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CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA

March 2007

Strawberry Creek Watershed ca. 1965

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for

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TABLE OF CONTENTS

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INTRODUCTION

The Lawrence Berkeley National Laboratory (LBNL), initially called the UC Radiation Laboratory, was originally located on the University of California Berkeley (UCB) central campus in Alameda County during 1932. By 1940, it was relocated to its present site in the steep hills of Strawberry Canyon east of the Hayward Fault and the central UCB campus (Figure 1). The first major facility, the 184-inch synchrocyclotron was built with funds from both private and university sources, and was used in the Manhattan Project in the development of the world's first nuclear bomb. Beginning in 1948 the U.S. Atomic Energy Commission and then its successor agency, the Department of Energy (DOE) funded the lab while it continued to expand its facilities in Strawberry Canyon.

Numerous geotechnical investigations have been conducted during the past six decades as LBNL expanded while also experiencing problems with slope stability. The many geotechnical and environmental reports generated by LBNL, as well as research from local academic, state, and federal entities, indicate that minimal agreement has existed among scientists on the location of bedrock contacts or location and status of earthquake faults and landslides in the Canyon.

This is important because LBNL has been required to monitor radioactive accidents and chemical releases that have contaminated the groundwater and tributary streams of Strawberry Creek, which flow westward from the jurisdictional boundaries of Oakland to Berkeley and the UCB Campus. There has been concern by the public that mitigation to protect public health might be compromised by the lack of comprehensive (and agreed upon) information on the potential transport pathways of contaminants along bedrock contacts, faults, and landslides. Without such information, the array of sampling wells

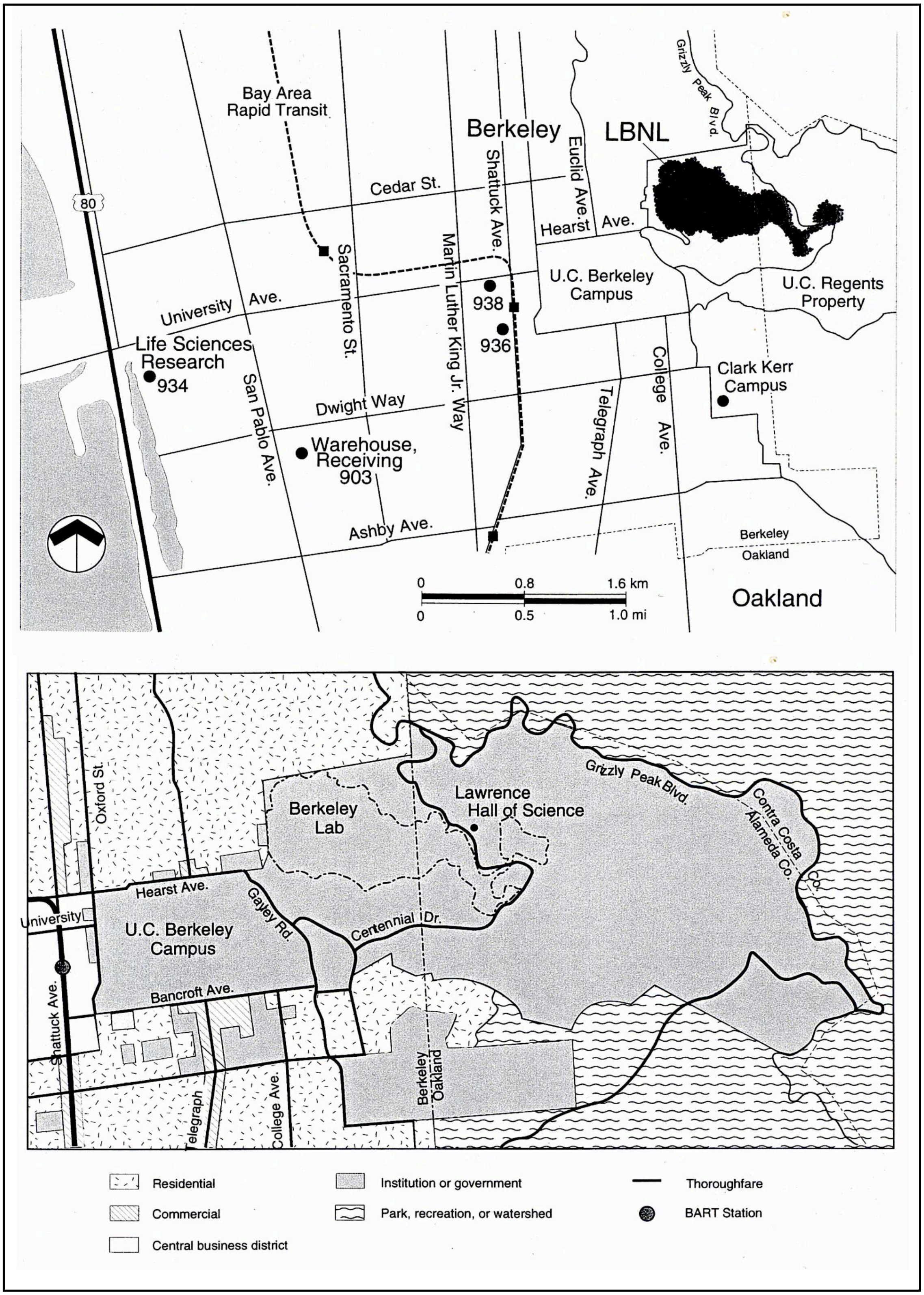


FIGURE 1. VICINITY AND ADJACENT LAND USE. Source: LBNL RCRA Facility Investigation Report, (also known as LBNL, 2000).

designed to monitor contaminant migration have not been strategically placed to define the limits of contamination or potential plume migration. During 1991, the Department of Energy's (DOE) Tiger Team found 678 violations of DOE regulations that cover management practices at LBNL. A key finding was that air, soil, and water in Berkeley and Oakland are contaminated with tritium and other radioactive substances and toxic chemicals.

Our project and this report "Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides, and Streams in Strawberry Canyon, Berkeley and Oakland, California" was supported by a grant from the Citizens' Monitoring and Technical Assessment Fund (MTA Fund) to the Committee to Minimize Toxic Waste (CMTW). The report addresses the need to compile and develop publicly accessible maps of Strawberry Canyon, which show the geologic and geomorphic characteristics that might influence ground and surface water movement near known LBNL contaminant sites. The intent of this map compilation project is to show where there is or is not agreement among the various technical reports and scientific interpretations of Strawberry Canyon. This report can be found on the following web site: http://www.cmtwberkeley.org

OBJECTIVES

The specific objectives of the project were:

1) Help define or show where there is potential confusion or disagreement about the location of geological units and associated faults by showing interpretations by various science organizations.
2) Help define the historical channel and landslide network.
3) Locate verifiable bedrock outcrops as the basis for geologic interpretation;
4) Identify sites of slope instability, especially those associated with groundwater, and landslides;
5) Synthesize surface geotechnical information with contaminant plume information for the greater Strawberry Canyon area on a common base map.
6) Post results of technical report on CMTW's web site.

This project provides necessary information to better evaluate the status of existing geological knowledge for Strawberry Canyon and the potential for contaminant migration pathways at existing plumes sites. By achieving a common base of understanding, a more effective monitoring and mitigation plan can be developed for the contamination sites. Benefits will also be provided for future geotechnical investigations during expansion of facilities at either LBNL or UCB. We have started by compiling available information on a series of overlays that show:

a) Current stream and storm drain network, and all sewer lines and hydraugers, delineation of the Lennert Aquifer;

b) Interpretation of historic drainage network and springs as indicated on the Map of Strawberry Valley and Vicinity Showing the Natural Sources of the Water Supply of the University of California, by Frank Soulé, Jr. 1875;
c) Geology;
d) Faults, seismicity, and Alquist Priolo Earthquake Fault Zone;
e) Landslides;
f) Areas of contamination evaluated in the Resource Conservation and Recovery Act (RCRA) process;
g) Additional toxic sites located outside the LBNL fence line, but on UC land, such as the old waste pit at the former Chicken Creek animal husbandry site as well as groves of trees and vegetation, south of the Lawrence Hall of Science, contaminated with tritium (radioactive hydrogen) in soil;
h) Topography with building sites, and roads.

REPORT ORGANIZATION

This report is specifically designed to demonstrate what is known about the key components of Strawberry Canyon that can influence surface and subsurface water transport, particularly near infrastructure and known contaminant plumes at LBNL. We have taken the key elements of surface drainage, geology, faults, and landslides and divided them into distinct subsections for this report.

We first provide a General Site Description and then provide information about the Contaminant Sites. This is followed by a brief discussion of Methods used in this report to produce original maps and compile existing information. Within the Results section, each subsection on Surface Drainage, Geology, Fault mapping, and Landslides provides background information and a few smaller scale maps showing recent interpretations. Larger maps are provided to show compilations of recent information.

These compilations are used to determine whether there is agreement by different researchers about the location of faults, bedrock contacts, or landslides. Each compilation map shows the contaminant plumes in the context of the different physical elements to determine if those elements could have potential influences on contaminant transport. The Plume Monitoring Sites are then shown to indicate the array and position of sampling and monitoring wells. This latter information is presented in much detail in several online documents produced by LBNL (2000, 2003, 2004 and 2007) that can be downloaded from their web site (www.lbl.gov/ehs/index2.shtml).

Within the Results subsection, a map on Zones of Concern is provided that indicates potential groundwater migration sites near each plume that might not be adequately sampled or understood given the present status of knowledge of factors that can influence groundwater transport. A map showing Future Development and Site Conditions and the compilation of potential factors that could influence plume migration is shown as the final map within the Results section. Conclusions and General Recommendations are provided at the end of the report.

GENERAL SITE DESCRIPTION

LBNL is located in a very seismically active area, next to the Hayward Fault on the steep west facing slopes of the Berkeley Hills within the 874-acre Strawberry Canyon. Figure 2 shows the location of the Alquist Priolo Earthquake Fault Zone and the footprint of buildings and roads in Strawberry Canyon. It also shows the location of several known contaminant plumes that are monitored by LBNL. The nature of these plumes is discussed further in the section on Contaminant Sites. The building sites and their associated numbers are shown in Figure 3a, while Figure 3b provides a legend to the building numbers.

Topographic relief in the canyon ranges from 400 feet to 1800 feet, whereas elevations within the LBNL boundary range from about 500 feet to 1000 feet. The Mediterranean climate of the Coast Ranges produces a mean annual rainfall of about 28 inches. Within the LBNL site, two major east-west trending creeks, Strawberry and North Fork of Strawberry, have perennial flow that drains respectively through Strawberry and Blackberry Canyons toward the City of Berkeley and the San Francisco Estuary.

CONTAMINANT SITES
Chemical and Hazardous Contamination

LBNL operations fall under a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit. The Permit requires that LBNL investigate and address historic releases of hazardous waste and hazardous constituents within their property as part of the RCRA Corrective Action Program. LBNL's Environmental Restoration Program is responsible for carrying out these activities.

Waste products at the LBNL have included solvents, gasoline, diesel fuel, waste oils, polychlorinated biphenyls (PCBs), Freon, metals, acids, etchants, and lead and chromate based paints. According to the LBNL RCRA Facility Investigation (RFI) Report (2000), the primary contaminants detected in soil and groundwater at LBNL have been volatile organic compounds (VOCs) including tetrachloroethene (also known as tetrachloroethylene or perchloroethene [PCE]), trichloroethene (also known as trichloroethylene [TCE]), carbon tetrachloride, 1,1-dichloroethene (1,1-DCE), cis-1, 2-dichloroethene (cis-1, 2-DCE), 1,1,1- trichloroethane (1,1,1-TCA), and 1,1-dichloroethane (1,1-DCA). Some of these are common solvents and degreasers that have been used at LBNL for equipment cleaning. Smaller concentrations of other VOCs (e.g., benzene, toluene, ethylbenzene, and xylenes [BTEX]; chloroform; and vinyl chloride) have also been detected.

The LBNL RFI (2000) reported that contamination of soil and groundwater by petroleum hydrocarbons was associated with former underground storage tank sites and that PCB contamination has been primarily associated with spilled transformer oils and waste oil tanks. Freon- 113, a coolant for experimental apparatus, has been detected in groundwater south of Building 71.

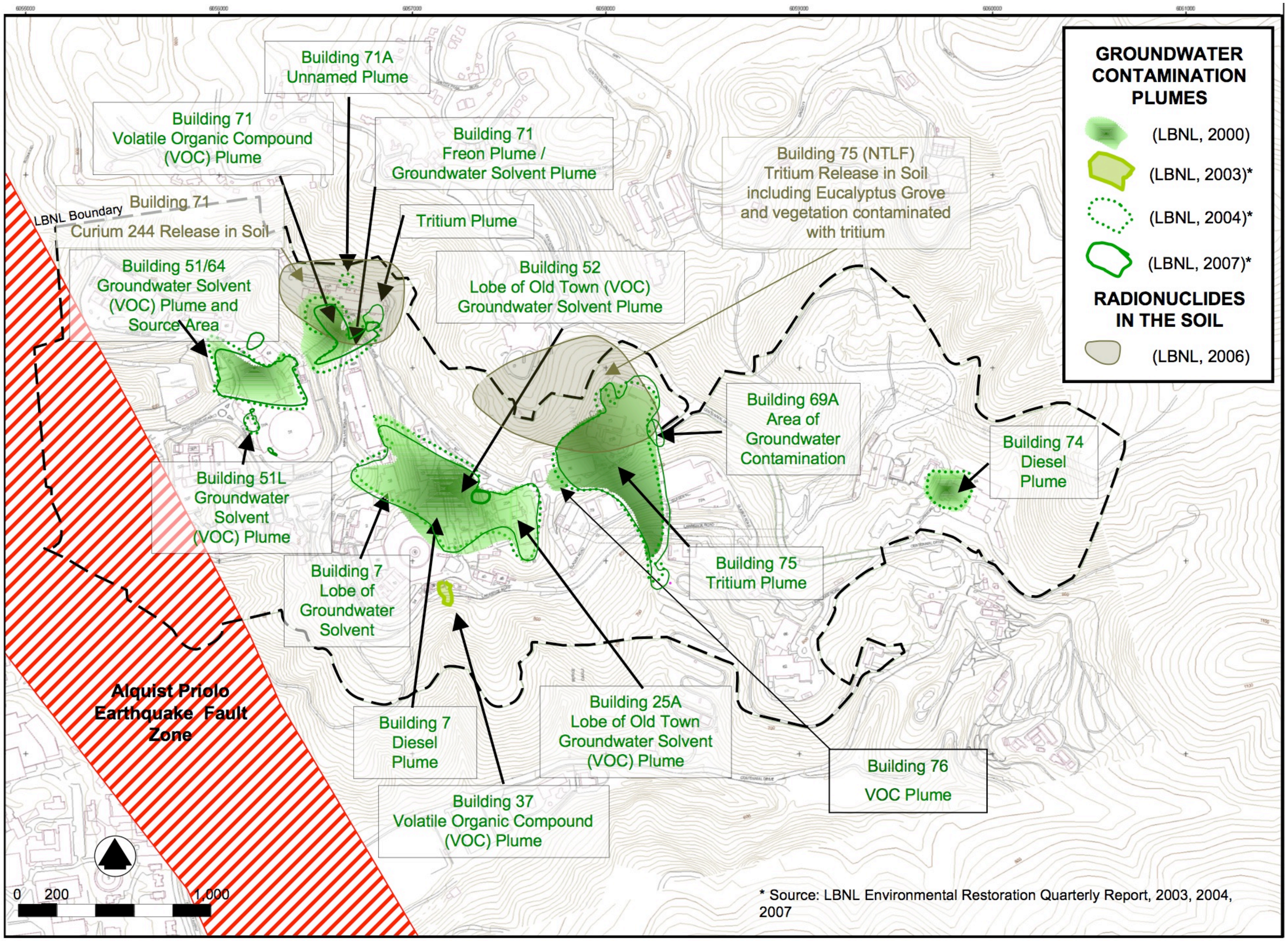


FIGURE 2. LBNL SITE MAP, GROUNDWATER CONTAMINATION PLUMES AND CONTAMINATED SOIL SITES.

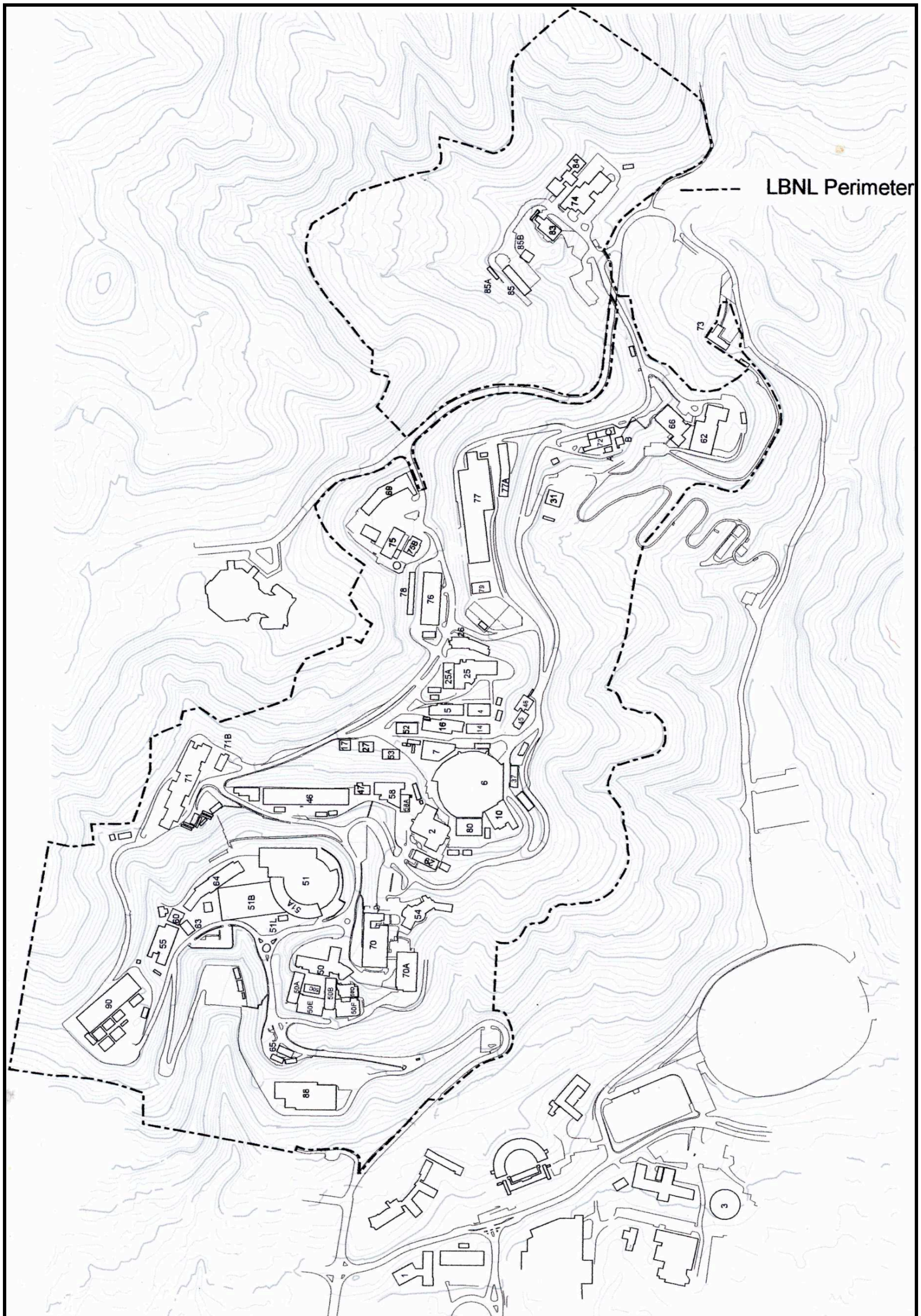


FIGURE 3a. BUILDINGS AT LBNL.
Source: LBNL RCRA Facility Investigation Report, (also known as LBNL, 2000).

2	Advanced Materials Laboratory (AML)	55	Life Sciences
2a	Materials Storage	55A	Life Sciences
4	ALS Support Facility	55B	Emergency Generator
4A	Safety Equipment Storage	55C	Life Sciences
5	Accelerator and Fusion Research	56	Biomedical Isotope Facility
5A	Mechanical Storage	58	Heavy Ion Fusion
5B	Electrical Storage	58A	Accelerator Research & Development
6	Advanced Light Source (ALS)	58B	Lubricant and Solvent Storage
7	ALS Support Facility	60	High Bay Laboratory
7A	Radio Shop	61	Standby Propane Plant
7C	Office	62	Materials & Chemical Sciences
10	ALS Support Facility	62A	Environmental Energy Technologies, Materials Sciences
10A	Utility Storage	62B	Utility Storage
13A-C	Environmental Monitoring	63	Environmental Energy Technologies
13E,F	Sewer Monitoring Station	64	B-factory, Life Sciences
13G	Waste Monitoring Station	64B	Riggers
13H	Radiation Monitoring Station	65	Site Access Office
14	Earth Sciences Laboratory	66	Surface Science Catalysis Lab, Materials Sciences, Center for Advanced Materials
16	Accelerator and Fusion Research Laboratory	67B,C	Environmental Energy Technologies
17	EH&S	67D	Mobile Infiltration Test Unit
25	Engineering Shop	67E	Environmental Energy Technologies Field Lab
25A	Engineering Shop	68	Upper Pump House
25B	Waste Treatment Facility	69	Archives and Records, Shipping
26	Health Services, EH&S	70	Nuclear Science, Environmental Energy Technologies
27	ALS Support Facility	70A	Chemical Sciences, Earth Sciences, Engineering, Life Sciences, Nuclear Science
29	Engineering, Life Sciences	70B	Utility
29A,B	Engineering	70E	Storage
29C	Environmental Energy Technologies	70G	Liquid Nitrogen Storage
31	Chicken Creek Maintenance Bldg., Earth Sciences	71	Center for Beam Physics, Ion Beam Technology
31A	Earth Sciences	71A	Ion Beam Technology, Low Beta Lab
34	ALS Chiller Building	71B	Center for Beam Physics
36	Grizzly Substation	71C,D,F,H,J,P	B-factory
37	Utilities Service	71K	Accelerator and Fusion Research, B-factory, Chemical Sciences
40	Engineering Electronics Lab	72	National Center for Electron Microscopy (NCEM)
41	Engineering Communications Lab	72A	High Voltage Electron Microscope (HVEM)
42A	Emergency Generator House	72B	Atomic Resolution Microscope (ARM)
43	Compressor Bldg.	72C	ARM Support Laboratory
44	Indoor Air Pollution Studies	73	Atmospheric Aerosol Research
44B	Environmental Energy Technologies	74	Life Sciences Laboratory
45	Fire Apparatus	74C	Emergency Generator
46	Accelerator and Fusion Research, Engineering, Environmental Energy Technologies, Photography Services, Printing	75	Radioisotope Service & National Tritium Labeling Facility (NTLF)
46A	Engineering Div. Office	75A,B,C	Environment, Health & safety
46B	Engineering	76	Facilities Shops, Motor Pool/Garage
46C, D	Accelerator and Fusion research	77	Engineering Shops
47	Accelerator and Fusion research	77A	Ultra High Vacuum Assembly Facility (UHV)
48	Fire Station	77C	Welding Storage
50	Accelerator & Fusion Research, Physics, Library	77D	Drum Liquid Storage
50A	Director's Office, Nuclear Science, physics	77H	Auxiliary Plating
50B	Physics, Computing Sciences	77J-N	Chemical Storage
50C	Computing Sciences, NERSC	78	Craft Stores
50D	Center for Computational Sciences and Engineering	79	Metal Stores
50E	Computing Sciences, Offices	80	ALS Support Facility
50F	Computing Services	80A	ALS Support Facility
51	Technical and Electronics Information	81	Liquid Gas Storage
51A	Bevatron	82	Lower Pump House
51B	External Particle Beam (EPB) Hall	83	Life Sciences Laboratory
51F, G	Nuclear Science	84	Human Genome Laboratory
51L	Computer Training Center	85	Hazardous Waste Handling Facility
51N, Q	Earth Sciences	88	88-Inch Cyclotron, Nuclear Science
52	Cable Winding Facility	88B	Compressor Shelter and Storage
52A	Utility Storage	88C	Flammable Gas/Liquid Storage
52B	ALS Support	88D	Emergency Generator
53	Environmental energy technologies	90	Copy Center, DOE Site Office, Earth Sciences, Environmental Energy Technologies
53A	Gardner's Storage	90B,F,G,H,J,K	Facilities
53B	Accelerator and Fusion Research	90C, P	Earth Sciences
54	Cafeteria	90R	Utility Storage

FIGURE 3b. KEY TO LBNL BUILDINGS SHOWN IN FIGURE 3a. Source: LBNL, 2000

The Human Health Risk Assessment (LBNL, 2003) identified chlorinated volatile organic compounds in soil and groundwater and PCBs in soil as chemicals of concern (COC) at LBNL. Prior to submission of the Corrective Measures Study (CMS) Report, Berkeley Lab completed Interim Corrective Measures (ICMs) that reduced residual PCB concentrations at the two units where PCB levels were a concern to less than the required media clean-up standard. LBNL (2007) discusses that after submittal of the Corrective Measures Implementation Work plan, elevated concentrations of PCBs were detected in shallow groundwater samples collected near the Building 51 Motor Generator Room Filter Sump, indicating PCBs were a potential COC in the soil at this location.

Groundwater is not used for drinking or other domestic water supply at LBNL. Water is supplied to LBNL and Berkeley residents by the East Bay Municipal Utility District (LBNL, 2007). In addition there are many private backyard wells in the city. Unless otherwise designated by the State's Water Quality Control Board, all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply. Exceptions to this policy are specified in State Water Resources Control Board Resolution 88-63.

Resolution 88-63 defines all groundwater as a potential source of drinking water, with limited exceptions for areas with total dissolved solids exceeding 3,000 milligrams per liter (mg/L), low yield (<200 gallons per day [gpd]), or naturally high levels of toxic chemicals that cannot reasonably be treated for domestic use. Under the Water Board's Water Quality Control Plan, groundwaters with a beneficial use of municipal and domestic supply have cleanup levels set no higher than Maximum Contaminant Levels (MCL's) or secondary MCLs for drinking water.

The following descriptions from the 2007 Draft LBNL Long Range Development Plan (LRDP) report exemplify some of the conditions and circumstances at the contaminant sites. Note that Old Town is in the general vicinity of Buildings 25 and 52, near the central land holdings of LBNL. All plumes can be seen in Figure 2. Further details can be found within the referenced reports.

> The Old Town Groundwater Solvent Plume is a broad, multi-lobed plume of VOC contaminated groundwater, which underlies much of the Old Town area. The distribution of chemicals in the plume indicates that it consists of three coalescing lobes that were originally discrete plumes derived from distinct sources. The Building 7 lobe, which contains the highest VOC concentrations of the three lobes, extends northwestward from the northwest corner of Building 7 to the parking area downhill from Building 58. Leaks and/or overflows of VOCs (primarily PCE) from the Former Building 7 Sump, an abandoned sump that was located north of Building 7, were the primary source of the Building 7 lobe. These chemicals were initially released as free product to the soil around the sump and then migrated as dense non-aqueous-phase liquid (DNAPL) into the saturated zone, forming a source zone for further migration of contaminants. Continuing dissolution of contaminants from the soil and westward to northwestward flow of the groundwater from the sump area has resulted in the development of the Building 7 lobe of the Old Town Groundwater Solvent Plume.

> Contaminated soil and groundwater were present beneath the area where Building 51L was located. The principal contaminants were VOCs that were used as cleaning solvents, or were derived from degradation of cleaning solvents. In addition, a small area of VOC-contaminated soil was present beneath the abandoned Building 51A stormdrain catch basin next to the Building 51A B-door. Contaminated soil in the bottom of the catch basin was removed in 2002. However, groundwater samples from temporary groundwater sampling point SB51A-01-8B installed through the catch basin have contained elevated VOC concentrations, suggesting the presence of additional contaminated soil beneath the catch basin.
>
> A network of subdrains and relief wells located around the perimeter of Building 51 collects subsurface water from the adjacent hillside. Water collected by this network discharges to the Motor Generator Room Filter Sump, which is part of the Building 51 internal floor-drain system. After submittal of the Corrective Measures Implementation (CMI) Work plan, elevated concentrations of PCBs were detected in shallow groundwater samples collected near the sump, indicating that PCBs were a potential COC in the soil at this location.
>
> The Building 51/64 Groundwater Solvent Plume extends south and west from the southeast corner of Building 64 beneath the former location of Building 51B. The corrective measures required for the Building 51/64 Groundwater Solvent Plume consist of operation of an in situ soil-flushing system in the up gradient portion of the plume, implementation of Monitored Natural Attenuation in the down gradient portion of the plume, and collection and treatment of water from the Building 51 subdrain system.

The location of the Building 69A Area of Groundwater Contamination is shown in Figure 2. The most likely source of the contamination was leakage from a pipeline in the Building 69A Hazardous Materials Storage and Delivery Area that drains to the Building 69A Storage Area Sump. A dislocation was observed in one of the sump drainpipes and repaired in 1987.

Radioactive Contamination

Since November 1991, the State of California Department of Toxic Substances Control (DTSC) and LBNL have identified 174 "units" of hazardous contamination in the Strawberry Creek Watershed. At least 8 of these 174 "units" were identified as having radioactive contamination. At the same time the California Department of Health Services (DHS) also participated as an additional quality assurance check and provided independent laboratory results to complement LBNL's environmental monitoring programs.

In September of 1995, the California Department of Health Services (DHS) Environmental Management Branch released the Agreement in Principle (AIP) Annual Report, which identified LBNL's National Tritium Labeling Facility (NTLF), Building 75 as a major concern for radioactive contamination in the environment. The AIP report states:

> This facility (NTLF) handles kilocurie quantities of tritium (^3H) to label a variety of molecules that are subsequently employed in chemical, pharmaceutical, and biomedical research. It is conceded that releases from the tritium-stack as well as fugitive releases from Building 75 are the primary source of tritium at LBNL. Air-fall, rainout, and possibly transport in fog impacts soil, groundwater, and surface water. There is an area of tritium contaminated groundwater in the vicinity of Building 75. The Quarterly Progress Report, First Quarter FY 1992, (May 1993) reports sampling ten hydraugers, one, immediately down-slope from NTLF, reportedly contained 32,000 pCi/L of tritium.

The AIP Program collected and analyzed surface water samples, which demonstrated that tritium is detectable in surface water around LBL. The AIP further states:

> One recent investigation, by Leticia Menchaca (LBNL), analyzing for tritium in transpired vapor from plants on LBNL suggest that there may be significant amounts of tritium in the upper, non-saturated, soil strata. It appears that there may be sufficient evidence to suggest that there may be more tritium in the environment than previously suspected. There are apparently no validated explanations for the appearance of tritium in streams not obviously associated with NTLF. (See Table 1)

During the above referenced investigation, tritium concentration in rainwater was detected as high as 239,000 pCi/L and 197,946 pCi/L in transpired water vapor from trees near the University of California's Lawrence Hall of Science.

Table 1. Comparison of Tritium Levels from Split LBNL Surface Water Samples

Collection Date: June 15, 1995 (Table LBNL-6c, AIP Report, 1995)

Location	AIP Results	AIP Duplicate	LBNL Results
	(pCi/L)	Results (pCi/L)	(pCi/L)
Blackberry Creek	3335 ± 255		
Claremont Creek	< 328		
Wildcat Creek	1147 ± 218	944 ± 214	
Lower Strawberry Creek	5902 ± 294		
Upper Strawberry Creek	< 328	< 328	

In addition, the AIP report expressed concern over the release of Curium-244 from Building 71, the Heavy Ion Linear Accelerator (HILAC). It states:

> An area of soil near Building 71 is historically (circa 1959) reported to have been contaminated with Curium-244 when a Curium target being used in an experiment was vaporized. Some of this contamination, reportedly, was transported by the buildings ventilation system and deposited outside. This is documented in two interviews in the RCRA Facility Assessment at LBL Sep. 30, 1992: this document reports that "Cleanup of curium contaminated concrete inside the building is documented but there is no record of sampling outside Bld. 71."

The AIP program's other concerns for radioactive contamination in the LBNL environs included former radioactive waste storage and staging areas, former radioactive decontamination areas and abandoned above ground radioactive waste holding tanks.

In 1998, the US Environmental Protection Agency (EPA) performed a Superfund reassessment of LBNL concluding that "Based upon a preliminary Hazard Ranking System score, the US EPA has determined that LBNL is eligible for the National Superfund Priorities List" for cleanup, due to tritium in air, soil, groundwater, and surface water.

In September of 2001, LBNL announced that the NTLF would cease operations by 12/31/01.

In June 2005 National Academy of Sciences panel, formally known as the Committee on Biological Effects of Ionizing Radiation, or BEIR, concluded that there is no exposure level found below which dosage of radiation is harmless. The preponderance of scientific evidence shows that even very low doses of radiation pose a risk of cancer or other health problems. The National Academy of Sciences panel is viewed as critical because it addresses radiation amounts commonly used in medical treatment and is likely to also influence the radiation levels that the government will allow at abandoned and other nuclear sites.

METHODS

Our approach to developing a basic understanding of the contaminant plumes of the Lawrence Berkeley National Laboratory and their interrelation to faults, landslides, and streams in Strawberry Canyon was to develop a series of overlays that would show the conditions and various interpretations by previous investigations. The base map data sources were from the City of Berkeley and LBNL Facilities Division, the map projection: California State Plane, Zone III, (map scale 1:3000). Map layers for plumes, geology, faults, and landslides were scanned and then digitized as individual slides.

For the historic channel and landslide network mapping, a base map scale of 1-inch equals 200 feet was used to draw channels and landslides as they were interpreted from stereo aerial photographs and historic maps. The historic map of the drainage network was from Soulé (1875). The topographic projections of Soulé's 1875 base map were not compatible to present day cartographic or survey standards. The stream network, however, in most cases, seems to have a good representation of the number of tributaries and the relationship of one confluence to another. Because Soulé's map could not be digitized directly as an overlay, it was necessary to interpret his intent with regard to channel and spring mapping. This was accomplished by referring to predevelopment topographic maps shown in LBNL (2000) and by viewing stereo pairs of historical air photos, some of which predated development of the 1940's.

Different years of aerial photography were used to map landslides, landslide scars, and colluvial deposits. Three black and white photos were used for the earliest period that represented circa 1935. There were a few sections of stereo overlap in these photos, whereas all the newer photos had complete stereo coverage. The full stereo photo analysis included photos from 1939, 1946, 1947, and 1990. A distinction was made, when possible, to establish between deep-seated and shallow slides. Shallow slides were expected to be less than 30 feet deep, whereas deep-seated slides exceeded 30 feet. Source areas for shallow slides, called colluvial hollows, were also mapped. These source areas often contain scars of former landslides and in some cases have had recent sliding, but certainty was low from aerial interpretation. When there was a high certainty of activity occurring within the last century, the slides were delineated accordingly. Activity status of earthflows was not determined. However, at the very least, these slides should be expected to have higher than normal creep rates than the surrounding soils and they will probably continue to have renewed activity within their boundaries.

RESULTS AND DISCUSSION OF DATA COMPILATION

Drainage Network Mapping

Within the Lab site, two major east-west trending creeks, Strawberry and North Fork of Strawberry, have perennial flow that drains respectively through Strawberry and Blackberry Canyons toward the City of Berkeley and the San Francisco Estuary. North Fork of Strawberry Creek flows through the boundaries of LBNL. Mainstream Strawberry Creek is not within LBNL boundaries, yet seven of its north-south trending tributaries that flow southward, do drain from the LBNL. These tributaries, cited in the LBNL RFI, 2000 include Cafeteria Creek, Ravine Creek, Ten-inch Creek, Chicken Creek, No-name Creek, Banana, and Pineapple Creeks as shown in Figure 4. The latter two flow into Botanical Garden Creek, which is not within the LBNL boundary, but flows into the central reach of mainstream Strawberry Creek.

The pathways of natural surface water runoff have been altered by years of land use activities in the Canyon, which have caused the natural topography to become highly altered by cut and fill activities, roads, impervious surfaces from buildings and parking lots, and by stormdrain and other infrastructure construction. Natural and land use-related landslides have also changed the flow pathways of both surface and groundwater. Numerous faults, deep-seated landslide failure planes, bedrock contacts, fractures, and joints compound the natural influences on groundwater. They can all strongly influence the direction and rate of subsurface flow.

However, the location of bedrock contacts and faults can be challenging to detect, especially in an unstable landscape where landsliding can mask the geomorphic signatures of faults and bedrock contacts. Overlaying surficial deposits from alluvial fans and colluvium can also obscure these features. Groundwater flow has also been artificially altered by spring development, wells, hydraugers, utility trenches, sewers, subsurface drains, and pumps installed to mitigate contamination, as well as to intercept hill water that historically has caused landslides at LBNL.

Campus Principal Engineer John Shively conceived of the idea of a vertical well to intercept hill-water that was causing landslides both inside and adjacent to LBNL in 1974. He retained Civil Engineer B. J. Lennert to install what is now known as the Shively well, located next to the UC Silver Space Sciences building. It should be noted that the major hill landslide of August 1974 (during a dry season) broke a lab building at LBNL, took out a portion of a laboratory road, and was threatening UC Berkeley's Lawrence Hall of Science.

At the same time another landslide was developing above the Lab's corporation yard, threatening the University's Centennial Drive. Lennert's attempts to stop the slides by dewatering the hill area with horizontal hydraugers weren't working. The Shively well apparently stopped both slides.

In 1984 Converse Consultants, Inc. conducted investigations in the eastern portion of the Strawberry Canyon. Their findings were published in a report titled "Hill Area Dewatering and Stabilization Studies" which defined the location of the Lennert Aquifer in the following:

> Dewatering measures instituted by Lennert were based on the belief that the main reservoir of deep ground water in the hill area is the volcanic flow (i.e., fractured) rocks of the Moraga Formation situated within a synclinal structure underlying the ridge extending from LBL Building 62 northward to Little Grizzly Peak. These flow rocks were thought to be bottomed in the syncline by less permeable Orinda Formation bedrock (although some permeable sandstone and conglomerate beds within the Orinda exist, they are interbedded with impermeable shales and siltstones). Lennert asserted that ground water was also controlled in the hill area by faults such as the University Fault and the New Fault, which acted as groundwater barriers or as conduits for water flow through cracks and voids along these faults. Lennert also asserted that surface water entered these "tension faults", entering directly and quickly into the groundwater regime.

The location of the Shively well that drains the Lennert aquifer, hydraugers as well as sewers, and stormdrains at LBNL are also shown in Figure 4.

Little remains of the natural drainage network within LBNL boundaries, yet its natural pattern can been interpreted from historical photos and information from Soulé (1875), as shown in Figure 5. The drainage network does not depict differences in perennial versus intermittent or ephemeral flow; it simply indicates where well-defined channels are expected. The springs, however, do represent sites of presumed perennial wetness. Soulé indicated that several springs were developed for water diversion prior to his 1875 map. In Figure 5, the arrows represent where channels might have become non-distinct as they spread across their alluvial fans at the base of steep hillsides. Alluvial fans store bedload and often convert surface flow to subsurface flow over coarse-bedded, highly permeable alluvium.

Near the central and northern LBNL property, two areas show a particularly high density of channels per unit area. These correspond to two east-west trending valleys. The eastern valley is referred to as East Canyon and the central one is Chicken Ranch Canyon. The high density of channels in these valleys appears to be associated with large landslides

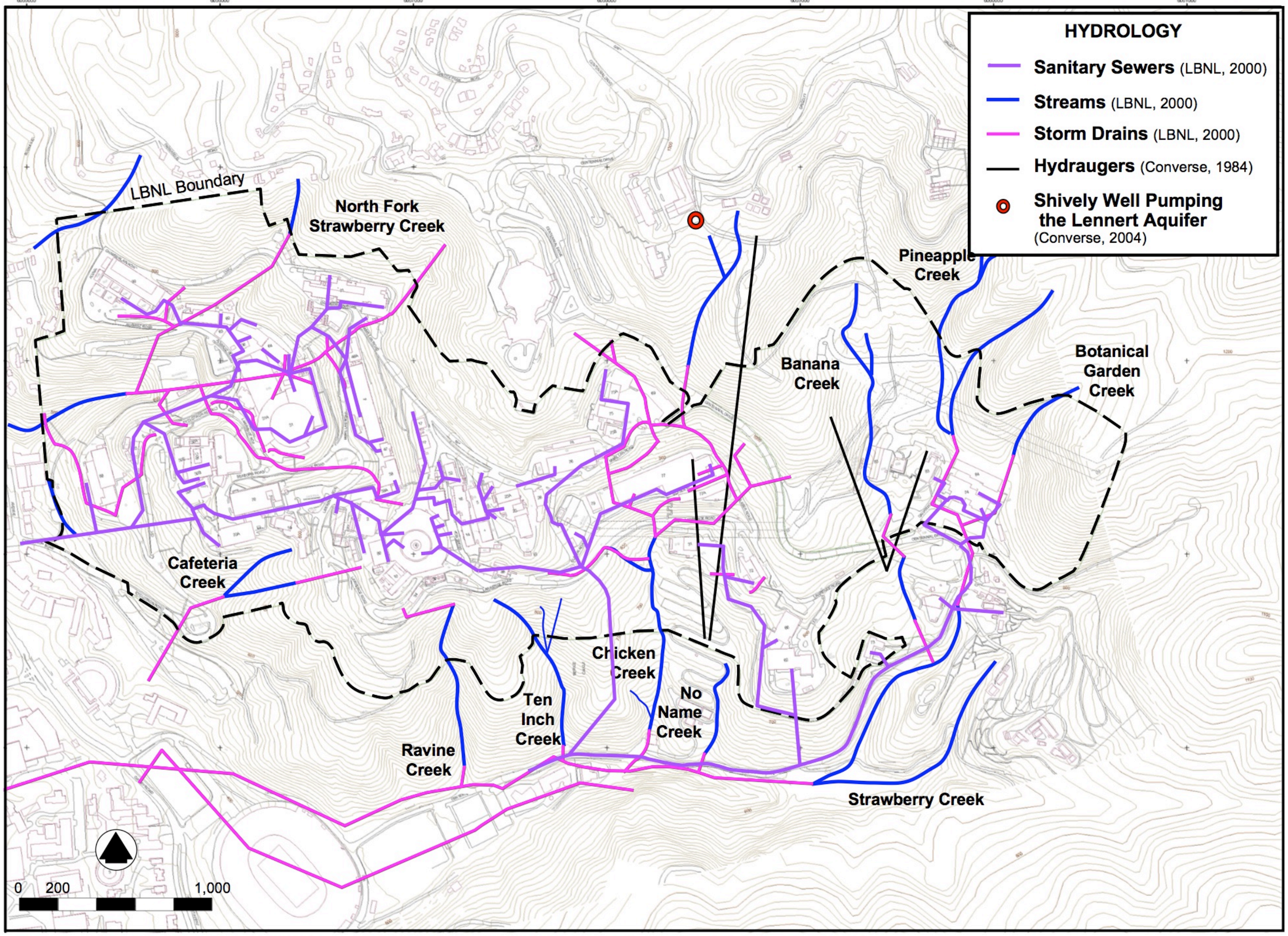


FIGURE 4. MODERN DRAINAGE NETWORK AT LBNL IN STRAWBERRY CANYON

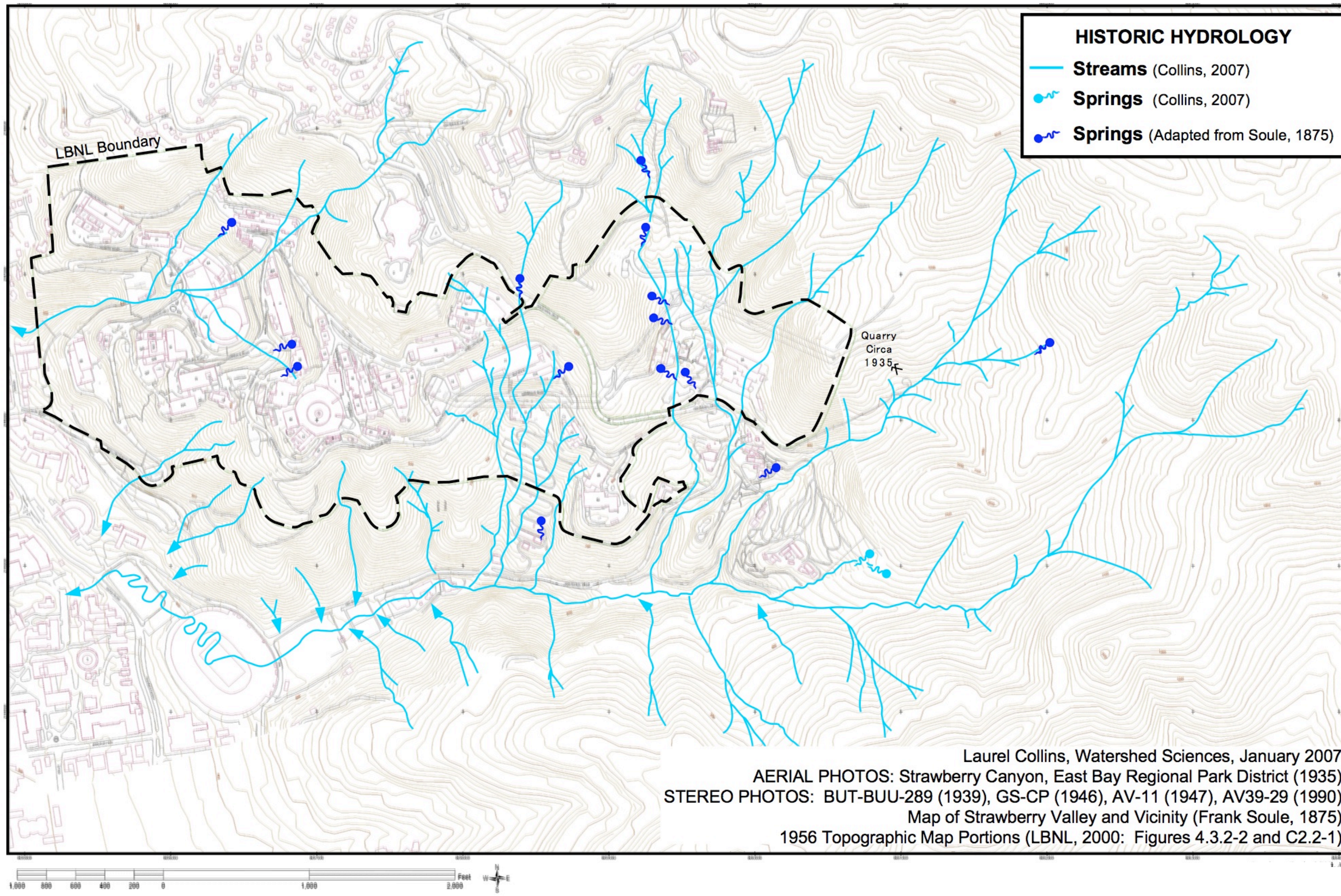


FIGURE 5. INTERPRETATION OF HISTORIC CHANNEL NETWORK AT LBNL IN STRAWBERRY CREEK WATERSHED

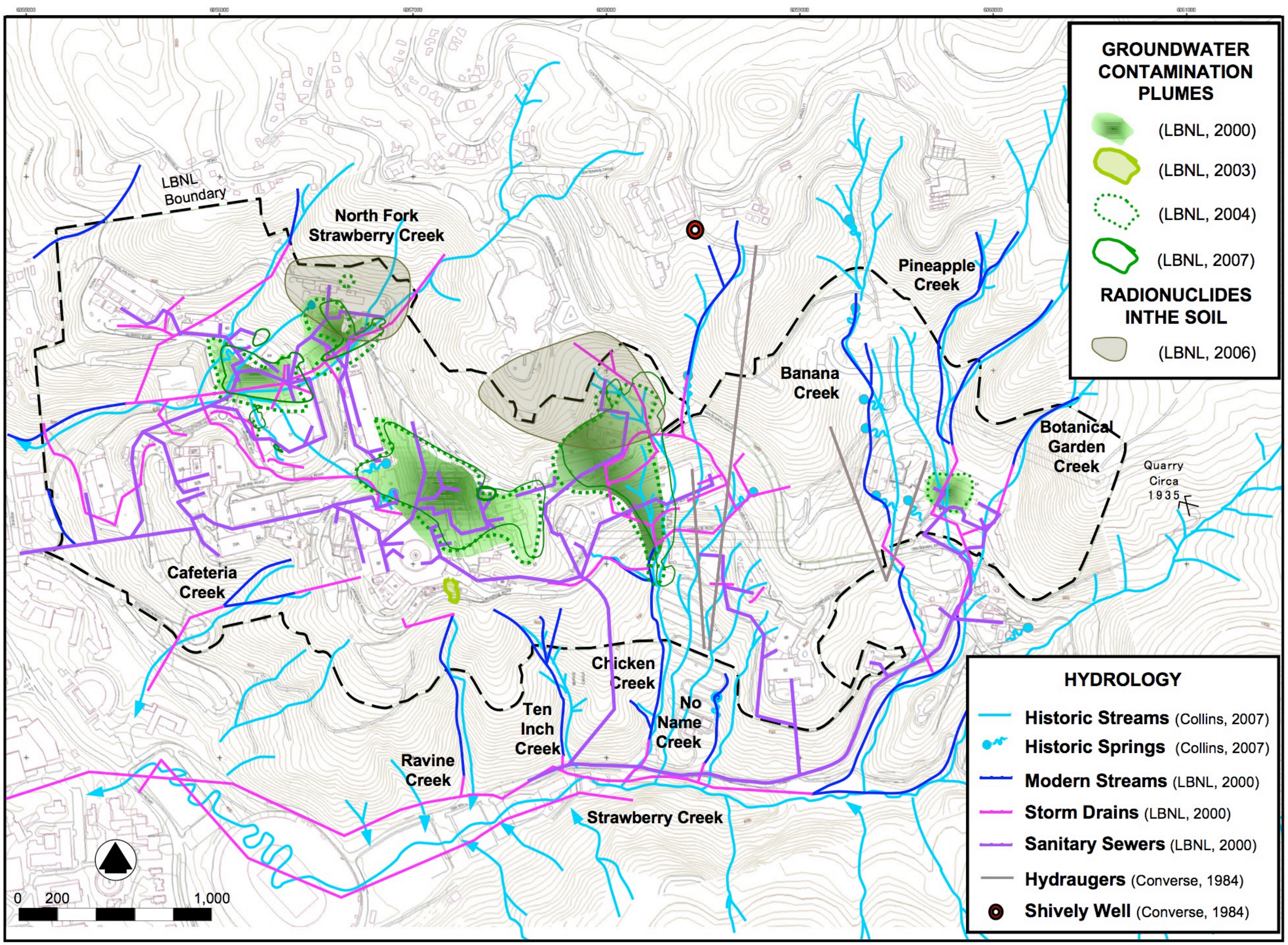


FIGURE 6. GROUNDWATER CONTAMINATION PLUMES IN RELATION TO THE MODERN AND HISTORIC DRAINAGE NETWORKS AT LBNL

that occupy the valley floors (Figure 7a). It is likely that highly erosive soils exist in the valley because they have been mechanically disturbed by both landsliding and faulting. In addition, the clay-rich nature of the soils and landslide deposits in these valleys often leads to slow percolation rates, especially along failure planes of earthflows, which can create perched water tables. These factors contribute to increased runoff per unit area, which leads to increased drainage density.

The historic drainage network helps with interpretation of topographic features such as the landslides in East and Chicken Creek Canyons, but it is also useful for showing movement along fault lines such as the Hayward Fault. At the bottom left corner of Figure 5, over 1200 feet of right lateral channel offset has occurred on Strawberry Creek along the area that is now the UCB stadium. Historic channel mapping is also important for predicting potential migration pathways of contaminant plumes along alluvial soils that might have been buried by large deposits of artificial fill, such as in Blackberry Canyon.

A compilation of the current and historic drainage network relative to the 2000, 2003, 2004, and 2007 LBNL contaminant plume locations is shown in Figure 6. Areas shown in grey indicate the location of radionuclides (tritium and curium 244) in soil (LBNL 2006). All the plumes, except Building 37 VOC plume, are shown to intersect historic drainage channels. Storm drains intersect all contaminant plumes except Building 37. The hydraugers do not appear to intersect plume boundaries, although the Building 74 Diesel Plume is very close to the northernmost hydrauger. The contaminant plumes have a general pattern of downhill convergence into both the historic channel and modern storm drain network.

Geologic Bedrock Mapping

The complex geology of Strawberry Canyon involves periods of volcanism, sedimentary deposition within fresh water and marine environments, tectonic uplift, folding, and significant shearing along fault zones that have offset different-aged terrains. LBNL (2000) describes the underlying geologic structure at the lab to be a northeast dipping faulted homocline. Generally, the oldest rocks occupy the lower portions of Strawberry Canyon, while youngest rocks are found toward the east along the ridge.

The middle of the Canyon is more complex with older bedrock formations faulted and offset against younger ones along the Space Science's fault, University fault, New fault, Strawberry Canyon fault, Lawrence Hall of Science fault complex and various un-named faults, as well as the Wildcat and East Canyon Faults. Bedrock of Jurassic to Cretaceous-aged Franciscan Assemblage is mostly to the west of the Hayward Fault, beyond Strawberry Canyon. In this area, these rocks are typically marine sandstones that are faulted against younger bedrock of the Great Valley Sequence along the Hayward Fault at the base of the canyon.

The Cretaceous-aged Great Valley Sequence also has a marine origin. It ranges from mudstone and shale to sandstone with occasional conglomerate. The Great Valley Sequence is in fault contact with the Late to Middle Miocene-aged Claremont and the Late Miocene-aged Orinda Formations in different parts of the Canyon. The Claremont Formation is primarily siliceous chert inter-bedded with shale that formed in a deep marine environment.

Locally the chert is commonly highly fractured, folded, and faulted. It tends to form erosion resistant outcrops along some ridges.

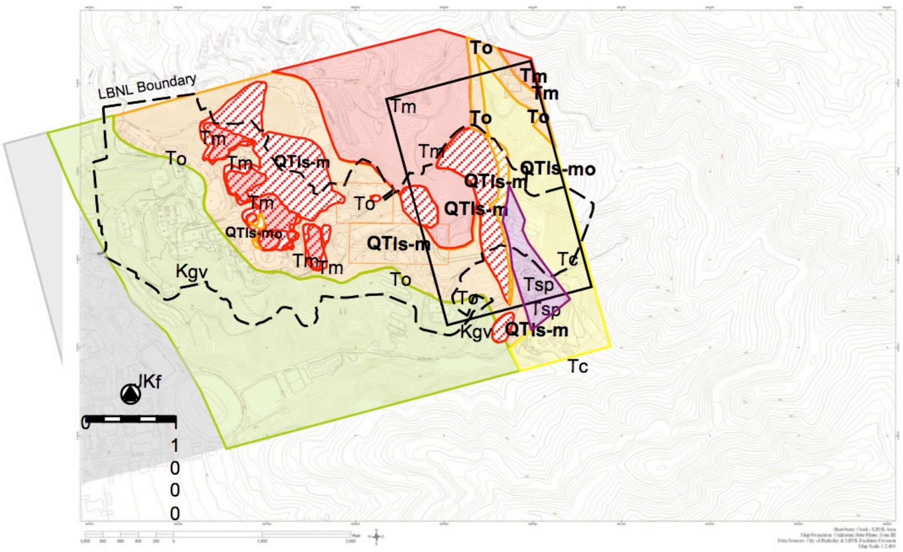
Conversely, the Orinda is primarily mudstones, sandstones, and minor conglomerates that formed in a non-marine environment. The predominantly clay-rich Orinda shale unit tends to be associated with topographic valleys and is particularly prone to deep-seated landslides. Orinda is stratigraphically overlain and occasionally inter-fingered with the Late Miocene Moraga Formation, which is volcanic in origin and locally tends to be highly fractured, jointed, brecciated, and commonly vesicular (LBNL, 2000). In some places, it has been faulted and offset against the Orinda, especially to the west of the Wildcat Fault.

Although both Orinda and Moraga Formations are highly fractured, the Moraga has hard volcanic flow rocks of andesite and basalt while the Orinda tends to have low strength and hardness. The Moraga Formation is overlain and in contact with the Late Miocene non-marine sedimentary deposits of the Siesta Formation along the northeastern ridgeline. Beyond the ridge, the volcanic rocks of the Late Miocene Bald Peak Formation overlay the Siesta Formation along the axis of a structural syncline (Graymer, 2000).

Figures 7a, 7b, and 7c show interpretations of the geology in Strawberry Canyon that are different. Although the maps also have slightly different spatial extents, they overlap through most of the LBNL property. All maps identify the Orinda, Moraga, and Claremont Formations, yet the location of the bedrock boundaries do not agree. There are also some slight naming differences for the Great Valley Group rocks identified by LBNL and Graymer versus the Panoche Formation identified by Borg. The Panoche Formation simply represents a part of the Great Valley Group and is therefore not a significant difference in interpretation. Dunn (1976) reported that with regard to slope stability, the worst building sites in Strawberry Canyon were along the Orinda, and the Orinda/Moraga contact zones. The principal formations shown to be intersecting the contaminant plume sites are the Orinda and Moraga Formations, Figures 8a and 8b.

Figure 8a shows a compilation of the Moraga bedrock contacts as individually mapped by LBNL, Graymer, Collins, and Borg in the respective Figures 7a, 7b, 7c, and 7d. Figure 8b shows a compilation of bedrock contacts of the Orinda Formation. Note that the Building 51L and 61/64 plumes intersect rocks of the Great Valley Sequence. The location of bedrock contacts near the plume sites is particularly important because ground water can travel laterally along the contact zone rather than just move topographically downhill. This is particularly relevant when sharp reductions in permeability occur in the downhill bedrock. Soil permeability and transmissivity are much greater in the Moraga Formation because it has lower clay content than the Orinda.

When groundwater traveling from the Moraga Formation intercepts the Orinda Formation, positive pore pressures can build, forcing water to move along alternative pathways such as along a bedrock contact, through fractures, or toward the surface where it can cause landslides and/or springs. Interpretation of the size of each contaminant plume and its migration is constrained by the array and number of sampling wells. If water laterally.



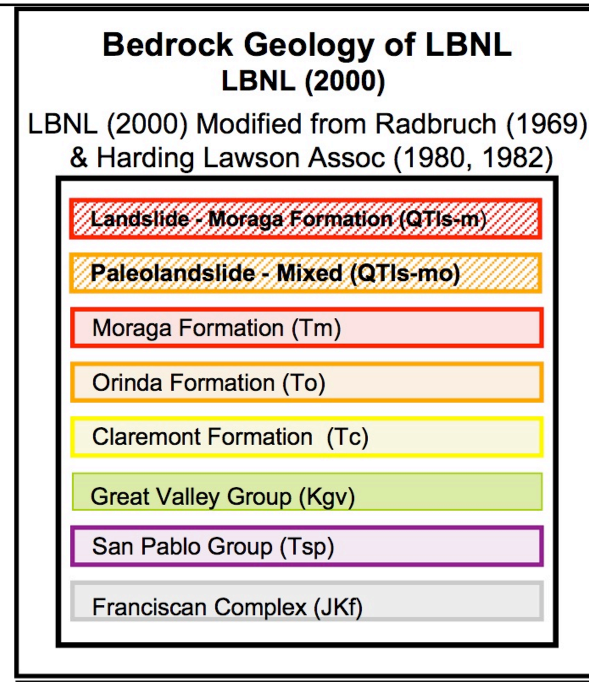
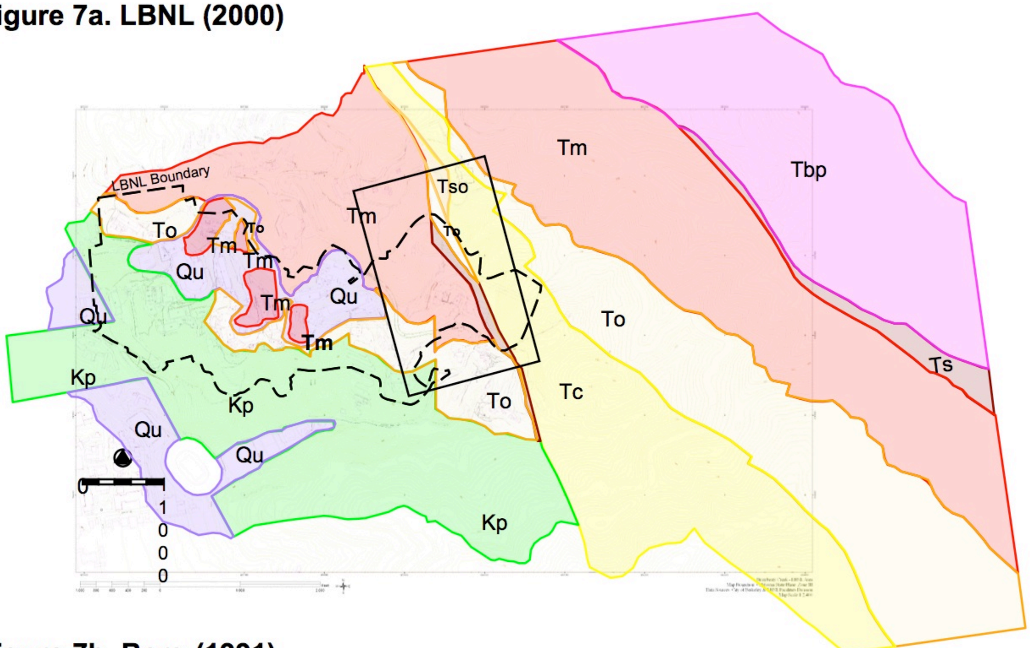


Figure 7a. LBNL (2000)



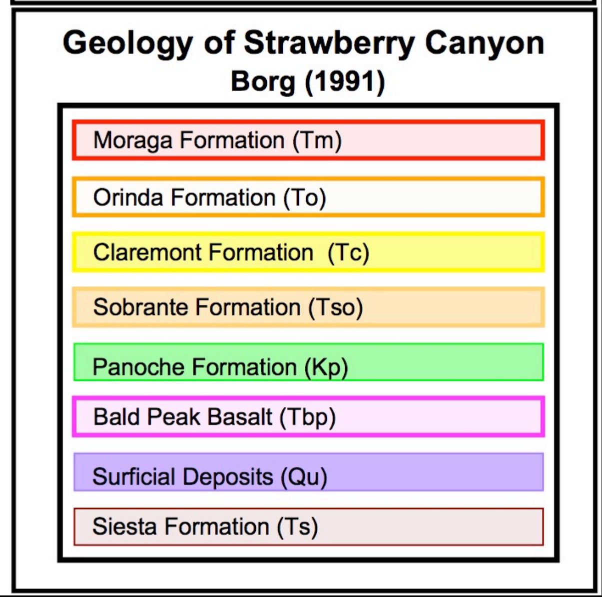


Figure 7b. Borg (1991)

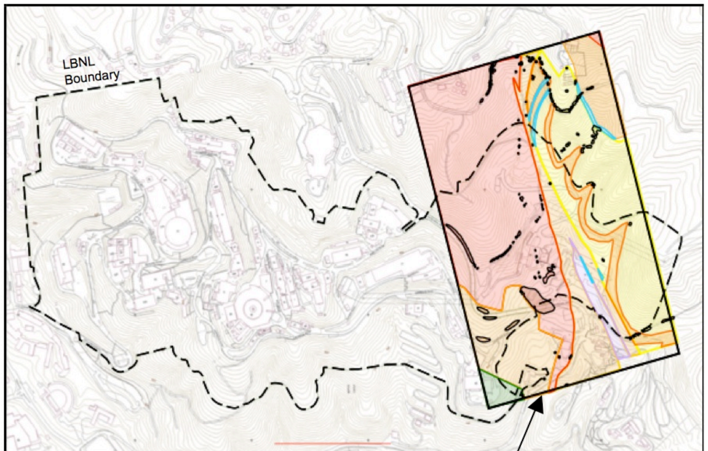


Figure 7c. Collins (1993)

Geology of the East Canyon and the Proposed Hazardous Waste Handling Facility (Collins 1993)

- Moraga Formation (Tm)
- Orinda Formation (To)
- Claremont Formation - Chert Outcrop (Tc)
- Claremont Formation - Sandstone Outcrop (Tc-ss)
- Claremont Formation - Shale outcrop (Tc - sh)
- Miocene and Upper Eocene Sediments (Tm-e)
- Upper Cretaceous Sediments (Ku)
- Landslides (LBNL Plant Eng, 1981)

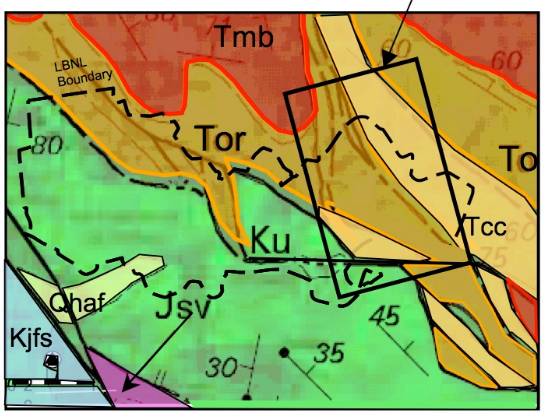


Figure 7d. USGS, Graymer (2000)

Geology in the LBNL Area USGS, Graymer (2000)

- Moraga Formation (Tm)
- Orinda Formation (To)
- Claremont Chert (Tcc)
- Holocene Alluvial Fan (Qhaf)
- Upper Cretaceous Sediments (Ku)
- Jurassic Keratophyre (Jsv)
- Franciscan Complex Sandstone (Kjfs)

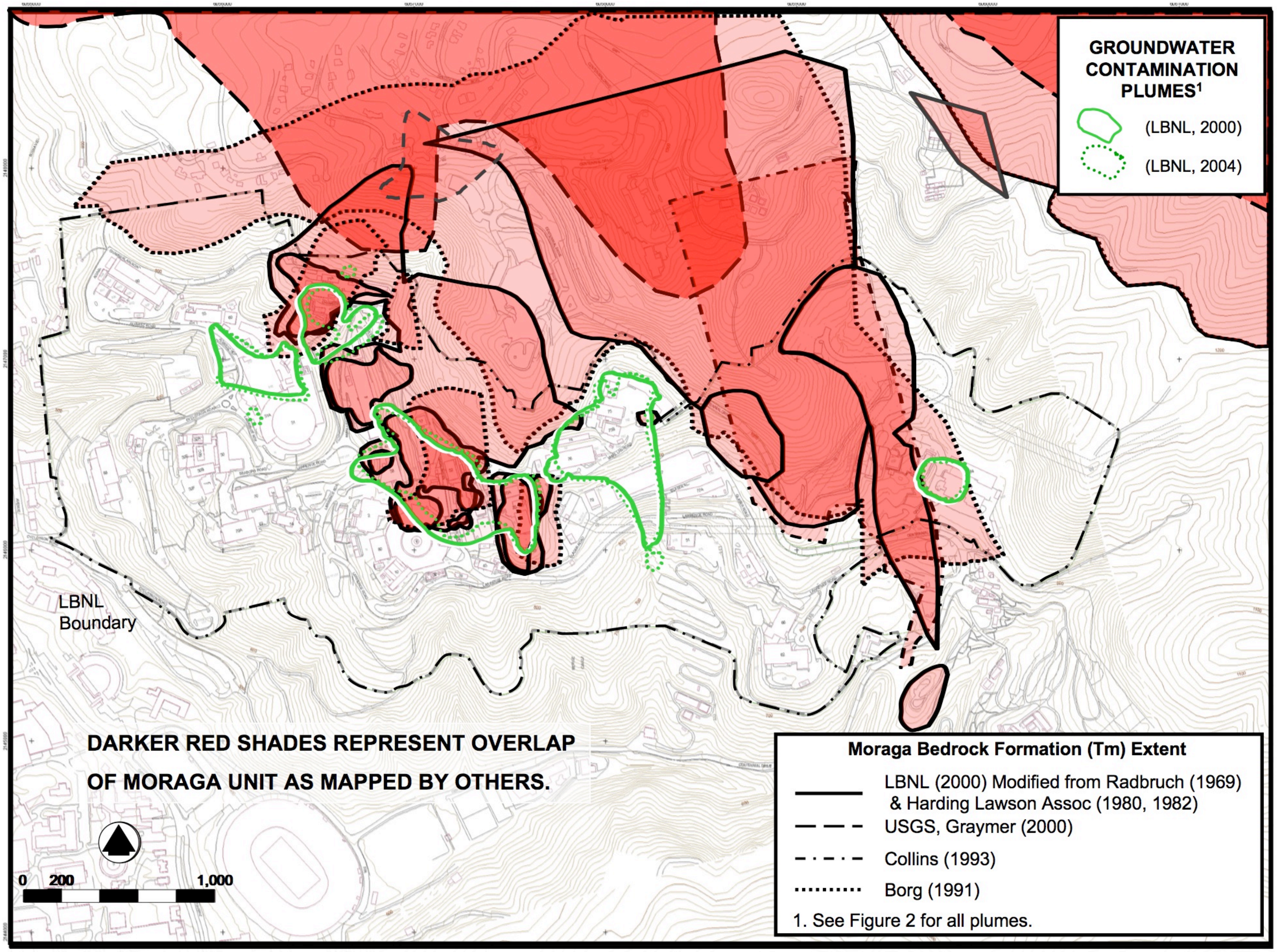


FIGURE 8a. COMPILATION OF GEOLOGIC MAPPING OF MORAGA BEDROCK FORMATION AT LBNL.

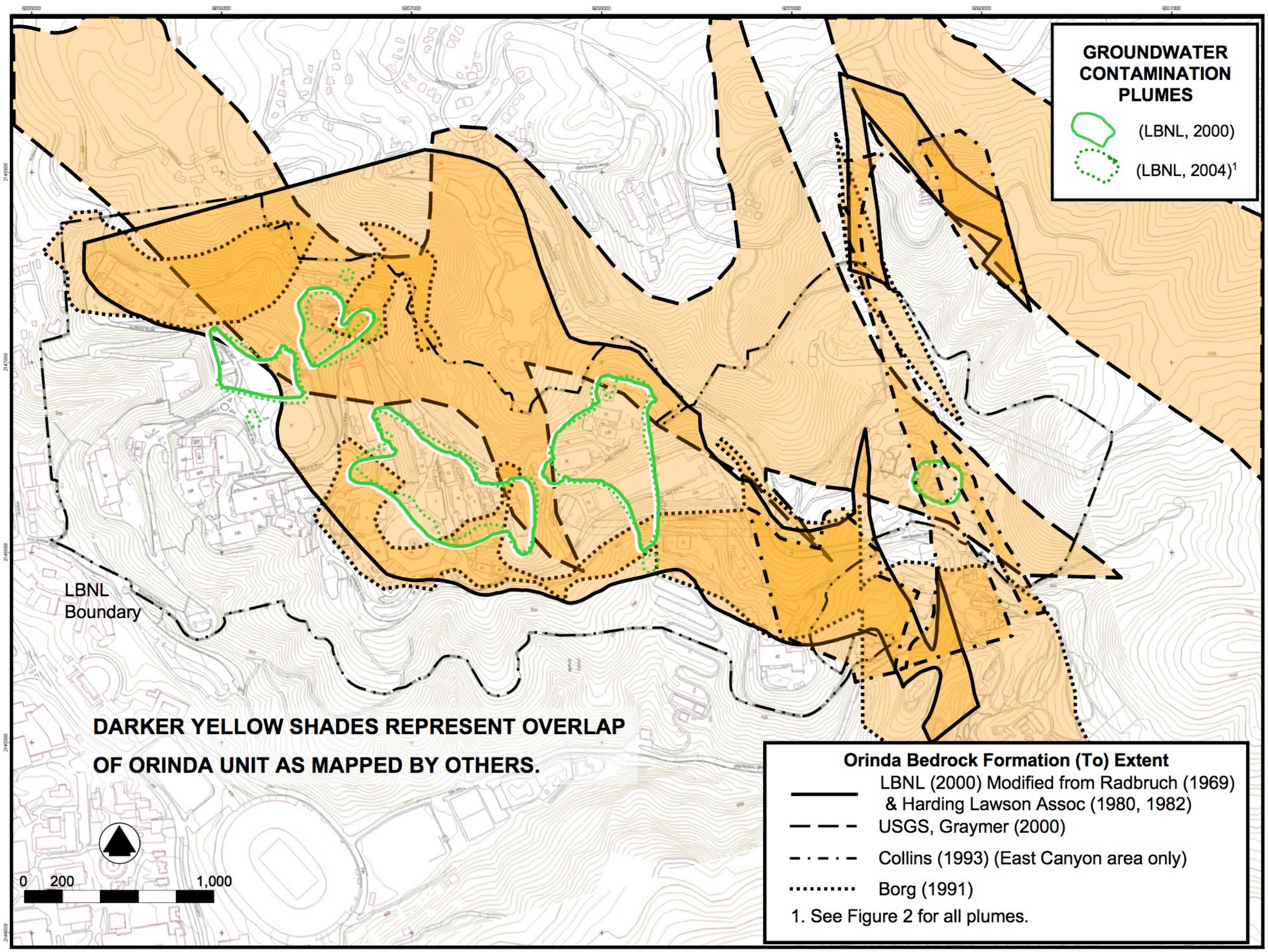


FIGURE 8b. COMPILATION OF GEOLOGIC MAPPING OF THE ORINDA BEDROCK FORMATION AT LBNL

migrates along a bedrock contact and if monitoring wells are not placed in a sufficient array to detect these potential flow pathways, the extent and migration of a plume could be easily misinterpreted. Figure 8a and 8b show substantial differences in the interpretation of the location of the bedrock contacts at nearly every plume site.

During the past 60 years, UCB and LBNL have produced innumerable investigations and geotechnical reports for existing and proposed building sites in Strawberry Canyon. Yet, agreementon the position of faults, landslides, and bedrock contacts has not been consistent among these reports. The lack of continuity among the various reports has been noted by previous researchers who have called for a more comprehensive effort to produce a verifiable picture of landslides and geology (Dunn 1976; Collins, 1993; Collins and Jones, 1994).

For example, in 1976 J. Dunn stated that with regard to instability of hillsides near Buildings 46 and 77, most activity involved failure of material in the Orinda Formation or sliding of the Moraga Volcanics on the Orinda. Although borings had been completed, samples recovered, and tested, he reported that the results and conclusions had not been tied together in a workable package. An earlier report by Collins (1993), recommended that "raw" geological observations such as bedrock outcrops should be shown on future geological investigations and that such maps should be an essential component of an integrated, comprehensive, and computerized database for the LBNL site.

With LBNL producing a GIS-based three-dimensional view of their local geologic interpretations, much has been accomplished since 1993. Yet, a verifiable map showing locations of bedrock outcrops and exposures in excavations remains elusive. Hence, it still remains unclear what information has or has not been used as a foundation for LBNL's geologic map, and why their interpretations differ from reports by their previous consultants

Fault Mapping

The Hayward Fault is part of the larger San Andreas Fault system. It is seismically active and falls within the Alquist Priolo Earthquake Fault Zone, Figure 2. Numerous secondary splay faults are also associated with the Hayward Fault, such as the Wildcat and East Canyon Faults that trend northwestward through East Canyon, Figure 9a. As shown in Figures 9b and 9c, these named faults, as well as the Space Science's Fault, University Fault, New Fault, Strawberry Canyon Fault, Lawrence Hall of Science Fault Complex and numerous un-named faults have been mapped by other researchers. Whether or not a fault has been named or identified within the Alquist Priolo Earthquake Zone does not mean that it is not imperative to show it on geologic maps, especially to relate its position to known contamination sites, especially when the information already exists in published reports.

With respect to plume migration, to identify whether a fault is active is not as important as identifying its potential influence on groundwater transport. Without sufficient understanding of fault locations, planning where to place monitoring wells for defining and constraining plume boundaries cannot be well founded. Fault mapping is also clearly important for identifying potential hazards to buildings and infrastructure, particularly because splay faults and other faults in close proximity to the Hayward Fault have potential to rupture during large magnitude quakes, especially those emanating nearby.

Figure 10 shows the plume locations and a compilation map of the faults shown by various researchers in Figures 9a, 9b, and 9c. As noted in Figure 10, we call the fault that runs along the Bevatron (Building 51a) and the Advanced Light Source (Building 6) the Cyclotron Fault. The compilation indicates that fault mapping by LBNL does not correspond well with faults mapped by USGS (2007), Converse Consultants (1984), Harding Lawson (1979), or Lennert Associates (1978). Although there is some general agreement about the Hayward, Cyclotron, and Wildcat Faults, there is poor agreement on the existence and location of many of the other faults mapped by others within the LBNL property boundary.

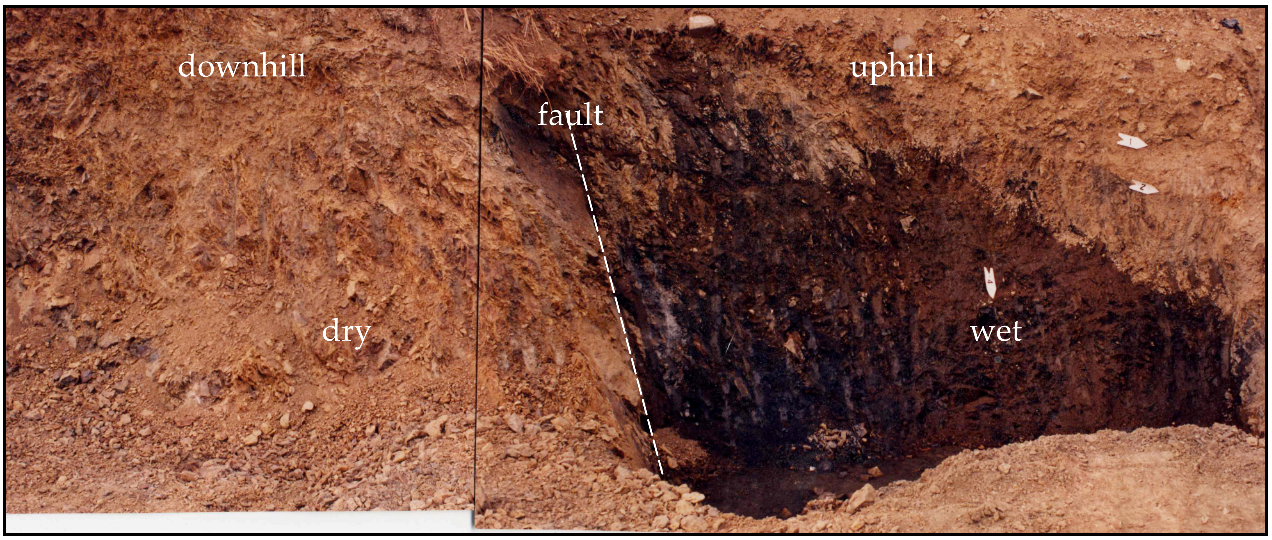


Photo 1. A nearly vertical fault in the Berkeley hills is impeding downhill transport of groundwater, causing it to flow laterally along the fault trace. Water is collecting in a pool at the base of the wet side of the excavation.

During grading operations for the construction of the new LBNL Hazardous Waste Handling Facility and throughout many new excavations in the Berkeley hills, conducted during the 1993 Oakland Hills post-fire reconstruction, Collins and Jones (1994) stated that they made numerous observations of faults exerting strong control on groundwater movement and swale development. Photo 1 shows an example of one of the sites they observed in the Berkeley Hills where groundwater flow moved laterally along a fault plane that impeded downslope groundwater transport. They also observed that the location of crown scarps of several recently active earthflows in the Berkeley Hills corresponded to the location of fault traces. They suggested that fault traces in many areas of the Berkeley Hills are masked by younger deposits of sediment from landslides and streams.

It is important to consider that when excavations expose faults or when utility trenches intersect faults that also intersect contaminated groundwater, the excavations or trenches can become additional avenues for contaminant plume migration. Also important to consider is that zones of varying permeabilities in clay-rich fault gouge can provide traps and pathways for moving water, and in some cases, the traps can build enough pressure to initiate landslides and potentially convert the subsurface flow to surface flow.

Potential problems associated with the lack of definitive geologic mapping in Strawberry Canyon are increased by the proximity of the active Hayward Fault and related seismicity. According to Steinbrugge, et al, (1987) the maximum magnitude earthquake anticipated is 7.5, which has the potential of causing right-lateral horizontal offsets that could average 5 feet along the Hayward Fault. Hoexter (1992) reported that there was potential for secondary or splay faults in the East Bay to have triggered slip from quakes generated along the primary Hayward Fault. Wildcat Fault appears to be a likely splay from the Hayward Fault. Hoexter's survey of historical earthquakes indicated that triggered slip on splays have movement that is usually less than 20% of the primary offset. This suggests that 1.5 feet of horizontal offset on a splay fault from the Hayward Fault could be anticipated if the maximum magnitude quake occurred. Hoexter also reported that vertical displacements could accompany horizontal slip, although a much smaller percentage of total movement would be expected. Such projections of horizontal and vertical offsets along secondary faults should be sufficient to warrant more detailed mapping of fault patterns within Strawberry Canyon.

We believe that sufficient information is not available from the literature to confidently determine the activity status of the numerous faults that exist along the Wildcat Fault shear zone, which may be as much as 600 feet wide and includes the East Canyon Fault (Collins, 1993). Published USGS maps in this report are not of adequate detail or scale to delineate all the bedrock complexity of Strawberry Canyon, yet more detail is shown by USGS than that which LBNL represented on their Bedrock Geology Map, provided in their investigative RFI report (LBNL, 2000). This is perplexing because much geologic complexity has been demonstrated in previous reports and investigations conducted by LBNL's own geotechnical consultants. For example, Figure 11 shows a compilation map detail of faults mapped by various consultants and researchers for just the East Canyon (Collins, 1993). Figure 11 demonstrates general agreement that the Wildcat Fault exists, but poor agreement on its location or number of traces within its shear zone. This site is important because it is the location of the diesel fuel plume near Building 74, and is the proposed location for new buildings in the East Canyon described in the recent LBNL LRDP Report (2007).

During the grading operations for the LBNL Hazardous Waste Handling Facility (Building 85), numerous northwest and east-west trending faults were exposed near the Wildcat Fault shear zone northwest of LBNL Building 74. So many faults were intersected that it brought into question whether the previous 1980 Harding Lawson report by Korbay and Lewis, called the Wildcat Fault Investigation (performed for Building 74), was actually sufficient to evaluate the Wildcat shear zone. The trench was located more than 1000 feet north of Building 74 and inconsistencies within the trench logs confounded interpretation of vertical displacements at the fault trace (Collins, 1993). Further concern arises about the activity status of Wildcat Fault because according to King (1984) and verbal communication from Curtis (1993), a disagreement occurred at the trench site between investigators Steve Korbay of Harding Lawson Associates and Dr. Garniss Curtis of UCB Department of Earth and Planetary Science. Curtis believed there was sufficient evidence in the trench site to designate the Wildcat Fault active, while Korbay did not.

LBNL does not show the Wildcat Fault as active (LBNL, 2000) and we are not presently aware of any additional trench investigations that have been conducted on the Wildcat Fault since 1980. Additional lines of evidence concerning fault activity in Strawberry Canyon, however, can be gleaned from maps showing the epicenters of local seismicity. In Figure 12a, we compiled the fault mapping by others from Figures 9a, 9b, and 9c and overlaid the epicenters of seismic events that have occurred in the Strawberry Canyon during the last 40 years. Over 57 earthquakes with Richter Magnitude between 1.8 and 3.0 have occurred in Strawberry Canyon. Such a high incidence of microseismicity within the mapped traces of Wildcat Fault and between the Wildcat and the Cyclotron Faults provides compelling evidence that additional faults other than just the Hayward should be considered as active in Strawberry Canyon. Indeed, recently during March 2007 two small earthquakes, magnitude 2.0 and 1.4, shook the Canyon along an un-named fault and the Hayward Fault, respectively (http://quake.wr.usgs.gov/recenteqs/).

During the 1991 excavation for Building 84 in the East Canyon, Collins, Jones, and Curtis observed bedrock contacts and numerous fault exposures in the excavated bedrock at the building site. Of particular significance was the discovery of an entire geologic bedrock unit, the Briones Formation, which had never before been mapped in Strawberry Canyon. The Briones outcrop, which was full of marine shell fragments, was interpreted as a tectonic block that has been dragged along the Wildcat Fault during the last 10 million years. Its displacement might exceed 9 miles, which is twice the amount previously considered possible along this fault (personal communication Dr. D. Jones, UCB Department of Earth and Planetary Science).

Pat Williams (former LBNL staff Scientist Earth Sciences Division) speculated that a structural connection might exist between the active Hayward and Pinole Faults, and that the linkage might be associated with the Wildcat Fault (personal communication, 1992). Bishop (1973) documented evidence of active creep along the Wildcat Fault north of El Cerrito. During a 1971 survey of the East Bay Municipal Utility District water tunnel (between San Pablo Reservoir and the Kensington Filtration plant), vertical and right lateral displacements were documented near the Wildcat Fault shear zone. Taylor (1992) reports that the pattern of fault creep observed in the Montclair area (south of Berkeley) and elsewhere along the Hayward fault indicates that the broad fault zone might contain more than one Holocene active fault trace.

During the winter of 1992, another subsurface trench investigation was conducted on the East Canyon Fault. It was performed by Geo Resource Consultants and LBNL staff for LBNL. Evidence of both vertical and horizontal offset was discovered. This dual type of motion is probably typical for faults in the Canyon. Jones and Brabb (1992) suggest that significant displacement has occurred across the Berkeley Hills from combined strike-slip and thrust movements. Jones (1992) reports that most of the major strike-slip faults in the

FIGURE 9. SELECTED EXAMPLES OF FAULT MAPPING STUDIES AT LBNL IN STRAWBERRY CANYON

FAULTS

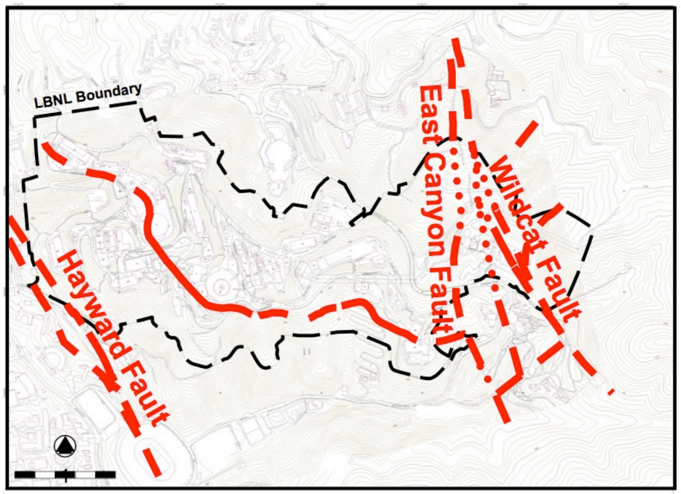


FIGURE 9a. LBNL (2000) Based on:
Harding-Lawson (1980, 1982), Radbruch (1969)

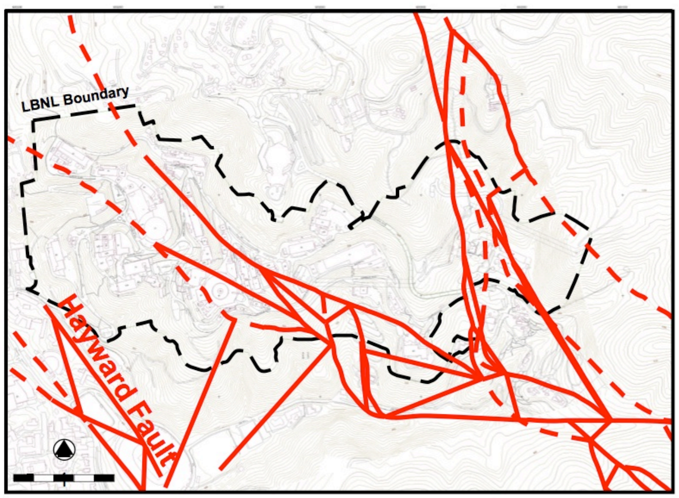


FIGURE 9b. USGS on Google Earth (2007)

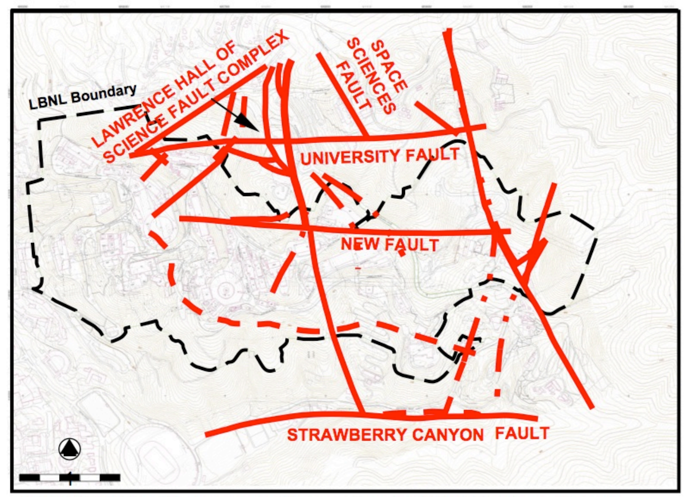


FIGURE 9c. Converse Consultants (1984) Based on:
Harding-Lawson (1979), Lennert & Associates (1978)
(Mapping does not include western portion of LBNL.)

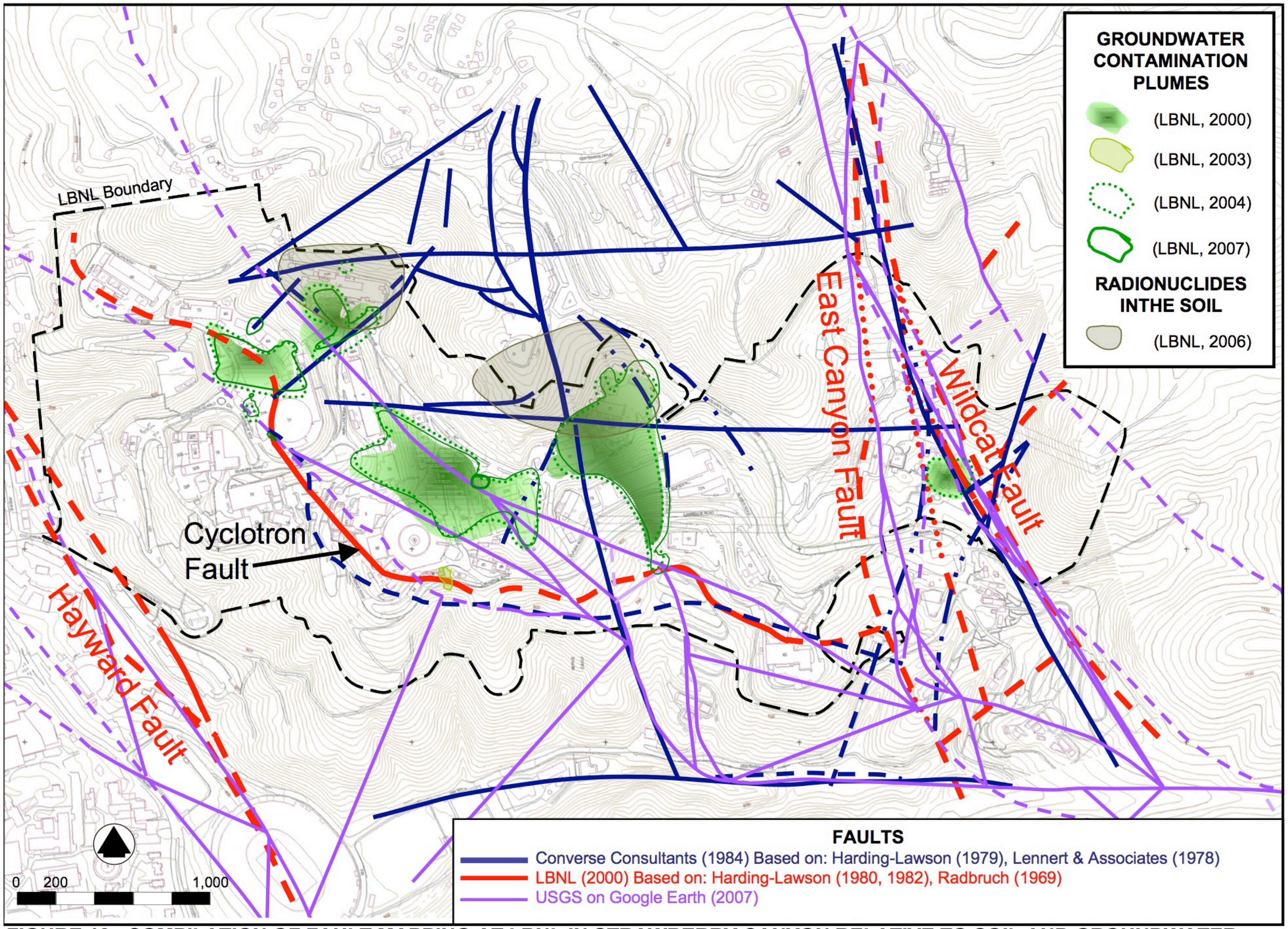


FIGURE 10. COMPILATION OF FAULT MAPPING AT LBNL IN STRAWBERRY CANYON RELATIVE TO SOIL AND GROUNDWATER CONTAMINANT PLUMES.

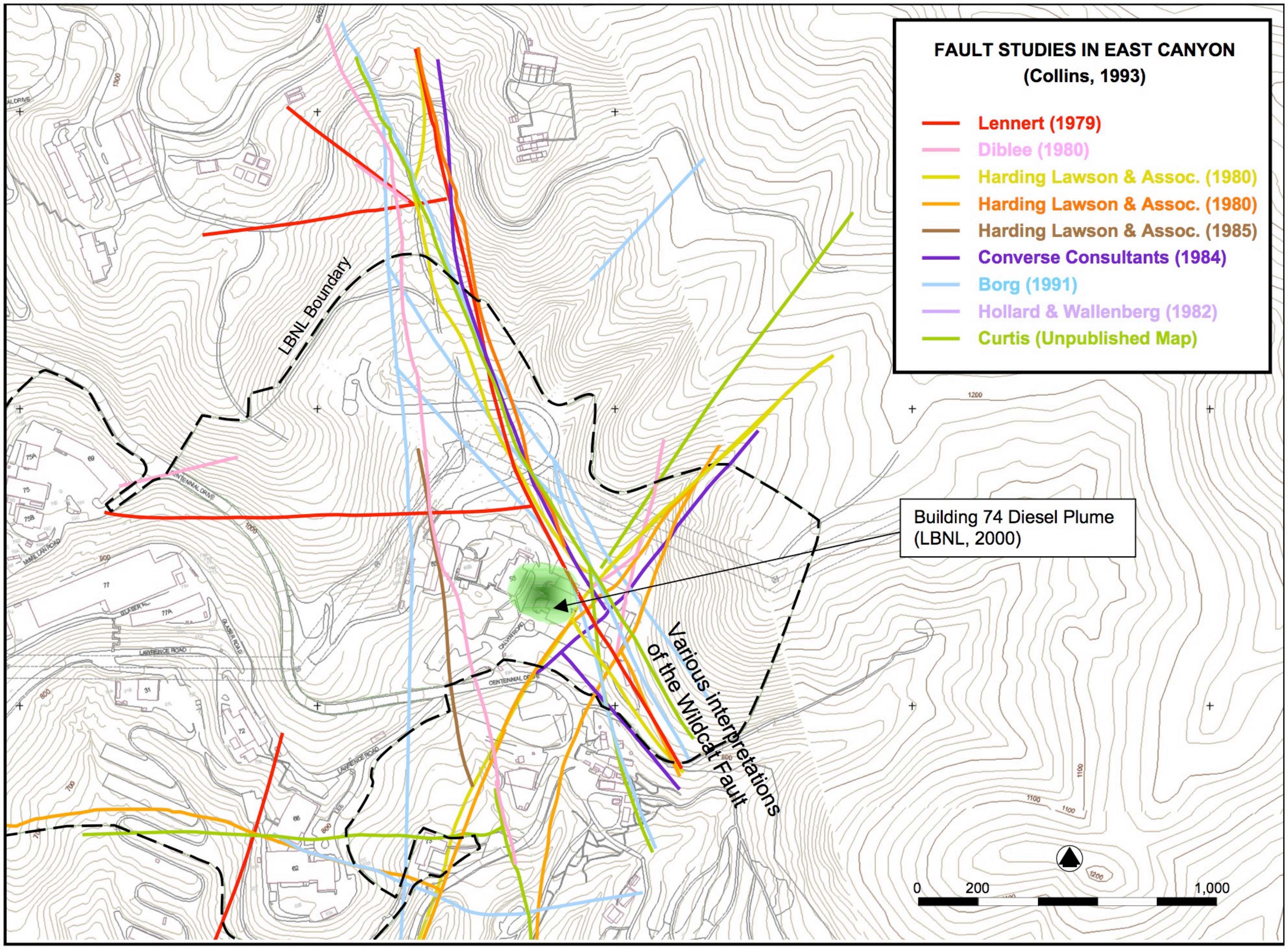


FIGURE 11. COMPILATION OF FAULT MAPPING AT LBNL IN EAST CANYON

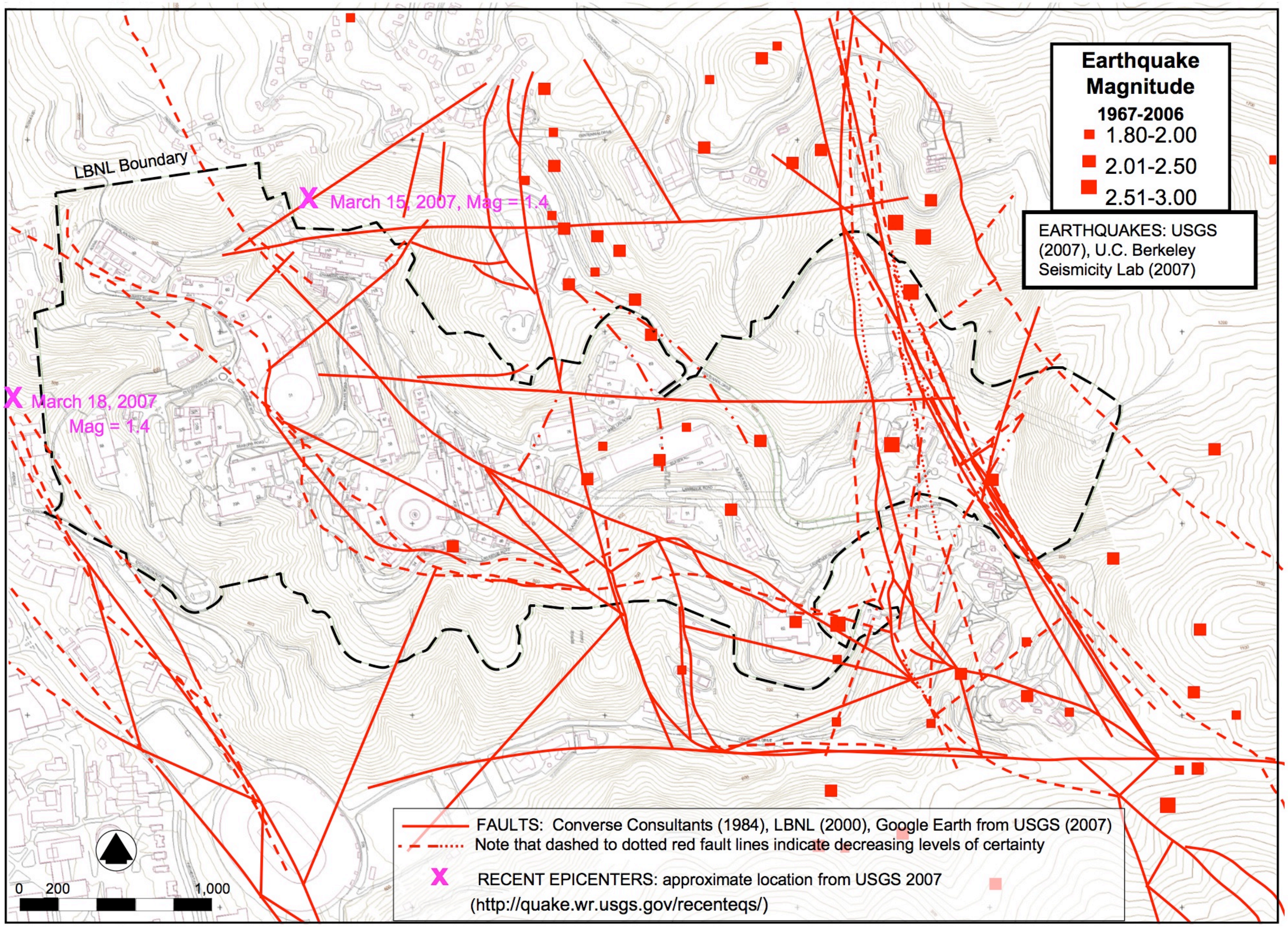


FIGURE 12a. EARTHQUAKE EPICENTERS AND FAULT COMPILATION AT LBNL IN STRAWBERRY CANYON 1967 - 2007

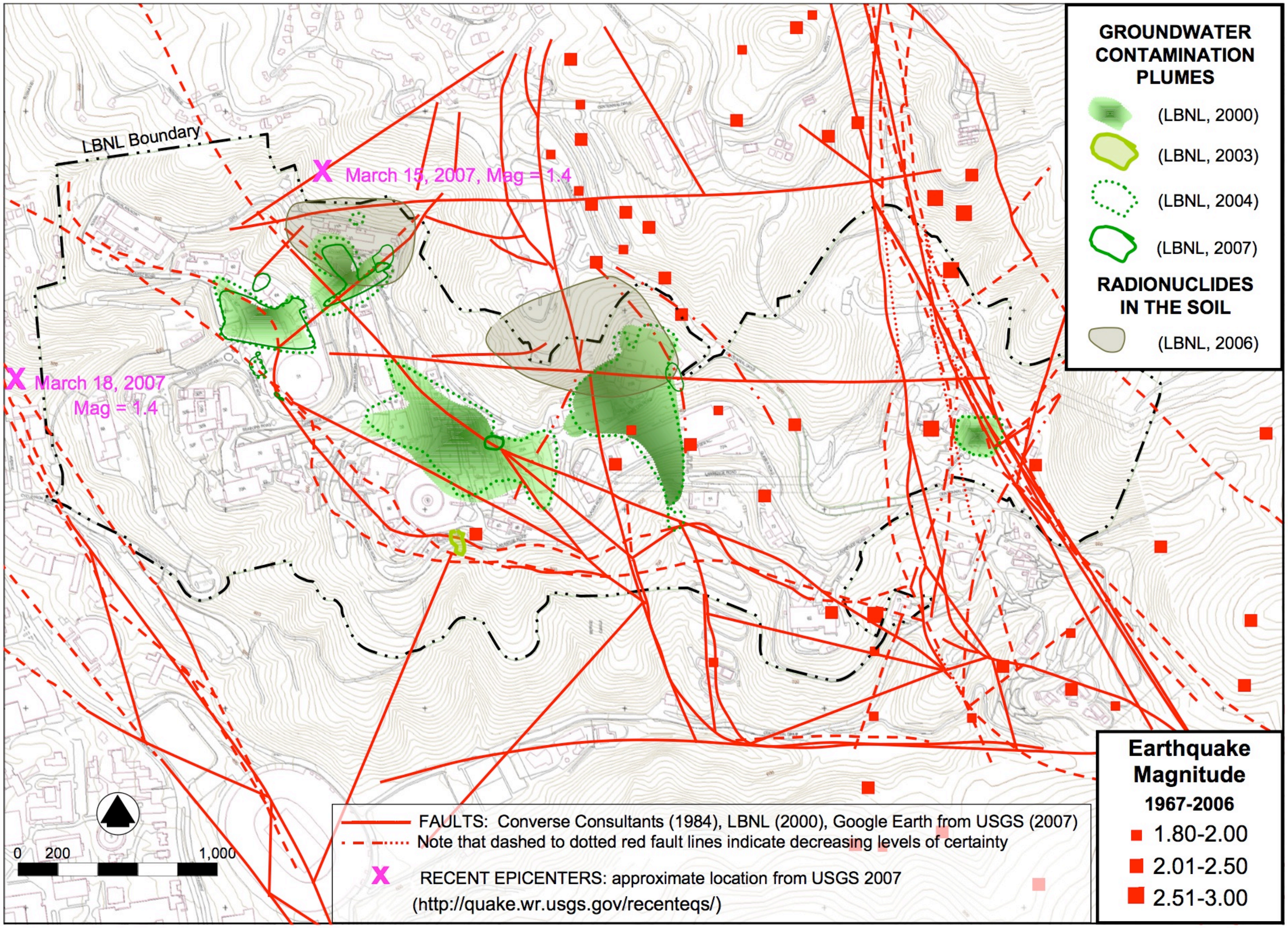


FIGURE 12b. GROUNDWATER CONTAMINATION PLUMES AND RADIOACTIVE CONTAMINATION IN SOIL RELATIVE TO FAULTS AND EARTHQUAKE EPICENTERS AT LBNL IN STRAWBERRY CANYON

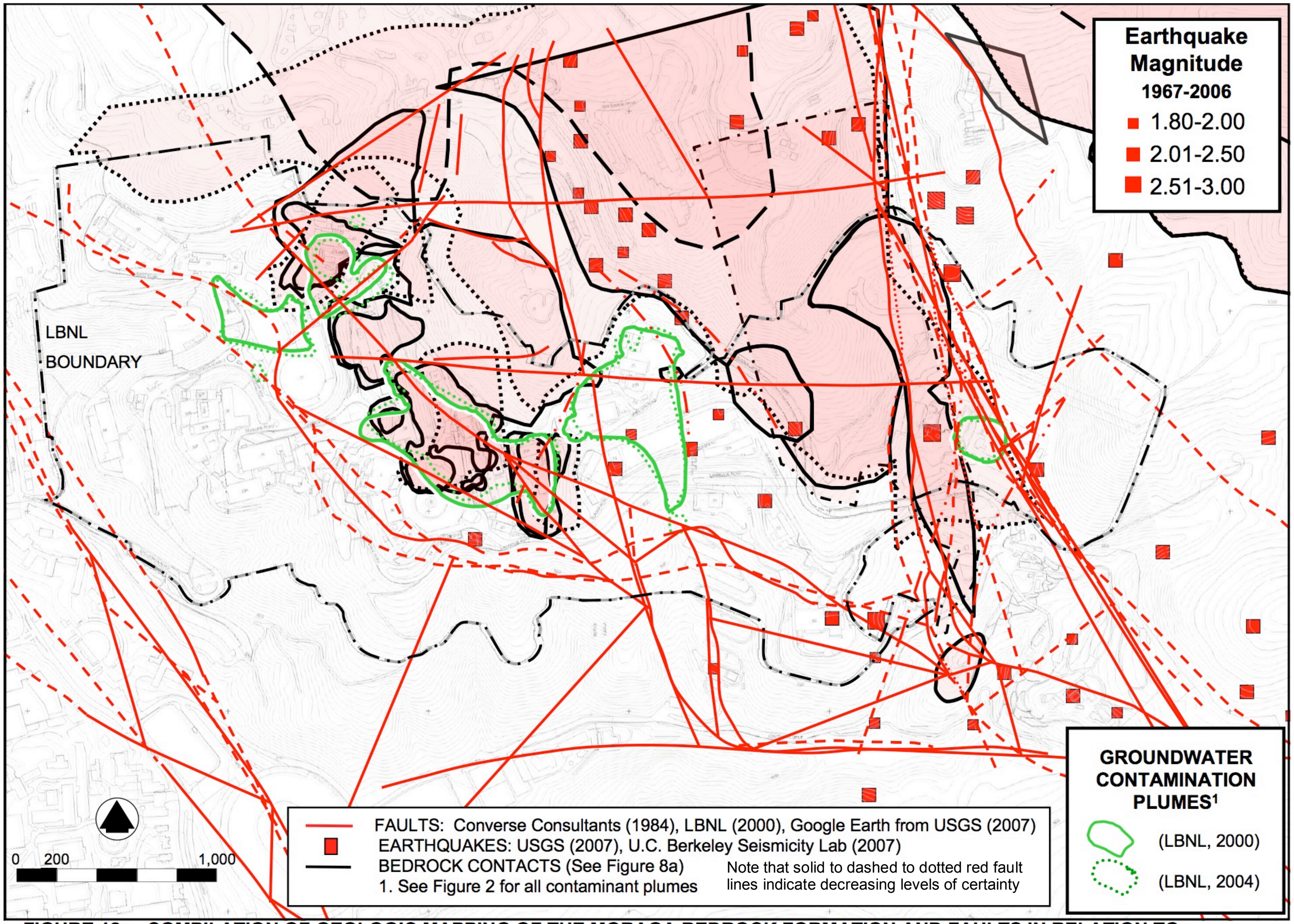


FIGURE 12c. COMPILATION OF GEOLOGIC MAPPING OF THE MORAGA BEDROCK FORMATION AND FAULTS IN RELATION TO CONTAMINANT PLUMES AT LBNL IN STRAWBERRY CANYON

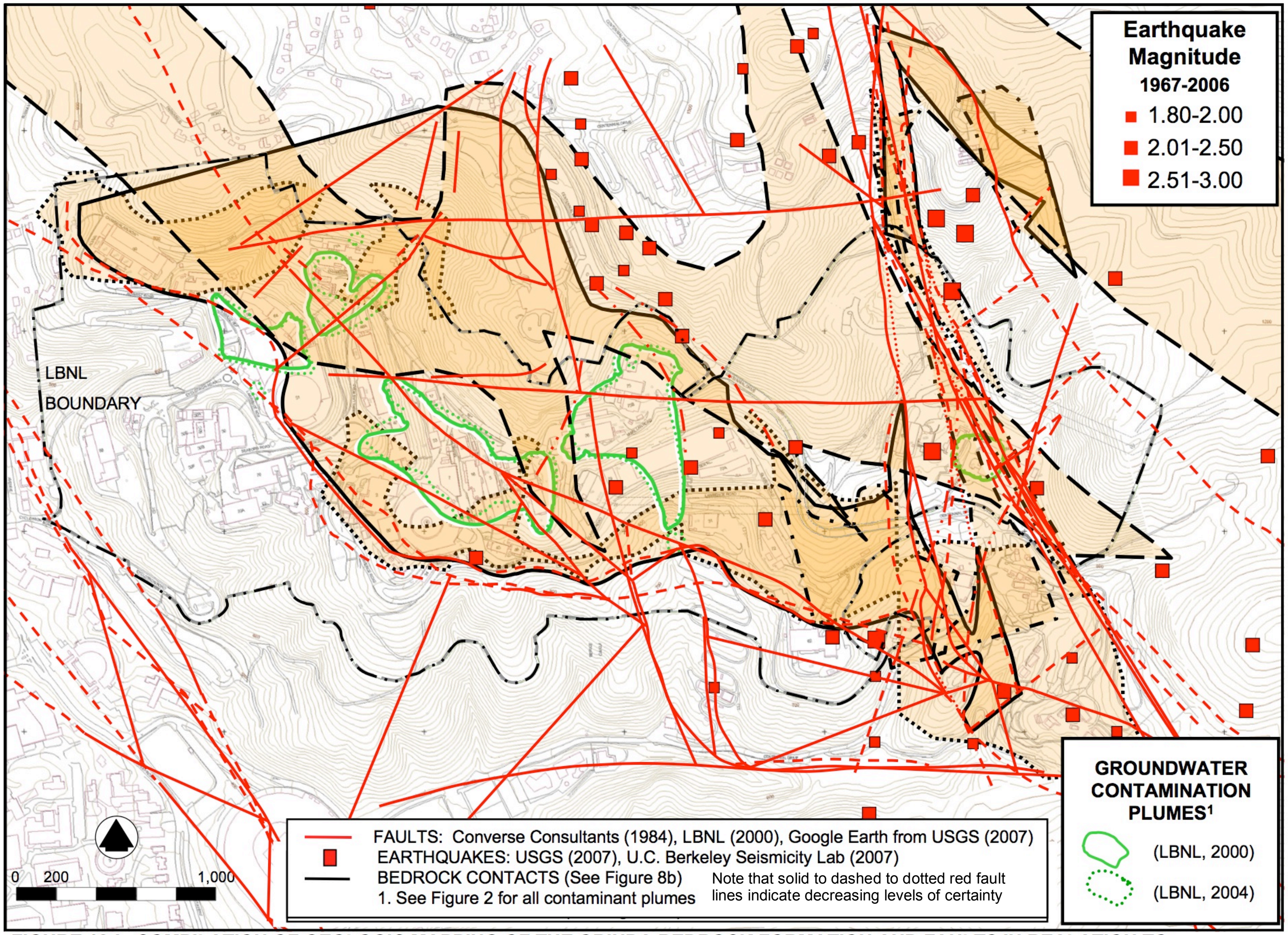


FIGURE 12d. COMPILATION OF GEOLOGIC MAPPING OF THE ORINDA BEDROCK FORMATION AND FAULTS IN REALATION TO CONTAMINANT PLUMES AT LBNL IN STRAWBERRY CANYON

Coast Ranges have attendant parallel thrust faults rooted within primary strike slip faults. In particular, Jones' geometric model of kinematics and stress transfer through the crust indicates that many thrust faults are still active within the Bay Area. The implication of these findings is that more consideration should be given to assessing risks posed byvertical displacements of faults, as well as horizontal offsets. Faults with a principal component of vertical motion have been mapped by LBNL (2000) and others (USGS, 2007; Converse Consultants, 1984; Harding Lawson, 1979; and Lennert Associates, 1978), but little is known about their potential for thrust or down-dropping movements.

In Figure 12b, the location of the various faults shown previously in Figure 12a is shown relative to contaminant plume sites. As can be seen, every plume intersects at least one fault that has been mapped by either LBNL, its consultants, or by USGS (Figures 9a, 9b, 9c). When fault locations and the different bedrock contacts are shown in combination with the contaminant plume locations, as in Figures 12c and 12d, a complex picture emerges, showing that numerous influences could be affecting groundwater transport and contaminant plume migration. In the latter two figures, it can be seen that faults and bedrock contacts do not necessarily coincide. If the complexity of geologic conditions at the contaminant plume sites is oversimplified, the extent and potential contaminant dispersement could be underestimated because monitoring wells were not placed at key positions along fault lines.

Landslide Mapping

Deep-seated and shallow landslides occur throughout the Berkeley Hills including Strawberry Canyon. Both artificial and natural mechanisms have contributed to increased rates of landslide activity in many areas. Land use activities in the hills can decrease slope stability by the action of grading large cuts or filling deep canyons to create flat areas for roads and buildings. Such grading operations interrupt surface and subsurface flow, and create impervious surfaces that increase runoff. The cuts remove lateral hillside support and convert groundwater flow to surface flow. The fills can increase the loading of a hillside and can increase or decrease groundwater saturation depending upon whether they are capped by an impervious surface and whether they are properly drained.

Triggers for initiating landslide movement can be artificial or natural. The natural triggering mechanisms can include intense or prolonged rainfall, greater than normal seasonal rainfall, earthquakes, or changes in mass balance from other landslides. Artificial triggers can include concentrated runoff from roads and other impervious surfaces, increased saturation from drain blockages, removal of root strength by deforestation, removal of lateral slope support, and increased loading of pre-existing slides by added weight of artificial fill.

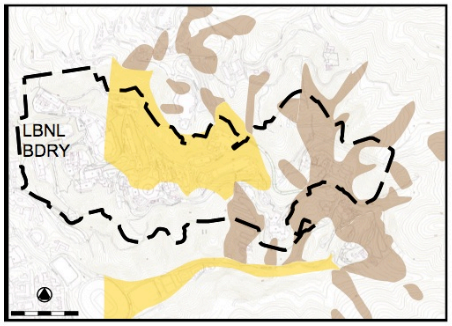
Several landslide maps of Strawberry Canyon have been produced by different researchers, as shown in Figures 13a through 13f. All maps show that numerous landslides have been mapped within the LBNL boundary, yet not all researchers agree on location, size, or types of landslides. Nor do all maps necessarily depict the same comparable landslide category. For example, some maps show colluvial deposits and some show colluvial hollows as source areas for shallow slides and/or landslide scars, for example Figure 13b versus Figure 13c.

Additionally, some maps group colluvium with fill, such as Figures 13a and 13b. Nonetheless, we expect that the brown polygons on map Figures 13a through 13e and the brown and purple ones in map Figure 13f all represent shallow to deep-seated landslide failures. Using historical and recent aerial photographs, the landslide features in Figure 13f were specifically mapped for this project and the slides therefore, are mapped relative to the historical topography and channel network as per Figure 5.

Figure 14 shows a compilation of the contaminant plumes with all the landslides and surficial mapping shown in Figure 13a-13f. The compilation shows general agreement about the existence of large landslides in Chicken Creek basin and East Canyon but the boundaries of individual landslides have poor overlap. Because Figure 14 becomes overwhelmed by landslide features that cover more than 50% of the LBNL property, it is too difficult to read the numerous overlapping polygons. We have therefore reduced the number of map overlays in Figure 15 to just three interpretations, Nielsen, LBNL, and Collins (Figures 13a, 13b, and 13f.) We also eliminated the fill and colluvium shown in Figure 14, along mainstream Strawberry Creek that was mapped by Nielson and LBNL near of the UCB Memorial stadium in the southwest corner of the map.

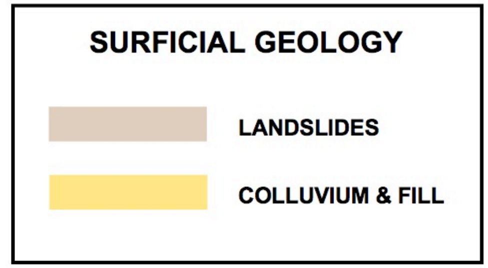
Figures 14 and 15 indicate that all the contaminant plumes either lie fully within or intersect the boundaries of landslides. This means that in addition to the complexities already demonstrated by bedrock contacts and faults intersecting the plume boundaries, there is also high probability that landslide failure planes could further influence groundwater movement. Moreover, the developing picture of complexity signifies that groundwater can transfer along any number of pathways (bedrock contacts, faults and landslide failure planes) and in any order of combination. In addition, future interpretation of contaminant plume migration could be complicated by continued earthflow creep movement or significant surges in slide activity.

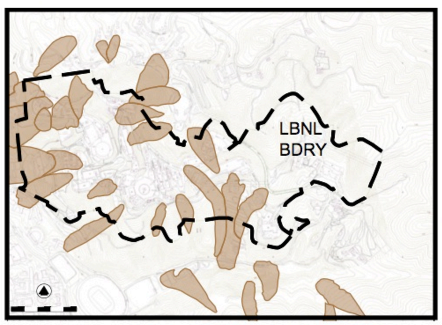
The deep-seated slides in Strawberry Canyon, shown in Figure 13e and 15, in most cases tend to be slumps, earthflow, or complex earthflows that can involve movement of large intact blocks of bedrock and extend from ridge top to valley bottom. The complex slides can be characterized by multiple failure planes and zones of stability and instability that change after the mass balance is altered by renewed activity or by man-made changes during grading operations. In many cases, there is rotational movement near the crown scarp and the entire mass can slowly creep or move in sudden surges. These kinds of slides are often associated with clay-rich earth or bedrock. Perched water tables at the rotated head of the deposit can be common. Similarly, springs can typically be found where the failure plane near the toe of the slide verges toward the ground surface and converts its subsurface flow to overland flow. If contaminant plumes intersect landslides and travel along landslide failure planes, surface waters within seep gullies on the landslide or at the toe of the slide could also be at risk of contamination.



13a. Tor Nielsen, 1975 (USGS)

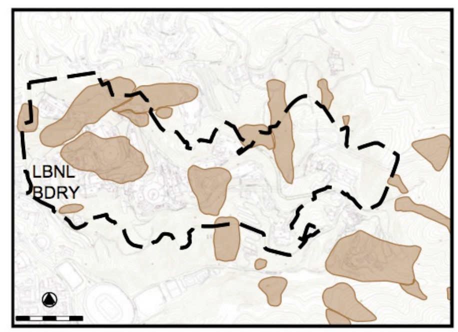
13b. LBNL, 2000





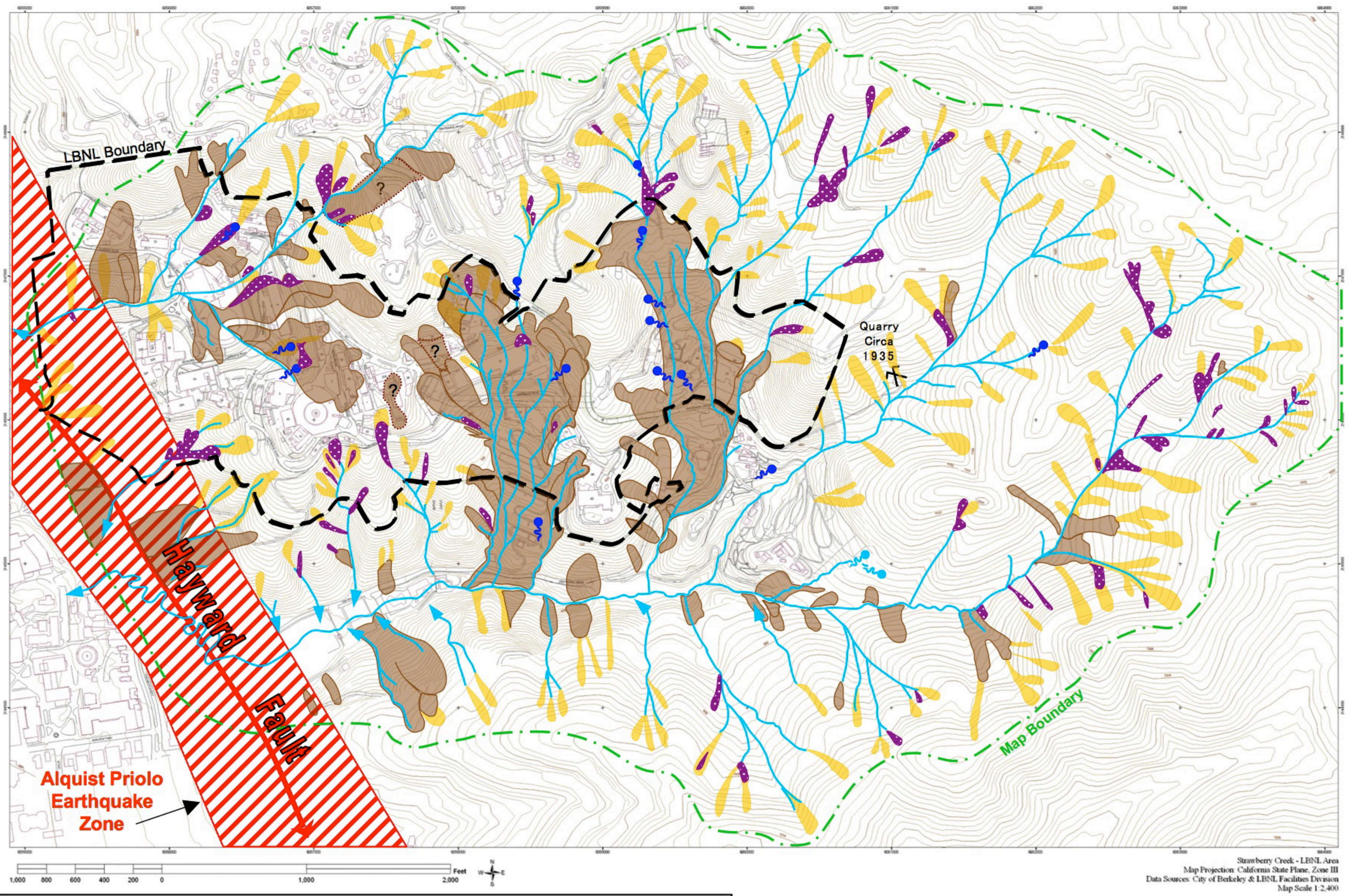
13c. Unpublished, Received from Kropp Assoc. (no author or date).

13d. Unpublished, Received from Kropp Assoc. (no author or date).



13e. California Geological Survey, 2003

FIGURES 13a-13e. MAPS OF LANDSLIDE STUDIES AND SURFICIAL DEPOSITS GEOLOGY



Colluvial Hollow: Source Area for Shallow Slides and/or Landslide Scar; Might Have Had Some Activity Within Colluvial Hollow During Last Century.

Earthflow, Slump, or Deep Seated Slide; Includes Area of Crown Scarp; Can include bedrock blocks; Portions of Some Earthflows May be Buried Beneath Alluvial Fans and Colluvium.

Debris Flow or Shallow Slide Active During Last Century

Historic Channel Network and Springs; Springs Adapted from Soule 1895

Laurel Collins, Watershed Sciences, January 2007

AERIAL PHOTOS: Strawberry Canyon, East Bay Regional Park District (1935)
STEREO PHOTOS: BUT-BUU-289 (1939), GS-CP (1946), AV-11 (1947), AV39-29 (1990)
Map of Strawberry Valley and Vicinity (Frank Soule, 1895)
1956 Topographic Map Portions (LBNL, 2000: Figures 4.3.2-2 and C2.2-1)
Hayward Fault from USGS Faults on Google Earth (2007)

FIGURE 13f. INTERPRETATION OF HISTORIC CHANNEL AND LANDSLIDE NETWORK AT LBNL IN STRAWBERRY CANYON

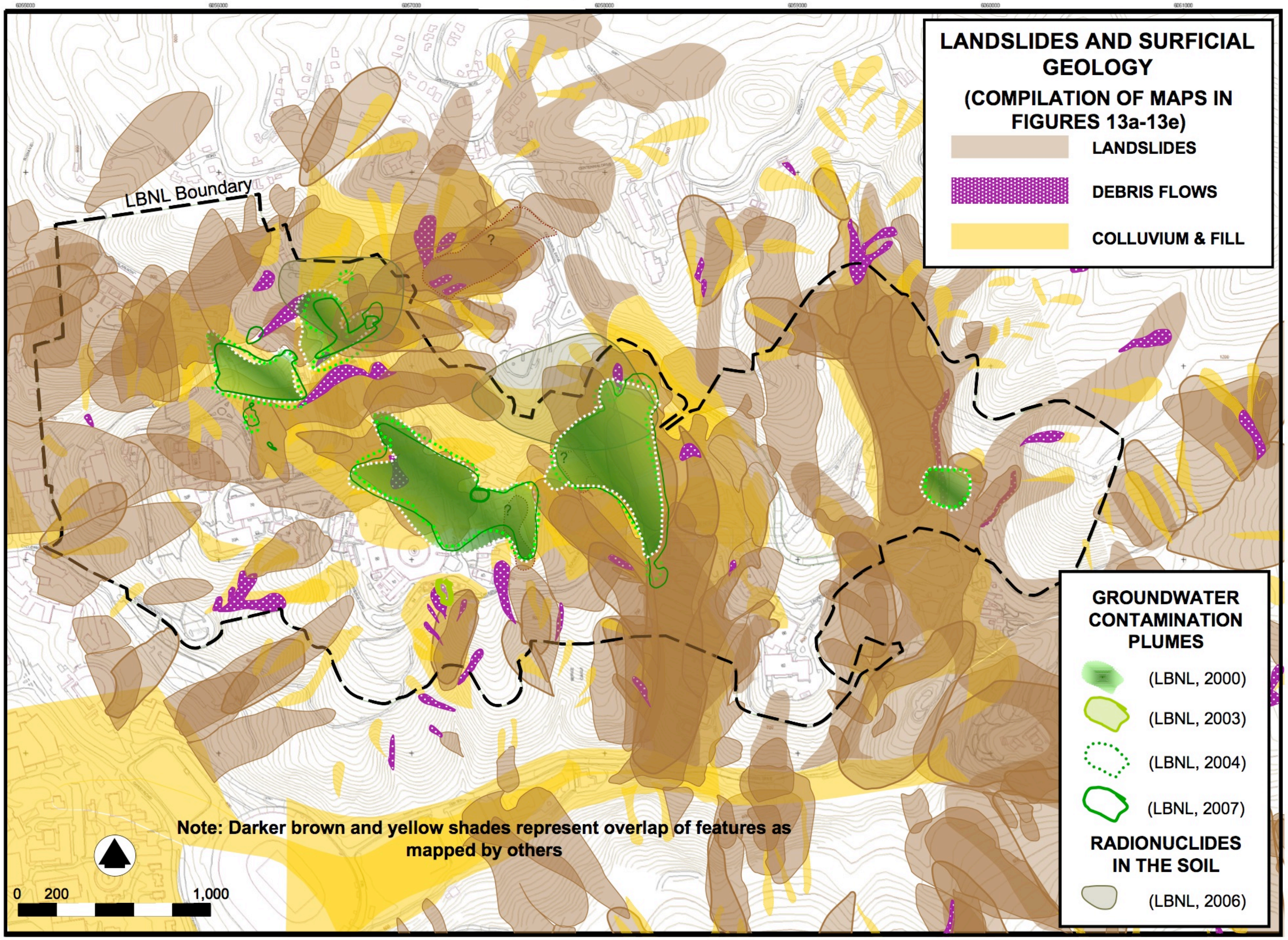


FIGURE 14. COMPILATION OF LANDSLIDE AND SURFICIAL GEOLOGY MAPS 13a-13f IN STRAWBERRY CANYON

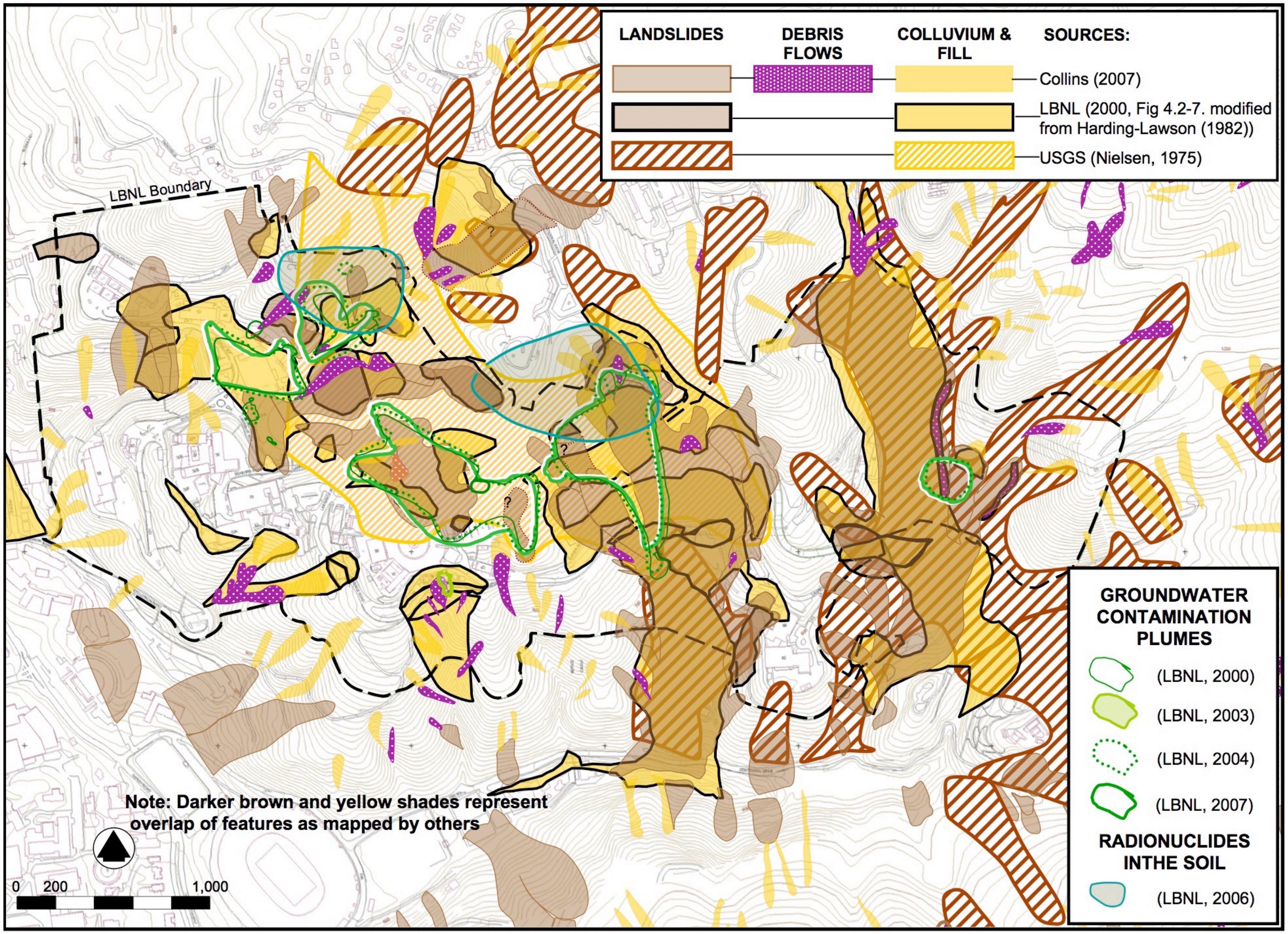


FIGURE 15. COMPILATION OF SELECTED LANDSLIDE MAPPING (FIGURES 13a,13b,13e) IN STRAWBERRY CANYON IN RELATION TO GROUNDWATER CONTAMINATION PLUMES

Shallow landslides in Strawberry Canyon, shown in Figures 13e and 15, tend to be soil slips, debris slides, and debris flows, which typically occur on steep slopes and move typically at high rates of speed. They tend to be translational in movement and are often associated with soils or bedrock that is porous and not necessarily clay-rich. They often occur within colluvium-filled hollows. The debris flows can form alluvial fans at the base of their run-out pathways.

The head of East Canyon appears to have numerous alluvial fan deposits that might be overlaying a deep-seated earthflow within the Orinda Formation. The earthflow might be overlaying or obscuring fault traces. Alternatively, the earthflow might have been sheered by fault displacement. Interpretation of earthflow shear planes versus fault planes at the Wildcat Fault trench were an additional subject of contention between Garniss Curtis (UC Berkeley) and Steve Korbay (Harding Lawson Associates) during the investigation that was discussed earlier in this report. In 1993, Jones and Collins also had concerns about interpretations of earthflow failure planes versus faults in the Chicken Creek basin area when they observed road cut exposures together with UCB staff and geotechnical consultants.

Plume Monitoring Sites

A series of monitoring and water quality sampling wells were constructed at the plume sites during 1990s when contamination monitoring was first required by State of California Department of Toxic Substances Control as a condition of LBNL's Hazardous Waste Facility Operating Permit (issued in 1993). The criteria for establishing well locations came from historic data review for activities in each building at LBNL that could have potentially led, during normal operations, to dumping, spills and accidents prior to the existence of any environmental regulations and oversight. Figure 16 shows the location of all the wells, some of which LBNL has already closed, i.e. "properly destroyed" or is in the process of closing.

Additionally, Figure 16 shows the location of the wells relative to the contaminant plume boundaries mapped by LBNL. Although numerous wells are located within the plume boundaries delineated by LBNL, the perimeters are not constrained by active sampling wells, especially along the potential migration pathways of faults, drainage courses, utility and sewer trenches, (and other engineered backfill) and landslides, as demonstrated in Figure 17a (map legend is Figure 17b). Bedrock contacts between Moraga and Orinda Formations (Figure 8a and 8b) are important, but were too complex to include in Figure 17a.

In order to adequately assess whether the monitoring wells are defining the actual contaminant plume boundaries, agreement on location of faults, bedrock contacts, and landslide boundaries is needed which is based upon well-founded information of what is actually known and what is hypothesized. Once improved mapping is accomplished at a higher resolution and accuracy than in the maps presented in this report, a strategy can then be developed to determine future locations of key sampling and monitoring sites. Until this is accomplished, there is reason for credible concern about contaminant plume boundaries and the groundwater monitoring program conducted to date by the LBNL.

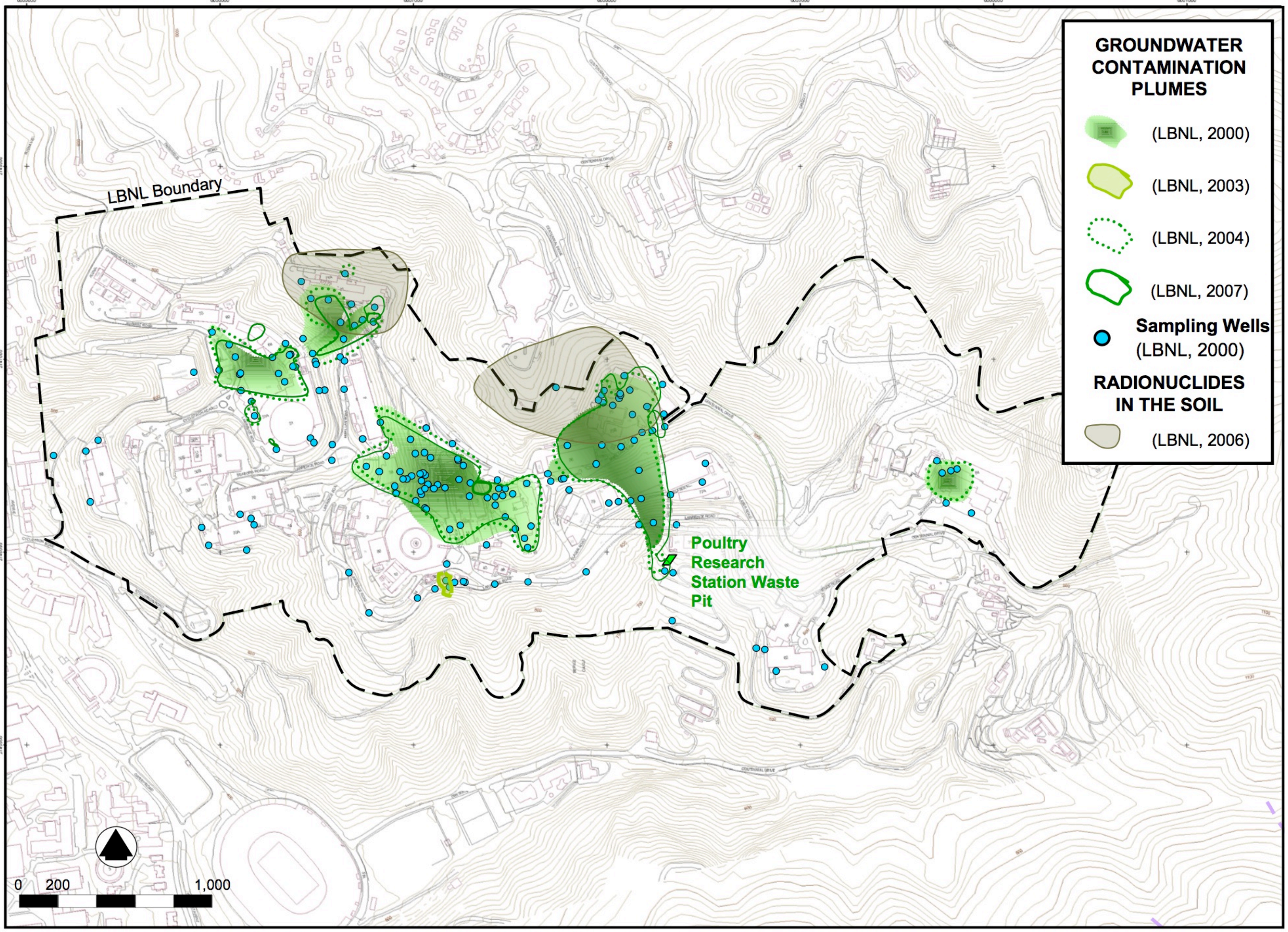


FIGURE 16. GROUNDWATER CONTAMINATION PLUMES AND SAMPLING WELLS

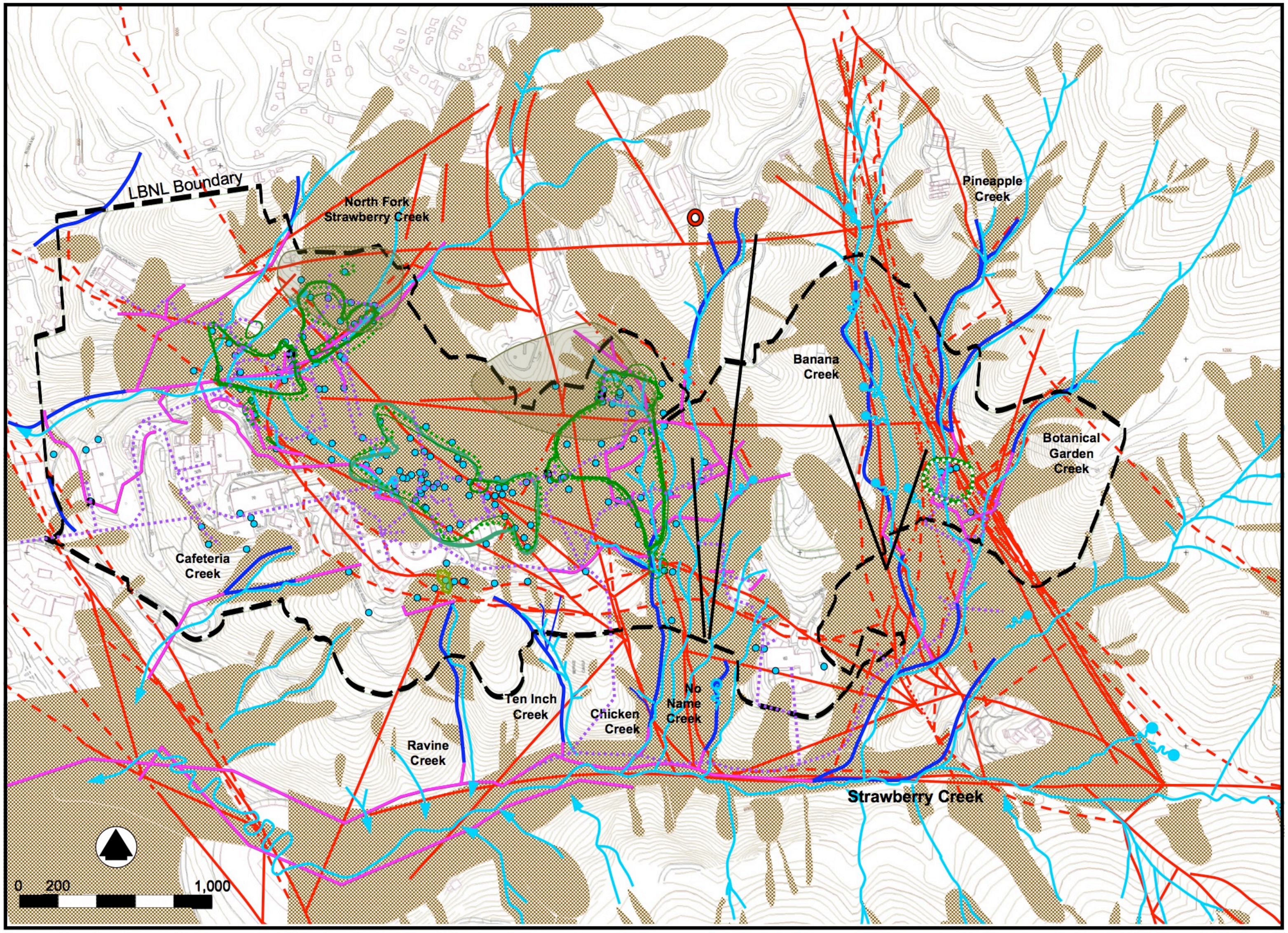


FIGURE 17a. COMPILATION OF MONITORING WELLS AND FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL. FOR BEDROCK CONTACTS VIEW FIGURES 8a AND 8b. SEE NEXT PAGE FOR MAP LEGEND.

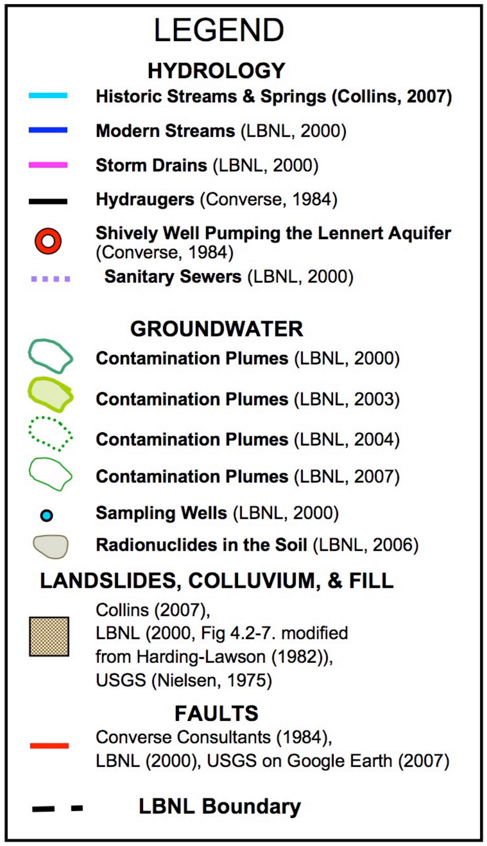


FIGURE 17b. LEGEND FOR FIGURE 17a COMPILATION OF FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL.

Zones of Concern for Potential Plume Migration

Given the status of what is currently known, Zones of Concern for potential migration of contaminant plumes are delineated in Figure 18a (legend shown in Figure 18b). These are areas where contaminant migration might yet be undetected because of either insufficient placement of sampling wells or insufficient understanding and/or consideration of where bedrock contacts, faults, landslides, utility trenches, and current or historic drainages exist. These zones were based upon the compilations of many other researchers mapping of geology, and infrastructure. The compilation maps shown previously were used to define Zones of Concern because we do not have knowledge of which individual geology or landslide map is most accurate. Hence, the Zones of Concern should be considered suggestive of possible areas requiring further investigation.

The zones provide a graphic example of why either a better array of monitoring wells are needed and why a verifiable picture of the physical landscape is essential in Strawberry Canyon. Furthermore, potential surface water contamination is possible along drainages that intersect faults, landsides, and bedrock contacts that intersect contaminant plumes. An additional component of contaminant plume analysis not addressed in our project is the depth of contamination and subsurface geologic conditions. These require three

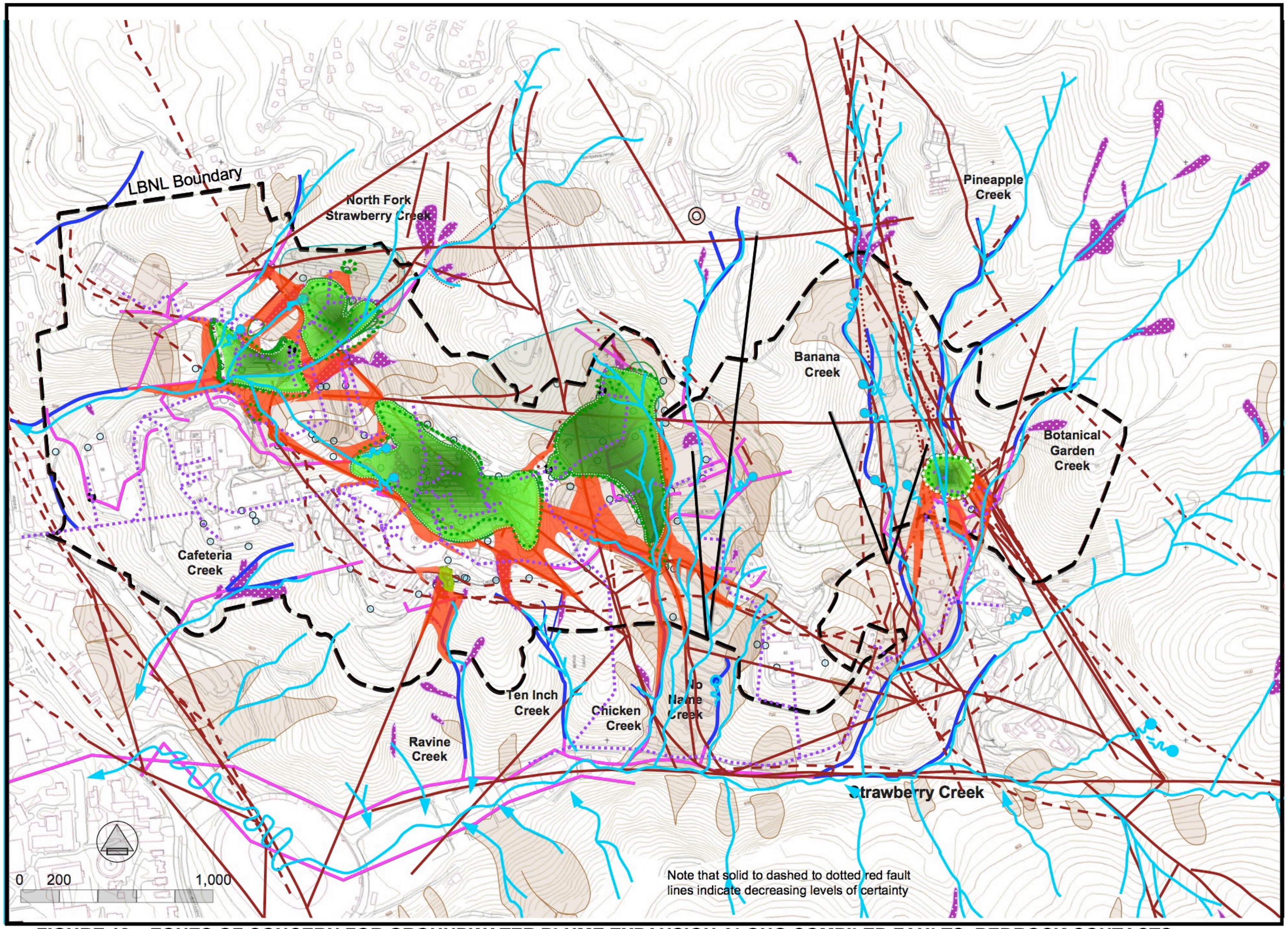


FIGURE 18a. ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALONG COMPILED FAULTS, BEDROCK CONTACTS, LANDSLIDES, HISTORIC AND MODERN CREEKS. SEE NEXT PAGE FOR MAP LEGEND.

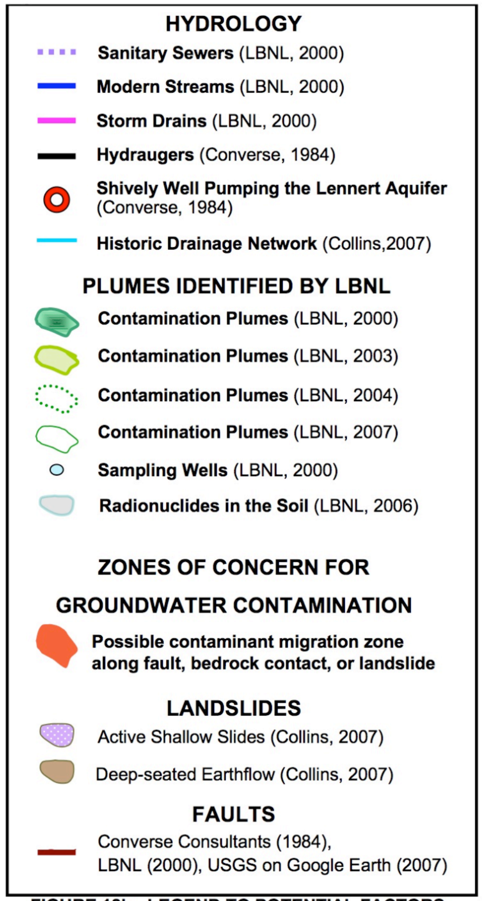


FIGURE 18b. LEGEND TO POTENTIAL FACTORS INFLUENCING CONTAMINATED GROUNDWATER PLUME EXPANSION

dimensional analyses, which LBNL has shown on their GIS-based maps (LBNL 2000) that use as their foundation the geologic picture of Figure 7a and fault map of Figure 9a.

Future Development and Site Conditions

The LBNL presently occupies 202 acres, however by 2025 LBNL anticipates a net increase of occupied space of about 660,000 square feet, an increase of 1000 people, and up to 500 additional parking spaces (LBNL, 2007a). Figure 19 shows the tentative footprint of proposed future buildings in their Long Range Development Plan, which is available at www.lbl.gov/LRDP/. The map shows about 30 new buildings dispersed throughout their property boundary. Much of the new construction is planned for areas previously avoided because of stability or fault issues. For example, the majority of the new construction will be located in the Chicken Creek basin and the East Canyon where deep-seated landslides have been mapped.

Figure 20a (map legend shown in Figure 20b) shows landslide hazard risks (as mapped by LBNL) and deep-seated landslides (as mapped on the historic drainage network in Figure 13f by Collins). Interestingly, the deep-seated slides are not considered areas of high to medium risk even though large-scale landslide movement could be triggered by

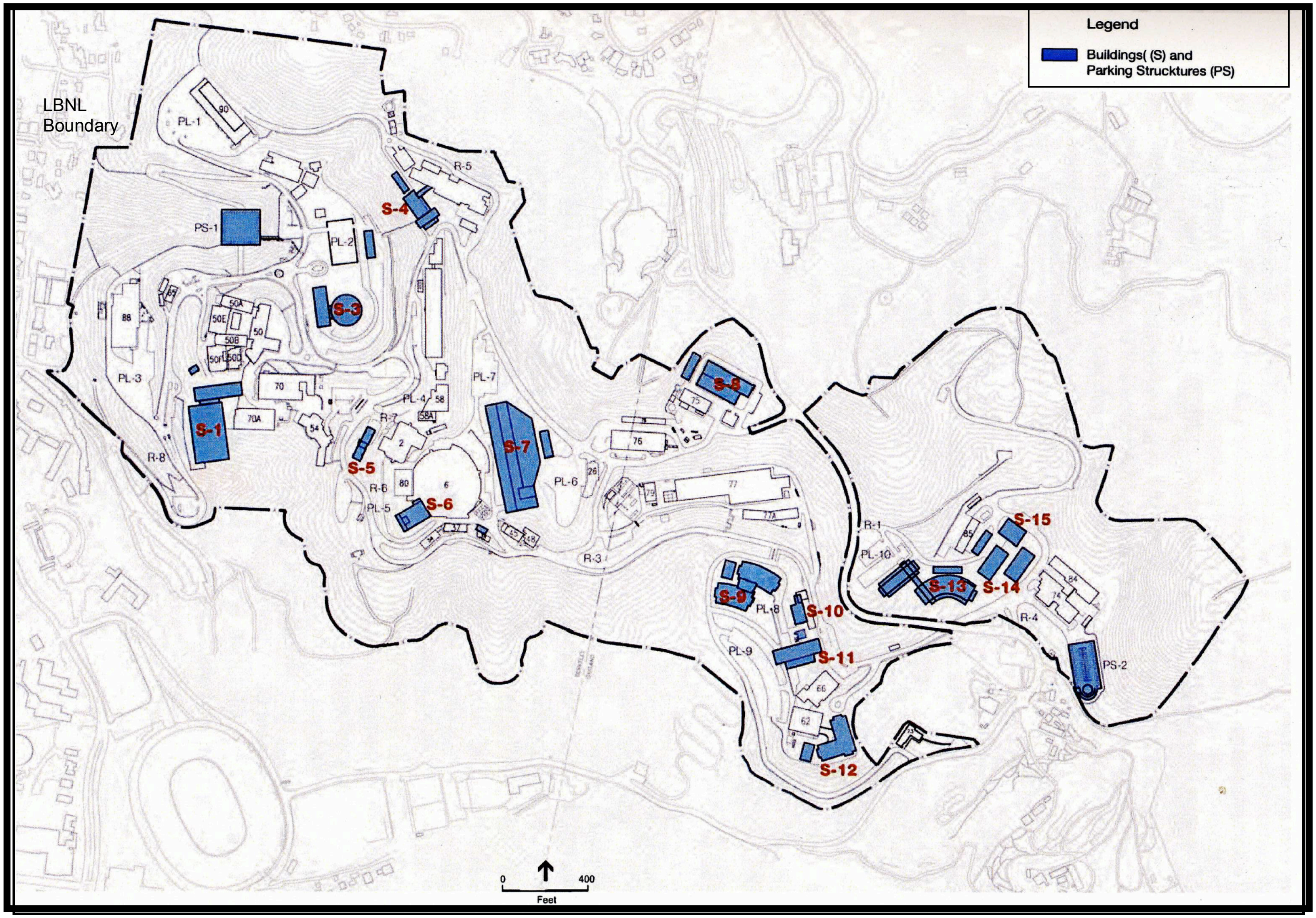


Figure 19. FUTURE BUILDING SITES AT LBNL ACCORDING TO LONG RANGE DEVELOPMENT PLAN (LBNL, 2007a).

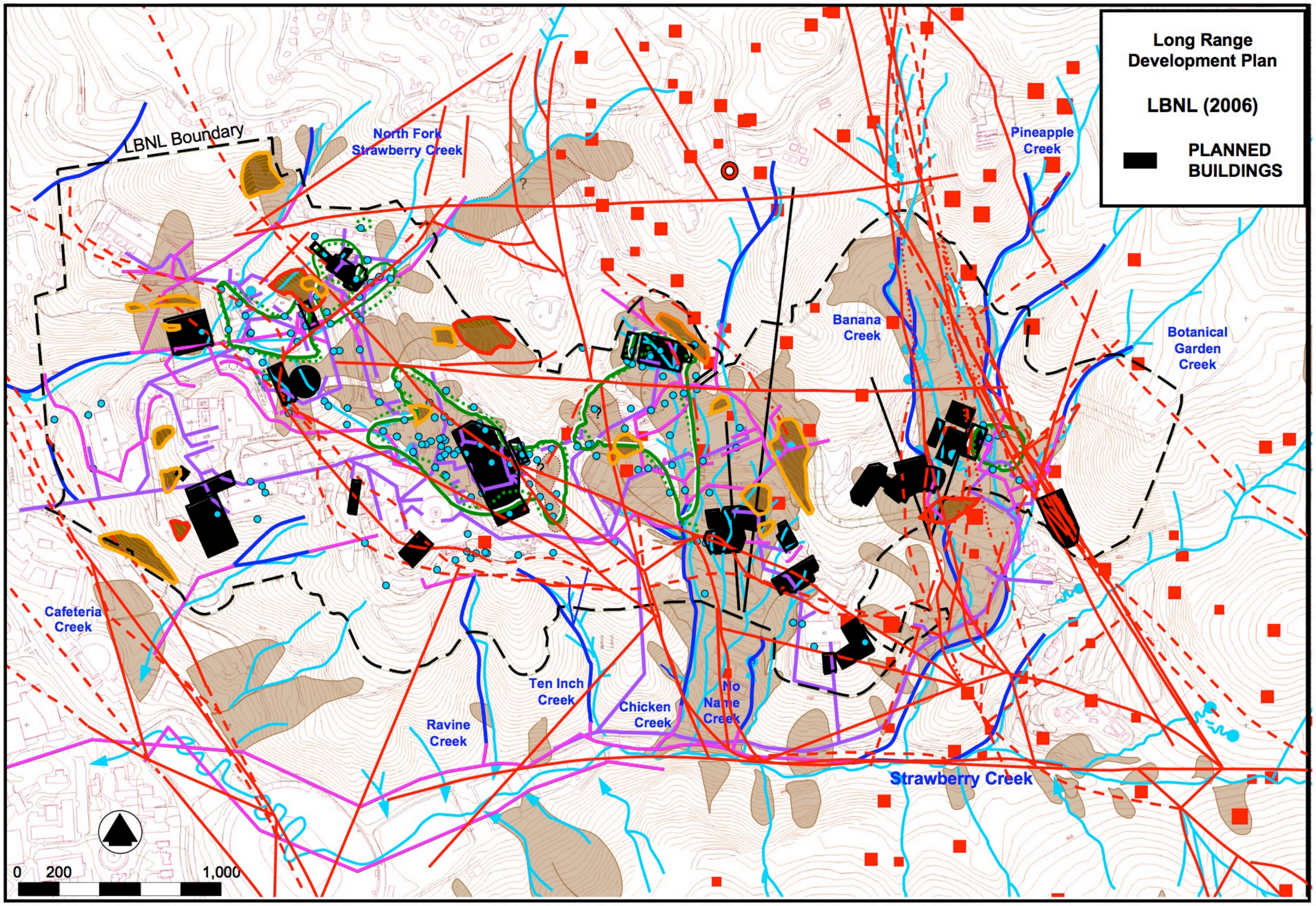


FIGURE 20a. VARIOUS COMPILED SITE CONDITIONS AT FUTURE BUILDING SITES OF LBNL'S LONG RANGE DEVELOPMENT PLAN. SEE NEXT PAGE FOR MAP LEGEND. NOTE THAT SOLID TO DASHED TO DOTTED RED FAULT LINES INDICATE DECREASING LEVELS OF CERTAINTY.

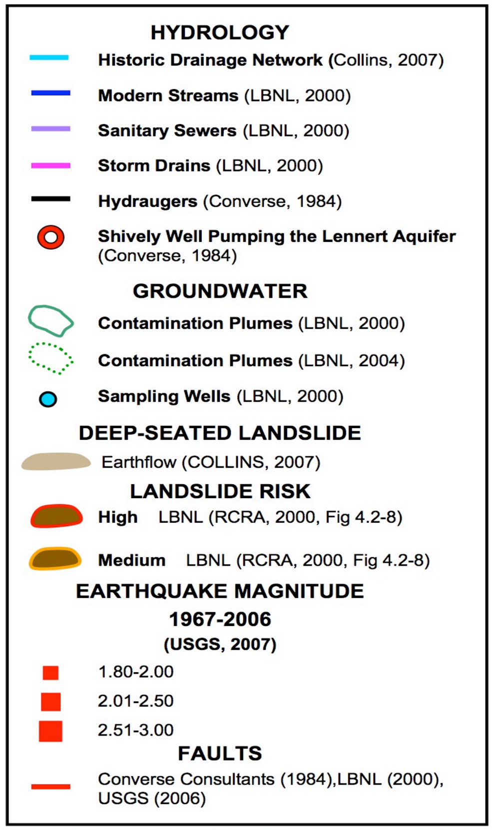


FIGURE 20b. KEY TO MAP 20a SITE CONDITIONS AND FUTURE BUILDING LOCATIONS

large magnitude earthquakes on the Hayward Fault and many of the slides overlay or intersect faults. Many buildings are shown to straddle faults that occur on the deep-seated landslides. Various other compiled site conditions in Figure 20a are also shown at the proposed LBNL building sites including the known contaminant plume locations. Some of the new building sites would require grading within the plume locations, which could alter existing groundwater transport pathways, as well as require special handling of contaminated soils.

As planning proceeds, Environmental Impact Analyses will require geologic and environmental information. These required legal documents demonstrate additional future needs for integrated and comprehensive mapping efforts of geologic and environmental conditions in Strawberry Canyon. As more excavations and investigations are conducted, the opportunities will increase to make verifiable geologic maps showing actual bedrock, landslide, and fault exposures.

CONCLUSIONS AND GENERAL RECOMMENDATIONS

At the very least, it is important to identify where there is valid disagreement on geologic conditions, particularly at contaminant plume sites, to determine if these sites pose a threat to human health and safety. Specific investigations or well placed monitoring wells could be designed to resolve some of these issues. Without an improved understanding and portrayal of the geology in Strawberry Canyon, it is difficult to accept that the monitoring sites were specifically designed to detect potential movement of groundwater along intersecting faults, landslide failure planes, bedrock contacts, utility trenches, storm drains, and historic drainages.

If the complexity of geologic conditions at the contamination sites has been and continues to be oversimplified, and because monitoring wells were not placed at key locations along faults, utility trenches, old creek beds/seeps and other parameters that influence groundwater movement, the extent and dispersement of contaminants may have been, and will continue to be underestimated in the future. As development continues in the Strawberry Creek Watershed, and probabilities increase for more uncontrolled releases and contaminant spills, the need will also increase to have an improved and comprehensive base of understanding. Protection of human health and water quality should be a priority, requiring more than a conservative approach when trying to investigate the extent of toxic contamination in an urban environment.

- An outside scientific technical review group should be formed to oversee LBNL's plume monitoring strategy and evaluate interpretations of plume migration.
- The types of factors that influence groundwater flow that have been compiled on the maps in this report should be developed on a three dimensional GIS base map.
- Information from previous consulting reports should be compiled to show the locations of verifiable bedrock outcrops, landslide deposits, landslide failure planes, and fault trace locations.
- Confidence levels should be assigned to various features such as faults, bedrock contacts, landslides, and boundaries of plume contamination.
- Future geologic investigations and excavation work in Strawberry Canyon should be required to show verifiable geologic exposures on the same base map and assign confidence levels to future interpretations.
- Further investigation of the nature of faulting, geology, and landslides in Strawberry Canyon should be conducted.

ACKNOWLEDGMENTS

We thank the Citizens' Monitoring and Technical Assessment Fund for supporting this project and the Urban Creeks Council for administering the grant. Gretchen Hayes is thanked for constructing many map overlays. Eric Edlund assisted with topographic base map production. Gene Bernardi, Roger Byrne, Claudia Carr, Jim Cunningham, Mark McDonald, and L. A. Wood are thanked for draft review, and Landis Bennett for posting the report on the web. Cover photograph courtesy of berkeleycitizen.org.

REFERENCES

Bishop, C.C., R. D. Knox, R. H. Chapman, D. A. Rogers, and G. B. Chase, 1973. Geological and Geophysical Investigations for Tri-Cities Seismic Safety and Environmental Resources Study: California Division of Mines and Geology, Preliminary Report 19, Report and Plates, 1973.

Borg, S. G., 1991. Geology of the Lawrence Berkeley Lab, LBNL, Internal Report Earth Science Division, 3 October 1991.

California Department of Health Services, 1995. AIP (Agreement in Principle) Annual Report.

California Geological Survey, 2003. Seismic Hazard Zone Report for the Oakland East 7.5-Minute Quadrangle, and Briones 7.5-Minute Quadrangle, Alameda, and Contra Costa Counties, by California, Department of Conservation.

Collins, L. M., 1993. Draft: Geology of the east Canyon and the Proposed Hazardous Waste Handling Facility, LBNL, Report and Plates, April 1993.

Collins and Jones, 1994. Research Proposal to UC Berkeley for Geological Investigation of Strawberry Canyon.

Converse Consultants, Inc., 1984. Hill Area Dewatering and Stabilization Studies

Curtis, G., 1993. Unpublished map of the Berkeley Hills, no date.

Diblee, T. W., Jr., 1980. Preliminary Geologic Map of the Briones Valley, US Geological Survey, Open File Report 80-539, Scale 1:24,000, 1980.

Dunn, R. J., 1976. Landslides and Engineering Geology at the Lawrence Berkeley Laboratory, for CE 299, Professor R.E. Goodman, Winter 1976, Spring 1976, Fall 1976, and December 1976. Report on file at Alan Kropp Assoc., Berkeley CA.

Hoexter, D. F., 1992. Potential for triggered Slip on Secondary Faults in the East Bay: Implications for the Planning Process, in Proceedings of the Second Conference on Earthquake Hazards in the Eastern San Francisco Bay Area: Special Publication 113, Department of Conservation Division of Mines and Geology, Dp. 153-158, 1992.

Holland, P. J., and H. A. Wollenberg, 1992. Initial Appraisal of the Geologic Controls of Ground Water Occurrence and Movement in the "Grizzly" Area of the Lawrence Berkeley Laboratory, LBNL, LBID - 1852, February 1992.

Jones, D. L., 1992. Tectonics of a Transpressive Plate Boundary: A New Paradigm for the Central California Coast Ranges, in Proceedings of the Second Conference on

Earthquake Hazards in the Eastern San Francisco Bay Area: Special Publication 113, Department of Conservation Division of Mines and Geology, p 28, 1992.

Jones, D. L., and E. Brabb, 1992. Tectonic Significance of the Neogene Berkeley Hills Fold and Thrust Belt, in Proceedings of the Second Conference on Earthquake Hazards in the Eastern San Francisco Bay Area: Special Publication 113, Department of Conservation Division of Mines and Geology, p 117, 1992.

King, K. B., 1984. Hill Area Dewatering and Stabilization Studies, Prepared for UCB, Dept. of Facilities Management: Converse Consultants, Job #82-41601, Report and Plates, October 1984.

Korbay, S. R., and L. E. Lewis, 1980. Wildcat Fault Study, Biomedical Laboratory Project, LBNL: Harding-Lawson Associates, Job#2000,145.01, Report and Plates, February 1980.

Korbay, S. R., 1982. Geology of Lawrence Berkeley Laboratory: Harding-Lawson Associates, Job #2000135.01, Report, and Plates, September 1982.

Korbay, S.R., 1985. Preliminary Geotechnical Evaluation Proposed East Canyon Corporation Yard Development, LBNL: Harding-Lawson Associates, Job #2000,170.01, Report and Plates, January 1985.

Kropp, A,. and Associates, no date. Two hand drawn landslide maps of Strawberry Canyon with no identified author.

Lawson, A. C., and C. Palache, 1900. The Berkeley Hills, A detail of Coast Range Geology, University of California Bulletin of Department of Geology, Vol. 2, #12, p. 349-350, Report and Plates, A. C. Lawson Editor, 1900.

LBNL, 2000. RCRA Facility Investigation (RFI) Report, 2000.

LBNL 2003, and 2004. LBNL Environmental Restoration Program (ERP) Quarterly Progress Reports.

LBNL, 2006. fig 1.4-8.ai

LBNL, 2007a. Notice of Availability LBNL, 2006 Long Range Development Plan and Draft Environmental Impact Report, January 22, 2007.

LBNL, 2007b. LBNL Long Range Development Plan, Draft Environmental Impact Report, January 22, 2007.

LBNL, 2007. Draft RCRA Corrective Measures Implementation Report for the Lawrence Berkeley National CA-EPA ID No: CA4890008986 Environmental Restoration, January 2007.

Lennert, B. J., Hill, 1979. Area Dewatering Program, Lawrence Berkeley Laboratory: Lennert and Associates, Job #789, Report and Plates, November 1979.

Provenzano, J. M., 1991. Report of Slide Repair Investigation, Adjacent to University of California Berkeley Botanical Gardens and across the Jordan Fire Trail, Berkeley, California: Job #2008-1-91, Report and Plates, October 1991.

Shively, J., PE, 1999. Letter to LBNL Director Shank.

Soulé, F., Jr., 1875. Map of Strawberry Valley and Vicinity.

Steinbrugge, K. V., J. H. Bennett, H. J. Lagorio, J. F. Davis, G. Borchardt and T. R. Toppozada, 1987. Earthquake Planning Scenario for a Magnitude 7.5 Earthquake on the Hayward Fault in the San Francisco Bay Area, by California Department of Conservation, Division of Mines and Geology, Special Publication 78, Report and Plates, 245 p., 1987.

Taylor, C. L., 1992. New Evidence of Fault Creep on a Second Trace of the Hayward Fault, Montclair Village Area of Oakland, California, in Proceedings of the Second Conference on Earthquake Hazards in the Eastern San Francisco Bay Area: Special Publication 113, Department of Conservation Division of Mines and Geology, p. 159-163, 1992.

USGS, 1975, Nielsen, T. US Geological Survey Open File Map 75-277-42, Oakland West, and Briones 7.5' quadrangles.

USGS, 2000 Graymer. Geologic Map and Map Database of the Oakland Metropolitan Area, Alameda, Contra Costa, and San Francisco Counties, California, Miscellaneous Field Studies, MF-2342 Version 1.

USGS on Google Earth, 2007. Geologic Map of Alameda County, from USGS Scientific Investigations Map 2918.

USGS, 2007. USGS web site for recent earthquakes: http://quake.wr.usgs.gov/recenteqs/

Williams, P., 1992. Online map of the Hayward Fault at UC Berkley:http://seismo.berkeley.edu/hayward/ucb_campus.html

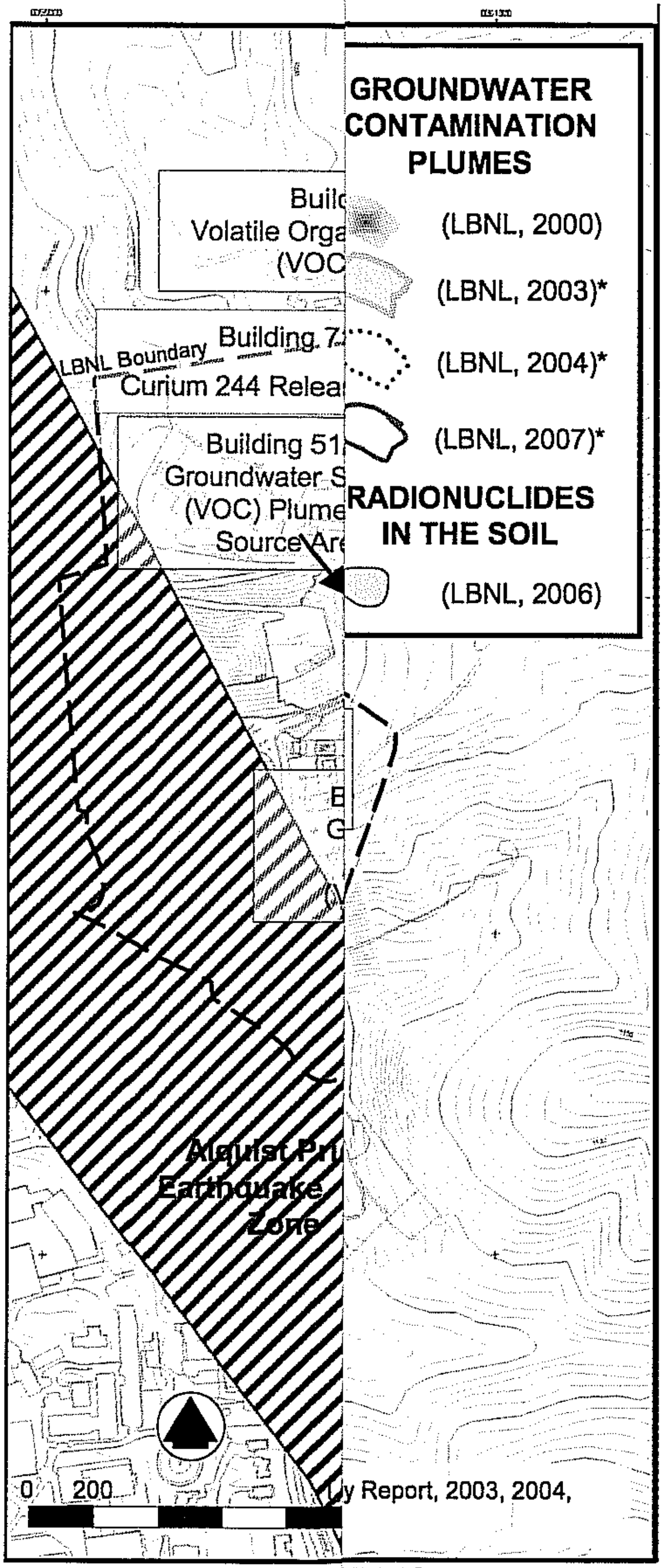


FIGURE 2. LBNL SITES.

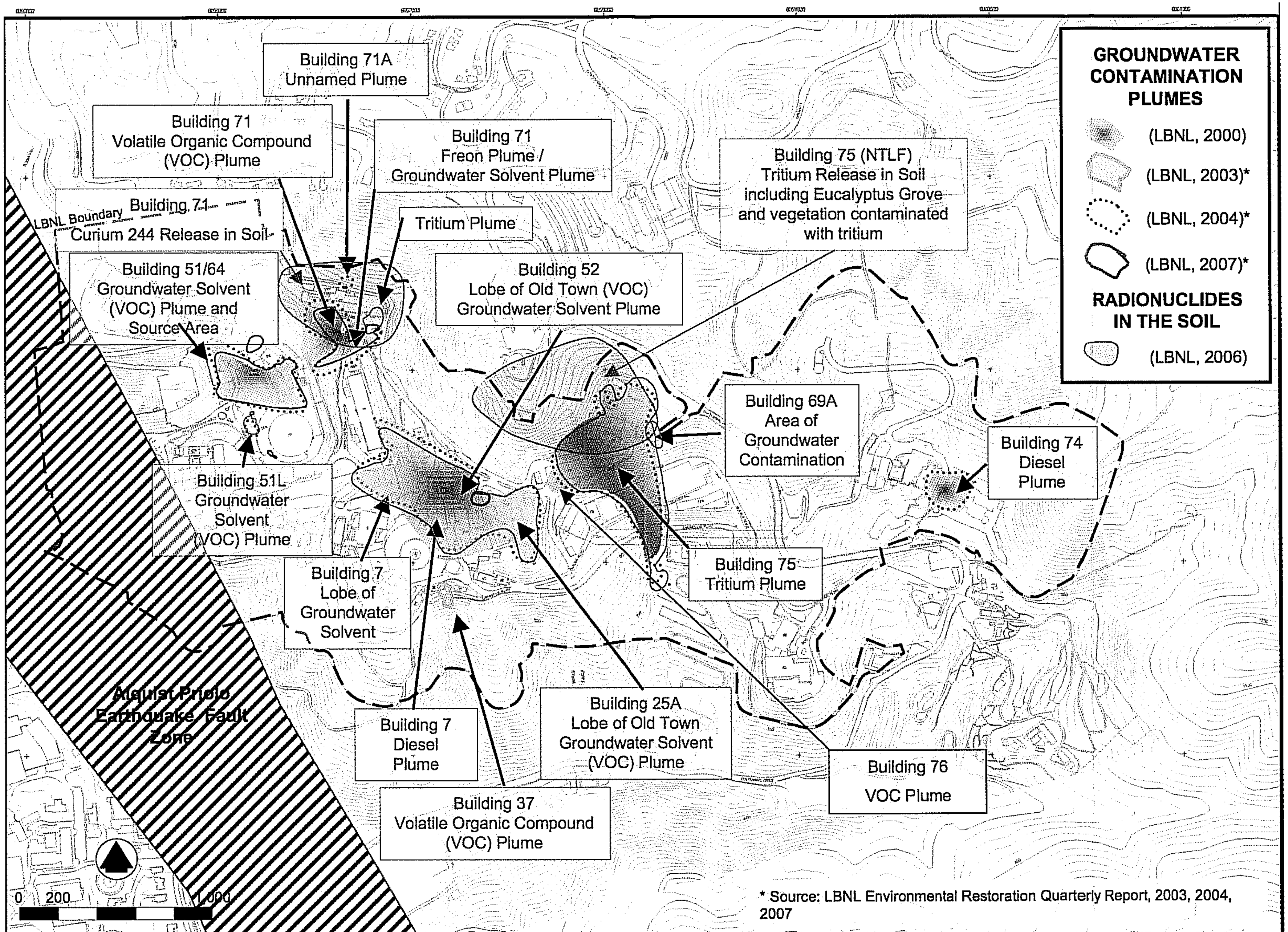


FIGURE 2. LBNL SITE MAP, GROUNDWATER CONTAMINATION PLUMES AND CONTAMINATED SOIL SITES.

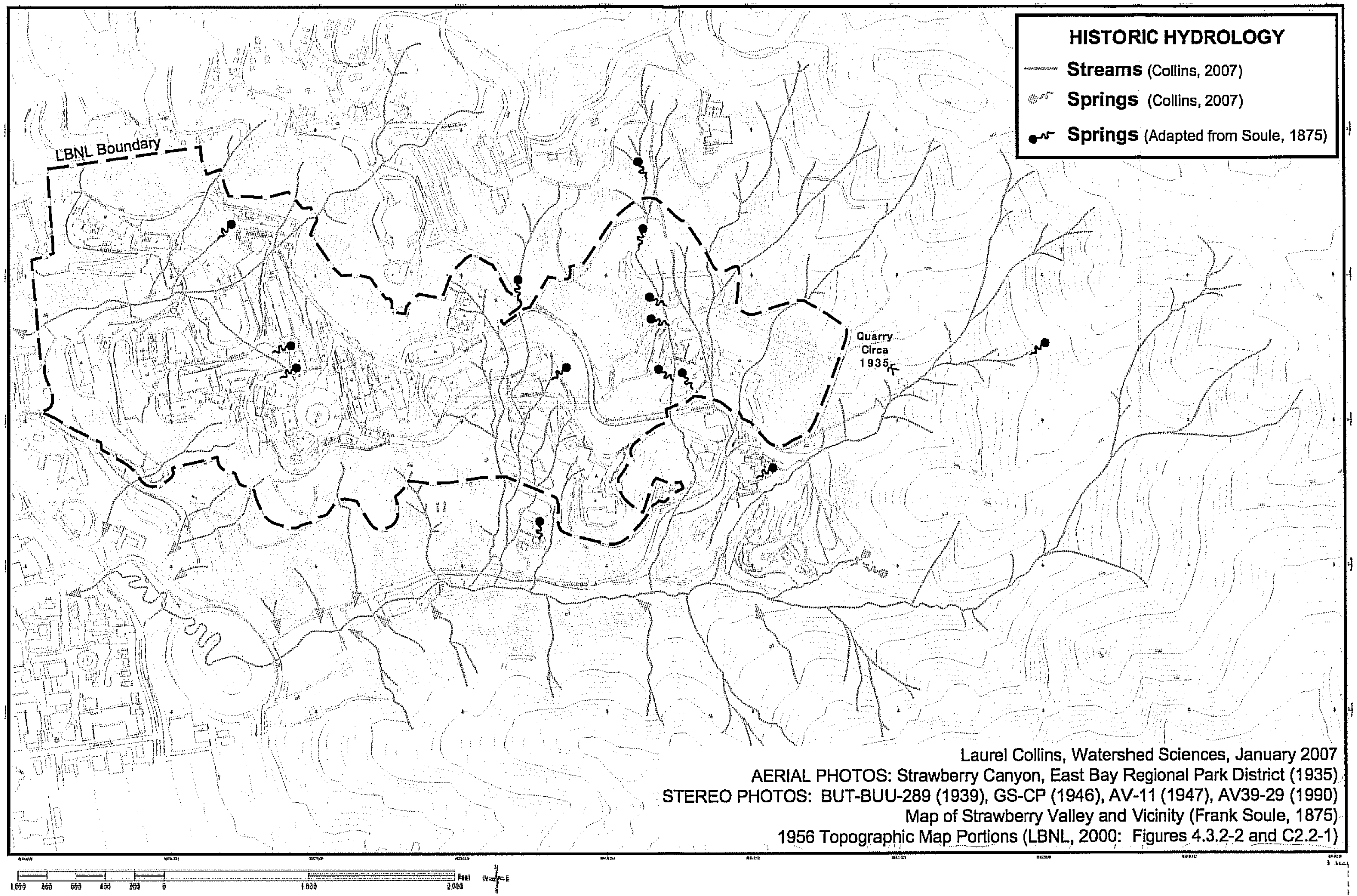


FIGURE 5. INTERPRETATION OF HISTORIC CHANNEL NETWORK AT LBNL IN STRAWBERRY CREEK WATERSHED

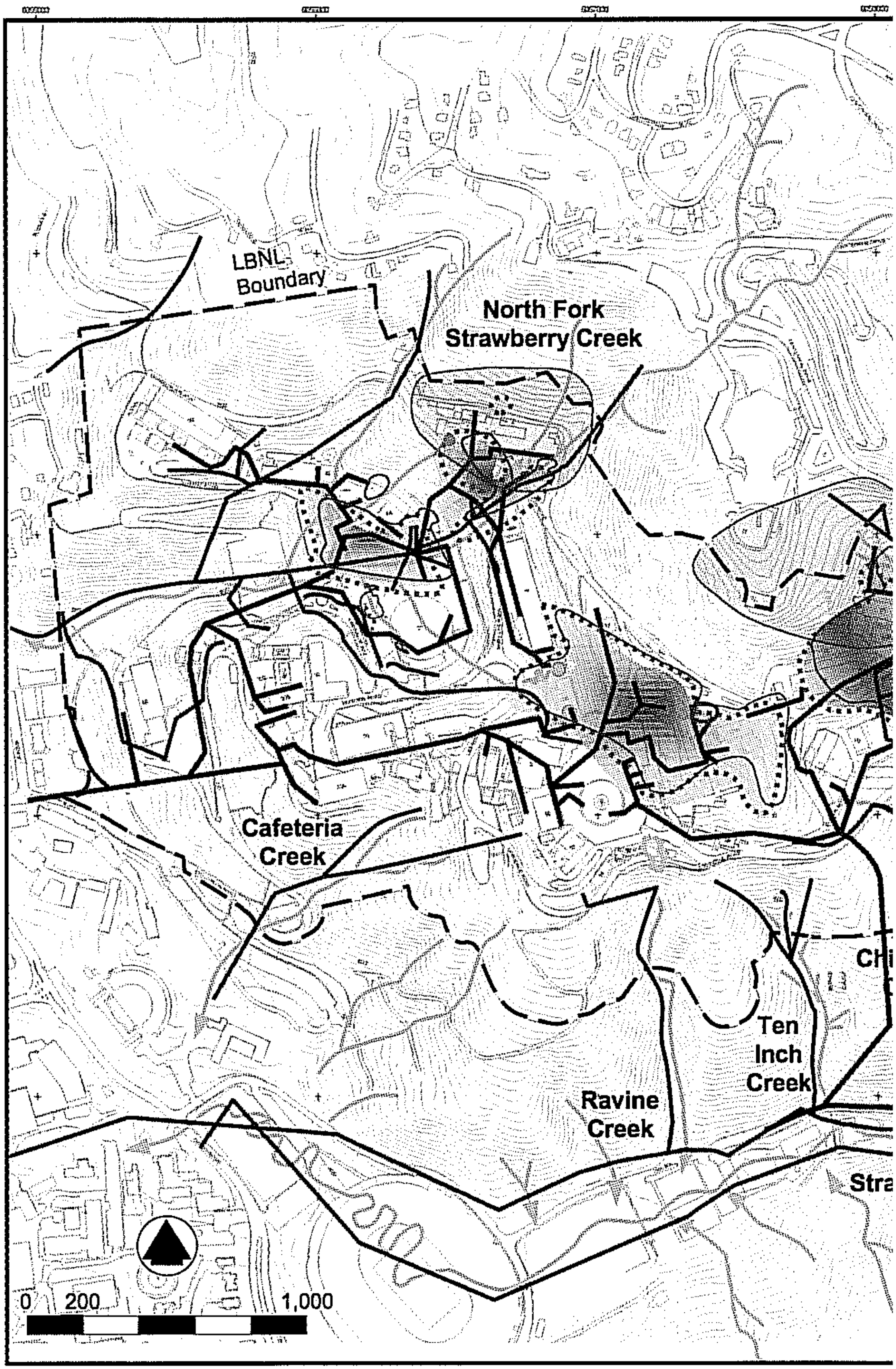


FIGURE 6. GROUNDWATER CONTAMINATION PLUMES IN RELATIO

FIGURE 9. SELECTED EXAMPLES OF FAULT MAPPING STUDIES AT LBNL IN STRAWBERRY CANYON

—— FAULTS

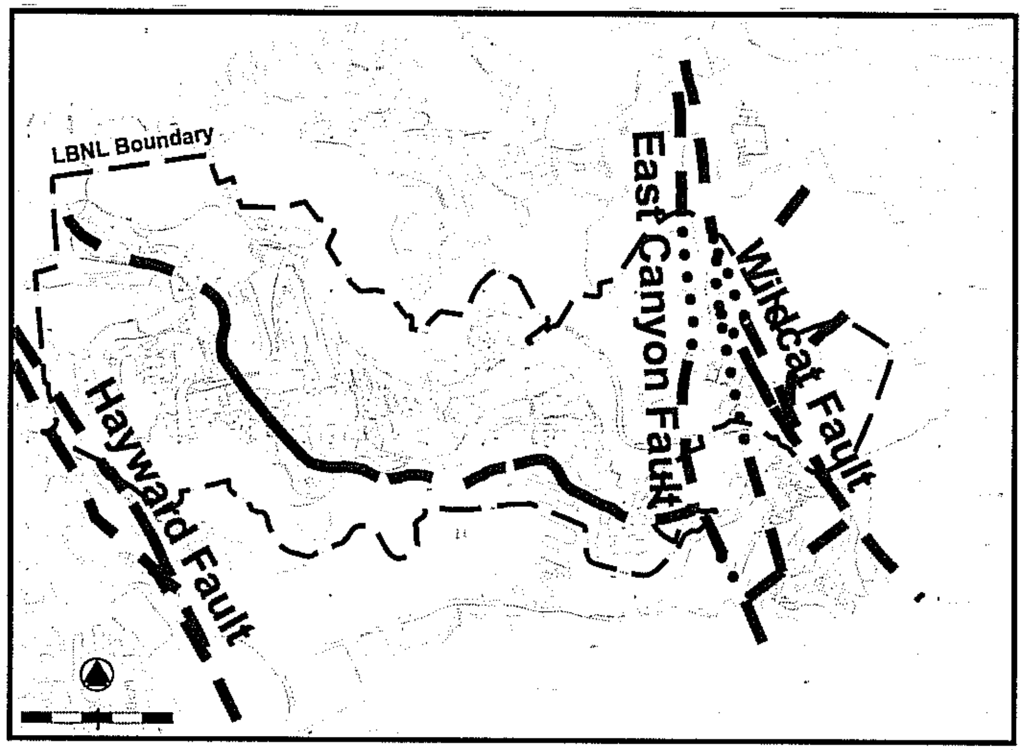


FIGURE 9a. LBNL (2000) Based on:
Harding-Lawson (1980, 1982), Radbruch (1969)

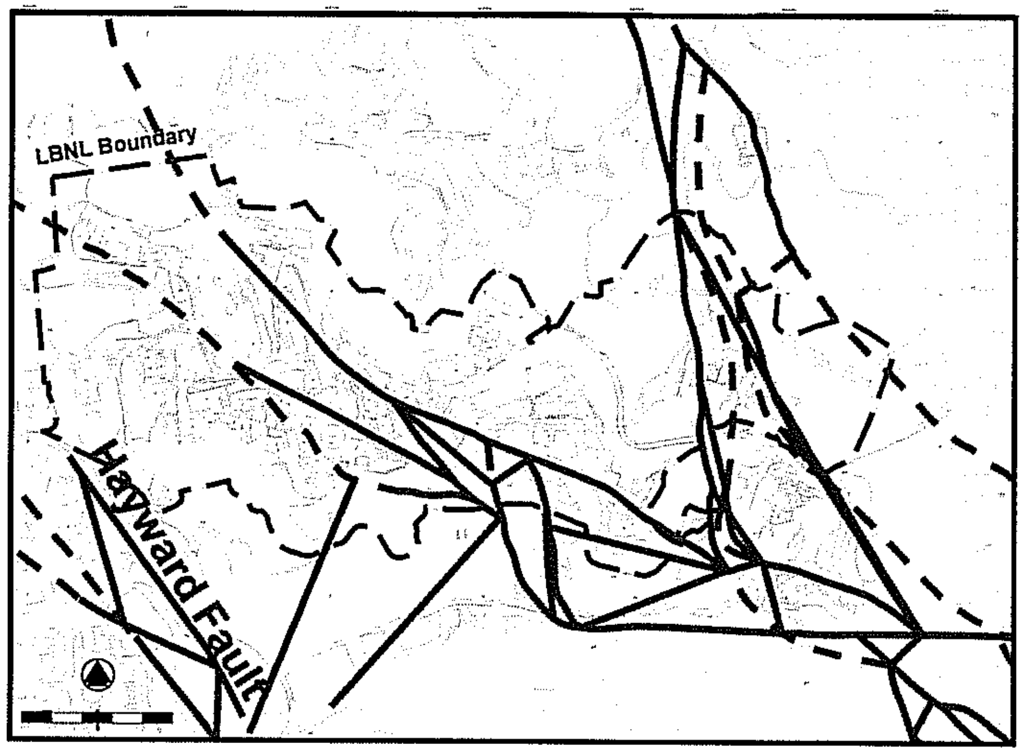


FIGURE 9b. USGS on Google Earth (2007)

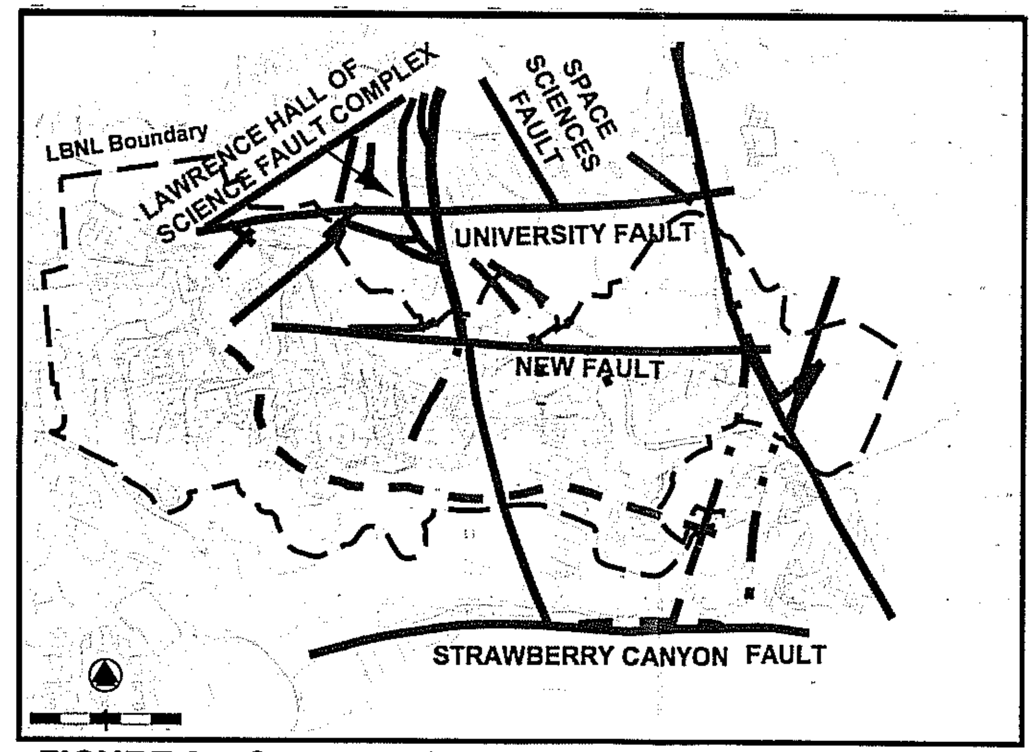


FIGURE 9c. Converse Consultants (1984) Based on:
Harding-Lawson (1979), Lennert & Associates (1978)
(Mapping does not include western portion of LBNL.)

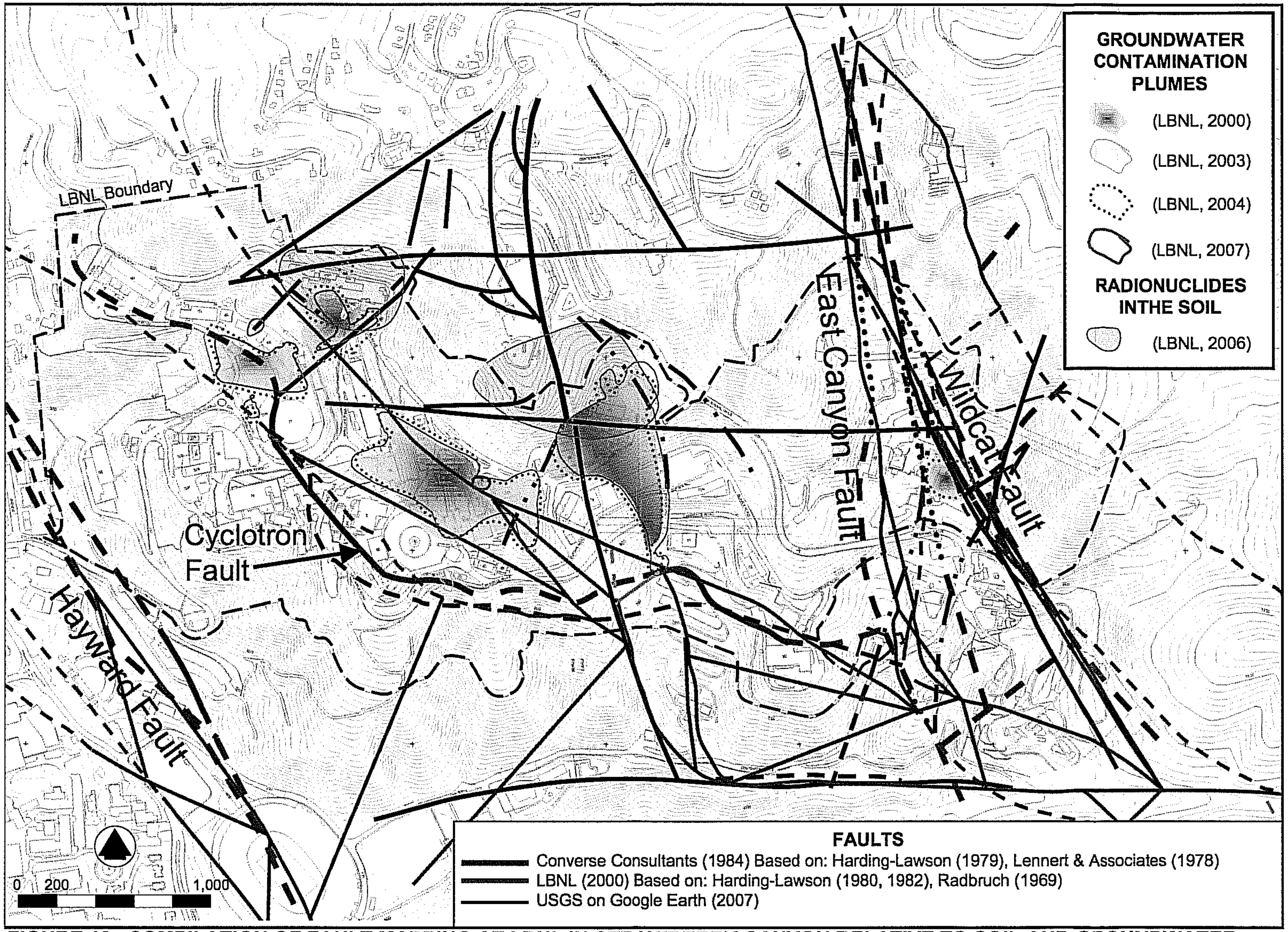


FIGURE 10. COMPILATION OF FAULT MAPPING AT LBNL IN STRAWBERRY CANYON RELATIVE TO SOIL AND GROUNDWATER CONTAMINANT PLUMES.

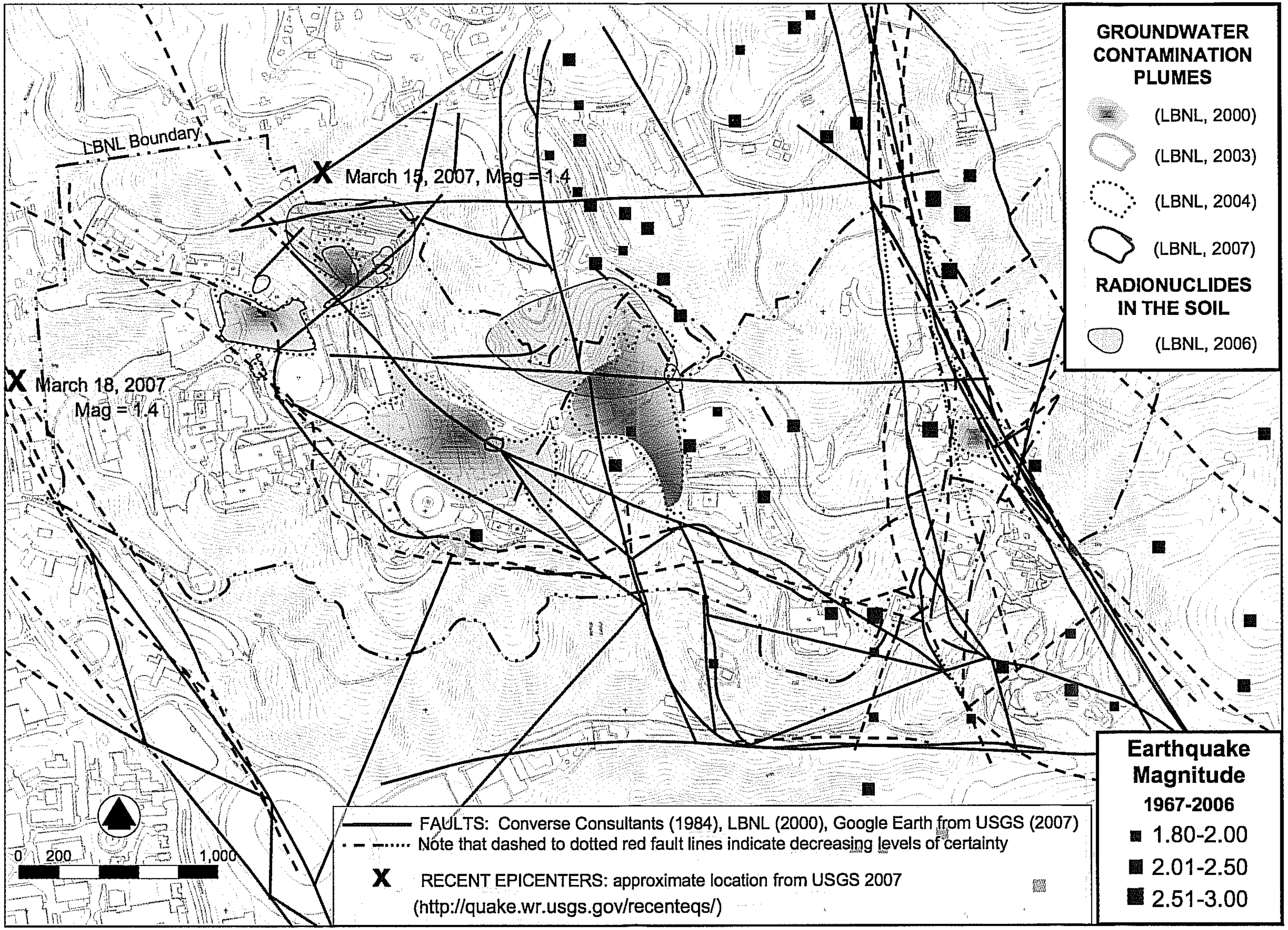
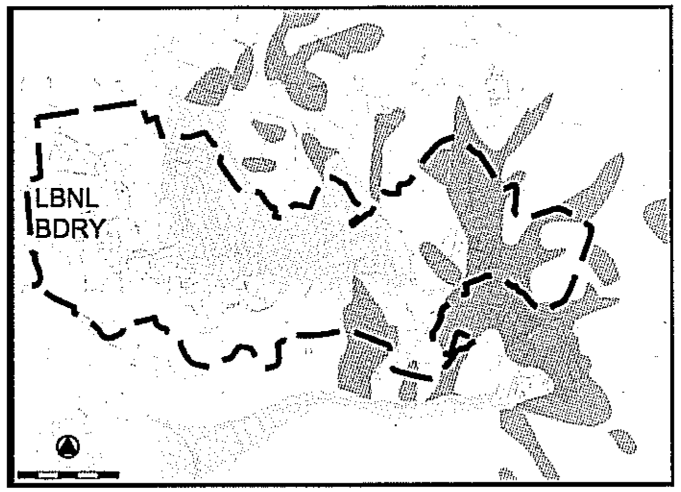
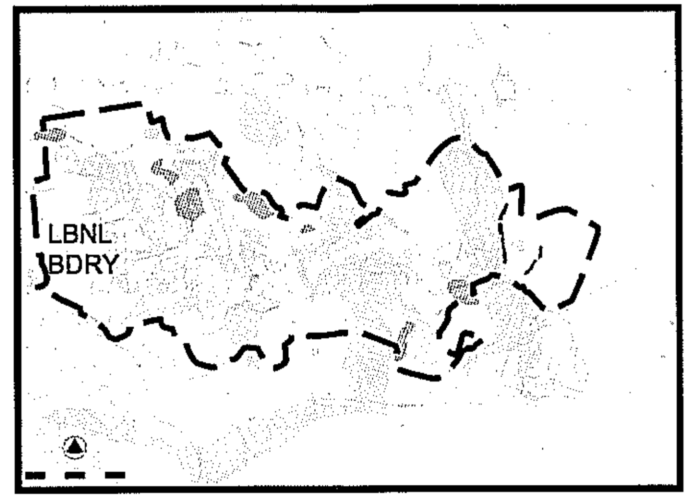


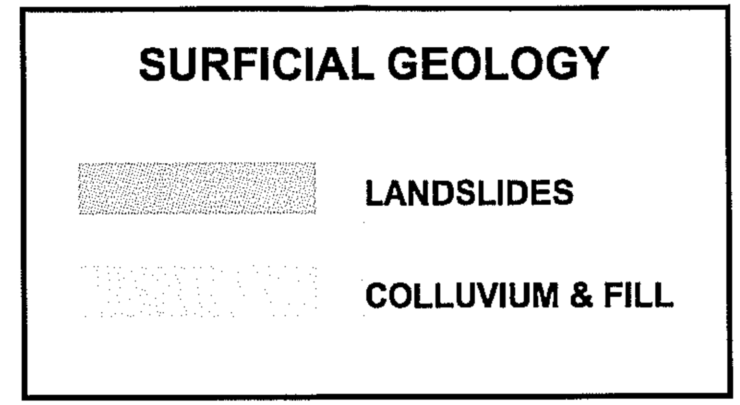
FIGURE 12b. GROUNDWATER CONTAMINATION PLUMES AND RADIOACTIVE CONTAMINATION IN SOIL RELATIVE TO FAULTS AND EARTHQUAKE EPICENTERS AT LBNL IN STRAWBERRY CANYON

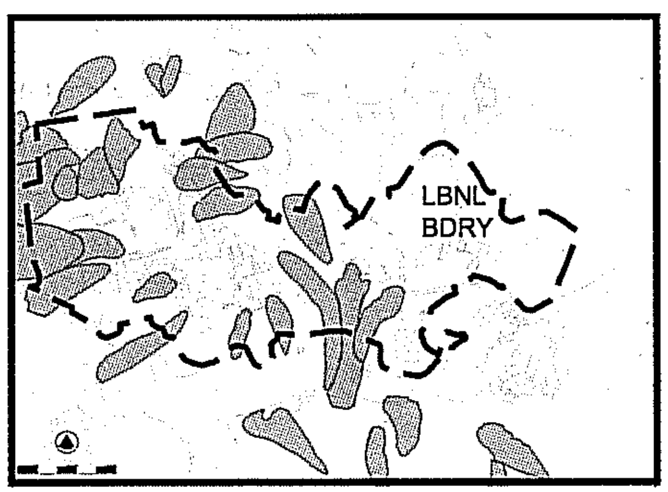


13a. Tor Nielsen, 1975 (USGS)

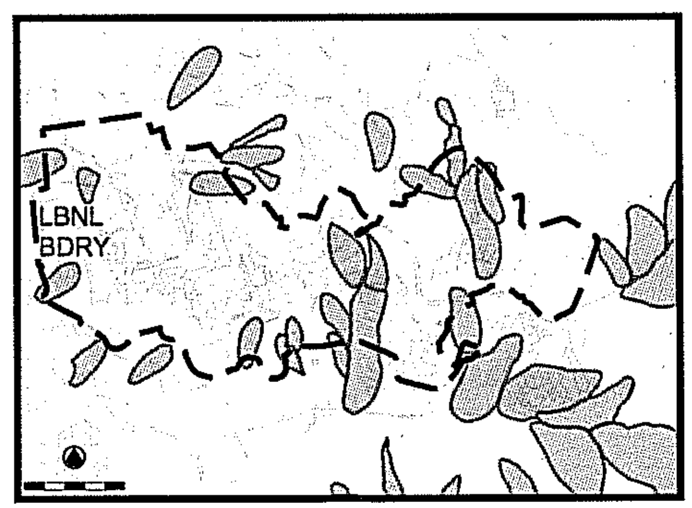


13b. LBNL, 2000





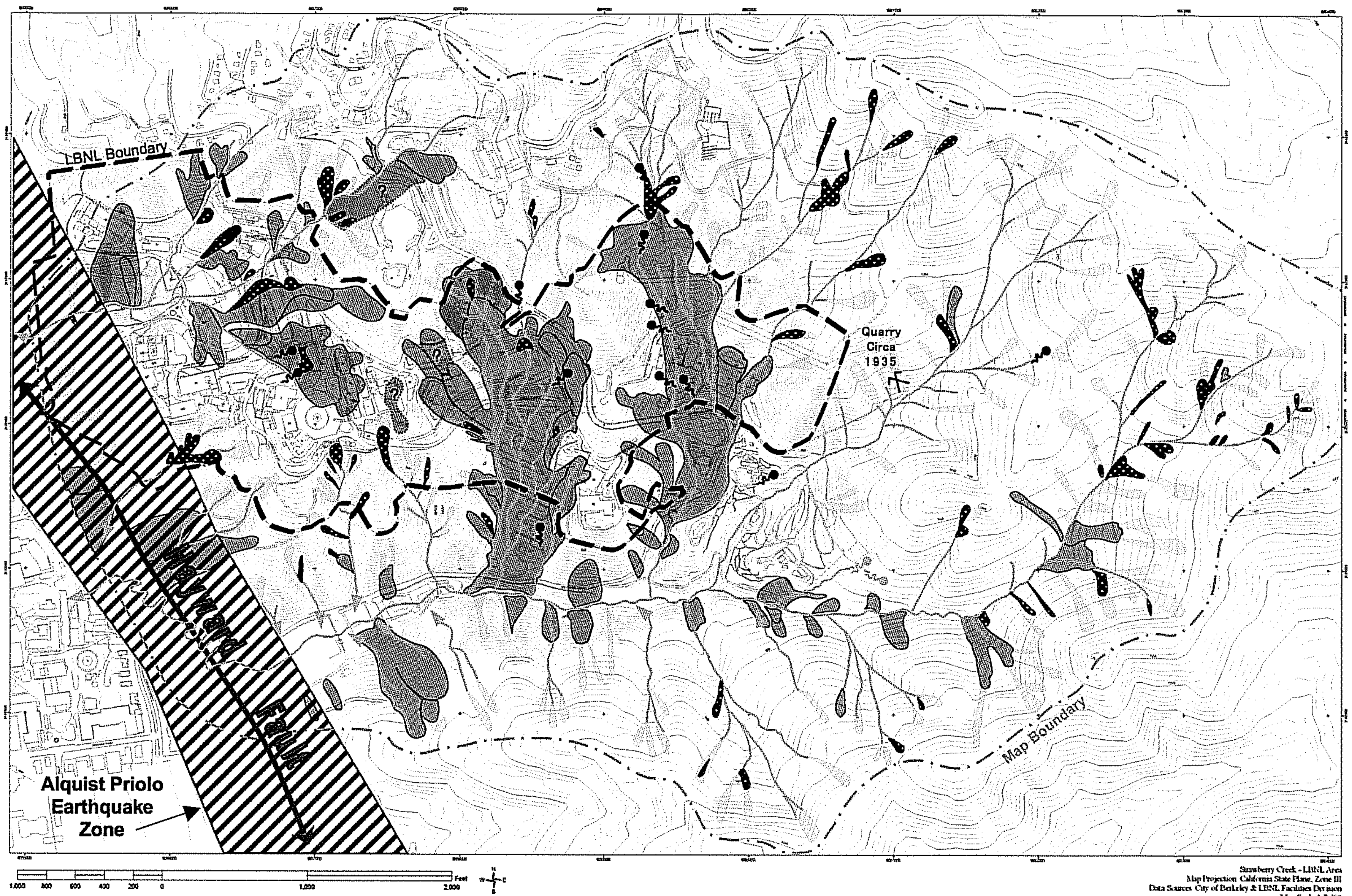
13c. Unpublished, Received from Kropp Assoc. (no author or date).



13d. Unpublished, Received from Kropp Assoc. (no author or date).

13e. California Geological Survey, 2003

FIGURES 13a-13e. MAPS OF LANDSLIDE STUDIES AND SURFICIAL DEPOSITS GEOLOGY



Colluvial Hollow: Source Area for Shallow Slides and/or Landslide Scar; Might Have Had Some Activity Within Colluvial Hollow During Last Century.

Earthflow, Slump, or Deep Seated Slide; Includes Area of Crown Scarp; Can include bedrock blocks; Portions of Some Earthflows May be Buried Beneath Alluvial Fans and Colluvium.

Debris Flow or Shallow Slide Active During Last Century

Historic Channel Network and Springs; Springs Adapted from Soule 1895

Laurel Collins, Watershed Sciences, January 2007

AERIAL PHOTOS: Strawberry Canyon, East Bay Regional Park District (1935)
STEREO PHOTOS: BUT-BUU-289 (1939), GS-CP (1946), AV-11 (1947), AV39-29 (1990)
Map of Strawberry Valley and Vicinity (Frank Soule, 1895)
1956 Topographic Map Portions (LBNL, 2000: Figures 4.3.2-2 and C2.2-1)
Hayward Fault from USGS Faults on Google Earth (2007)

FIGURE 13f. INTERPRETATION OF HISTORIC CHANNEL AND LANDSLIDE NETWORK AT LBNL IN STRAWBERRY CANYON

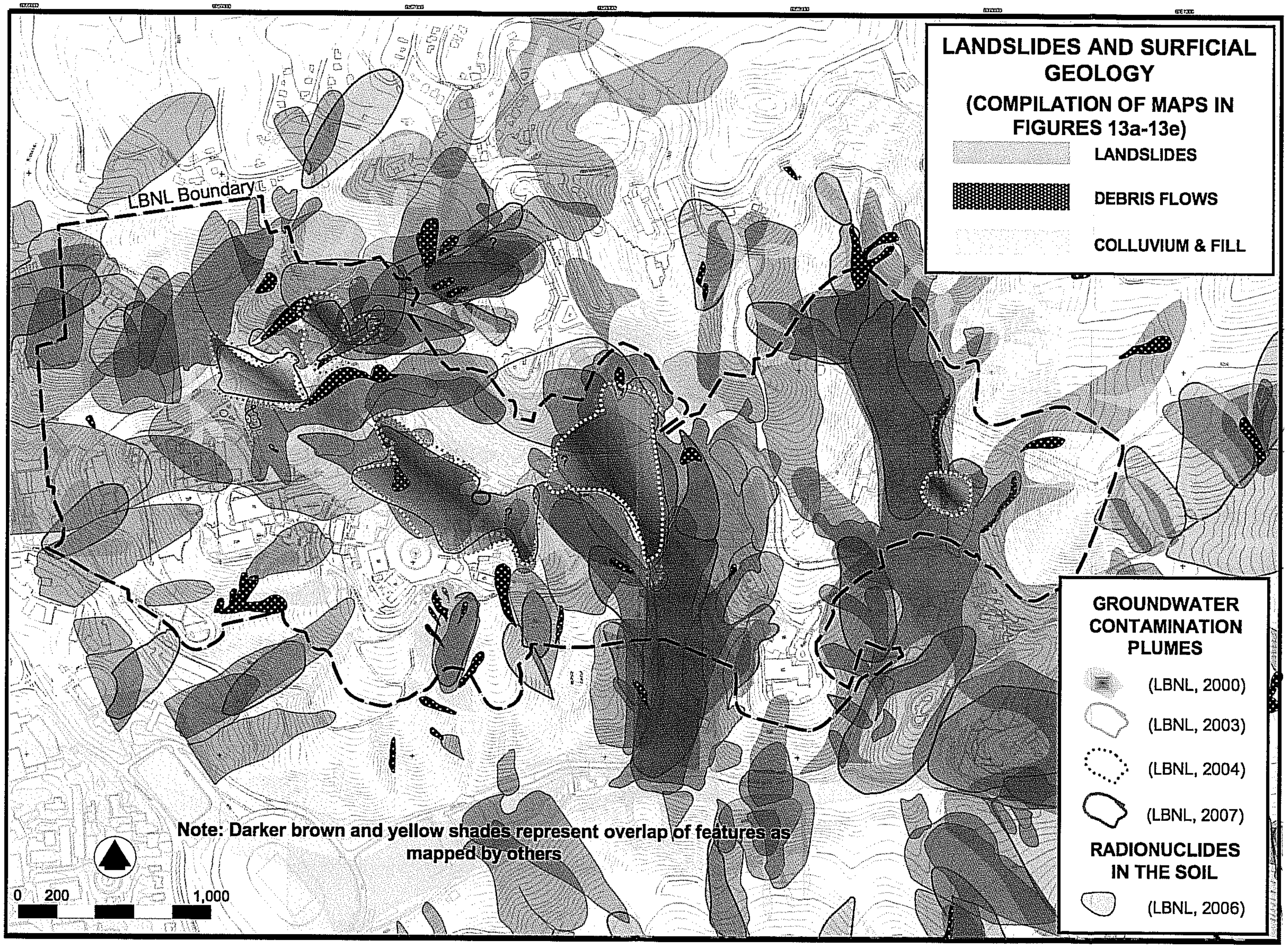


FIGURE 14. COMPILATION OF LANDSLIDE AND SURFICIAL GEOLOGY MAPS 13a-13f IN STRAWBERRY CANYON

22

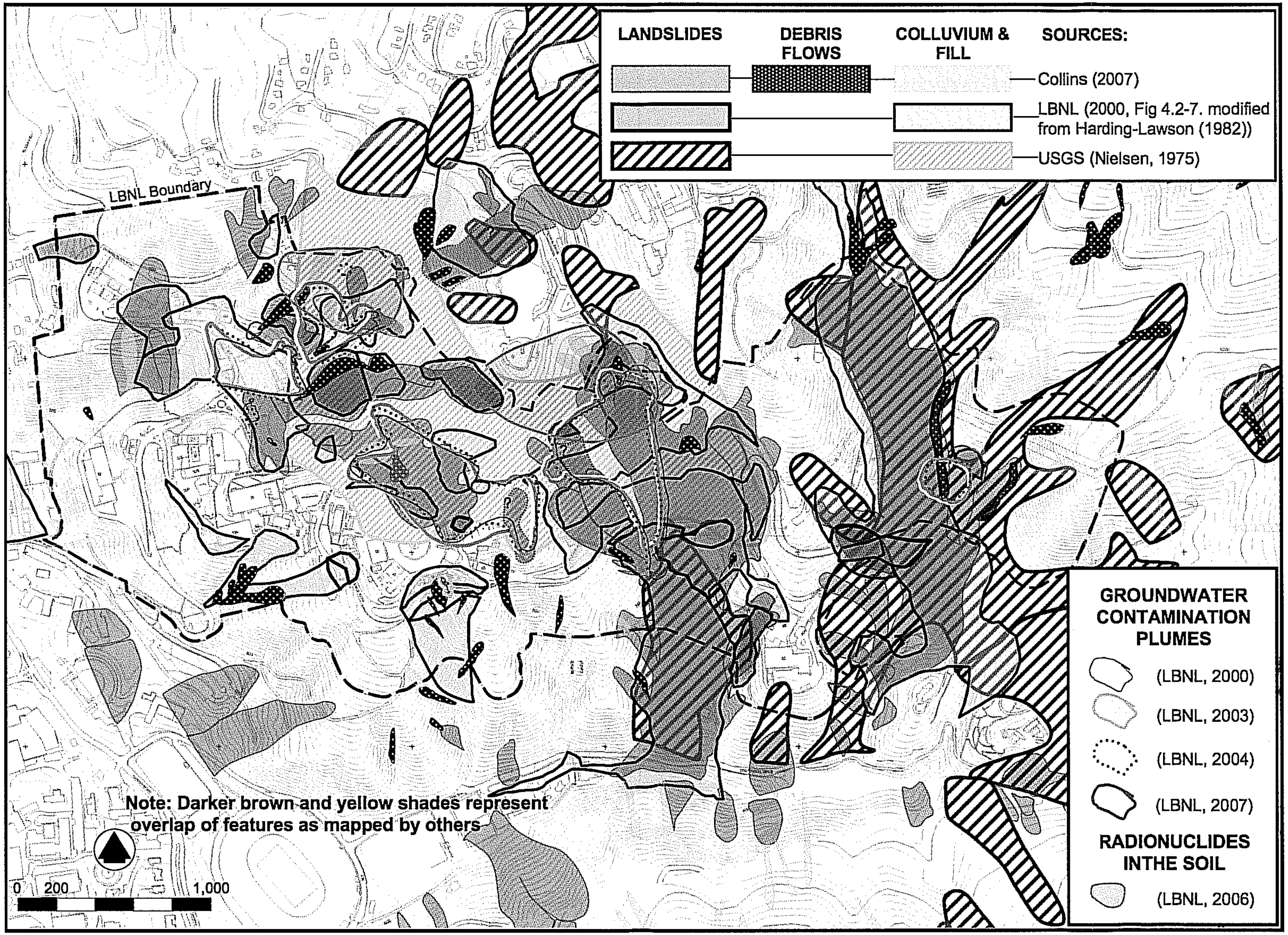


FIGURE 15. COMPILATION OF SELECTED LANDSLIDE MAPPING (FIGURES 13a,13b,13e) IN STRAWBERRY CANYON IN RELATION TO GROUNDWATER CONTAMINATION PLUMES

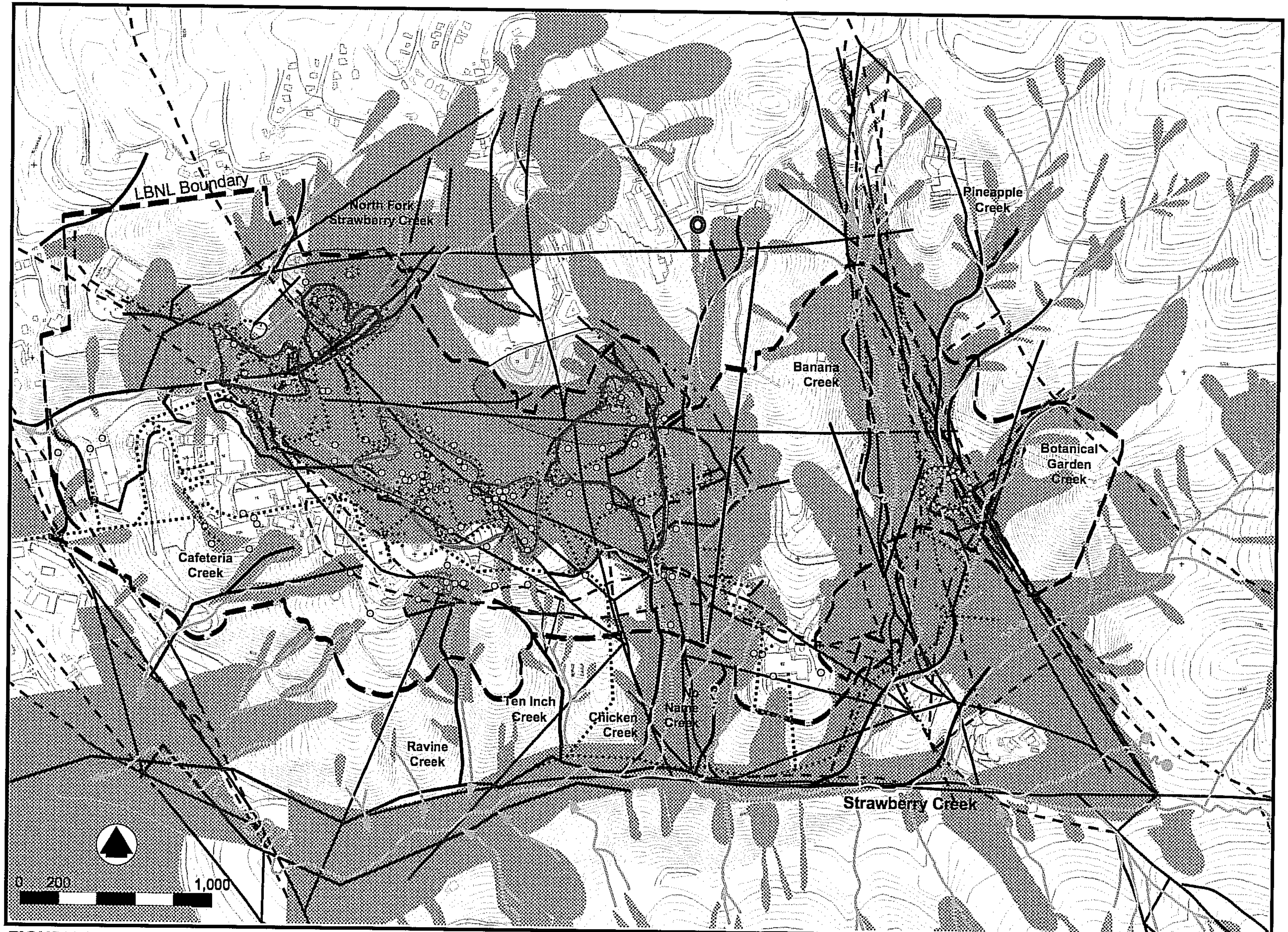


FIGURE 17a. COMPILATION OF MONITORING WELLS AND FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL. FOR BEDROCK CONTACTS VIEW FIGURES 8a AND 8b. SEE NEXT PAGE FOR MAP LEGEND.

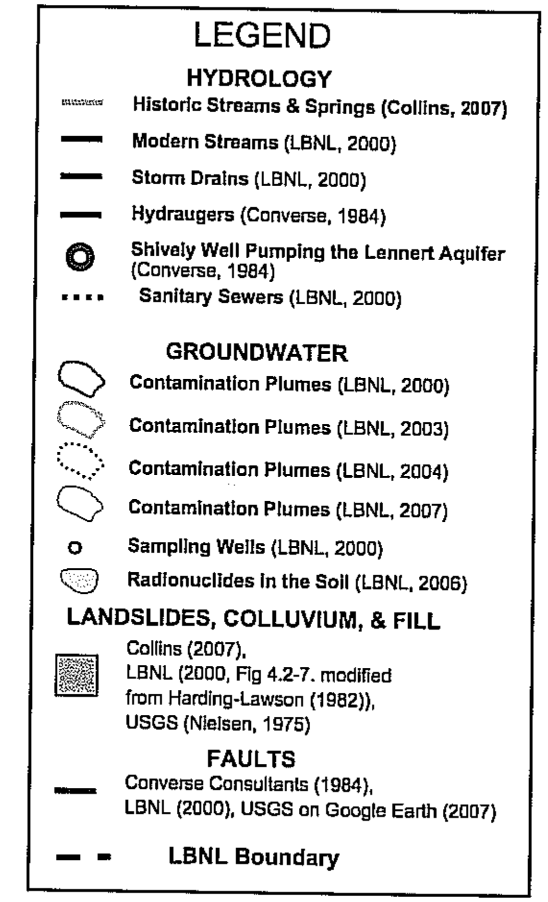
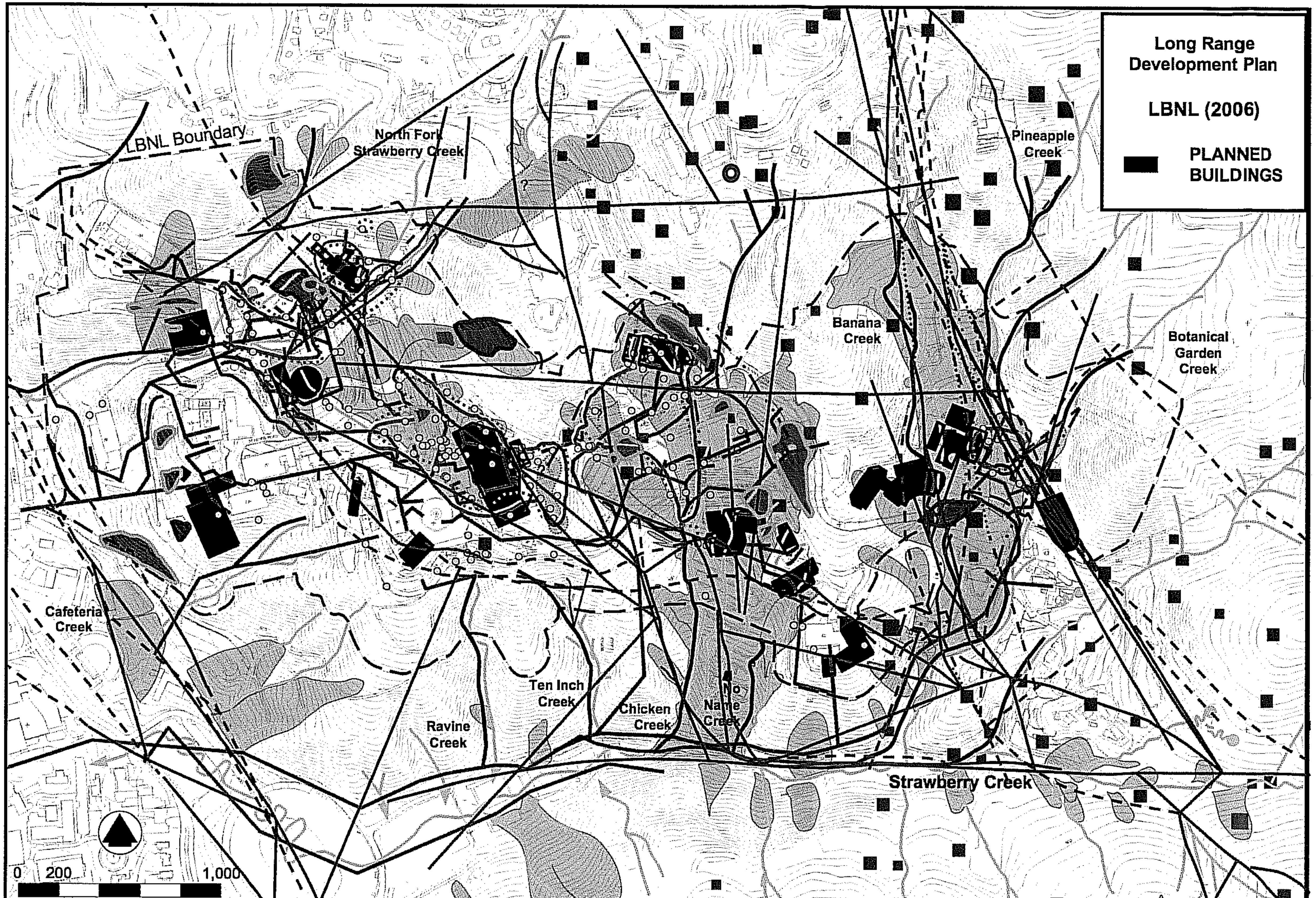


FIGURE 17b. LEGEND FOR FIGURE 17a COMPILATION OF FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL.

FIGURE 18a. ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALON(LANDSLIDES, HISTORIC AND MODERN CREEKS. SEE NEXT PAGE FOR MAP LEGENI



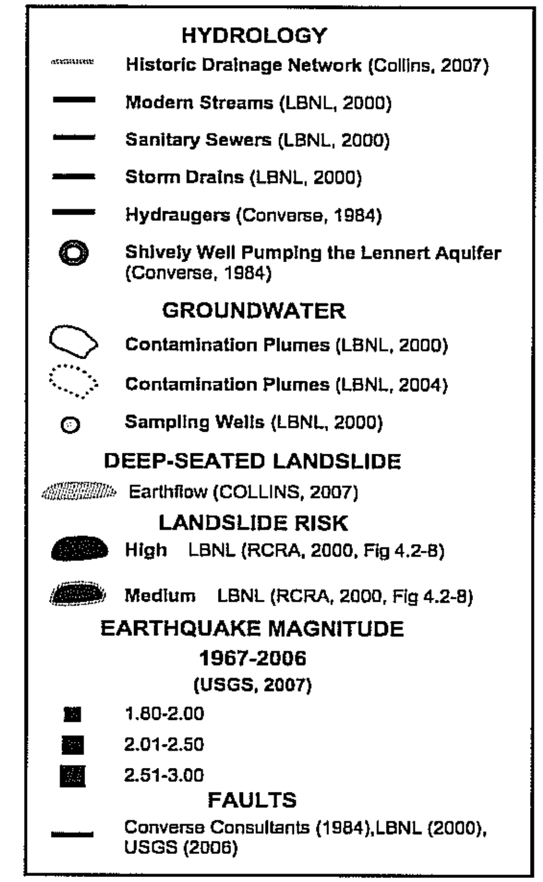


FIGURE 20b. KEY TO MAP 20a SITE CONDITIONS AND FUTURE BUILDING LOCATIONS

FIGURE 20a. VARIOUS COMPILED SITE CONDITIONS AT FUTURE BUILDING SITES OF LBNL'S LONG RANGE DEVELOPMENT PLAN. SEE NEXT PAGE FOR MAP LEGEND. NOTE THAT SOLID TO DASHED TO DOTTED RED FAULT LINES INDICATE DECREASING LEVELS OF CERTAINTY.

ATTACHMENT 2.

Committee to Minimize Toxic Waste

Jeff Philliber, Environmental Planner
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 69-201
Berkeley, CA 94720

January 3, 2008

Subject: Comments on the Draft Environmental Impact Report (DEIR) for the Construction and Operation of the Computational Research and Theory (CRT) Facility at the Lawrence Berkeley National Laboratory (LBNL) site.

Dear Mr. Philliber,

It is extremely troubling to see yet another proposal by the University of California (UC) to construct huge facilities (140,000 square feet in this case, for personnel of 300) on one of the <u>MOST</u> hazardous sites in the state, i.e. on top of the active Hayward Fault, within the Alquist-Priolo Eartquake Fault Zone, on a steep hillside slope without adequate ingress/egress!

It appears that the LBNL's Oakland Scientific Facility is a much better suited location to house ultra-sensitive super-computers, as is the case currently, and we ask that the NERSC (National Energy Research Scientific Computing) Center remain in Oakland.

We also ask that the UC's Richmond Field Station (RFS) site be given very serious consideration to house all the other UC/LBNL Computational Science and Engineering Program facilities, i.e. to spread the risk in case of a natural disaster, such as the predicted "Big One" on the Hayward Fault.

The proposed building site is one of the very few areas of virgin land at LBNL in the Strawberry Creek Watershed, and it should be preserved as such! In addition special consideration should be given to Cafeteria Creek, to preserve and improve one of the still daylighted tributaries of Strawberry Creek.

The CRT DEIR is extremely deficient with regard to addressing the many potential, serious hazards associated with earthquakes and landslides in the steep-sloped Strawberry Creek Watershed site.

These concerns were raised by the Committee to Minimize Toxic Waste (CMTW) and other community groups and individuals already in 2003, when UC/LBNL proposed the construction of Building 49 (B 49)at this very same location.

The comments provided in the B 49 CEQA process are still valid, and we ask that they are taken into consideration and responded to within the context of the CRT DEIR process.

Pages 3-4 of this letter include CMTW's comments. We are also including the transcript of Public Comments provided at the June 30, 2003 scoping meeting for the preparation of the DEIR for B 49, a total of 68 pages of community concerns about the site. (Attachment 1)

In addition we are enclosing Appendix A (as Attachment 2) and Appendix B (as Attachment 3) from the September 2003 DEIR for B 49 Project. Pages A-1 to A-82 and B-1 to B-182 reflect grave community concern and opposition to UC's plans to build on this treacherous site!

As our general comments, for the CRT DEIR sections related to: Air Quality, Biological Resources, Geology and Soils, Hazards and Hazardous Materials, Hydrology and Water Quality, Land Use and Planning, Population and Housing, Public Services, Transportation and Traffic, Utilities, Service Systems and Energy, we are submitting our March 2007 Report (as a CD) titled:

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRETATION TO FAULTS, LANDSLIDES AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA.(Attachment 4).

We ask that the Report text and maps be included in their entirety (as hard copies and maps in color) as part of the CRT Final EIR, and responded to. In addition we are providing 13 Report maps, 11"x17" in full color, titled: LBNL SITE MAP, groundwater contamination plumes and contaminated soil sites (F2), INTERPRETATION OF HISTORIC CHANNEL NETWORK at LBNL in Strawberry Creek Watershed (F5), GROUNDWATER CONTAMINATION PLUMES IN RELATION TO THE MODERN AND HISTORIC DRAINAGE NETWORKS AT LBNL (F6), SELECTED EXAMPLES OF FAULT MAPPING STUDIES AT LBNL IN STRAWBERRY CANYON (F9), COMPILATION OF FAULT MAPPING at LBNL in Strawberry Canyon relative to soil and groundwater contaminant plumes(F10).

Committee to Minimize Toxic Waste

Jeff Philliber
Environmental Planning Coordinator
Lawrence Berkeley National Laboratory
MS 90K
One Cyclotron Road
Berkeley, CA 94720

October 31, 2003

Re: Comments on the Draft Environmental Impact Report (DEIR) regarding the Construction and Operation of Building 49 (B 49) at the Lawrence Berkeley National Laboratory (LBNL).

Dear Mr. Philliber,

B 49 is proposed to be constructed on one of the riskiests sites possible in the Bay Area, practically on top of the Hayward Fault, in the Alquist-Priolo Earthquake Fault Zone.

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to "regulate development on or near fault traces" and to "prohibit the location of most structures for human occupancy across these traces". In addition to B 49 there are both University of California Berkeley (UCB) and LBNL buildings in the A-P Fault Zone. The Final EIR must have a comprehensive discussion with detailed maps showing the location of all present and proposed buildings in this seismic hazard zone as well as the location of all known earthquake fault traces between the Hayward Fault and the Wildcat Fault criss-crossing the LBNL site and the Strawberry Creek Watershed, and to answer the question: why build there?

On the basis of research conducted since the 1989 Loma Prieta earthquake, US Geological Survey (USGS) and other scientists conclude that there is a 70% probability of at least one magnitude 6.7 or greater quake, capable of causing widespread damage, striking the San Francisco Bay region before 2030. (Attachment 3).

In February of 2003 the California Geological Survey published a series of Seismic Hazard Zone maps, which indicate that most of the LBNL site is located in a very high-risk earthquake induced landslide area. Please provide in the Final EIR detailed USGS maps related to landslides, and again answer the question: why build there?

The DEIR practically ignored the fact that the proposed B 49 site is located in a significant watershed. The Map of Strawberry Valley and vicinity by Frank Soule, 1875 (Attachment 4) indicates that there were originally at least 5 creeks with tributaries in the general B 49 area, between the North Fork of Strawberry Creek and the Strawberry Creek itself to the south. In the Final EIR please provide a detailed contour map, showing the predevelopment state of the western portion of LBNL, including all the 7+ creeks then and their status today. The enclosed circa 1935 (?) contour map shows the various tributaries of the North Fork of Strawberry Creek, just north of the B 49 site. (Attachment 5).

LBNL has been subjected to numerous wet season landslides in the past. The B 49 geotechnical investigations were done during the dry summer months. The Final EIR must consider worst case rainy season El Nino type groundwater conditions and include maps/figures showing the groundwater elevations with respect to the excavation of the site, and assess the risk for landslides under these circumstances.

As stated in our September 3, 2003 comments (Attachment 6), LBNL currently has several acres of flat, developed, contaminated building sites, occupied by decommissioned facilities.

What would be the cost of clean-up of one of these sites for B 49? What is the current cost of excavating 26,000 cubic yards of soil from the proposed site? What is the cost of removal, transport and dumping of this soil? What is the total construction budget for B 49? Please provide a cost/benefit analysis for the above, and a serious consideration for using an existing flat developed site as an alternate site rather than the proposed horrendous excavation of a pristine hillside in a special Watershed.

In conclusion, contrary to what was stated in the DEIR, this whole development project remains controversial, namely due to the many natural hazards present at the site. For this reason it is imperative that you obtain assessments from independent experts (geologist, hydrologist, watershed/creek specialist etc.) regarding the multiple site hazards and risk analysis/scientific opinions on the appropriateness of building a six-story, 65,000 square foot office building on such a hazard ridden site. One risk analysis scenario should be: What would happen if a 6.7 or greater earthquake hit in the middle of the worst El Nino rainfall year when the total hillside was completely saturated?

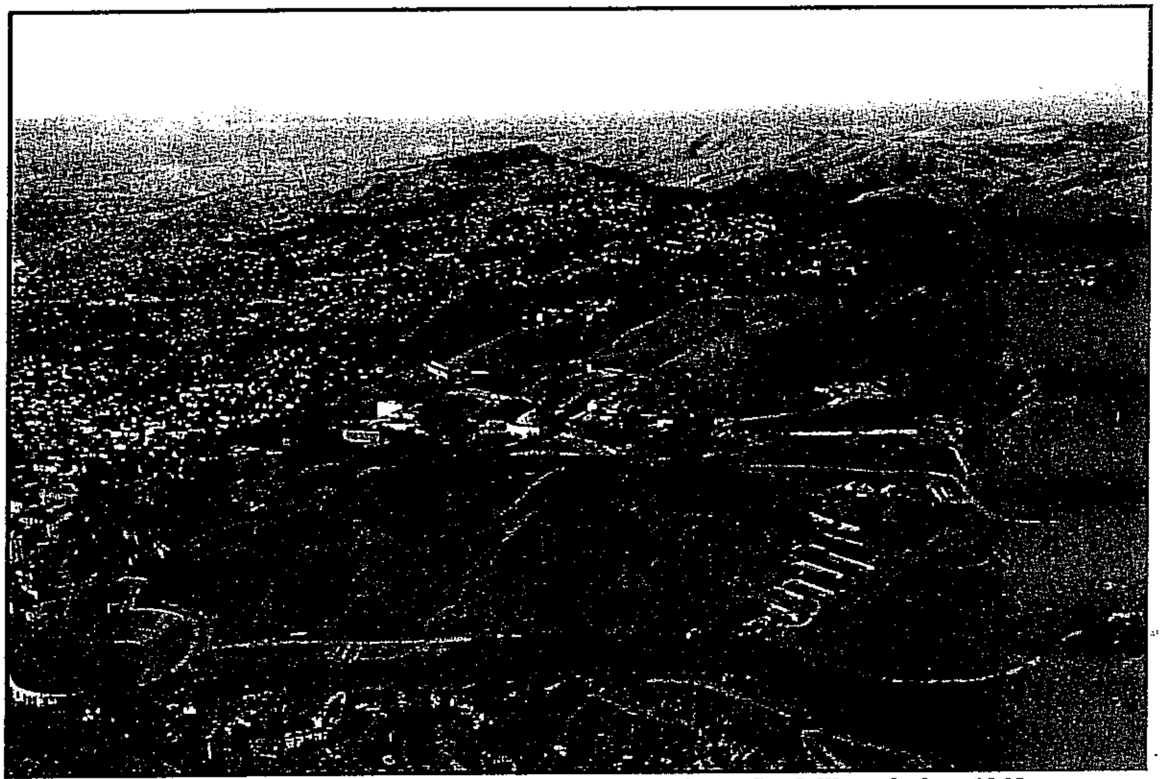
Sincerely,

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

PS. Who is the consultant referred to in your July 2, 2003 letter (Attachment 7) ?

CONTAMINANT PLUMES OF THE LAWRENCE BERKELEY NATIONAL LABORATORY AND THEIR INTERRELATION TO FAULTS, LANDSLIDES, AND STREAMS IN STRAWBERRY CANYON, BERKELEY AND OAKLAND, CALIFORNIA

March 2007



Strawberry Creek Watershed ca. 1965

Watershed Sciences

Laurel Collins, Geomorphologist
Watershed Sciences
1128 Fresno Ave
Berkeley, California 94707
collins@lmi.net

for

Pamela Sihvola, Project Manager
Committee to Minimize Toxic Waste
P.O. Box 9646
Berkeley, CA 94709

5

Of special interest is map titled:
GROUNDWATER CONTAMINATION PLUMES AND RADIOACTIVE CONTAMINATION IN SOIL RELATIVE TO FAULTS AND EARTHQUAKE EPICENTERS AT LBNL IN STRAWBERRY CANYON (F12b).

In Figures 12a and b we compiled the fault mapping by others (See Figure 9) and overlaid the epicenters of seismic events that have occurred in the Strawberry Canyon during the last 40 years, which amounted to over 57 earthquakes. Such a high incidence of seismic activity within the mapped traces of Wildcat Fault and between the Wildcat and the Cyclotron Faults provides compelling evidence that additional faults, other than just the Hayward Fault should be considered ACTIVE in Strawberry Canyon. See section on Fault Mapping on pages 24-35 of the Report.

Other map titles: MAPS OF LANDSLIDE STUDIES AND SURFICIAL DEPOSITS GEOLOGY (F13a-13e), INTERPRETATION OF HISTORIC CHANNEL AND LANDSLIDE NETWORK AT LBNL IN STRAWBERRY CANYON (F13f), COMPILATION OF LANDSLIDE AND SURFICIAL GEOLOGY MAPS 13a-13f IN STRAWBERRY CANYON (F14), COMPILATION OF SELECTED LANDSLIDE MAPPING(Fs 13a,b,e) IN STRAWBERRY CANYON IN RELATION TO GROUNDWATER CONTAMINATION PLUMES (F15), COMPILATION OF MONITORING WELLS AND FACTORS WITH POTENTIAL INFLUENCES ON GROUNDWATER TRANSPORT AT LBNL (F 17a), ZONES OF CONCERN FOR GROUNDWATER PLUME EXPANSION ALONG COMPILED FAULTS, BEDROCK CONTACTS, LANDSLIDES, HISTORIC AND MODERN CREEKS (F18a), and VARIOUS COMPILED SITE CONDITIONS AT FUTURE BUILDING SITES OF LBNL'S LONG RANGE DEVELOPMENT PLAN (F20a).

The maps referenced above are provided to supplement the inadequacies of the CRT DEIR, and to provide a more comprehensive picture of the natural and man-made hazards at LBNL.

On page 1.0-3 of the CRT DEIR there is a reference to the possibility that the federal government (i.e. Department of Energy) might close LBNL. It is our understanding that this is being considered and will possibly happen on or around CY 2010. Both the CRT and Helios projects are funded by other than DOE sources. Please, provide updated information what impacts might DOE's closing of LBNL cause. How are the lands under UC or other non-DOE funded projects being transferred out of the DOE's currently lease-held lands (50 year land lease)? Please, provide a site map that shows which land tracts/areas are being considered to be transferred out of DOE's current land lease. This is of specific interest with respect to the areas of contamination at LBNL, and who will be responsible for cleaning up the DOE's legacy contamination?What kinds of Environmental Review documents are being considered for these potential land transfers? What is the situation with the proposed CRT lands?

In conclusion we ask that the NERSC Center stay in Oakland, and that the Richmond Field Station site be considered for all other UC and non-DOE funded future projects. This is the only way to mitigate the horrendous traffic and diesel exhaust impacts along the corridor from the northeast to the southeast corners of the UC Berkeley Campus.

In addition we ask that all remaining virgin lands in the Strawberry Creek Watershed be preserved and all creeks, tributaries of the Strawberry Creek be restored and protected!

We hope that UC/LBNL will finally acknowledge that the Canyon is already overbuilt, and cannot safely accommodate any new development and that the focus of the University should be in planning for the WORST CASE SCENARIO, i.e. how to quarantee the survival of the maximum amount of students and Berkeley residents when the Hayward Fault erupts!

Sincerely,

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

PS. Please enclosed also find a copy of the transcript from the August 8, 2007 Public Scoping Meeting on the CRT and Helios Projects (Attachment 5) and copies of the written comments provided by the public regarding the above referenced projects (Attachment 6). We feel that the public concerns were <u>not</u> adequately taken into consideration in the CRT DEIR!

A D D E N D U M

As stated earlier, UC's CRT Facility is being proposed for exactly the same site as Building 49 (B49) was in 2003. A DEIR for B49 was circulated and a public hearing held, however, the Final EIR was never made available to the public.

We therefore ask, that the transcript of the October 20, 2003 public hearing on the B49 DEIR, as well as the written comments provided by the public <u>be included</u> as part of our comments for the CRT DEIR as Attachment 7.

We also ask that the August 8, 2007 CRT Facility scoping meeting transcript be included as Attachment 8.

ATTACHMENT 1.
(69 PAGES)

SCOPING MEETING

FOR PREPARATION OF A

DRAFT, TIERED ENVIRONMENTAL IMPACT REPORT

BUILDING 49 - OFFICE BUILDING

and

G - 4 PARKING LOT

LAWRENCE BERKELEY NATIONAL LABORATORY

North Berkeley Senior Center

June 30th, 2003

REPORTER'S TRANSCRIPT OF PROCEEDINGS
BY: JUDY LARRABEE, SHORTHAND REPORTER

CLARK REPORTING

2161 SHATTUCK AVENUE, SUITE 201

BERKELEY, CALIFORNIA 94704

(510) 486-0700

PROCEEDINGS

---oOo---

MS. POWELL: Good evening. I'm Terry Powell

ATTACHMENT 2
(82 PAGES)

APPENDIX A

REVISED (AUGUST 2003) NOTICE OF PREPARATION AND RESPONSES

ATTACHMENT 3
(182 PAGES)

APPENDIX B

ORIGINAL (JUNE 2003) NOTICE OF PREPARATION AND RESPONSES


ATTACHMENT 4.
CONTAMINANT PLUMES OF THE
LAWRENCE BERKELEY NATIONAL LABORATORY
AND THEIR INTERRELATION TO FAULTS, LANDSLIDES,
AND STREAMS IN STRAWBERRY CANYON,
BERKELEY AND OAKLAND, CALIFORNIA
March 2007

ATTACHMENT 5
(67 PAGES)

Lawrence Berkeley National Laboratory

Helios Energy Research Facility & Computational Research and Theory Facility Public Scoping Meeting

August 8, 2007

ATTACHMENT 6
(27 PAGES)

Lawrence Berkeley National Laboratory

Helios Energy Research Facility & Computational Research and Theory Facility Notice of Preparation Public Scoping Comments

July 26, 2007 – August 24, 2007

ATTACHMENT 7.

CONSTRUCTION AND OPERATION
OF THE

BUILDING 49 PROJECT

LAWRENCE BERKELEY NATIONAL LABORATORY
UNIVERSITY OF CALIFORNIA

Final Environmental Impact Report

December 2003

State Clearinghouse No. 2003062097

BERKELEY LAB

ATTACHMENT 8.

DRAFT ENVIRONMENTAL IMPACT REPORT
LBNL HELIOS ENERGY RESEARCH FACILITY &
COMPUTATIONAL RESEARCH AND THEORY (CRT) FACILITY

SCOPING MEETING
FINAL TRANSCRIPT
Wednesday, August 8, 2007
North Berkeley Senior Center
1900 Hearst Avenue
6:30 - 8:30 p.m.

REPORTER'S TRANSCRIPT OF PROCEEDINGS
BY: JUDY LARRABEE, SHORTHAND REPORTER

CLARK REPORTING AND VIDEOCONFERENCING
2161 SHATTUCK AVENUE, SUITE 201
BERKELEY, CALIFORNIA 94704
(510) 486-0700

PROCEEDINGS

MS. POWELL: My name is Terry Powell. I'm

ATTACHMENT 3.
(82+1 PAGES)

Lawrence Berkeley National Laboratory

Helios Energy Research Facility & Computational Research and Theory Facility Public Scoping Meeting

August 8, 2007

DRAFT ENVIRONMENTAL IMPACT REPORT
LBNL HELIOS ENERGY RESEARCH FACILITY &
COMPUTATIONAL RESEARCH AND THEORY (CRT) FACILITY

SCOPING MEETING

FINAL TRANSCRIPT

Wednesday, August 8, 2007

North Berkeley Senior Center

1900 Hearst Avenue

6:30 - 8:30 p.m.

REPORTER'S TRANSCRIPT OF PROCEEDINGS
BY: JUDY LARRABEE, SHORTHAND REPORTER

CLARK REPORTING AND VIDEOCONFERENCING

2161 SHATTUCK AVENUE, SUITE 201

BERKELEY, CALIFORNIA 94704

(510) 486-0700

PROCEEDINGS

MS. POWELL: My name is Terry Powell. I'm the Community Relations Officer at Lawrence Berkeley National Lab, and I'd like to welcome you here tonight for this scoping meeting on the Draft EIRs to be prepared for Berkeley Lab's proposed Helios Energy Research Facility and for the proposed Computational Research and Theory Facility.

First, general information. I'd like to remind you that the bathrooms are down the hall on the left, and there are some light refreshments on the back table.

There are some guidelines and procedures for this meeting, and I'd like to let you know them briefly. The meeting is a two-hour meeting from 6:30 to 8:30. It looks like we will go a little over, not much.

There were some materials on the table -- you probably saw them -- including cards, speakers cards, comment cards, some handouts and sign-in sheets.

The speaker cards are light blue. Please fill one out if you'd like to make comments or ask questions about the preparation of the Environmental Impact Reports. And we need to have your contact information, so please complete that card so that we can notify you about the follow-on activities on these projects.

There are also a salmon-colored card. Beverly, would you hold one up please? You're welcome to make your comments in writing and submit them. And Jeff Philliber will discuss that in more detail.

We have a court reporter tonight, Judy Larrabee, who is present and she will prepare a transcript of this meeting. It will be available in the Draft EIR.

She will need a five- to ten-minute break about halfway through, so be prepared. We're going to take a little bit of a break halfway through this evening.

This meeting tonight gives you the opportunity to ask questions and to make comments on the Proposed Draft EIRs. So when you come up to make your comments or questions, please give us your full name for the record.

So that everyone who wishes to speak has the opportunity, we'd like to limit your comments to three minutes, so please try to keep your questions or comments to that time. Beverly Harris, our Community Relations office staffer, has a timer for this purpose. We'll put the microphone here and we'll ask you to come forward. We'll call your name. Those of you in the audience, if you cannot hear the speakers, please let us know and we'll try to turn up the volume.

A little benefit of additional information for you. If there is time available after all the speakers have had a chance to speak, we'll do what we've done in the past which is to ask if people want to make additional comments. So please know that that time, if available, will be here.

Responses to your questions will not be given tonight. Repeat, will not be given tonight. The purpose of this meeting -- and Jeff Philliber, our planner at the lab, will give more insight into this -- the purpose is to receive your comments and your ideas for consideration in preparing the Draft Environmental Impact Report. Please also feel free to write your comments on the salmon-colored cards as I mentioned.

This meeting I want to point out is for the environmental review, not focused so much on the science, but on these facility projects. After the meeting ends, there may be time and some of our scientists here may be available to talk with you informally if you have some questions on the science.

And finally if you have an interest to receive future information, please sign up on our sign-up sheets with that with your address or e-mail. We do not hand out that sheet. We don't sell it to anybody. I wanted to assure somebody who had asked that question. We respect your privacy.

The environmental documents are available on the Web site www.lbl.gov/Community. They are also available in the Berkeley Public Library, Reference Desk area on the second floor, and in addition the Laboratory's library.

The agenda for tonight is very simple. This brief introduction. We have some project overview on both the Helios Energy Research Facility, which will be given by the scientists Elaine Chandler and Susan Jenkins on the Helios Facility, and on the Computational Research Facility, Michael Banda. Jeff Philliber will also give us some information on the Environment Impact Report process. And then we'll take your comments or your questions.

So with that we're going to begin, and we'd like to begin with the Helios Energy Research Facility and Elaine Chandler, who is working on the

Helios Project as the project manager for the Lawrence Berkeley National Lab.

MS. CHANDLER: Thank you. I'm really happy to be here to talk about the Helios Project. I live in Berkeley. I spend a lot of my free time talking to my neighbors like you about the Helios Project.

So the Helios Building, as my slide says, is housing new science to ensure a carbon-neutral transportation fuel. This idea came to us with the appearance of Steve Chu, our LBL Laboratory Director, who is very concerned about the environment and has told us all that transportation fuel is the biggest source of carbon dioxide in the atmosphere for the United States.

It's a big problem. Many, many of our scientists are very concerned about global warming, and this is the project that we are putting together to help ameliorate that issue. It might take 10 years. It might take 20 years. It might be, as our young colleagues say, their generation's moon shot, or it might be the next generation's moon shot. I think we're very committed at the Lab to get this problem solved one way or the other. It might take some learning before we get there. This is what we're talking about.

I'm going to talk about the Helios Solar Energy Research Center which is a high-tech materials approach to solving the problem. Dr. Susan Jenkins who is here from the Energy Biosciences Institute is going to talk about the biological approach to solar fuels.

So you can see in the pictures that I've put on the slide that there is a range of approaches that we're taking. We don't know in the end, in 50 years, which approach will be the biggest payoff. But we do know that as a human race we have to do something if we are going to use transportation fuels. Otherwise we'll be in big trouble.

Let me talk about the Solar Energy Research Center. It uses artificial methods to capture sunlight and creates solar fuels from water and carbon dioxide which we imagine will be scarfed up from the atmosphere that is already enriched with carbon dioxide. It's a technique that requires no arable land.

In the United States we actually have a lot of arable land that isn't being used for crops because we've been raising more and more improved crops. And so we have cropland, 100 million acres of cropland, that is not being used for crops. So the availability of arable land is not an issue in the United States, but in many, many countries it is. In southeast Asia, it's a big problem. In Africa where there's drought, it's a big problem. So there has to be more than one approach for us to solve this problem.

So this approach uses material science and physics and chemistry that was not available ten years ago. We feel that we could have tried this and in some ways did try this approach in the past, but it never panned out because they didn't have enough knowledge about how to control the generation of electrical charge from light and the control of the chemical reactions. But now we have learned a lot in the last ten years, especially in the last five years, and we think we can do it.

So I want to show an example of one of the approaches that we're thinking of. This is an example that uses nano-photovoltaics imbedded in a nano-porous membrane. And nano-photovoltaics is a photovoltaic cell -- and we have made many of them -- that has the length that is about one-tenth the thickness of your hair and the width is ten times smaller.

So they're tiny photovoltaic cells the size of a molecule and you can connect catalytic molecules to them so they will power the catalytic molecules, and the molecules will take carbon dioxide or water molecules from the air and split them. And then having an array of these many, many, many, many billions will produce a membrane that will do the job.

So this is one approach and I'm bringing it up because using this approach you can see what kind of laboratories we have to build to make it happen. So in the Helios Building we are planning a nano-photovoltaic synthesis facility, an area with analytical instruments so they can measure the properties and the performance of these things that we're constructing. And I don't have an electron microscope, but in the microscope you can look down to the scale and see what's going on.

In addition, we have some catalysts. Catalysts have for many years been making very efficient chemical reactions. Most of the things we eat, the additives and all this, are made with catalysts. Our shampoos are made with catalysts. Even our transportation fuels are made with catalysts to save money. But we don't have a sophisticated enough knowledge of catalysts to break down carbon dioxide and scarf up that carbon to make transportation fuel. So we have to have a big push to get better catalysts.

And finally, we know how to make some membranes, but we don't know how to make the membranes we will need. So we have a big membrane synthesis lab planned.

So that's this part, and now Susan.

MS. JENKINS: Thank you. Well, thanks for coming out to hear our presentation this evening.

I would like to start by just stating an obvious problem: we need to meet the world's increasing demand for energy while simultaneously reducing the trend of global warming. There are solutions. One solution: develop environmentally sound and sustainable alternative energy sources which are being developed in the programs like the one Elaine just highlighted.

When you consider these facts, the total amount of energy humans use annually is delivered to the earth in one hour from the sun. Biomass serves only 11 percent of human energy needs, two-thirds of which is gathered unsustainably. That's not good.

80 to 85 percent of our energy comes from

fossil fuels and 70 percent of petroleum uses for transportation. We think that we have one step toward the solution and that's in creating the Energy Biosciences Institute.

What is the institute? It is a partnership between UC Berkeley, University of Illinois and the Lawrence Berkeley Lab funded with $500 million over ten years from BP. Goals include elimination of bottlenecks to biofuels, development of improved biotechnologies for fuel production and education of scientists and engineers across relevant disciplines.

I put this slide up here to illustrate the many steps that are actually involved in this process from the biomass, or the actual plants that will be used to the end product of ethanol or the biofuel of choice. Each one of these steps represents a significant research endeavor. A lot is not known in most of these steps so there's a lot to be done.

And so we've divided our scientific program into these five major areas: Feedstock Development is the first one, where the biomass engineering studies on lignin and biotic stress will be carried out predominantly here at U.C. Berkeley and LBNL with the ones highlighted in gray; the four areas there to be carried out predominantly at the University of Illinois.

The next three areas, Biomass Depolymerization, Fossil Fuel Bioprocessing and Carbon Sequestration and Biofuels Production, the work will predominantly take place here.

One area we're particularly excited about is the Socio-Economic Systems because we feel this is a unique opportunity -- and I don't think that this has been done much before -- where we've actually included this as a significant part of our research program. And the first three areas, the Next Generation Assessment, Biofuels Markets and Networks, and Social Interactions and Risks will predominantly take place here.

And finally, another area that I think is a terrific component of our program are our Education Goals. I could just read them here, but we're definitely going to be developing new programs: training post-docs, Ph.D, developing interdisciplinary graduate programs in socio-economic law, policy, material science and life sciences as well as educating the public and developing programs for this and K through 12 as well, and providing extension activities targeting the greater agricultural community in the United States and globally. Thank you.

MR. BANKS: We have a little tag team going here. My name is Gary Banks. I'm a project manager in the facilities department at the Berkeley Lab, and I'm going to talk about the new building that's going to house this wonderful research that's being proposed here.

So I want to start out with just some facts and details about the project. It's about 160,000 gross square foot building facility that we're proposing to build. The project budget is $160 million, and that includes hard costs and soft costs. So the construction budget is around $125 million for this facility. It's going to be about a five-story structure.

We're locating -- or we're proposing to locate this building in a cluster on the Berkeley Lab that houses other material science research. So there will be a collaboration by the vicinity of this new structure.

We're going to access this area through an existing road that will be improved, and we're proposing 50 parking spots for this site, and the primary access to this area will be through buses or mass transportation.

The building will support about 500 people doing research and administrative work in the building.

This is an overall site planner, site map of the Berkeley Lab. This is the stadium, Greek Theater for a little orientation there. This is the Blackberry Gate coming off Hearst and then Centennial Road on this side here. And this is the cluster of the material sciences or research going on, and we are proposing to put this in the midst of that cluster there.

This is a larger site plan of this particular area. This is the building here. Again Centennial, existing road coming in, parking. I'll get a little bit more into what this is. This is an auditorium detached and these are the existing buildings in that area.

I just want to talk about some of the features. I only have a total of about five minutes and briefly give you an overview of this.

We plan on making this a very high performing building in terms of energy resources, environmental energy. So it's going to be a very efficient building with lots of stable design.

And we're going to do that to a number of areas in a number of ways. We're going to try to use extensive photovoltaic panels on this building. We're proposing green roofs which will not only give it some thermal mass around the building but also keep as much stormwater on this site without it running down the hill.

And also the way we're designing this is to build it into the hillside to reduce the visual impact of the building. Also the green roofs which are landscaped roofs with landscaped material on them will also reduce the visual impact of the new facility.

So this is a computer rendering, 3D rendering of the building. And this is the Helios portion that Elaine was talking about and the EBI portion that Susan -- this is the detached auditorium with the green roof, sod roof, landscape material, whatever you want to call it, and an existing molecular foundry facility that really looks over the top of this. And between these two elements there's a center core that's kind of a gathering space with a cafeteria.

These are some building sections going through here. I don't know how well you can see them from back there. There's a little footprint of the building with some section lines going through, but this shows here the four-story structure of the Helios section that's being sort of stepped into the hillside to reduce its mass. And then here you can see where we're taking earth over the top of it to reduce its impact.

And then there's another section going through the EBI portion and also through the lobby here. There's going to be an entrance on the hillside into the lab area and this is the Berkeley campus side. There's a five-story structure here on the hillside.

My last slide. I just want to mention again there's a lot of positive reasons why we're doing this. It is to address the climate change and the problems that we have. I know the Chancellor for the Berkeley campus has referred to it as this generation's moon shot or moon mission.

We're going to be trying to address clean energy alternatives with the research and the building, harness the sun's energy. The building, this research facility, will be built to reflect that mission. Now on to the CRT.

MS. POWELL: I notice some of you were straining to see the slides. We will put the slides up on the Web site as soon as we can.

And now we're going to go on to the Computational Research and Theory building with some presentations of information by the scientist Michael Banda.

MR. BANDA: Thank you. I'm Michael Banda. What I'd like to tell you about is the scientific efforts that will be going on in this facility.

This facility will house three different programs. One is the National Energy Scientific Computing Center. This is the hardware. It's a series of large high-performance computers.

The second one is the Computational Research Division, and these are the scientists that develop the software and application tools to use in scientific experiments. And thirdly is a Computational Science and Engineering Program that is a collaboration between UC Berkeley and LBL to train the next generation of computational scientists. So we have hardware, software and training.

So a little bit more about NERSC. NERSC is one of the largest computer resources for unclassified basic research in the country, and indeed in the world. What it specializes in are computations of scale, very large computations that could not be done otherwise.

The types of science that go on in these are the -- just as an example -- there are some climate modeling, material sciences, cosmology and others. But that's just an example of it. Next slide.

Beside serving the entire scientific community, there are over 2900 users. These are remote users. They don't come here. They all access over high-performance networks.

In 2006 we had over 300 projects. And most important to us is what is the scientific output. There were over 1400 refereed articles that were published last year from efforts at NERSC.

This demographic shows you the types of people that compute here, where they come from in a very broad stroke. About half of the resource are from universities, 42 percent of the resource are from other DOE laboratories, and then these other labs -- this is typically something like NASA, would be an example there -- and a very small portion of industry. And that fluctuates throughout the years.

NERSC is not new at Berkeley. Well, it's relatively new. It came here in 1996. And it was located up in the hill in the Building 50 complex.

In 2000, because high-performance computers grew in size and requirements, we had to move, and we moved to a leased facility in Oakland, the Oakland Scientific Facility. And by 2010 we'll outgrow that facility. We need to come back to the hill for scientific collaborations but also to accommodate the program.

One of the things that we've never had since coming here is a purpose-built facility for computing. We've always renovated something. We renovated a room in Building 50 Complex. We renovated an old bank in Oakland and now we're going to put this together and try to do it in the best way possible.

One of the other groups is the Computational Research Division. As I mentioned, these are the folks that do the software analysis. They are the scientists who actually write the codes and do the discipline-specific research. They are computational scientists, computer scientists and applied mathematicians.

The types of things they do -- this is just a broad stroke example again -- but you'll notice that some of these overlap with what the NERSC facility is. These are common types of experimentations.

What I'd really like to say, though, is what the Computation Research Division folks do, and what we do in high-performance computing, is provide the so-called "third leg of science." We all know this from school, theory and experiment and their relationship to each other. But what we can do now with some of these systems is actually do simulations that are sufficient to inform experiment and theory. And simulations allow us to do things that put two words together, for example, experimental cosmology. You can't experiment with cosmology but you can do it by simulation. That's an example of what we do.

The teaching component consists of, as I mentioned, a joint program between LBL and UCB to train these scientists and to use something called a designated emphasis in a particular discipline. Someone would be studying physics or chemistry and they would also be trained in the computational tools for that, as well as putting large teams together from Berkeley campus that would collaborate with our folks on areas of common interest. Some of the first possible candidates for this would be climate, cosmology or computer architecture.

I have to apologize. This is not projecting very well, but bear with me. This is an outline of the coast of the United States. This is Florida down here, and I'm going to run a graphic in a moment.

This is a graphic from one of our climate modelers. And what happened here is that this climate modeler got access to a high-performance system, got many more computer processors to work with. And as a result, without changing its code, he ran the same code, the same computer software but had much better resolution. He could look in finer and finer detail on the planet in this global climate model. And to his surprise, hurricanes showed up. Let me show you.

You can see that a simulated hurricane rolls in exactly the right place. It doesn't roll through Kansas or Nebraska. It goes right up the coast where it's supposed to. Similarly, other hurricanes or typhoons showed up in the Pacific in the right place. And what this did is it verified the understanding of the physics and the multi-physics that go on in climate modeling.

One last example is probably a very recognized George Smoot who won the Nobel Prize last year. He won the prize for work that was calculated in 1992.

And what he did was calculate the cosmic microwave background radiation signal, the remnant of the Bang, or actually the expansion, 300,000 years after the Big Bang. And this is one of its images from that time. And he did this with about four processors, a small computer. But the point was made.

However, to advance this much farther by using something that can take advantage of 6,000 processors, the granularity and the detail of the cosmic background is much different now. And what we can see here are temperature signatures that start to mimic the clustering of galaxies in the universe.

And so these are the kinds of science that we try to do with both the high-performance computers and the computational scientists.

Now I'll turn it over to Les Dutton who is going to speak to you about the building permit.

MR. DUTTON: Hi. My name is Les Dutton. I'm the director for CRT and I'd like to talk to you really about the building and its location on the site. Michael is the one that talks about all the science.

So this is a map of the LBL, as you can see, and the Computational Research and Theory Facility is located down on the left-hand side. We have Hearst Avenue, which you're all probably familiar with, coming up Cyclotron Road and then here's the facility. We're quite close to campus as well so we've got that good interaction with campus.

On this diagram you can see the building is located near 50, 70, and 70A Complexes and the LRDP have specifically asked us to bring those facilities together. So you may think it's in quite a closed vicinity but this is the way we planned it.

We're in the schematic design phase at the moment, and schematic design phase is just at the beginning. So what you see here today is really an early concept. We're about six weeks into that process. So we can modify this.

The gray color here is actual space for offices. We have 86,000 gross square feet with housing for 300 people. Now those people are actually not new to site; they're located at 50, 70 and 70A Complexes. So that issue with traffic won't actually be there. There are some new people but it's not a lot.

We've also got 22,000 square feet of mechanical space which is really to keep the computers cool and

32,000 of computer floor which is shown here in this column.

This is the view looking southwest. You can see the entry plaza here. Once again what we tried to do is bring the buildings together in the shade. We're also using the 50 complex auditorium because we need an auditorium here. We're saving space. We're using this one. And the entrance is close to all the collaborators so it's quite easy to see. There's a connection there between all the people that Michael Banda explained before.

The east-west orientation, once again it's best for solar gain. What we tried to do here is, if you can see the direction of Building 70A, 70 and 50 Complex, ideally people would have normally turned this building around the other way to get a great view of Berkeley and San Francisco. We've not done that. We've looked for that good orientation to save energy. So we don't get a big solar gain in trying to cool the building down.

This one is actually looking up from campus and Berkeley. Let me point out on this slide that there's a sloping roof here to minimize the impact, the visual impact from campus in Berkeley. This is the computer floor here with surfaces below it. We also have an office complex here and a building here. And what we tried to do as well so we can connect from campus up to the building is we have a stairway here that comes up, and we have several landings, and the people that work on campus can use this balcony area here to come across the building, go down an elevator, join with campus. So it's that community feel we're trying to get.

And what we've done also, as the other guys in Helios have said, we've tried to bury the building low so it has the least visual impacts as possible, but not so low that it increases the cost. Once again, we've followed the general theme.

And that's the end of my presentation. I'd like to introduce Jeff Philliber.

MR. PHILLIBER: Let me start by saying my name is Jeff Philliber. I'm the Lab's environmental planner.

Our court reporter has graciously agreed to stay an extra 15 or 20 minutes if necessary to make sure that everyone's comments are heard. If you don't have comments at the time the meeting is scheduled to end, we'll end. So I'm going to proceed with my presentation now. Thank you.

I'm here to discuss the CEQA process that's involved with both Environmental Impact Reports for both projects. The purpose of this scoping meeting is three-fold. We want to again present the basic information that you've heard from our speakers. We want to explain the CEQA process and that's what I'm doing. And most importantly, we want to hear and record your suggestions and comments and questions so that we can consider those as we prepare the Draft EIR.

What the scoping meeting is not, and the reason I'm bringing this up is because this question usually comes up during scoping meetings, it's not a Q and A forum or a discussion type of forum.

There's several reasons for this. The principal reasons are it detracts from the purpose of the meeting of giving everyone a chance to be heard and recorded. No one person from the Lab is really qualified to answer all the different questions you might have. And thirdly it creates a discrepancy in the information that other members of the public won't get if they're not at this meeting.

We do, however, want to answer all of your questions so we will do it three ways. If you have procedural or really basic questions, we are going to record those tonight, and on the Web site that

Terry Powell referred to earlier, we're going to answer those questions on the Web so that they're accessible to everyone.

If you have substantive questions or questions about the analysis or the environmental merits of the project, those will be addressed in the Environmental Impact Report, the Draft EIR, for each project.

If you have scientific questions, some of our scientific folks have graciously agreed to stick around after the meeting and we might be able to have some very civil conversations if you have some questions.

AUDIENCE MEMBER: That contradicts Number three in the first set there.

MR. PHILLIBER: I'm going to just go on, but Gene if you put that forward we'll answer any question you may have or criticisms.

The CEQA process for these Environmental Impact Reports follows the standard CEQA process. We start with scoping, which we're in right now. We've already issued our initial study along with Notices of Preparation for each of the projects, and tonight is the public scoping meeting. All of your comments again will be incorporated into the analysis we do for the Draft Environmental Impact Report which will be issued and will be circulated publicly for comments and public review.

We will hold a public hearing much like this forum when we have all of your comments after the period is up. We will respond to each comment in the Final Environmental Impact Report in a Response to Comments document. Then we will circulate a Final EIR to anyone who has commented on the Draft EIR and then we'll go to the Regents to ask for certification on the EIRs.

The time frames are as follows: scoping is a 30-day process. We're in it right now. The Draft EIR is expected out probably the beginning of October of 07. That's a 45-day minimum process mandated by CEQA. The Final EIR will be circulated from about seven to ten days, which is a requirement under CEQA for agencies and the public who have commented on the Draft EIR. And the Regents meeting we'd like to go to for both projects is in mid-January of 08.

A few other items about these EIRs. Again, just so we're clear, this is a tandem process, two separate EIRs on the same schedule. So you'll be able to look at them side by side. They're both project-specific EIRs which are tiered from our recently certified 2006 LRDP EIR. We'll be able to incorporate all the relevant studies, analyses and mitigation measures from that document into these tiered documents.

We'll also be able to take advantage of some of the sophisticated models we came up with for the LRDP EIR, including our site-wide health risk assessment and our site-wide environmental visual models.

There is no NEPA as part of this project because there's no federal involvement either in approvals or funding. The issues that will be evaluated in each of the two EIRs are the ones you see here: aesthetics, air quality, biological resources, geology and seismicity, hazards and hazardous materials, noise, traffic, utilities, and of course cumulative impacts and alternatives.

Issues that are focused out through the initial study process -- and you can read about these in the initial study -- are agricultural resources, cultural resources, land use, mineral resources, population and employment and public services. The reason these are focused out -- and again you can read the rationale for this -- is either they're adequately and fully addressed in the 2006 LRDP EIR for the purposes of these projects, or there are no impacts or relevance to these projects. If you have any comments on those, again, please get those in during this 30-day period.

And I'd just like to end by pointing out that we're able to carry forward many of the environmental values that are expressed in the 2006 LRDP EIR through these tiered EIRs and in these projects. For example, these projects will follow UC's sustainability policies. They're going to be the most energy-efficient buildings -- we're striving to make these the most energy-efficient buildings of their kind.

For the first time we have made a pledge that there will be no net increase in stormwater runoff from either of these projects, which is a significant development.

Biological resource mitigations, if you're familiar with the 2006 Environmental Impact LRDP EIR, you know that we had a very comprehensive set of biological resources mitigations that will now be instituted in each of these types of large projects.

And we have very limited parking in tandem with a very aggressive transportation demand management program to keep traffic impacts very minimal.

So that's the end of my presentation. I'm going to turn it back to Terry and we'll get on with your comments.

MS. POWELL: I'm going to call the speakers in the order I received your cards, and if you have cards could you bring them up.

The first speaker is David Chandler.

AUDIENCE MEMBER: Is there a time limit on this?

MS. POWELL: As I said, we're asking you to keep to three minutes, and if there's extra time at the end we'll take additional comments.

MR. CHANDLER: I'm a resident of Berkeley. I'm also a UC Berkeley faculty member in the chemistry department, and I have decided to spend the next several years of my life in the twilight of my career trying to help the world because I have two granddaughters and two daughters. I do know enough about science that I could play some role in addressing the energy crisis.

But the problem is so immense that it can't be addressed with small efforts. It must be addressed in a massive way. And I'm very grateful that Steve Chu came to UC Berkeley to run the Laboratory and to direct us in this Helios program.

That's all I want to say.

MS. POWELL: George Oram.

MR. ORAM: Hi. I'll address the audience, but my comments are really for the UC people.

I know from attending previous meetings and hearing about them, of many bodies that want to do projects, that you guys have no concept of how insulting it is to people like us to have you lay out a six-month schedule to achieve something when you haven't even heard what the people here think. I cannot tell you how unbelievably deeply it angers people. And it leads to projects getting turned down because people have to play out their unhappiness.

Now, we've had a very nice presentation as to the science here, and I don't understand it, but I'm willing to concede that it's all necessary. But why can't it be in the middle of Nevada? Why can't it be in Merced? Why can't PG&E can't get enough power into Oakland that the computing Lab can stay where it is? And I have a background in computers since 1957. I used to sell the sons of bitches.

Why have you not in your remarks talked at all about why that property, why these buildings, have to be up on a hillside, and why there are not alternatives? We'd like to know what the alternatives are, and we'd like you to consider the alternatives in this way: if we're not allowed to put this stuff up on this hill, what is our next best place? Because there is a next best place. And it might even be better.

Now I know there's going to be other talk about this because I know some of the people in the audience, but the university is where it is because that hillside was a great aquifer at one time, and it still is a great aquifer. There used to be a lake where the stadium is that fed all the water for the university.

What are you going to do about that? What if we need that water some day? Water is a scarcity in the world. I've been studying that particular issue.

I think this is as ill-conceived a project as many that I have reviewed, including the bus rapid transit, which is probably to bring people down to this building which absolutely doesn't need to be here.

Thank you very much.

MS. POWELL: Anne Wagley.

MS. WAGLEY: It's going to be hard to follow up on that one.

My name is Anne Wagley, and I'm a Berkeley resident, and I have a few brief points to make.

The UC Regents have approved and will approve various EIRs, including these discussed tonight, which have overlapping impacts on the city of Berkeley.

I am concerned about the lack of coordination between the University and the Lab on the proposed major construction projects, including the stadium project, and how the construction and future intensified uses affect the quality of life for residents of Berkeley.

I urge you to take a close look at the cumulative impacts of all projects approved by the Regents in your analyses.

My second point relates to mitigation. The Lab has built up quite intensely in the hills above the City of Berkeley, and road access to your facilities and sewer and stormwater drains run through the City of Berkeley. Our roads and our culverts are aging and it is the taxpayers of Berkeley who have to pay for their upkeep, not you.

As we have seen recently in midtown Manhattan and in Minneapolis, Minnesota, neglect of aging infrastructure can have tragic consequences. Please consider paying for the infrastructure impacts, even the past impacts, that you impose on the City of Berkeley.

And this brings me to my third point. While residents in California may be happy with their financial support for the University of California and the Lab, why should we support a for-profit oil company such as British Petroleum? BP should not take advantage of the tax-free haven you have up on the hill.

If they want to do business here, they can set up shop somewhere in Berkeley and pay property taxes and fees and assessments as do all other for-profit businesses in Berkeley. By allowing them to operate as proposed on the land that has been given to the people of California is just ripping the taxpayers off.

Finally, I would like you to take a good look at what you are doing to the hill, the landscape on which you sit and the vulnerabilities of the Strawberry Creek Watershed. I do not think you are being good stewards of the natural resource, and the abuse of this area from the top of the hill down to the stadium is a tragedy for all.

There are plenty of brownfield sites in the Bay Area, even some that the Regents now own in Richmond, that would benefit from the intensified uses you plan for Strawberry Canyon.

Please consider the alternatives and work to preserve what remains of the Strawberry Creek Watershed. Thank you.

MS. POWELL: Thank you. Gianna Ranuzzi.

MS. RANUZZI: I want to thank you for giving this presentation. It's a wonderful rallying point for the citizens of Berkeley, and I think this is a beginning for us to get more together on this.

What I would like to see is an analysis of the Notice of Preparation. You told us about what the program was, but I agree with that gentleman that we have to have alternative sites. One lady mentioned another place, Mare Island.

I'm worried that this is in our watershed. This is above our heads. You said very conservatively on the CRT Report that there's a 62 percent chance of an earthquake, but I read in newspapers that we have to be prepared for this all the time. And you said that the land was prone to landslides. So this makes me feel very nervous about the health risk.

It's near a major population center, plus it's going to be difficult for the 3,650 people that are in the Lab to get out of there.

I used to take classes where I went across Grizzly Peak, and there's something called tule fog. You have to thread through here. It's very dangerous.

I worked on the Draft South Side Plan doing research, and there is a big controversy about whether Durant and Bancroft should be one-way street or two-way streets. And it was suggested by the fire department that you had to keep it to be a one-way street because of the extreme danger of getting fire trucks up there.

This is a bad place for it. I am worried about the environment. I'm worried about our life, our safety. This is going to be a terrible catastrophe if you had anything happen up there.

Please consider having it at another place. I'm worried about the Bevatron Center. If you take 4,600 in truckloads out of there or if you encase it, either way it's wrong.

It was a bad program. The nano-technology foundry should have had an EIR. We need to study all these. We need to extend the period of this program because in these Notice of Preparations they say that they're adequate mitigations in the long-range development plan of the Lab, but they don't say what it is. And so we need more time. We need you to take leadership in helping us through this process.

I'm not talking about the merits of the building. It said in one place that the Regents said that the benefits outweigh the risks. No, we're not talking about the benefits of this building. We're talking about the location. And so we need to have alternatives, and it's the wrong place. You're making a terrible mistake. Welcome Chernobyl.

MS. POWELL: Martha Nicoloff.

MS. NICOLOFF: I wonder actually if there is a more suitable site for this important and large project that's being reviewed tonight. Given the predictions of the Hayward Fault that's just waiting for the big one and also the creek bed and drainage problems, significant reduction of open space and the possible damage to a mature grove of redwoods, I would like to ask the question: have you considered the existing and empty buildings at Mare Island

Shipyard?

The site is not far up the East Bay coast and there are comfortable looking single family and duplexes being constructed there recently. It makes no sense to think of cramming all the many projected uses, and beyond the two we're talking tonight, in the relatively tight space of Strawberry Canyon with a possibility that earthquakes could release hazardous materials. Thank you. Martha Nicoloff.

MS. POWELL: Thank you, Martha.

MS. NICOLOFF: I don't want to give up these pictures, but I'll put them someplace where you can have a look at them.

MS. POWELL: Ayr?

AYR: All right. Well, first off, I also very much resent this process and the way it takes place. I just feel like if there's a proposal, it should be actually really a proposal and people should talk about it. I feel like ya'll present things as a done deal far too often, and I think that's one of the ways the system works to push its way, is to present things like they're a done deal and there's not much you can do about it.

And really, I think as far you're concerned, that's pretty much the case. I think this is pretty much a dog and pony show. My props to Mac over there on that one. Basically I mostly resent that. So I just want to start off by that.

Now that I've said that to ya'll, let me come to speak to who I really came to speak to here, which is ya'll.

I really appreciate people's concerns for Strawberry Canyon and that watershed. We should treat our watersheds better, and that goes for everywhere.

As far as the impacts on the environment of this project, I think they're much bigger than any one watershed. I think if you look at the technology that they're talking about, particularly the biofuels, which -- let's be clear -- they're talking about genetically modified organisms which we still don't have a really good handle on long term. And when I say long term, I mean long term, over the generations. We don't really know how that's going to affect us.

I think that what we've already seen is we've seen corporate agriculture and corporate science solutions have the effect they've had on this planet. And after the war you have these big chemical companies that have all these chemicals left over that they were killing people with and they worked with people at the Ford Foundation and the Rockefeller Foundation, and they said, "You know, let's start researching this stuff in our universities. How can we use all these chemicals to improve lives and better living through chemistry," and all this, you know? And if we could have stopped those research facilities from being built in the 40s, our world might be a little bit better off today. Our soil might just have a chance. We still might be able to drink the water.

So these are really serious things. We're talking about our water, our air, and our earth, and if we really want a way to impact on the environment, we got to start there.

This project to me it's just furthering the whole push toward very limited narrow thinking that has basically destroyed many, many ecosystems and especially negatively affected the Global South.

Yeah. Burning fossil fuels is not working out for us, and we do need to deal with that. But the way to deal with that is not to then turn the Global South from oil producing, mineral producing factories into mono-crop, genetically altered food farms. So if this thing goes through to the extent they want it to go through, it's going to affect millions of people around the world.

And we have a responsibility to stop this now, and I really resent that they're acting like it's a done deal. They're about to sign a contract. The DEIR is not even in yet. We're still supposedly working on that all together, right here, right? Do you know what I'm saying? So basically we need to demand a one-year moratorium right now. No deal. No deal.

MS. POWELL: Thank you. Our next speaker is Merrilee Mitchell.

MS. MITCHELL: I didn't want to get mad as I usually do up here, and so I brought some papers to hand out.

The first one is on the trees, 'cause the trees are so important. We don't hear any mention of them except if you check out every time they build a building they're cutting some down.

So this was a very good document I got. I copied it. I don't know if maybe -- I don't know. If some of you could help me --

MS. POWELL: Why don't you put them on the table?

MS. MITCHELL: I don't want to because

then they won't get to where I want them to go. Thank you very much.

Now basically when a tree dies, it releases the carbon back into the air. The death of one 70-year-old tree would return over 3 tons of carbon to the atmosphere.

I believe the University in Strawberry Canyon should be doing the kind of research that understands that and helps us to save these trees, Because all over the world what's happening they're cutting down the rainforest -- I'm going to blow it and sing a song. There's a song I heard that just drove me up the wall because it was a song for kids that they sing when they get upset. And it was called -- oh dear. It was Stand by Me. And it was, "If we are wise -- if we are wise, we know that there's always tomorrow." And we don't know that any more because of what they're doing with our trees.

And now they're doing this stuff, which is going to get people in China and other places all over the world driving cars so people in the Haas Business School that have investments can make money on the biodiesel. And ethanol doesn't really work that good, the more we're finding out -- and we are finding out.

So these things on the trees here, the young trees that are being planted, they'll say they'll plant three when they cut down one. Most of them don't survive, and if they don't get past ten years old, they're not doing what we need them to do. So this article is very good.

Another article, this is about Lab workers suffering fallout. This is the UC Berkeley labs. They're not taking care of their own workers. They're not cleaning up their toxins. And I want to share it. If you can pass this around. I'll get more copies.

And then I have another one here on radiation and this is reconsidering nuclear power, and if you look at page three, you'll see quotes from the Dr. Chu that was mentioned before.

AUDIENCE MEMBER: Who is he?

MS. MITCHELL: Dr. Chu is the head of the Lab and the Helios Project. Helios is supposed to mean sun but there's not a lot of sun. There's not a lot of sunshine in this whole thing. But there is radiation and it's hot. They want to bring back radiation.

So if you read about it, they're talking about things that are going to take many, many, many years and they should not be doing it in Strawberry Canyon over active faults and stuff like that. For example, one of his concepts is that you could recycle the waste products. And ever since radiation began, they've been talking about it, but they haven't gotten too far. But it takes a while. It's going to take years and we shouldn't have it in our backyard.

(Timer sounds.)

I just want to ask one question.

AUDIENCE MEMBER: What's the question?

AUDIENCE MEMBER: We want the question.

MS. POWELL: I'm sorry. Everyone gets an equal amount of time.

MS. MITCHELL: My question is simply that I would like to know if you've gotten filters and things for the nano-technology.

AUDIENCE MEMBER: Those things don't work.

MS. MITCHELL: I know. But --

MS. POWELL: Thank you.

MS. MITCHELL: -- are they doing anything to protect us from those nano-tech particles that are going to be used in the Helios Project? And they're going to be used in the EBI.

MS. POWELL: Okay. That was the question.

Our next speaker is Francisco Ramos Stierle.

MR. STIERLE: I gave her 20 seconds of my time.

As a fourth-year grad student of the astrophysics program at the University of California Berkeley, I would like to share with you the perspective of the majority of our generation, and that generation cares about our future.

And as a scientist, of course we are not against science. We are against the unethical applications of science. We are for the construction of a scientific, rational and humanitarian society. That's what we are for.

And the problem -- I would like to point three points. The problem isn't the problem. I saw that we have a problem. Energy supply, yes. We have a problem with global warming, yes. And you stop there. That's the problem.

We have to see the big perspective. What is going to be the social implications? What is going to be the environmental implications? Slow down. Slow food. Slow science.

We've seen it already. 20 years ago, if somebody would have listened to the scientist, "Watch out with global warming" 20 years ago, nothing of this would have happened. So listen to the scientists now.

They are driven by greed and by -- that's the other point. British Petroleum -- not BP -- British Petroleum has a dark past, but we all have some problems in our lives. So that's okay. But what I'm worried about is the dark present. Okay? That's what this generation, and the generation of the gentleman, that's what we're worried about, is the dark present.

So we would like to give a message to the society that we are different than the University of California and worried about the public. Let's go through action rather than words. Okay?

They have money. They have a $2 billion profit in 2005 and yet they want to use $17 million that is devoted for education. That's taxpayers. Like we said, why they don't put that money?

Well, that's not the problem. Again, my focus here is as a scientist and to share with you the majority -- it's a majority, okay? It's not in the mass media. It's the majority of our generation are worried about the big picture, the long term.

The earth is but one country and the humankind its citizens.

MS. POWELL: Jason Ahmadi.

AUDIENCE MEMBER: Can you announce who comes next so we can have an idea what is going on?

MS. POWELL: Yes. Anna Aguirre. Thank you for the suggestion.

MR. AHMADI: Hi everybody. My name is Jason Ahmadi. I'm an almost-undergraduate alumni at UC Berkeley. I got a little couple of more things I got to clear up. I got all my units done but, you know, other stuff.

So this is a nice little California presentation we got here. It's pretty informative, but it's kind of pointless because British Petroleum isn't going to come here. It's not going to happen. So thank you for telling me about your imaginary building and your imaginary research project, but it's a little waste of time. But it's okay. It's okay.

It's kind of funny also how you mentioned in the beginning. I was taking notes so I can say some stuff. This meeting is not about the science of what you guys are doing, and then half the things that you guys yourselves talked about was about the science. It's kind of funny that you can talk about it but we can't.

So basically the problem with British Petroleum, BP, or the other names that it's had throughout the generations since it's started, is that it's all about profit. It's always trying to mine the most profit and not caring about anything else.

I'm not saying that, you know, BP wouldn't do something good. No. BP would do something really good if there was money in it. If they say, "We can do the moral thing and we can get the money," then BP will be right there.

So it's all about profit. That's what this meeting is about too. We're having this meeting right now so they can figure out all the things that they can fix. You know, get the community's -- let's just see what they think. Because in their minds, they're really the community. They're really sorry. They're building their building here, and really, they just want to see the most information they can get to get the most profit.

Now, this isn't surprising to me at all. I'm going to talk a little bit about before they were even British Petroleum. There's this oil company who had interest in Iranian oil. They actually had the rights to this oil of Iran. And so this democratically elected guy Mohammed Mossadeq -- I don't know if you've ever heard of this man -- he came up he says, "No. We've going to nationalize this Iranian oil. This is our soil. The oil is under our soil. It's our soil. You give us some money for this oil." So British Petroleum, unable to get any get response from their own government, come to the United States. And what do they do? They use the CIA to do a coup d'état and oust Mohammed Mossadeq for their profit.

I just don't think that we can -- maybe they're trying to do something environmental, but I don't think we can trust them. This is my university. I went to school here for four years to this great university that loves to do things like this. Four years of my life. You know what? I don't want it in my university and I don't want it in the world. Thank you.

MS. POWELL: Anna Aguirre. And the next speaker is Peter Ralph.

MS. AGUIRRE: My name is Anna Aguirre. And I'm entitling this particular presentation the Arrogance of UC.

I'm only going by what I've seen today. I haven't been involved in anything at UC for a long time.

Let's start with the fact that the agenda for the scoping meeting had no time written in there as to when the meeting was going to begin. That's number one.

Number two. I have attended many scoping meetings because I am 74, but I've been attending a lot of meetings that have to do with energy plants and those are put on by the State Energy Commission.

UC's arrogance is such that they didn't even bring any copies to this meeting. They assume that all of us had computers. Well, I don't have a computer. It's not that -- computers are not good for my eyes. They're not good for the cancer that I just went through. It's not good for my open heart surgery. It's not good for a lot of things. So that's part of the arrogance of UC.

And I have no idea until I moved to Berkeley the control that UC exercises over the lives of those of us who happen to reside in Berkeley.

I bought my house in November and I just moved in like three months ago. But it's just overwhelming when you think about it. It's very, very difficult to really follow and see exactly how many projects they're really involved in.

But continuing with the arrogance, it has to do with the documents not being available.

Number two. One of my biggest concerns that I have is according to what I have read, British Petroleum is going to put something like 200 of their employees right into the faculty at UC. Now, you know, they don't have to go through what everybody else has to go through to get a job at UC. They're just being plopped in there.

That to me is again -- I'm just going by what I have read, and I do read at least six papers a day after going to Berkeley and going to Stanford and a couple of other places. I read English pretty well, even though English is not my native tongue.

So as residents, I also worry about the fact that even though people don't like to talk about it, everybody who is here involved in this, making the presentations, they're all Anglo. There are no Latinos. There are no African Americans. There are no Asians. Nobody. Everybody is an Anglo, and that worries me because it tells me that [against] the arrogance of UC is that we do not have to worry about anybody. We are UC and we do things our way and forget about the residents of Berkeley. We don't even need to think about them or take them into consideration.

The last thing that I have in here is that I don't believe that whatever they are trying to do can be as confusing as trying to read an energy plant information. I think all of us here are able to understand and read, and I worry about when an organization does not give us the documents of the meeting. It's not clear at all. It's not transparent at all. Thank you.

MS. POWELL: Thank you.

Peter Ralph and following Peter Ralph, Hillary Lehr.

MR. RALPH: Hi. Thanks to everybody for giving background and context on this whole thing.

In the presentation that the Helios and EBI folks made, they referred several times to this project as being the next generation's moon shot. An another metaphor that they've used several times, like in the proposal and in the celebration for signing the deal, they compared it to the Manhattan Project which is I think really appropriate for reasons that -- symbolizing the ways that people are worried about it.

They're entering into this project by saying how we're in this time of crisis and we need to act really quick and do this really big science thing really fast. We're not really thinking about what the longer term implications of that are going to be.

How this specifically affects the building that they're proposing to make is that in the EBI and Helios facilities they're going to be doing lots of genetic engineering, but specifically synthetic biology which is not just genetic engineering but it's this entirely new thing where one of the aims is to construct entirely new organisms from scratch which haven't existed before. Needless to say, there hasn't been any research on the potential effects of this sort of thing, partly because they don't exist. But also partly because they don't seem to be worried about it.

We don't know hardly anything about what the potential health or environmental hazards of all these things, specifically synthetic biology and also, I gather, nano-technology, could be.

So when they build this building, when they look at the environmental impacts of this building, I think they really need to address that specifically, like outline things like the containment, and these things with unknown effects.

I hear that the biohazards safety level or whatever it's called that they're proposing to have at this building is the same as what the genetic researchers working on corn have at Berkeley. It's just not the same thing. I think that we really need to look at that.

MS. POWELL: Thank you.

Hillary Lehr and the next speaker would be Gene Bernardi.

MS. LEHR: Hi. I'd like to thank everybody for being here tonight, but I have some really serious concerns that there's a really serious communication problem happening between what the University of California thinks they need to do and thinks their accountability is to the public and what your responsibilities actually are. So I'm going to try to fill in some of those.

I just graduated from UC Berkeley and spent five years dealing with the university telling me that they knew what the answers were going to be for all of the problems in the world, while we were learning in our classrooms that solving the problems that our entire globe is facing today are incredibly complex issues that involve engaging and listening to a wide range of voices from around the world.

That's still not happening. And elite groups of people who are not experiencing the worst problems in the world are the people that are continuing to say what the problems are, as you said on your site so clearly, and what the solutions are.

I'm sorry, but that just doesn't add up. The solutions are not that simple. They're not that technological, and if they're not democratically decided, then there's a very small likelihood that they're actually going to be solutions and it's much more probable that the problems are actually going to be worse.

There is no global Environmental Impact Report for the impacts of the EBI. There is no global justice policy that UC is employing when they're making these decisions. Instead they will build another corporate-controlled facility, and under the UC sustainability policy, because it has a green roof, say that it's a great solution for the future.

It's not. I want a global Environmental Impact Report on the products produced by the EBI because this Environmental Impact Report is a way that the university can say that they held their responsibilities to the public when the truth is that they haven't even begun.

Lastly, I'm really tired of people saying that because it's Berkeley -- I think the CEO of BP said that it was no mistake that they chose Berkeley because they have the inkling that dealing with biofuels is going to engage social issues, and somehow having a lab where people thought about what might happen, what social and environmental risks and mitigations, said that because it's happening in the Bay Area, because the research is happening at Berkeley, that somehow that will lessen the impact of these devastating GMO biofuels. It's just really insulting.

Lockheed Martin is in the Bay Area. Bechtel is in the Bay Area. They're building bombs and missiles that are killing innocent civilians in Iraq. The fact that they're in the Bay Area doesn't have anything to do with the fact that they're reeking havoc on the rest of the globe. And UC Berkeley really should examine their laurels and what they're using them for instead of imagining that somehow developing biofuels that corporations are going to distribute around the rest of the world, because they're doing it at Berkeley, that somehow it's going to be okay. It's not.

There's no public forum. There's no place to engage voices from the Global South. There's no way that UC is actually capable of listening other than having a three-minute time period when there's a huge timer that's going off when there's still so much more to be said and so much more listening that you need to do. I really want a one-year moratorium.

MS. POWELL: Gene Bernardi and then Nathan Murthy.

MS. BERNARDI: Hi. Well, some of the points I was going to cover have already been covered but I'll rub them in. I also wanted to point out. I was very interested in Anna's comment that UC is arrogant. And I must say that there's another institution involved here, the Department of Energy, that's also very arrogant.

Let's not forget the Department of Energy used to be the Atomic Energy Commission. That's the one that had the Manhattan Project that was mentioned. So think about what whether you can trust such an agency.

Speaking of honesty, the scoping report announcement that came out, the announcement of this session, didn't say a word about the involvement of

British Petroleum. Did anybody notice that? It seems that most of the audience here knows that the research that's going to be in this building is going to be funded by British Petroleum. As someone else said, how is that we're here having a scoping session about this building, this facility, to house this research, when I understand the Regents haven't yet signed the contract with British Petroleum, spending all our tax money on all these studies, all these scientists? They're already working on their Draft EIR and everything. And the Regents haven't even signed the contract yet.

And also in the presentation, there's all this emphasis, this is the Helios Project, you know. There's only one of the speakers that I heard drop BP very softly and quickly.

It kind of reminds me I think it was the novel 1984, wasn't it, that talked about double speak? War is peace. Here we have Helios Project. It's actually British Petroleum.

What is the involvement of the sun here? We all know that it takes solar power or sunshine to grow plants and that they're going to be working with plants, but when I think if I put solar panels on my roof, I'm not dealing with plants. I just don't see that they're going to be working with what we call solar energy. They're trying to develop solar energy. It seems all the emphasis on these plants and there's been a lot of talk that is actually going to use up more energy to produce than it's going to save in the end.

So in this article that our reporter here Mr. Brenneman wrote in the July 22/23rd issue of The Planet, he says that BP-funded research programs is designed to turn crops and coal into fuel for internal combustion engines. I'd like to know what kind of research is going to be done on coal in the Strawberry Canyon. That should be very interesting.

I wish that the scientists could answer that question later for all of the audience to hear the answer. They said that they couldn't answer our questions because people who aren't here wouldn't have the benefit of the answers. Well, let's have the scientists answer the questions later in front of all of us.

MS. POWELL: Nathan Murphy and after Nathan is Doug Buckwald.

MR. MURPHY: I have two sets of concerns. First directed at the people giving the presentation, the second set of concerns directed to the public.

First set of concerns is I really do want all of you people, all the people working on this Draft EIR to consider, as most people have already stated, the broader implications and some of the broader problems of some of these projects.

I do want to say first of all that I am really sick of hearing a lot of these thrown-out western assumptions about the application of science, especially in this corporatized context.

I'm also sick and tired of hearing some of the rhetoric that some of you are putting forth. I do also want the people drafting the EIR to be aware of -- I believe that Steven Chu once said in the interview with the Chancellor that this will be our mission to save the world. I'm tired of that Messianic rhetoric. It's the colonists who wanted to save the savages and the Americas and in Asia and in Africa. That didn't turn out too well.

My more material set of concerns. I do also want those people who work on the Draft EIR proposal to understand those are my cultural concerns, some of the cultural effects of this proposal under the EIR, within the EIR.

Material concerns. First of all, there's only

255,000 square miles of land in the United States and I believe that it would require over 1 million square miles of land in order to supplant our entire gasoline supply.

I'm also concerned about some of the fossil fuel extraction processes that will be going on. I still want the people working on the draft proposal to be aware of some of those concerns and also be aware of some of the potential hazards that there could be with GMOs and with nano-technology.

I am also concerned by the fact that there are earthquakes under these buildings. That's highly unsafe for some of these projects for GMOs and nano-technology.

I do also want the people working on this project to take into consideration what was done under the deal with the Novartis Project because obviously part of the EIR, part of the environment, is the academic environment and that seems to be also under current threat.

And I do also want the people working on the Draft EIR to revisit some of the concerns that were not addressed during the development of the nano-tech building.

My second set of concerns is directed to the public. I do want all of you to realize that we can stop this thing. These same kinds of dialogues were able to stop the construction of the Novartis Building. Under CEQA, through the injunction that we have imposed on the university, we were able to stop, delay for months, the destruction of all those oaks at the oak grove. We can stop this thing.

And I do want all of us to understand just like Prime Minister Mossadeq of Iran understood that this was his country, this is not British Petroleum's university. This is not your university. This is not the White Anglo Saxon elite's. This is not the colonialist's university. This is our university. Please take it back. Go for it.

MS. POWELL: Doug Buckwald and then Zachary Runningwolf.

MR. BUCKWALD: My name is Doug Buckwald. I have lived in Berkeley since 1979. That's about 28 years now. I used to go hiking in Strawberry Canyon all the time, sometimes as many as five times a week, early morning, late evening. I loved it, going up by the Bergland River, through the redwood groves, up the upper fire trial. It was a gorgeous place to be.

As the years have gone by, I have seen more and more buildings going up, more and more fences, more and more roads. It's becoming the kind of thing that I wanted to avoid down in the city when I went up there now.

It's terrible. It is a tragedy what they've done up there. They are fewer trees and less green space. And now I hate to say I hardly go anymore because it is very upsetting to me. In fact, I think it's obscene what UC has done in that watershed.

In fact, it's a perfect example of poor environmental stewardship, and it is hypocritical of these UC representatives here standing before us claiming they're the ones who are going to save the planet when they can't even acknowledge the damage they're doing every single day in that watershed, in that beautiful canyon, that belongs to all of us who live here.

And what they've told us tonight is, "Hi. We're glad to talk with you. We're going to increase the damage now." I think that's a very bad idea and I want to say to the UC staff here, if you are allowed to go ahead and build all these massive new buildings and laboratories and other facilities, you're going to have to change the motto of UC

Berkeley. We know now their motto is, "Let there be light." You've going to have to change that to "Let there be corporate delight" because that is increasingly how you operate here.

Corporate funding, corporate partnerships, corporate models for decision making. But the only problem is you are a public educational institution, so you have to pretend that there is adequate public involvement in your planning process.

And that's where we all come in. Yay for us. Just like tonight. We get to make little three-minute speeches, and my little buzzer's going to happen pretty soon here, as they sit stone-faced as the statues on Easter Island, not responding at all.

And actually these guys haven't been very stone-faced. Usually they are. There's been a lot more smirking and snickering here than I have ever seen before at a UC meeting. I know many of you have noticed that.

I've lost count of the number of these kind of meetings I have gone to. I have come in earnest and made requests for mitigations, better understanding of projects, clear information about what the plans were, begged and begged and begged as if I was on my knees, and UC has not ever done one single thing I've asked for. And that's exactly the same as for many other people I've spoken with.

There is nothing like adequate public process here. It's only decide, announce, defend, DAD. That's what they're doing here. They've decided, they've announced and now they're defending it, and you don't matter at all. That's UC's attitude and it is the definition of arrogance.

MS. POWELL: Following Zachary Runningwolf is Helloise Lamplighter.

MR. RUNNINGWOLF: Hello. My name is Zachary Runningwolf. I'm a mayoral candidate for your city. I'm also a Native American leader and I'm also the one who spearheaded the current tree sit which is in its 248th day. We're standing strong against this democratic university.

First point that I want to say about the EIR was the oak grove. You're proposing to put a sports facility on top of my ancestors. We're not down, and yet your university is continuing on.

Your university is denying that there is a fault line, active fault line. They dug a 12-foot trench on both sides of the stadium. Earthquakes go all the way down, mile and a half underneath the earth's crust, yet the university is excusing it.

Trust you. Yeah. You're violating a federal law by digging up my ancestors. You're violating the state law because that's a World War I war memorial. You're violating a city law which is a tree ordinance. So you say trust you? Oh, hell no. No. No way.

And then there's other problems. You're talking about -- which is -- this is Indian country, and it's from Alaska all the way to the Tapachula. Everybody's welcome here. Everybody is welcome here. But you need to stop abusing mother earth.

We need not to seek it in technology but in a lifestyle change. We need to not trust British Petroleum which has taken away our mass transits in every single city. We need to build our mass transportation instead of trusting UC.

So there is so much wrong with this, but I only have three minutes and I don't want to see that buzzer. Anyway, you won't get this done.

MS. POWELL: Helloise Lamplighter and then Mark McDonald.

MS. LAMPLIGHTER: Thank you, thank you all very much for all of your very much wisdom tonight because this is a very important issue. And I want to speak for the living things for now and for in the future because this is a very, very bad idea. What you talking of we have a bigger problem and now you go in the wrong direction as fast as you can in the wrong direction because it's a very bad idea.

So I have some questions. The first question I have for the university is could you please clean up the messes you made first before you going to make more messes. You got a big uranium plume is coming down in our canyon. You got a big mess over there in Richmond. You got a lot of big messes from the last time you tried this technology. So maybe you like clean that up first before you go on and make a new mess.

How can you think we can trust you? With the nano-technology, genetically engineered plants that you let grow. I mean, I weed in my garden in front of the (INAUDIBLE) the grass that escapes by a UC professor, you know.

It's already destroying ecosystems. You may have not noticed up there in the canyon, but it's growing where the native plants used to be because it's a little "whoopsie" from the last time we tried. So it's very dangerous, the nano-technology, and your genetically engi -- it's not a funny thing.

We hear those people very smart about that, you know. it's very dangerous. So that's my question. How do you think we can trust you? Really, you know?

Another thing is what in the heck are you thinking with this like we're going to grow our gasoline and then also that we can all keep driving our SUVs? That's not a good solution.

Where you gonna grow it? Like they say, these nice people here say, you want to be growing it on the natural land? You going to be growing it where they're growing food for people right now? Look at how things get grown right now, industrial agricultural. It's not a pretty sight. It's very, very damaging. It is not something going to help the planet to be growing industrial agriculture so we can keep driving our SUVs.

Now why you not do some research and make a nice magnetic model rail public transit. We'll figure out how to make it free, get some real solutions. But people driving all those cars? Why don't you do that research? You don't do that research because British Petroleum they don't want you to be doing that research. They want to keep making the money so they got you all a'working now for them to keep a'selling us so we drive the stupid cars more and more.

So it's a big problem really all the way around. So I can take a breath. Okay. So I call on the Helios, the sun, come down and bless these people. They be the smartest people in our community up there in the university, that they see folly of their way and we start to notice the natural systems of things, and we honor -- that be our watershed, our land, right above us, and we treat it with some respect and we start working with nature and not in this very, very destructive idea.

So let's switch it around everybody. All right. Thank you very much.

MS. POWELL: Mark McDonald and then Janice Thomas.

MR. McDONALD: Hi. Boy that is a tough act to come after. My name is Mark McDonald and I've lived here since 1975 and I've worked here.

I have a lot of problems that I haven't totally figured out, so I'm not going to comment on them tonight, with this new project. And I don't really see the point of really bringing them up.

I too wish they would clean up a lot of the plumes that are still at the hill, the VOCs, the tritium, all the stuff that's coming down the hill toward me and my neighbors who live in Berkeley.

That's really what I want to talk about. It's like I don't really see the point of going after the LBNL folks here because they know like I know like you really know, they really have nothing to do with it. This is the Department of Energy.

AUDIENCE MEMBER: They're right back here.

MR. McDONALD: Right. But we're talking about a political issue here, and that's what I want to talk about.

I live in Berkeley, and I want to defend my town against a national laboratory. And a national laboratory is just doing what they do. They expand and they pollute and then they try to con the people that everything is okay, and that's really just what's going on. But you're not going to recognize this town in 20 years if these people keep building these things.

I've been coming up here for many of these sessions, and I've asked for overall truck trips, but it looks like when it comes to my taxes, we are building for their trucks. There's no limit. Our tax money is no object.

The thing is we really need to defend the town, so I'm talking politics here. You need to talk to your neighbors. You need to write letters. You need to start pressuring the Berkeley city government who is on board with a lot of these things or they're out to lunch.

You've got a mayor who is holding the door open. He'll tell you there's no point in fighting them. He's wrong. Take a walk down People's Park. I've been fighting that for decades. It's still ours. Do you know what I mean? So there is a point in fighting this thing. We closed the tritium lab, a disaster, and it's still being cleaned up.

So the thing is you really need to reach out to your neighbors. Write letters. Pressure your city officials. We need to get Berkeley to defend itself from the federal government here. Absolutely. It's what's going on in here.

In 20 years this place will be a university lab complex. Most of us will have left because we won't be able to stand it any more. Now maybe that's just a natural sacrifice, but I don't want it.

I'm trying to raise a kid here and it's getting harder and harder with all these truck trips. They've got the northeast quadrant. They've got all these ten buildings they want to build. They've got the Bevatron 4600 truck trips. I mean, come on. This place is getting nuts. Two people were killed last summer with runaway trucks on the steep hills.

There's lot of other places to build these things. There's the Alameda Air Base. They can't even find people to go out there. There's Hunter's Point. Mare Island was mentioned.

They don't need to be up on this hill. It's a very ecologically sensitive place. If you want to stay here, if you like something about the place, you've got to defend it against these kinds of projects because if you don't like this there will be more. So that's all I've got to say.

MS. POWELL: Janice Thomas and then AG.

MS. THOMAS: Good evening. My name is Janice Thomas. I hope people have seen this photograph. It's in the initial study for one of the buildings. It is a scorched earth that is up there. You didn't see that tonight in the PowerPoint presentation. But this is what we're working with. This is what we're up against.

I'm not going to speak about the type of research per se. That's a whole other subject. But I'm going to focus just for tonight on where it's going be done.

100,000 thousand gallons of water a day used to be produced by Strawberry Canyon. This was in the 1800s. There were salmon in the upper reaches, trout in the upper reaches. It was not just seasonal. It was all through the year. We don't have that anymore because of this.

Now this development up in the canyon could stop, and we are going to stop it. We are going to stop it. And we have to stop it. We have to be a model to the people all through the Bay Area because there is a Chancellor's Task Force that is organizing mayors throughout the Bay Area for this very growth industry, this very corporate money making industry. And we are going to be the model citizens.

So we've got to stop it, and one of the assumptions that the university and LBL is working on is the contiguity myth. They are arguing -- and this is a question for you guys -- they are arguing that they have to be next door to each other to do their collaborative research. They have to build right there so they can like picnic together or something.

Well, I'm a community activist and I do most things by e-mail. My next-door neighbor, we do e-mail. Okay, we talk and we play and other things too, but we do most of our work by e-mail. People are communicating all over the globe but these people have to be like right next door in the same building. No, they don't. And they need to do cultural landscape research. They haven't done that, and that is really offensive.

Tomorrow night at Dwight and Dana. Show up. There's a nationally renowned expert who is going to talk about the cultural landscape at Strawberry Canyon. Please show up because we're going to videotape and we'll submit it within our 30 days and in fact that will be a cultural resource.

Suburban sprawl. Right up there. I want to know about health risk assessment that they're going to tier off of, a site-wide health risk assessment when we don't even know what the health effects are of nano particles and GMOs. So this offends me. This is bogus.

Vegetation management. If they have to scorch the earth to locate up there to be fire safe then no, they shouldn't be up there. They need to restore this environment. This is so clear. We have downstream flooding in our yards, in our basements, because of surfaces right here.

What else do I have to say? I think that's enough. Thank you.

MS. POWELL: Our last card, AG. Can you state your full name for the record, please?

AG: I think the presentations have given us a clear example of why the process is going to fail and they've provided a really bad example for the rest of the world. The project, if you listen to justifications carefully, is premised on the notion that Berkeley needs BP; that in order to do this great job, they need a worldwide company to bridge what they call the "lab to market gap."

This presentation is a clear example of why that effort is going to fail because one of the clearest lessons of the green revolution is about the need for transparency, accountability, decentralization, participation. That comes out in study after study about the adoption of crops around the world.

This presentation shows why this administration is funding that. The idea that the buildings are going to be environmental because they have grass on their roofs or that an adequate public consultation can involve an hour and a half meeting where each get three minutes or condescending presentations that follow contradictory rules, these are all examples of the ineptness of the process.

From the six months between June to February, last year, when Berkeley was formulating its proposal to BP, there was not one public meeting. This is a bad example to the rest of the world who are going to be dealing with these effects of biofuel crops.

So we should be clear that this does not constitute an adequate consultation and let no one say that it does. Let no one use these crisis narratives and claims to act in the public good to save the world for us, to ride roughshod over our concerns and try to silence critics.

And I just want to say it's really important for us to make connections because this project is going to have connections around the world. It's going to have field stations in Africa and Asia and Latin America. And we need to be involved. If it does go through, we need to be involved in connecting with those people, connecting with the people in West Berkeley that are going to be affected by the JBEI.

And so this struggle is important not just for Strawberry Canyon, not just for Berkeley, but for peoples around the world. We need to be making those connections and bringing in more people of color and more people from low-income areas, people from around the world. It's really important, not just for us, but for everybody. Thanks.

MS. POWELL: I have two other cards. Pamela Sihvola and Barbara Robben.

MS. SIHVOLA: My name is Pamela Sihvola and I have participated with many neighborhood groups in Berkeley for the past decade, over a decade, trying to encourage the Laboratory to clean up their act in the Strawberry Creek watershed.

The LBNL proposed expansion in the watershed is absolutely utterly ill-advised. The seismically active Strawberry Canyon site was never intended to permanently house a nuclear nano-tech industrial complex when the construction of the Cyclotron started in the 1940s during the Second World War as part of the Manhattan Project to develop the world's first nuclear bomb.

The primary direction of the long-range development plan for the Laboratory should have been to off-load the development from the main hillside to other alternative locations. And the current LRDP never adequately addressed alternatives.

Most of the proposed buildings, which include the Helios as well as the CRT, are located in deep-seated landslide areas that are intersected by dozens of named and not unnamed earthquake faults within a complex network of historic modern streams and stormdrains and large groundwater plumes of chemical and radioactive contamination.

This map here is basically -- the black dots indicate all of the buildings that are proposed in the long-range development plan. The brown areas are the known landslide areas. All of the red lines indicate earthquake faults in the canyon, and these red squares are locations of epicenters of seismic activity in the last 40 years. The Laboratory has never acknowledged that the canyon indeed has active faults, but how is it possible that there are at least 40 known epicenters per USGS that have taken place -- earthquakes that have taken place in the canyon, including two earthquakes last March which was still included in our map.

Of special concern is the proposed location of the massive CRT building right in the middle of Alquist-Priolo Earthquake Fault Zone. The Hayward fault is right here, and here is the CRT building. This planning clearly defies the very purpose of the

Alquist-Priolo Earthquake Fault Zoning Act.

In addition, the Lab fails to consider the protection of Cafeteria Creek next to the CRT building. It also fails to describe a comprehensive watershed management plan, its implementation for the protection of the many named tributaries of Strawberry Creek.

Another hazard location is designated for the British Petroleum Funded Biofuels Institute to be built next to the nano-tech facility, found in the Chicken Creek Subbasin. The area is a location of a large radioactive tritium groundwater plume where seepage from the groundwater surface water has been detected but the laboratory refuses to acknowledge it.

MS. POWELL: Your time is up. Can we have you come back --

AUDIENCE MEMBER: No. Let her speak.

MS. POWELL: Excuse me. We have one more speaker and we'll let someone come back after that speaker.

Barbara Robben.

MS. ROBBEN: My name is Barbara Robben. I'm a graduate of UC in geology and soil science.

One of the things we had to do was go up and map Strawberry Canyon. It's full of fissures. It's got slumping, landsides, and of course when you get that kind of an environment then you're talking about the no-neg surface water discharge or something like that. But when you build a hardscape and you don't have the water, you have to do something with it, so I don't know if it's injection wells they're talking about or something.

But anyway, when water goes down the slope, it goes into Strawberry Creek. Then it gets into the food chain. And so if there's fish or whatever it is, it could go through the whole food chain and it gets spread around. So it wouldn't be just in the creek. It might go quite a bit farther as the animals that are drinking the water go off and die or something like that.

Then you get the Hayward fault, and when that rips, which it will, it's going to really -- the buildings aren't going to be standing anymore. They're going to be all over. And so whatever is in those buildings is going to be spread all around so we get sparkle dust in the creek and in the air and everyplace else.

So, the soil. If you start using the soil to create fuel, then you're going to be basically depleting the soil, and soil -- we don't really have that much of it on the planet if you'll notice. If you start burning that up, it's going to be serious trouble. And so people's short-term solution is to put fossil-fuels-generated fertilizers on it and things like that, pesticides so that you can grow -- but I don't really think that's what's going to be working.

And the example that we said affecting other nations too, other people will be watching what we're doing.

And really a bad example. In a way particularly bad to have this thing situated up on the hill is because Berkeley -- this university is expanding to the north, especially to the south, all the way over to the School for the Blind over in that direction. And now they're trying to expand into downtown Berkeley and then up into the hills.

Don't get me started on the oaks and so forth, and Maxwell Family Field and Haas Business School. It's way, way too much construction in that area. And the technology that they're striving for, it's just plain scary. It needs to be really thought out.

So I think what we all need to do is to simplify our lives. Start thinking about 100 years ago and how people were able to survive. Grow your own food, walk or use a horse and like that.

We can do that, and that's what people are doing in a great part of the world. I think that's -- at least we can take a breath and do that for a while and see what happens while the people are working on their formulas over there. I think that's the way.

MS. POWELL: Our court reporter needs a five-minute break.

(Short recess.)

MS. SIHVOLA: Pamela Sihvola with the Committee to Minimize Toxic Wastes continuing comments.

Going back to the location of the proposed British Petroleum Funded Biofuels Institute, which is to be built next to the molecular foundry, the last nano-tech facility in the Chicken Creek Subbasin.

The map here and this particular plume is a radioactive tritium plume and the orange areas are the ones that are the projected pathway, all the contamination to flow into the Strawberry Creek which is at the base of the canyon.

The Chicken Creek basin is contaminated not only with tritium in the soil because it has been a dumping ground for various other areas where tritiated soil has been put to aerate. This was the Laboratory's method of cleanup, to aerate the soil, dumping it in here. So this very issue has to be addressed in a most detailed way in the EIR.

I also wanted to point out that the Laboratory has failed to address the significance of the Lennert Aquifer which is located in the northeastern portion of the Laboratory and the university land. There was a major landslide in 1974 which took a lab building in half, destroyed roads, and since then the aquifer has been pumped by the Shively Well at the UC Space Sciences Building preventing further damage to that building and the Lawrence Hall of Science.

I'm asking the Lab to evaluate the extent of the Lennert Aquifer at LBNL, how many gallons are currently pumped annually and where does the water go, and why.

These two long pipes here indicate hydraugers. This is the Shively Well here. This is a hydrauger. This is a hydrauger, and they are dewatering the hillside to prevent further sliding in this area.

The British Petroleum facility is going to be right here, so the question is what is going to happen to the hydraugers and the water that's coming from the aquifer to this area? And indeed, the dewatering devices are the main source of water for No-name Creek, which is the next one to the Chicken Creek. So these are very important questions that need to be addressed in the EIR.

And again, going back to this previous map, the Laboratory insists that there are no active faults in the canyon. We can sort of follow the fault lines and we can follow the contamination plumes, and it looks like the contamination kind of follows the fault lines.

I would also ask the Laboratory to do a comprehensive analysis of the geologic and geomorphologic mapping all of the facilities' site and characterize the physical parameters of the watershed that influence the ground and surface water transport of the existing legacy contamination.

Lastly, since Jeff asked -- is Jeff here still? Okay. So Jeff, our report from which this map is from, the report is called The Contaminant Plumes of the Lawrence Berkeley National Laboratory and their Interrelation to Faults, Landslides and Streams in

Strawberry Canyon, Berkeley, and Oakland, California. These can be found on our Web site www.cmtwberkeley.org. Thank you.

MR. BUCKWALD: I'm Doug Buckwald again.

I ended my talk by describing this process as a classic example of decide, announce, defend which is a totally illegitimate public process.

But other people don't think that is a good way to do things. They think there are better ways to do city planning. In fact, the American Planning Association has come up with a list of ten basic principles that you ought to follow. They're very good principles. Let's compare those to what's happened here tonight.

Number one. Involve all interested groups and individuals as early in the planning process as possible. Gee, that would have been months or years ago for this project. How many people were involved months or years ago? Raise your hands. Nobody.

Make sure that the first several meetings are focused on sharing information and ideas rather than narrowing options. Raise your hand if you got to be part of that. Nobody.

Number three. Be inclusive, making sure to conduct sufficient outreach efforts to reach individuals that may not be aware of the project being considered or may not understand how it may impact them.

This outreach question is very curious. Why are we having this meeting in the first few days of August when many people in Berkeley are on vacation, the Council has gone on their break, and no students are here except a few that are staying here in the summer. I think it's a coincidence. That's the only thing I can think of. It's a coincidence. Yeah, it's a coincidence that happens with great regularity. So anyway, that's principle Number three.

Number four. Tailor the process so it's appropriate for the people involved and the project being considered. How many people appreciated the presentation here tonight which were about science which they said right up front, "We're not here to talk about the science. Everyone needs to understand that." It was just so bizarre right away. Everything they're talking about is just the science and how great it is, very little about the actual building, the impacts that people will suffer, any of those things.

It's so funny. They made the rules for this meeting. And like the first thing, "Oh, we don't have to obey that rule." They don't even acknowledge that they're disobeying it. It's just bizarre.

Number five. Provide leadership that is collaborative and fairly represents all interested parties. How many people have been in a position of leadership on this project that are here tonight? Raise your hands.

(Mr. Chandler responds from audience.)

You might have been. Very good. Collaborative leadership involves all the different interest groups in a community.

Number six. Identify and nurture mutual interests. God, that sounds good. And you know what? That language should sound familiar because UC Berkeley uses it all the time when they talk about their activities. "We only want to do things that have mutual benefits for the community, and we care about the community, and we make sure everything is done in the right way." My God, the day they do that the first time there will be shock waves that reverberate through the whole city. It would be a great thing. That's why this is a good model of principles.

Number seven. Share accurate and complete information with all participants. That would be a wonderful thing to do. So many of these cases, I've sat through these presentations and I've heard things and then I've heard later, oh yeah, there's 25 things they didn't tell us that are really the most important things of all, and too bad. It's too late now. It's standard process for them. It would certainly be helpful for our mental and physical well-being if they would do that.

Number eight. Make sure all discussions and deliberations are handled in an open and fair way. It is often helpful for professional mediators to facilitate meetings to ensure the process is equitable and all involved feel that the outcome reflects their interests and concerns.

Again, that's a wonderful principle. I don't think that's ever happened in a UC project, and it should happen with every UC project.

Number nine. Validate results to make sure that any decision reached will conform to the relevant, legal and financial constraints. This also makes me laugh a little bit because they love to say that. We're certain we're obeying all the legal constraints we have because we don't have to obey any of your laws.

They don't have to obey our land use laws, our zoning laws, our construction regulations. It's amazing they have carte blanche to decide -- to do something however they want and the heck with any of the laws in this host city, such as Berkeley, that they operate in. That needs to be changed too.

Number ten. Use the media throughout the process to keep the entire community informed about the options being considered and the decisions reached. And, of course, with decide, announce, defend, you don't want that to happen at all.

That's one reason there are so few people here tonight. There should have been hundreds of people. This is a massive set of projects. But there aren't because they have been very crafty to make sure, "Yeah, we got the notice out, but by gosh we did a great job because not too many people found out about it and this will be perfect. We'll have another small turnout in the middle of the summer; we'll say 'Great, we did it, ' and we'll go ahead on our merry way and do everything we want to do."

We have to do better in Berkeley. We have to do better with our lives. We have to do better with the lives of UC students and UC professors and UC staff and faculty. They as well are affected by these bad decisions.

This is getting worse and we have to stop it, and we have to stop it now. And thank you all for coming tonight too.

MS. POWELL: I have one more person who would like to speak again. Merrilee Mitchell.

MS. MITCHELL: I have a question for the record, and this is what is the relationship with the Berkeley mayor's office and the Department of Energy? That's the question for you to answer.

But what I know is just a little bit. What I know is that the Mayor's chief of staff, Cisco DeVries, he's also the energy -- half time as the energy, this Measure G and a lot of stuff they're doing in Berkeley. It kind of relates to the university many times.

Okay. The mayor's chief of staff was secretary to the secretary of energy. Now that was back in the Clinton Administration, and all I know is that he did fly around a presidential jet and visited countries all over the world.

And what I am picking up from talks to people in the community is there is a relationship. When I read that article about the nano-tech facility that went up and no CEQA, no EIR, I noticed that they were doing something called tiering. They didn't do a CEQA EIR because they tiered off other EIRs, and one went back to 1987.

So without me going on and on about it, it seems to me from what I was reading there and the other things we're talking about is that there is a relationship that goes back to 1987 with planning this facility, but you notice it didn't come in until Tom Bates came in. The nano-tech facility came in in 2003 and Bates got in in 2002.

I have one more thing. The no net stormwater sounded very interesting to me because I would like to know for the record where will the stormwater go? So, well, it's going to have to go in the ground. So are you going to clean it up first because you don't have a record on cleaning up anything. So what's going to be in this new stuff, new stuff that we don't even know what it is with the GMOs and the nano-techs and everything?

But then we've been hearing about this wonderful aquifer up in the canyon. And so you're going to put that in there. So that is one thing I know.

I give you the question but I did know this that they were talking at the LBL -- they were having some lectures. They were talking about using coal and the problems -- coal is very dirty. That's why they said they want to bring back nuclear.

But what they want to do with the coal, they said -- I don't know what it means -- but sequester the CO2 in the ground. But they really don't know how to do it. So I hope they're not planning to do that in Strawberry Canyon, but it seems like they'd do anything in Strawberry Canyon. And they shouldn't be allowed. So that's it.

There's one more thing. Some people I notice out here have been telling me about high-tech all around the Bay here. And we see it coming in. And you go to the DAPAC and they're talking about point towers. These are office buildings for the university. This is downtown. We're not even talking about Strawberry Canyon.

And then somebody mentioned something about conferences with mayors, the folks from the labs talking to the mayors all around. And so what it is is they're planning to get them, and say, "Oh, we got jobs. Oh, we got -- " all these different things that involve money, and a lot of people really don't know what's coming with it because they don't have much biology background.

So we got a big job because it's bigger in Berkeley. Thank you very much.

MS. POWELL: That concludes the formal part of our meeting tonight. Thank you.

(The meeting adjourned at 9:00 p.m.)

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REPORTER'S CERTIFICATE

I, JUDITH L. LARRABEE, a Hearing Shorthand Reporter in the State of California duly authorized to administer oaths, hereby certify:

That the proceedings therein were taken down in shorthand by me, a disinterested person, at the time and place therein stated, that the proceedings were thereafter reduced to typewriting, by computer, under my direction and supervision, and that the foregoing is a full, true and correct transcript of the proceedings therein to the best of my ability.

IN WITNESS WHEREOF, I have hereunto set my hand on this twenty-seventh day of August, 2007.

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Judith Larrabee, Shorthand Reporter