April 25, 2007

Mr. Ed Bailey, Radiation Program Director
Radiologic Health Branch
State Department of Health Services
P.O. Box 997414 (MS 7610)
Sacramento, CA 95899-7414

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT RELATED TO THE LICENSE TERMINATION PLAN FOR THE RANCHO SECO NUCLEAR GENERATING STATION

Dear Mr. Bailey:

The U.S. Nuclear Regulatory Commission (NRC) is considering the request made by Sacramento Municipal Utility District for approval of the License Termination Plan (LTP) for the Rancho Seco Nuclear Generating Station. In conjunction with our review of the LTP, the NRC staff has prepared the enclosed draft Environmental Assessment. We are providing the draft to you for your review and comment. An electronic copy has also been provided to Steve Hsu of your staff. Please provide any comments you have to me by letter within 30 days from the date of this letter. Please contact me if you have questions at (301) 415-3017 or by e-mail at jbh@nrc.gov.

Sincerely,

/RA/

John B. Hickman, Project Manager
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No. 50-312

Enclosure: Environmental Assessment

April 25, 2007

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State Department of Health Services
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U.S. NUCLEAR REGULATORY COMMISSION
SACRAMENTO MUNICIPAL UTILITY DISTRICT
DOCKET NO. 50-321
ENVIRONMENTAL ASSESSMENT RELATED TO CONSIDERATION OF THE
LICENSE TERMINATION FOR THE RANCHO SECO NUCLEAR GENERATING STATION

1.0 INTRODUCTION

The U.S. Nuclear Regulatory Commission (NRC) is considering the Sacramento Municipal Utility District (SMUD; the licensee) request for approval of the License Termination Plan (LTP) submitted for the Rancho Seco Nuclear Generating Station (Rancho Seco). Consistent with the decommissioning ruling that appeared in the *Federal Register* on July 29, 1996, (61 FR 39278), the NRC has prepared this environmental assessment (EA) to determine the environmental effects from approval of the LTP and subsequent release of the site from NRC licensing for unrestricted use (as defined in Title 10 of the *Code of Federal Regulations*, Part 20, Section 1402 (10 CFR 20.1402). As discussed in Section 1.3 (Scope) of this document, the primary scope of this EA is the determination of the adequacy of the radiation release criteria and the adequacy of the final status survey (FSS) as presented in the LTP.

1.1 Background

Rancho Seco has a deactivated pressurized-water nuclear reactor and is located on a 2,480-acre SMUD site in Sacramento County at 14440 Twin Cities Road, Herald, California. Rancho Seco was constructed between 1968 and 1974, and in August 1974, the reactor was licensed to operate commercially at 2,772 megawatts thermal. After passage of a non-binding referendum by the voters of Sacramento County in 1989, SMUD decided to permanently shut down Rancho Seco. In an August 1989 public meeting, SMUD formally informed the NRC that the plant was shut down permanently and notified the NRC of its intent to seek amendments to the Rancho Seco operating license and decommission the facility (NRC, 1989a). Prior to the current 10 CFR 50.82 requirements for decommissioning and license termination (published July 1996, 61 FR 39278), SMUD submitted a proposed Rancho Seco decommissioning plan in May 1991 (SMUD, 1991). In March 1995, NRC issued an Order that approved the plan and authorized decommissioning of the site (NRC, 1995). In February 1997, SMUD began active decommissioning of the site. In March that same year, SMUD submitted its Post Shutdown Decommissioning Activities Report (PSDAR) (SMUD, 1997), pursuant to 10 CFR 50.82 requirements, superceding its original decommissioning plan. Transfer of all spent nuclear fuel to its 10 CFR Part 72 licensed independent spent fuel storage installation (ISFSI) was completed in August, 2002 (SMUD, 2006a).

In April 2006, SMUD submitted its LTP (SMUD, 2006a). NRC sent requests for additional information (RAI) regarding the LTP, with corresponding SMUD responses in November 2006 (SMUD, 2006d) and April 2007 (SMUD, 2007). In 2006, SMUD also submitted a revision to its historical site assessment (SMUD, 2006b) and a groundwater monitoring report (SMUD,

2006c). SMUD is proposing to decontaminate the Rancho Seco site to meet 10 CFR 20.1402 requirements for unrestricted use, once the site is released from licensing. Permanent buildings and structures, as well as paved areas and eleven concrete pads of removed structures, are currently planned to remain in place at the site after license termination and are identified in photographs provided in the April 2007 SMUD RAI response letter (SMUD, 2007): diesel buildings; back-up control center; nuclear services electrical building; auxiliary building; reactor containment building; spent fuel building; turbine building; switch yard control building; machine shop; "B" warehouse; personal access portal building; interim onsite storage building (IOSB); receiving warehouse; and an unfinished technical support building.

SMUD is also proposing that the site be released from NRC licensing for unrestricted use in two phases, and the Part 50 license terminated with completion of the second phase. The LTP (Table 3-1) identifies that, for the first phase, the major decommissioning activities are planned for completion in early 2008. The first phase release includes most of the site, except for the IOSB. The IOSB will remain on the Part 50 license and SMUD plans to continue to store only low-level radioactive waste from the Rancho Seco site in the building until it finds a suitable waste disposal option (SMUD, 2006a). Further, IOSB operations will continue to include: the maintenance program; the radiation protection plan for implementing the radiological controls program; the radiological environmental monitoring program; an emergency plan; and the SMUD radioactive waste procedure "IOSB Building Operations" (SMUD, 2007). After the first phase of site release, the remaining IOSB Part 50 licensed site footprint will be approximately 1.1 acres with a proposed new fence line around the licensed area. The IOSB is located near the Part 72 licensed ISFSI fence boundary. The combined maximum dose to a worker between the ISFSI and IOSB fence lines, including dose from material within the first phase released area between the fence lines, is estimated by SMUD to be 0.15 millisievert per year [0.15 mSv/yr] [or 15 millirem per year (mrem/yr)], which is below the 0.25 mSv/yr (or 25 mrem/yr) limit for license termination in 10 CFR 20.1402 (SMUD, 2007 B).

NRC has completed several previous EAs during the period of Rancho Seco site decommissioning. Two EAs were related to license amendments addressing record keeping and another EA was for an exemption and license amendment. A fourth EA, March 2005, was completed for an amendment to the Part 72 ISFSI license, allowing ISFSI storage of Greater-than-Class-C waste (defined in 10 CFR 72) that was generated and stored at the Part 50 licensed Rancho Seco site (NRC, 2005). These previous EAs were reviewed as part of this EA process and found to be consistent with the information in this EA.

1.2 Need for the Proposed Action

As specified in 10 CFR 50.82, licensees of nuclear facilities may apply to the NRC to decommission a facility and terminate their license. These requirements outline a process to follow for eventual termination of the license, including the requirement that NRC will approve the licensee's LTP provided that the criteria in 10 CFR 50.82(a)(10) are met. SMUD submitted the required LTP (SMUD, 2006a) prior to requesting license termination, as specified in 10 CFR 50.82(a)(9).

The NRC determines: (1) whether procedures and activities planned for completing decommissioning (adequacy of radiation release criteria and the FSS) appear sufficient as described in the LTP; and (2) if implemented according to plan, the plan would demonstrate that the site is suitable for unrestricted use. Further, NRC determines whether additional planning, investigation, and/or other activities will be needed to support the decision on site release for unrestricted use and license termination. This EA describes the potential environmental effects (both radiological and non-radiological) from the decision to approve the SMUD LTP and subsequent release of the site from the NRC license for unrestricted use (pursuant to 10 CFR 20.1402), followed by termination of the license.

1.3 Scope

A significant rule change in 1996 (61 FR 39278) allows a licensee to perform major decommissioning activities after submittal of a PSDAR. The 1996 rule change also prohibits decommissioning activities that could result in significant environmental impacts which have not been previously reviewed. The licensee is also required to include in the PSDAR a discussion of the reasons for concluding that the planned decommissioning activities are bounded by previously issued environmental impact statements. For the LTP, the scope of the NRC approval is identified in the final rule:

> The Commission must consider: (1) the licensee's plan for assuring that adequate funds will be available for final site release, (2) radiation release criteria for license termination, and (3) the adequacy of the final survey required to verify that these release criteria have been met.

NRC details its review of these three areas in its Safety Evaluation Report (SER). The licensee's radiation release criteria and the adequacy of the site FSS are considered during development of this EA. However, funding available for decommissioning activities conducted until site release does not result in environmental impacts and will not be discussed in this EA.

In fulfilling its obligations under the National Environmental Policy Act (NEPA), the NRC evaluates the environmental impacts associated with approval of the LTP and subsequent termination of the license, as discussed above. Both radiological and non-radiological impacts are considered. These impact evaluations will typically involve an assessment of the remaining buildings/structures and residual material present at the site at the time the site is released and the license is terminated. In the case of this EA, release of the site for unrestricted use and termination of the license will be completed in two phases (discussed in Section 1.1).

1.3.1 Issues Studied in Detail

Consistent with NEPA regulations and guidance to focus on environmental issues of concern, this EA examines resource areas that were selected because of their potential to be affected by license termination: land use; water resources; and human health. Specifically, the EA

considers potential impacts on these resources from structures and/or residual materials that will remain after the site is released from NRC licensing for unrestricted future use.

1.3.2 Issues Eliminated from Detailed Study

For reasons cited above, impacts to air quality, historical and cultural resources, ecological resources (including endangered and threatened species), socioeconomic factors, transportation, noise, visual and scenic quality, waste management, and accident analysis are not reasonably expected to be impacted by approval of license termination activities (i.e., adequacy of radiation release criteria and the FSS) and site release for unrestricted use. As discussed in Section 1.3 (Scope) above, financial assurance for decommissioning at the site is not related to the environment and will not be discussed in this EA.

Decommissioning activities are not studied in this document. Decommissioning impacts were previously assessed by the NRC in program-level NEPA documents: the Generic Environmental Impact Statement for Decommissioning (NRC, 1988 and 2002). As described in Section 1.3 (Scope) above, environmental impacts from decommissioning activities are addressed in the PSDAR. SMUD submitted their PSDAR in March 1997 (SMUD, 1997), along with a discussion of the environmental impacts from its decommissioning activities.

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

2.1 The Proposed Action

The proposed action is the NRC approval of the LTP for the Rancho Seco Plant. Before approving the LTP, the NRC staff reviews the LTP to ensure that the proposed license termination activities (i.e., adequacy of radiation release criteria and final status radiation survey) will be performed in accordance with NRC regulations to ensure that (1) public health and safety are protected and (2) there will be no significant impact on the quality of the human environment from the unrestricted release (i.e., no restrictions on future site use) of the Rancho Seco site from NRC licensing. Further, the LTP would become part of the NRC license in a separate license amendment (Amendment Number 133); thereby, including the LTP in NRC inspection and enforcement at the Rancho Seco site. This license amendment would, specify that the licensee must seek NRC approval in order to make certain changes to the specific LTP.

As described in the Background (Section 1.1), SMUD plans to complete decommissioning of Ranch Seco for unrestricted use [detailed in 10 CFR 20.1402 and the Section 3.4 (Human Health) of this report] after termination of license in two phases**.** During the first phase, the majority of the site is planned to be released from the NRC 10 CFR Part 50 license. The remainder of the licensed site will continue to include the current interim onsite storage building (IOSB) for Class B and C radioactive waste (defined in 10 CFR 61), with the overall Part 50 licensed area being considerably reduced in size. SMUD estimates that decommissioning of the IOSB and the remaining Part 50 licensed site will be completed by 2028 (LTP Section 3.3.6.2)**,**

when this remaining area will be reviewed by NRC for unrestricted release from the license and the license terminated (SMUD, 2006a).

In order to meet the NRC unrestricted release criteria, areas of the site will be divided into survey units and sampled/surveyed in accordance with the LTP to verify that the derived concentration guideline levels (DCGLs) will be met and, consequently, demonstrate compliance with NRC release criteria. The DCGLs are discussed in Sections 3.1.1 (Radiological Contamination), 3.4 (Human Health), and 4.3 (Human Health Impacts).

2.2 No-Action Alternative

The no-action alternative was considered relative to the SMUD request for approval of the LTP. The no-action alternative would mean that NRC would not approve the LTP and neither the unrestricted use criteria would be applied nor the Rancho Seco license terminated. Further, this alternative is in conflict with the NRC 10 CFR 50.82 license termination requirements, which state that the Commission shall approve an LTP, by license amendment, if the LTP demonstrates that the remainder of the decommissioning activities, amongst other provisions, will not have a significant effect on the quality of the environment. Additionally, pursuant to this regulation, NRC shall terminate the license after the remaining dismantlement has been performed (1) in accordance with the approved LTP and (2) both the final radiation survey and associated documentation demonstrate compliance with decommissioning in 10 CFR 20, Subpart E. Therefore, the no-action alternative is eliminated from further consideration in this EA.

3.0 AFFECTED ENVIRONMENT

3.1 Site Description

As described in the LTP (SMUD, 2006a) (e.g., Sections 1.3.2, 6.2.1, and 8.5), Rancho Seco is located in the southeast part of Sacramento County, California, approximately 40 kilometers (km) (25 miles) southeast of Sacramento and 42 km (26 miles) north-northeast of Stockton. The populations of Sacramento and Stockton are approximately 445,000 and 490,000 respectively. The nearest population center of greater than 25,000 or more is Lodi, approximately 27 km (17 miles) south-southwest of the site, with approximately 57,000 people (U.S. Census Bureau, 2006).

The Rancho Seco site is located in the new foothills of the Sierra Nevada Mountains, with the Sierra Nevada Mountains to the east and the coast range along the Pacific Ocean to the west. The site is an area of flat to lightly rolling terrain at an elevation of approximately 60 meters (200 feet) mean sea level. To the east of the site, the land becomes more rolling, rising to an elevation of 180 meters (600 feet) at a distance of about 11 km (seven miles), and increasing in elevation toward the Sierra Nevada foothills (SMUD, 2006a).

The climate at Rancho Seco is described in the LTP as typical of the Great Central Valley of California. The rainy season occurs between October and May. More than two-thirds of the annual rainfall generally occurs from December through March. Incidents of severe weather, such as tornados and hurricanes, are infrequent (SMUD details its analysis in LTP Section 8.5) (SMUD, 2006a).

The soil consists of hard to very hard silts and silty clays, with dense to very dense sands and gravel. There is no evidence of faulting beneath the site. The nearest fault system is approximately 16 km (ten miles) east of the site and has been inactive for over 135 million years (SMUD, 2006a).

3.1.1 Radiological Contamination

Several areas within the industrial area have been identified as having been radiologically impacted (i.e., an NRC term defined in 10 CFR 50.2 to indicate potential for residual radioactivity in excess of natural background radiation levels) by the operation of the facility which includes: the retention basin; tank farm; barrel farm; areas adjacent to the regenerative hold up tank area; storm drains; oily water separator; cooling tower basins; and turbine building drains and sumps. There are several areas outside of the industrial area, identified as the non-industrial area, that have historically had radionuclide concentrations detected above background (i.e., impacted per Part 50 terminology). These areas include the discharge canal sediment, discharge canal soil, depression area soil, and the storm drain outfall. In total, the Part 50 defined radioligically impacted area is approximately 165 acres and is outlined in LTP Figure 2-2 (SMUD, 2006a).

In general, the extent of radiological contamination at a site is determined through a process of site characterization that includes radiological surveys with detectors and measuring instruments, as well as historical site assessment. Surveys are conducted to determine the nature and extent of radioactive material contamination in buildings, plant systems and components, site grounds, and both surface and ground water. The process of characterizing the site radiological contamination is described in further detail in both the LTP (Chapter 2) (SMUD, 2006a) and NRC SER (Site Characterization Section) (NRC, 2007).

SMUD identifies a list of 26 site-specific radionuclides in Table 6-1 of the LTP that are potentially present in soils, groundwater, and structures. These radionuclides include fission and activation products that are typical for pressurized-water reactor plants and were identified using information in several NRC NUREG documents (listed in LTP Section 6.3.1) and the ORIGEN computer code (using irradiated fuel assembly data). During this process, other radionuclides were identified as potentially present at the site and were eliminated from further consideration. Elimination was based on the assessment that these radionuclides, if present, contribute to less than 0.1 percent of the total activity and the potential radiation dose contribution by the sum of these radionuclides is less than one percent of the total calculated radiation dose (detailed in LTP Section 6.3.2).

Specifically, the 26 radionuclides are being used in the determination of acceptable radiological contamination and radiation dose levels at the site after release (i.e., also included in NRC dose modeling to determine acceptance of the LTP). All 26 radionuclides, for example, are assigned DCGLs for examining surface contamination on buildings. Additionally, based on analysis of the highest level of soil contamination identified at the site prior to decommissioning (spent fuel cooler pad soil) DCGLs for FSS of the soil were developed and based on C-14, Co-60, Ni-63, Sr-90, Cs-134, and Cs-137. Further, the 26 radionuclides form the basis for identifying specific radionuclides of interest for various other site media components (e.g., volumetric contamination and piping) at the site and corresponding DCGLs (discussed in LTP Chapter 6).

Table 5-4D of the LTP shows all the structures that, prior to decommissioning, had contamination above the DCGL (SMUD, 2006d). Radiological sampling for contamination outside of the industrial area is detailed in the LTP. Specifically, during plant operation, the Oak Ridge National Laboratory evaluated for NRC the environmental impact of the authorized radioactive liquid effluent releases from Rancho Seco Power Plant in 1986 (NRC, 1986). This report and subsequent radiological sampling is discussed in LTP Chapter 2 and in a SMUD response to an NRC letter (SMUD, 2006d).

3.1.2 Hazardous and Chemical Contamination

Decommissioning activities at the site are subject to Federal regulations, permits, licenses, notifications, approvals, and acknowledgments, including those for hazardous waste generation/disposition, handling and removal of asbestos, handling and removal of lead paint, and removal of underground storage tanks. Specific, U.S. Environmental Protection Agency regulations (40 CFR) adhered to during decommissioning and operation of the site, for example, include the following: Part 61 (asbestos handling and removal); Parts 122 through 125 (National Pollutant Discharge Elimination System); Part 141 (safe drinking water); Part 190 (radiation protection for nuclear power operations); Parts 260 through 272 (Resource Conservation and Recovery Act); Part 280 (underground storage tanks); Part 761 (polychlorinated biphenyls); and Parts 129-132 (Clean Water Act) (SMUD, 2007).

3.2 Land Use

The 10 CFR Part 50 licensed site is an approximately 87-acre fence-enclosed industrial area containing the nuclear facility, as well as an emergency backup data center and a SMUD backup control center that are used to support SMUD functions if there are disruptions with its headquarters facility. Additional structures within the industrial area are identified in the LTP (SMUD, 2006a) and the SMUD 2007 RAI response letter (SMUD, 2007), with key structures highlighted in the listing provided in Section 4.1 (Land Use Impacts). This site is located within an overall approximate 2,480 acre area that is owned by SMUD (owner-controlled area). Land use within the owner-controlled area also includes the following: a solar power (photo-voltaic) electrical generating station (50 acres); the 10 CFR Part 72 licensed ISFSI (previously discussed; 10 acres); Rancho Seco Lake and recreation area (560 acres, southeast of the industrial area); a gas-fired power plant (30 acres); a receiving warehouse; portions of a paved

access road; and a residence [approximately 1.6 km (one mile) from the industrial area fence] (SMUD, 2006a; SMUD, 2007). A map of the Rancho Seco site is provided in LTP Figure 8-1, and the industrial area is detailed in Figure 2-1. Aerial photographs of the industrial area (before and after decommissioning) are provided in the SMUD April 2007 RAI response letter (SMUD, 2007).

The land surrounding the Rancho Seco site, within a 24 meter (15-mile) radius, is identified by Sacramento County as remaining predominantly (70 percent) agricultural and grazing (beef cattle) for future use. Portions of the non-impacted area and impacted (per Part 50; Section 3.1.1) area (e.g., south storm drain outfall area and the liquid effluent pathway area) that are located within the owner-controlled area are open range areas that are leased to local ranchers for cattle grazing. At present, there are three large-scale commercial dairies in the vicinity, with the closest dairy located approximately 13 km (eight miles) northwest of the site. Further, domestic use dairy cows are present at a ranch (2,480 acres) located approximately one-mile east of the site. Future build-up around the site is expected to be sparse. A new housing development is located approximately 8 km (5 miles) northwest of the site (two to five-acre plots). SMUD also identifies in the LTP that there may be a future build-up of new residences to the west of the site (one to ten-acre plots)(SMUD, 2006a).

Rancho Seco Lake and park include picnicking, camping, boating, fishing, and swimming. A 75-acre wildlife compound and a seven-mile nature trail are also within the park. Other recreation areas in the relative vicinity of the site and their approximate distance from the site include: a portion of Lake Camanche [16 km (10 miles) southeast]; 3 golf courses [16 km (10 miles) east, and approximately the same distance at locations to the southwest and north]; and Lake Amador [21 km (13 miles) east]. Activities at the two lakes include boating, fishing, and camping. Additional reservoirs and lakes exist within 24 km (15 miles) of the site, including municipal reservoirs used for recreation (SMUD, 2006a; SMUD, 2007).

An overview diagram of the industrial area roads, rail, and pavement is provided in LTP Figure 2-33. LTP Figure 8-1 identifies transportation routes to and from the industrial area. State Route 104 is located just north of the site, connecting with State Routes 99 and 88 (to the west and east of the site, respectively) and the main access road to the industrial site and recreation area. Rail access is a spur that connects to the Union Pacific rail line (parallel to State Route 104).

3.3 Water Resources

The discussion of water resources is divided into surface water and groundwater. The sections that follow provide a summary overview of the characteristics of each at and near the Rancho Seco site.

3.3.1 Surface Water

Surface water in the vicinity of the site includes: Clay Creek; unnamed tributaries to Clay Creek; Rancho Seco Reservoir, which was formed by damming Clay Creek in the southeast area of the owner-controlled area with construction of Rancho Seco Nuclear Generating Station; and an area of vernal pools and seasonal marshes. All of these features are south or southeast of the industrial area. Clay Creek eventually discharges beyond the site boundaries into Hadselville Creek.

Runoff from the industrial area drains into an unnamed tributary of Clay Creek. Further, releases from the industrial area [averaging 22,710 liters (6,000 gallons) per minute] are discharged in the liquid effluent pathway downstream from the site retention basins into this creek. Most of these releases to the creek are conveyed to the site from the Folsom South Canal. Other sources of flow in this unnamed creek are releases from the Rancho Seco Reservoir and runoff in its catchment west of the dam and up gradient from the industrial area.

Since the investigation for the development of Rancho Seco in the 1960's, flooding has not occurred within the site boundaries from storm runoff. Also, the industrial area is not within the 100-year flood plain. However, vernal pools and seasonal marshes develop west of the industrial area and in shallow surface depressions during and after the December to March rainy season (URS Corporation, 2006a).

3.3.2 Groundwater

Groundwater at the Rancho Seco site is located within the Cosumnes Subbasin of the San Joaquin Valley Groundwater Basin (URS Corporation, 2006a). This subbasin has extensive unconsolidated and semi-consolidated sedimentary deposits, approximately 608 meters (2,000 feet) thick, where most of this material below the water table is likely water-bearing deposits. The uppermost water-bearing unit (the saturated zone or unconfined water table) at this site is within the Mehrten Formation about 50 meters (165 feet) below ground surface (bgs). Additional water-bearing units are likely to exist in the deeper, older sedimentary deposits until the metamorphic bedrock is reached at about 608 meters (2,000 feet) bgs. However, the actual thickness of the sedimentary rocks and their water-bearing status has not been verified because boreholes and wells onsite do not extend below the Mehrten Formation (URS Corporation, 2006b).

The uppermost water-bearing unit within the Mehrten Formation contains the groundwater that would most likely contain, if present, radionuclides from Rancho Seco operations. SMUD indicates that leaks, spills, and/or releases occurred during Rancho Seco operations and involved several areas: spent fuel building; spent fuel cooler pad outside the spent fuel building; tank farm; retention basins; barrel farm; storm drains; turbine building drains and sumps; oily water separator; and regenerant hold up tank areas. The potential for radionuclide movement to the saturated groundwater zone was significantly greater for leaks associated with the spent fuel building and spent fuel cooler pad than with the other mentioned structures and

areas. Further, remediation of soil at the spent fuel building and spent fuel cooler pad is complete. As a result of information collected during this process, SMUD reports that radionuclides from Ranch Seco operations are not being observed at depths as far as 7.6 meters (25 feet) below grade for the Spent Fuel Building (SMUD, 2006a).

The uppermost water-bearing unit yield is lower for groundwater beneath the site than at other locations in the subbasin. The predominant lithologies of the water-bearing unit at the site are siltstones and claystones, and the hydraulic conductivity of these lithologies range from $1x10^7$ to $1x10^4$ centimeters per second ($4x10^6$ to $4x10^3$ inches per second) (SMUD, 1985).

In 2005, SMUD installed four groups of monitoring (three wells per group) within and down-gradient of the industrial area. These wells were all screened in water-bearing units of the Mehrten Formation from about 50 to 103 meters (160 to 340 feet) bgs. Because one monitoring well was dewatered, a replacement monitoring well was installed with a deeper screened interval in February of 2006. SMUD performed four quarterly sampling events on these twelve monitoring wells and on three existing water supply wells: Summer and Fall of 2005; and Winter and Spring of 2006. The groundwater samples from these wells were analyzed for potential radionuclides that may have resulted from operations at Ranch Seco; however, these radionuclide concentrations were not observed to be any higher than typical background levels. Further, using these quarterly sampling events, SMUD developed potentiometric groundwater surfaces and groundwater flow directions for the industrial area and nearby areas (up-gradient and down-gradient). These groundwater surfaces and regional groundwater surfaces are delineated in figures within the reports developed for SMUD by the URS Corporation (URS Corporation, 2006a and 2006b) and demonstrate that groundwater is flowing toward the southwest.

There is extremely slow movement of the ground water and, consequently, the potential radionuclides from operations that may be in the groundwater. The movement of potential radionuclides at the site in a downward direction to reach the saturated zone is estimated by SMUD to take 80 years [based on a vertical hydraulic conductivity of $2.0x10^4$ centimeters per second ($7.8x10^3$ inches per second)]. SMUD also estimates that the time for the groundwater beneath the industrial area to travel to the site boundary, a distance of 942 meters (3,100 feet), is approximately 1,500 years [based on a horizontal hydraulic conductivity of $2.0x10^4$ centimeters per second ($7.8x10^3$ inches per second)] (URS Corporation, 2006a).

3.4 Human Health

Potential human health hazards associated with the Rancho Seco site range from potential exposure to very low levels of radioactivity in soils, to elevated levels of radioactivity within the remaining facility and support structures and systems (e.g. remaining tunnels, lines, and sumps).

The intent of the final decommissioning activity at Rancho Seco is to reduce radiological contamination at the site to meet NRC requirements for unrestricted release of the site. After decommissioning activities are complete, license termination activities will verify adequacy of

the radiological release criteria (i.e., DCGLs) and the FSS. Unrestricted use of the site is based on determination of total effective dose equivalent (TEDE; 10 CFR 20) and is specified in 10 CFR 20.1402, as follows:

> A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA).

The licensee (in this case, SMUD) is committed to developing DCGLs commensurate with demonstrating compliance with the dose-based release criteria. The licensee will then demonstrate through the FSS that residual radioactivity concentrations at the site are equal to or below the DCGLs.

The DCGLs in use at the Rancho Seco site were calculated using the computer codes RESRAD (Versions 6.22 and 6.3) and RESRAD-BUILD (Version 3.22 and 3.3) for generating the DCGLs. These mathematical models translate residual radioactivity into potential radiation doses to the public, based on selected land-use scenarios, exposure pathways, and identified critical groups. Calculating the dose to the critical group is intended to bound the individual dose to other possible exposure groups. The critical group is a relatively small group of individuals, due to their habits, actions, and characteristics, who could receive among the highest potential radiation dose of people at some time in the future. By using the hypothetical critical group as the dose receptor, it is unlikely that any individual would actually receive radiation doses in excess of that calculated for the average member of the critical group. Industrial workers are the critical group used for dose assessment at the Rancho Seco site (SMUD, 2006a).

4.0 Environmental Impacts

4.1 Land Use impacts

Termination of the Rancho Seco license is not reasonably expected to result in any adverse impacts to the onsite and adjacent land use. Specifically, the reasonably foreseeable agricultural, grazing, residential, and recreational land uses in adjacent areas would continue as expected. Existing Federal and state requirements would continue (LTP Section 8.7), except for NRC licensing requirements. Additionally, local government permits and approvals would continue, including the agreement with the County of Sacramento regarding the administration, operation, and maintenance of recreational facilities at Rancho Seco Lake.

Clean-up of hazardous materials at the site is expected to occur as a result of decommissioning. At present, the underground storage tanks for diesel fuel have been

removed and remaining lines cleaned, and SMUD does not plan to add future tanks to the site. The hazardous material warehouse and its contents will be removed, except for the concrete pad (SMUD, 2007). Any materials remaining at the site or generated at the site after it is released from the NRC license would continue to be regulated by the same requirements presently in place since Rancho Seco would be maintained as an industrial site.

Access to the site as an industrial area would be maintained by SMUD Asset Protection. The public would not have free access to the site, as security of the industrial area would be maintained to comply with the Federal Enegy Regulatory Commission and other agencies regulating electrical distribution systems. The majority of the infrastructure of the site (e.g., buildings, roads, parking lots) would not change after the site is released from NRC licensing. The switch yard, switch yard control building, and transmission lines would remain in operation. Additional structures and buildings that would remain after license termination include: back-up control center; training and records building; diesel buildings; nuclear service electrical building; auxiliary building; reactor containment building; spent fuel building; turbine building; machine shop; “B” warehouse; personal access portal building; IOSB, receiving warehouse; and an unfinished technical support building (SMUD, 2007).

4.2 Water Resources

Termination of the license for the Rancho Seco site, using the proposed plan, would not be expected to result in potentially significant and adverse impacts to either surface water or groundwater. In addition to Federal and State of California requirements, specific state and local agency permits and approvals would continue to apply for water at the site, including: California Water Resources Board diversion permit; Central Valley Regional Water Quality Control Board waste discharge agreement; the Federal Water Pollution Control Act water quality certification; and Army Corp of Engineers permits addressing the dredging, discharge, and deposit of materials into tributaries of navigable waters.

4.2.1 Surface Water

Prior to the period of potential license termination, there will be a slight decrease in the amount of impervious areas onsite where fill materials will replace a small area of decommissioned buildings and impervious materials. Storm water drainage that currently exists at the site through sheet flow runoff and point discharges will also be reduced by a small amount because infiltration from precipitation will increase in these fill areas.

SMUD recently renewed its NPDES permit, and plans to maintain the same discharge volumes that it has generated since the reactor shutdown. Both the existing water supply system and sewage system would remain in place (URS Corporation, 2006a).

4.2.2 Groundwater

The radiological results of groundwater monitoring program where groundwater samples were collected and analyzed every three months, as described in Section 3.3.2, demonstrate that radionuclides from operations, including tritium (a radionuclide that is easily transported in water), have not contaminated the uppermost water-bearing unit at this site (URS Corporation, 2006a).

4.3 Human Health Impacts

Compliance with the requirements of 10 CFR 20.1402 for unrestricted release from NRC licensing would ensure that the residual radioactivity left at the site would not cause the total effective dose equivalent (TEDE) to an average member of the critical group (industrial workers) to exceed 0.25 mSv/yr (25 mrem/yr). Residual radioactivity must also be reduced to levels that are as low as reasonably achievable (ALARA; defined in 10 CFR 20).

SMUD is proposing DCGLs as acceptable levels of residual radioactivity that can be left at the site and comply with the unrestricted use criteria that is specified in 10 CFR 20, Subpart E. The manner in which the DCGLs are derived for the Rancho Seco site is documented in LTP Chapter 6 (SMUD, 2006a). As part of the NRC decision on whether to approve the LTP, the NRC conducted an SER process to evaluate the adequacy of the DCGLs to provide protection for members of the public after the proposed site releases (NRC, 2007).

In deriving the surface soil DCGLs, an industrial worker is considered to represent the average member of the critical group. The worker is assumed to be exposed to contaminated soil by the following exposure pathways: (1) direct exposure; (2) inhalation of airborne radionuclides; (3) ingestion of contaminated soil; (4) drinking water from a contaminated well; and (5) exposure to buried piping. For subsurface soil DCGLs, SMUD would apply the surface soil DCGLs to subsurface soil contamination. As discussed in detail in LTP Section 6.6.2, subsurface contamination has been observed in discrete pockets. Further analysis (using peak of the mean dose results) demonstrates a decrease in dose with increasing depth of the discrete pockets of contamination beneath the soil. The LTP states that using the surface soil DCGL values is more conservative than developing higher DCGL values for discrete pockets of subsurface soil contamination. As stated in LTP Section 6.6.2.6.3, the developed subsurface soil DCGL values would be non-conservative if the subsurface soil contamination is excavated later and spread on the surface, becoming surface soil contamination. Table 6-5 of the LTP lists DCGLs that would be used for residual radioactivity in soil.

For buried piping DCGLs, the buried piping is assumed to disintegrate instantaneously upon license termination to better evaluate the radiological exposure to its contents. As such, the disintegrated media is subsurface soil and the media volume is assumed to be equal to the piping volume. Soil contamination is assumed to be uniformly mixed within the volume. Therefore, SMUD would apply soil DCGLs to buried piping.

The industrial worker is considered to represent the average member of the critical group in deriving the building surface DCGLs. The building occupancy scenario is used to evaluate potential exposure to fixed and removable surface radioactivity within structures that will be left on the site after license termination. The worker is assumed to be exposed to penetrating radiation from surface sources, inhalation of resuspended surface contamination, and inadvertent ingestion of surface contamination. Table 6-9 of the LTP lists the DCGL values used for residual radioactivity that remains on existing building surfaces. In addition, SMUD determined that volumetric DCGL values were needed since some structures may be potentially contaminated from neutron activation. Volumetric contamination may also exist due to the migration of surface contamination into materials of construction. Table 6-10 of the LTP lists the proposed DCGL values for activated and volumetrically contaminated bulk material.

In deriving the DCGLs for embedded piping, SMUD assumed a scenario in which an industrial worker is exposed to residual radioactivity from a location within the concrete-encased piping (i.e., embedded) as well as from contaminated surfaces of the building. SMUD considers the potential dose from embedded piping to be additive along with the potential dose to the worker from residual radioactivity from building surfaces. The LTP (Section 6.6.7) states that the surface DCGLs will be reduced by the dose contribution from embedded piping to ensure compliance with the dose criterion. However, to preclude the additional dose contribution from embedded piping, SMUD has committed to grout any piping which has residual contamination above the adjusted NRC screening levels.

For the containment building, the majority of the interior concrete will be removed, leaving only the carbon steel liner plate. Therefore, SMUD determined that the industrial worker scenario used to derive the structural surface DCGLs is an unrealistic scenario for application to the interior surface of the containment building. SMUD developed two sets of DCGLs for the containment building to determine the most limiting scenario in this case: (1) an industrial worker building inspection scenario and (2) a building renovation/demolition scenario. SMUD determined that the building renovation/demolition scenario was more limiting than the industrial worker building inspection scenario. In LTP Section 6.6.5.4, SMUD states that a more conservative approach would be imposed in that structural surface DCGLs, derived in LTP Section 6.6.3, would be applied to the reasonably accessible surfaces of the containment building. The renovation/demolition DCGLs listed in Table 6-12 of the LTP would be applied to the containment building dome surfaces. Worker safety during remediation and FSS activities was considered in selecting the application of the containment building DCGLs.

Two additional exposure scenarios were analyzed: a resident farmer scenario (in place of the industrial use scenario); and grazing cattle adjacent the industrial area. The calculated total dose for a resident farmer scenario within the currently licensed site (industrial area) exceeds the unrestricted use limit of 0.25 mSv/yr (25 mrem/yr) for approximately 30 years following the first phase of release and license termination. LTP Section 6.8.2.4 describes this information and the rationale for why it is unlikely that the current impacted area for NRC licensed industrial site would be transferred from industrial use to the public during the next 30 years. Hence, the resident farmer is not a reasonably forseeable scenario and would not be considered for compliance with 10 CFR 20 criteria (NRC, 2006). Further, the cattle grazing scenario (LTP

Section 6.8.3) analyzes the dose impact of maintaining an industrial worker scenario within the industrial area while allowing cattle grazing in the areas outside of the industrial area and consumption of meat from the cattle by an offsite member of the public. The calculation identified a maximum potential dose (peak of the mean) of approximately 0.05 mSv/yr (5.13 mrem/yr).

As discussed in Section 1.1 (Background), the Rancho Seco site would be released from NRC licensing for unrestricted use in two phases. The approach identified in the LTP, using DCGLs and the FSS process, would be applied at both phases of release toward license termination for the site.

NRC staff evaluated the appropriateness of the postulated exposure scenarios and the methodology used for deriving the DCGLs. The staff has concluded that any potential radiation exposures from residual radioactivity that would be present after license termination have not been underestimated by SMUD and are protective of the general public (NRC, 2007d).
The SMUD plan would use a series of surveys and the FSS to demonstrate compliance with the radiological release criteria consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (NRC, 2000). As identified in previous sections of this report, planning for the final status survey involves an iterative process that requires appropriate site characterization (on the basis of the potential residual radionuclide concentration levels relative to the DCGLs) and formal planning. SMUD has committed to an integrated design that would address the selection of appropriate survey and laboratory instrumentation and procedures, including a statistically-based measurement and sampling plan for collecting and evaluating the data needed for the final status survey. The staff has determined that the sampling strategy and survey data evaluation methodology presented in the LTP are adequate (NRC, 2007d).
Provided that the DCGLs are demonstrated through the FSS, there would be no anticipated adverse impacts to human health from approval of license termination, as described in the final rule “Radiological Criteria for License Termination” (62 FR 39058).

4.4 Cumulative Impacts

The NRC approval of the SMUD Rancho Seco LTP (the proposed action), when combined with known effects on notable resources at the site, is not anticipated to result in any cumulative impacts. Rather, decommissioning and remediation of the Ranch Seco site, resulting in the release of the site for future unrestricted use, would reduce the opportunity for potential negative cumulative impacts.

5.0 AGENCIES AND PERSONS CONSULTED AND SOURCES USED

The NRC staff prepared this EA with consultation from the State of California Office of Historic Preservation. NRC began the consultation by letter, dated October 30, 2006 (NRC, 2006b). The State Historic Preservation Officer responded in a letter, dated February 15, 2007 (Donaldson, 2007), with clarifying questions, information requests, and considerations. NRC

responded with the requested information and clarification, letter dated March 12, 2007 (NRC, 2007a). Based their review of the March 12 letter, the Historic Preservation Officer's representative suggested that the NRC further evaluate whether or not its action on the LTP is an undertaking (as defined in 36 CFR 800). NRC conducted the evaluation, and provided the determination that the action is not an undertaking to the State Historic Preservation Officer in a letter, dated March 16, 2007 (NRC, 2007b) and was also requested by the representative, which mutually concluded the consultation. Therefore, NRC has complied with Section 106 of the National Historic Preservation Act on this matter.

The NRC staff has determined, based on the scope of this action, that the proposed action will not affect listed species or critical habitat. Therefore, no further consultation is required under Section 7 of the Endangered Species Act.

The staff provided a draft of this EA to the State of California for review.

[Insert Summary]

6.0 CONCLUSION

The NRC has prepared this EA (ADAMS Accession No: MLXXXXXX) related to the issuance of a license amendment to Facility Operating License No. 50-321, that would approve the SMUD LTP. On the basis of this EA, the NRC staff conclude that there are no significant environmental impacts and the license amendment does not warrant the preparation of an environmental impact statement. Accordingly, the NRC staff review team recommends a Finding of No Significant Impact determination for this action.

7.0 LIST OF PREPARERS

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8.0 LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As is Reasonably Achievable
bgs	below ground surface
CFR	Code of Federal Regulations
DCGL	Derived Concentration Guideline Limit
EA	Environmental Assessment
FR	*Federal Register*
FSS	Final Status Survey
IOSB	Interim Onsite Storage Building
ISFSI	Independent Spent Fuel Storage Installation
km	kilometer
LTP	License Termination Plan
mrem	millirem
mSv	millisievert
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
PSDAR	Post Shutdown Decommissioning Activities Report
RAI	Request for Additional Information
TEDE	Total Effective Dose Equivalent
yr	year

9.0 REFERENCES

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10 CFR 61. Code of Federal Regulations, Title 10 *Energy*, Part 61, "Licensing Requirements for Land Disposal fo Radioactive Waste."

10 CFR 72. Code of Federal Regulations, Title 10 *Energy*, Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste."

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