Enclosure 1
PG&E Letter HBL-14-006

PACIFIC GAS AND ELECTRIC COMPANY
HUMBOLDT BAY POWER PLANT
DOCKET NO. 50-133, LICENSE NO. DPR-7

HUMBOLDT BAY POWER PLANT UNIT 3
ANNUAL RADIOACTIVE
EFFLUENT RELEASE REPORT

January 1 through December 31, 2013

TABLE OF CONTENTS

INTRODUCTION

This report summarizes gaseous and liquid radioactive effluent releases from Humboldt Bay Power Plant (HBPP) Unit 3 for the four quarters of 2013. The report includes calculated potential radiation doses from these radioactive effluents and a comparison with the numerical guidelines of 10 CFR 50, Appendix I, as well as a summary of shipments of solid radioactive waste. The concentrations of plant effluent releases during the reporting period were well below Offsite Dose Calculation Manual (ODCM) limits.

The information is reported as required by Appendix B, Section 8.3 of the Humboldt Bay Quality Assurance Plan and Section 4.2 of the ODCM, and it is presented in the general format of Regulatory Guide (RG) 1.21, Appendix B (except for the topics identified below).

Meteorology

The meteorological data logging system was removed from service in 1967 so the information specified by RG 1.21 is not available. Previous HBPP Annual Radioactive Effluent Release Reports summarized the cumulative joint frequency distribution of wind speed, direction, and atmospheric stability for the period April 1962 through June 1967, when the meteorological data logging system was in service.

Short-lived Nuclides, Iodine and Noble Gasses

The Unit was last operated on July 2, 1976. Due to the long decay time since operation, short-lived radionuclides are neither expected nor reported. This includes Iodines and noble gases other than Kr-85. During 2008, all of the spent nuclear fuel was transferred from the Spent Fuel Pool (SFP) to the Independent Spent Fuel Storage Installation (ISFSI), so there is now no source term for Kr-85.

Air Particulate Filter Composites – Sr-90

Air particulate sample filters are composited quarterly and analyzed off-site for Sr-90.

Air Particulate Filter Composites – Am-241

Air particulate sample filters are composited quarterly and analyzed off-site for Am-241.

Air Particulate Filter Composites – Gross Alpha

Each weekly sample filter is individually counted for gross alpha activity, rather than analyzing a monthly composite of the filters, as described in RG 1.21.

Gaseous Effluents – Tritium

Tritium releases during plant operation were less than detection levels. Because the plant was permanently shutdown in 1976, current tritium release levels are less than the release levels that occurred during plant operations. Therefore, no tritium samples were collected during this reporting period. Since the fuel has been relocated to the ISFSI and the SFP water is below the drinking water standard, no significant tritium can be released by the gaseous mode.

Liquid Effluents – Sr-90

Batch releases are analyzed individually offsite for Sr-90, rather than analyzed as a quarterly composite as described in RG 1.21.

Liquid Effluents – Ni-63

Batch releases are analyzed individually offsite for Ni-63, rather than analyzed as a quarterly composite as described in RG 1.21.

Average Energy

Calculations for the average energy of gaseous releases of fission and activation gases are not required for HBPP.

I. SUPPLEMENTAL INFORMATION

A. Regulatory Limits

1. Gaseous Effluents

a. Noble Gas Release Rate Limit

Noble gases are no longer an issue since the spent nuclear fuel has been relocated to the ISFSI.

b. Iodine Release Rate Limit

Due to the long decay time since the unit was shutdown, the license does not define an iodine release rate limit.

c. Particulate Release Rate Limit

The radioactive particulate release rate limit is based on concentration limits from 10 CFR 20, divided by an annual average dispersion factor for the sector with the least favorable atmospheric dispersion. The applicable annual average dispersion factors for plant stack and for incidental releases are 1.0E-5 and 6.59E-3 seconds per cubic meter, respectively. When both plant stack and incidental releases occur, the "percent of applicable limit" in Table 1 is the sum of the values for "percent of applicable limit" for each of the release paths.

2. Liquid Effluents

a. Concentration Limit

Concentration limits for liquid effluent radioactivity released to Humboldt Bay are taken from 10 CFR 20.

B. Maximum Permissible Concentrations

1. Gaseous Effluents

Maximum Permissible Concentrations for gaseous effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 1.

2. Liquid Effluents

Maximum Permissible Concentrations for liquid effluents are taken from 10 CFR 20, Appendix B, Table 2, Column 2.

C. Measurements and Approximations of Total Radioactivity

1. Gaseous Effluents – Elevated Release

The original plant stack (an elevated release point) was removed in 1998 and replaced with a roof-level discharge point that is considered a ground level release point. Ventilation and system vents are routed to these release points, referred to as the current plant stack or modular HEPA ventilation units. Therefore, elevated releases did not occur at HBPP during 2013.

2. Gaseous Effluents – Ground-level Release

a. Fission and Activation Gases

Fission and activation gases are no longer an issue since the spent fuel has been relocated to the ISFSI.

b. Iodines

Due to the long decay time since operation (shutdown July 2, 1976), no detectable releases of radioactive Iodines can be expected. Therefore, neither the Technical Specifications nor the ODCM require that these radionuclides be monitored.

c. Particulates

A continuous monitor equipped with an alpha spectrometer, with its response calibrated for Am-241, monitors the alpha particulate activity

released from the stack. This monitor was installed in December of 2009.

Radioactive particulates released from the plant stack are monitored by continuous sample collection on particulate filters. Filter papers are removed from the stack sampling system weekly, and are analyzed for the concentration of gamma-emitting nuclides using an intrinsic germanium detector. All statistically significant gamma peaks are identified.

Radioactive particulates released from modular HEPA ventilation units are monitored by continuous sample collection on particulate filters. Filter papers are removed from modular ventilation system weekly, and are analyzed for the concentration of gamma-emitting nuclides using an intrinsic germanium detector. All statistically significant gamma peaks are identified.

After decaying at least seven days, the filters are analyzed for gross alpha radioactivity using a scintillation counter.

Filters are composited and analyzed quarterly for Strontium-90 (the only radioactive Strontium present) and Americium-241 by alpha spectroscopy.

The estimated error of the reported particulate release values is based on uncertainty in sample flow rate, stack flow rate, modular HEPA unit flow rate, detector calibration, and typical sample counting statistics.

The Minimum Detectable Activity (MDA) for all particulate filter samples was less than the applicable Lower Limit of Detection (LLD) presented in the ODCM.

Individual sample release results are assigned to calendar quarters as of the termination of the sample period. Composite sample release results are assigned to the applicable calendar quarter. The release activity is sample concentration multiplied by sample duration and nominal release flow rate (30,500 cfm for the stack or 2,000 cfm for modular HEPA units).

3. Liquid Effluents

   a. Batch Releases

Water from contaminated plant systems was collected, filtered, and treated with Cesium-specific ion-exchange media, and analyzed before discharge (on a batch basis) through the liquid radwaste process monitor. During periods of inoperability of the liquid radwaste process monitor, two samples were collected and analyzed as required in the ODCM.

Samples of liquid waste batches were analyzed for the concentration of gamma-emitting nuclides (intrinsic germanium detector). All statistically important peaks were identified. Additionally, all batches were analyzed

for radioactive strontium (Sr-90), gross alpha, Ni-63 and tritium by an off-site laboratory.

The estimated error of the reported release values is estimated based on uncertainty in sample volume, batch volume, detector calibration, and typical sample counting statistics.

The MDA for all batch samples was less than the applicable LLD presented in the ODCM.

The last batch liquid effluent discharge occurred on December 11, 2013.

b. Continuous Releases

There were no continuous liquid effluent releases during this report period.

D. Batch Release Statistics

1. Liquid

a.	Number of batch releases	15
b.	Total time period for batch releases	2188 minutes
c.	Maximum time period for a batch release	200 minutes
d.	Average time period for a batch release	145.8 minutes
e.	Minimum time period for a batch release	23 minutes

2. Gaseous

a.	Number of batch releases	0
b.	Total time period for batch releases	N/A
c.	Maximum time period for a batch release	N/A
d.	Average time period for a batch release	N/A
e.	Minimum time period for a batch release	N/A

E. Abnormal Release Statistics

1. Liquid

a.	Number of abnormal releases	0
b.	Total activity released	N/A

2. Gaseous

a.	Number of abnormal releases	0
b.	Total activity released	N/A

II. GASEOUS AND LIQUID EFFLUENTS

A. Gaseous Effluents

Table 1 summarizes the total quantities of radioactive gaseous effluents released. Section A of Table 1 has been omitted as Fission & Activation Gases are neither expected or measured. Table 2A is for reporting the quantities of each of these nuclides determined to be released from an elevated release point (there are none). Table 2B presents the quantities of each of the nuclides determined to be released by the stack or other routes (i.e., ground level release points). Section 1 of Tables 2A and 2B is omitted as Krypton-85 is neither expected nor measured.

There were no "Batch Mode" gaseous releases.

B. Liquid Effluents

Table 3 summarizes the total quantities of radioactive liquid effluents. Table 4 presents the quantities of each of the nuclides determined to be released.

The quantity of radionuclides released in 2013 is similar to that released in 2012.

TABLE 1

GASEOUS EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
B. Particulates						
1. Total release	Ci	<3.90E-06	<4.29E-06	<7.43E-06	<8.15E-06	3.60E1
2. Average release rate	µCi/sec	<5.02E-07	<5.45E-07	<9.34E-07	<1.03E-06	
3. Percent of applicable limit	%	<4.05E-06	<8.64E-06	<1.38E-05	<2.06E-05	
4. Applicable limit	µCi/cc	1.24E-10	1.24E-10	1.24E-10	1.24E-10	
5. Gross alpha radioactivity	Ci	<2.57E-07	<2.64E-07	<2.59E-07	<2.70E-07	

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected. The < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e. treated as zero). When combining non-detected results for different nuclides (e.g., activity totals of multiple nuclides, when none were detected), all values with the < symbol are used.

If the total release for a period is determined to be a "less than" value, the limits are based on analytical results obtained in November, 2005, the mixture was determined to be 84 percent Cs-137, 11 percent Co-60 and 5 percent Sr-90.

TABLE 2A

GASEOUS EFFLUENTS – ELEVATED RELEASE – PARTICULATES CONTINUOUS MODE - NUCLIDES RELEASED

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Particulates					
Cobalt-60	Ci	N/A	N/A	N/A	N/A
Strontium-90	Ci	N/A	N/A	N/A	N/A
Cesium-137	Ci	N/A	N/A	N/A	N/A
Am-241	Ci	N/A	N/A	N/A	N/A
Total for period	Ci	N/A	N/A	N/A	N/A

Table Notes:

N/A – There were no elevated gaseous effluents during the report period.

TABLE 2B

GASEOUS EFFLUENTS – GROUND-LEVEL RELEASES
NUCLIDES RELEASED

Nuclides Released	Unit	Continuous Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
2. Particulates					
Cobalt-60	Ci	<1.92E-06	<1.93E-06	<1.95E-06	<2.06E-06
Strontium-90	Ci	<2.57E-07	<2.85E-07	<2.07E-07	<3.07E-07
Cesium-137	Ci	<1.72E-06	<1.76E-06	<1.80E-06	<1.89E-06
Americium-241	Ci	<2.68E-09	<1.86E-08	<1.54E-08	<1.03E-08
Total for period	Ci	<3.90E-06	<3.99E-06	<3.98E-06	<4.26E-06

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e., treated as zero). When combining non-detected results for different nuclides (e.g., activity totals of multiple nuclides, when none were detected), all values with the < symbol are used.

TABLE 3

LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

	Units	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Est. Total Error, %
A. Fission & Activation Products						
1. Total release (not including tritium, gases, alpha)	Ci	8.03E-4	9.05E-4	3.12E-4	1.73E-5	1.00E1
2. Average diluted concentration	µCi/ml	1.31E-09	1.46E-09	5.05E-10	2.08E-11	
3. Percent of applicable limit	%	1.25E-01	1.33E-01	2.57E-02	1.76E-3	
4. Applicable limit	µCi/ml	1.04E-06	1.10E-06	1.97E-06	1.59E-6	
B. Tritium						
1. Total release	Ci	2.96E-04	3.78E-03	1.34E-03	3.56E-03	1.50E1
2. Average diluted concentration	µCi/ml	4.80E-10	6.12E-09	2.17E-09	5.76E-09	
3. Percent of applicable limit	%	4.80E-05	6.12E-04	2.17E-04	5.76E-04	
4. Applicable limit	µCi/ml	1.00E-03	1.00E-03	1.00E-03	1.00E-03	
C. Gross Alpha Radioactivity						
1. Total release	Ci	<1.84E-07	<4.57E-07	<3.68E-07	<2.78E-07	1.00E1
D. Volume of waste released (prior to dilution)	Liters	7.99E+04	1.28E+05	8.38E+04	9.77E+04	3.00E0
E. Volume of dilution water	Liters	6.18E+08	6.18E+08	6.18E+08	6.18E+08	1.50E1

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e., treated as zero). When combining non-detected results for different nuclides (e.g., activity totals for multiple nuclides, when none were detected), all values with the < symbol are used.

*Tidal Dilution Volume calculated to be 2.47E+09 Liters/Year, as documented in the HBPP procedure TBD-208, rev.1, *OUTFALL CANAL EFFLUENT DILUTION FACTORS*, effective 7/5/12.

TABLE 4

LIQUID EFFLUENTS – NUCLIDES RELEASED

Nuclides Released	Unit	Batch Mode			
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Strontium-90	Ci	4.02E-06	3.97E-06	4.94E-06	2.96E-07
Cesium-137	Ci	7.61E-04	7.98E-04	1.23E-04	8.38E-06
Cobalt-60	Ci	3.66E-06	4.93E-05	7.51E-05	5.71E-06
Americium-241	Ci	<4.42E-06	<5.08E-06	<2.29E-06	<1.65E-06
Nickel-63	Ci	3.43E-05	5.39E-05	1.09E-04	<2.94E-06
Tritium	Ci	2.96E-04	3.78E-03	1.34E-03	3.56E-03
Total for period	Ci	1.10E-03	4.69E-03	1.65E-03	3.58E-03

Table Notes:

The < symbol used in this table means that a majority of the measurements contributing to the result were less than the Minimum Detectable Activity (MDA) for the analyses. Data for individual nuclides combines detected and non-detected results as if all values were detected, but the < symbol is applied if less than 50 percent of the combined value is made up of detected results. When combining detected and non-detected results for different nuclides (e.g., activity totals of multiple nuclides), values with the < symbol are ignored (i.e., treated as zero).

III. SOLID RADIOACTIVE WASTE

Table 5 summarizes the disposal of solid radioactive waste during the report period.

Note: Processed Waste shipments sent for vendor processing are not considered disposed waste until after waste is processed and shipped for disposal. At the time of this report, some Processed Waste shipments had not yet been processed and sent to disposal. Therefore, data for Table 5, Part 1.d, "Other (Processed Waste)," and Table 5, Part 3, "Solid Waste Disposition," will be resubmitted in next year's 2014 Radioactive Effluent Release Report Errata.

TABLE 5

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite For Burial Or Disposal

1. Type of Waste	Unit	12 Month Period	Estimated Total Error, %
a. Spent resins, filter sludges,	Cubic Meter	1.04E+01	1.00E1
evaporator bottoms, etc.	Ci	5.52E+01	5.60E1
b. Dry compressible waste,	Cubic Meter	3.37E+03	1.00E1
contaminated equipment, etc.	Ci	1.24E+00	5.60E1
c. Irradiated components,	Cubic Meter	3.00E+01	1.00E1
control rods, etc.	Ci	1.67E+03	5.60E1
d. Other (Processed Waste)	Cubic Meter	4.39E+01	1.00E1
	Ci	5.90E-01	5.60E1

TABLE 5 - Continued

2. Estimate of major nuclide composition (by type of waste)	Unit	Nuclide	12 Month Period
a. Spent resins, filter sludges, evaporator bottoms, etc.	%	H-3	3.06E-09
	%	C-14	3.16E-02
	%	Fe-55	2.37E-01
	%	Co-60	3.11E+00
	%	Ni-59	2.10E-01
	%	Ni-63	3.16E+01
	%	Sr-90	6.10E+00
	%	Nb-94	2.72E-05
	%	Tc-99	4.06E-03
	%	Cs-137	5.75E+01
	%	Eu-154	7.26E-05
	%	U-235	1.19E-05
	%	Pu-238	7.31E-02
	%	Pu-239	5.75E-02
	%	Pu-240	5.59E-02
	%	Pu-241	7.94E-01
	%	Pu-242	2.68E-03
	%	Am-241	1.60E-01
	%	Cm-243	3.08E-03
	%	Cm-244	3.06E-03
b. Dry compressible waste, contaminated equipment, etc.	%	H-3	1.22E-02
	%	C-14	3.72E-02
	%	Fe-55	3.09E-01
	%	Co-60	7.95E+00
	%	Ni-63	2.90E+01
	%	Sr-90	5.64E+00
	%	Tc-99	3.12E-03
	%	Cs-137	5.16E+01
	%	Eu-154	3.31E-05
	%	U-233	1.46E-03
	%	U-234	2.04E-03
	%	U-235	5.79E-06
	%	U-238	2.07E-03
	%	Pu-238	3.17E-01
	%	Pu-239	1.93E-01
	%	Pu-240	1.93E-01
	%	Pu-241	3.86E+00
	%	Pu-242	2.43E-03
	%	Am-241	9.44E-01
	%	Cm-243	1.73E-02
	%	Cm-244	1.73E-02

TABLE 5 - Continued

c. Irradiated components, control rods, etc.	%	H-3	6.69E-04
	%	C-14	1.72E-01
	%	Fe-55	1.14E-01
	%	Co-60	2.94E+01
	%	Ni-59	6.17E-01
	%	Ni-63	6.97E+01
	%	Sr-90	3.73E-04
	%	Nb-94	9.34E-04
	%	Tc-99	4.23E-04
	%	Cs-137	2.08E-03
	%	U-233	7.82E-09
	%	U-235	6.57E-10
	%	U-238	1.08E-09
	%	Pu-238	6.20E-04
	%	Pu-239	2.41E-04
	%	Pu-241	4.52E-03
	%	Pu-242	4.97E-05
	%	Am-241	4.58E-03
	%	Cm-242	1.50E-07
	%	Cm-243	7.04E-05

d. Other (processed waste),	%	H-3	7.42E-01
	%	C-14	1.35E-02
	%	Fe-55	7.11E-01
	%	Co-60	3.91E+00
	%	Ni-59	3.46E-03
	%	Ni-63	2.89E+01
	%	Sr-90	5.25E+00
	%	Tc-99	7.27E-02
	%	I-129	3.34E-02
	%	Cs-137	5.67E+01
	%	U-233	6.12E-03
	%	U-234	6.12E-03
	%	U-238	1.13E-02
	%	Pu-238	1.63E-01
	%	Pu-239	2.42E-01
	%	Pu-240	1.33E-01
	%	Pu-241	1.68E+00
	%	Pu-242	2.40E-03
	%	Am-241	1.28E+00
	%	Cm-243	8.28E-02
	%	Cm-244	8.39E-02

TABLE 5 - Continued

3. Solid Waste Disposition	Number of Shipments	Mode of Transportation	Destination
	27	Truck - Hittman	Energy Solutions, LLC
	229	Truck – NCF/Savage	US Ecology
	6	Truck - Hittman	WCS

B. Irradiated Fuel Shipments

1. Irradiated Fuel Disposition	Number of Shipments	Mode of Transportation	Destination
	None	N/A	N/A

Table Note:

Two hundred twenty nine shipments were made to US Ecology under a 10 CFR 20.2002 exemption. These shipments included 4.92E-03 Curies of Cs-137 and 4.73E-04 Curies of Co-60.

IV. RADIOLOGICAL IMPACT ON MAN

A comparison of calculated doses from various paths has shown that the offsite doses are primarily due to direct radiation and to the consumption of aquatic foods. Maximum doses to individuals (for the maximally exposed organs and age groups) are summarized in Table 6. Doses from noble gases are not reported, as noble gas releases were neither expected nor measured. There are no airborne or liquid dose pathways from the adjacent ISFSI, and the direct radiation measurement locations for HBPP include the contribution from the ISFSI. Therefore, these doses comply with 40 CFR 190 as there are no other uranium fuel cycle facilities within 8 km of the HBPP and ISFSI.

A. Doses to the average individual in the population from all receiving-water-related pathways were calculated for detected releases, based on the guidance of RG 1.109. The highest results were less than 0.01 mrem/yr (total body) for the Adult age group, and less than 0.01 mrem/yr for the bone of the Child age group.

   These doses are well below the 10 CFR 50, Appendix I numerical guidelines for limiting effluents as low as is reasonably achievable (ALARA) (3 mrem/yr to the total body and 10 mrem/yr to any organ).

B. Total body doses to the average individual in the population from gaseous effluents to a distance of 50 miles from the site are not calculated, but this dose is less than the total body dose to an average individual present at the maximally exposed location. For an average individual at the maximally exposed location, the total body dose (determined with the same dispersion and deposition parameters as used to calculate maximum exposure) was not explicitly calculated as there were no significant detected releases. Performing the calculation with the observed "less than" values for releases produced a result less than 0.02 mrem/yr.

   This maximum calculated dose is well below the 10 CFR 50, Appendix I numerical ALARA guidelines (10 mrem/yr for gamma radiation and 20 mrad/yr for beta radiation from noble gases and 15 mrem/yr to any organ from tritium and radionuclides in particulate form).

C. Total body doses (to the average individual in unrestricted areas from direct radiation from the facility) are based on thermoluminescent dosimeter (TLD) results of stations at the site boundary, using the shoreline occupancy factors given in RG 1.109 for the highest average potential individual (Teen age group). For this group, direct radiation would result in an exposure of less than 0.01mrem/yr.

   This maximum potential dose is well below the 10 CFR 20.1302(b)(2)(ii) limit of 50 mrem/yr from external sources necessary to demonstrate compliance with the 10 CFR 20.1301 dose limit for individual members of the public.

TABLE 6

RADIATION DOSE FOR MAXIMALLY EXPOSED INDIVIDUALS

Dose Source	Dose, milli-rem				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Liquid Effluents					
Water-related Pathways (1)	<0.01 (4)	<0.01 (4)	<0.01 (4)	<0.01 (4)	<0.01 (4)
	<0.01 (5)	<0.01 (5)	<0.01 (5)	<0.01 (5)	<0.01 (5)
Airborne Effluents					
Particulates (2, 6)	-	-	-	-	-
	-	-	-	-	-
Direct Radiation (3)	<0.01	<0.01	<0.01	<0.01	0.01

Notes:

1. Maximum total body and organ doses to individuals in unrestricted areas from receiving-water-related exposure pathways were calculated from the average concentrations of liquid releases detected during the report period, following the applicable portions of RG 1.109 and NUREG-4013.
2. Maximum total body and organ doses to individuals in unrestricted areas from airborne-particulate-related exposure pathways were calculated from the average concentrations of airborne particulate releases detected during the report period, following the applicable portions of RG 1.109 and NUREG-4013. Modular HEPA ventilation unit releases were calculated as though they were through the stack.
3. Total body doses (to the maximum individual in the population) are based on TLD results of stations at the site boundary, using the shoreline occupancy factors of RG 1.109 for the maximum potential individual (Teen age group).
4. Total body (Adult age group).
5. Bone (Child age group).
6. For stack releases for all four quarters of 2013, a majority of the results were "not detected," resulting in a total activity considered "not detected," for which no dose is calculated.

V. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

As decommissioning proceeds at HBPP, systems change or get removed requiring that changes be made to the ODCM. During the last year there were two revisions made to reflect these changes: Revision 23 and Revision 24. The specific changes are as follows:

Revision 23 (Effective 5/1/2013)

Part I

Section 1.7

The Liquid Radwaste Treatment System has been replaced with the FIXS. Added FILTERED ION EXCHANGE SYSTEM (FIXS) definition to replace 1.10 Liquid Radwaste Treatment System. FIXS provides an equivalent capability to reduce the quantity of radioactive material released in liquid radioactive waste effluents prior to discharge.

Section 1.9

Text was revised to add the definition of ground water treatment system. This is a modification of the Liquid Radioactive Waste System definition to incorporate the definition of an Active Treatment System (ATS) from the new NPDES permit associated with the Storm Water Pollution Prevention Plan. This is to provide a definition of a new term in the ODCM that has associated limitations on radioactive contaminants which be in water sent to the system, to ensure the requirements of Limiting Condition 2.3.1 is maintained. In addition, the new NPDES permit prohibits radioactive releases that exceed the Reportable Quantities in 40 CFR 302.4 Appendix B. See Section 3.5.

Section 1.10

Delete Liquid Radwaste Treatment System definition. The original plant radioactive waste treatment system has been dismantled and has been replaced by the FIXS, definition found in Section 1.7.

Section 1.12

Added definition for Modular HEPA Ventilation Unit. Modular HEPA ventilation units have been used at HBPP but all effluents to the environment have been through the plant stack. In final phase of decommissioning the plant stack will be removed and modular HEPA ventilation units will be discharged to the environment.

Section 2.1

Text deleted. The Liquid Radwaste Treatment System use is discontinued. Radioactive water associated with the SFP and primary systems will be processed using the filtered

ion exchange system. Only storm water and ground water will be treated and released using the Ground Water Treatment System. Due to the much lower potential source terms than those associated with an operating reactor, continuous monitoring of liquid releases will be replaced with grab sampling, composite sampling and analysis. Action 21 sampling requirement when the liquid radioactive waste monitoring instrumentation is inoperable has been moved to Part I, Section 2.3.2.

Section 2.2.1

Changed to 2.1.1 with deletion of Section 2.1 for liquid effluent instrumentation and added clarification that this guidance pertains to gaseous releases through the plant stack. The instrumentation requirements of this section are only applicable to gaseous effluent releases through the plant stack. This allows suspension of this requirement without change to the ODCM when releases through the plant stack are discontinued.

Section 2.2.2

Changed numbering and revised text to clarify that Table 2-4 applies when gaseous effluent releases were occurring through the plant stack. This is to allow suspension of this requirement without change to the ODCM when releases through the plant stack are discontinued.

Section 2.2.2 Table 2-4

Changed Channel Function Test frequency from daily to weekly on Stack Particulate Airborne Monitoring Systems. See basis in Section 3.3 in TSD-12-090.

Section 2.3.2

Text changed from liquid waste to liquid effluents. Liquid radioactive wastes will be treated by an off-site waste processor.

Section 2.3.3

The requirements from Action 21 of the Part I, Section 2.1, were moved to this Section.

Table 2-5

Word change, eliminated Waste from the title and changed to effluents. Liquid radioactive wastes will be treated by an off-site waste processor.

Table 2-5B. Plant Continuous Releases

Deleted Caisson Sump, which is no longer used for continuous releases, and replaced with Ground Water Treatment system. Changed daily grab samples to weekly, monthly,

and quarterly composite samples. The ground water treatment system will be used for the final phases of decommissioning with composite sampling to correlate radioactivity concentrations with released volumes on a weekly basis.

Table 2-5 Footnotes

Changed analysis requirements for Gross Alpha, Sr-90, Ni-63 to be required only when gamma emitting radionuclides are detected in the influent to the ground water treatment system. Characterization and scoping sampling data has demonstrated that transuranic and hard to detect radionuclides are not present without detectable levels of associated gamma emitting radionuclides.

Table 2-5. Footnotes b, c, d

Changed "waste" to "effluent". Liquid radioactive wastes will be treated by an off-site waste processor.

Section 2.5

Text was revised from Liquid Waste Treatment System to Filtered Ion Exchange System or Ground Water Treatment System and replace waste with effluent throughout section. Liquid radioactive wastes will be treated by an off-site waste processor.

Section 2.6.2

Added modular ventilation monitoring to stack monitoring exclusion for monitoring for noble gases because the spent fuel (noble gas source term) has been transferred to the ISFSI.

Table 2-6

Added section to table for Modular HEPA Ventilation Discharge. Modular HEPA ventilation units equipped with mixing boxes and sample per ANSI/HPS N13.1 1999 will be used as the decommissioning progresses and will eventually be the only gaseous effluent release when the plant stack use is discontinued. Sample types and frequencies mirror those used for the stack. This provides a basis for monitoring modular HEPA ventilation unit gaseous effluents in the ODCM.

Table 2-6. Footnote b.

Updated to require that samples be changed at least once per 7 days (3-day extension permitted). This footnote is used for the HEPA ventilation monitoring requirements in Table 2-6. The three day extension is intended to make allowances for weekends and holidays.

Table 2-6 Footnote h and i.

Added footnotes h and i for the quarterly Am-241 LLDs. This allows for use of higher LLD for short HEPA run/sample collection times. As explained in Section 3.6 there is no impact on potential doses due to the lower release volumes.

Table 2-7 Direct

Modified the number of TLDs required for the site boundary to a minimum of 8 to allow the monitoring location to be reduced as source term is removed from site during the final phases of decommissioning. Changes in site boundary fence locations and numbers will be documented to provide a basis for the changes.

Table 2-7 Waterborne

Added intake canal and changed from continuous sampler to weekly dip sample for either discharge or intake canal. The ODCM will allow the ground water treatment to be discharged to either the discharge or intake canal. Discharges will be monitored and effluent concentrations and doses will be calculated based upon release composite sampling or grab samples. The ODCM allows weekly dip sample monitoring on the discharge canal if the composite sampler is inoperable. Since the liquid effluents will be monitored by composite sampling, this change is consistent with monitoring requirements in previous revisions of the ODCM.

Table 2-7

Deleted ground water monitoring from table. Groundwater results will continue to be monitored and reported in accordance with ground water monitoring programs procedures and reported in the Annual Radioactive Effluent Release Report in accordance with NRC IEN 2012-05. It is not necessary to contain ground water monitoring requirements in the ODCM. The SFP will be drained early in the final phase of decontamination and dismantlement and the ground water monitoring program requires operational flexibility to adjust to changes to site access and hydrogeology as soils and building substructures are removed. The permitted ground water discharge is via the Storm Water Pollution Prevention Plan (SWPPP). Ground water monitoring results are reported in the Annual Decommissioning Radiological Environmental Monitoring Program Report as required by Table 4-1 in the ODCM.

Table 2-7 Ingestion

Removed Pedrotti and Holgerson dairy annual milk sampling. Removal was based upon no detection of Sr-90 or plant related gamma emitters in milk since decommissioning started. Any significant releases that could impact local food sources would be detected in air samples and/or liquid effluents surface water sampling. In such an event a pathways analysis and investigative sampling would be part of the evaluation.

Table 2-9 Notation continued

Deleted wording because annual milk samples have been eliminated from Table 2-7.

Table 2-10

Deleted Stations 16 and 18 Pedrotti and Hogerson dairies from list of Environmental Monitoring Station Locations. Annual milk samples have been eliminated from Table 2-7.

Section 2-11.2

Updated text to remove reference to Figure 2-1 and 2-2.

Figure 2-1 HBPP On-Site TLD Locations

Modified the number of TLDs required for the site boundary to a minimum of 8 in Table 2-7 and deleted map and table. This is to allow the monitoring locations to be reduced as source term is removed from site during the final phases of decommissioning. Changes in site boundary fence locations and numbers will be documented to provide a basis for the changes. This will include a map showing the locations.

Figure 2-2

Deleted the map and table of ground water monitoring well locations. Ground water monitoring sampling analysis and locations are not required to be in the ODCM. These details are normally described in the site ground water monitoring program and results are reported in the Annual Decommissioning Radiological Environmental Monitoring Program Report as required by Table 4-1 in the ODCM.

Section 2.13.2

Deleted the limitation on solid radioactive waste system radioactivity inventory to be maintained at less than 1000 Ci. During final phase of decommissioning, the potential exists to have greater than 100 Ci of waste in inventory as greater than Class C (GTCC) waste in the ISFSI of in the form of Class B and C wastes associated with reactor segmentation and structures, systems, and components (SSC) removal. The packaging handling and storage of these wastes, are evaluated against the Defueled Safety Analysis Report (DSAR), Environmental Impact, Decommissioning Plan, etc. criteria as part of the 10 CFR 50.59 and 50.72 process. This limiting condition in the ODCM is no longer applicable and is not required.

Section 2.13.3

Updated wording to make it clear that the inventory requirement pertained to liquid radioactive waste in outdoor tanks and that an annual inventory of solid radioactive waste was not required by the ODCM. Surveillance requirement was changed as liquids going

into the FIXS and Ground Water Treatment System (GWTS) tanks are sampled to meet concentration limits and to ensure the inventory does not exceed 0.25 Ci. Limiting condition 2.13.1 requires that radiological inventory of wastes in outdoor tanks that are capable of retaining or treating tank overflows shall not exceed 0.25 Ci. This wording preserves the annual surveillance required to verify this limiting condition while allowing the removal of the 100Ci solid waste limitation of 2.13.2.

Section 3.1

Deleted section on basis for Radioactive Liquid Effluent Monitoring Instrumentation as it pertains to Liquid Radwaste Treatment Systems monitoring instrumentation, which has been removed from the ODCM.

Section 3.5

Changed liquid waste to liquid effluent to reflect updated wording.

Section 3.13

Text referring to solid radioactive waste was removed to reflect bases of Section 2.13.2.

Table 4-1

Added Intake canal effluent to reflect text added to Table 2-7.

Part II

Section 1.0

Revised text because the Liquid Radwaste Treatment System monitor instrument is being removed, therefore set point calculations are no longer required for liquid releases. Similarly use of the plant stack will be discontinued along with the use of the corresponding effluent monitoring instrumentation. However, calculation of concentrations at the Owner Controlled Area boundary will still be required to demonstrate compliance with instantaneous or short term concentration limits. Therefore, the guidance for how to calculate site boundary concentration is maintained along with calculation of stack monitoring set points.

Section 1.1

Text was changed that allows liquid effluent concentrations at the Unrestricted Area to be calculated based upon sample results.

Section 1.1.1

Added 1.1.1 to explain that no credit is taken for tidal dilution of the canal if the outfall is near the outlet and is not the furthermost portion of the canal from the entrance of the Bay, and that ODCM equation 2-3 is used to calculate the Bay concentration. Changes were made to the Dilution Factor (DF) canal term definition to eliminate the terminology associated with the Liquid Radwaste Treatment System and explains the basis of the calculation in terms of release volumes.

Section 1.1.2

Changed wording to this former Section 1.1.1 to specify under which conditions credit for the canal tidal dilution may be taken. Additional revision of text to eliminate the terminology associated with the Liquid Radwaste Treatment System and explanation of calculation. It also clarifies that the dilution is based upon releases to the discharge canal and that this bounds discharges to the intake canal since the volume of the intake canal is larger than the discharge canal and therefore concentrations would be lower than calculated at the Unrestricted Area boundary.

Section 1.1.2 through 1.1.10

Removed steps pertaining to the Liquid Radwaste Treatment System radiation monitor which are no longer applicable.

Section 1.2

Updated text to continue to allow for gaseous effluent concentrations at the Unrestricted Area boundary alarm set points to be calculated for the stack until its use is discontinued.

Section 1.2.1

It was clarified that 30,000 cfm is for the plant stack.

Section 1.2.2

Clarification added to section, that the values pertain to plant stack releases. The equation for ground releases is also given in this section. This can be used for calculating Unrestricted Area concentrations from Modular HEPA Ventilation units discharging to the atmosphere.

Section 1.2.6

Added stack release to statement for clarification. Clarifies that it pertains to releases form the plant stack.

Section 2.3

Added clarification to section to specify under what conditions credit can be taken for tidal dilution for the canal. This revision included an added equation to provide mathematical equation for the diluted activity in the bay and to specify equation for when canal tidal dilution cannot be used. Provided mathematical equation for the diluted activity in the bay. Added text to specify equation for when canal tidal dilution cannot be used. See Section 3.4.

Section 2.4

Text was revised to add basis for bounding intake canal with previous discharge canal calculation. The dilution volume of the release compared to the tidal dilution volume of the discharge canal is significant for continuous operation of the ground water discharge system. Made editorial changes to reflect current facility status and change to tidal dilution flow for this revision of the ODCM. Also changes to make consistent terminology between an effluent, which is a release and the discharge canal which is a site structure.

Section 2.5.1

To maintain consistency with new terminology, updated wording to incorporate FIXS and GWST, change waste to effluents and to refer to Surveillance Requirement of 2.5.2. To clarify consistent with new terminology and incorporate PRC comment linking action to Surveillance Requirement prior to release.

Section 3.0

Changed section title to maintain consistency with Part I changes where the liquid waste treatment system is eliminated.

Section 3.1.1

Changed wording to maintain consistency with Part I changes where the liquid waste treatment system is eliminated.

Section 3.1.2

Revised as the old National Pollutant Discharge Elimination System (NPDES) permit is no longer applicable and has been replaced by the California NPDES Permit for construction related storm water CAS000002. Placed Table 14 – 40 CFR 302.4, Appendix B, Reportable Quantities (RQ) for GEL Part 61 Radionuclides from Section 3.5 here. Added sampling requirements on discharges from the GWTS to ensure releases do not exceed a reportable quantity. Added clarity that the GWTS also functions as the Active Treatment System (ATS).

Section 3.2

Deleted 3.2.1 through 3.2.2 to eliminate description of the Liquid Radwaste Treatment System. Change 3.2.3 wording to maintain consistency with Part I changes where the liquid waste treatment system is eliminated and the ground water treatment system is defined and introduced.

Section 4.0

No changes were made to the Gaseous Effluents Calculations. The ODCM already specified X/Qs for stack and non-stack releases. Clarifies that gaseous releases through modular HEPA ventilation units will be monitored and doses will be estimated using the non-stack release.

Tables 4-1 through 4-4

Changed titles of Inhalation dose conversion factor (DCF) table to refer to proper NUREG type.

Tables 4-8 through 4-11

Changed titles of Inhalation DCF table to refer to proper NUREG type.

Tables 4-12 through 4-13

Changed titles to refer to proper NUREG.

Section 5.0

Provided method of incorporating calculated annual doses, annual skin doses and annual organ doses from modular HEPA units into the fuel cycle annual limit calculation.

Appendix A 1.0

Change to text to maintain consistency with Part I and Part II changes.

Appendix A Table A-1

Deleted this change since we will continue releases using FIXS.

Revision 24 (Effective 7/16/2013)

List of Tables- Part I

Changed the Part I Table numbering to be consistent with existing implementing procedure ODCM Table references. In previous revision to the ODCM, renumbering the tables created an inconsistency implementing procedures. The table numbering is changed to minimize the number of procedure revisions necessary to implement.

List of Tables Part II

Corrected typo in regulatory reference to 40 CFR 302.4.

Section 1.7

Grammatical correction in FIXS definition. Since portions of the existing liquid radioactive waste system remain in service they are part of the filtered ion exchange system.

Section 1.9

Revised text and added clarification that the GWTS processes water that satisfies the environmental effluent release criteria. The GWTS is not an installed liquid radioactive waste processing system and it's influent is controlled to level consistent with the license basis on plant liquid effluents (i.e., 10 times the Effluent Concentration Limits (ECL)).

Section 1.13

Added clarification of when the need of a HEPA mixing device is established. The modular HEPA Ventilation effluent pathway must meet the criteria of ANSI/HPS N13.1-1999 and according to the manufacturer the HEPA currently in use satisfies the ANSI guidance. The need for a mixing device, shrouded probe, and establishing a representative sampling location is assesses on a case by case basis and with the guidance of the ANSI standard.

Section 2.1
Change table numbering to be consistent with implementing procedures.

Table 2-2

Change table numbering to be consistent with implementing procedures.

Table 2-3

Change table numbering to be consistent with implementing procedures. The GWTS in

not a radioactive effluent treatment system. Added to footnote to clarify influent allows excess of an ECL if samples are measured for more difficult to measure nuclide. Clarification on hold tanks for the FIXS and remaining portions of the "old" liquid radioactive waste (LRW) system. Added to footnote d. Clarification provides that sampling may be suspended when there is no continuous release pathway. Current expectations are that most releases will be batch releases and assessed per Section A of Table 2-5.

Section 2.5

Removed references to Ground Water Treatment System as it is not an installed liquid radioactive processing system and its influent is controlled to level consistent with the license basis on plant liquid effluents (i.e., 10 times the ECL).

Section 2.6.3

Typo correction, "3.6" should be "3.5." The reference is to the basis for not routinely assessing tritium dose rate in gaseous effluent.

Table 2-6, footnote h

Editorial correction, deleted an extra period.

Section 2.11.2

Editorial correction, deleted an extra comma.

Table 2-7 Table Notation 3

Changed wording from "DCPP" to "NVLAP accredited processor". Diablo Canyon is currently considering changing to a vendor provided service for TLD processing.

Table 2-7, Waterborne, Surface Water

Added composite sampling to allow the use of automated sampling equipment, if available. At the time Revision 23, several discharge points were being evaluated for GWTS. The addition of the footnote provides the latitude to not sample those discharge points that are not being used.

Section 2.13.3

Added alternate surveillance requirements to the existing maintenance of an activity inventory. The alternate surveillance requirements are consistent with the limiting condition and only provide alternate methods of assessment or prevention of spills. Currently, there are 2 large outdoor tanks with a capacity of approximately

20,000 gallons, each is provided with some measure of spill retention and would require greater than 3E-3 µCi/ml concentration to exceed 0.25 Ci.

Part II

Section 1.2

Deleted value that is no longer used in the subsequent equation and no longer valid. Stack effluent rate of 25,000 cfm is corrected later. Updated the example calculation shown in 1.2.2 through 1.2.9 to reflect the current X/Q in ODCM, Appendix B and stack flow rate of 25,000 cfm and dose calculations relative to Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs).

Section 3.1.2

Added text to provide some clarity of overlapping requirements, but should clarify that a change in NPDES requirements does not necessitate a change to the ODCM. Text was revised for an additional grammatical correction.

Table 2.7

Grammatical correction, "These" to "The"

Section 3.2.1

Revised statement that clarifies the GWTS is not relied upon for radioactivity removal, but may contain licensed material after being in service for a period of time.

Section 4.1.2

Typo correction, "3.6" should be "3.5". The reference is to the bases for not routinely assessing tritium dose rate in gaseous effluent.

Section 4.3.4 through 4.3.13

Enhanced references to the Appendix B for X/Q to ensure that the appropriate value is used based on the effluent pathway.

Section 5

Grammatical correction in 5.1.c, 5.2.b, 5.2.c, 5.3.b, and 5.3.c. Added reference to the Bases 3.5 in 5.1.c and corrected equation reference in 5.2.b and 5.3.b to (4-3). The reference to the Bases 3.5 reiterates that Tritium is not normally monitored based on limited source ter. Equation 4-3 is corrected the correct reference for calculating skin

dose and organ dose from particulates.

VI. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

There were no changes to the Process Control Program during the report period.

VII. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

The Liquid Radwaste Treatment System has been replaced with the FIXS. Effective December 23, 2013, HBPP no longer uses outfall canal dilution for liquid effluents. Liquid radioactive waste will be sampled and shipped offsite for disposal.

VIII. INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

Liquid Effluent Monitoring
Radioactive Liquid Effluent Monitoring System (RLEMS)

Revision 23, May 2013, of the ODCM deleted reference to the RLEMS. The alternate ODCM requirement for the RLEMS to be operable (two independent samples to be analyzed with an independent verification of calculations of the instantaneous concentrations) was met for subsequent releases.

Airborne Effluent Monitoring Instrumentation
Stack Particulate Airborne Monitoring System (SPAMS)

There were no unplanned SPAMS out of service periods during the report period.

IX. ERRATA

No Errata to report.