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NQA 06-028

August 3, 2006

U.S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, DC 20555

Docket No. 50-312
Rancho Seco Nuclear Generating Station
License No. DPR-54
RANCHO SECO HISTORICAL SITE ASSESSMENT, REVISION 1

Attention: John Hickman

Attached is the Rancho Seco Historical Site Assessment (HSA), Revision 1, dated August 2006. The changes include the addition of Section 6.9.5 to address the absence of onsite disposal of radioactive materials, a revision to Figures 4.1, 6.1, and 6.2 to match those used in the LTP submittal, and other editorial corrections.

Please replace the existing HAS, Revision 0 pages from the cover page through page72 with the attached HAS, Revision 1 from the cover page through page72. Appendices A through E remain unchanged.

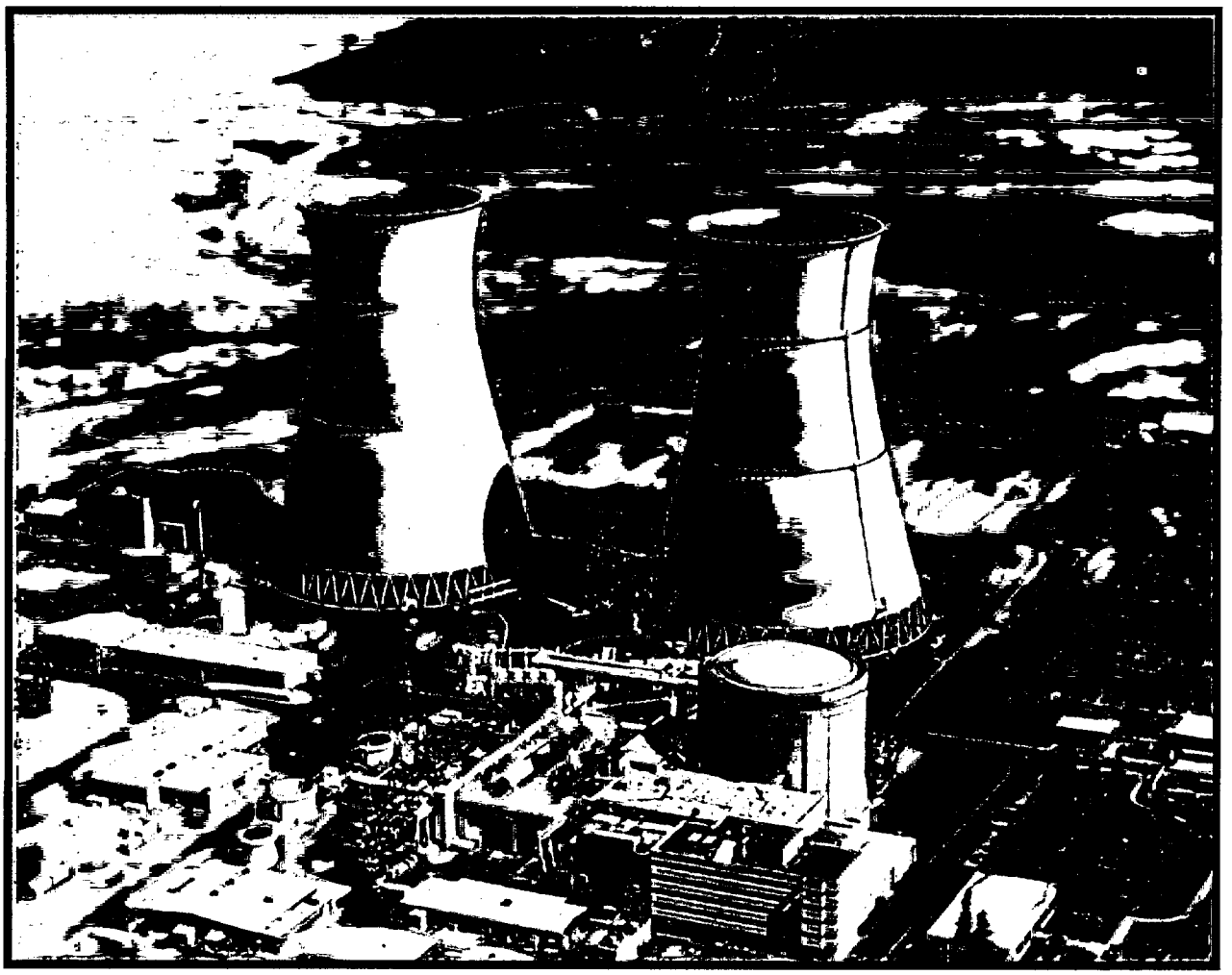
Members of your staff with questions requiring additional information or clarification may contact me at (916) 732-4843.

Sincerely,

Robert E. Jones
Supervising Quality Engineer

Cc w/ attachment: NRC Region IV

NMSS01



Sacramento Municipal Utility District
Rancho Seco Nuclear Generating Station
Historical Site Assessment

Revision 1

August 2006

Historical Site Assessment
Document Approval

REVISION SUMMARY:

Various Sections: Perform editorial corrections

Section 6.9: Added Section 6.9.5 to address the absence of onsite disposal of radioactive materials

Figures 4.1, 6.1 and 6.2: Revised figures to match those used in the LTP submittal

Decommissioning status was not updated to reflect current progress

Document Approved by: _____

Einar T. Ronningen
Dismantlement Superintendent (Radiological)

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Executive Summary

The Sacramento Municipal Utility District (herein referred to as the District) has conducted the Historical Site Assessment (HSA) of its Rancho Seco Nuclear Generating Station (RSNGS) in support of the ultimate decommissioning and license termination of the facility. The HSA, as a preliminary component in the Radiological Site Survey Investigation (RSSI), will provide guidance for subsequent activities, culminating with the final status survey (FSS) and license termination. The HSA will designate the initial segregation of the site into various Areas and Survey Units and provide guidance in the development of the procedures and maps required to document the characterization, remediation, and ultimate 10 CFR Part 50 license termination of the site when compared to the release criteria referenced in the MARSSIM standard.

The HSA was developed consistent with the methodology described in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual"; including personnel interviews, and detailed record reviews.

RSNGS operated from 1974 through 1989 within a highly regulated environment, which continues today. This highly regulated and documented environment provided a significant foundation for the development of the HSA.

The evaluations performed to date identify locations outside of the historic power block where radioactive material contamination may have occurred due to various causes such as spills or loss of material control. These locations have been designated as Impacted Areas requiring additional investigation prior to the FSS.

The District-owned and controlled property, comprised of some 2480 acres, includes the 87 acre Industrial Area site. Of the nearly 2400 acres outside of the Industrial Area, approximately 80 acres have been impacted by licensed operations. These include the Plant Liquid Effluent Discharge water course way to the Southwest of the site and the Storm Drain outfalls located to the South of the facility. These two areas have been designated as Impacted. The remaining 2300 acres outside of the Industrial Area have been designated as Non-Impacted areas. The Industrial Area is designated as Impacted based on the diversity of operations conducted in this area.

The District believes that the information contained within the HSA and the resulting conclusions for site area classifications accurately describe the radiological conditions that currently exist at the site.

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1.0 INTRODUCTION

The Sacramento Municipal Utility District (herein referred to as the District) has conducted the Historical Site Assessment of its Rancho Seco Nuclear Generating Station in accordance with the guidance of the Multi-Agency Radiation Survey and Site Investigation Manual, NUREG-1575 (MARSSIM) [Ref. 9.1] in support of the ultimate decommissioning and license termination of the facility.

The HSA formally began in July 2001, after several preliminary radiological assessments of the facility operations and their impact on remediation necessary prior to the performance of the Final Status Surveys (FSSs). These preliminary surveys, collectively referred to as the "Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station" (RCPRSNPGS) [Ref. 9.2], were conducted shortly after the shut down and termination of commercial operation of the RSNGS in June 1989.

This characterization effort was undertaken prior to the implementation of the MARSSIM guidelines and therefore, relied primarily on the guidance of NUREG/CR-2082 "Monitoring for Compliance With Decommissioning Termination Survey Criteria" [Ref. 9.3] and Nuclear Regulatory Commission (NRC) Draft Regulatory Guide DG-1005 For Nuclear Reactor Facilities. "Standard Format and Content for Decommissioning Plans for Nuclear Reactors" [Ref. 9.4]

Additional surveys had been anticipated for the RCPRSNPGS. These included Phase III surveys and the FSS, to be performed in the 2007 and 2011 time frame respectively (phases I & II having been completed prior to 1997). With the issuance of MARSSIM, these surveys will be incorporated into the MARSSIM directed site characterization, FSS design, and the District's License Termination Plan (LTP) for the facility, the schedule of which will be determined by the District's senior management.

The HSA consisted of a review of historical:

- Plant incident records;
- Plant maintenance records;
- Plant modification records;
- Plant radiological survey records; and
- Regulatory reports submitted by the District to various governmental agencies.

The HSA also included written questionnaires and oral interviews with current and past facility employees regarding historical incidents that posed potential impacts to the facility. A review of historic site aerial photographs and physical inspections of the facility were performed to verify and validate the results of the historical record reviews.

These efforts were designed to document the District's detailed knowledge of those events with a potential to impact the decommissioning of the site and final termination of its license.

Concurrent with the performance of the HSA was the initial segregation of the facility into individual *areas* and specific, uniquely identified, *survey units*. This provides the basis for

development of area/unit specific site drawings and survey maps required to document the characterization, remediation, and final release survey process. A major output from the HSA process was the information used as the basis for the preliminary MARSSIM classifications of the initial survey units.

The initial classification of the site areas is based on the historical information and site characterization data. Data from operational surveys, surveys performed in support of decommissioning, routine surveillance, or any other applicable data may be used to change the original classification of an area up to the time of the FSS as long as the classification reflects the level of residual activity existing prior to any remediation in the area.

To prevent the spread of radioactive material, Rancho Seco was designed with multiple boundaries to contain the plants' radioactive materials within its many components, systems, and structures. During the operation of the plant from 1974 through 1989, many of these systems and structures, (and many that were not designed to become contaminated) have been impacted due to the routine operations, non-routine events and maintenance activities associated with the operational and post operational history of the plant.

The most significant of these systems and structures include:

- Reactor Containment Building;
- Auxiliary Building;
- Spent Fuel Storage Building;
- Interim Onsite (radwaste) Storage Building (IOSB);
- Turbine Building;
- Solidification Building;
- Contractor Fab Shop;
- Tank Farm;
- Regenerate Holdup Tanks;
- Auxiliary Boilers;
- Main and Auxiliary Steam Systems;
- Main and Auxiliary Feed Water Systems;
- Clean Drain System;
- Component/Turbine Cooling Water Systems;
- Nitrogen Gas System;
- Service Air System;
- Discharge piping from RHUTS;
- Main circulating water basins;

- Retention basins;
- Control Rod Drive Cooling System; and
- Nuclear Service Cooling Water System.

The initial MARSSIM classification of these areas, the majority of which lie within that area comprising the historic power-block, was based on the design function of the area of concern or the areas' operational history.

These areas were given Impacted Area designations. Should subsequent investigations over the course of the decommissioning project support reclassification, the circumstances and rationale will be appropriately documented.

During the operational history of the facility, radioactive liquid spills, waste processing and storage activities, and maintenance activities on contaminated equipment and components occurred outside of the Radiologically Controlled Area (RCA) but within the Industrial Area fence line. These events have resulted in the assignment of an Impacted Area designation for the Industrial Area. Should data acquired during the course of the decommissioning project support reclassification; the circumstances and rationale will be appropriately documented.

The District-controlled property areas outside of the Industrial Area have been initially classified as Non-Impacted with the exception of Area 100000 because of the land area north of the plant effluent watercourse and the plant effluent watercourse and Area 200000 because of the storm drain outfalls within the area. These two locations will be initially managed as Impacted Areas.

The classification assignments of the areas outside of the Industrial Area have been substantiated by the non-Industrial Area surveys performed by Shonka Research Associates, Inc. (Rancho Seco Non-Industrial Area Survey Project, Final Report, June 26, 2001 [Ref. 9.17]). This project provided direct scanning of over 300,000 square meters of surface area and documented over 80,000 gamma spectral samples without detection of radioactive material of plant origin above background (spiked fields and known contamination along the effluent canal the exceptions).

The program to terminate the RSNGS license (DPR-54), including the HSA, followed by scoping, characterization, and remediation surveys will provide the information required to fully characterize the facility.

The MARSSIM process for preparing for FSS provides multiple opportunities to re-evaluate decisions reached during any phase of the program such that areas with preliminary classifications may be reclassified should subsequent information show these preliminary classifications as not justified.

The District believes the investigation associated with the development of this HSA has resulted in a knowledge base that accurately describes the areas of potential impact and provides a conservative basis for the initial classification of the site's survey units.

Based on the recommendations contained in MARSSIM, these HSA results are presented as follows:

- Section 1.0 - Introduction;

- Section 2.0 - Objectives of the Historical Site Assessment: General purpose of the Historical Site Assessment;
- Section 3.0 - Terms, Acronyms, and Abbreviations: Presents a listing of the abbreviations and acronyms used in the HSA;
- Section 4.0 - Property Identification: Physical and environmental characteristics of the facility;
- Section 5.0 - HSA Methodology: Methodology used in the development of the HSA;
- Section 6.0 - Operational History: Operational history of site including summaries of the documents providing significant information contributing to the characterization of the facility;
- Section 7.0 - Findings: HSA findings on the potential contaminates and Impacted Areas, including descriptions of the major Areas and significant Survey Units;
- Section 8.0 - Conclusions: Conclusions of the HSA;
- Section 9.0 - References: List of references applicable to the HSA; and
- Section 10.0 - Appendices: List of HSA appendices and addendums.

2.0 OBJECTIVES OF HISTORICAL SITE ASSESSMENT

The Sacramento Municipal Utility District conducted the Historical Site Assessment of the Rancho Seco Nuclear Generating Station to:

- Identify known and potential sources of radioactive material and radioactively contaminated areas including systems, structures and environmental media based on the investigation and evaluation of existing information;
- Identify areas of the site with no conceivable or likely potential for radioactive or hazardous materials contamination and assign a preliminary classification of Non-Impacted while assigning a preliminary classification of Impacted to all remaining portions of the site;
- Evaluate the potential for migration of radiological and hazardous substances beyond the boundaries of the Industrial Area or District property;
- Develop the records to be utilized during the design of subsequent scoping, characterization, remediation, and the FSS; and
- Provide preliminary information necessary to identify and segregate the site into survey units evaluated against the criteria specified in the MARSSIM guidelines for classification. This classification will designate the need for and level of remedial action required within a particular survey unit as well as the level of intensity required during the FSS.

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3.0 TERMS, ACRONYMS, AND ABBREVIATIONS

ACM: Asbestos Containing (or Contaminated) Material

AEC: Atomic Energy Commission (also USAEC)

α - Alpha: contamination with alpha emitting radionuclides when used in the context of radiological surveys. When used in the context of the statistical analysis of survey data, α will denote a Type I error (rejecting the null hypothesis when it is in fact true).

AOC: Area of Concern

β - Beta: contamination with beta emitting radionuclides when used in the context of radiological surveys. When used in the context of the statistical analysis of survey data, β will denote a Type II error (accepting the null hypothesis when it is in fact false).

BOP: Balance Of Plant

BWST: Borated Water Storage Tank

CCPM: Corrected Counts per minute. (CPM minus background CPM)

CCR: California Code of Regulations

CCW: Component Cooling Water

CFR: Code of Federal Regulations

CEQA: California Environmental Quality Act.

cm^2: Square centimeters

Co-60: Cobalt-60 (radioactive isotope of cobalt metal)

cpm: Counts per minute

Cs-137: Cesium-137 (radioactive isotope of cesium)

CSCA: Controlled Surface Contamination Area

CST: Condensate Storage Tank

DCGL: Derived Concentration Guideline Level

dpm: Disintegrations per minute (DPM, Dpm, or dpm)

dpm/100cm^2: Disintegrations per minute per 100 square centimeter surface area (or dpm/100 cm^2)

DSAR: Defueled Safety Analysis Report

DTSC: Department of Toxic Substance Control. California agency regulating hazardous materials and waste

EPA: Environmental Protection Agency (also USEPA)

FONSI: Finding of No Significant Impact

FSAR: Final Safety Analysis Report

FSS: Final Status Survey

Ft: feet

γ - Gamma: contamination with gamma emitting radionuclides when used in the context of radiological surveys.

GEIS: Generic Environmental Impact Statement

HP: Health Physics

HSA: Historic Site Assessment

IDAP: Incremental Decommissioning Action Plan

IOSB: Interim On-site (Radwaste) Storage Building

ISFSI: Independent Spent Fuel Storage Installation

LER: License (e) Event Report

LLD: Lower Limit of Detection

LTP: License Termination Plan

MARSSIM: Multi-Agency Radiation Survey and Site Investigation Manual

MDA: Minimum Detectable Activity

mph: miles per hour (or MPH)

mR/hr: millirem per hour

MSL: mean sea level

MWe: megawatt - electrical (output)

MWt: megawatt – thermal

μCi: microcurie (also μCi, μCi/g (per gram), μCi/ml (per milliliter), μCi/cc (per cubic centimeter)

NOAA: National Oceanographic and Atmospheric Administration

NPDES: National Pollutant Discharge Elimination System

NRC: Nuclear Regulatory Commission (Also USNRC)

ODCM: Offsite Dose Calculation Manual

ODR: Occurrence Description Report

OTSG: Once Thru Steam Generator(s)

PAP: Personnel Access Point

PASS: Post Accident Sampling System

PCP: Process Control Program

PDP: Proposed Decommissioning Plan

PDQ: Potential Deviation from Quality

PE: Plant Effluent

pCi: picocurie (pCi/l (per liter), pCi/g (per gram))

PUDF: Plan for Ultimate Disposition of the Facility

QA: Quality Assurance

QC: Quality Control

RB: Reactor Building (or RCB Reactor Containment Building)

RCA: Radiologically Controlled Area

RCPRSNPGS: Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station

RCRA: Resource Conservation and Recovery Act

RCS: Reactor Coolant System

REMP: Radiological Effluent Monitoring Program

RP: Radiation Protection

RSNGS: Rancho Seco Nuclear Generating Station consisting of an 87 acre Industrial Area containing the nuclear facility and a total site area of 2,480 acres

RSSI: Radiological Site Survey Investigation

RHUT: Regenerant Holdup Tank(s) (A, B, & C)

RWP: Radiation Work Permit

SAR: Safety Analysis Report

SER: Safety Evaluation Report

SMUD: Sacramento Municipal Utility District

SUID: Survey Unit Identification Number

UFSAR: Updated Final Safety Analysis Report

USAEC: United States Atomic Energy Commission (also AEC)

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4.0 PROPERTY IDENTIFICATION

4.1 Facility Characteristics

4.1.1 Licensee Identification (DPR-54)

Sacramento Municipal Utility District

Rancho Seco Nuclear Generating Station

Physical address

6201 S Street, Sacramento, California 95817-1899

Mailing address

PO Box 15830, Sacramento, California 95852-1830

4.1.2 Location

Rancho Seco Nuclear Generating Station

14440 Twin Cities Rd

Herald, California 95638

The property, herein called the site, is located in the southeast part of Sacramento County, state of California and lies either wholly or partly within Sections 27, 28, 29, 32, 33, and 34 of township 6 North, Range 8E. The nuclear reactor unit lies entirely within section 29.

The site is approximately 25 miles southeast of Sacramento and 26 miles northeast of Stockton in the central valley of California between the foothills of the Sierra Nevada Mountains to the east and the Pacific Coast range bordering the Pacific Ocean to the west. A map of the facility and location is included as Figure 4.1.

The RSNGS site consists of an approximately 87-acre fence-enclosed Industrial Area containing the nuclear facility surrounded by District-owned and District-controlled property totaling 2,480 acres.

The District constructed a 30-acre natural gas-fired power plant on the RSNGS site, approximately ½ mile south of the Industrial Area boundary. Also within the 2,480 acre site are the 560 acre Rancho Seco Reservoir and Recreation Area; a 50 acre solar power (photo-voltaic) electrical generating station; and the 10 acre, 10 CFR Part 72 licensed Independent Spent Fuel Storage Installation (ISFSI).[1]

[1] The 10 CFR Part 72 licensed ISFSI is independent of the 10 CFR Part 50 licensed facility.

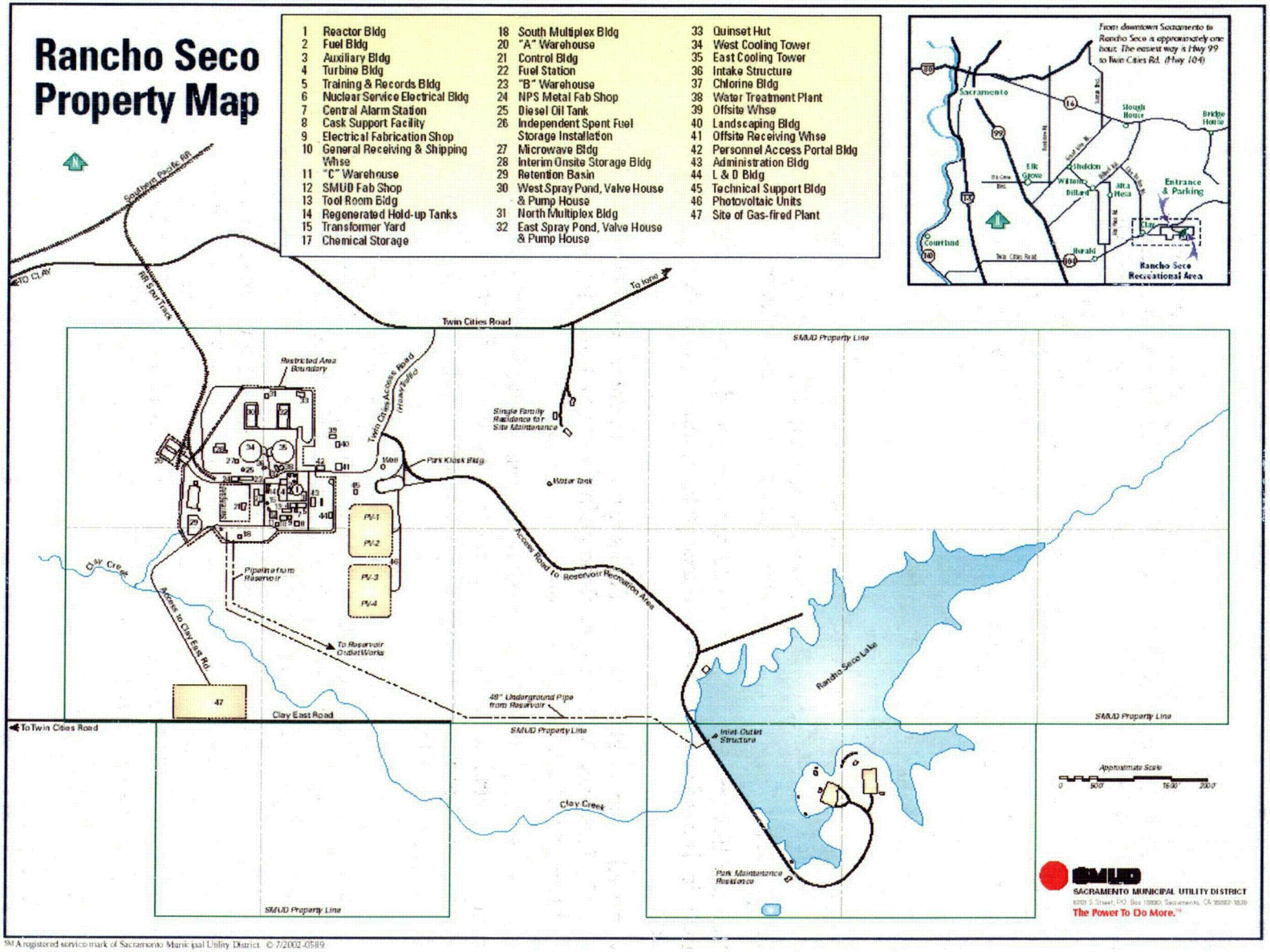

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Figure 4.1

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4.1.3 Topography

The plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. The plant's grade level of approximately 165 feet above MSL allows excellent drainage without danger of flooding. The elevation of the site acreage varies from 130 feet to 280 feet above MSL and drainage along natural gullies varies from two to six percent. Runoff from the site drains into a seasonal "No – name" creek that is a tributary to Clay creek. Clay creek empties into Hadselville creek. Hadselville creek then empties in turn into: Laguna creek south, Consumnes River, Mokelomne River, Sacramento River, into the Pacific Ocean via the Sacramento River Delta.[2]

4.1.4 Stratigraphy

Information regarding the stratigraphy of the site is taken, in part, from the FSAR [Ref. 9.5].

The stratigraphy below the site consists of a basement of Mesozoic and Paleozoic metaphoric rock, overlain with several tertiary and quaternary period formations including:

- Recent Alluvium (Qal) consisting of stream deposited gravel, sand, and silt. This material is confined to present drainage courses and ranges in depth from 0 to 5 feet.
- Older Alluvium (Qalo) consists of old stream and terrace deposits of gravel, sand, and silt. This material covers the flood plains in the southwest portion of the site and ranges in depth from 0 to 10 feet.
- Arroyo Seco formation (Qas) consists of deposits of well-rounded cobbles, pebbles, and sand derived chiefly from pre-Cretaceous sediments on pediment surfaces. This formation caps uplands in the eastern portion of the site and ranges in depth from 0 to 15 feet.
- Laguna formation (T1) consists of sand, silt, and some gravel; may or may not contain clay. Fluviatile deposits are poorly bedded, poorly exposed, and non-andesitic in composition. This is the predominant formation within the site and ranges in depth from 0 to approximately 130 feet.
- Mehrten I consists of fluviatile sandstone, siltstone, and conglomerate dominantly of andesitic detritus. Locally contains horizons of coarse andesitic agglomerate of mudflow origin. This formation has no pre-construction surface exposure and there is little possibility that any construction excavation entered this formation, which has an approximate thickness of 225 feet.

[2] The site information contained in Sections 4.1.3 through 4.2.5.8 is based on the current FSAR and has not been updated to the current date of this document.

- Valley Springs formation (Tv) consists of pumice and fine siliceous ash with much greenish-gray clay and some vitreous tuff, glassy quartz sand, conglomerate; commonly well bedded; derived largely from rhyolithic ejectamenta thrown out from the high Sierra Nevada. This formation also has no site surface exposures and an estimated average thickness of 250 feet.

4.2 Environmental Characteristics

4.2.1 Geology

Information regarding the geology of the site is taken, in part, from the FSAR.

Rancho Seco is located about 25 miles southeast of Sacramento California in the low foothills of the Sierra Nevada Mountains. The site is founded on the Pliocene Laguna Formation and is underlain by an estimated 1,500 to 2,000 feet of Tertiary or older sediments deposited on a basement complex of granite to metamorphic rocks. Field exploration included;

- 1,552 feet of bucket auger holes logged in detail;
- A 602 foot core hole visually and geophysically logged;
- 2,016 feet of small-bore hole borings that were logged and from which, soil samples were taken for laboratory analysis; and
- Approximately 11,500 feet of geophysical refraction profiles.

The resulting data from this exploration strongly indicate a lack of faulting below the Rancho Seco site.

4.2.2 Seismology

Information regarding the seismology of the site is taken, in part, from the FSAR.

There are no indications of faulting below the site. The nearest fault, located approximately 10 miles to the east of the site, is the Foothill Fault System. This system has been inactive since the Jurassic Period, some 135 million years ago. The nearest active faults, located over 70 miles to the west, are the Hayward and San Andreas.

In response to questions by the NRC, prompted by a magnitude 5.7 earthquake on a fault previously believed to be inactive near Oroville, Ca. the District commissioned the reinvestigation of potential seismic activity in the vicinity of the site (Response to NRC questions on Geologic and Seismologic Conditions, 1987 [Ref. 9.14]). The results confirmed the lack of any credible faults closer than the Foothill Fault considered in the original licensing documents.

A search of the USGS database for earthquakes with intensities greater than IV on the modified Mercalli scale (Richter scale 4.0 or larger – Table 4.1) within a 200-mile radius of the plant resulted in 846 such events.

Table 4.1
Magnitude / Intensity Comparison

Magnitude and Intensity measure different characteristics of earthquakes. Magnitude measures the energy released at the source of the earthquake. Magnitude is determined from measurements on seismographs. Intensity measures the strength of shaking produced by the earthquake at a certain location. Intensity is determined from effects on people, human structures, and the natural environment.

The following table gives intensities that are typically observed at locations near the epicenter of earthquakes of different magnitudes.

Magnitude	Intensity	Description
1.0 - 3.0	I	**I.** Not felt except by a very few under especially favorable conditions.
3.0 - 3.9	II - III	**II.** Felt only by a few persons at rest, especially on upper floors of buildings. **III.** Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 - 4.9	IV - V	**IV.** Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably. **V.** Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 - 5.9	VI - VII	**VI.** Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. **VII.** Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.0 - 6.9	VII - IX	**VIII.** Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. **IX.** Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.0 and higher	VIII or higher	**X.** Some well-built wooden structures destroyed: most masonry and frame structures destroyed with foundations. Rails bent. **XI.** Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly. **XII.** Damage total. Lines of sight and level are distorted. Objects thrown into the air.

C-02

The largest event was the 1989 Loma Prieta earthquake (Magnitude 7.1 (7.2 in other literature), Modified Mercalli IX, 160 km distant) and the nearest was a magnitude 4.3, Modified Mercalli V, quake, 45.36 miles (73 km) from the site.

Restricting the search criteria to a 50-mile (80.5 km) radius results in only three monitored events.

These results, along with the geographical positioning of the site, aerial photos, and mapping of the facility are included in Appendix D.

4.2.3 Hydrology

Information regarding the hydrology of the site is taken, in part, from the FSAR and the USAR [Ref. 9.6].

As described in section 4.1.3 Topography, above, the plant site's rolling terrain is not directly intersected by any streams; however, drainage from higher levels is well defined and intercepts with runoff streams at lower levels. Runoff from the site drains into an un-named "No-Name" creek, which in-turn empties into Clay creek. Clay creek empties into Hadselville creek. Hadselville creek then empties in turn into: Laguna creek south, Consumnes River, Mokelomne River, Sacramento River, into the Pacific Ocean via the Delta.

Within recent historical times no flooding or inundation from storms or runoff has occurred within the site boundaries. It is highly unlikely that the site could be flooded, even with abnormal rainfall intensities.

Since the commencement of operations in 1974, the only significant change in regional land use had been the conversion of several sections of land near the facility from grazing to wine grape production. An additional change of some note would be the population expansion that has occurred in the communities of Galt and Ione, Ca. According to the City of Galt Housing Needs Assessment, Administrative Draft, October 2001, the population of this historically-agricultural community, located between 10 and 15 miles from the site, doubled from 1990 to 2000 and the number of residential properties nearly doubled to almost 6000 units. While notable, the Ione expansion has not been as dramatic.

Surveys conducted by the County of Sacramento indicate that the land adjoining the site, within at least a 15-mile radius, will remain primarily for agricultural and grazing use; therefore, the rainfall runoff factors will remain constant and not cause any difference in the hydrological properties of the region.

Within this 15-mile radius, seven reservoirs or lakes of note exist. These include small, private impoundments for agricultural use (i.e., Arroyo Seco and Wallace – under 3,000 acre feet) and moderate, municipal reservoirs for recreation and domestic, municipal usage (Comanche and Pardee reservoirs and Lake Amador – up to 435,000 acre feet).

4.2.4 Hydrogeology

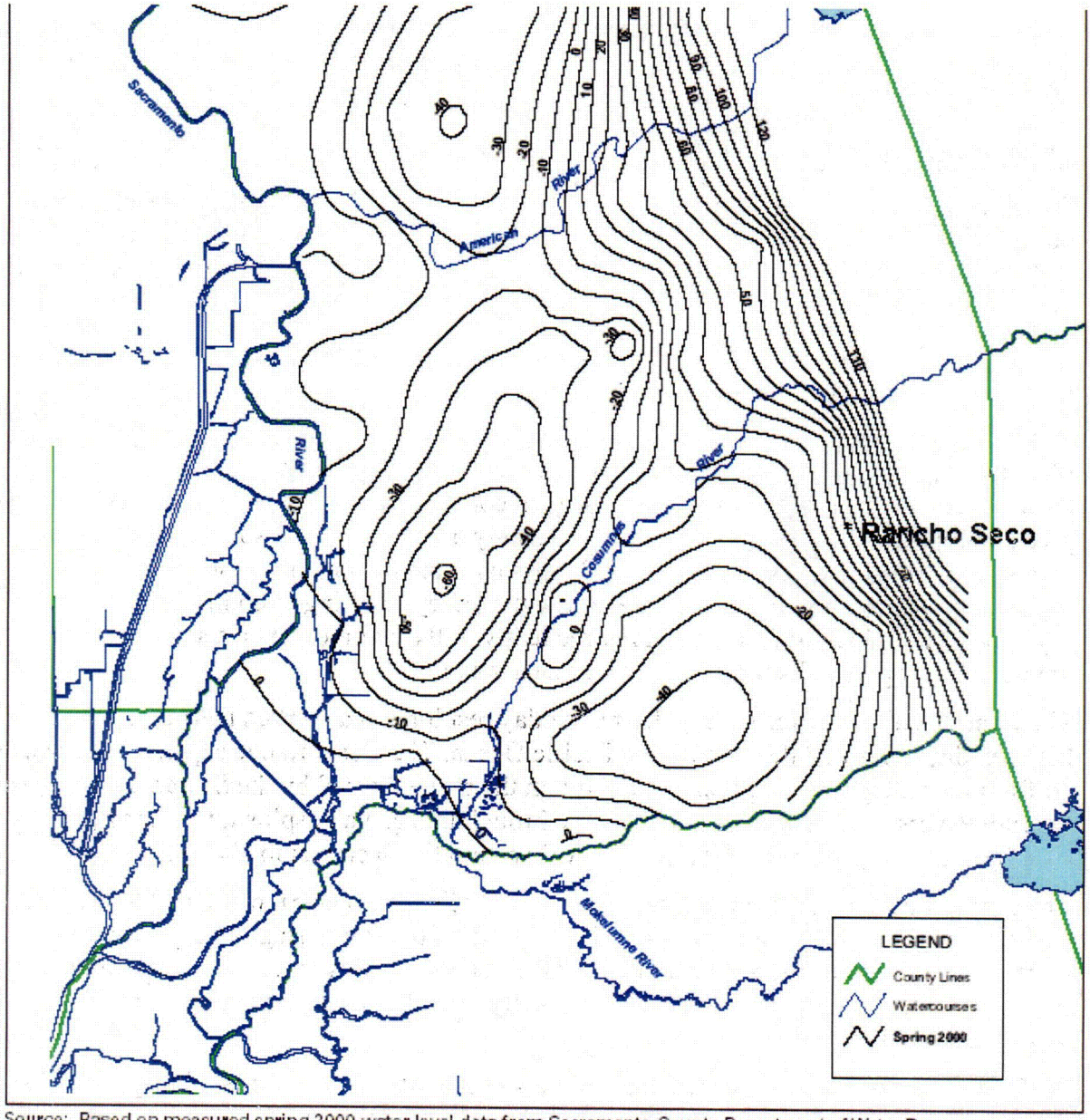
Ground water in the area is found at depths generally greater than 100 feet in the sediments of the Laguna and Mehrten Formations. The sand and gravel zones of these formations yield water readily to wells predominately west of the facility in the Central Valley. At the site

however, the formations are less permeable, and the Laguna Formation is above the water table; depth to water in the vicinity of the site is approximately 150 feet.

Ground water flow is generally to the west. West of the site the flow is affected by a conical depression resulting from the ground water pumping center to the Southwest near the town of Galt, Ca. (Figure 4.2)

Water from the Laguna and Mehrten formations is of generally good quality in the vicinity of RSNGS. It is a sodium bicarbonate-type with low total dissolved solids, generally less than 200 ppm. Potable water for RSNGS site comes from four wells producing from the Mehrten formation at a depth interval of 200-350 feet. Two wells are located within the Industrial Area, one well serving the Rancho Seco Reservoir and Recreation Area and one well serving a residence located at the northeastern corner of the site.

Studies performed during the initial sighting evaluation and documented in the FSAR, as well as several conducted since the commencement of operations (Geotechnical Investigation for Proposed Evaporation Ponds, ERPT-C0104, Rev.1, [Ref. 9.12] and the Final Engineering Report Assessment of Spent Fuel Liner Leakage, ERPT-M0221, Rev.0, 1990, [Ref. 9.13]), indicate that the permeability of the site soils result in infiltration rates (from several hundred to several thousand years) that effectively preclude any radiological impact on the aquifer or the closest well to the site by the facility.



Source: Based on measured spring 2000 water level data from Sacramento County Department of Water Resources

Contour numbers indicate feet from mean sea level (msl)

Credit: Sacramento County 2002 Zone 40 Water Supply Master Plan EIR

http://www.saccodwr.org/files/Water/EIR/Z40%20Sect%204.7%20Water.pdf

Figure 4.2

Ground Water Contour Map

C-03

4.2.5 Meteorology

4.2.5.1 General Climatology

The climate of the RSNGS site is generally that of the Great Central Valley of California. Summers are hot and cloudless and winters are mild. The rainy season occurs between October and May with more than two-thirds of the annual rainfall occurring in December through March. Heavy fog occurs in mid-winter, primarily in December and January, and may last for several days.

Incidents of severe weather, such as Tornados and thunderstorms are infrequent.

The most controlling geographical influence on climate results from the mountains, which surround the valley to the west, north, and east. During the winter, storms that pass through the area are moderated by the mountains, which collect much of the precipitation. The precipitation that does occur in the valley is usually accompanied by south to southeast winds. The cold north and northwest winds pass over the mountains to the north where the air is warmed dynamically by the descent into the valley resulting in comparatively warm, dry winds. A similar condition occurs infrequently in the summer when a steep pressure gradient develops, producing a pronounced heat wave.

The Central Valley warms greatly during the day resulting in a marked thermal contrast between the valley and the air over the Pacific Ocean. The Coast Range separates the marine air from the valley air except for a gap through the range formed by the Sacramento and San Joaquin Rivers. The heavy marine air flows through this gap and splits into a northerly flow into the San Joaquin Valley and a southerly flow into the Sacramento Valley.

The divergence zone between the two flows usually lies between Stockton and Sacramento near the site. The divergence zone is typically north of the site during the day, resulting in north to northwest winds. As the air in the valley cools, the flow decreases and calm may set in. If the drainage from the Sierra Nevada is sufficient, the winds may shift to southeasterly and increase in speed.

During the hottest mid-summer months, light westerly winds may persist all night. During the winter, the synoptic gradients prevail much of the time and the wind trajectories over the Sacramento-Stockton-RSNGS region are reasonably uniform.

4.2.5.2 Extreme Winds

Wind data from Sacramento Executive Airport from 1951 to 1971 were used to conduct an extreme wind probability distribution approximate to the RSNGS site. Table 4.2 presents the highest expected wind speed that will be expected for the indicated recurrence interval.

Table 4.2

Expected Extreme Wind Speeds

Return Period (years)	Wind speed (mph)
50	90
100	101
1000	149
10000	169

The highest recorded average wind speed for Sacramento during the period of July 1877 through December 1989 was 70 mph (recorded in both December 1952 and November 1953).

4.2.5.3 Tornados

Tornados have been recorded in California but with a frequency of only two per year (National Climatic Summary, 1969). They are generally not severe, and in many cases amount to little more than a whirlwind that may cause damage to trees and light structures. An examination of newspaper accounts of nine tornados in California indicates that only one may have been accompanied by wind speeds higher than 100 mph.

The location of a possible tornado strike can be approximated by a geometrical point. The probability of a tornado occurring at a specific point can be estimated by the principle of geometric probability. If two tornados per year are used, the return period for RSNGS is approximately 27,855 years. Because the intensity of California tornados is much less than the "classical mid-western types", winds in only one of five of these tornados would be expected to exceed 100 mph.

This information is reasonably confirmed by searches conducted of the National Oceanic and Atmospheric Administration's (NOAA) database which result in the following information.

From 1950 through 1995, California, as a whole, averaged 5 tornados per year. This relates to an average of 0.3 tornados per year per 10,000 square miles.

The annual average number of strong-violent (F2-F5) tornados in California for the same period is zero (0).

4.2.5.4 Tropical Storms and Hurricanes

The possibility of severe storms in the area can be limited to thunder storms and tornados. A discussion of tropical storms and hurricanes is not applicable to RSNGS.

4.2.5.5 Precipitation Extremes

The precipitation Climatology of the Great Central Valley is characterized by a dry season from June through September and a rainy season from October to May. No precipitation records were taken from RSNGS, but because precipitation is associated with large-scale synoptic systems, the data in Table 4.3 below, taken from the ISFSI FSAR [Ref. 9.19], are believed to be representative of the site.

The annual rainfall occurs almost exclusively in the winter months.

Table 4.3

Precipitation Climatology

Averages (inches)

Month	Sacramento	Stockton
January	3.18	2.55
February	2.99	2.46
March	2.36	2.05
April	1.40	1.14
May	0.59	0.44
June	0.1	0.07
July	0.01	0.01
August	0.02	0.01
September	0.19	0.19
October	0.77	0.63
November	1.45	1.17
December	3.24	2.66
Total	**16.29**	**13.37**

A frequency of occurrence of a given precipitation intensity for Sacramento is presented in Table 4.4 (from the ISFSI FSAR). As stated above, this data is believed representative of the conditions that exist at the site and shows that virtually all of the precipitation falls at a rate of under a quarter inch per hour.

Table 4.4

Precipitation Intensity

Year	Intensity (inches/hour)			
	0.01-0.09	**0.10-0.24**	**0.25-0.49**	**0.50-0.99**
1961	79.5%	17.7%	2.3%	0.5%
1962	81.8%	17.0%	0.8%	0.4%
1963	80.0%	17.8%	2.2%	0.0%
1964	86.2%	11.3%	2.2%	0.3%
1965	89.0%	10.0%	1.0%	0.0%
Average	**83.5%**	**14.6%**	**1.7%**	**0.2%**

4.2.5.6 Snow and Ice Storms

The possibility of severe storms in the area can be limited to thunderstorms and tornados. Snow in the Sacramento area is extremely rare. Most snow that has been observed in the Sacramento Valley occurs in January. Given the lack of significant snowfall in the region, a detailed discussion of snow and ice is not applicable to the RSNGS site.

4.2.5.7 Thunderstorms

Thunderstorms, and associated lighting strike, occur infrequently in the area, with the mean number of days per year with thunderstorm activity ranging between 5 in the Sacramento area to 3 in the Stockton area.

4.2.5.8 Restrictive Dilution Conditions (Inversions)

Inversions occur in the Great Valley as a result of cold air advection near the ground or cooling of the earth causing a cooling of the air near the ground. Radiational cooling occurs at night when there are no low clouds. Both types occur at RSNGS with the advection type usually associated with the westerly wind bringing in cool air from the Pacific Ocean.

Temperature inversions at the ground can be expected to occur every night during the summer upwards to several hundred feet. These temperature inversions are the result of the flow of cool maritime air in to the area during the late afternoon and evening hours. During the winter, shallow (a few hundred feet) but intense surface inversions can be expected occasionally during the nighttime hours under light wind conditions.

5.0 HSA METHODOLOGY

The methodology used for the RSNGS Historical Site Assessment is that found in NUREG-1575, MARSSIM. As described in MARSSIM, RSNGS, being a NRC licensee has much of the HSA related information within the records management system used to maintain its records throughout its operational history.

5.1 Approach and Rationale

The primary objective of the HSA records search process was the identification of those events posing a significant probability of impacting the hazardous or radiological characterization of the site. These included system, structure, or area contamination from system failures resulting in airborne releases, liquid spills or releases, or the loss of control over solid material management.

Each incident identified that posed a realistic potential to impact the characterization of the site was further investigated. This investigation focused on the scope of contaminant sampling and analysis, remedial actions taken to mitigate the situation, and any post-remedial action sampling, survey, and analysis in an attempt to identify the "as left" condition of the incident location. The records management system provided the source of a vast majority of the documents inspected.

Also included in the research associated with the development of the HSA were:

- Relevant excerpts from written reports and correspondences;
- Personnel interviews, including the use of questionnaires, of current, former and retired plant personnel to confirm documented incidents and identify undocumented incidents; and
- Site inspection, utilizing historic site drawings, photographs, prints, and diagrams to identify, locate, confirm, and document areas of concern.

Information from this research was used in the HSA development, including the compilation of data, evaluation of results, documentation of findings, and the characterization and identification of Areas and Survey Units.

Relevant information that becomes available following the publication of the HSA during the characterization and remediation phases of the License Termination Program will be evaluated and documented.

5.2 Documents reviewed

In researching the HSA, the records reviewed include:

- License and Technical Specification reports;
- Annual operational and environmental reports;
- Environmental investigations performed by independent entities;
- Regulatory actions against the site;

- Documentation from interviews conducted with currently employed and retired/separated site personnel;
- Radiological control surveys associated with identified events;
- Site inspection and surveillance documents associated with identified events;
- Federal, State and local regulations;
- Regulatory and Industry guidance documents;
- Annual Environmental and Operational documents;
- License Event Reports (LERs);
- Occurrence Description Reports (ODRs);
- Quality departure documents, including Potential Deviations from Quality (PDQ) and Deviation from Quality (DQ);
- Radiological and environmental survey documents;
    - Routine radioactive release reports;
    - Non-routine reports provided to the NRC under the provisions of the facility's technical specifications, 10 CFR Part 20, and 10 CFR Part 50;
    - Plant incident or condition reports;
    - Radiological assessments; and
    - Quality control/Quality Assurance finding documents.

Records maintained to satisfy the requirements of 10 CFR Part 50.75(g)(1) provided a major source of documentation for the HSA records review process.

Appendix A contains a summary of the details found in the documents reviewed. A brief incident description, radiological implications, and finding synopsis, are included.

5.3 Site Reconnaissance

As provided for in MARSSIM Section 3.5, a formal site reconnaissance was not performed, based on the continuous occupancy of the site by the licensee, the detailed information available through the records, and the personnel interviews performed. Appropriate site reconnaissance has been performed to verify locations and current conditions of items or issues discovered during these investigations.

5.4 Personnel Interviews

Between August 2001 and December 2002, approximately 150 observations were noted from the individuals contacted in the HSA questionnaire program. These individuals represented a combination of current and past employees, primarily from the operations and radiation protection staffs. These two groups were chosen due to their knowledge of and association with the systems and source terms being investigated for this assessment.

The personnel surveys included a combination of questionnaires completed by a majority of the participants as well as individual and group interviews with several of the participants.

With few exceptions, the personnel observations were corroborated by either the observations of other interviewees or documentation discovered during the records search. Table 5.1 contains a brief summary of the survey results showing the number of observations recorded for the various general areas identified. Appendix B contains copies of the questionnaire and a response summary sheet.

Table 5.1

Personnel Observations Summary

General Area of Observation	Number of Observations
Auxiliary Boiler, pad, drains sump	10
Auxiliary Building	7
"B" Warehouse	4
Barrel Farm (Waste Storage Area)	4
Balance of Plant (BOP)	14
Building Maintenance/Machine Shop	4
"C" Warehouse	2
Circulating Water Basins surrounding area	16
Fabrication and Weld Shops Building	2
Contractor Fab Shop	8
"GRS" Warehouse	1
Interim Onsite Storage Building (IOSB)	5
Non-Radiological Observations	4
Plant Effluent	4
Quonset Hut	11
Retention Basin	2
RHUT's	13
Storm Drains	5
Training and Records Laboratory	1
Tank Farm	13
Tool Room	1
Turbine Building	9
Tritium Evaporator	3
Training Simulator Building (offsite)	1
"Upper/Outer" Storage Yard	1
Sewer Plant	1

5.5 Historical Construction Photograph Review

Collections of historical construction photographs were reviewed to assess their contribution to this HSA. A selection of construction photographs is included as Appendix E. Also, additional original construction photographs are contained in the Construction Report issued by Bechtel Corporation [Ref. 9.20].

6.0 OPERATIONAL HISTORY

The following summary of the facility's history was determined through a review of site records, documents and personnel interviews.

6.1 Introduction

The RSNGS was issued its 10 CFR Part 50 operating license (DPR-54) on August 16, 1974 and attained initial criticality one month later, on September 16, 1974. The facility became commercial on April 18, 1975.

The facility is described in multiple licensing documents including:

- "Rancho Seco Nuclear Generating Station Unit 1 Defueled Safety Analysis Report" [Ref. 9.7]; and
- US Nuclear Regulatory Commission (formerly the US Atomic Energy Commission), Safety Evaluation by the Directorate of Licensing, US Atomic Energy Commission, in the matter of Sacramento Municipal Utility District Rancho Seco Nuclear Generating Station, Unit 1, " Docket 50-312 (SER) [Ref. 9.8].

RSNGS had a pressurized water reactor (PWR) designed and constructed by Bechtel Power Corporation with its nuclear steam supply system (NSSS), rated at 2,770-MWt, 913 MWe, provided by Babcock and Wilcox. Condenser cooling and make-up water was provided via the Folsom-South canal, constructed by the Bureau of Reclamation.

The RSNGS site is located in southern Sacramento County, California, approximately 25 miles southeast of Sacramento and 26 miles northeast of Stockton. The site is located on 2,480 acres entirely owned by the District. The facility is located between the Sierra Nevada Mountains to the east, and the Pacific Coast range bordering the Pacific Ocean to the west. The rural area is used almost entirely for agricultural purposes including row and silage crops, cattle graze land, and in recent years, wine grape production. Within the five-mile radius of the site, there are no significant tourist attractions or variations in population. The nearest population area is approximately 6.5 miles from the site while the closest substantial populations (>20,000) are Galt, and Lodi, CA. at 10 and 17 miles from the site, respectively. The main access to the site is State Highway 104 (Twin Cities Road), which runs from highway 99 (just north of Galt, CA) in the west, to State Highway 88 (just east of Ione, CA) to the east.

After approximately 15 years of operation, RSNGS was shut down for the last time on June 7, 1989, after passage of a non-binding referendum by the voters of Sacramento County recommending the District discontinue operation of RSNGS.

The reactor was completely defueled on December 8, 1989.

Unable to attract a buyer for the facility, the District formally notified the U.S. Nuclear Regulatory Commission (NRC) of its intent to permanently shut down the facility, requesting a possession-only license on April 26, 1990.

As noted in the "Rancho Seco Nuclear Generating Station Proposed Decommissioning Plan" (PDP) [Ref. 9.9], RSNGS operated for approximately 2,149 effective full power days (seven fuel cycles), over the course of its operating lifetime.

A summary of the operational history is provided in Table 6.1 below.

TABLE 6.1

Operational History - RSNGS

Date	Event
Oct. 1968	Received construction permit
Mar. 1969	Commenced site preparation/construction
Aug. 1974	Operating License (OL) issued
Aug. 1974	Completed initial fuel loading
Sept. 1974	Achieved initial criticality
Apr. 1975	Commenced commercial operations
Jun. 1975 – Oct 1976	Two unplanned outages to repair material deficiencies. Full power achieved in Mar. 1976. Full power regained in Oct. after 7-month stator coil outage.
1977	8 months of full power operations (75% capacity factor Jul-Dec.)
Nov. 1978	Completed cycle three refueling in 35 days
Aug. 1980	Turbine rotor failure resolved
Jun. 1982	Frequent electrical inverter trip resolution achieved
Apr. 1983	Turbine oil system associated trip issues resolved
Aug. 1984	Steam Generator repairs and Aux. Feed water modification outage
Dec 1985	Extended plant shutdown resulting from overcooling unusual event
Mar. 1986-88	Extended plant shutdown for post TMI-mod installation, emergency feed water system modifications, detailed system analysis and test program implemented, and installation of two additional backup diesel generators.
Jun 1989	Resolved feed water transient issue, completed restart testing. Public referendum voted to have SMUD discontinue operation of RSNGS. Plant shuts down for last time on June 7, 1989.
Aug. 1989	SMUD notifies NRC of its intent to seek a decommissioning amendment to its license.

TABLE 6.1

Operational History – RSNGS

(Continued)

Date	Event
Sept. 1989	District fails in its attempts to sell RSNGS or convert to non-nuclear operation.
Dec. 1989	Reactor defueling completed on December 8, 1989.
Jul. 1990	SMUD submits the Plan for Ultimate Disposition of the Facility in response to NRC request.
1991	May - SMUD submits RSNGS Proposed Decommissioning Plan (PDP) October - Board approves California Environmental Quality Act "Negative Declaration" for PDP (State clearinghouse number (SCH#) 91062072)
Mar. 1992	RSNGS OL amended to Possession Only
Mar. 1995	NRC approves PDP
1997	January - SMUD Board approves Incremental Decommissioning Action Plan (IDAP for 1997 through 1999) and California Environmental Quality Act "Subsequent Negative Declaration" (SCH# 96112047) for IDAP Post Shutdown Decommissioning Activities Report (PSDAR) Submitted IAW 10 CFR Part 50.82 (PSDAR supercedes the PDP)
1999-2000	January 1999 – SMUD Board approves IDAP – Rev. #1 (continue decommissioning through license termination) and CEQA "Subsequent Negative Declaration" for IDAP Rev. #1 (SCH#99042092)
Jun. 2000	June 30, 2000 – NRC issued SMUD a 10 CFR Part 72 license to store RSNGS's spent nuclear fuel at the ISFSI
Aug. 2002	Spent fuel transfer to ISFSI complete – TS amendments. 129 and 130 take affect – precludes SF possession on the 10 CFR Part 50 licensed facility and eliminates the need for an Operations Shift Supervisor or Certified Fuel Handlers
Oct 2002	TS amend. 131 takes effect eliminating security plan requirements from the 10 CFR Part 50 licensed facility

The fact that the plant was shut down years before the expiration of its operating license resulted is several significant impacts, two of which include:

- The District's inability to comply with the requirements of 10 CFR Part 50.75 regarding the submission of a preliminary decommissioning plan five years prior to the cessation of operations; and
- A significant shortage of funds within the decommissioning trust fund.

6.2 Decommissioning Plan Chronology

Prompted by a NRC staff request, the "Plan for Ultimate Disposition of the Facility" (PUDF), was submitted in July 1990 [Ref. 9.10]. The original intent of the licensee, as outlined in this document, was to decommission RSNGS using the SAFSTOR – Deferred DECON alternative. This alternative was to include Custodial, as well as Hardened, – SAFSTOR applications as generally defined in the "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," NUREG-0586, August 1988 (GEIS) [Ref. 9.11]. Dismantlement following the SAFSTOR period was estimated to occur in the 2008 to 2012 time frame.

On May 20, 1991, the District submitted the PDP for the Rancho Seco facility, dated April 15, 1991, for NRC approval. The District subsequently submitted supplements to the PDP for review dated April 15, August 6, & August 21, 1992; January 7, April 7, & April 19, 1993; and March 23, April 28, July 26, & October 26, 1994. After an extensive NRC staff review, the PDP was approved on March 20, 1995.

Simultaneous with this review was the amendment of the District's Operating license (DPR-54), to reflect a possession-only authorization on March 17, 1992 and the NRC staff's review of the associated safety evaluation and environmental assessment of the impacts associated with the decommissioning of RSNGS resulted an initial Finding Of No Significant Impact (FONSI), issued on June 16, 1993.

Also occurring during this period was the decision by the District to commence, in an incremental manner, the dismantlement of the site during the Custodial SAFSTOR period.

In 1991, the District Board of Directors approved the negative declaration prepared for the original PDP (Resolution No. 91-10-18) on October 17, 1991. (State Clearinghouse No. 91062072)

In January 1997, the District Board of Directors approved (Resolution 97-01-07) a significant revision to the Decommissioning Plan titled "Incremental Decommissioning Action Plan" (IDAP) and a subsequent negative declaration regarding the potential environmental impacts. (State Clearinghouse No. 96112047)

In April of 1999, the District Board of Directors approved revisions to the IDAP (IDAP – R1) accelerating the schedule of the decommissioning effort. (State Clearinghouse No. 99042092)

In accordance with the applicable provisions of the California Environmental Quality Act (CEQA), the District prepared and circulated the studies and evaluations necessary to support

the subsequent negative declarations associated with the PDP, IDAP, and IDAP – R1. This included multiple public meetings convened by the District and the NRC.

6.3 Regulatory Overview

The RSNGS has been, and continues to be, closely monitored in a highly regulated environment. Regulatory oversight is provided by an extensive collection of Federal, State, Local, and licensee personnel in addition to non-regulatory industrial peer groups and local stakeholders.

This hierarchy of oversight has carried out its various responsibilities during the sighting, licensing, construction, operations, and decommissioning phases of the plant's life and includes:

- United States Atomic Energy Commission (AEC);
- United States Nuclear Regulatory Commission;
- United States Environmental Protection Agency (EPA);
- US Army Corps. Of Engineers – Bureau of Reclamation;
- California Department of Health Services – Radiological Health Branch;
- California Department of Toxic Substance Control (DTSC);
- California Regional Water Quality Control Board;
- State Water Resources Control Board;
- California Department of Fish and Game;
- Sacramento Metropolitan Air Quality Management District;
- Local/County Governments; and
- District Regulatory affairs/licensing.

6.3.1 Permits and Licenses

Permits, issued to the District in association with the construction, operation, and dismantlement of RSNGS, are summarized in Table 6.2

TABLE 6.2

Licenses and Permits

Issuing Agency	Permit/License Number
USAEC Construction Permit – Pressurized Water Nuclear Plant	CPPR-56
USAEC SNM License	SNM-1333
USAEC Byproduct Materials License	04-14866-01
California Department of Health – Radiation Health Section Radioactive Materials License	2239-34
USAEC Possession Only License (POL)	#DPR-54
USAEC Facility Operating License (FOL issued 8/16/74)	#DPR-54
California Regional Water Quality Control Board NPDES permit	# CA0004758
California Regional Water Quality Control Board Waste Discharge Order	Annual order renewal
California Department of Health – ELAP (Environmental Lab analysis permit)	1681
County of Sacramento – Air Pollution Control District Permit to operate Steam Boiler #3677 (E-365)	#292
County of Sacramento – Air Pollution Control District Permit to operate Steam Boiler #3680 (E-360)	#293
County of Sacramento – Air Pollution Control District Permit to operate Diesel Generator (G866A)	#294
County of Sacramento – Air Pollution Control District Permit to operate Diesel Generator (G866B)	#295
County of Sacramento – Air Pollution Control District Permit to operate Diesel Generator (G100A)	#7731
County of Sacramento – Air Pollution Control District Permit to operate Diesel Generator (G100B)	#7732
County of Sacramento – Air Pollution Control District Permit to operate Gasoline Dispensing Facility	#4175
County of Sacramento – Air Pollution Control District Permit to operate Steam Boiler V-200 Reactor Pressure Vessel	None
Sacramento Regional County Sanitation District Class II discharge permit	#LWH-5/98

TABLE 6.2 (continued)

Licenses and Permits

Issuing Agency	Permit/license number
State of California Department of Public Health Laboratory Services Sanitation and Radiation Laboratory. Non-Commercial Water Laboratory.	None
Sacramento County Health Department – Environmental Health Branch Non-Community Water System Permit	#232
Sacramento County Health Department – Environmental Health Branch Non-Community Water System Permit	#302
Sacramento Metropolitan Air Quality Management District (Formerly - County of Sacramento, Air Pollution Control District) Operation of abrasive blasting booth and bag house exhaust vent	13918 & 13919
Sacramento Metropolitan Air Quality Management District Operation of stand-by diesel driven fire pump	11345
Sacramento Metropolitan Air Quality Management District Operation of 80 horse power Diesel back-up electrical generator	11344
Sacramento Metropolitan Air Quality Management District Operation of gasoline storage and dispensing station (One 4000 gallon tank with one nozzle)	13392
Sacramento Metropolitan Air Quality Management District Operation of unconfined abrasive blaster and bag house exhaust vent	13833 & 13834
Sacramento Metropolitan Air Quality Management District Operation of abrasive blasting booth and bag house exhaust vent	13769 & 13770
Sacramento Metropolitan Air Quality Management District Operation of stand-by air compressor (Gasoline driven)	11343
State of California Agricultural & Services Agency, Department of Industrial Relation, Division of Industrial Safety Operate bridge crane (TDI diesel cranes) - Load down rated	2.6.921.84
State of California Agricultural & Services Agency, Department of Industrial Relation, Division of Industrial Safety Operate bridge crane (TDI diesel cranes) – Load down rated	2.6.922.84
State of California Agricultural & Services Agency, Department of Industrial Relation, Division of Industrial Safety Operate bridge crane (IOSB crane No. Y-112)	6.25.1249.85

TABLE 6.2 (continued)

Licenses and Permits

State of California Department of Industrial Relations Division of Occupational Safety and Health Operation of Auxiliary Building grade level monorail crane No. A-1	7955
State of California Department of Industrial Relations Division of Occupational Safety and Health Operation of Reactor Building polar crane No. Y-204A	8159
State of California Department of Industrial Relations Division of Occupational Safety and Health Operation of Turbine Building gantry crane No. Y-304	8013
State of Washington Department of Social and Health Services Disposal site use permit	6170
Cooling tower transite removal /Bechtel building asbestos removal permits	Provided by contractor
State of California Department of Industrial relations Pressure vessel Permits	Various

6.4 Waste Handling Procedures

Waste materials generated at RSNGS are generally described as radioactive, hazardous, mixed (radioactive/hazardous), universal, or non-regulated.

To ensure the conformance with prescribed regulatory requirements, waste handling evolutions are controlled through various administrative and operational procedures.

6.4.1 Process Control Program (PCP)

The PCP established a program to provide the District and regulators with a reasonable assurance that the radioactive wastes generated at the facility are properly classified, characterized, processed, packaged, manifested, marked, labeled and transported in accordance with the wide spectrum of regulations governing these activities.

6.4.2 Rancho Seco Administrative Procedures (RSAP)

RSAP's provide general departmental guidance in the control of various activities within the facility including those associated with radioactive and hazardous material/waste handling.

6.4.3 Radiation Control Manual (RCM)

The RCM provides implementing procedures for the control of radioactive material including training requirements, material receipt procedures, and controls for the release of personnel and materials from the controlled area.

6.4.4 Radwaste Control Manual (RWCM)

The RWCM provides implementing procedures for the management of radioactive waste generated at the RSNGS including material receipts, waste classification, container selection, waste-stream specific processing procedures and characterization verifications.

6.4.5 Chemistry Department Procedures Manual

These procedures include chemical controls, off-site dose calculation, and radioactive effluent control implementing procedures.

6.4.6 Surveillance Procedures (SP)

SP's are used to document the performance of tests to demonstrate the effectiveness and efficiency of the various implementing procedures and performance of equipment and personnel activities associated with the waste management program.

6.5 Current Site Usage

RSNGS was shut down on June 7, 1989.

6.5.1 Description of Operations

Current operations, post fuel transfer to the ISFSI, center on the administrative, technical and physical tasks associated with the dismantlement of the RSNGS.

In August 2002, the transfer of spent fuel from the spent fuel pool to the ISFSI was completed and RSNGS transitioned into the Defueled Technical Specifications, greatly reducing the procedural and operational controls required at the facility.

6.5.2 Preliminary Site Characterization

The initial characterization of the RSNGS site resulted from the review and evaluation of surveys and evaluations previously conducted to determine the extent and nature of residual contamination. In accordance with the guidance of MARSSIM, this initial site characterization (as to the Impacted or Non-Impacted nature of the site) began in 2001 and was completed in 2002. The HSA including the initial site characterization is the product of the evaluations and investigation necessary to define the current condition at the site and assign preliminary Area classifications. This effort also addressed the hazardous material and "state-only" regulated material at the site that may impact future remediation/dismantlement.

6.6 Site Dismantlement

6.6.1 Dismantlement activities within the Power Block

As of January 2003, the decommissioning project has removed virtually all (with the exception of imbedded or buried piping) of the secondary plant systems including:

- Main Steam;
- Auxiliary Steam;
- Main Feed Water;
- Main Condensate and Make-up;
- Main Circulating Water Pumps;
- Main turbine and Condenser; and
- The vast majority of the support systems located in the Turbine Building.

Within the Auxiliary Building, a majority of the systems have been removed. Spent Fuel Building dismantlement began in October 2002.

Within the Reactor Containment Building, significant progress has been made including removal of all four reactor coolant pumps and motors, a substantial portion of the reactor coolant system, reactor building ventilation system, and support/electrical/mechanical systems.

6.6.2 Dismantlement activities outside the Power Block

Dismantlement activities outside of the facility power block are directed at the removal of temporary buildings and structures and are being carried out in accordance with standard site procedures for the release of potentially contaminated materials and equipment. Final Status Survey's will be conducted of the "footprint" left from these structures' dismantlement to verify that no residual contamination above the established derived concentration guideline level (DCGL) will remain following license termination.

6.7 Radiological Sources

The majority of regulated waste resulting from the decommissioning of the RSNGS will result from the radiological contamination of plant structures and equipment. The primary source of this contamination was the operation of the facility nuclear reactor and its associated support systems. Based on information developed for the IDAP (section 3.1.3), the radiological inventory of the facility is described in the following sections.

6.7.1 Spent Fuel

The largest single contributor to the radioactive inventory at the facility was spent fuel. Based on estimates performed in 1989, 140,800,000 curies, consisting of primarily (~70%) Cs-137, Pr-144, Ce-144, Ba-137m, Sr-90, Y-90, Pm-147, and Pu-241 remain. This will decay to approximately 39,630,000 curies by 2009 with Cs-137, Ba-137m, Sr-90, Y-90, and Pu-241 representing over 97% of the remaining activity.

6.7.2 Irradiated Hardware

Non-Fuel contributors to the radiological inventory, estimated at approximately 95,000 curies of primarily (>99%) Co-60, Fe-55, and Ni-63, include:

- Orifice rod assemblies (ORA's);
- Burnable poison rod assemblies (BPRA's);
- Retainer assemblies (RA's); and
- Incore instruments.

The ORA's, BPRA's, and RA's were transferred to the ISFSI, along with the spent fuel. The incore instruments were sectioned for shielded storage pending transfer to the ISFSI. The activity associated with these irradiated components will decay to under 9,000 Ci of Co-60 and Ni-63 by 2009.

6.7.3 Reactor Vessel and Internals

As of May 1, 2003, approximately 99,500 curies of primarily (>61%) Co-60, comprised of reactor pressure vessel internals and the reactor pressure vessel, are contained within the primary shield wall [Ref. 9.21].

6.7.4 Plant Systems

Systems internally contaminated by the operation of the RSNGS have been characterized repeatedly during plant operations. The most substantial of these characterizations was performed in 1984 by Pacific Northwest Laboratory (PNL-1546, 1984) [Ref. 9.22] showing an estimated 4,500 curies resulting primarily of (>88%) Fe-55, Co-58, Ni-63, and Co-60.

6.7.5 Industrial Area Contamination

Several areas within the Industrial Area have been identified as having been radiologically impacted by the operation of the facility including:

- Retention Basins;
- Tank Farm;
- Barrel Farm;
- Regenerant Hold Up Tanks (RHUT's);
- Storm Drains;
- Oily Water Separator;
- Cooling Tower Basins; and
- Turbine Building drains and sumps.

6.7.6 Non-Industrial Area Contamination

Four locations outside of the Industrial Area have historically had radionuclide concentrations detected above background.

6.7.6.1 Discharge Canal Sediment

The plant discharge canal sediment has shown detectable concentrations of licensed radioactive material resulting from 10 CFR Part 20.2001(a)(3) authorized radioactive liquid releases. This release path has been the subject of numerous studies by the facility staff as well as the Lawrence Livermore National Laboratory (LLNL) and is routinely monitored via the Radiological Environmental Monitoring Program. As discussed in the PDP, the most recent of the LLNL studies (UCRL-ID-106111, November 1990) reported maximum radioactive sediment concentrations of 1.47 pCi/g Co-60 (April 1989), 1.20 pCi/g Cs-134 (January 1989), and 11.00 pCi/g Cs-137 (January 1989) at points within 1,640 feet (0.5 kilometer) of the plant effluent discharge point (0.3 km for January 1989 sampling, 0.5 km for April 1989 sampling).

Current (March 1, 2004) concentrations can be estimated to be $\leq$ 0.207 pCi/g Co-60, 0.007 pCi/g Cs-134, and 7.74 pCi/g Cs-137 (based on the radioactive decay of the 1989 results). Washout and other transport mechanisms will have also affected the concentrations of radioactive material in the effluent discharge path. RSNGS will update the status of this source term as additional studies are completed.

Oak Ridge National Laboratory also evaluated the environmental impact of the authorized radioactive liquid releases for the NRC. This evaluation was applied to both onsite and offsite locations. The results of this evaluation are documented in NUREG/CR-4286, Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant [Ref. 9.15].

As part of the Radiological Environmental Monitoring Program and reported to the NRC in the 2002 Annual Radiological Environmental Operating Report [Ref. 9.16], 24 samples of sediment were collected from the discharge canal and the Clay/Hadselville/Laguna Creeks during 2002. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 in the range of 0.017 to 0.604 pCi/g with a mean of 0.111 pCi/g and Co-60 in the range of 0.008 to 0.035 pCi/g with a mean of 0.021 pCi/g.

6.7.6.2 Discharge Canal Soil

During plant operation and during the period of authorized radioactive liquid releases, discharge canal sediment was dredged from the canal and deposited as a band adjacent to the canal. Because the discharge canal sediment was known to contain radioactive materials of plant origin, sampling of the soil adjacent to the discharge canal was added to the Radiological Environmental Monitoring Program. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, eight soil samples were collected from this area. Cs-137 was identified in seven out of eight of these samples at a concentration range of 0.042 to 0.266 pCi/g.

6.7.6.3 Depression Area Soil

The depression area is an onsite location adjacent to "No Name" Creek. The discharge canal, discussed above, flows into "No Name" Creek. On occasion and during periods of authorized radioactive liquid releases, "No Name" Creek overflowed and collected in the depression area. Because of this, sampling of the soil in the depression area was added to the Radiological Environmental Monitoring Program. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, 14 soil samples were collected from this area. Cs-137 was identified in 12 of these 14 samples at a concentration range of 0.070 to 48.15 pCi/g. Cs-134 was identified in two samples at a concentration range of 0.060 to 0.177 pCi/g. Co-60 was identified in six samples at a concentration range of 0.086 to 1.10 pCi/g.

6.7.6.4 Storm Drain Outfall

The Radiological Environmental Monitoring Program has routinely identified low levels of radioactive materials of potential plant origin in soil samples taken at storm drain locations. As reported to the NRC in the 2002 Annual Radiological Environmental Operating Report, 30 soil samples were collected from 15 storm drain outfall locations during 2002. Gamma spectrometry analysis of these samples indicated the presence of Cs-137 in the range of 0.013 to 0.102 pCi/g with a mean of 0.043 pCi/g and Mn-54 in one sample at a concentration of 0.007 pCi/g.

During the fourth quarter of 2000, Shonka Research Associates, Inc. (SRA) conducted detailed surveys of selected areas outside of the Industrial Area. These surveys were conducted to support consideration of an area south of the Industrial Area proposed for the Cosumnes Power Plant (CPP) to be constructed on the RSNGS site. The surveys also determined the boundary of any Impacted Areas and determined background survey values for comparison to Impacted Area values. These surveys included scan surveys conducted using the Subsurface Multi-Spectral Contamination Monitor (SMCM) system developed by SRA, fixed point *in situ* NaI(Tl) spectroscopy measurements and soil sampling for laboratory analysis. To manage the surveys, the site was divided into twelve survey areas. Non-Impacted Areas required 10% areal scan surveys and Non-Impacted Areas bounding Impacted Areas required 50% areal scan surveys.

The final report on these surveys noted that due to several factors, including the marshy conditions of the fields to the south of the plant, several *in situ* sample points had to be relocated. According to the study's authors, this relocated configuration represented the best combination of complete west-east coverage along the storm drain outfall area to the south of the plant.

The SMCM scan and the *in situ* measurement survey results for the outfall area immediately south of the Industrial Area and for the proposed CPP location showed no evidence of plant-derived contaminants in these areas. Cs-137 MDCs for the SMCM scans of these areas ranged from 0.26 to 0.77 pCi/g and for *in situ* measurements from 0.31 to 0.40 pCi/g. Two out of five soil samples from these areas tested positive for Cs-137 at a range of 0.03 to 0.30 pCi/g with an analysis MDA of 0.03 pCi/g.

NUREG/CR-4286 established Cs-137 background concentrations in the vicinity of RSNGS. Four locations, at distances of 4 to 10 miles from RSNGS and lying approximately north,

south, east and west of the site. The average concentration of Cs-137 in these locations was 0.41 pCi/g. Decaying this average value from December 1984 (the approximate sampling date for NUREG/CR-4286) to December 2002 gives a background concentration of 0.27 pCi/g.

6.7.6.5 Comparison of Soil Concentrations with NRC Screening DCGLs

As discussed above, Mn-54, Co-60, Cs-134 and Cs-137 have been identified at concentrations above background in four locations outside of the Industrial Area. On December 7, 1999 the NRC published screening DCGL values in the Federal Register [Ref. 9.18] for various common radionuclides. These screening DCGL values may be used to evaluate the significance of the soil contamination found outside of the Industrial Area.

The published NRC generic screening DCGL values are as follows:

Mn-54	15 pCi/g
Co-60	3.8 pCi/g
Cs-134	5.7 pCi/g
Cs-137	11 pCi/g

Based on these values, the discharge canal sediment, the discharge canal soil and the storm drain outfall soil will likely not exceed site-specific DCGL values. The depression area soil does exceed the NRC screening DCGL values. However, it must be compared with site-specific DCGL values developed for surface soils before determination if remediation is necessary.

6.8 Waste Stream Description

6.8.1 Hazardous Materials/Wastes

The RSNGS site contains a variety of hazardous materials. The use, storage, handling, and disposal of these materials are controlled through the same procedures and programs used during the operation of the facility. In addition to the material management programs in place, the District complies with the OSHA Hazard Communication Standard (29 CFR Part 1910.120) that requires all employers to provide information to its employees about the hazardous substances that they may come into contact with. This is accomplished through the District's Hazard Communication Program that includes training, labeling, other forms of warning, and the availability of Material Safety Data Sheets (MSDS). The District is not abandoning the site, nor do they intend to discontinue the possession or use of hazardous materials or any permits associated with their use. Therefore, the review of hazardous material events for this HSA has not been performed in the same detail as would be done for a site that is to have an unrestricted release from the aspect of hazardous materials.

6.8.1.1 Universal Waste

Universal waste means any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR Part 273:

- Batteries as described in 40 CFR Part 273.2;
- Pesticides as described in 40 CFR Part 273.3; and
- Thermostats as described in 40 CFR Part 273.4.

Additionally, in accordance with California regulatory requirements, "the hazardous wastes listed in this section are exempt from the management requirements of chapter 6.5 of division 20 of the California Health and Safety Code and its implementing regulations except as specified in chapter 23 and, therefore, are not fully regulated as hazardous waste. The wastes listed in this section are subject to regulation under chapter 23 and shall be known as "universal waste."

- Batteries as described in section CCR 66273.2;
- Thermostats as described in section CCR 66273.4;
- Lamps as described in section CCR 66273.5;
- Cathode ray tube material as described in CCR 66273.6;
- Aerosol cans as specified in Health and Safety Code section 25201.16;
- Mercury-containing motor vehicle light switches as specified in Health and Safety Code section 25214.5 (M001 Wastes) and motor vehicles that contain such switches, as described in section 66273.7.1);
- Non-automotive mercury switches and products that contain such switches (including, but not limited to, M002 Wastes), as described in section 66273.7.2;
- Mercury-containing pressure or vacuum gauges, as described in section 66273.7.4;
- Mercury counterweights and dampers, as described in section 66273.7.6;
- Mercury thermometers, as described in section 66273.7.7;
- Mercury dilators and weighted tubing, as described in section 66273.7.8;
- Mercury-containing rubber flooring, as described in section 66273.7.9; and
- Mercury gas flow regulators, as described in section 66273.7.10.

6.8.1.2 RCRA Waste

The California DTSC and EPA regulate the packaging, storage, processing and disposal of listed or characteristic waste materials. RSNGS must demonstrate compliance with both the federal EPA and State program requirements. Material at RSNGS in this category include:

- Polychlorinated Biphenyls (PCBs);
- Asbestos-Containing Material (ACM);
- Laboratory solvents and reagents;
- Chrome containing waste materials;

- Lead waste;
- Mercury waste from instrumentation;
- Cadmium waste;
- Corrosive waste from laboratory and cleaning processes;
- Spent aerosol cans;
- Ignitable waste from Laboratory and maintenance activities; and
- Paint related waste solvents from maintenance activities.

6.8.1.3 Mixed Waste

Mixed wastes are those wastes regulated by the EPA or equivalent state agency, that are also contaminated with radioactive material. At RSNGS, these wastes include,

- Mercury from radioactive system sampling or monitoring instrumentation;
- Chromium containing radioactive air filters generated during decommissioning;
- Radiologically contaminated solvent from the laboratory and painting and decontamination processes; and
- Radiologically contaminated lead from shielding and paint.

6.8.2 Low Level Radioactive Waste (LLRW)

Low level radioactive waste means those waste materials contaminated with radioactive material. LLRW is collected, characterized, classified, packaged and shipped for either processing or disposal at appropriately licensed facilities.

Between 1974 and 1990, RSNGS made 459 LLRW shipments in support of facility operations.

309 dry solid shipments ~ 147,000 ft^3

150 bulk liquid shipments ~ 458,000 gals. (Prior to the discontinuation of liquid waste shipments in 1980).

After the station's shut down in 1989, the site made only 8 waste shipments totaling less than 4,500 ft^3 between 1990 and 1992 and did not ship radwaste again until 1997 when dismantlement activities in the Turbine building commenced. The original decommissioning waste volume estimate, based on the 1991 PDP, was estimated to be approximately 200,000 ft^3.

This material can include:

- Dry Active Waste (DAW) – paper, plastic, glass, wood, used PPE, scrap metal, floor sweeping, etc.;
- Contaminated asbestos insulation material;

- Soil and soil like debris including rubblized concrete and asphalt from various site yard areas;
- Equipment, tanks, pumps, motors, generator, and other metal components;
- Sludge's – organic and inorganic solids from tanks, pipes, and pumps; and
- Charcoal – contaminated filter media used to filter liquid process system and ventilation systems.

Since the commencement of incremental decommissioning in 1997, several changes to the volume estimates and inventories have been made as well as significant progress in the dismantlement and disposal of wastes. Spanning the period 1997 to 1999, the successful incremental phase of the decommissioning project demonstrated that decommissioning could be effectively undertaken by completing the dismantlement and disposal of the secondary system at a cost avoidance of approximately 42 million dollars over what had been estimated.

This success provided the basis for the Board's approval of full scale decommissioning, which commenced in 2000.

The progress of the decommissioning program to date (December 31, 2003) and the revised projection of remaining waste volumes are summarized below.

Class A

- Shipped to date ~190,000 ft^3
  - Processors ~ 59,000 ft^3
  - Disposal ~ 131,000 ft^3
- Remaining ~ 123,274 ft^3

Class B

- Shipped to Date - none
- Remaining ~ 949 ft^3

Class C

- Shipped to date - none
- Remaining ~ 424 ft^3

GTCC –

The estimated volume of Greater than Class C (GTCC) waste, resulting from the dismantlement of the reactor internals, is approximately 48.4 cubic feet. Current plans call for the amendment of the ISFSI 10 CFR Part 72 license to accommodate the storage of the GTCC material within the ISFSI until its final disposition, anticipated to be in the Spent Fuel Repository.

6.8.3 Spent Fuel

The spent fuel transfer to the ISFSI was completed in August 2002. Spent fuel will remain in the ISFSI until the Federal Spent Fuel Repository becomes operational, sometime after 2010 based on current estimates attained from the Department of Energy's Yucca Mountain Project website.

6.9 Incident Descriptions

Based on the review of existing plant records (annual and semi-annual reports, licensee notifications, Occurrence description reports, and PDQ's) approximately 260 incidents with radiological or hazardous material implications occurred between commencement of plant operation in 1974 and approval to continue decommissioning through license termination in 1999. A number of these took place within the power block and, while contributing to the radiological contamination of the power block structures, were generally contained within the RCA. Those occurring outside of the power block have contributed to the Impacted classification of substantial portions of the Industrial Area. These include:

- Airborne releases with structural or geological contamination potential;
- Spills outside of the power block or incidents involving potential contamination based on system leakage from systems that had been historically contaminated by primary to secondary leaks;
- Loss of control of radioactive materials resulting in the potential for contamination outside of the power block;
- Plant liquid radioactive effluents resulting in soil contamination;
- Hazardous material spills or losses of control; and
- Contamination of systems not originally designed as radioactive systems outside of the historic power block.

A summary index of these incidents is included as Appendix A.

6.9.1 Radiological Spills

The records search showed that between 1974 and 1999, 158 documented spills occurred at the facility. Less than forty of these documented spills occurred within the power block and, while contributing to the radiological contamination of the power block structures, were generally contained within the radiologically controlled drains and waste systems. These spills and releases can be grouped into three basic categories as described below.

- Spills that were ultimately contained within the site's controlled process drain system (including the oily water separator, RHUT's, and retention basins), contaminating the surfaces between the spill site and drain;
- Spills ultimately entering the site's uncontrolled storm drain system contaminating the drain system as well as the surfaces between the spill site, the drain and the outfall; and

- Spills resulting in the saturation and contamination of the media in the immediate area surrounding the spill (i.e., concrete, soil, asphalt, gravel, etc.).

These spills generally resulted in the affected areas being designated as Impacted Areas for FSS design purposes.

6.9.2 Chemical Spills

The records search revealed that between 1974 and 1999, twenty-eight documented cases involving the mishandling or loss of control over hazardous chemical materials exist. These range from spills of acids and caustics used in the plant's various systems to anti-freeze and transmission fluid from District vehicles. There were a minimal number of chemical spills occurring outside of the building comprising the historic power block. A majority of these occurred within one of the facility's structures.

These spills were controlled and remediated in accordance with the policies and procedures associated with these occurrences, including:

- Ranch Seco Hazardous Materials Business Plan;
- RSAP – 0229, Hazardous Waste Management;
- RSAP – 0223, Oil Spill Prevention, Control, and Countermeasures;
- OP-C-32, Onsite Oil Spill;
- OP-C-46A, Hazardous Material Spill/Release; and
- Rancho Seco Emergency Plan.

6.9.3 Loss of Material Control

The records search showed that between 1974 and 1998, there are 12 documented cases regarding the loss of control of radioactive material or material contaminated with radioactive material resulting in the potential for contamination spread in the immediate vicinity. Areas affected by these incidents will be initially classified as Impacted Areas.

6.9.4 System Cross-Contamination

Starting in 1975, with indications of cross contamination of the CCW system from the RCS and expanding dramatically in 1981 with the first indications of primary to secondary leakage through the OTSGs, systems not originally expected to contain radioactivity became contaminated. The level of contamination varied from system to system and in general, was minimal.

In accordance with plant chemistry and surveillance procedures, open cycle and closed cycle cooling systems, auxiliary systems, tankage, and standing water were routinely monitored. In accordance with the guidance of NRC IE Notice 80-10, non-contaminated systems were routinely monitored for radioactivity, and those systems with measurable activity were evaluated (typically through an Engineering or 10 CFR Part 50.59 review process) for potential impacts against the 10 CFR Part 50, Appendix I criteria.

The potential exists for leaks from these systems to have resulted in the contamination of additional site systems and locations not originally expected to be contaminated.

Based on the records search performed for the HSA investigation, 165 documented cases involving events of this nature occurred during the operation of RSNGS. These areas, primarily within the Turbine Building and Tank Farm, are classified as Impacted Areas.

6.9.5 Onsite Disposal of Licensed Radioactive Materials

The records search and personnel interviews did not reveal any indication of onsite disposal of licensed radioactive materials. Also, a database search of communications with the AEC/NRC did not reveal any requests for approval of proposed alternate disposal procedures under the provisions of 10 CFR 20.302 or 10 CFR 20.2002. Therefore, the District concludes that onsite disposal of radioactive materials has not occurred at this site.

6.10 Survey Unit Identification and Classification

6.10.1 Site Classification

The identification, designation, and classification of individual survey units are an ongoing process that will be completed prior to submittal of the Final Status Survey Plan contained within the License Termination Plan.

6.10.2 Assessment Performance

The Site Characterization working group of the Decommissioning Planning Team will perform the assessments required to assign preliminary Area and Survey Unit classifications, and Survey Unit identification codes to the site.

6.10.3 Areas

The entire 2,480 acre site is divided into Areas. Areas are typically larger physical sections of the site that may contain one or more survey units depending on their classification. Areas that have no reasonable potential for residual contamination are classified as Non-Impacted Areas. These Areas have no radiological impact from site operations and are typically identified early in decommissioning. Areas with reasonable potential for residual contamination are classified as Impacted. Impacted Areas of the site are depicted in Figure 6.1, Impacted Area Designations. Areas of the 2,480 acre site not depicted in Figure 6.1 as Impacted are classified as Non-Impacted.

6.10.4 Survey Units

A Survey Unit is a physical area consisting of buildings, structures, or land areas of specifically defined shapes and sizes, for which a unique decision will be made regarding if the presence of any residual radioactive material meets or exceeds predetermined release criteria. A Survey Unit is a single contiguous area, whose size is dependent upon its physical characteristics (open land vs. structural building, dry hillside vs. wetland marsh), radiological conditions (Impacted vs. Non-Impacted, remote material storage area vs. a CSCA), and whose operational conditions are reasonably consistent with the exposure modeling used to

determine the classification. (A Survey Unit will carry a single classification as described in table 6.3. An area whose physical or radiological conditions mandate multiple classifications will be divided such that each Survey Unit will have a single, consistent classification.)

6.10.5 Initial Designation of Areas

Using reasonable and available physical and documented references, nine Areas were identified and assigned Area identification numbers. Except as noted below, Areas one (100000) through seven (700000) are located outside of the Industrial Area while Area eight (800000) is comprised of the entire Industrial Area. Area nine (900000) contains all portions of the 2,480 acre site not included in Areas one through eight.

Current Area designations (coordinates as referenced on SK-RP-0001, Radiological Characterization Plot Map) are:

- Area 100000, Plant Effluent Water Course bounded by AA2, AA16, AF16, AI18 and AY2 (back to AA2);
- Area 200000, South Plant Outfall bounded by AI19, AI39, AO39, and AO13 (back to AI19);
- Area 300000, Southern region bounded by AY2, AP13, AP39, and AZ39 (back to AY2);
- Area 400000, South Eastern region bounded by Y40, Y66, AY66, and AY40 (back to Y40);
- Area 500000, North Eastern region bounded by AE37, T37, U35, V35, V38, X38, X66, and AE66 (back to AE37) – Note: Area 5 contains two Impacted Survey Units; one that is bounded by Q40, R40, R37, U37, U35, V35, V38, X38, X44, and Q44 (back to Q40) plus one consisting of those cells through which the access road to highway 104 passes;
- Area 600000, Northern region bounded by AE2, L2, L36, and AE36 (back to AE2);
- Area 700000, Western region (excluding ISFSI and that portion transversed by the railroad spur) bounded by M2, M20, N20, Q19, U19, W16, Z16, and Z2 (back to M2);
- Area 800000 – Those portions of the District-controlled Rancho Seco property not included in and surrounded by SA01-SA07. Area 800000 (SA08) is also commonly referred to as the Industrial Area and lies primarily within the industrial area fence with the notable exception of parking areas located to the east of the site. (bounded by M21, N21, P19, U19, X17, AF17, AH19, AH39, Y39, Y37, W37, W34, T34, T36, and M36 (back to M21)); and
- Area 900000 – Those portions of the District-controlled Rancho Seco property not included in Areas 100000 through 800000.

Areas of the site are depicted in Figure 6.2, Area Designations.

6.10.6 Survey Unit Designation Program

The Impacted Areas are being further subdivided into survey units and assigned a unique Survey Unit Identification Number (SUID) along with a preliminary classification. Descriptions of the initial Survey Units identified are provided in Appendix C. These initial Survey Units may be either further divided or combined and will be classified during design of the FSS.

The guidance provided by the MARSSIM Classification matrix is provided in Table 6.3 below.

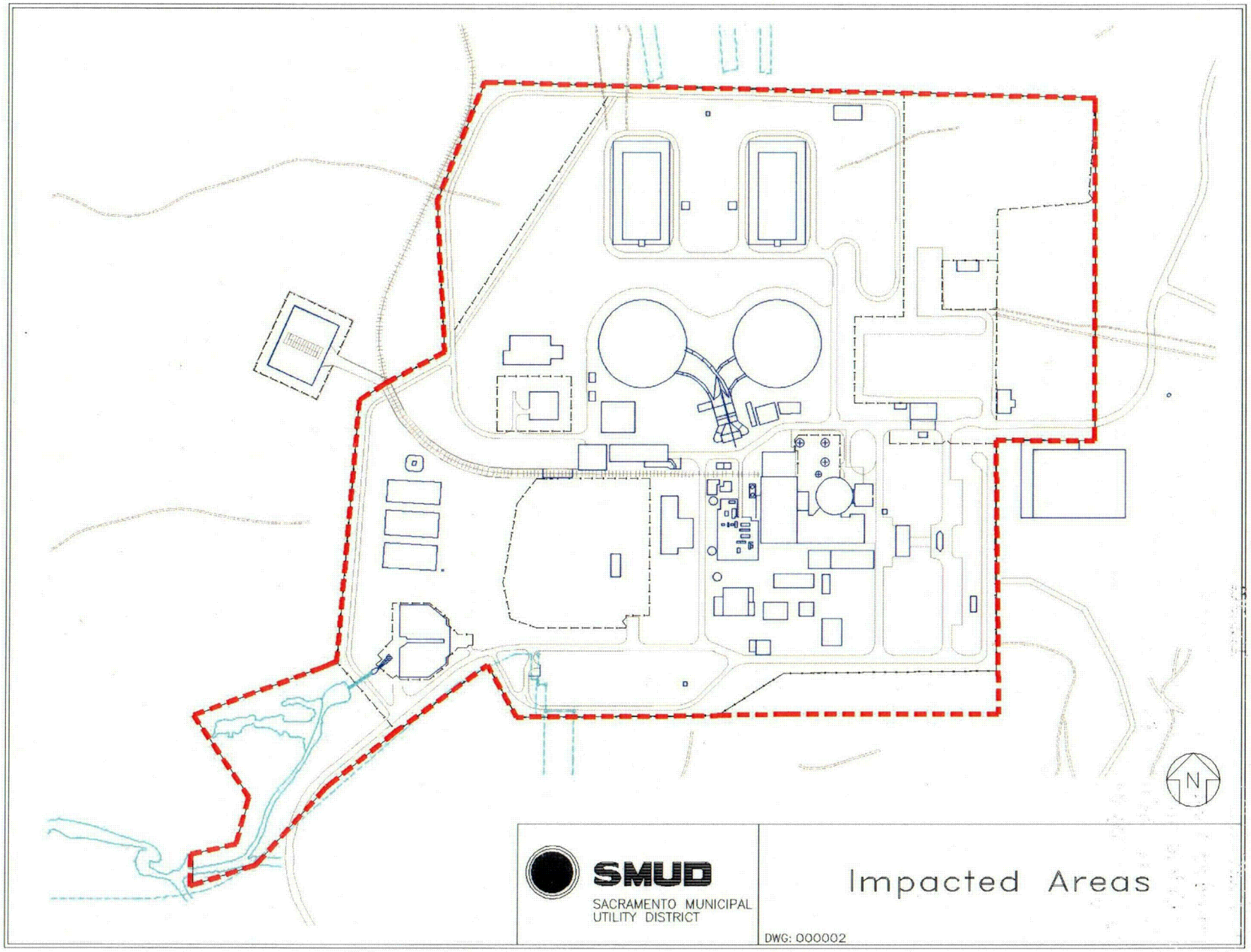


Figure 6.1
Impacted Area Designations

C-04

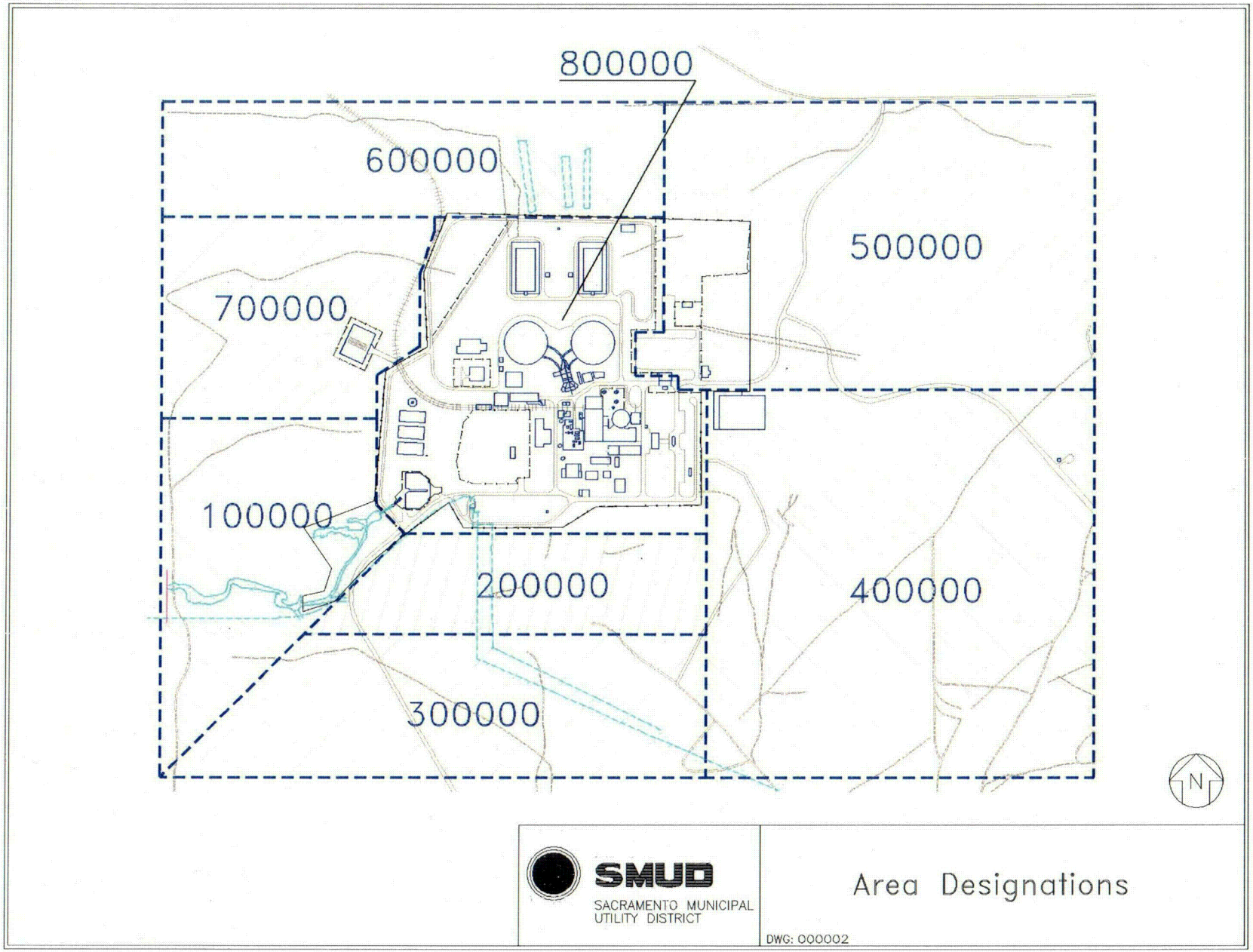


Figure 6.2

Area Designations

C-05

TABLE 6.3

MARSSIM Survey Unit Classification Matrix

		Area		Survey requirements			
Area Classification	Definition	Structures	Land	Scan	Sampling / direct measurement	EMC evaluation	Instrument MDC
Non-Impacted	Areas, as determined during the HSA, having no reasonable potential for residual radioactive contamination.	No limit	No limit	None required	None required	Not required	N/A
Impacted Class III	Impacted areas not expected to contain residual contamination above fraction of $DCGL_W$ [10%]	No limit	No limit	Judgmental	Random	Required	0.1 $DCGL_W$ Max
Impacted Class II	Impacted areas not expected to exceed $DCGL_W$	1,000 m^2	10,000 m^2	10-100%	Systematic	Required	0.5 $DCGL_W$ Max
Impacted Class I	Impacted areas with potential to exceed $DCGL_W$, isolated areas to exceed $DCGL_{EMC}$, or where remediation has been performed to meet DCGL criteria	100 m^2	2,000 m^2	100%	Systematic	Required	0.5 $DCGL_W$ Max

6.11 Radiological Impact Summaries

6.11.1 Area 100000 (SA01) – Plant Effluent Area

Available documentation of the radiological impacts associated with the evaluations from specific incidents during the operational and post operational period include:

6.11.1.1 Licensee identified events

Document	Equipment/System/location	Remarks
ODR 75-46	RHUT overflow	~1,765 gal overflowed to PE before divert (H-3 only)
ODR 76-79	PE diversion for road construction altered PE flow measurements	Flow rate calculation re-verified with minimal impact noted.
ODR 81-192	RHUT sample line discharges directly to PE	Cumulative impact unknown (≥ 500 µCi Co-60) [Also ODR81-193, 209]
ODR 84-223	CST (T-358) overflow ~900 gallons	Release within 10 CFR Part 20 limits 96 µCi H-3, 0.21 µCi Cs-137 to PE
ODR 87-764	System drained in contaminated area removed without sample 55 gal. Dumped down uncontrolled storm drain between Aux and RB	Cs-137 at 1.75E-7 µCi/ml (no mention of any diversion of PE) 1987 semi-annual report ~1000 gal. Max dose 3.33E-4 mrem.
1988 annual report	Cs-137 detected during routine monitoring	57 µCi Cs-137 in 3.10 E+06 gal. release – Est. dose 0.0125 mrem
1988 annual report	MSR valve leakage between April and September	Turbine Building floor drains to PE - ~88 gal. / ~ 3 µCi H-3, Cs-134, and Cs-137 released.
PDQ 89-512	Radiological survey results (up to 58 uR/hr contact) along creek raise concerns associated with EPA criteria	No limits were exceeded (activity resulted from permitted releases)

6.11.1.2 Independent Evaluations Conducted

Document	Equipment/System/location	Remarks
UCID-20267	Rancho Seco Liquid Effluent Pathway Aquatic and Terrestrial Dietary Survey Report – November 30, 1984.	Study to establish and define the potential exposure pathways associated with the liquid effluent releases from RSNGS.
UCID-20295	Concentration of Radionuclides in Fresh Water Fish Downstream of Rancho Seco Nuclear Generating Plant – December 27, 1984.	Established basic correlations between species, diet, size, and radiological concentration of common game fish in downstream waterways. Using consumption data from UCID-20267, calculated maximum intakes of Cs-137 in the 70,000-pCi/year range.
UCID-20298	Radionuclides in Sediments Collected Downstream from Rancho Seco Nuclear Power Generating Station.	Estimated that only 20% of the Cs-134/137 discharged between 1981 and 1984 are associated with the bottom sediments (to a depth of 12 cm.) in Clay, Hadselville, and Laguna Creeks to a distance of 16.2 miles (26 km) from the plant
UCID-20367	Environmental Radiological Studies Downstream from Rancho Seco Nuclear Power Generating Station. March 22, 1985	Primarily summarizes UCID – 20267, 20295, & 20298 and recommends further investigation of aquatic and terrestrial food source pathways
UCID-20641	Environmental Radiological Studies Downstream from the Rancho Seco Nuclear Power Generating Station - 1985. February 6, 1986.	Part I documents follow-up investigation of radioactivity concentrations in fish and sediment samples. Part II contains appendices with sample data

Independent Evaluations Conducted

(Continued)

Document	Equipment/System/location	Remarks
NUREG/CR-4286 (ORNL-6183)	Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant. March 1986.	Based on the analysis of the data gathered, the potential for exposures above 25 mrem/yr appear highly unlikely, stating that in its summary "... it seems reasonable to assume that unless some individual is eating 14 to 18 kg of fish per year caught in the sump, Clay Creek, or Hadselville Creek at Clay Station Road, a 25 mrem/year dose . . . is not reached by any individual around Rancho Seco."
UCID – 20963	Environmental Radiological Studies Conducted During 1986 in the Vicinity of the Rancho Seco Nuclear Power Generating Station. March 22, 1987	Documents the continuation of the environmental monitoring research being performed. Cs concentration in fish has returned to background at distances greater than 7.5 km from the plant effluent boundary.
UCRL-106111	Environmental Radiological Studies in 1989 Near the Rancho Seco Nuclear Power Generating Station. November 1990.	Documents the 1989 follow-up to the environmental effluents studies performed in 84-87. Recommendations include suspension of the studies unless a normal or above normal precipitation cycle prompts an evaluation of the potential redistribution of the activity inventory.
None	Rancho Seco Non-Industrial Area Survey Project. Shonka Research Associates, Inc. June 2001.	Determined that there is now "no presence of contamination discernable from background" with the exception of the effluent path itself and the swales associated with it.

6.11.1.3 District Initiated Evaluations

Document	Equipment/System/location	Remarks
RPDP 90-001	Over reporting of effluent release activities for Ag110m, Co-57, Co-58, Co-60, Cs-134, Cs-137, Mn-54, & Sb-125 by up to 40%	Based on residual activity detected in retention basin sludge during clean up activities in 1985 & 1989. Ag-110m~30%, Co-57~2%, Co-58<1%, Co-60~26%, Cs-134~2%, Cs-137~3%, Mn-54~2.5%, & Sb-125~42%
RPDP 90-010	A multiple topical study, including "Field #14" Soil contamination.	Estimate that ~350 ft^3 of dredging wastes will fail to decay to less than the anticipated 10 mrem/standard utilized in 1990. (See 91-006 for follow-up)
RPDP 91-006	Radiological characterization Along the Plant Effluent Stream.	Summarized investigation documentation between 1985 and 1989 in preparation for further studies. Noted the elevated levels detected in the dredge piles and that ~1020 ft^3 of these piles had been containerized as radwaste.
RPDP 92-004	Effluent course characterization	Soil contamination depth profile

District Initiated Evaluations

(Continued)

Document	Equipment/System/location	Remarks
RPDP 92-005	Offsite Soil Sector survey	Provided characterization data from within an approximate 2000-foot radius of Reactor Containment Building (360°) surrounding facility with direct measurement and soil sample correlations.
RPDP 92-006	Effluent wastewater course radiological characterization	Provides a summary of studies to date and established soil contamination half-lives and remediation options.
RPDP 92-008	Soil activity vs. Measured exposure rate wastewater course area.	Early attempt to correlate the soil activity to direct gamma readings.
RPDP 92-009	Half-life Calculations for Clay Creek Bank	Estimates environmental half-life of effluent creek at ~ 4 years
RPDP 92-010	TEDE calculation for soil sample taken at grid location AI-16	186 mrem/year, decaying to 9.9 mrem/year in ~4 half-lives (17 years).
RPDP 93-002A	Evaluation of Soil in Area AH & AI-15	Additional data attempting to correlate soil activity and direct dose measurements
RPDP 93-003	Evaluation of Soil in Area AM-5	Additional data attempting to correlate soil activity - direct dose measurements and various depth of soil removal.
RPDP 93-006	Evaluation of Soil in Area AN-2	Activity concentration vs. depth to 6"
RPDP 93-008	Offsite Soil Sector Survey	Provided characterization data within 3-mile radius, 360° surrounding facility with direct measurement and soil sample correlations.

District Initiated Evaluations

(Continued)

Document	Equipment/System/location	Remarks
RPDP 94-003	Soil environmental half-life evaluation.	Estimates environmental half-life of effluent creek at ~ 4 years
RPDP 95-004	Radiological Characterization Report	Summarizes the characterization effort and the decision not to remediate the effluent canal.
RPDP 95-007	Offsite uR/hr versus Soil Activity Correlation	Provides two different models with which to estimate annual exposure from measured dose rates in the effluent canal area.

6.11.2 Area 200000 (SA02) – South Plant Outfall Area

Available documentation of the radiological impacts associated with the evaluations from specific incidents during the operational and post operational period include:

6.11.2.1 Licensee Identified Events

Document	Equipment/System/location	Remarks
ODR 82-0248	Leakage from (auxiliary) large boiler ran down storm drain	Plant Effluent H-3 4.5E-06 to 6.6E-06 (μCi/ml)
ODR 84-0217	Hydro-pump hose burst – water down storm drain	Hydro source CST – H-3 2.00E-05 μCi/ml
ODR 84-0317	Drain hose fails releasing 500 gallons from T-993 to storm drain	2.20E-05 μCi/ml – 2880 μCi total release
ODR 85-0075	Hole in "B" RHUT releases ~ 1000 gallon to storm drain	2.00E-04 μCi/ml at storm drain - < 4.30E-06 at the outfall
PDQ 90-0367	H-3 Evap (RWS-730) leaks 500 gallons across Tank Farm into storm drain south of East cooling tower	H-3 at 3.8E-02 and Cs-137 at 3.6E-08 μCi/ml
PDQ 93-0088	A RHUT agitator leaks 450 gallons down storm drain.	Release – 37 μCi H-3, 8.30E-03 μCi Co-60, 3.15E-03 μCi Cs-134, 8.52E-02 μCi Cs-137
PDQ 02-0015	B RHUT agitator leaks 450 gallons down storm drain resulting in an unmonitored release	H-3 at 4.42E-06 and Cs-137 at 2.80E-09 μCi/ml

6.11.3 Areas 300000 – 700000

With the exception of two Impacted Survey Units contained in Area 500000 as described in Section 6.10.5, no radiological impacts were identified that impacted these Areas.

One Impacted Survey Unit within Area 500000 consists of the employee parking lot, Parking Area #2 and Parking Area #4. One event was identified in this area, ODR 870301 where a pallet with articles tagged "Contact RP prior to disassembly outside RCA" was found in this area. Also, this area has been used as a staging area for radioactive material shipments, both incoming and outgoing.

The second Impacted Survey Unit consists of those cells through which the access road to highway 104 passes. Since this access road serves as the point of egress and ingress of radioactive material shipments, it must be classified as Impacted in accordance with MARSSIM classification guidance.

6.11.4 Area 800000 (SA08)

Area 800000 is comprised of that area of the site known as the Industrial Area. The identified radiological impacts on the Industrial Area are too numerous to summarize here. A brief summary of each radiological occurrence is included in Appendix A, HSA 10 CFR Part 50.75(g) Document Review Summary.

6.11.5 Area 900000 (SA09)

Area 900000 is comprised of those areas of the entire 2,480 acre site not contained in Areas 100000 through 800000.

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7.0 FINDINGS

RSNGS, like all commercial nuclear power plants, is designed with multiple boundaries to contain the unit's radioactive contents within its many systems, components, and structures. Many of these systems and structures have been impacted due to routine operations and maintenance activities during the operational and post operational history of the plant. Structures anticipated to be classified as Impacted by the unit's operation include the Reactor Containment Building, Auxiliary Building, Spent Fuel Storage Building, Interim Onsite (radwaste) Storage Building (IOSB), and much of the Tank Farm and the systems contained within it. Other systems, components and structures that were not originally anticipated to be contaminated have been impacted as the result of system cross contamination between the primary coolant system and secondary steam systems due to the failure of tubes within the unit's OTSGs. Areas and systems impacted as a result of these primary to secondary leaks include:

- Turbine Building;
- Emergency Feed pumps;
- CST in the tank farm;
- Regenerate Holdup Tanks;
- Auxiliary Boilers;
- Main and Auxiliary Steam Systems;
- Main Feed Water System;
- Retention basins;
- Condensate System; and
- Auxiliary Feed Water System.

Other major non-nuclear systems became contaminated by leakage directly from the primary system or by materials that had been in contact with primary coolant including:

- Nitrogen Gas System;
- Control Rod Drive Cooling System;
- Service Air System;
- Nuclear Service Cooling Water System; and
- Turbine/Component Cooling Water System.

System leakage from these systems in turn contaminated the Clean Drain System.

As referenced earlier in the report, Area 800000, comprising the Industrial Area, as well as Areas 100000 and 200000 and the Impacted portion of Area 500000 will be divided into unique survey units consistent with the guidance contained in MARSSIM. The initial MARSSIM classification of these areas will be based on the design function of the area of

concern (AOC) or its operational history. Of particular significance are those areas historically referred to as the power block. These include:

- Reactor Containment Structure;
- Auxiliary Building;
- Spent Fuel Building;
- Turbine Building; and
- Tank Farm.

In general, these areas are being assigned Impacted Area classifications. Should information be developed during the course of the project supporting reclassification of these areas, the circumstances and rationale will be documented appropriately.

During the operational history of the facility, radioactive liquid spills, radioactive waste processing, storage, and certain maintenance activities on contaminated equipment and components occurred outside of the historic power block. These occurrences have resulted in the preliminary assignment of Impacted Area classifications to the areas affected. These include, in part:

- North and South Turbine Building lay down areas;
- Radioactive Waste Barrel Farm;
- Radioactive Waste Solidification Pad (East of Auxiliary Building grade);
- Machine Shop;
- Auxiliary Building yard area;
- Construction and Pipe Fabrication Shops; and
- "C" warehouse.

Should future survey data support reclassification of these areas, the circumstances and rationale will be documented appropriately.

Several occurrences involving radioactive materials have potentially impacted other areas outside the RCA. These include the storage of radioactive materials in the following locations:

- Turbine Rotor Storage Shed;
- Paved access surrounding the East and West Spray Ponds;
- Quonset Hut;
- Switchyard;
- Main site tool room; and
- North and South Storage Yards.

Incident specific survey and post remediation survey results have been used in the assignment of a preliminary Survey Unit classification of Impacted.

The District-controlled property outside of the Industrial Area has been initially classified as Non-Impacted with the exception of the storm drain outfalls (Area 200000) and the plant effluent water course way (Area 100000).

These preliminary classification assignments have been substantiated by the Non-Industrial Area survey work performed by Shonka Research Associates, Inc. This project provided direct scanning of over 300,000 square meters accompanied by over 80,000 gamma spectral samples without the detection of any radioactive material of site origin above background.

Table 7.1

Area Designations

Area 100000 (SA01)	Impacted
Area 200000 (SA02)	Impacted
Area 300000 (SA03)	Non-Impacted
Area 400000 (SA04)	Non-Impacted
Area 500000 (SA05)	Non-Impacted*
Area 600000 (SA06)	Non-Impacted
Area 700000 (SA07)	Non-Impacted
Area 800000 (SA08)	Impacted
Area 900000 (SA09)	Non-Impacted

* Area 500000 contains an impacted area within it as described in Section 6.10.5.

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8.0 CONCLUSIONS

The RSNGS HSA provides sufficient evidence to support Impacted Area classification for Area 100000, Area 200000, and Area 800000 only. Area's 300000 through 700000 and 900000 shall be classified as Non-Impacted Areas and excluded from further investigation and survey actions with the exception of two Impacted Areas within Area 500000 as described in Section 6.10.5.

Based on current and historic sample results from the licensees Radiological Environmental Monitoring Program (REMP), there is no indication that surface waters on or near the facility or the ground water off of the site has been affected by the licensed operation of the facility. However, further evaluations of the groundwater directly below the licensed facility are also planned prior to the LTP submittal. The plant effluent watercourse contains deposits with measurable amounts of radioactive material resulting from liquid releases conducted in accordance with the regulatory and permit requirements imposed on the facility.

There were periods of liquid effluent releases during operation of the plant where it was determined that calculated dose to a maximally exposed individual via the liquid effluent pathway exceeded the design objective level of 10 CFR Part 50, Appendix I. However, it was also determined that these liquid effluent releases did not exceed the concentration limits of 10 CFR Part 20 or the fuel cycle dose limit of 40 CFR Part 190. The need for remediation of this material, the dose from which has already been accounted for in accordance with the regulation governing radioactive effluent from power plants will be determined prior to submittal of the LTP.

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9.0 REFERENCES

9.1 NUREG-1575 - Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

9.2 Radiological Characterization Plan for the Rancho Seco Nuclear Power Generating Station (RCPRSNPGS including Quick Look (April 4 and 14, 1990), Phase I (April 14 through May 9, 1990), and Phase II (1991 through 1997)

9.3 NUREG/CR-2082 – "Monitoring for Compliance with Decommissioning Termination Survey Criteria"

9.4 NRC draft Regulatory Guide DG-1005 "Standard Format and Content for Decommissioning Plans for Nuclear Reactors

9.5 Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit No. 1, Final Safety Analysis Report

9.6 Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit No. 1, Updated Final Safety Analysis Report

9.7 Sacramento Municipal Utility District, Rancho Seco Facility, Defueled Safety Analysis Report

9.8 Safety Evaluation by the Directorate of Licensing, US Atomic Energy Commission, in the matter of Sacramento Municipal Utility District, Rancho Seco Nuclear Generating Station, Unit 1, Docket 50-312

9.9 Rancho Seco Nuclear Generating Station Proposed Decommissioning Plan" (PDP)

9.10 Plan for Ultimate Disposition of the Facility" (PUDF), July 1990

9.11 Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, NUREG-0586, August 1988 (GEIS)

9.12 Geotechnical Investigation for Proposed Evaporation Ponds, ERPT-C0104, Rev.1, 1989

9.13 Final Engineering Report Assessment of Spent Fuel Liner Leakage, ERPT-M0221, Rev.0, 1990

9.14 Response to NRC questions on Geologic and Seismologic Conditions 1987

9.15 NUREG/CR-4286, Evaluation of Radioactive Liquid Effluent Releases From the Rancho Seco Nuclear Power Plant, March 1986

9.16 Annual Radiological Environmental Operating Report, January – December 2002, Rancho Seco Nuclear Station, Herald, California

9.17 Rancho Seco Non-Industrial Area Survey Project Rev. 2 – Shonka Research Associates, Inc June 26, 2001.Appendices and Addendums

9.18 Federal Register, Vol. 64, No. 234, December 7, 1999, FR Doc. 99–31508

9.19 Rancho Seco Independent Spent Fuel Storage Installation Final Safety Analysis Report Volumes I, II, and III

9.20 Bechtel Corporation, Construction Report for Rancho Seco Nuclear Generating Station Unit No. 1, January 15, 1976

9.21 Report 2041-RE-009, Rev. 1, Rancho Seco Activation Analysis and Component Characterization, WMG, Inc., July 2003

9.22 PNL (Pacific Northwest Laboratory), 1984 "Residual Radionuclide Distribution and Inventory at Rancho Seco Nuclear Generating Station." PNL-5146, June 1984

10.0 APPENDICES AND ADDENDUMS

Appendix A: HSA 10 CFR Part 50.75(g) Document Review Summary

Appendix B: Personnel Interview Program

Appendix C: Area Summary and Preliminary Survey Unit Identification

Appendix D: Miscellaneous Location and Earthquake Data and Figures

Appendix E: Miscellaneous Historical Construction Photographs

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