APPENDIX 8.14B

Humboldt Bay Power Plant Historical Site Assessment

Humboldt Bay Power Plant

Historical Site Assessment

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Eureka, California

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Table of Contents

1 Glossary of Terms, Acronyms and Abbreviations 1-1
2 Executive Summary 2-2
3 Purpose of the Historical Site Assessment 3-3
4 Property Identification 4-4
4.1 Physical Characteristics 4-4
4.1.1 License Holder 4-4
4.1.2 Location 4-4
4.1.3 Topography 4-4
4.1.4 Stratigraphy 4-4
4.2 Environmental Setting 4-5
4.2.1 Geology 4-5
4.2.2 Hydrogeology 4-5
4.2.3 Meteorology 4-6
5 Historical Site Assessment Methodology 5-8
5.1 Approach and Rationale 5-8
5.2 Boundaries of Site 5-12
5.3 Documents Reviewed 5-12
5.4 Property Inspections 5-12
5.5 Personal Interviews 5-13
6 History 6-14
6.1 Licensing History 6-14
6.2 Current Site Status 6-14
6.3 Fossil Power Units 6-15
6.4 Nuclear Power Unit 6-15
6.4.1 Description of Circumstances Impacting Site Radiological Status 6-15
6.4.2 Waste Handling Procedures 6-17
6.4.3 Adjacent Land Usage 6-18
7 Findings 7-22
7.1 Potential Contaminates 7-22
7.2 Potentially Contaminated Areas 7-22
7.2.1 Impacted Areas – Known and Potential 7-22
7.2.2 Non-Impacted Areas 7-25
7.3 Related Environmental Concerns 7-25
8 Conclusions 8-26
9 Future Decommissioning Actions 9-26
10 References 10-27
11 Appendices 11-28
A. C 11-28
B. Site Diagrams Showing MARRSIM Classifications 11-28
C. Table of Impacted Areas and Classifications 11-28

1 Glossary of Terms, Acronyms and Abbreviations

Pu – Plutonium

Am – Americium

Ni – Nickel

Cs – Cesium

Co – Cobalt

Fe – Iron

HBPP – Humboldt Bay Power Plant

FSAR – Final Safety Analysis Report

DSAR – Defueled Safety Analysis Report

ISFSI – Independent Spent Fuel Storage Installation

NRC – Nuclear Regulatory Commission

HSA – Historical Site Assessment

MARSSIM – Multi-Agency Radiation Survey and Site Investigation Manual

PG&E – Pacific Gas and Electric Company

DPR – Demonstration Power Reactor

SWMU – Solid Waste Mangagement Unit

DCGL – Derived Concentration Guideline Level

NWP – Northwestern Pacific

AEC – Atomic Energy Commission

PSDAR – Post Shutdown Safety Analysis Report

SAFSTOR – Safe Storage

DP – Decommissioning Plan

CFR – Code of Federal Regulations

2 Executive Summary

The Humboldt Bay Power Plant (HBPP) site, owned by Pacific Gas and Electric (PG&E), consists of 143 acres on the southern edge of Humboldt Bay 4 miles Southwest of the town of Eureka, in Humboldt County, in the state of California. PG&E maintains 4 operational electrical generating units at the HBPP site that run on fossil type fuels and one nuclear unit that has been in cold shutdown and safe storage (SAFSTOR) since 1976.

PG&E and HBPP personnel are preparing for the decommissioning of Unit 3 and subsequent license termination. Full-scale decommissioning activities can not proceed until the spent fuel is transferred to the Independent Spent Fuel Storage Installation (ISFSI) that is to be constructed in 2007. In addition, the electricity demands of northern California require the 4 operational power units, which have been radiologically impacted, to continue to operate until a new fossil plant is constructed and placed into service. The concurrent activities require integral planning and management.

This Historical Site Assessment is being prepared as the site's first step in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) process. The MARSSIM manual, formally known by the NRC as Nuclear Regulatory Guide-1757 (NUREG-1757), provides guidance to assemble a statistically accurate final status survey plan to support the ultimate goal of terminating the Demonstration Power Reactor #7 (DPR-7) NRC License at the HBPP site..

Data from the HSA investigation suggests that the land and structures that may require remediation (Class 2) lie very near to the Unit 3 Nuclear Reactor's Radiation Controlled Area (RCA). Unit 3 will require remediation (Class 1) of both the structures and land areas in the RCA. The migration of surface and subsurface contamination appears to be limited to areas very near to Unit 3, but further investigations are warranted. The areas of concern for the New Plant and the ISFSI show little remaining affect from operations at HBPP and the available data suggests that these areas will not require remediation Class 3).

3 Purpose of the Historical Site Assessment

The purpose of this Historical Site Assessment (HSA) is to document a comprehensive investigation that identifies, collects, organizes, and evaluates historical information relevant to the Humboldt Bay Power Plant (HBPP) site. The HSA uses this historical information to provide initial classifications based on guidance contained in NUREG-1575 (MARSSIM), “Multi-Agency Radiation Survey and Site Investigation Manual” (Ref. 8.1) The classifications will be used to guide characterization and remediation efforts. Final structure and land area classifications used for the final status survey will be based on the HSA and future characterizations.

The HSA describes the site's physical configuration, identifies the radioactive constituents of site contamination, assesses the migration of contaminants, identifies contaminated media, identifies non-impacted and impacted areas, and classifies impacted areas.

4 Property Identification

4.1 Physical Characteristics

4.1.1 License Holder

Pacific Gas and Electric (PG&E) is the holder of the Possession Only License (POL) number DPR-7.

Pacific Gas & Electric
245 Market Street, Room 750-N9B
San Francisco, California

4.1.2 Location

Humboldt Bay Power Plant
1000 King Salmon Avenue
Eureka, California

Humboldt Bay Power Plant is located about four miles true southwest of the city of Eureka, Humboldt County, California, and consists of 142.9 acres of land. The geographical coordinates of the centerline of the reactor containment structure are as follows:

Latitude: North 40 degrees, 44 minutes, 29 seconds
Longitude: West 124 degrees, 12 minutes, 36 seconds

4.1.3 Topography

Terrain of the site varies from submerged and low tidal land, protected by dikes and tide gates, to a high precipitous bluff along the southwestern boundary. Elevations range from approximately -3 feet to +75 feet based on a datum of the mean lower low water (MLLW) level.

4.1.4 Stratigraphy

The geology in the region is presented and discussed in Section 2.6.3 of the Independent Spent Fuel Storage Installation (ISFSI) Final Status Safety Report

(FSAR). This detailed information may be viewed in the Master Reference List on the CD included with this document.

4.2 Environmental Setting

An extensive study of the environmental setting was performed for the ISFSI license application. The following sections paraphrase the applicable sections, while detailed information may be found in section 2.0 of the ISFSI FSAR (ref. 10.3). This detailed information may be viewed in the Master Reference List on the CD included with this document.

4.2.1 Geology

HBPP lies in the Northern California Coast Ranges geomorphic province. This province consists of a system of longitudinal mountain ranges (2000 to 4000 foot elevations with occasional 6000 feet peaks) and valleys with a trend of N 30 degrees to 40 degrees W.

The immediate vicinity of the site consists of sand and alluvial soil and strata of the Hookton and Carlotta sedimentary formations. These formations are primarily consolidated sands, gravels, and clays and conglomerates with good engineering properties. HBPP buildings have their foundations in these strata.

The principal rocks in the area range in age from late Jurassic to early Upper Cretaceous. These rocks are in two groups:

- Clastic sedimentary rocks, consisting of sandstone, mudstone, and conglomerate
- Volcanic and associated rocks, consisting of greenstone, basalt, chert, and minor amounts of limestone
- In the site area, younger rocks overlie the volcanic strata. These rocks are dominantly marine sandstone, mudstone, and conglomerates ranging in age from the late Cretaceous to early Pleistocene. Recent alluvium forms the shallow strata in the valleys and in areas along the coast.

4.2.2 Hydrogeology

Groundwater supplies all domestic, industrial, and agricultural needs in Humboldt County except that which is supplied by the Ruth reservoir. A groundwater study made in the area of HBPP prior to Unit 3 construction (Morliave, 1960) identified the following important features of the groundwater system:

- Movement of all groundwater is generally toward the bay.
- Vertical rates of groundwater movement in the area of the plant are a few inches per day in the light surface alluvium.

- Horizontal movement in aquifers beneath the site ranges from several feet to hundreds of feet per day.

- Groundwater elevation in the area near the bay is similar to sea level and may be somewhat affected by tidal action.

- Both a groundwater and slight topographic divide appear to exist between HBPP and Elk River. These features reduce the probability of liquid discharges or leakage from the plant site to this stream either by surface or groundwater flow.

- Southwest of the plant, an area exists which has slight landward groundwater gradients under some conditions. However, this area lies within an area that is affected by tidal action. Negligible inland flow is estimated to occur.

- Any migration of materials of plant origin into the soils beneath or near the plant would move vertically quite slowly until reaching the saturation zone. Migration would then be horizontal, toward the bay.

- The surface runoff from the site is directed into drains discharging into the plant cooling water intake canal, through the plant, and into Humboldt Bay via the discharge canal. Outside the area served by the plant drain system, surface runoff drains into Buhne Slough, the natural drainage for the area, which drains into Humboldt Bay.

- The nearest streams to the site are Salmon Creek and Elk River, which are within a mile south and north of the site, respectively, and which discharge into Humboldt Bay. These streams are used for watering livestock, but are not used as a potable water supply.

- The Mad River flows west approximately 13 -15 miles northeast of the site. The Ruth reservoir, the source of the city's water supply, is located on this river.

- To the south, the Eel River discharges to the Pacific Ocean 8-10 miles from HBPP. This river is not used for potable water within 25 miles of HBPP.

4.2.3 Meteorology

The climate at HBPP is mesic oceanic, characteristic of the northwestern coast of the continental United States. The area has two distinct seasons differentiated by precipitation rather than temperature. The wet season extends roughly from November through March and yields approximately 75 percent of the average annual precipitation. The dry season, extending from May through September, contributes only 10 percent of

the average annual precipitation. The transitional months, April and October, contribute the balance. The mean annual precipitation is 39 inches.

The range of air temperatures is minimal, averaging 52°F annually, 46°F in winter and 56°F in summer.

The prevailing wind direction is from the north. The wind distribution is 24.3 percent offshore, 57 percent onshore, and 18.7 percent light and variable. Average wind speeds are strongest for the north winds (16 mph) and the southeast winds (12.5 mph) during the wet seasons. These are lower during the dry season. During the rainy seasons, the wind from the south-southwest dominates slightly.

Prevailing winds can be expected to carry airborne effluents from the plant south and inland 55 percent of the time. Approximately 20 percent of the effluents would be distributed across the bay entrance to the ocean.

Approximately 25 percent of the effluents would be discharged into calm air and distributed randomly.

5 Historical Site Assessment Methodology

5.1 Approach and Rationale

This Historical Site Assessment (HSA) documents those events and circumstances occurring during the history of the facility that contributed to the contamination of portions of the site environs above background levels. Information relevant to changes in the radiological status of the site following publication of the HSA will be considered a part of the ongoing characterization evaluations and decommissioning activities. These ongoing activities include the expansion of the site groundwater investigation and evaluations of subsurface contamination. The results of the ongoing investigations into the extent of subsurface contamination will drive continuing remediation and/or mitigation efforts as appropriate.

The HSA involved collecting, organizing, and evaluating information that described the HBPP site in terms of physical configuration and the extent to which the site was radioactively contaminated as a result of plant operations and SAFSTOR activities. The HSA information was used to bound and classify survey areas. The boundaries of the identified survey areas, as depicted in Figure B-1 (Land Areas), and Figure B-2 (Structures) in Appendix B, are based on operational history, including recorded significant events and common radiological profiles from previous characterization efforts. The preliminary survey area classifications are shown in Appendix C for structures and for open land areas. Survey areas for structures and land will be broken into multiple survey units where appropriate in order to meet the survey unit size limitations recommended by NUREG1575 (ref. 1) prior to final status surveys.

The general criteria used to classify the survey areas were drawn from the regulatory guidance of NUREG-1575 (MARSSIM) as follows:

Non-impacted Area: Areas where there is no reasonable possibility (extremely low probability) of residual contamination. Non-impacted areas are typically off-site and may be used as background reference areas.

Impacted Area: Areas that could possibly contain residual radioactivity in excess of natural background or fallout levels. All impacted areas must be classified as Class 1, 2 or 3 as described in NUREG-1575.

Class 1 Area: Impacted areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiological surveys) above the anticipated DCGL.

Class 2 Area: Impacted areas that have a potential for radioactive contamination or known contamination, but are not expected to exceed the anticipated DCGL.

Class 3 Area: Impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the anticipated DCGL, based on site operating history and previous radiological surveys.

Information collected for each survey area includes a description of the survey area, an operational history, an evaluation of past and current translocation pathways, and a description of the status of decommissioning work. The findings section for each survey area includes an assessment of radiological contaminants, contaminated media, current radiological status, results of any subsurface mitigation or remediation efforts, and remaining decommissioning activities.

The general process for integrating the HSA with continuing characterization, DCGL Development, and the Final Status Survey is shown in the flowchart on the following page.

PROCESS FOR INTEGRATING HSA WITH CHARACTERIZATION AND FSS

Review HBPP operational history and identify significant events contributing to contamination of the site.

↓

Assemble available historical reference documentation.

↓

Assign Survey Area Classification.

↓

Publish Historical Site Assessment Document

↓

Obtain Site-Specific DCGL's.

↓

Update Survey Area packages as decommissioning activities progress. Include results of continuing characterization activities and document progress of remediation/mitigation of sub-surface survey areas.

↓

End-state of decommissioning attained. All areas below appropriate DCGL's.

↓

Evaluate Data Quality in survey area packages using DQO/DQA process and prepare characterization survey plans.

↓

Obtain additional characterization data if necessary and document turn-over surveys.

↓

Begin Final Status Survey process.

5.2 Boundaries of Site

The HBPP site consists of about 143 acres on the southern edge of Humboldt Bay 4 miles southwest of the town of Eureka, in Humboldt County, in the state of California.

PG&E owns the land located within the licensed site property boundary, however, California State Law dictates the public must have access to all beaches in the state of California. Therefore, a public trail lies between the northern fence line and Humboldt Bay. PG&E property is generally an arrow-shaped parcel of land pointing to the northeast. The wedge portion of the arrow has boundaries provided by Humboldt Bay to the north, Northwestern Pacific (NWP) Railroad (abandoned) to the southeast, and King Salmon Avenue to the southwest. PG&E property extends out 2200 feet towards the southwest along the central one-third of the King Salmon Avenue boundary to provide the tail of the arrow as shown in Appendix B-1.

The owner controlled area, land inside of the main fence line, is approximately 13 acres of the total 143 acres. The northern boundary of the owner controlled area is paralleled by a public access trail. The southeast boundary is bordered by the abandoned NWP railroad, while the southwestern boundary is bordered by wetlands.

5.3 Documents Reviewed

In performing the HBPP Historical Site Assessment (HSA), the following documents were reviewed:

- Radiological Characterization Reports
- Environmental Reports
- Environmental Monitoring Reports
- Licensee Event Reports
- Construction Photographs
- Historical Photographs
- Topographical Maps
- Construction Drawings
- As Built Drawings
- Plant Operating Reports
- Plant Safety Analyses
- Radiological Surveys
- Plant Operating Logs

5.4 Property Inspections

The HBPP site is in the early stages of the decommissioning process. The only decommissioning activities to date have been the removal of the 250 foot stack. Areas inside of Unit 3 have undergone decontamination to control occupational exposure, not for decommissioning purposes. The HBPP site continues to generate electricity through Units 1 & 2. Plant operations, maintenance and security personnel continue to occupy the site in support of HBPP site operations and maintenance.

Preparations are being made to begin construction of the ISFSI and to construct a new electrical generating plant. These operations will pose some risk to the license termination process unless procedural controls and administrative controls are instituted. These controls, along with integrated planning and communication among the different planning organizations, will be necessary to ensure a minimal risk of spreading contamination and/or placing structures on soils that have contamination greater than anticipated DCGLs.

Specific controls should be in place to track the location of excavated soils for construction purposes from the point of origin (excavation) through temporary onsite storage to final disposition. Disturbed/excavated soils that are evaluated and verified to have radiological constituents at non-detectable levels (below the environmental Lower Limit of Detection (LLD) for soils) could be used as backfill in some excavated areas.

5.5 Personal Interviews

Personal interviews of current and former HBPP site personnel were held during the site inspection and via telephone during the HSA process. Personnel were selected based on their employment history at the HBPP site. Interview efforts were focused on personnel who were employed during the time that Unit 3 was in operation. Personnel were interviewed that held positions in maintenance, qualified reactor operators, and radiation protection. Undocumented events were not discovered during this process, but the interviews did prove helpful in assessing the historical operations.

6 History

6.1 Licensing History

PG&E is the holder of the Humboldt Bay Power Plant Unit 3 Operating License, DPR-7. Unit 3 was granted a construction permit by the Atomic Energy Commission (AEC) on October 17, 1960, and construction began in November 1960. The AEC issued Provisional Operating License No. DPR-7 for Unit 3 in August 1962. Unit 3 achieved initial criticality on February 16, 1963, and began commercial operation in August 1963.

On July 2, 1976, Unit 3 was shut down for annual refueling and to conduct seismic modifications. In December 1980 it became apparent that the cost of completing required upgrades made the possibility of restarting Unit 3 uneconomical. Work was suspended at that time awaiting further guidance regarding modification requirements. In 1983, updated economic analyses indicated that restarting Unit 3 would probably not be cost effective, and in June 1983 PG&E announced its intention to decommission the unit. A possession only license amendment was issued in 1985 and the plant has been in a SAFSTOR status.

PG&E received approval by the NRC for its decommissioning plan (DP) in July 1988, however, since this was subsequent to the 1996 NRC decommissioning rule, the licensee converted the DP into its Defueled Safety Analysis Report (DSAR) which is updated every two years.

In February 1998, PG&E issued a Post Shutdown Safety Analysis Report (PSDAR). The plant is currently in SAFSTOR with incremental decommissioning activities ongoing. Decommissioning work to date at HBPP involves completed asbestos removal, removal of the 250 foot stack and preliminary radiological characterization on structures and the environment.

PG&E received approval, November 2005, from the NRC to construct an Independent Spent Fuel Storage Installation (ISFSI) onsite. PG&E will transfer spent fuel bundle assemblies currently in the spent fuel pool to the dry cask storage installation, thus allowing decommissioning activities to proceed on Unit 3.

6.2 Current Site Status

The HBPP site is undergoing a complex transition process that entails numerous activities to run concurrently. To get Unit 3 through decommissioning and to the goal of license termination, PG&E is in the process of the following tasks:

- Planning of Decommissioning Activities, i.e. DCGL Development characterization, remediation, final status surveys, license termination plan
- Plan, license, and construct new power plants and place into service
- Construct and place into service the ISFSI
- Operate Units 1 & 2

As of the time this report was written, PG&E has obtained approval for an ISFSI license from the NRC and is preparing to break ground for its construction in April 2007. The application for the new generating units should be submitted to the California Energy Commission by October 2006 with groundbreaking for construction planned in April 2007.

6.3 Fossil Power Units

PG&E maintains 4 operational electrical generating units at the HBPP site. Current power generating units consist of two oil and/or natural gas fueled units (Unit 1 rated at 52 MWe and Unit 2 rated at 53 MWe). Two diesel-fueled gas turbine Mobile Emergency Power Plants (MEPPs), each rated at 15 MWe. Due to the electricity demands of northern California, these units will continue to operate until the new fossil plant is constructed and placed into service. Major decommissioning of the Unit 3 nuclear reactor will not begin until the fossil units have been dismantled to reduce the risk of cross contamination.

6.4 Nuclear Power Unit

Humboldt Bay Power Plant Unit 3 was a natural circulation boiling water reactor and associated turbine-generator operated by Pacific Gas and Electric Company (PG&E). To simplify plant design, Unit 3 included certain features that were not typical of nuclear plants of that era. Natural circulation within the reactor vessel eliminated the need for recirculation pumps, a direct cycle design eliminated the need for heat transfer loops between the reactor and turbine-generator, and as a joint effort between PG&E and General Electric Company, the pressure suppression containment system was developed to eliminate the need for the large containment structures that had been used at earlier nuclear plants. The pressure suppression containment design permitted the reactor to be located below ground level. The reactor has been in cold shutdown and SAFSTOR since 1976.

There are ten systems that are either shared by Units1, 2 &3 or the system is supplied from Units 1 and/or 2. The systems relevant to the HSA are the Oil-Water Separators and the Yard Drain System because of cross contamination issues. The Oil-water separator and sump for Unit 2 was contaminated by an accidental spill of Closed Cooling Water and the Yard Drain system has been contaminated by several accidental liquid releases of radioactive waste. These occurrences are discussed in greater detail in the following section.

6.4.1 Description of Circumstances Impacting Site Radiological Status

During the operation of Unit 3 and during SAFSTOR, certain events occurred that affected plant conditions and have to be considered during decommissioning. The following paragraphs describe some these events and how they relate to the decommissioning effort. None of these events caused conditions that would prevent Unit 3 or the HBPP site from being decommissioned with current technologies and work practices. HBPP radiation protection department continually investigates and documents spills and incidents through procedure, HBAP D-500, *Documenting Site*

Radioactive Contamination during SAFSTOR. Information on minor spills/incidents and more detailed information on the incidents listed may be found in this document.

Reactor Fuel Releases

- When Unit 3 began operation, the fuel utilized stainless steel cladding. In 1964 and 1965, fuel cladding failures began to occur and it was determined that the cause of the failures was stress corrosion cracking of the stainless steel cladding. In 1965, the stainless steel-clad fuel was replaced with zircaloy-clad fuel.

  The early fuel cladding failures resulted in contamination of the reactor vessel, spent fuel storage pool, and plant systems with fission products and transuranic nuclides. These failures have also resulted in transuranic nuclide contamination on concrete surfaces within Unit 3. All stainless steel-clad fuel was shipped offsite for reprocessing during the years 1969 through 1971.

- In 1975, a fuel assembly was dropped into the spent fuel pool cask loading pit, and several fuel rods separated from the assembly. A special container was fabricated to contain the assembly. The assembly and the loose rods have been retrieved and stored in the container in the spent fuel storage pool fuel storage racks.

Liquid Releases

- In March 1966, it was discovered that a leak in the spent fuel storage pool liner had developed. Operating procedures were developed to minimize leakage and investigations were conducted to determine the magnitude of any groundwater contamination that could have occurred. Samples of groundwater from the plant wells, the reactor caisson sump, and two of three test wells did not reveal signs of contamination. One test well drilled north of the spent fuel storage pool (between the pool and the bay) revealed evidence of contamination, but the levels were a factor of 100 below allowable drinking water limits. The test wells have been monitored regularly since that time and results of the surveillance have indicated no increase in activity.

  A review is currently underway to assess the groundwater monitoring program, specifically for tritium, in support of a Nuclear Energy Institute (NEI) Industry Action Plan for tritium in groundwater for nuclear plants in operation or undergoing decommissioning.

- On 1/26/73, concentrated radiological waste was found to be leaking through a piping penetration from the Concentrated Waste Tank (CWT) Vault to the radwaste tankage area, into the tankage area sump, and through the sump drain line to the outfall canal. After valving the sump to send the water to the radwaste system, investigation found that a valve from the concentrator to the #2 CWT had been left partially open. As a result, contaminated water filled the #2 CWT, and the subsequent overflow filled the bottom of the vault to the level of the wall penetration. To evaluate the event for reporting to the NRC and the NCRWQCB, it was assumed that all of the liquid entering the sump (less than 50 gallons) reached the outfall canal through the sump drain line.

- On 9/7/73, after a sudden rain shower, contaminated liquid came up through openings in a manhole cover to an electric pull box located at the SW corner of the liquid radwaste tankage area. The contaminated liquid flowed across the pavement into the yard drains in the Unit 3 yard, North of Unit 2 fans, and between the #2/3 condensate storage tanks. The liquid also followed a ditch along the bank North of Unit 2, going through drain rock and a perforated pipe into the yard drain system. This is the "North loop" part of the yard drain system, which goes to the intake canal. The contamination originated from the overflow of the CWT vault on 1/26/73, and it reached the electric pull boxes and conduits because their drains were in common with the drain from the tankage area sump to the outfall canal. The source of the water which flushed the contamination from the pull box to the yard was the rainwater draining from the hill north of the plant, which at that time was routed to the radwaste tankage area. It is likely that most of the water that was assumed to reach the outfall canal on 1/26/73 was actually collected in the pull boxes and conduits.

- On several occasions during the operation of Unit 3, radioactively contaminated liquids were spilled in certain areas of the facility. Since access to most areas of Unit 3 is controlled for purposes of contamination and radiation exposure control, the corrective action was to clean up the spill and either decontaminate the area or fix the contamination so that exposures required either for decontamination or resulting from the contamination would be consistent with ALARA considerations. During the SAFSTOR period, residual contamination resulting from these spills were contained and monitored. Final decontamination of these areas to levels acceptable for unrestricted use will be accomplished as part of the final decommissioning program.

Gaseous Releases

- Unplanned gaseous releases to the atmosphere have not occurred based on current documentation, operating reports and personal interviews. There have been documented airborne releases inside of Unit 3. These releases may have affected Units 1 & 2.

6.4.2 Waste Handling Procedures

The Defueled Safety Analysis Report (DSAR), section 2.3.2, describes the systems and equipment for handling radioactive waste generated as a byproduct of prior plant operation and maintenance of the spent fuel pool. Section 3.4.2 describes radioactive waste processing and disposal methods. HBPP waste handling procedures are intended to contain, adequately treat, and dispose of these radioactive byproducts. The waste disposal system uses several basic methods to treat and dispose of radioactive material:

- Retention in storage to allow natural decay of short lived radioactive isotopes.
- Filtration and ion exchange to remove radioactive constituents from liquids.
- Evaporation to concentrate radioactive constituents.

- Filtration by charcoal and high efficiency particulate air filters for gaseous discharge.
- Dilution of low-activity liquid and gaseous discharges.

Spent fuel was removed from the site and shipped to a reprocessing facility in the early years of plant operation. The last spent fuel shipments from HBPP occurred in 1971. All of the stainless steel clad fuel that was prone to integrity failure was remove from site during this timeframe. After that date, spent fuel remained on site in the SFP. This spent fuel is currently contained in the Spent Fuel Pool (SFP) awaiting construction of the Independent Spent Fuel Storage Installation (ISFSI), where, upon completion, the spent fuel and other Class B and C waste will be transferred.

Construction of buildings, roads and railways during and after nuclear operations at the HBPP site involved excavation of contaminated soils. By site procedure, contaminated soils were sent to an NRC licensed disposal facility. Soils that were deemed non-contaminated by site procedures using gamma scans with a GM detector were placed onsite either west or east of the discharge canal.

6.4.3 Adjacent Land Usage

The following paragraphs describe the features and uses of land within 5 miles of the plant. Included is a summary of the population centers within 10 miles of the HBPP site.

6.4.3.1 Bodies of Water

As an integral component of the ISFSI Design, a detailed evaluation of the geologic strata was completed. This assessment reported that HBPP lies in the Eureka Plain Sub-basin of the North Coast Basin. The Eureka plain drainage basin is within the hydrologic unit defined as the Redwood Creek-Mad River-Humboldt Bay Unit. With respect to the site, the watersheds of Humboldt Bay and the bay itself are the most relevant surface water bodies. The four major creeks that drain into Humboldt Bay are Freshwater Creek, Elk River, Salmon Creek, and Jacoby Creek. Several smaller tributaries also drain into the Bay. Salmon Creek and Elk River are the nearest streams to the site, within a mile south and north of the site respectively. Salmon Creek and Elk River are used for watering livestock, but are not used as a potable water supply.

Several acres of wetlands are in the immediate vicinity of PG&E property as well as on PG&E owned property. In the main section of PG&E property, property northeast of King Salmon Avenue, there are approximately 70 acres of land south of the bay. The Army Corps of Engineering has deemed about 21 of the 70 acres as wetlands. An additional 6 acres have been designated as California coastal Wetlands.

6.4.3.2 Land Use

The HBPP site is located on the northern California coast in Humboldt County, approximately 4.8 km (3 mi) southwest of the city of Eureka. PG&E owns 143 acres of land area along the mainland shore of Humboldt Bay and the intertidal areas extending approximately 150 m (500 ft) into Humboldt Bay from this land area. At the HBPP, PG&E has full authority to control all activities within its property lines. As stated

previously, the HBPP consists of four electric generation units that are currently operating and Unit 3, which is not in use. Units 1 and 2 are co-located conventional 53 megawatt-electric (MWe) units capable of operating on fuel oil or natural gas. Unit 3 is located in a separate building, adjacent to Unit 2. Two gas turbines, rated at 15 MWe each, are located in the vicinity of the Units 1, 2, and 3 structures. The four generating units and Unit 3, as well as the plant site, are owned by PG&E.

Humboldt Bay and the surrounding lowlands comprise the region south, east, and west of the site. The lowland areas around the site are primarily vacant land and are used to a limited extent for grazing beef cattle. Humboldt Hill is the dominant feature southeast of the site. Most of the mountainous area east and southeast of the site is inaccessible.

The City of Eureka, with a population of approximately 26,000, is the largest population center in Humboldt County. Within 8 km (5 mi) of the HBPP site, there are several small residential communities including: King Salmon, Humboldt Hill, Fields Landing, and the suburban communities surrounding Eureka. King Salmon is located to the west of the HBPP site, adjacent to the site location, while Fields Landing is located approximately 0.4 mile south. No major new developments are currently planned for the area within 8 km (5 mi) of the HBPP site.

A total of nine farms and ranches and one community vegetable garden have been identified within 8.0 km (5 mi) of the HBPP site. The primary local farming products are dairy products, cattle, goats, and llamas. Most of the dairies are located along the Elk River to the north of the HBPP Site, while the coastal lowlands are used primarily for cattle grazing and ranching. The nearest dairy, which produces approximately 3028 liters (800 gallons) of milk per day, is located 2.9 km (1.8 mi) east of the site. The nearest vegetable garden is the Wiyot Tribe community vegetable garden located approximately 6.8 km (4.2 mi) southwest of the site.

The primary industry in the area, and in Humboldt County, is lumber and lumber/paper manufacturing. Lumber production in Humboldt County in 2000 was valued at $285.5 million. A lumber-loading shipyard is located on Humboldt Bay less than 1.6 km (1 mi) south of the HBPP site.

The HBPP site is located in the vicinity of several ports that support commercial and sport fishing activities, and a public trail to access a breakwater for recreational fishing. Among the fish harvested are sole, rockfish, salmon, and tuna, along with crabs and shrimp and prawns.

Visitors are attracted to the area by the numerous state and county parks both along the coast and in the inland forests. In addition to the small beach on the western side of the peninsula, there are public beaches located along Humboldt Bay and the Pacific Ocean coast that are popular with local residents as well as tourists. Much of the coastal area on the inside of the bay falls within the boundaries of the Humboldt Bay National Wildlife Refuge, which is within 8 km (5 mi) of the HBPP site.

Demography

The population distribution and projections for areas around the proposed HBPP site are based on the Year 2000 census and on estimates prepared by the California Department of Finance (California Department of Finance, 2004). The area within 80.5

km (50 mi) of the HBPP Site includes most of Humboldt County and a small portion of Trinity County. Approximately 50 percent of the area within the radius is on land, with the balance being Humboldt Bay and the Pacific Ocean. In general, the portion of California that lies within 80.5 km (50 mi) of the HBPP Site is relatively sparsely populated, with the exception of a few urbanized areas along the coast.

According to the 2000 Census (U.S. Census Bureau, 2004), the population of Humboldt County was 126,518 and the population of Trinity County was 13,022. Humboldt County has seven incorporated cities ranging in size from approximately 300 to 26,000 persons. Approximately 67,000 of county residents reside in unincorporated communities. The nearest population center to the HBPP site, the City of Eureka, had a population of 26,128 in 2000.

There are numerous schools located within 16.1 km (10 mi) of the HBPP site, particularly in the population centers. Several K-12 schools are located within 8 km (5 mi) of the site, serving the City of Eureka and neighboring communities. Humboldt State University, with an enrollment of approximately 7,500 students, is located in the City of Arcata approximately 24.1 km (15 mi) northeast of the HBPP site. The College of the Redwoods is located within 8 km (5 mi) of the site just south of the City of Eureka and has an enrollment of approximately 5,000 full and part-time students.

In addition to the resident population, there is a seasonal influx of vacation and weekend visitors within a 80.5-km (50-mi) radius, especially during the summer months. The influx is heaviest in the area around Humboldt Redwoods State Park (located about 72.4 km (45 mi) south-southeast of Eureka) and along the Pacific Ocean coast north of the site in the area around the City of Trinidad. An estimated 2.1 to 2.2 million people visit the county per year (PG&E, 2003a).

Land Access

The only access to the HBPP site is from the south via King Salmon Avenue, which also serves the community of King Salmon situated on the western part of the peninsula. A public-access trail runs along the shoreline and along the fence to the northwest of the PG&E-controlled area.

The major travel access in the vicinity of the HBPP site and other communities of Humboldt County is via US Highway 101, which generally traverses north-south through Humboldt County. This highway passes about 0.48 km (0.3 mi) southeast of the HBPP site and is accessible approximately 0.56 km (0.35 mi) to the southeast of the site. Highway 101 continues north into Oregon and south to San Francisco and Los Angeles.

A set of North Coast Railroad tracks runs generally north-south along the southeastern PG&E property line. This rail system has been out of service since 1997. Presently, there are no existing plans to repair and reuse the tracks; however, the railroad owner and Humboldt County are considering this possibility.

Air Access

Commercial air traffic into and out of Humboldt County is primarily through the Arcata Airport, located in McKinleyville, approximately 25.75 km (16 mi) north of the HBPP site. The air transportation system in Humboldt County serves a range of aircraft types and

aeronautical uses. Nine public-use airports are located in Humboldt County. Scheduled passenger service, typically turbo-prop planes, is only available from the Arcata Airport.

Sea Access

The Port of Humboldt Bay is the largest marine shipping facility between San Francisco Bay, located 225 nautical miles to the south, and Coos Bay, Oregon, located 156 nautical miles to the north. Humboldt Bay can accommodate vessels up to 213.4 m (700 ft) long and 33.5 m (110 ft) wide, and weighing a total of 50,000 dead weight tons. On-board cranes and manpower are used to load and off-load cargo, as there are currently no dockside cranes in use. Seven port terminals are located on Humboldt Bay, with five of them located to the north of Eureka. The nearest terminal to the HBPP site is the Humboldt Bay Forest Product Dock, located just to the south of King Salmon, approximately 0.64 km (0.4 mi) from the HBPP. The Fields Landing lumber shipyard lies another 1.2 km (0.75 mi) or so further south along the shoreline.

There are several boat landings in the community of King Salmon, located just west of the entrance gate to the PG&E-controlled area. The community of King Salmon serves frequent commercial and recreational boat traffic.

7 Findings

7.1 Potential Contaminates

The primary contaminants of concern for the HBPP site are Fe^{55}, Co^{60}, Cs^{134}, Cs^{137}, Ni^{63}, $Pu^{238-241}$, and Am^{241}. Since the plant has been in cold shutdown and SAFSTOR since 1976, the more abundant activation and fission products, Fe^{55} and Co^{60}, have decayed to 0.1% and 1.6%, respectively, of their total activity because of their short half-life. This has led to Cs^{137} and Ni^{63} as the most abundant radionuclides in the HBPP inventory as shown in Appendix A. (PNL-4628)

Personnel at HBPP have seen an increase in Am^{241} since the shutdown of Unit 3. The increase is most likely from the beta decay of Pu^{241} to Am^{241}. The radionuclide inventory performed in 1981 did not include analysis for Pu^{241}, possibly due to detection limits. Plutonium-241 decays by a very weak beta at 20.8 KeV. It also decays by alpha emission to Neptunium-237, however, this mode of decay has a relative abundance of less than 1%. No equilibrium point will be reached between Pu^{241} and Am^{241} because of their short to long half lives, 14.4 years and 432.7 years, respectively. The increase of Am^{241} should reach 90% of its maximum in approximately 48 years from the date the last fuel cladding failure that occurred in1965. This will occur around the year 2013 and the maximum should occur about 73 years after the last fuel failure or 2038.

7.2 Potentially Contaminated Areas

7.2.1 Impacted Areas – Known and Potential

All areas and structures were classified according to available radiological characterization data, historical site operations, and personal interviews. Classifications are designed to be conservative. All areas, or sections of an area, can and may be changed when new radiological sample data becomes available. Appropriate documentation should be provided for the justification of changes.

7.2.1.1 Class 1

Buildings and Structures

All buildings, systems and structures associated with the Unit 3 nuclear reactor or associated with radioactive material handling meet the MARSSIM Class 1 definition. (See Appendix B-2) These areas have been designated as Class1 due to elevated levels of radioactive contamination, or the high potential for elevated levels, that will require remediation and/or disposal at an NRC licensed disposal facility. A list and summary of these building, systems and structures is contained in Appendix C, while detailed information is contained in Section 2.0 of the HBPP Defueled Safety Analysis Report (DSAR).

During the early operations of the HBPP Unit 3, there was a substantial history of fuel cladding failures associated with the use of stainless steel clad fuel in its initial core

loadings. The history of fuel failure, along with more than 13 years of commercial operation, lead to the accumulation of fission and activation products in the piping, in nuclear plant system components, the spent fuel pool and on all concrete surfaces. Painted surfaces in unit 3 should be investigated further for alpha emitting radionuclides due to contamination control efforts to affix loose contamination. This characterization effort should be performed prior to release or disposal of building materials in Unit 3.

The primary contaminants of concern for systems of Unit 3 are Fe^{55}, Co^{60}, Cs^{134}, Cs^{137}, Ni^{63}, $Pu^{238-241}$, and Am^{241}per reference 9.11; however, since the plant has been in cold shutdown and SAFSTOR since 1976, the more abundant activation and fission products, Fe^{55} and Co^{60}, have decayed to 0.1% and 1.6%, respectively, of their total activity because of their short half-life. This has led to Cs^{137} and Ni^{63} as the most abundant radionuclides in the HBPP inventory as shown in the updated table in Appendix A.

PNL-4628, *Residual Radionuclide Distribution and Inventory at the Humboldt Bay Nuclear Plant,* a thorough radionuclide inventory performed in 1981 by Pacific Northwest Laboratories, describes in detail the percent distribution in various systems and structures in Unit 3. This document may provide important data for future decommissioning activities in Unit 3 in the areas of radiation protection, remediation, and waste disposal. Additional radionuclide sample data for systems in Unit 3 and relevant radiation safety calculations have been captured in HBPP technical basis document TBD-204, *Selection of Derived Air Concentration Limits for Airborne Radioactivity at HBPP* (ref. 10.16).

Land Areas

From the information reviewed, radiological contamination at the HBPP site has been kept to the few acres surrounding the Unit 3 Nuclear Unit. All of the land within the Radiological Controlled Area (RCA) fence line meets the MARSSIM Class 1 definition due to elevated levels of radioactive contamination, or the high potential for elevated levels. These areas should require remediation and/or disposal at an NRC licensed disposal facility. In addition, land north of Units 1 and 2 up to the Secondary Gas Regulators meets the Class 1 definition due to known elevated contamination levels in the north branch of the Yard Drain System and known contamination below the Unit 2 Fan. The Northwest section of the North Yard Drain system was an open trench in the early years of operation until the unit was placed in SAFSTOR and the Unit 3 yard had asphalt installed.

Other land areas that meet the MARSSIM Class 1 definition due to known elevated contamination levels are the sediments around the Yard Drain discharge near the Intake Structure, the discharge canal sediments, and the land area in the vicinity of waste discharge piping from Unit 3 to the discharge canal. (See Appendix B-3)

The primary contaminant of concern is Cs^{137} due to its longer half life. Transuranic contaminants of reactor origin have been detected in the discharge canal, but at levels below potential DCGLs for transuranic radionuclides. Subsurface soils will have H^3, Tritium, as an additional contaminant of concern, but may be below DCGLs. Tritium has been detected in groundwater monitoring wells southwest and southeast of Unit 3. The root cause of this contamination is not currently known, but it is hypothesized that it has migrated from either the spent fuel pool or from an overflow of the condensate

demineralizer tank in 1974 that may have contaminated a French drain line along the old abandoned rail spur.

A review is currently underway to assess the groundwater monitoring program specifically for tritium in support of a Nuclear Energy Institute (NEI) Industry Action Plan for tritium in groundwater for nuclear plants in operation or undergoing decommissioning. (ref. xx)

7.2.1.2 Class 2

Buildings and Structures

The structures that meet the Class 2 definition are Unit 1, Unit 2, the Water Intake System, the Welding Shop and the Machine Shop. Units 1 and 2 may require limited amounts of remediation due to their proximity to Unit 3. Access to and egress from Unit 3 was primarily through these units. Detectable amounts of contamination have been measured in these units and may be above DCGL levels in pathways and in isolated areas. In addition, reactor origin contamination has been detected on the Unit 1 and Unit 2 ventilation intake structure. The machine shop may require limited remediation based on historical accounts of work on contaminated items. The items had fixed contamination that was made removable by machining methods. The machine shop was decontaminated by site procedures when work was completed, however, residual contamination may still be present above DCGL levels.

Land Areas

Land areas that meet the MARSSIM Class 2 definition are the areas surrounding the Class 1 land areas and Class 1 building and structures. Land areas designated as class 2 provide a buffer zone between land areas designated Class 1 and land areas designated Class 3 where the boundary of contamination is not evident. Land areas may also be designated Class 2 if the data does not definitively show, until DCGLs have been established, that remediation will be required.

There are several distinct areas that have been put into the Class 2 category. These areas are the surface and subsurface soils surrounding Units 1,2, &3, the Yard Drain System Soils, the Spoils Area, areas surrounding the Discharge Canal, sediments in the Intake Canal, and the asbestos SWMU. Further investigation and characterization should delineate these soils and sediments into their precise MARRSIM classification for the final status survey.

Soil excavations that occurred at the HBPP site were scanned for contamination. Soils with levels below the contaminated threshold, but greater than the clean threshold were placed in a spoils area west of the Discharge Canal (see Appendix B). Surface Soil sample data in the area did not show contamination levels greater than anticipated DCGLs, but further investigation into subsurface soils is warranted.

7.2.1.3 Class 3

Buildings and Structures

All building and systems outside of the RCA, and not listed in sections 7.2.1.1 and 7.2.1.2, meet the definition of a MARSSIM Class 3 designation based on historical operations at the HBPP site. Table XX.X provides a list and description of the building and structure designated as class 3 structures. Further investigation should be made into the possible contamination of old roof layers on all buildings. Contamination has been detected in old surveys, but layers have been added to the roofs. Contamination, if found, should be limited to the roofing materials only.

Land Areas

All PG&E property outside of the controlled area and the land area within the controlled area, except the areas delineated in sections 7.2.1.1 and 7.2.1.2, meet the MARSSIM Class 3 definition based on the site operating history, characterization data, and personnel interviews. The primary contaminant of concern for the Class 3 land areas inside the controlled area is Cs^{137} and Co^{60}, but the levels should be less than the most restrictive DCGLs that could be derived.

HBPP procedures for excavated soils involved screening soils with Geiger Mueller detectors to scan for contamination. Soils that were deemed clean by site procedures were placed east of the Discharge Canal. The old site procedures were not available, however, previous characterizations efforts did not indicate levels of contamination that would be greater than anticipated DCGLs.

7.2.2 Non-Impacted Areas

HBPP property areas that extend into Humboldt Bay to the north of the owner controlled areas have been determined to be a non impacted area. Zero contamination has been detected in the sediments at the confluence of Humboldt Bay and the discharge canal as well as across the width of the PG&E owned area of the bay. Conservative planning and cautions should be used during remediation of the discharge canal to prevent the Humboldt Bay sediments from being impacted by site operations. (GTS Duratek, 1998)

7.3 Related Environmental Concerns

An environmental concern during remediation will be a Solid Waste Management Unit (SWMU) of buried chemical waste, along with heavy metals, that was used to clean out items from Unit 2 and is buried north of this unit. This area is marked and managed according to site procedures.

8 Conclusions

PG&E is at the beginning of complex transformations at the HBPP Site. Two new structures, the ISFSI and the New Plant, must be constructed before the site can begin the major work on the nuclear reactor decommissioning and on the old fossil plant dismantlement. The site can not achieve license termination with these new structures in place without foresight, planning and prompt actions. A properly planned characterization effort before and/or during ground breaking on the new structures should allow for license termination of NRC License DPR-7.

Data from the HSA investigation suggests that the land and structures that may require remediation lie very near to the Unit 3 nuclear reactor, which will require remediation, unless disposed of in at NRC licensed facility. The migration of surface and subsurface contamination appears to be limited to areas very near to Unit 3, but further investigations are warranted. The areas of concern for the New Plant and the ISFSI show little remaining affect from operations at HBPP and the available data suggests that these areas will not require remediation.

All classifications are subject to change if new data becomes available. Site procedures will be developed to ensure that proper documentation occurs for a change in classification to a building, structure, system, or land area.

9 Future Decommissioning Actions

The next step in the MARSSIM decommissioning process is to perform scoping/characterization surveys and DCGL development. The scoping/characterization surveys will be performed on building interior surfaces and land areas to determine the precise extent of contamination, especially in Class 2 areas, using the developed DCGLs.

Building surveys will determine the magnitude of contamination and help delineate classification boundaries inside of Units 1 & 2. These surveys will also assist in determining the dismantlement process and waste streams, i.e. decontaminate and disposed of in public landfills, dismantle and send to an NRC licensed landfill, etc. Scoping/characterization survey data will be used as the MARSSIM Final Status Survey (FSS) data for license termination if it is performed to the same pedigree as the FSS plan. This will take foresight, coordination and planning since the FSS plan has not been written.

Scoping/characterization surveys are especially important to determine the extent of subsurface contamination in the areas of New Plant and ISFSI construction. Both areas are classified as Class 3, but there is limited subsurface survey data. The critical area for scoping/characterization surveys is south of Unit 3 to precisely determine the area of tritium contamination. These surveys will be required before the construction of the New Plants.

10 References

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11. Pacific Northwest Laboratory, "Residual Radionuclide Distribution and Inventory at the Humboldt Bay Nuclear Plant" (PNL-4628), May 1983.
12. GTS Duratek, "Structural Characterization Report for the Humboldt Bay Power Plant", March 1998.
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14. PG&E, "Defueled Safety Analysis Report (DSAR)" (L-3), January 26, 2006.
15. PG&E, Architectural General Layout, Plant Site, Drawing No. 4042688, Rev. 1.
16. PG&E, "Selection of Derived Air Concentration Limits for Airborne Radioactivity at HBPP" TBD-204, April 2, 2004.
17. PG&E, “Strategic Plan for the Transition of the Humboldt Bay Power Plant Unit 3 from SAFSTOR to Decommissioning.” *Proprietary and Confidential.* (DRAFT, Revision 3)

11 Appendices

A. C
B. Site Diagrams Showing MARRSIM Classifications
C. Table of Impacted Areas and Classifications

Appendix A

Decay corrected Radionuclide inventory

The following table displays the radionuclides of concern for the HBPP Site. The "July 1981" quantities are the from PNL-4628, *Residual Radionuclide Distribution and Inventory at the Humboldt Bay Nuclear Plant* (ref. 9.X) report. The values were then decay corrected to September 2006. The inventory focuses on the systems and surfaces in Unit 3 and associated buildings and does not focus on quantities in the environs, land and water, surrounding the power plant.

Radionuclide	Half-Life (years)	Inventory (millicuries)	2006 Decay Corrected
55Fe	2.7	149000	243.5
60Co	5.27	18000	672.3
137Cs	30.2	2200	1239.6
63Ni	100	1400	1177.3
54Mn	0.855	337	5.3E-07
90Sr	28.5	17.9	9.7
241Am	432	12.1	11.6
238Pu	87.7	7	5.7
239-240Pu	24110	6.1	6.1
244Cm	18.1	4.9	1.9
242Cm	0.446	0.12	1.6E-18

Appendix B

MARRSIM Classification Map

HUMBOLDT BAY POWER PLANT
INITIAL MARSSIM
SURVEY CLASSIFICATIONS

Pacific Gas and Electric Company®

DRAWING BY:	TPM	DATE:	9/10/08	SHEET NO.:	B1
REVISION:		DRAWING NO.:	PGE-BASE-MAP.DWG		

Appendix C

Building and Structure Summary

HBPP Building Summary Table

Building Name	Approx. Grid Location	Description	MARSSIM Class
Paint & Materials Storage	E5611 N8883	Three Sea/Land Containers (covered area between two), for storage of coatings and scaffolding.	3
Radiation Protection & Decommissioning Project Offices	E5661 N8967	Office space consisting of five trailers assembled side by side (AKA "five-wide"). Gravel pad was recycled from pad under crane (on top of clean pavement in Radwaste Yard) used for stack removal project.	3
MEPP Generator Storage	E5722 N9028	Relatively new sheet metal structure on concrete pad, used for storage of spare MEPP generator.	3
RP Storage	E5692 N8989	Two Sea/Land containers for materials storage, on concrete pad. Concrete pad was probably placed about 1975 as floor of wooden building for seismic upgrades by Wismer/Becker (AKA "wizbiz building"). Wooden structure later removed.	3
Sandblast & Paint Facility	E5503 N8933	Sheet metal building on concrete pad, contains sandblast booth, paint booth, storage and office space. PG&E# 8780	3
Diesel Fuel Storage Tank Area	E5344 N8897	Two diesel fuel tanks for MEPPs, in concrete curbed area	3
Warehouse C-Vans	E5408 N9008	Three Sea/Land containers (Fire Equipment, Spill Equipment, spare MEPP jet turbine)	3
OCB U-#3	E5308 N9000	Unit 3 circuit breakers. Original oil-filled breakers replaced with Sulfur Hexafloride breakers. Now used for MEPPs.	3
Storage Building 7069	E5208 N8972	Concrete block building for equipment and material storage, probably constructed mid-1960s.	3
Relay Building	E5164 N9039	Concrete block structure for relays controlling plant circuit breakers. Probably constructed in late 1950s. PG&E# 6375	3
Storage Building 8048	E5236 N8986	Sheet metal building on concrete pad, for equipment and material storage, probably constructed in early 1970s.	3
Steam Cleaning Station	E5250 N9064	Concrete pad with surrounding waist-high wood walls, to provide contained work area for steam cleaning oily equipment. Probably constructed in early 1980s.	3
Oil/Water Separators	E5256 N9083	One for each of Units 1 and 2. Original separators were concrete. New separator tanks were installed about 1990, using the original separator structure as secondary containment. The original oil collection sumps were cleaned and then filled with concrete.	3
Assembly Building	E4503 N9142	Wood frame structure on concrete perimeter foundation, probably constructed in early 1960s. Used for meetings, training, etc.	3
Training Building	E4867 N9136	Concrete block structure, constructed about 1974, originally intended to be a security search area. Has been used for training, is now office space. PG&E# 8318.	3
Drawing Control Building	E4914 N9144	Concrete block structure, constructed about 1974, originally intended to be a security alarm station/badge issue area. Is now office space. PG&E# 7881.	3
Intake Structure	E4969 N9047	Concrete structure for screens and circulating water pumps for Units 1, 2 & 3. Miscellaneous concrete pieces have been used for riprap in the area near E5000N8958.	3
Switchyard Structures	E5075 N8897	Graveled area, includes switching structure, circuit breakers and transformers for Units 1 & 2.	3

Rigger's Shed	E5056 N9050	Sheet metal structure on concrete pad, used for sling and rigging equipment storage. PG&E# 8321	3
Fuel Oil Service Tanks	E4747 N9431 & E4706 N9472	Insulated steel tanks for fuel oil. Probably constructed in late 1950s.	3
Hydrogen Bottle Storage	E5039 N9372	Concrete block structure partially embedded in dirt bank. Stores Hydrogen for Unit 1/2 generators. Probably constructed in late 1950s.	3
Propane Tank	E5169 N9506	Steel tank on concrete footings, used for Unit 3 emergency generator. Originally also used for Units 1/2 oil fire igniters. Tank was relocated from E4983N9350 in the mid 1970s.	3
Fresh Water Tank	E4925 N9342	Steel tank for plant fresh water (and fire water) supply. Probably constructed in late 1950s.	3
Fire Pump House	E4914 N9303	Concrete block structure for fire pumps (one diesel, two electric). Fire system was also water source for Unit 3 low pressure core flooding.	3
Office Annex	E4919 N9233	Concrete block structure for administrative offices. Probably constructed in 1980s.	3
MEPPS 2 & 3	E5269 N8825	Two trailer-based Mobile Electric Power Plants (MEPPs) were located at HBPP about 1978. Each MEPP consists two trailers, one for a jet turbine and generator, the other for operating controls, and a gasoline auxiliary power unit (APU). Each of the turbine/generator trailers has had a concrete pad installed and has been enclosed in a sheet metal soundproofing structure, constructed in the 1990s.	3
MEPP Control Building	E5222 N8869	Built to contain a new compressed air start system and controls for the MEPPs. Sheet metal structure on concrete pad. Constructed within the last 5 years.	3
Security Building	E4867 N9136	See "Training Building"	3
FFD Trailer	E4725 N9111	Trailer, containing offices and restroom connected to sanitary sewer system, for collecting "Fitness for Duty" (FFD) samples. Located here about 2005.	3
Effluent Ponds	E5783 N9194	The ponds were installed in the mid 1970s to "treat" (neutralize the acidity of) Units 1/2 "boiler blowdown" (smaller pond) and "metal cleaning waste (larger pond)." The metal cleaning waste was generated from two processes, acid cleaning the water side of the boiler tubes, and water washing the fire side of the boiler tubes. Trace radioactive contamination was transferred to the metal cleaning waste pond with water from the boiler fire side washes. Initially, the ponds were concrete with a single Hypalon fabric liner. The ponds were later modified to add layers of gravel and thicker plastic liners.	2
Caustic Storage Area	E5833 N9258	Sea/Land container modified with internal partition. One end is for sampling equipment, the for storage of Sodium Hydroxide solution for neutralizing the Effluent Pond water.	3
Hazardous Waste Storage	E5650 N9289	Sheet metal building on concrete pad. Partitioned into two sections, one for waste solvents, the other for solid hazardous waste. Probably constructed in 1980s.	1

Fuel Oil Storage Tanks	E4686 N9283 & E4503 N9517	"Bunker C" fuel oil storage tanks for Units 1/2. Currently, No. 1 is empty and cleaned. Constructed in the late 1950s.	2
Diesel Fuel Tank	E4800 N9433	Steel tank for diesel oil storage. Probably constructed in late 1950s.	3
Distilled Water Tanks	From E5075 N9365 to E5156 N9365	Steel tanks for Units 1/2, constructed in late 1950s.	2
Lube Oil Tanks	E5117 N9328	Steel tanks for Units 1/2, constructed in late 1950s.	2
Liquid Rad Waste Building	E5247 N9414	Sheet metal structure over original concrete structure was constructed for SAFSTOR to provide ventilation control and to enclose the tanks.	1
Low Level Storage Building	E5322 N9478	Concrete block building constructed for Unit 3 solid radioactive waste storage in the mid 1960s. Is divided into two sections. Note that the side toward Unit 2 was used for a project to encapsulate the highly (alpha) contaminated filters from the High Level Storage Vault.	1
Solid Rad Waste Storage / Handling Building	E5308 N9514	Sheet metal structure on concrete pad, with concrete truck ramp, constructed in mid 1980s. Used for preparing packaged radioactive waste for shipment.	1
High Level Storage Vaults	E5289 N9458	A concrete structure constructed below grade (early 1960s) for storage of high dose rate solid radioactive materials. Divided into three sections. The section nearest the canal was used to store unpackaged contaminated filters. The other two vaults were used to store drummed wastes. All sections are currently empty.	1
The Rad Waste Area Kelly Building	E5281 N9550	A sheet metal structure, temporarily anchored. It was used in the mid-1190s to package sections of the Unit 3 stack for disposal.	1
Alternate Access Control	E5364 N9244	This is a pair of "office" trailers, severely modified with a common roof and supports for heavy equipment. The trailers were located here in the mid-1990s to provide access for the Caisson Inleakage Repair Project.	1
Decon Office	E5342 N9219	This is a small "office" trailer. It was placed here in the mid 1980s to be used as a counting room for RCA samples for the SAFSTOR environmental report.	1
Refueling Building	E5269 N9294	Concrete structure, part of Unit 3, constructed about 1960.	1
Condensate Demineralizer Room	E5275 N9261	Concrete structure, part of Unit 3, constructed about 1960.	1
Hot Shop & Calibration Facility	E5289 N9136	Concrete block structure, part of Unit 3, constructed about 1960.	1
Seal Oil Room	E5239 N9175	Concrete structure, part of Unit 3, constructed about 1960.	1
Pipe Tunnel	E5244 N9239	Concrete structure, part of Unit 3, constructed about 1960.	1
Reactor Feed Pump Area	E5208 N9239	Structure is part concrete block, part cast concrete, part of Unit 3, constructed about 1960.	1

Security Area	E5281 N9247	Part of Unit 3. Concrete floor, concrete wall toward refueling building, otherwise asbestos cement exterior walls, plaster over metal lath or concrete block interior walls. Composite on sheet metal roof. Was originally used for make-up Demineralizer equipment.	1
Access Control	E5258 N9253	Part of Unit 3. Concrete floor, concrete block walls, to support counting room pad above. Asbestos cement walls and composite on sheet metal roof. Was the transition between contaminated and uncontaminated areas during operation. Part of the wall was lined with steel in the mid 1970s to provide seismic support.	1
Washdown Area	E5272 N9214	Part of Unit 3. Concrete floor with waist high concrete block walls, no roof. Was used for Unit 3 turbine overhauls.	1
Laundry Area	E5261 N9244	Part of Unit 3. Concrete floor, concrete block walls, to support concrete equipment pad above. Was used for contaminated laundry during operation. Walls were lined with steel in the mid 1970s to provide seismic support.	1
Multi-zone Fan Area	E5261 N9244	Part of Unit 3. Concrete slab over Laundry Area, for ventilation supply unit.	1
Counting Room	E5247 N9256	Part of Unit 3. Concrete slab over part of Access Control. This area was the original battery room for Unit 3.	
Locker Room	E5256 N9278	Part of Unit 3. Concrete floor. Wall is concrete toward the refueling building, otherwise plaster over metal lath.	1
Unit 3 Control Room	E5231 N9239	Part of Unit 3. Concrete floor, concrete wall toward refueling building and turbine enclosure, otherwise asbestos cement walls. Composite on sheet metal roof.	1
Instrument Repair Shop	E5217 N9281	Part of Unit 3. Concrete floor, concrete wall toward refueling building, otherwise concrete block walls. Composite on sheet metal roof.	1
Propane Engine Generator Area	E5217 N9281	Part of Unit 3. Area was originally outdoors, below Instrument Repair shop. Was enclosed in concrete block walls in mid 1970s.	1
Turbine	E5247 N9219	The Unit 3 turbine is inside the concrete turbine enclosure (for radiation shielding).	1
Generator/Exciter	E5242 N9183	The Unit 3 generator and exciter are outdoors. This area was usually considered “clean” during operation.	
Recombiner Vault	E5236 N9356	The recombiner vault is a concrete structure built in the mid 1970s, to contain equipment for reducing the stack radioactivity releases. The facility was completed after the unit last operated in 1976, so the equipment was not contaminated. The equipment was removed about 2002.	1
U-3 Building Structures	E5242 N9247	Structure mostly steel reinforced cast concrete with portions of concrete block, asbestos cement panel walls and . Composite on sheet metal roof, constructed in early 1960s.	1
U-2 Seal Oil Room	E5158 N9178	Part of Unit 2. Area is part of concrete pedestal for turbine/generator above, containing generator seal oil system.	2
U-2 Condenser	E5158 N9194	Part of Unit 2, constructed below turbine.	2
U-2 Boiler	E5164 N9289	Part of Unit 2. The air/gas/fire side has been subject to traces of contamination from unit 3 windblown soils.	2
2.4 KV Room	E5114 N9231	Common breaker room (and battery room) for Units 1 and 2. Concrete block walls.	2

U-2 Building Structures	E5158 N9231	Structure mostly girders, concrete floors, with some concrete block or asbestos cement walls. Composite on sheet metal roof, constructed about 1960.	2
U-1 Seal Oil Room	E5067 N9186	Part of Unit 1. Area is part of concrete pedestal for turbine/generator above, containing generator seal oil system.	2
U-1 Condenser	E5064 N9206	Part of Unit 1, constructed below turbine.	2
U-1 Boiler	E5072 N9292	Part of Unit 1. The air/gas/fire side has been subject to traces of contamination from unit 3 windblown soils, to a lesser degree than Unit 2.	2
U-1 Building Structures	E5078 N9244	Structure mostly girders, concrete floors, with some concrete block or asbestos cement walls. Composite on sheet metal roof, constructed in the late 1950s.	2
Cold Machine Shop	E5019 N9186	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof. Was occasionally used to machine contaminated components from Unit 3.	2
Welding Shop	E5017 N9117	Added to the Cold Machine Shop perhaps in the 1970s, sheet metal walls on concrete slab.	2
Warehouse	E4992 N9175	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof.	2
Office and Shop Structures	E5003 N9244	Constructed in the late 1950s, to support Units 1/2, with concrete block walls and a composite on sheet metal roof.	2
Storm Water Drains	E5322 N9339 to E4969 N9342 to E4936 N9094 and E5317 N9247 to E5261 N9117 to E4936 N9094	Routes rainwater runoff from all three units, including roof drains, to the intake canal. Mostly constructed of corrugated metal pipe between concrete drain sumps, with a few connected section of perforated drain pipe in drain rock. Was contaminated during Unit 3 operation.	2
Oily Water Separators		See Oil/Water separators, above…	2
U-2 Oily Water Sump	E5189 N9186	Collects floor and equipment drains from within the unit 2 buildings and from the area around the unit 3 turbine lube oil system.	2