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3.0 IDENTIFICATION OF REMAINING DECOMMISSIONING ACTIVITIES

3.1 Introduction

In accordance with 10 CFR 50.82 (a)(9)(ii)(B), the License Termination Plan (LTP) must identify the major remaining dismantlement and decontamination activities. This chapter was written following the guidance of NUREG-1700, "Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans," [Reference 3-1] and Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors," [Reference 3-2] and will discuss those dismantlement activities as of December 31, 2005. Information is presented to demonstrate that these activities will be performed in accordance with 10 CFR 50 and will not be inimical to the common defense and security or to the health and safety of the public pursuant to 10 CFR 50.82(a)(10). Information that demonstrates that these activities will not have a significant effect on the quality of the environment is provided in LTP Chapter 8, Supplement to the Environmental Report.

The information includes those areas and equipment that need further remediation and an estimate of radiological conditions that may be encountered. Included are estimates of associated occupational radiation dose and projected volumes of radioactive waste.

Sacramento Municipal Utility District's (District's) primary goals are to decommission the Rancho Seco Nuclear Generating Station (Rancho Seco) safely and to maintain the continued safe storage of spent fuel in an Independent Spent Fuel Storage Installation (ISFSI). The District will decontaminate and dismantle Rancho Seco in accordance with the DECON alternative, as described in NUREG-0586, "Final Generic Environmental Impact Statement" (FGEIS) [Reference 3-3]. Completion of the DECON option is contingent upon access to one or more low-level waste (LLW) disposal sites. Currently, Rancho Seco has access to the disposal facilities of Energy*Solutions*[1]. These facilities currently only accept Class A waste. Completion of the second phase of site release will require access to a LLW disposal facility, acceptable to the District, which can accept Class B and C waste.

The District is currently conducting decontamination and dismantlement (D&D) activities at the Rancho Seco site in accordance with the Rancho Seco Post Shutdown Decommissioning Activities Report (PSDAR) [Reference 3-4]. Decommissioning activities are being coordinated with the appropriate Federal and State regulatory agencies in accordance with plant administrative procedures. All special nuclear material (spent fuel) is located at the ISFSI. By the end of the second quarter of 2006, it is expected that all greater than Class C (GTCC) waste material will also be located at the ISFSI.

Decommissioning activities at Rancho Seco are conducted in accordance with the Rancho Seco Defueled Safety Analysis Report (DSAR) [Reference 3-5], Permanently Defueled Technical Specifications [Reference 3-6], Rancho Seco Quality Assurance Program (QAP) [Reference 3-7], existing 10 CFR Part 50 license, and the requirements of 10 CFR 50.82(a)(6) and (a)(7). If an activity requires prior Nuclear Regulatory Commission (NRC) approval under 10 CFR 50.59(c)(2) or a change to the Rancho Seco Permanently Defueled Technical Specifications or license, a submittal shall be made to the NRC for review and approval before implementation of the activity in question.

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[1] Energy*Solutions* was previously Envirocare of Utah

Decommissioning activities are conducted in accordance with the Rancho Seco Radiation Protection Program, the Off-Site Dose Calculation Manual (ODCM), Safety Program, and the Radwaste Manual. Such activities are and shall be conducted in accordance with these established programs that are frequently inspected by the NRC. Activities conducted during decommissioning do not pose any greater radiological or safety risk than those conducted during former plant operations. Decommissioning activity radiological risk is bounded by previously analyzed radiological risk for former operating activities that occurred during major maintenance and outage evolutions.

The activities described in Section 3.3, Future Decommissioning Activities, include activities up to the future release of the site. This section provides an overview and describes the major remaining components of contaminated plant systems and, as appropriate, a description of specific equipment remediation considerations.

Information related to the remaining D&D tasks is also provided. This information includes an estimate of the quantity of radioactive material to be released in accordance with 10 CFR 20.2001, a description of proposed control mechanisms to ensure areas are not re-contaminated, estimates of occupational exposures, and characterization of radiological conditions to be encountered and the types and quantities of radioactive waste. This information supports the assessment of impacts considered in other sections of the LTP and provides sufficient detail to identify inspection or technical resources needed during the remaining dismantlement activities. Many of these dismantlement tasks require coordination with other federal, state or local regulatory agencies or groups.

The dismantlement activities described in Section 3.3 provide the NRC the information to support site release and future license termination pursuant to 10 CFR 50.82(a)(11)(i). Therefore, this section was written to clearly indicate each dismantlement activity that remains to be completed prior to qualifying for license termination. The final state of the Industrial Area will be a partially abandoned facility (as defined in Chapter 1 of this LTP) with portions, other than the power block, available for reuse. The impacts of decommissioning activities performed will be to reduce residual radioactivity to a level that permits release of the property for beneficial reuse by the District for industrial purposes.

3.2 Completed Decommissioning Activities and Tasks

3.2.1 Spent Fuel Storage

The District signed the contract in 1992 for the design, licensing and fabrication of a transportable storage system. In 1995 the ISFSI was constructed and fabrication of the cask and associated equipment began. However, in 1996, quality issues throughout the dry storage industry and vendor bankruptcy forced work to be stopped. In 1997, a new supplier resumed the design and license work.

The transportable storage system consists of a transportation cask, twenty-one dry storage canisters, twenty-two horizontal storage modules and a multi-axle trailer. The cask serves for on-site transfer and off-site transportation overpack for the canisters. The canisters hold the spent fuel in a structural array and are then seal-welded. The horizontal storage modules are thick reinforced concrete storage bunkers used to store the canisters. The twenty-second module will provide storage for GTCC waste from reactor vessel internals.

Fuel movement began in May of 2001 and was completed in August of 2002. All spent fuel is currently stored in the ISFSI under a separate Part 72 license.

3.2.2 Spent Fuel Pool Activities

The eleven spent fuel racks were removed from the pool during the first quarter of 2003 and shipped to Energy*Solutions* for direct disposal. The process for removal and disposal began with vacuuming the debris from each cell, followed by radiological survey for hot spots and further rack decontamination during removal from the pool. A vacuuming unit coupled with high-loading filters was used to collect the loose debris from the racks.

Upon removal each rack was placed on the cask wash-down platform, where a thorough decontamination and survey of each cell and outer surface was performed. The racks were then removed from the wash-down platform and staged for drying, followed with a coating of spray adhesive, and wrapped in 12-mil plastic. The 12-mil plastic served for contamination control during packaging, which occurred outside on the plant turbine deck.

The racks were then moved to a laydown area outside the fuel building, down-ended, and placed in a watertight shipping bag. The final step involved re-rigging the rack for placement in a large metal strong-tight container. Each rack had less than an A2 quantity of radioactivity that allowed use of the strong-tight container. Radiological surveys were performed to ensure DOT radiation limits were met, communications applied, and the package placed on the transport vehicle for disposal. Each transport package contained only one rack and was transported by highway for disposal at Energy*Solutions*.

Dose rates on the rack exteriors ranged from 2 mrem/h on the top, to 15 mrem/h in the middle, and 50 to 80 mrem/h on the bottom. Hotspots within the cells ranged from 1 to 4 rem/h. The hotspots were easily removed through decontamination using high-pressure washing except for the 4 rem/h hotspot, which was found between the cells and was found to be mobile. After making several attempts to remove the hot spot, ready-mix grout was poured into the cell matrix, to fix the hotspot in place. The introduction of grout lowered the measured dose rate to less than 80 mrem/h.

Prior to decontamination, loose surface contamination ranged from 300,000 to 500,000 dpm/100 cm^2 beta-gamma, and less than 20 dpm/100 cm^2 alpha. Post-decontamination levels were found to be no more than 30,000 dpm/100 cm^2 beta-gamma.

Following successful completion of the rack project, the remaining pool water was drained, and the pool walls and floor were pressure washed. Loose contamination levels on the floor and walls after washdown ranged from 1,000 to 3,000 dpm/100 cm^2. The remaining water and wash water was sent to a holding tank for processing. Work then commenced on removal of the pool liner plate, which was constructed of ¼ inch thick stainless steel and was connected to the concrete wall with numerous embedded supports positioned at 6-foot centers in the horizontal and vertical direction. Various methods for removal were considered including plasma cutting and machine cutting the plates. Plasma cutting would have involved a tremendous effort to construct an enclosed area to control smoke and potential hazardous fumes (chromium +6) generated by the flame cut. Although a slow process, machine cutting was selected because it generated little secondary waste, involved no industrial hygiene concerns and was proven to be capable of performing the cuts.

The machine cutting was performed with a carbide bit installed on a hydraulically operated milling unit track which could be positioned horizontally or vertically depending on the cut to be made. The carbide bit travels along the milling unit track machining the stainless steel as it travels. The milling unit was affixed to the wall by use of fasteners installed with a stud gun.

The milled sections of the liner plate were loaded into top-loading 20 foot Seavans and shipped for direct disposal. Dose rates on a loaded Seavan were no greater than 0.2 mrem/h.

Once the liner plate was removed, the underlying concrete structure and subsurface soil was sampled to ascertain if pool water leakage (known to have occurred) would require their excavation and packaging for disposition. No significant activity was found below the concrete floor.

3.2.3 System Removal

System removal began in 1997 with secondary system components. As experience was gained in removal, decontamination and shipping, removal rates increased and staff was added to begin full decommissioning. In 2000 system removal moved to the Tank Farm and the Auxiliary Building, both containing significantly more contaminated systems. After an initial building decontamination, work moved to the Reactor Building in 2002. Most contaminated systems had been removed by mid 2004 with the exception of large components. Remaining radioactive liquids were processed in temporary systems.

3.2.4 Large Component Removal

3.2.4.1 Reactor Coolant Pumps

Main reactor coolant piping and the reactor coolant pumps were removed and shipped in 2002 with the exception of piping sections attached to the reactor vessel remaining in the primary shield walls. Primary piping was cut with machine tooling into short sections that could be filled with other piping and placed into standard shipping containers. The four reactor coolant pumps were removed and packaged for shipment to Energy*Solutions* in two rail cars. Packaging included welded covers on piping connections and stuffing boxes, paint for contamination control, and heavy bags for final packaging. The pumps were blocked and braced in the rail cars with heavy cables and steel cradles.

3.2.4.2 Reactor Head

A major work activity during 2003 involved the disposition of the Reactor Head. This Babcock and Wilcox design consisted of sixty-nine Control Rod Drive Motors, each weighing approximately 1,000 pounds; a Service Structure weighing 35,000 pounds and the Reactor Head itself, weighing 160,000 pounds.

This work began with removal of the Service Structure, which was removed from the Reactor Head after flame cutting the lower shroud. The Service Structure was removed from the Refueling Cavity and taken to an adjacent work area where it was segmented. These sections were packaged into a 20-foot Seavan, which was subsequently sent to a processor for dispositioning.

The next step was to remove the Control Rod Drive Mechanisms (CRDMs) from the Reactor Head. The CRDMs were grouped by their applicable function during plant operation and consisted of safeties, control and power shaping rods. There was very little radiological data associated with the CRDMs and leadscrews, which connected to the control rods, thus the dismantlement crew proceeded very carefully during removal of the CRDMs.

The CRDMs were removed by cutting the nozzles just below the mounting flange by use of a machine tool. Once cut, the CRDM was lifted from the cavity, surveyed and placed in a processing area where it was segmented into box-sized lengths for disposition.

The first CRDM removed was from the "safety" group and surveys indicated low dose rates. The survey along the length of the lead screw indicated 50 to 60 mrem/h gamma while the tip of the lead screw was 40 mrem/hr gamma. There was little fluctuation in dose rates as the different CRDM groups were removed and surveyed. All were packaged within a metal container and sent for direct disposal after segmentation.

The Reactor Head was segmented with use of a diamond wire cable supplied by the segmentation vendor. The five segmented sections included three sections of the flange and two sections of the top portion of the Head, cut just off-center through a clear path around the remaining portions of the CRDM nozzles.

The reactor head showed no signs of corrosion including the extended area around the CRDM nozzles.

3.2.4.3 Pressurizer

The Pressurizer, a 45-foot long, 150-ton component, was disposed of at Energy*Solutions* in May of 2004. Preparation for this project included removal of piping systems with subsequent plugging of the penetrations. Contracts were established for rigging and removal of the Pressurizer from the Reactor Building and for railroad transport to Energy*Solutions*. Exterior dose rates were 0.2 mrem/h or less except for a hot spot at the Pressurizer bottom where the surge line exits the vessel. To ensure 49 CFR 173.441 radiation limits were met, a carbon steel shielding cover was placed over the surge line and welded to the exterior of the vessel reducing the contact dose rate to less than 200 mrem/h. To prepare the vessel for contamination control while handling onsite, a polymer-based latex paint was applied to the exterior rendering loose contaminant levels to less than 1,000 dpm/100 cm^2. The Pressurizer was shipped as a surface contaminated object within a soft-sided strong tight container

3.2.4.4 Steam Generators

The Rancho Seco Steam Generators are of Babcock & Wilcox (B&W) design and commonly known as Once-Through Steam Generators (OTSGs). The B&W design consists of two such steam generators, each approximately 80 feet in height, 12 feet in diameter, and over 550 tons in weight. The OTSGs were too large to ship to Energy*Solutions* in their intact state due to rail clearances with respect to the length of the generator and certain radii of track along the required route to the disposal facility. Rancho Seco cut the OTSGs in the latitudinal direction at approximately the halfway point and capped the cuts with large steel plates to meet rail requirements and enable the OTSGs to be shipped directly for disposal to Energy*Solutions*.

Rancho Seco staff evaluated each section of the OTSG as it's own package and included other documentation to submit with the request for the DOT Exemption which was approved by the DOT in May 2004. The first OTSG was segmented and removed from the Reactor Building in the last quarter of 2004 and loaded onto railcars. Blocking and bracing work was completed and shipment of the OTSG sections was performed in December 2004. The second OTSG was similarly prepared and shipped in January 2005.

3.2.4.5 Outside Tanks

Two large stainless-steel tanks and two lined carbon-steel outdoor tanks were dismantled, packaged and shipped for direct disposal in 2003. The four tanks included the:

1. Borated Water Storage Tank (BWST),
2. Demineralized Reactor Coolant Storage Tank (DRCST),
3. The A Regenerant Hold-Up Tank, and
4. The B Regenerant Hold-Up Tank (RHUT).

The BWST and DRCST contained water for reactor coolant makeup and filling the reactor cavity during outages. The RHUTs held water collected for discharge.

The process for tank removal was the same for all four – layout of cut locations, lead paint abatement of these locations (if required), plasma arc segmentation of the stainless-steel sections or cutting torch segmentation of the carbon steel sections and packaging the sections in open-top 20 foot Seavans. The original plan for the RHUTs was to attempt free release, however residual activity prevented this. The BWST and DRCST presented minor contamination control challenges regarding radioactivity within the tanks - up to 400,000 dpm/100 cm^2 beta-gamma was discovered on the surfaces of the inner walls and floors. A wash-down of the interior was conducted prior to segmentation and the wash water with gross contamination was sent to a holding tank for processing.

The inside of the RHUTs were lined with a rubber barrier, which was removed and placed within a Seavan with segmented sections of the tank. The barrier was only slightly contaminated and the desire was that the inner tank would be free of detectable contamination and could thus, be free released. Small amounts of radioactive contamination were discovered in many areas inside the tank and the decision was made not to pursue free release.

The BWST and the DRCST each weighed 112,000 pounds while the A RHUT weighed 38,000 pounds and the B RHUT weighed 56,000 pounds. The segmented waste from these tanks was packaged into eight open-top 20-foot Seavans; each Seavan contained approximately 300 cubic feet of waste and was shipped for disposal at Energy*Solutions*.

3.2.5 Underground Pipe Removal

Underground pipe of highly contaminated systems has been removed except for a small portion remaining to be removed in 2006. These systems include the Decay Heat System, Borated Water System, Radioactive Waste System and the Spent Fuel Cooling System. Other minimally contaminated systems were also removed, or sampled and surveyed to ensure that they could remain. These include the Component Cooling Water System, Auxiliary Feedwater System, Main Condensate and Make-up System, and portions of the Clean Drain System used for radioactive effluents. Portions of non-impacted systems in close proximity to the target piping were also removed. The radioactive discharge line from the RHUTs to the Retention Basins is scheduled to be removed in the spring of 2007.

3.2.6 Non-Radiological Decommissioning Activities

Non-radiological decommissioning activities include the removal of temporary buildings such as wooden or metal structures after being cleared by Radiation Protection. Underground storage tanks for diesel fuel oil were removed and the remaining lines cleaned. Asbestos was removed from the cooling towers, the roofs of permanent buildings and other miscellaneous locations. Removal of non-essential materials and equipment and general cleanup of the site was also performed. The electrical generator was sold and removed. The Switchyard remains in operation by the newly constructed Cosumnes Power Plant (CPP) being operated on a non-impacted portion of the 2,480-acre Rancho Seco site.

3.3 Future Decommissioning Activities

Table 3-1 lists the current schedule for the remaining decommissioning activities. The following sections describe those activities.

Table 3-1

Schedule of Remaining Major Activities

Activity	Start Date	Finish Date
Reactor Vessel Internals Removal	January 2005	June 2006
Rector Vessel Removal	May 2006	December 2006
Underground Piping	June 2006	May 2007
Reactor Building Internal Structures Removal	December 2006	January 2008
Embedded Piping Decontamination	October 2005	June 2007
Auxiliary Building Decontamination	October 2005	October 2007
Spent Fuel Pool Decontamination	April 2006	April 2007
Wastewater Systems Decontamination	October 2005	October 2007
Reactor Building Decontamination	January 2008	June 2008

3.3.1 Remaining Component Removal

3.3.1.1 Reactor Vessel Internals

The Reactor Vessel Internals project is currently in progress and is expected to be completed in the second quarter of 2006. The final activation analysis and radiological characterization of the Vessel and Internals was completed in June of 2003. As of that date the GTCC waste totaled approximately 50,000 curies with 28,000 curies attributable to Co-60.

The GTCC waste weighs approximately 25,000 pounds and has been packaged into a single canister and will be stored within the onsite ISFSI alongside the spent fuel under the separate Part 72 license. It is scheduled to be transported from the reactor cavity to the ISFSI in the fuel cask by June of 2006.

Class A pieces are being shipped in boxes and liners to Energy*Solutions*. Class B and C waste, approximately 16,000 curies (as of January 1, 2006), will be stored in liners in the Interim Onsite Storage Building (IOSB) under the Part 50 license until acceptable disposal is arranged.

With the exception of the plenum, the vessel internals are being cut or disassembled underwater with mechanical milling or cutting devices designed to minimize the production of fine material that could be dispersed in the water or air.

3.3.1.2 Reactor Vessel

The Reactor Vessel is scheduled to be segmented and shipped beginning in the third and fourth quarters of 2006 once the vessel internals project is complete, the cavity drained, and the cavity and vessel are cleaned. In preparation, shield blocks around the flange will be removed and the mirror insulation on the vessel will be removed. Once the vessel is removed the remaining primary piping segments will be removed from the shield wall penetrations.

The vessel will be segmented using a robotic arm and a high-pressure water/abrasive cutting head. Pieces will be sized to allow standard packaging with the exception of the cylinder pieces opposite the core that will require special packaging. The fuel region of the vessel will be cut into six pieces vertically and be placed into two boxes, grouted and transported by rail.

3.3.1.3 Remaining Underground Pipe

Portions of underground pipe (approximately 140 linear feet) from the Borated Water System and the Decay Heat System in the area in front of the Reactor Building equipment hatch remain to be removed. They are scheduled to be removed during the summer of 2006. The radioactive discharge line from the RHUTs to the Retention Basins is scheduled to be removed in the spring of 2007.

3.3.1.4 Reactor Building Exhaust Ventilation

The only remaining radiological exhaust system, the Reactor Building Exhaust System, is currently in use to exhaust and filter the Reactor Building atmosphere. This system will remain until significant activities in the Reactor Building are complete.

3.3.2 Reactor Building Internal Structure Removal

Once the Reactor Vessel is removed, work is to begin on the removal of almost all concrete and internal structures in the Reactor Building. Removal of the concrete to the liner plate should minimize the need for decontamination and simplify the final status survey (FSS). Only the building liner should remain inside the structure and possibly a grade level platform just inside the equipment hatch. The structure removal includes the activated steel and concrete around the vessel, and the polar crane.

3.3.3 Decontamination of Structures and Systems

Decontamination methods include wiping, washing, vacuuming, scabbling, spalling, and abrasive blasting. Selection of the preferred method is based on the specific situation. Other decontamination technologies will be considered and utilized, as appropriate. Approved administrative procedures and processes control decontamination. These controls ensure that wastewater is collected for processing by liquid waste processing systems. Airborne contamination control and waste processing systems are used as necessary to control and monitor releases. Decontamination methods are further discussed in Chapter 4 of this LTP.

3.3.3.1 Reactor Building

Some liner decontamination is expected to be required once internal structures are removed. Cleaning, up to and including paint removal, will be done as necessary to meet the derived concentration guideline level (DCGL).

3.3.3.2 Auxiliary Building

Extensive decontamination is planned for rooms below grade level in the Auxiliary Building. Many of the rooms were exposed to leaking or spraying water systems and decontamination is expected to include extensive surface removal including core boring and sawing. It may be necessary to remove floors or sumps if contamination extends through the concrete. These rooms are currently undergoing removal of obstacles that will interfere with 100% scanning surveys.

3.3.3.3 Spent Fuel Pool

Significant decontamination is required for the Spent Fuel Pool. The pool liner has been removed and one interior wall where significant pool liner leakage has occurred is scheduled for removal. Once the wall is removed decontamination of remaining wall and floor surfaces will occur as well as the cleaning of the embedded leak chases and through-wall pipes.

3.3.3.4 Turbine Building

The Turbine Building has only minor contamination levels with little decontamination planned with the exception of selected floor drain piping segments and sumps.

3.3.3.5 Embedded Pipe Systems

Embedded pipe systems are located in all of the impacted buildings listed above. Most embedded system piping is for floor drains. Cleaning is in progress with an initial high-pressure wash to remove debris followed by an abrasive grit blast process as required. Once cleaned to acceptable limits most embedded piping will be grouted to mitigate reuse or transport of remaining residual activity.

3.3.3.6 Wastewater Systems

While most wastewater piping that will remain is believed to be below DCGL levels, the Retention Basins and associated bottom drains will require remediation and/or partial removal. The radioactive discharge line from the RHUTs to the Retention Basins is expected to be removed. Storm drains that lead directly offsite and storm drains that collect system drainage and lead to the outfall should require no remediation. Some system piping that leads to the storm drains is currently being removed in lieu of extensive surveys. Cleaning is currently underway on the oil/water separator. Oil and sludge will be removed and a FSS will be performed.

3.3.4 Non-Radiological Activities

3.3.4.1 Outbuilding Demolition

The demolition of temporary outbuildings continues. The remaining concrete pads will be surveyed as a part of the FSS process.

3.3.4.2 Site Grading

Once Phase I site release is obtained, low areas will be filled and graded for drainage. These areas include the cooling tower basins and canal, the spray ponds and the below grade portion of the Turbine Building including the circulating water lines. Other grading and landscaping may occur.

3.3.5 Control Mechanisms to Ensure No Recontamination

Due to the large scope of remaining structures and systems to be decontaminated and the need for some FSS activities to be performed in parallel with dismantlement activities, a systematic approach to controlling areas is established. Upon commencement of the FSS for survey areas within the Restricted Area where there is a potential for re-contamination, implementation of one or more of the following control measures will be required:

- Personnel training,
- Installation of barriers to control access to surveyed areas,
- Installation of barriers to prevent the migration of contamination from adjacent areas,
- Installation of postings requiring personnel to perform contamination monitoring prior to surveyed area access,
- Locking entrances to surveyed areas of the facility,
- Installation of tamper-evident labels or seals, or
- Upon completion of FSS, the area is placed under periodic routine survey by Radiation Protection to ensure no re-contamination occurs. If re-contamination is identified, an investigation will be initiated that would result in corrective actions up to and including re-performance of the FSS for that area.

3.3.6 Deferred Activities

3.3.6.1 Storage of Class B and C Waste

It is the decision of District management that acceptable waste disposal options for Class B and C waste do not exist at this time. As a result, the waste will be stored in the IOSB until such time as an acceptable waste disposal site is available. Once a solution is available, waste will be shipped and the building will be decontaminated as required.

3.3.6.2 Final Status Survey of IOSB

Once the IOSB is decontaminated a FSS will be performed in accordance with this LTP and a final release from the Part 50 license will be requested. The time frame for that request is currently scheduled for 2028, but depends of factors outside of District control. The request is expected to occur prior to the decommissioning of the ISFSI.

3.4 Radiological Impacts of Decontamination and Dismantlement Activities

3.4.1 Occupational Exposure

Figure 3-1 provides Rancho Seco cumulative site dose and estimates for the decommissioning project. These estimates were developed to provide site management ALARA goals. The goals are verified by summation of actual site dose, as determined by appropriate dosimetry. ALARA estimates are a compilation of work plan (radiation work permit) estimates for the period. This information is in addition to information gathered for reporting of yearly site dose in accordance with the Rancho Seco Quality Manual (RSQM), Appendix A. The annual report of occupational dose meets the guidance of NRC Regulatory Guide 1.16, "Reporting of Operating Information-Appendix A Technical Specifications," [Reference 3-8]. The total nuclear worker exposure during decommissioning is currently estimated to be less than 200 person-rem. This estimate is significantly below the 1,215 person-rem estimate of the FGEIS for immediate dismantlement and below the ten-year SAFSTOR estimate of 664 person-rem.

3.4.2 Public Exposure

Continued application of Rancho Seco's current and future Radiation Protection, Radioactive Waste, Radiological Effluent Technical Specification and Radiological Environmental Monitoring Programs assures public protection in accordance with 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Section 8.6.2 of this LTP contains an evaluation of estimated public exposure as a result of decommissioning activities including the transportation of radioactive waste as compared to the FGEIS.

3.4.3 Estimate of Quantity of Radioactive Material to be Shipped for Disposal or Processing

Rancho Seco has shipped for radioactive disposal approximately 5,560 cubic meters (196,325 cubic feet) through December 31, 2005. The estimate of remaining waste is 11,730 cubic meters (414,206 cubic feet), most of which is very low activity concrete debris from the Reactor Building interior. This volume of waste is bounded by NUREG-0586, (FGEIS) volume for the reference pressurized water reactor of 18,343 cubic meters (647,700 cubic feet).

3.4.4 Solid Waste Activity and Volume

Rancho Seco's Annual Radioactive Effluent Release Report, submitted in accordance with the RSQM and 10 CFR 50.36(a), includes a report on solid waste activity and volumes. This report is submitted before May 1st each year. A summary of solid waste disposal for 1997 through 2005 is provided in Table 3-2. Future updates may be obtained from Rancho Seco for inspection.

Table 3-2
Solid Waste Effluent Release Report Summary

Waste Type	Source	Year	Volume (m^3)	Total Curies	Principle Radionuclides
a.	Spent Resins, filter sludges, evaporator bottoms, etc.	1997 1998 1999 2000 2001 2002 2003 2004 2005	0 0 46.5 37.7 26.1 21.1 3.01 0 0	0 0 0.867 1.40 0.03 4.79 0.082 0 0	Co-60, Sr-90, Cs-137, Cs-134, Fe-55, Ni-63, H-3, C-14
b.	DAW, contaminated equipment, etc.	1997 1998 1999 2000 2001 2002 2003 2004 2005	0 196 434 498 422 946 710 799 784	0 0.025 0.89 3.12 3.99 53.7 13.2 124 131	Co-60, Cs-137, Fe-55, Ni-63, C-14, Sr-90, H-3
c.	Irradiated components, control rods, etc.	1997-2002 2003 2004 2005	0 0.166 3.17 0	0 0.599 0.0007 0	Co-60, Ni-63, Fe-55, Eu-152, Eu-154
d.	Other (primary metals, valves, piping)	1997 1998 1999 2000 2001 2002 2003 2004 2005	0 0 0.89 11.2 116 246 132 117 6.64	0 0 0.05 0.147 1.02 6.31 2.35 7.13 0.008	Co-60, Fe-55, Ni-63, Cs-137, C-14, Sr-90, H-3

3.4.5 Liquid Waste Activity and Volume

Rancho Seco also reports, in accordance with the RSQM, Appendix A, the Annual Radioactive Effluent Release Report, which includes data on liquid waste. The set of data provided in Table 3-3 provides a compilation of this information. A summary of the liquid waste effluent release reports for 1997 through 2004 is provided below. Liquid effluent release data was not available for 2005 at the time of this LTP submittal; future updates may be obtained from Rancho Seco for inspection. Releases for 2005 and 2006 are expected to be similar to 2004 releases, a small fraction of the limits. Liquid radioactive releases are expected to cease in 2007.

Table 3-3

Liquid Waste Effluent Releases

Year	Tritium Release (Ci)	Dissolved and Entrained Gas Release (Ci)	Alpha Release (Ci)	Other Fission and Activation Release (Ci)	Volume (Liters)	Volume of Dilution Water (Liters)	Max. Dose Commitment - Whole Body (mrem)	Max Dose Commitment - Organ (mrem)
1997	8.15E -03	0.00	0.00	8.07E-05	2.02E+06	1.40E+10	0.026	0.051
1998	5.50E+00	0.00	0.00	9.11E-05	2.27E+07	1.53E+10	0.094	0.147
1999	5.53E-01	0.00	0.00	5.65E-04	1.06E+06	1.69E+10	0.128	0.266
2000	2.64E+00	0.00	0.00	5.13E-04	3.61E+06	1.64E+10	0.139	0.276
2001	3.52E+00	0.00	0.00	6.50E-03	9.82E+06	1.58E+10	0.065	0.093
2002	1.15E+01	0.00	1.52E-05	1.36E-03	1.37E+07	1.68E+10	0.258	0.372
2003	1.82E+01	0.00	2.53E-05	5.55E-03	1.70E+07	1.57E+10	0.666	1.26
2004	8.73E-03	0.00	0.00	3.95E-05	4.28E+06	1.76E+10	0.010	0.023

3.4.6 Gaseous Waste Activity and Volume

Rancho Seco also reports, in accordance with the RSQM, Appendix A, the Annual Radioactive Effluent Release Report, which includes data on gaseous waste. The set of data provided in Table 3-4 provides a compilation of this information. A summary of the liquid waste effluent release reports for 1997 through 2004 is provided below. After all spent fuel was moved to the ISFSI for storage, no source for gases exists. Particulate matter is the only expected material to be released in gaseous effluents after 2002. Gaseous effluent release data was not available for 2005 at the time of this LTP submission; future updates may be obtained from Rancho Seco for inspection. Releases for 2005 and 2006 are expected to be similar to 2004 releases, a small fraction of the limits. Radioactive gaseous releases are expected to cease in early 2008.

Table 3-4
Gaseous Waste Effluent Releases

Year	Fission and Activation Gas Release (Ci)	Iodines (Ci)	Particulates (Ci)	Tritium (Ci)	Whole Body Dose, β (mrads)	Whole Body Dose, γ (mrads)	Organ Dose (mrem)
1997	0.00	0.00	0.00	1.61E+00	0.00	0.00	5.22E-02
1998	0.00	0.00	0.00	2.87E+00	0.00	0.00	9.33E-02
1999	2.84E-02	0.00	0.00	1.94E+00	1.76E-04	1.55E-06	6.59E-02
2000	0.00	0.00	0.00	1.74E+00	0.00	0.00	5.65E-02
2001	0.00	0.00	0.00	9.04E-01	0.00	0.00	2.93E-02
2002	0.00	0.00	1.07E-05	1.41E+00	0.00	0.00	1.11E-01
2003	0.00	0.00	9.91E-06	3.50E-01	0.00	0.00	6.98E-02
2004	0.00	0.00	2.13E-06	4.10E-02	0.00	0.00	1.42E-02

3.5 Site Description after License Release

Currently, no permanent buildings or structures on site are scheduled for demolition. The switchyard is in use for the Cosumnes Power Plant, the IOSB will be used for storage of Class B and C waste, the Administration Building is used as an Emergency Operation Facility for the District in case Sacramento facilities are unavailable and the Secondary Alarm Station is used by ISFSI security personnel. Various other buildings may be used for office space or maintenance activities.

The District may at some future date decide to demolish or refurbish any of the buildings or structures onsite. However, the impacted structures (Reactor Building, Spent Fuel Building and the Auxiliary Building) are unlikely to be reused or demolished in the near future.

Many possible uses for the site or portions of the site have been considered but it will remain District property and the site's most likely use would be for future electric generation due to switchyard access and water availability.

3.6 Coordination with Outside Entities

The decommissioning and termination of Rancho Seco's 10 CFR Part 50 license involves, among others, the US NRC, the US Department of Transportation, US Department of Energy, the State of California (Cal/OSHA, Cal/EPA, State Water Resources Board, Central Valley Regional Water Quality Control Board), Sacramento County and the local fire district. Chapter 8 of this LTP discusses some of the related requirements.

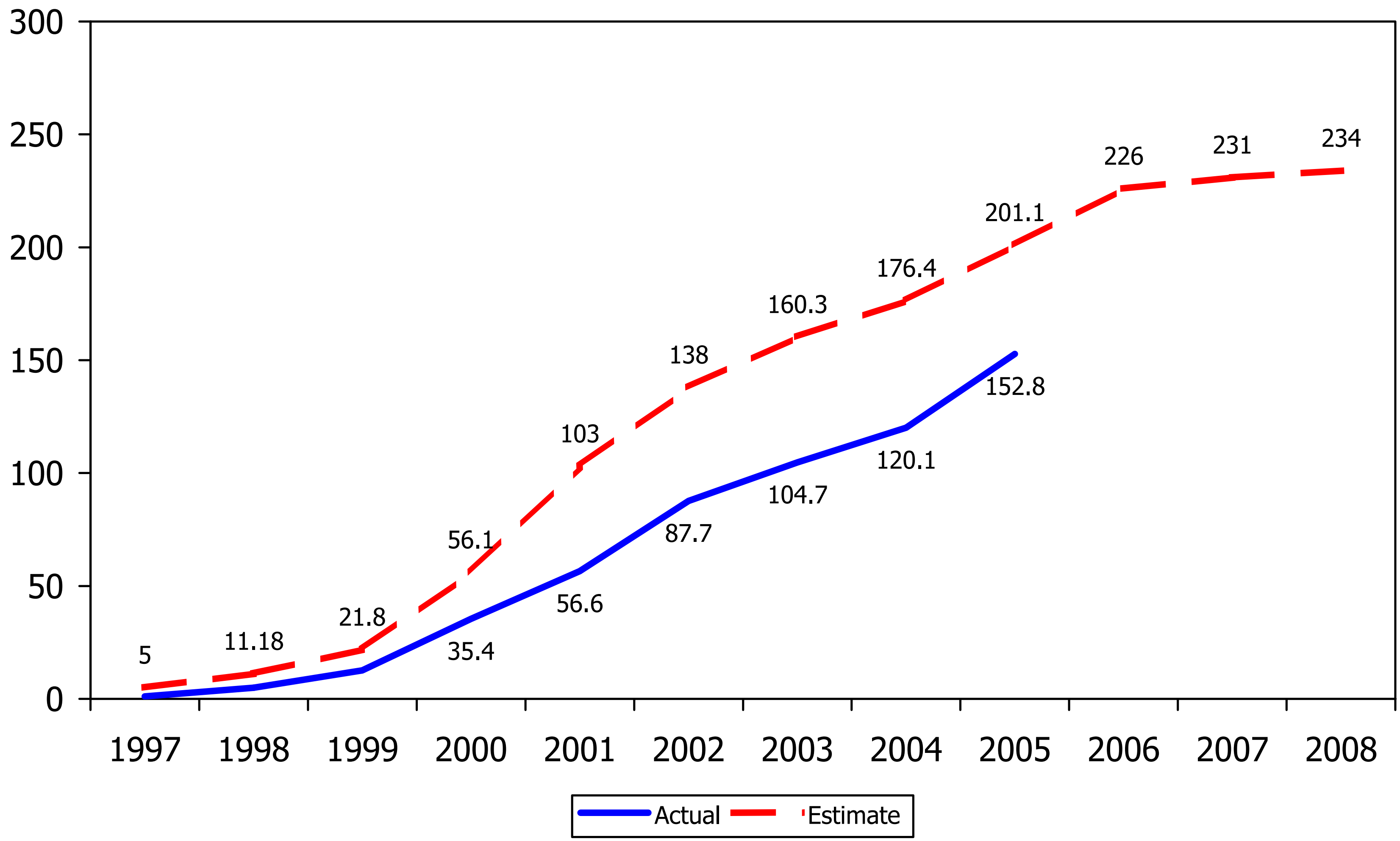

Figure 3-1
Dose-Estimate and Actual (Person-Rem)

3.7 References

3-1 U.S. Nuclear Regulatory Commission NUREG-1700, “Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans” (April 2000)

3-2 U.S. Nuclear Regulatory Commission Regulatory Guide 1.179, “Standard Format and Content of License Termination Plans for Nuclear Power Reactors” (January 1999)

3-3 U.S. Nuclear Regulatory Commission NUREG-0586, “Final Generic Environmental Impact Statement (FGEIS) on Decommissioning of Nuclear Facilities” (August 1998)

3-4 Rancho Seco Post Shutdown Decommissioning Activities Report (PSDAR), Revision 4,

3-5 Rancho Seco Defueled Safety Analysis Report, Amendment 6, October 25, 2004

3-6 Rancho Seco Unit 1, Permanently Defueled Technical Specifications, Amendment 130, September 29, 2005

3-7 Sacramento Municipal Utility District, Rancho Seco Quality Manual

3-8 U.S. Nuclear Regulatory Commission Regulatory Guide 1.16, Revision 4, “Reporting of Operating Information-Appendix A Technical Specifications, August 1975