



**Pacific Gas and  
Electric Company**

Loren D. Sharp  
Director & Plant Manager  
Humboldt Bay Nuclear

Humboldt Bay Power Plant  
1000 King Salmon Avenue  
Eureka, CA 95503

707.444.0819  
Internal: 375.0819  
Fax: 707.444.0871

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U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Docket No. 50-133  
License No. DPR-7  
Humboldt Bay Power Plant Unit 3  
Annual Radiological Environmental Monitoring Report for 2015

Dear Commissioners and Staff:

Enclosed is the Humboldt Bay Power Plant Unit 3, "Annual Radiological Environmental Monitoring Report" for 2015. This report provides the information required by Section 4.1 of the SAFSTOR/Decommissioning Offsite Dose Calculation Manual (ODCM).

The report has three sections. Section A provides a summary description of the SAFSTOR Radiological Environmental Monitoring Program (REMP), including maps of sampling locations. Section A also provides the results of licensee laboratory participation in the Interlaboratory Comparison Program.

Section B provides summaries, interpretations, and analyses of trends of the results of the REMP for the reporting period. The material provided is consistent with the objectives outlined in the ODCM, and in 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

Section C provides monitoring results for the reporting period. Radiological environmental samples and environmental radiation measurements were taken at the locations identified in ODCM Table 2-7 as quality-related locations. The summarized results are formatted for applicable reporting requirements of the NRC Radiological Assessment Branch's Branch Technical Position, Revision 1, dated November 27, 1979.

There are no new or revised regulatory commitments (as defined in NEI 99-04) made in this letter.

NM5501

If you have any questions regarding information in the enclosed report, please contact Mr. Hossein Hamzehee at (805) 545-4720.

Sincerely,

A handwritten signature in black ink, appearing to read "Loren Sharp". The signature is fluid and cursive, with the first name "Loren" and last name "Sharp" clearly distinguishable.

Loren D. Sharp

*Director and Plant Manager Humboldt Bay Nuclear*

cc/enc: Marc L. Dapas, NRC Region IV Administrator  
John B. Hickman, NRC Project Manager  
HBPP Humboldt Distribution

Enclosure

**HUMBOLDT BAY POWER PLANT UNIT 3**  
**ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT**  
**JANUARY 1 THROUGH DECEMBER 31, 2015**

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**PACIFIC GAS AND ELECTRIC COMPANY  
ANNUAL RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT FOR  
HUMBOLDT BAY POWER PLANT UNIT 3, COVERING THE PERIOD  
JANUARY 1 THROUGH DECEMBER 31, 2015**

This annual report is required by Section 4.1 of the SAFSTOR Offsite Dose Calculation Manual (ODCM). This report provides information about the Radiological Environmental Monitoring Program (REMP) for the period of January 1 through December 31, 2015, in a manner consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C.

The report has three sections. Section A provides a summary description of the REMP, including maps of sampling locations. Section A also provides the results of licensee laboratory participation in the Interlaboratory Comparison Program.

Section B provides summaries, interpretations, and analyses of trends of the results of the REMP for the reporting period. The material provided is consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

Section C provides the results of analyses of radiological environmental samples and of environmental radiation measurements taken during the period pursuant to the quality related locations specified in the table and figures in the ODCM, presented as both summarized and tabulated results of these analyses and measurements. The summarized results are formatted for applicable reporting requirements of the NRC Radiological Assessment Branch's Branch Technical Position.

## **A. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

### **1. Program Description**

The NRC Radiological Assessment Branch issued a Branch Technical Position (BTP) on environmental monitoring in March 1978. Revision 1 of the BTP was issued as Generic Letter 79-65, "Radiological Environmental Monitoring Program Requirements – Enclosing Branch Technical Position," Revision 1, dated November 27, 1979, and sets forth an example of an acceptable minimum radiological monitoring program. The specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of individuals resulting from plant effluents.

As discussed below, many of the exposure pathway sample requirements specified in the BTP are not required for the HBPP REMP because of the baseline conditions established in the SAFSTOR Decommissioning Plan (now identified as the Post Shutdown Decommissioning Activities Report (PSDAR) and Defueled Safety Analysis Report (DSAR)) and the Environmental Report.

In addition, the nuclides specified for analysis by the BTP have been revised to reflect the available source term at a nuclear power plant that has been shut down since July 2, 1976.

The REMP consists of the collection and analysis of both onsite and offsite environmental samples. HBPP personnel perform sample collection and sample analysis of airborne radioactivity. General Engineering Laboratories (GEL) personnel perform sample analysis of ground water radioactivity. Mirion Technologies personnel perform analysis of thermoluminescent dosimeters (TLDs) used for monitoring direct radiation. A summary of the REMP is provided as Table A-1, "HBPP RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM".

Sample collection for the REMP is performed at the sampling stations defined by Table A-2, "DISTANCES AND DIRECTIONS TO HBPP OFFSITE SAMPLE LOCATIONS", Figure A-1, "HBPP ONSITE AIR SAMPLE LOCATIONS," Figure A-2, "HBPP OFFSITE AIR SAMPLE LOCATION," Figure A-3, "HBPP ONSITE TLD LOCATIONS", Figure A-4 "HBPP OFFSITE TLD LOCATIONS", and Figure A-5 "HBPP GROUNDWATER SAMPLE POINTS".

## 2. Monitoring Requirements

### a. Offsite Environmental Monitoring

#### 1. Airborne

The SAFSTOR ODCM requires one (1) offsite environmental air sampling station. The air sampler is run continuously and samples are analyzed weekly for Gross Beta and Gross Alpha activity. Station 3 satisfies this requirement as shown on Figure A-2. Quarterly the composited samples are analyzed for Gamma Isotopic.

#### 2. Direct Radiation

The SAFSTOR ODCM requires four (4) offsite environmental monitoring stations and one (1) offsite control station equipped with TLDs to monitor gamma exposure. The TLDs are required to be exchanged quarterly. Offsite environmental stations selected to satisfy this requirement are Stations 1, 2, 14, 25, while T17 is the offsite control station as shown on Figure A-4. These stations are considered to represent the offsite locations for the direct radiation pathway.



### 3. Ingestion

The requirement to perform milk sampling was removed from the SAFSTOR ODCM Revision 24 based upon no detection of Sr-90 or plant-related gamma emitters in milk since decommissioning began.

#### b. Onsite Environmental Monitoring

##### 1. Airborne

The SAFSTOR ODCM requires five (5) air sampling stations. The stations selected to satisfy this requirement are Stations AM1 through AM5 as shown on Figure A-1. The air samplers are run continuously and samples are analyzed weekly for Gross Beta and Gross Alpha activity. Quarterly the composited samples are analyzed for Gamma Isotopic, by station.

##### 2. Direct Radiation

The SAFSTOR ODCM requires a minimum of 8 onsite environmental monitoring stations at or within the site boundary fence line, equipped with TLDs to monitor gamma exposure. TLDs are required to be exchanged quarterly. A total of 16 TLD stations are currently used to satisfy this requirement. Stations T1 through T16 are shown on Figure A-3. Four (4) additional TLDs were added around the ISFSI in 2010. These are Stations T18 through T21.

Each quarter the exposures from 20 stations are determined, which results in 80 analyses for a full year. Each TLD station has three TLDs, each containing a number of phosphors (normally three). The phosphor exposures for each TLD are averaged and then the three TLDs per station are averaged to provide the quarterly exposure for the station.

The minimum number of TLDs was modified in the ODCM from 16 to 8 stations to allow monitoring locations to be reduced as source term is removed from the site during the final phase of decommissioning.

### 3. Waterborne

#### Surface Water

Effective December 31, 2013, discharge of processed radioactive liquid effluents to Humboldt Bay was terminated. Any remaining or incidental radioactive liquids in concentrations exceeding 10 times 10 CFR 20, Appendix B, Table 2 Column 2 are manifested for disposal at a regulated disposal facility. Sampling and manifesting requirements are consistent with the requirements of the receiving facility and not subject to ODCM methodology. Sampling of surface water is not required by the current revision of the SAFSTOR ODCM.

## Groundwater

Revision 23 of the SAFSTOR ODCM transferred ground water monitoring program requirements from the ODCM to HBPP's ground water monitoring program procedures. The number and type of required monitoring wells are specified by procedure rather than the ODCM. This was done to allow operational flexibility needed to adjust to changes to site access and hydrogeology as soils and building substructures are removed. SAPN 1290022 documented the reassignment of groundwater monitoring from the ODCM to plant procedures.

A total of fourteen (14) intermediate and deep ground water wells are included in the current groundwater monitoring initiative. Intermediate wells range in depth from 45 ft. to 69 ft. and are comprised of MW-11, RCW-SFP-1, RCW-SFP-2, RCW-SFP-3, RCW-SFP-4, RCW-SFP-5, and RCW-SFP-6. Deep ground water monitoring wells range in depth from 83 ft. to 110 ft. and include RCW-CS-3, RCW-CS-5, RCW-CS-6, RCW-CS-7, RCW-CS-8, RCW-CS-9 and RCW-CS-10. Each well was sampled on a quarterly basis. Well locations are shown on Figure A-5, "HBPP GROUNDWATER SAMPLE POINTS".

### c. Other Monitoring

Airborne, ingestion and terrestrial pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to SAFSTOR License Amendment Request 84-01, dated July 31, 1984, established baseline conditions for these pathways. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the PSDAR and DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR. The Environmental Report also contains a description of the demography and human activities within the environs surrounding the site.

As a matter of plant policy, groundwater leakage into the reactor caisson has been routinely sampled, approximately monthly, and analyzed for tritium and gamma emitters, in order to develop a historical record of these parameters. The results are reported in Table C-5, but are not considered part of the SAFSTOR REMP. This sampling was discontinued after April 2015 due to impending building demolition and was documented in corrective action SAPN 1403808.

### 3. Interlaboratory Comparison Program

PG&E's contract laboratory, GEL, has analyzed evaluation samples provided by a commercial supplier to satisfy the requirement to participate in an Interlaboratory Cross-Check Program. HBPP count room personnel also participated in the Eckert & Ziegler Interlaboratory Cross-Check Program. This participation includes sufficient determinations (sample medium and

radionuclide combination) to ensure independent checks on the precision and accuracy of the measurements of radioactive materials in the REMP samples. Table A-3, "GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA", and Table A-4, "HBPP PARTICIPATION – ECKERT & ZIEGLER INTERLABORATORY CROSS-CHECK PROGRAM DATA", represent analyses performed for HBPP (Table A-3) and by HBPP personnel (Table A-4). The agreement criteria are consistent with the guidance for "Confirmatory Measurements" as described in NRC Inspection Procedure 83502.03, "Radiological Environment Monitoring Program and Radioactive Material Control Program."

GEL analyzed four sets of Eckert & Ziegler Analytics samples for 23 parameters that are representative of analyses performed for HBPP during 2015. All results met the acceptance criteria. The 2014 fourth quarter Eckert & Ziegler Analytics sample data that was not included in the HBPP 2014 REMP report are included in the HBPP 2015 REMP report. This was tracked in corrective action SAPN 1401944.

HBPP analyzed four sets of Eckert & Ziegler Analytics samples for gamma in soil, (1<sup>st</sup> and 4<sup>th</sup> quarters), gamma air filter and alpha/beta air filter (2<sup>nd</sup> quarter), and gamma in water and tritium in water (3<sup>rd</sup> quarter). These analyses are representative of those performed by HBPP count room personnel during 2015. All results met the acceptance criteria.

#### 4. NEI Groundwater Protection Initiative

Groundwater monitoring data is collected in accordance with the Nuclear Energy Institute (NEI) Groundwater Protection Initiative. The results show that there are detectable concentrations of radionuclides in the groundwater within the HBPP restricted area. These are believed to be the results of historical spills at the site.

The impact of these detectable concentrations is negligible, because the groundwater is saline and is not used now nor likely to be used in the future for either direct consumption or for agricultural purposes.

### B. TRENDS, BASELINE COMPARISONS AND INTERPRETATIONS

Section B provides interpretations of results, and analyses of trends of the results. The material provided is consistent with the objectives outlined in the ODCM, and in 10CFR 50, Appendix I, Sections IV.B.2, IV.B.3, and IV.C. Section B also includes a comparison with the baseline environmental conditions at the beginning of SAFSTOR.

#### 1. General Comments

The Environmental Report, submitted to the NRC as Attachment 6 to SAFSTOR License Amendment Request 84-01, established baseline conditions for soil, biota and sediments. The results to date indicate no significant change

from the baseline environmental conditions established in the Environmental Report.

The results, interpretations, and analysis of trends of the results, indicate that SAFSTOR activities have had no measurable radiological effect on the environment. Facility surveys for radiation and radioactive surface contamination are performed on both a scheduled basis and on an as-required basis. These surveys indicate that the radioactivity control barriers established for SAFSTOR and decommissioning continue to be effective.

As discussed below, the ODCM calculation model conservatively assumes that exposure pathways begin at the unrestricted area boundary, also known as the owner controlled area (OCA) boundary. Since there have been no significant changes in the location of the boundary, no survey for changes to the use of unrestricted areas was necessary.

## 2. Direct Radiation Pathway

A plot of the radiation level trends for the five (offsite) locations is shown in Figure B-1, "OFFSITE ENVIRONMENTAL RADIATION LEVEL TRENDS." A plot of the radiation level trends for onsite stations is shown in Figure B-2, "ONSITE ENVIRONMENTAL RADIATION LEVEL TRENDS." The plots show that the offsite annual doses continue to be within the ranges that have been observed over the last ten years.

HBPP changed TLD processing services beginning in January 2014. Data from previous years was based on a Panasonic TLD system. Data in 2014 and 2015 is based on Mirion Genesis type TLD system. The apparent rise in Figures B-1 and B-2 may be a result of the change in monitoring devices in tandem with the increase in decommissioning activities.

Figure B-2 includes the average dose for two groups of onsite stations, selected by their potential to be affected by radioactive waste handling activities. Figure B-2 also shows that dose measurement variations can be attributed to in-plant sources and low-level waste packaging and shipping activities. However, allowing for the background change in the general environs, all measurements were comparable to the ranges observed at these locations since entering SAFSTOR, with the onsite station dose levels approximately within the range of dose levels shown by the offsite stations.

The ODCM calculation model for the direct radiation exposure pathway assumes an occupancy factor for the portion of the unrestricted area boundary that is closest to the radioactive waste handling area of the plant, (TLDs T5-T8), which is the location of the highest potential exposure. The occupancy factor is 67 hours per year, based on regulatory guidance for shoreline recreation, even though the actual shoreline is farther from the boundary. Since there have been no significant changes of the locations of the radioactive waste handling activities, boundary, or shoreline, no further survey for changes to the use of unrestricted areas is necessary. Using the maximum yearly dose, as seen on TLDs T5-T8 and corrected to the 67 hour occupancy, and subtracting the average of the five (5) offsite TLDs, the dose to the maximum exposed individual from this source was indistinguishable from background.

The Independent Spent Fuel Storage Installation (ISFSI) was constructed in 2008, and spent fuel transfer from the spent fuel pool (SFP) was completed in December 2008. As a result of this, the dose rates at the OCA fence line increased slightly. The ISFSI Final Safety Analysis Report (FSAR) assumes an occupancy factor of 2,080 hours per year at the OCA fence line. Using the maximum yearly dose, as seen on TLDs T18-T21 and corrected to the 2080 hour occupancy, and subtracting the average of the five (5) offsite control TLDs, the dose to the maximum exposed individual from this source would be 1.70 mRem per year.

### 3. Airborne Pathway

Airborne pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to SAFSTOR License Amendment Request 84-01, established baseline conditions for the airborne pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the PSDAR and DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR. The ODCM calculation model for the airborne pathway assumes that the airborne exposure pathway (inhalation exposure) is at the unrestricted area boundary, which is the location of the highest potential exposure.

### 4. Waterborne Pathway

#### a. Surface Water

The original Liquid Radwaste Treatment System has been dismantled and removed. The Spent Fuel Pool has been drained and the radioactive water processed through a filtered ion exchange system. Liquid radioactive wastes were shipped for disposal to a regulated disposal facility. Discharges of liquid radioactive effluent to Humboldt Bay were eliminated after December 2013.

b. Groundwater

None of the samples of the fourteen (14) SAFSTOR REMP monitoring wells indicated detectable levels of tritium. For gamma radioactivity, sample results were typical of those observed since entering SAFSTOR. Results for other parameters and samples were comparable to the ranges observed since entering SAFSTOR.

This report also contains information on gamma emitting radionuclides and tritium concentrations in the Caisson Sump and gamma emitting radionuclide concentrations for the SFP French Drain during the first four months of 2015. There was detectable radioactivity, due to plant operations, at these sample points. Both of these locations are believed to be contaminated as a result of groundwater intrusion into historically contaminated areas of concrete and fill material. Due to impending demolition of the Refueling Building, this sampling effort was ceased after April 2015. The cessation of sampling was documented in SAPN 1403808.

The ODCM does not provide a model for the groundwater waterborne pathway, because the groundwater is saline and is not used now nor likely to be used in the future for either direct consumption or for agricultural purposes.

5. Ingestion Pathway

Ingestion pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to SAFSTOR License Amendment Request 84-01, established baseline conditions for the ingestion pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the PSDAR and DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR.

The ODCM calculation model for the airborne pathway assumes that the ingestion pathways (milk, meat and vegetable consumption) begin at the unrestricted area boundary, which is the location of the highest potential exposure, whether any dairy, farm, etc. is actually present.

6. Terrestrial Pathway

Terrestrial pathway monitoring is not required by the ODCM. The Environmental Report, submitted to the NRC as Attachment 6 to SAFSTOR License Amendment Request 84-01, established baseline conditions for the terrestrial pathway. In accordance with the NRC-approved SAFSTOR Decommissioning Plan, (now identified as the PSDAR and DSAR), these baseline conditions will only need to be reestablished prior to final decommissioning if a significant release occurs during SAFSTOR.

The ODCM calculation model for the terrestrial pathway conservatively assumes that the terrestrial exposure (direct radiation from airborne radioactivity deposition) is at the unrestricted area boundary, which is the location of the highest potential exposure.

## **C. MONITORING RESULTS**

### **1. Annual Summary**

Results of the REMP sampling and analysis are summarized in Table C-1 in the format of the BTP Table 3. None of the REMP samples results exceeded the reporting levels for radioactivity concentration in environmental samples specified in HBPP ODCM Table 2-8.

All of the minimum detectable activities (MDAs) for analyses required by the SAFSTOR REMP were less than or equal to the lower limit of detection (LLD) criteria for radioactivity in environmental samples specified in Table C-1 of this report.

Because alpha and beta radioactivity analyses of the saline ground water are less effective than tritium and gamma radioactivity analyses for monitoring potential SFP leakage, the ODCM does not currently require alpha and beta radioactivity analyses in water to be part of the SAFSTOR REMP.

### **2. Direct Radiation Pathway**

Monitoring of the direct radiation pathway is performed at 20 onsite locations near the OCA fence line, and at four offsite environmental monitoring stations and one offsite (control) location (Location number T17) in the vicinity of the facility. Monitoring is performed with TLDs with multiple crystal elements. Three TLDs are installed at each station, and the set is exchanged quarterly. The reported result and its standard error are calculated from the measurements of multiple elements in the TLD triplet. Results of the onsite and offsite monitoring are provided in Tables C-2 and C-3, respectively.

### 3. Airborne Pathway

Five onsite samples and one offsite sample were collected and analyzed weekly for Gross Beta and Gross Alpha activity.

The required quarterly composited samples were analyzed for Gamma Isotopic by station. All air sample results for alpha and beta activity, and quarterly composite results for Co-60 and Cs-137 are provided in Table C-7. The environmental air filter second quarter composite at location AM1 (East Fence) identified Co-60 with an activity of  $5.24\text{E-}03 \text{ pCi/m}^3$ . The composite sample identification of Co-60 was likely to have occurred during the demolition of the Liquid Radwaste Building. The weekly sample results for alpha and beta particulate met the effluent acceptance criteria in the ODCM. The activity identified in the composite sample would not have resulted in a measurable dose to a member of the public and was well below the effluent concentration limits in 10 CFR 20, Appendix B, Table 2, Column 1. Offsite laboratory analysis of the composited filters reaffirmed that no significant release occurred and the onsite sampling and analytical protocols accurately reflect the HBPP effluents. This event was addressed in corrective action SAPN 1407196.

All LLD's were met for Gross Beta (required LLD  $1.0\text{E-}02 \text{ pCi/m}^3$ ) and Cs-137 (required LLD of  $6.0\text{E-}02 \text{ pCi/m}^3$ ).

### 4. Waterborne Pathway

#### a. Surface Water

Surface water sampling of the waterborne pathway is no longer performed due to the termination of liquid effluent releases in December 2013.

#### b. Groundwater

Groundwater sampling of the waterborne pathway was performed by sampling fourteen (14) monitoring wells located to monitor for leakage from the SFP. Sampling of these monitoring wells was performed quarterly in accordance with plant procedures.

The ground water monitoring program requirements were transferred from the ODCM to HBPP's ground water monitoring program procedures. The number and type of required monitoring wells are specified by procedure rather than the ODCM to allow operational flexibility needed to adjust to changes to the site during decommissioning and demolition activities. Ground water results will continue to be reported in the annual REMP report. Detailed results of groundwater monitoring are provided in Table C-4.

The tritium concentration for all of the wells listed in Table C-4 during 2015 was less than the MDA of approximately 300 pCi/liter. All of the monitoring wells are inside the OCA boundary, and the groundwater is saline and is not used now nor likely to be used in the future for either direct consumption or for agricultural purposes. Therefore, there is no groundwater waterborne



pathway for a member of the public. None of the other ODCM required REMP samples indicated detectable levels of tritium or gamma radioactivity.

Because alpha and beta radioactivity analyses of the saline groundwater are less effective than tritium and gamma radioactivity analyses for monitoring potential SFP leakage, plant procedures do not currently require alpha and beta radioactivity analyses to be part of the SAFSTOR REMP. Nevertheless, alpha and beta radioactivity analyses are performed as a matter of plant policy, in order to maintain a historical record of this parameter for the remainder of SAFSTOR. These results are included in Table C-4, but are not considered part of the SAFSTOR REMP.

All required sampling and analysis for the monitoring wells of the waterborne pathway required during this reporting period were performed successfully. During the second quarterly ground water monitoring well event, monitoring well RCW-CS-7 was unable to be purged. Water monitoring parameters were not collected (conductivity, pH and turbidity). Adequate volume of sample for gross alpha, gross beta, Am-241, Cs-137, Co-60 and Total Strontium could not be obtained. The only sample obtained for offsite analysis was the H-3 sample. This action was documented in corrective action SAPN 1406334.

Groundwater leakage into the reactor caisson was also routinely sampled, approximately monthly, and analyzed for gamma emitters and tritium as a matter of plant policy, in order to develop a historical record of these parameters for SAFSTOR and decommissioning. These results are included in Table C-5, but are not considered part of the SAFSTOR REMP.

The French drain beneath the SFP was also routinely sampled, approximately monthly, and analyzed for gamma emitters as a matter of plant policy, in order to develop a historical record of this parameter for SAFSTOR and decommissioning. These results are included in Table C-6, but are not considered part of the SAFSTOR REMP.

Sampling of the caisson and the French drain was discontinued after April 2015 due to impending demolition of the Refuel Building. This was documented in corrective action SAPN 1403808.

5. Ingestion Pathway

Ingestion pathway monitoring is not required by the ODCM.

6. Terrestrial Pathway

Terrestrial pathway monitoring is not required by the ODCM.

## 7. NEI Groundwater Protection Initiative Voluntary Reporting Results

The NEI Groundwater Protection Initiative contains the following requirements:

### **OBJECTIVE 2.2 VOLUNTARY COMMUNICATION**

*Make informal notification as soon as practicable to appropriate State/Local officials, with follow up notification to the NRC, as appropriate, regarding significant onsite leaks/spills into groundwater and onsite or offsite water sample results exceeding the criteria in the REMP as described in the ODCM/ODAM.*

HBPP Response to 2.2:

There were no reports or notifications required to be generated in 2015 for groundwater results exceeding reporting/notification levels or significant onsite leaks/spills.

### **OBJECTIVE 2.3 THIRTY-DAY REPORTS**

*Submit a 30-day report to the NRC for any water sample result for onsite groundwater that is or may be used as a source of drinking water that exceeds the criteria in the licensee's existing REMP for 30-day reporting of offsite water sample results. Copies of 30-day reports for both onsite and offsite water samples will also be provided to the appropriate State agency, and:*

HBPP Response to 2.3:

There were no reports or notifications required to be generated in 2015 for groundwater results exceeding reporting/notification levels or significant onsite leaks/spills.

## OBJECTIVE 2.4 ANNUAL REPORTING

*Document all on-site ground water sample results and a description of any significant on-site leaks/spills into groundwater for each calendar year in the AREOR for REMP or the ARERR for the RETS as contained in the appropriate reporting procedure, beginning with Calendar year 2006.*

### HBPP Response to 2.4:

Onsite groundwater monitoring points are described and reported in this report as follows: MW-11, RCW-SFP-1, RCW-SFP-2, RCW-SFP-3, RCW-SFP-4, RCW-SFP-5, RCW-SFP-6, RCW-CS-3, RCW-CS-5, RCW-CS-6, RCW-CS-7, RCW-CS-8, RCW-CS-9, RCW-CS-10, the caisson sump and the French drain. A summary of the sample results are provided in Section C.

There were no significant onsite leaks/spills into groundwater in 2015.

Note: the term "significant" is defined by the NEI Initiative as greater than 100 gallons.

## 8. Errata for Previous Years' Reports

The 2014 fourth quarter Eckert & Ziegler Analytics interlaboratory sample data that was omitted from the HBPP 2014 REMP report is included in Table A-3 of the HBPP 2015 REMP report. This was tracked in corrective action SAPN 1401944.

The following editorial errors occurred in the HBPP 2014 REMP report and were tracked in corrective action SAPN 1417681:

- Section A.2.c. "Other Monitoring" on page 4 incorrectly referred to Table C-6 instead of Table C-5 for caisson monitoring results.
- Table C-4, "Groundwater Monitoring Well Results," on page 28 incorrectly identified the sample date for the fourth quarter as 8/13/2014 instead of 11/11/2014.

**TABLE A-1**  
**HBPP RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**

<b>Exposure Pathway And/Or Sample</b>	<b>Number of Samples And Locations</b>	<b>Sampling and Collection Frequency</b>	<b>Type of Analysis</b>
<b>AIRBORNE</b>	5 onsite locations, 1 offsite location	Continuous sampler operation with sample collection at least once per 7 days	Gross alpha and Gross beta radioactivity following filter change. Gamma Isotopic <sup>(a)</sup> analysis on quarterly composite (by station).
<b>DIRECT RADIATION</b>	20 onsite stations with TLDs	TLDs exchanged quarterly	Gamma exposure
	5 offsite stations with TLDs	TLDs exchanged quarterly	Gamma exposure
<b>WATERBORNE</b> Groundwater	14 monitoring wells	Quarterly	Gross alpha and Gross beta radioactivity, Tritium and Gamma Isotopic <sup>(a)</sup> analysis.

<sup>(a)</sup> Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the facility.

**TABLE A-2**  
**DISTANCES AND DIRECTIONS TO HBPP OFFSITE SAMPLE LOCATIONS**

Station Number	Offsite Measurement Pathway	Station Name	Radial Direction		Radial Distance From Plant (Miles)
			Sector	By Degrees	
3	Airborne	Humboldt Hill	SSE	158	0.9
1	Direct Radiation	King Salmon Picnic Area	W	270	0.3
2	Direct Radiation	City of Fortuna Water Pollution Control Plant, 180 Dinsmore Drive, Fortuna	SSE	158	9.4
14	Direct Radiation	South Bay School/ Parking Lot	S	180	0.4
25	Direct Radiation	Irving Drive, Humboldt Hill	SSE	175	1.3
T17	Direct Radiation	Mitchell Heights Drive	NNE	45	6.0

**TABLE A-3**  
**GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2014	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Water	I-131	E11060	4th	3/10/2015	1.11E+02	9.53E+01	1.16	Acceptable
	Ce-141	E11060	4th	3/10/2015	3.02E+02	2.84E+02	1.06	Acceptable
	Cr-51	E11060	4th	3/10/2015	5.43E+02	5.26E+02	1.03	Acceptable
	Cs-134	E11060	4th	3/10/2015	1.90E+02	2.13E+02	0.89	Acceptable
	Cs-137	E11060	4th	3/10/2015	2.58E+02	2.57E+02	1.01	Acceptable
	Co-58	E11060	4th	3/10/2015	1.73E+02	1.68E+02	1.03	Acceptable
	Mn-54	E11060	4th	3/10/2015	3.06E+02	2.92E+02	1.05	Acceptable
	Fe-59	E11060	4th	3/10/2015	2.51E+02	2.26E+02	1.11	Acceptable
	Zn-65	E11060	4th	3/10/2015	4.20E+02	3.84E+02	1.09	Acceptable
	Co-60	E11060	4th	3/10/2015	3.24E+02	3.04E+02	1.06	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2014	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Milk	Sr-89	E11058	4th	3/10/2015	9.09E+01	9.57E+01	0.95	Acceptable
	Sr-90	E11058	4th	3/10/2015	1.39E+01	1.56E+01	0.89	Acceptable
	I-131	E11059	4th	3/10/2015	9.34E+01	9.51E+01	0.98	Acceptable
	Ce-141	E11059	4th	3/10/2015	2.33E+02	2.19E+02	1.06	Acceptable
	Cr-51	E11059	4th	3/10/2015	4.22E+02	4.06E+02	1.04	Acceptable
	Cs-134	E11059	4th	3/10/2015	1.50E+02	1.64E+02	0.91	Acceptable
	Cs-137	E11059	4th	3/10/2015	2.16E+02	1.98E+02	1.09	Acceptable
	Co-58	E11059	4th	3/10/2015	1.32E+02	1.30E+02	1.02	Acceptable
	Mn-54	E11059	4th	3/10/2015	2.39E+02	2.25E+02	1.06	Acceptable
	Fe-59	E11059	4th	3/10/2015	1.80E+02	1.75E+02	1.03	Acceptable
	Zn-65	E11059	4th	3/10/2015	3.32E+02	2.97E+02	1.12	Acceptable
	Co-60	E11059	4th	3/10/2015	2.49E+02	2.35E+02	1.06	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2014	Report Date	GEL Value (pCi)	Reference Value (pCi)	Ratio	Evaluation
Cartridge	I-131	E11057	4th	3/10/2015	8.70E+01	9.89E+01	0.88	Acceptable

**TABLE A-3 (Continued)**  
**GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Water	I-131	E11177	1st	5/21/2015	9.92E+01	9.67E+01	1.03	Acceptable
	Ce-141	E11177	1st	5/21/2015	1.40E+02	1.39E+02	1.01	Acceptable
	Cr-51	E11177	1st	5/21/2015	3.95E+02	3.66E+02	1.08	Acceptable
	Cs-134	E11177	1st	5/21/2015	1.12E+02	1.26E+02	0.89	Acceptable
	Cs-137	E11177	1st	5/21/2015	1.69E+02	1.67E+02	1.01	Acceptable
	Co-58	E11177	1st	5/21/2015	1.78E+02	1.80E+02	0.99	Acceptable
	Mn-54	E11177	1st	5/21/2015	1.66E+02	1.59E+02	1.05	Acceptable
	Fe-59	E11177	1st	5/21/2015	2.14E+02	1.95E+02	1.10	Acceptable
	Zn-65	E11177	1st	5/21/2015	3.25E+02	2.99E+02	1.09	Acceptable
	Co-60	E11177	1st	5/21/2015	3.23E+02	3.28E+02	0.98	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Milk	Sr-89	E11175	1st	5/21/2015	9.75E+01	1.05E+02	0.93	Acceptable
	Sr-90	E11175	1st	5/21/2015	1.10E+01	1.44E+01	0.77	Acceptable
	I-131	E11176	1st	5/21/2015	9.60E+01	9.75E+01	0.98	Acceptable
	Ce-141	E11176	1st	5/21/2015	2.13E+02	2.11E+02	1.01	Acceptable
	Cr-51	E11176	1st	5/21/2015	5.88E+02	5.55E+02	1.06	Acceptable
	Cs-134	E11176	1st	5/21/2015	1.71E+02	1.91E+02	0.90	Acceptable
	Cs-137	E11176	1st	5/21/2015	2.59E+02	2.53E+02	1.02	Acceptable
	Co-58	E11176	1st	5/21/2015	2.64E+02	2.72E+02	0.97	Acceptable
	Mn-54	E11176	1st	5/21/2015	2.43E+02	2.40E+02	1.01	Acceptable
	Fe-59	E11176	1st	5/21/2015	3.14E+02	2.95E+02	1.06	Acceptable
	Zn-65	E11176	1st	5/21/2015	4.67E+02	4.53E+02	1.03	Acceptable
	Co-60	E11176	1st	5/21/2015	4.81E+02	4.98E+02	0.97	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi)	Reference Value (pCi)	Ratio	Evaluation
Cartridge	I-131	E11174	1st	5/21/2015	8.01E+01	7.74E+01	1.03	Acceptable

**TABLE A-3 (Continued)**  
**GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Water	I-131	E11219	2nd	8/6/2015	9.53E+01	9.34E+01	1.02	Acceptable
	Ce-141	E11219	2nd	8/6/2015	1.24E-01	Not Pres.	--	Acceptable
	Cr-51	E11219	2nd	8/6/2015	3.47E+02	2.93E+02	1.18	Acceptable
	Cs-134	E11219	2nd	8/6/2015	1.63E+02	1.73E+02	0.94	Acceptable
	Cs-137	E11219	2nd	8/6/2015	1.34E+02	1.33E+02	1.01	Acceptable
	Co-58	E11219	2nd	8/6/2015	7.21E+01	7.26E+01	0.99	Acceptable
	Mn-54	E11219	2nd	8/6/2015	1.17E+02	1.07E+02	1.10	Acceptable
	Fe-59	E11219	2nd	8/6/2015	1.76E+02	1.61E+02	1.09	Acceptable
	Zn-65	E11219	2nd	8/6/2015	2.85E+02	2.64E+02	1.08	Acceptable
	Co-60	E11219	2nd	8/6/2015	2.10E+02	2.05E+02	1.03	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Milk	Sr-89	E11217	2nd	8/6/2015	9.13E+01	8.26E+01	1.11	Acceptable
	Sr-90	E11217	2nd	8/6/2015	1.16E+01	1.27E+01	0.91	Acceptable
	I-131	E11218	2nd	8/6/2015	1.05E+02	9.59E+01	1.10	Acceptable
	Ce-141	E11218	2nd	8/6/2015	2.70E+00	Not Pres.	--	Acceptable
	Cr-51	E11218	2nd	8/6/2015	2.70E+02	2.76E+02	0.98	Acceptable
	Cs-134	E11218	2nd	8/6/2015	1.46E+02	1.63E+02	0.90	Acceptable
	Cs-137	E11218	2nd	8/6/2015	1.31E+02	1.25E+02	1.05	Acceptable
	Co-58	E11218	2nd	8/6/2015	7.18E+01	6.84E+01	1.05	Acceptable
	Mn-54	E11218	2nd	8/6/2015	1.02E+02	1.01E+02	1.01	Acceptable
	Fe-59	E11218	2nd	8/6/2015	1.51E+02	1.51E+02	1.00	Acceptable
	Zn-65	E11218	2nd	8/6/2015	2.63E+02	2.48E+02	1.06	Acceptable
	Co-60	E11218	2nd	8/6/2015	1.96E+02	1.93E+02	1.02	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi)	Reference Value (pCi)	Ratio	Evaluation
Cartridge	I-131	E11216	2nd	8/6/2015	8.92E+01	8.01E+01	1.11	Acceptable



**TABLE A-3 (Continued)**  
**GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Water	I-131	E11313	3rd	11/15/2015	1.00E+02	9.67E+01	1.03	Acceptable
	Ce-141	E11313	3rd	11/15/2015	2.05E+02	1.99E+02	1.03	Acceptable
	Cr-51	E11313	3rd	11/15/2015	5.42E+02	5.02E+02	1.08	Acceptable
	Cs-134	E11313	3rd	11/15/2015	1.75E+02	1.98E+02	0.89	Acceptable
	Cs-137	E11313	3rd	11/15/2015	2.40E+02	2.38E+02	1.01	Acceptable
	Co-58	E11313	3rd	11/15/2015	2.45E+02	2.46E+02	1.00	Acceptable
	Mn-54	E11313	3rd	11/15/2015	2.88E+02	2.71E+02	1.06	Acceptable
	Fe-59	E11313	3rd	11/15/2015	2.31E+02	2.11E+02	1.10	Acceptable
	Zn-65	E11313	3rd	11/15/2015	3.75E+02	3.30E+02	1.14	Acceptable
	Co-60	E11313	3rd	11/15/2015	3.11E+02	3.08E+02	1.01	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Milk	Sr-89	E11311	3rd	11/15/2015	8.79E+01	9.91E+01	0.89	Acceptable
	Sr-90	E11311	3rd	11/15/2015	1.07E+01	1.64E+01	0.65	Acceptable
	I-131	E11312	3rd	11/15/2015	9.61E+01	9.99E+01	0.96	Acceptable
	Ce-141	E11312	3rd	11/15/2015	2.15E+02	2.13E+02	1.01	Acceptable
	Cr-51	E11312	3rd	11/15/2015	5.82E+02	5.38E+02	1.08	Acceptable
	Cs-134	E11312	3rd	11/15/2015	1.89E+02	2.12E+02	0.89	Acceptable
	Cs-137	E11312	3rd	11/15/2015	2.43E+02	2.55E+02	0.95	Acceptable
	Co-58	E11312	3rd	11/15/2015	2.50E+02	2.63E+02	0.95	Acceptable
	Mn-54	E11312	3rd	11/15/2015	3.02E+02	2.90E+02	1.04	Acceptable
	Fe-59	E11312	3rd	11/15/2015	2.30E+02	2.26E+02	1.02	Acceptable
	Zn-65	E11312	3rd	11/15/2015	3.62E+02	3.53E+02	1.02	Acceptable
	Co-60	E11312	3rd	11/15/2015	3.42E+02	3.30E+02	1.04	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi)	Reference Value (pCi)	Ratio	Evaluation
Cartridge	I-131	E11310	3rd	11/15/2015	8.21E+01	8.15E+01	1.01	Acceptable

**TABLE A-3**  
**GEL PARTICIPATION – INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Water	I-131	E11415	4th	2/18/2016	1.05E+02	9.26E+01	1.13	Acceptable
	Ce-141	E11415	4th	2/18/2016	1.27E+02	1.12E+02	1.14	Acceptable
	Cr-51	E11415	4th	2/18/2016	2.60E+02	2.44E+02	1.07	Acceptable
	Cs-134	E11415	4th	2/18/2016	1.25E+02	1.39E+02	0.90	Acceptable
	Cs-137	E11415	4th	2/18/2016	1.12E+02	9.95E+01	1.13	Acceptable
	Co-58	E11415	4th	2/18/2016	9.73E+01	9.56E+01	1.02	Acceptable
	Mn-54	E11415	4th	2/18/2016	1.41E+02	1.26E+02	1.12	Acceptable
	Fe-59	E11415	4th	2/18/2016	1.11E+02	9.34E+01	1.19	Acceptable
	Zn-65	E11415	4th	2/18/2016	2.43E+02	2.15E+02	1.13	Acceptable
	Co-60	E11415	4th	2/18/2016	1.92E+02	1.85E+02	1.04	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Milk	Sr-89	E11413	4th	2/18/2016	9.41E+01	8.61E+01	1.08	Acceptable
	Sr-90	E11413	4th	2/18/2016	9.74E+00	1.25E+01	0.78	Acceptable
	I-131	E11414	4th	2/18/2016	1.01E+02	9.12E+01	1.11	Acceptable
	Ce-141	E11414	4th	2/18/2016	1.36E+02	1.29E+02	1.06	Acceptable
	Cr-51	E11414	4th	2/18/2016	2.79E+02	2.81E+02	0.99	Acceptable
	Cs-134	E11414	4th	2/18/2016	1.45E+02	1.60E+02	0.91	Acceptable
	Cs-137	E11414	4th	2/18/2016	1.15E+02	1.15E+02	1.00	Acceptable
	Co-58	E11414	4th	2/18/2016	1.06E+02	1.10E+02	0.96	Acceptable
	Mn-54	E11414	4th	2/18/2016	1.53E+02	1.45E+02	1.06	Acceptable
	Fe-59	E11414	4th	2/18/2016	1.19E+02	1.08E+02	1.10	Acceptable
	Zn-65	E11414	4th	2/18/2016	2.69E+02	2.48E+02	1.08	Acceptable
	Co-60	E11414	4th	2/18/2016	2.12E+02	2.13E+02	0.99	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	GEL Value (pCi)	Reference Value (pCi)	Ratio	Evaluation
Cartridge	I-131	E11412	4th	2/18/2016	7.73E+01	7.98E+01	0.97	Acceptable

**TABLE A-4**  
**HBPP PARTICIPATION – ECKERT & ZIEGLER INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Gamma Soil	Ce-141	E11119	1st	4/16/2015	3.14E-01	3.06E-01	1.03	Acceptable
	Cr-51	E11119	1st	4/16/2015	8.09E-01	8.06E-01	1.00	Acceptable
	Cs-134	E11119	1st	4/16/2015	2.77E-01	2.77E-01	1.00	Acceptable
	Cs-137	E11119	1st	4/16/2015	4.52E-01	4.46E-01	1.01	Acceptable
	Co-58	E11119	1st	4/16/2015	3.96E-01	3.96E-01	1.00	Acceptable
	Mn-54	E11119	1st	4/16/2015	3.65E-01	3.49E-01	1.05	Acceptable
	Fe-59	E11119	1st	4/16/2015	4.63E-01	4.29E-01	1.08	Acceptable
	Zn-65	E11119	1st	4/16/2015	7.06E-01	6.58E-01	1.07	Acceptable
	Co-60	E11119	1st	4/16/2015	7.12E-01	7.23E-01	0.99	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi)	Reference Value (pCi)	Ratio	Evaluation
Gamma Filter	Cr-51	E11215	2nd	7/2/2015	2.37E+02	2.47E+02	0.96	Acceptable
	Cs-134	E11215	2nd	7/2/2015	1.28E+02	1.46E+02	0.88	Acceptable
	Cs-137	E11215	2nd	7/2/2015	1.09E+02	1.12E+02	0.97	Acceptable
	Co-58	E11215	2nd	7/2/2015	6.11E+01	6.12E+01	1.00	Acceptable
	Mn-54	E11215	2nd	7/2/2015	9.26E+01	9.00E+01	1.03	Acceptable
	Fe-59	E11215	2nd	7/2/2015	1.43E+02	1.36E+02	1.05	Acceptable
	Zn-65	E11215	2nd	7/2/2015	2.33E+02	2.22E+02	1.05	Acceptable
	Co-60	E11215	2nd	7/2/2015	1.68E+02	1.73E+02	0.97	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi)	Reference Value (pCi)	Ratio	Evaluation
Alpha/Beta Filter	Alpha	E11214	2nd	7/2/2015	1.26E+02	1.20E+02	1.05	Acceptable <sup>1</sup>
	Beta	E11214	2nd	7/2/2015	2.39E+02	2.39E+02	1.00	Acceptable

**TABLE A-4 (Continued)**  
**HBPP PARTICIPATION – ECKERT & ZIEGLER INTERLABORATORY CROSS-CHECK PROGRAM DATA**

Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi/g)	Reference Value (pCi/g)	Ratio	Evaluation
Gamma Water	Ce-141	E11334	3rd	11/5/2015	2.01E+02	1.99E+02	1.01	Acceptable
	Cr-51	E11334	3rd	11/5/2015	5.03E+02	5.02E+02	1.00	Acceptable
	Cs-134	E11334	3rd	11/5/2015	1.76E+02	1.98E+02	0.89	Acceptable
	Cs-137	E11334	3rd	11/5/2015	2.41E+02	2.38E+02	1.01	Acceptable
	Co-58	E11334	3rd	11/5/2015	2.43E+02	2.46E+02	0.99	Acceptable
	Mn-54	E11334	3rd	11/5/2015	2.83E+02	2.71E+02	1.05	Acceptable
	Fe-59	E11334	3rd	11/5/2015	2.18E+02	2.11E+02	1.04	Acceptable
	Zn-65	E11334	3rd	11/5/2015	3.44E+02	3.30E+02	1.04	Acceptable
	Co-60	E11334	3rd	11/5/2015	3.06E+02	3.08E+02	0.99	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi/L)	Reference Value (pCi/L)	Ratio	Evaluation
Tritium Water	H-3	E11333	3rd	11/5/2015	4.59E+03	4.80E+03	0.96	Acceptable
Sample/ Analysis	Radionuclide	Sample Number	Quarter 2015	Report Date	HBPP Count Room (pCi)	Reference Value (pCi)	Ratio	Evaluation
Gamma Soil	Ce-141	E11359	4th	12/21/2015	2.44E-01	2.22E-01	1.10	Acceptable
	Cr-51	E11359	4th	12/21/2015	4.61E-01	4.85E-01	0.95	Acceptable
	Cs-134	E11359	4th	12/21/2015	2.77E-01	2.77E-01	1.00	Acceptable
	Cs-137	E11359	4th	12/21/2015	2.90E-01	2.76E-01	1.05	Acceptable
	Co-58	E11359	4th	12/21/2015	1.92E-01	1.90E-01	1.01	Acceptable
	Mn-54	E11359	4th	12/21/2015	2.76E-01	2.50E-01	1.10	Acceptable
	Fe-59	E11359	4th	12/21/2015	1.92E-01	1.86E-01	1.03	Acceptable
	Zn-65	E11359	4th	12/21/2015	4.81E-01	4.29E-01	1.12	Acceptable
	Co-60	E11359	4th	12/21/2015	3.79E-01	3.68E-01	1.03	Acceptable

Table A-4 Notes:

Analysis results based on 10 minute count times for alpha and beta analysis on Protean SN 7109. Alpha filter cross checks normally performed on each Protean gas flow proportional counter at count times of 5 minutes, 10 minutes and 20 minutes. Beta filter cross checks normally performed on each Protean gas flow proportional counter at count times of 5 minutes and 10 minutes.

**TABLE C-1**  
**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL REPORT SUMMARY**

Docket No. 50-133; License No. DPR-7

Reporting Period January 1 – December 31, 2015

Medium or Pathway Sampled [Unit of Measurement]	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	All Indicator Locations	Location with Highest Annual Mean		Control Locations	Number of Non-routine Reported Measurements
			Mean,(Fraction), & [Range] <sup>b</sup>	Name	Mean, (Fraction) & [Range] <sup>b</sup>	Mean, (Fraction) & [Range] <sup>b</sup>	
AIRBORNE  Particulates  [pCi/m <sup>3</sup> ]	(52) samples per station: • Gross Beta, • Gross Alpha • Gamma Isotopic analysis on quarterly composite (by station)  (5) Onsite Locations (1) Offsite Locations	• Gross Beta 1.00E-02 pCi/m <sup>3</sup>  • Gamma Isotopic analysis on quarterly composite (by station)  • Cs-137 6.00E-02 pCi/m <sup>3</sup>	East Fence (AM1) Gross Alpha (pCi/m <sup>3</sup> ) mean 3.41E-03, (6/52), [2.40E-03 to 4.78E-03] Gross Beta (pCi/m <sup>3</sup> ) mean 1.46E-02, (51/52), [3.52E-03 to 3.54E-02] Building 12 (AM2) Gross Alpha (pCi/m <sup>3</sup> ) mean 2.74E-03, (13/52), [1.83E-03 to 4.90E-03] Gross Beta (pCi/m <sup>3</sup> ) mean 1.50E-02, (46/52), [3.62E-03 to 4.22E-02] Annex (AM3) Gross Alpha (pCi/m <sup>3</sup> ) mean 2.80E-03, (16/52), [2.33E-03 to 3.53E-03] Gross Beta (pCi/m <sup>3</sup> ) mean 1.39E-02, (51/52), [4.16E-03 to 3.93E-02] Relay Building (AM4) Gross Alpha (pCi/m <sup>3</sup> ) mean 2.51E-03, (15/52), [2.01E-03 to 3.53E-03] Gross Beta (pCi/m <sup>3</sup> ) mean 1.63E-02, (51/52), [3.49E-03 to 4.15E-02] Oil Water Separator (OWS – AM5) Gross Alpha (pCi/m <sup>3</sup> ) mean 2.87E-03, (11/52), [2.01E-03 to 4.14E-03] Gross Beta (pCi/m <sup>3</sup> ) mean 1.49E-02, (51/52), [3.48E-03 to 4.71E-02]	East Fence        Relay Bldg.	Gross Alpha (pCi/m <sup>3</sup> ) mean 3.41E-03, (6/52), [2.40E-03 to 4.78E-03]        Gross Beta (pCi/m <sup>3</sup> ) mean 1.63E-02, (51/52), [3.49E-03 to 4.15E-02]     Cs-137 <MDA	Humboldt Hill (Station 3) Gross Alpha (pCi/m <sup>3</sup> ) mean 2.97E-03, (13/52); [1.86E-03 to 4.76E-03]      Gross Beta (pCi/m <sup>3</sup> ) mean 1.10E-02, (45/52), [3.59E-03 to 2.78E-02]	N/A
DIRECT RADIATION [mR/quarter]	(80) Fence line TLD readings  (20) Off-site TLD Readings	5 mRem	Fence Line TLDs (T1 to T16 and T18 to T21) 16.3 ± 0.1, (80/80), [14.0 to 19.2]	Station T-20, Figure B-1	T20 (mR/qtr) mean 17.5 ± 0.3, (1/4), [16.3 to 19.2]	Stations 1, 2, 14, 25 and T17 (mR/qtr) mean 15.7 ± 0.1, (20/20), [13.6-19.2]	0

**TABLE C-1**  
**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL REPORT SUMMARY**

Medium or Pathway Sampled [Unit of Measurement]	Type and Total Number of Analyses Performed	Lower Limit of Detection <sup>a</sup> (LLD)	All Indicator Locations		Location with Highest Annual Mean		Control Locations		Number of Non-routine Reported Measurements
			Mean, (Fraction) & [Range] <sup>b</sup>		Name, Distance and Direction	Mean, (Fraction) & [Range] <sup>b</sup>	Mean, (Fraction) & [Range] <sup>b</sup>		
WATERBORNE Groundwater (Monitoring wells) [pCi/L]	Gamma isotopic (56)	Co-60:15 pCi/L Cs-137:18 pCi/L	Co-60 <MDA (0/56) [N/A]	Cs-137 <MDA (0/56) [N/A]	Co-60 N/A	Cs-137 N/A	Co-60 <MDA (0/56) [N/A]	Cs-137 <MDA (0/56) [N/A]	0
	Tritium(56)	ODCM: 2.0E+03 pCi/L Plant Policy: 400	<MDA, (0/56), [N/A]		N/A		<MDA, (0/56), [N/A]		0
	Drinking Water	Not Required	N/A		N/A		N/A		N/A
	Sediment	Not Required	N/A		N/A		N/A		N/A
	Algae	Not Required	N/A		N/A		N/A		N/A
INGESTION	Not Required	N/A	N/A		N/A		N/A		N/A
TERRESTRIAL Soil	Not Required	N/A	N/A		N/A		N/A		N/A

<sup>a</sup>The LLD is defined as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95 percent probability with only 5-percent probability of falsely concluding that a blank observation represents a "real" signal. LLD is defined as the a priori (before the fact) lower limit of detection (as pCi per unit mass or volume) representing the capability of a measurement system and not as the a posteriori (after the fact) limit for a particular measurement. (Current literature defines the LLD as the detection capability for the instrumentation only, and the MDA, minimum detectable concentration, as the detection capability for a given instrument, procedure and type of sample.) The actual MDA values for the radionuclide specific analyses were at or below the LLD.

<sup>b</sup>The mean and the range are based on detectable measurements only. The fraction of detectable measurements at specified locations is indicated in parentheses; e.g., (10/12) means that 10 out of 12 samples contained detectable activity. The range of detected results is indicated in brackets; e.g., [23 to 34].

Not Required: Not required by the HBPP Unit 3 Technical Specifications or the SAFSTOR Offsite Dose Calculation Manual. Baseline environmental conditions for this parameter were established in the Environmental Report as referenced by the SAFSTOR Decommissioning Plan (now identified as the Post Shutdown Decommissioning Activities Report and Defueled Safety Analysis Report).

N/A – Not applicable

**TABLE C-2  
ONSITE ENVIRONMENTAL TLD STATIONS**

Station Number	TLD Exposure Measurements (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
T1	15.9 ± 0.3	16.0 ± 0.2	18.5 ± 0.7	17.4 ± 0.7
T2	15.4 ± 0.6	15.4 ± 0.4	18.1 ± 1.0	16.4 ± 0.6
T3	15.9 ± 0.7	14.9 ± 0.5	18.5 ± 0.5	16.4 ± 0.9
T4	16.2 ± 0.7	15.6 ± 0.5	19.1 ± 0.3	16.2 ± 0.8
T5	15.1 ± 0.5	14.9 ± 0.3	18.0 ± 1.1	15.3 ± 0.4
T6	14.5 ± 0.4	14.0 ± 0.3	17.5 ± 0.5	14.7 ± 0.4
T7	14.8 ± 0.3	15.0 ± 0.6	18.1 ± 0.6	15.2 ± 0.5
T8	14.5 ± 0.6	14.6 ± 0.6	16.8 ± 0.8	15.0 ± 0.3
T9	16.0 ± 0.5	15.2 ± 0.7	18.5 ± 0.5	16.4 ± 0.5
T10	14.5 ± 0.4	15.6 ± 0.6	17.8 ± 0.6	15.7 ± 0.5
T11	14.4 ± 0.4	15.1 ± 0.4	17.6 ± 0.9	16.4 ± 0.5
T12	15.1 ± 0.5	15.7 ± 0.8	18.7 ± 0.6	16.3 ± 0.3
T13	15.9 ± 1.1	16.1 ± 0.5	18.6 ± 0.5	16.9 ± 0.5
T14	15.9 ± 0.5	16.4 ± 0.4	19.1 ± 0.5	16.5 ± 0.3
T15	14.9 ± 0.4	15.5 ± 0.7	18.0 ± 0.9	15.6 ± 0.8
T16	14.2 ± 0.7	15.1 ± 0.7	17.2 ± 0.3	15.5 ± 0.4
T18	15.4 ± 0.4	16.3 ± 0.6	18.5 ± 1.2	17.0 ± 0.4
T19	18.3 ± 7.1	16.4 ± 0.4	18.6 ± 1.1	17.4 ± 0.6
T20	16.3 ± 0.5	16.6 ± 0.6	19.2 ± 0.5	17.7 ± 0.4
T21	16.5 ± 0.5	15.7 ± 0.4	19.0 ± 0.5	16.9 ± 0.4

Parameter	Calculated Parameters (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Average	15.4 ± 0.1	15.5 ± 0.1	18.3 ± 0.2	16.2 ± 0.1
Maximum	16.5 ± 0.5	16.6 ± 0.6	19.2 ± 0.5	17.7 ± 0.4

Table C-2 Notes:

1. These exposures are reported for a standardized period of 90 days.
2. The reported exposures do not have an average background subtracted.

**TABLE C-3**  
**OFFSITE (Control) ENVIRONMENTAL TLD STATIONS**

Station Number	TLD Exposure Measurements (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1	14.1 ± 0.4	15.2 ± 0.6	18.0 ± 0.8	15.8 ± 0.2
2	16.5 ± 0.7	16.6 ± 0.4	19.2 ± 0.7	17.5 ± 0.8
14	13.6 ± 0.5	13.6 ± 0.5	17.1 ± 0.8	14.5 ± 0.5
25	14.5 ± 1.1	14.2 ± 0.2	16.8 ± 0.7	14.7 ± 0.3
T17	14.1 ± 0.6	14.3 ± 0.6	17.5 ± 0.4	15.4 ± 0.5

Parameter	Calculated Parameters (mR)			
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Average	14.6 ± 0.3	14.8 ± 0.2	17.7 ± 0.3	15.6 ± 0.2
Maximum	16.5 ± 0.7	16.6 ± 0.4	19.2 ± 0.7	17.5 ± 0.8

Table C-3 Notes:

1. These exposures are reported for a standardized period of 90 days.



**TABLE C-4**  
**GROUNDWATER MONITORING WELL RESULTS**

Monitor Well Number	Sample Date	Alpha Activity (pCi/L)	Beta Activity (pCi/L)	Gamma Activity (pCi/L)		Tritium Activity (pCi/L)
				Cs-137	Co-60	
MW-11*	2/16/2015	< 5.36 (MDA)	8.14 ± 2.17	< 6.23 (MDA)	< 5.40 (MDA)	< 321 (MDA)
RCW-SFP-1*	2/16/2015	< 2.36 (MDA)	4.19 ± 1.25	< 5.59 (MDA)	< 5.77 (MDA)	< 324 (MDA)
RCW-SFP-2*	2/16/2015	< 9.97 (MDA)	< 9.38 (MDA)	< 5.55 (MDA)	< 4.28 (MDA)	< 314 (MDA)
RCW-SFP-3*	2/16/2015	< 6.66 (MDA)	7.63 ± 2.97	< 4.72 (MDA)	< 5.20 (MDA)	< 316 (MDA)
RCW-SFP-4*	2/16/2015	< 5.52 (MDA)	4.76 ± 2.31	< 4.45 (MDA)	< 4.47 (MDA)	< 320 (MDA)
RCW-SFP-5*	2/16/2015	< 7.08 (MDA)	< 3.81 (MDA)	< 5.14 (MDA)	< 4.10 (MDA)	< 314 (MDA)
RCW-SFP-6*	2/16/2015	< 12.2 (MDA)	< 10.0 (MDA)	< 6.09 (MDA)	< 5.57 (MDA)	< 319 (MDA)
RCW-CS-3*	2/16/2015	< 1.75 (MDA)	< 1.94 (MDA)	< 4.70 (MDA)	< 3.07 (MDA)	< 325 (MDA)
RCW-CS-5*	2/16/2015	< 2.99 (MDA)	3.81 ± 1.60	< 4.93 (MDA)	< 5.15 (MDA)	< 328 (MDA)
RCW-CS-6*	2/16/2015	< 115 (MDA)	< 83.1 (MDA)	< 5.42 (MDA)	< 3.83 (MDA)	< 322 (MDA)
RCW-CS-7*	2/16/2015	< 135 (MDA)	< 87.2 (MDA)	< 6.26 (MDA)	< 6.74 (MDA)	< 334 (MDA)
RCW-CS-8*	2/16/2015	< 147 (MDA)	< 92.7 (MDA)	< 5.07 (MDA)	< 7.00 (MDA)	< 311 (MDA)
RCW-CS-9*	2/16/2015	< 23.7 (MDA)	< 31.6 (MDA)	< 5.05 (MDA)	< 4.75 (MDA)	< 323 (MDA)
RCW-CS-10*	2/16/2015	< 25.2 (MDA)	< 21.6 (MDA)	< 3.93 (MDA)	< 3.80 (MDA)	< 325 (MDA)
MW-11*	5/13/2015	< 11.2 (MDA)	< 10.70 (MDA)	< 4.19 (MDA)	< 4.26 (MDA)	< 346 (MDA)
RCW-SFP-1*	5/13/2015	< 2.97 (MDA)	< 3.56 (MDA)	< 4.54 (MDA)	< 3.44 (MDA)	< 346 (MDA)
RCW-SFP-2*	5/13/2015	< 16.2 (MDA)	< 9.68 (MDA)	< 6.31 (MDA)	< 6.76 (MDA)	< 347 (MDA)
RCW-SFP-3*	5/13/2015	< 25.8 (MDA)	< 15.90 (MDA)	< 3.73 (MDA)	< 4.60 (MDA)	< 343 (MDA)
RCW-SFP-4*	5/13/2015	< 10.8 (MDA)	< 8.73 (MDA)	< 4.69 (MDA)	< 3.01 (MDA)	< 347 (MDA)
RCW-SFP-5*	5/13/2015	8.73 ± 4.47	< 3.80 (MDA)	< 5.24 (MDA)	< 5.72 (MDA)	< 326 (MDA)
RCW-SFP-6*	5/13/2015	< 13.8 (MDA)	< 11.90 (MDA)	< 4.20 (MDA)	< 3.22 (MDA)	< 332 (MDA)
RCW-CS-3*	5/13/2015	< 3.05 (MDA)	< 2.49 (MDA)	< 4.51 (MDA)	< 6.20 (MDA)	< 342 (MDA)
RCW-CS-5*	5/13/2015	< 4.25 (MDA)	4.45 ± 1.85	< 4.60 (MDA)	< 4.59 (MDA)	< 349 (MDA)
RCW-CS-6*	5/13/2015	< 217 (MDA)	< 90.4 (MDA)	< 4.14 (MDA)	< 4.76 (MDA)	< 391 (MDA)
RCW-CS-7*	5/13/2015	Note 1	Note 1	Note 1	Note 1	< 344 (MDA)
RCW-CS-8*	5/13/2015	< 240 (MDA)	< 153 (MDA)	< 3.97 (MDA)	< 4.05 (MDA)	< 346 (MDA)
RCW-CS-9*	5/13/2015	< 29.5 (MDA)	< 20.2 (MDA)	< 4.47 (MDA)	< 4.71 (MDA)	< 350 (MDA)
RCW-CS-10*	5/13/2015	< 30.1 (MDA)	< 20.4 (MDA)	< 3.45 (MDA)	< 4.64 (MDA)	< 344 (MDA)
MW-11*	8/13/2015	< 22.0 (MDA)	< 10.9 (MDA)	< 3.93 (MDA)	< 4.81 (MDA)	< 219 (MDA)
RCW-SFP-1*	8/13/2015	< 23.5 (MDA)	< 16.0 (MDA)	< 3.54 (MDA)	< 3.91 (MDA)	< 239 (MDA)
RCW-SFP-2*	8/13/2015	< 16.1 (MDA)	< 11.3 (MDA)	< 3.46 (MDA)	< 3.85 (MDA)	< 229 (MDA)
RCW-SFP-3*	8/13/2015	< 44.5 (MDA)	< 30.1 (MDA)	< 3.85 (MDA)	< 4.57 (MDA)	< 236 (MDA)
RCW-SFP-4*	8/13/2015	< 38.5 (MDA)	< 20.3 (MDA)	< 4.39 (MDA)	< 5.06 (MDA)	< 237 (MDA)
RCW-SFP-5*	8/13/2015	< 13.1 (MDA)	< 8.19 (MDA)	< 4.42 (MDA)	< 4.08 (MDA)	< 237 (MDA)
RCW-SFP-6*	8/13/2015	< 11.8 (MDA)	< 6.71 (MDA)	< 3.75 (MDA)	< 2.97 (MDA)	< 248 (MDA)
RCW-CS-3*	8/13/2015	< 3.15 (MDA)	2.53 ± 1.14	< 3.86 (MDA)	< 3.84 (MDA)	< 236 (MDA)
RCW-CS-5*	8/13/2015	< 2.74 (MDA)	2.71 ± 1.10	< 4.62 (MDA)	< 4.51 (MDA)	< 235 (MDA)
RCW-CS-6*	8/13/2015	< 122 (MDA)	< 103 (MDA)	< 3.94 (MDA)	< 3.37 (MDA)	< 243 (MDA)
RCW-CS-7*	8/13/2015	< 353 (MDA)	< 145 (MDA)	< 2.94 (MDA)	< 3.18 (MDA)	< 248 (MDA)
RCW-CS-8*	8/13/2015	< 139 (MDA)	< 107 (MDA)	< 5.29 (MDA)	< 4.82 (MDA)	< 239 (MDA)
RCW-CS-9*	8/13/2015	< 136 (MDA)	< 86.2 (MDA)	< 4.75 (MDA)	< 4.57 (MDA)	< 232 (MDA)
RCW-CS-10*	8/13/2015	< 39.9 (MDA)	< 28.5 (MDA)	< 4.82 (MDA)	< 6.69 (MDA)	< 233 (MDA)

\*Indicates fourteen (14) groundwater monitoring wells.

**TABLE C-4 (Continued)**  
**GROUNDWATER MONITORING WELL RESULTS**

Monitor Well Number	Sample Date	Alpha Activity (pCi/L)	Beta Activity (pCi/L)	Gamma Activity (pCi/L)		Tritium Activity (pCi/L)
				Cs-137	Co-60	
MW-11*	11/09/2015	< 5.83 (MDA)	< 4.82 (MDA)	< 3.57 (MDA)	< 2.80 (MDA)	< 296 (MDA)
RCW-SFP-1*	11/09/2015	< 18.9 (MDA)	< 8.70 (MDA)	< 4.80 (MDA)	< 4.27 (MDA)	< 292 (MDA)
RCW-SFP-2*	11/09/2015	< 31.3 (MDA)	< 17.5 (MDA)	< 5.55 (MDA)	< 4.57 (MDA)	< 288 (MDA)
RCW-SFP-3*	11/09/2015	< 44.2 (MDA)	< 35.6 (MDA)	< 3.08 (MDA)	< 3.70 (MDA)	< 297 (MDA)
RCW-SFP-4*	11/09/2015	< 31.0 (MDA)	< 15.0 (MDA)	< 4.48 (MDA)	< 5.45 (MDA)	< 293 (MDA)
RCW-SFP-5*	11/09/2015	< 18.1 (MDA)	< 5.28 (MDA)	< 3.67 (MDA)	< 4.66 (MDA)	< 297 (MDA)
RCW-SFP-6*	11/09/2015	< 4.30 (MDA)	< 3.71 (MDA)	< 4.05 (MDA)	< 4.61 (MDA)	< 288 (MDA)
RCW-CS-3*	11/09/2015	< 2.27 (MDA)	1.70 ± 0.872	< 4.87 (MDA)	< 3.74 (MDA)	< 293 (MDA)
RCW-CS-5*	11/09/2015	< 3.06 (MDA)	1.95 ± 0.921	< 4.38 (MDA)	< 3.71 (MDA)	< 284 (MDA)
RCW-CS-6*	11/09/2015	< 183 (MDA)	< 131 (MDA)	< 4.78 (MDA)	< 4.76 (MDA)	< 292 (MDA)
RCW-CS-7*	11/09/2015	< 150 (MDA)	< 82.1 (MDA)	< 4.38 (MDA)	< 4.52 (MDA)	< 294 (MDA)
RCW-CS-8*	11/09/2015	< 145 (MDA)	< 95.5 (MDA)	< 4.43 (MDA)	< 5.53 (MDA)	< 282 (MDA)
RCW-CS-9*	11/09/2015	117 ± 61.8	< 64.6 (MDA)	< 3.89 (MDA)	< 5.89 (MDA)	< 292 (MDA)
RCW-CS-10*	11/09/2015	< 33.8 (MDA)	< 15.0 (MDA)	< 6.40 (MDA)	< 6.83 (MDA)	< 304 (MDA)

Indicates (14) groundwater monitoring wells.

**TABLE C-4 (Continued)**  
**GROUNDWATER MONITORING WELL RESULTS**

Calculated Parameters (By Monitor Well Number)	Alpha Activity (pCi/L)	Beta Activity (pCi/L)	Gamma Activity (pCi/L)		Tritium Activity (pCi/L)
			Cs-137	Co-60	
Average: MW-11	Note 5	8.14 ± 2.17	Note 5	Note 5	Note 5
Average: RCW-SFP-1*	Note 5	4.19 ± 1.25	Note 5	Note 5	Note 5
Average: RCW-SFP-2*	Note 5	Note 5	Note 5	Note 5	Note 5
Average: RCW-SFP-3*	Note 5	7.63 ± 2.97	Note 5	Note 5	Note 5
Average: RCW-SFP-4*	Note 5	4.76 ± 2.31	Note 5	Note 5	Note 5
Average: RCW-SFP-5*	8.73 ± 4.47	Note 5	Note 5	Note 5	Note 5
Average: RCW-SFP-6*	Note 5	Note 5	Note 5	Note 5	Note 5
Average: RCW-CS-3*	Note 5	2.12 ± 1.01	Note 5	Note 5	Note 5
Average: RCW-CS-5*	Note 5	3.23 ± 1.37	Note 5	Note 5	Note 5
Average: RCW-CS-6*	Note 5	Note 5	Note 5	Note 5	Note 5
Average: RCW-CS-7*	Note 5	Note 5	Note 5	Note 5	Note 5
Average: RCW-CS-8*	Note 5	Note 5	Note 5	Note 5	Note 5
Average: RCW-CS-9*	117 ± 61.8	Note 5	Note 5	Note 5	Note 5
Average: RCW-CS-10*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: MW-11	Note 5	8.14 ± 2.17	Note 5	Note 5	Note 5
Maximum: RCW-SFP-1*	Note 5	4.19 ± 1.25	Note 5	Note 5	Note 5
Maximum: RCW-SFP-2*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-SFP-3*	Note 5	7.63 ± 2.97	Note 5	Note 5	Note 5
Maximum: RCW-SFP-4*	Note 5	4.76 ± 2.31	Note 5	Note 5	Note 5
Maximum: RCW-SFP-5*	8.73 ± 4.47	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-SFP-6*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-CS-3*	Note 5	2.53 ± 1.14	Note 5	Note 5	Note 5
Maximum: RCW-CS-5*	Note 5	4.45 ± 1.85	Note 5	Note 5	Note 5
Maximum: RCW-CS-6*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-CS-7*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-CS-8*	Note 5	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-CS-9*	117 ± 61.8	Note 5	Note 5	Note 5	Note 5
Maximum: RCW-CS-10*	Note 5	Note 5	Note 5	Note 5	Note 5

\*Indicates (14) groundwater monitoring wells.

Table C-4 Notes:

1. RCW-CS-7 was unable to be purged during the second quarterly groundwater sampling event and water monitoring parameters were not collected (conductivity, pH and turbidity). Adequate volume of sample for gross alpha, gross beta, Am-241, Cs-137, Co-60 and Total Strontium could not be obtained. The only sample obtained for offsite analysis was the H-3 sample. This action was documented in corrective action SAPN 1406334.
2. Reported values are net measurements (above instrument background). The normal minimum detectable activities (MDAs) for the analyses for gross alpha, gross beta and tritium are approximately 4, 4 and 300 pCi/L, respectively. Results that are at or below the normal MDA are reported as "<MDA".
3. Gamma activity measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/L, respectively. The actual MDAs for these analyses were at or below the LLD.
4. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.
5. Results identified as "<" are not included in the calculation of average and maximum values.

**TABLE C-5**  
**CAISSON SUMP MONITORING RESULTS**

Sample Date	Cs-137 Activity (pCi/L)	Co-60 Activity (pCi/L)	Tritium Activity (pCi/L)
1/15/2015	<MDA	<MDA	820 ± 380
2/18/2015	<MDA	<MDA	810 ± 350
3/11/2015	<MDA	<MDA	< 570 (MDA)
4/24/2015	<MDA	<MDA	< 580 (MDA)

**Table C-5 Notes:**

1. Gamma measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/L, respectively. The MDA for these analyses was at or below the LLD and are reported as "< MDA".
2. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.
3. Tritium analysis is performed on a measured aliquot of distilled sample. The reported values are net measurements above instrument background. The normal MDA for the analyses for tritium was less than 600 pCi/L. Results that are at or below the normal MDA are reported as "< MDA".
4. Sampling of the caisson was discontinued after April 2015 due to impending demolition of the Refueling Building. This was documented in corrective action SAPN 1403808.

**TABLE C-6  
FRENCH DRAIN MONITORING RESULTS**

Sample Date	Cs-137 Activity (pCi/L)	Co-60 Activity (pCi/L)	Tritium Activity (pCi/L)
1/7/2015	217 ± 23	<MDA	8,070 ± 280
1/15/2015	243 ± 24	<MDA	7,640 ± 510
1/29/2015	236 ± 23	<MDA	7,970 ± 480
2/18/2015	239 ± 24	<MDA	9,050 ± 490
3/11/2015	234 ± 25	<MDA	10,290 ± 510
3/26/2015	243 ± 26	<MDA	9,850 ± 510
4/9/2015	213 ± 23	<MDA	10,020 ± 510
4/24/2015	236 ± 25	<MDA	9,520 ± 510

**Table C-6 Notes:**

1. Gamma measurements are performed on the original sample, with results corrected to the time of sampling. Naturally occurring isotopes are not reported. The maximum lower limits of detection (LLDs) for Co-60 and Cs-137 are 15 and 18 pCi/L, respectively. The MDA for these analyses was at or below the LLD and are reported as "< MDA".
2. For purposes of this report, LLD is defined as the a priori (before the fact) lower limit of detection, which represents the capability of the measurement system. MDA is defined as the a posteriori (after the fact) limit of detection capability considering a given instrument, procedure and type of sample.
3. Tritium analysis is performed on a measured aliquot of distilled sample. The reported values are net measurements above instrument background. The normal MDA for the analyses for tritium was less than 600 pCi/L. Results that are at or below the normal MDA are reported as "< MDA".
4. Sampling of the French drain was discontinued after April 2015 due to impending demolition of the Refueling Building. This was documented in corrective action SAPN 1403808.

**Table C-7**  
**ODCM REQUIRED AIR SAMPLES: EAST FENCE (AM1)**

Sample Start Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	< 2.59E-03 (MDA)	2.05E-02 ± 4.28E-03	< 2.01E-03 (MDA)	< 1.81E-03 (MDA)
1/8/2015	< 3.38E-03 (MDA)	2.22E-02 ± 5.18E-03		
1/15/2015	2.40E-03 ± 1.92E-03	9.97E-03 ± 3.92E-03		
1/22/2015	< 3.32E-03 (MDA)	3.18E-02 ± 5.94E-03		
1/29/2015	< 3.38E-03 (MDA)	1.97E-02 ± 4.95E-03		
2/5/2015	< 3.36E-03 (MDA)	1.12E-02 ± 4.03E-03		
2/12/2015	< 3.46E-03 (MDA)	2.92E-02 ± 5.86E-03		
2/19/2015	< 3.33E-03 (MDA)	2.64E-02 ± 5.51E-03		
2/26/2015	< 3.35E-03 (MDA)	1.54E-02 ± 4.48E-03		
3/5/2015	< 3.40E-03 (MDA)	3.55E-02 ± 6.30E-03		
3/12/2015	< 3.38E-03 (MDA)	1.30E-02 ± 4.25E-03		
3/19/2015	< 3.33E-03 (MDA)	9.01E-03 ± 3.73E-03		
3/26/2015	< 3.37E-03 (MDA)	5.26E-03 ± 3.25E-03		
4/2/2015	< 3.41E-03 (MDA)	1.03E-02 ± 3.97E-03	5.24E-03 ± 1.26E-03 (Note 1)	< 2.55E-03 (MDA)
4/9/2015	< 3.32E-03 (MDA)	1.52E-02 ± 4.43E-03		
4/16/2015	4.78E-03 ± 2.75E-03	9.58E-03 ± 3.88E-03		
4/23/2015	< 3.37E-03 (MDA)	8.77E-03 ± 3.75E-03		
4/30/2015	< 3.39E-03 (MDA)	1.02E-02 ± 3.94E-03		
5/7/2015	< 3.34E-03 (MDA)	1.46E-02 ± 4.39E-03		
5/14/2015	< 3.41E-03 (MDA)	1.35E-02 ± 4.32E-03		
5/21/2015	< 3.24E-03 (MDA)	9.46E-03 ± 3.72E-03		
5/28/2015	< 3.49E-03 (MDA)	5.45E-03 ± 3.37E-03		
6/4/2015	< 3.39E-03 (MDA)	1.16E-02 ± 4.10E-03		
6/11/2015	< 3.36E-03 (MDA)	1.05E-02 ± 3.94E-03		
6/18/2015	< 3.37E-03 (MDA)	9.48E-03 ± 3.83E-03		
6/25/2015	3.04E-03 ± 2.10E-03	< 6.06E-03 (MDA)		
7/2/2015	< 3.37E-03 (MDA)	1.09E-02 ± 3.99E-03	< 1.94E-03 (MDA)	< 1.99E-03 (MDA)
7/9/2015	< 3.36E-03 (MDA)	7.35E-03 ± 3.54E-03		
7/16/2015	< 3.37E-03 (MDA)	6.31E-03 ± 3.41E-03		
7/23/2015	< 3.37E-03 (MDA)	1.02E-02 ± 3.92E-03		
7/30/2015	< 3.38E-03 (MDA)	8.09E-03 ± 3.65E-03		
8/6/2015	< 3.36E-03 (MDA)	7.70E-03 ± 3.59E-03		
8/13/2015	< 3.37E-03 (MDA)	1.27E-02 ± 4.21E-03		
8/20/2015	< 3.36E-03 (MDA)	1.05E-02 ± 3.94E-03		
8/27/2015	< 3.32E-03 (MDA)	1.49E-02 ± 4.40E-03		
9/3/2015	< 3.43E-03 (MDA)	1.25E-02 ± 4.24E-03		
9/10/2015	< 3.36E-03 (MDA)	9.10E-03 ± 3.77E-03		
9/17/2015	4.75E-03 ± 2.73E-03	1.34E-02 ± 4.29E-03		
9/24/2015	2.96E-03 ± 2.13E-03	2.18E-02 ± 5.14E-03		
10/1/2015	< 3.37E-03 (MDA)	3.27E-02 ± 6.07E-03	< 1.79E-03 (MDA)	< 1.40E-03 (MDA)
10/8/2015	< 3.36E-03 (MDA)	2.98E-02 ± 5.82E-03		
10/15/2015	< 3.38E-03 (MDA)	1.87E-02 ± 4.85E-03		
10/22/2015	< 3.36E-03 (MDA)	1.79E-02 ± 4.76E-03		
10/29/2015	< 3.38E-03 (MDA)	1.06E-02 ± 3.97E-03		
11/5/2015	< 3.35E-03 (MDA)	1.92E-02 ± 4.87E-03		
11/12/2015	< 3.35E-03 (MDA)	1.12E-02 ± 4.02E-03		
11/19/2015	< 4.00E-03 (MDA)	1.50E-02 ± 4.99E-03		
11/25/2015	2.51E-03 ± 1.81E-03	3.50E-02 ± 5.68E-03		
12/3/2015	< 3.47E-03 (MDA)	1.05E-02 ± 4.04E-03		
12/10/2015	< 3.36E-03 (MDA)	9.09E-03 ± 3.77E-03		
12/17/2015	< 3.39E-03 (MDA)	3.52E-03 ± 3.01E-03		
12/24/2015	< 3.92E-03 (MDA)	6.11E-03 ± 3.78E-03		

**Table C-7 (Continued)**  
**ODCM REQUIRED AIR SAMPLES: BUILDING 12 (AM2)**

Sample Start Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	1.83E-03 ± 1.46E-03	1.88E-02 ± 4.15E-03	< 2.00E-03 (MDA)	< 1.76E-03 (MDA)
1/8/2015	< 3.37E-03 (MDA)	2.18E-02 ± 5.13E-03		
1/15/2015	< 3.42E-03 (MDA)	1.71E-02 ± 4.73E-03		
1/22/2015	3.49E-03 ± 2.30E-03	3.28E-02 ± 6.01E-03		
1/29/2015	< 3.40E-03 (MDA)	3.08E-02 ± 5.93E-03		
2/5/2015	< 3.35E-03 (MDA)	1.01E-02 ± 3.89E-03		
2/12/2015	2.43E-03 ± 1.94E-03	2.99E-02 ± 5.93E-03		
2/19/2015	2.93E-03 ± 2.11E-03	1.77E-02 ± 4.72E-03		
2/26/2015	< 3.34E-03 (MDA)	1.18E-02 ± 4.08E-03		
3/5/2015	2.39E-03 ± 1.91E-03	3.55E-02 ± 6.31E-03		
3/12/2015	2.37E-03 ± 1.89E-03	9.83E-03 ± 3.87E-03		
3/19/2015	< 3.33E-03 (MDA)	8.66E-03 ± 3.70E-03		
3/26/2015	2.37E-03 ± 1.90E-03	5.97E-03 ± 3.37E-03		
4/2/2015	< 3.40E-03 (MDA)	< 6.13E-03 (MDA)	< 1.90E-03 (MDA)	< 1.47E-03 (MDA)
4/9/2015	< 3.32E-03 (MDA)	8.64E-03 ± 3.69E-03		
4/16/2015	< 3.40E-03 (MDA)	1.35E-02 ± 4.31E-03		
4/23/2015	< 3.38E-03 (MDA)	9.84E-03 ± 3.87E-03		
4/30/2015	< 3.39E-03 (MDA)	9.18E-03 ± 3.80E-03		
5/7/2015	< 3.33E-03 (MDA)	7.64E-03 ± 3.57E-03		
5/14/2015	< 3.41E-03 (MDA)	1.31E-02 ± 4.28E-03		
5/21/2015	2.85E-03 ± 2.05E-03	1.32E-02 ± 4.16E-03		
5/28/2015	4.90E-03 ± 2.82E-03	6.90E-03 ± 3.59E-03		
6/4/2015	< 3.21E-03 (MDA)	4.34E-03 ± 3.00E-03		
6/11/2015	2.95E-03 ± 2.12E-03	< 6.05E-03 (MDA)		
6/18/2015	< 3.38E-03 (MDA)	1.30E-02 ± 4.25E-03		
6/25/2015	< 3.42E-03 (MDA)	8.44E-03 ± 3.72E-03		
7/2/2015	< 3.37E-03 (MDA)	7.36E-03 ± 3.55E-03	< 2.19E-03 (MDA)	< 1.92E-03 (MDA)
7/9/2015	2.36E-03 ± 1.89E-03	1.09E-02 ± 3.98E-03		
7/16/2015	< 3.37E-03 (MDA)	1.05E-02 ± 3.96E-03		
7/23/2015	< 3.37E-03 (MDA)	7.36E-03 ± 3.55E-03		
7/30/2015	< 3.38E-03 (MDA)	7.73E-03 ± 3.61E-03		
8/6/2015	< 3.37E-03 (MDA)	< 6.07E-03 (MDA)		
8/13/2015	< 3.36E-03 (MDA)	1.51E-02 ± 4.46E-03		
8/20/2015	< 3.37E-03 (MDA)	1.96E-02 ± 4.93E-03		
8/27/2015	< 3.33E-03 (MDA)	1.07E-02 ± 3.94E-03		
9/3/2015	< 3.42E-03 (MDA)	9.25E-03 ± 3.83E-03		
9/10/2015	< 3.37E-03 (MDA)	1.33E-02 ± 4.27E-03		
9/17/2015	< 3.38E-03 (MDA)	9.50E-03 ± 3.84E-03		
9/24/2015	< 3.37E-03 (MDA)	2.21E-02 ± 5.17E-03		
10/1/2015	2.36E-03 ± 1.89E-03	4.22E-02 ± 6.77E-03	< 1.29E-03 (MDA)	< 1.27E-03 (MDA)
10/8/2015	< 3.37E-03 (MDA)	2.53E-02 ± 5.45E-03		
10/15/2015	< 3.37E-03 (MDA)	1.72E-02 ± 4.70E-03		
10/22/2015	< 3.36E-03 (MDA)	2.06E-02 ± 5.01E-03		
10/29/2015	< 3.39E-03 (MDA)	1.16E-02 ± 4.10E-03		
11/5/2015	< 3.36E-03 (MDA)	1.40E-02 ± 4.34E-03		
11/12/2015	2.34E-03 ± 1.87E-03	8.34E-03 ± 3.66E-03		
11/19/2015	< 4.00E-03 (MDA)	1.46E-02 ± 4.95E-03		
11/25/2015	< 2.85E-03 (MDA)	3.07E-02 ± 5.36E-03		
12/3/2015	< 3.48E-03 (MDA)	3.62E-03 ± 3.09E-03		
12/10/2015	< 3.36E-03 (MDA)	< 6.05E-03 (MDA)		
12/17/2015	< 3.39E-03 (MDA)	< 6.09E-03 (MDA)		
12/24/2015	< 3.92E-03 (MDA)	< 7.06E-03 (MDA)		



**Table C-7 (Continued)**  
**ODCM REQUIRED AIR SAMPLES: ANNEX BUILDING (AM3)**

Sample Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	< 2.60E-03	2.44E-02 ± 4.60E-03	< 1.64E-03 (MDA)	< 1.54E-03 (MDA)
1/8/2015	< 3.39E-03	1.76E-02 ± 4.75E-03		
1/15/2015	< 3.42E-03	1.14E-02 ± 4.10E-03		
1/22/2015	3.50E-03 ± 2.30E-03	3.50E-02 ± 6.19E-03		
1/29/2015	< 3.38E-03	2.82E-02 ± 5.72E-03		
2/5/2015	< 3.36E-03	8.05E-03 ± 3.63E-03		
2/12/2015	2.42E-03 ± 1.94E-03	2.56E-02 ± 5.55E-03		
2/19/2015	2.33E-03 ± 1.87E-03	2.08E-02 ± 4.99E-03		
2/26/2015	< 3.36E-03	1.89E-02 ± 4.85E-03		
3/5/2015	< 3.39E-03	3.93E-02 ± 6.59E-03		
3/12/2015	< 3.39E-03	1.45E-02 ± 4.42E-03		
3/19/2015	2.33E-03 ± 1.87E-03	7.96E-03 ± 3.59E-03		
3/26/2015	< 3.37E-03	5.25E-03 ± 3.25E-03		
4/2/2015	< 3.42E-03	1.21E-02 ± 4.17E-03	< 2.32E-03 (MDA)	< 1.78E-03 (MDA)
4/9/2015	2.33E-03 ± 1.86E-03	1.28E-02 ± 4.18E-03		
4/16/2015	< 3.39E-03	1.41E-02 ± 4.38E-03		
4/23/2015	< 3.39E-03	1.34E-02 ± 4.29E-03		
4/30/2015	2.95E-03 ± 2.12E-03	1.09E-02 ± 3.98E-03		
5/7/2015	< 3.36E-03	9.46E-03 ± 3.83E-03		
5/14/2015	< 3.39E-03	1.62E-02 ± 4.61E-03		
5/21/2015	< 3.26E-03	8.82E-03 ± 3.65E-03		
5/28/2015	< 3.50E-03	1.20E-02 ± 4.23E-03		
6/4/2015	< 3.39E-03	6.34E-03 ± 3.43E-03		
6/11/2015	< 3.36E-03	7.69E-03 ± 3.59E-03		
6/18/2015	< 3.38E-03	1.30E-02 ± 4.25E-03		
6/25/2015	< 3.40E-03	6.98E-03 ± 3.51E-03		
7/2/2015	< 3.37E-03	7.02E-03 ± 3.50E-03	< 1.70E-03 (MDA)	< 1.92E-03 (MDA)
7/9/2015	2.36E-03 ± 1.89E-03	1.05E-02 ± 3.95E-03		
7/16/2015	< 3.37E-03	5.26E-03 ± 3.25E-03		
7/23/2015	< 3.37E-03	6.66E-03 ± 3.46E-03		
7/30/2015	2.37E-03 ± 1.89E-03	4.91E-03 ± 3.20E-03		
8/6/2015	< 3.36E-03	6.63E-03 ± 3.45E-03		
8/13/2015	2.96E-03 ± 2.13E-03	1.09E-02 ± 4.00E-03		
8/20/2015	< 3.36E-03	1.12E-02 ± 4.03E-03		
8/27/2015	2.92E-03 ± 2.10E-03	1.18E-02 ± 4.06E-03		
9/3/2015	3.01E-03 ± 2.17E-03	1.22E-02 ± 4.19E-03		
9/10/2015	2.95E-03 ± 2.12E-03	5.94E-03 ± 3.35E-03		
9/17/2015	< 3.36E-03	1.19E-02 ± 4.10E-03		
9/24/2015	< 3.40E-03	1.52E-02 ± 4.50E-03		
10/1/2015	< 3.37E-03	3.27E-02 ± 6.06E-03	< 1.41E-03 (MDA)	< 1.08E-03 (MDA)
10/8/2015	2.94E-03 ± 2.12E-03	2.38E-02 ± 5.30E-03		
10/15/2015	< 3.39E-03	1.16E-02 ± 4.10E-03		
10/22/2015	< 3.36E-03	1.36E-02 ± 4.31E-03		
10/29/2015	< 3.38E-03	1.38E-02 ± 4.34E-03		
11/5/2015	2.93E-03 ± 2.11E-03	1.18E-02 ± 4.08E-03		
11/12/2015	3.53E-03 ± 2.32E-03	1.36E-02 ± 4.30E-03		
11/19/2015	< 4.00E-03	1.46E-02 ± 4.95E-03		
11/25/2015	3.02E-03 ± 1.99E-03	3.14E-02 ± 5.42E-03		
12/3/2015	< 3.47E-03	1.01E-02 ± 3.98E-03		
12/10/2015	< 3.34E-03	4.16E-03 ± 3.06E-03		
12/17/2015	< 3.41E-03	< 6.14E-03 (MDA)		
12/24/2015	< 3.92E-03	6.52E-03 ± 3.84E-03		

**Table C-7 (Continued)**  
**ODCM REQUIRED AIR SAMPLES: RELAY BUILDING (AM4)**

Sample Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	< 2.59E-03 (MDA)	2.19E-02 ± 4.40E-03	< 1.60E-03 (MDA)	< 1.81E-03 (MDA)
1/8/2015	< 3.39E-03 (MDA)	2.12E-02 ± 5.09E-03		
1/15/2015	< 3.42E-03 (MDA)	1.85E-02 ± 4.87E-03		
1/22/2015	2.33E-03 ± 1.87E-03	3.47E-02 ± 6.15E-03		
1/29/2015	2.37E-03 ± 1.90E-03	2.36E-02 ± 5.30E-03		
2/5/2015	< 3.36E-03 (MDA)	1.33E-02 ± 4.26E-03		
2/12/2015	< 3.45E-03 (MDA)	3.02E-02 ± 5.94E-03		
2/19/2015	2.33E-03 ± 1.87E-03	1.98E-02 ± 4.91E-03		
2/26/2015	< 3.36E-03 (MDA)	1.43E-02 ± 4.38E-03		
3/5/2015	2.38E-03 ± 1.91E-03	3.75E-02 ± 6.45E-03		
3/12/2015	< 3.39E-03 (MDA)	1.23E-02 ± 4.19E-03		
3/19/2015	< 3.33E-03 (MDA)	1.18E-02 ± 4.06E-03		
3/26/2015	2.36E-03 ± 1.89E-03	3.49E-03 ± 2.98E-03		
4/2/2015	2.40E-03 ± 1.92E-03	1.07E-02 ± 4.01E-03	< 2.03E-03 (MDA)	< 2.04E-03 (MDA)
4/9/2015	< 3.32E-03 (MDA)	1.35E-02 ± 4.26E-03		
4/16/2015	< 3.40E-03 (MDA)	1.38E-02 ± 4.36E-03		
4/23/2015	2.37E-03 ± 1.90E-03	8.80E-03 ± 3.76E-03		
4/30/2015	2.36E-03 ± 1.89E-03	1.19E-02 ± 4.11E-03		
5/7/2015	< 3.36E-03 (MDA)	1.89E-02 ± 4.86E-03		
5/14/2015	< 3.39E-03 (MDA)	1.24E-02 ± 4.19E-03		
5/21/2015	3.43E-03 ± 2.26E-03	1.19E-02 ± 4.03E-03		
5/28/2015	< 3.49E-03 (MDA)	1.06E-02 ± 4.06E-03		
6/4/2015	< 3.39E-03 (MDA)	1.59E-02 ± 4.58E-03		
6/11/2015	< 3.36E-03 (MDA)	8.04E-03 ± 3.63E-03		
6/18/2015	< 3.38E-03 (MDA)	1.48E-02 ± 4.45E-03		
6/25/2015	< 3.40E-03 (MDA)	4.87E-03 ± 3.21E-03		
7/2/2015	< 3.37E-03 (MDA)	7.02E-03 ± 3.50E-03	< 1.74E-03 (MDA)	< 1.99E-03 (MDA)
7/9/2015	< 3.37E-03 (MDA)	1.97E-02 ± 4.94E-03		
7/16/2015	< 3.37E-03 (MDA)	1.19E-02 ± 4.11E-03		
7/23/2015	< 3.37E-03 (MDA)	7.71E-03 ± 3.60E-03		
7/30/2015	2.37E-03 ± 1.89E-03	1.27E-02 ± 4.21E-03		
8/6/2015	< 3.36E-03 (MDA)	8.74E-03 ± 3.73E-03		
8/13/2015	< 3.37E-03 (MDA)	1.69E-02 ± 4.66E-03		
8/20/2015	2.35E-03 ± 1.88E-03	1.36E-02 ± 4.30E-03		
8/27/2015	< 3.33E-03 (MDA)	2.08E-02 ± 4.99E-03		
9/3/2015	< 3.44E-03 (MDA)	1.58E-02 ± 4.59E-03		
9/10/2015	3.53E-03 ± 2.33E-03	1.26E-02 ± 4.19E-03		
9/17/2015	< 3.36E-03 (MDA)	1.68E-02 ± 4.65E-03		
9/24/2015	< 3.40E-03 (MDA)	3.26E-02 ± 6.08E-03		
10/1/2015	2.36E-03 ± 1.89E-03	4.15E-02 ± 6.71E-03	< 1.41E-03 (MDA)	< 1.27E-03 (MDA)
10/8/2015	< 3.35E-03 (MDA)	2.55E-02 ± 5.46E-03		
10/15/2015	< 3.39E-03 (MDA)	1.66E-02 ± 4.65E-03		
10/22/2015	< 3.36E-03 (MDA)	2.13E-02 ± 5.08E-03		
10/29/2015	< 3.38E-03 (MDA)	1.76E-02 ± 4.75E-03		
11/5/2015	< 3.34E-03 (MDA)	2.20E-02 ± 5.13E-03		
11/12/2015	< 3.35E-03 (MDA)	1.19E-02 ± 4.09E-03		
11/19/2015	< 4.00E-03 (MDA)	1.00E-02 ± 4.39E-03		
11/25/2015	2.01E-03 ± 1.61E-03	3.11E-02 ± 5.41E-03		
12/3/2015	< 3.47E-03 (MDA)	7.22E-03 ± 3.60E-03		
12/10/2015	< 3.33E-03 (MDA)	9.37E-03 ± 3.79E-03		
12/17/2015	< 3.42E-03 (MDA)	< 6.15E-03 (MDA)		
12/24/2015	2.75E-03 ± 2.20E-03	4.07E-03 ± 3.47E-03		

**Table C-7 (Continued)**  
**ODCM REQUIRED AIR SAMPLES: OIL WATER SEPARATOR (AM5)**

Sample Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	< 2.59E-03 (MDA)	2.98E-02 ± 5.01E-03	< 1.64E-03 (MDA)	< 1.59E-03 (MDA)
1/8/2015	< 3.39E-03 (MDA)	1.62E-02 ± 4.61E-03		
1/15/2015	< 3.42E-03 (MDA)	1.64E-02 ± 4.65E-03		
1/22/2015	< 3.32E-03 (MDA)	3.53E-02 ± 6.22E-03		
1/29/2015	2.37E-03 ± 1.90E-03	2.46E-02 ± 5.39E-03		
2/5/2015	< 3.36E-03 (MDA)	1.26E-02 ± 4.19E-03		
2/12/2015	< 3.45E-03 (MDA)	3.60E-02 ± 6.39E-03		
2/19/2015	< 3.33E-03 (MDA)	2.22E-02 ± 5.13E-03		
2/26/2015	< 3.36E-03 (MDA)	6.99E-03 ± 3.49E-03		
3/5/2015	2.38E-03 ± 1.91E-03	4.71E-02 ± 7.14E-03		
3/12/2015	< 3.39E-03 (MDA)	4.22E-03 ± 3.11E-03		
3/19/2015	< 3.33E-03 (MDA)	6.58E-03 ± 3.42E-03		
3/26/2015	< 3.37E-03 (MDA)	9.46E-03 ± 3.83E-03		
4/2/2015	< 3.42E-03 (MDA)	1.28E-02 ± 4.26E-03	< 2.03E-03 (MDA)	< 1.92E-03 (MDA)
4/9/2015	< 3.32E-03 (MDA)	1.18E-02 ± 4.05E-03		
4/16/2015	< 3.40E-03 (MDA)	1.59E-02 ± 4.59E-03		
4/23/2015	< 3.38E-03 (MDA)	1.30E-02 ± 4.25E-03		
4/30/2015	2.36E-03 ± 1.89E-03	1.16E-02 ± 4.07E-03		
5/7/2015	< 3.36E-03 (MDA)	1.26E-02 ± 4.19E-03		
5/14/2015	< 3.39E-03 (MDA)	7.76E-03 ± 3.62E-03		
5/21/2015	2.86E-03 ± 2.06E-03	9.51E-03 ± 3.74E-03		
5/28/2015	< 3.49E-03 (MDA)	1.05E-02 ± 4.06E-03		
6/4/2015	3.57E-03 ± 2.35E-03	8.82E-03 ± 3.76E-03		
6/11/2015	< 3.36E-03 (MDA)	9.80E-03 ± 3.86E-03		
6/18/2015	2.97E-03 ± 2.14E-03	1.62E-02 ± 4.61E-03		
6/25/2015	< 3.40E-03 (MDA)	4.16E-03 ± 3.10E-03		
7/2/2015	< 3.37E-03 (MDA)	3.50E-03 ± 2.99E-03	< 1.70E-03 (MDA)	< 1.59E-03 (MDA)
7/9/2015	3.55E-03 ± 2.33E-03	1.16E-02 ± 4.08E-03		
7/16/2015	< 3.37E-03 (MDA)	1.16E-02 ± 4.08E-03		
7/23/2015	< 3.37E-03 (MDA)	1.02E-02 ± 3.92E-03		
7/30/2015	< 3.37E-03 (MDA)	1.05E-02 ± 3.96E-03		
8/6/2015	< 3.36E-03 (MDA)	3.48E-03 ± 2.98E-03		
8/13/2015	2.96E-03 ± 2.13E-03	1.44E-02 ± 4.40E-03		
8/20/2015	2.35E-03 ± 1.88E-03	7.33E-03 ± 3.53E-03		
8/27/2015	< 3.33E-03 (MDA)	1.39E-02 ± 4.30E-03		
9/3/2015	< 3.44E-03 (MDA)	1.36E-02 ± 4.35E-03		
9/10/2015	< 3.35E-03 (MDA)	9.07E-03 ± 3.76E-03		
9/17/2015	< 3.37E-03 (MDA)	8.41E-03 ± 3.69E-03		
9/24/2015	< 3.40E-03 (MDA)	1.84E-02 ± 4.84E-03		
10/1/2015	4.14E-03 ± 2.51E-03	4.04E-02 ± 6.64E-03	< 7.92E-04 (MDA)	< 1.31E-03 (MDA)
10/8/2015	< 3.35E-03 (MDA)	2.10E-02 ± 5.04E-03		
10/15/2015	< 3.39E-03 (MDA)	1.38E-02 ± 4.35E-03		
10/22/2015	< 3.36E-03 (MDA)	2.24E-02 ± 5.18E-03		
10/29/2015	< 3.38E-03 (MDA)	8.10E-03 ± 3.65E-03		
11/5/2015	< 3.34E-03 (MDA)	1.64E-02 ± 4.59E-03		
11/12/2015	< 3.35E-03 (MDA)	1.78E-02 ± 4.74E-03		
11/19/2015	< 4.00E-03 (MDA)	1.46E-02 ± 4.95E-03		
11/25/2015	2.01E-03 ± 1.61E-03	3.70E-02 ± 5.83E-03		
12/3/2015	< 3.47E-03 (MDA)	9.40E-03 ± 3.89E-03		
12/10/2015	< 3.34E-03 (MDA)	6.26E-03 ± 3.38E-03		
12/17/2015	< 3.41E-03 (MDA)	4.25E-03 ± 3.13E-03		
12/24/2015	< 3.92E-03 (MDA)	< 7.05E-03 (MDA)		

**Table C-7 (Continued)**  
**ODCM REQUIRED AIR SAMPLES: HUMBOLDT HILL (STATION 3)**

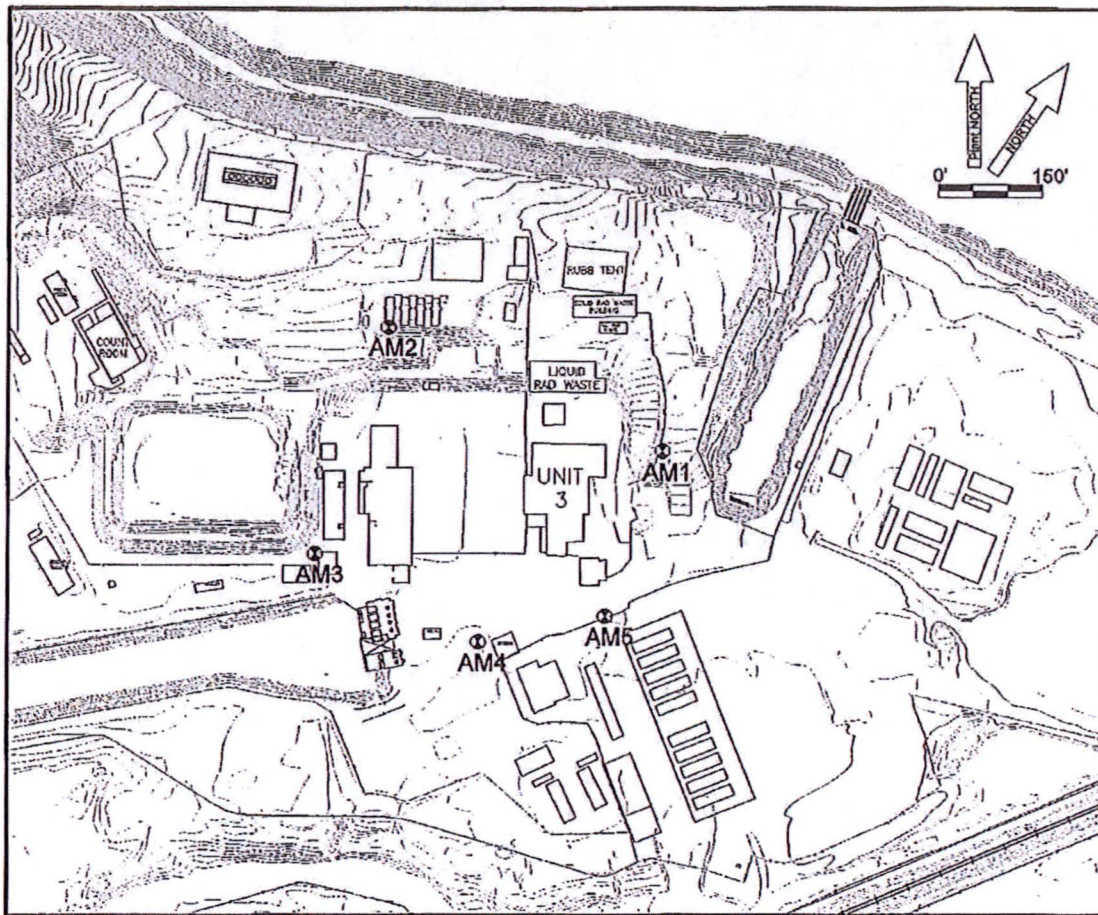
Sample Date	Alpha Activity (pCi/m <sup>3</sup> )	Beta Activity (pCi/m <sup>3</sup> )	Composite Gamma Activity (pCi/m <sup>3</sup> )	
			Co-60	Cs-137
12/30/2014	1.86E-03 ± 1.49E-03	2.02E-02 ± 4.32E-03	< 1.12E-03 (MDA)	< 1.48E-03 (MDA)
1/8/2015	< 3.29E-03 (MDA)	1.54E-02 ± 4.45E-03		
1/15/2015	< 3.43E-03 (MDA)	8.22E-03 ± 3.71E-03		
1/22/2015	< 3.38E-03 (MDA)	2.54E-02 ± 5.47E-03		
1/29/2015	2.35E-03 ± 1.88E-03	2.55E-02 ± 5.46E-03		
2/5/2015	< 3.35E-03 (MDA)	6.98E-03 ± 3.48E-03		
2/12/2015	< 3.39E-03 (MDA)	2.72E-02 ± 5.65E-03		
2/19/2015	< 3.36E-03 (MDA)	1.26E-02 ± 4.18E-03		
2/26/2015	3.38E-03 ± 8.30E-04	1.02E-02 ± 3.93E-03		
3/5/2015	2.37E-03 ± 1.89E-03	2.78E-02 ± 5.66E-03		
3/12/2015	< 3.39E-03 (MDA)	1.06E-02 ± 3.98E-03		
3/19/2015	< 3.29E-03 (MDA)	4.78E-03 ± 3.12E-03		
3/26/2015	< 3.44E-03 (MDA)	4.65E-03 ± 3.21E-03		
4/2/2015	< 3.37E-03 (MDA)	5.25E-03 ± 3.25E-03	< 2.03E-03 (MDA)	< 1.48E-03 (MDA)
4/9/2015	< 3.37E-03 (MDA)	5.96E-03 ± 3.36E-03		
4/16/2015	< 3.39E-03 (MDA)	1.16E-02 ± 4.10E-03		
4/23/2015	< 3.35E-03 (MDA)	3.82E-03 ± 3.02E-03		
4/30/2015	2.97E-03 ± 2.14E-03	6.69E-03 ± 3.48E-03		
5/7/2015	< 3.37E-03 (MDA)	8.77E-03 ± 3.74E-03		
5/14/2015	< 3.25E-03 (MDA)	8.47E-03 ± 3.62E-03		
5/21/2015	4.30E-03 ± 2.61E-03	1.68E-02 ± 4.76E-03		
5/28/2015	< 3.31E-03 (MDA)	1.00E-02 ± 3.85E-03		
6/4/2015	< 3.46E-03 (MDA)	3.59E-03 ± 3.07E-03		
6/11/2015	< 3.36E-03 (MDA)	< 6.05E-03 (MDA)		
6/18/2015	< 3.38E-03 (MDA)	8.80E-03 ± 3.76E-03		
6/25/2015	2.42E-03 ± 1.85E-03	8.34E-03 ± 3.68E-03		
7/2/2015	< 3.37E-03 (MDA)	< 6.07E-03 (MDA)	< 1.94E-03 (MDA)	< 1.68E-03 (MDA)
7/9/2015	4.76E-03 ± 2.73E-03	1.02E-02 ± 3.94E-03		
7/16/2015	< 3.37E-03 (MDA)	8.43E-03 ± 3.69E-03		
7/23/2015	< 3.37E-03 (MDA)	8.77E-03 ± 3.74E-03		
7/30/2015	3.55E-03 ± 2.34E-03	7.02E-03 ± 3.50E-03		
8/6/2015	< 3.37E-03 (MDA)	4.55E-03 ± 3.14E-03		
8/13/2015	2.37E-03 ± 1.89E-03	5.96E-03 ± 3.36E-03		
8/20/2015	2.37E-03 ± 1.89E-03	< 6.07E-03 (MDA)		
8/27/2015	< 3.37E-03 (MDA)	3.85E-03 ± 3.04E-03		
9/3/2015	< 3.36E-03 (MDA)	5.24E-03 ± 3.24E-03		
9/10/2015	< 3.37E-03 (MDA)	7.72E-03 ± 3.60E-03		
9/17/2015	< 3.38E-03 (MDA)	6.69E-03 ± 3.48E-03		
9/24/2015	< 3.36E-03 (MDA)	1.19E-02 ± 4.10E-03		
10/1/2015	3.55E-03 ± 2.34E-03	2.67E-02 ± 5.57E-03	< 1.29E-03 (MDA)	< 1.27E-03 (MDA)
10/8/2015	< 3.37E-03 (MDA)	1.69E-02 ± 4.66E-03		
10/15/2015	< 3.38E-03 (MDA)	8.79E-03 ± 3.75E-03		
10/22/2015	< 3.32E-03 (MDA)	1.18E-02 ± 4.05E-03		
10/29/2015	< 3.41E-03 (MDA)	7.45E-03 ± 3.59E-03		
11/5/2015	2.37E-03 ± 1.90E-03	4.56E-03 ± 3.15E-03		
11/12/2015	< 3.38E-03 (MDA)	7.38E-03 ± 3.56E-03		
11/19/2015	< 3.92E-03 (MDA)	< 7.06E-03 (MDA)		
11/25/2015	< 2.93E-03 (MDA)	2.44E-02 ± 4.95E-03		
12/3/2015	< 3.30E-03 (MDA)	< 5.93E-03 (MDA)		
12/10/2015	< 3.48E-03 (MDA)	< 6.26E-03 (MDA)		
12/17/2015	< 3.38E-03 (MDA)	< 6.08E-03 (MDA)		
12/24/2015	< 3.89E-03 (MDA)	7.29E-03 ± 3.94E-03		

Table C-7 Notes

1. The second quarterly composite sample at location AM1 (East Fence) identified Co-60 with an activity of  $5.24\text{E-}03 \text{ pCi/m}^3$ . Identification of Co-60 was likely to have occurred during the demolition of the Liquid Radwaste Building. The weekly sample results for alpha and beta particulate met the effluent acceptance criteria in the ODCM. The activity identified in the composite sample would not have resulted in a measurable dose to a member of the public and was well below the effluent concentration limits in 10 CFR 20, Appendix B, Table 2, Column 1. Offsite laboratory analysis of the composited filters reaffirmed that no significant release occurred and the onsite sampling and analytical protocols accurately reflect the HBPP effluents. This event was addressed in corrective action SAPN 1407196.
2. Composite samples for first, second, third and fourth quarter ODCM Air Samples were analyzed by gamma spectroscopy. Sample analyses were performed by HBPP count room personnel. All samples met the LLD requirements of  $6.0\text{E-}02 \text{ pCi/m}^3$  for Cs-137.
3. All LLD's were met for Gross Beta (required LLD  $1.0\text{E-}02 \text{ Ci/m}^3$ ).
4. All samples reported as <MDA represent results that had no identified gamma peaks.
5. Humboldt Hill (Offsite) is also known as Station 3. East Fence is also known as AM1. Building 12 is also known as AM2. Annex Building is also known as AM3. Relay Building is also known as AM4. Oil Water Separator (O.W.S.) is also known as AM5.



**FIGURE A-1  
HBPP ONSITE AIR SAMPLE LOCATIONS**

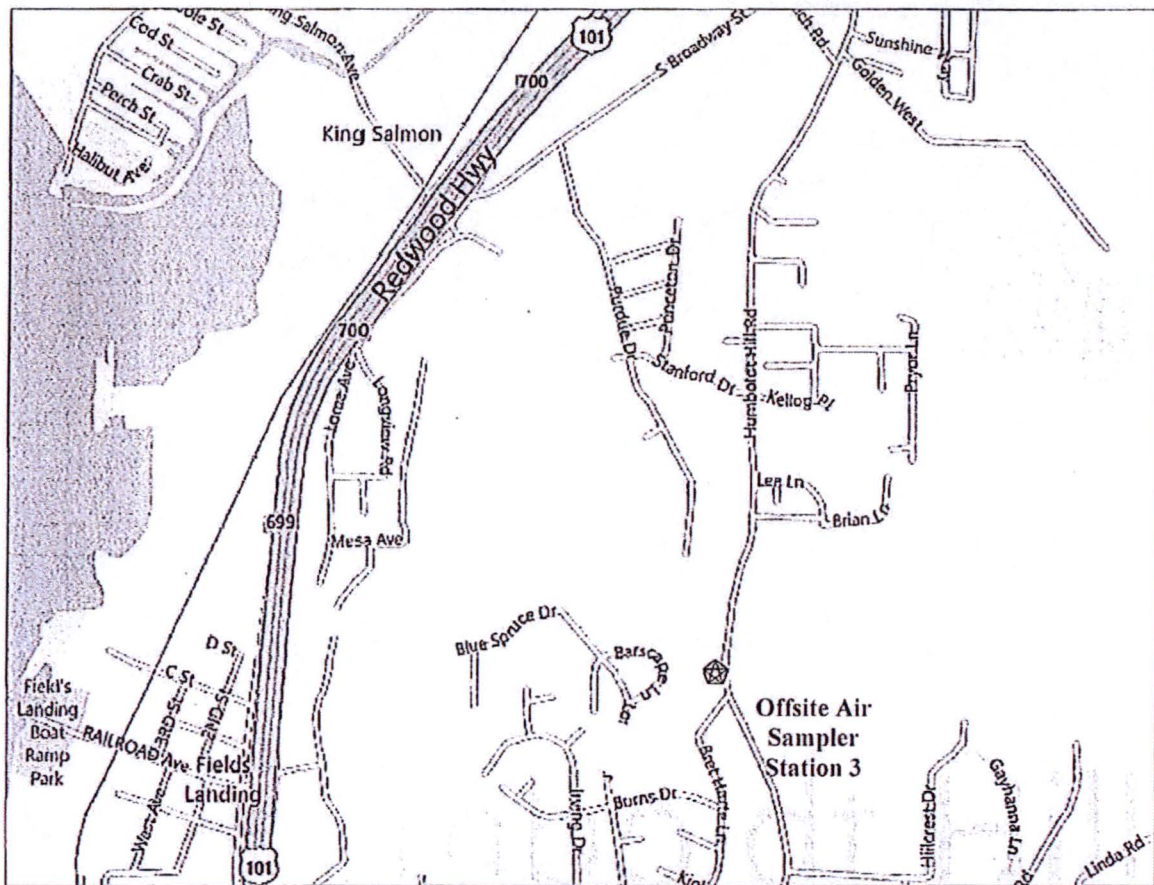


Location Number	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			HBPP (called north)	
	Easting	Northing	el.	East	North
AM1	5949518.63	2161208.89	20.68	5383.96	9299.72
AM2	5949091.47	2161143.20	33.05	4989.34	9475.92
AM3	5949177.71	2160817.45	11.29	4885.34	9155.45
AM4	5949441.54	2160838.93	11.36	5118.73	9030.56
AM5	5949576.07	2160969.08	11.94	5302.31	9067.06

Figure A-1 Note:

1. Humboldt Hill (Offsite) is also known as Station 3, East Fence is also known as AM1, Building 12 is also known as AM2, Annex is also known as AM3, Relay Building is also known as AM4, O.W.S. is also known as AM5.

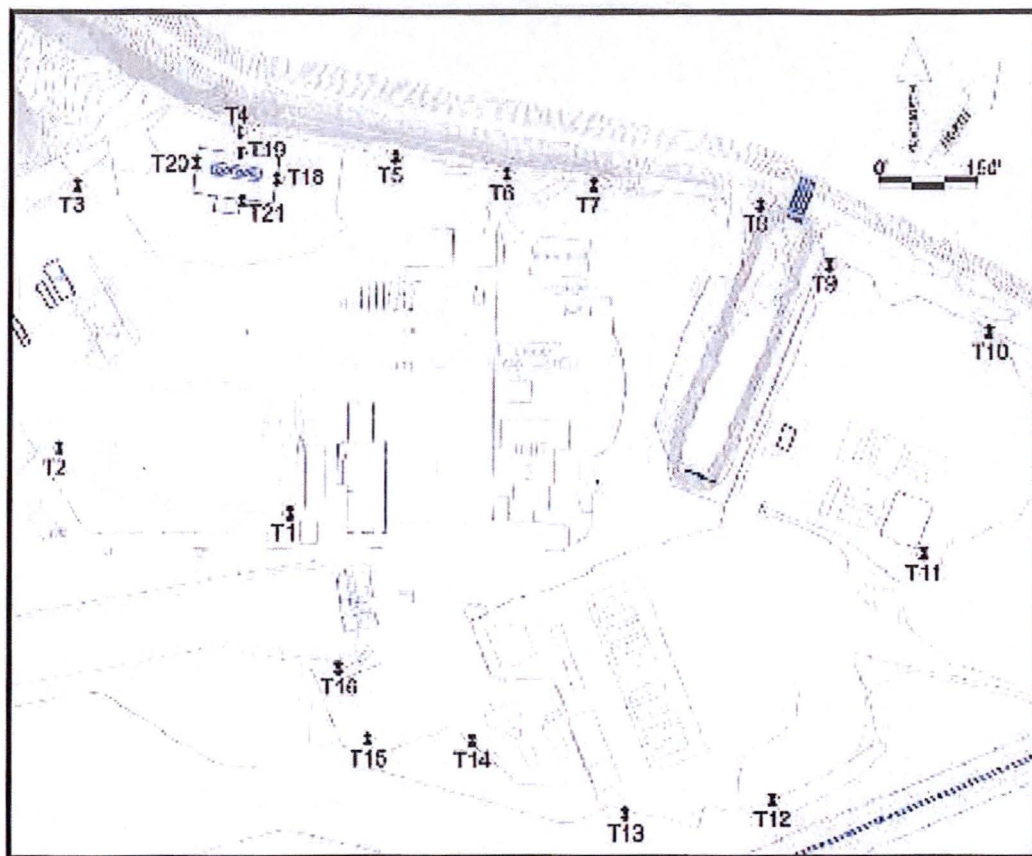
**FIGURE A-2**  
**HBPP OFFSITE AIR SAMPLE LOCATION**  
**HUMBOLDT HILL (Station 3)**



GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Degree.Decimal	
Easting	Northing	el.	Latitude	Longitude
5951260.28	2155706.11	234.94	40.72676	-124.20274



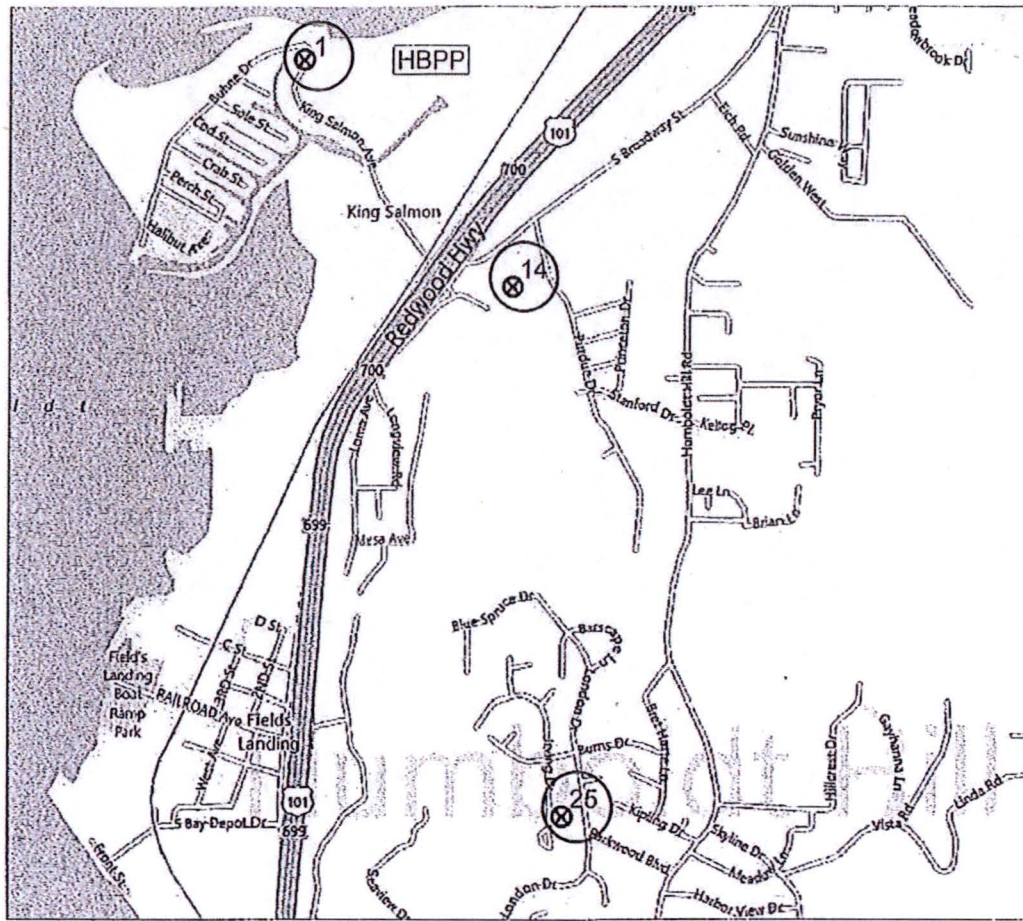
**FIGURE A-3**  
**HBPP ONSITE TLD LOCATIONS**  
**Stations T1 – T21 (excluding T17)**



Location Number	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			HBPP (called north)	
	Easting	Northing	el.	East	North
T1	5949161.06	2160822.11	10.78	4873.87	9168.63
T2	5948804.52	2160710.72	11.56	4513.84	9268.18
T3	5948809.45	2161061.84	41.77	4540.12	9668.91
T4	5948778.72	2161289.91	43.66	4795.13	9752.07
T5	5949002.39	2161368.44	38.19	5036.50	9713.72
T6	5949159.22	2161437.55	36.30	5205.77	9686.84
T7	5949280.02	2161494.61	32.04	5338.22	9669.36
T8	5949511.99	2161608.36	12.96	5594.82	9639.33
T9	5949668.60	2161582.00	11.79	5701.27	9547.04
T10	5949912.89	2161633.96	11.17	5945.65	9443.64
T11	5950011.77	2161297.55	14.18	5846.48	9107.30
T12	5950019.25	2160858.44	11.25	5614.86	8734.19
T13	5949841.53	2160718.03	9.79	5389.40	8712.46
T14	5949583.98	2160684.24	10.48	5154.63	8823.60
T15	5949448.88	2160600.96	10.34	4995.96	8826.81
T16	5949352.82	2160667.18	10.80	4951.10	8934.52
T18	5948867.24	2161239.36	43.47	4852.98	9678.44
T19	5948796.71	2161242.74	42.84	4795.52	9719.50
T20	5948747.14	2161191.68	44.14	4726.20	9703.44
T21	5948834.52	2161182.89	45.71	4799.39	9644.52

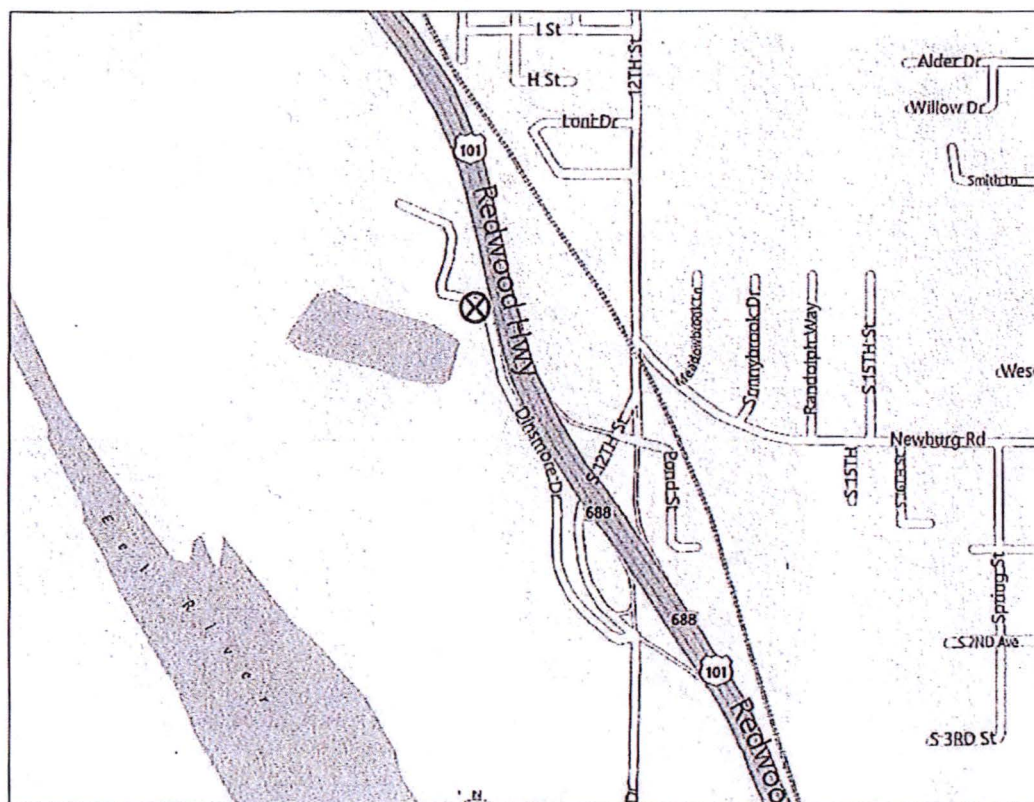
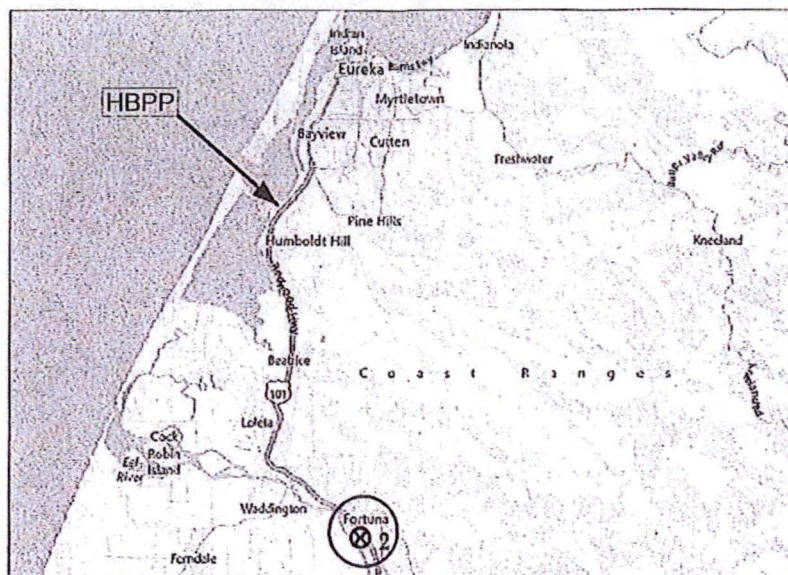


**FIGURE A-4**  
**HBPP OFFSITE TLD LOCATIONS**  
**Stations (1, 14 & 25)**



Station	GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Degree Decimal	
	Easting	Northing	el.	Latitude	Longitude
1	5948026.52	2161183.79	11.38	40.74156	-124.21903
14	5949876.83	2158864.39	18.65	40.73533	-124.20802
25	5950247.30	2154214.18	229.22	40.72260	-124.20626

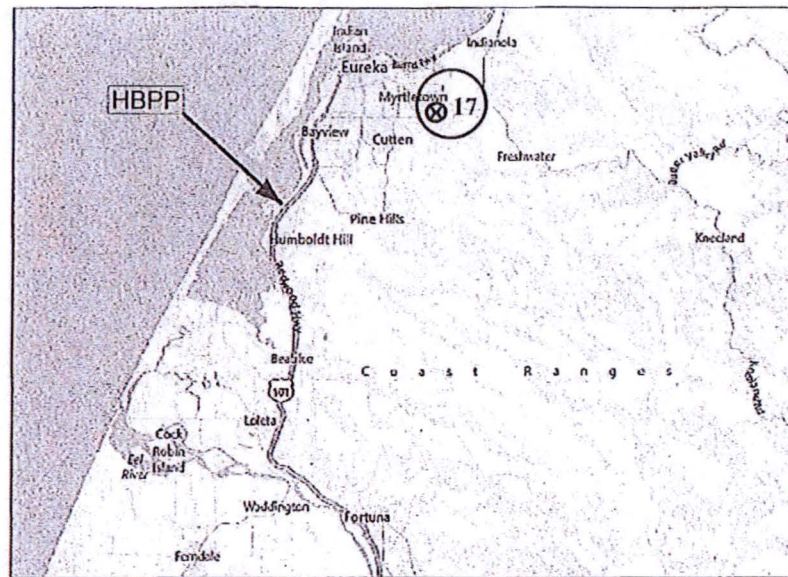
**FIGURE A-4 (Continued)**  
**HBPP OFFSITE TLD LOCATION**  
**FORTUNA (Station 2)**



GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Degree.Decimal	
Easting	Northing	el.	Latitude	Longitude
5962583.86	2105797.82	35.53	40.59057	-124.15746



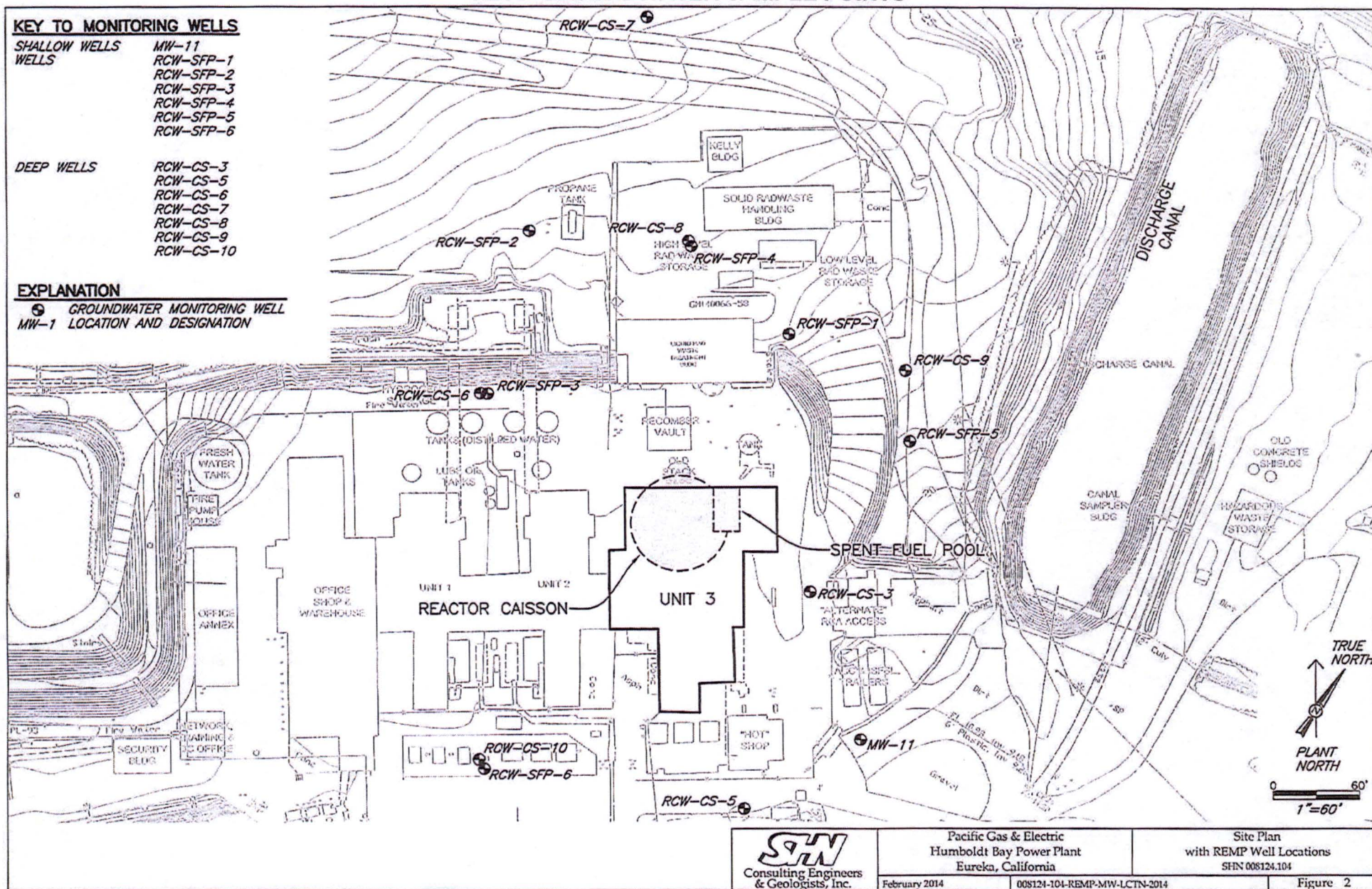
**FIGURE A-4 (Continued)**  
**HBPP OFFSITE TLD LOCATION**  
**EUREKA (Control Location T17)**



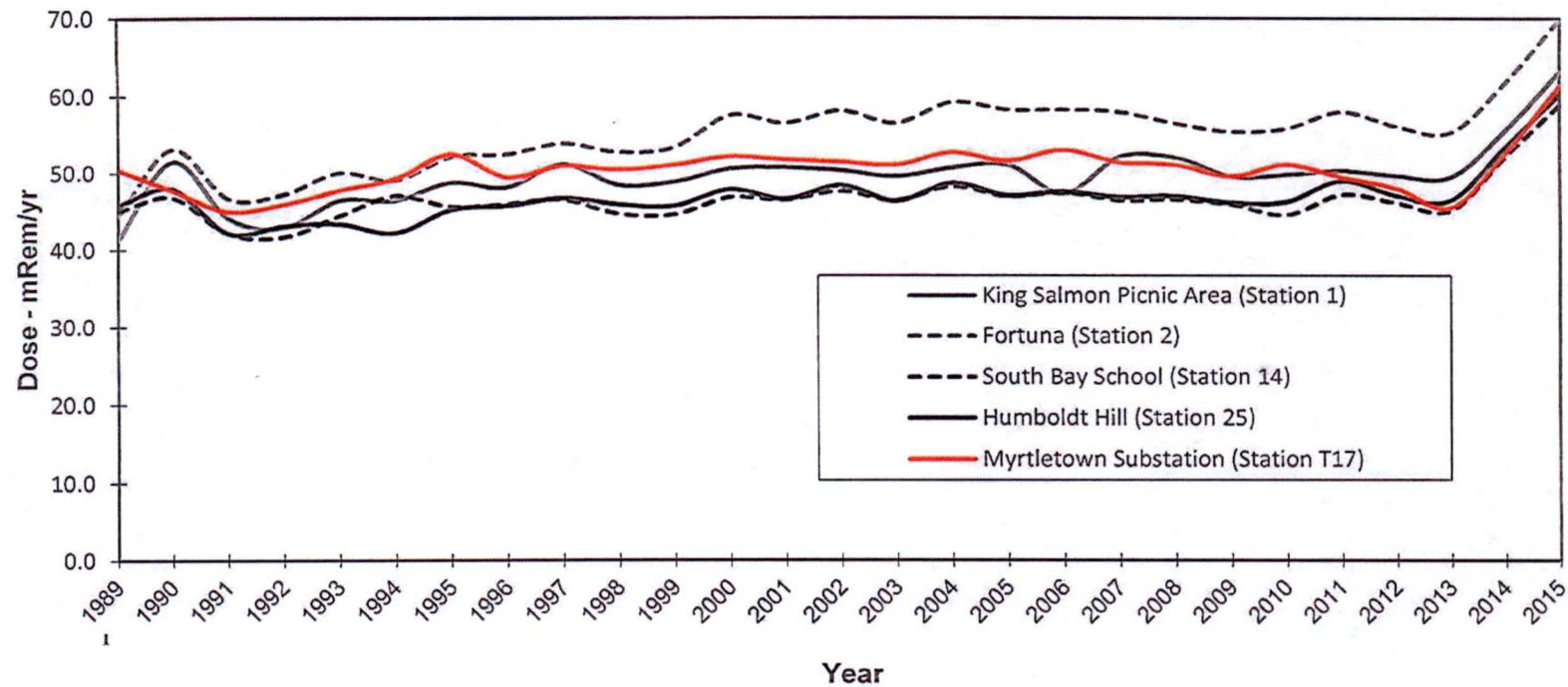
GPS Coordinates (NAD83/NAVD88 CA. Zone 1)			Degree.Decimal	
Easting	Northing	el.	Latitude	Longitude
5976549.55	2175490.19	164.85	40.78276	-124.11324



**FIGURE A-5  
HBPP GROUNDWATER SAMPLE POINTS**



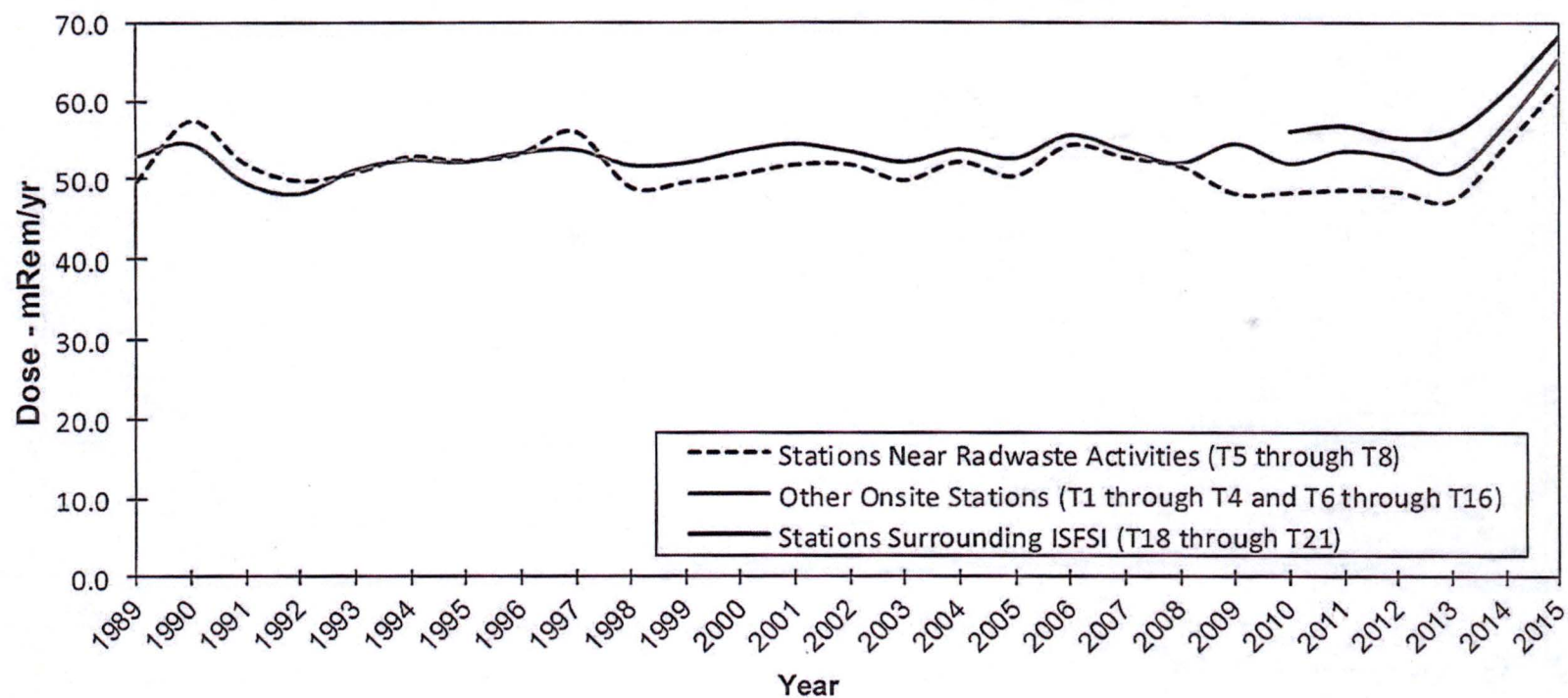
**FIGURE B-1  
OFFSITE ENVIRONMENTAL RADIATION LEVEL TRENDS**



The baseline values for each location were obtained by averaging the readings at each location from 1977 through 1983. These values, however, were obtained using ion chambers instead of TLDs. The average annual values from 1977 through 1983 were Station 1 – 83.0 mRem, Station 2 – 79.8 mRem, Station 14 – 80.2 mRem, and Station 25 – 73.7 mRem.



**FIGURE B-2**  
**ONSITE ENVIRONMENTAL RADIATION LEVEL TRENDS**



The baseline values for the two areas were obtained by averaging the readings for each area from 1977 through 1983. These values, however, were obtained using ion chambers instead of TLDs. The average annual value from 1977 through 1983 for the stations near the radwaste activities was 78.6 mRem and the average annual value for other onsite stations was 79.4 mRem.