hours in public facilities discussing and voting for resolutions such as "The Precautionary Principle" and "Stop Cancer Where It Starts" as well as discussing implementation of "The Nuclear Free Berkeley Act," only to have the City Council ignore their own resolutions and the law?

Should not the current city councilmembers suspend judgment on an issue until they have studied it and determined the Council history on the issue? In this case, thousands of dollars approved by the City Council spent for a report "Review of Radiological Monitoring at LBNL" (Aug. 23, 2001). In this report it is stated that radiation doses from the Bevatron accelerator, measured at the Olympus Gate monitoring station located a few meters below a residence at Olympus Avenue and Wilson Circle exceeded the allowed annual dose by 60 percent. Why is it that this monitoring station no longer appears on the lab's yearly site environmental report maps? Has the monitoring stopped despite the extraordinarily long half-life of many of the radioactive materials associated with accelerators?

Call, mail or e-mail the LBNL director and/or Kim Abbott: 486-4000, LBNL 1 Cyclotron Road MS 90-1023 Berkeley, CA 94720. Or e-mail: kim.abbott@bso.science.doe.gov.

Demand a full blown environmental impact report and environmental impact statement and demand notification of neighbors, schools and Lawrence Hall of Science patrons and an extension of the public comment period on the EA which is now scheduled to end at 5 p.m. Saturday, July 18.

Gene Bernardi is a resident of Berkeley and lives near the Lawrence Berkeley National Laboratory.

Coming Soon to a Neighborhood Near You!

By PAMELA SHIVOLA

The Department of Energy (DOE) and the Lawrence Berkeley National Laboratory (LBNL) are proposing to build an experimental High Energy Plasma Laser Accelerator Facility ("BELLA") just 448 feet from a residential neighborhood in Northeast Berkeley, and 516 feet from the Lawrence Hall of Science, a children's school and museum.

The proposed facility is to be located at LBNL in an existing building (Building 71), which was previously deemed seismically unsafe and is located in a landslide area. The site is crisscrossed by several earthquake faults according to a 1984 Converse Consultants Report. It is also next to the North Fork of Strawberry Creek and one of the many springs of the Strawberry Creek Watershed. Past operations of the HILAC accelerator, in the same building, contaminated groundwater and soil in the area with volatile organic compounds, Freon, radioactive Curium 244 and tritium, according to LBNL's Site Restoration Program Reports.

DOE is currently circulating an environmental assessment under the National Environmental Policy Act (NEPA) on this project, for the purpose of soliciting public comments on the assessment, which can be obtained from LBNL's website, www.lbl.gov/community/BELLA.The comment period ends July 18.

The Petawatt-class laser accelerator will be capable of accelerating beams to energies in the order of 10 billion electron-volts (GeV). The 10 billion electron-volt BELLA is 60 percent more powerful than LBNL's Bevatron accelerator, now in the process of being demolished, which reached 6.2 GeV as reported by Franke and Greenhouse ("Review of Radiological Monitoring at LBNL: Final Report," City of Berkeley, 2001).

Operating accelerators produce a variety of radiation fields, including neutrons, gamma rays, muons and other radiations. This accelerator is no different. The Franke and Greenhouse Report also revealed that in the past 800 mrem/y radiation doses, measured at the Olympus Gate monitoring station, (located between the homes and Building 71), exceeded the then allowed annual dose of 500 mrem/y by 60 percent.

Is it a coincidence that this monitoring station no longer appears on LBNL's Site Environmental Report maps, and that the station now, surrounded by vegetation, seems abandoned?

A full blown environmental impact statement under NEPA and an environmental impact report under CEQA is essential, due to the proposed facility's proximity to sensitive receptors and the natural (the Hayward Earthquake Fault Zone, High-Risk Fire Area) and man-made hazards (contamination) of the site.

Email your comments to kim.abbott@bso.science.doe.gov before the July 18 deadline.

Note: In 2005 the National Academy of Sciences Panel: BEIR VII, Committee on Biological Effects of Ionizing Radiation determined that there is no safe dose of ionizing radiation, no exposure level below which dosage is harmless!

Pamela Sihvola is a member of the Committee to Minimize Toxic Waste.

Abbott, Kim

From: merrilie Mitchell [merriliem@sbcglobal.net]
Sent: Sunday, July 19, 2009 12:00 AM
To: Abbott, Kim
Subject: Comments on LBNL's Bella Laser Accelerator Project -- Environmental Assessment

Dear Ms Kim Abbott,
Here are my comments re LBNL's Bella Laser Accelerator Project -- Environmental Assessment:

First, I attended a public presentation at the Community Environmental Advisory Committee (CEAC) and got an overview of the project.

- This type research does not belong in the location chosen -- up in the hills and canyons above the UC Campus, in the area known in Berkeley as the hills, and Strawberry Canyon. This area should be Priority Conservation Area -- an environment with highest best use clearly to be Open Space, recreation, hiking, wildlife corridor, etc. **MM-1**
- There is money from many sources to pay for the transformation necessary to heal the earth where the Labs have been doing their research. ABAG (Association of Bay Area Governments); ARRA (Obama Stimulus money); Brownfields legislation; East Bay Regional Parks bond money which could purchase the land to complete the link between two regional parks as well as connect the Greenbelt for Berkeley which is the densest city in Alameda County. **MM-2**
- This area used by the Labs is also the prime greenhouse gas (GHG) elimination area for Berkeley. It is the area where trees, plants and healthy soil organisms can most efficiently remove CO2 and other Carbon gases from the air, along with nitrogen and sulfur pollutants and PM-10s --black Carbon particulates that we inhale directly into our respiratory and circulatory systems. **MM-3**
- The Labs mission is energy efficiency but they can't match what nature does for us during photosynthesis, critical to consider if we believe life on earth is in danger because of man-made global warming. Our country is the leader in GHG production per capita in the world. The Labs scientists are among the highest per capita users of energy in our country. **MM-4**
- Whatever good the Labs believe they are doing up there in the canyon, they are using tremendous amounts of energy, and in this project will use huge amounts of concrete, and make incredible amounts of toxic waste before and after they do their research--to recycle the building, and the mildly radioactive Bevatron nearby. **MM-5**
- This area near Lawrence Hall of Science and not far from the beautiful, peaceful Botanical Gardens, needs to be restored to highest standards man can manage , and then to let nature have a chance to work her magic. **MM-6**
- There may never again be a time when so many sources of funds could be made available to clean up the "Old Town" and the toxics and start anew in an appropriate environment, not near earthquake faults, not in the middle of a high class recreational area, not near creeks that flow from a pristine Aquifer (Lenert??)-- that could serve the UC Campus and City of Berkeley as a source of drinking water--the University could make money from it! **MM-7**
- There are no real alternative sites listed in the Environmental Assessment, merely sites in the same Strawberry Creek watershed.area. A new satellite campus by Oakland's Lake Merritt--? -- a state-of-the-art, near transit, clean tech, safe lab campus? **MM-8**
- But the Bella Laser Accelerator needs a special environment away from populated areas. Do the right thing and gain back the respect of the people and the world.(The Labs were reported on in the media, a 9 page article in the Contra Costa Times--*Lab Workers Suffer Fallout*, P 1, J July 1, 2007... with more photos and stories of sick workers--go to *ContraCostaTimes.com* This article is about LBNL and two other DOE Labs with workers sick, in most cares from radiation, struggling to get Federal compensation **MM-9**

for illnesses, and failing 75% of the time

- Other stories in the media show a pattern of the Labs to avoid following Berkeley's "Precautionary Prinicipal" in the Canyon laboratories when forging ahead with new research and development, lax standards when carrying contaminated waste, disrepect for neighbors near the labs, running diesel buses through Berkeley at frequent (ten minute intervals) idling the engines fulltime for layovers while spewing filthy diesel pollution in the heart of Downtown Berkeley. There is no reason to believe the Labs have changed their way or cleaned up their act for this new BELLA accelerator project.
- There is reason to suspect they will be increasing the power of acceleraton by a factor of 10 from 1billion to 10 billion because they discuss the concept of stringing 100 or so BELLA's together. And say " With this kind of power, conditions like those inside an exploding star could be recreated: cosmology would come into the laboratory."
- Lord help these scientists and Regents to look at nature and marvel, To consider how energy intensive and endangering and disrespectful to the environment and the public that their science has sometimes become, how far from the original mission of the Labs -- to save energy.

MM-9 (cont.)

MM-10

MM-11

MM-12

Abbott, Kim

From: Mark McDonald [cathmark@earthlink.net]
Sent: Friday, July 17, 2009 8:00 PM
To: Abbott, Kim
Cc: Mark McDonald

Please accept my questions as comments which will hopefully be answered by DOE/LBNL regarding the BELLA laser project. Please acknowledge the reception of these comments. Thank you,
M.M.

1) What is the technical definition of a buffer zone? | MMCD-1

2) What types of research technologies require the utilization of a buffer zone? | MMCD-2

3) Does the operation of an accelerator with the power handling capabilities of the BELLA apparatus prudently require a buffer zone? | MMCD-3

4) Does the absence of a buffer zone, the close proximity of inhabited neighborhoods and the close proximity of the Lawrence Children's Science museum (HOS) preclude the operation of a high power laser accelerator like the BELLA facility? | MMCD-4

5) How much time and money are saved by the DOE by employing a Environmental Assessment instead of a normal EIR review process under NEPA and CEQA ? | MMCD-5

6) Will the project manager(s) of the BELLA accelerator receive a bonus upon completion? | MMCD-6

7) Will the amount of any bonus compensation be affected by monies saved by employing an Environmental Assessment instead of a normal EIR review under NEPA and CEQA ? | MMCD-7

8) Are the management of DOE and LBNL aware of the conclusions of the investigation/report (Review of Radiological Monitoring of LBNL : Final Report) by the City of Berkeley's privately hired scientific consultant B. Franke of IFEU which claims that the neighbors of LBNL received significantly higher exposures of ionizing radiation from past accelerator operations than previously reported by LBNL? | MMCD-8

9) In lieu of the IFEU report, why is DOE/LBNL attempting to construct and operate an accelerator that operates at higher energy levels than previous | MMCD-9

accelerators even closer to neighbor boundaries without the one monitor station that was employed previously ?

MMCD-9 (Cont.)

10) Why doesn't DOE/LBNL propose a system of peripheral monitors to better inform and protect the adjacent public from dangerous radiation ?

MMCD-10

11) Are workers at LBNL forced to receive higher doses of radiation than non-employee civilians?

MMCD-11

12) Has the findings and conclusions of the BEIR 7 Committee of the Academy of Sciences which report that there is no safe level of exposure to ionizing radiation had any effect on operations and standards and regulations of activities at LBNL that involve radioactive substances or processes?

MMCD-12

13) Does the groundwater at the site of the proposed accelerator still contain VOC's, freon, radioactive curium 244 and tritium?

MMCD-13

14) Will the construction and operation of the BELLA accelerator hinder, complicate or delay remediation of contamination from previous operations ?

MMCD-14

Mark McDonald 1815 Parker St Berkeley Ca 94703

Abbott, Kim

From: martha nicoloff [nicoloff2@yahoo.com]
Sent: Friday, July 17, 2009 4:47 PM
To: Abbott, Kim
Subject: Bella Laser-powered Accelerator

July 17. 2009 Dear Sir, many residents were alarmed when a nanotech facility was established in the Strawberry Canyon area without an EIR.
Now, the announcement of a high powered Bella laser in building 71 in yesterdays Planet newspaper without public hearings and
a state environmental impact study is beyond belief. Do the right thing let Berkeley's citizens have full knowledge of the
possible danger.

MN-1

Sincerely Martha Nicoloff nicoloff2@yahoo.com
Former Planning Commissioner,Adjustments Board and
North Berkeley Neighborhood Council Chair

Abbott, Kim

From: Phoebe Anne Sorgen [phoebeso@earthlink.net]
Sent: Friday, July 17, 2009 6:54 PM
To: Abbott, Kim
Subject: public comment re "BELLA"

Dear Kim Abbott:

Please notify me that you have received this in a timely manner and made note that one more Berkeley resident is requesting a complete and thorough environmental impact report and complete and thorough environmental impact statement re "BELLA". Please notify all neighbors, schools, and past/potential visitors to the Lawrence Hall of Science. Most important, please extend the public comment period through September because interested parties are traveling during the summer. **PS-1**

This is a high risk fire area, high risk earthquake area, and slide zone. Even if that were not the case, I believe it is unwise and disrespectful to build an experimental High Energy Plasma Laser Accelerator Facility in such close proximity to residential neighborhoods. **PS-2**

By the way, I speak Italian and am offended that this is called "bella." A beautiful word was thus ruined. **PS-3**

Sincerely,

Phoebe Sorgen
northeast Berkeley homeowner since 1989

Abbott, Kim

From: Russ Mitchell [russ@russmitchell.com]
Sent: Tuesday, July 21, 2009 10:34 AM
To: Abbott, Kim
Subject: lab neighbor supports you

I live just a few blocks from the lab. I am not connected with the lab. The BELLA is fine by me.

RM-1

Abbott, Kim

From: carole schemmerling [caroleschem@hotmail.com]
Sent: Friday, July 17, 2009 1:45 PM
To: Abbott, Kim
Subject: Bldg 71

STRAWBERRY CREEK WATERSHED COUNCIL

The Strawberry Creek Watershed Council is concerned about the proposal to build the high efficiency plasma laser accelerator (BELLA) in Strawberry Canyon. While the re-use of an existing building is certainly a better strategy than putting a new building onto this already densely
developed site, this building like all others at LBNL is a hazard.

The Report Preparers have done a very good job of making a well written, readable report that is designed to reassure the public that no problems will arise from this project. However, real concerns are not addressed, such as:

* no mention is made of the fact that this project is situated in Strawberry Creek Watershed which is a habitat for plants and animals as well as humans, which are negatively impacted by all the of the activities generated by LBNL — SCWC-1

* no mention of the north branch of Strawberry Creek which runs next to building 71 and a spring that persists there(after the Lab's efforts to get rid of it), because it is on one of the many faults that criss cross the Hill. It is not reasonable to assume that the creek and spring could never be affected by contamination. How will the Lab be able to prevent accidents there? — SCWC-2

* no mention is made of complex of faults on the site — SCWC-3

* no mention is made of the contaminants in the waste water that is carried in a sewer down Hearst St. In a storm event how will LBNL deal with the inevitable spills into the streets? — SCWC-4

* no mention of how LBNL will respond if there is a fire storm on the Hill? What happens when the materials in the building 71 burns? What will be done when the eucalyptus trees that are impregnated with Tritium burns? — SCWC-5

The assumptions that the report presents; that all issues are addressed and are not a cause for concern, are arrogant, deliberate and dangerous.

Until the Lab, DOE and the Regents pays attention to these very serious concerns, the Strawberry Creek Watershed Council believes that no more development should take place in the Canyon.

Carole Schemmerling
for the SCWC

Abbott, Kim

From: JThomas621@aol.com
Sent: Saturday, July 18, 2009 1:17 PM
To: Abbott, Kim
Subject: comments on BELLA draft EA
Attachments: BELLA_comment.doc

Greetings.

Attached please find comments on the Draft Environmental Assessment prepared for the Berkeley Laboratory Laser Accelerator laser, laser plasma accelerator, ancillary equipment, and radiation shielding. A hard copy of the comments will be sent in today's mail.

J a n i c e T h o m a s

SAVE STRAWBERRY CANYON

P.O. BOX 1234

BERKELEY, CALIFORNIA 94701

Save Strawberry Canyon is a citizens' group that seeks to preserve and protect the watershed lands and cultural landscape of Strawberry Canyon. Save Strawberry Canyon was formed out of the urgent need to take action in response to the threat of intrusive, inappropriate development on the Canyon lands.

Strawberry Canyon, opposite the Golden Gate, is a unique link to the East Bay Regional Park district lands and, by its streams and views, to the San Francisco Bay. The Canyon itself with its streamside vegetation, oak-bay woodlands, grasslands, and surrounding slopes, is a rich repository of wildlife directly adjacent to the dense urban populations of the UC Berkeley Campus and the cities of Berkeley and Oakland.

Save Strawberry Canyon seeks to inform the public about the impacts of proposed developments, to encourage location of such developments to more suitable sites, and to promote better public access to the beautiful Canyon with its wildlife and scenic resources.

July 14, 2009

Via electronic mail kim.abbott@bso.science.doe.gov

Kim Abbott
Department of Energy Office of Science
Berkeley Site Office
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 90-1023
Berkeley, CA 94720

Re: Comment on the BELLA draft EA

Dear Kim Abbott,

Thank you for the opportunity to comment on the Environmental Assessment (EA) prepared for the BELLA project, the new accelerator proposed for the Lawrence Berkeley National Laboratory hill site. These comments are submitted on behalf of Save Strawberry Canyon, a non-profit organization dedicated to the preservation and protection of Strawberry Canyon and the headwaters of Strawberry Creek.

The proposed project is an "experimental facility" (EA, p.3). Save Strawberry Canyon takes note that this small one meter laser would generate 10 billion electron volts.

SSC-1

The experimental nature of the project is perhaps the singularly most important project characteristic from an environmental standpoint. Please clarify the basis for estimates of radioactive emissions. Please provide evidence of the documents and reports which are

the basis for estimated radioactive emissions. Furthermore, please provide empirical evidence which shows that the three feet thick concrete wall at the west end and the "16 inches of lead, 36 inches of steel, and another 6 feet of concrete...outside the Experimental Cave" (EA, p.27) suffice to absorb the radiation to the level estimated.

SSC-1 (Cont.)

The EA uses these estimates as the basis for assumptions about health impacts to the people living in the vicinity and to visiting children, who are sensitive receptors, at the nearby science museum. As stated in the EA, the proposed project is as close as 448 feet from Campus Drive, a residential neighborhood, and 516 feet from the Lawrence Hall of Science. Was a health risk assessment prepared for the project? Any number of impacts might be underestimated due to faulty estimates of radioactive emissions.

SSC-2

The proposed project would be located in Blackberry Canyon, which is drained by the North Fork of Strawberry Creek. The EA neglects to mention this relationship. Please clarify the potential impacts to hydrology, water quality, and soil. The relationships are particularly important in light of historic groundwater contamination as evidenced by a radioactive plume described in the EA. Given that the proposed project is an experimental methodology with estimated predictions about radioactive emissions, please clarify the federal obligations under the Clean Water Act.

SSC-3

The proposed project has cumulative impacts which would degrade Strawberry Canyon. As stated in the EA, the proposed project is one of several construction projects in the vicinity. LBNL maintains that these projects are synergistically related (see LBNL Long Range Development Plan EIR), and as such, relocating any one of these projects may affect the viability of the others and may reduce the cumulative impacts of the whole. Hence, please explain why it is necessary to locate the proposed project at the LBNL hill site. Please clarify the relationship between the BELLA project and any and all projects which are synergistically related.

SSC-4

The projects listed in the EA as having potential for cumulative impacts include Seismic Phase 1, Seismic Phase 2, the User Support Building, Building 51 and the Bevatron Demolition, Building 77 Rehabilitation, Building 6 Seismic Upgrade, the Southeast Campus Integrated Projects, the Northeast Quadrant Science and Safety Projects, the Computational Research and Theory Building, the Helios Energy Research Facility, the Guest House. The EA neglects to mention that the Helios Energy Research Facility Final Environmental Impact Report (EIR) was **decertified** by the Regents. Please refer to the Notice of Preparation of an EIR for the Helios project dated 12/1/08 and issued by the University of California where it states that "...(t)he Regents has decertified the Final Environmental Impact Report and rescinded the design approval of the Helios Energy Research Facility as previously proposed. This Notice of Preparation has been issued to inform the agencies and the general public that a new EIR will be prepared for the redesigned Helios Energy Research Facility Project." At present, no EIR has been issued for the redesigned Helios facility.

SSC-5

In closing, the proposed project perpetuates a legacy of inappropriate experimental research at this hillside location. Whatever higher purpose the research would accomplish is not the point. The societal cost of squandered natural resources and the cavalier dismissal of threats to human health from proximate radiation sources are of grave concern.

SSC-6

Thank you for considering our comments and concerns.

Yours sincerely,

Janice Thomas
Secretary,
Save Strawberry Canyon

cc: Edgar Bailey, Chief, Radiological Health Branch, CA Dept of Health Services
Susan Moore, Chief Supervisor, US Fish and Wildlife Service, Sacramento Office

SAVE Strawberry Creek Watershed

REC'D JUL 2 0 2009

STOP the Further Destruction of the Strawberry Creek Watershed

We, the undersigned, petition our elected local, State and Federal Representatives to request that The Lawrence Berkeley National Laboratory (LBNL) and the Department of Energy (DOE) 1). Cease immediately the demolition of the Bevatron accelerator and the hauling of radioactive and hazardous waste down Shattuck Avenue, through South Berkeley to I-80, until a public hearing has been convened in accordance with the Nuclear Free Berkeley Act, and 2). Prepare an Environmental Impact Report (EIR) and an Environmental Impact Statement (EIS) for the proposed High Energy Plasma Laser Accelerator (HEPLA/BELLA) slated for LBNL next to a residential neighborhood, and

SSCW-1

We, the undersigned, urge the Department of Energy (DOE), the Lawrence Berkeley National Laboratory (LBNL), and the University of California (UC) Regents to immediately cease the further destruction of the Strawberry Creek Watershed.

SSCW-2

Since the Manhattan Project in the 40s, the operations at LBNL have contaminated the soil, surface and groundwater, and vegetation in the Strawberry Creek Watershed with toxic materials including radioactive tritium, uranium, VOCs, diesel, Freon, PCBs, and much more.

To: Kim Abbot, NEBA Document Manager
Department of Energy, Berkeley Site Office
One Cyclotron Road, MS90-R1023, Berkeley, CA 94720

Subject: Comments on DOE's Environmental Assessment for BELLA Laser Acquisition, Installation, and Use for Research and Development

I am submitting the enclosed petitions on behalf of "Preserve the Strawberry Creek Watershed Alliance". To date over 100 concerned Berkeley residents have signed the petition asking that an Environmental Impact Report (EIR) and an Environmental Impact Statement (EIS) must be prepared for the proposed High Energy Plasma Laser Accelerator Facility (HEPLA/BELLA) slated for the Lawrence Berkeley National Laboratory (LBNL) next to a residential neighborhood and a children's school and museum, the Lawrence Hall of Science.

The undersigned also urge that DOE, LBNL, and the University of California (UC) Regents immediately cease further destruction of the Strawberry Creek Watershed caused by development in this most fragile, high-risk earthquake, wildfire, and land slide area.

Sincerely, Gianna Ranuzzi

Gianna Ranuzzi, Secretary, Preserve the Strawberry Creek Watershed Alliance
2917 Lorina Street, Berkeley, CA 94705-1806

Sponsored by: Preserve the Strawberry Creek Watershed Alliance

Abbott, Kim

From: Timothy Ma [timothyma@berkeley.edu]
Sent: Friday, July 17, 2009 11:36 AM
To: Abbott, Kim
Subject: The BELLA accelerator is perfectly fine.

Hi,
I was a reading an article in the Berkeley Daily Planet about radiation produced from upcoming project BELLA. First of all, the radiation she describes may sound bad and weird, but it is not uncommon. At this moment, there are MILLIONS of muons coming from outer space that are hitting us right now. Cosmic neutrons are also hitting us, and gamma rays are easily stopped by shielding. As a physics student at Berkeley and someone who worked on a small part of this project a year ago. Her statistics on dosage from the accelerator came from the previous old accelerator. We know a lot more than we did back then, and radiation is constantly monitored to ensure it is below safety levels. As a physics student at Berkeley and someone who worked on a small part of this project a year ago, I have confidence that the scary terms used are actually harmless and the dosage from simply living is somewhat comparable.

TM-1

Thanks,
Timothy Ma
timothyma@berkeley.edu

APPENDIX C

RESPONSES TO COMMENTS TABLE

Table No.	Comment No.	Comment Text	Response
Arlene Merryman			
1	AM-1	Concerned citizens request delay of High Energy laser accelerator installation.	In accordance with DOE NEPA regulations (10 CFR part 1021.301), the Draft EA shall be made available at DOE discretion for a comment period of 14 to 30 days. The Draft EA was available for comment for 31 days.
2	AM-2	Concerned citizens request notification of all neighbors within a mile.	The Department of Energy made the BELLA Draft EA publicly available through widespread notices of availability, through Draft EA postings at the local public library and online, and through direct mailings of the document and/or compact disks to any member of the public who requested them. Local neighborhood associations were notified, and free hard copies of the Draft EA were mailed to any person or organization that requested one. The DOE has fully met its commitment to public involvement pursuant to 40 CFR Part 1506.6.
3	AM-3	Concerned citizens request further study of radiation Effects.	DOE ensures the safety of the public and workers by complying with 10 CFR Part 835, Occupational Radiation Protection for radiation exposure and DOE Order 5400.5. DOE order 5400.5 establishes standards and requirements that protect the public from risk from radiation exposure. Chapter 10 CFR Part 835 establishes radiation protection standards, limits, and program requirements for protecting individuals (workers) from ionizing radiation resulting from the conduct of DOE activities. As discussed in EA Section III.A.1, accelerator systems are not new. Their impacts are therefore known, radiation categorized and quantified, and documented. What is uncommon about this system is the laser mechanism for accelerating the electron beam. That part of the system does not generate radiation. It also does not generate mixed radioactive and chemical hazards. Shielding using concrete, lead and steel, is described in Section IV.B.1.b of the EA. Shielding would be designed to meet the requirements of 10 CFR Part 835 and DOE Order 5400.5 to protect LBNL workers and the public. Monitors would measure the performance of the shielding and shut down the

Table No.	Comment No.	Comment Text	Response
			BELLA Laser Plasma Accelerator in the event that the shielding does not meet safety criteria. LBNL's ongoing radiation monitoring program monitors the area outside Building 71 for accelerator-produced radiation. Monitoring results and the location of the monitors are published in the Site Environmental Reports. The latest report (2007) can be found online at: http://www.lbl.gov/ehs/esg/Reports/tableforreports.htm. LBNL's reports have consistently shown that the greatest gamma radiation dose to the public has been well below allowable limits. The BELLA project would install additional monitors inside the building as described in EA Section IV.B.1.b. Cumulative impacts are discussed in Final EA Section V. Building 71 houses the LOASIS program. A description of LOASIS operations can be found at: http://www-afrd.lbl.gov/loasis.html. An environmental evaluation of LOASIS operations is beyond the scope of this EA except to the extent of the potential cumulative impacts if the BELLA project proceeds. The BELLA project would be integrated with LOASIS to the extent that they would share some staffing and equipment resources and would be located in the same building. The actual accelerator apparatus associated with each program would not be integrated. Each apparatus is either independently shielded with separate caves or would be independently shielded and governed by individually designed safety protocols. The shielding provided by each cave ensures that any radiation outside the cave walls would be within the required limits at all times. Because of the protection provided by each cave, the impact of operating all the accelerators at once would be indistinguishable from operating the accelerators separately. It is anticipated that BELLA would contribute no measurable radiation at the LBNL

Table No.	Comment No.		Comment Text	Response
				property boundaries, whether specifically or cumulatively with all other LBNL activities, including LOASIS.
4	AM-4		Concerned citizens request an Environmental Impact Report easily accessible online.	After the Department of Energy completes the NEPA analysis and determination, the University of California will conduct any necessary California Environmental Quality Act review of this project.
Committee to Minimize Toxic Waste, Pam Sihvola Chair				
5	CMTW-1	A	The Project Description for the above referenced project/proposed action is entirely inadequate, incomplete and deficient. It completely excludes the description of the already operating LOASIS (Laser Optical Accelerator Systems Integrated Studies) Program's Laser Research Facilities at the Lawrence Berkeley National Laboratory (LBNL), into which the proposed High Energy Plasma Laser Accelerator (BELLA) will be integrated.	Please refer to response to comment AM-3. The BELLA EA adequately describes the proposed action as required in 40 CFR part 1508.9 and 10 CFR part 1021.321.
		B	According to an article in the Daily Californian, July 6, 2009, issue: "The new accelerator (BELLA) will replace the lab's current device, which has a chamber that is only 3.3 centimeters long…The current device can charge the particles to 1 billion electron volts…" (Attachment 1).	The July 6 article referred to by the commenter and stating that BELLA will "replace the Lab's current device" is incorrect.
		C	Furthermore, in April of 2008, Berkeley Lab's News Center included a feature article titled: "BELLA: The New State in Laser Wakefield led by Wims Leemans, of Berkeley Lab's Accelerator and Fusion Research Division (AFRD), has held the world's record for laser-wakefield acceleration, accelerating high-quality electron beams to energies exceeding 1 GeV (1 billion electron volts)". (Attachment 2)	The attachment provided by the commenter has been received and noted.
		D	In summary, the BELLA EA failed to analyze the impacts/cumulative impacts of the LOASIS program, already in operation in Building 71 (B71), of which the BELLA accelerator is proposed to be a part.	See response to comment AM-3.

Table No.	Comment No.		Comment Text	Response
6	CMTW-2	A	The EA failed to provide a comprehensive floor plan of B71, to clearly show all the existing spaces that currently house the LOASIS program facilities, and how and where the proposed BELLA accelerator will fit in. One page 13 of the EA there are only 6 random photographs of rooms (195, 115, 126, 131, 128, 146), without any coherent plan to show how they relate to the rest of the building, and the LOASIS program projects.	This Final EA includes a partial floor plan of the existing Building 71 (see Final EA Figure 4) indicating where the photographs in Figure 3 were taken. Please see response to comment AM-3 for how the project relates to the rest of the building and the LOASIS program.
		B	In addition, the EA failed to provide a cross selection of B71, to show the same, i.e. the relationship of the new BELLA apparatus to the existing LOASIS and other project facilities in B71, the proposed new roof level addition for new utilities, the locations for radiation and EMF (Electromagnetic Field) monitoring devices, the shielding areas for the accelerators and beam dump areas etc.	Please see response to comment AM-3 for how the project relates to the rest of Building 71 and the LOASIS program. Locations and need for radiation and electromagnetic field monitoring devices and the shielding and beam dump areas would be determined during project design and would be in accordance with the requirements of 10 CFR Part 835 and DOE Order 5400.5 to protect LBNL workers and the public.
7	CMTW-3		None of the LOASIS program projects' Environmental Impacts have ever been circulated for Public Review and Comment in the past. These projects include, but are not limited to the LOASIS 40-terwatt laser (40 TW, or 40 trillion watts) project. When was it built? Where is it exactly located in B71? What is the direction of the beam? What is the location of the beam dump? How extensive, and what kind of shielding is in place for the LOASIS 40-TW laser? Will the BELLA 10 GeV (10 billion electron volt) laser accelerator operate at the same time with LOASIS 40-TW laser? What are the cumulative impacts of these 2 accelerators? How many other projects are housed in B71, LOASIS or otherwise? What are their cumulative impacts added to BELLA and the LOASIS 40-TW laser? How is direct, ionizing radiation and EMF radiation being monitored outside the building? Will the BELLA 10 GeV (10 billion electron volt) laser accelerator operate at the same time with LOASIS 40-TW laser? What are the cumulative impacts of these 2 accelerators? How many other projects are housed in B71, LOASIS or	All major federal actions undertaken by the Department of Energy at LBNL undergo environmental review under NEPA in accordance with 10 CFR 1021. Circulation of NEPA documentation and decision making to the public is determined by level of NEPA documentation that is required for each individual proposed action. The LOASIS program has undergone appropriate NEPA and CEQA reviews throughout its lifetime. Please see website http://loasis.lbl.gov/main.html for additional details regarding the LOASIS program. Also refer to response to comment AM-3. There are a number of monitors on the perimeter of LBNL that do measure accelerator-produced radiation in the vicinity of this proposed action. Refer to responses to comment AM-3, and CMTW-30.

Table No.	Comment No.	Comment Text	Response
		otherwise? What are their cumulative impacts added to BELLA and the LOASIS 40-TW laser?	
8	CMTW-4	The April 2008 Berkeley Lab BELLA article referred to the ultimate end goal of the BELLA project, i.e. the "stringing of a hundred or so of BELLA's 10-GeV modules together" and creating "intense colliding beams of electrons and positrons with center-of-mass energies of 1 TeV, a trillion electron volts, or more, within just a few hundred meters. That's twice the energy of a conventional 30-kilometer collider...about the size of a typical sports arena." What indeed is the proposed location for the 100 BELLA facility? Is the stringing of 100 BELLAs proposed to done at LBNL? Is the Stanford Linear Accelerator Complex (SLAC) a candidate?	This comment is speculative and outside the scope of the EA. The scope is described in Section III.A and does not include a 100-BELLA laser project.
9	CMTW-5	What will the programmatic Environmental Review documents be for the 100 BELLA project? When will they be circulated for public review and comment?	Please see response to comment CMTW-4.
10	CMTW-6	What are the 2 companies currently considered for the construction of the BELLA laser?	The proposed BELLA laser has not yet been constructed. It is not within the scope of this EA to identify or speculate regarding what subcontractors would perform the work.
11	CMTW-7	A more detailed and careful analysis of the Affected Environmental and Environmental Consequences section of the EA must be prepared, otherwise it is deemed inadequate, incomplete and deficient.	This comment is interpreted as a summary of the comments CMTW-8 to 15 that are addressed individually, below.
12	CMTW-8	The EA failed to analyze and describe in detail the many natural and man-made hazards present at the site of B71. The building itself was previously deemed seismically unsafe. It is located in a known landslide area, which is crisscrossed by several earthquake faults; the University Fault and the Lawrence Hall of Science Fault Complex, according to a 1984 Converse Consultants Report. The North Fork of Strawberry Creek is present at the site as well as many of the springs of the Strawberry Creek Watershed. Springs usually indicate the	The BELLA EA addresses the fact that there are earthquake faults in the area and that the Hayward fault is an active fault. EA Section IV.A includes discussion of known faults in the project area. As noted in Section IV.A, the proposed action would improve the capacity of Building 71 to withstand a seismic event. This EA also identifies that work completed prior to 2009 improved the seismic stability of the building.

Table No.	Comment No.	Comment Text	Response
		presence of earthquake faults. The EA also failed to consider the fact that B71 and the entire LBNL site is in the Hayward Earthquake Fault Zone, considered one of the most dangerous in the country. Indeed experts predict that the Hayward Fault is ripe for a catastrophic earthquake at any time!	
13	CMTW-9	The Strawberry Creek Watershed and its Canyons re in a high risk wildland fire zone as well, fact not addressed in the EA.	The location of the proposed project, Building 71, is within the reaches of the Strawberry Canyon watershed but is not within the Strawberry Canyon itself. Please refer to Final EA Section IV.B.1.d for an analysis of on-site fire hazards. The proposed undertaking does not increase the likelihood, or the potential environmental consequences, of a wildland fire at LBNL. Extensive site-wide measures are in place at LBNL to minimize the risks associated with wildland fire, including: a vegetation management program; an on-site fire department; three 200,000-gallon water tanks for continuous fire-suppressive water pressure even in event of an earthquake; adherence to fire codes and sprinklerization in construction projects; inclusion of automated shut-off valves for natural gas lines; and emergency training and procedures for all on-site personnel. For further details, please refer to Section 1.2.5 of the Site Environmental Report and Section IV.F of the LBNL 2006 Long Range Development Plan EIR. The goal of vegetation management is to minimize wildfire damage to structures. The purpose of these vegetation management (fuel reduction) efforts is to substantially reduce the intensity of any future fire storm. As a result, Laboratory buildings would more likely survive such a fire, and the lower-intensity fire conditions at the Laboratory would allow regional fire fighters to suppress the flame front so that it would not proceed to the west of the Laboratory. The above mentioned fire protection measures are not affected by the individual or cumulative effects of the Proposed Action, which would take place within an existing building, bring about 5 to 10 new personnel to Building 71, and include the storage of

Table No.	Comment No.		Comment Text	Response
				only small amounts of cleaning solvents in the building. Please also see response to comment CMTW-21B
14	CMTW-10		Also excluded was the fact that the Canyon lands of the LBNL site are habitat for Endangered Species!	There are no known endangered species and no known critical habitat for any endangered species anywhere on the LBNL site. There is US Fish and Wildlife Service-identified critical habitat for the Alameda whipsnake, a federally and State listed "threatened" species, which exists on the far eastern area of the Lab, distant from Building 71, the project site. There is habitat that is identified as "moderate potential" for Alameda whipsnake closer to Building 71, but that area is outside the footprint of any project activities. Please see also response to comment SCWC-1.
15	CMTW-11	A	The EA also failed to analyze the legacy contamination created by past operations of the HILAC accelerator, the SuperHILAC and the BEVALC, all associated with B71.	Contamination from past operations at Building 71 was described in EA Section IV.B.1.
		B	The groundwater and soil in the area are contaminated by Volatile Organic Compounds (VOCs), Freon, radioactive Curium 244 and tritium, according to LBNL's Site Restoration Program Reports.	EA Section IV.B.2 states that the existing groundwater contamination is downgradient of the BELLA construction site. This undertaking would not encounter the downgradient plume.
16	CMTW-12		As part of our comment letter, we are submitting a Report by Laurel Collins, Geomophologist of Watershed Sciences, titled: CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA (Attachment 3). Sections of Chemical and Hazardous Contamination, Drainage Network Mapping, Fault Mapping, Landslide Mapping, Plume Monitoring Sites, Zones of Concern for Potential Plume Migration, Radioactive Contamination and Future Development and Site Conditions cover all the areas that the EA mostly ignored. (See also website: www.cmtwberkeley.org)	The commenter's letter and attachments are noted. The commenter has not identified any specific information in the referenced document that is pertinent to the scope of this project. Please see response to comment CMTW-11B.

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17	CMTW-13	We ask that all the concerns expressed above will be analyzed in detail in a forthcoming EIS (Environmental Impact Statement) and an EIR (Environmental Impact Report under the California Environmental Quality Act/CEQA).	Please see response to comment AM-4.
18	CMTW-14	Operating accelerators produce a variety of radiation fields, including neutrons, gamma rays, muons and other radiations. This accelerator is no different. The 10 billion electron-volt, Petawatt-class laser accelerator BELLA is 60% more powerful than LBNL's BEvatron accelerator, now in the process of being demolished, which reached 6.2 GeV as reported by Franke and Greenhouse ("Review of Radiological Monitoring at LBNL: Final Report", City of Berkeley, 2001) The Franke and Greenhouse Report also revealed that in the past 800 mrem/y radiation doses, measured at the Olympus Gate monitoring station (located between homes and B71), exceeded the then allowed annual does of 500 mrem/y by 60%, despite of all the massive shielding, build around the Bevtron. (Attachment 4, pages 36-39, 45)	Please see response to comment AM-3. Also please see response to comment MMcD-8.
19	CMTW-15	The BELLA EA fails to consider and analyze any kind of monitoring at LBNL's Olympus Gate monitoring station, and to our surprise we discovered that the station no longer appears on LBNL's Site Environmental Report maps, and that the Station now, surrounded by vegetation, seems abandoned. This is especially troubling, in view of the Franke and Greenhouse Report and the statements in the EA, that BELLA is proposed to be located just 138 meters (448 feet) from the residential neighborhood of Northeast Berkeley, and 159 meters (516 feet) from the Lawrence Hall of Science, a children's school and museum! (Attachment 5, A and B).	Please see response to comment AM-3.
20	CMTW-16	A more detailed and careful analysis of the Proposed Action and Alternatives section of the EA must be prepared, otherwise it is deemed inadequate and incomplete.	Please see responses to comments CMTW-17 to 25.

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21	CMTW-17		Indeed, what is meant by the following statement on page 20; regarding the siting of BELLA: "Off-site locations such as leased space were considered...but rejected because vacant accelerator facilities in the area are uncommon, and a large perimeter around the building might have to be leased and secure to provide an equivalent amount of protection from potential risk of radiation exposure to the public."	The statement acknowledges that, depending on the configuration of the building, the site, and the shielding, the offsite leased space may need a large perimeter to provide additional protection to ensure that the radiation dose to the public does not exceed regulatory limits. Also, please see the response to comment CMTW-18B.
22	CMTW-18	A	First, the BELLA apparatus is described to be 1 meter long, so it does not require much space! Secondly, nowhere in the EA are there discussions about the does of radiation of the public might receive at the current proposed location.	Please see EA Section IV.B.1.b, which states that the radiation dose to the general public would be maintained below regulatory limits.
		B	What is the actual size of a "large perimeter around the building" to protect the public from the risk of radiation exposure? Is it 100 meters, 200 meters, 300 meters?	A large perimeter is not required around Building 71, because adequate protection is provided by the shielding from the cave and beam dump.
		C	According to the EA the closest home is just 138 meters away. Which specific residence is the measurement to? And measured from where? Please, describe in detail.	The measurement is an approximate measurement from Building 71 to the closest residences.
23	CMTW-19		Has anyone at LBNL informed the unsuspecting homeowners on Campus Drive, whose bedrooms, decks and backyards directly look into B71, specifically into the western part of the building where the beam dump is to be located?	Please see response to comment AM-2.
24	CMTW-20		Have you asked if these homeowners would like to have direct radiation monitoring stations in their backyards?	LBNL has a perimeter monitoring system as described in response to comment AM-3.
25	CMTW-21	A	Has a comprehensive Safety Analysis Document been prepared and finalized? What is the location of the MEI (Maximally Exposed Individual, for the purposes of the SAD calculations)? Is it again a child at the Lawrence Hall of Science, a mere 159 meters away, or a homeowner, just behind B71?	As described in EA Section III.A.4.avii, the process for designing and implementing the BELLA project would include development of the Safety Analysis Document (SAD) for the BELLA accelerator. The SAD for the project would be prepared and approved before the accelerator is operational. The notional Maximally Exposed Individual would assume a location on the site boundary and the exposure calculation would be based on the largest event that could occur once the accelerator is operational.

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		B	There must be an open, transparent discussion of the risks potentially facing the MEIs, during normal operations, during a variety of accidental situations, not excluding an earthquake, landslide or wildland firestorm, such as what occurred in 1991 in the Berkeley-Oakland Hills, just a quarter mile from LBNL.	The accelerator would produce radiation only during normal operation and would shut down and stop producing radiation during a disruptive event (e.g., that caused ground shaking or power disruption). During other potentially catastrophic events, like wildland fires, bomb threats, etc., operations of BELLA would be halted, as would most research activities at LBNL. Also please see response to comment CMTW-21A.
26	CMTW-22		Also on page 20, there is a discussion regarding the "Upgrading of the existing TREX laser in Building 71, to the equivalent power output…would result in approximately three years of down time for this system and prevent LOASIS from meeting mission-critical research commitments. Also, the existing TREX front-end is 14 years old and would need replacement to maintain reliability." Please describe the location of TREX, what is the direction of the beam? What is the quality of the shielding around TREX?	Please see response to comment AM-3. TREX is considered in this EA to the extent upgrading it was an alternative to the proposed project; the location and direction of the beam were not relevant to its viability as an alternative and the environmental impacts of the operation of TREX are outside the scope of this EA. Information is available online at: http://loasis.lbl.gov/main.html for additional details regarding the LOASIS program.
27	CMTW-23		Has it been operating for the last 14 years, without anyone in the community knowing?	This question is outside the scope of this EA. Information is available online at: http://loasis.lbl.gov/main.html for additional details regarding the LOASIS program. As stated in the EA Section III.B.3, TREX has been operating for 14 years.
28	CMTW-24		Where is the beam dump area? Please show in detail within a floor plan and cross section! How and where is the potential radiation exposure from TREX being measured?	Please see responses to comments AM-3 and CMTW-22.
29	CMTW-25		Where are those data for the public to review? How long has the monitoring for TREX radiation been going on and why are the data not included in LBNL's annual Site Environmental Reports?	Please see response to comment AM-3.
30	CMTW-26		The NEPA EA process did not provide for a public hearing. Concerned members of the community petitioned city commissions to invite Wim Leemans, the director of the	Consistent with past DOE practice and in accordance with NEPA Regulations and DOE NEPA Implementing Procedures, there was no public hearing accompanying public circulation of

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			BELLA project to give a presentation so the public could ask questions. Indeed on July 9, 2009 the City's Community Environmental Advisory Commission held a one-hour meeting, which included two powerpoint presentations, one by Mr. Leemans and the second one by Mr. Lockhart, from the facilities division. There was no opportunity for the public to ask questions. After the meeting LBNL's Community Relations Officer physically blocked my conversation with Mr. Leemans, regarding questions I had about a Daily Californian article about the project, and screamed: "Don't tell her anything, you don't have to tell her anything!"	the Draft EA. As mentioned by the commenter, LBNL staff did make brief presentations to the City of Berkeley's Community Environmental Advisory Commission (CEAC) on July 9, 2009, at the City of Berkeley's request. The general public was invited by the CEAC to attend.
31	CMTW-27	A	When we later requested to receive printouts of the powerpoint presentation, Mr. Abbott of DOE flatly denied our request. (Attachment 6.)	The DOE received a July 15, 2009 telephone call from the commenter requesting the slides that were shown by Lab staff at the July 9, 2009 CEAC meeting. The DOE responded in a July 15, 2009 e-mail, as follows: "*The slides that were shown at the July 9 CEAC meeting were simply illustrative and were intended to assist the CEAC in conceptualizing some of the speakers' points. The slides were not intended to be viewed out of context of those oral presentations. More information about BELLA and other accelerator science and programs is available on our website: http://www-afrd.lbl.gov/loasis.html and at http://newscenter.lbl.gov/press-releases/2009/06/25/bella-accelerating-electrons/. We appreciate your interest in the BELLA project and look forward to receiving any comments you may have on the BELLA Environmental Assessment. The Draft EA is available on line at http://www.lbl.gov/community/BELLA/. Copies of the Draft EA are also available in the main Berkeley Public Library. If you wish to comment on the Draft EA please mail your comments to Kim Abbott, National Environmental Policy Act Document Manager, U.S. Department of Energy, Berkeley Site Office, One Cyclotron Road, M/S 90- R1023, Berkeley, CA 94720 or send them via e-mail to kim.abbott@bso.science.doe.gov. Comments must be received before 5 p.m. on July 18, 2009.*"

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		B	We therefore ask that those powerpoint presentation graphics be included as an addendum to the responses to comments document, as they illustrated details of the project and building better than anything in the EA.	The comment is noted. Please see response to comment CMTW-27A.
		C	Furthermore, it was curious to witness how desperately DOE and LBNL want to keep everything about this project so secret. WHY?	The comment is noted. Please see response to comment AM-2.
32	CMTW-28		What is the atomic gas mentioned in the Daily Californian July 6, 2009 article: "The scientists must first charge a chamber of atomic gas through which the particles will travel." In another article, the chamber was filled hydrogen. Does hydrogen at some point because radioactive? What is radioactive hydrogen? What are the constituents of the end product, plasma?	Hydrogen gas is present in the chamber and is used to form the plasma. In this process, which occurs in an electric discharge, the hydrogen gas is first dissociated into hydrogen atoms and the electron released from the proton. After a few hundreds of nanoseconds, when the discharge current has stopped, the electron and proton recombine and the hydrogen atoms recombine into hydrogen gas. The chemical end product of the BELLA operation is therefore a very small amount of ordinary hydrogen gas. This information has been added to Final EA Section III.A.3.c. No radioactive forms of hydrogen will be formed by the laser accelerator.
33	CMTW-29		Mr. Leemans presentation also alluded to the LOASIS program laser projects, in addition to TREX and BELLA, he also described GODZILLA and CHIHUAHUA. What are they? Where are they located?? Please, describe in detail!	The material presented by Dr. Leemans is not part of this EA. Please see responses to CMTW-27 and AM-3

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34	CMTW-30	Finally in another Daily Californian (March 30, 2009) article, in which Mr. Leeman states: "Because the high-energy laser system produces a large electric field, it can be built at a smaller scale than normal-sized accelerators while producing the same amount of energy." How is this large electric field contained? How is the EMF measured? What is the extent of the EMF? Please, describe in detail. (Attachment 7)	High electric fields would be produced by the interaction of the laser with the plasma in the accelerator chamber/tube. The electrical field is contained within a metal housing, a configuration known as a Faraday cage. The electromagnetic field outside the cage would be equivalent to the field generated by a 1-watt light bulb and should not be an issue of concern for personnel or the public. This information has been added to Final EA Section IV.A.
35	CMTW-31	The EA failed to analyze the continued and cumulative impacts of LBNL operations upon the residential neighborhoods of Panoramic Hill to the south and the Campus-Olympus-Wilson Circle neighborhoods to the NE. The EA must include detailed analysis pertaining to the fact that LBNL OPERATES IN A RESIDENTIAL NEIGHBORHOOD, WITHOUT ANY BUFFER ZONE!,	EA Section V includes discussion of cumulative impacts. Specifically, Section V.B.1 of the Final EA identifies the cumulative hazards and human health effects relevant to the concerns of residential neighbors.
36	CMTW-32	[A]lternatives, such as off-loading LBNL facilities (LOASIS/BELLA) from the hill site must be considered! - especially since the entire project is funded with our taxpayer monies under the Federal Stimulus Bill, ARRA (American Recovery and Reinvestment Act).	Please see EA Section III.B.2, Location Alternatives Considered but Rejected.
37	CMTW-33	And lastly issues related to LBNL's energy consumption, contribution to our local environment's greenhouse gas emissions etc. please, accept my comments to ----> the UC Berkeley 2020 Long Range Development Plan (LRDP) Amendment and 2020 LRDP Environmental Impact Report (EIR) Addendum to address Climate Change, as comments to be considered and responded to as part of the BELLA EA process.	Please see Section V.B.3, Energy Use and Greenhouse Gases, and Section V.B. 6, Air Quality, of the EA. DOE notes that the attachments have been received. However, without a specific reference in the attachments, there is no apparent comment pertaining to the BELLA EA to which DOE can respond.
38	CMTW-34	Also as part of our comments I am enclosing a Daily Californian article of June 1, 2009, titled Climate Plan Needs More Analysis, addressing concerns about LBNL's energy consumption, generation of radioactive, hazardous, and bio-hazardous medical waste, etc. Also included LBNL's contribution of diesel particulate matter from the fleet of aging	Please see response to comment CMTW-33.

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		diesel busses and from the continuous hauling of demolition debris from the hill via downtown for years to come. Please respond to all the LBNL related sections of the enclosed comment letter and the 2 attached articles. (Attachment 8, 4 pages)	
39	CMTW-35	In conclusion, naming this apparatus BELLA is contrived and misleading. Call it what it is: a High Energy Plasma Laser Accelerator, i.e. HEPLA. There is nothing bella bout it!	The comment is noted.
40	CMTW-36	[W]e ask that a full blown EIS be prepared under NEPA and an EIR under the California Environmental Quality Act (CEQA). We need a Public Hearing on the project, including the entire LOASIS program.	For the BELLA project, the DOE will review this Final EA and all comments received and responses, and will decide whether to prepare a Finding of No Significant Impact (FONSI) or an EIS, pursuant to 40 CFR part 1501.4(c). Also please see response to comment AM-4 regarding CEQA Also, please see response to comment AM-3 regarding LOASIS.
41	CMTW-37	All the "attachments" are an integral part of this comment letter, and should be considered as such, including the 53 pages of the Collins Strawberry Creek Report.	See response to comment CMTW-33.
42	CMTW-38	The most egregious omission of the BELLA EA is the following: In 2005 the National Academy of Sciences Panel: BEIR VIII, Committee on Biological Effects of Ionizing Radiation determined that there is NO SAFE DOSE OF IONIZING RADIATION, NO EXPOSURE LEVEL BELOW WHICH DOSAGE IS HARMLESS!	Please see response to comment AM-3.
43	CMTW-39	Please, make this BEIR VII finding a part of this process, include it as one of the guiding principles! (Attachment 9.)	Please see response to comment CMTW-33.
Citizens for Science Accountability and Safety (submitted twice, once by Mary Rose Kaczorowski and once by Darlene Pratt)			
45	CSAS-1	1a. One of the primary differences between NEPA and CEQA is the way significance is determined and later discussed in environmental documents. Under NEPA, significance is used to determine whether an EIS, or some lower level of documentation, will be required. NEPA requires that when an EIS is prepared it must be determined if the proposed federal	The commenter's characterization of the process and difference between NEPA and CEQA is noted.

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			action (project) as a whole has the potential to "significantly affect the quality of the human environment." The determination of significance is based on context and intensity. We also know that there are several problem areas that are not sufficiently mentioned or addressed in this BELLA Draft Environmental Assessment exist. We also know there is uncertainty because this EA acknowledges that there is uncertainty and ambiguity.	
46	CSAS-2	A	1b. The BELLA Draft Environmental Assessment also does not adequately describe or address actual containment. Buildings are also seismically unsafe and are within close proximity to a residential neighborhood (approx. 138 meters) and near a popular Area for bicycling, running and in close proximity to a Science Educational Facility that includes a high volume of school children and visitors Weekdays and weekends.	The commenter's reference to "containment" is understood to mean "Shielding and Protection," as identified in the commenter's letter. Please see responses to comments CSAS-8A to E.
		B	Buildings are also seismically unsafe[.]	Seismic safety of the buildings is addressed in EA Section IV.A. Also, please see response to comment CMTW-21B
		C	Buildings are ... within close proximity to a residential neighborhood (approx. 138 meters) and near a popular Area for bicycling, running and in close proximity to a Science Educational Facility that includes a high volume of school children and visitors Weekdays and weekends.	The distance from BELLA to the nearest residence is described conservatively in the EA as approximately 448 ft (137 m), as correctly stated by the commenter. In fact, the approximate distance from the BELLA location to the nearest structure is more accurately 570 feet, or 174 m. The edge of the Lawrence Hall of Science parking lot is approximately 728 feet, or 220 meters to the east. The refined distances are included in the revised Section IV.B.5 of the Final EA.

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47	CSAS-3	A	1c. Measured Radiation Levels of BELLA's operations are not adequately addressed with BELLA's (a new experiment regime) integration with the already up and running LOASIS (Laser Optics & Accelerator Systems Integrated Studies) project regime. The bigger picture of these and other integrated projects with BELLA have never been analyzed in this.	Please see response to comment AM-3.
		B	The high voltage power supplies, capacitors and high-current switching devices are also not adequately discussed in relationship to the laser mechanics and their location.	EA Section III.A.3.a.i discusses the Utility Room that would be constructed above the Laser Room to house the laser system's power, cooling, and vacuum support modules.
48	CSAS-4		Nuclear Pollution in the aggregate is mentioned but there is no adequate proof that the shielding will protects the highly populated local neighborhood and visitors to the Lawrence Hall of Science. (See page 27 of Draft Environmental Assessment Sec. IV B 1b)	Please see the responses to comments AM-3 and CMTW-21A.
49	CSAS-5		Have the BELLA LOASIS laser devices or systems been certified, if so which class of laser or system is being used?	Research lasers do not require certification per 21 CFR 1040.10. Please also see response to comment CSAS-6.
50	CSAS-6		It appears that The BELLA project will be using Class 3 and or 4. A Class 4 laser or laser systems are any that exceeds the output limits (Accessible Emission Limits, AEL's) of a Class 3 device. As would be expected, these lasers may be either a fire or skin hazard or a diffuse reflection hazard. Very stringent control measures are required for a Class 4 laser or laser system. For lasers with wavelengths > 1400 nm, large area exposures to the skin can result in dryness and even heat stress. Lasers can present a serious hazard to the eyes and skin. High power lasers can produce a fire hazard. There are other associated hazards inherent with certain laser systems such as electrical, chemical, air contaminants, compressed gases, and cryogenics.	The BELLA project will use a Class 4 laser system. The potential hazards resulting from laser operation are discussed in EA Section IV.B.1.b. The BELLA project would follow existing standards, including the American National Standard Institute Z136.1 Safe Use of Lasers Standard and LBNL Pub 3000, chapter 16, Lasers. Information on the use of compressed gases and cryogenics is presented in Final EA Section IV.B.1.e.
51	CSAS-7		Gamma rays have the shortest wavelength of all waves in the electromagnetic spectrum, and therefore have the greatest ability to penetrate through any gap, even a subatomic one, in what might otherwise be an effective shield. Because of their high energy, gamma photons travel at the speed	Please see EA Section IV.B.1.b for discussion of these matters.

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			of light and can cover hundreds to thousands of meters in air before spending their energy. They can pass through many kinds of materials, including human tissue. Where is this discussed in the Draft Environmental Assessment?	
52	CSAS-8	A	6. Shielding and Protection Question: What if the shielding does not work? How will we know if the shielding will work?	Please see response to comment AM-3.
		B	[How will we know if the shielding will work?...] especially when there will be utilization of pure or mixed chemicals and wastes that will be produced.	Final EA Section IV.B.1.f (Draft EA Section IV.B.1.e) states that chemicals used during operation would be limited to methanol, ethanol, isopropyl alcohol, and acetone. No mixed (both radiologically and chemically hazardous) waste would be produced by BELLA.
		C	These direct impacts from when the laser system is engaged (turned on) include Gamma Rays , Radiation and associated sub atomic phenomenon that must be monitored. How can this be monitored for protection of the public and workers when these experiments could exceed regulatory exposure limits...	See response to comment AM-3.
		D	[How can this be monitored for protection of the public and workers] especially when such "pollution" has not yet been able to be measured due to it unprecedented structure.	Please see response to comment AM-3. As discussed in EA Section III.A.1, accelerator systems are not new. Their impacts are therefore known, radiation categorized and quantified, and documented. What is uncommon about this system is the laser mechanism for accelerating the electron beam. The laser and plasma components of the system do not generate radiation. The system also does not generate mixed radioactive and chemical hazards.
		E	Yes—there are theoretical calculations—but these are based on computations and not the real time nature of this new frontier that BELLA will be opening the doors to.	Please see response to comment AM-3.

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		F	[In reference to health effects of gamma radiation] It might be necessary to examine the design of the shielding material.	The laser-driven accelerator would not produce any new type of radiation. EA Section IV.B.1.b discusses the types of radiation that would be produced by operating the laser plasma accelerator. These types of radiation are the same as would be produced by any electron accelerator of similar energy level.
		G	[In reference to health effects of gamma radiation] [It might be necessary to examine the design of the] Pb filter in the gamma rays spectrum analysis.	Please see response to comment AM-3.
53	CSAS-9		7. Cryogenic Liquids. The use of cryogenic coolants with laser systems can cause skin burns, displacement of oxygen in poor ventilated areas and explosions because of bad connections. Where is the discussion of Cryogenic Liquids, their use, storage and integration?	Use of cryogenic liquids is common at LBNL and it is done so safely and in accordance with environment, health, and safety requirements. Please see Section IV.B.1.e which has been added to the Final EA, for the discussion of cryogenic liquids.
54	CSAS-10		8. Non-Beam Hazards-Laser Generated Air Contaminants (LGAC) The following are not adequately addressed in this Environmental Assessment • Air contaminants may be generated when certain Class 3b and Class 4 laser beams interact with matter. LGAC may be gaseous or particulate and can, under certain conditions, pose occupational concern. • When the target irradiance reaches a given threshold, approximately 10e7 Wcm² target materials including plastics, composites, metals, and tissues, may liberate toxic and noxious airborne contaminants. • LGAC include metallic fumes and dust, metallic oxide fumes, chemical and gaseous vapors, and biological fragments • To prevent personnel from inhaling the LGAC and to prevent the release of LGAC to the environment, how will the exhaust be contained and mitigated?	No LGAC would be generated or exhausted by the BELLA project.

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55	CSAS-11		9. Non-Beam Hazards-Compressed Gases • The use of compressed gases is common in the laser laboratory. Some lasers use both pure gases and gas mixtures as the lasing media. • The high pressure of the gas translates into substantial potential energy stored in the cylinder. If this pressure is released in an uncontrolled manner (such as broken nozzle) the cylinder can become an unguided missile. How will compressed gas cylinders be properly restrained to prevent damage to the nozzle or regulator. • If Non-Beam Hazards-Compressed Gases leak, depending on the gas, it may be toxic, corrosive, flammable, etc. How will this be controlled and monitored?	Compressed gases are routinely and safely used at LBNL and would be on the BELLA project. Please see Section IV.B.1.e which has been added to the Final EA, for the discussion of compressed gases.
56	CSAS-12	A	• Some laser systems create significant levels of noise in the laser laboratory.	The comment is noted.
		B	• Noise generated by the laser system that is at 90 decibels or higher requires hearing protection.	The comment is noted.
		C	Where is the noise survey in this Environmental Assessment?	Noise is discussed in Section IV.B.7 of this Final EA. BELLA construction noise would be mostly contained within Building 71. For the limited amount of construction activities that would occur outside of Building 71, a noise survey is not considered necessary. Ambient noise in the vicinity of Building 71 was surveyed for the 2006 LRDP EIR Section IV.I. As concluded from the survey, "most of the noise generated by the on-site stationary sources and construction equipment attenuates to levels that are not noticeably above the ambient noise environment at the nearby receptors." Moreover, the loudest conceivable exterior construction noise for BELLA – jack hammering – would reach approximately 88 decibels, and this activity would likely last for only a few hours in total. At the nearest residence, approximately 570 feet away, that sound level would be expected to attenuate to approximately 64 or

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				fewer decibels. That would be well below the Berkeley Noise Ordinance R-1 threshold of 75 decibels for construction and demolition noise during normal business hours. Most BELLA laser operational noise would be contained within the building. The only exception would be air handling units on the roof, but these would operate within the existing ambient noise level for the building and would not be noticeable to off-site receptors. Noise levels inside the building above those requiring hearing protection are not anticipated to be generated by the BELLA system. If noise levels were ever to reach a level at which hearing protection would be required, such protection would be supplied or the noise level would be reduced. BELLA operations would comply with existing LBNL Hearing Safety rules, as outlined in Pub 3000, Chapter 4, Industrial Hygiene, Sec. 4.5.1, Hearing Conservation Program.
57	CSAS-13		How will BELLA be integrated into LOASIS ? This relationship of the two regimes is not adequately described nor defined. LOASIS is not described. What does integrate mean? Where is the LOASIS in building 71 in relation to the six rooms empty rooms (pictured in the Draft Environmental Assessment) designated for BELLA? What other research regime are and will be going on in Building 71 and what are the cumulative impacts of issues expressed within this public comment document?	Please refer to response to comment AM-3.
58	CSAS-14	A	This Draft Environmental Assessment) does not discuss the cumulative impacts of this unprecedented integration of BELLA and LOASIS which is purely experimental with unknown impacts yet to be discovered.	Please see response to comment AM-3.
		B	There are many articles citing that the BELLA regime and associated plasma wakefield accelerators experiments have much more planned than a single 10 meter beam pulse. The Draft Environmental Assessment) does not at all mention the additional stringing of hundreds of BELLAS together.	As the commenter correctly states, the EA does not mention the concept of "stringing of hundreds of BELLAs together." The research proposed under the BELLA program is described and analyzed in its entirety in the BELLA EA. Please also see response to comment CMTW-4.

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59	CSAS-15	A	Building 71, formerly called HILAC/Super Hilac /Bevalc (see Appendices E of LBNL's Long Range Development Plan Draft EIR Jan. 22 2007). This building is contaminated by previous operations.	Clean-up of Building 71 areas affected by the BELLA project and removal of any hazardous materials is described in EA Sections III.A.4.i and ii.
		B	The 6 empty rooms designated for BELLA as described in the Draft Environmental Assessment are not discussed in relation to existing contamination by research activities currently ongoing in Building 71 and there is not a clear relation to where these rooms are in the building.	Please see response to comment AM-3 and CSAS-15A.
60	CSAS-16		12. Safety Component Procurement Inspection Criteria. This Draft Environmental Assessment document does not address: A Corrective Action Plan that provides, for each finding or deficiency addressed, a thorough analysis of the underlying causal factors to determine whether systemic program weaknesses exist, steps to address the cause(s) of the finding, detailed descriptions of the corrective action(s) to resolve each finding and prevent recurrence, and a general outline for the conduct of the proposed independent corrective action effectiveness review. For each corrective action, the document needs to show the responsible person(s) and organizations, the date of action initiation, key milestones, the date of expected completion of the action, how actions will be tracked to closure, deliverable(s) that will signify completion, and the mechanism(s) for verifying closure.	The DOE NEPA regulations do not require a Corrective Action Plan.
61	CSAS-17		CEQA does require identifying each "significant effect on the environment" resulting from this project and its associated experimental (named and unnamed) regimes and ways to mitigate each significant effect. A significant effect on any environmental resource triggers the preparation of an EIR.. This all then begs the question as to how effective this Draft	This EA is prepared by DOE in furtherance of the National Environmental Policy Act in accordance with 40 CFR Parts 1500-1508 and 10 CFR Part 1021. Please see response to comment AM-4 regarding the EIR.

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		Environmental Assessment can be in assessing the value of certainty in regards to answering CEQA's requirements.	
62	CSAS-18	This Draft Environmental Assessment does not prove a careful balancing of benefit versus risk. This Draft Environmental Assessment also does not provide for a full and complete discovery of harm Rather then defend various investments (research, monetary, patent, etc.) based interests this Draft Environmental Assessment a draft EIR/EIS needs to specifically prove that there will be "no harm" and also that the precautionary principle is utilized.	The EA is prepared pursuant to 40 CFR parts 1500 to 1508, and 10 CFR parts 1021, et seq. and complies with those requirements. There are no specific requirements in NEPA regulations to include in an EA a "benefit versus risk" analysis, a "discovery of harm" statement, or utilization of the "precautionary principle." Please see response to comment AM-4 regarding CEQA.
63	CSAS-19	Specifically there is no existing proof or peer reviewed scientific studies available to confirm that no harm to local populations (human and the environment) will be avoided when BELLA and associated plasma wakefield accelerators, and the smashing of subatomic particles (such as electrons or protons together at high energies in new experimental ways using toxic gases or chemicals) will occur in real time not in the theoretical abstract.	EA Section III, Proposed Action and Alternatives, describes the BELLA system and its operation. The BELLA project would not include the "smashing" of subatomic particles as described by the commenter. BELLA-related propagation of subatomic particles would occur only in the beam dump and would be absorbed by the beam dump. Final EA Section IV.B.1.f (Draft EA Section IV.B.1.e) includes the statement that solvents would be used for the purpose of cleaning of the optical surfaces. "Toxic gases or chemicals" would not be used in these experiments. Please also see the responses to comments AM-3, CSAS-8B, and CSAS-8D.
64	CSAS-20	Given that there are still technical issues to be resolved as discussed in international Plasma Wavelength research literature. This plan as described in the Draft Environmental Assessment does not meet the requirements pursuant to the California Environmental Quality Act (CEQA) which utilizes the environmental analysis prepared by a Federal agency under the National Environmental Policy Act (NEPA).	Please refer to response to comment CSAS-17.
65	CSAS-21	Careful independent scientific scrutiny of the potential harm is required.	The comment is noted. Health physics pertaining to accelerators and shielding has been studied extensively by a wide range of scientists for many decades.
66	CSAS-22	This plan pursuant to the California Environmental Quality Act (CEQA) while utilizing the environmental analysis	Please refer to response to comment CSAS-17.

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		prepared by a Federal agency under the National Environmental Policy Act (NEPA) still require multiple Draft Environmental Assessments. There are clearly several projects and separate projects integrated herein and several joint EIS/EIR's under CEQA are required.	
67	CSAS-23	NEPA requires, as part of the discussion of each alternative, discussion of mitigation measures and growth inducing impacts.	EA Section III.B presents a discussion of alternatives. Indirect impacts are analyzed throughout Chapter IV, Affected Environment and Environmental Consequences. Mitigation measures are not included as no significant impacts are identified in the BELLA EA. Growth-inducing impacts are discussed under CSAS-25, below.
68	CSAS-24	CEQA requires a separate discussion of these issues, focusing on the project. CEQA specifically allows the use of an EIS in place of an EIR when the EIS meets all substantive requirements of CEQA (Section 21083.5 and Guidelines Section 15221). An EIS typically places equal emphasis on the project and alternatives. CEQA, however, emphasizes the project and relates the discussions of significant effects, cumulative effects, and growth inducing impacts directly to that project.	Please refer to response to comment CSAS-17, above.
69	CSAS-25	The details in this EA are not sufficient in regards to examination of the plan's significant effects, cumulative effects, and growth-inducing impacts. Guidelines Section 15221 states that a separate discussion of mitigation measures and growth-inducing impacts will need to be "added, supplemented, or identified before the EIS can be used as an EIR."	Please refer to response to comment CSAS-17, above. The EA discusses environmental impacts in Chapter IV and cumulative impacts in Chapter V. "Growth inducing effects" are defined under 40 CFR Part 1508.8(b). Growth inducing effects are not reasonably foreseeable for this proposed project outside of what is already examined in the EA and accounted for in the project description, which describes the project through construction, operation, and decommissioning phases.
70	CSAS-26	13. a. Baseline conditions A fundamental question in this environmental analysis is what baseline conditions should be used for determining whether the BELLA plan will result in significant environmental effects. Should the potential impacts of the reuse aspects of this plan only be analyzed relative to the past uses and cumulative impact	Baseline conditions are described as part of the "affected environment" discussion in EA Chapter IV. DOE has considered potential environmental effects both within a project-specific framework (project effects + current baseline) and within a cumulative framework (project effects + baseline + effects of other past, present, and reasonably foreseeable

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		of past uses or in the context (i.e., cumulative impact etc.) of the higher level of activity which will occur? No hazardous material or waste can be included in a baseline, nor can water quality issues. This Draft Environmental Assessment does not ensure that the public, as well as responsible and trustee agencies are given ample opportunity to consider and discuss any proposed baselines.	future projects). As per the Council on Environmental Quality's (CEQ) Guidance on the Consideration of Past Actions in Cumulative Effect Analysis, "Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined. Agencies retain substantial discretion as to the extent of such inquiry and the appropriate level of explanation." (CEQ, 6/24/95). BELLA water quality and hazardous materials and waste analyses are not quantitative projections that rely on baseline measurements.
71	CSAS-27	Further Discussion of considerable growth inducing impacts are also needed.	Please refer to response to comment CSAS-25, above.
72	CSAS-28	I would like to end with submitting into the record for consideration re: this Draft Environmental Assessment a document that is applicable testimony on the merits of The Department of Energy's National Laboratories by John W. Gofman, M.D., Ph.D. Professor Emeritus, UC Berkeley Dept. of Molecular and Cell Biology.	The Commenter's additional materials are received and noted.
Dan Mattson			
73	DM-1	This letter is to address citizen concerns about the proposed remodeling at LBNL to accommodate BELLA, and the operation of BELLA as well. We rely on the draft environmental assessment (EA) for BELLA, the April 2008 LBNL News Center story on BELLA, LOASIS history, and the DOE LBNL FY 2005 Annual Performance Evaluation & Appraisal (http://www.lbl.gov/DIR/OIA/assets/docs/OCA/OCA_ContractPerform/PEAR05_Annual_AP_B.pdf) dated Jan. 30, 2006 for background for this letter. We appreciate that the transparency exists in the US that these documents can be found online.	The comment is noted.

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74	DM-2	We start with this quote from the EPA environmental justice web page, followed by a quote from the BELLA draft EA...It is apparent that EPA and DOE have somewhat different ideas about environmental justice. We focus in particular on the last sentence of the EPA paragraph, "... equal access to the decision-making process to have a healthy environment in which to live, learn, and work." Given that LBNL is in the vicinity of residential neighborhoods, Lawrence Hall of Science, the Botanical Gardens and public hiking trails, our concern is of merit.	The BELLA EA includes discussion of "Environmental Justice" issues in Sections IV.B.11 and V.B.12. Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs the federal government to make environmental justice a part of the federal decision-making process. The Department of Energy has invited public participation. Please see response to comment AM-2.
75	DM-3	LOASIS has been a subject of research since 1993, with a BELLA prototype Laser Accelerator operational since 2005. This has come about with little or no public input, no environmental impact report, and no oversight except DOE and perhaps a few Senators and Congressmen. BELLA takes this high-energy research to an order of magnitude greater power output and with plans to go very much higher than that. This is pushing the envelope of electromagnetic science to the very edge even while a candid scientist will admit the theory, the basic theory of electromagnetism and by extension light and photonics, is not fully understood. Given the legacy of 130 years or more of environmental health problems that have resulted from for profit application of scientific research, we believe it is shortsighted to be as dismissive of possible public health and environmental impacts as the BELLA EA seems to be.	Please refer to response to comment AM-3.
76	DM-4	At minimum, respect for democratic process demands a much more thorough vetting of this technology and its potential for being a hazard in a densely populated area. We request that such presentation include public hearings.	This project follows all applicable regulatory processes and procedures, including the NEPA process. Please refer to responses to comments AM-1 through AM-4, above.

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77	DM-5	A	We also have concerns about increases in electromagnetic fields (emf) from BELLA that could impact members of the public living near or making use of the above-mentioned facilities near LBNL. Specifically these concerns include: Direct emanation of elf from the facility or from the power lines that feed the facility out to at least 100 yards.	Please refer to Final EA Section IV.A. There is no evidence or expectation that the BELLA Project would contribute to the EMF levels within Building 71 or the surrounding area. No new power lines are being constructed as part of the BELLA project. Electrical power for Building 71 is fed from LBNL's substation located southeast of the building, in the opposite direction from the nearest residences. The existing power lines serving Building 71 are underground.
		B	Harmonic distortion, e.g. 180 hz/triplans feeding back into the distribution system or the ground system such that fields might extend hundreds of yards from the facility. Dirty power, e.g. direct and harmonic emf emanation from switching power supplies and other such loads that produce fundamental frequencies and harmonics in the range from 10-12khz to 100khz and beyond to several Mhz.	Please refer to Final EA Section IV.A. LBNL scientific apparatus is highly sensitive to electrical fields and distortion. To allow the instruments to operate successfully, the power distribution system is designed and constructed to prevent interference from ELF and harmonics. The project would therefore have sensing/tripping devices, grounding, and shielding in accordance with all applicable safety codes and standards. This would supply protection in excess of that necessary for protection of human health.
		C	RF radiation, especially digitally modulated microwave signals, that produces a sustained field strength of .1 μw or greater in the vicinity of the lab.	There would be no radio frequency (RF) radiation associated with the BELLA project. RF power supplies or amplifiers would not be used.
78	DM-6		As a part of the EIR process we request that DOE/LBNL conduct a comprehensive pre-BELLA electromagnetic field survey of the upper canyon area, accompanied by a third-party independent expert and community members.	Please see responses to comments CSAS-17 and DM-5A.
Darlene Pratt (handwritten on comments from Citizens for Science Accountability and Safety				
79	DP-1		This is a matter of extreme importance to the health and welfare of the citizens of Berkeley and the surrounding area. Therefore we need a thorough EIS.	See response to comment CMTW-36.
East Bay Municipal Utility District				
80	EBMUD-1		The existing LBNL facilities are currently served by EBMUD's Shasta and Berkeley View Pressure Zones. If additional water service is needed, the project sponsor should contact EBMUD's New Business Office and request a water service estimate to	This project does not require additional water service. BELLA water supply demand would be consistent with the projections identified in the 2006 Water Supply Assessment approved by EBMUD for LBNL sitewide operations. However, if additional

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			determine costs and conditions for providing additional water service to the existing parcels. Engineering and installation of water services requires substantial lead-time, which should be provided for in the project sponsor's development schedule.	water service were needed, the Department of Energy would contact EBMUD's New Business Office and request a water service estimate.
Gene Bernardi				
81	GB-1		This is to request that you extend the comment period on the EA for the BELLA laser accelerator. I received notice re: this project on June 23, 2009, not even the 30 days presumably allotted for comment. Furthermore, it was then several days or more before I received the EA + other materials, pertinent.	Please see response to comment AM-1.
82	GB-2		Please include the enclosed articles as a part of my comments: "Lab Smookers Council Over Tiny Laser Accelerations Big Wallop," "Coming Soon to a Neighborhood Near You!" and "Laser-powered Accelerator Plan Gets Boost From Recovery Act." All in The Berkeley Daily Planet, July 16-22, 2009.	Comments noted.
83	GB-3	A	Please also answer the questions: 1) Who are the two companies who went to build a laser for BELLA under your supervision?	Please see response to CMTW-6.
		B	2) What are the military requirements driving the advances in the field of laser technology? (See Berkeley Lab, NEWS CENTER: Feature Stories, April 2008.	Refer to EA Section II.A, Purpose and Need. The proposed project is not being driven by "military requirements".
		C	3) Why is our tax money being spent to create "conditions like those inside an exploding star in a laboratory?	That statement was referring to research that is beyond the capabilities or scope of this project. As stated in the EA Chapter I, Executive Summary, the ultimate goal of this undertaking is to support the DOE's need to substantially reduce the size, cost, energy usage, and environmental impacts associated with future electron or positron accelerators.
Merrilie Mitchell				
84	MM-1		This type research does not belong in the location chosen -- up in the hills and canyons above the UC Campus, in the area known in Berkeley as the hills, and Strawberry Canyon. This area should be Priority Conservation Area – an environment with highest best use clearly to be Open Space, recreation, hiking, wildlife corridor, etc.	The comment is noted.

Table No.	Comment No.	Comment Text	Response
85	MM-2	There is money from many sources to pay for the transformation necessary to heal the earth where the Labs have been doing their research. ABAG (Association of Bay Area Governments); ARRA (Obama Stimulus money); Brownfields legislation; East Bay Regional Parks bond money which could purchase the land to complete the link between two regional parks as well as connect the Greenbelt for Berkeley which is the densest city in Alameda County.	The comment is outside the scope of this BELLA project NEPA review.
86	MM-3	This area used by the Labs is also the prime greenhouse gas (GHG) elimination area for Berkeley. It is the area where trees, plants and healthy soil organisms can most efficiently remove CO2 and other Carbon gases from the air, along with nitrogen and sulfur pollutants and PM-10s –black Carbon particulates that we inhale directly into our respiratory and circulatory systems.	The comment is outside the scope of this BELLA project NEPA review.
87	MM-4	The Labs mission is energy efficiency but they can't match what nature does for us during photosynthesis, critical to consider if we believe life on earth is in danger because of man-made global warming. Our country is the leader in GHG production per capita in the world. The Labs scientists are among the highest per capita users of energy in our country.	The comment is outside the scope of this BELLA project NEPA review.
88	MM-5	Whatever good the Labs believe they are doing up there in the canyon, they are using tremendous amounts of energy, and in this project will use huge amounts of concrete, and make incredible amounts of toxic waste before and after they do their research--to recycle the building, and the mildly radioactive Bevatron nearby.	Removal of Hazardous Materials and Demolition for New Construction is discussed in EA Sections III.4 ii and iii, and New Construction in III.4.iv.
89	MM-6	This area near Lawrence Hall of Science and not far from the beautiful, peaceful Botanical Gardens, needs to be restored to highest standards man can manage, and then to let nature have a chance to work her magic.	The comment is noted.

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90	MM-7		There may never again be a time when so many sources of funds could be made available to clean up the "Old Town" and the toxics and start anew in an appropriate environment, not near earthquake faults, not in the middle of a high class recreational area, not near creeks that flow from a pristine Aquifer (Lenert??)-- that could serve the UC Campus and City of Berkeley as a source of drinking water--the University could make money from it!	The comment is outside the scope of this BELLA project NEPA review.
91	MM-8		There are no real alternative sites listed in the Environmental Assessment, merely sites in the same Strawberry Creek watershed area. A new satellite campus by Oakland's Lake Merritt--? -- a state-of-the-art, near transit, clean tech, safe lab campus?	Off-site locations are discussed in EA Section III.B.2.
92	MM-9	A	But the Bella Laser Accelerator needs a special environment away from populated areas.	Please refer to response to comment AM-3.
		B	Do the right thing and gain back the respect of the people and the world. (The Labs were reported on in the media, a 9 page article in the Contra Costa Times--Lab Workers Suffer Fallout, P 1, J July 1, 2007... with more photos and stories of sick workers--go to ContraCostaTimes.com This article is about LBNL and two other DOE Labs with workers sick, in most cares from radiation, struggling to get Federal compensation for illnesses, and failing 75% of the time	The comment is outside the scope of this BELLA project NEPA review.
93	MM-10		Other stories in the media show a pattern of the Labs to avoid following Berkeley's "Precautionary Prinicipal" in the Canyon laboratories when forging ahead with new research and development, lax standards when carrying contaminated waste, disrepect for neighbors near the labs, running diesel buses through Berkeley at frequent (ten minute intervals) idling the engines fulltime for layovers while spewing filthy diesel pollution in the heart of Downtown Berkeley. There is no reason to believe the Labs have changed their way or cleaned up their act for this new BELLA accelerator project.	The comment is outside the scope of this BELLA project NEPA review.

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94	MM-11	There is reason to suspect they will be increasing the power of acceleraton by a factor of 10 from 1billion to 10 billion because they discuss the concept of stringing 100 or so BELLA's together. And say " With this kind of power, conditions like those inside an exploding star could be recreated: cosmology would come into the laboratory."	Please see the response to comment CMTW-4.
95	MM-12	Lord help these scientists and Regents to look at nature and marvel, To consider how energy intensive and endangering and disrespectful to the environment and the public that their science has sometimes become, how far from the original mission of the Labs – to save energy.	The comment is noted.
Mark McDonald			
96	MMcD-1	1) What is the technical definition of a buffer zone?	The EA does not include any reference to, or "technical definition" for, the term "buffer zone."
97	MMcD-2	2) What types of research technologies require the utilization of a buffer zone?	Please see the response to comment MMcD-1.
98	MMcD-3	3) Does the operation of an accelerator with the power handling capabilities of the BELLA apparatus prudently require a buffer zone?	See responses to comments AM-3 and MMcD-1, and EA Section IV.B.1.b.
99	MMcD-4	4) Does the absence of a buffer zone, the close proximity of inhabited neighborhoods and the close proximity of the Lawrence Children's Science museum (HOS) preclude the operation of a high power laser accelerator like the BELLA facility?	Please see the responses to comments AM-3 and MMcD-1 and EA Section IV.B.1.b.
100	MMcD-5	5) How much time and money are saved by the DOE by employing a Environmental Assessment instead of a normal EIR review process under NEPA and CEQA ?	This EA is prepared pursuant to NEPA; an EIR is a document that is exclusive to the CEQA process. One will not be used as a substitute for the other. See also response to comment CMTW-36.
101	MMcD-6	6) Will the project manager(s) of the BELLA accelerator receive a bonus upon completion?	There are no bonuses earmarked or intended for the staff associated with the planning, approval, or construction of the BELLA project.

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102	MMcD-7	7) Will the amount of any bonus compensation be affected by monies saved by employing an Environmental Assessment instead of a normal EIR review under NEPA and CEQA ?	Please see the response to comment MMcD-6. No bonus compensation has ever been awarded to any LBNL UC or DOE Berkeley Site Office employee based on that employee's promotion of one level of NEPA (or CEQA) documentation over another level.
103	MMcD-8	8) Are the management of DOE and LBNL aware of the conclusions of the investigation/report (Review of Radiological Monitoring of LBNL : Final Report) by the City of Berkeley's privately hired scientific consultant B. Franke of IFEU which claims that the neighbors of LBNL receive significantly higher exposures of ionizing radiation from past accelerator operations than previously reported by LBNL?	DOE and LBNL are aware of the IFUE report cited by the Commenter. Please see the LBNL reports cited in the IFUE report.
104	MMcD-9	9) In lieu of the IFEU report, why is DOE/LBNL attempting to construct and operate an accelerator that operates at higher energy levels than previous accelerators even closer to neighbor boundaries without the one monitor station that was employed previously ?	Please see the response to comment AM-3 regarding radiation monitors.
105	MMcD-10	10) Why doesn't DOE/LBNL propose a system of peripheral monitors to better inform and protect the adjacent public from dangerous radiation ?	Please see the response to comment AM-3 regarding radiation monitors.
106	MMcD-11	11) Are workers at LBNL forced to receive higher doses of radiation than non-employee civilians?	No. As stated in EA Section IV.B.1.b, DOE does have different standards for LBNL personnel and members of the public. Accordingly, all LBNL workers receive special training to identify, understand, and operate safely within areas with higher than background radiation. LBNL workers who actually work in such controlled areas receive even further training and are closely monitored with dosimeters to ensure that their exposures are minimal and well within health and safety regulations. Moreover, LBNL is committed to using the As Low As Reasonably Achievable (ALARA) principle to ensure that doses to workers and the public are kept well below regulatory limits. No LBNL workers are "forced" to receive higher exposures to radiation than the general public.

Table No.	Comment No.	Comment Text	Response
107	MMcD-12	12) Has the findings and conclusions of the BEIR 7 Committee of the Academy of Sciences which report that there is no safe level of exposure to ionizing radiation had any effect on operations and standards and regulations of activities at LBNLthat involve radioactive substances or processes?	Please refer to response to comment AM-3 regarding radiation regulations applicable to the proposed BELLA project.
108	MMcD -13	13) Does the groundwater at the site of the proposed accelerator still contain VOC's, freon, radioactive curium 244 and tritium?	No. As discussed in EA Section IV.B.2, DOE has not identified any groundwater contamination at the BELLA construction site.
109	MMcD -14	14) Will the construction and operation of the BELLA accelerator hinder, complicate or delay remediation of contamination from previous operations?	No active remediation programs at LBNL would be hindered, complicated, or delayed by the BELLA project. Such remediation efforts are downgradient of this project area and no groundwater contamination has been identified under Building 71.
Martha Nicoloff			
110	MN-1	Many residents were alarmed when a nanotech facility was established in the Strawberry Canyon area without an EIR. Now, the announcement of a high powered Bella laser in building 71 in yesterdays Planet newspaper without public hearings and a state environmental impact study is beyond belief. Do the right thing let Berkeley's citizens have full knowledge of the possible danger.	Please refer to response to comment AM-4.
Phoebe Anne Sorgen			
111	PS-1	Please notify me that you have received this in a timely manner and made note that one more Berkeley resident is requesting a complete and thorough environmental impact report and complete and thorough environmental impact statement re "BELLA". Please notify all neighbors, schools, and past/potential visitors to the Lawrence Hall of Science. Most important, please extend the public comment period through September because interested parties are traveling during the summer.	The comment is noted. Please also refer to responses to comments AM-2 and AM-4, above.

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112	PS-2	This is a high risk fire area, high risk earthquake area, and slide zone. Even if that were not the case, I believe it is unwise and disrespectful to build an experimental High Energy Plasma Laser Accelerator Facility in such close proximity to residential neighborhoods.	Please see the responses to comments AM-3, CMTW-9, and CMTW-31.
113	PS-3	By the way, I speak Italian and am offended that this is called "bella." A beautiful word was thus ruined.	The comment is noted.
Russ Mitchell			
114	RM-1	Lab neighbor supports you: I live just a few blocks from the lab. I am not connected with the lab. The BELLA is fine by me.	The comment is noted.
Strawberry Creek Watershed Council			
115	SCWC-1	[There is] no mention is made of the fact that this project is situated in Strawberry Creek Watershed which is a habitat for plants and animals as well as humans, which are negatively impacted by all the of the activities generated by LBNL.	As stated in EA Section IV.A , most construction activities and equipment would be located inside Building 71. Construction staging would take place on an existing paved area. The Proposed Action would therefore not measurably affect any biological resources (including wildlife and habitats, threatened or endangered species, surface water, wetlands, floodplains, rivers, forests, farmland, or other natural resources) during construction or operation.
116	SCWC-2	[There is] no mention of the north branch of Strawberry Creek which runs next to building 71 and a spring that persists there (after the Lab's efforts to get rid of it), because it is on one of the many faults that criss cross the Hill. It is not reasonable to assume that the creek and spring could never be affected by contamination. How will the Lab be able to prevent accidents there?	See response to comment SCWC-1. While a segment of intermittent/ephemeral drainage exists about 300 feet to the west of Building 71, this drainage (which eventually feeds into the North Fork of Strawberry Creek) would not be adversely affected by the proposed project.
117	SCWC-3	[There is] no mention is made of complex of faults on the site.	EA Section IV.A includes a discussion of known faults in the area of the project site.
118	SCWC-4	[There is] no mention is made of the contaminants in the waste water that is carried in a sewer down Hearst St. In a storm event how will LBNL deal with the inevitable spills into the streets?	EA Section IV.B.4.c addresses wastewater. The sewer system along sanitary sewer sub-basin 17-013 (Hearst Avenue) has capacity in excess of what is necessary to accommodate peak

Table No.	Comment No.	Comment Text	Response
			flow during wet weather. Spills into City streets during rainstorms are not therefore "inevitable," as asserted by the commenter. Nevertheless, even if in some unforeseen situation, the sanitary sewer were to overspill into City streets, no adverse BELLA-specific impacts would be expected or reasonably foreseeable. As described in Final EA Section IV.B.1.f (Draft EA Section IV.B.1.e), the BELLA project uses only very limited quantities of optical surface cleaning solvents and their use would be in compliance with all regulations and permits regarding discharge into sanitary sewers.
119	SCWC-5	[There is] no mention of how LBNL will respond if there is a fire storm on the Hill? What happens when the materials in the building 71 burns? What will be done when the eucalyptus trees that are impregnated with Tritium burns?	Please see response to comment CMTW-9. This proposed undertaking would not affect any trees in the area, therefore the EA analysis does not include discussion of trees at LBNL.
Save Strawberry Canyon, Janice Thomas, Secretary			
120	SSC-1	The proposed project is an "experimental facility" (EA, p.3). Save Strawberry Canyon takes note that this small one meter laser would generate 10 billion electron volts. The experimental nature of the project is perhaps the singularly most important project characteristic from an environmental standpoint. Please clarify the basis for estimates of radioactive emissions. Please provide evidence of the documents and reports which are the basis for estimated radioactive emissions. Furthermore, please provide empirical evidence which shows that the three feet thick concrete wall at the west end and the "16 inches of lead, 36 inches of steel, and another 6 feet of concrete…outside the Experimental Cave" (EA, p.27) suffice to absorb the radiation to the level estimated.	Refer to responses to comments AM-3 and CSAS-8D. Also, response to comment AM-3 describes the documents used to estimate BELLA project radiation and shielding.

Table No.	Comment No.	Comment Text	Response
121	SSC-2	The EA uses these estimates as the basis for assumptions about health impacts to the people living in the vicinity and to visiting children, who are sensitive receptors, at the nearby science museum. As stated in the EA, the proposed project is as close as 448 feet from Campus Drive, a residential neighborhood, and 516 feet from the Lawrence Hall of Science. Was a health risk assessment prepared for the project? Any number of impacts might be underestimated due to faulty estimates of radioactive emissions.	Please see response to comment AM-3. The EA includes a discussion and analysis of hazards and human health in Section IV.B.1. A health risk assessment was not deemed necessary to support the EA given several factors, including the maturity of applicable regulations and orders, the reliability of these regulations and orders to ensure effective safety of the system and efficacy of the shielding in containing radiation, the LBNL radiation monitoring program in place, the small amount of time that the laser and accelerator would operate at full power, the high attenuation rate of any radiation that might conceivably make it past the shielding, and the distance from sensitive receptors.
122	SSC-3	The proposed project would be located in Blackberry Canyon, which is drained by the North Fork of Strawberry Creek. The EA neglects to mention this relationship. Please clarify the potential impacts to hydrology, water quality, and soil. The relationships are particularly important in light of historic groundwater contamination as evidenced by a radioactive plume described in the EA. Given that the proposed project is an experimental methodology with estimated predictions about radioactive emissions, please clarify the federal obligations under the Clean Water Act.	Please see response to comment CMTW-11B regarding groundwater contamination. The EA does not describe the existing downgradient groundwater plume as being radioactive. Project construction would comply with all Clean Water Act requirements as well as the LBNL Storm Water Discharge Permit. BELLA operations would not result in radioactive contamination of any jurisdictional waters of the United States; therefore, Clean Water Act compliance issues would not be triggered. It is true that stormwater in the Building 71 area does drain, and would continue to be drained, into the North Fork of Strawberry Creek.
123	SSC-4	The proposed project has cumulative impacts which would degrade Strawberry Canyon. As stated in the EA, the proposed project is one of several construction projects in the vicinity. LBNL maintains that these projects are synergistically related (see LBNL Long Range Development Plan EIR), and as such, relocating any one of these projects may affect the viability of the others and may reduce the cumulative impacts of the whole. Hence, please explain why it is necessary to locate the proposed project at the LBNL hill site. Please clarify the relationship between the BELLA project and any and all projects which are	This proposed project is not located in Strawberry Canyon. Also, please see responses to comments CMTW-32 and AM-3.

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		synergistically related.	
124	SSC-5	The projects listed in the EA as having potential for cumulative impacts include Seismic Phase 1, Seismic Phase 2, the User Support Building, Building 51 and the Bevatron Demolition, Building 77 Rehabilitation, Building 6 Seismic Upgrade, the Southeast Campus Integrated Projects, the Northeast Quadrant Science and Safety Projects, the Computational Research and Theory Building, the Helios Energy Research Facility, the Guest House. The EA neglects to mention that the Helios Energy Research Facility Final Environmental Impact Report (EIR) was decertified by the Regents. Please refer to the Notice of Preparation of an EIR for the Helios project dated 12/1/08 and issued by the University of California where it states that "(t)he Regents has decertified the Final Environmental Impact Report and rescinded the design approval of the Helios Energy Research Facility as previously proposed. This Notice of Preparation has been issued to inform the agencies and the general public that a new EIR will be prepared for the redesigned Helios Energy Research Facility Project." At present, no EIR has been issued for the redesigned Helios facility.	The comment is noted and clarifying information has been added to the text. Please see Final EA Section, V.A.1.b.
Save Strawberry Creek Watershed			
125	SSCW-1	We, the undersigned, petition our elected local, State and Federal Representatives to request that The Lawrence Berkeley National Laboratory (LBNL) and the Department of Energy (DOE)...2). Prepare an Environmental Impact Report (EIR) and an Environmental Impact Statement (EIS) for the proposed High Energy Plasma Laser Accelerator (HEPLA/BELLA) slated for LBNL next to a residential neighborhood.	The petition is noted and included in this Final EA.
126	SSCW-2	We, the undersigned, urge the Department of Energy (DOE), the Lawrence Berkeley National Laboratory (LBNL), and the University of California (UC) Regents to immediately cease the further destruction of the Strawberry Creek Watershed. Since	The petition is noted and included in this Final EA. Existing contamination of soil, and surface and groundwater around Building 71 is discussed in EA Section IV.B.2.

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		the Manhattan Project in the 40s, the operations at LBNL have contaminated the soil, surface and groundwater, and vegetation in the Strawberry Creek Watershed with toxic materials including radioactive tritium, uranium, VOCs, diesel, Freon, PCBs, and much more.	
Timothy Ma			
127	TM-1	I was a reading an article in the Berkeley Daily Planet about radiation produced from upcoming project BELLA. First of all, the radiation she describes may sound bad and weird, but it is not uncommon. At this moment, there are MILLIONS of muons coming from outer space that are hitting us right now. Cosmic neutrons are also hitting us, and gamma rays are easily stopped by shielding. As a physics student at Berkeley and someone who worked on a small part of this project a year ago. Her statistics on dosage from the accelerator came from the previous old accelerator. We know a lot more than we did back then, and radiation is constantly monitored to ensure it is below safety levels. As a physics student at Berkeley and someone who worked on a small part of this project a year ago, I have confidence that the scary terms used are actually harmless and the dosage from simply living is somewhat comparable.	The comment is noted.