Attachment 12 –
Attachment 3 of Pamela Sihvola and LA Wood Letter June 7, 2005

ATTACHMENT 3.

Draft 9/8/00

Monitors Removed!

1995 - The Pineapple Creek monitor, which showed high tritium concentrations in 1993, is removed sometime in 1995 along with monitors in five other creeks in Strawberry Canyon:

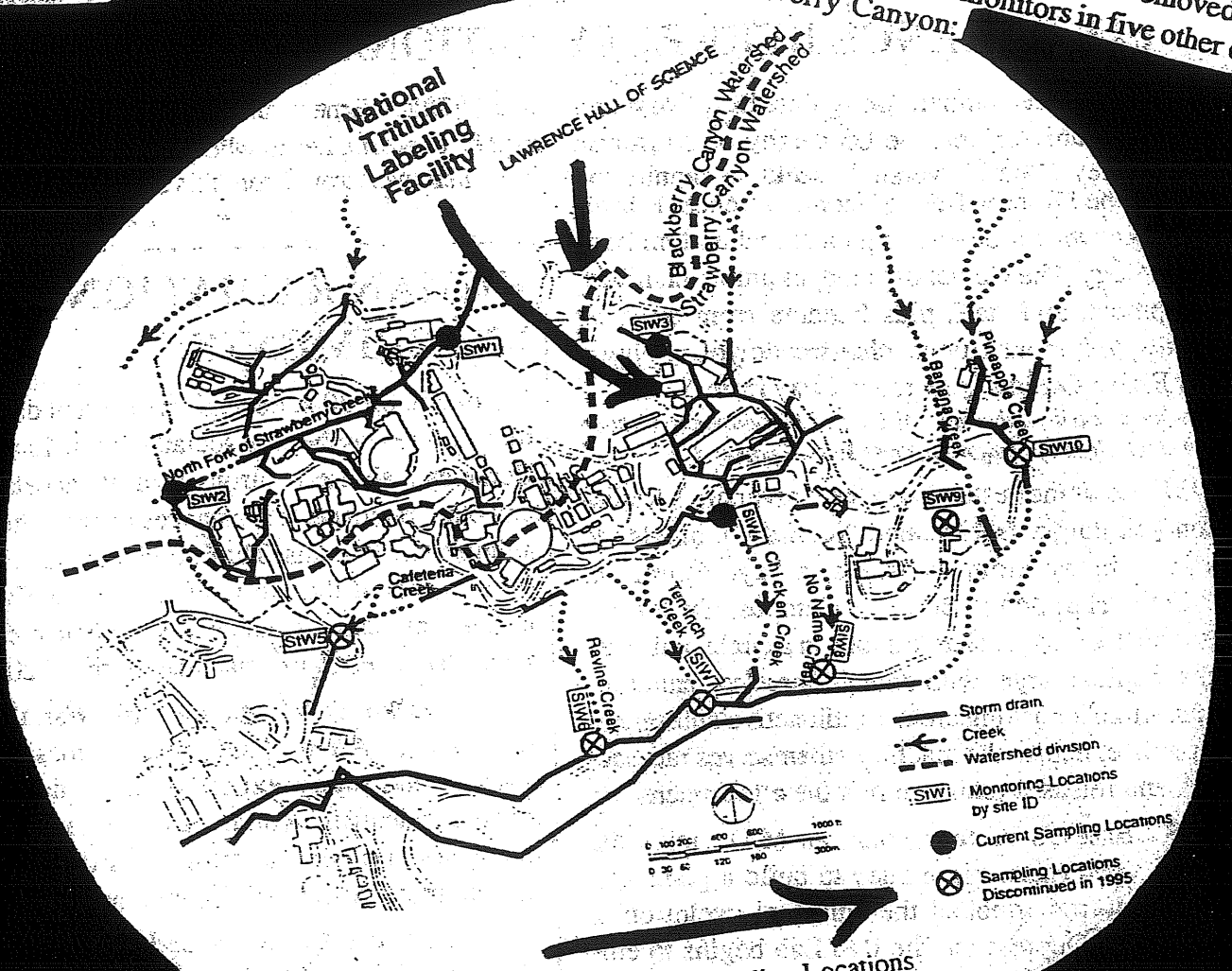

Figure 5-3. Stormwater Sampling Locations

DRAFT RADIOACTIVE CONTAMINATION CHRONICLE of LAWRENCE BERKELEY NATIONAL LABORATORY

written by Barbara George, Director of Women's Energy Matters, based on research by members of the Committee to Minimize Toxic Waste.

RADIOACTIVE
CONTAMINATION CHRONICLE
of LAWRENCE BERKELEY NATIONAL LABORATORY

1928 - In fierce competition against East Coast and European universities, the University of California at Berkeley ("the University") seeks to capture the lead in the hot new field of atomic science. It is already known for developing electrical and military technology. The University pledges ample facilities, equipment, and staff, plus freedom from teaching chores, to hire ambitious, charismatic young physicist Ernest Orlando Lawrence away from Yale.
[Lawrence and his Laboratory, Vol. 1, by J.L. Heilbron and Robert W. Seidel, Univ. of California Press 1989, Chapter 1]

1931 - Lawrence establishes the University's Radiation Laboratory (nicknamed "RadLab"), builds the first of many atom smashers, a "cyclotron," at LeConte Hall on the Berkeley Campus. Cyclotrons uses magnets to accelerate atoms in a circle until they smash into a target with enough force to shatter atoms. Atom smashing creates radioactive substances and waste, makes the machines themselves radioactive, and releases radiation into the atmosphere.

1935 - Ernest's brother, John, an M.D., joins the RadLab and raises big money to build a giant, 60-inch cyclotron (dubbed the "medical cyclotron"). During the Depression, the Rad Lab begins to emphasize medical applications of radiation because money is available for medical research, while other physics funding is scarce.
[Lawrence and his Laboratory, *p. 27]*

TABLE OF CONTENTS

late **1930's** - Ernest and John experiment on their mother, exposing her to whole body neutron radiation from their cyclotron. From this time forward, RadLab

(continued on next page)

HUMAN RADIATION EXPERIMENTS!

Starting in the 30's, through the present day, doctors and researchers associated with Lawrence Berkeley Lab use neutrons from its accelerators and other radioactive substances to experiment on animals and humans. They conduct some of their experiments at the Univ. of California Hospital in San Francisco, a center for nuclear medicine since it acquired X-ray machines in the 1920's.

During WWII and the Cold War, the Defense Dept., Atomic Energy Commission and NASA fund many experiments to determine whether scientists, workers and military personnel would remain functional while handling nuclear materials or fighting in a nuclear war.

Human subjects are used without informed consent—violating the Nuremberg Code. Many are low-income and people of color; some are prison inmates and handicapped children.

Experiments include injecting patients with plutonium, causing them to eat or inhale radioactive substances, and subjecting them to whole body or focussed radiation. Doses are high enough to kill them within weeks, or cause a lifetime of suffering.

Official secrecy prevails until 1993, when U.S. Energy Secretary Hazel O'Leary, appalled by human experiments described in Congressional hearings and news articles, establishes a new "openness" policy at DOE and orders unprecedented declassification of documents.
[Plutonium Files, *by Eileen Welsome 1999;* Human Radiation Experiments, *published by the U.S. Dept. of Energy 1995]*

CHRONOLOGY

(continued from page 1)

scientists experiment with radiation on thousands of people and animals.
[The Plutonium Files, *by Eileen Welsome, Dial Press 1999, p. 25]*

1938 - Using the 60-inch cyclotron, RadLab scientists discover tritium, along with numerous other radioactive elements.
["Lawrence and his Laboratory: Nuclear Science at Berkeley," by J. L. Heilbron, Robert W. Seidel, and Bruce R. Wheaton, article in LBL News, *Fall 1981)*

1939 - E. O. Lawrence predicts that his discovery, radioactive sodium, will replace radium for medical treatment. Famous for his showmanship, he goes on a national lecture tour which features volunteers drinking the sodium and Lawrence tracking its course through their bodies. Volunteers include RadLab colleagues Robert Oppenheimer (who became the Director of the Manhattan Project, which developed the atomic bomb), Luis Alvarez (discoverer of tritium) and Joseph Hamilton, who later establishes the RadLab's radiation health and safety program.

Hamilton, too, gives public talks about the benefits of radioisotopes, in which he drinks a glassful of radioactive iodine and holds a Geiger counter up to his neck to show how iodine concentrates in the thyroid gland. He spends the war years carrying out research on radiation effects on animals for the Manhattan Project, and begins an extensive program of radiation experiments on humans (see sidebar).

Hamilton dies in 1957 at the age of 49, two years after being diagnosed with leukemia. Lawrence dies of colitis in 1958, at the age of 57. Oppenheimer dies of cancer in 1967 at age 62.
[Heilbron, 1981, p. 25; Plutonium Files p. 29, 161]

RADIOACTIVE CONTAMINATION CHRONICLE of Lawrence Berkeley National Laboratory was written by Barbara George, Director of Women's Energy Matters, based on research by members of the Committee to Minimize Toxic Waste. For info, call 510-843-2152 (CMTW) or 510-528-5104 (WEM).

1940 - Construction begins on the184-inch cyclotron, on the hill above campus where most of the Lab moves after the war. The "184" operates from 1946 to 1987.

1940's - Lawrence establishes the Donner Lab specifically for radiobiology experiments. RadLab operations remaining on Central Campus include Donner Lab, Crocker Lab, LeConte Hall and Gilman Hall.

1941 - Glenn Seaborg discovers that plutonium will split ("fission"), indicating it could be used for a bomb or power plant. Day and night for 2-1/2 years, RadLab scientists and grad students use the 60-inch cyclotron to manufacture plutonium for the Manhattan Project's research on the atom bomb.
[Heilbron, 1981]

July 1944 - When a special reactor for producing plutonium comes online in Oak Ridge, Tennessee, the RadLab's 60-inch cyclotron shuts down for decontamination and overhaul after 20,000 continuous hours of operation.
[Heilbron, 1981, p. 43]

July 16, 1945 - The first bomb is exploded in a New Mexico test: "Trinity."

August 6, 1945 - The first atomic bomb used in war instantly kills over 160,000 people in Hiroshima; thousands more die of radiation exposure over the next weeks, months, and years — up through the present day.

August 9, 1945 - The bomb dropped on Nagasaki kills another 70,000 people immediately, causing lingering death for tens of thousands more.

September 10, 1945 - Oppenheimer and Leslie Groves, the Army General in charge of the Manhattan Project, hold a press conference at the Trinity site. They claim the Japanese are lying, and deny that radiation could cause such hideous, painful suffering — in spite of reports to the contrary that they are receiving from Manhattan Project doctors who have travelled Japan to observe the effects.

In November, Groves testifies about radiation at a Congressional hearing: "As I understand it from the doctors... they say it is a pleasant way to die."
[Plutonium Files, pp. 112, 118]

1947 - The Atomic Energy Act establishes the Atomic Energy Commission and develops a system of contracts with universities to administer a network of Labs involved in nuclear weapons research. The RadLab becomes part of the network. UC Berkeley gets the contract to run the Radiation Lab, Los Alamos Lab (New Mexico) and Lawrence Livermore Lab (built in the 50's in Livermore, Calif.)
[Heilbron, 1981, p. 49]

1954 - The massive Bevatron accelerator is completed, costing ten times as much as the "184."

1957 - Upon Lawrence's death, the University renames the Radiation Lab the "Lawrence Radiation Laboratory."

1957 - The Heavy Ion Linear Accelerator (HILAC) is built. The Bevatron and HILAC operate until the early 1990's.

High Radiation Levels!

1959 - The Olympus Gate monitoring station (at the northwest edge of current Lawrence Hall of Science parking lot) measures 825 millirem/year of neutron radiation from the RadLab's accelerators, way over the exposure limit for the general public. At that time, the limit was 500 mrem/yr; now it is 10 mrem/yr. (See Jan. 2000: a new LBNL study claims the 1959 exposure was not really this high.)
[Review of Radiological Monitoring at LBNL; Preliminary Technical Report, *by Bernd Franke, IFEU, 6/30/00, p. 21-23]*

1961 - The 88-inch sector-focused cyclotron is completed (still operating in 2000).

1961 - Melvin Calvin receives the Nobel Prize in Chemistry for his study of organic compounds "labeled" with Carbon-14 at the RadLab. (See sidebar, Tritium Labeling.) His group, the Division of Chemical Biodynamics, obtains a new building on campus, ultimately named the Melvin Calvin Lab. Tritium is one of several radioactive substances used there.

1962 - LBNL replaces the Outdoor Radioactive Waste Storage Area at Building 5 with a new Hazardous Waste Handling Facility at Building 75, which remains at this site until approximately1998. Radio-

continued on p. 6

WHAT IS TRITIUM?

A radioactive form of hydrogen, tritium was only recently recognized as one of the most harmful radioactive substances. It easily forms water, so it can enter the body through the mouth, nose or skin. Once inside, tritium can penetrate every cell and radiate the whole body.

By contrast, other radioactive substances, because of their chemistry, will only go to certain parts of the body. For instance strontium-90 behaves like calcium and lodges in bones and teeth, while radioactive iodine goes to the thyroid gland.

Any radioactive substance that gets inside the body bombards nearby cells like tiny wrecking balls. The damage continues for as long as the radioactive substance stays in the body, or until it stops radiating. It takes more than 120 years for tritium to stop radiating (see Glossary).

Scientists believe that most tritium passes through the body in a few weeks, but a small amount stays in the cells for months, and a fraction becomes permanently incorporated.

HOW DOES TRITIUM AFFECT THE BODY?

Tritium causes a host of problems, including cancer, immune dysfunction, sterility, low sperm count, birth defects, genetic damage, and mutations in future generations. "This means the inability of a species to reach full potential — fewer great scientists, philosophers, artists... or statesmen."
[The Angry Genie, by Karl Z. Morgan, U. of Oklahoma Press, 1999, p. 127]

WHAT IS "TRITIUM LABELING"?

Tritium labeling means to attach tritium atoms to a chemical compound, which can then be tracked by a radiation measuring device. "Labelled" compounds are used for experiments, for instance injected into animals or plants.

Customers of LBNL's National Tritium Labeling Facility include developers of pesticides, drugs, and genetically modified organisms.

WHY IS THE DANGER OF TRITIUM DISCOUNTED?

You need expensive instruments to detect radiation; you can't see, hear, smell, taste or feel it, and effects can be delayed for decades or even generations. This makes it easy for nuclear agencies and corporations to downplay its dangers. They particularly discount the danger of tritium, because it is a key component of nuclear weapons, it is emitted by nuclear power stations and it is useful for medical experiments.

Karl Morgan, a physicist who for nearly two decades chaired the US and international committees that set radiation standards, said his colleagues "have had as a major objective the preservation of the floundering nuclear power business." The international committee "prostituted itself regarding the danger of tritium," legalizing *higher* doses in 1973 after he argued they should be five times *lower.*
[The Angry Genie, by Karl Morgan, p. 117]

Nuclear Sugar Daddy to the Medical Profession

The Atomic Energy Commission, awash in cash during the Cold War, dominated not only the fields of nuclear weapons and power but also became Sugar Daddy to the medical profession, making a whole generation of medical researchers, physicians and pharmaceutical companies dependent on its largesse. It went so far as to fund the whole startup faculty for the UCLA Medical School!
[Plutonium Files, p. 180]

For 50 years, the AEC, together with the military and space program, snared the medical community in a Faustian bargain: massive funding in return for participation, or at least silence, in unsavory top-secret medical experiments carried out on thousands of human beings without their knowledge or consent (see sidebar, Human Radiation experiments).

The experiments were not designed to test whether low levels of radiation were dangerous in the long term; quite the contrary, their primary purpose was to determine how much radiation human beings could tolerate, in the short term, to assure the military that its soldiers could fight a nuclear war.

In this atmosphere, eminent independent scientists received little funding for serious studies of long-term dangers to human health from low levels of radiation. Instead, they were met with tremendous resistance: data was withheld, their reputations were attacked, and extreme efforts were made to suppress or discredit their results. Epidemiologist Dr. Rosalie Bertell was even run off the road!

Nevertheless, dissident scientists have built a persuasive mound of information about health problems among uranium miners, workers at nuclear weapons and power plants, soldiers marched through nuclear tests, neighbors of nuclear facilities, and patients exposed to x-rays or radiation treatments.

"Truth is the Daughter of Time" - Dr. A. Stewart

Dr. Alice Stewart, a British physician and epidemiologist who led the way with her Oxford Survey of Childhood Cancer, which reported in 1956 that just one prenatal x-ray doubles the chance of a child getting cancer.

In the 1970's she worked on a famous U.S. government study of workers at the Hanford nuclear weapons compound in Washington State. The Mancuso-Stewart-Kneale study found that workers got cancer even from doses lower than the "safe" worker limits of 5 rems/year.

The Atomic Energy Commission had expected the study to find nothing and was alarmed that this report would tarnish the image of nuclear technology and lead to a flood of compensation claims. It yanked the funding, canceled the rest of the study (which was supposed to look at all the government's facilities), and attempted to seize the files. After that, the government only let its own labs study the figures. Alice comments:

"Talk about the fox guarding the chicken coop—here you have the fox reporting on morbidity and mortality in the chicken coop."

It took fifteen years of litigation, Congressional hearings and legislation before Dr. Stewart finally got to see more data — in 1990, when she was 85 years old!

It was not until 1993 that Stewart gained access to *part* of the health data collected from Japanese atomic-bomb survivors—an even tighter U.S.

government secret. Stewart has long charged that flaws in the official studies of Hiroshima/Nagasaki survivors perpetuate false assumptions, particularly about low-level radiation. The official line is that low level radiation causes negligible harm, and the only long-term effect of radiation is cancer; however Alice has proved that low doses, repeated, are more harmful than a single, larger dose, and that radiation damages the immune system itself, causing a great variety of ills which can kill people even before cancer can manifest.

Official studies do not recognize that, by definition, the survivors were more fit than the average. They don't take into account the many thousands of people, including most children and old people, who died during the desperate five years after the war, before the study began. They don't consider that survivors had cultural reasons to deny having miscarriages or other reproductive problems. They refuse to acknowledge the high levels of TB, blood disorders, skin problems, fatigue and other health problems among survivors have any link to radiation. "When awkward findings come up...they ignore whatever doesn't fit their interpretation."

[The Woman Who Knew Too Much, by Gayle Greene, U. of Michigan Press, 1999, p. 8, 123, 140-148]

MAKING SENSE OF GOV'T RADIATION STANDARDS

The most important thing to keep in mind about radiation standards is that the numbers are not set in stone. Every few years, somebody proves that people are getting sick from legal exposures, and levels are reduced. *Responsible scientists say that levels currently permitted for exposure to tritium are three to five times too high.*

Radiation standards are incredibly hard to follow, because the danger of radiation is a political hot potato surrounded by ethical, scientific and bureaucratic controversy. (See sidebar, Danger) Unfortunately, experts describe radiation with a dozen different terms that don't easily convert to one another, and use mathematical jargon when arithmetic would do.

MAXIMUM LEVELS FOR GENERAL PUBLIC

The U.S. Environmental Protection Agency (EPA) regulates the public's exposure to radioactivity, but the Dept. of Energy and the Nuclear Regulatory Commission are allowed to set different standards for workers in nuclear facilities.

- the *maximum* allowed level for *tritium in air* is 10,000 picocuries per cubic meter of air

One curie = 37 billion atomic disintegrations per second. A picocurie = one trillionth of a curie (0.000000000001)

- the *maximum* allowed level for *tritium in drinking water* is 20,000 picocuries per liter

[LBNL's 1997 Health Risk Assessment p. 4-20]

HIGHER DOSE OK FOR WORKERS?

While the maximum dose allowed for the public has been reduced to 10 millirems a year, (same as 10,000 picocuries of tritium per cu. m. of air, see above); the worker dose has remained 5 rems/yr since 1968.

WHAT IS A "REM?"

A rem is a number arrived at by a controversial formula that estimates the health impacts of different radioactive elements on a "standard man" (adult male) comparable to a certain dose of x-rays. (A "millirem" is 1/1000 of a rem.)

The trouble is that human individuals are not standard, they are young, old, male, female, short, tall, well or badly nourished, etc. Radioactive elements are also chemically different from each other. Science and medicine have barely begun to investigate how different radioactive elements interact with all the various organs of different human bodies.

[DOE, Understanding Tritium during Decommissioning, p. 9 Radiation Dosimetry]

THE SUPERFUND LAW

EPA also administers the "Superfund" law, which is designed to clean up extremely contaminated sites. Under this law, the *Cancer Risk Screening Concentration* (the level requiring further investigation) for *tritium in air* is 50 picocuries per cu. meter; for *tritium in groundwater* it is 600 picocuries per liter. Further investigation enables EPA to calculate a "Hazard Ranking Score" that determines whether the site will be placed on the National Priority List for federally funded and supervised cleanup.

active and toxic waste is stored, handled, treated and prepared for shipment in this area.

"During early LBL operations, liquid waste was primarily disposed to the sewer... Disposal of wastes was generally undocumented. Waste handling procedures remained unchanged until 1973 when the Atomic Energy Commission required that LBL begin submitting annual site waste management plans, which described operations, practices, facilities, and plans related to waste management and decommissioning."
[1991 US EPA Superfund Assessment, p. 8]

1969 - After five years of site preparation and construction, the Lawrence Hall of Science opens to the public, featuring programs for school children. The center of the main floor is devoted to displays portraying the excitement of nuclear research. The Hall is not part of the Lab, but is located on the hill directly above Building 75, which later becomes the National Tritium Labeling Facility.

At this time (1969) Building 75 is the Radioisotope Services Building. It is divided into six laboratories, including the Radiogas Tritium Laboratory and the Hot Lab, which handles a variety of dangerous radionuclides. The Hot Lab has a vent pipe that goes up to the roof, follows along it, turns 90 degrees, goes underground and comes up again in a eucalyptus grove 100 meters from the Hall of Science. This vent is now known as the "tritium stack."

1971 - The name, Lawrence Radiation Laboratory, is changed to "Lawrence Berkeley Laboratory."

1982 - Building 75 is converted to the National Tritium Labeling Facility (NTLF), which begins to receive funding from the National Institutes of Health (NIH). The facility is capable of handling thousands of curies of tritium annually.

Accident! Monitor Removed!

February 27, 1984 - "The neck of a reaction flask broke... releasing 240 curies of tritium [as tritiated water vapor] from the Building 75 tritium stack." A monitor measures 100,000 picocuries of tritium per cu. meter of air, *ten times more than EPA's current (year 2000) maximum permissible level for the general public of 10,000 picocuries.*

This is the only monitor located on the ground level right outside the NTLF, where people walk around and wait for the bus. A footnote in an LBL report states that this monitor *"was discontinued 7/17 due to construction and 'replaced' [sic]" by another monitor that is several hundred feet further away from the NTLF.*
[LBL's1984 Annual Environmental Monitoring Report, Table 6]

High Radiation Levels!

1985 - Tritium concentrations measured in sewer water in Strawberry station reach a maximum of 700,000 picocuries per liter of sewer water; average 40,000 picocuries per liter for the year.
[4/15/97 Summary Tables of Environmental Tritium Measurements at Berkeley Lab, submitted by LBNL to the Tritium Issues Working Group]

High Radiation Levels!

1986 - LBL reports tritium concentration of 107,000 picocuries per kilogram (pCi/Kg) in vegetation (eucalyptus leaves) close to Bldg. 75. This is 1000 times the level of background radiation.
[Environmental Monitoring at LBL, East Canyon Preoperational Survey, 1986; Feb. 1988 DOE Environmental Survey for LBNL]

1987 - The 184 accelerator is decommissioned and replaced on the same foundation by the Advance Light Source (ALS) accelerator (which is still operating as of 2000). Uranium contamination is discovered under the foundation but not removed.

This contamination "was traced to a sump which drained to an underground pipe. The contaminated pipe was left buried without being characterized for the quantity of contamination in the pipe or the migration of contamination in the surrounding soils. There are also no operations records, final radiological and chemical reports, or final project reports for this activity."
[US DOE Tiger Team Assessment of LBNL, Feb. 1991]

High Radiation Levels!

1988 - LBNL reports 570 curies of tritium are released from the NTLF stack during this year. Tritium concentrations measured in rainwater collected near the NTLF reach a maximum of 775,000 picocuries per liter (38 times the permissible level for drinking water), an average of 221,000 picocuries

per liter for the year (11 times the permissible level for drinking water).
[4/15/97 Summary Tables of Environmental Tritium Measurements at Berkeley Lab, submitted by LBNL to the Tritium Issues Working Group]

1988 - The Dept. of Energy states: "The major pathways for potential contamination of soil at the LBL are the operations of the accelerators, routine and accidental airborne releases, routine and accidental liquid releases and activities associated with waste disposal practices."
[Feb. 1988 DOE Environmental Survey for LBNL, p. 3-26)

1989 – LBNL produces an Environmental Impact Report (EIR) requesting State approval of a new Hazardous Waste Handling Facility (HWHF) for the Lab.

Earthquake!

October 1989 - The Loma Prieta earthquake (7.1 Richter scale) hits the San Andreas fault over 50 miles from Berkeley. Just a few miles from LBNL, the Bay Bridge breaks and the Cypress freeway collapses.

1990 - NTLF begins tritium "recycling" program. Only around 1% of the tritium remains in the "labelled" compound; the rest is sent out as waste. "Recycling" chemically recaptures some of this tritium for future reuse. The Lab claims it recycles 80-90%, but it appears to be less than 30%. (See 1996, recycling claims in doubt)

High Radiation Levels!

1990 - LBNL's 1981-1990 summary of tritiated water vapor measured at the edges of its property shows concentrations ranging from 1100 to 12,000 picocuries per cubic meter of air, exceeding the exposure limit for the general public of 10,000 picocuries per cu. meter.
[LBNL's 1990 Annual Site Environmental Report, Table 5]

678 Violations!

February 1991 - U.S. Dept. of Energy investigation reports 678 violations of DOE regulations covering management practices at LBNL; finds its monitoring network inadequate, finds Berkeley-Oakland air, soil and water contaminated with tritium, other radioactive substances and toxic chemicals; and finds the Lab not in compliance with federal standards for radioactivity in air (the National Emissions Standards for Hazardous Air Pollutants, or NESHAPs).
[DOE Tiger Team Assessment of LBNL]

Because of these findings, the Dept. of Energy funds a program intended to provide independent confirmation of LBNL's monitoring programs. It is conducted by the California Dept. of Health Services (DHS), which has jurisdiction over radioactivity in California.
[California Agreement in Principle (AIP) Program, 1991 cover letter]

April 19, 1991 - The Environmental Protection Agency (EPA) files a Notice of Violation, giving the Lab until Feb. 95 to come into compliance with federal standards for radioactivity in air (NESHAPs).

July 1991 - The Environmental Protection Agency (EPA) Superfund assessment of LBNL states *"A release of hazardous substances to air does not appear to have occurred at the site"*— in spite of many reports to the contrary! As a result of this assessment, LBNL is not listed as a Superfund site at this time.
[EPA's Federal Facility Preliminary Assessment/ Site Inspection Review of LBNL, 1991]

(The documents that EPA reviewed for the assessment contained *no air emissions data.* When asked why in Dec. 98, EPA stated that the air emissions data did not meet their quality standards, therefore they did not look at it.)
[12/98 EPA response to letter from the Committee to Minimize Toxic Waste]

Firestorm!

October 1991 - The Berkeley Oakland Hills firestorm rages out of control for three days, completely destroying 3000 homes. It burns within 3/4 mile of LBNL. The inventory for all types of radioactive waste at the Lab's Hazardous Waste Handling Facility, located just below the Lawrence Hall of Science, is listed as 3.5 million curies at this time.

High Radiation Levels!

1992 - Tritium concentrations measured in soil (pore water) near the NTLF reach a maximum of 68,000 picocuries per liter (three times the legal maximum for drinking water); average 39,000 picocuries for the year. Concentrations measured in hydrauger water (a perforated pipe that drains unstable soil dur-

ing the rainy season) on the hill below the NTLF reaches a maximum of 33,000 picocuries per liter; averages 23,000 picocuries per liter for the year.
[4/15/97 Summary Tables of Environmental Tritium Measurements at Berkeley Lab, submitted by LBNLto the Tritium Issues Working Group]

1992 - The Bevatron and HILAC accelerators are closed but not officially decommissioned, thus not investigated for contamination or cleaned up.

1992 - David Balgobin is hired as manager of Environmental Monitoring, to improve LBNL's environmental performance. Over time, he becomes disillusioned by the Lab's unwillingness to improve its performance or to release readily available environmental data to the public. He eventually resigns in disgust.
[May 2000 conversation between the author and David Balgobin]

1992 – In an action unrelated to LBNL, the University notifies the community that it is going to build a replacement for the Canyon Chemical Facility ("Acidhouse"), where the University keeps radioactive and toxic waste from its labs. The community is amazed to learn that toxic and radioactive waste is stored near the UC Botanical Garden in Strawberry Canyon. The Panoramic Hill Neighborhood Assn. forms a subcommittee called the Committee to Minimize Toxic Waste (CMTW), which insists that the University consider a site on campus closer to the labs generating the waste. Ultimately the University chooses the Callaghan site on campus.

September 1992 - LBNL publishes its Final Supplemental Environmental Impact Report for renewing the contract between US DOE and the University for operation and management of LBNL.

High Radiation Levels!

1993 - Tritium concentrations measured in storm water in Pineapple Creek (just across from the UC Botanical Garden) reach 20,000 picocuries per liter (the maximum permissible limit for drinking water); nearby Chicken Creek reads 18,100 picocuries per liter. The Pineapple Creek monitor is subsequently removed (see 1995).
[4/15/97 Summary Tables of Environmental Tritium Measurements at Berkeley Lab, submitted by LBNLto the Tritium Issues Working Group]

1993 - After reviewing the Tiger Team report, the City of Berkeley's Community Environmental Advisory Commission (CEAC) raises concerns about tritium and toxic chemicals at LBNL. A series of articles appears in the San Francisco Bay Guardian.

May 4, 1993 - California approves a permit for LBNL's new Hazardous Waste Handling Facility, allowing for storage and "simple treatment," including limited "oxidation" (burning) of radioactive waste.
[LBNL's 1996 Site Environmental Report, Vol. 1]

Accident!

Fall 1993 - A high release of tritium from the NTLF is variously reported as 24, 44 or 68 curies. "The AIP Program has proposed that DOE audit the tritium inventory, use and rcovery to ensure proper quality control and validity of results."
[1995 AIP Annual Report, p. 14]

December 1993 - Health Physics Magazine devotes a whole issue to tritium, edited by Tore Straume. New research exposes tritium as one of the most harmful of all radioactive elements, because it readily forms water and invades all cells of the body, causing whole body radiation exposure.

December 7, 1993 - U.S. Energy Secretary Hazel O'Leary declares a new openness policy, giving people access for the first time to data from the Department's nuclear labs, including human radiation experiments. (See sidebar p. 1, Human Radiation Experiments)

March 9, 1994 - LBNL requests a change in the classification of its new Hazardous Waste Handling Facility (HWHF) from a "Category 3 Non-Reactor Nuclear Facility" to a "Non-Nuclear Facility," which requires less stringent construction measures.

LBNL claims the facility will apply "administrative controls" to keep within the limits of the Non-Nuclear classification. "Controls" include shipping waste quarterly in order not to exceed the storage limit of1000 curies of tritium; *or, if not possible to ship the waste (if waste facilities won't take it), storing excess tritium at the NTLF — which is not designed to store waste, and has no storage permit!*
[3/9/94 letter from David McGraw, Dir. EH&S Division at LBNL to DOE's Oakland office]

April 5, 1994 - The Dept. of Energy grants the Non-Nuclear classification for the Hazardous Waste Facility.
[4/5/94 memo from Alex Dong, Acting Director, Waste Management Div. DOE to DOE-Western Operations Div.]

High Radiation Levels!

Fall 1994 - Lab employee and graduate student Susan Monheit collects several hundred environmental samples on and offsite for her masters thesis. *She measures 239,000 picocuries per liter in rainwater offsite, near the Hall of Science, over 12 times EPA's maximum permitted for drinking water, and 197,946 picocuries per liter in transpired water vapor in trees near the NTLF* ("transpired" means water taken up by plant roots which comes out through the leaves).

After Monheit's results are published, her contract is not renewed.
["The Use of Plant-Transpired Water to Monitor Sub-surface Tritium Contamination in Soil and Groundwater," by Susan Monheit, M.S., University of San Francisco, 1996; 4/15/97 Summary Tables of Environmental Tritium Measurements at Berkeley Lab, submitted by LBNL to the Tritium Issues Working Group]

Waste Handling Violations!

February 1995 - The Hanford Radioactive Disposal Facility in Richland, WA, confronts LBNL over its waste handling procedures. During 1994, an area of the Hanford facility had to shut down because of concern that incompatible chemicals discovered in LBNL waste drums might cause an explosion.
[1995 Site Environmental Report p. 3-31, 32]

As a result, three external reviews of LBNL's hazardous waste management program are conducted in 1995, concluding, "The review raised issues on instrument calibration, design, control, non-conformance reporting, quality assurance, waste characterization, packaging, procedures, sampling, and document control."
[LBNL 1995 Site Environmental Report, p. 3-32, 33]

April 1995 - Hanford complains about another discrepancy involving two drums of LBNL waste with shipping papers listing the wrong number of inner bottles.

May 1995 - Hanford issues a moratorium on waste shipments from LBNL until it improves its procedures, and informs LBNL that it will scrutinize LBNL shipments more closely in the future.

May 8, 1995 – Because of the Hanford moratorium, LBNL applies for temporary authorization to increase its storage capacity for "mixed" (radioactive/hazardous) waste. California's Dept. of Toxic Substances Control (DTSC) grants the authorization.

August 21, 1995 – LBNL applies for a permit to permanently increase their storage capacity for "mixed" waste, and also requests a permit to perform various waste treatments on site. Its plan lists a full fire fighting staff in case a waste treatment starts a fire.
[LBNL's Mixed Waste Site Treatment Plan, 8/21/95]

Firefighters Dismissed!

That same month, LBNL firefighters go door to door in the neighborhoods around the Lab, petitioning LBNL not to cut their jobs.

Immediately after receiving its permit in October, 1995, LBNL cuts 40% of its firefighters, after which the Lab no longer has the capacity to respond to a "Level A" (extremely serious) toxic or radioactive emergency.

September 1995 - LBNL predicts that the NTLF will release no more than 100 curies/year of tritium, even though it released an average of 225 curies per year from 1982 to 1995.
[LBNL's Draft Environmental Health-Risk Assessment for Tritium Releases at the NTLF at LBNL, Sept. 1995]

September 30, 1995 - A report by the program set up in 1991 to provide independent confirmation of LBNL monitoring briefly describes Dr. Leticia Menchaca's investigation of plants near Bldg 75 (the NTLF). The report suggests that "there may be more tritium in the environment than previously suspected."
[1995 Annual Report of AIP program]

The report outlines a number of "Other Areas Suggested for Future Oversight Investigations" which are radioactively contaminated, stating that "The AIP Program has not had an opportunity to review or comment on any report or study" of these areas. It will not have an opportunity, because in late 1995, the Dept. of Energy suddenly eliminates

the program's funding, six months before it is supposed to end. These areas include:

Bldg. 71: nearby soil contaminated with Curium-244;

Bldg. 75-A: Radioactive Waste Storage Area, where two stored gamma irradiators containing cesium and cobalt emit 0.2 millirem per *hour* at the nearest accessible distance, and 18 millirems per year at the fence near the Hall of Science (ten millirems per year is the maximum permissible dose for the general public).

The AIP report notes: "This area is listed as approved for No Further Investigation, 9/14/93."

Bldg 4 – former RadWaste Storage and staging area. "No Further Investigation status was requested by LBL in November 1994."

Bldg. 5 – Former Radioactive Decontamination area. A 1995 report found "detectable levels of strontium-90 beneath the concrete slab... Without further explanation the report of 'no gamma radiation detected with a detection limit of 200 picocuries per liter' and two soil borings reported as 'within background' are rather ambiguous..." Contamination "may have been transported away from this area in water; soil from areas where run off water could collect as well as sediment in storm drains, sewer drains, and traps should also be evaluated."

Bldg 74 – Abandoned Above-ground Rad Waste Holding Tanks. "If they were not surveyed and found to be free of radiologic contamination before they were buried under an addition to building 74, [sic] this could pose a significant hurdle to be crossed if the site is ever to be released for unrestricted use."

Bldg 74 - Six Inactive Aboveground Rad Waste Holding Tanks.

California's Dept. of Toxic Substances Control is listed as the lead agency for most of these areas, even though DTSC later acknowledges it has no authority to regulate radioactivity. (See also 5/5/99)
[5/5/99 letter from Salvatore Ciriello of DTSC to Iraj Javandel of LBNL]

October 27, 1995 - The Dept. of Toxic Substances Control issues an inspection report alleging three violations for mixed waste shipments to Hanford.
[1995 LBNL Site Environmental Report, p. 3-31]

November 9, 1995 - The Dept. of Toxic Substances Control extends for six months LBNL's temporary authorization to store radioactive/hazardous "mixed" waste in excess of permitted capacity.

December 1995 - An article by Tore Straume in *Health Physics* magazine describes tritium radiation as more harmful than gamma rays, which were previously considered the most damaging form of radiation.

Monitors Removed!

1995 - The Pineapple Creek monitor, which showed high tritium concentrations in 1993, is removed sometime in 1995 along with monitors in five other creeks in Strawberry Canyon: Banana Creek, No Name Creek, Ten-Inch Creek, Ravine Creek and Cafeteria Creek. Only four stormwater sampling locations remain.
[1995 LBNL Site Environmental Report, p. 5-8. Figure 5-3 "Stormwater Sampling Locations" shows sampling locations "Discontinued in 1995"]

High Radiation Levels!

1996 - *Tritium concentrations measured by Dr. Leticia Menchaca in water in plant tissues near the NTLF reach a maximum of 128,186 picocuries per liter (six times more than the limit for drinking water), and average 77,400 picocuries per liter for the year (almost four times more than the limit).* Concentrations of "organically bound tritium" (i.e., tritium incorporated into the plants' cells) in trees near the NTLF reach a maximum of 524 picocuries per gram; offsite, 200 meters northwest of the NTLF, near the Lawrence Hall of Science, Menchaca measures 252 picocuries per gram.
[4/15/97 Summary of Environmental Tritium Levels at Berkeley Lab, submitted by LBNL to the Tritium Issues Working Group]

Monitors Removed!

1995 - Over half the air samples collected from LBNL's eight-monitor network during 1995 exceed the EPA's Cancer Risk Screening Concentration. *However, by 1996, four of these monitors are no longer part of the network, including monitors at Melvin Calvin Lab, the Math Research Institute (above the Lawrence Hall of Science), and Olympus*

Gate (the Hall of Science parking lot).

In addition, LBNL changes the sampling frequency of the four remaining monitors from weekly to monthly, so fewer samples are collected in 1996. This could give false low readings, because the monitors absorb no more tritium if they become saturated. (See sidebar, Monitors Unreliable)
[EPA's 8/4/98 Superfund Reassessment, Table 3-1, p. 3-6]

1996 - LBNL Draft Fact Sheet summarizing Tritium Risk Assessment claims 80% of tritium is recycled. However, based on the Lab's shipping documents from 1990 through Aug.1, 1998, it appears that less than 30% is recycled. (See also October 1998)
["Tritium Purchases, Releases, Shipments and Disposal 1969-Present" (Aug. 1, 1998)]

February 5, 1996 LBNL holds a public meeting on permit modifications to increase storage and treatment of radioactive/hazardous "mixed" waste at the Hazardous Waste Handling Facility.

Waste Handling Error Closes NTLF!

March 96 - The NTLF is closed through October 1996. An NTLF employee tells CMTW it is closed because benzene was found mixed with tritium waste.
[Spring 1996 telephone conversation between CMTW and NTLF employee]

March 5, 1996 - A Lab memo mentions that LBNL wants DOE to expand the limits of tritium they can store without becoming a Category 3 Nuclear Facility. (See September 1997).
[Memo 4/22/96 from Robin Wendt, head of Waste Mgmt, LBNL to Carol Kilusiak, CEQA/NEPA officer at LBNL] (

March 7, 1996 - The Dept. of Toxic Substances Control holds a Public Hearing, although not required by law, because of public outcry about LBNL's request for permanent permit modification to increase storage and treatment of radioactive/hazardous "mixed" waste at the Hazardous Waste Handling Facility (HWHF) in Strawberry Canyon.

May 10, 1996 - The Dept. of Toxic Substances Control issues a Consent Order allowing LBNL to exceed its maximum storage capacity for radioactive/hazardous "mixed" wastes at the Hazardous Waste Handling Facility until DTSC makes a final determination on the permit modification.

July 22, 1996 - LBNL initiates its "Tritiated Mixed Waste Treatability Study," (without telling the community about it until after there is an accident, see 7/24/98). The designation "study" gives LBNL an exemption from the Dept. of Toxic Substances Control permit process, allowing it to oxidize "mixed" (radioactive/ hazardous) waste from the NTLF.

The NTLF has 2000 curies of mixed waste that waste storage facilities won't take because it is difficult to store and requires a complex oxidation process; however LBNL is not supposed to keep it because it's not a permanent waste storage site.

Oxidation takes place at the NTLF, and releases radiation and a variety of toxic compounds into the environment, possibly including dioxin.

The treatment is a multi-step process, including heating the waste in a steel kettle, combustion with spark plugs, and drying in a kiln.

After oxidation, LBNL must go through EPA to get the waste "delisted" (certified that hazardous chemicals have been removed and what is left "pure" radioactive waste).
[2/8/99 letter from Communities for a Better Environment to Rep. Barbara Lee; 8/16/00 communication between author and DTSC]

September 17, 1996 - The Berkeley City Council passes a unanimous Resolution to close the NTLF and clean up the site. The Council expresses extreme concern about the potential for radioactive contamination in the event of a landslide, fire or earthquake. The Lab sits astride the Hayward fault.

November 27, 1996 - Dr. Menchaca's contract at LBNL is not renewed. She protests: "I was told my work, my results, the data that I produced, and the reports that I submitted to my superiors were 'not existent' and I was not allowed to publish or to talk about work...at the Laboratory... I was told that my most recent reports were shredded on my last day of work... I believe that the termination of my employment was a planned retaliation for having told Calif. Dept. of Health Services staff and Dept. of Energy staff about the concentrations of tritium that I was finding...my research was exposing errors in the han-

dling and analysis of environmental samples and data."
[11/27/96 letter from Dr. Leticia Menchaca to Phil Williams at LBNL]

1997 - The Dept. of Energy adds the word "National" to their labs, so Lawrence Berkeley Lab is now called "Lawrence Berkeley National Lab" (LBNL).

January 1997 - LBNL creates the Tritium Issues Work Group (TIWG). EPA and California's Dept. of Health Services are cochairs; the Dept. of Toxic Substances Control is to assist the Dept. of Health Services in collecting samples and evaluating data; the City of Berkeley's Citizen's Environmental Advisory Commission (CEAC) is to participate in all phases; CMTW is to act as watchdog and active participant. LBNL and the Dept. of Energy are supposedly not members, are only there to provide resources. Two years later, community members walk out and TIWG disbands. (See April 21, 99)

January 6, 1997 - In a letter to the City of Berkeley, the Dept. of Energy refuses to close the NTLF, claiming that its work is in the "national interest." The letter says DOE has requested its Oakland office to review NTLF tritium emissions monitoring, in cooperation with other responsible federal and state of California agencies.
[1/6/97 letter from DOE to Sherry Kelly, City Clerk, City of Berkeley]

March 31, 1997 - First waste shipment to Hanford after Hanford lifts the moratorium. CMTW believes that the radioactivity listed for these drums may actually correlate with what's inside.

April 1997 - LBNL's Health-Risk Assessment for Tritium Releases at the NTLF estimates organically bound tritium in vegetation as 81 picocuries per kilogram, although Dr. Menchaca actually measured up to 345,000 picocuries per kilogram of organically bound tritium in vegetation in Zone 2 between the tritium stack and the Hall of Science!
[Final Environmental Health-Risk Assessment for Tritium Releases at the NTLF, April 1997,Table 4-10, p. 4-30 "Tritium Concentrations in Zone 2, Assuming a Release of 100 Ci/Year"]

None of the maps in the Health Risk Assessment show the location of the tritium stack. On the Site map (p. 1-5) the tritium stack is not used as the center for Zone 1: "the highest likely exposure." If the stack were the center, the Hall of Science would be within the highest zone of exposure. Instead, the center is the Northeast corner of Bldg. 75, where the oxidizer which converts tritium gas into tritiated water vapor is located. The monitor that was closest to this area was removed in 1984 after only 6 months' operation, with measurements as high as 100,000 picocuries per cu. meter of air.

The Health-Risk Assessment states that approximately 1 in 100 lifelong residents of Berkeley will die of cancer due to exposure to natural background radiation.
[Final Health-Risk Assessment, 1997, Table 1-1, p. 1-10 Health risks from Background Radiation]

May 6, 1997 - LBNL officially declares that the proposed permit modifications to the Hazardous Waste Handling Facility will not result in new significant impacts, and therefore does not require an Environmental Impact Report.
[LBNL's 5/6/97 Notice of Determination, Subsequent Mitigated Negative Declaration]

May 97 - The Cities of Berkeley and Oakland support a lawsuit by the Group to Eliminate Toxics, calling upon the University of California, as manager of LBNL, to set aside its approval of the permit modification for the Hazardous Waste Handling Facility and prepare an Environmental Impact Report. In June, 1998, a judge rules against the lawsuit on a technicality.

July 9, 1997 - In a letter to Mayor Dean, David Wemmer (head of NTLF) describes concerned Berkeley citizens as "the opposition." (See Brookhaven sidebar, last page)

September 1997 - The Dept. of Energy increases the Category 3 Non-Reactor Nuclear Facility tritium inventory threshold from 1000 curies to 16,000 curies — a direct benefit for LBNL.

September 1997 - The Dept. of Energy renews UC Berkeley's five-year contract to manage LBNL.

approx 1998 – LBNL's new Hazardous Waste Handling Facility starts operating. The 5/10/96 Consent Order from the Dept. of Toxic Substances Control allows it to increase storage of mixed waste although the permit modification has not yet been approved.

February 3, 1998 - Dr. Tore Straume, hired by the City of Berkeley to review LBNL's Tritium Environmental Health—Risk Assessment, states that tritium causes more biological damage than X-rays or gamma rays. Gamma rays were previously thought to be the most harmful form of radiation, based on studies of fallout from nuclear weapons.

March 20, 1998 - An EPA review of LBNL's monitoring plan criticizes LBNL for using outdated sampling techniques that fail to identify what radioactive substances are present in the soil. EPA points out that very affordable modern technology that could identify the substances is readily available. It also questions why LBNL only plans to keep monitoring records for 5 years; "Isn't a time period of 10 years more commonly used for legal documents' retention times?"

[3/20/98 memo from John Griggs, EPA's National Air and Radiation Environmental Laboratory, to Perlann Wood and Shelly Rosenblum of EPA Region 9]

Accident!

April 20, 1998 - The Lab unlawfully discharges 160 gallons of water contaminated with tritium, arsenic, mercury and lead into City of Berkeley storm drains. It fails to report the release, and when asked why, the Lab sends a letter stating that it isn't required to report such incidents. The City of Berkeley disagrees and refers the matter to the Alameda County District Attorney.

[7/15/98 letter from Nabil Al-Hadithy, City of Berkeley's Toxic Management Division, to David McGraw, Dir. of Environment, Health and Safety Div. of LBNL]

Accident!

July 24, 1998 – Unplanned release of at least 35 curies of tritium from the Waste Treatability "Study" at NTLF. The release goes out through a vent in the roof of NTLF, not the main stack on the hill; therefore it is not measured by the special monitor on the stack. The amount released is deduced after the fact from measurements in "silica gel" monitors. (see sidebar, Monitors Unreliable)

CMTW demands an investigation of the accident; two years later, in August, 2000, the Dept. of Toxic Substances Control begins to investigate, although it only has authority over the toxic materials released, not the tritium.

From 1995 on, there is no external agency responsible for ongoing oversight of radiation at LBNL; the Department of Energy is in the position of monitoring itself. (See jurisdiction questions 5/5/99)

August 4, 1998 – US EPA issues a Superfund Reassessment, per CMTW request, stating, "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. However, further investigation must take place before any final decision to place LBNL on the National Priorities List. Tritium sampling, which is in dispute as of August 2000, is key to this investigation (see 1/26/00, 5/1/00 and 6/30/00 for issues in dispute).

September 1998 - The Berkeley City Council reaffirms its Resolution asking for permanent closure of the NTLF.

October 1998 - LBNL sends a shipment of recaptured tritium for recycling, with a shipping document claiming it contains 6,850 curies. CMTW questions the amount of radioactivity in the shipment, since LBNL has not received more than 5,000 curies of tritium since the last recycling shipment. CMTW asks the recipient of the shipment (Lawrence Livermore Lab) how much was received, and are

Unreliable Monitors

A special monitor on the NTLF tritium stack is supposed to give a continuous record of tritium measurements, like a series of snapshots. However, according to David Balgobin, this "real-time" monitor (named "Overhoff," for its manufacturer) has never been successfully calibrated.

Silica gel monitors have problems, too. They collect tritium like a sponge collects water, but when they become saturated, like a sponge, they fail to collect anything more.

[8/00 communication between author and David Balgobin; 7/00 communication between author and Dr. Menchaca]

told: only 3200 curies. When this issue is brought to the attention of the radiation expert hired by the City of Berkeley, Bernd Franke, in 2000, he follows up on the discrepancies, and finally LBNL admits that it had indeed overstated the amount of tritium in the shipment. However, it now claims it sent 4550 curies, and proceeds to adjust the Dept. of Energy's database (NMMSS) by only 2500 curies.

December 11, 1998 - CMTW letter to US EPA after a meeting on Sept. 10 at Congressmember Barbara Lee's office, asks EPA to perform a comprehensive radiological survey of the site, including other radionuclides in addition to tritium, as part of their review for Superfund National Priority Listing. EPA forwards these requests to the Dept. of Energy, and it says we're already looking at these problems under the Resource Conservation and Recovery Act (RCRA). However, CMTW notes that there is no radioactive oversight under the Resource Conservation and Recovery Act. Also, under the Superfund law, the community would be more involved in the site investigation and cleanup process.

April 1999 - The Dept. of Health Services states that in the Census Tract southeast of LBNL, which includes the top of Panoramic Hill and the area around the Claremont Hotel, *"The observed number of breast cancers is higher than the expected number at a statistically significant level."*
[4/1/99 letter from Eva Glazer, California Dept. of Health Services]

April 1999 - City of Berkeley hires radiation expert Arjun Makhajani of the Institute for Energy and Environmental Research (IEER) to review LBNL's radiation performance. Makhajani spends nine months trying to obtain information from LBNL, and finally withdraws in December, 1999, citing the Lab's non-cooperation. He says dealing with LBNL was a "Kafka-esque nightmare."

April 21, 1999 - After more than two years of meetings, all community members of the Tritium Issues Work Group withdraw, because of the non-cooperation by the Lab. The Work Group is disbanded.

May 5, 1999 - The Dept. of Toxic Substances Control asks for radioactive materials to be removed from the Resource Conservation and Recovery Act

WHO'S IN CHARGE HERE?

The question of who regulates radiation at LBNL came up at the July 1999 Quarterly Meeting LBNL holds with regulatory agencies to keep them abreast of its Site Environmental Restoration program, headed by Iraj Javendel. (No members of the public, or even the City of Berkeley, are allowed at these meetings, although Javendel gives briefings for the City's Environmental Commission.)

At this meeting, regulators express considerable confusion about who's in charge. "Michael [Michael Rochette of California's Regional Water Quality Control Board] noted that he had been under the impression that the 1993 memorandum of understanding (MOU) of agency responsibilities was still in effect and that the Dept. of Health Services (DHS) had been overseeing issues related to radiological contamination. The DHS had been given oversight responsibility for radionuclide issues by the DTSC [California Dept. of Toxic Substances Control] as part of the Agreement in Principle (AIP) with the DOE. However, the AIP is no longer in effect and DHS has not been overseeing radionuclide issues. Tony Natera [of DTSC, who first called attention to this problem] noted that in the 1993 MOU, the intent was to have the DHS oversee radiological conerns for mixed waste. Michael noted that the RWQCB [the Regional Water Board] understands that the DOE is the lead regulatory agency for radionuclide issues but under the Porter Cologne Act, the RWQCB has jurisdiction of radionuclides in water. The RWQCB wants to assure that there is review by a California State agency where there is radionuclide contamination in soil above a groundwater plume. He asked if the MOU identifying agency roles and responsibilities could be rewritten. Iraj responded that if possible he would schedule a meeting..."

This meeting has never happened.
[Environmental Restoration Program Quarterly Review Meeting Minutes, 7/28/99]

(RCRA) process because DTSC has no jurisdiction over radionuclides.
[5/5/99 letter from Sal Ciriello of DTSC to Iraj Javandel of LBNL's Site Restoration Program]

June 1999 – The Dept. of Toxic Substances Control approves LBNL's permit modification for increased storage of mixed waste at the Hazardous Waste Handling Facility. CMTW files an appeal, saying the Lab should have done an Environmental Impact Report. To date (August, 2000) no decision has been made on the appeal, and LBNL continues to operate the Hazardous Waste Handling Facility under the Consent Order.

July 14, 1999 - In a meeting arranged by Congressmember Barbara Lee, a panel of scientists and a physician ask the National Institutes of Health not to renew their grant to the NTLF. The NIH later informs Rep. Lee that because of the concerns expressed in the presentation, in addition to renewing the NTLF grant they will supplement it so that NTLF can hire a Health Physicist.

December 21, 1999 - The City of Berkeley contracts with the Institute for Energy and Environmental Research (IFEU), in Germany, to review past and present radioactive exposures from LBNL.

January 2000 - A new LBNL study argues that the 1959 neutron doses recorded at the Olympus Gate monitoring station should be revised; that the Lab really didn't exceed the exposure limit.
[IFEU Preliminary Report, 6/30/00, p. 22]

January 2000 - Energy Sec.Bill Richardson acknowledges that some nuclear workers were made ill from radiation on their jobs. He promises compensation, but some complain that a complex procedure may make it difficult to collect.

January 26, 2000 - LBNL creates another group to give the appearance of public participation, the Environmental Sampling Project Task Force. This time, the Lab maintains full control, and handpicks all 23 members of the panel. It invites representatives from only two community groups and two neighborhood groups; the rest of the panel consists of staff and contractors of LBNL, the Dept. of Energy and the University; regulators; and representatives of the biomedical and nuclear medicine industries.

The Lab wants this group to sign off on its Tritium Sampling Plan, the same plan that was submitted two years earlier to the Tritium Issues Working Group, which deemed it inadequate, cursory, superficial and inappropriate, since it did not address the full extent of radiological contamination at the site. The Lab intends for this survey to determine whether LBNL will be on the National Priorities List for Superfund cleanup.

April 11, 2000 - The Alameda County School Board votes to recommend a moratorium on school visits to the Lawrence Hall of Science, because of radiation danger from the NTLF.

April 25, 2000 - After pressure from LBNL, the School Board revises its resolution, advising parents, teachers and administrators to investigate for themselves the hazards at the Hall of Science from LBNL's tritium emissions.

May 1, 2000 - The Water Board demands that groundwater be included in LBNL's Tritium Sampling Plan because groundwater is one of the four key pathways for exposure that EPA uses to calculate the Hazard Ranking Score, which determines whether the site will be on the National Priorities List for Superfund cleanup. Past contamination in the groundwater has exceeded EPA's permissible limit for drinking water.
[5/1/00 letter to LBNL from California's Regional Water Quality Control Board]

Firestorm!

May 7, 2000 - A fire set by forestry personnel flares out of control near Los Alamos National Lab in Northern New Mexico, the second of three nuclear weapons labs managed by UC Berkeley. The Lab is closed May 8, and the entire town of Los Alamos is evacuated May 10. The inferno sweeps through canyons where waste has been stored and comes within yards of Lab buildings, but officials claim there is no danger from radiation. The fire devours 46,000 acres and 235 homes before it is declared under control (but still burning) May 24.

continued on p. 17

GLOSSARY

AEC - Atomic Energy Commission, created after World War II to oversee and promote the use of nuclear technology for weapons, electric power, medicine and industry. Later splits into the Dept. of Energy and the Nuclear Regulatory Commission.

AIP - California Agreement in Principle Program, funded by the Dept. of Energy and operated by California's Dept. of Health Services (DHS) Environmental Management Branch, designed to provide independent confirmation of LBNL'senvironmental monitoring.

CAP 88 - Computer model used to determine compliance with air pollution standards (NESHAPs). Assumes flat ground, therefore does not reflect conditions on a steep hillside like LBNL, where the top of the tritium stack is *below* the Hall of Science, and wind speed and direction varies with land contours.

CEAC - The City of Berkeley's Citizens' Environmental Advisory Commission

CERCLA - Comprehensive Environmental Response, Compensation and Liability Act of 1980 (the "Superfund" law)

CMTW - Committee to Minimize Toxic Waste, started in 1992 as a subcommittee of the Panoramic Hill Neighborhood Assn.

DOE - U.S. Department of Energy

DTSC - California's Dept. of Toxic Substance Control. Ordinarily has no jurisdication over radioactive substances; however they allowed themselves to be used by LBNL as if they were the lead agency on radiological concerns until 5/5/99.

EIR - Environmental Impact Report

EPA - U.S. Environmental Protection Agency

HWHF - Hazardous Waste Handling Facility

HALF-LIFE - Referring to any radioactive substance, half the atoms will lose their radioactivity ("decay") in the first half-life, half of the remaining atoms will lose their radioactivity in the next half-life, etc. It takes more than ten half-lives for radiation to decay to practically nothing. Tritium has a 12-1/2 year half life, so it takes 125 years for tritium to become harmless.

ISOTOPE - various forms of radioactive elements, with different atomic weights

NESHAPs - National Emissions Standards for Hazardous Air Pollutants

MIXED WASTE - radioactive waste mixed with hazardous (flammable, corrosive or reactive) chemical constituents

NIH - National Institutes of Health

NRC - Nuclear Regulatory Commission, has the dual mission of promoting and regulating nuclear power.

NTLF - National Tritium Labelling Facility

PANORAMIC HILL ASSN. - Neighborhood association in neighborhood on the hill south of LBNL.

RADIONUCLIDE - A radioactive substance

RADIATION STANDARDS - see sidebar, p. 5

RCRA - Resource Conservation and Recovery Act, which regulates toxics, but not radioactive substances

RWQCB - California's Regional Water Quality Control Board

TIWG - Tritium Issues Work Group

TRITIUM - A radioactive form of hydrogen, see sidebar p. 3

TRITIUM LABELLING - see sidebar, p. 3

A *VERY* DIFFERENT STORY AT BROOKHAVEN NAT'L LABORATORY

January 17, 1997 - Brookhaven National Lab, on Long Island, New York, announces tritium leak of five curies from High Flux Beam Reactor.

May, 1997 - Article on Brookhaven tritium leak in May 1997 Nature magazine hits newstands. Brookhaven Director Nicholas Samios "retires." Energy Secretary Federico Pena terminates the contract with Associated Universities, Inc., which ran Brookhaven for 50 years. AUI included Yale, Harvard, Columbia, and MIT. Pena admonishes Lab officials for referring to concerned community members as "the opposition."

Nov. 99 - High Flux Beam Reactor shuts down.

Firestorm!

June 30, 2000 - A brush fire started by a highway collision rages near the Hanford nuclear weapons and waste facilities in southeast Washington State. Officials claim there is no danger from radiation.

June 30, 2000 - The City of Berkeley's radiation expert, Germany's Institute for Energy and Environmental Research (IFEU) submits its first report, which states that the Lab's radiation monitors are inadequate and unreliable, contamination is more widespread than previously understood, and inventory data is so inaccurate (±30%) that it is useless for determining how much tritium has excaped.

The report reveals that tritium is not released gradually, but in short bursts, during NTLF operations. Therefore, a person nearby would get a higher dose in a shorter time than the Lab's computer model (CAP 88) indicates. IFEU recommends an investigation of whether such doses exceeded legal limits.

The Lab's monitors could miss the bursts, because there are too few of them, and they monitor only the predominant wind directions.

In its review of the Lab's Tritium Sampling Plan, IFEU calls for groundwater sampling, more air monitors and more thorough soil sampling.

[Preliminary Technical Report on Radiological Monitoring at LBNL by IFEU, 6/30/00]
"DOE: Labs contaminated forever!"

August 7, 2000 - The National Academy of Science announces that LBNL and 143 other facilities that played a role in U.S. nuclear weapons programs will never be clean enough for unrestricted public use. According to the NAS study, "At many sites, radiological and nonradiological hazardous wastes will remain, posing risks to humans and the environment for tens or even hundreds of thousands of years."

The report says the government does not have the technology, money or management techniques to prevent the contamination from spreading; and restrictions against public access are unlikely to endure — but the Department of Energy has failed to consider the costs to society of containment failure. For instance, the Los Alamos fire set the stage for mudslides in the upcoming rainy season that could contaminate the Rio Grande with radioactive and toxic chemicals.

In an interview, the chair of the study committee comments, "The Dept. of Energy often makes a plan as if things were going to work which don't always work. [Their] planning assumption should be that things may turn out to be wrong." The report says, "Much of our current knowledge of the long-term behavior of wastes... may eventually be proved wrong," and most systems intended to contain radioactive waste "will eventually fail."

["Four Bay Area labs a long-term hazard," West County Times 8/8/00; "Nuclear Sites Called Permanently Unsafe," SF Chronicle, 8/8/00]