4.6 HYDROLOGY AND WATER QUALITY

4.6.1 INTRODUCTION

This section presents existing hydrologic conditions at the project site and its vicinity and analyzes the potential for implementation of the proposed Solar Energy Research Center (SERC) project to affect hydrologic resources.

Information used in the analysis below was obtained from site visits, the Lawrence Berkeley National Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) Environmental Impact Report (EIR), and environmental documents associated with specific LBNL projects.

In response to the Notice of Preparation for this EIR, commenters expressed concern regarding the proposed storm drain's impacts to Ten Inch Creek.

4.6.2 ENVIRONMENTAL SETTING

The discussions below described existing surface and groundwater conditions on the LBNL hill site and in its vicinity, concentrating primarily on aspects that are specific to the SERC project site.

Regional Setting

The LBNL hill site is located in the East Bay hills, near the western edge of the Coast Range physiographic province. The hills are roughly parallel to the northwest-southeast trend of the major mountain ridges in the province with spur ridges and canyons oriented perpendicular to main ridges. The majority of the LBNL hill site is situated in the upper portion of one of these east-west trending canyons – Strawberry Canyon, which is drained by the South Fork of Strawberry Creek. A small portion of the LBNL hill site lies within Blackberry Canyon, which is drained by the North Fork of Strawberry Creek. The two forks of Strawberry Creek join approximately 3,500 feet southwest of LBNL's western boundary on the University of California Berkeley (UC Berkeley) campus.

Climate

The LBNL hill site experiences a Mediterranean climate, with almost all precipitation falling between the months of October and April. The long-term mean annual rainfall is approximately 30.5 inches, calculated from more than 30 years of records (water years[1] 1975 to 2008) at the LBNL rain gauge. This is an

[1] Hydrologic monitoring in much of the western United States is often carried out on a water year basis to account for the seasonality of winter rains and summer dry periods. The water year begins on October 1 and ends on September 30 of the named year. For example, water year 2010 began on October 1, 2009, and will end on September 30, 2010.

appropriate value for hydraulic design and analysis purposes in the LBNL area. Year-to-year variability in rainfall can be considerable. Based on the long-term precipitation record at the LBNL rain gauge, in any particular month, the maximum rainfall can be twice the long-term monthly average or it can be almost zero. Evaporation rates and evapotranspiration rates are typically low during the late fall and winter months, then rise in spring in response to warmer weather.

Stormwater Drainage

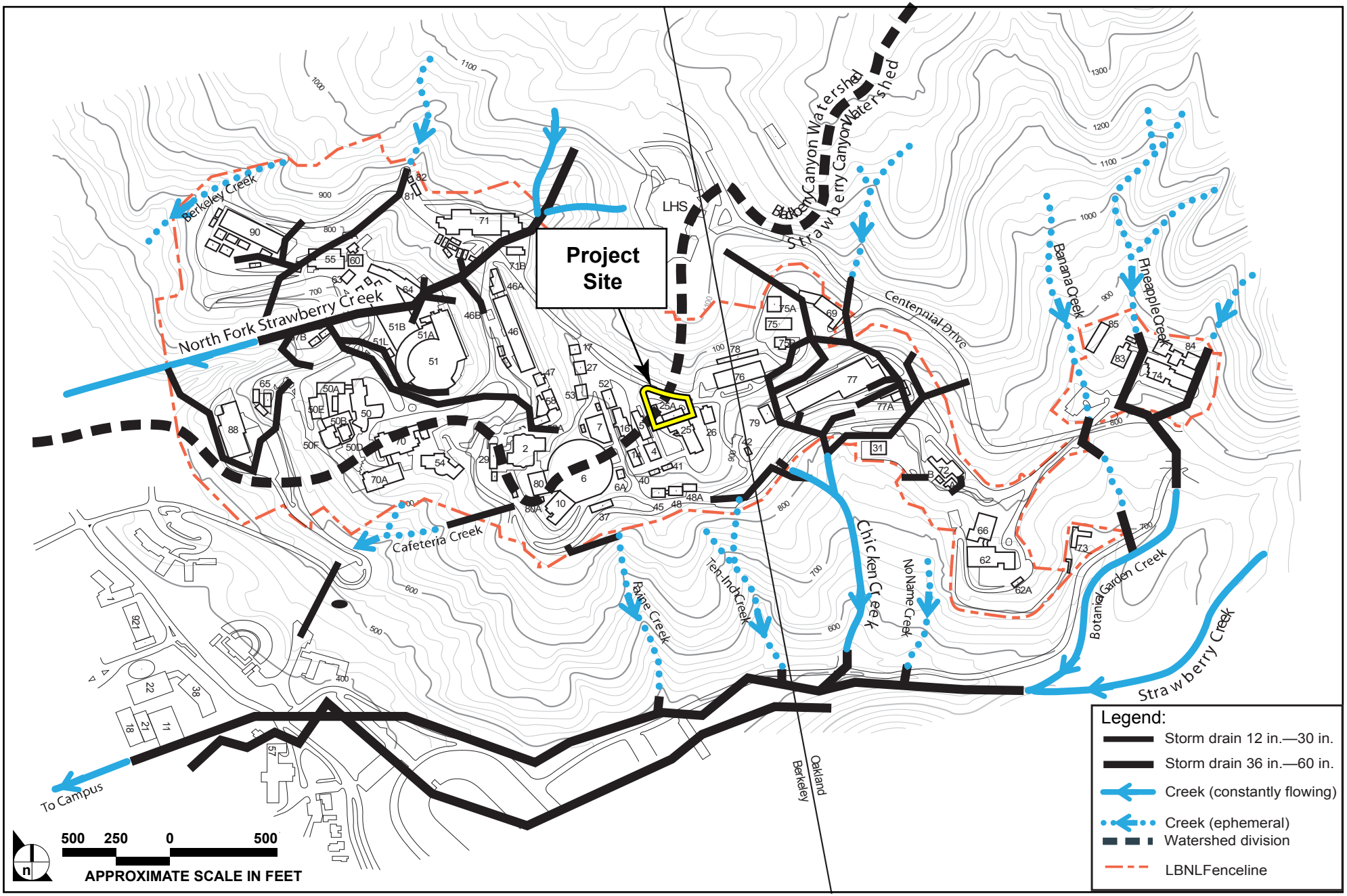
Stormwater at the LBNL hill site is handled by a combination of engineered features such as storm drains, down drains and v-ditches as well as by creeks that flow into Strawberry Creek. Runoff from the east side of Building 25A drains to the east and discharges to Chicken Creek, while the runoff from the west side of Building 25A and Buildings 44, 44A, 44B also drains to the east but discharges to Ten-Inch Creek. Chicken Creek and Ten-Inch Creek are the two small, north-south trending tributaries of the South Fork of Strawberry Creek, which flows to the San Francisco Bay. Much of the perennial Chicken Creek within the LBNL hill site has been realigned within underground storm drains installed to capture runoff from LBNL buildings and associated infrastructure, including Building 25A. Chicken Creek emerges as a surface stream downslope of the LBNL fenceline but re-enters a culvert just upstream of its confluence with Strawberry Creek, which also flows within a storm drain in that reach. Ten-Inch Creek is an intermittent stream. Flows from Ten-Inch Creek are captured in a culvert upstream of Centennial Drive, which joins Strawberry Creek downstream of Chicken Creek (see **Figure 4.6-1, Existing Stormwater Drainage Near Project Site**).

Flooding

The project site is not located within the 100-year flood zone as mapped by the Federal Emergency Management Agency (FEMA).

Soils

Soils at the project site form a thin (less than 10-foot-thick) veneer over the underlying bedrock (Alan Kropp & Associates 2010). The site is situated on soils assigned to the Xerorthents-Millsholm complex, 30 to 50 percent slopes, which typically consist of about 70 percent by area xerorthents and 20 percent by area Millsholm loam, with minor inclusions of Maymen loam and Los Gatos loam. The permeability, erosion potential, and shrink-swell potential of these soils are described in **Section 4.3, Geology and Soils.**



SOURCE: LBNL – 2009

FIGURE **4.6-1**

Existing Stormwater Drainage Near Project Site

Surface Water Quality

The SERC project site is currently occupied by Buildings 25A, 44, 44A, and 44B, which will be demolished under the Old Town Demolition and Environmental Restoration project prior to construction of the SERC project. The project site is surrounded by buildings, paved roads, parking lots, and a 0.25-acre redwood grove. These land uses suggest that the area likely contributes pollutants commonly found in urban runoff such as oil, grease, and metal brake dust. UC LBNL uses only one type of herbicide, which is used locally (no broadcast spraying) to prevent re-sprouting of cut eucalyptus trunks. There are no eucalyptus trees on the SERC project site. Pesticides are used only to control non-flying insects within buildings (no spraying is conducted), and rodents are controlled by non-pesticide methods (trapping). UC LBNL Environmental Health and Safety (EH&S) reviews these practices annually. Best management practices (BMPs) are in place to control the quality or quantity of stormwater runoff as required by the site-wide National Pollutant Discharge Elimination System (NPDES) General Industrial Permit. Steeply sloping open space areas contribute sediment (turbidity) to receiving waters. Existing run-off and run-on from uphill locations is shown on **Figure 4.6-1**.

LBNL prepared an Alternative Stormwater Monitoring Plan (ASWMP) in 2009, as required by the NPDES General Industrial Permit, to provide an industrial activity-specific indicator of pollutant contributions from regulated activities at the LBNL hill site and, thus, a reliable basis for evaluating the performance and effectiveness of BMPs, as described in the Stormwater Pollution Prevention Plan (SWPPP) for LBNL. The monitoring program that has historically been implemented at LBNL has focused on larger drainage areas within the hill site, with the result that monitoring results have reflected the combined runoff from regulated and non-regulated areas (LBNL 2010a). The ASWMP is specifically designed to focus on the areas of industrial activity, which represent the only potential sources of pollutants that are specifically regulated under the General Permit.

Stormwater sampling was performed in 2009, spanning the 2008–2009 and 2009–2010 wet seasons, at six locations with regulated industrial activities. These sampling sites are located at:

- Blackberry Parking Lot (previous bus parking and storage industrial area);
- Building 76, Fuel Dispensing Area;
- Buildings 77 and 79, Metal Fabrication, Storage, and Scrap Recycling;
- Building 85, Hazardous Waste Handling Facility (HWHF); and
- Building 64, Bus Parking Lot.

Stormwater sampling is conducted at the above-mentioned sites twice yearly in accordance with General Industrial Permit requirements. UC LBNL samples runoff from the first storm event of the season and one other. Samples are analyzed for a suite of potential pollutants based on the Standard Industrial Classification (SIC) targeted constituents as described in the General Industrial Permit. The General Industrial Permit requires the analysis of total suspended solids, pH, specific conductivity, and total oil and grease at each monitoring station. Based on the SIC codes for specific industrial activities conducted at LBNL, sector-specific parameters as specified in the General Permit monitoring program include nitrite and nitrate as nitrogen, metals (aluminum, arsenic, copper, cadmium, iron, lead, magnesium, mercury, silver, and zinc), ammonia, and chemical oxygen demand. Storm discharges are visually observed monthly during the wet season, and quarterly visits are conducted to check for the presence of unauthorized non-stormwater discharges.

Stormwater sampling results are reported in both the permit-required annual report and the yearly Site Environmental Report. The Site Environmental Report for 2008 (LBNL 2009a)[2] states that analytical results at all stormwater stations in water year 2008 were below detectable concentrations for mercury and tritium. Detectable results for other parameters varied by location and storm event. In all cases, the results were within historical levels for LBNL, consistent with background levels, within regional Water Quality Control Plan (i.e., Basin Plan) objectives, and below drinking water standards.

In addition to stormwater sampling, surface waters in the creeks are sampled as part of LBNL's Environmental Monitoring Plan and LBNL's Environmental Restoration Program. Per the Environmental Monitoring Program, grab samples are collected semi-annually from four creeks – Chicken Creek, the North Fork of Strawberry Creek, Winter Creek, and Wildcat Canyon Creek (off site). The samples are analyzed for gross alpha and gross beta radioactive particle emitters, total metals (aluminum, copper, iron, mercury, and zinc), nitrate plus nitrite, chemical oxygen demand, total suspended solids, pH, and conductivity. Twice yearly, grab samples are collected from eight creeks per the Environmental Restoration Program – Botanical Garden Creek, Cafeteria Creek, Chicken Creek, No Name Creek, the North Fork of Strawberry Creek, Ravine Creek, Ten-Inch Creek, and Winter Creek. All samples are analyzed for dissolved metals and volatile organic compounds. Under the Environmental Restoration Program, tritium is sampled only at two creeks – the North Fork of Strawberry Creek and Chicken Creek. The Site Environmental Report for 2008 states that no VOCs were detected in any samples collected during the year, and when detectable dissolved metals were observed, they were within historical levels for the LBNL hill site, within Basin Plan objectives, and below drinking water standards. When gross alpha, gross beta, or tritium radioactivity were detected (in approximately 20 percent of samples), the

2 The 2008 Site Environmental Report is the most recent report available on the LBNL website (http://www.lbl.gov/ehs/).

activity was slightly above analytical detection limits and below the drinking water standard (LBNL 2009a).

In addition to stormwater and creek water sampling, rainwater is sampled as part of LBNL's overall environmental surveillance program. Monthly composite rainfall samples are collected at one on-site location and analyzed for tritium, gross alpha, and gross beta activity. The Site Environmental Report for 2008 states that monthly composite rainfall sample results were consistent with historical values and were below drinking water standards. All sample results for gross alpha and gross beta were below or near detection limits. No tritium activity was detected in any of the samples. (LBNL 2009a).

Groundwater

Due to the high relief and the varying geologic units at the site, depth to groundwater within the LBNL hill site can vary considerably, both spatially and temporally. Groundwater depths at LBNL vary from at the ground surface (where springs occur) to approximately 100 feet below ground surface (bgs). A generalized groundwater piezometric map contained within the 2008 LBNL Site Environmental Report (LBNL 2009a) indicates that depth to groundwater currently varies approximately between 10 and 20 feet bgs near the location of the proposed project. Groundwater flow directions are generally westward and southward.

Groundwater Quality

The SERC project site is located in an area where volatile organic compounds (VOCs) that were used as cleaning solvents and their associated degradation products are present in the groundwater. The area of contamination has been designated the Building 25A lobe of the Old Town Groundwater Solvent Plume. The Building 25A lobe extends both southwards and westwards from Building 25A. In August 2005, DTSC approved UC LBNL's proposed soil and groundwater cleanup measures (DOE 2005). The corrective measure for the Building 25A lobe is an *in-situ* soil flushing technique. The soil flushing system consists of a groundwater extraction trench west of Building 25A and south of Building 44, a groundwater extraction well located north of Building 25A, and a shallow gravel-filled infiltration bed immediately west of Building 25A (see **Figure 3.0-7**). The groundwater extraction trench controls the migration of contaminated groundwater from the Building 25A lobe source area. The trench is approximately 40-feet long and 40-feet deep and is backfilled with gravel. An extraction well was installed in the trench backfill. The extracted groundwater is treated to non-detectable levels of VOCs at the Building 25A Treatment System, which consists of a 1,000-pound granular activated carbon (GAC) canister with an in-line 55-gallon GAC drum as backup (LBNL 2007). The treated groundwater is then conveyed by a short pipeline section to the infiltration bed where it percolates into the ground. Several

wells located in the Building 25A area monitor the progress of the corrective measure toward achieving the required groundwater cleanup level (drinking water standards), including a monitoring well inside Building 25A. Although the corrective measure has been effective in significantly reducing contaminant concentrations, with concentrations decreasing to the required cleanup level over much of the Building 25A lobe area, concentrations still remain well above drinking water standards in some wells at the project site. UC LBNL has mapped the extent of groundwater contamination and provides quarterly updates of the monitoring program (LBNL 2010b).

4.6.3 REGULATORY CONSIDERATIONS

This section describes the local, state, and federal regulatory context to be considered for the SERC project. It also discusses plans and policies adopted in the LBNL 2006 LRDP to address hydrology and water quality concerns, including development strategies, stormwater pollution prevention plans, and stormwater management practices, among others.

Federal and State Regulations

Federal and state water quality regulations apply to development projects that may adversely affect the quality of surface waters or groundwater through the discharge of wastewater and stormwater. Section 303 of the Federal Clean Water Act (CWA) and the State's Porter-Cologne Water Quality Control Act establish water quality objectives for all waters in the State. These objectives are implemented locally through Water Quality Control Plans and the NPDES permitting program. Because hydrology is inextricably linked to ecosystem and wildlife health, the California Department of Fish and Game also has regulatory oversight over projects that affect lakes, streambeds, and adjacent riparian zones. In addition, Section 404 of the CWA gives the U.S. Army Corps of Engineers authority to regulate discharges of dredged or fill material into Waters of the United States.

Water Quality Control Plan

Pursuant to the CWA and the Porter-Cologne Water Quality Control Act, the California legislature granted authority to protect and enhance water quality in California to the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCB). The SWRCB provides oversight and coordination while the RWQCBs guide and regulate water quality in streams and aquifers through development of Water Quality Control Plans, or Basin Plans. The SERC project site drains to waters regulated by the Region 2 (San Francisco Bay) Basin Plan which was approved in 1995 and updated in 2006. Beneficial water uses are designated in the Basin Plan for local aquifers, streams, marshes, and rivers, as well as water-quality objectives that must be met to protect these uses. For

Strawberry Creek, the existing beneficial uses include water contact recreation, non-contact water recreation, warm freshwater habitat, and wildlife habitat (SFBRWQCB 2010).

Total Maximum Daily Load – Section 303(d) of the Clean Water Act

The State of California is required by Section 303(d) of the CWA to provide the United States Environmental Protection Agency (U.S. EPA) with a list of water bodies considered by the State to be impaired (i.e., not meeting water quality standards and not supporting their beneficial uses). The list also identifies the pollutant or stressor causing impairment, and establishes a schedule for developing a control plan to address the impairment, typically a Total Maximum Daily Load (TMDL). The TMDL specifies the amount of the target pollutant that the waterbody can sustain on a daily or annual basis and is established by amending the water quality control plan. TMDLs are prepared by the RWQCBs and result in amendments to Water Quality Control Plans which must be approved by the U.S. EPA. The 303(d) list is used by the U.S. EPA to prepare the biennial federal CWA Section 305(b) Report on Water Quality.

Although Strawberry Creek is not included in the 2006 303(d) list, the RWQCB has found that San Francisco Bay Area urban creeks do not consistently meet the Basin Plan's narrative water quality objectives pertaining to toxicity. In response, the Basin Plan was amended on November 16, 2005, by Board Resolution R2-2005-0063 to establish a TMDL to reduce diazinon, an insecticide, and pesticide-related toxicity in Bay Area urban creeks (Johnson 2005). The TMDL has been incorporated into the Basin Plan as it has been approved by the State Water Resources Control Board, the Office of Administrative Law, and the U.S. EPA.

National Pollutant Discharge Elimination System

The U.S. EPA has delegated management of California's NPDES program to the State Board and the nine Regional Board offices. The NPDES program was established in 1972 to regulate the quality of effluent discharged from easily detected point sources of pollution such as wastewater treatment plants and industrial discharges. The 1987 amendments to the CWA [Section 402(p)] recognized the need to address nonpoint source stormwater runoff pollution and expanded the NPDES program to operators of municipal separate storm sewer systems (MS4s), construction projects, and industrial facilities.

Industrial

Because of metal finishing activities, terminal and service facilities for motor vehicle passenger transportation, operation of a hazardous waste treatment facility, and a scrap recycling facility (Standard Industrial Classification or SIC codes 3499, 4173, 4953, and 5093), UC LBNL must be permitted under

NPDES industrial regulations. The State Board administers the NPDES General Permit for Discharges of Stormwater Runoff Associated with Industrial Activities (General Industrial Permit). The General Industrial Permit requires the implementation of management measures that will achieve the performance standard of best available technology economically achievable and best conventional pollutant control technology to control pollutants in stormwater runoff from industrial facilities. The General Industrial Permit also requires the development of a Storm Water Pollution Prevention Plan (SWPPP) and a monitoring plan. The SWPPP identifies sources of pollutants and describes the means to manage the sources to reduce stormwater pollution. UC LBNL filed a Notice of Intent in March 1992 and obtained permit identification number 201S002421.[3] Details of the 7th revision of the LBNL SWPPP, dated February 2010 are included later in this section.

Construction

The State Board administers the NPDES General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (General Construction Permit). In order to cover a construction project disturbing 1 acre or more of land under the General Construction Permit, a facility must submit a Notice of Intent to the State Board prior to the beginning of construction. Effective July 1, 2010, all dischargers are required to obtain coverage under the Construction General Permit Order 2009-0009-DWQ adopted on September 2, 2009. The General Construction Permit requires that projects develop and implement a SWPPP, identifying potential sources of pollution and specifying runoff controls during construction for the purpose of minimizing the discharge of pollutants in stormwater from the construction area. The SWPPP should contain a site map which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The permit also includes post-construction standards with the requirement for all construction sites to match pre-project hydrology to ensure that the physical and biological integrity of aquatic ecosystems is maintained. This "runoff reduction" approach is analogous in principle to Low Impact Development (LID) and will serve to protect related watersheds and water bodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

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3 The ID has since changed to 201I002421.

Municipal

The cities of Oakland and Berkeley are both participating agencies signatory to the Alameda Countywide Clean Water Program (ACCWP) NPDES Municipal Stormwater Permit, which regulates urban runoff discharges from municipalities based on the 1987 amendments to the CWA. Since the first five-year permit was issued by the RWQCB in 1991, the ACCWP has successively implemented a series of comprehensive stormwater management plans for urban runoff management meeting Regional Board standards.

When the permit was renewed in 2003, the RWQCB included new design standards for runoff treatment control measures (Provision C.3) from new development and significant redevelopment. The reissued permit also required development of a Hydrograph Modification Management Plan (HMP) to manage increased peak runoff flows and volumes (hydromodification) and avoid erosion of stream channels and degradation of water quality caused by new and redevelopment projects (Provision C.3.f). UC LBNL is generally exempt from local regulations (including Provision C.3.f); however, UC LBNL has included provisions in the 2006 LRDP to control hydromodification (see 'LBNL Stormwater Management' section below).

Resource Conservation and Recovery Act

In May 1993, a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit was issued to UC LBNL by the California Department of Toxic Substances Control (DTSC), which is the California Environmental Protection Agency department responsible for enforcing hazardous waste regulations and overseeing hazardous waste cleanup activities in California. The permit included provisions that UC LBNL investigate and clean up all historical releases of hazardous chemicals at the site. On August 31, 2005, DTSC approved UC LBNL's proposed soil and groundwater cleanup measures, including the cleanup measures that are being implemented at the project site described earlier in this section.

Local Plans and Policies

The LBNL hill site is an approximately 200-acre site owned by the Regents of the University of California, where the University conducts research, service, and training work within the University's mission. The LBNL hill site includes research and support structures that are primarily part of a multi-program national laboratory called the Lawrence Berkeley National Laboratory, a federally funded research and development center operated and managed by the University of California under a U.S. Department of Energy (DOE)-UC contract. As such, the University is exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University

seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The LBNL hill site is located astride the Berkeley – Oakland city boundary, with a portion of LBNL located in each city. The SERC project site is located within the Berkeley city boundary. The following sections summarize the development strategies in the LBNL 2006 LRDP, LBNL Design Guidelines, other LBNL documents, and the policies in the City of Berkeley General Plan related to water quality and hydrology.

2006 LRDP Principles and Strategies

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP. Development strategies set forth in the 2006 LRDP that are applicable to hydrology and water quality include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, streams and mature tree stands by focusing future development primarily within the already developed areas of the site;
- Increase development densities within the most developed areas of the site 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 energy efficiency and sustainability policies to reduce energy, water, and material consumption and provide improved occupant health, comfort, and productivity;
- Consolidate parking into larger lots and/or parking structures, and locate these facilities near Laboratory entrances to reduce traffic within the main site;
- Remove parking from areas targeted for outdoor social spaces and service areas;
- Consolidate service functions wherever possible in the Corporation Yard;
- 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 maintain or reduce stormwater run-off and provide landscape elements and planting to stabilize slopes, reduce erosion and sedimentation;
- Maintain a safe and reliable utility infrastructure capable of sustaining the Laboratory's scientific endeavors; and

- Design infrastructure improvements to embody sustainable practices.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the 2006 LRDP and provide specific guidelines for site planning, landscape and building design as a means to implement the 2006 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 2006 LRDP. The LBNL Design Guidelines provide the following specific planning and design guidance for the hydrologic and water quality aspects of new development to achieve these design objectives.

- Minimize impacts to disturbed slopes;
- Minimize further increases in impermeable surfaces at the Berkeley Lab; and
- Minimize visual and environmental impacts of new parking lots.

The design guidelines would be applied to the proposed project as part of the 2006 LRDP program. As part of the design review and approval process, the proposed project would be evaluated for adherence to the design guidelines and any other relevant plans and policies. Approvals would be subject to satisfactory compliance with these provisions.

LBNL Stormwater Pollution Prevention Plan

UC LBNL developed a SWPPP and a Storm Water Monitoring Plan (SWMP) in 1992 to comply with the NPDES General Industrial Permit. The most recent revision of the LBNL SWPPP (LBNL 2010a) identifies potential sources of pollution and describes best management practices (BMPs) used to protect stormwater quality. In accordance with LBNL's ASWMP, water quality samples are collected during the wet season to demonstrate the effectiveness of the SWPPP and compliance with NPDES requirements (LBNL 2009b).

Potential sources of pollution identified in the LBNL SWPPP include: materials management, vehicles, construction and maintenance activities,[4] and spills and leaks. Three levels of BMPs are considered for each pollutant: source control, management control, and treatment control. Examples of BMPs that have been implemented and are described in the LBNL SWPPP include, but are not limited to:

- Safe handling of materials during loading, unloading, and transport to avoid container breakage and spillage (i.e., spill containment, personnel training);

[4] Although construction activities are included in LBNL's industrial SWPPP, UC LBNL would file a Notice of Intent prior to construction of the project to comply with the NPDES General Construction Permit.

- Proper handling and appropriate storage of materials (i.e., indoor use, proper containers, inspections);
- Control of radionuclide use (i.e., LBNL Radiological Work Authorization Program);
- Washing and servicing of vehicles to prevent leaks and spills to the storm drain system (i.e., off-site repair, discharge of wash station to oil-water separator and sanitary sewer system);
- Parking guidelines to prevent erosion (i.e., routine sweeping of parking lots, pavement inspections and repair);
- BMPs to avoid impact to the storm drain system from soil erosion or construction materials (i.e., cover excavation piles, storm drain inlet protection, concrete washout controls);
- Maintenance of stormwater-related facilities (i.e., inspections and cleaning);
- Prevention of sediment and erosion (i.e., landscaping); and
- Hazardous materials and waste management guidelines (i.e., waste minimization, spill prevention, personnel training).

LBNL Stormwater Management

UC LBNL utilizes a variety of engineered stormwater facilities at the hill site to control surface water flows, which are described below:

- **Primary debris interceptors**. Structural steel tubes, evenly spaced and embedded in concrete across drainage channels, which remove heavy, floating items such as logs, limbs, stumps, and brush from storm runoff entering the LBNL hill site from upstream portions of the drainage. Primary debris interceptors prevent blockage of the storm system entrance and potential flooding; as debris collects on the interceptors, these features also function as local seasonal check dams by storing, slowing, and further dissipating energy of larger storm flows;
- **Secondary debris interceptors**. Heavy vertical grids of rebar spaced more closely together than primary debris interceptors to filter out smaller debris, constructed downstream from primary interceptors to further manage flows originating upstream of the site as they enter the LBNL hill site. Fiber rolls and similar instruments are typically placed seasonally at the secondary interceptors to help filter out suspended soil particles from runoff and act as smaller check dams, silting pools, and energy dissipaters;
- **Rip-rap**. Sharp-edged cobblestone typically placed at all entrances and outfall points in the storm drain system. Rip-rap is frequently cemented together and both dissipates energy and protects slopes and channels;
- **Wing walls and head walls**. Concrete walls used where open-channel flow enters a piping system to protect embankment and channel walls from erosion. Steel grates on the inlet structure also filter debris which may have bypassed the primary or secondary debris interceptors;

- **Concrete v-ditches**. Channels used in all earthwork projects along the tops of cut slopes and at intermediate benches on the face of the slope. V-ditches intercept surface runoff to keep the slope face from eroding and channeling;

- **Jute mesh**. Jute mesh installed on all slopes exposed by construction or grading activities on slopes steeper than 2:1 to prevent erosion until hydroseeding and/or ground cover is well established. Mesh is pinned to the slope with long metal staples and typically reinforces the emerging grasslands for about one year. Fiber rolls are staked at regular intervals across the faces of slopes to slow down and filter surface runoff;

- **Down drains**. Pipes that convey water down the face of slopes from a collection point at the top of the slope to a lower elevation at a stable outfall point to prevent erosion and damage to the slope face; and

- **Impervious, semi-pervious and pervious pavements, curbs, berms, and water dispersal systems**. Surfaces that convey and control storm runoff to prevent runoff from eroding otherwise unprotected surfaces or from flowing down unprotected slopes.

As part of ongoing efforts to coordinate stormwater management efforts within the Strawberry Creek watershed, as well as in response to public comments received as part of the 2006 LRDP EIR process, UC LBNL expanded its stormwater management practices to reflect the 'Continuing Best Practices' outlined in UC Berkeley's 2020 LRDP EIR (LBNL 2006 LRDP Final EIR, Appendix A, pp. IV.G-16 and 17). These measures that help to clarify certain specific goals to control hydrologic and water quality impacts are listed below:

- During the design review process and construction phase, LBNL will verify that the proposed project complies with all applicable requirements and BMPs (reflecting UCB Continuing Best Practice HYD-1-a);

- LBNL will implement an urban runoff management program containing the BMPs included in the Strawberry Creek Management Plan. LBNL will also continue to comply with its NPDES stormwater permitting requirements by implementing appropriate construction and post-construction control measures and BMPs required by project-specific SWPPPs. Stormwater Pollution Prevention Plans would be prepared as required by regulation to prevent discharge of pollutants and to minimize sedimentation and the transport of soils resulting from construction-related activities (reflecting UCB Continuing Best Practice HYD-1-b);

- Landscaped areas of development sites will be designed to absorb runoff from rooftops and walkways where feasible. LBNL will ensure that open or porous paving systems be included in project designs wherever feasible, to minimize impervious surfaces and absorb runoff. "Feasibility" is based on site constraints such as topography, slope steepness and stability, soil type and permeability (reflecting UCB Continuing Best Practice HYD-2-c);

- To accommodate existing runoff, LBNL will continue to maintain and clean its storm drain system (reflecting UCB Continuing Best Practice HYD-4-a);

- Development that encroaches on creek channels and riparian zones will be restricted. Creek channels will be preserved and enhanced, where feasible. An undisturbed buffer zone will be maintained between proposed LRDP projects and creek channels (reflecting UCB Continuing Best Practice HYD-4-c);

- LBNL will manage runoff into storm drain systems such that the aggregate effect of projects implementing the LRDP is to approximate pre-project runoff volumes (reflecting UCB Continuing Best Practice HYD-4-e); and

- Any project proposed with potential to alter drainage patterns will be accompanied by a hydrologic modification analysis. Such an analysis will then incorporate a plan to prevent increases of flow from the newly developed site, preventing downstream flooding and substantial siltation and erosion (reflecting UCB LRDP Mitigation Measure HYD-5).

City of Berkeley General Plan

The City of Berkeley General Plan was adopted on April 23, 2002. The following policies are contained in the General Plan pertaining to hydrology and water quality:

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.

F. Encourage the maintenance and restoration of creeks and wetlands and appropriate planting to cleanse soil, water, and air of toxins;

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

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 EM-25: Groundwater: Protect local groundwater by promoting enforcement of state water quality laws that ensure non-degradation and beneficial use of groundwater;

Policy EM-27: Creeks and Watershed Management: Whenever feasible, daylight creeks by removing culverts, underground pipes, and obstructions to fish and animal migrations.

Actions:

D. Restrict development on or adjacent to existing open creeks. When creeks are culverted, restrict construction over creeks and encourage design solutions that respect or emphasize the existence of the creek under the site.

F. Work in cooperation with adjoining jurisdictions to jointly undertake creek and wetland restoration projects, to improve water quality and wildlife habitat, to allow people to enjoy creeks as part of urban open space.

G. Regulate new development within 30 feet of an exposed streambed as required by the Creeks Ordinance and minimize impacts on water quality and ensure proper handling of stormwater runoff by requiring a careful review of any public or private development or improvement project proposed in water sensitive areas.

H. Consider amending the Creek Ordinance to restrict parking and driveways on tops of culverts and within 30 feet of creeks; and

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 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.

4.6.4 IMPACTS AND MITIGATION MEASURES

Significance Criteria

The impact of the proposed project on hydrology and water quality would be considered significant if it would exceed the following Standards of Significance, in accordance with Appendix G of the *California Environmental Quality Act (CEQA) Guidelines* and the UC CEQA Handbook:

- Violate any water quality standards or waste discharge requirements;

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;

- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;

- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;

- Otherwise substantially degrade water quality;

- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;

- Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or

- Cause inundation by seiche, tsunami, or mudflow.

Issues Not Discussed Further

The SERC project Initial Study found that impacts to groundwater supply would be less than significant, because the project would not deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. Groundwater in the project area is not used for public supply and most of the project site is currently impervious.

The LBNL hill site is not located within a 100-year flood hazard zone and therefore the proposed SERC project would not impede or redirect flood flows. The proposed SERC project would not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam because the project site is not within an area downstream of a dam or levee. Also, because of the elevation and location of the project site on a ridge at the LBNL hill site, impacts due to seiche, tsunami, or mudflow would be less than significant. These issues are not discussed further in this section.

Project Impacts and Mitigation Measures

SERC Impact HYDRO-1: **Development of the project site would not substantially alter the drainage pattern of the site or result in an increased volume of stormwater runoff such that the flows would exceed the capacity of planned storm drain systems, lead to flooding, or cause erosion in the receiving waters. (*Less than Significant*)**

The project site is currently occupied by buildings and other impervious surfaces such as paved parking areas. The areas where infrastructure improvements would be constructed as part of the proposed project are also either impervious or compacted in conjunction with the ongoing activities in the area. Implementation of the SERC project and associated utility and roadway improvements would not increase the area of impervious surfaces at the project site. As stormwater infiltration at the site is currently low and there would be no increase in impervious surfaces at the site from project implementation, the proposed project would not result in a substantial increase in runoff compared to existing conditions. Because site runoff would not increase over current conditions, off-site flooding or hydromodification-related erosion impacts in the downstream receiving waters are not expected.

As noted in **Section 3.0, Project Description**, the existing storm drain system that serves the project site and its vicinity is currently inadequate for the existing storm water flows that are generated on site. As part of the Seismic Phase 2 GPL project or as part of the SERC project, a new storm drain would be installed to convey the project site's runoff into the LBNL storm drain system, which discharges into the North Fork and main stem of Strawberry Creek. Impacts from the installation of that storm drain are analyzed in the Initial Study for this project (included in **Appendix 1.0**) and in other sections of this EIR. Since the new storm drain would be installed as part of the proposed project (in the event that it is not installed as part of the Seismic Phase 2 GPL project), the proposed project would not result in storm water flows that exceed the capacity of the storm drain system. Furthermore, the storm drain would convey site runoff into a catch basin in Grizzly Station Road and would not discharge into Ten-Inch Creek. Therefore, the stormwater flows from the project site would not affect Ten-Inch Creek. The impact would be less than significant.

Mitigation Measure: No project-level mitigation measure is required.

SERC Impact HYDRO-2: **Project construction activities would not increase turbidity or decrease water quality in surface waterways. (*Less than Significant*)**

Although the project site currently overlies the VOC plume, groundwater beneath the site would be tested and treated as necessary after the existing buildings are demolished as part of the Old Town

Demolition and Environmental Restoration project, prior to the start of construction for the SERC project. Therefore, there would be no impact related to encountering contaminated groundwater during project construction.

UC LBNL currently employs, and would continue to employ, a wide array of construction-period best management practices to minimize the potential for accidental discharges of fill or other materials into surface waters. Active management of construction-related stormwater flows from development sites is a standard part of contract specifications on all construction projects undertaken by UC LBNL. Construction projects incorporate control measures and are monitored to manage stormwater flows and potential discharge of pollutants. For example, UC LBNL's standard construction specifications include requirements for installation of erosion control netting and riprap to protect slopes and minimize adverse effects of runoff; protection of existing plant materials; application and maintenance of hydroseeding (sprayed application of seed and reinforcing fiber on graded slopes); no washout of concrete trucks to the storm drain system; and proper disposal of wastewater resulting from vehicle washing (LBNL 2010a) LBNL also implements spill prevention and response programs to minimize pollutants in runoff. Construction sites are replanted as soon as practicable following construction. In addition, UC LBNL's construction specifications require that contractors properly maintain construction vehicles to minimize fluid leaks and contractors not refuel construction equipment in proximity to waterways. These ongoing programs would reduce the potential for accidental discharge during construction to adversely affect surface and groundwater quality.

In addition to the employment of LBNL best management practices, the impact to surface and groundwater quality would be below the level of significance with required development and implementation of a SWPPP as required by the NPDES permit program. The SWPPP would incorporate LBNL's standard stormwater management practices and engineering controls as well as standards outlined in Association of Bay Area Governments' Manual of Standards for Erosion and Sediment Control Measures (ABAG 1995) and the California Stormwater Quality Association's (CASQA) Construction BMP Handbook/Portal (CASQA 2009).[5] Development of a project-specific SWPPP has been included in the project for compliance with the California NPDES General Permit for Storm Water Discharges Associated with Construction Activity. The impact related to construction site runoff would be less than significant.

Mitigation Measure: No project-level mitigation measure is required.

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5 CASQA developed the new 2009 CASQA Construction BMP Handbook/Portal to complement the new State Construction General Permit, which took effect on July 1, 2010. As of July 2010, CASQA will no longer make available and will not support the 2003 CASQA Construction BMP Handbook.

SERC Impact HYDRO-3: **Project operations would not violate any water quality standards or waste discharge requirements or result in other water quality impacts. (*Less than Significant*)**

As the site is almost entirely developed with impervious surfaces at the present time, implementation of the proposed project will not result in substantially more impervious surfaces. Therefore, surface runoff rates and volumes would remain the same under the proposed project as compared to existing conditions. A small portion of the project site would be landscaped, but the project would not violate the Basin Plan as diazinon would not be used for pest control.

As described above, groundwater in the Building 25A area is contaminated with VOCs. The groundwater encountered at the project site during construction would be tested, treated to non-detectable levels of VOCs, and appropriately disposed by one of various options, including but not limited to discharge to the sanitary sewer system or injection into the ground at the project site. Upon completion of construction, the project would also not discharge potentially contaminated groundwater as the project design includes groundwater sumps which would intercept groundwater that collects next to the basement of the SERC building. The collected groundwater would be tested, treated and appropriately disposed. Therefore, the proposed project would result in a less than significant impact to water quality. For the proposed project's impact on the groundwater treatment system, refer to **SERC Impact HAZ-2**.

Mitigation Measure: No project-level mitigation measure is required.

4.6.5 CUMULATIVE IMPACTS

As stated in **subsection 4.0.4**, the 2006 LRDP EIR included the evaluation of the environmental impacts from the construction of a large building at the proposed site of the SERC project, in conjunction with the rest of the projected growth at the LBNL hill site, growth at UC Berkeley, and in the nearby communities.

The cumulative impact related to hydrology and water quality (LRDP Impact HYDRO-4) is presented on pages IV.G-27 to IV.G-28 of the 2006 LRDP EIR. The analysis considers the hydrologic and water quality impacts of cumulative growth under the 2006 LRDP, including the proposed project, the UC Berkeley 2020 LRDP, and the City of Berkeley and Oakland general plans, and concludes that because of compliance with federal, state and local policies, the cumulative impact would be less than significant. No further evaluation of long term cumulative impacts is considered necessary. The project's construction-phase cumulative impact is described below.

Cumulative Impact HYDRO-1: **Construction of multiple projects at the UC Berkeley campus and LBNL hill site during the 2010 to 2013 window would not create a significant short-term cumulative impact on water quality. (*Less than Significant*)**

Construction impacts on hydrology and water quality are typically water quality–focused, relating to:

- the potential for ground-disturbing activities to accelerate erosion and increase delivery of sediment to off-site water bodies; and
- the potential for accidental spills or releases of various substances used in construction to affect the quality of surface waters and groundwater.

As discussed previously in this section, project sites larger than 1 acre must comply with the current NPDES General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (General Construction Permit), recently updated via Construction General Permit Order 2009-0009-DWQ (adopted by the SWRCB on September 2, 2009). Order 2009-0009-DWQ puts in place a stringent program of performance-based requirements to control key aspects of water quality in runoff from construction sites. Because of the controls in place at the project level, cumulative construction-related impacts on water quality are expected to be less than significant.

Mitigation Measure: No mitigation is required.

4.6.6 REFERENCES

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