IV.M. Utilities, Service Systems, and Energy

IV.M.1 Introduction

This section addresses the potential impacts on water supply systems, wastewater disposal systems, storm drainage systems, solid waste disposal systems, and energy systems that could result from implementation of the proposed 2006 LRDP. An expanded discussion of the existing and proposed on-site stormwater drainage system is included in Section IV.G, Hydrology and Water Quality.

IV.M.2 Setting

IV.M.2.1 Water Supply

The East Bay Municipal Utility District (EBMUD) water supply system consists of a network of reservoirs, aqueducts, treatment plants, and distribution facilities. The water supply system extends from its primary water source, the Mokelumne River, in the Sierra Nevada mountain range, to water treatment plants or to reservoirs[1] within its service area, and ultimately to residences and businesses in the East Bay. On average, 90 percent of the water delivered by EBMUD comes from the Mokelumne River watershed, with the remaining 10 percent originating as runoff from local watersheds within the service area.

EBMUD provides the high pressure water supply for LBNL at two separate connections. The primary connection is to EBMUD's Shasta Pressure Zone, which provides water service to customers within an elevation range of 900 to 1,050 feet and has a two-million-gallon capacity. The second connection is to the Berkeley View Pressure Zone, which provides water service to customers within an elevation range of 1,050 to 1,250 feet and has a one-million-gallon capacity. The Lab receives its water through a 12-inch meter on Campus Drive in the Shasta Pressure Zone and a 6-inch meter on Summit Road from the Berkeley View Pressure Zone.

On-Site Water System

High pressure water is distributed throughout LBNL by an extensive piping layout providing domestic and fire protection water to the site. The Lab's system also supplies make-up water for cooling towers, irrigation water, and water for other on-site miscellaneous uses. The system includes fire hydrants, fire department connections, and sprinkler services to almost all LBNL buildings. In many areas of the site, the LBNL water delivery system is looped and equipped with block valves, which can be used to isolate portions of the system for repair or replacement while still maintaining full service to most facilities. With the Lab's loop distribution design, other portions of the system can continue to be served from the other side of the loop.

[1] EBMUD's East Bay service area includes five reservoirs: Briones, Chabot, Lafayette, San Pablo, and Upper San Leandro.

All utility systems within the Laboratory's boundary are owned and operated by the Laboratory. In addition, the sanitary sewer line from the Strawberry Gate to the Strawberry Outfall – located outside the Laboratory boundary – is owned and operated by LBNL.

The Lab conducts periodic inspections of its water distribution system and has installed back-flow prevention devices in accordance with the Uniform Plumbing Code to ensure the purity of the domestic water supply system. Periodic pressure tests are performed to ensure that the system operates at appropriate pressure levels.

Due to differences in elevation at the Lab, there are five main pressure zones operating at the nominal pressure of 70 pounds per square inch (psi).[2] The water distribution system is entirely a gravity system, except for the emergency fire protection system. Most of the existing pipe in the system is either cement mortar lined and coated steel pipe with welded joints or ductile iron pressure pipe with mechanical joints. The pipe has been designed and installed to resist forces caused by earth movement due to slides and/or earthquakes, and/or located to avoid potential unstable earth areas.

There are two sources of water supply into the Laboratory. One source is from a 12-inch diameter pipe line originated from EBMUD Shasta Reservoir, which has a capacity of over 2 million gallons. The bottom of the reservoir is at elevation 1,149 feet above mean sea level (MSL). The second source is a 6-inch line from EBMUD Berkeley View Reservoir, which has a capacity of over 3 million gallons. The bottom of the Berkeley View Reservoir is at elevation 1,317 feet above MSL. Since the Laboratory's elevation is at an average of elevation of 840 feet above MSL, the flow capacity of these two lines combined will be approximately 5,000 gallons per minute. There is a connection between the Lab's water supply and UC Berkeley's supply outside of the UC Botanical Garden.

To supplement the water supply provided by EBMUD, LBNL operates and maintains three 200,000-gallon water storage tanks on-site for emergency water supply in the event of service interruption from EBMUD. One tank is located near Building 82 in the Central Research Area, one is located at Building 68 in the Grizzly Operations Support Area, and the third tank is located above Building 85 in the East Canyon Area. The tanks at Buildings 82 and 68 are each equipped with a diesel-powered pump and automatic controls to pressurize LBNL's water distribution system if EBMUD service is interrupted. The tank located near Building 85 will continue to maintain water flow for the fire protection system during emergencies by gravity. In normal operation, water is slowly circulated from the LBNL system through the 200,000-gallon tanks so they are always filled with potable water and the full 600,000 gallons are always available if required. The first two of the emergency water systems were installed around 1979. The third tank was completed in December 2003.

In the event that one or both of the water supply pipelines from EBMUD to Berkeley Lab are damaged, the storage tanks and fire pumps on-site would maintain water supply and water pressure to every building and fire hydrant on site. (There are 64 fire hydrants located for

[2] Pounds per square inch: the amount of operating pressure.

optimum service distribution throughout the Laboratory. Each hydrant has one four-inch and two 2.5-inch valve connections.) Each pump would start automatically when it senses a drop in water pressure in the distribution system. Such pump activation is announced via the site-wide fire alarm system at the fire dispatch center. The pump can also be manually started or stopped from the fire dispatch console or at the control panel at each of the pump houses.

Water Demand

During 2003, total annual water consumption at LBNL was approximately 41.6 million gallons. Of the total water demand, personal water use, or water used directly by the Lab population for consumption and sanitary purposes, accounted for slightly less than 50 percent of the total demand, or 20.5 million gallons. Process water, used for research, cooling, heating, industrial, cleaning, construction, and landscaping purposes, accounted for the balance of total water use (LBNL, 2004).

Over time, the demand for water at LBNL has been decreasing due to improved efficiency on-site. Between 1990 and 2003, total annual water use, including both personal water and process water, decreased from approximately 78.6 million gallons to 41.6 million gallons. This represents about a 47-percent reduction in water use. During this time, the building gross square footage at LBNL increased by about nine percent (from approximately 1.62 million gross square feet [gsf] to 1.76 million gsf). This improved efficiency has been achieved in several ways. Over the past 15 years, all of the Lab's "once through" cooling systems have been eliminated. Several cooling towers have been retrofitted with non-chemical water treatment systems, increasing the cooling tower operating cycles and thereby reducing water replacement need. All of the commodes at LBNL have been either replaced with low-flow models or adjusted for low-flow operation, all shower heads have been replaced with low-flow shower heads, and all wash basin faucets have been replaced with low-flow aerators.

Pipe Replacement Needs

All major cast iron pipe mains at the LBNL site have been replaced. There are still some cast iron pipe laterals from some of the mains to various buildings. All new pipes are either ductile iron pipes with Class 50 pipe wall thickness, PVC conforming to AWWA C900, pressure class 250 or polyethylene, class 200. Within the next 20 years, the existing 12-inch diameter pipe that is cement mortar lined and coated will require replacement. The pipe was installed in early 1960. The line is currently provided with an Impressed Current Cathodic Protection System. It is expected that the pipe will likely fail within the next 20 years either due to the failing Cathodic Protection System or due to other unforeseeable conditions. The Lab intends to replace the pipe if it fails.

IV.M.2.2 Wastewater

EBMUD provides wastewater treatment services to parts of Alameda and Contra Costa counties along the east shore of the San Francisco Bay, including the project site. In the project area, wastewater is collected and conveyed via the City of Berkeley's public sewer system and EBMUD-operated interceptor sewers to the regional wastewater treatment facility located

southwest of the Interstate 80 and Interstate 580 interchange in Oakland. Wastewater is collected by 29 miles of interceptor lines that move wastewater from about 1,400 miles of sewers owned and operated by the jurisdictions served.

Currently, EBMUD's wastewater treatment facility has an average annual daily flow of 77 million gallons per day (mgd) during dry weather conditions (EBMUD, 2001). During wet weather, the treatment plant accepts more flow;[3] the plant has a sustainable primary treatment[4] capacity of 320 mgd, and a maximum secondary treatment[5] capacity of 168 mgd. After treatment, wastewater is discharged off the East Bay shore into the San Francisco Bay via a one-mile-long deep-water outfall line.

On-Site Wastewater Collection System

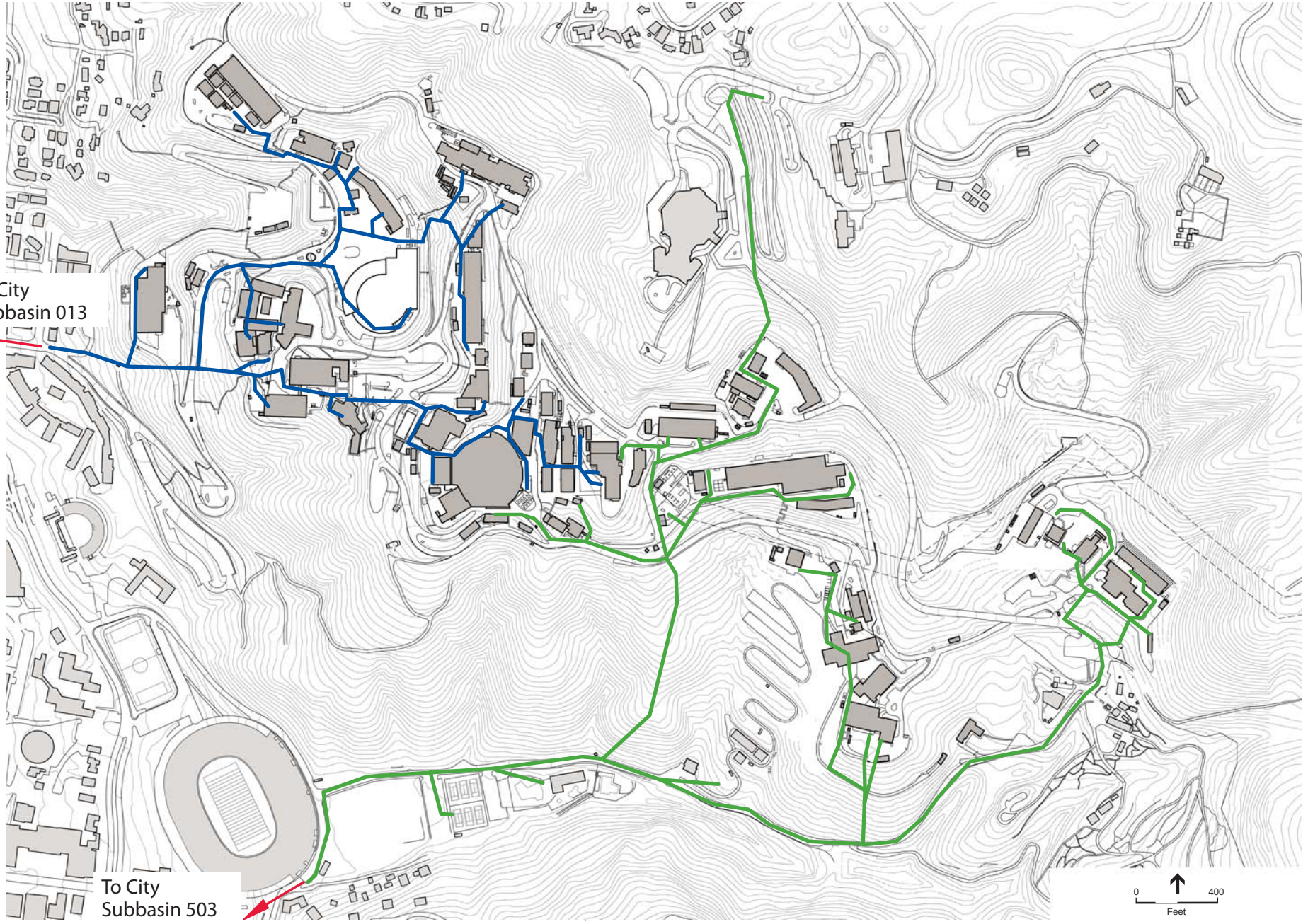
Wastewater at the Lab is carried via a gravity flow system, owned and operated by LBNL and eventually discharged to the City of Berkeley's public sewer system through two monitoring stations, one located at Hearst Avenue (Hearst Monitoring Station) and the other at Centennial Drive in Strawberry Canyon (Strawberry Monitoring Station). The monitoring stations measure the volume of the effluent on a continuous basis. In addition, samples of the effluent are taken at regular intervals and evaluated for radioactivity and other constituents mandated by EBMUD.

The Lab's effluent from the Hearst Monitoring Station flows to just above the intersection of Highland Place and Cyclotron Road, where it ties into the City of Berkeley's sewer system at City sanitary sewer sub-basin 17-013. Effluent from the Strawberry Monitoring Station flows through a UC Berkeley sewer line, which ties into the City of Berkeley's system at a manhole near the intersection of Stadium Rim Road and Canyon Road, located southeast of Memorial Stadium at City sanitary sewer sub-basin 17-503. Part of the effluent from this monitoring station originates from UC Berkeley facilities, including the Lawrence Hall of Science as shown in Figure IV.M-1. The City of Berkeley's sewer system transports the effluent from both monitoring stations to EBMUD's north interceptor sewer and then to the treatment facility in Oakland.

Infiltration and Inflow

The main concern with sewer flow in the project vicinity and region-wide in the EBMUD system is the infiltration and inflow (known as "infiltration / inflow" or "I/I") of stormwater into the sanitary sewer system attributed to the poor condition of aging sewer pipes. LBNL has acted to address infiltration/inflow problems in its system through a concerted sewer infrastructure upgrade program. A plumbing maintenance and upgrade effort has been undertaken during the past 15 years by LBNL, along with installation of water-saving devices and systems, to substantially lower average sewer flows. These ongoing efforts have reduced both peak wet

3 Storage basins provide plant capacity for a short-term hydraulic peak of 415 mgd.
4 *Primary* treatment involves preliminary treatment (screening) and sedimentation (the removal of solid particles from suspension by gravity).
5 *Secondary* treatment involves biological treatment of wastewater to remove remaining organic matter.



SOURCE: Lawrence Berkeley National Laboratory (2006)

LBNL 2006 Long Range Development Plan . 201074

Figure IV.M-1
Existing Sanitary Sewer Lines at LBNL

weather as well as average sewer flows by well over half.[6] Moreover, LBNL's peak wet weather infiltration/inflow rate is less than half that of the City of Berkeley, and it is only approximately 10 percent of that found in the EBMUD service district on average. LBNL continues to seek ways to reduce both water consumption and sewage generation.

Wastewater Generation

Annual wastewater generation at LBNL is approximately 38 million gallons, with personal wastewater accounting for approximately half and process water accounting for the other half. While sewer flows vary widely according to the time of day and time of year, the Lab's approximate peak daily flow is about 274,000 gallons per day (gpd) during dry weather conditions and 821,000 gpd during peak wet weather conditions (LBNL, 2004). At the Hearst Monitoring Station, the average wastewater flow is about 50,000 gpd and can range from 30,000 to 100,000 gpd. At the Strawberry Monitoring Station, LBNL's approximate average daily flow is 100,000 gpd and can range from 40,000 to 120,000 gpd. These ranges represent averages throughout the year. The effluent flow at the Strawberry Monitoring Station also includes the UC Berkeley Hill Campus area buildings, which contribute about half of the amount measured.

Sewer System Conditions and Upgrades

LBNL currently pays EBMUD for assessed sewer services. The University has also contributed to the City of Berkeley's sewer upgrade program, which is intended to increase wet weather flow capacity and decrease infiltration/inflow conditions. The City of Berkeley's infiltration/inflow correction program was initiated in 1987 and includes rehabilitation or replacement of 50 percent of the City's existing system over 30 years, as well as installation of 12 miles of new sewer lines to accommodate overflow conditions by the year 2007. By 1999, over 25 percent of the planned replacement and rehabilitation had been completed and 10 miles of the proposed 12 miles of new sewer lines had been installed. A 22-mile interceptor line along Adeline Street, completed in 1992, now conveys wet weather flow to EBMUD's storage and treatment facilities. The City's infiltration/inflow correction program allows for a 20 percent increase in the base wastewater flow due to changes in land use or population (City of Berkeley, 2001).

Sanitary sewage from LBNL's eastern portion (and upstream UC Berkeley Hill Campus buildings) generally is routed into pipes exiting the Lab at Centennial Drive. The LBNL Centennial Drive sanitary sewer flows into the UC Berkeley sewer on Centennial Drive and then into City of Berkeley's sanitary sewer sub-basin 17-503.[7] This sub-basin also collects wastewater from other sources, including the City of Oakland Panoramic Hill area. From sewer sub-basin 17-503, LBNL's wastewater continues to flow through City sanitary sewer basin 17 to basin 15 and into EBMUD-operated interceptor sewers and its treatment facility.

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6 The ratio of water consumption to wastewater generation for developed areas is typically 1:1. According to existing data at LBNL, wastewater generation is about 95 percent of water consumption. Thus the reduction in sewer flows at LBNL has been comparable to reductions in water consumption, both about 47 percent between 1990 and 2003.

7 A "sub-basin" is a small-flow sanitary sewer collection area established by the City of Berkeley. Several sub-basins flow into a larger "basin," which collects effluent and directs it to the EBMUD sanitary sewer waste treatment plant.

Sanitary sewer sub-basin 17-503 is constrained around Dwight Avenue during peak wet weather conditions. The problem is cross-jurisdictional, since sub-basin 17-503 receives wastewater flow from both the City of Berkeley and the City of Oakland. Additionally, the sewer pipes cross both the Hayward fault and numerous landslide areas, making them vulnerable to damage. The constricted portion of sub-basin 17-503 runs beneath Prospect Road, which is the principal automobile access to a large portion of the Panoramic Hill neighborhood. Rehabilitation of or improvement to this portion of sewer line would be difficult as it would obstruct access, egress, and emergency service to this residential area. Resolving the capacity problem with the City of Berkeley sanitary sewer sub-basin 17-503 is not scheduled to be addressed in the near term (LBNL, 2004; Yee, 2006).

Effluent from LBNL's western portion generally flows into sub-basin 17-013 by way of the Hearst Monitoring Station. The sanitary sewer lines on Hearst Avenue are relatively new and in good condition, and they flow directly into the interceptor on Shattuck Avenue. Sub-basin 17-013 is not currently constrained during peak wet weather flows, and it is expected to have future wet weather capacity to meet LBNL's growth needs during the term of the 2006 LRDP (LBNL, 2004).

IV.M.2.3 Stormwater Drainage

In order to control stormwater runoff, a drainage system has been installed that discharges into the north fork of Strawberry Creek to the north and to Strawberry Creek itself to the south. The existing system provides for runoff intensities expected in a 100-year maximum-intensity storm. An expanded discussion of the existing and proposed on-site stormwater drainage system is included in Section IV.G, Hydrology and Water Quality.

The LBNL storm drain system is a gravity-fed network of open and culverted drainage conveyances, running generally east to west. Drain pipes range from 4-inch diameter to 36-inch diameter and consist of metal, PVC, concrete and tile pipe. Run-on (i.e., water draining onto the site from off-site locations) enters the site via open drainage channels and combines with runoff from the LBNL site. The combined drainage is conveyed across developed portions of the Lab via underground piping, and is then discharged at established open drainage channels of the Strawberry Watershed.

IV.M.2.4 Non-Hazardous Solid Waste

The LBNL Facilities Department provides a range of non-hazardous waste management services to LBNL staff and visitors. As a government-owned facility operated through contract by the University of California, LBNL must comply with waste minimization reporting requirements issued by the Department of Energy (DOE), the State of California, the University of California, and LBNL itself. Appendix F of the contract between the University of California and DOE for the operation of LBNL contains a performance measure pertaining to sanitary waste reduction. The goal, consistent with the overall DOE performance measure, was to reduce the amount of routine solid sanitary waste going to land disposal by 67 percent by the end of Fiscal Year (FY) 2004, using the amount of solid sanitary waste sent to land disposal in 1993 as the baseline.

LBNL had achieved a waste reduction of about 85 percent as of FY 2004, thereby exceeding the FY 2004 goal. The reductions were achieved through waste segregation and recycling efforts, and through a composting and mulching program.[8] The plant material recycling program has resulted in a 10-percent reduction in LBNL solid waste. During 2004, LBNL generated 1,070 tons of recycled waste and 210 tons of disposed waste.[9]

Richmond Sanitary (waste and recycling contractor) collects non-hazardous, non-recyclable solid waste, including construction waste, generated at LBNL, and transports it to a collection station in Richmond, California. The waste is baled and then delivered to the Altamont Landfill in Livermore, California. Recycled waste, including aluminum, glass, paper, landscape materials, and recyclable wood, is collected separately by Richmond Sanitary and transported to its recycling facility in Richmond. There, recycled materials are sorted, baled, and transferred to recycling vendors.

IV.M.2.5 Electricity

Electrical power at the Lab is purchased from the Western Area Power Administration and delivered by the Pacific Gas and Electric (PG&E) transmission system to the Lab's Grizzly Substation located adjacent to Building 77. PG&E delivers power to LBNL on two overhead 115-kilovolt (kV), 3-phase, 60-Hertz (Hz) transmission lines with a joint capacity of approximately 100 megawatts (MW). Both of these transmission lines feed power from PG&E's El Sobrante switching station to the Grizzly Substation. The Grizzly Substation consists of two DOE-owned 120/12 kV power transformers with a combined capacity of 100 MW. This substation is for the exclusive use of LBNL. In addition, LBNL's power can be supplied from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Substation.

The main power distribution system at the Lab consists of a 12.47-kV underground system with smaller substations and transformers that reduce voltage to 480/277 volts (V) or 208/120 V. The 12.47-kV distribution system has dual primary feeders to provide reliable power. Certain buildings are equipped with special voltage regulation in order to ensure that critical experiments will not be disrupted by transient voltage within the system. Total electrical power consumption at LBNL in 2003 was 74,500 megawatt hours (MWh).

LBNL also has a number of stationary and portable emergency power generators. These generators start automatically in the event of a power failure and are used to provide an emergency power supply for certain critical services (e.g., for laboratory exhaust fans, exit lights, the fire station, Radio Communications Facility, and the Health Services Building) and other important activities at LBNL. The generators are powered either by diesel, gasoline, or natural gas fuel. The total generating capacity of these emergency generators is approximately 6,250 kilowatts. Diesel-powered generators greater than 50 horsepower (approximately

8 Data are compiled from waste and recycling quantities reported by LBNL's sanitary waste contractors. Routine solid sanitary waste does not include wastes generated during site renovations, site restoration, or other one-time activities, or recycled waste.

9 "Recycled" solid waste includes paper, glass, metals, and other materials that are recycled and transported off-site for reuse, and "disposed" solid waste includes personal and process non-hazardous waste solids that are disposed in off-site sanitary landfills.

35 kilowatts) require an operating permit from the Bay Area Air Quality Management District. LBNL has 22 such generators (23 with the inclusion of the Molecular Foundry generator), and all but one are rated in the tens to hundreds of kilowatts of power capacity. The remaining generator is rated at 2000 kilowatts of generating capacity. All permitted generators are limited in the number of hours per year of use for maintenance and testing operations. All of the permitted generators are allowed unlimited use during conditions that meet the regulatory definition of an emergency.

IV.M.2.6 Natural Gas

Natural gas is used at the Lab for heating all buildings, equipment, operations, and some experimental uses. The natural gas supply is provided by the Defense Fuel Supply Center in Oregon and delivered by the PG&E system. The LBNL natural gas system receives its supply from a 6-inch PG&E line operating at 50 pounds per square inch gauge (psig).[10] The point of delivery is a meter vault in the hillside area above Cyclotron Road and below Building 88. A 6-inch gas line operating at 13.5 psig distributes high pressure natural gas from PG&E's metering vault to the buildings throughout the Laboratory, with the exception of Buildings 73 and 73A. Buildings 73 and 73A receive their gas supply directly from a PG&E supply line that travels up Centennial Drive to the UC Berkeley Botanical Garden. Building pressure generally ranges from 0.25 to 1.25 psig. The piping for the LBNL on-site natural gas system consists of two types: coated and wrapped steel, and polyethylene. The system includes pipes, valves, fittings, pressure-reducing stations, earthquake emergency shut-off valves, meters, and appurtenances. Current (2003) natural gas usage is approximately 1.6 million Therms, or about 20,720 British thermal units (Btu) per gross square foot.

IV.M.2.7 Other On-Site Utilities

LBNL also employs building-specific or site-wide utilities specific to Lab research or specialized equipment. These utilities include:

Compressed Air. The Laboratory-wide compressed air system provides compressed air to laboratories and shops for cleaning or driving hand-held tools and vacuum pumps. Berkeley Lab has approximately 11,000 linear feet of compressed air pipeline.

Low-Conductivity Water. The Laboratory low-conductivity water system provides low-conductivity water to laboratory buildings. The water is primarily used to provide cooling of sensitive equipment for research purposes, including for accelerator magnet amplifiers. This system has approximately 11,500 linear feet of pipeline.

Treated Water. The treated water system is a closed-loop cooling water system that provides cooling water to laboratory buildings for cooling equipment, chillers, and other purposes. This system has approximately 4,500 linear feet of pipeline.

Purified Water. Purified water systems are necessary for some scientific research. These systems are installed locally either at the point of use in specific laboratories or at individual building sites. There is no Laboratory-wide purified water system.

[10] Pounds per square inch gauge: the amount of operating pressure.

De-Ionized Water. De-ionized water systems are necessary for some scientific research. These systems are installed locally either at the point of use in specific laboratories or at individual building sites. There is no Laboratory-wide de-ionized water system.

IV.M.2.8 State Regulatory Environment

Planning for water supply and distribution, solid waste disposal, and energy are regulated at the state level. Specific regulations that would be relevant to implementation of the 2006 LRDP are described below.

Water Supply and Distribution

Senate Bill (SB) 610, codified as Sections 10910-10915 of the California Public Resources Code, requires local water providers to conduct a water supply assessment for projects proposing over 500 housing units or equivalent usage. The local water suppliers must also prepare an Urban Water Management Plan (UWMP) to guide planning and development in the water supplier's service area.

Solid Waste Disposal

The California Integrated Waste Management Act of 1989, or Assembly Bill (AB) 939, established the Integrated Waste Management Board, required the implementation of integrated waste management plans, and also mandated that local jurisdictions divert at least 50 percent of all solid waste generated, beginning January 1, 2000.

Energy

Buildings constructed after June 30, 1977 must comply with standards identified in Title 24 of the California Code of Regulations. Title 24 requires the inclusion of state-of-the-art energy conservation features in building design and construction, including the incorporation of specific energy-conserving design features, use of non-depletable energy resources, or a demonstration that buildings would comply with a designated energy budget.

IV.M.2.9 Local Plans and Policies

LBNL is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned or controlled by The Regents of the University of California. As such, LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, LBNL seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The western part of the LBNL site is within the Berkeley city limits, and the eastern part is within the Oakland city limits. This section summarizes relevant policies in the Berkeley and Oakland general plans.

Berkeley General Plan

Berkeley General Plan policies relevant to the proposed 2006 LRDP include the following:

Water Supply and Distribution

Berkeley General Plan policies pertaining to water supply and distribution include:

> Policy EM-26 Water Conservation. Promote water conservation through City programs and requirements.
>
> *Actions*:
>
> B) Consider participation in the East Bay Municipal Utility District's East Bay-shore Recycled Water Project to make recycled water available for irrigation and other non-potable uses.
>
> Policy EM-31 Landscaping. Encourage drought-resistant, rodent-resistant, and fire-resistant plants to reduce water use, prevent erosion of soils, improve habitat, lessen fire danger, and minimize degradation of resources.

Wastewater

Berkeley General Plan policies that relate to wastewater collection and treatment include:

> Policy EM-24 Sewers and Storm Sewers. Protect and improve water quality by improving the citywide sewer system.

Stormwater Drainage

Berkeley General Plan policies related to stormwater management include:

> Policy EM-23 Water Quality in Creeks and San Francisco Bay. Take action to improve water quality in creeks and San Francisco Bay.
>
> *Actions*:
>
> D) Restore a healthy freshwater supply to creeks and the Bay by eliminating conditions that pollute rainwater, and by reducing impervious surfaces and encouraging use of swales, cisterns, and other devices that increase infiltration of water and replenishment of underground water supplies that nourish creeks.
>
> E) Ensure that new development pays its fair share of improvements to the storm sewerage system necessary to accommodate increased flows from the development.
>
> F) Coordinate storm sewer improvements with creek restoration projects.
>
> Policy S-27 New Development: Use development review to ensure that new development does not contribute to an increase in flood potential.
>
> *Actions*:
>
> C) Require new development to provide for appropriate levels of on-site detention and/or retention of stormwater.

D) Regulate development within 30 feet of an exposed streambed as required by the Preservation and Restoration of Natural Watercourses (Creeks) Ordinance.

Solid Waste

The Berkeley General Plan identifies policies regarding solid waste including:

Policy EM-7 Reduced Wastes. Continue to reduce solid and hazardous wastes.

Policy EM-8 Building Reuse and Construction Waste. Encourage rehabilitation and reuse of buildings whenever appropriate and feasible in order to reduce waste, conserve resources and energy, and reduce construction costs.

Policy EM-10 Materials Recovery and Remanufacturing. Support and encourage serial materials recovery and remanufacturing industries.

Policy EM-11 Biodegradable Materials and Green Chemistry. Support efforts to phase out the use of long-lived synthetic compounds, such as pesticides and vehicle anti-freeze, and certain naturally occurring substances which do not biodegrade. Encourage efforts to change manufacturing processes to use biodegradable materials, recycle manufactured products, reuse byproducts, and use "green" products.

Energy

Berkeley General Plan policies relating to energy conservation include:

Policy EM-35 Energy-Efficient Design. Promote high-efficiency design and technologies that provide cost-effective methods to conserve energy and use renewable energy sources.

Policy EM-36 Energy Conservation. Continue to implement energy conservation requirements for residential and commercial buildings at the time of sale and at time of major improvements.

Policy EM-39 Business Energy Conservation. Encourage all businesses to implement energy conservation plans.

Policy EM-40 Market Support. Support the market for energy-efficient technologies and services.

Oakland General Plan

The Oakland General Plan Land Use and Transportation Element was approved in March 1998. Policy language is focused on economic development (Industry and Commerce policies), Transportation and Transit-Oriented Development, Downtown, the Waterfront, and the Neighborhoods, as well as Housing. The following policy is applicable to utilities:

Policy I/C1.9 Locating Industrial and Commercial Area Infrastructure. Adequate public infrastructure should be located within existing and proposed industrial and commercial areas to retain viable existing uses, improve the marketability of existing vacant or underutilized sites, and encourage future user and development of these areas with activities consistent with the goal of this Plan.

The Open Space, Conservation and Recreation (OSCAR) Element, adopted in 1996, addresses the management of open land, natural resources, and parks in Oakland. Policies relevant to the proposed project are discussed below.

Water Supply and Distribution

OSCAR Element policies pertaining to water supply and distribution include:

> Policy CO-4.1 Water Conservation. Emphasize water conservation and recycling strategies to meet future demand.
>
> Policy CO-4.2 Drought-Tolerant Landscaping. Require the use of drought tolerant plants to the greatest extent possible and encourage the use of irrigation systems which minimize water consumption.
>
> Policy CO-4.4 Water-Conscious Development Patterns. Encourage regional development patterns which make environmentally sound use of water resources.

Wastewater

OSCAR Element policies pertaining to wastewater include:

> Policy CO-5.3 Control of Urban Runoff. Employ a broad range of strategies, compatible with the Alameda Countywide Clean Water Program, to: (a) reduce water pollution associated with stormwater runoff; (b) reduce water pollution associated with hazardous spills, runoff from hazardous material areas, improper disposal of household hazardous wastes, illicit dumping, and marina "live-aboards"; and (c) improve water quality in Lake Merritt to enhance the lake's aesthetic, recreational, and ecological functions.
>
> Action 5.3.11 Improved Sewer Collection and Treatment. Reduce water pollution from sanitary sewer collection and treatment systems, including wastewater collection lines and the regional treatment plant. Continue the systemwide improvement program to correct infiltration and inflow problems in the East Bay Municipal Utility District and Oakland sewer systems.

Also applicable are Policy CO-4.1 and Policy I/C1.9, above.

Stormwater Drainage

OSCAR Element policies pertaining to stormwater drainage include Policy CO-5.3, Control of Urban Runoff, above.

Solid Waste

The Oakland General Plan does not identify policies regarding solid waste or recycling.

Energy

OSCAR Element policies pertaining to energy include:

> Policy CO-13.3 Construction Methods and Materials. Encourage the use of energy-efficient construction and building materials. Encourage site plans for new development which maximize energy efficiency.

IV.M.3 Impacts and Mitigation Measures

IV.M.3.1 Significance Criteria

The impact of the proposed LRDP on utilities, energy, and service systems would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the state CEQA Guidelines and the UC CEQA Handbook:

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Have insufficient water supplies available to serve the project from existing entitlements and resources, or if new or expanded entitlements are needed;
- Result in the need for increased chilled water or steam generation capacity or major distribution improvements;
- Result in a determination by the wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs; and
- Not comply with applicable federal, state, and local statutes and regulations related to solid waste.

IV.M.3.2 Impact Assessment Methodology

The environmental impact analysis for utilities, energy, and service systems in this EIR begins with an assessment of existing utility use and infrastructure services at LBNL. The projected utilities and infrastructure services demand generated by subsequent development projects pursuant to the LRDP are then calculated and compared to existing usage to determine the net increase. Finally, the projected utility usage is compared to the capacity. Impacts on stormwater drainage facilities are addressed in Section IV.G, Hydrology and Water Quality, of this EIR. Moreover, Berkeley Lab does not employ either chilled water or steam generation systems, and therefore these issues are not discussed below.

IV.M.3.3 2006 LRDP Principles, Strategies, LBNL Design Guidelines

2006 LRDP Principles and Strategies

The 2006 LRDP proposes four fundamental principles that form the basis for the development strategies provided for each element of the LRDP. The two principles most applicable to utilities-related aspects of new development are to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship" and to "Build a safe, efficient, cost-effective scientific infrastructure capable of long-term support of evolving scientific missions."

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP (see Chapter III, Project Description for further discussion, and see Appendix B for a full listing of principles, strategies, and design guidelines). Development strategies set forth in the 2006 LRDP that are applicable to utilities include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, riparian areas, and mature tree stands by focusing future development primarily within the already developed areas of the site;
- Provide flexibility in the identification of land uses and in the siting of future facilities to accommodate the continually evolving scientific endeavor;
- Increase development densities within areas corresponding to existing clusters of development to preserve open space, and enhance operational efficiencies and access;
- To the extent possible site new projects to replace existing outdated facilities and ensure the best use of limited land resources;
- To the extent possible, site new projects adjacent to existing development where existing utility and access infrastructure may be utilized;
- Site and design new facilities in accordance with University of California Presidential Policy for Green Building Design to reduce energy, water, and material consumption and provide improved occupant health, comfort, and productivity;
- Exhibit the best practices of modern sustainable development in new projects as a way to foster a greater appreciation of sustainable practices at the Laboratory;
- Utilize native, drought-tolerant plant materials to reduce water consumption; focus shade trees and ornamental plantings at special outdoor use areas;
- Minimize impervious surfaces to reduce storm water run-off and provide landscape elements and planting to stabilize slopes, and reduce erosion and sedimentation;
- Maintain a safe and reliable utility infrastructure capable of sustaining the Laboratory's scientific endeavors;
- Consolidate utility distribution into centralized utility corridors that generally coincide with major roadways;

- Ensure that utility infrastructure improvements accommodate future facility expansion and alterations in the most cost-effective means possible; and
- Design infrastructure improvements to embody sustainable practices.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the LRDP and are proposed to be adopted by the Lab following The Regents' consideration of the LRDP. The LBNL Design Guidelines provide specific guidelines for site planning, landscape and building design as a means to implement the LRDP's development principles as each new project is developed. Specific design guidelines are organized by a set of design objectives that essentially correspond to the strategies provided in the LRDP. The LBNL Design Guidelines provide the following specific planning and design guidance relevant to the utilities-related aspects of new development:

- Minimize impacts of disturbed slopes;
- Respect view corridors;
- Create a cohesive identity across the Lab as a whole by following established precedents for new landscape elements;
- Provide appropriate site lighting for safety and security;
- Segregate public entries and paths from service entries and paths where feasible;
- Reduce the amount of impermeable surfaces at the Lab;
- Create buildings that are flexible, modular, and expandable; and
- Organize service functions to minimize conflicts and visual impacts.

IV.M.3.4 Impacts and Mitigation Measures

Impact UTILS-1: Implementation of the proposed 2006 LRDP would increase the demand for water. (Less than Significant)

During 2003, total water consumption at LBNL was approximately 41.6 million gallons. Of this amount, personal water use accounted for slightly less than 50 percent of the total demand, or 20.5 million gallons. Process water accounted for the balance majority of total water use (LBNL, 2004). As stated in the Introduction to this EIR, as a result of the reduction in scope of the proposed project in response to comments from the City of Berkeley, this EIR assumes the 2006 LRDP would result in 2.42 million gsf of occupiable (research and support) building space at the Lab's hill site. The impact analysis below regarding water demand is based on a more conservative projected use of water associated with the original proposal of 2.56 million gsf of potential development. This more conservative analysis will ensure that the Lab has thoroughly evaluated potential impacts associated with water demand. Using this more conservative analysis, implementation of the 2006 LRDP

would generate an estimated water demand of approximately 56.5 million gallons per year (see Table IV.M-1). This represents an increase of about 36 percent, or 14.9 million gallons. Of this total increase, the annual demand for personal water would increase by approximately 27 percent and the demand for process water would increase by about 45 percent. The percentage of water demand associated with personal water use would decrease slightly, to about 46 percent, as compared with baseline (2003) conditions, in which personal water use accounted for slightly less than 50 percent of total demand.

TABLE IV.M-1
EXISTING AND PROJECTED ANNUAL WATER DEMAND

Water (million gallons)	Current Use (2003) 1,760,000 gsf	Projected Use (2025) 2,560,000 gsf[c]	Increase under Project
Personal[a]	20.5	26.0	5.5
Process[b]	21.1	30.5	9.4
Water (total)	41.6	56.5	14.9

[a] "Personal" water is water used directly by Lab population for consumption and sanitary purposes.
[b] "Process" water is water employed for research, cooling, heating, industrial, cleaning, construction, and landscaping uses.
[c] Gross square footage under originally proposed 2006 LRDP. Gross square footage under currently proposed 2006 LRDP would be less (2,420,000 gsf).

gsf – gross square feet

SOURCE: LBNL (2003).

The 2006 LRDP as currently proposed would provide for 660,000 gsf of net new occupiable space at the hill site, or approximately 17.5 percent less net new occupiable space than the 2006 LRDP as originally proposed (800,000 gsf) (see Chapter III, Project Description, for details). Accordingly, it is estimated that the additional water demand would be reduced by approximately a like amount.

Pursuant to Sections 10910-10915 (SB 610)[11] of the California Water Code, LBNL submitted a request to EBMUD to prepare a water supply assessment (WSA) for the proposed project.[12]

EBMUD submitted the WSA to LBNL in a letter dated November 23, 2004 and confirmed by EBMUD on February 23, 2006. EBMUD confirmed that the project's estimated water demand is accounted for in EBMUD's water demand projections, as published in the 2000 Urban Water Management Plan (EBMUD, 2004). The proposed project would not change EBMUD's 2020 water demand projection, nor would it result in a new significant increase in water use beyond what EBMUD has projected for the region. Therefore, the proposed project would not result in the need for new or expanded water entitlements. The WSA was based on the increased level of

[11] The LBNL water supply system is a private water system and does not meet the definition of a city or county system as defined in the California Water Code Sections 10910-10915. However, LBNL will voluntarily comply with the Water Code as delineated in these sections, including the water supply assessment provision.
[12] A "project," as defined by SB 610, includes proposals for new residential use over 500 units, retail use over 500,000 square feet, office use over 250,000 square feet, hotel/motel use over 500 rooms, industrial use over 40 acres or 650,000 square feet, a mixed-use project including any use as large as the above, or any project that would demand water greater than the equivalent of 500 dwelling units.

potential development under the LRDP as described in the Notice of Preparation. As the 2006 LRDP as currently proposed includes a reduced amount of potential development compared to the originally proposed LRDP (by about 17.5 percent of net new occupiable space), the conclusion that the project would not result in the need for new or expanded water entitlements applies equally to the reduced 2006 LRDP as currently proposed.

As further stated in the WSA, during periods of multiple-year drought conditions, EBMUD's studies indicate that, with current water supply and projected 2020 demand, deficiencies in water supply of up to 67 percent could occur. The project's water demand would contribute to this projected deficiency in supply during drought periods (EBMUD, 2004). To address projected deficiencies in water supply during future drought conditions, EBMUD recommends implementation of water conservation measures at the project site to avoid significantly affecting its system.

New buildings constructed under the 2006 LRDP would install water conservation devices such as low-flow plumbing fixtures and water-saving appliances; other devices and new technology (e.g., drip irrigation, re-circulating cooling systems, etc.) would be employed where practicable to further water conservation. Additionally, landscaping introduced to the project site as a result of the 2006 LRDP would include drought-tolerant plant materials with a long-term goal to wean the majority of the plant materials off the irrigation system and allow them to naturalize.

The 2006 LRDP also includes various system upgrades intended to improve reliability and reduce water loss due to outdated, deteriorating pipelines. Improvements include the replacement of selected existing water distribution lines.

The on-site water delivery system at LBNL and connection to off-site pipes are sized for firefighting, which requires roughly 20 times larger capacity than the infrastructure necessary for water delivery for daily use. Thus, existing infrastructure is adequate for future development and redevelopment under the 2006 LRDP.[13] Based on the discussion above, the project would generate a less-than-significant impact with respect to demand for water services.

Mitigation: None required.

Project Variant. Under the project variant, the adjusted daily population (ADP) on the hill site would increase by approximately 1,350. The project variant does not propose additional building space on the hill site, and staff consolidated from off-site locations would be accommodated within the total 2.42 million gsf (660,000 gsf new) of net new occupiable (research and support) building space proposed under the current 2006 LRDP.

[13] Normal water use at LBNL, including cooling tower use, ranges from 10 gpm to a peak of 167 gpm. LBNL has conducted fire hydrant testing on a biannual basis to determine the available water supply capacity. The flow test usually consisted of two hydrants flowing simultaneously with an average of 1,800 gpm flow from one hydrant. The total flow from two hydrants is 3,600 gpm. Hence the 20 times larger capacity is being maintained.

While the ADP increase under the project variant (1,350) would be approximately 35 percent higher than the ADP increase under the currently proposed LRDP program (1,000), the increase in water demand and other utility demand is estimated at about 10 percent because the project variant would not result in additional building space at the hill site. The projected increase in water demand associated with the project variant is approximately 10 percent, or 1.49 million gallons per year, higher than projections for the 2006 LRDP.

The project variant would result in an incremental increase in water demand compared to the 2006 LRDP, and it is expected that EBMUD would have available capacity to accommodate the project variant. Therefore, the impact would be less than significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. The scenario is based on the amount of development originally proposed in the LRDP, and the Water Supply Assessment is also based on that originally proposed amount of potential development, so the scenario remains an appropriate and conservative basis for the evaluation of impacts to water supply. Individual projects as identified in the Illustrative Development Scenario would not result in significant impacts related to water supply for the reasons described above.

Impact UTILS-2: Implementation of the proposed 2006 LRDP would generate additional wastewater, requiring system improvements to ensure that additional wastewater flows from the Lab are directed into unconstrained sub-basins. (Significant; Less than Significant with Mitigation)

LBNL sewers are maintained in very good condition. During wet weather conditions, LBNL generates about two to three times as much wastewater as the amount generated on a peak dry weather day. For comparison purposes, the City of Berkeley generates about six to seven times as much wastewater on wet days as the peak dry weather wastewater flow. Increased wastewater flow during wet weather conditions is attributed to the infiltration and inflow of stormwater into the sanitary sewer system, and results in the EBMUD treatment facility receiving about seven to 10 times as much wastewater on wet days as on a peak dry weather day.

Based on the more conservative analysis, as described above (i.e., based on the originally proposed 2006 LRDP), the annual wastewater generation at LBNL would increase by about 13.5 million gallons, or by about 36 percent, with the implementation of the 2006 LRDP. Daily wastewater generation would be about 346,000 gpd during peak dry weather conditions, and would reach a peak of 893,000 gpd during wet weather (see Table IV.M-2).

TABLE IV.M-2
EXISTING AND PROJECTED WASTEWATER GENERATION

Wastewater (million gallons)	Current Use (2003) 1,760,000 gsf		Projected Use (2025) 2,560,000 gsf[c]		Increase under Project	
Total Wastewater (million gallons/year)	37.5		51.0		13.5	
Personal[a] Wastewater (million gallons/year)	18.5		23.5		5.0	
Process[b] Wastewater (million gallons/year)	19.0		27.5		8.5	
Daily Wastewater (gallons per day)	Peak dry weather 274,000	Peak wet weather 821,000	Peak dry weather 346,000	Peak wet weather 893,000	Peak dry weather 72,000	Peak wet weather 72,000

a "Personal" wastewater is sanitary sewer water generated directly by Lab population from consumption and sanitary activities.
b "Process" wastewater is sanitary sewer water generated from research, cooling, heating, industrial, and cleaning activities.
c Gross square footage under originally proposed 2006 LRDP. Gross square footage under currently proposed 2006 LRDP would be less (2,420,000 gsf).

gsf – gross square feet

SOURCE: LBNL (2003).

The City of Berkeley's infiltration/inflow correction program set a maximum allowable peak wastewater flow from each sub-basin within the city, and EBMUD agreed to design and construct wet weather conveyance and treatment facilities to accommodate these flows. EBMUD prohibits discharge of wastewater flows above the allocated peak flow for a sub-basin because conveyance and treatment capacity for wet weather flows may be adversely affected by flows above the agreed limit. The Centennial Drive sewer, or sub-basin 17-503, is currently constrained during peak wet weather events. About half the existing sewage flow from LBNL entering the Centennial Drive sanitary sewer comes from LBNL and the remaining flow comes from the UC Berkeley hill area. It is unlikely that this ratio will change substantially in the future with the growth proposed under either institution's new LRDPs; in any event, additional inflow would further aggravate the existing peak wet weather capacity constraints in sub-basin 17-503.

Independent from the LRDP program, LBNL has planned to address its contribution to the capacity issues in the City of Berkeley's sub-basin 17-503. Although LBNL has substantially reduced its sewage flows into this sub-basin through improvements in water use efficiency and sanitary sewer system improvements, the Lab is working toward intercepting and diverting the LBNL/UC Berkeley-hill-area effluent flow before it enters the constricted portion of sub-basin 17-503. To address its planned development and increased sanitary sewer flows from the eastern area of the Lab, LBNL is working with UC Berkeley and the City of Berkeley to identify a feasible solution that would be enacted to accommodate future growth under the LRDP program. LBNL has completed a study reviewing options to divert LBNL-related sewer flow from the surcharged manhole. Options under investigation include:

1) Rerouting flow (via gravity system) upstream of the surcharged manhole through the nearby UC Berkeley Sewer System network, ultimately discharging into the Oxford Avenue sewer main and beyond;

2) Rerouting flow upstream of the surcharged manhole across LBNL property (via lift stations) and discharging into the City of Berkeley system in the vicinity of Cyclotron Road and Hearst Avenue; or

3) Diverting the Strawberry Outfall flows around the point of constriction in sub-basin 17-503 and discharging to a new tie-in at the City of Berkeley sewer system.

LBNL intends to choose one of these options and move forward with the improvement independent of the new LRDP. EBMUD anticipates having adequate dry weather capacity to treat the proposed wastewater flow from LBNL at buildout of the 2006 LRDP (EBMUD, 2003). However, it may not have capacity during wet conditions. Mitigation Measure UTILS-2 would reroute the discharge away from constrained sub-basins, and additional effluent resulting from development under the 2006 LRDP would be directed to sub-basin 17-013 and/or sub-basin 17-304, which are not constrained during wet weather conditions and have available capacity to accommodate the Lab's projected wastewater flows. Therefore, with the incorporation of Mitigation Measure UTILS-2, the implementation of the proposed 2006 LRDP would not exceed the City's sub-basin capacity.

> **Mitigation Measure UTILS-2:** LBNL shall implement programs to ensure that additional wastewater flows from the Lab are directed into unconstrained sub-basins, as necessary and appropriate. LBNL shall continue to direct the Lab's existing western effluent flows into sub-basin 17-013. In addition, new flows at the Lab shall be directed into either sub-basin 17-013, sub-basin 17-304, unconstrained portions of sub-basin 17-503, or another sub-basin that has adequate capacity. Final design and implementation of these improvements shall be negotiated between the appropriate parties and shall undergo appropriate environmental review and approval. LBNL shall closely coordinate the planning, approval, and implementation of this mitigation with the City of Berkeley and the UC Berkeley, as appropriate.
>
> **Significance after Mitigation:** Less than significant.

Project Variant. The project variant would increase the ADP at the hill site and would result in additional wastewater generation. Similar to demands for water, wastewater generation associated with the project variant is expected to increase by approximately 10 percent, or 1.35 million gallons per year, above projections for the 2006 LRDP based on the more conservative approach used in this analysis. The project variant would not result in more building space, but rather an intensification in the use of space planned under the 2006 LRDP.

As noted above, sub-basin 17-503 is constrained during wet weather, and additional wastewater flow into sub-basin 17-503 would further aggravate peak wet weather capacity constraints. EBMUD anticipates having adequate dry weather capacity to treat the proposed wastewater flow from LBNL at buildout of the 2006 LRDP (EBMUD, 2003). Because the project variant would result in an incremental increase in on-site wastewater generation compared to the 2006 LRDP,

but no substantial overall increase in wastewater generation in the vicinity,[14] it is expected that EBMUD would have available capacity to accommodate the project variant. Additional wastewater generated from the project variant would be directed to sub-basin 17-013 and/or sub-basin 17-304, which are not constrained during wet weather conditions and have available capacity to accommodate the Lab's projected wastewater flows. With implementation of Mitigation Measure UTILS-2, this impact would be less than significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of wastewater impacts. Individual projects as identified in the Illustrative Development Scenario would generate additional wastewater. With implementation of the mitigation measure above, this impact would be less than significant for the reasons described above.

Impact UTILS-3: Development proposed under the 2006 LRDP would generate solid waste, but would not require new facilities. (Less than Significant)

The proposed 2006 LRDP would result in an increased waste stream due to an increase in operations (additional personnel and building square feet). The originally proposed 2006 LRDP would increase LBNL's adjusted daily population (ADP) from the baseline of 4,375 to 5,525. The increase in ADP would take place at the main hill site. The increase translates into an average annual growth rate of approximately 1.1 percent. This would result in an increase in disposed waste from the existing estimate of about 413 tons per year to about 520 tons per year at buildout of the LRDP (see Table IV.M-3). The amount of recycled waste generated at LBNL would also increase from the existing annual estimate of 1,592 tons to 2,006 tons. The proportion of recycled waste to disposed waste under buildout of the LRDP would remain at the existing ratio of roughly 4:1. (The currently proposed 2006 LRDP, which would increase the ADP from 4,375 to 5,375, would result in similar increases in disposed and recycled wastes.)

Currently, disposed waste from LBNL is transported to the Altamont Landfill. The Altamont Landfill has a permitted maximum daily disposal of 11,150 tons per day. Under existing conditions, LBNL disposed waste accounts for about 0.01 percent of the daily permitted disposal. Under the 2006 LRDP, the projected disposed waste would increase but would remain at roughly 0.01 percent of the daily permitted disposal. The Altamont Landfill has recently updated its

[14] The large majority of the Lab's leased space is within Berkeley and Oakland.

TABLE IV.M-3
EXISTING AND PROJECTED ANNUAL SOLID WASTE

Solid Waste	Current Use (2003) 1,760,000 gsf	Projected Use (2025) 2,560,000 gsf [c]	Increase under Project
Recycled Waste[a]	1,592 tons	2,006 tons	508 tons
Disposed Waste[b]	413 tons	520 tons	127 tons

[a] "Recycled" solid waste includes paper, glass, metals, and other materials that are recycled and transported off-site for reuse.
[b] "Disposed" solid waste includes personal and process non-hazardous waste solids that are disposed in off-site sanitary landfills.
[c] Gross square footage under originally proposed 2006 LRDP. Gross square footage under currently proposed 2006 LRDP would be less (2,420,000 gsf).

gsf – gross square feet

SOURCE: LBNL (2003).

conditional use permit, which allows for an additional capacity of approximately 40 million tons of disposal over the next 19 to 38 years (St. John, 2004). Therefore, development at LBNL attributed to the 2006 LRDP would not cause any landfill to exceed its permitted capacity and would result in a less-than-significant impact.

Mitigation: None required.

Project Variant. The project variant would increase the ADP at the hill site by 1,350, approximately 350 more than the ADP increase associated with implementation of the currently proposed 2006 LRDP. The project variant would therefore increase the waste stream from the hill site, generating approximately 10 percent, or 63.5 tons of annual waste, more than the projected increase in solid waste volume under the 2006 LRDP.

LBNL's current disposed waste accounts for about 0.01 percent of the daily permitted disposal at the Altamont Landfill. The project variant would result in an increase to approximately 0.015 percent of the daily permitted disposal at the Altamont Landfill. The Altamont Landfill has capacity for approximately 40 million tons of disposal over the next 19 to 38 years (St. John, 2004). Therefore, development at LBNL attributed to the project variant would not cause any landfill to exceed its permitted capacity and would result in a less-than-significant impact.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of solid waste generation impacts. Individual projects as identified in the

Illustrative Development Scenario would not result in significant impacts related to solid waste generation for the reasons described above.

Impact UTILS-4: On-site construction due to development proposed under the 2006 LDRP would generate construction waste and debris. (Significant; Less than Significant with Mitigation)

Development at LBNL under the 2006 LRDP would generate waste and debris over the course of the 20-year planning period. The Lab's recent construction patterns indicate there are extended periods of little or no major construction interspersed with periods when more than one medium or large construction project may be underway. For purposes of this analysis, the estimated annual peak average of construction[15] activity is analyzed, which is approximately twice the annual average, or the equivalent of two large construction projects being underway simultaneously.

Waste generated by construction-related debris is estimated at approximately 3.9 pounds per square foot of construction, and waste generated by demolition is approximately 155 pounds per square foot of demolition (U.S. EPA, 1998). Based on the recently completed EIR for LBNL's Building 49, 50 percent of construction waste would be diverted from the solid waste disposal stream, approximately five percent of resources would be reused, and approximately 25 percent of building materials would be recycled (LBNL, 2003). Construction and demolition debris would be removed from the site and disposed of at a local landfill.

Without planning for the recycling of construction and demolition waste, projects developed pursuant to the 2006 LRDP could impede the ability of the City of Berkeley to meet the waste diversion requirements of the California Integrated Waste Management Act (AB 939), and also the Altamont Landfill's capacity for solid waste could be adversely affected. Implementation of the following mitigation measure would ensure that the project would not impede the City of Berkeley's ability to meet the 50-percent diversion requirements of AB 939, and would ensure that the project's impact on the Altamont Landfill would be less than significant.

> **Mitigation Measure UTILS-4:** LBNL shall develop a plan for maximizing diversion of construction and demolition materials associated with the construction of the proposed project from landfill disposal.
>
> **Significance after Mitigation:** Less than significant.

Project Variant. The project variant and the 2006 LRDP would result in about the same new building space on the hill site. Therefore, the impact under the project variant would be the same as under the proposed LRDP. With incorporation of Mitigation Measure UTILS-4, the impact would be less than significant.

[15] For the purposes of this EIR, the term "construction," unless specifically indicated otherwise, includes activities that involve construction of new facilities, major rehabilitation or modification of existing facilities, and demolition of existing facilities.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to solid waste generation resulting from project construction. For the reasons identified above, with implementation of Mitigation Measure UTILS-4, individual projects under the Illustrative Development Scenario would not result in significant impacts related to solid waste generation resulting from project construction.

Impact UTILS-5: Development proposed under the 2006 LDRP would create additional demand for electricity and natural gas, but would not result in the construction of new or expansion of existing energy production and/or transmission facilities. (Less than Significant)

Based on the more conservative approach described above (i.e., based on the originally proposed 2006 LRDP), implementation of the 2006 LRDP would increase the demand for both electricity and natural gas by 154,380 MWh per year and about 748,098 Therms per year, respectively (see Table IV.M-4). The projected annual demand for electricity at the LRDP planning horizon is minimal (less than 0.08 percent) compared to total electricity use in the state of California, which was about 273 million MWh in 2002 (California Energy Commission, 2002). The projected demand for natural gas at LBNL is also minimal (0.02 percent), when compared to total natural gas consumption of about 12,769 million Therms in California in 2000 (California Energy Commission, 2000). Ongoing conservation efforts at Berkeley Lab include use of energy-efficient equipment, such as transformers and motors, variable frequency drives for on-demand power, and automatic climatic controls.

TABLE IV.M-4
EXISTING AND PROJECTED ANNUAL ELECTRICITY AND NATURAL GAS DEMAND

Utility	Current Use (2003) 1,760,000 gsf	Projected Use (2025) 2,560,000 gsf[a]	Increase under Project
Electricity (MWh)	74,500	228,880	154,380
Natural Gas (Therms)	1,645,816	2,393,914	748,098

[a] Gross square footage under originally proposed 2006 LRDP. Gross square footage under currently proposed 2006 LRDP would be less (2,420,000 gsf).

gsf – gross square feet; MWh – megawatt hours

SOURCE: LBNL (2003).

The delivery of additional electricity and natural gas to LBNL could be accommodated by existing infrastructure. Development under the 2006 LRDP would require specific utility connections for new buildings that would occur in existing developed areas, and would be incorporated with the construction or rehabilitation of new structures. No new structures would be developed solely for the purpose of supplying new electricity or natural gas to LBNL. The impact would be considered less than significant.

Mitigation: None required.

Project Variant. Under the project variant the ADP on the hill site would increase by approximately 1,350, rather by 1,000 as anticipated under the currently proposed LRDP. The project variant would not result in additional building space on the hill site, and LBNL staff would be accommodated within the new 660,000 gsf of occupiable (research and support) building space currently proposed under the 2006 LRDP. Because the project variant would not result in new building space, it is expected that it would result in minimal increases in the demand for electricity and natural gas at the hill site when compared to the demand generated by the 2006 LRDP. The delivery of additional electricity and natural gas to the hill site could also be accommodated by existing infrastructure, and delivery to individual buildings would be incorporated with the construction or rehabilitation of new structures.

The project variant would include ongoing energy conservation efforts at the hill site, including the continued use of energy-efficient equipment, such as transformers and motors, variable frequency drives for on-demand power, and automatic climatic controls.

For reasons noted above, the project variant would not result in significant impacts related to electricity and natural gas.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to electricity and natural gas. Individual projects as identified in the Illustrative Development Scenario would not result in significant impacts related to electricity and natural gas supply for the reasons described above.

IV.M.3.5 Cumulative Impacts

This analysis considers cumulative growth as represented by the implementation of the Berkeley and Oakland general plans (and thus includes growth anticipated by the City of Berkeley General Plan EIR), and implementation of the UC Berkeley 2020 LRDP (including the Southeast Campus Integrated Projects) along with implementation of the proposed LBNL 2006 LRDP. (Demolition of the Building 51 complex – housing the Bevatron accelerator – although the subject of a separate project-specific EIR, is analyzed as part of the 2006 LRDP because the buildings were in place when the EIR analyses were undertaken.) Additional projects currently underway at UC Berkeley, described in Section VI.C, Cumulative Impacts, of this EIR, are also accounted for in the cumulative analysis.

The geographic context for this cumulative analysis includes Berkeley Lab and areas proximate to the Lab within the cities of Berkeley and Oakland that rely on the same service providers as LBNL. This analysis evaluates whether the impacts of the proposed LRDP, together with the impacts of cumulative development, would result in a significant impact (based on the significance criteria on p. IV.M-14) and, if so, whether the contribution of the LRDP to this impact would be considerable. Both conditions must apply in order for the project's cumulative impacts to rise to the level of significance.

Impact UTILS-6: The proposed 2006 LRDP, in combination with other reasonably foreseeable development in the surrounding area, would contribute to cumulative demand for utilities, service systems, and energy. (Less than Significant)

The development and redevelopment proposed under the 2006 LRDP would not result in significant impacts on utilities and service systems with the incorporation of mitigation measures identified above. However, the project, in conjunction with reasonably foreseeable development at UC Berkeley's campus and in nearby communities, could result in increases in demand for utilities and energy. With respect to water supply, EBMUD has indicated that the project site and its associated water demand are accounted for in its cumulative demand projections, through planning horizon year 2020, in the 2000 UWMP.

The EIR for the UC Berkeley Southeast Campus Integrated Projects (SCIP) identifies a significant impact related to wastewater collection as a result of implementation of the Integrated Projects (UC Berkeley, 2006). Specifically, the SCIP EIR notes that the existing sanitary sewer in Bancroft Avenue may not have adequate capacity to accommodate the improvements to Memorial Stadium, and that UC Berkeley would consult with the City of Berkeley about connecting the Integrated Projects to other sewer lines that have adequate capacity. The SCIP EIR also describes the discussions underway among LBNL, UC Berkeley, and the City of Berkeley to address sanitary sewer capacity, which are described above under Impact UTILS-2 (UC Berkeley, 2006; p. 4.9-8). As described under Impact UTILS-2, LBNL intends to proceed with sanitary sewer improvements that would avoid adverse effects on constrained wastewater collection facilities, and thus implementation of the 2006 LRDP would not result in a cumulative significant impact on wastewater facilities. With implementation of Mitigation Measure UTILS-2, development under the 2006 LRDP would not contribute considerably to cumulative impacts on

wastewater collection facilities, and the cumulative impact would, therefore, be less than significant. (The SCIP EIR did not identify adverse effects on other utilities, and therefore the Integrated Projects would not contribute to any other cumulative impacts.)

Other foreseeable development in the surrounding area would contribute to cumulative increases in utility and energy demand; however, new development would occur within a largely built-out urban area where utilities and service systems generally are provided. Additionally, these increases in demand attributed to other development would be addressed on a site-by-site basis by the service providers prior to approval of new development, and through CEQA review of each development project. The incremental increase in demand for utilities associated with the 2006 LRDP would not be expected to represent a substantial increase in demand for utility and service systems, and existing utility delivery systems would be expected to handle growth anticipated under the proposed LRDP. Therefore, the effect of this project in combination with other foreseeable development would not be significant, nor would the project's contribution to any cumulative effects be cumulatively considerable.

Mitigation: None required.

Project Variant: The project variant would result in impacts to utilities, service systems, and energy substantially similar to the impacts to utilities, service systems, and energy that would result from the 2006 LRDP development. The cumulative utilities, service systems, and energy impacts of the project variant would therefore be less than significant as described above.

Individual Future Project / Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development under the 2006 LRDP. For reasons noted above with regard to implementation of the LRDP, the effect of a future project under the LRDP as identified in the Illustrative Development Scenario, in combination with other reasonably foreseeable development in the surrounding area, on the cumulative demand for utilities, service systems, and energy would not be significant, nor would its contribution be cumulatively considerable.

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