LBNL COMMUNITY ADVISORY GROUP (CAG)

CAG Meeting Summary

Thursday, July 8, 2010
7:00 pm – 9:30 pm
North Berkeley Senior Center

CAG Members Present:

Rebecca Daly, UC Berkeley Student
Marcos Gandara, Community member
William Gilbert, Claremont Elmwood Neighborhood Association (CENA)
Dan Marks, City of Berkeley Planning Department
Mark McLeod, Buy Local Berkeley
Dean Metzger, Berkeleyans for a Livable University Environment (BLUE)
Phila Rogers, Community member
Carole Schemmerling, Strawberry Creek Watershed Council
Elizabeth Stage, Lawrence Hall of Science
Anne Wagley, Community member

CAG Members Absent:

Mark Berson, Berkeley Chamber of Commerce
LeRoy Blea, Berkeley Community Health Commission
Whitney Dotson, Community member
Paul Licht, UC Botanical Garden
Phil Price, LBNL employee

Welcome and Introductions

Daniel Iacofano of MIG welcomed CAG members, community members and staff, and provided a brief introduction to the evening's primary topic of discussion: Lab geology and geotechnical safety. Because this is a topic of great interest and concern among the Berkeley community, the Lab has agreed to video-record the meeting session at the request of community members. This video will be available as one of the records of the session.

Daniel invited a round of introductions, provided an overview of agenda items for the evening, and briefly reviewed the CAG process to date. Daniel welcomed suggestions as to how to improve the process, noting the diverse set of concerns and ideas held by CAG members and other process participants.

Update on Currently Proposed and Possible Future Projects

Jerry O'Hearn provided a brief description and overview of the status of seven currently proposed LBNL projects. At least one CAG member expressed concern that the proposed projects may not represent the best use of public money and requested that the Lab share information on project funding sources and costs.

The following numbers, provided during the meeting, are estimates and should not be considered precise figures. Jerry suggested further discussion of this topic at a later meeting, with the chance to provide greater detail and precise dollar amounts.

- **Old Town Demolition.** Department of Energy (DOE) project. Estimated project cost: $40 million.
- **Solar Energy Research Center.** UC project funded by a combination of state funds, public utility funds and gift funds. Estimated project cost: $54 million.
- **Seismic Phase 2.** DOE project. $15 million of funding for FY2010 comes from ARRA federal stimulus funds.
- **Seismic Phase 3.** No funding identified to date.
- **BELLA.** Estimated project cost: $26 million, part of which is funded by ARRA stimulus dollars.
- **User Test Bed Facility.** DOE project. $16 million of funds are stimulus dollars.
- **Computational Research & Theory Facility.** UC-funded project. Estimated project cost: $113 million.

Overview of Geology and Geotechnical Status of the Lab

An Introduction to Geology at the Lab

Preston Jordan, Research Geologist and Certified Hydrogeologist at LBNL Earth Sciences Division, shared a presentation titled, "An Introduction to the Geology and Engineering Geology of Lawrence Berkeley National Laboratory."

Preston began with a discussion of the basic characteristics of the two primary geologic faults at LBNL:

- **Hayward Fault (active).** The Hayward Fault runs through the western margin of the Lab. It is considered an active fault, which means there have been surface ruptures of the fault over the last 11,000 years. This is based on the State definition of an active fault.
- **Wildcat Fault (inactive).** The Wildcat Fault is one of two main bounding faults for the Lab, running along the eastern margin of the Lab. The State does not consider it an active fault, and numerous investigations have shown it is inactive.

Mr. Jordan discussed the probability of an earthquake occurring at the Hayward/Rodgers fault compared to that for the greater Bay Area. He also shared maps of modified Mercalli scale measures for the Hayward Fault. The modified Mercalli scale measures the intensity of shaking in the event of an earthquake. Actual shaking may be one class higher or lower than estimated.

Mr. Jordan discussed the three main geologic units or formations at the Lab: the Great Valley Group, the Orinda Formation and the Moraga Formation. An inactive, unnamed fault

sits above the Great Valley Group and below the Orinda Formation. He described the basic geologic characteristics of the units, including age of the units and history of development and deposition. He also discussed additional volcanic rocks somewhat associated with the existing ground surface at the Lab. The Lab is studying these rocks presently.

Mr. Jordan provided a general overview of the data that the Lab has used to interpret its geology. Approximately 1,000 borings have been drilled across the Lab, representing the primary set of data available.

UC Berkeley Professor Emeritus Garniss Curtis has put forth two hypotheses concerning the geology of the Lab:

- The Caldera Hypothesis, which asserts that the majority of the Lab is founded on top of a volcanic caldera located to the west of the Wildcat Fault and extending to the Great Valley Group.
- The bedding of the Great Valley rock west of the Advanced Light Source building runs parallel to the slope of the hill. He has claimed that in the event of a Hayward Fault earthquake, if these rocks were to become saturated, a catastrophic landslide would occur and could cause severe damage as far as 1,000 feet downslope.

Mr. Jordan presented arguments and data refuting Dr. Curtis' hypotheses. He also noted that Dr. Russell Graymer, an expert on East Bay geology with the USGS, does not believe the hypothesized caldera is present.

Mr. Jordan also shared a map of known landslides at the Lab, including slides that have been stabilized. He suggested that the 1973 Building 46 landslide was the result of an intense hydrologic event (heavy precipitation). He presented data in support of this hypothesis.

To conclude his presentation, Mr. Jordan shared that, from the Lab's perspective:

- There is no evidence of a caldera at the Lab.
- The topography of the Lab suggests that volcanic rocks are stronger and more resistant to erosion than the other geologic units.
- There is no evidence of a past landslide on the western slope of the Lab impacting the area below.
- Slope stability is a concern at the Lab, as it is throughout the Berkeley Hills.
- The LBNL site is on average more stable than the surrounding hills due to the initial site characteristics and the completed slope stability projects.
- LBNL will continue to evaluate and improve slope stability.

CAG Questions and Comments

CAG members asked a number of questions and expressed concerns in response to Mr. Jordan's presentation. The following is a summary of CAG member statements and questions and Lab responses.

- Meeting with Dr. Curtis and exchanging data in support of the competing theories related to the Lab's geology would be a valuable thing to do.
  - The Lab did meet with Curtis when the Caldera Hypothesis was advanced, but data was not exchanged in support of their competing theories.
- Have you conducted studies of water flow and rock permeability at the Lab site?
  - Various tests have been conducted to measure the permeability of the geologic units at the Lab. There is a public report (2000) available on the website that presents this information.
- How much water came from the well (Shively well near the Space Sciences Institute) west of Wildcat Canyon?
  - A new pump with a flow meter has been installed here as part of an effort to study the hydrogeologic framework of the entire site. (LBL Staff note: The pumping rate measured here recently for a research project was 10 gallons per minute. Dr. Curtis has suggested the well produces 14 to 16 million gallons over ten years, which is a bit less than 3 gallons per minute on average. On average more than 30 million gallons per year of precipitation falls on the area mapped as Moraga Formation in the RFI 2000 bedrock geology map, which is only part of the area underlain by the Moraga Formation west of the Wildcat Fault.)
- What is the definition of bedrock that the Lab uses when describing geologic conditions?
  - Geologists define bedrock as material not related to existing depositional processes, not by the strength of the rock.
- Please provide the community with access to the data discussed and presented here, and to data relevant to future meeting topics in advance of the meeting. For example, please provide all the bore logs for the lab.

Hazard Mitigation at the Lab

Wayne Magnusen of Alan Kropp & Associates gave a presentation on geologic hazard mitigation at the Lab. Mr. Magnusen is a geotechnical engineer with a strong understanding of the conditions at the Lab and experience designing measures to ensure building seismic safety. Alan Kropp & Associates is currently consulting LBNL for the Seismic Phase 2 process.

Mr. Magnusen provided an overview of four primary earthquake-related hazards. He described and provided historic examples of each hazard, summarized State regulations and appropriate implementation and mitigation measures related to each hazard, and presented

examples of investigations and mitigation measures that have been conducted and put in place at the Lab.

A brief description of each hazard and Mr. Magnesun's conclusions related to each hazard are provided below.

Fault rupture. Occurs when land on either side of a fault moves relative to one another. In all cases, the zone that experiences the rupture is relatively narrow. Primary regulations and development standards established by the 1972 Alquist-Priolo Earthquake Fault Zoning Act.

- Only one new LBNL project is within the A-P Zone: the Computational Research and Theory (CRT) building.
- A trenching investigation was performed at the CRT site and no faults were found.
- Other faults at LBNL that are outside of the A-P Zone are not considered active.
- New construction at LBNL fully complies with all State regulations and guidelines pertaining to fault rupture.
- New construction at LBNL appropriately mitigates fault rupture risks.

Ground shaking. The shaking that results from the energy released by an earthquake. Primary regulations and development standards established by the 2007 California Building Code.

- Ground shaking is a hazard that exists throughout much of California.
- All new construction at LBNL fully complies with the current version of the California Building Code, which requires that buildings be designed to resist the anticipated level of ground shaking at the building's location
- Predicted levels or earthquake shaking at LBNL are no greater than other areas in Berkeley and may be less than areas close to the Bay, where soft soils can amplify ground motions.
- New construction at LBNL appropriately mitigates ground shaking risks.

Ground failure (liquefaction). Ground failure caused by lateral spreading, which results in seismically induced landslides and subsidence. Primary regulations and development standards established by the 1990 Seismic Hazards Mapping Act.

- There are no State-defined Zones of Required Investigation for liquefaction at LBNL.
- Geotechnical and geologic investigations are performed for all new projects at LBNL in which the potential for liquefaction is investigated and assessed.
- All new construction at LBNL fully complies with the Seismic Hazard Mapping Act and the associated State guidelines that govern liquefaction hazards.

- New construction at LBNL appropriately mitigates liquefaction risks.

Landsliding. Movement triggered by Earthquake shaking. Key factors that affect stability are the strength of slide materials and groundwater levels. Primary regulations and development standards established by the 1990 Seismic Hazards Mapping Act.

- Landslides exist at LBNL at specific sites. The largest landslides at LBNL are less than 100 feet thick; most landslides are much smaller and many have been repaired.
- Landslides at LBNL have limited displacement potential. There are no "runaway" landslides at LBNL that would affect buildings or people offsite.
- Onsite, landslide hazards are mitigated using accepted mitigation methods in accordance with State regulations and guidelines.
- New construction at LBNL appropriately mitigates landslide risks.

CAG Questions and Comments

CAG members asked the following questions and expressed the following concerns in response to Mr. Magnusen's presentation:

- Touring the Lab site, evidence of the Lab's historical risk of landslides and related hydrologic and drainage issues can be seen clearly. The Hazardous Waste Handling Facility and plans for the CRT building demonstrate the extent to which the Lab must engineer and mitigate to make buildings safe.
- If you take all the money used to build seismically safe buildings at the Lab, how much would you save? There are a number of community members that are very concerned by the hundreds of millions of public dollars invested to safely build on the hill. There must be safer areas to build, which would allow for the use of this money towards investment in scientific equipment and discovery.
- There has been discussion of the State moving towards applying the international building code. How will this affect what we do in California and in the Bay Area? Will the Lab become involved in building code issues?
    - The 2007 State Building Code is based on the 2006 International Building Code. Many methodologies previously used have been updated to ensure a more site-specific analysis and to get a much more consistent measure of what the ground shaking would be at each site. This presentation helps illustrate how much has been learned over time, in this case related to seismic building safety and standards.
- What kind of earthquake movement has to be accommodated by the Stadium?
    - The stadium is in the near field of the fault, and so fault rupture is one of the major issues at the stadium. With respect to ground shaking, ground motions do not vary much over a short distance. In other words, there is not a huge amount of variation in the near field of the fault.

Lab Seismic Program

Fred Angliss, the Chief Structural Engineer at LBNL, presented on the Lab's seismic program goals and criteria, the evaluations that have led to the Lab's rehabilitation projects, and how the Lab addresses new buildings from a seismic perspective.

The goal of the Lab's Seismic Program is to achieve Life Safety for building occupants in the event of the Maximum Credible Event. A Maximum Credible Event is one equivalent to a 7.0+ earthquake on the Hayward Fault or that causes accelerations at or above 0.7g for 20 seconds.

The lab has adopted the UC Seismic Safety Policy, which Fred briefly reviewed. The Lab's program produces a seismic safety rating for buildings and proceeds to demolish or upgrade the lowest rated buildings. From 2007 to 2010 buildings rated poor or very poor have declined as a percentage from 38 percent to 18 percent, and buildings rated good have increased from 17 percent to 26 percent. The current Seismic Phase 2 project is one phase of the building upgrade program.

New and future buildings at the Lab are designed to the current California Building Code. Structural designs are also peer reviewed by an independent structural engineer.

Public Comment and Additional CAG Comments

During Lab presentations and CAG discussion of geologic and geotechnical issues, community participants shared a number of comments and suggestions.

Requests for Data and Information

- The video entitled, "The Fault: Quakes, Slides & the Lawrence Berkeley Lab" has been enormously mischaracterized. We have requested reports related to projects at Old Town but have not received them. As a result, we have very little idea of what is actually occurring there.
- What soils were found in the 500-foot boring taken at the Lab?
  - Primarily sedimentary rock including shale, sandstone and chert. Formations encountered included the Claremont (Monterey Group), Briones (San Pablo Group) and Orinda Formations. With these borings we can see that the Briones and Orinda Formations are inter-bedded and that there is no fault between them as previously interpreted (for instance, in the 2000 report).
- Where is the bedrock at the Lab? Maps do not clearly show its location.

Seismic Safety and Related Concerns

- According to the DOE Environmental Assessment, (on the Seismic Phase 2B Proposed Action at LBNL) a landslide under Building 85 will be stopped by using 40 to 50-foot piers. This is concerning. There are high-perched water tables in this area.
- The Orinda Formation is primarily claystone and siltstone, which give rise to many problems in civil engineering. They slump and flow when subjected to stress, which is what has been happening for years at the Lab.

- There is a lack of trust that exists between the community and the Lab and University. Plans to continue with the Stadium are based on an exemption created unfairly.
- The geotechnical investigation conducted for the BELLA facility states that the stability of this building is at risk. The report also states that its recommendations are not intended to stabilize the site or mitigate the potential for landslide-type movements.
- The Lab location is not a place to continue building. There are unknown, underground water sources and serious potential risks to development here.

Site Contamination and Environmental Health

- Toxic materials and related contamination are present at the Lab. While there are claims that toxic materials would stay on site in the event of an earthquake at the Lab, I am not convinced this is true.
- Use ARRA stimulus funds to clean up contamination at the Lab before new structures are planned.
- The mitigation program for on-site contamination at the Lawrence Livermore Lab is very impressive. Why was funding for the Lawrence Berkeley Lab mitigation program cut and the program discontinued?
    - The Lab program budget was reduced because in 2006 the program transitioned from the investigation phase to the implementation (monitoring, maintenance and operations) phase. The investigation phase is the more expensive part of the process. The setting at Lawrence Livermore Lab geologic setting is different and so program comparisons are difficult to make.
- Address community concerns related to the contamination that exists here and the potential relationship between contamination at the Lab and community and environmental health. Years ago, the Lab was listed as a federal Superfund site. Now it is no longer on this list.[1]
- What is the transport model for soil and groundwater contaminants at the Lab? Where can the public go to find comprehensive cross-sections of the Lab, and what is the true anticipated movement of these contaminants along fault lines?
    - Lab hydrostratigraphy is discussed to considerable detail in the RFI report. Geologic units at the LBNL site map very closely with the hydrogeologic units, which is why they may be difficult to decipher. The results of numerical simulation of contaminant transport in the Old Town area of LBNL are reported in Zhou et al. (2004).

[1] LBL staff note: USEPA, at the request of Committee to Minimize Toxic Waste and others, began looking into National Tritium Labeling Facility releases at the Lab in 1997. EPA listed the Lab as "potentially eligible" for the Superfund list pending investigation. After reviewing extensive environmental sampling, EPA announced in 2002 that tritium levels at the Lab were well below federal health standards and decided not to place the Lab on the Superfund list. EPA changed the status from "potentially eligible" to "no further federal Superfund response action."

Additional Comments

- I agree with comments about the inappropriate use of public money to stabilize landslide areas. When compared with housing to the north of the Lab, private landowners take on this responsibility. When LBNL pays for this, it uses public funds.

- I am concerned that misinformation about the Lab is used against the Lawrence Hall of Science. If there is a probability that the Lawrence Hall of Science would in fact slip off the hill in the event of an earthquake or landslide, this information needs to be understood and presented using evidence-based information.

Next Steps

The next CAG meeting will take place on September 13th, 2010, from 7:00 pm to 9:30pm at the North Berkeley Senior Center.

LBNL and MIG will post links of requested reports to the CAG website for the community to more readily access. The Lab will plan to hold a separate meeting to discuss groundwater at the Lab and related concerns.

Meeting summaries and documents, presentation materials, and meeting dates, times and locations will continue to be available on the CAG website (www.lbnl-cag.org).