NEXTera ENERGY POINT BEACH

April 28, 2016

NRC 2016-0020
10 CFR 72.44
TS 5.6.2

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

Point Beach Nuclear Plant, Units 1 and 2
Dockets 50-266, 50-301 and 72-005
Renewed License Nos. DPR-24 and DPR-27

2015 Annual Monitoring Report

In accordance with Point Beach Nuclear Plant (PBNP) Technical Specification 5.6.2, enclosed is the Annual Monitoring Report for PBNP Units 1 and 2, for the period January 1 through December 31, 2015.

The Annual Monitoring Report contains information relating to the effluent impact upon the public, as well as information relating to plant releases, solid waste shipments, results from the radiological environmental monitoring program, the groundwater protection program, and miscellaneous monitoring activities which occurred in 2015. The report also covers the results of radiological monitoring of the PBNP Independent Spent Fuel Storage Installation (ISFSI), as required by 10 CFR 72.44. The contracted laboratory's final Radiological Environmental Monitoring Program results (Appendix 1) is included.

This letter contains no new regulatory commitments and no revisions to existing regulatory commitments.

Very truly yours,

NextEra Energy Point Beach, LLC

Bryan Woyak
Licensing Manager

Enclosures

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW
American Nuclear Insurers
WI Division of Public Health, Radiation Protection Section
Office of Nuclear Material Safety and Safeguards, USNRC

ENCLOSURE 1

ANNUAL MONITORING REPORT 2015

NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT

DOCKETS 50-266 (UNIT 1), 50-301 (UNIT 2), 72-005 (ISFSI)
RENEWED LICENSES DPR-24 and DPR-27

January 1, 2015 through December 31, 2015

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SUMMARY

The Annual Monitoring Report for the period from January 1, 2015, through December 31, 2015, is submitted in accordance with Point Beach Nuclear Plant (PBNP) Units 1 and 2, Technical Specification 5.6.2 and filed under Dockets 50-266 and 50-301 for Facility Operating Licenses DPR-24 and DPR-27, respectively. It also contains results of monitoring in support of the Independent Spent Fuel Storage Installation (ISFSI) Docket 72-005. The report presents the results of effluent and environmental monitoring programs, solid waste shipments, non-radioactive chemical releases, and circulating water system operation.

During 2015, the following Curies (Ci) of radioactive material were released via the liquid and atmospheric pathways:

	Liquid	Atmospheric
Tritium (Ci)	866	80.1
[1]Particulate (Ci)	0.0516	0.0000689
Noble Gas (Ci)	(-)	0.826
C-14[2]	0.0197	11.75

(-)Noble gases in the liquids are added to the atmospheric release totals.
[1]Atmospheric particulate includes radioiodine (I-131 - I-133).
[2]Liquid is measured, atmospheric is calculated.

For the purpose of compliance with the effluent design objectives of Appendix I to 10 CFR 50, doses from effluents are calculated for the hypothetical maximally exposed individual (MEI) for each age group and compared to the Appendix I objectives. Doses less than or equal to the Appendix I values are considered to be evidence that PBNP releases are as low as reasonably achievable (ALARA). The maximum annual calculated doses in millirem (mrem) or millirad (mrad) are shown below and compared to the corresponding design objectives of 10 CFR 50, Appendix I.

LIQUID RELEASES

Dose Category	Calculated Dose	Appendix I Dose
Whole body dose	0.00684 mrem	6 mrem
Organ dose	0.00684 mrem	20 mrem

ATMOSPHERIC RELEASES

Dose Category	Calculated Dose	Appendix I Dose
Particulate organ dose	0.0315 mrem	30 mrem
Noble gas beta air dose	0.0000996 mrad	40 mrad
Noble gas gamma ray air dose	0.000274 mrad	20 mrad
Noble gas dose to the skin	0.000349 mrem	30 mrem
Noble gas dose to the whole body	0.00234 mrem	10 mrem

The results show that during 2015, the doses from PBNP effluents were a small percentage (≤0.12%) of the Appendix I design objectives. Therefore, operation of the PBNP radwaste treatment system continues to be ALARA.

A survey of land use with respect to the location of dairy cattle was made pursuant to Section 2.5 of the PBNP Environmental Manual. As in previous years, no dairy cattle were found to be grazing at the site boundary. Therefore, the assumption that cattle graze at the site boundary used in the evaluation of doses from PBNP effluents remains conservative. Of the sixteen compass sectors around PBNP, six are over Lake Michigan. A land use census (LUC) of the remaining ten sectors over land containing identifies any changes in the closest garden, occupied dwelling, and dairy in each sector. The 2014 LUC results confirmed the assumption that, for the purpose of calculating effluent doses, the maximally exposed person lives at the south boundary remains conservative. There is no change in that assumption for 2015.

The 2015 Radiological Environmental Monitoring Program (REMP) collected 771 individual samples for radiological analyses. Quarterly composites of weekly air particulate filters generated an additional 24 samples and quarterly composites of monthly lake water samples resulted in a further 16 samples. Finally, 10 crop samples grown on the site were analyzed. This yields a total of 821 samples. The ambient radiation measurements in the vicinity of PBNP and the ISFSI was conducted using 146 sets of thermoluminescent dosimeters (TLDs).

Air monitoring from six different sites did not reveal any effect from Point Beach effluents.

Terrestrial monitoring consisting of soil, vegetation, and milk found no influence from PBNP. Similarly, samples from the aquatic environment, consisting of lake and well water, fish and algae revealed no buildup of PBNP radionuclides released in liquid effluents. Therefore, the data show no plant effect on its environs.

No new dry storage units added to the ISFSI in 2015. The total number remains at 39 dry storage casks: 16 ventilated, vertical storage casks (VSC-24) and 23 NUHOMS®, horizontally stacked storage modules. The subset of the PBNP REMP samples used to evaluate the environmental impact of the PBNP ISFSI showed no environmental impact from its operation.

The environmental monitoring conducted during 2015 confirmed that the effluent control program at PBNP ensured a minimal impact on the environment.

One-hundred-fifty-two (152) samples were analyzed for H-3 as part of the groundwater protection program (GWPP). These samples came from drinking water wells, monitoring wells, yard drain outfalls, yard manholes, and surface water on site. Also included in this number were a sump associated with the subsurface drainage system (SSD) located under the plant foundation, and four groundwater containment integrity monitoring wells located in the facades. The results show no substantial change in H-3 from previous years. Low levels of tritium continue under the plant foundation. No drinking water wells (depth >100 feet) have any detectable H-3. Tritium continues to be confined to the upper soil layer where the flow is toward the lake. Groundwater samples from wells in the vicinity of the remediated, former earthen retention pond continue to show low levels of H-3 whereas none was detectable in the wells monitoring the potential offsite tritium movement. Gamma scans of samples originating within the power block found no plant related gamma emitters.

The results of GWPP monitoring indicate no significant change from previous years.

Part A
EFFLUENT MONITORING

1.0 INTRODUCTION

The PBNP effluent monitoring program is designed to comply with federal regulations for ensuring the safe operation of PBNP with respect to releases of radioactive material to the environment and its subsequent impact on the public. Pursuant to 10 CFR 50.34a, operations should be conducted to keep the levels of radioactive material in effluents to unrestricted areas as low as reasonably achievable (ALARA). In 10 CFR 50, Appendix I, the Nuclear Regulatory Commission (NRC) provides the numerical values for what it considers to be the appropriate ALARA design objectives to which the licensee's calculated effluent doses may be compared. These doses are a small fraction of the dose limits specified by 10 CFR 20.1301 and lower than the Environmental Protection Agency (EPA) limits specified in 40 CFR 190.

10 CFR 20.1302 directs PBNP to make the appropriate surveys of radioactive materials in effluents released to unrestricted and controlled areas. Liquid wastes are monitored by inline radiation monitors as well as by isotopic analyses of samples of the waste stream prior to discharge from PBNP. Airborne releases of radioactive wastes are monitored in a similar manner. Furthermore, for both liquid and atmospheric releases, the appropriate portions of the radwaste treatment systems are used as required to keep releases ALARA. Prior to release, results of isotopic analyses are used to adjust the release rate of discrete volumes of liquid and atmospheric wastes (from liquid waste holdup tanks and from gas decay tanks) such that the concentrations of radioactive material in the air and water beyond PBNP are below the PBNP Technical Specification concentration limits for liquid effluents and release rate limits for gaseous effluents.

Solid wastes are shipped offsite for disposal at NRC licensed facilities. The amount of radioactivity in the solid waste is determined prior to shipment in order to determine the proper shipping configuration as regulated by the Department of Transportation and the NRC.

10 CFR 72.210 grants a general license for an Independent Spent Fuel Storage Installation (ISFSI) to all nuclear power reactor sites operating under 10 CFR 50. The annual reporting requirement pursuant to 10 CFR 72.44(d)(3) is no longer applicable. However, any release of radioactive materials from the operation of the ISFSI must also comply with the limits of Part 20 and Part 50 Appendix I design objectives. The dose criteria for effluents and direct radiation specified by 10 CFR 72.104 states that during normal operations and anticipated occurrences, the annual dose equivalent to any real individual beyond the controlled area must not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ. The dose from naturally occurring radon and its decay products are exempt. Because the loading of the storage casks occurs within the primary auxiliary building of PBNP, the doses from effluents due to the loading process will be assessed and quantified as part of the PBNP Radiological Effluent Control Program.

2.0 RADIOACTIVE LIQUID RELEASES

The radioactive liquid release path to the environment is via the circulating water discharge. A liquid waste treatment system in conjunction with administrative controls is used to minimize the impact on the environment and maintain doses to the public ALARA from the liquid releases.

2.1 Doses From Liquid Effluent

Doses from liquid effluent are calculated using the methodology of the Offsite Dose Calculation Manual (ODCM). These calculated doses use parameters such as the amount of radioactive material released, the total volume of liquid, the total volume of dilution water, and usage factors (e.g., water and fish consumption, shoreline and swimming factors). These calculations produce a conservative estimation of the dose. For compliance with 10 CFR 50, Appendix I design objectives, the annual dose is calculated to the hypothetical maximally exposed individual (MEI). The MEI is assumed to reside at the site boundary in the highest χ/Q sector and is maximized with respect to occupancy, food consumption, and other uses of this area. As such, the MEI represents an individual with reasonable deviations from the average for the general population in the vicinity of PBNP. A comparison of the calculated doses to the 10 CFR 50, Appendix I design objectives is presented in Table 2-1. The conservatively calculated dose to the MEI is a very small fraction of the Appendix I design objective.

Table 2-1
Comparison of 2015 Liquid Effluent Calculated Doses to
10 CFR 50 Appendix I Design Objectives

Annual Limit [mrem]	Highest Total Calculated Dose [mrem]	% of Design Objective
6 (whole body)	0.00684	0.114 %
20 (any organ)	0.00684	0.0342 %

2.2 2015 Circulating Water Radionuclide Release Summary

Radioactive liquid releases via the circulating water discharge are summarized by individual source and total curies released on a monthly basis semi-annual and annual totals (Table 2-2). These releases are composed of processed waste, wastewater effluent, and blowdown from Units 1 and 2. The wastewater effluent consists of liquid from turbine hall sumps, plant well house backwashes, sewage treatment plant effluent, water treatment plant backwashes, the Unit 1 and 2 facade sumps and the subsurface drainage system sump.

2.3 2015 Isotopic Composition of Circulating Water Discharges

The isotopic composition of circulating water discharges during the current reporting period is presented in Table 2-3. The noble gases released in liquids are reported with the airborne releases in Section 3.

The 2015 processed waste volume (Table 2-2) decreased about 20% from 2014 (8.76E+05 to 6.94E+05 gallons). Additionally, there was a concomitant decrease in the total isotopic curie distribution (gamma emitters plus hard-to-detects other that strontium) from 6.42E-02 Ci to 5.16E-02 Ci. In contrast, Sn-113/117m increased (from 3.11E-03 to 4.67E-03 Ci) whereas Sb-122/124/125 decreased (from 3.48E-03 Ci to 6.55E-04 Ci). Decreases also occurred in Co-58/60, Cr-51, Mn-54, Fe-55/59, and Zn-65 whereas Ni-63 increased. C-14 also had a small increase from 1.15E-02 to 1.97E-02 Ci in 2015. As in 2013 and 2014, no Sr-89 or Sr-90 was detected in liquids during 2015. H-3 increased from 796 to 866 Ci in 2015. Tritium continues to be the major radionuclide released via liquid discharges.

2.4 Beach Drain System Releases Tritium Summary

Beach drain is the term used to describe the point at which the site yard drainage system empties onto the beach of Lake Michigan. Six of these outfalls carry yard and roof drain runoff to the beach. A seventh outfall drains a small portion of the grassy area on top of the bluff overlooking the lake. The quarterly results from the monthly beach drain samples are presented in Table 2-4. The total monthly flow is calculated assuming that the flow rate at the time of sampling persists for the whole month**.** In 2015, no tritium was observed at the effluent LLDs. No H-3 found in the beach drains is included in the effluent totals unless it can be shown to be the result of a spill or similar event. Because the source of beach drain H-3 has been determined to be recapture, including beach drain H-3 in the effluent totals would be double counting (NRC RIS 2008-03, Return/re-use of previously discharged radioactive effluents).

The principle source of water for the beach drains is the yard drain system. Yard drain water sources are rain and snow melt. During the winter natural melting is the principle source. (In the past, runoff has been enhanced by the use of snow melting machines where the melt water is emptied into the yard drains. [See Section 14.2 for further discussion.]) Additionally, various roof drains connect to the yard drain system. In addition to precipitation, the roof drains also carry condensate from various building AC units. A secondary source may be groundwater in leakage. This is evidenced by flow during periods of no precipitation.

Because there are no external storage tanks or piping that carries radioactive liquids, the main source of radioactivity for this system is recapture/washout of airborne H-3 discharges via the yard drain system. Because of these various recapture sources, the beach drains also are sampled as part of the groundwater monitoring program. These results and other groundwater monitoring results are presented in Part D of this Annual Monitoring Report.

Table 2-2
Summary of Circulating Water Discharge
January 1, 2015 through December 31, 2015

	Jan	Feb	Mar	Apr	May	Jun	Total Jan-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Total Activity Released (Ci)														
Gamma Scan(+HTDs)[1]	6.21E-04	7.02E-04	1.77E-03	2.53E-04	3.82E-03	5.72E-03	1.29E-02	1.40E-03	1.03E-03	4.81E-03	9.23E-03	8.18E-03	1.41E-02	5.16E-02
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium	0.00E+00	4.76E+00	9.71E+01	1.43E+01	3.45E+01	1.19E+02	2.70E+02	7.69E+01	7.76E+01	1.51E+02	5.59E+01	3.82E+01	1.97E+02	8.66E+02
Strontium (89/90/92)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Vol Released (gal)														
Processed Waste	0.00E+00	8.04E+03	4.05E+04	2.08E+04	3.12E+04	3.51E+04	1.36E+05	3.09E+04	4.02E+04	1.34E+05	1.28E+05	1.08E+05	1.17E+05	6.94E+05
Waste Water Effluent[2]	3.12E+06	2.57E+06	2.44E+06	2.56E+06	2.48E+06	2.47E+06	1.56E+07	2.77E+06	2.74E+06	3.06E+06	2.74E+06	2.91E+06	3.45E+06	3.33E+07
U1 SG Blowdown	2.76E+06	2.41E+06	2.68E+06	2.69E+06	3.16E+06	2.59E+06	1.63E+07	2.67E+06	2.57E+06	2.80E+06	2.68E+06	2.64E+06	2.96E+06	3.26E+07
U2 SG Blowdown	3.87E+06	1.63E+06	1.84E+06	1.75E+06	6.95E+05	1.75E+06	1.15E+07	1.77E+06	2.24E+06	2.45E+06	5.72E+05	4.31E+06	2.96E+06	2.58E+07
Total Gallons	9.75E+06	6.62E+06	7.00E+06	7.02E+06	6.37E+06	6.85E+06	4.36E+07	7.23E+06	7.59E+06	8.45E+06	6.12E+06	9.97E+06	9.49E+06	9.25E+07
Total cc	3.69E+10	2.51E+10	2.65E+10	2.66E+10	2.41E+10	2.59E+10	1.65E+11	2.74E+10	2.87E+10	3.20E+10	2.31E+10	3.77E+10	3.59E+10	3.50E+11
Dilution vol(cc)[3]	8.18E+13	7.39E+13	8.18E+13	1.18E+14	1.26E+14	1.22E+14	6.03E+14	1.26E+14	1.26E+14	1.22E+14	7.60E+13	1.18E+14	1.22E+14	1.29E+15
Avg diluted discharge conc (µCi/cc)														
Gamma Scan (+HTDs)[1]	7.59E-12	9.50E-12	2.17E-11	2.14E-12	3.04E-11	4.70E-11		1.11E-11	8.20E-12	3.95E-11	1.21E-10	6.96E-11	1.15E-10	
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Tritium	0.00E+00	6.44E-08	1.19E-06	2.15E-07	2.74E-07	9.79E-07		6.12E-07	6.17E-07	1.24E-06	7.35E-07	3.25E-07	1.61E-06	
Strontium (89/90/92)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Max Batch Discharge Conc (µCi/cc)														
Tritium	0.00E+00	9.09E-06	3.23E-05	9.30E-06	2.03E-05	3.86E-05		3.61E-05	3.25E-05	3.92E-05	2.34E-05	1.55E-05	4.06E-05	
Gamma Scan	7.59E-12	1.46E-11	1.22E-09	4.68E-11	2.93E-09	4.55E-10		5.08E-11	6.87E-11	1.77E-09	5.43E-09	2.76E-09	1.53E-09	

1 HTDs include Fe-55, C-14, Ni-63, and Tc-99. Does not include strontium which is totaled separately.
2 The waste water effluent system replaced the Retention Pond which was taken out of service in September 2002.
3 Circulating water discharge from both units.
Note: Dissolved noble gases detected in liquid effluents (e.g., Xe-133, Xe-135, etc.) are added to the atmospheric release summaries

Table 2-3
Isotopic Composition of Circulating Water Discharges (Ci)
January, 2015 through December 31, 2015

Nuclide	Jan	Feb	Mar	Apr	May	Jun	Total Jan-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total Jan-Dec
H-3	0.00E+00	4.76E+00	9.71E+01	1.43E+01	3.45E+01	1.19E+02	2.70E+02	7.69E+01	7.76E+01	1.51E+02	5.59E+01	3.82E+01	1.97E+02	8.66E+02
C-14	0.00E+00	0.00E+00	1.04E-04	0.00E+00	3.78E-04	4.65E-03	5.13E-03	1.00E-04	3.04E-04	3.86E-03	1.60E-04	3.46E-04	9.78E-03	1.97E-02
F-18	6.21E-04	6.95E-04	3.97E-04	1.54E-04	5.97E-04	2.22E-04	2.69E-03	1.20E-03	5.72E-04	5.32E-04	1.75E-04	4.73E-04	1.08E-03	6.71E-03
Cr-51	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.37E-03	1.45E-03	0.00E+00	3.82E-03
Mn-54	0.00E+00	0.00E+00	9.92E-06	0.00E+00	5.26E-06	3.16E-06	1.83E-05	0.00E+00	1.84E-06	0.00E+00	8.79E-05	6.34E-05	2.47E-06	1.74E-04
Fe-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-04	0.00E+00	1.18E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.18E-04
Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.55E-05	0.00E+00	0.00E+00	1.55E-05
Co-57	0.00E+00	0.00E+00	3.61E-06	0.00E+00	1.47E-05	4.20E-06	2.25E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-05
Co-58	0.00E+00	3.90E-06	6.03E-04	5.94E-06	1.83E-03	4.32E-04	2.87E-03	2.07E-05	1.98E-05	1.13E-05	2.28E-03	2.06E-03	1.80E-03	9.06E-03
Co-60	0.00E+00	3.71E-06	4.15E-04	4.53E-06	2.94E-04	2.26E-04	9.43E-04	5.03E-05	9.35E-05	3.00E-04	1.44E-03	8.87E-04	3.38E-04	4.05E-03
Ni-63	0.00E+00	0.00E+00	8.28E-05	2.13E-05	4.02E-04	1.17E-04	6.23E-04	1.75E-05	2.13E-05	0.00E+00	6.78E-05	6.11E-05	8.44E-05	8.75E-04
Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-05	0.00E+00	0.00E+00	1.48E-05
As-76	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.74E-05	0.00E+00	2.74E-05
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	0.00E+00	0.00E+00	2.13E-05	0.00E+00	0.00E+00	0.00E+00	2.13E-05	0.00E+00	0.00E+00	0.00E+00	5.23E-04	4.03E-04	2.67E-05	9.74E-04
Nb-97	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.66E-07	0.00E+00	0.00E+00	0.00E+00	3.66E-07
Zr-95	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.27E-04	2.25E-04	4.87E-06	5.57E-04
Tc-99	0.00E+00	0.00E+00	1.04E-05	1.26E-05	6.73E-06	0.00E+00	2.98E-05	4.56E-06	1.49E-05	4.11E-05	0.00E+00	0.00E+00	6.22E-06	9.66E-05
Ag-110m	0.00E+00	0.00E+00	0.00E+00	5.44E-05	5.40E-05	2.11E-06	1.11E-04	3.15E-06	0.00E+00	0.00E+00	2.20E-05	2.25E-06	0.00E+00	1.38E-04
Sn-113	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn-117m	0.00E+00	0.00E+00	1.27E-04	0.00E+00	3.18E-05	3.24E-05	1.91E-04	7.55E-06	3.79E-06	2.07E-06	1.66E-03	2.07E-03	7.33E-04	4.67E-03
Sb-122	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-05	5.84E-06	2.61E-05	0.00E+00	0.00E+00	0.00E+00	4.52E-05	1.11E-04	1.99E-04	3.80E-04
Sb-125	3.80E-05	0.00E+00	0.00E+00	0.00E+00	6.79E-05	1.94E-05	1.25E-04	0.00E+00	0.00E+00	6.13E-05	3.09E-05	1.03E-06	5.68E-05	2.75E-04
I-131	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Te-132	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.59E-07	6.11E-06	1.79E-06	0.00E+00	8.87E-06
Ba-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
La-140	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ce-141	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The dissolved noble gases detected in liquid effluents (e.g., Xe-133, Xe-135, etc.) are added to the atmospheric release summaries. "-" = no analysis

Table 2-4
Subsoil System Drains - Tritium Summary
January 1, 2015, through December 31, 2015

	S-1	S-3	S-7	S-8	S-9	S-10	S-11
1st Qtr							
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2nd Qtr							
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	1.41E+06	2.49E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E+04
3rd Qtr							
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	1.34E+05	4.46E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4th Qtr							
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Flow (gal)	4.40E+05	1.32E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2.6 Land Application of Sewage Sludge and Wastewater

In 1988, pursuant to 10 CFR 20.302(a), Point Beach received NRC approval for the disposal of sewage sludge, which may contain trace amounts of radionuclides, by land application on acreage within the site. Land application of sewage sludge is regulated by the Wisconsin Department of Natural Resources. Point Beach has not land applied sewage sludge for over a decade. Therefore, Point Beach has not renewed its WI DNR permit to dispose of sewage sludge in this manner.

There were no sludge disposals by land application during 2015. All disposals were done at the Manitowoc Sewage Treatment Plant.

2.7 Carbon-14

Carbon-14 (C-14) is a naturally occurring radionuclide. Nuclear weapons testing of the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Small amounts of C-14 also are produced by nuclear reactors, but the amounts produced are less than C-14 produced by weapons testing or that occur naturally. Based on information from the NRC obtained at industry sponsored workshops, NextEra Point Beach began evaluating C-14 liquid discharges in 2009, prior to the issuance of Regulatory Guide 1.21 [RG 1.21], Rev 2 in June of 2009. Point Beach continues to analyze batch liquid waste discharges for C-14 and reporting the results in the Annual Monitoring Report.

The NRC requested that all nuclear plants report C-14 emissions beginning with the 2010 monitoring reports. Pursuant to NRC guidance in RG 1.21(Rev 2), evaluation of C-14 in liquid wastes is not required because the quantity released via this pathway is much less than that contributed by gaseous emissions.

However, as stated above, Point Beach began C-14 analyses and reporting prior to the issuance of RG 1.21 (Rev 2). RG 1.21 states that a radionuclide is a principal effluent component if it contributes greater than 1% of the Appendix I design objective dose compared to the other radionuclides in the effluent type, or, if it is greater than 1% of the activity of all radionuclides in the effluent type. In this case, C-14 is compared to other (non-tritium or noble gases) radionuclides discharged in liquids.

For 2015, the monthly and total C-14 (1.97E-02 Ci) in liquid discharges are documented in Table 2-3. The amount of C-14 released makes up about 38% of the non-tritium radionuclides released in liquids.

The liquid C-14 dose contribution is included in the doses calculated for the hypothetically, maximally exposed individual (Table 2-1). Under the parameters and pathways used for the dose calculations, there is no C-14 dose contribution to the infant age group. For the remaining age groups, the C-14 contributes roughly 85% of the bone dose and 1.5 – 2.7% of the dose to the whole body and to other organs specified in RG 1.109.

3.0 RADIOACTIVE AIRBORNE RELEASES

The release paths to the environment contributing to radioactive airborne release totals during this reporting period were the auxiliary building vent stack, the drumming area vent stack, the letdown gas stripper, the Unit 1 containment purge stack, and the Unit 2 containment purge stack. A gaseous radioactive effluent treatment system in conjunction with administrative controls is used to minimize the impact on the environment from the airborne releases and maintain doses to the public ALARA.

3.1 Doses from Airborne Effluent

Doses from airborne effluent are calculated for the maximum exposed individual (MEI) following the methodology contained in the PBNP ODCM. These calculated doses use parameters such as the amount of radioactive material released, the concentration at and beyond the site boundary, the average site weather conditions, and usage factors (e.g., breathing rates, food consumption). In addition to the MEI doses, the energy deposited in the air by noble gas beta particles and gamma rays is calculated and compared to the corresponding Appendix I design objectives. A comparison of the annual Appendix I design objectives for atmospheric effluents to the highest organ dose and the noble gas doses calculated using ODCM methodology is listed in Table 3-1. C-14 is not included in the Appendix I calculations because it is not an Appendix I radionuclide. The C-14 dose calculation has been required since 2010 (see Sections 3.4 through 3.6, below, for a more detailed description) and is treated separately. The comparison between airborne effluent doses with and without C-14 is shown in Table 3-4. The highest Appendix I dose is the child age group for the liver, thyroid, kidney, lung, and GI-LLI at 3.15E-02 mrem. Had C-14 been included, the child-bone dose would have been the highest at 2.42E-01 mrem. The doses demonstrate that releases from PBNP to the atmosphere continue to be ALARA.

3.2 Radioactive Airborne Release Summary

Radioactivity released in airborne effluents for 2015 is summarized in Table 3-2. The particulate total is slightly lower in 2015 than in 2014 (6.34E-05 Ci vs. 6.60E-05 Ci). H-3 increased slightly from 75.5 Ci to 80.1 Ci. Noble gases decreased from 1.44E+00 to 8.26E-01Ci.

3.3 Isotopic Airborne Releases

The monthly isotopic airborne releases for 2015, from which the airborne doses were calculated, are presented in Table 3-3. Carbon-14 is not included in Table 3-3 because it was calculated and not measured. C-14 is discussed in the following sections.

As in 2014, in 2015 the outage impact of the isotopic mixture is demonstrated in the comparison of the October particulate releases. During October nine different particulates were identified in the airborne effluent whereas in the non-outage months, at most three were found. Most are released via the open hatch on the 66-foot elevation of containment. The convective flow through the open hatch during purge is unfiltered. Although the flow is into the façade, there are two circumferential gaps around the façade. It is assumed that the release into façade is transferred to the outside and therefore is treated as a release to the environment.

3.4 Carbon-14

C-14 is a naturally occurring radionuclide. Nuclear weapons testing of the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Small amounts of C-14 also are produced by nuclear reactors as neutrons interact with the dissolved oxygen and nitrogen in the primary coolant. However, these amounts produced by nuclear reactors are much less that those produced by weapons testing or that occur naturally.

The NRC has requested that nuclear plants report C-14 emissions. C-14 is a hard-to-detect radionuclide. It is not a gamma emitter and must be chemically separated from the effluent stream before it can be measured. Because nuclear plants currently are not equipped to perform this type of sampling, RG 1.21 allows for calculating C-14 discharges based on fission rates.

The Electric Power Research Institute (EPRI) developed the methodology for calculating C-14 generation and releases for the nuclear industry. The results were published as Technical Report 1021106 (December 2010), "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents." In addition to neutron flux, the percent oxygen and nitrogen in the VCTs is used in the C-14 calculation as both gases contribute to the generation of C-14. Pursuant to NRC guidance (Regulatory Guide 1.21, Rev 2, p. 16, June 2009), most of the C-14 emissions from nuclear plant occur in the gaseous phase.

The Point Beach C-14 generation for 2015 was calculated using the EPRI guidance and the current core parameters resulting from the power uprate. The calculated amounts were 5.89 Ci for Unit 1 and 5.85 Ci for Unit 2 yielding a total of 11.75 Ci which is 0.11 Ci lower than 2014. It is noted that the nitrogen in the VCTs also was lower 2015 than in 2014. The 2015 calculated total 11.75 Ci is roughly 600 times higher than the 1.97E-02 Ci of C-14 determined by analyses of composites from liquid waste batch discharges, steam generator blowdown, and other waste streams.

3.5 C-14 Airborne Effluent Dose Calculation

The dose from the airborne C-14 is dependent on its chemical form. The C-14 released to the atmosphere consists of both organic and inorganic species. Both the inorganic and organic C-14 contributes to the inhalation dose. Only the inorganic $^{14}CO_2$ species contributes to the dose from the ingestion of photosynthetically incorporated C-14. The organic forms such as methane, CH_4, are not photosynthetically active. For PWRs such as PBNP most of the gaseous C-14 occurs as methane, $^{14}CH_4$, not as carbon dioxide, $^{14}CO_2$.

The amount of $^{14}CO_2$ present in the PBNP airborne effluent has not been measured. However, such measurements have been made at a comparable PWR sites similar to the PBNP design. The Ginna nuclear generating station is of similar design to PBNP. It is a Westinghouse 2-loop PWR of the same vintage as PBNP and approximately the same power (prior to the PBNP power uprate).

Measurements at Ginna for 18 months in 1980 - 1981 (Kunz, "Measurement of ^{14}C Production and Discharge From the Ginna Nuclear Power Reactor," 1982) found that ten percent of the C-14 was discharged as $^{14}CO_2$. Therefore, 10% of the 11.75 Ci of the calculated C-14 for PBNP will be used in the ingestion dose calculations.

C-14 dose calculations were made using the dose factors and the methodology of Regulatory Guide 1.109. The inhalation dose was calculated using all of the C-14 calculated to be released. All the C-14 is used because whether the C-14 is in the form of $^{14}CO_2$ or one of the organic forms, such as CH_4, both would be inhaled and contribute to a lung dose.

For the other existing pathways, milk, meat, and produce, the dose depends upon the amount incorporated into biomass consumed by cattle and people: forage for cattle and produce for humans. Incorporation only occurs via photosynthesis. Photosynthesis only incorporates $^{14}CO_2$ and hence the use only of the 10% fraction of the total C-14 release for these pathways.

The airborne effluent C-14 dose calculations were made as described above. They were made for the MEI as explained in Section 2.1. This approach utilizes all the pathways that are applicable to a hypothetical person residing at the site boundary. Because C-14 is present as a gas, the pathways are milk, meat, and produce (vegetables, fruit, and grain) and the Regulatory Guide 1.109, Table E-5 usage factors applied to the calculation. As such, the resulting dose will be conservative in that the produce usage factor includes grain and fruit and these pathways do not exist in the vicinity of the point for which the C-14 doses are calculated. Furthermore, because leafy vegetables are included in the produce pathway, they are not used as a separate pathway because that would result in double accounting for leafy vegetable dose contribution.

Carbon-14 is not an Appendix I radionuclide. Therefore, airborne C-14 is not summed with the other airborne radioactive effluents for comparison of airborne effluent dose to the Appendix I dose objectives. However, the C-14 doses are presented and compared to the other radionuclide doses in Table 3-4.

3.6 C-14 Measurements

No C-14 measurements were made of PBNP airborne effluents. In 2010, C-14 was measured in crops grown on fields in the owner controlled area located in the highest χ/Q sector at the site's south boundary. One field is leased for feed corn by a dairy south of the plant. That dairy is part of the REMP. In an adjacent field soybeans are grown by another farmer. These two crops were sampled in this sector and as well as in a background location about 17 miles SW of the plant. Based on the measurement error, there was no statistical difference between the results obtained on site in the highest χ/Q sector as compared to the background site some 17 miles away (2013 AMR, Table 10-3). These results demonstrated that the dose from C-14 in Point Beach airborne effluents should not measurably increase the C-14 dose compared to that received from naturally occurring C-14 in plants (1 mrem: NCRP Report 93, Ionizing Radiation Exposure of the Population of the United States, 1987, p.12). .

Table 3-1
Comparison of 2015 Airborne Effluent Calculated Doses to 10 CFR 50 Appendix I Design Objectives

Category	Annual Appendix I Design Objective	January-December Calculated Dose	Percent of Appendix I Design Objective
Particulate	30 mrem/organ	0.0315 mrem	0.105
Noble gas	40 mrad (beta air)	0.0000996 mrad	0.000249
Noble gas	20 mrad (gamma air)	0.000247 mrad	0.00124
Noble gas	30 mrem (skin)	0.000349 mrem	0.00116
Noble gas	10 mrem (whole body)	0.000234 mrem	0.00234

Table 3-2
Radioactive Airborne Effluent Release Summary
January 1, 2015, through December 31, 2015

							Total							
	Jan	Feb	Mar	Apr	May	Jun	Jan-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total NG from Liq (Ci)	0.00E+00	0.00E+00	7.65E-04	0.00E+00	4.01E-05	9.48E-04	1.75E-03	6.64E-04	1.54E-03	1.02E-02	3.81E-03	2.79E-03	1.25E-02	3.33E-02
Total Noble Gas (Ci)[1]	7.82E-02	1.15E-01	7.39E-02	5.76E-02	5.44E-02	6.34E-02	4.43E-01	6.32E-02	7.55E-02	7.59E-02	4.55E-02	4.58E-02	7.69E-02	8.26E-01
Total Radioiodines (Ci)[2]	0.00E+00	0.00E+00	2.61E-09	0.00E+00	0.00E+00	0.00E+00	2.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-09
Total Particulate (Ci)[3]	7.10E-06	5.06E-07	2.92E-05	0.00E+00	0.00E+00	0.00E+00	3.68E-05	0.00E+00	0.00E+00	3.27E-06	2.46E-05	3.87E-06	3.79E-07	6.89E-05
Alpha (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Strontium(Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
All other beta + gamma (Ci)	7.10E-06	5.06E-07	2.92E-05	0.00E+00	0.00E+00	0.00E+00	3.68E-05	0.00E+00	0.00E+00	3.27E-06	2.46E-05	3.87E-06	3.79E-07	6.89E-05
Total Tritium (Ci)	6.52E+00	6.92E+00	9.10E+00	6.96E+00	5.22E+00	6.37E+00	4.11E+01	4.77E+00	3.81E+00	3.64E+00	1.43E+01	5.58E+00	6.90E+00	8.01E+01
Max NG H'rly Rel.(Ci/sec)	1.85E-07	7.48E-08	7.07E-08	6.90E-08	7.63E-08	7.44E-08		7.57E-08	6.89E-08	7.71E-08	5.62E-08	4.82E-08	6.10E-08	

[1] Total noble gas (airborne + liquid releases) does not include F-18 which is not a noble gas. F-18 monthly and annual totals are presented in Table 3-3..
[2] Airborne radioiodines only include I-131 and I-133. Although for dose calculations iodines are grouped with particulates, for this reporting table they are separated from the particulate group.
[3] Total Particulate is the sum of alpha, strontium, and others. It does not include radioiodines or C-14. C-14 was calculated for the year and no monthly values are available.
.

TABLE 3-3
Isotopic Composition of Airborne Releases
January 1, 2015 through December 31, 2015

	Jan	Feb	Mar	Apr	May	Jun	Semi-	Jul	Aug	Sep	Oct	Nov	Dec	Total
Nuclide	(Ci)	(Ci)	(Ci)	(Ci)	(Ci)	(Ci)	**Annual**	(Ci)	(Ci)	(Ci)	(Ci)	(Ci)	(Ci)	(Ci)
H-3	6.52E+00	6.92E+00	9.10E+00	6.96E+00	5.22E+00	6.37E+00	4.11E+01	4.77E+00	3.81E+00	3.64E+00	1.43E+01	5.58E+00	6.90E+00	8.01E+01
Ar-41	4.71E-02	4.34E-02	5.03E-02	4.65E-02	4.11E-02	4.81E-02	2.76E-01	4.77E-02	5.82E-02	5.52E-02	2.27E-02	3.75E-02	5.06E-02	5.48E-01
Kr-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-85m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-131m	0.00E+00	4.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.49E-05	4.48E-04
Xe-133	3.10E-02	6.96E-02	2.35E-02	1.09E-02	1.32E-02	1.51E-02	1.63E-01	1.55E-02	1.70E-02	2.03E-02	2.25E-02	8.24E-03	2.60E-02	2.73E-01
Xe-133m	2.35E-05	9.46E-04	5.14E-05	0.00E+00	0.00E+00	0.00E+00	1.02E-03	0.00E+00	1.77E-05	9.67E-05	2.60E-04	0.00E+00	1.23E-04	1.52E-03
Xe-135	1.10E-04	1.13E-03	0.00E+00	2.21E-04	1.75E-04	1.71E-04	1.80E-03	0.00E+00	2.46E-04	3.21E-04	7.89E-05	2.95E-05	1.85E-04	2.66E-03
Xe-135m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-18	6.96E-06	0.00E+00	2.68E-05	0.00E+00	0.00E+00	0.00E+00	3.38E-05	0.00E+00	0.00E+00	3.27E-06	1.25E-06	3.86E-06	3.65E-07	4.25E-05
Cr-51	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.06E-06	0.00E+00	0.00E+00	1.06E-06
Mn-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	1.41E-07	5.04E-07	2.42E-06	0.00E+00	0.00E+00	0.00E+00	3.07E-06	0.00E+00	0.00E+00	0.00E+00	7.61E-07	3.53E-10	0.00E+00	3.83E-06
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-06	0.00E+00	0.00E+00	1.03E-06
Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.36E-07	0.00E+00	0.00E+00	3.36E-07
Zr-95	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.60E-07	0.00E+00	0.00E+00	1.60E-07
I-131	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	0.00E+00	0.00E+00	2.61E-09	0.00E+00	0.00E+00	0.00E+00	2.61E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.61E-09
Sb-124	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sb-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-55	0.00E+00	1.49E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-09	0.00E+00	0.00E+00	0.00E+00	1.49E-05	8.12E-09	1.01E-08	1.49E-05
Ni-63	0.00E+00	4.97E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.97E-10	0.00E+00	0.00E+00	0.00E+00	5.03E-06	2.74E-09	3.41E-09	5.04E-06
Tc-99	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-89	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn-113	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sn-117m	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The Noble Gases listed above include the liquid contribution

Table 3-4
Comparison of Airborne Effluent Doses (Appendix I and C-14)

2015 Appendix I (Airborne Particulate + Tritium) Dose (mrem)

	Bone	Liver	T-WB	Thyroid	Kidney	Lung	GI-LLI	Skin
Adult	1.93E-04	1.88E-02	1.88E-02	1.87E-02	1.87E-02	1.87E-02	1.88E-02	4.09E-05
Teen	2.58E-04	2.16E-02	2.16E-02	2.15E-02	2.16E-02	2.15E-02	2.16E-02	4.09E-05
Child	4.11E-04	3.15E-02	3.15E-02	3.15E-02	3.15E-02	3.15E-02	3.15E-02	4.09E-05
Infant	1.11E-04	1.39E-02	1.39E-02	1.39E-02	1.39E-02	1.39E-02	1.39E-02	4.09E-05

2015 Carbon-14 Dose (mrem)

	Bone	Liver	T. Body	Thyroid	Kidney	Lungs	GI-LLI	Skin
Adult	6.66E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	1.32E-02	0.00E+00
Teen	1.04E-01	2.08E-02	2.08E-02	2.08E-02	2.08E-02	2.08E-02	2.08E-02	0.00E+00
Child	2.41E-01	4.81E-02	4.81E-02	4.81E-02	4.81E-02	4.81E-02	4.81E-02	0.00E+00
Infant	1.23E-01	2.61E-02	2.61E-02	2.61E-02	2.61E-02	2.61E-02	2.61E-02	0.00E+00

2015 Total Airborne Non-Noble Gas Dose (Particulate + H-3 + C-14 (mrem)

	Bone	Liver	T-WB	Thyroid	Kidney	Lung	GI-LLI	Skin
Adult	6.68E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02	3.20E-02	4.09E-05
Teen	1.05E-01	4.24E-02	4.24E-02	4.23E-02	4.23E-02	4.23E-02	4.23E-02	4.09E-05
Child	2.42E-01	7.96E-02	7.97E-02	7.96E-02	7.96E-02	7.96E-02	7.96E-02	4.09E-05
Infant	1.23E-01	4.00E-02	4.00E-02	3.99E-02	4.00E-02	3.99E-02	4.00E-02	4.09E-05
Ann.Limit	3.00E+01	3.00E+01		3.00E+01	3.00E+01	3.00E+01	3.00E+01	3.00E+01
% Limit	8.06E-01	2.65E-01		2.65E-01	2.65E-01	2.65E-01	2.65E-01	1.36E-04

The percent of limit is calculated using the highest total dose, the Child Age Group.

4.0 RADIOACTIVE SOLID WASTE SHIPMENTS

4.1 Types, Volumes, and Activity of Shipped Solid Waste

The following types, volumes, and activity of solid waste were shipped from PBNP for offsite disposal or burial during 2015. No Types C or D waste were shipped. No irradiated fuel was shipped offsite. The volume, activity and type of waste are listed in Table 4-1.

Table 4-1
Quantities and Types of Waste Shipped from PBNP in 2015

A. Spent resins, filter sludge, evaporator bottoms, etc.	2.4 m^3	65.100 Ci
	84.0 ft^3	
B. Dry compressible waste, contaminated equipment, etc	205.8 m^3	0.212 Ci
	7266.0 ft^3	
C. Irradiated components, control rods, etc.	0.00 m^3	N/A Ci
	ft^3	
D. Other	0.0 m^3	N/A Ci
Steam generators: Unit 1 removed 1984; Unit 2 removed 1996	0 ft^3	

4.2 Solid Waste Disposition

There were four solid waste shipments from PBNP during 2015. The dates and destinations are shown in Table 4-2.

Table 4-2

2015 PBNP Radioactive Waste Shipments	
Date	**Destination**
01/14/15	Oak Ridge, TN
06/09/15	Andrews, TX
06/17/15	Clive, Utah
10/21/15	Oak Ridge, TN

4.3 Major Nuclide Composition (by Type of Waste)

The major radionuclide content of the 2015 solid waste was determined by gamma isotopic analysis and the application of scaling factors for certain indicator radionuclides based on the measured isotopic content of representative waste stream samples. The estimated isotopic content is presented in Table 4-3. Only those radionuclides with detectable activity are listed.

Table 4-3
2015 Estimated Solid Waste Major Radionuclide Composition

TYPE A			TYPE B		
	Percent	Activity		Percent	Activity
Nuclide	Abundance	(mCi)	Nuclide	Abundance	(mCi)
TOTAL	100	6.51E+04	TOTAL	100	2.11E+02
Ni-63	3.442E+01	2.24E+04	Co-60	3.861E+01	8.16E+01
Co-58	2.320E+01	1.15E+04	Fe-55	3.216E+01	6.79E+01
Co-60	1.598E+01	1.04E+04	Co-58	6.508E+00	1.37E+01
Be-7	8.467E+00	5.51E+04	Cr-51	4.743E+00	1.00E+01
Fe-55	6.807E+00	4.43E+03	Ni-63	3.626E+00	7.66E+00
Sb-125	3.688E+00	2.40E+03	Sb-125	2.619E+00	5.53E+00
Mn-54	2.797E+00	1.82E+03	Nb-95	2.073E+00	4.38E+00
Cs-137	2.136E+00	1.39E+03	Ru-106	1.247E+00	2.64E+00
Ni-59	4.287E-01	2.79E+02	Zr-95	1.132E+00	2.39E+00
Sb-124	3.596E-01	2.34E+02	Tc-99	1.131E+00	2.39E+00
Co-57	3.550E-01	2.31E+02	Sn-113	1.011E+00	2.14E+00
Ag-110m	3.304E-01	2.15E+02	Mn-54	1.006E+00	2.12E+00
Nb-95	2.366E-01	1.54E+02	Sb-124	7.820E-01	1.65E+00
C-14	2.136E-01	1.39E+02	Ni-59	7.370E-01	1.56E+00
Sn-113	2.013E-01	1.31E+02	Zn-65	4.180E-01	8.83E+02
H-3	1.613E-01	1.05E+02	Fe-59	3.450E-01	7.28E-01
Ce-144	8.744E-02	5.69E+01	H-3	3.280E-01	6.93E-01
Zr-95	7.115E-02	4.63E+01	Sn-117m	3.180E-01	6.71E-01
Sr-90	3.089E-02	2.01E+01	Pu-241	2.580E-01	5.45E-01
Sr-89	1.480E-02	9.63E+00	Ag-110m	2.140E-01	4.52E-01
Tc-99	4.180E-03	2.72E+00	Co-57	1.640E-01	3.46E-01
Pu-241	2.259E-03	1.05E+03	Ce-144	1.450E-01	3.06E-01
Am-241	1.388E-03	9.03E-01	Cs-137	1.150E-01	2.42E-01
Pu-238	5.025E-04	3.27E-01	Nb-94	8.600E-02	1.83E-01
Cm-243	3.580E-04	2.33E-01	Pu-238	8.500E-02	1.79E-01
Pu-239	3.150E-04	2.05E-01	Pu-239	6.300E-02	1.34E-01
Cm-242	7.207E-05	4.69E-02	Sr-90	4.100E-02	8.64E-02
			Sr-89	1.300E-02	2.65E-02
			Am-241	1.000E-02	2.21E-02
			C-14	6.000E-03	1.17E-02
			Cm-243	3.000E-03	7.20E-03
			Pu-242	1.000E-03	2.13E-03
			Cm-242	4.000E-04	8.98E-04

5.0 NONRADIOACTIVE CHEMICAL RELEASES

5.1 Scheduled Chemical Waste Releases

Scheduled chemical waste releases to the circulating water system from January 1, 2015, to June 30, 2015, included 1.70E+04 gallons of neutralized wastewater. The wastewater contained 5.24E-01 lbs. of suspended solids and 1.05E+02 lbs. of dissolved solids.

Scheduled chemical waste releases to the circulating water system from July 1, 2015, to December 31, 2015, included 1.08E+05 gallons of neutralized wastewater. The wastewater contained 1.57E+00 lbs. of suspended solids and 6.71E+02 lbs. of dissolved solids.

Scheduled chemical waste releases are based on the average analytical results obtained from sampling a representative number of neutralizing tanks.

5.2 Miscellaneous Chemical Waste Releases

Miscellaneous chemical waste releases from the wastewater effluent (based on effluent analyses) to the circulating water for January 1, 2015, to June 30, 2015, included 2.09E+07 gallons of clarified effluent. The wastewater contained 2.26E+03 lbs. of suspended solids.

Miscellaneous chemical waste releases from the wastewater effluent (based on effluent analyses) to the circulating water for July 1, 2015, to December 31, 2015, included 1.75E+07 gallons of clarified effluent. The wastewater contained 3.26E+03 lbs. of suspended solids.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from January 1, 2015, to June 30, 2015, included 4.27E+05 lbs. of sodium bisulfite solution (1.62E+05 lbs. sodium bisulfite), 4.48E+05 lbs. of Sodium Hypochlorite Solution (5.60E+04 lbs. sodium hypochlorite), and 4.15E+03 lbs. Acti-Brom 1338 (1.87E+03 lbs. sodium bromide).

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from July 1, 2015, to December 31, 2015, included 8.29E+05 lbs. of sodium bisulfite solution (3.15E+05 lbs. sodium bisulfite), 8.13E+05 lbs. Sodium Hypochlorite Solution (1.02E+05 lbs. sodium hypochlorite), 8.25E+03 lbs. Acti-Brom 1338 (3.71E+03 lbs. sodium bromide).

6.0 CIRCULATING WATER SYSTEM OPERATION

The circulating water system operation during this reporting period for periods of plant operation is described in Table 6-1.

Table 6-1
Circulating Water System Operation for 2015

	UNIT	JAN	FEB	MAR	APR	MAY	JUN
Average Volume Cooling Water Discharge [million gal/day]*	1	358.2	358.2	358.2	527.3	542.5	542.5
	2	358.2	358.2	358.2	532.8	548.3	548.3
Average Cooling Water Intake Temperature [°F]	1	37.3	42.2	40.2	44.5	47.5	53.8
	2	37.9	43.0	40.8	44.6	48.0	54.2
Average Cooling Water Discharge Temperature [°F]	1	69.6	69.6	72.2	64.6	66.1	72.6
	2	69.0	69.3	70.8	62.8	65.1	71.2
Average Ambient Lake Temperature [°F]		34.2	33.7	37.4	41.0	43.9	49.7

Table 6-1(continued)
Circulating Water System Operation for 2015

	UNIT	JUL	AUG	SEP	OCT	NOV	DEC
Average Volume Cooling* Water Discharge [million gal/day]**	1	542.5	542.5	542.5	563.1	504.8	520.0
	2	548.3	548.3	548.3	104.4	547.2	540.2
Average Cooling Water Intake Temperature [°F]	1	54.2	56.5	55.7	55.3	44.5	41.0
	2	54.9	57.1	56.1	53.3	44.9	41.3
Average Cooling Water Discharge Temperature [°F]	1	72.8	75.6	74.9	75.2	63.7	59.9
	2	71.7	73.7	72.2	56.3	61.4	58.8
Average Ambient Lake Temperature [°F]		49.2	51.7	52.0	53.0	41.7	38.5

* For days with cooling water discharge flow.
**U1 outage circ water shut down 10/3/15 – 10/30/15

Part B
Miscellaneous Reporting Requirements

7.0 ADDITIONAL REPORTING REQUIREMENTS

7.1 Revisions to the PBNP Effluent and Environmental Programs

Neither the ODCM, the RECM, nor the Environmental Manual (EM) were revised in 2015.

7.2 Interlaboratory Comparison Program

ATI Environmental, Inc, Midwest Laboratory, the analytical laboratory contracted to perform the radioanalyses of the PBNP environmental samples, participated in the Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP) as well as in the interlaboratory comparison studies administered by Environmental Resources Associates (ERA) during 2015. The ERA environmental crosscheck program replaces the Environmental Measurements Laboratory (EML) Quality Assessment Program which was discontinued. The results of these comparisons can be found in Appendix A of the attached final report for 2015, January – December 2015 from ATI Environmental Inc.

7.3 Special Circumstances

No special circumstances report regarding operation of the explosive gas monitor for the waste gas holdup system was needed during 2015.

Part C
RADIOLOGICAL ENVIRONMENTAL MONITORING

8.0 INTRODUCTION

The objective of the PBNP Radiological Environmental Monitoring Program (REMP) is to determine whether the operation of PBNP or the ISFSI has radiologically impacted the environment. To accomplish this, the REMP collects and analyzes air, water, milk, soil, vegetation (grasses, weeds, and crops), and fish samples for radionuclides and uses thermoluminescent dosimeters (TLDs) to determine the ambient radiation background. The analyses of the various environmental media provide data on measurable levels of radiation and radioactive materials in the principal pathways of environmental exposure. These measurements also serve as a check of the efficacy of PBNP effluent controls.

The REMP fulfills the requirements of 10 CFR 20.1302, PBNP General Design Criterion (GDC) 17, GDC 64 of Appendix A to 10 CFR 50, and Sections IV.B.2 and IV.B.3 of Appendix I to 10 CFR 50 for the operation of the plant. A subset of the PBNP REMP samples, consisting of air, soil and vegetation also fulfills 10 CFR 72.44(d)(2) for operation of the ISFSI. Additionally, TLDs provide the means to measure changes in the ambient environmental radiation levels at sites near the ISFSI and at the PBNP site boundary to ensure that radiation levels from the ISFSI are maintained within the dose limits of 10 CFR 72.104. Because the ISFSI is within the PBNP site boundary, radiation doses from PBNP and the ISFSI, combined, must be used to assess compliance with 10 CFR 72.122 and 40 CFR 190. Therefore, radiological environmental monitoring for the ISFSI is provided by selected sampling sites, which are part of the PBNP REMP.

For the aquatic environment, the samples include water as well as the biological integrators, such as fish and filamentous algae. Because of their migratory behavior, fish are wide area integrators. In contrast, the filamentous algae periphyton is attached to shoreline rocks and concentrate nuclides from the water flowing by their point of attachment. Grab samples of lake water provide a snapshot of radionuclide concentrations at the time the sample is taken; whereas analysis of fish and filamentous algae yield concentrations integrated over time.

The air-grass-cow-milk exposure pathway unites the terrestrial and atmospheric environments. This pathway is important because of the many dairy farms around PBNP. Therefore, the REMP includes samples of air, general grasses, and milk from the PBNP environs. An annual land use survey is made to determine whether the assumptions on the location of dairy cattle remain conservative with respect to dose calculations for PBNP effluents. The dose calculations assume that the dairy cattle are located at the south site boundary, the highest depositional sector. In addition, soil samples are collected and analyzed in order to monitor the potential for long-term buildup of radionuclides in the vicinity of PBNP.

For the measurement of ambient environmental radiation levels that may be affected by direct radiation from PBNP or by noble gas effluents, the REMP employs a series of TLDs situated around PBNP and the ISFSI.

9.0 PROGRAM DESCRIPTION

9.1 Results Reporting Convention

The vendor used by PBNP to analyze the environmental samples is directed to report analysis results as measured by a detector, which can meet the required lower limit of detection (LLD) as specified in Table 2-2 of the Environmental Manual for each sample. The report provided by the vendor (see Appendix 1) contains values, which can be either negative, positive or zero plus/minus the two sigma counting uncertainty, which provides the 95% confidence level for the measured value.

The LLD is an *a priori* concentration value that specifies the performance capability of the counting system used in the analyses of the REMP samples. The parameters for the *a priori* LLD are chosen such that only a five percent chance exists of falsely concluding a specific radionuclide is present when it is not present at the specified LLD. Based on detector efficiency and average background activity, the time needed to count the sample in order to achieve the desired LLD depends upon the sample size. Hence, the desired LLD may be achieved by adjusting various parameters. When a suite of radionuclides are required to be quantified in an environmental sample such as lake water, the count time used is that required to achieve the LLD for the radionuclide with the longest counting time. Therefore, in fulfilling the requirement for the most difficult to achieve radionuclide LLD, the probability of detecting the other radionuclides is increased because the counting time used is longer than that required to achieve the remaining radionuclide LLDs.

The REMP results in this report are reported as averages of the measurements made throughout the calendar year plus/minus the associated standard deviation. If all net sample concentrations are equal to or less than zero, the result is reported as “Not Detectable” (ND), indicating no detectable level of activity present in the sample. If any of the net sample concentrations indicate a positive result statistically greater than zero, all of the data reported are used to generate the reported statistics. Because of the statistical nature of radioactive decay, when the radionuclide of interest is not present in the sample, negative and positive results centered about zero will be seen. Excluding validly measured concentrations, whether negative or as small positive values below the LLD, artificially inflates the calculated average value. Therefore, all generated data are used to calculate the statistical values (i.e., average, standard deviation) presented in this report. The calculated average may be a negative number.

As mentioned above, radioactive decay is a statistical process which has an inherent uncertainty in the analytical result. No two measurements will yield exactly the same result. However, the results are considered equal if the results fall within a certain range based upon the statistical parameters involved in the process. The REMP analytical results are reported at the 95% confidence limit in which the true result may be two standard deviations above or below the reported result. This means that there is only a 5% chance of concluding that the identified radioactive atom is not there when it really is present in the sample. A false positive is an analytical result which statistically shows that the radionuclide is present in the sample when it really is not there. Typically, if the 95%

confidence interval for a positive does not include zero, the radionuclide is considered to be present. For example, the result is reported as 100 ± 90. One hundred minus 90 yields a positive result and therefore may be considered to be present. However, this may be a false positive. If the radionuclide was not in the plant effluent, this result would fall into that category which 5% of the time it is falsely concluded that the radionuclide is present when in actuality it is not. This usually happens at low concentrations at or near the LLD where fluctuations in the background during the counting process skew the results to produce a positive result.

In interpreting the data, effects due to the plant must be distinguished from those due to other sources. A key interpretive aid in assessment of these effects is the design of the PBNP REMP, which is based upon the indicator-control concept. Most types of samples are collected at both indicator locations and at control locations. A plant effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuation in radiation levels arising from other sources.

9.2 Sampling Parameters

Samples are collected and analyzed at the frequency indicated in Table 9-1 from the locations described in Table 9-2 and shown in Figures 9-1, 9-2 and 9-3. (The latter two figures show sampling locations not shown in preceding figures due to space limitations. The location of the former retention pond, retired and remediated to NRC unrestricted access criteria, is indicated in Figure 9-3). The list of PBNP REMP sampling sites used to determine environmental impact around the ISFSI is found in Table 9-3. The minimum acceptable sample size is found in Table 9-4. In addition, Table 9-1 indicates the collection and analysis frequency of the ISFSI fence TLDs.

9.3 Deviations from Required Collection Frequency

Deviations from the collection frequency given in Table 9-1 are allowed because of hazardous conditions, automatic sampler malfunction, seasonal unavailability, and other legitimate reasons (Section 2.2.6 of the Environmental Manual). Table 9-5 lists the deviations from the scheduled sampling frequency that occurred during the reporting period.

9.4 Assistance to the State of Wisconsin

The Radiation Protection Unit of the Wisconsin Department of Health and Family Services maintains a radiological environmental monitoring program to confirm the results from the PBNP REMP. As a courtesy to the State of Wisconsin, PBNP personnel also collects certain environmental samples (Table 9-6) for the State from sites that are near PBNP sampling sites, or are co-located.

9.5 Program Modifications

In 2013, the placement of TLDs was reviewed with respect to the potential of trees and structures for interfering with the measurement of ambient radiation from natural background and of direct radiation from the plant and from airborne effluents. Two locations were found to have potential interferences. Two replacement TLD sites (E-16B and E-26B) were added in the 4th quarter of 2013. The new sites are in close proximity to E-16 and E-26 and were used concurrently with the old sites to provide data for comparisons between the old and new locations prior to deleting the old locations. These old sites were discontinued beginning in the second quarter of 2015. Based on the proximity of the new locations to the old locations, there was no need to revise the Environmental Manual maps.

Table 9-1
PBNP REMP Sample Analysis and Frequency

Sample Type	Sample Codes	Analyses	Frequency
Environmental Radiation Exposure	E-01, -02, -03, -04, -05 -06, -07, -08, -09, -12 -14, -15, -16, -16B, -17, -18, 20, -22, -23, -24, -25, -26, -26B, -27, -28 -29, -30, 31, -32, -38, -39,-41, -42,-43, -TC -	TLD	Quarterly
Vegetation	E-01, -02, -03, -04, -06, -08, -09, -20,	Gross Beta Gamma Isotopic Analysis	3x/yr as available
Algae	E-05, -12	Gross Beta Gamma Isotopic Analysis	3x/yr as available
Fish	E-13	Gross Beta Gamma Isotopic Analysis (Analysis of edible portions only)	3x/yr as available
Well Water	E-10	Gross Beta, H-3 Sr-89, 90, I-131 Gamma Isotopic Analysis	Quarterly
Lake Water	E-01, -05, -06, -33	Gross Beta, Sr-89/90, H-3 I-131 Gamma Isotopic Analysis	Monthly / Quarterly composite of monthly collections Monthly Monthly
Milk	E-11, -40, -21	Sr-89, 90 I-131 Gamma Isotopic Analysis	Monthly
Air Filters	E-01, -02, -03, -04, -08, -20	Gross Beta I-131 Gamma Isotopic Analysis	Weekly (particulate) Weekly (charcoal) Quarterly (on composite particulate filters)
Soil	E-01, -02, -03, -04, -06, -08, -09, -20,	Gross Beta Gamma Isotopic Analysis	2x/yr
Shoreline Sediment	E-01, -05, -06, -12, -33,	Gross Beta Gamma Isotopic Analysis	2x/yr
ISFSI Ambient Radiation Exposure	North, East, South, West Fence Sections	TLD	Quarterly

Table 9-2
PBNP REMP Sampling Locations

Location Code	Location Description
E-01	Primary Meteorological Tower South of the Plant
E-02	Site Boundary Control Center - East Side of Building
E-03	Tapawingo Road, about 0.4 Miles West of Lakeshore Road
E-04	North Boundary
E-05	Two Creeks Park
E-06	Point Beach State Park - Coast Guard Station; TLD located South of the Lighthouse on Telephone pole
E-07	WPSC Substation on County V, about 0.5 Miles West of Hwy 42
E-08	G.J. Francar Property at Southeast Corner of the Intersection of Cty. B and Zander Road
E-09	Nature Conservancy
E-10	PBNP Site Well
E-11	Dairy Farm about 3.75 Miles West of Site
E-12	Discharge Flume/Pier
E-13	Pumphouse
E-14	South Boundary, about 0.2 miles East of Site Boundary Control Center
E-15	Southwest Corner of Site
E-16, 16B	WSW, Hwy 42, a residence about 0.25 miles North of Nuclear Road
E-17	North of Mishicot, Cty. B and Assman Road, Northeast Corner of Intersection
E-18	Northwest of Two Creeks at Zander and Tannery Roads
E-20	Reference Location, 17 miles Southwest, at Silver Lake College
E-21	Local Dairy Farm just South of Site on Lakeshore and Irish Roads
E-22	West Side of Hwy 42, about 0.25 miles North of Johanek Road
E-23	Greenfield Lane, about 4.5 Miles South of Site, 0.5 Miles East of Hwy 42
E-24	North Side of County Rt. V, near intersection of Saxonburg Road
E-25	South Side of County Rt. BB, about 0.5 miles West of Norman Road
E-26, -26B	804 Tapawingo Road, about 0.4 miles East of Cty. B, North Side of Road
E-27	Intersection of Saxonburg and Nuclear Roads, Southwest Corner, about 4 Miles WSW
E-28	TLD site on western most pole between the 2^{nd} and 3^{rd} parking lots.
E-29	Area of North Meteorological Tower.
E-30	NE corner at Intersection of Tapawingo and Lakeshore Roads.
E-31	On utility pole North side of Tapawingo Road closest to the gate at the West property line.
E-32	On a tree located at the junction of property lines, as indicated by trees and shrubs, about 500 feet east of the west gate on Tapawingo Road and about 1200 feet south of Tapawingo Road. The location is almost under the power lines between the blue and gray transmission towers.
E-33	Lake Michigan shoreline accessed from the SE corner of KNPP parking lot. Sample South of creek.
E-38	Tree located at the West end of the area previously containing the Retention Pond.
E-39	Tree located at the East end of the area previously containing the Retention Pond.
E-40	Local Dairy Farm, W side of Hwy 42, about 1.8 miles north of the Nuclear Rd intersection
E-41	NW corner of Woodside and Nuclear Rds (Kewaunee County)
E-42	NW corner of Church and Division, East of Mishicot
E-43	West side of Tannery Rd south of Elmwood (7th pole south of Elmwood)
E-TC	Transportation Control; Reserved for TLDs

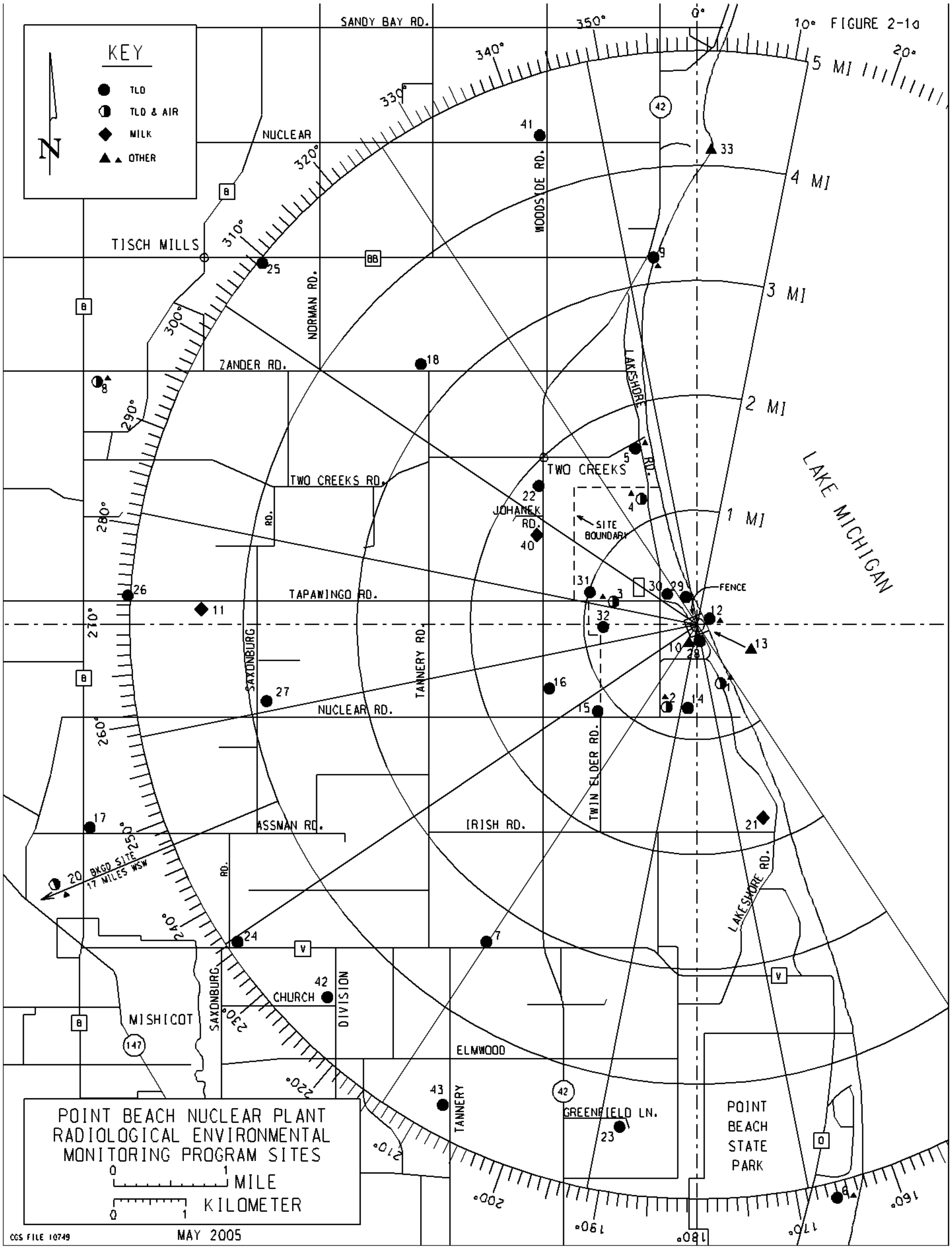


Figure 9-1
PBNP REMP Sampling Sites

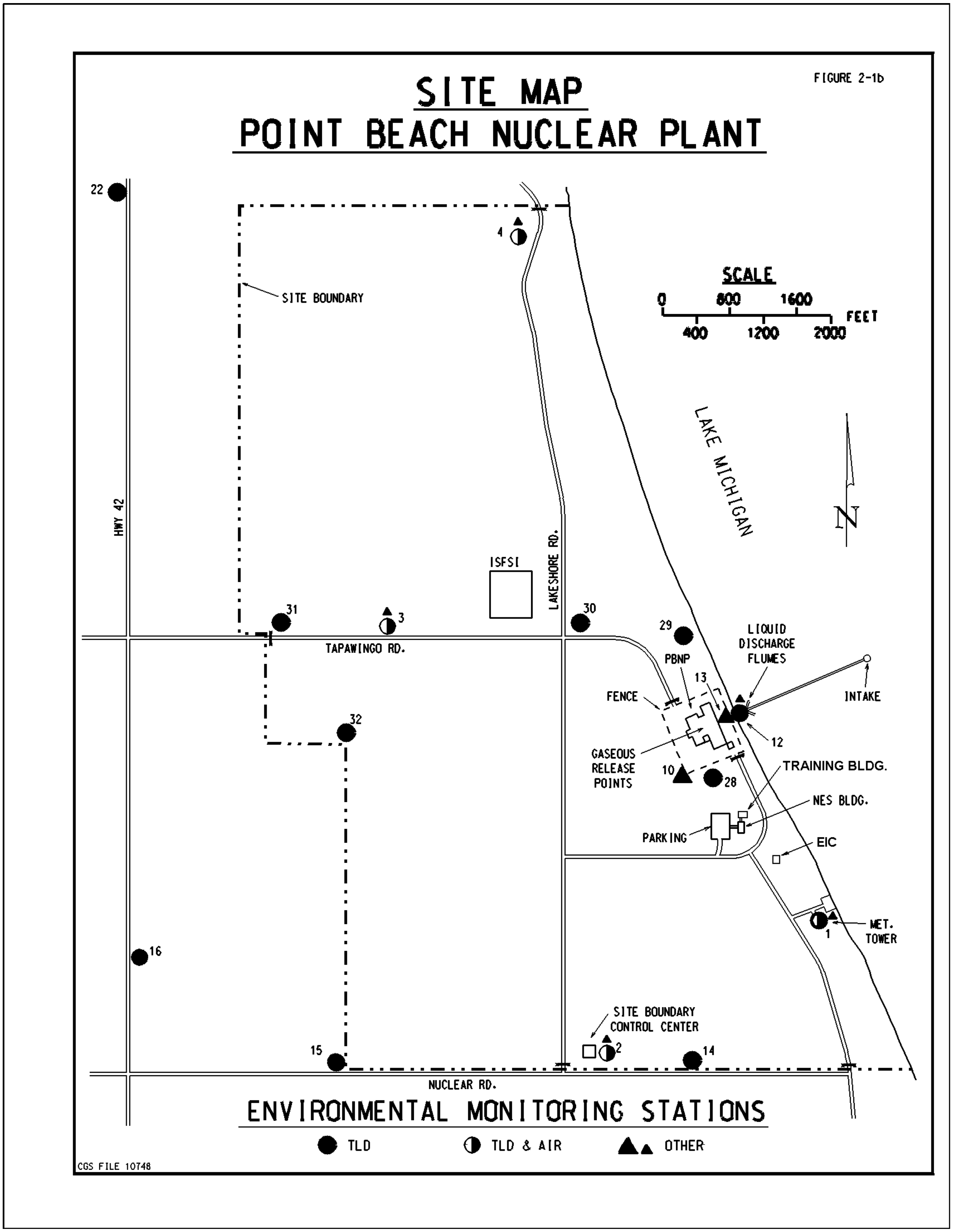


Figure 9-2
Map of REMP Sampling Sites Located Around PBNP

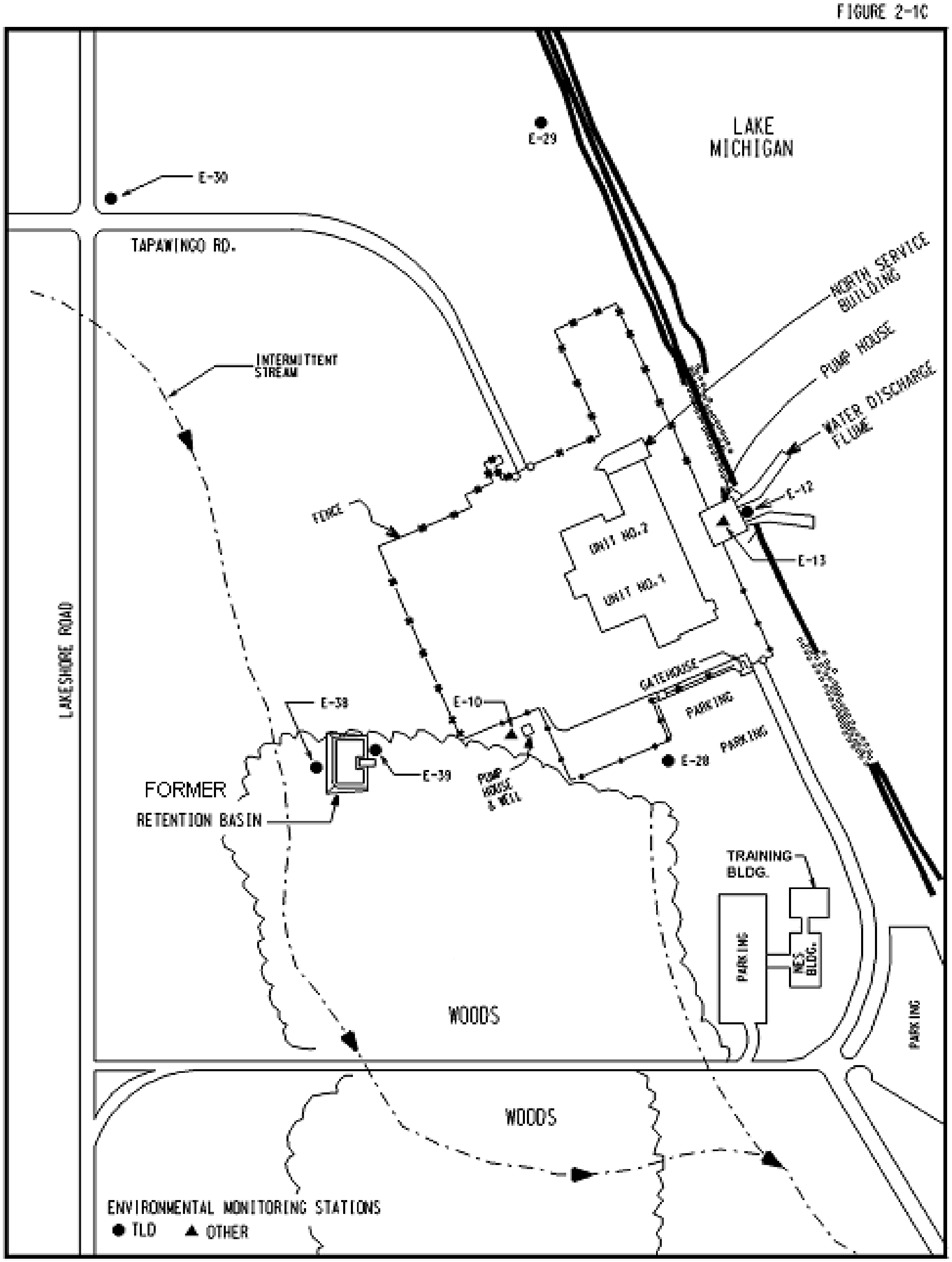


Figure 9-3
Enhanced Map Showing REMP Sampling Sites Closest to PBNP

Table 9-3
ISFSI Sampling Sites

Ambient Radiation Monitoring (TLD)	Soil, Vegetation and Airborne Monitoring
E-03	E-02
E-28	E-03
E-29	E-04
E-30	
E-31	
E-32	

Table 9-4
Minimum Acceptable Sample Size

Sample Type	**Size**
Vegetation	100-1000 grams
Lake Water	8 liters
Air Filters	250 m3 (volume of air)
Well Water	8 liters
Milk	8 liters
Algae	100-1000 grams
Fish (edible portions)	1000 grams
Soil	500-1000 grams
Shoreline Sediment	500-1000 grams

Table 9-5
Deviations from Scheduled Sampling and Frequency During 2015

Sample Type	Location	Collection Date	Reason for not conducting REMP as required	Plans for Preventing Recurrence
LW	E-01, E-05, E-06, E-33	2/15/2015	Icy conditions at the shore prevented getting close enough to the lake to get a water sample.	Nautral occurrence
AP/I	E-01	7/1/2015	No power to sampler	Unknown cause
Algae	E-5, E-12 E-5 E-5, E-12	6/10/2015 8/27/2015 10/7/2015	No algae found growing in area	Natural occurrence

Table 9-6
Sample Collections for State of Wisconsin

Sample Type	Location	Frequency
Lake Water	E-01	Monthly
Air Filters	E-07 E-08	Weekly
Fish	E-13	Quarterly, As Available
Precipitation	E-04 E-08	Twice a month, As Available
Milk	E-11 E-21	Monthly
Well Water	E-10	Twice per year

9.6 Analytical Parameters

The types of analyses and their frequencies are given in Table 9-1. The LLDs for the various analyses are found in the Section 10 (Table 10-1) with the summary of the REMP results. All environmental LLDs listed in Table 2-2 of the Environmental Manual (also in Table 10-1) were achieved during 2015.

9.7 Description of Analytical Parameters in Table 9-1

9.7.1 Gamma isotopic analysis

Gamma isotopic analysis consists of a computerized scan of the gamma ray spectrum from 80 keV to 2048 keV. Specifically included in the scan are Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. However, other detected nuclear power plant produced radionuclides also are noted. The above radionuclides detected by gamma isotopic analysis are decay corrected to the time of collection. Frequently detected, but not normally reported in the Annual Monitoring Report, are the naturally occurring radionuclides Ra-226, Bi-214, Pb-212, Tl-208, Ac-228, Be-7, and K-40.

9.7.2 Gross Beta Analysis

Gross beta analysis is a non-specific analysis that consists of measuring the total beta activity of the sample. No individual radionuclides are identifiable by this method. Gross beta analysis is a quick method of screening samples for the presence of elevated activity that may require additional, immediate analyses.

9.7.3 Water Samples

Water samples include both Lake Michigan and well water. The Lake Michigan samples are collected along the shoreline at two locations north and two locations south of PBNP. The well water is sampled from the on-site PBNP well. Gross beta measurements are made on the solids remaining after evaporation of the unfiltered sample to dryness. Gamma isotopic analyses are performed using 1-liter liquid samples. Strontium is determined by chemical separation and beta counting.

9.7.4 Air Samples

Particulate air filters are allowed to decay at least 72 hours before gross beta measurements are made in order for naturally occurring radionuclides to become a negligible part of the total activity. Gross beta measurements serve as a quick check for any unexpected activity that may require immediate investigation. Quarterly composites of the particulate air filters are analyzed for long-lived radionuclides such as Cs-134 and Cs-137. Charcoal cartridges for radioiodine are counted as soon as possible so the I-131 will undergo only minimal decay prior to analyses. The weekly charcoal cartridges are screened for I-131 by counting them all at the same time to achieve a lower LLD. If a positive result is obtained, each cartridge is counted individually.

In order to ensure that the air sampling pumps are operating satisfactorily, a gross leak check is performed weekly. The pumps are changed out annually for calibration and maintenance beyond what can be accomplished in the field.

9.7.5 Vegetation

Vegetation samples consist predominantly of green, growing plant material (grasses and weeds most likely to be eaten by cattle if they were present at the sampling site). Care is taken not to include dirt associated with roots by cutting the vegetation off above the soil line.

No special vegetation samples were obtained for C-14 analyses in 2015.

9.7.6 Environmental Radiation Exposure

The 2015 environmental radiation exposure measurements were made using TLD cards. The TLD card is a small passive detector, which integrates radiation exposure. Each TLD consists of a Teflon sheet coated with a crystalline, phosphorus material (calcium sulfate containing dysprosium) which absorbs the gamma ray energy deposited in them. Each TLD is read in four distinct areas to yield four exposure values which are averaged. Prior to the third quarter of 2001, exposure data was obtained using three lithium fluoride (LiF) TLD chips sealed in black plastic. The difference in material types can impact the amount of exposure measured. An evaluation of the response difference between the two types of TLD in 2001 demonstrated that the TLD cards produced a 14% higher response than the LiF chips (2011 AMR, Table 9-7, p. 36).

The reported field exposure is the arithmetic average of the measured exposure values at each location minus the exposure transportation control TLD (exposure received while the field TLD is in storage and transit). The gamma rays may originate from PBNP produced radionuclides or from naturally occurring radionuclides. The TLDs remain at the monitoring site for roughly three months prior to analyses and the results are reported as mrem per seven days. Because the TLDs are constantly bombarded by naturally occurring gamma radiation, even during shipment to and from PBNP, the amount of exposure during transportation is measured using transportation controls with each shipment of TLDs to and from the laboratory. The doses recorded on the transportation controls are subtracted from the monitoring TLDs in order to obtain the net *in situ* dose.

9.7.7 ISFSI Ambient Radiation Exposure

The ISFSI fence TLDs are part of the 10CFR72.44 monitoring and are not considered part of the REMP. However, their results can be used indirectly to determine whether the operation of the ISFSI is having an impact on the ambient environmental radiation beyond the site boundary. Impacts are determined by comparison of fence TLD results to the results of the monitoring at PBNP site boundary and other selected locations. These results are used as part of the 40CFR190 compliance demonstration.

10.0 RESULTS

10.1 Summary of 2015 REMP Results

Radiological environmental monitoring conducted at PBNP from January 1, 2015, through December 31, 2015, consisted of analysis of air filters, milk, lake water, well water, soil, fish, shoreline sediments, algae, and vegetation as well as TLDs. The results are summarized, averages and high values, in Table 10-1 which contain the following information:

Sample:	Type of the sample medium
Description:	Type of measurement
LLD:	*a priori* lower limit of detection
N:	Number of samples analyzed
Average:	Average value ± the standard deviation of N samples
High:	Highest measured value ± it's associated 2 sigma counting error
Units:	Units of measurement

For certain analyses, an LLD, which is lower than that required by REMP, is used because the lower value derives from the counting time required to obtain the LLDs for radionuclides that are more difficult to detect. For these analyses, both LLDs are listed with the tech spec required REMP LLD given in parentheses. The results are discussed in the narrative portion of this report (Section 11). Blank values have not been subtracted from the results presented in Table 10-1. A listing of all the individual results obtained from the contracted analytical laboratory and the laboratory's radioanalytical quality assurance results and Interlaboratory Crosscheck Program results are presented in the Appendix.

In Table 10-1 no results are reported as less than LLD (<LLD). All results are reported to Point Beach by the contracted radioanalytical laboratory "as measured" whether positive or negative (see Section 9-1). Based on these results, a radionuclide is considered detected if it meets the criterion that the measured value minus its 2σ counting error is greater than zero ($x-2\sigma > 0$). An "ND" entry in Table 10-1 means that for this radionuclide the criterion was not satisfied for any of the measurements. If one analysis fulfilled the criterion, then all of the reported results, both positive and negative, were used in calculating the average shown in Table 10-1.

The method of determining averages based on "as measured" results follows the recommendations made in NUREG-0475 (1978), “Radiological Environmental Monitoring by NRC Licensees for Routine Operations of Nuclear Facilities Task Force Report,” and in Health Physics Society Committee Report HPSR-1 (1980) “Upgrading Environmental Radiation Data” released as document EPA 520/1-80-012 and in more recent documents such as ANSI N42.23-1996, “Instrument Quality Assurance for Radioassay Laboratories;” ANSI N13.30-1996, “Performance Criteria for Radiobioassay;” DE91-013607, “Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance” and NUREG-1576, "Multi-Agency Radiological Laboratory Analytical Protocols Manual."

In addition to the required radionuclides for each medium analyzed, Table 10-1 also has an additional radionuclide listed known to originate with nuclear power plants. This radionuclide is either Co-60, Ru-103, or any other radionuclide which has the lowest LLD based on the analytical parameters needed to meet the LLDs required for radionuclides specified for the medium being analyzed. The radionuclide is identified by parentheses.

During the analyses for those radionuclides specifically required to be identified, naturally occurring radionuclides such as Ra-226, Be-7 and K-40 are detected in many samples. Their concentrations are presented in Table 10-1 for a comparison to those radionuclides for which specific analyses are required by the regulations. There are no regulatory required LLDs for naturally occurring radionuclides.

Finally, Point Beach reports the results for soil analyses. There is no regulatory requirement for soil analyses in standard RETS (NUREG-0472 and NUREG-1301). Point Beach includes soil analyses in the REMP to be able to compare current results to the historical record.

Additional sampling was initiated in 2015. Approximately 60% of the 1260 acres (FSAR 2.1) comprising the NextERA Point Beach site is licensed to farmers who use the land to grow various crops. These crops consist of corn, hay, alfalfa, and soy beans and appear to be for cattle feed. Ten samples were obtained from the nine separate plots and gamma scanned for radionuclides representative of Point Beach effluents and for naturally occurring radionuclides. Results are reported in Table 10-2.

Table 10-3 contains the ISFSI fence TLD results.

Table 10-1
Summary of Radiological Environmental Monitoring Results for 2015

Sample	Description	N	LLD (a)	Average ± 1 Std. Deviation (b)	High ± 2 sigma	Units
TLD	Environmental Radiation	126	1 mrem	1.18 ± 0.20	1.66 ± 0.06	mR/7days
	Control (E-20)	4	1 mrem	1.20 ± 0.15	1.30 ± 0.15	mR/7days
Air	Gross Beta	259	0.01	0.025 ± 0.010	0.057 ± 0.005	pCi/m3
	Control (E-20) Gross beta	52	0.01	0.024 ± 0.009	0.057 ± 0.005	pCi/m3
	I-131	259	0.030 (0.07)	ND	-	pCi/m3
	Control (E-20) I-131	52	0.030 (0.07)	ND	-	pCi/m3
	Cs-134	20	0.01(0.05)	ND	-	pCi/m3
	Control (E-20) Cs-134	4	0.01(0.05)	ND	-	pCi/m3
	Cs-137	20	0.01(0.06)	0.0000 ± 0.0003	0.0007 ± 0.0006	pCi/m3
	Control (E-20) Cs-137	4	0.01(0.06)	0.0000 ± 0.0003	0.0004 ± 0.0003	pCi/m3
	Other γ emitters (Co-60)	20	0.1	0.0000 ± 0.0004	0.0006 ± 0.0005	pCi/m3
	Control (E-20) Other (Co-60)	4	0.1	ND	ND	pCi/m3
	Natural Be-7	20	-	0.064 ± 0.012	0.084 ± 0.017	pCi/m3
	Control (E-20) Natural Be-7	4	-	0.065 ± 0.005	0.071 ± 0.013	pCi/m3
Milk	Sr-89	36	5	ND	-	pCi/L
	Sr-90	36	1	0.5 ± 0.3	1.3 ± 0.4	pCi/L
	I-131	36	0.5	ND	-	pCi/L
	Cs-134	36	5 (15)	0.0 ± 0.8	2.1 ± 1.7	pCi/L
	Cs-137	36	5 (18)	0.6 ± 0.9	2.3 ± 2.1	pCi/L
	Ba-La-140	36	5 (15)	-0.8 ± 1.9	2.7 ± 1.2	pCi/L
	Other gamma emitters(Co-60)	36	15	0.4 ± 1.1	3.0 ± 1.9	pCi/L
	Natural K-40	36	-	1409 ± 60	1496 ± 106	pCi/L
Well Water	Gross beta	4	4	1.6 ± 1.3	2.9 ± 1.7	pCi/L
	H-3	4	200 (3000)	15.1 ± 78.1	103.9 ± 99.7	pCi/L
	Sr-89	4	5(10)	ND	-	pCi/L
	Sr-90	4	1 (2)	0.2 ± 0.5	0.9 ± 0.3	pCi/L
	I-131	4	0.5 (2)	ND	-	pCi/L
	Mn-54	4	10 (15)	ND	-	pCi/L
	Fe-59	4	30	ND	-	pCi/L
	Co-58	4	10(15)	ND	-	pCi/L
	Co-60	4	10(15)	ND	-	pCi/L
	Zn-65	4	30	ND	-	pCi/L
	Zr-Nb-95	4	15	ND	-	pCi/L
	Cs-134	4	10(15)	ND	-	pCi/L
	Cs-137	4	10(18)	ND	-	pCi/L
	Ba-La-140	4	15	0.8 ± 1.9	3.1 ± 1.7	pCi/L
	Other gamma emitters(Ru-103)	4	30	ND	-	pCi/L
Algae	Gross beta	1	0.25	3.04 ± 0.13	3.04 ± 0.13	pCi/g
	Co-58	1	0.25	ND	-	pCi/g
	Co-60	1	0.25	ND	-	pCi/g
	Cs-134	1	0.25	ND	-	pCi/g
	Cs-137	1	0.25	0.012 ± 0.007	0.012 ± 0.007	pCi/g
	Natural Be-7	1	-	0.85 ± 0.09	0.85 ± 0.09	pCi/g
	Natural K-40	1	-	2.26 ± 0.16	2.26 ± 0.16	pCi/g

Table 10-1 (continued)
Summary of Radiological Environmental Monitoring Results for 2015

Sample	Description	N	LLD (a)	Average ± 1 Std. Deviation (b)	High ± 2 sigma	Units
Lake Water	Gross beta	44	4	1.6 ± 1.0	4.4 ± 1.1	pCi/L
	I-131	44	0.5 (2)	ND	-	pCi/L
	Mn-54	44	10 (15)	0.1 ± 0.7	1.3 ± 1.1	pCi/L
	Fe-59	44	30	-0.6 ± 2.0	4.4 ± 4.2	pCi/L
	Co-58	44	10(15)	0.0 ± 1.0	2.6 ± 2.0	pCi/L
	Co-60	44	10(15)	ND	-	pCi/L
	Zn-65	44	30	-0.5 ± 2.5	3.8 ± 2.7	pCi/L
	Zr-Nb-95	44	15	-0.1 ± 1.1	2.4 ± 2.0	pCi/L
	Cs-134	44	10 (15)	-0.1 ± 1.1	3.1 ± 2.0	pCi/L
	Cs-137	44	10 (18)	0.2 ± 0.6	2.3 ± 2.1	pCi/L
	Ba-La-140	44	15	-0.8 ± 2.2	2.9 ± 1.5	pCi/L
	Other gamma (Ru-103)	44	30	-0.2 ± 0.9	1.9 ± 1.8	pCi/L
	Sr-89	16	5(10)	ND	-	pCi/L
	Sr-90	16	1 (2)	0.28 ± 0.15	0.71 ± 0.38	pCi/L
	H-3	16	200 (3000)	97 ± 116	452 ± 94	pCi/L
Fish	Gross beta	14	0.5	2.81 ± 0.56	3.62 ± 0.08	pCi/g
	Mn-54	14	0.13	0.002 ± 0.007	0.013 ± 0.009	pCi/g
	Fe-59	14	0.26	0.006 ± 0.027	0.056 ± 0.036	pCi/g
	Co-58	14	0.13	-0.004 ± 0.010	0.010 ± 0.008	pCi/g
	Co-60	14	0.13	0.004 ± 0.009	0.030 ± 0.021	pCi/g
	Zn-65	14	0.26	ND	-	pCi/g
	Cs-134	14	0.13	ND	-	pCi/g
	Cs-137	14	0.15	0.029 ± 0.012	0.054 ± 0.020	pCi/g
	Other gamma (Ru-103)	14	0.5	0.000 ± 0.011	0.020 ± 0.009	pCi/g
	Natural K-40	14	-	2.42 ± 0.57	3.25 ± 0.42	pCi/g
Shoreline Sediment	Gross beta	10	2	8.28 ± 1.30	11.20 ± 0.92	pCi/g
	Cs-134	10	0.18	ND	-	pCi/g
	Cs-137	10	0.15	0.019 ± 0.008	0.029 ± 0.016	pCi/g
	Natural Be-7	10	-	ND	-	pCi/g
	Natural K-40	10	-	5.75 ± 1.53	8.69 ± 0.50	pCi/g
	Natural Ra-226	10	-	0.38 ± 0.07	0.54 ± 0.17	pCi/g
Soil	Gross beta	16	2	22.62 ± 6.24	31.19 ± 1.22	pCi/g
	Cs-134	16	0.15	ND		pCi/g
	Cs-137	16	0.15	0.154 ± 0.077	0.315 ± 0.036	pCi/g
	Natural Be-7	16	-	0.053 ± 0.090	0.190 ± 0.070	pCi/g
	Natural K-40	16	-	14.52 ± 4.04	18.99 ± 0.89	pCi/g
	Natural Ra-226	16	-	0.86 ± 0.36	1.37 ± 0.32	pCi/g
Vegetation	Gross beta	24	0.25	6.81 ± 1.94	13.74 ± 0.33	pCi/g
	I-131	24	0.06	0.000 ± 0.008	0.016 ± 0.010	pCi/g
	Cs-134	24	0.06	ND	-	pCi/g
	Cs-137	24	0.08	0.004 ± 0.012	0.052 ± 0.016	pCi/g
	Other gamma emitters (Co-60)	24	0.25	-0.005 ± 0.005	0.011 ± 0.008	pCi/g
	Natural Be-7	24	-	1.59 ± 0.80	2.97 ± 0.25	pCi/g
	Natural K-40	24	-	5.42 ± 1.16	7.55 ± 0.53	pCi/g

(a) When two LLD values are listed, the required LLD per the PBNP REMP is enclosed in the parentheses. Whenever possible, PBNP uses the lower value to obtain greater sensitivity.
(b) "ND" indicates that the sample result is Not Detectable, i.e., sample concentrations were statistically equal to zero or <MDA.

Table 10-2
Feed Crops Grown on Point Beach Land

		Average			Max		
	Number	pCi/g		2σ	pCi/g		2σ
Gross Beta	10	4.94	±	3.76	8.12	±	0.27
Be-7	10	1.66	±	4.08	6.21	±	0.42
K-40	10	4.05	±	4.22	6.45	±	0.39
Mn-54	10		ND			-	
Fe-59	10		ND			-	
Co-58	10		ND			-	
Co-60	10	0.000	±	0.009	0.006	±	0.005
Zn-65	10		ND			-	
Zr-Nb-95	10		ND			-	
Cs-134	10		ND			-	
Cs-137	10	0.003	±	0.007	0.009	±	0.006
Ba-La-140	10		ND			-	

ND = Not detected

Table 10-3
Average ISFSI Fence TLD Results for 2015

Fence Location	Average	±	Standard Deviation	Units
North	2.31	±	0.25	mR/7 days
East	3.24	±	0.19	mR/7 days
South	1.17	±	0.05	mR/7 days
West	4.36	±	0.16	mR/7 days

11.0 DISCUSSION

11.1 TLD Cards

The ambient radiation was measured in the general area of the site boundary, at an outer ring four – five miles from the plant, at special interest areas, and at one control location, roughly 17 miles southwest of the plant. The average indicator TLD is 1.18 ± 0.20 mR/7-days compared to 1.20 ± 0.15 mR/7-days at the background location. These two values are not significantly different from each other. Neither are the indicator TLD values significantly different from those observed from 2001 through 2014 for the same type of TLD (tabulated below in Table 11-1). Prior to third quarter of 2001 TLD LiF chips were used versus the current TLD cards, see Section 9.7.6 for additional information. The response difference between the two types of TLDs is evident in Table 11-1. Prior to 2001 all of the annual averages are <1 mrem/7-days. Beginning in 2001, all are >1 mrem/7-days.

Table 11-1
Average Indicator TLD Results from 1993 – 2015

Year	Average mR/7-days	±	St. Dev*
1993	0.82	±	0.15
1994	0.90	±	0.12
1995	0.87	±	0.13
1996	0.85	±	0.12
1997	0.87	±	0.11
1998	0.79	±	0.13
1999	0.79	±	0.21
2000	0.91	±	0.15
2001	1.06	±	0.19
2002	1.17	±	0.21
2003	1.10	±	0.20
2004	1.10	±	0.22
2005	1.04	±	0.21
2006	1.14	±	0.21
2007	1.08	±	0.20
2008	1.05	±	0.17
2009	1.08	±	0.17
2010	1.11	±	0.15
2011	1.14	±	0.25
2012	1.17	±	0.17
2013	1.14	±	0.20
2014	1.07	±	0.19
2015	1.18	±	0.20

*St. Dev = Standard Deviation

No fuel was added to the ISFSI during 2015. However, four empty dry fuel storage units were stored at the ISFSI for use in 2016. The west fence TLDs continue to record higher exposures followed by the east, north, and south fence locations (Table 11-2). This sequence has been observed for the last five years.

There is no significant change in the exposure on the TLD monitoring locations around the ISFSI (Table 11-3). The results at E-03 and E-31 (W of the ISFSI) and E-32 (SW of the ISFSI) are similar to previous years (1.36, 1.24, and 1.40, respectively) and continue to be higher than E-30 (1.07) on the east side and closest to the ISFSI. E-03, about equidistant between the ISFSI and the site boundary location, E-31, continues to be higher than the site boundary location. (See Figs. 9-1 and 9-2 for locations).

Table 11-2
Average ISFSI Fence TLD Results (mR/7 days)

TLD FENCE LOCATION				
YEAR	North	East	South	West
1995	1.29	1.28	1.10	1.26
1996	2.12	1.39	1.10	1.68
1997	2.05	1.28	1.00	1.66
1998	2.08	1.37	1.02	1.86
1999	2.57	1.84	1.11	3.26
2000	2.72	2.28	1.25	5.05
2001	2.78	2.54	1.36	6.08
2002	2.79	2.74	1.42	6.46
2003	2.70	2.60	1.50	6.88
2004	2.61	2.12	1.41	6.50
2005	2.54	2.05	1.44	5.63
2006	2.73	2.35	1.38	5.80
2007	2.72	2.73	1.34	5.47
2008	2.64	2.37	1.36	5.36
2009	2.36	2.35	1.20	4.63
2010	2.64	3.02	1.41	5.05
2011	2.44	2.62	1.31	4.75
2012	2.59	3.27	1.40	4.92
2013	2.57	3.66	1.15	4.28
2014	2.45	3.35	1.14	4.24
2015	2.31	3.24	1.17	4.36

Although the mR/7-day results for the three TLD locations nearest the site boundary (E-03 1.36 ± 0.31; E-31, 1.24 ± 0.30; E-32, 1.40 ± 0.38) are higher than at the background site E-20 (1.20 ± 0.29), they are comparable at the 95% confidence level, indicating a small, but not significant, increase in ambient gamma radiation at the site boundary due to the operation of the ISFSI.

Further data supporting this conclusion is the comparison of the TLD results at selected locations around the ISFSI before and after the storage of spent fuel at the ISFSI (Figure 11-1). As stated in Section 9.7.6, the TLD values increased by about 14% in the second half of 2001 when the TLD monitoring devices were changed from LiF chips in the first half of the 2001 to calcium sulfate impregnated TLD cards. After that initial change, the measured radiation exposure, as measured by the TLD cards, has remained fairly constant with a slight increase with the addition of stored fuel at the ISFSI. Each year the variations in the TLD results appear to move in concert with each other and with the background site, E-20, which is 17 miles south west of the ISFSI.

Comparing the ISFSI TLD results to results from surrounding REMP indicator and background TLDs reveals minimal impact of the ISFSI on the surrounding

Figure 11-1 ISFSI AREA TLD RESULTS

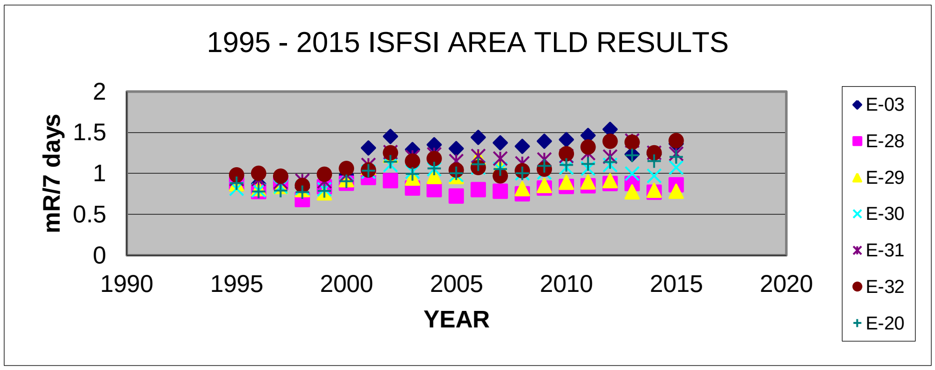


Table 11-3
Average TLD Results Surrounding the ISFSI (mR/7 days)

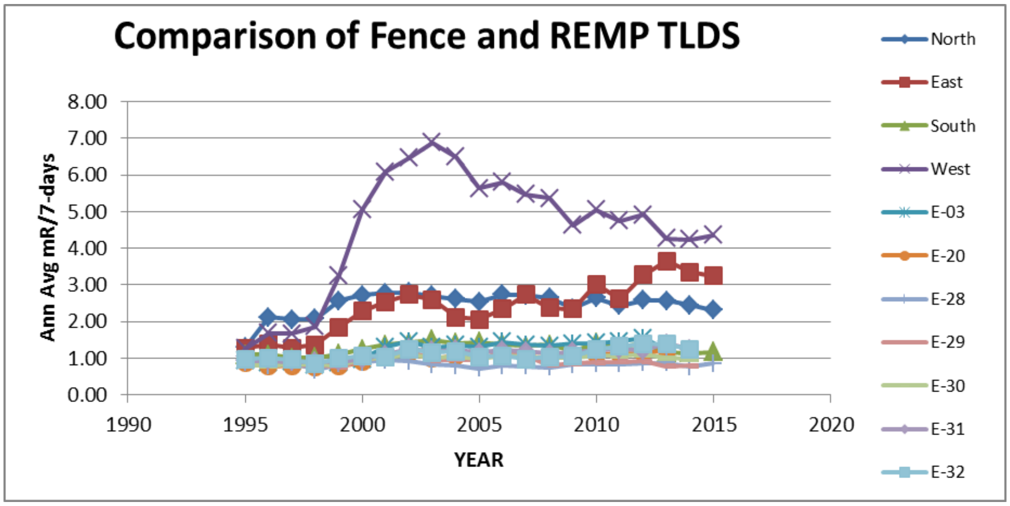
	Sampling Site						
	E-03	E-28	E-29	E-30	E-31**	E-32**	E-20***
Pre-Operation*	0.93	0.87	0.87	0.81	0.93	0.98	0.88
1996	0.87	0.78	0.81	0.79	0.93	1.00	0.78
1997	0.91	0.89	0.84	0.84	0.89	0.97	0.79
1998	0.82	0.68	0.80	0.82	0.91	0.85	0.77
1999	0.88	0.83	0.76	0.80	0.90	0.99	0.78
2000	0.98	0.88	0.92	0.99	0.98	1.06	0.90
2001	1.31	0.95	1.07	1.02	1.10	1.04	1.03
2002	1.45	0.91	1.22	1.10	1.26	1.25	1.14
2003	1.29	0.82	0.94	1.02	1.20	1.15	0.99
2004	1.35	0.80	0.96	1.05	1.23	1.18	1.06
2005	1.30	0.72	0.96	0.98	1.15	1.04	1.00
2006	1.44	0.80	1.19	1.07	1.21	1.07	1.11
2007	1.37	0.78	1.07	1.05	1.18	0.97	1.05
2008	1.33	0.75	0.81	1.00	1.12	1.03	1.00
2009	1.39	0.82	0.85	1.01	1.17	1.05	1.09
2010	1.41	0.84	0.89	1.07	1.21	1.24	1.10
2011	1.46	0.85	0.90	1.06	1.25	1.32	1.12
2012	1.54	0.87	0.91	1.10	1.21	1.39	1.14
2013	1.23	0.87	0.77	1.00	1.40	1.38	1.22
2014	1.23	0.77	0.79	0.97	1.25	1.25	1.15
2015	1.36	0.86	0.78	1.07	1.24	1.40	1.20

*Pre-Operational data are the averages of the years 1992 through 3rd quarter of 1995.
**Sites E-31 and E-32 are located at the Site Boundary to the West and South-West of the ISFSI.
***E-20 is located approximately 17 miles WSW of the ISFSI.

radiation levels (Figure 11-2). As previously discussed, the small increase is more related to the switch from the LiF chips to the calcium sulfate impregnated Teflon TLD cards as evidenced by the synchronicity with E-20, the background site.

LiF TLD chips were replaced with calcium sulfate impregnated Teflon TLD cards in the third quarter of 2001 resulting in a higher measured background values.

Figure 11-2 Comparison of ISFSI Fence TLDs to Selected REMP TLDs



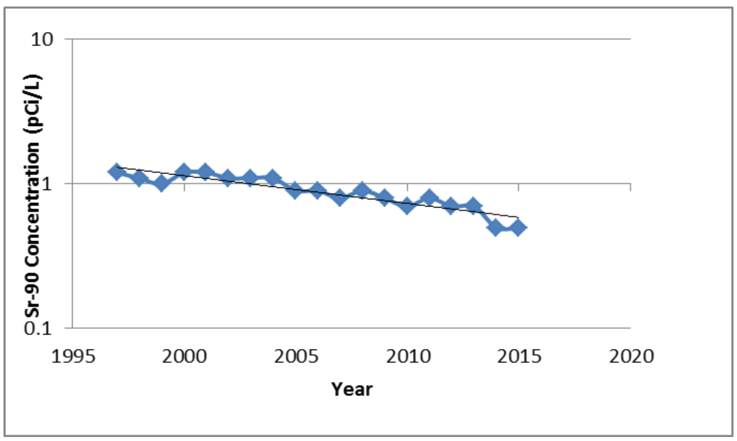
11.2 Milk

Naturally occurring potassium-40 (1409 ± 60 pCi/l) continues to be the most prevalent radionuclide measured in milk at concentrations roughly 2000 times higher than the only potential plant related radionuclide, Sr-90 (0.6 ± 0.3 pCi/l), detected in milk. The annual average Sr-90 concentrations in milk continue to be similar to previous years. There were several (3 of 36) positive Ba-La-140 results. However, PBNP did not discharge any Ba-La-140 during the years 2013 - 2015. Given the short half-life of Ba-La-140 (12.8 days), it is unlikely that these results represent a carry- over from previous years. Because the highest Ba-La-140 concentration is very near the detection limit, the positive values are considered to be false positives attributable to the statistical nature of radioactive decay. Some low positive Cs-134 (2 of 36) and Cs-137 (6 of 36) results were obtained. No airborne Cs-134 or Cs-137 was discharged from PBNP in 2015. The Cs-134 results are considered to be false positives which occur due to the random fluctuations in background in low activity samples. The Cs-137 values also are near the detection limit and therefore may be false positive. Another possibility is residual Cs-137 recycling through the environment from the 1960's atmospheric weapons tests and events such as Chernobyl and Fukushima. Several (3 of 36) positive Co-60 values were obtained. The only airborne Co-60 release occurred in October via the Unit 2 containment hatch. Two of the small positive results occurred prior to October. The small positive Co-60 result is from a sample obtained within the time frame of one Co-60 release. However, it is upwind of the site. Based on the sample locations and on the low Co-60 concentration values, all of the Co-60 results are considered to be false positives. No I-131 was discharged and no positive I-131 results were obtained.

Although the average Sr-90 concentrations have not changed much over the last nineteen (19) years, 1.2 ± 0.5 pCi/L in 1997 to 0.5 ± 0.3 pCi/L in 2015, a graph of the annual averages displays a logarithmic decrease over time (Figure 11-3). The annual averages are from the monthly Sr-90 measurements from three different dairies (Fig. 9-1). The only dairy that has been in the monitoring program over the entire 1997 – 2015 timespan under consideration is located at site E-21. It is located south of the plant. The other two, E-40 and E-11, are replacements for dairies which had dropped out of the program at various times during this time interval. The replacements were chosen to maintain, to the extent possible, the former sampling sites west and north of Point Beach.

Over the years1997 to 2015, the Sr-90 in milk decreases with a half-life of 15.0 years. Because the radiological half-life is 28.6 years, the shorter removal half-life indicates that environmental factors as well as radioactive decay are working to decrease the concentration of Sr-90 in milk. The calculated physical removal half-life is 31.7 years.

Figure 11-3
Sr-90 Concentration in Milk (1997 – 2015)



The major Sr-90 input to the environment was from fallout from atmospheric weapons testing during the early 1960s with minor inputs during the 50's, 70's and later contributions from the Chernobyl accident in the late 1980s and from Fukushima in 2011. The Sr-90 in milk persists due to its 28.6 year half-life and to cycling in the biosphere. With little or no atmospheric input to the environment, the mode of entry into cattle feed must be root uptake by forage crops and transfer into the milk. Therefore, the shorter observed half-life is indicative of Sr-90 removal from the soil by processes other than radioactive decay. Over the time period of this graph (1997 – 2015), PBNP discharged airborne Sr-90 only in 3 years: 1998, 2.4E-08 Ci; 2004, 3.2E-08 Ci; and 2011, 1.6 E-08 Ci. These low discharges do not appear to impact the decreasing concentrations as they continue to decrease over time. It is concluded that the milk data for 2015 show no radiological effects of the plant operation.

11.3 Air

The average annual gross beta concentrations (plus/minus the two-sigma uncertainty) in weekly airborne particulates at the indicator and control locations were 0.025 ± 0.019 pCi/m^3 and 0.024 ± 0.019 pCi/m^3, respectively, and are similar to levels observed from 1993 through 2014 (Figure 11-4).

The 2015 weekly gross beta concentrations reveal higher winter values and lower summer values (Figure 11-5). This is a repeat of the patterns seen in 2006 - 2014. As in 2014, there is a slight peak in late summer followed by some lower values in October and early November. The cause for this variation is not known. However, the control and indicators are moving in concert. Therefore, a plant effect can be ruled out. Similarly, there is a decreasing trend in January before returning to the January highs in February. Again, the indicator and background sites move in concert ruling out a plant effect.

Figure 11-4 Annual Average Air Gross β (1993 – 2015)

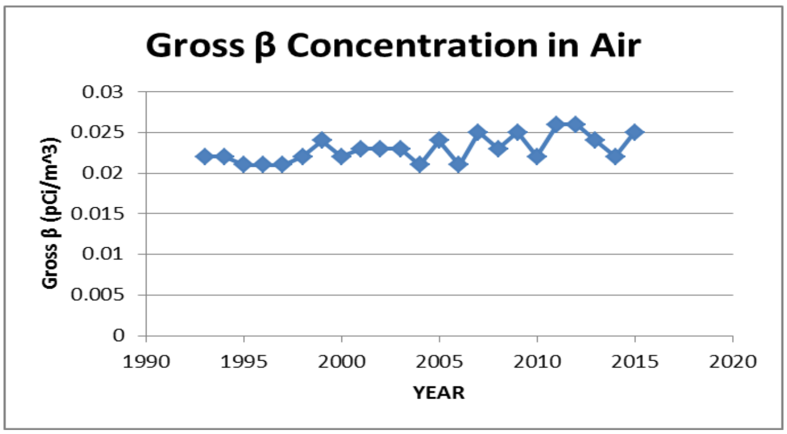
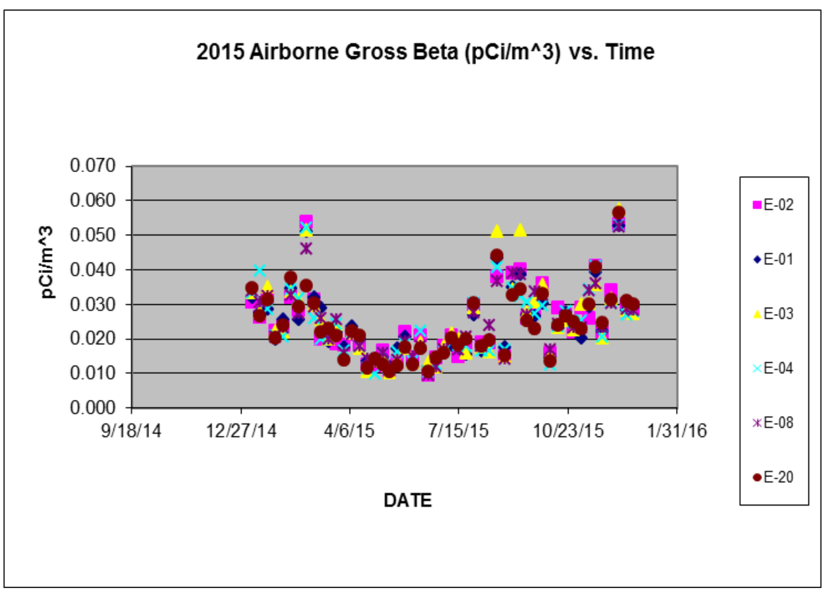


Figure 11-5 2015 Airborne Gross Beta



No I-131 was detected during 2015. In 2005, the new method of evaluating airborne I-131 was instituted. Instead of counting each charcoal cartridge separately, all six cartridges for the week are counted as one sample in a predetermined geometry to screen the samples for I-131. If any airborne radioiodine is detected, each sample cartridge is counted individually. With no detectable I-131, the reported analytical result is the minimum detectable activity (MDA) conservatively calculated using the smallest of the six sample volumes. The reported MDAs ranged from 0.005 to 0.0.016 pCi/m^3. Because the analysis LLD is based on counting only one cartridge, the use of six cartridges or roughly six times the sample volume with the same count time as would be needed to achieve the desired LLD for only one sample, the actual LLD is about six times lower than the programmatic value given in Table 10-1. Similarly, the actual MDA is about one-sixth of that reported, in the range of 0.001 to 0.003 pCi/m^3.

At each sampling location, the particulate filters are composited quarterly and analyzed for Cs-134, Cs-137 and any other (Co-60) detectable gamma emitters. As summarized in Table 10-1, low, positive results (5 of 24) for gamma emitters attributable to Point Beach were detected. By contrast, naturally occurring Beryllium-7 was found in all of the quarterly composites at concentrations an order of magnitude higher. Be-7 ($T_{1/2}$ = 53.3 days) is produced in the atmosphere by the interaction of cosmic rays with oxygen and nitrogen nuclei. Its half-life is long enough to allow for it to be detected in the quarterly composited filters. Based on location and results at or below the MDC, the Co-60 and Cs-137 results are concluded to be false positives.

In summary, the 2015 air gamma data from quarterly composites do not demonstrate an environmental impact from the operation of PBNP.

11.4 Lake Water

For the REMP-specified gamma emitting radionuclides listed in Table 10-1, reported concentrations continue to occur as small, negative and positive values scattered around zero, indicating no radiological impact from the operation of PBNP. Lake Michigan water samples are collected north (E-33 and E-05) and south (E-01 and E-06) of PBNP (see Figure 9-1).

There were sixteen, slightly positive indications of gamma emitters during 2015, nine north of the plant and seven to the south. Although the major current is from north to south, these locations may be upstream or downstream of the plant discharge depending upon wind stress which can reverse currents. A comparison of when the positive results were obtained to when discharges occurred suggests that the small, positive results are false positives. For example, positive results were obtained for Ru-102, Cs-134, and Ba-La-140 which were not in the 2015 effluents. Similarly, positive results were obtained for Mn-54 and Cs-137 in months when these radionuclides were not discharged. Also, Zr-95 and Nb-95 were identified in months they were not discharged but not in the months they were in the PBNP effluents. Finally, the measured concentrations are in the range of 2 – 4 pCi/l which convert to 2 – 4E-09 µCi/cc or 10 – 100 times greater than the typical discharge concentrations of E-14 to E-11 µCi/cc. Based on the further dilution which occurs in the lake after discharge, it is highly unlikely that observed positive results are real. Therefore, based on these comparisons, it is concluded that the sixteen positive results are false positives and not indications of PBNP effluents in Lake Michigan during 2015.

A false positive is concluding an isotope is present when it isn't. False positives occur most often at the detection limit when the random fluctuations of the background result in lower than normal background activity. The result is a higher net count and hence falsely concluding an isotope is present when it isn't because the value is statistically above zero.

In conclusion, based on the results of the gamma scans of Lake Michigan water, there is no measureable impact on the lake from PBNP discharges.

Aliquots of the monthly samples are composited quarterly and analyzed for Sr-89/90 and for tritium. Small amounts of Sr-90 were detected. As in 2012 - 2014, Point Beach did not discharge any Sr-90 in 2015. There were five lake water composites in which the Sr-90 concentrations were slightly positive. They occurred north and south of the plant. Sr-90 has a 28.6 year half-life and, like Cs-137, is a remnant of atmospheric weapons testing in the '50s and '60s. Therefore, positive Sr-90 concentrations are indicative of fallout being recycled in Lake Michigan.

Tritium, in addition to being produced by water-cooled reactors such as PBNP, also is a naturally occurring radionuclide. It also was produced by atmospheric weapons testing. However, due to its mobility, any H-3 now found in Lake Michigan at the concentrations typically found in monitoring programs cannot be from that time period. It is the result of power plant discharges. Point Beach discharges on the order of 700 - 800 Ci per year.

Eight of the sixteen quarterly composites had positive H-3 indications. Three were south and five were north of the PBNP discharge. The highest, 452 ± 94 pCi/l, was from a fourth quarter composite sample about 1.6 miles north (E-05) of Point Beach with a lower value of 237 ± 84 pCi/l from a location (E-33) about 4.5 miles north of PBNP near the shut-down Kewaunee plant. Based on this result, the individual month samples from the two locations were analyzed for H-3. The highest concentrations occurred in the December 10^{th} samples, 1336 ± 139 pCi/l closest to PBNP and a lower value of 464 ± 111 pCi/l near the Kewaunee plant. (Both results are lower than the EPA drinking water standard of 20,000 pCi/l) There were no positive H-3 results for the October or November samples north of PBNP. As a further check the December 10^{th} samples from the two locations 0.6 (E-01) and 6 miles (E-06) south of PBNP also were analyzed for H-3 and no positive results were obtained. Because Kewaunee had not discharged any H-3 in the month preceding the December 10^{th} samples and PBNP had seven discharges containing H-3 in the six days prior to the December 10^{th} sample, it is concluded that the observed H-3 results were due to PBNP effluents. The occurrence and analyses were documented in the PBNP CAP.

11.5 Algae

Filamentous algae attached to rocks along the Lake Michigan shoreline are known to concentrate radionuclides from the water. Samples are obtained at Two Creeks Park and at the PBNP discharge (locations 5 and 12 in Figure 9-1). In order to allow the algae time to grow, typically no samples are collected until June and then again August and October. This is done to ensure that there is enough new growth to provide a sample. In 2015 only one algae sample was obtained and that was on August 27th near the PBNP discharge. On the other occasions the algae either was not present or located in spot which was visible but not accessible. Positive results were obtained for the naturally occurring radionuclides Be-7 and K-40. No Co-58, Co-60, or Cs-134 was detected. Cs-137 was detected at 0.012 ± 0.007 pCi/g. This is roughly half the highest concentration (0.023 ± 0.009 pCi/g) found at the same location in in 2014. Co-58 and Co-60 which were discharged in the seven months preceding the August sample were not detected.

As previously discussed, fallout Cs-137 recycles in Lake Michigan and is attached to particles. The positive results are attributable to the recycling of bomb fallout from weapons testing in the '50s, 60's and other nuclear events such as Chernobyl and Fukushima. There also may be a small contribution, but unknown, amount from past nuclear plant discharges. Because PBNP did not discharge any Cs-137 in 2015 prior the August sample, it is concluded that the positive result is indicative the recycling of fallout and other previously discharged Cs-137 in Lake Michigan.

11.6 Fish

Fourteen fish were analyzed in 2015. All 14 fish had detectable amounts of Cs-137 with results ranging from 0.012 ± 0.010 to 0.054 ± 0.020 pCi/g. The Cs-137 is attributable to the recycling of this radionuclide in Lake Michigan. The majority of Cs-137 entered Lake Michigan as fallout from atmospheric weapons testing in the '50s and '60s with lesser amounts from events at Chernobyl and Fukushima.

Fish analyses also yielded small amounts of Mn-54 (0.013 ± 0.009), Fe-59 (0.056 ± 0.036), Co-58 (0.010± 0.008), Co-60 (0.030 ± 0.021), and Ru-103 (0.020 ± 0.009) pCi/g. These results could be false positives. For example, Fe-59 was found is a fish from 3/15/15. However, no prior Fe-59 discharge occurred in 2015 and in 2014, Fe-59 was released only in April and May. Based on the May Fe-59 discharge concentration of 1.58E-11µCi/cc or 0.0000158 pCi/cc (Permit 14-00049L) and assuming no decay or further dilution in the lake, an iron bioaccumulation factor of 100 for freshwater fish (RG 1.109, Rev.1, Table A-1) yields a fish concentration of 0.00158 pCi/g in March of 2015. If radioactive decay were considered, a decay of about 7 half-lives or roughly 300 days would have to be factored in making the fish concentration even lower by a factor of about 1/128th of the original. This is below the highest measured Fe-59 concentration of 0.056 pCi/g. Therefore, it is concluded that the low measured Fe-59 concentrations in fish are false positives.

The same evaluation holds for Co-58 and Co-60. Co-58 and Co-60 in December release permit 14-000111L had concentrations of 6.73E-11µCi/cc (6.7E-05 pCi/cc) and 5.75E-12 µCi/cc (5.75E-06 pCi/cc), respectively. Appling a bioconcentration factor of 50 yields fish concentrations of 3.37E-04 and 2.88 E-04 pCi/g, respectively, before decay and further dilution in Lake Michigan. The first positive Co-60 in a fish (0.013 pCi/g) was from a sample from 1/18/2015. This is much higher than predicted by RG 1.109. Also, no Co-58 was found in the same fish and it was discharged in a higher concentration than Co-60. Therefore, PBNP discharges can’t be the cause of the identified Co-58 and Co-60. The conclusion is that the low cobalt concentrations are false positives. Similarly, it is concluded that the positive result for Ru-103 is a false positive because no Ru-103 was released in either 2014 (2014 AMR Table 2-3) or 2015 (Table 2-3).

The highest radionuclide concentration in fish is naturally occurring K-40 with an average concentration of 2.42E+00 pCi/g.

Based on these results, it is concluded that there is no impact of PBNP discharges on Lake Michigan fish.

11.7 Well Water

Three plant related radionuclides were detected in main plant well water (E-10) during 2015, Ba-La-140 and Sr-90. The April 15th Ba-La-140 result is considered to be a false positive because of its short half-life and the fact that none has been discharged in 2014 or in 2015 prior to the sampling date. Also the Sr-90 is considered to be a false positive because its concentration of 0.9 ± 0.3 pCi/l is much higher than the gross beta result of 0.2 ± 0.9 pCi/l. Had the Sr-90 result been real, the gross beta should have been comparable given the greater efficiency of counting the Sr-90 daughter product, Y-90, which would have been present in the gross beta measurement. Therefore, it is concluded that there is no evidence of PBNP effluents getting into the aquifer supplying drinking water to PBNP.

11.8 Soil

Cs-137 is present in the soils throughout North America and the world resulting from the atmospheric nuclear weapons testing in the 1950s, 1960s, and 1970s and from the 1986 Chernobyl accident, and more recently, from the Fukushima event. Soil is an integrating sample media, in that it is a better indicator of long term buildup of Cs-137 as opposed to current deposition for local sources. In addition to erosion and radioactive decay, human activities can modify the soil Cs-137 concentrations. Evidence for the latter are the typically higher Cs-137 concentrations found at E-06, 0.315 ± 0.036 pCi/g in May and 0.28 ± 0.033 in October as compared to other locations. At E-06, trees growing and incorporating Cs-137 during the time of atmospheric fallout are now being burned in camp fires thereby releasing the incorporated Cs-137 to the surrounding area. In 2015, as in 2014, Cs-137 was found in all soils analyzed with the highest values in May and in October both being at E-06, Point Beach State Park. There is no indication of a plant effect based on the comparison of indicator and background results. By comparison to naturally occurring radionuclides, the Cs-137 concentrations continue to be present in soil samples at well below levels of naturally occurring K-40 (5.38 ± 0.37 to 18.99 ± 0.89 pCi/g). In addition to K-40, other naturally occurring radionuclides such as Be-7 and Ra-226 were found in the soil. There is no evidence of Point Beach effluent in the soil samples.

11.9 Shoreline Sediment

Shoreline sediment consists of sand and other sediments washed up on the Lake Michigan shore. As in soil samples, the only non-naturally occurring radionuclide found in these samples is Cs-137. Eight of the ten samples have Cs-137 concentrations statistically different from zero. The shoreline sediment Cs-137 concentrations continue to be about one-tenth of that found in soils. This is expected because Cs-137 in the geological media is bound to fine particles, such as clay, as opposed to the sand found on the beach. Lake Michigan sediments are a known reservoir of fallout Cs-137. Wave action suspends lake sediments depositing them on the beach. The fine particles deposited on the beach eventually are winnowed from the beach leaving the heavier sand; hence the lower Cs-137 concentrations in beach samples. In contrast to Cs-137, K-40, which is actually part of the minerals making up the clay and sand, is at a concentration about several hundred times higher than the Cs-137 that is attached to particle surfaces. Therefore, it is not surprising that Cs-137 is present at concentrations 1% or less of the naturally occurring concentrations of K-40. The absence of any PBNP effluent nuclides, such as Co-58/60, other than Cs-137 indicates that the most likely source of the observed Cs-137 is the cycling of radionuclide in the Lake Michigan environment and not current PBNP discharges. As with soil, the naturally occurring radionuclides such as K-40, and Ra-226 are found in the shoreline sediment samples. Therefore, the shoreline sediment data indicate no radiological effects from current plant operation.

11.10 Vegetation

The REMP collects two general types of vegetation within the site. The first consists of general vegetation, non-cultivated plants which would be consumed by grazing cattle. The second consists of crops grown on site acreage licensed to farmers, about half the site's 1400 acres, for growing feed crops for cattle. Ten samples of cultivated crops (corn, hay, alfalfa, and soybeans) grown on this acreage were obtained for analyses.

The naturally occurring radionuclides Be-7 and K-40 were found in all of the general vegetation samples. The source of Be-7 is atmospheric deposition. It is continuously formed in the atmosphere by cosmic ray spallation of oxygen, carbon, and nitrogen atoms. (Spallation is a process whereby a cosmic ray breaks up the target atom's nucleus producing a radionuclide of lower mass.) Be-7 concentrations ranged from 0.18 ± 0.08 to 2.97 ± 0.25 pCi/g. The average concentrations increased from May (0.94 ± 1.10 pCi/g) than in July (1.28 ± 0.42) and October (2.54 ± 0.78). This is consistent with the known temporal variability in Be-7 concentrations in air near the earth's surface and the gradual build-up of fallout on the vegetation over time. In contrast, K-40 is a primordial radionuclide which is incorporated into vegetation from the soil during the growing process. By not being dependent upon seasonal atmospheric variations and plant surface to capture deposition, the K-40 concentrations from root uptake are more uniform with averages of 4.97, 5.60, and 5.71 in May, July, and October, respectively.

Cs-137 can be present in vegetation via both pathways. Fresh Cs-137 fallout is associated, like Be-7, with deposition on the plant surface. Old fallout from the '50s and '60s is now being incorporated into growing plants in the same manner as potassium because it is in the same chemical family as potassium. This fallout Cs-137 has been found in firewood ash at many locations in the United States that are far from any nuclear plants (S. Farber, "Cesium-137 in Wood Ash, Results of a Nationwide Survey," 5th Ann. Nat. Biofuels Conf., 10/21/1992).

In 2015 only four of the twenty-four vegetation samples had a positive indication for Cs-137 and only E-06 (0.052 ± 0.016) was significantly above background. Typically, only the vegetation collected at monitoring site E-06, in the Point Beach State Park south of PBNP, has detectable levels of Cs-137. This occurrence is attributed to the above described mechanism. The only airborne Cs-137 discharged by PBNP occurred in October 2015. Therefore, it is unlikely that the four positive Cs-137 values resulted from PBNP releases.

The only other radionuclides having positive indication were Co-60 and I-131. Although Co-58 airborne releases occurred prior to the July vegetation sample, no Co-60 was released. If the Co-60 were from PBNP effluent, Co-58 also should have been detected. No airborne I-131 releases occurred during 2015. Therefore, the I-131 can't be from PBNP. Based on these considerations, the Co-60 and I-131 results, it is concluded that these results are false positives.

Based on the 2015 general vegetation sampling results, it is concluded that there is little or no effect from PBNP effluents.

Similar results and conclusions are reached from the analytical results for the crops grown on site acreage. Naturally occurring Be-7 and K-40 are found in all crops. As in general vegetation, K-40 is incorporated from the soil whereas Be-7 is from atmospheric deposition. Only two crop samples had slightly positive results, one for Co-60 and the other for Cs-137. Although Co-58 airborne releases occurred prior to the September crop sample, no Co-60 was released. Therefore, the Co-60 is concluded to be a false positive. Similarly, in 2015 no airborne Cs-137 occurred in PBNP effluent prior to the September sample. The Cs-137 could be an indication of fallout from weapons testing, Chernobyl, and Fukushiima. However, because in both cases the results were below the minimum detectable concentration, the results are determined to be false positives.

Therefore, based on the analytical results from crops grown on site, there is little or no evidence of PBNP effluents

11.12 Land Use Census

In accordance with the requirements of Section 2.5 of the Environmental Manual, a visual verification of animals grazing in the vicinity of the PBNP site boundary was completed in 2015. No significant change in the use of pasturelands or grazing herds was noted. Therefore, the existing milk-sampling program continues to be acceptable. The nearest dairy lies in the SSE sector and it is one of the Point Beach REMP milk sampling sites. This dairy leases land in the S and SSE sectors at the PBNP site boundary for growing feed corn. Also, the highest χ/Q (1.09E-06) and D/Q (6.23E-09) values occur in these sectors. Therefore, dose calculations to the maximum exposed hypothetical individual, assumed to reside at the site boundary in the S sector, continues to be conservative for the purpose of calculating doses via the grass-cow-milk and the other ingestion pathways.

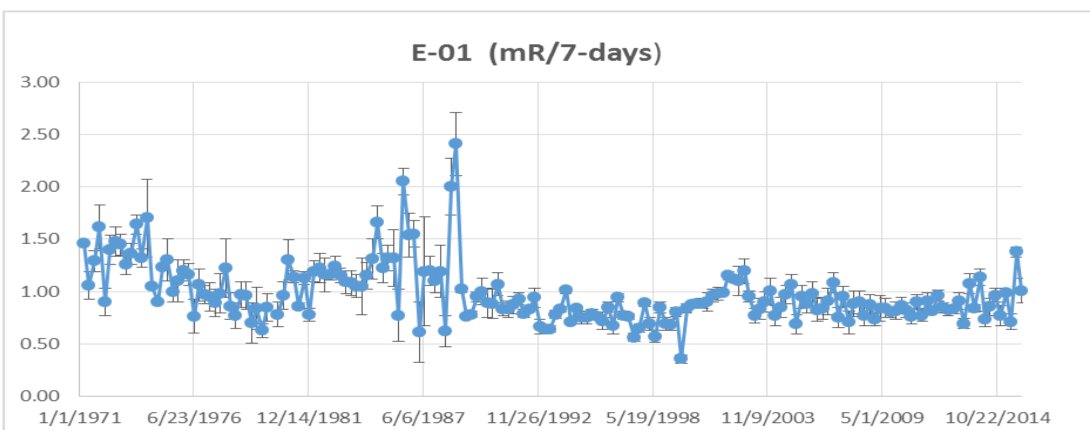
11.13 Long Term TLD Trending

To put the 2015 REMP TLD results in perspective, it is instructive to look at long term trends. The following examines the TLD results from 1971 to 2015. The ANSI standard (ANSI/HPS N13.37-2014 "Environmental Dosimetry) states that the data from early vintage dosimetry systems (c. 1970 – 1990) should not be considered comparable to current dosimetry systems in establishing a baseline for environmental TLD results. These problems are evident from the review of our early data as discussed below.

The pre-operational data, 1968 – 1970, are not included. The pre-operational ambient radiation monitoring sites were E-01 (the met tower area) through E-04 (the north boundary). They were monitored using TLDs and ionization chambers. E-04 was used as a background location until E-08 (see Figure 9-1) was added for the operational REMP in 1971. Prior to 1975, a control TLD stored in a lead pig was used for a comparison to those placed in the field. In the pre-operational data, the control TLD could be equal to or higher than the field results and both the field and control TLD results appear erratic compared to the ion-chamber results. Also, the reported TLD results do not have transportation exposures from New Mexico to Wisconsin subtracted. Therefore, only the TLD results beginning in 1971, with the transportation caveat, are used in this analysis of long-term trends.

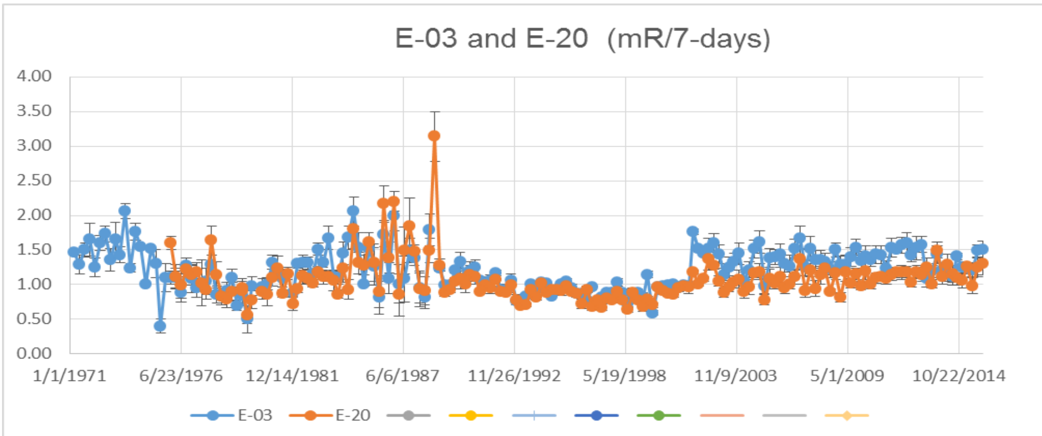
The trend at E-01(Figure 11-6) shows slowly decreasing tread from 1971 to 1979. This is may be an artifact. The cause is not known. As previously mentioned, no transportation controls were used until the 4th quarter of 1975 so no transport dose corrections were made prior to that quarter. There is a small increase in 1980 when the current contracted REMP lab began. A slowly decreasing exposure rate occurs from 1980 – 1992 except for the 1984 - 1988 time segments. The erratic results from 1984 – 1988 was traced to a faulty connection in the TLD reader.

Figure 11-6 E-01 Results 1971 - 2015



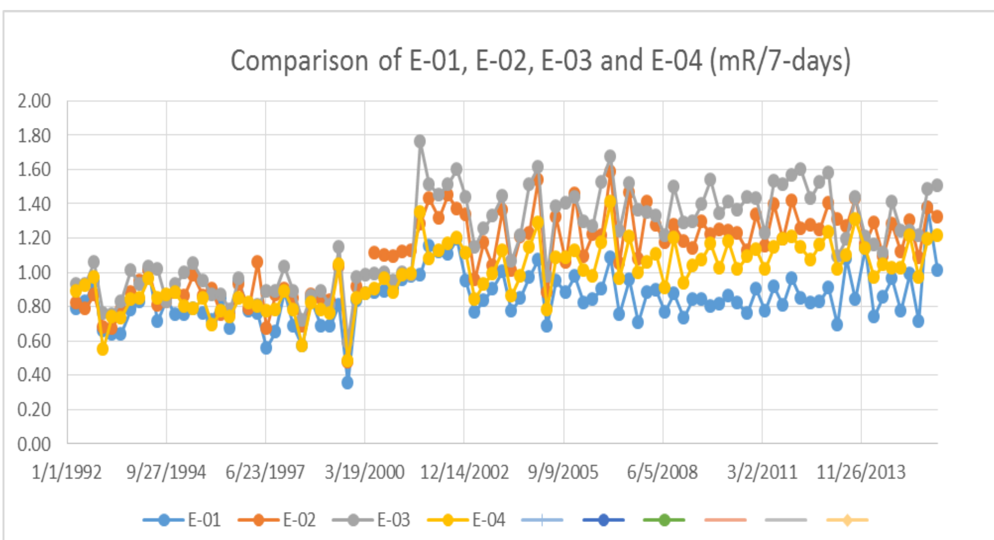
The TLD package from 1980 to 2001 consisted of three LiF chips sealed in a black plastic bag. The magnitude of the error bars indicates the degree of variability of the 1984 - 1988 results from the three chips due to a fault in the TLD reader. The results appear much the same for the E-03 and E-20 results (Figure 11-7). Note that E-20 did not begin until 1976. Again, there is an increase in both the E-20 (the background site) and E-03 (the location nearest the ISFSI) which coincides with the switch from the LiF chips to the Teflon TLD cards. Given that the first twelve casks were loaded December 1995 to September 2000 in which there were no increases in the TLD results, the increase in 2001 indicates that this change is the result of the different response of the new TLDs and not of any effluents or shine from the plant.

Figure 11-7 Comparison of E-03 and E-20 Results 1971 – 2015



Narrowing the time window for the TLD comparisons from 1992 to the present allows a comparison among the for original four TLD locations since the introduction of the ISFSI (Figure 11-8) without the interference by the faulty TLD reader in the mid-1980s. Sites E-01 and E-02 are about 1 mile south of the ISFSI. E-03 is 1200 feet west and E-04 is 4300 feet north.

Figure 11-8 Comparison of E-01, E-02, E-03 and E-04 Results 1992 – 2015



The comparison shows a definite difference between E-01 and the other three locations. E-01, although approximately the same distance from the ISFSI as E-02 and further away than either E-03 or E-04, is lower than the other three sites. Therefore, distance is not the determining factor in the difference among the measured exposures. There are two factors which could cause the observed difference. The first difference is that E-02, E-3, and E-04 are surrounded by plowed fields whereas the area around E-01 is uncultivated. Second, E-01 is within 100 feet of the lake. Therefore, about 50% of the area contributing natural radiation to the location is a combination of beach sand and lake water. As seen from the REMP soil and beach analyses, beach sand has lower averages Ra-226 content than the soil, 0.38 ± 0.07 pCi/g for beach sand *vs*. 0.86 ± 0.36 pCi/g for soil.

The impact of the ISFSI on the ambient radiation levels at its nearest site boundary, the west boundary is shown in Figure 11-9. The ISFSI impact on ambient exposure levels was addressed briefly in Section 11.1 (see Figure 11-2).

Figure 11-9 E-03, E-31, and Background Site E-20 Results 1992 to 2015

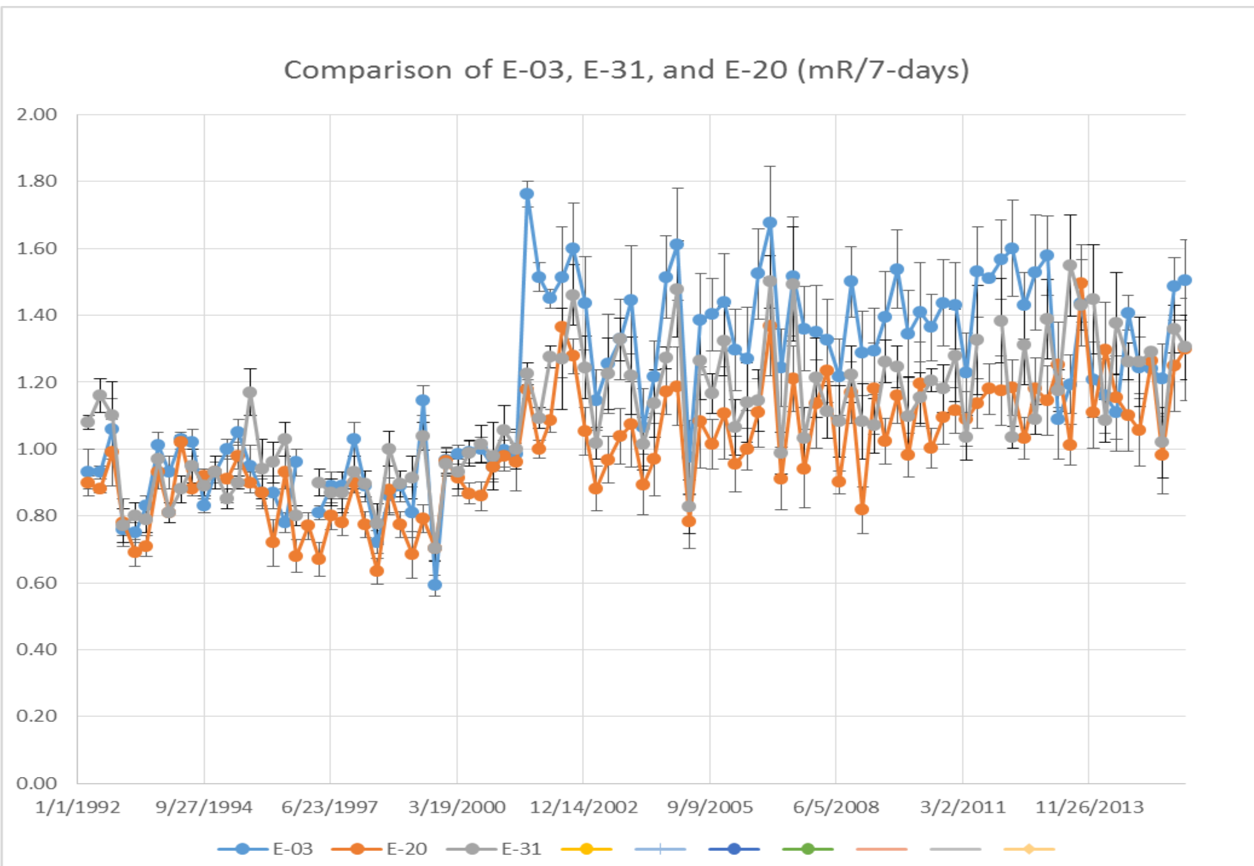


Figure 11-2 shows that beginning with the use of the Teflon TLD cards in the fourth quarter of 2000, the measured exposure levels at E-03 are 2 – 5 mR/7-days lower than the exposures at the west fence of the ISFSI. Figure 11-9 shows that although their individual 95% confidence levels overlap indicating no statistical difference, the quarterly exposures at E-03 (about 1200 feet from the ISFSI) are consistently higher than the exposure at E-31 (at the site boundary about 1400 feet west of E-03). Therefore, the lower values at E-31 compared to E-03 appear to be a real difference as the distance from the ISFSI increases at the west boundary. Because land usage and location are similar at E-03 and E-31, the cause of the previously identified response differences between E-03 and E-01 are not applicable. Therefore, the lower results at the site boundary location E-31show that the exposures from the ISFSI are dropping off and approaching the lower readings found at the background site E-20.

12.0 REMP CONCLUSION

Based on the analytical results from the 811 environmental samples and from 130 sets of TLDs that comprised the PBNP REMP for 2015, PBNP effluents had no discernable effect on the surrounding environs. The calculated effluent doses are below the 10 CFR 50, Appendix I dose objectives demonstrate that PBNP continues to have good controls on effluent releases. The control of effluents from PBNP continues to be acceptable pursuant to the ALARA criteria of 10 CFR 50.34a. Additionally, when the TLD results are factored in to the overall exposure, the resulting doses are lower than the ISFSI (10 CFR 72.104) and EPA (40 CFR 190) limits of 25 mrem whole body, 75 mrem thyroid, and 25 mrem any other organ.

From the long-term analysis of TLD results, there is no evidence of elevated ambient radiation levels from the operation of Point Beach except for the slightly higher exposures measured at the site boundary (E-31) compared to the background reference site (E-20).

Part D
GROUNDWATER MONITORING

13.0 PROGRAM DESCRIPTION

PBNP monitors groundwater for tritium as part of the Groundwater Protection Program (GWPP). During 2015 the sampling program consisted of beach drains, intermittent stream and bog locations, drinking water wells, façade wells, yard electrical manholes, ground water monitoring wells, and the subsurface drainage (SSD) system sump located in the U-2 façade.

In the late 1970s, the beach drains entering Lake Michigan were found to contain tritium. The beach drains are the discharge points for yard drainage system, which carries storm water runoff, and are known to be infiltrated by groundwater as observed by discharges even when no rain has occurred. In the 1980s, the source of H-3 for this pathway was postulated to be spent fuel pool leakage into the groundwater under the plant. Based on this observation, modifications were made to the pool, and the tritium concentrations decreased below the effluent LLDs. Beach drain effluents continue to be monitored and are accounted for in the monthly effluent quantification process. Because the beach drains are susceptible to groundwater in-leakage from other sources such as the area around the former retention pond which is known to contain H-3, the beach drains are monitored as part of the groundwater monitoring program. In addition to H-3, groundwater beach drain samples also are gamma scanned for the same suite of radionuclides as lake water using the lake water LLDs.

Three intermittent stream locations and the Energy Information Center (EIC) well were added to the groundwater monitoring program in the late 1990s when it was discovered that tritium diffusion from the then operable, earthen retention pond was observable in the intermittent streams which transverse the site in a NW to SE direction. A fourth stream location closer to the plant was added in 2008. These streams pass on the east and west sides of the former retention pond and empty into Lake Michigan about half a mile south of the plant near the meteorological tower. The intermittent stream samples track H-3 in the surface groundwater.

The groundwater monitoring program also includes two bogs / ponds on site. One is located about 400 feet SSE of the former retention pond; the other, about 1500 feet N.

In addition to the main plant well, four other drinking water wells also are monitored. The Site Boundary Control Center well, located at the plant entrance, the Warehouse 6 well, on the north side of the plant, and the EIC well, located south of the plant. In 2012, a new building (Warehouse 7) was constructed for radwaste. The well for this building was added to the GWPP. These wells do not draw water from the top 20 - 30 feet of soil which is known to contain H-3. These wells monitor the deeper (200 - 600 feet), drinking water aquifer from which the main plant well draws its water. The two soil layers are separated by a gray, very dense till layer of low permeability identified by hydrological studies.

Manholes in the plant yard and for the subsurface drainage (SSD) system under the plant are available for obtaining ground water samples. The plant yard manholes for accessing electrical conduits are susceptible to ground water in-leakage. Therefore, a number of these were sampled. The SSD system was designed to lessen hydrostatic pressure on the foundation by controlling the flow of water under the plant and around the perimeter of the foundation walls. The SSD system flows to a sump in the Unit 2 facade. The sump was sampled ten times during 2015.

Due to flooding concerns, man-holes and clean-outs for the SSD now are sealed in 2014. Therefore, only the SSD sump now is used for sampling.

In the 1990s, two wells were sunk in each unit’s façade to monitor the groundwater levels and look for evidence of concrete integrity as part of the ISI IWE Containment Inspection Program. These wells are stand pipes which are sampled periodically for chemical analyses. Façade well sampling has been part of the GWPP since 2007. These wells are sampled quarterly.

The groundwater sampling sites (other than the beach drains, SSDs and manholes) are shown in Figure 13.1.

Figure 13-1 Groundwater Monitoring Locations

14.0 RESULTS AND DISCUSSION

14.1 Streams and Bogs

The results from the surface groundwater monitoring associated with the former retention pond are presented in Table 14-1. For the most part, the creek results are barely above the detection level and less than the MDC. The highest averages are for the East Creek and STP which are in the flow path to Lake Michigan. The West Creek is west of the former retention pond, an upstream location with respect to the groundwater flow. The H-3 concentration at GW-08, close to the former retention pond, is about one-tenth of the H-3 concentrations it had prior to the remediation of the retention pond.

Table 14-1 Intermittent Streams and Bogs
H-3 Concentration (pCi/l)

Month	GW-01(E-01)			GW-02			GW-03			GW-17			BOGS						MDC
	Creek Confluence			E. Creek			W. Creek			STP			GW-07			GW-08			
Jan	NS	±		NS	±		NS	±		NS	±								
Feb	NS	±		NS	±		NS	±		NS	±								
Mar	167	±	80	270	±	85	93	±	76	196	±	81							147
Apr	136	±	80	222	±	84	107	±	79	220	±	84							147
May	106	±	80	ND	±		129	±	81	131	±	81	135	±	84	275	±	91	150
Jun	123	±	78	184	±	81	ND	±		174	±	80							143
Jul	124	±	81	83	±	79	141	±	82	221	±	86							143
Aug	77	±	76	173	±	81	117	±	78	138	±	79							145
Sep	143	±	81	189	±	83	113	±	79	220	±	85							147
Oct	ND	±		ND	±		ND	±		112	±	76							141
Nov	ND	±		163	±	80	ND	±		97	±	77							144
Dec	ND	±		122	±	78	ND	±		NS	±								144
Average	125	±	29	176	±	54	117	±	17	168	±	49							

A blank indicates no sample was available. Streams are sampled monthly; bogs, annually.
NS = no sample due to dry or frozen. Streams are sampled monthly; bogs, annually.
Values are presented as the measured value and the 95% confidence level counting error.
ND = measured value is less than the minimum detectable concentration. The LLD = 200 pCi/l.

The analyses of these surface water samples show low concentrations of H-3. Although small positive H-3 concentrations occur in samples from the confluence of the two creeks (GW-01) and from the West Creek (GW-03), all, but one, of these concentrations are below their associated MDCs. In contrast, there are more positive results from GW-02 (south end of the East Creek) and GW-17 (located at the north end of the East Creek). GW-17 is directly east of the former retention pond area in the groundwater flow path to Lake Michigan. The East Creek concentrations are generally lower than the 300 - 350 pCi/l found before the retention pond was remediated in 2002. It should be noted that the East Creek, in addition to being path of the west to east groundwater flow from the old retention pond, also is fed by yard runoff from the west side of the yard which may account for the higher values.

The bog (GW-08) SE of the former retention pond is higher than the bog at GW-07 north of the former retention pond. These results are in conformance with the west to east groundwater flow described in the Site Conceptual Model and the FSAR.

The GW-08 bog result is down from the 3000 pCi/l seen before the pond was remediated.

14.2 <u>Beach Drains</u>

The 2015 results for the beach drains are presented in Table 14-2. [The drain data from left to right in the table are in the order of the drains from north to south.] S-1 collects yard drainage from the north part of the site yard; S-3, from the south. Drains S-8 and S-9 carry water from the lake side yard drains whereas drains S-7 and S-10 are from the turbine building roof. S-11 is not connected to any yard drain system and mainly carries groundwater flow and runoff from a small lawn area south of the plant.

Table 14-2
2015 Beach Drain Tritium
Average H-3 Concentration (pCi/l)

Month	S-1	S-7	S-8	S-9	S-10	S-3	S-11	MDC
Jan	NF ±	NF ±	NF ±	NF ±	NF ±	NF ±	NF ±	
Feb	NF ±	NF ±	NF ±	NF ±	NF ±	NF ±	NF ±	
Mar	355 ± 95	NF ±	NF ±	NF ±	NF ±	316 ± 93	210 ± 88	148
Apr	134 ± 86	NF ±	NF ±	NF ±	NF ±	430 ± 99	214 ± 90	150
May	200 ± 87	NF ±	NF ±	NF ±	NF ±	302 ± 92	NF ±	147
Jun	212 ± 87	NF ±	NF ±	NF ±	NF ±	190 ± 86	NF ±	155
Jul	160 ± 100	NF ±	NF ±	NF ±	NF ±	262 ± 104	NF ±	154
Aug	122 ± 85	NF ±	NF ±	NF ±	NF ±	644 ± 107	NF ±	150
Sep	205 ± 84	NF ±	NF ±	NF ±	NF ±	249 ± 87	NF ±	148
Oct	244 ± 86	NF ±	NF ±	NF ±	NF ±	165 ± 82	NF ±	149
Nov	342 ± 92	NF ±	NF ±	NF ±	NF ±	219 ± 86	NF ±	151
Dec	292 ± 87	NF ±	NF ±	NF ±	NF ±	152 ± 80	NF ±	145
Avg =	227 ± 81					293 ± 148	212 ± 3	

ND = not detected and ≤MDC
NF = no sample due to no flow

The high H-3 concentrations (355 and 644 pCi/l) occur in March of 2015 at S-1 and August at S-3. As in previous years, measureable H-3 results occur mostly in drains S-1 and S-3. As shown in previous reports, these high values are attributable to precipitation scavenging by rain and snow followed by melting.

Gamma scans were performed on the beach drain samples at the LLD used for lake water. A few indications of small, positive concentration values below the calculated MDC were found for Zr-Nb-95(1), Cs-137(2), Fe-59 (1), Zn-65(1), Ba-La-140(4) as well as for naturally occurring Be-7(1). A liquid release source can be ruled out because no Ba-La-140 was released in 2015. Had there been a liquid source radionuclides such as Co-58 and Co-60 would have been seen as well. Similarly, no airborne Ba/La-140 was released either. Given that the measured concentrations are below their analytical MDC values, that they occur sporadically, and that some of these isotopes were not found in PBNP effluent, these small, positive values are considered to be false positives. Therefore, it is concluded that H-3 is the only PBNP radionuclide found in the beach drains.

14.3 Electrical Vaults and Other Manholes

Manholes for access to below ground electrical facilities are susceptible to groundwater in-leakage. The manholes east side of the plant, between the Turbine building and Lake Michigan have low H-3 concentrations (Table 14-3). These manholes, Z-066A and Z-067A through Z-066D AND Z-067D, run in parallel in the NE section of the yard beginning just north of the Unit 2 truck bay and run from the Unit 2 truck bay north to the EDG building. Z-068 is located just west of the EDG building and north of Z-66/67D. Each of the two A, B, C, and D vaults is side by side. Based on being side-by-side, it is expected that the each pair of manholes 66A/67A, etc. would have similar H-3 concentrations. This is appears to hold except for the 66B/67B vaults where the April H-3 results were not different from zero in the 66B sample. Unequal groundwater inleakage is the most probable cause.

Table 14-3
2015 East Yard Area Manhole Tritium (pCi/l)

MH	4/23/2015			9/28/2015		
Z-066A	77	±	76	163	±	83
Z-067A	139	±	79	209	±	85
Z-066B	ND			ND		
Z-067B	248	±	84	ND		
Z-066C	ND	±		153	±	82
Z-067C	98	±	77	125	±	81
Z-066D	153	±	80	212	±	85
Z-067D	199	±	82	136	±	81
Z-068	250	±	85	220	±	86
MDC	152			149		
ND = not detected						

14.4 Façade Wells and Subsurface Drainage System

There are two methods of sampling the groundwater under the plant foundation. The first is a set of four shallow wells, two in each façade. The other is a subsurface drainage system (SSD). The façade wells were installed to monitor for groundwater conditions which may be detrimental to the integrity of the concrete and rebar of each unit's foundation. The SSD was designed to relieve hydrostatic pressure on each unit's foundation as well as the Auxiliary and Turbine buildings.

The façade wells are not located symmetrically in the two units. The Unit 1 façade wells are east of the containment in the SE (1Z-361A) and NE (1Z-361B) corners of the façade. However, in Unit 2, there is one well in the NW corner (2Z-361A) and the other rotated approximately 180° in the SW corner (2Z-361B). In each the well cap is level with the floor.

The 2015 façade well results are shown in Table 14-4. The Unit 1 wells continue to have higher H-3 concentrations than the U2 wells with 1Z-361A, in the SE corner of the Unit 1 façade, having the highest H-3 concentrations. The highest results are in line with the 2013 and 2014 highs of 324 and 375 pCi/l, respectively. By contrast, the 2007 and 2008 high concentrations were 1169 - 1331 pCi/l. Based on these façade well results, the conclusion is that H-3 is unevenly distributed in the soil beneath the plant continues to be true.

Table 14-4
2015 Facade Well Water Tritium (pCi/l)

Month	UNIT 1		UNIT 2		MDC
	1Z-361A	1Z-361B	2Z-361A	2Z-361B	
February	307 ± 91	147 ± 83	NS ±	ND ± 81	151
April	287 ± 107	ND ±	ND ±	ND ± 84	183
August	253 ± 87	ND ±	ND ±	101 ± 80	150
October	346 ± 88	ND ±	ND ±	120 ± 77	141

To relieve hydrostatic pressure on the foundation, Point Beach has an external and an internal subsurface drainage system (SSD) to drain groundwater away from the foundation.

The internal SSD consist of perforated piping which drains groundwater by gravity to a sump located in the Unit 2 façade. The part of the SSD under the Turbine Building is at a higher elevation than the part under the facades. The SSD sump results are presented in Table 14-5. The 2015 average concentration of 599 ± 131 pCi/l is not statistically different than the 725 ± 235, 643 ± 201 and 513 ± 269 pCi/l seen in 2014, 2013 and 2012, respectively.

The external SSD system runs along the external foundation walls for the Unit 1 and Unit 2 facades, the Auxiliary Building, the North Service Building, and the Turbine Hall. It is not connected to the internal SSD system. During 2014, work to mitigate the possibility of external flooding events uncovered the N and S external SSD outfalls. Both the north and south halves of the external SSD system drain toward the beach. No samples from the external SSD were obtained in 2015 because there was not flow.

Table 14-5
2015 Unit 2 Facade SSD Sump H-3 (pCi/l)

Date	pCi/l		2σ	MDC
20-Jan	682	±	135	196
15-Feb	721	±	107	148
26-Mar	475	±	102	152
30-Apr	648	±	106	147
2-Jun	741	±	109	155
30-Jun	591	±	105	149
31-Aug	577	±	104	147
30-Sep	306	±	91	144
30-Oct	683	±	103	143
7-Dec	568	±	98	146
31-Dec	496	±	112	152
Average	590	±	128	

In addition to H-3, the façade wells and internal SSD samples were gamma scanned. As in lake water samples, small positive values below their calculated, minimum detectable concentrations were found.

The isotopes in the SSD and façade wells were Fe-59, Co-58/60, Zr-Nb-95, Cs-137, and Ba-La-140. In the SSD, Mn-54, Fe-59, Co-60, Cs-137, and Ba-La-140 had small, positive values. There are no known inputs to the soil beneath the plant. Therefore, because the values were less than or equal to the MDC, it is concluded that these results are false positives.

14.5 Potable Water and Monitoring Wells

Outside of the protected area, ten wells, in addition to the main plant well (Section 11.7), are used for monitoring H-3 in groundwater: the four potable water wells, GW-04 (Energy Information Center or EIC), GW-05 (Warehouse 6), GW-18 (Warehouse 7), GW-06 (Site Boundary Control Center), and six H-3 groundwater monitoring wells, GW-11 through GW-16 (Figure 13-1). The potable water wells monitor the deep, drinking water aquifer whereas the monitoring wells penetrate less than 30 feet to monitor the top soil layer. The potable water aquifer is separated from the shallow, surface water aquifer by a thick, impermeable clay layer. The potable water wells had no detectable H-3 (Table 14-6).

Table 14-6
2015 Potable Well Water Tritium Concentration (pCi/l)

Month	EIC WELL GW-04	EIC MDC	Warehouse 6 Well GW-05	SBCC Well GW-06	WH 7 GW-18	GW-05, 06, 18 MDC
Jan	ND	192	ND	ND	ND	165
Feb	ND	142				
Mar	ND	147				
Apr	ND	147	ND	ND	ND	158
May	ND	150				
Jun	ND	143				
Jul	ND	143	ND	ND	ND	154
Aug	ND	145				
Sep	ND	147				
Oct	ND	141	ND	ND	ND	149
Nov	ND	144				
Dec	ND	144				

ND= not detected

The monitoring well results are similar to that obtained in 2014. The two monitoring wells showing consistent, detectable H-3 (GW-15, GW-16) are in the flow path from the retention pond area to the lake (Table 14-7). The highest H-3 concentration occurs at GW-15, the well closest to the former unlined retention pond. However, considering the statistical uncertainty of the measurements, the results from GW-15 and GW-16 are the same.

These two samples and those from the nearby surface water sample locations (GW-03, the east creek; GW-08, the bog to the SE of the former pond; and GW-17, the surface water on the SE corner of the STP) demonstrate that the area around and in the groundwater flow from the former retention pond remain impacted by the H-3 that diffused from the pond into the soil while it was in use.

Table 14-7 2015 Quarterly Monitoring Well Tritium (pCi/l)

Q	MW-01 GW-11	MW-02 GW-12	MW-06 GW-13	MW-05 GW-14	MW-04 GW-15	MW-03 GW-16	MDC
1	ND ±	NS ±	ND ±	ND ±	*131 ± *105	147 ± 106	196
2	ND ±	ND ±	ND ±	ND ±	ND ±	186 ± 81	159
3	130 ± 82	ND ±	159 ± 83	139 ± 82	284 ± 89	199 ± 85	143
4	108 ± 76	NS ±	134 ± 77	91 ± 75	187 ± 80	179 ± 80	141

ND= not statistically different from zero. NS = no sample available

*Duplicate samples taken. The other results was ND.

15.0 GROUNDWATER SUMMARY

Groundwater monitoring indicates that low levels of tritium continue to occur in the upper soil layer but not in the deep, drinking water aquifer. These results also indicate that the low levels of tritium are restricted to a small, well defined area close to the plant. Results from precipitation analyses (2011 AMR) show that airborne H-3 concentrations are higher close to the plant as compared to results at the site boundaries. The observed tritium concentrations in the yard manholes can be explained by the higher H-3 in precipitation close to the plant. In addition to tritium captured by precipitation, the beach drains also receive the H-3 captured in the AC condensate because the condensate drainage is connected to the yard drain system.

Tritium continues in the soil below the plant foundation as evidenced by results from the subsurface drainage system and from the façade wells.

Except for the monitoring wells downstream from the former retention pond, the monitoring well tritium concentrations are not different from zero. These results conform to the known west-to-east groundwater flow at the site. Therefore, the impact of the flow of tritiated groundwater from the vicinity of the former retention pond toward the lake on beach drain S-3 tritium results as can not be discounted. The impact of this flow would be greater on beach drain S-3 than on S-1 because the eastward flow in the area of S-3 would be less impacted by plant structures than the drainage system feeding beach drain S-1.

In conclusion, the groundwater H-3 concentrations observed at Point Beach are below the EPA drinking water standards prior to emptying into Lake Michigan where they will undergo further dilution. All analyses to date indicate that the drinking water contains no tritium. None of the H-3 in the upper soil layer is migrating off-site toward the surrounding population. This is based on the known west-to-east groundwater flow toward Lake Michigan and the negative results from the four wells (GW-11 through GW-14, Figure 13-1). Additionally, because no H-3 is detected in either of the four on-site drinking water wells close to the power block or from the drinking water well at the site boundary, none of the H-3 observed in the upper soil layer has penetrated into the drinking water aquifer to endanger either on-site or off-site personnel.

APPENDIX 1

Environmental, Inc. Midwest Laboratory
Final Report for the Point Beach Nuclear Plant
and
Other Analyses
Reporting Period: January – December 2015

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

FINAL REPORT
TO
NextEra Energy

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP) FOR THE POINT BEACH NUCLEAR PLANT TWO RIVERS, WISCONSIN

PREPARED AND SUBMITTED
BY
ENVIRONMENTAL INCORPORATED MIDWEST LABORATORY

Project Number: 8006

Reporting Period: January-December, 2015

Reviewed and
Approved by ____________________ Date 02-01-2016
B. Grob, M.S.
Laboratory Manager

Distribution: K. Johansen, 1 hardcopy, 1 e-mail

Received 2-8-16
reviewed 2-8-16 KO
AR02107483 generated
for slightly elevated H3
for 4th quarter at
Two Creeks

POINT BEACH NUCLEAR PLANT

TABLE OF CONTENTS

POINT BEACH NUCLEAR PLANT

LIST OF TABLES

POINT BEACH NUCLEAR PLANT

1.0 INTRODUCTION

The following constitutes the final 2015 Monthly Progress Report for the Environmental Radiological Monitoring Program conducted at the Point Beach Nuclear Plant, Two Rivers, Wisconsin. Results of analyses are presented in the attached tables. Data tables reflect sample analysis results for both Technical Specification requirements and Special Interest locations and samples are randomly selected within the Program monitoring area to provide additional data for cross-comparisons.

For gamma isotopic analyses, the spectrum covers an energy range from 80 to 2048 KeV. Specifically included are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters, such as K-40 and Ra daughters, are frequently detected in soil and sediment samples. Specific isotopes listed are K-40, Tl-208, Pb-212, Bi-214, Ra-226 and Ac-228. Unless noted otherwise, the results reported under "Other Gammas" are for Co-60 and may be higher or lower for other radionuclides.

All concentrations, except gross beta, are decay corrected.

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples.

POINT BEACH NUCLEAR PLANT

2.0 LISTING OF MISSED SAMPLES

Sample Type	Location	Expected Collection Date	Reason
LW	E-01	02-15-15	No sample due to icy conditions.
LW	E-05	02-15-15	No sample due to icy conditions.
LW	E-06	02-15-15	No sample due to icy conditions.
LW	E-33	02-15-15	No sample due to icy conditions.
Algae	E-05	06-10-15	No algae found
Algae	E-12	06-10-15	No algae found
AP/AI	E-01	07-01-15	Loss of power due to storms.
Algae	E-05	08-27-15	No algae found
Algae	E-05	10-07-15	No algae found
Algae	E-12	10-07-15	No algae found

3.0 Data Tables

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-01, Meteorological Tower
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131	Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030	Required LLD		0.010	0.030
01-07-15	343	0.032 ± 0.004	< 0.007	07-08-15	295	0.018 ± 0.003	< 0.011
01-14-15	304	0.028 ± 0.004	< 0.013	07-15-15	300	0.018 ± 0.003	< 0.006
01-21-15	295	0.029 ± 0.004	< 0.010	07-22-15	301	0.016 ± 0.003	< 0.008
01-28-15	297	0.020 ± 0.003	< 0.007	07-29-15	301	0.027 ± 0.004	< 0.009
02-04-15	299	0.025 ± 0.003	< 0.005	08-05-15	300	0.017 ± 0.003	< 0.008
02-11-15	307	0.035 ± 0.004	< 0.010	08-12-15	301	0.019 ± 0.003	< 0.010
02-18-15	301	0.025 ± 0.003	< 0.006	08-19-15	292	0.043 ± 0.005	< 0.011
02-25-15	305	0.051 ± 0.004	< 0.009	08-26-15	307	0.018 ± 0.003	< 0.009
				09-02-15	300	0.035 ± 0.004	< 0.009
03-04-15	309	0.032 ± 0.004	< 0.013				
03-11-15	298	0.029 ± 0.004	< 0.009	09-09-15	293	0.039 ± 0.004	< 0.011
03-18-15	301	0.019 ± 0.003	< 0.012	09-16-15	304	0.027 ± 0.004	< 0.006
03-25-15	306	0.022 ± 0.004	< 0.010	09-23-15	300	0.027 ± 0.004	< 0.011
04-01-15	304	0.018 ± 0.003	< 0.011	09-30-15	297	0.030 ± 0.004	< 0.008
1st Quarter Mean ± s.d.		0.028 ± 0.009	< 0.009	3rd Quarter Mean ± s.d.		0.026 ± 0.009	< 0.009
04-08-15	311	0.024 ± 0.003	< 0.006	10-07-15	302	0.015 ± 0.003	< 0.006
04-15-15	298	0.020 ± 0.003	< 0.014	10-14-15	302	0.023 ± 0.004	< 0.008
04-22-15	296	0.013 ± 0.003	< 0.009	10-21-15	296	0.027 ± 0.004	< 0.007
04-29-15	306	0.014 ± 0.003	< 0.010	10-28-15	305	0.024 ± 0.004	< 0.005
05-06-15	300	0.015 ± 0.003	< 0.012	11-04-15	308	0.020 ± 0.003	< 0.008
05-13-15	300	0.012 ± 0.003	< 0.010	11-11-15	315	0.029 ± 0.004	< 0.010
05-20-15	301	0.017 ± 0.003	< 0.014	11-18-15	304	0.039 ± 0.004	< 0.010
05-27-15	301	0.020 ± 0.003	< 0.010	11-24-15	274	0.022 ± 0.004	< 0.015
06-03-15	302	0.013 ± 0.003	< 0.010	12-02-15	336	0.031 ± 0.004	< 0.006
06-10-15	302	0.017 ± 0.003	< 0.012	12-09-15	310	0.053 ± 0.005	< 0.009
06-17-15	310	0.012 ± 0.003	< 0.009	12-16-15	298	0.028 ± 0.004	< 0.007
06-24-15	293	0.014 ± 0.003	< 0.009	12-22-15	269	0.029 ± 0.004	< 0.012
07-01-15		ND[a]		12-30-15	352	0.027 ± 0.003	< 0.009
2nd Quarter Mean ± s.d.		0.016 ± 0.004	< 0.010	4th Quarter Mean ± s.d.		0.028 ± 0.009	< 0.009
				Cumulative Average		0.025 ± 0.009	< 0.009

[a] "ND" = No data; see Table 2.0, Listing of Missed Samples.

POINT BEACH NUCLEAR PLANT

Table 1: Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-02, Site Boundary Control Center
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-07-15	350	0.031 ± 0.003	< 0.007
01-14-15	303	0.026 ± 0.004	< 0.013
01-21-15	287	0.032 ± 0.004	< 0.011
01-28-15	306	0.022 ± 0.003	< 0.007
02-04-15	310	0.024 ± 0.003	< 0.005
02-11-15	307	0.032 ± 0.004	< 0.010
02-18-15	310	0.028 ± 0.004	< 0.006
02-25-15	323	0.054 ± 0.004	< 0.008
03-04-15	307	0.031 ± 0.004	< 0.013
03-11-15	303	0.020 ± 0.004	< 0.009
03-18-15	303	0.020 ± 0.004	< 0.012
03-25-15	305	0.019 ± 0.004	< 0.010
04-01-15	306	0.018 ± 0.003	< 0.011
1st Quarter Mean ± s.d.		0.027 ± 0.009	< 0.009
04-08-15	305	0.021 ± 0.003	< 0.006
04-15-15	305	0.018 ± 0.003	< 0.014
04-22-15	290	0.012 ± 0.003	< 0.009
04-29-15	305	0.012 ± 0.003	< 0.010
05-06-15	302	0.017 ± 0.003	< 0.012
05-13-15	302	0.010 ± 0.003	< 0.010
05-20-15	297	0.013 ± 0.003	< 0.015
05-27-15	297	0.022 ± 0.003	< 0.010
06-03-15	300	0.014 ± 0.003	< 0.010
06-10-15	300	0.021 ± 0.003	< 0.012
06-17-15	304	0.009 ± 0.003	< 0.009
06-24-15	294	0.014 ± 0.003	< 0.009
07-01-15	301	0.018 ± 0.003	< 0.012
2nd Quarter Mean ± s.d.		0.016 ± 0.004	< 0.011

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-08-15	303	0.021 ± 0.004	< 0.011
07-15-15	300	0.015 ± 0.003	< 0.006
07-22-15	299	0.019 ± 0.003	< 0.008
07-29-15	303	0.030 ± 0.004	< 0.009
08-05-15	298	0.019 ± 0.003	< 0.008
08-12-15	305	0.019 ± 0.003	< 0.010
08-19-15	304	0.038 ± 0.004	< 0.010
08-26-15	295	0.015 ± 0.003	< 0.010
09-02-15	295	0.039 ± 0.004	< 0.009
09-09-15	303	0.040 ± 0.004	< 0.010
09-16-15	310	0.026 ± 0.004	< 0.006
09-23-15	296	0.028 ± 0.004	< 0.011
09-30-15	298	0.036 ± 0.004	< 0.008
3rd Quarter Mean ± s.d.		0.027 ± 0.009	< 0.009
10-07-15	297	0.016 ± 0.003	< 0.006
10-14-15	296	0.029 ± 0.004	< 0.008
10-21-15	302	0.027 ± 0.004	< 0.007
10-28-15	302	0.022 ± 0.004	< 0.006
11-04-15	308	0.029 ± 0.004	< 0.008
11-11-15	307	0.026 ± 0.004	< 0.010
11-18-15	297	0.041 ± 0.004	< 0.010
11-24-15	264	0.022 ± 0.004	< 0.016
12-02-15	343	0.034 ± 0.004	< 0.006
12-09-15	306	0.053 ± 0.005	< 0.009
12-16-15	299	0.030 ± 0.004	< 0.007
12-22-15	260	0.029 ± 0.004	< 0.013
12-30-15	353	0.027 ± 0.003	< 0.009
4th Quarter Mean ± s.d.		0.029 ± 0.009	< 0.009
Cumulative Average		0.025 ± 0.010	< 0.009

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-03, West Boundary
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-07-15	339	0.033 ± 0.004	< 0.007
01-14-15	293	0.028 ± 0.004	< 0.013
01-21-15	297	0.035 ± 0.004	< 0.010
01-28-15	298	0.022 ± 0.003	< 0.007
02-04-15	302	0.022 ± 0.003	< 0.005
02-11-15	310	0.034 ± 0.004	< 0.009
02-18-15	300	0.031 ± 0.004	< 0.006
02-25-15	305	0.052 ± 0.004	< 0.009
03-04-15	306	0.030 ± 0.004	< 0.013
03-11-15	299	0.026 ± 0.004	< 0.009
03-18-15	299	0.020 ± 0.004	< 0.012
03-25-15	299	0.024 ± 0.004	< 0.010
04-01-15	307	0.016 ± 0.003	< 0.011
1st Quarter Mean ± s.d.		0.029 ± 0.009	< 0.009
04-08-15	308	0.022 ± 0.003	< 0.006
04-15-15	297	0.017 ± 0.003	< 0.014
04-22-15	286	0.010 ± 0.003	< 0.009
04-29-15	304	0.013 ± 0.003	< 0.010
05-06-15	303	0.014 ± 0.003	< 0.012
05-13-15	303	0.010 ± 0.003	< 0.010
05-20-15	301	0.014 ± 0.003	< 0.014
05-27-15	301	0.017 ± 0.003	< 0.010
06-03-15	304	0.013 ± 0.003	< 0.010
06-10-15	304	0.019 ± 0.003	< 0.012
06-17-15	294	0.013 ± 0.003	< 0.009
06-24-15	294	0.012 ± 0.003	< 0.009
07-01-15	289	0.018 ± 0.003	< 0.013
2nd Quarter Mean ± s.d.		0.015 ± 0.003	< 0.011

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-08-15	300	0.022 ± 0.004	< 0.011
07-15-15	299	0.020 ± 0.003	< 0.006
07-22-15	296	0.016 ± 0.003	< 0.008
07-29-15	305	0.029 ± 0.004	< 0.009
08-05-15	296	0.017 ± 0.003	< 0.008
08-12-15	302	0.016 ± 0.003	< 0.010
08-19-15	213	0.051 ± 0.006	< 0.015
08-26-15	306	0.015 ± 0.003	< 0.009
09-02-15	289	0.034 ± 0.004	< 0.009
09-09-15	300	0.051 ± 0.005	< 0.011
09-16-15	302	0.027 ± 0.004	< 0.006
09-23-15	304	0.031 ± 0.004	< 0.011
09-30-15	295	0.036 ± 0.004	< 0.008
3rd Quarter Mean ± s.d.		0.028 ± 0.012	< 0.009
10-07-15	305	0.015 ± 0.003	< 0.006
10-14-15	297	0.023 ± 0.004	< 0.008
10-21-15	302	0.025 ± 0.004	< 0.007
10-28-15	302	0.023 ± 0.004	< 0.006
11-04-15	302	0.030 ± 0.004	< 0.008
11-11-15	310	0.030 ± 0.004	< 0.010
11-18-15	298	0.036 ± 0.004	< 0.010
11-24-15	263	0.020 ± 0.004	< 0.016
12-02-15	336	0.031 ± 0.004	< 0.006
12-09-15	302	0.057 ± 0.005	< 0.009
12-16-15	300	0.028 ± 0.004	< 0.007
12-22-15	264	0.027 ± 0.004	< 0.013
12-30-15	352	0.028 ± 0.003	< 0.009
4th Quarter Mean ± s.d.		0.029 ± 0.010	< 0.009
Cumulative Average		0.025 ± 0.011	< 0.010

[a] Low volume due to shut down for calibration.

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-04, North Boundary
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-07-15	345	0.033 ± 0.004	< 0.007
01-14-15	305	0.040 ± 0.004	< 0.013
01-21-15	300	0.028 ± 0.004	< 0.010
01-28-15	310	0.021 ± 0.003	< 0.007
02-04-15	316	0.020 ± 0.003	< 0.005
02-11-15	291	0.034 ± 0.004	< 0.010
02-18-15	314	0.032 ± 0.004	< 0.006
02-25-15	330	0.052 ± 0.004	< 0.008
03-04-15	310	0.026 ± 0.004	< 0.013
03-11-15	300	0.020 ± 0.004	< 0.009
03-18-15	295	0.021 ± 0.004	< 0.013
03-25-15	301	0.024 ± 0.004	< 0.010
04-01-15	309	0.016 ± 0.003	< 0.011
1st Quarter Mean ± s.d.		0.028 ± 0.010	< 0.009
04-08-15	308	0.022 ± 0.003	< 0.006
04-15-15	302	0.018 ± 0.003	< 0.014
04-22-15	293	0.011 ± 0.003	< 0.009
04-29-15	305	0.010 ± 0.003	< 0.010
05-06-15	305	0.016 ± 0.003	< 0.012
05-13-15	305	0.011 ± 0.003	< 0.010
05-20-15	301	0.016 ± 0.003	< 0.014
05-27-15	301	0.018 ± 0.003	< 0.010
06-03-15	305	0.014 ± 0.003	< 0.010
06-10-15	305	0.022 ± 0.003	< 0.012
06-17-15	306	0.010 ± 0.003	< 0.009
06-24-15	296	0.012 ± 0.003	< 0.008
07-01-15	307	0.017 ± 0.003	< 0.012
2nd Quarter Mean ± s.d.		0.015 ± 0.004	< 0.010

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-08-15	305	0.019 ± 0.003	< 0.011
07-15-15	301	0.018 ± 0.003	< 0.006
07-22-15	295	0.018 ± 0.003	< 0.008
07-29-15	304	0.030 ± 0.004	< 0.009
08-05-15	310	0.017 ± 0.003	< 0.007
08-12-15	305	0.016 ± 0.003	< 0.010
08-19-15	297	0.041 ± 0.004	< 0.011
08-26-15	303	0.017 ± 0.003	< 0.009
09-02-15	290	0.035 ± 0.004	< 0.009
09-09-15	300	0.032 ± 0.004	< 0.011
09-16-15	305	0.031 ± 0.004	< 0.006
09-23-15	303	0.027 ± 0.004	< 0.011
09-30-15	296	0.030 ± 0.004	< 0.008
3rd Quarter Mean ± s.d.		0.025 ± 0.008	< 0.009
10-07-15	309	0.012 ± 0.003	< 0.006
10-14-15	300	0.024 ± 0.004	< 0.008
10-21-15	302	0.028 ± 0.004	< 0.007
10-28-15	305	0.025 ± 0.004	< 0.005
11-04-15	302	0.025 ± 0.004	< 0.008
11-11-15	315	0.034 ± 0.004	< 0.010
11-18-15	300	0.041 ± 0.004	< 0.010
11-24-15	270	0.020 ± 0.004	< 0.015
12-02-15	340	0.031 ± 0.004	< 0.006
12-09-15	305	0.053 ± 0.005	< 0.009
12-16-15	299	0.027 ± 0.004	< 0.007
12-22-15	263	0.028 ± 0.004	< 0.013
12-30-15	358	0.025 ± 0.003	< 0.009
4th Quarter Mean ± s.d.		0.029 ± 0.010	< 0.009
Cumulative Average		0.024 ± 0.010	< 0.009

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-08, G.J. Francar Residence
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-07-15	340	0.034 ± 0.004	< 0.007
01-14-15	306	0.030 ± 0.004	< 0.013
01-21-15	298	0.032 ± 0.004	< 0.010
01-28-15	306	0.021 ± 0.003	< 0.007
02-04-15	313	0.023 ± 0.003	< 0.005
02-11-15	295	0.033 ± 0.004	< 0.010
02-18-15	299	0.027 ± 0.004	< 0.006
02-25-15	310	0.046 ± 0.004	< 0.009
03-04-15	306	0.029 ± 0.004	< 0.013
03-11-15	300	0.026 ± 0.004	< 0.009
03-18-15	303	0.020 ± 0.004	< 0.012
03-25-15	304	0.026 ± 0.004	< 0.010
04-01-15	304	0.016 ± 0.003	< 0.011
1st Quarter Mean ± s.d.		0.028 ± 0.008	< 0.009
04-08-15	307	0.021 ± 0.003	< 0.006
04-15-15	296	0.018 ± 0.003	< 0.014
04-22-15	288	0.014 ± 0.003	< 0.009
04-29-15	302	0.013 ± 0.003	< 0.010
05-06-15	306	0.016 ± 0.003	< 0.012
05-13-15	306	0.012 ± 0.003	< 0.010
05-20-15	297	0.014 ± 0.003	< 0.015
05-27-15	297	0.019 ± 0.003	< 0.010
06-03-15	303	0.015 ± 0.003	< 0.010
06-10-15	303	0.018 ± 0.003	< 0.012
06-17-15	312	0.010 ± 0.003	< 0.009
06-24-15	296	0.012 ± 0.003	< 0.008
07-01-15	312	0.017 ± 0.003	< 0.012
2nd Quarter Mean ± s.d.		0.015 ± 0.003	< 0.011

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-08-15	298	0.020 ± 0.003	< 0.011
07-15-15	302	0.017 ± 0.003	< 0.006
07-22-15	304	0.021 ± 0.003	< 0.008
07-29-15	311	0.028 ± 0.004	< 0.009
08-05-15	307	0.018 ± 0.003	< 0.008
08-12-15	269	0.024 ± 0.004	< 0.011
08-19-15	285	0.037 ± 0.004	< 0.011
08-26-15	306	0.014 ± 0.003	< 0.009
09-02-15	289	0.039 ± 0.004	< 0.009
09-09-15	303	0.039 ± 0.004	< 0.010
09-16-15	307	0.027 ± 0.004	< 0.006
09-23-15	298	0.034 ± 0.004	< 0.011
09-30-15	299	0.033 ± 0.004	< 0.008
3rd Quarter Mean ± s.d.		0.027 ± 0.009	< 0.009
10-07-15	296	0.017 ± 0.003	< 0.006
10-14-15	291	0.024 ± 0.004	< 0.008
10-21-15	301	0.026 ± 0.004	< 0.007
10-28-15	302	0.023 ± 0.004	< 0.006
11-04-15	305	0.023 ± 0.003	< 0.008
11-11-15	314	0.034 ± 0.004	< 0.010
11-18-15	306	0.036 ± 0.004	< 0.010
11-24-15	270	0.023 ± 0.004	< 0.015
12-02-15	344	0.030 ± 0.004	< 0.006
12-09-15	307	0.053 ± 0.005	< 0.009
12-16-15	293	0.029 ± 0.004	< 0.007
12-22-15	271	0.028 ± 0.004	< 0.012
12-30-15	351	0.026 ± 0.003	< 0.009
4th Quarter Mean ± s.d.		0.029 ± 0.009	< 0.009
Cumulative Average		0.025 ± 0.009	< 0.009
Indicator Locations Annual Mean ± s.d.		**0.025 ± 0.010**	**< 0.009**

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.
Location: E-20, Silver Lake
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
01-07-15	347	0.035 ± 0.004	< 0.007
01-14-15	345	0.027 ± 0.003	< 0.011
01-21-15	299	0.031 ± 0.004	< 0.010
01-28-15	300	0.020 ± 0.003	< 0.007
02-04-15	306	0.024 ± 0.003	< 0.005
02-11-15	296	0.038 ± 0.004	< 0.010
02-18-15	306	0.029 ± 0.004	< 0.006
02-25-15	319	0.035 ± 0.004	< 0.008
03-04-15	310	0.030 ± 0.004	< 0.013
03-11-15	295	0.022 ± 0.004	< 0.009
03-18-15	298	0.023 ± 0.004	< 0.012
03-25-15	300	0.021 ± 0.004	< 0.010
04-01-15	309	0.014 ± 0.003	< 0.011
1st Quarter Mean ± s.d.		0.027 ± 0.007	< 0.009
04-08-15	307	0.022 ± 0.003	< 0.006
04-15-15	296	0.021 ± 0.003	< 0.014
04-22-15	285	0.011 ± 0.003	< 0.009
04-29-15	304	0.014 ± 0.003	< 0.010
05-06-15	301	0.012 ± 0.003	< 0.012
05-13-15	301	0.010 ± 0.003	< 0.010
05-20-15	303	0.012 ± 0.003	< 0.014
05-27-15	303	0.017 ± 0.003	< 0.010
06-03-15	304	0.013 ± 0.003	< 0.010
06-10-15	304	0.017 ± 0.003	< 0.012
06-17-15	313	0.010 ± 0.003	< 0.009
06-24-15	296	0.014 ± 0.003	< 0.008
07-01-15	309	0.016 ± 0.003	< 0.012
2nd Quarter Mean ± s.d.		0.015 ± 0.004	< 0.010

Date Collected	Vol. (m^3)	Gross Beta	I-131
Required LLD		0.010	0.030
07-08-15	299	0.020 ± 0.003	< 0.011
07-15-15	299	0.018 ± 0.003	< 0.006
07-22-15	300	0.020 ± 0.003	< 0.008
07-29-15	301	0.030 ± 0.004	< 0.009
08-05-15	311	0.018 ± 0.003	< 0.007
08-12-15	301	0.020 ± 0.003	< 0.010
08-19-15	283	0.044 ± 0.005	< 0.011
08-26-15	306	0.015 ± 0.003	< 0.009
09-02-15	289	0.033 ± 0.004	< 0.009
09-09-15	311	0.034 ± 0.004	< 0.010
09-16-15	307	0.025 ± 0.004	< 0.006
09-23-15	302	0.023 ± 0.003	< 0.011
09-30-15	298	0.033 ± 0.004	< 0.008
3rd Quarter Mean ± s.d.		0.026 ± 0.009	< 0.009
10-07-15	309	0.013 ± 0.003	< 0.006
10-14-15	293	0.024 ± 0.004	< 0.008
10-21-15	299	0.027 ± 0.004	< 0.007
10-28-15	306	0.025 ± 0.004	< 0.005
11-04-15	305	0.023 ± 0.003	< 0.008
11-11-15	311	0.030 ± 0.004	< 0.010
11-18-15	301	0.041 ± 0.004	< 0.010
11-24-15	265	0.025 ± 0.004	< 0.016
12-02-15	346	0.031 ± 0.004	< 0.006
12-09-15	301	0.057 ± 0.005	< 0.009
12-16-15	299	0.031 ± 0.004	< 0.007
12-22-15	264	0.030 ± 0.004	< 0.013
12-30-15	349	✓ 0.027 ± 0.003	< 0.009
4th Quarter Mean ± s.d.		0.029 ± 0.010	< 0.009
Cumulative Average		0.024 ± 0.009	< 0.009
Control Annual Mean ± s.d.		0.024 ± 0.009	< 0.009

POINT BEACH NUCLEAR PLANT

Table 2. Gamma emitters in quarterly composites of air particulate filters

Units: pCi/m^3

Location	Lab Code Req. LLD	Be-7 -	Be-7 MDC	Cs-134 0.01	Cs-134 MDC	Cs-137 0.01	Cs-137 MDC	(Other) Co-60 (0.10)	(Other) (Co-60) MDC	Volume m^3
				1st Quarter						
E-01	EAP- 1903	0.074 ± 0.015	-	0.0000 ± 0.0004	< 0.0005	0.0002 ± 0.0004	< 0.0006	-0.0002 ± 0.0007	< 0.0007	3970
E-02	- 1904	0.084 ± 0.017	-	-0.0003 ± 0.0004	< 0.0008	0.0002 ± 0.0005	< 0.0008	-0.0001 ± 0.0006	< 0.0007	4020
E-03	- 1905	0.058 ± 0.015	-	0.0000 ± 0.0004	< 0.0007	0.0001 ± 0.0006	< 0.0010	0.0003 ± 0.0005	< 0.0007	3953
E-04	- 1906	0.061 ± 0.020	-	-0.0004 ± 0.0005	< 0.0009	-0.0001 ± 0.0005	< 0.0007	-0.0001 ± 0.0007	< 0.0008	4025
E-08	- 1907	0.061 ± 0.017	-	0.0003 ± 0.0004	< 0.0008	0.0003 ± 0.0005	< 0.0009	-0.0001 ± 0.0005	< 0.0007	3983
E-20	- 1908	0.063 ± 0.014	-	0.0004 ± 0.0004	< 0.0007	0.0000 ± 0.0005	< 0.0008	-0.0001 ± 0.0006	< 0.0007	4030
				2nd Quarter						
E-01	EAP- 3960	0.069 ± 0.018	-	0.0000 ± 0.0004	< 0.0009	-0.0004 ± 0.0006	< 0.0008	0.0001 ± 0.0006	< 0.0004	3620
E-02	- 3961	0.065 ± 0.014	-	-0.0003 ± 0.0005	< 0.0009	-0.0004 ± 0.0006	< 0.0007	0.0004 ± 0.0005	< 0.0008	3901
E-03	- 3962	0.066 ± 0.012	-	-0.0001 ± 0.0004	< 0.0008	0.0007 ± 0.0006	< 0.0010	-0.0002 ± 0.0005	< 0.0005	3888
E-04	- 3963	0.064 ± 0.014	-	0.0001 ± 0.0005	< 0.0007	-0.0002 ± 0.0006	< 0.0006	-0.0008 ± 0.0006	< 0.0004	3937
E-08	- 3964	0.062 ± 0.011	-	-0.0002 ± 0.0004	< 0.0008	-0.0001 ± 0.0004	< 0.0005	-0.0003 ± 0.0004	< 0.0004	3925
E-20	- 3965	0.066 ± 0.013	-	0.0000 ± 0.0004	< 0.0008	-0.0001 ± 0.0005	< 0.0006	0.0000 ± 0.0006	< 0.0005	3927
				3rd Quarter						
E-01	EAP- 5991	0.076 ± 0.015	-	-0.0003 ± 0.0006	< 0.0009	0.0002 ± 0.0006	< 0.0007	0.0006 ± 0.0005	< 0.0005	3892
E-02	- 5992	0.068 ± 0.016	-	-0.0002 ± 0.0005	< 0.0010	0.0000 ± 0.0006	< 0.0010	0.0001 ± 0.0006	< 0.0007	3910
E-03	- 5993	0.083 ± 0.015	-	-0.0002 ± 0.0005	< 0.0009	-0.0002 ± 0.0005	< 0.0007	0.0006 ± 0.0006	< 0.0006	3805
E-04	- 5994	0.071 ± 0.016	-	0.0000 ± 0.0006	< 0.0010	0.0000 ± 0.0007	< 0.0010	0.0002 ± 0.0006	< 0.0006	3914
E-08	- 5995	0.080 ± 0.015	-	-0.0003 ± 0.0005	< 0.0011	0.0001 ± 0.0006	< 0.0010	-0.0009 ± 0.0006	< 0.0005	3878
E-20	- 5996	0.071 ± 0.013	-	0.0001 ± 0.0003	< 0.0006	0.0004 ± 0.0003	< 0.0006	-0.0003 ± 0.0003	< 0.0003	3906
				4th Quarter						
E-01	EAP- 7361	0.050 ± 0.011	-	-0.0002 ± 0.0004	< 0.0008	0.0000 ± 0.0004	< 0.0006	0.0000 ± 0.0004	< 0.0004	3969
E-02	- 7362	0.056 ± 0.011	-	-0.0002 ± 0.0004	< 0.0008	-0.0001 ± 0.0004	< 0.0006	0.0001 ± 0.0003	< 0.0003	3934
E-03	- 7363	0.050 ± 0.014	-	-0.0001 ± 0.0005	< 0.0010	0.0007 ± 0.0006	< 0.0011	-0.0001 ± 0.0005	< 0.0006	3931
E-04	- 7364	0.047 ± 0.009	-	0.0002 ± 0.0003	< 0.0007	0.0000 ± 0.0004	< 0.0005	-0.0004 ± 0.0003	< 0.0003	3969
E-08	- 7365	0.041 ± 0.010	-	-0.0001 ± 0.0003	< 0.0006	-0.0003 ± 0.0003	< 0.0004	-0.0003 ± 0.0004	< 0.0003	3950
E-20	- 7366	0.059 ± 0.015	-	-0.0002 ± 0.0004	< 0.0007	-0.0003 ± 0.0005	< 0.0005	-0.0003 ± 0.0006	< 0.0003	3948
Annual Mean±s.d.		**0.064 ± 0.011**		**-0.0001 ± 0.0002**	**< 0.0008**	**0.0000 ± 0.0003**	**< 0.0007**	**0.0000 ± 0.0004**	**< 0.0005**	

POINT BEACH NUCLEAR PLANT

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-11 Lambert Dairy Farm

Collection Date	01-14-15	MDC	02-11-15	MDC	03-11-15	MDC	Required LLD
Lab Code	EMI- 113		EMI- 540		EMI- 966		
Sr-89	0.9 ± 0.9	< 0.7	0.2 ± 0.7	< 0.6	0.2 ± 0.7	< 0.7	5.0
Sr-90	1.3 ± 0.4	< 0.6	0.9 ± 0.3	< 0.4	0.8 ± 0.3	< 0.5	1.0
I-131	0.05 ± 0.15	< 0.26	-0.02 ± 0.10	< 0.19	-0.11 ± 0.12	< 0.23	0.5
K-40	1294 ± 103	-	1438 ± 51	-	1394 ± 97	-	
Cs-134	2.1 ± 1.7	< 3.8	-0.2 ± 0.7	< 1.5	-1.1 ± 1.5	< 3.0	5.0
Cs-137	2.2 ± 2.1	< 3.9	0.6 ± 0.8	< 1.7	-0.2 ± 2.0	< 2.9	5.0
Ba-La-140	-2.7 ± 1.6	< 4.7	0.5 ± 0.7	< 3.1	1.3 ± 1.8	< 4.2	5.0
Other (Co-60)	2.5 ± 2.2	< 3.2	0.7 ± 0.9	< 1.5	0.1 ± 1.8	< 2.4	15.0

Collection Date	04-08-15		05-13-15		06-10-15		Required LLD
Lab Code	EMI- 1465		EMI- 2376		EMI- 2905		
Sr-89	0.0 ± 0.8	< 0.8	-0.3 ± 0.9	< 0.8	0.3 ± 0.8	< 0.7	5.0
Sr-90	0.8 ± 0.3	< 0.5	1.0 ± 0.4	< 0.7	0.7 ± 0.3	< 0.5	1.0
I-131	0.19 ± 0.24	< 0.46	-0.06 ± 0.15	< 0.28	-0.02 ± 0.18	< 0.32	0.5
K-40	1472 ± 75	-	1418 ± 77	-	1389 ± 95	-	
Cs-134	0.3 ± 1.3	< 2.4	0.2 ± 1.4	< 2.4	-1.1 ± 1.6	< 2.8	5.0
Cs-137	0.7 ± 1.4	< 3.0	-0.4 ± 1.5	< 1.9	0.4 ± 2.0	< 3.6	5.0
Ba-La-140	-1.1 ± 1.3	< 2.2	2.7 ± 1.2	< 4.5	1.3 ± 1.7	< 2.6	5.0
Other (Co-60)	-1.1 ± 1.5	< 2.4	1.0 ± 1.4	< 2.2	0.5 ± 1.8	< 2.5	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-11 Lambert Dairy Farm

Collection Date	07-08-15	MDC	08-12-15	MDC	09-09-15	MDC	Required LLD
Lab Code	EMI- 3501		EMI- 4449		EMI- 4914		
Sr-89	0.1 ± 0.6	< 0.7	0.3 ± 0.8	< 0.7	0.3 ± 0.8	< 0.7	5.0
Sr-90	0.5 ± 0.3	< 0.5	0.8 ± 0.3	< 0.5	0.7 ± 0.3	< 0.6	1.0
I-131	0.04 ± 0.16	< 0.28	0.04 ± 0.21	< 0.44	-0.03 ± 0.11	< 0.20	0.5
K-40	1496 ± 106	-	1388 ± 41	-	1388 ± 126	-	
Cs-134	-0.6 ± 1.6	< 2.9	-0.9 ± 0.7	< 1.4	0.5 ± 1.8	< 3.8	5.0
Cs-137	2.3 ± 2.1	< 3.1	0.2 ± 0.8	< 1.7	2.2 ± 2.3	< 4.4	5.0
Ba-La-140	-0.3 ± 1.6	< 1.2	-2.9 ± 0.6	< 2.8	2.6 ± 2.1	< 3.8	5.0
Other (Co-60)	3.0 ± 1.9	< 2.8	-0.1 ± 0.8	< 1.0	0.3 ± 2.4	< 3.3	15.0

Collection Date	10-14-15		11-11-15		12-09-15		Required LLD
Lab Code	EMI- 5781		EMI- 6482		EMI- 6910		
Sr-89	0.1 ± 0.8	< 0.7	0.5 ± 0.6	< 0.7	-0.2 ± 0.8	< 0.8	5.0
Sr-90	1.0 ± 0.3	< 0.5	0.6 ± 0.3	< 0.4	0.8 ± 0.4	< 0.6	1.0
I-131	0.16 ± 0.19	< 0.32	0.05 ± 0.11	< 0.20	-0.15 ± 0.16	< 0.30	0.5
K-40	1250 ± 109	-	1376 ± 42	-	1366 ± 105	-	
Cs-134	-0.6 ± 1.9	< 3.5	0.1 ± 0.7	< 1.3	0.5 ± 1.8	< 3.4	5.0
Cs-137	-0.2 ± 2.2	< 3.8	-0.1 ± 0.8	< 1.6	0.1 ± 2.0	< 2.4	5.0
Ba-La-140	0.5 ± 1.5	< 3.4	-2.5 ± 0.7	< 2.0	0.3 ± 1.6	< 3.2	5.0
Other (Co-60)	2.5 ± 1.8	< 1.8	0.2 ± 0.9	< 1.5	-0.4 ± 2.0	< 2.2	15.0

POINT BEACH NUCLEAR PLANT

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-21 Strutz Dairy Farm

Collection Date	01-14-15	MDC	02-11-15	MDC	03-11-15	MDC	Required LLD
Lab Code	EMI- 114		EMI- 541		EMI- 967		
Sr-89	0.5 ± 0.7	< 0.8	0.0 ± 0.6	< 0.7	0.6 ± 0.8	< 0.8	5.0
Sr-90	0.3 ± 0.3	< 0.6	0.2 ± 0.3	< 0.5	0.4 ± 0.3	< 0.6	1.0
I-131	0.14 ± 0.15	< 0.25	0.12 ± 0.20	< 0.40	-0.13 ± 0.11	< 0.22	0.5
K-40	1458 ± 101	-	1426 ± 76	-	1479 ± 92	-	
Cs-134	0.7 ± 1.6	< 2.9	-2.0 ± 1.2	< 2.5	0.1 ± 1.6	< 2.7	5.0
Cs-137	2.0 ± 1.9	< 3.2	0.5 ± 1.5	< 2.1	0.5 ± 1.8	< 3.2	5.0
Ba-La-140	2.5 ± 1.3	< 2.2	-2.3 ± 1.4	< 3.8	0.1 ± 1.6	< 1.8	5.0
Other (Co-60)	-0.1 ± 1.9	< 2.6	-0.2 ± 1.5	< 2.6	1.9 ± 2.0	< 2.3	15.0

Collection Date	04-08-15		05-13-15		06-10-15		Required LLD
Lab Code	EMI- 1466		EMI- 2377		EMI- 2906		
Sr-89	0.6 ± 0.7	< 0.8	0.4 ± 0.7	< 0.8	0.2 ± 0.7	< 0.8	5.0
Sr-90	0.3 ± 0.3	< 0.5	0.1 ± 0.3	< 0.6	0.2 ± 0.3	< 0.6	1.0
I-131	0.16 ± 0.16	< 0.28	0.03 ± 0.15	< 0.27	0.10 ± 0.18	< 0.31	0.5
K-40	1360 ± 76	-	1463 ± 102	-	1454 ± 98	-	
Cs-134	1.4 ± 1.3	< 2.5	0.0 ± 1.6	< 2.8	0.8 ± 1.6	< 3.3	5.0
Cs-137	1.6 ± 1.5	< 3.0	1.0 ± 2.1	< 3.0	1.0 ± 2.0	< 2.9	5.0
Ba-La-140	-4.1 ± 1.3	< 2.1	-3.6 ± 1.7	< 2.9	-4.3 ± 1.5	< 2.6	5.0
Other (Co-60)	0.9 ± 1.6	< 2.5	-0.7 ± 2.0	< 1.8	-0.5 ± 2.0	< 2.6	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-21 Strutz Dairy Farm

Collection Date	07-08-15	MDC	08-12-15	MDC	09-09-15	MDC	Required LLD
Lab Code	EMI- 3502		EMI- 4450		EMI- 4915		
Sr-89	0.3 ± 0.7	< 0.7	0.6 ± 0.8	< 0.9	0.3 ± 0.7	< 0.8	5.0
Sr-90	0.5 ± 0.3	< 0.5	0.4 ± 0.3	< 0.6	0.2 ± 0.3	< 0.5	1.0
I-131	0.15 ± 0.19	< 0.33	0.17 ± 0.23	< 0.46	0.03 ± 0.10	< 0.18	0.5
K-40	1403 ± 97	-	1481 ± 43	-	1298 ± 107	-	
Cs-134	0.1 ± 1.9	< 3.5	-0.2 ± 0.7	< 1.4	0.1 ± 1.7	< 3.4	5.0
Cs-137	1.9 ± 1.8	< 3.5	-0.1 ± 0.8	< 1.2	0.5 ± 2.4	< 3.5	5.0
Ba-La-140	-0.2 ± 1.6	< 2.4	-3.4 ± 0.7	< 4.2	-1.9 ± 1.8	< 1.7	5.0
Other (Co-60)	-1.6 ± 2.0	< 2.2	-0.2 ± 0.9	< 1.8	0.4 ± 2.4	< 3.3	15.0

Collection Date	10-14-15		11-11-15		12-09-15		Required LLD
Lab Code	EMI- 5782		EMI- 6483		EMI- 6911		
Sr-89	-0.3 ± 0.7	< 0.8	0.2 ± 0.5	< 0.7	-0.1 ± 0.6	< 0.8	5.0
Sr-90	0.4 ± 0.3	< 0.6	0.1 ± 0.2	< 0.4	0.2 ± 0.3	< 0.5	1.0
I-131	0.19 ± 0.20	< 0.35	-0.01 ± 0.19	< 0.42	0.18 ± 0.18	< 0.31	0.5
K-40	1323 ± 112	-	1468 ± 41	-	1459 ± 104		
Cs-134	-0.7 ± 1.9	< 3.6	-1.1 ± 0.7	< 1.2	0.4 ± 1.8	< 3.7	5.0
Cs-137	-0.2 ± 2.2	< 3.8	0.0 ± 0.8	< 1.0	0.6 ± 1.8	< 3.4	5.0
Ba-La-140	-1.2 ± 1.5	< 3.1	-0.1 ± 0.7	< 2.9	-1.0 ± 1.5	< 5.2	5.0
Other (Co-60)	-0.4 ± 2.1	< 3.1	-0.4 ± 0.8	< 1.2	2.1 ± 2.1	< 1.9	15.0

POINT BEACH NUCLEAR PLANT

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-40 Barta

Collection Date	01-14-15	MDC	02-11-15	MDC	03-11-15	MDC	Required LLD
Lab Code	EMI- 115		EMI- 542		EMI- 968		
Sr-89	-0.7 ± 0.6	< 0.6	-0.2 ± 0.6	< 0.6	0.2 ± 0.7	< 0.7	5.0
Sr-90	0.7 ± 0.3	< 0.5	0.5 ± 0.3	< 0.4	0.5 ± 0.3	< 0.5	1.0
I-131	-0.01 ± 0.20	< 0.41	0.05 ± 0.10	< 0.17	0.02 ± 0.12	< 0.21	0.5
K-40	1329 ± 77	-	1471 ± 76	-	1421 ± 81	-	
Cs-134	0.7 ± 1.3	< 2.2	0.4 ± 1.3	< 2.6	1.1 ± 1.5	< 2.4	5.0
Cs-137	-1.3 ± 1.4	< 1.7	1.3 ± 1.5	< 2.7	1.6 ± 1.6	< 2.7	5.0
Ba-La-140	-0.2 ± 1.1	< 3.6	-1.7 ± 1.2	< 5.3	-3.1 ± 1.2	< 0.9	5.0
Other (Co-60)	1.7 ± 1.7	< 2.9	1.2 ± 1.5	< 2.5	0.6 ± 1.8	< 2.5	15.0

Collection Date	04-08-15		05-13-15		06-10-15		Required LLD
Lab Code	EMI- 1467		EMI- 2378		EMI- 2907		
Sr-89	-0.2 ± 0.9	< 0.9	-0.8 ± 0.7	< 0.7	-0.4 ± 0.7	< 0.7	5.0
Sr-90	0.6 ± 0.4	< 0.6	0.9 ± 0.3	< 0.5	0.5 ± 0.3	< 0.5	1.0
I-131	0.15 ± 0.25	< 0.48	-0.06 ± 0.17	< 0.31	0.14 ± 0.22	< 0.38	0.5
K-40	1419 ± 93	-	1424 ± 84	-	1447 ± 68	-	
Cs-134	0.1 ± 1.7	< 3.0	-0.6 ± 1.4	< 2.9	-1.0 ± 1.2	< 2.3	5.0
Cs-137	0.8 ± 1.8	< 3.2	1.8 ± 1.6	< 2.9	0.1 ± 1.3	< 2.3	5.0
Ba-La-140	0.5 ± 1.6	< 4.1	0.6 ± 1.2	< 2.4	0.2 ± 1.0	< 2.8	5.0
Other (Co-60)	-1.1 ± 1.9	< 3.0	-0.2 ± 1.7	< 2.9	0.1 ± 1.3	< 2.3	15.0

Table 3. Radioactivity in milk samples

Collection: Monthly

Sample Description and Concentration (pCi/L)

E-40 Barta

Collection Date	07-08-15	MDC	08-12-15	MDC	09-09-15	MDC	Required LLD
Lab Code	EMI- 3503		EMI- 4451		EMI- 4916		
Sr-89	-0.1 ± 0.6	< 0.6	-0.8 ± 0.8	< 0.8	0.3 ± 0.9	< 0.9	5.0
Sr-90	0.4 ± 0.3	< 0.4	0.6 ± 0.4	< 0.6	0.4 ± 0.4	< 0.7	1.0
I-131	0.07 ± 0.13	< 0.19	0.08 ± 0.13	< 0.22	-0.13 ± 0.21	< 0.39	0.5
K-40	1360 ± 104	-	1445 ± 39	-	1383 ± 112		
Cs-134	0.2 ± 1.8	< 3.7	-0.4 ± 0.7	< 1.2	0.5 ± 1.8	< 3.8	5.0
Cs-137	-1.0 ± 2.1	< 2.9	0.6 ± 0.8	< 1.5	-0.1 ± 2.6	< 3.8	5.0
Ba-La-140	-0.1 ± 1.7	< 2.1	-0.9 ± 0.6	< 2.1	-1.9 ± 2.1	< 2.3	5.0
Other (Co-60)	-1.1 ± 2.2	< 1.8	-0.5 ± 0.8	< 0.8	0.8 ± 2.4	< 3.1	15.0

Collection Date	10-14-15		11-11-15		12-09-15		Required LLD
Lab Code	EMI- 5783		EMI- 6484		EMI- 6912		
Sr-89	-0.1 ± 0.6	< 0.7	0.0 ± 0.6	< 0.9	-0.2 ± 0.6	< 0.6	5.0
Sr-90	0.6 ± 0.3	< 0.5	0.3 ± 0.3	< 0.5	0.4 ± 0.3	< 0.4	1.0
I-131	0.07 ± 0.13	< 0.23	0.14 ± 0.18	< 0.31	-0.07 ± 0.16	< 0.30	0.5
K-40	1431 ± 99	-	1384 ± 82	-	1486 ± 96		
Cs-134	-1.4 ± 1.8	< 3.4	0.6 ± 1.3	< 2.5	-0.4 ± 1.6	< 3.1	5.0
Cs-137	-0.6 ± 1.9	< 3.0	1.2 ± 1.4	< 2.2	0.7 ± 1.9	< 3.5	5.0
Ba-La-140	-1.8 ± 1.6	< 3.0	-0.6 ± 1.2	< 4.6	1.9 ± 1.4	< 2.1	5.0
Other (Co-60)	1.0 ± 1.9	< 2.4	0.3 ± 1.5	< 1.7	0.2 ± 1.8	< 2.9	15.0

Sr-89 Annual Mean + s.d.	**0.1 ± 0.4**
Sr-90 Annual Mean + s.d.	**0.6 ± 0.3**
I-131 Annual Mean + s.d.	**0.05 ± 0.10**
K-40 Annual Mean + s.d.	**1409 ± 60**
Cs-134 Annual Mean + s.d.	**0.0 ± 0.8**
Cs-137 Annual Mean + s.d.	**0.6 ± 0.9**
Ba-La Annual Mean + s.d.	**-0.8 ± 1.9**
Co-60 Annual Mean + s.d.	**0.4 ± 1.1**

Table 4. Radioactivity in Well Water Samples, E-10
Collection: Quarterly
Units: pCi/L

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Req. LLD	Annual Mean ±s.d
Collection Date	01-15-15	04-15-15	07-09-15	10-07-15		
Lab Code	EWW- 140	EWW- 1664	EWW- 3618	EWW- 5625		
Gross Beta	2.9 ± 1.7	0.2 ± 0.9	2.4 ± 1.9	0.7 ± 1.0	4.0	**1.6 ± 1.3**
H-3	103.9 ± 99.7	57.5 ± 78.4	-52.0 ± 91.1	-49.2 ± 70.8	500	**15.1 ± 78.1**
Sr-89	0.0 ± 0.6	-1.5 ± 0.7	0.2 ± 0.3	0.2 ± 0.3	5.0	**-0.3 ± 0.8**
Sr-90	0.0 ± 0.2	0.9 ± 0.3	-0.1 ± 0.2	-0.1 ± 0.2	1.0	**0.2 ± 0.5**
I-131	0.07 ± 0.13	-0.03 ± 0.13	0.22 ± 0.24	0.08 ± 0.13	0.5	**0.09 ± 0.10**
Mn-54	-0.4 ± 1.3	-0.3 ± 1.5	1.2 ± 2.1	-0.7 ± 1.7	10	**0.0 ± 0.9**
Fe-59	0.1 ± 2.4	-2.9 ± 2.9	1.4 ± 3.8	-0.7 ± 3.5	30	**-0.5 ± 1.8**
Co-58	-1.3 ± 1.3	0.3 ± 1.5	-1.0 ± 2.1	1.0 ± 1.5	10	**-0.2 ± 1.1**
Co-60	-0.7 ± 1.4	-0.4 ± 1.6	1.6 ± 2.0	0.4 ± 1.5	10	**0.2 ± 1.0**
Zn-65	0.2 ± 2.6	0.3 ± 3.2	-7.5 ± 4.5	-4.0 ± 3.4	30	**-2.8 ± 3.7**
Zr-Nb-95	-0.6 ± 1.6	-2.6 ± 1.7	-3.3 ± 2.3	-0.8 ± 1.8	15	**-1.8 ± 1.3**
Cs-134	0.5 ± 1.4	1.0 ± 1.4	-1.0 ± 1.9	0.2 ± 1.7	10	**0.2 ± 0.8**
Cs-137	-0.2 ± 1.6	1.8 ± 1.8	0.5 ± 2.5	0.2 ± 1.9	10	**0.6 ± 0.9**
Ba-La-140	1.2 ± 1.6	-1.4 ± 2.0	0.2 ± 3.2	3.1 ± 1.7	15	**0.8 ± 1.9**
Other (Ru-103)	1.2 ± 1.4	-0.8 ± 1.4	-1.2 ± 2.4	0.1 ± 2.0	30	**-0.2 ± 1.1**

MDC Data

Collection Date	01-15-15	04-15-15	07-09-15	10-07-15		
Lab Code	EWW- 140	EWW- 1664	EWW- 3618	EWW- 5625		
Gross Beta	< 2.8	< 1.7	< 3.6	< 2.0	4.0	**< 2.5**
H-3	< 187.6	< 151.9	< 153.9	< 148.7	500	**< 160.5**
Sr-89	< 0.8	< 0.6	< 0.5	< 0.4	5.0	**< 0.6**
Sr-90	< 0.5	< 0.5	< 0.4	< 0.5	1.0	**< 0.5**
I-131	< 0.22	< 0.23	< 0.45	< 0.22	0.5	**< 0.28**
Mn-54	< 2.6	< 2.8	< 3.4	< 3.1	10	**< 2.9**
Fe-59	< 4.4	< 4.2	< 6.2	< 6.4	30	**< 5.3**
Co-58	< 1.7	< 2.6	< 2.5	< 2.0	10	**< 2.2**
Co-60	< 1.2	< 2.2	< 2.7	< 2.6	10	**< 2.2**
Zn-65	< 4.3	< 5.5	< 5.2	< 3.2	30	**< 4.6**
Zr-Nb-95	< 3.6	< 2.5	< 5.1	< 3.7	15	**< 3.7**
Cs-134	< 2.7	< 2.7	< 4.2	< 3.6	10	**< 3.3**
Cs-137	< 2.3	< 3.1	< 4.2	< 3.5	10	**< 3.3**
Ba-La-140	< 6.1	< 3.5	< 4.2	< 4.2	15	**< 4.5**
Other (Ru-103)	< 3.7	< 3.3	< 4.7	< 3.8	30	**< 3.9**

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-01 (Meteorological Tower)
Collection: Monthly composites
Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 136		NS[a]		ELW- 988		ELW- 1660		
Date Collected	01-15-15		02-15-15		03-11-15		04-16-15		Req. LLD
Gross beta	2.2 ± 0.8	< 1.3	-		3.5 ± 1.1	< 1.8	2.4 ± 0.7	< 0.9	4.0
I-131	0.05 ± 0.13	< 0.23	-		-0.04 ± 0.22	< 0.49	-0.07 ± 0.12	< 0.22	0.5
Be-7	4.2 ± 15.8	< 32.8	-		7.9 ± 13.3	< 32.6	-4.4 ± 14.8	< 20.6	
Mn-54	0.1 ± 1.4	< 2.5	-		0.4 ± 1.2	< 2.5	-0.5 ± 1.5	< 2.2	10
Fe-59	0.9 ± 3.0	< 5.0	-		0.1 ± 2.7	< 2.7	-4.2 ± 3.3	< 2.7	30
Co-58	0.1 ± 1.4	< 1.9	-		0.3 ± 1.3	< 2.4	0.2 ± 1.4	< 2.5	10
Co-60	0.8 ± 1.6	< 2.3	-		1.0 ± 1.3	< 1.7	-1.2 ± 1.7	< 1.7	10
Zn-65	-2.3 ± 3.2	< 3.3	-		-1.6 ± 2.7	< 3.9	-1.9 ± 4.3	< 6.9	30
Zr-Nb-95	-0.5 ± 1.4	< 3.2	-		-0.2 ± 1.4	< 3.5	1.8 ± 1.6	< 3.0	15
Cs-134	0.4 ± 1.6	< 3.1	-		0.1 ± 1.2	< 2.5	-0.6 ± 1.6	< 3.1	10
Cs-137	-1.9 ± 1.8	< 1.6	-		0.1 ± 1.6	< 2.6	0.4 ± 1.9	< 3.6	10
Ba-La-140	-2.5 ± 2.1	< 6.3	-		-4.3 ± 1.5	< 5.7	0.4 ± 2.0	< 4.3	15
Other (Ru-103)	-1.7 ± 1.8	< 3.0	-		-0.3 ± 1.5	< 3.8	-0.9 ± 1.7	< 2.6	30
Lab Code	ELW- 2422		ELW- 2935		ELW- 3614		ELW- 4480		
Date Collected	05-14-15		06-11-15		07-09-15		08-13-15		Req. LLD
Gross beta	1.1 ± 0.5	< 0.8	1.0 ± 0.5	< 0.9	1.2 ± 0.9	< 1.6	1.1 ± 0.5	< 0.9	4.0
I-131	-0.07 ± 0.13	< 0.24	0.15 ± 0.19	< 0.35	-0.05 ± 0.16	< 0.29	0.03 ± 0.15	< 0.26	0.5
Be-7	-1.7 ± 5.9	< 13.1	-5.7 ± 20.1	< 33.7	-9.5 ± 12.2	< 29.5	-11.0 ± 19.0	< 30.5	
Mn-54	-0.1 ± 0.6	< 0.9	1.3 ± 2.0	< 4.0	-1.0 ± 1.6	< 1.6	-0.9 ± 2.0	< 3.0	10
Fe-59	-0.4 ± 1.2	< 2.8	-2.6 ± 4.1	< 5.0	-2.2 ± 3.3	< 4.2	-3.5 ± 3.7	< 3.3	30
Co-58	-0.7 ± 0.6	< 0.8	-0.4 ± 2.0	< 3.1	1.0 ± 1.7	< 2.9	-1.0 ± 1.9	< 2.5	10
Co-60	-0.5 ± 0.6	< 1.2	-2.1 ± 1.9	< 1.7	0.6 ± 1.7	< 1.5	2.1 ± 2.2	< 3.8	10
Zn-65	0.1 ± 1.2	< 2.0	-0.2 ± 4.3	< 6.8	0.1 ± 3.1	< 4.8	-1.6 ± 4.8	< 4.0	30
Zr-Nb-95	0.0 ± 0.6	< 1.4	2.4 ± 2.0	< 3.3	2.9 ± 1.6	< 3.9	-0.7 ± 1.9	< 3.3	15
Cs-134	-0.2 ± 0.7	< 1.4	0.9 ± 2.0	< 4.2	-1.2 ± 1.6	< 2.7	0.7 ± 2.1	< 4.3	10
Cs-137	0.2 ± 0.7	< 1.3	-0.5 ± 2.4	< 3.5	0.1 ± 1.8	< 2.7	0.5 ± 2.0	< 3.5	10
Ba-La-140	0.0 ± 0.7	< 3.3	0.9 ± 3.1	< 4.5	0.9 ± 1.8	< 5.7	0.8 ± 2.1	< 3.6	15
Other (Ru-103)	-0.2 ± 0.7	< 1.4	1.1 ± 2.1	< 4.3	0.4 ± 1.5	< 3.4	-0.4 ± 2.1	< 4.4	30
Lab Code	ELW- 5108		ELW- 5784		ELW- 6353		ELW- 6938		
Date Collected	09-16-15		10-14-15		11-05-15		12-10-15		Req. LLD
Gross beta	0.5 ± 0.5	< 0.9	1.3 ± 0.6	< 0.9	1.6 ± 1.0	< 1.8	1.8 ± 0.6	< 0.9	4.0
I-131	0.02 ± 0.14	< 0.25	0.03 ± 0.17	< 0.30	0.02 ± 0.13	< 0.23	0.03 ± 0.15	< 0.27	0.5
Be-7	-4.5 ± 18.8	< 44.6	4.1 ± 17.9	< 37.5	2.4 ± 4.8	< 15.1	2.9 ± 10.8	< 23.6	
Mn-54	-0.2 ± 2.5	< 4.6	-0.6 ± 1.4	< 2.0	0.2 ± 0.6	< 0.9	-0.3 ± 1.4	< 2.7	10
Fe-59	4.4 ± 4.2	< 5.6	-3.4 ± 3.3	< 4.8	-0.7 ± 1.0	< 2.7	1.1 ± 2.3	< 5.0	30
Co-58	-3.5 ± 2.2	< 2.6	0.5 ± 1.7	< 3.3	0.3 ± 0.5	< 1.1	0.8 ± 1.2	< 2.3	10
Co-60	1.0 ± 2.7	< 4.4	-0.9 ± 2.0	< 1.5	-0.4 ± 0.6	< 1.0	-1.6 ± 1.6	< 1.5	10
Zn-65	1.1 ± 5.0	< 3.8	0.5 ± 3.6	< 2.7	-1.3 ± 1.1	< 1.7	3.4 ± 2.9	< 3.1	30
Zr-Nb-95	-0.1 ± 2.6	< 6.6	-2.3 ± 1.6	< 2.1	0.5 ± 0.6	< 1.7	-0.5 ± 1.3	< 2.1	15
Cs-134	-3.2 ± 2.6	< 4.4	-1.1 ± 1.7	< 3.3	-0.1 ± 0.6	< 1.1	0.5 ± 1.3	< 2.3	10
Cs-137	1.2 ± 2.9	< 4.1	0.2 ± 1.7	< 2.6	0.5 ± 0.7	< 1.3	0.1 ± 1.6	< 2.7	10
Ba-La-140	1.8 ± 2.4	< 14.4	0.4 ± 1.7	< 7.8	-1.3 ± 0.6	< 1.7	1.6 ± 1.4	< 2.8	15
Other (Ru-103)	-0.1 ± 2.2	< 5.1	0.6 ± 1.8	< 4.0	-0.4 ± 0.6	< 1.3	0.3 ± 1.2	< 2.5	30

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-05 (Two Creeks Park)
Collection: Monthly composites | Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 137		NS[a]		ELW- 989		ELW- 1661		
Date Collected	01-15-15		02-15-15		03-12-15		04-16-15		Req. LLD
Gross beta	2.5 ± 0.8	< 1.2	-		3.4 ± 1.0	< 1.6	1.7 ± 0.6	< 0.9	4.0
I-131	0.07 ± 0.13	< 0.22	-		0.03 ± 0.14	< 0.26	0.07 ± 0.22	< 0.45	0.5
Be-7	7.0 ± 11.3	< 22.8	-		13.1 ± 15.5	< 35.8	-9.8 ± 17.3	< 32.8	
Mn-54	-1.0 ± 1.2	< 1.6	-		-0.1 ± 1.6	< 2.2	0.1 ± 1.6	< 2.6	10
Fe-59	-2.3 ± 2.7	< 2.8	-		-2.7 ± 3.4	< 3.3	-1.6 ± 3.2	< 4.3	30
Co-58	0.9 ± 1.2	< 2.3	-		0.8 ± 1.5	< 3.3	-0.9 ± 1.5	< 1.9	10
Co-60	0.7 ± 1.5	< 1.9	-		0.7 ± 1.1	< 0.8	-0.1 ± 1.2	< 2.1	10
Zn-65	-0.7 ± 2.3	< 2.1	-		-1.1 ± 3.3	< 4.2	-1.5 ± 4.4	< 5.1	30
Zr-Nb-95	-1.9 ± 1.4	< 1.9	-		-0.3 ± 1.7	< 4.4	0.1 ± 1.9	< 4.7	15
Cs-134	-0.7 ± 1.3	< 2.4	-		1.1 ± 1.7	< 3.5	1.0 ± 1.6	< 2.8	10
Cs-137	0.5 ± 1.4	< 2.6	-		0.0 ± 1.9	< 2.1	-0.2 ± 2.0	< 2.3	10
Ba-La-140	1.3 ± 1.4	< 2.8	-		1.9 ± 2.0	< 6.2	0.8 ± 1.6	< 3.0	15
Other (Ru-103)	1.2 ± 1.3	< 3.4	-		1.0 ± 1.8	< 3.5	1.9 ± 1.8	< 3.8	30
Lab Code	ELW- 2423		ELW- 2936		ELW- 3615		ELW- 4481		
Date Collected	05-14-15		06-11-15		07-09-15		08-13-15		Req. LLD
Gross beta	1.0 ± 0.5	< 0.8	0.8 ± 0.5	< 0.8	1.1 ± 0.9	< 1.7	0.8 ± 0.5	< 0.8	4.0
I-131	-0.02 ± 0.12	< 0.22	0.00 ± 0.20	< 0.43	0.00 ± 0.15	< 0.27	0.03 ± 0.14	< 0.25	0.5
Be-7	-4.2 ± 6.0	< 11.8	-7.3 ± 23.6	< 38.5	-13.5 ± 14.7	< 18.2	-4.8 ± 10.6	< 18.6	
Mn-54	0.7 ± 0.6	< 1.3	-1.1 ± 2.2	< 2.7	0.5 ± 1.5	< 1.9	0.2 ± 1.4	< 2.1	10
Fe-59	-0.1 ± 1.3	< 3.2	-1.1 ± 4.9	< 5.7	2.1 ± 3.0	< 3.9	0.4 ± 2.4	< 5.2	30
Co-58	-0.5 ± 0.6	< 1.0	0.5 ± 2.1	< 3.9	0.4 ± 1.4	< 2.3	0.7 ± 1.4	< 2.4	10
Co-60	-0.3 ± 0.7	< 1.2	-1.6 ± 2.4	< 2.8	-0.4 ± 1.6	< 1.4	-0.4 ± 1.6	< 2.3	10
Zn-65	-0.4 ± 1.3	< 2.0	-11.1 ± 6.1	< 6.8	-4.8 ± 3.7	< 2.7	-0.5 ± 2.7	< 5.9	30
Zr-Nb-95	-0.4 ± 0.6	< 2.0	-2.8 ± 2.8	< 3.3	-1.4 ± 1.6	< 2.5	-1.0 ± 1.5	< 2.9	15
Cs-134	-0.4 ± 0.6	< 1.3	-3.1 ± 2.4	< 4.5	-1.1 ± 1.6	< 3.3	-0.9 ± 1.5	< 2.8	10
Cs-137	0.5 ± 0.7	< 1.6	1.0 ± 2.1	< 4.0	0.9 ± 1.9	< 3.3	-0.5 ± 1.5	< 1.9	10
Ba-La-140	-6.6 ± 0.8	< 2.2	-3.2 ± 2.7	< 2.2	-0.7 ± 2.0	< 9.5	-3.4 ± 1.6	< 4.6	15
Other (Ru-103)	-1.3 ± 0.7	< 1.0	-1.3 ± 2.3	< 3.0	-0.9 ± 1.9	< 3.9	-0.3 ± 1.4	< 3.2	30
Lab Code	ELW- 5109		ELW- 5785		ELW- 6354		ELW- 6939		
Date Collected	09-16-15		10-14-15		11-05-15		12-10-15		Req. LLD
Gross beta	0.6 ± 0.5	< 0.8	1.2 ± 0.5	< 0.8	2.2 ± 0.9	< 1.6	1.3 ± 0.5	< 0.8	4.0
I-131	-0.03 ± 0.15	< 0.27	0.11 ± 0.22	< 0.41	-0.01 ± 0.22	< 0.45	-0.02 ± 0.15	< 0.27	0.5
Be-7	7.6 ± 18.0	< 45.9	10.1 ± 16.3	< 43.1	-8.2 ± 14.8	< 26.6	17.8 ± 11.7	< 29.8	
Mn-54	-0.1 ± 1.8	< 2.8	0.5 ± 1.5	< 2.9	0.7 ± 1.4	< 2.4	-0.1 ± 1.3	< 1.5	10
Fe-59	-0.7 ± 3.5	< 6.6	0.4 ± 2.8	< 4.3	0.5 ± 3.0	< 5.2	1.7 ± 2.5	< 3.8	30
Co-58	0.0 ± 1.6	< 3.0	-0.2 ± 1.4	< 2.3	-0.6 ± 1.6	< 2.2	0.2 ± 1.6	< 1.7	10
Co-60	1.0 ± 1.8	< 2.3	-0.6 ± 1.8	< 1.8	-0.1 ± 1.7	< 1.9	1.0 ± 1.4	< 2.6	10
Zn-65	-5.2 ± 4.3	< 3.6	2.0 ± 2.6	< 4.1	-2.6 ± 3.1	< 3.0	2.2 ± 2.7	< 4.7	30
Zr-Nb-95	-1.3 ± 1.6	< 3.8	0.4 ± 1.6	< 4.6	-0.1 ± 1.4	< 3.4	0.3 ± 1.4	< 3.0	15
Cs-134	1.9 ± 1.7	< 3.5	-1.0 ± 1.7	< 3.3	-0.3 ± 1.4	< 2.7	0.8 ± 1.4	< 2.6	10
Cs-137	-1.3 ± 2.0	< 3.1	-0.1 ± 2.0	< 3.0	0.4 ± 1.7	< 2.8	0.7 ± 1.5	< 1.9	10
Ba-La-140	1.3 ± 2.3	< 13.0	-3.6 ± 1.8	< 11.0	1.4 ± 1.3	< 7.6	1.0 ± 1.5	< 2.9	15
Other (Ru-103)	0.3 ± 1.9	< 4.7	0.7 ± 1.7	< 4.6	0.5 ± 1.7	< 3.8	0.0 ± 1.3	< 2.5	30

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-06 (Coast Guard Station)
Collection: Monthly composites Units: pCi/L

		MDC		MDC		MDC		MDC	
Lab Code	ELW- 138		NS[a]		ELW- 990		ELW- 1662		
Date Collected	01-15-15		02-15-15		03-12-15		04-16-15		Req. LLD
Gross beta	4.0 ± 0.9	< 1.3	-		4.4 ± 1.1	< 1.8	2.0 ± 0.6	< 0.9	4.0
I-131	0.02 ± 0.20	< 0.39	-		0.06 ± 0.24	< 0.49	0.15 ± 0.25	< 0.50	0.5
Be-7	-1.7 ± 10.8	< 24.6	-		9.8 ± 9.3	< 19.1	1.8 ± 15.0	< 27.2	
Mn-54	0.7 ± 1.1	< 2.1	-		0.9 ± 1.2	< 2.6	0.6 ± 1.5	< 2.9	10
Fe-59	1.7 ± 2.1	< 3.4	-		-1.9 ± 2.1	< 3.5	-0.3 ± 2.9	< 4.3	30
Co-58	1.2 ± 1.2	< 2.4	-		-0.5 ± 1.1	< 1.7	1.1 ± 1.3	< 3.0	10
Co-60	0.7 ± 1.5	< 2.3	-		-0.8 ± 1.1	< 1.1	1.2 ± 1.6	< 2.5	10
Zn-65	-0.8 ± 2.4	< 2.4	-		-1.3 ± 2.5	< 4.3	1.0 ± 2.9	< 3.7	30
Zr-Nb-95	0.5 ± 1.4	< 2.9	-		0.1 ± 1.2	< 2.9	-0.4 ± 1.3	< 2.5	15
Cs-134	0.1 ± 1.3	< 2.5	-		-0.3 ± 1.2	< 2.2	0.4 ± 1.4	< 2.7	10
Cs-137	0.8 ± 1.5	< 2.5	-		-0.2 ± 1.5	< 2.6	0.3 ± 1.6	< 2.9	10
Ba-La-140	-3.7 ± 1.2	< 1.7	-		0.8 ± 1.4	< 4.3	-3.3 ± 1.7	< 3.6	15
Other (Ru-103)	0.3 ± 1.1	< 2.9	-		0.3 ± 1.0	< 2.5	0.1 ± 1.6	< 2.2	30
Lab Code	ELW- 2424		ELW- 2937		ELW- 3616		ELW- 4482		
Date Collected	05-14-15		06-11-15		07-09-15		08-13-15		Req. LLD
Gross beta	0.4 ± 0.5	< 0.9	1.3 ± 0.6	< 0.9	1.1 ± 0.9	< 1.7	0.8 ± 0.5	< 0.9	4.0
I-131	-0.07 ± 0.11	< 0.21	0.01 ± 0.13	< 0.23	0.14 ± 0.17	< 0.30	-0.03 ± 0.15	< 0.26	0.5
Be-7	0.3 ± 4.9	< 14.7	12.0 ± 18.5	< 37.2	-0.2 ± 17.0	< 34.3	-10.0 ± 14.6	< 37.5	
Mn-54	0.0 ± 0.6	< 1.2	0.5 ± 1.4	< 2.3	-0.1 ± 1.8	< 1.9	1.5 ± 1.7	< 2.8	10
Fe-59	0.9 ± 1.1	< 2.9	1.6 ± 3.3	< 3.3	0.2 ± 4.2	< 8.1	0.5 ± 2.9	< 4.9	30
Co-58	0.4 ± 0.6	< 1.5	0.2 ± 2.1	< 4.5	-2.3 ± 1.9	< 2.0	1.7 ± 1.7	< 3.2	10
Co-60	0.1 ± 0.6	< 0.6	1.4 ± 1.8	< 2.4	0.9 ± 2.3	< 3.4	-1.1 ± 1.8	< 1.4	10
Zn-65	0.4 ± 1.1	< 2.6	1.3 ± 4.2	< 6.5	-0.2 ± 4.3	< 1.8	0.2 ± 2.9	< 2.9	30
Zr-Nb-95	-0.4 ± 0.6	< 1.8	-1.2 ± 1.7	< 2.5	1.9 ± 2.1	< 4.9	0.1 ± 1.7	< 3.3	15
Cs-134	-0.1 ± 0.6	< 1.2	0.8 ± 1.8	< 3.4	3.1 ± 2.0	< 3.8	-0.9 ± 1.9	< 3.8	10
Cs-137	0.3 ± 0.7	< 1.4	0.6 ± 2.1	< 4.0	1.5 ± 1.9	< 3.6	-0.1 ± 1.9	< 2.9	10
Ba-La-140	-2.3 ± 0.6	< 4.6	0.7 ± 2.1	< 2.2	-3.6 ± 2.2	< 6.9	-2.0 ± 1.7	< 4.0	15
Other (Ru-103)	0.2 ± 0.6	< 1.5	-2.0 ± 2.1	< 3.1	-1.0 ± 2.2	< 3.8	-1.0 ± 1.6	< 2.9	30
Lab Code	ELW- 5110		ELW- 5786		ELW- 6355		ELW- 6940		
Date Collected	09-16-15		10-14-15		11-05-15		12-10-15		Req. LLD
Gross beta	1.1 ± 0.5	< 0.9	0.7 ± 0.5	< 0.9	2.4 ± 1.0	< 1.8	1.7 ± 0.6	< 0.9	4.0
I-131	0.12 ± 0.14	< 0.24	-0.03 ± 0.23	< 0.41	0.17 ± 0.26	< 0.49	-0.02 ± 0.16	< 0.29	0.5
Be-7	1.7 ± 9.3	< 26.6	-14.1 ± 16.7	< 30.4	-3.3 ± 5.9	< 11.2	7.6 ± 10.8	< 20.8	
Mn-54	1.3 ± 1.1	< 2.5	-1.8 ± 1.7	< 2.8	0.5 ± 0.6	< 1.3	0.5 ± 1.3	< 2.3	10
Fe-59	-1.3 ± 2.1	< 5.1	-0.6 ± 3.0	< 6.2	1.1 ± 1.1	< 3.0	-3.4 ± 2.8	< 5.2	30
Co-58	0.4 ± 1.1	< 3.1	-0.8 ± 1.8	< 3.6	0.4 ± 0.6	< 1.4	-0.8 ± 1.2	< 1.5	10
Co-60	0.2 ± 1.2	< 1.6	-0.7 ± 1.5	< 1.6	0.1 ± 0.7	< 1.0	-0.1 ± 1.4	< 2.0	10
Zn-65	-2.0 ± 2.6	< 1.9	2.9 ± 3.7	< 4.4	0.7 ± 1.2	< 1.8	3.8 ± 2.7	< 3.4	30
Zr-Nb-95	-0.7 ± 1.1	< 3.9	1.6 ± 1.7	< 5.4	0.1 ± 0.6	< 1.6	0.3 ± 1.5	< 2.6	15
Cs-134	-0.2 ± 1.1	< 2.1	1.3 ± 1.7	< 3.2	-0.4 ± 0.6	< 1.3	0.4 ± 1.3	< 2.3	10
Cs-137	-0.8 ± 1.3	< 1.8	0.4 ± 2.2	< 2.5	0.0 ± 0.7	< 1.2	0.3 ± 1.5	< 2.6	10
Ba-La-140	-2.3 ± 1.3	< 10.3	1.1 ± 1.9	< 6.8	-1.0 ± 0.7	< 5.0	0.8 ± 1.9	< 2.6	15
Other (Ru-103)	0.0 ± 1.1	< 3.7	-1.6 ± 1.9	< 2.8	-0.2 ± 0.7	< 1.9	-0.8 ± 1.2	< 2.2	30

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Table 5. Lake water, analyses for gross beta, iodine-131 and gamma emitting isotopes.
Location: E-33 (Kewaunee)
Collection: Monthly composites

Units: pCi/L

Lab Code	ELW- 139	MDC	NS[a]	MDC	ELW- 991	MDC	ELW- 1663	MDC	
Date Collected	01-15-15		02-15-15		03-12-15		04-16-15		Req. LLD
Gross beta	3.2 ± 0.8	< 1.1	-		2.4 ± 1.0	< 1.8	1.0 ± 0.5	< 0.8	4.0
I-131	-0.01 ± 0.16	< 0.29	-		0.02 ± 0.13	< 0.23	-0.15 ± 0.21	< 0.48	0.5
Be-7	-3.0 ± 8.0	< 13.3	-		-3.2 ± 8.9	< 20.4	-8.6 ± 14.3	< 29.1	
Mn-54	-0.8 ± 1.0	< 1.5	-		0.5 ± 1.0	< 2.1	-0.5 ± 1.4	< 2.0	10
Fe-59	2.4 ± 1.7	< 3.8	-		-0.8 ± 1.8	< 2.3	-1.5 ± 3.0	< 4.2	30
Co-58	-0.5 ± 1.0	< 1.8	-		0.6 ± 1.0	< 2.3	0.1 ± 1.5	< 2.0	10
Co-60	-0.1 ± 0.9	< 1.1	-		-0.5 ± 1.1	< 1.1	-1.3 ± 1.8	< 1.6	10
Zn-65	-0.6 ± 1.5	< 2.3	-		0.1 ± 2.1	< 1.8	2.7 ± 3.2	< 2.4	30
Zr-Nb-95	-0.1 ± 1.1	< 2.5	-		0.5 ± 1.2	< 3.3	-2.6 ± 1.7	< 2.3	15
Cs-134	0.0 ± 1.0	< 1.9	-		1.2 ± 1.1	< 2.0	-1.2 ± 1.4	< 3.0	10
Cs-137	-0.6 ± 1.2	< 1.8	-		0.2 ± 1.3	< 2.4	0.6 ± 1.8	< 3.3	10
Ba-La-140	-0.9 ± 1.1	< 3.8	-		1.5 ± 1.1	< 2.8	2.9 ± 1.5	< 2.5	15
Other (Ru-103)	0.2 ± 0.9	< 2.2	-		-0.9 ± 1.1	< 2.4	-0.6 ± 1.8	< 2.1	30

Lab Code	ELW- 2425	MDC	ELW- 2938	MDC	ELW- 3617	MDC	ELW- 4483	MDC	
Date Collected	05-14-15		06-11-15		07-09-15		08-13-15		Req. LLD
Gross beta	2.1 ± 1.0	< 1.8	1.0 ± 0.5	< 0.8	1.6 ± 0.9	< 1.6	0.9 ± 0.5	< 0.8	4.0
I-131	-0.03 ± 0.12	< 0.23	-0.04 ± 0.11	< 0.21	-0.01 ± 0.20	< 0.37	0.01 ± 0.16	< 0.29	0.5
Be-7	-4.0 ± 4.9	< 11.0	2.8 ± 10.7	< 24.9	4.3 ± 13.9	< 36.1	9.2 ± 11.1	< 30.0	
Mn-54	0.1 ± 0.6	< 1.2	0.6 ± 1.0	< 1.7	0.0 ± 1.5	< 2.6	0.4 ± 1.5	< 2.9	10
Fe-59	-1.1 ± 1.0	< 2.8	0.3 ± 2.1	< 2.5	-0.7 ± 2.5	< 4.0	-0.3 ± 2.7	< 5.3	30
Co-58	-0.2 ± 0.5	< 1.3	-0.3 ± 0.9	< 1.3	0.3 ± 1.5	< 3.5	-1.0 ± 1.2	< 1.7	10
Co-60	0.3 ± 0.6	< 1.2	-0.3 ± 1.1	< 2.0	-0.2 ± 1.5	< 1.8	-0.2 ± 1.6	< 1.8	10
Zn-65	0.7 ± 1.1	< 2.5	-1.1 ± 2.4	< 3.5	-0.2 ± 2.6	< 2.9	-0.2 ± 2.4	< 3.1	30
Zr-Nb-95	-0.2 ± 0.6	< 1.7	0.6 ± 1.1	< 2.4	-2.4 ± 1.6	< 2.7	2.2 ± 1.3	< 3.7	15
Cs-134	-0.1 ± 0.6	< 1.1	-0.2 ± 1.1	< 2.2	-0.8 ± 1.7	< 2.9	0.8 ± 1.6	< 3.0	10
Cs-137	0.6 ± 0.7	< 1.2	-0.4 ± 1.3	< 1.5	0.4 ± 1.9	< 2.8	0.2 ± 1.7	< 2.5	10
Ba-La-140	-2.3 ± 0.7	< 2.4	-3.2 ± 1.3	< 1.8	-1.0 ± 1.7	< 6.5	-1.4 ± 1.7	< 7.6	15
Other (Ru-103)	-0.9 ± 0.5	< 1.9	-1.3 ± 1.3	< 2.1	-0.4 ± 1.5	< 3.0	0.2 ± 1.3	< 3.2	30

Lab Code	ELW- 5111	MDC	ELW- 5787	MDC	ELW- 6356	MDC	ELW- 6941	MDC	
Date Collected	09-16-15		10-14-15		11-05-15		12-10-15		Req. LLD
Gross beta	0.6 ± 0.5	< 0.8	0.9 ± 0.5	< 0.8	1.8 ± 0.9	< 1.7	2.3 ± 0.6	< 0.8	4.0
I-131	0.13 ± 0.16	< 0.27	0.00 ± 0.19	< 0.35	0.25 ± 0.26	< 0.49	0.13 ± 0.17	< 0.29	0.5
Be-7	7.8 ± 8.4	< 19.7	16.4 ± 14.4	< 38.0	2.5 ± 4.4	< 13.5	-5.6 ± 19.1	< 29.6	
Mn-54	0.3 ± 0.8	< 1.7	0.1 ± 1.4	< 2.3	-0.2 ± 0.6	< 1.0	0.1 ± 2.0	< 3.7	10
Fe-59	1.0 ± 1.6	< 3.5	-5.6 ± 2.5	< 3.3	-0.7 ± 1.0	< 2.8	-3.4 ± 4.2	< 5.9	30
Co-58	-0.3 ± 0.8	< 1.8	-0.7 ± 1.7	< 2.9	0.4 ± 0.5	< 1.2	2.6 ± 2.0	< 3.4	10
Co-60	-0.2 ± 0.9	< 1.5	0.2 ± 1.6	< 1.6	0.1 ± 0.6	< 1.0	-1.3 ± 1.7	< 1.4	10
Zn-65	-1.1 ± 1.8	< 2.6	2.1 ± 3.2	< 6.1	-1.0 ± 1.1	< 1.5	-1.9 ± 5.0	< 5.7	30
Zr-Nb-95	1.3 ± 0.8	< 2.5	-1.9 ± 1.6	< 2.4	-0.1 ± 0.5	< 1.8	0.3 ± 2.0	< 2.9	15
Cs-134	-0.6 ± 0.9	< 1.6	-0.4 ± 1.4	< 2.9	0.2 ± 0.5	< 1.0	0.3 ± 2.1	< 3.8	10
Cs-137	-0.1 ± 0.9	< 1.1	1.5 ± 1.8	< 2.1	0.3 ± 0.6	< 1.1	2.3 ± 2.1	< 4.0	10
Ba-La-140	-4.3 ± 1.0	< 4.2	0.8 ± 2.2	< 13.4	0.7 ± 0.7	< 3.8	-5.3 ± 2.1	< 1.8	15
Other (Ru-103)	-0.7 ± 0.9	< 2.3	1.6 ± 1.6	< 4.1	0.5 ± 0.5	< 1.6	-0.4 ± 2.3	< 3.6	30

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

Annual

All locations	**Mean ± s.d.**		**Mean ± s.d.**		**Mean ± s.d.**
Gross Beta	**1.6 ± 1.0**				
I-131	**0.03 ± 0.08**	**Co-58**	**0.0 ± 1.0**	**Cs-134**	**-0.1 ± 1.1**
Be-7	**0.3 ± 8.0**	**Co-60**	**-0.1 ± 0.9**	**Cs-137**	**0.2 ± 0.6**
Mn-54	**0.1 ± 0.7**	**Zn-65**	**-0.5 ± 2.5**	**Ba-La-140**	**-0.8 ± 2.2**
Fe-59	**-0.6 ± 2.0**	**Zr-Nb-95**	**-0.1 ± 1.3**	**Ru-103**	**-0.2 ± 0.9**

Table 6. Lake water, analyses for tritium, strontium-89 and strontium-90.
Collection: Quarterly composites of weekly grab samples
Units: pCi/L

Location	E-01 (Meteorological Tower)								
Period	1st Qtr.	MDC	2nd Qtr.	MDC	3rd Qtr.	MDC	4th Qtr.	MDC	
Lab Code	ELW- 1087		ELW- 3139		ELW- 5202		ELW- 7017		Req. LLDs
H-3	-38 ± 71	< 148	55 ± 74	< 144	128 ± 78	< 142	85 ± 76	< 145	500
Sr-89	-0.13 ± 0.66	< 0.76	0.17 ± 0.88	< 1.01	0.17 ± 0.63	< 0.76	0.34 ± 0.62	< 0.73	5.0
Sr-90	0.35 ± 0.28	< 0.53	0.28 ± 0.37	< 0.73	0.19 ± 0.30	< 0.59	0.22 ± 0.26	< 0.51	1.0

Location	E-05 (Two Creeks Park)								
Period	1st Qtr.		2nd Qtr.		3nd Qtr.		4th Qtr.		
Lab Code	ELW- 1088		ELW- 3140		ELW- 5203		ELW- 7018 [a]		Req. LLDs
H-3	15 ± 74	< 148	29 ± 73	< 144	96 ± 76	< 142	452 ± 94 (*)	< 145	500
Sr-89	-0.05 ± 0.63	< 0.79	0.29 ± 0.62	< 0.78	0.48 ± 0.58	< 0.73	0.53 ± 0.63	< 0.72	5.0
Sr-90	0.24 ± 0.26	< 0.51	0.12 ± 0.25	< 0.52	0.16 ± 0.26	< 0.51	0.14 ± 0.26	< 0.52	1.0

Location	E-06 (Coast Guard Station)								
Period	1st Qtr.		2nd Qtr.		3nd Qtr.		4th Qtr.		
Lab Code	ELW- 1089		ELW- 3141		ELW- 5204		ELW- 7019		Req. LLDs
H-3	4 ± 74	< 148	86 ± 76	< 144	61 ± 74	< 142	61 ± 75	< 145	500
Sr-89	-0.08 ± 0.57	< 0.69	-0.80 ± 0.86	< 0.91	-0.04 ± 0.50	< 0.61	-0.43 ± 0.69	< 0.78	5.0
Sr-90	0.23 ± 0.24	< 0.46	0.71 ± 0.38	< 0.64	0.23 ± 0.24	< 0.45	0.47 ± 0.31	< 0.55	1.0

Location	E-33 (Kewaunee)								
Period	1st Qtr.		2nd Qtr.		3nd Qtr.		4th Qtr.		
Lab Code	ELW- 1090		ELW- 3142		ELW- 5205		ELW- 7020		Req. LLDs
H-3	158 ± 82	< 148	8 ± 72	< 144	113 ± 77	< 142	237 ± 84 (*)	< 145	500
Sr-89	0.39 ± 0.57	< 0.69	-0.21 ± 0.57	< 0.68	-0.15 ± 0.54	< 0.62	-0.24 ± 0.61	< 0.76	5.0
Sr-90	0.14 ± 0.23	< 0.44	0.26 ± 0.25	< 0.48	0.41 ± 0.26	< 0.44	0.26 ± 0.27	< 0.51	1.0

(*) monthly analyses being done to find which month in quarter is highest KO 2-8-16

Tritium Annual Mean ± s.d.	**97 ± 116**
Sr-89 Annual Mean ± s.d.	**0.02 ± 0.36**
Sr-90 Annual Mean ± s.d.	**0.28 ± 0.15**

[a] Tritium recounted with a result of 584±99 pCi/L.

Table 7. Fish, analyses for gross beta and gamma emitting isotopes.
Location: E-13
Collection: 2x / year Units: pCi/g wet

	Sample Description and Concentration	MDC		MDC		MDC	Req. LLD
Collection Date	01-05-15		01-06-15		01-18-15		
Lab Code	EF- 146		EF- 148		EF- 1334		
Type	Lake Trout		White Fish		Smallmouth Bass		
Ratio (wet/dry wt.)	4.71		4.87		5.19		
Gross Beta	3.31 ± 0.09	< 0.031	3.41 ± 0.10	< 0.038	3.26 ± 0.03	< 0.010	0.5
K-40	2.49 ± 0.34	-	3.25 ± 0.42	-	3.03 ± 0.40	-	
Mn-54	0.005 ± 0.007	< 0.015	0.001 ± 0.010	< 0.013	0.002 ± 0.010	< 0.023	0.13
Fe-59	-0.010 ± 0.018	< 0.054	-0.044 ± 0.021	< 0.028	-0.004 ± 0.018	< 0.133	0.26
Co-58	0.008 ± 0.007	< 0.020	-0.003 ± 0.009	< 0.014	-0.018 ± 0.009	< 0.028	0.13
Co-60	0.001 ± 0.010	< 0.015	-0.004 ± 0.010	< 0.011	0.013 ± 0.010	< 0.018	0.13
Zn-65	-0.009 ± 0.020	< 0.024	0.006 ± 0.024	< 0.026	0.010 ± 0.017	< 0.037	0.26
Cs-134	0.003 ± 0.009	< 0.018	-0.005 ± 0.009	< 0.015	0.000 ± 0.009	< 0.017	0.13
Cs-137	0.014 ± 0.011	< 0.020	0.012 ± 0.010	< 0.012	0.025 ± 0.013	< 0.021	0.15
Other (Ru-103)	0.020 ± 0.009	< 0.042	0.010 ± 0.008	< 0.016	-0.014 ± 0.007	< 0.049	0.5
Collection Date	03-15-15		03-15-15		03-30-15		
Lab Code	EF- 1335		EF- 1336		EF- 1337		
Type	Lake Herring		Burbot		Chinook		
Ratio (wet/dry wt.)	5.19		5.77		5.17		
Gross Beta	3.16 ± 0.03	< 0.010	1.75 ± 0.02	< 0.009	2.30 ± 0.02	< 0.007	0.5
K-40	2.32 ± 0.34	-	0.94 ± 0.49		2.11 ± 0.30		
Mn-54	-0.001 ± 0.009	< 0.015	-0.014 ± 0.021	< 0.025	-0.007 ± 0.008	< 0.011	0.13
Fe-59	-0.003 ± 0.015	< 0.037	0.056 ± 0.036	< 0.108	-0.029 ± 0.018	< 0.034	0.26
Co-58	-0.015 ± 0.009	< 0.015	-0.021 ± 0.020	< 0.039	0.001 ± 0.007	< 0.016	0.13
Co-60	0.003 ± 0.011	< 0.012	0.030 ± 0.021	< 0.021	0.002 ± 0.009	< 0.013	0.13
Zn-65	-0.006 ± 0.018	< 0.024	0.008 ± 0.041	< 0.082	-0.008 ± 0.018	< 0.030	0.26
Cs-134	-0.002 ± 0.008	< 0.015	0.000 ± 0.021	< 0.044	0.000 ± 0.008	< 0.016	0.13
Cs-137	0.044 ± 0.023	< 0.022	0.038 ± 0.027	< 0.049	0.023 ± 0.010	< 0.018	0.15
Other (Ru-103)	0.000 ± 0.007	< 0.030	-0.010 ± 0.018	< 0.073	-0.010 ± 0.008	< 0.016	0.5

Table 7. Fish, analyses for gross beta and gamma emitting isotopes.
Location: E-13
Collection: 2x / year Units: pCi/g wet

	Sample Description and Concentration (pCi/g wet)	MDC		MDC		MDC	Req. LLD
Collection Date	04-30-15		05-18-15		06-12-15		
Lab Code	EF- 2214		EF- 2637		EF- 3732		
Type	Lake Trout		Lake Trout		Lake Trout		
Ratio (wet/dry wt.)	3.42		3.78		3.82		
Gross Beta	2.78 ± 0.06	< 0.020	2.43 ± 0.06	< 0.020	3.62 ± 0.08	< 0.029	0.5
K-40	2.59 ± 0.41	-	2.46 ± 0.41	-	2.33 ± 0.40	-	
Mn-54	-0.004 ± 0.009	< 0.013	0.013 ± 0.009	< 0.014	0.003 ± 0.008	< 0.016	0.13
Fe-59	0.025 ± 0.021	< 0.042	0.008 ± 0.018	< 0.039	0.036 ± 0.019	< 0.055	0.26
Co-58	0.000 ± 0.009	< 0.016	0.000 ± 0.009	< 0.007	0.008 ± 0.008	< 0.019	0.13
Co-60	0.008 ± 0.006	< 0.013	0.002 ± 0.010	< 0.014	0.003 ± 0.010	< 0.016	0.13
Zn-65	-0.011 ± 0.024	< 0.013	-0.013 ± 0.020	< 0.009	-0.017 ± 0.022	< 0.022	0.26
Cs-134	-0.004 ± 0.009	< 0.013	0.000 ± 0.009	< 0.016	-0.010 ± 0.010	< 0.018	0.13
Cs-137	0.021 ± 0.010	< 0.015	0.037 ± 0.021	< 0.018	0.022 ± 0.011	< 0.018	0.15
Other (Ru-103)	0.004 ± 0.009	< 0.021	0.005 ± 0.008	< 0.009	-0.011 ± 0.009	< 0.027	0.5
Collection Date	06-19-15		08-18-15		09-02-15		
Lab Code	EF- 3733		EF- 4660		EF- 5230		
Type	Burbot		Lake Trout		Coho		
Ratio (wet/dry wt.)	5.99		5.08		5.15		
Gross Beta	2.06 ± 0.06	< 0.028	2.32 ± 0.05	< 0.029	2.72 ± 0.06	< 0.018	
K-40	2.00 ± 0.36	-	2.22 ± 0.35	-	2.58 ± 0.39		
Mn-54	0.011 ± 0.009	< 0.015	0.006 ± 0.009	< 0.018	0.004 ± 0.009	< 0.020	
Fe-59	-0.010 ± 0.020	< 0.049	0.029 ± 0.016	< 0.051	0.032 ± 0.015	< 0.048	
Co-58	-0.014 ± 0.008	< 0.013	0.010 ± 0.008	< 0.013	0.002 ± 0.008	< 0.018	
Co-60	0.002 ± 0.010	< 0.012	0.004 ± 0.010	< 0.014	0.000 ± 0.010	< 0.015	
Zn-65	-0.023 ± 0.022	< 0.019	0.006 ± 0.015	< 0.019	0.006 ± 0.017	< 0.029	
Cs-134	-0.006 ± 0.009	< 0.019	0.006 ± 0.008	< 0.015	0.003 ± 0.008	< 0.014	
Cs-137	0.054 ± 0.020	< 0.018	0.041 ± 0.020	< 0.021	0.026 ± 0.011	< 0.019	
Other (Ru-103)	-0.009 ± 0.009	< 0.031	0.001 ± 0.007	< 0.034	0.018 ± 0.007	< 0.036	

Table 7. Fish, analyses for gross beta and gamma emitting isotopes.
Location: E-13
Collection: 2x / year Units: pCi/g wet

	Sample Description and Concentration (pCi/g wet)	MDC		MDC		MDC	Req. LLD
Collection Date	11-27-15		11-27-15				
Lab Code	EF- 6744		EF- 6745				
Type	Chinook Salmon		Lake Trout				
Ratio (wet/dry wt.)	4.07		4.15				
Gross Beta	3.24 ± 0.06	< 0.020	2.95 ± 0.07	< 0.025			0.5
K-40	3.22 ± 0.42	-	2.34 ± 0.38	-			
Mn-54	0.004 ± 0.008	< 0.012	0.000 ± 0.008	< 0.015			0.13
Fe-59	-0.003 ± 0.018	< 0.026	0.002 ± 0.016	< 0.035			0.26
Co-58	-0.011 ± 0.008	< 0.009	0.002 ± 0.008	< 0.014			0.13
Co-60	-0.002 ± 0.009	< 0.008	-0.005 ± 0.008	< 0.008			0.13
Zn-65	-0.011 ± 0.021	< 0.013	-0.004 ± 0.019	< 0.026			0.26
Cs-134	0.001 ± 0.008	< 0.016	0.004 ± 0.007	< 0.013			0.13
Cs-137	0.021 ± 0.011	< 0.017	0.021 ± 0.011	< 0.017			0.15
Other (Ru-103)	-0.003 ± 0.008	< 0.020	-0.003 ± 0.008	< 0.018			0.5

	Annual
	Mean ± s.d.
Gross Beta	**2.81 ± 0.56**
K-40	**2.42 ± 0.57**
Mn-54	**0.002 ± 0.007**
Fe-59	**0.006 ± 0.027**
Co-58	**-0.004 ± 0.010**
Co-60	**0.004 ± 0.009**
Zn-65	**-0.005 ± 0.010**
Cs-134	**-0.001 ± 0.004**
Cs-137	**0.029 ± 0.012**
Other (Ru-103)	**0.000 ± 0.011**

POINT BEACH NUCLEAR PLANT

Table 8. Radioactivity in shoreline sediment samples

Collection: Semiannual

Sample Description and Concentration (pCi/g dry)

		MDC		MDC		MDC	
Collection Date	4/16/2015		4/16/2015		4/16/2015		
Lab Code	ESS- 1668		ESS- 1669		ESS- 1670		LLD
Location	E-01		E-05		E-06		
Gross Beta	6.93 ± 0.88	< 1.13	7.14 ± 0.84	< 1.06	8.60 ± 0.95	< 1.19	2.0
Be-7	0.028 ± 0.050	< 0.09	-0.034 ± 0.037	< 0.08	-0.063 ± 0.061	< 0.14	
K-40	5.73 ± 0.40	-	3.20 ± 0.26	-	5.13 ± 0.39	-	-
Cs-134	0.000 ± 0.007	< 0.012	-0.002 ± 0.004	< 0.007	0.001 ± 0.007	< 0.013	0.15
Cs-137	0.008 ± 0.009	< 0.017	0.006 ± 0.006	< 0.009	0.025 ± 0.013	< 0.013	0.15
Tl-208	0.045 ± 0.022	-	0.032 ± 0.012	-	0.090 ± 0.020	-	-
Pb-212	0.20 ± 0.057	-	0.079 ± 0.016	-	0.32 ± 0.069	-	-
Bi-214	0.12 ± 0.027	-	0.094 ± 0.017	-	0.23 ± 0.034	-	-
Ra-226	0.38 ± 0.15	< 0.28	0.31 ± 0.11	< 0.19	0.54 ± 0.17	< 0.30	-
Ac-228	0.20 ± 0.063	-	0.11 ± 0.030	-	0.27 ± 0.077	-	-
Collection Date	4/16/2015		4/16/2015				
Lab Code	ESS- 1671		ESS- 1672				
Location	E-12		E-33				
Gross Beta	9.14 ± 0.88	< 1.05	7.72 ± 0.83	< 1.04			2.0
Be-7	0.011 ± 0.053	< 0.11	-0.036 ± 0.051	< 0.10			
K-40	5.75 ± 0.38	-	5.81 ± 0.40	-			-
Cs-134	-0.007 ± 0.007	< 0.009	0.000 ± 0.006	< 0.009			0.15
Cs-137	0.014 ± 0.008	< 0.015	0.017 ± 0.008	< 0.014			0.15
Tl-208	0.042 ± 0.022	-	0.038 ± 0.018	-			-
Pb-212	0.12 ± 0.018	-	0.16 ± 0.054	-			-
Bi-214	0.13 ± 0.026	-	0.11 ± 0.025	-			-
Ra-226	0.42 ± 0.14	< 0.25	0.31 ± 0.16	-			-
Ac-228	0.15 ± 0.047	-	0.14 ± 0.049	-			-

POINT BEACH NUCLEAR PLANT

RADIOACTIVITY IN SHORELINE SEDIMENT SAMPLES

(Semiannual Collections)

Sample Description and Concentration (pCi/g dry)

		MDC		MDC		MDC	
Collection Date	10/14/2015		10/14/2015		10/14/2015		Req.
Lab Code	ESS- 5818		ESS- 5820		ESS- 5821		LLD
Location	E-01		E-05		E-06		
Gross Beta	8.10 ± 0.87	< 1.07	9.15 ± 0.92	< 1.11	11.20 ± 0.92	< 1.06	2.0
Be-7	0.037 ± 0.067	< 0.17	-0.001 ± 0.061	< 0.14	-0.001 ± 0.066	< 0.18	
K-40	5.22 ± 0.40	-	7.78 ± 0.42	-	8.69 ± 0.50	-	-
Cs-134	-0.006 ± 0.008	< 0.017	-0.003 ± 0.006	< 0.013	0.005 ± 0.007	< 0.011	0.15
Cs-137	0.029 ± 0.016	< 0.016	0.014 ± 0.008	< 0.015	0.020 ± 0.010	< 0.017	0.15
Tl-208	0.059 ± 0.018	-	0.065 ± 0.018	-	0.050 ± 0.016	-	-
Pb-212	0.19 ± 0.027	-	0.15 ± 0.020	-	0.14 ± 0.024	-	-
Bi-214	0.15 ± 0.041	-	0.23 ± 0.029	-	0.13 ± 0.027	-	-
Ra-226	0.47 ± 0.24	-	0.35 ± 0.14	< 0.29	0.37 ± 0.18	< 0.35	-
Ac-228	0.20 ± 0.059	-	0.18 ± 0.069	-	0.17 ± 0.080	-	-

Collection Date	10/14/2015		10/14/2015			
Lab Code	ESS- 5822		ESS- 5823			
Location	E-12		E-33			**Annual Mean ±s.d.**
Gross Beta	7.31 ± 0.84	< 1.04	7.50 ± 0.94	< 1.22	2.0	**8.28 ± 1.30**
Be-7	-0.012 ± 0.056	< 0.14	0.058 ± 0.064	< 0.21		**-0.001 ± 0.037**
K-40	4.69 ± 0.34	-	5.56 ± 0.41	-	-	**5.75 ± 1.53**
Cs-134	-0.002 ± 0.006	< 0.011	-0.008 ± 0.007	< 0.012	0.15	**0.00 ± 0.00**
Cs-137	0.026 ± 0.011	< 0.012	0.028 ± 0.013	< 0.015	0.15	**0.019 ± 0.008**
Tl-208	0.050 ± 0.014	-	0.049 ± 0.020	-	-	**0.05 ± 0.02**
Pb-212	0.14 ± 0.021	-	0.13 ± 0.021	-	-	**0.16 ± 0.06**
Bi-214	0.13 ± 0.024	-	0.086 ± 0.025	-	-	**0.14 ± 0.05**
Ra-226	0.36 ± 0.20	-	0.33 ± 0.17	< 0.33	-	**0.38 ± 0.07**
Ac-228	0.14 ± 0.061	-	0.14 ± 0.051	-	-	**0.17 ± 0.05**

POINT BEACH NUCLEAR PLANT

Table 9. Radioactivity in soil samples

Collection: Semiannual

Sample Description and Concentration (pCi/g dry)

		MDC		MDC		MDC	
Collection Date	5/29/2015		5/29/2015		6/1/2015		Req.
Lab Code	ESO- 2728		ESO- 2729		ESO- 2730		LLD
Location	E-01		E-02		E-03		
Gross Beta	8.08 ± 0.92	< 1.15	31.19 ± 1.22	< 1.04	26.25 ± 1.15	< 1.03	2.0
Be-7	0.098 ± 0.057	< 0.12	0.14 ± 0.10	< 0.21	0.026 ± 0.088	< 0.18	
K-40	5.38 ± 0.37	-	18.99 ± 0.89	-	18.03 ± 0.81	-	-
Cs-134	-0.004 ± 0.006	< 0.008	-0.004 ± 0.011	< 0.018	-0.004 ± 0.008	< 0.013	0.15
Cs-137	0.031 ± 0.015	< 0.013	0.12 ± 0.044	< 0.032	0.15 ± 0.030	< 0.022	0.15
Tl-208	0.054 ± 0.015	-	0.20 ± 0.035	-	0.20 ± 0.034	-	-
Pb-212	0.16 ± 0.028	-	0.51 ± 0.046	-	0.57 ± 0.096	-	-
Bi-214	0.13 ± 0.027	-	0.36 ± 0.053	-	0.33 ± 0.042	-	-
Ra-226	0.42 ± 0.14	< 0.27	1.02 ± 0.32	-	1.18 ± 0.27	-	-
Ac-228	0.26 ± 0.057	-	0.62 ± 0.11	-	0.68 ± 0.11	-	-

Collection Date	6/1/2015		5/29/2015		6/1/2015		
Lab Code	ESO- 2731		ESO- 2732		ESO- 2734		
Location	E-04		E-06		E-08		
Gross Beta	15.40 ± 1.07	< 1.20	19.14 ± 1.10	< 1.14	22.32 ± 1.15	< 1.15	2.0
Be-7	0.094 ± 0.068	< 0.13	0.191 ± 0.073	< 0.15	0.15 ± 0.082	< 0.20	
K-40	8.39 ± 0.56	-	11.85 ± 0.66	-	13.44 ± 0.74	-	-
Cs-134	0.005 ± 0.008	< 0.015	-0.002 ± 0.008	< 0.013	-0.001 ± 0.010	< 0.016	0.15
Cs-137	0.088 ± 0.024	< 0.018	0.315 ± 0.036	< 0.024	0.23 ± 0.034	< 0.023	0.15
Tl-208	0.11 ± 0.022	-	0.082 ± 0.027	-	0.092 ± 0.031	-	-
Pb-212	0.33 ± 0.077	-	0.19 ± 0.038	-	0.21 ± 0.030	-	-
Bi-214	0.17 ± 0.039	-	0.15 ± 0.035	-	0.17 ± 0.037	-	-
Ra-226	0.41 ± 0.22	-	0.38 ± 0.22	-	0.53 ± 0.24	-	-
Ac-228	0.38 ± 0.087	-	0.28 ± 0.067	-	0.35 ± 0.091	-	-

Collection Date	6/1/2015		5/29/2015		
Lab Code	ESO- 2735		ESO- 2736		
Location	E-09		E-20		
Gross Beta	26.28 ± 1.15	< 1.03	23.45 ± 1.18	< 1.17	2.0
Be-7	0.077 ± 0.093	< 0.21	-0.20 ± 0.09	< 0.15	
K-40	17.00 ± 0.82	-	14.20 ± 0.77	-	-
Cs-134	0.009 ± 0.010	< 0.016	-0.006 ± 0.010	< 0.014	0.15
Cs-137	0.11 ± 0.035	< 0.026	0.089 ± 0.022	< 0.018	0.15
Tl-208	0.14 ± 0.031	-	0.12 ± 0.025	-	-
Pb-212	0.51 ± 0.10	-	0.49 ± 0.10	-	-
Bi-214	0.40 ± 0.054	-	0.24 ± 0.044	-	-
Ra-226	0.92 ± 0.29	-	0.67 ± 0.26	-	-
Ac-228	0.51 ± 0.10	-	0.46 ± 0.093	-	-

POINT BEACH NUCLEAR PLANT

Table 9. Radioactivity in soil samples

Collection: Semiannual

Sample Description and Concentration (pCi/g dry)

Collection Date	10/28/2015	MDC	10/28/2015	MDC	10/28/2015	MDC	Req.
Lab Code	ESO- 6252		ESO- 6253		ESO- 6254		LLD
Location	E-01		E-02		E-03		
Gross Beta	24.11 ± 1.58	< 1.69	26.54 ± 1.59	< 1.56	28.29 ± 1.60	< 1.50	2.0
Be-7	0.024 ± 0.090	< 0.18	0.020 ± 0.094	< 0.19	0.083 ± 0.085	< 0.21	
K-40	16.38 ± 0.72	-	16.15 ± 0.73	-	15.01 ± 0.69	-	-
Cs-134	0.003 ± 0.010	< 0.020	-0.006 ± 0.011	< 0.018	0.002 ± 0.009	< 0.018	0.15
Cs-137	0.17 ± 0.035	< 0.030	0.095 ± 0.034	< 0.031	0.12 ± 0.026	< 0.024	0.15
Tl-208	0.16 ± 0.025	-	0.16 ± 0.028	-	0.17 ± 0.030	-	-
Pb-212	0.51 ± 0.038	-	0.52 ± 0.040	-	0.46 ± 0.036	-	-
Bi-214	0.34 ± 0.045	-	0.31 ± 0.046	-	0.26 ± 0.039	-	-
Ra-226	1.12 ± 0.30	-	0.83 ± 0.32	-	1.37 ± 0.32	-	-
Ac-228	0.61 ± 0.12	-	0.40 ± 0.075	-	0.48 ± 0.082	-	-

Collection Date	10/28/2015		10/28/2015		10/28/2015		
Lab Code	ESO- 6255		ESO- 6256		ESO- 6257		
Location	E-04		E-06		E-08		
Gross Beta	28.38 ± 1.62	< 1.55	13.87 ± 1.37	< 1.73	18.75 ± 1.13	< 1.21	2.0
Be-7	0.085 ± 0.090	< 0.25	-0.026 ± 0.080	< 0.14	0.058 ± 0.075	< 0.24	
K-40	17.17 ± 0.73	-	8.55 ± 0.52	-	15.61 ± 0.71	-	-
Cs-134	-0.009 ± 0.010	< 0.013	0.000 ± 0.008	< 0.014	-0.012 ± 0.009	< 0.011	0.15
Cs-137	0.12 ± 0.024	< 0.023	0.28 ± 0.033	< 0.024	0.24 ± 0.030	< 0.023	0.15
Tl-208	0.15 ± 0.027	-	0.070 ± 0.020	-	0.11 ± 0.026	-	-
Pb-212	0.46 ± 0.036	-	0.24 ± 0.028	-	0.29 ± 0.029	-	-
Bi-214	0.36 ± 0.041	-	0.14 ± 0.031	-	0.30 ± 0.054	-	-
Ra-226	1.14 ± 0.29	-	0.30 ± 0.21	< 0.42	1.23 ± 0.25	-	-
Ac-228	0.45 ± 0.095	-	0.25 ± 0.091	-	0.40 ± 0.10	-	-

Collection Date	10/28/2015		10/28/2015			
Lab Code	ESO- 6258		ESO- 6259		**Annual**	
Location	E-09		E-20		**Mean ± s.d.**	
Gross Beta	28.28 ± 1.21	< 1.10	21.61 ± 1.11	< 1.09	**22.62 ± 6.24**	2.0
Be-7	0.008 ± 0.092	< 0.18	0.016 ± 0.10	< 0.25	**0.053 ± 0.09**	
K-40	18.83 ± 0.77	-	17.29 ± 0.85	-	**14.52 ± 4.04**	-
Cs-134	0.007 ± 0.009	< 0.018	-0.012 ± 0.012	< 0.019	**0.018 ± 0.08**	0.15
Cs-137	0.15 ± 0.028	< 0.026	0.17 ± 0.031	< 0.031	**0.154 ± 0.077**	0.15
Tl-208	0.16 ± 0.030	-	0.16 ± 0.031	-	**0.13 ± 0.04**	-
Pb-212	0.47 ± 0.035	-	0.53 ± 0.043	-	**0.40 ± 0.14**	-
Bi-214	0.36 ± 0.044	-	0.40 ± 0.062	-	**0.28 ± 0.10**	-
Ra-226	0.85 ± 0.28	-	1.30 ± 0.36	-	**0.86 ± 0.36**	-
Ac-228	0.60 ± 0.075	-	0.60 ± 0.10	-	**0.46 ± 0.14**	-

Table 10. Radioactivity in vegetation samples
Collection: Tri-annual

Sample Description and Concentration (pCi/g wet)

		MDC		MDC		MDC	
Location	E-01		E-02		E-03		
Collection Date	5/29/2015		5/29/2015		6/1/2015		
Lab Code	EG- 2709		EG- 2710		EG- 2711		Req. LLD
Ratio (wet/dry)	3.08		3.82		5.35		-
Gross Beta	7.62 ± 0.15	< 0.050	5.80 ± 0.18	< 0.087	7.42 ± 0.13	< 0.035	0.25
Be-7	1.37 ± 0.16	-	1.64 ± 0.21	-	0.51 ± 0.09	± 0.09	-
K-40	5.01 ± 0.37	-	5.78 ± 0.40	-	5.01 ± 0.31	-	-
I-131	0.006 ± 0.006	< 0.019	0.007 ± 0.006	< 0.023	0.002 ± 0.005	< 0.009	0.060
Cs-134	0.002 ± 0.006	< 0.011	0.001 ± 0.006	< 0.012	-0.001 ± 0.004	< 0.008	0.060
Cs-137	0.008 ± 0.007	< 0.012	-0.001 ± 0.007	< 0.013	-0.002 ± 0.005	< 0.011	0.080
Other (Co-60)	0.002 ± 0.007	< 0.013	0.002 ± 0.007	< 0.008	-0.003 ± 0.006	< 0.009	0.060
Location	E-04		E-06		E-08		
Collection Date	6/1/2015		5/29/2015		6/1/2015		
Lab Code	EG- 2713		EG- 2714		EG- 2715		Req. LLD
Ratio (wet/dry)	6.09		5.28		4.71		-
Gross Beta	3.98 ± 0.08	< 0.026	5.04 ± 0.10	< 0.034	6.71 ± 0.13	< 0.041	0.25
Be-7	0.65 ± 0.10	-	1.11 ± 0.16	-	1.57 ± 0.18	± 0.175	-
K-40	2.82 ± 0.24	-	4.36 ± 0.33	-	5.89 ± 0.41	-	-
I-131	-0.002 ± 0.005	< 0.015	-0.012 ± 0.007	< 0.018	-0.007 ± 0.006	< 0.014	0.060
Cs-134	0.000 ± 0.005	< 0.008	-0.003 ± 0.007	< 0.011	0.004 ± 0.006	< 0.012	0.060
Cs-137	0.002 ± 0.005	< 0.010	0.052 ± 0.016	< 0.015	-0.001 ± 0.007	< 0.014	0.080
Other (Co-60)	0.001 ± 0.004	< 0.006	-0.002 ± 0.008	< 0.011	0.003 ± 0.008	< 0.014	0.060
Location	E-09		E-20				
Collection Date	6/1/2015		5/29/2015				
Lab Code	EG- 2716		EG- 2717				Req. LLD
Ratio (wet/dry)	3.90		5.27				-
Gross Beta	6.77 ± 0.14	< 0.042	6.42 ± 0.13	< 0.044			0.25
Be-7	0.52 ± 0.13	-	0.18 ± 0.08	± 0.08			-
K-40	5.52 ± 0.34	-	5.39 ± 0.30	-			-
I-131	-0.003 ± 0.004	< 0.011	0.001 ± 0.005	< 0.016			0.060
Cs-134	0.000 ± 0.005	< 0.009	0.001 ± 0.005	< 0.009			0.060
Cs-137	0.005 ± 0.006	< 0.012	-0.002 ± 0.005	< 0.007			0.080
Other (Co-60)	-0.001 ± 0.006	< 0.007	-0.001 ± 0.005	< 0.005			0.060

Table 10. Radioactivity in vegetation samples
Collection: Tri-annual

Sample Description and Concentration (pCi/g wet)

		MDC		MDC		MDC	
Location	E-01		E-02		E-03		
Collection Date	07-22-15		07-22-15		07-22-15		
Lab Code	EG- 4014		EG- 4015		EG- 4016		Req. LLD
Ratio (wet/dry)	3.32		4.01		4.21		-
Gross Beta	5.43 ± 0.12	< 0.048	6.47 ± 0.13	< 0.043	8.02 ± 0.16	< 0.055	0.25
Be-7	1.26 ± 0.22	-	1.15 ± 0.23	-	1.08 ± 0.16	-	-
K-40	3.77 ± 0.42	-	5.70 ± 0.46	-	6.62 ± 0.44	-	-
I-131	0.016 ± 0.010	< 0.037	0.004 ± 0.009	< 0.033	-0.003 ± 0.007	< 0.025	0.060
Cs-134	-0.008 ± 0.009	< 0.017	-0.003 ± 0.008	< 0.017	0.000 ± 0.007	< 0.013	0.060
Cs-137	0.001 ± 0.009	< 0.011	0.005 ± 0.009	< 0.011	0.007 ± 0.008	< 0.013	0.080
Other (Co-60)	0.001 ± 0.010	< 0.011	0.011 ± 0.008	< 0.011	-0.003 ± 0.007	< 0.008	0.060
Location	E-04		E-06		E-08		
Collection Date	07-22-15		07-22-15		07-22-15		
Lab Code	EG- 4017		EG- 4018		EG- 4019		Req. LLD
Ratio (wet/dry)	3.82		2.67		3.28		-
Gross Beta	7.45 ± 0.17	< 0.057	5.60 ± 0.12	< 0.041	4.71 ± 0.12	< 0.054	0.25
Be-7	1.69 ± 0.20	-	1.13 ± 0.15	-	1.13 ± 0.19	-	-
K-40	6.56 ± 0.49	-	4.45 ± 0.34	-	4.42 ± 0.38	-	-
I-131	0.001 ± 0.007	< 0.026	0.015 ± 0.006	< 0.025	-0.004 ± 0.008	< 0.029	0.060
Cs-134	0.001 ± 0.008	< 0.014	-0.004 ± 0.006	< 0.012	-0.003 ± 0.007	< 0.015	0.060
Cs-137	0.004 ± 0.009	< 0.015	0.001 ± 0.008	< 0.013	-0.002 ± 0.007	< 0.013	0.080
Other (Co-60)	-0.005 ± 0.008	< 0.007	0.003 ± 0.007	< 0.010	0.001 ± 0.008	< 0.007	0.060
Location	E-09		E-20				
Collection Date	07-22-15		07-22-15				
Lab Code	EG- 4020		EG- 4021				Req. LLD
Ratio (wet/dry)	3.67		3.38				-
Gross Beta	8.01 ± 0.17	< 0.056	13.74 ± 0.33	< 0.13			0.25
Be-7	1.39 ± 0.20	-	1.43 ± 0.24	-			-
K-40	7.32 ± 0.51	-	5.93 ± 0.48	-			-
I-131	0.003 ± 0.008	< 0.034	0.005 ± 0.010	< 0.045			0.060
Cs-134	-0.002 ± 0.007	< 0.014	-0.002 ± 0.008	< 0.015			0.060
Cs-137	-0.002 ± 0.008	< 0.016	-0.005 ± 0.010	< 0.013			0.080
Other (Co-60)	0.009 ± 0.008	< 0.008	-0.006 ± 0.013	< 0.012			0.060

Table 10. Radioactivity in vegetation samples
Collection: Tri-annual

Sample Description and Concentration (pCi/g wet)

		MDC		MDC		MDC	
Location	E-01		E-02		E-03		
Collection Date	10-01-15		10-01-15		10-01-15		
Lab Code	EG- 5421		EG- 5422		EG- 5423		Req. LLD
Ratio (wet/dry)	2.95		2.79		4.88		-
Gross Beta	5.11 ± 0.19	< 0.079	7.62 ± 0.26	< 0.11	7.38 ± 0.22	< 0.072	0.25
Be-7	2.95 ± 0.31	-	2.38 ± 0.28	-	2.17 ± 0.27	-	-
K-40	4.78 ± 0.50	-	5.53 ± 0.48	-	6.72 ± 0.48	-	-
I-131	-0.006 ± 0.013	< 0.031	-0.013 ± 0.009	< 0.018	-0.007 ± 0.010	< 0.033	0.060
Cs-134	-0.002 ± 0.009	< 0.019	0.006 ± 0.009	< 0.018	0.002 ± 0.008	< 0.016	0.060
Cs-137	-0.005 ± 0.012	< 0.018	-0.004 ± 0.010	< 0.014	0.001 ± 0.009	< 0.015	0.080
Other (Co-60)	-0.003 ± 0.011	< 0.012	-0.001 ± 0.011	< 0.011	-0.001 ± 0.010	< 0.015	0.060
Location	E-04		E-06		E-08		
Collection Date	10-01-15		10-01-15		10-01-15		
Lab Code	EG- 5424		EG- 5425		EG- 5426		Req. LLD
Ratio (wet/dry)	3.74		3.18		3.78		-
Gross Beta	8.56 ± 0.27	< 0.095	4.71 ± 0.17	< 0.071	7.83 ± 0.24	< 0.088	0.25
Be-7	2.71 ± 0.30	-	2.19 ± 0.26	-	2.97 ± 0.25	-	-
K-40	6.46 ± 0.51	-	3.79 ± 0.38	-	4.81 ± 0.44	-	-
I-131	0.001 ± 0.009	< 0.022	-0.011 ± 0.009	< 0.026	0.001 ± 0.009	< 0.043	0.060
Cs-134	-0.004 ± 0.008	< 0.016	-0.003 ± 0.009	< 0.015	-0.002 ± 0.008	< 0.016	0.060
Cs-137	0.004 ± 0.010	< 0.017	0.016 ± 0.011	< 0.018	0.012 ± 0.010	< 0.016	0.080
Other (Co-60)	-0.008 ± 0.009	< 0.011	0.007 ± 0.009	< 0.009	-0.005 ± 0.009	< 0.011	0.060
Location	E-09		E-20				
Collection Date	10-01-15		10-01-15				
Lab Code	EG- 5427		EG- 5428				Req. LLD
Ratio (wet/dry)	4.50		4.08				-
Gross Beta	5.77 ± 0.19	< 0.071	7.20 ± 0.24	< 0.10			0.25
Be-7	2.03 ± 0.28	-	2.92 ± 0.31	-			-
K-40	6.01 ± 0.45	-	7.55 ± 0.53	-			-
I-131	0.001 ± 0.009	< 0.024	0.016 ± 0.010	< 0.051			0.060
Cs-134	0.000 ± 0.008	< 0.015	-0.006 ± 0.009	< 0.017			0.060
Cs-137	0.005 ± 0.009	< 0.019	-0.002 ± 0.011	< 0.018			0.080
Other (Co-60)	0.000 ± 0.009	< 0.007	-0.005 ± 0.010	< 0.012			0.060

Beta Annual Mean ± s.d.	**6.81 ± 1.94**
Be-7 Annual Mean ± s.d.	**1.59 ± 0.80**
K-40 Annual Mean ± s.d.	**5.42 ± 1.16**
I-131 Annual Mean ± s.d.	**0.000 ± 0.008**
Cs-134 Annual Mean ± s.d.	**-0.001 ± 0.003**
Cs-137 Annual Mean ± s.d.	**0.004 ± 0.012**
Co-60 Annual Mean ± s.d.	**-0.005 ± 0.005**

POINT BEACH NUCLEAR PLANT

Table 11. Aquatic Vegetation, analyses for gross beta and gamma emitting isotopes.

Collection: Triannual
Units: pCi/g wet

Sample Description and Concentration					
Collection Date		**MDC**	08-27-15	**MDC**	Req.
Lab Code	NS[a]		ESL- 4698		LLD
Location	E-05		E-12		
Ratio (wet wt./dry wt.)			6.86		
Gross Beta	-		3.04 ± 0.13	< 0.11	0.25
Be-7	-		0.85 ± 0.09	-	-
K-40	-		2.26 ± 0.16	-	-
Co-58	-		-0.001 ± 0.003	< 0.007	0.25
Co-60	-		0.004 ± 0.004	< 0.007	0.25
Cs-134	-		-0.001 ± 0.004	< 0.007	0.25
Cs-137	-		0.012 ± 0.007	< 0.008	0.25

	Annual Mean ± s.d.
Gr. Beta	**3.04**
Be-7	**0.85**
K-40	**2.26**
Co-58	**-0.001**
Co-60	**0.004**
Cs-134	**-0.001**
Cs-137	**0.012**

[a] "NS" = No sample. See Table 2.0, Listing of Missed Samples.

Table 12. Ambient Gamma Radiation [a] Po
LLD/7days: < 1mR/TLD

1st. Quarter, 2015

Date Annealed:	12-11-14	Days in the field	89
Date Placed:	01-02-15	Days from Annealing	
Date Removed:	04-01-15	to Readout:	124
Date Read:	04-14-15		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	89	17.7 ± 0.8	12.5 ± 1.0	12.8 ± 1.0	0.99 ± 0.08
E-2	89	21.7 ± 0.3	16.5 ± 0.5	16.9 ± 0.5	1.30 ± 0.04
E-3	89	20.9 ± 1.9	15.8 ± 2.0	16.1 ± 2.0	1.24 ± 0.15
E-4	89	20.6 ± 1.7	15.4 ± 1.8	15.7 ± 1.8	1.21 ± 0.14
E-5	89	19.8 ± 1.3	14.7 ± 1.4	15.0 ± 1.4	1.16 ± 0.11
E-6	89	17.4 ± 1.2	12.3 ± 1.3	12.5 ± 1.3	0.97 ± 0.10
E-7	89	18.1 ± 1.3	13.0 ± 1.4	13.3 ± 1.4	1.02 ± 0.11
E-8	89	18.6 ± 1.5	13.4 ± 1.5	13.7 ± 1.6	1.06 ± 0.12
E-9	89	22.1 ± 0.5	16.9 ± 0.7	17.3 ± 0.7	1.33 ± 0.05
E-12	89	16.3 ± 1.1	11.2 ± 1.2	11.4 ± 1.2	0.88 ± 0.09
E-14	89	19.9 ± 1.1	14.7 ± 1.2	15.1 ± 1.2	1.16 ± 0.09
E-15	89	18.2 ± 0.3	13.1 ± 0.5	13.4 ± 0.5	1.03 ± 0.04
E-16	89	20.5 ± 0.4	15.3 ± 0.6	15.7 ± 0.6	1.20 ± 0.05
E-16B	89	20.8 ± 0.6	15.6 ± 0.7	16.0 ± 0.7	1.23 ± 0.08
E-17	89	20.4 ± 1.0	15.3 ± 1.1	15.6 ± 1.1	1.20 ± 0.09
E-18	89	21.9 ± 1.7	16.8 ± 1.7	17.1 ± 1.8	1.32 ± 0.13
E-22	89	21.4 ± 1.2	16.3 ± 1.2	16.6 ± 1.3	1.28 ± 0.10
E-23	89	20.0 ± 0.9	14.8 ± 1.0	15.1 ± 1.0	1.17 ± 0.08
E-24	89	19.3 ± 0.8	14.2 ± 0.9	14.5 ± 0.9	1.12 ± 0.07
E-25	89	18.1 ± 0.5	12.9 ± 0.7	13.2 ± 0.7	1.02 ± 0.05
E-26	89	17.5 ± 1.1	12.3 ± 1.2	12.6 ± 1.2	0.97 ± 0.09
E-26B	89	18.3 ± 0.3	13.2 ± 0.5	13.5 ± 0.5	1.04 ± 0.04
E-27	89	20.6 ± 0.7	15.5 ± 0.8	15.8 ± 0.8	1.22 ± 0.06
E-28	89	14.8 ± 0.4	9.6 ± 0.5	9.9 ± 0.5	0.76 ± 0.04
E-29	89	15.5 ± 1.3	10.4 ± 1.4	10.6 ± 1.4	0.82 ± 0.11
E-30	89	17.9 ± 1.0	12.8 ± 1.0	13.1 ± 1.1	1.01 ± 0.08
E-31	89	21.5 ± 0.4	16.4 ± 0.6	16.7 ± 0.6	1.29 ± 0.04
E-32	89	20.6 ± 1.0	15.5 ± 1.1	15.8 ± 1.1	1.22 ± 0.09
E-38	89	18.2 ± 1.0	13.0 ± 1.1	13.3 ± 1.1	1.02 ± 0.09
E-39	89	20.5 ± 1.2	15.3 ± 1.3	15.7 ± 1.3	1.21 ± 0.10
E-41	89	17.6 ± 0.6	12.4 ± 0.7	12.7 ± 0.7	0.98 ± 0.05
E-42	89	21.7 ± 1.2	16.5 ± 1.2	16.9 ± 1.3	1.30 ± 0.10
E-43	89	18.0 ± 1.3	12.9 ± 1.3	13.1 ± 1.4	1.01 ± 0.10
Control					
E-20	89	21.2 ± 1.4	16.0 ± 1.4	16.4 ± 1.4	1.26 ± 0.11
Mean±s.d.		19.3 ± 1.9	14.2 ± 1.9	14.5 ± 1.9	1.12 ± 0.15

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	12-11-14	01-07-15	4.6 ± 0.4	5.0 ± 0.3
	03-24-15	04-14-15	2.4 ± 0.2	2.5 ± 0.2

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

POINT BEACH NUCLEAR PLANT

Table 12. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

2nd Quarter, 2015

Date Annealed:	03-24-15	Days in the field	90
Date Placed:	04-01-15	Days from Annealing	
Date Removed:	06-30-15	to Readout:	105
Date Read:	07-07-15		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	90	12.6 ± 0.8	9.1 ± 1.0	9.2 ± 1.0	0.71 ± 0.08
E-2	90	17.4 ± 1.2	13.9 ± 1.3	14.1 ± 1.4	1.08 ± 0.10
E-3	90	19.0 ± 1.2	15.6 ± 1.3	15.7 ± 1.3	1.21 ± 0.10
E-4	90	15.9 ± 0.7	12.5 ± 0.9	12.6 ± 0.9	0.97 ± 0.07
E-5	90	17.2 ± 0.4	13.7 ± 0.7	13.9 ± 0.7	1.07 ± 0.06
E-6	90	13.7 ± 0.4	10.2 ± 0.7	10.3 ± 0.7	0.80 ± 0.05
E-7	90	15.0 ± 0.2	11.5 ± 0.6	11.6 ± 0.6	0.90 ± 0.05
E-8	90	15.0 ± 0.9	11.6 ± 1.0	11.7 ± 1.1	0.90 ± 0.08
E-9	90	16.9 ± 0.7	13.4 ± 0.9	13.6 ± 0.9	1.05 ± 0.07
E-12	90	14.9 ± 0.2	11.4 ± 0.6	11.6 ± 0.6	0.89 ± 0.05
E-14	90	17.2 ± 1.3	13.7 ± 1.5	13.9 ± 1.5	1.07 ± 0.11
E-15	90	20.0 ± 1.7	16.6 ± 1.8	16.8 ± 1.8	1.29 ± 0.14
E-16B	90	16.8 ± 0.4	13.4 ± 0.7	13.5 ± 0.7	1.04 ± 0.06
E-17	90	18.4 ± 0.1	15.0 ± 0.6	15.1 ± 0.6	1.17 ± 0.05
E-18	90	21.6 ± 0.5	18.1 ± 0.8	18.3 ± 0.8	1.41 ± 0.06
E-22	90	18.4 ± 0.7	14.9 ± 0.9	15.1 ± 0.9	1.16 ± 0.07
E-23	90	20.3 ± 0.5	16.9 ± 0.8	17.1 ± 0.8	1.31 ± 0.06
E-24	90	15.9 ± 0.3	12.5 ± 0.6	12.6 ± 0.6	0.97 ± 0.05
E-25	90	19.3 ± 0.5	15.9 ± 0.8	16.1 ± 0.8	1.23 ± 0.06
E-26B	90	14.9 ± 0.6	11.5 ± 0.8	11.6 ± 0.8	0.89 ± 0.06
E-27	90	19.3 ± 0.6	15.8 ± 0.8	16.0 ± 0.8	1.23 ± 0.06
E-28	90	13.3 ± 0.2	9.9 ± 0.6	10.0 ± 0.6	0.77 ± 0.05
E-29	90	11.4 ± 0.4	8.0 ± 0.7	8.1 ± 0.7	0.62 ± 0.06
E-30	90	15.3 ± 0.6	11.9 ± 0.8	12.0 ± 0.8	0.92 ± 0.06
E-31	90	16.6 ± 1.2	13.1 ± 1.4	13.3 ± 1.4	1.02 ± 0.11
E-32	90	20.3 ± 0.2	16.8 ± 0.6	17.0 ± 0.6	1.31 ± 0.05
E-38	90	17.1 ± 0.2	13.7 ± 0.6	13.8 ± 0.6	1.06 ± 0.05
E-39	90	17.5 ± 0.5	14.1 ± 0.8	14.2 ± 0.8	1.09 ± 0.06
E-41	90	15.7 ± 0.3	12.2 ± 0.6	12.4 ± 0.6	0.95 ± 0.05
E-42	90	18.7 ± 0.6	15.2 ± 0.8	15.4 ± 0.8	1.18 ± 0.06
E-43	90	17.7 ± 0.5	14.3 ± 0.8	14.4 ± 0.8	1.11 ± 0.06
Control					
E-20	92	16.4 ± 1.4	12.9 ± 1.5	12.8 ± 1.5	0.98 ± 0.12
Mean±s.d.		16.9 ± 2.4	13.4 ± 2.4	13.6 ± 2.4	1.04 ± 0.18

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	03-24-15	04-14-15	2.4 ± 0.2	2.5 ± 0.2
	06-08-15	07-07-15	4.3 ± 0.3	4.6 ± 0.4

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

POINT BEACH NUCLEAR PLANT

Table 12. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

3rd Quarter, 2015

Date Annealed:	06-08-15	Days in the field	86
Date Placed:	06-30-15	Days from Annealing	
Date Removed:	09-24-15	to Readout:	115
Date Read:	10-01-15		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	86	20.3 ± 0.3	16.9 ± 0.6	17.9 ± 0.7	1.38 ± 0.05
E-2	86	20.3 ± 0.6	16.9 ± 0.8	17.8 ± 0.9	1.37 ± 0.07
E-3	86	21.7 ± 0.9	18.3 ± 1.1	19.3 ± 1.1	1.49 ± 0.09
E-4	86	18.1 ± 1.1	14.7 ± 1.2	15.5 ± 1.3	1.19 ± 0.10
E-5	86	19.0 ± 1.1	15.5 ± 1.2	16.4 ± 1.3	1.26 ± 0.10
E-6	86	16.2 ± 0.8	12.8 ± 0.9	13.5 ± 1.0	1.04 ± 0.08
E-7	86	16.1 ± 0.6	12.7 ± 0.8	13.4 ± 0.8	1.03 ± 0.06
E-8	86	17.7 ± 1.3	14.2 ± 1.4	15.1 ± 1.4	1.16 ± 0.11
E-9	86	21.0 ± 0.6	17.6 ± 0.8	18.6 ± 0.9	1.43 ± 0.07
E-12	86	14.5 ± 0.7	11.1 ± 0.9	11.7 ± 0.9	0.90 ± 0.07
E-14	86	18.1 ± 0.5	14.7 ± 0.8	15.6 ± 0.8	1.20 ± 0.06
E-15	86	18.7 ± 0.6	15.2 ± 0.8	16.1 ± 0.9	1.24 ± 0.07
E-16	86	19.4 ± 1.1	16.0 ± 1.2	16.9 ± 1.3	1.30 ± 0.10
E-16B	86	20.5 ± 0.5	17.0 ± 0.8	18.0 ± 0.8	1.39 ± 0.06
E-17	86	19.0 ± 0.9	15.6 ± 1.1	16.5 ± 1.1	1.27 ± 0.09
E-18	86	21.2 ± 1.1	17.8 ± 1.2	18.8 ± 1.3	1.45 ± 0.10
E-22	86	20.0 ± 1.2	16.6 ± 1.3	17.5 ± 1.4	1.35 ± 0.11
E-23	86	20.0 ± 0.8	16.6 ± 0.9	17.6 ± 1.0	1.35 ± 0.08
E-24	86	17.9 ± 0.6	14.5 ± 0.8	15.3 ± 0.8	1.18 ± 0.06
E-25	86	18.2 ± 0.5	14.7 ± 0.7	15.6 ± 0.8	1.20 ± 0.06
E-26	86	18.7 ± 1.3	15.3 ± 1.4	16.2 ± 1.5	1.25 ± 0.11
E-26B	86	17.1 ± 0.7	13.7 ± 0.9	14.5 ± 0.9	1.12 ± 0.07
E-27	86	20.3 ± 0.5	16.9 ± 0.7	17.8 ± 0.8	1.37 ± 0.06
E-28	86	14.3 ± 0.8	10.8 ± 1.0	11.5 ± 1.0	0.88 ± 0.08
E-29	86	13.6 ± 0.8	10.2 ± 1.0	10.8 ± 1.0	0.83 ± 0.08
E-30	86	16.3 ± 1.1	12.9 ± 1.3	13.7 ± 1.3	1.05 ± 0.10
E-31	86	20.1 ± 0.7	16.7 ± 0.9	17.7 ± 0.9	1.36 ± 0.07
E-32	86	20.7 ± 0.7	17.3 ± 0.9	18.3 ± 1.0	1.41 ± 0.07
E-38	86	17.2 ± 0.9	13.7 ± 1.0	14.5 ± 1.1	1.12 ± 0.08
E-39	86	20.3 ± 1.4	16.9 ± 1.5	17.9 ± 1.6	1.37 ± 0.12
E-41	86	18.2 ± 0.5	14.8 ± 0.8	15.7 ± 0.8	1.21 ± 0.06
E-42	86	22.3 ± 0.8	18.8 ± 0.9	19.9 ± 1.0	1.53 ± 0.08
E-43	86	20.5 ± 1.7	17.1 ± 1.8	18.1 ± 1.9	1.39 ± 0.15
Control					
E-20	86	18.8 ± 1.6	15.3 ± 1.7	16.2 ± 1.8	1.25 ± 0.14
Mean±s.d.		18.7 ± 2.1	15.3 ± 2.1	16.2 ± 2.3	1.24 ± 0.18

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	06-08-15	07-07-15	4.3 ± 0.3	4.6 ± 0.4
	09-11-15	10-01-15	2.3 ± 0.1	2.5 ± 0.2

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

POINT BEACH NUCLEAR PLANT

Table 12. Ambient Gamma Radiation [a]
LLD/7days: < 1mR/TLD

4th Quarter, 2015

Date Annealed:	09-16-14	Days in the field	90
Date Placed:	10-04-14	Days from Annealing	
Date Removed:	01-02-15	to Readout:	113
Date Read:	01-07-15		

Location	Days in Field	Total mR	Net mR	mR/Stnd Qtr (91 days)	Net mR per 7 days
Indicator					
E-1	90	16.8 ± 1.4	13.0 ± 1.5	13.1 ± 1.5	1.01 ± 0.12
E-2	90	20.8 ± 0.9	17.0 ± 1.0	17.2 ± 1.0	1.32 ± 0.08
E-3	90	23.1 ± 1.5	19.3 ± 1.6	19.6 ± 1.6	1.50 ± 0.12
E-4	90	19.4 ± 0.4	15.6 ± 0.6	15.7 ± 0.6	1.21 ± 0.05
E-5	90	21.0 ± 0.4	17.2 ± 0.6	17.4 ± 0.6	1.34 ± 0.05
E-6	90	17.6 ± 0.5	13.8 ± 0.7	14.0 ± 0.7	1.08 ± 0.05
E-7	90	18.3 ± 0.2	14.5 ± 0.5	14.7 ± 0.5	1.13 ± 0.04
E-8	90	18.8 ± 0.7	15.0 ± 0.8	15.2 ± 0.9	1.17 ± 0.07
E-9	90	19.4 ± 0.6	15.6 ± 0.7	15.7 ± 0.7	1.21 ± 0.06
E-12	90	17.4 ± 1.2	13.6 ± 1.3	13.8 ± 1.3	1.06 ± 0.10
E-14	90	21.3 ± 1.8	17.5 ± 1.9	17.7 ± 1.9	1.36 ± 0.15
E-15	90	23.0 ± 1.0	19.2 ± 1.1	19.4 ± 1.1	1.50 ± 0.09
E-16B	90	20.2 ± 0.2	16.4 ± 0.5	16.6 ± 0.5	1.27 ± 0.04
E-17	90	22.6 ± 0.7	18.8 ± 0.8	19.0 ± 0.8	1.46 ± 0.06
E-18	90	23.2 ± 0.9	19.4 ± 1.0	19.6 ± 1.0	1.51 ± 0.08
E-22	90	23.1 ± 0.9	19.3 ± 1.1	19.5 ± 1.1	1.50 ± 0.08
E-23	90	25.2 ± 0.6	21.4 ± 0.8	21.6 ± 0.8	1.66 ± 0.06
E-24	90	20.4 ± 0.5	16.6 ± 0.7	16.8 ± 0.7	1.29 ± 0.06
E-25	90	21.1 ± 0.8	17.3 ± 0.9	17.5 ± 0.9	1.35 ± 0.07
E-26B	90	19.2 ± 0.2	15.4 ± 0.5	15.6 ± 0.5	1.20 ± 0.04
E-27	90	23.6 ± 0.8	19.8 ± 0.9	20.0 ± 0.9	1.54 ± 0.07
E-28	90	16.8 ± 0.3	13.0 ± 0.6	13.2 ± 0.6	1.01 ± 0.04
E-29	90	14.6 ± 0.6	10.8 ± 0.8	10.9 ± 0.8	0.84 ± 0.06
E-30	90	20.2 ± 0.8	16.4 ± 0.9	16.6 ± 0.9	1.28 ± 0.07
E-31	90	20.6 ± 1.2	16.8 ± 1.3	17.0 ± 1.3	1.30 ± 0.10
E-32	90	25.1 ± 0.5	21.3 ± 0.7	21.6 ± 0.7	1.66 ± 0.05
E-38	90	20.1 ± 0.4	16.3 ± 0.6	16.5 ± 0.7	1.27 ± 0.05
E-39	90	20.5 ± 0.8	16.7 ± 0.9	16.9 ± 0.9	1.30 ± 0.07
E-41	90	19.4 ± 0.5	15.6 ± 0.7	15.8 ± 0.7	1.21 ± 0.05
E-42	90	22.0 ± 0.7	18.2 ± 0.9	18.4 ± 0.9	1.42 ± 0.07
E-43	90	21.5 ± 0.7	17.7 ± 0.8	17.9 ± 0.9	1.38 ± 0.07
Control					
E-20	90	20.5 ± 1.9	16.7 ± 2.0	16.9 ± 2.0	1.30 ± 0.15
Mean±s.d.		20.1 ± 1.5	16.7 ± 2.4	19.7 ± 1.5	1.30 ± 0.19

In-Transit Exposure	Date Annealed	Date Read	ITC-1	ITC-2
	09-11-15	10-01-15	2.3 ± 0.1	2.5 ± 0.2
	12-08-15	01-09-16	5.2 ± 0.3	5.2 ± 0.3

[a] The $CaSO_4$:Dy dosimeter cards provide four separate readout areas. Values listed represent the mean and standard deviation of the average of the four readings.

Annual Indicator Mean±s.d.	18.9 ± 2.6	14.9 ± 2.5	15.3 ± 2.6	1.2 ± 0.2
Annual Control Mean±s.d.	19.2 ± 2.2	15.3 ± 1.7	15.6 ± 1.9	1.2 ± 0.1
Annual Indicator/Control Mean±s.d.	18.9 ± 2.6	14.9 ± 2.5	15.3 ± 2.6	1.2 ± 0.2

Table 13. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Intermittent Streams

Sample ID	GW-01				GW-02		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-22-15		NS[a]		01-22-15		NS[a]	
02-25-15		NS[a]		02-25-15		NS[a]	
03-25-15	EWW- 1247	167 ± 80	< 147	03-25-15	EWW- 1248	270 ± 85	< 147
04-29-15	EWW- 2019	136 ± 80	< 147	04-29-15	EWW- 2020	222 ± 84	< 147
05-20-15	EWW- 2643	106 ± 80	< 150	05-20-15	EWW- 2644	3 ± 75	< 150
06-24-15	EWW- 3233	123 ± 78	< 143	06-24-15	EWW- 3234	184 ± 81	< 143
07-23-15	EWW- 4150	124 ± 81	< 143	07-23-15	EWW- 4151	83 ± 79	< 143
08-27-15	EWW- 4699	77 ± 76	< 145	08-27-15	EWW- 4700	173 ± 81	< 145
09-30-15	EWW- 5373	143 ± 81	< 147	09-30-15	EWW- 5374	189 ± 83	< 147
10-28-15	EWW- 6222	39 ± 72	< 141	10-28-15	EWW- 6223	69 ± 74	< 141
11-25-15	EWW- 6682	53 ± 74	< 144	11-25-15	EWW- 6683	163 ± 80	< 144
12-30-15	EWW- 7226	70 ± 75	< 144	12-30-15	EWW- 7227	122 ± 78	< 144
Mean ± s.d.		104 ± 42		Mean ± s.d.		148 ± 79	

Sample ID	GW-03				GW-17		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-22-15		NS[a]		01-22-15		NS[a]	
02-25-15		NS[a]		02-25-15		NS[a]	
03-25-15	EWW- 1249	93 ± 76	< 147	03-25-15	EWW- 1251	196 ± 81	< 147
04-29-15	EWW- 2021	107 ± 79	< 147	04-29-15	EWW- 2023	220 ± 84	< 147
05-20-15	EWW- 2645	129 ± 81	< 150	05-20-15	EWW- 2647	131 ± 81	< 150
06-24-15	EWW- 3235	-4 ± 71	< 143	06-24-15	EWW- 3237	174 ± 80	< 143
07-23-15	EWW- 4152	141 ± 82	< 143	07-23-15	EWW- 4154	221 ± 86	< 143
08-27-15	EWW- 4701	117 ± 78	< 145	08-27-15	EWW- 4703	138 ± 79	< 145
09-30-15	EWW- 5375	113 ± 79	< 147	09-30-15	EWW- 5377	220 ± 85	< 147
10-28-15	EWW- 6224	45 ± 73	< 141	10-28-15	EWW- 6226	112 ± 76	< 141
11-25-15	EWW- 6684	-27 ± 70	< 144	11-25-15	EWW- 6686	97 ± 77	< 144
12-30-15	EWW- 7228	45 ± 74	< 144	12-30-15		NS[b]	
Mean ± s.d.		76 ± 58		Mean ± s.d.		168 ± 49	

Wells

Sample ID	GW-04 (EIC Well)		
Collection Date	Lab Code	Tritium	MDC
01-22-15	EWW- 327	-78 ± 90	< 192
01-22-15	EWW- 676	-39 ± 72	< 142
03-25-15	EWW- 1250	19 ± 72	< 147
04-29-15	EWW- 2022	13 ± 74	< 147
05-20-15	EWW- 2646	-3 ± 74	< 150
06-24-15	EWW- 3236	2 ± 71	< 143
07-23-15	EWW- 4153	48 ± 77	< 143
08-27-15	EWW- 4702	-24 ± 70	< 145
09-30-15	EWW- 5376	-101 ± 67	< 147
10-28-15	EWW- 6225	14 ± 71	< 141
11-25-15	EWW- 6685	-25 ± 70	< 144
12-30-15	EWW- 7229	51 ± 74	< 144
Mean ± s.d.		-10 ± 46	

[a] Water frozen.
[b] No sample.

Table 13. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Beach Drains

Sample ID	S-1				S-3		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-10-15		NF[a]		01-10-15		NF[a]	
02-10-15		NF[a]		02-10-15		NF[a]	
04-02-15	EWW- 1355	355 ± 95	< 148	04-02-15	EWW- 1356	316 ± 93	< 148
04-22-15	EWW- 1778	134 ± 86	< 150	04-22-15	EWW- 1779	430 ± 99	< 150
05-06-15	EWW- 2222	200 ± 87	< 147	05-06-15	EWW- 2223	302 ± 92	< 147
06-02-15	EWW- 2748	212 ± 87	< 155	06-02-15	EWW- 2749	190 ± 86	< 155
07-09-15	EWW- 3622	160 ± 100	< 154	07-09-15	EWW- 3623	262 ± 104	< 154
08-05-15	EWW- 4340	122 ± 85	< 150	08-05-15	EWW- 4341	644 ± 107	< 150
09-10-15	EWW- 4990	205 ± 84	< 148	09-10-15	EWW- 4991	249 ± 87	< 148
10-07-15	EWW- 5629	244 ± 86	< 149	10-07-15	EWW- 5631	165 ± 82	< 149
11-05-15	EWW- 6408	342 ± 92	< 151	11-05-15	EWW- 6409	219 ± 86	< 151
12-10-15	EWW- 6935	292 ± 87	< 145	12-10-15	EWW- 6936	152 ± 80	< 145
Mean ± s.d.		227 ± 81		Mean ± s.d.		293 ± 148	

Sample ID	S-7				S-8		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-10-15		NF[a]		01-10-15		NF[a]	
02-10-15		NF[a]		02-10-15		NF[a]	
04-02-15		NF[a]		04-02-15		NF[a]	
04-22-15		NF[a]		04-22-15		NF[a]	
05-06-15		NF[a]		05-06-15		NF[a]	
06-02-15		NF[a]		06-02-15		NF[a]	
07-09-15		NF[a]		07-09-15		NF[a]	
08-05-15		NF[a]		08-05-15		NF[a]	
09-10-15		NF[a]		09-10-15		NF[a]	
10-07-15		NF[a]		10-07-15		NF[a]	
11-05-15		NF[a]		11-05-15		NF[a]	
12-10-15		NF[a]		12-10-15		NF[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	S-9				S-10		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-10-15		NF[a]		01-10-15		NF[a]	
02-10-15		NF[a]		02-10-15		NF[a]	
04-02-15		NF[a]		04-02-15		NF[a]	
04-22-15		NF[a]		04-22-15		NF[a]	
05-06-15		NF[a]		05-06-15		NF[a]	
06-02-15		NF[a]		06-02-15		NF[a]	
07-09-15		NF[a]		07-09-15		NF[a]	
08-05-15		NF[a]		08-05-15		NF[a]	
09-10-15		NF[a]		09-10-15		NF[a]	
10-07-15		NF[a]		10-07-15		NF[a]	
11-05-15		NF[a]		11-05-15		NF[a]	
12-10-15		NF[a]		12-10-15		NF[a]	
Mean ± s.d.				Mean ± s.d.			

[a] "NF" = No flow.

Table 13. Groundwater Tritium Monitoring Program
(Monthly Collections)
Units = pCi/L

Beach Drains (cont.)

Sample ID S-11

Collection Date	Lab Code	Tritium	MDC
01-10-15		NF[a]	
02-10-15		NF[a]	
04-02-15	EWW- 1357	210 ± 88	< 148
04-22-15	EWW- 1780	214 ± 90	< 150
05-06-15		NF[a]	
06-02-15		NF[a]	
07-09-15		NF[a]	
08-05-15		NF[a]	
09-10-15		NF[a]	
10-07-15		NF[a]	
11-05-15		NF[a]	
12-10-15		NF[a]	
Mean ± s.d.		212 ± 3	

Sample ID **U2 Façade Subsurface Drain Sump**

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-20-15	EW- 508	682 ± 135	< 196				
02-15-15	EW- 993	721 ± 107	< 148				
03-26-15	EW- 1501	475 ± 102	< 152				
04-30-15	EW- 2227	648 ± 106	< 147				
06-02-15	EW- 2747	741 ± 109	< 155				
06-30-15	EW- 4025	591 ± 105	< 149				
08-31-15	EW- 4951	577 ± 104	< 147				
09-30-15	EW- 6410	306 ± 91	< 144				
10-31-15	EW- 6411	683 ± 103	< 143				
12-07-15	EW- 6978	568 ± 98	< 146				
12-31-15	EW- 7465	496 ± 112	< 152				
Mean ± s.d.		590 ± 128					

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains

Units: = pCi/L — Gamma isotopic analysis

Location	S-1		S-3		S-7		S-8	
Collection Date	01-10-15		01-10-15		01-10-15		01-10-15	
Lab Code	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	-		-		-		-	
Mn-54	-		-		-		-	
Fe-59	-		-		-		-	
Co-58	-		-		-		-	
Co-60	-		-		-		-	
Zn-65	-		-		-		-	
Zr-Nb-95	-		-		-		-	
Cs-134	-		-		-		-	
Cs-137	-		-		-		-	
Ba-La-140	-		-		-		-	

Location	S-9	S-10	S-11	S-1
Collection Date	01-10-15	01-10-15	01-10-15	02-10-15
Lab Code	NF[a]	NF[a]	NF[a]	NF[a]
Be-7	-	-	-	-
Mn-54	-	-	-	-
Fe-59	-	-	-	-
Co-58	-	-	-	-
Co-60	-	-	-	-
Zn-65	-	-	-	-
Zr-Nb-95	-	-	-	-
Cs-134	-	-	-	-
Cs-137	-	-	-	-
Ba-La-140	-	-	-	-

Location	S-3	S-7	S-8	S-9
Collection Date	02-10-15	02-10-15	02-10-15	01-10-15
Lab Code	NF[a]	NF[a]	NF[a]	NF[a]
Be-7	-	-	-	-
Mn-54	-	-	-	-
Fe-59	-	-	-	-
Co-58	-	-	-	-
Co-60	-	-	-	-
Zn-65	-	-	-	-
Zr-Nb-95	-	-	-	-
Cs-134	-	-	-	-
Cs-137	-	-	-	-
Ba-La-140	-	-	-	-

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-10		S-11		S-1		S-3	
Collection Date	02-10-15		02-10-15		04-02-15		04-02-15	
Lab Code	NF[a]	MDC	NF[a]	MDC	EW- 1355	MDC	EW- 1356	MDC
Be-7	-		-		5.9 ± 6.3	< 17.4	2.7 ± 5.9	< 14.7
Mn-54	-		-		-0.6 ± 0.6	< 0.8	0.3 ± 0.6	< 1.1
Fe-59	-		-		1.4 ± 1.2	< 3.1	-0.1 ± 1.2	< 3.1
Co-58	-		-		0.2 ± 0.6	< 1.4	0.5 ± 0.5	< 1.2
Co-60	-		-		0.1 ± 0.6	< 1.1	-0.3 ± 0.6	< 1.1
Zn-65	-		-		0.7 ± 1.5	< 2.8	-0.4 ± 1.3	< 2.5
Zr-Nb-95	-		-		-0.8 ± 0.7	< 1.5	0.8 ± 0.6	< 1.7
Cs-134	-		-		0.3 ± 0.7	< 1.3	0.3 ± 0.6	< 1.2
Cs-137	-		-		1.0 ± 0.8	< 1.4	0.0 ± 0.7	< 1.2
Ba-La-140	-		-		-2.1 ± 0.7	< 2.3	-0.9 ± 0.7	< 3.2

Location	S-7	S-8	S-9	S-10
Collection Date	04-02-15	04-02-15	04-02-15	04-02-15
Lab Code	NF[a]	NF[a]	NF[a]	NF[a]
Be-7	-	-	-	-
Mn-54	-	-	-	-
Fe-59	-	-	-	-
Co-58	-	-	-	-
Co-60	-	-	-	-
Zn-65	-	-	-	-
Zr-Nb-95	-	-	-	-
Cs-134	-	-	-	-
Cs-137	-	-	-	-
Ba-La-140	-	-	-	-

Location	S-11		S-1		S-3		S-7
Collection Date	04-02-15		04-22-15		04-22-15		04-22-15
Lab Code	EW- 1357		EW- 1778		EW- 1779		NF[a]
Be-7	1.6 ± 4.7	< 14.4	2.2 ± 4.7	< 14.3	-4.3 ± 10.3	< 27.8	-
Mn-54	0.6 ± 0.6	< 1.1	-0.2 ± 0.6	< 0.8	-1.4 ± 1.3	< 2.3	-
Fe-59	-0.5 ± 1.1	< 1.7	-0.3 ± 1.0	< 2.6	-0.2 ± 2.1	< 2.9	-
Co-58	0.1 ± 0.6	< 1.4	0.3 ± 0.6	< 1.1	-0.7 ± 1.1	< 1.5	-
Co-60	-0.3 ± 0.6	< 1.2	0.2 ± 0.6	< 0.9	0.1 ± 1.2	< 1.7	-
Zn-65	0.2 ± 1.1	< 2.1	0.0 ± 1.1	< 2.2	0.2 ± 2.0	< 2.8	-
Zr-Nb-95	-0.3 ± 0.6	< 1.6	-0.4 ± 0.6	< 1.7	-1.1 ± 1.4	< 2.2	-
Cs-134	0.4 ± 0.6	< 1.1	-0.5 ± 0.6	< 1.1	-1.7 ± 1.2	< 2.2	-
Cs-137	0.5 ± 0.7	< 1.3	0.1 ± 0.7	< 1.1	1.5 ± 1.4	< 2.6	-
Ba-La-140	-0.5 ± 0.7	< 3.5	0.1 ± 0.6	< 5.7	-3.0 ± 1.4	< 3.2	-

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-8		S-9		S-10		S-11	MDC
Collection Date	04-22-15		04-22-15		04-22-15		04-22-15	
Lab Code	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC	EW- 1780	MDC
Be-7	-		-		-		-0.2 ± 13.5	< 28.1
Mn-54	-		-		-		0.5 ± 1.3	< 2.7
Fe-59	-		-		-		2.2 ± 2.8	< 5.9
Co-58	-		-		-		-0.5 ± 1.3	< 2.1
Co-60	-		-		-		0.4 ± 1.1	< 1.9
Zn-65	-		-		-		-0.5 ± 3.0	< 3.3
Zr-Nb-95	-		-		-		0.5 ± 1.4	< 3.3
Cs-134	-		-		-		-1.0 ± 1.3	< 2.6
Cs-137	-		-		-		0.2 ± 1.4	< 1.9
Ba-La-140	-		-		-		1.9 ± 1.5	< 5.5

Location	S-1		S-3		S-7		S-8	
Collection Date	05-06-15		05-06-15		05-06-15		05-06-15	
Lab Code	EW- 2222		EW- 2223		NF[a]		NF[a]	MDC
Be-7	-0.1 ± 6.3	< 15.2	5.8 ± 4.9	< 16.1	-		-	
Mn-54	0.3 ± 0.6	< 1.2	0.3 ± 0.6	< 1.4	-		-	
Fe-59	0.4 ± 1.2	< 3.7	-1.6 ± 1.0	< 1.9	-		-	
Co-58	-1.0 ± 0.6	< 1.0	0.0 ± 0.6	< 1.4	-		-	
Co-60	0.6 ± 0.6	< 1.3	0.5 ± 0.6	< 1.2	-		-	
Zn-65	-0.2 ± 1.3	< 2.0	0.3 ± 1.2	< 2.5	-		-	
Zr-Nb-95	-0.7 ± 0.7	< 1.3	-0.2 ± 0.6	< 1.3	-		-	
Cs-134	-0.1 ± 0.7	< 1.3	0.3 ± 0.6	< 1.1	-		-	
Cs-137	0.4 ± 0.7	< 1.4	0.5 ± 0.7	< 1.1	-		-	
Ba-La-140	-1.9 ± 0.7	< 5.0	-3.4 ± 0.7	< 4.6	-		-	

Location	S-9		S-10		S-11		S-1	
Collection Date	05-06-15		05-06-15		05-06-15		06-02-15	
Lab Code	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC	EW- 2748	
Be-7	-		-		-		-7.7 ± 9.9	< 19.4
Mn-54	-		-		-		0.7 ± 1.2	< 2.4
Fe-59	-		-		-		-0.7 ± 2.3	< 3.6
Co-58	-		-		-		-0.8 ± 1.1	< 1.3
Co-60	-		-		-		-0.9 ± 1.5	< 1.9
Zn-65	-		-		-		-2.5 ± 2.8	< 4.3
Zr-Nb-95	-		-		-		-1.1 ± 1.4	< 2.3
Cs-134	-		-		-		0.8 ± 1.1	< 2.3
Cs-137	-		-		-		0.4 ± 1.4	< 1.9
Ba-La-140	-		-		-		-0.9 ± 1.4	< 3.5

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L | Gamma isotopic analysis

Location	S-3		S-7		S-8		S-9	
Collection Date	06-02-15		06-02-15		06-02-15		06-02-15	
Lab Code	EW- 2749	MDC	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC
Be-7	4.8 ± 11.3	< 30.0	-		-		-	
Mn-54	-0.3 ± 1.2	< 1.9	-		-		-	
Fe-59	1.4 ± 2.0	< 3.1	-		-		-	
Co-58	0.9 ± 1.3	< 2.2	-		-		-	
Co-60	-0.3 ± 1.5	< 1.6	-		-		-	
Zn-65	-1.5 ± 2.8	< 3.2	-		-		-	
Zr-Nb-95	0.8 ± 1.5	< 4.4	-		-		-	
Cs-134	0.2 ± 1.3	< 2.3	-		-		-	
Cs-137	-0.5 ± 1.4	< 2.1	-		-		-	
Ba-La-140	-0.8 ± 1.4	< 2.5	-		-		-	

Location	S-10		S-11		S-1		S-3	
Collection Date	06-02-15		06-02-15		07-09-15		07-09-15	
Lab Code	NF[a]		NF[a]		EW- 3622		EW- 3623	
Be-7	-				-8.7 ± 12.5	< 32.1	9.1 ± 20.0	< 47.7
Mn-54	-				-1.3 ± 1.4	< 1.8	1.2 ± 2.2	< 3.7
Fe-59	-				-1.5 ± 2.8	< 3.8	0.6 ± 4.0	< 4.9
Co-58	-				0.1 ± 1.3	< 1.5	1.0 ± 1.7	< 2.4
Co-60	-				1.3 ± 1.4	< 2.0	0.8 ± 2.0	< 2.3
Zn-65	-				0.6 ± 3.2	< 5.6	-3.1 ± 4.9	< 7.2
Zr-Nb-95	-				-0.3 ± 1.5	< 2.7	-0.9 ± 2.3	< 5.7
Cs-134	-				-0.5 ± 1.3	< 2.7	0.7 ± 2.0	< 3.9
Cs-137	-				-1.3 ± 1.7	< 2.2	-0.7 ± 2.2	< 3.4
Ba-La-140	-				-2.9 ± 1.8	< 2.7	-4.5 ± 2.8	< 6.5

Location	S-7		S-8		S-9		S-10	
Collection Date	07-09-15		07-09-15		07-09-15		07-09-15	
Lab Code	NF[a]		NF[a]		NF[a]		NF[a]	
Be-7	-		-		-		-	< 47.7
Mn-54	-		-		-		-	< 3.7
Fe-59	-		-		-		-	< 4.9
Co-58	-		-		-		-	< 2.4
Co-60	-		-		-		-	< 2.3
Zn-65	-		-		-		-	< 7.2
Zr-Nb-95	-		-		-		-	< 5.7
Cs-134	-		-		-		-	< 3.9
Cs-137	-		-		-		-	< 3.4
Ba-La-140	-		-		-		-	< 6.5

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains (cont.)

Units: = pCi\L								Gamma isotopic analysis
Location	S-11		S-1		S-3		S-7	
Collection Date	07-09-15		08-05-15		08-05-15		08-05-15	
Lab Code	NF[a]	MDC	EW- 4340	MDC	EW- 4341	MDC	NF[a]	MDC
Be-7	-		-0.1 ± 11.4	< 30.6	0.3 ± 12.1	< 29.3	-	
Mn-54	-		1.2 ± 1.6	< 2.6	-0.2 ± 1.6	< 3.1	-	
Fe-59	-		0.9 ± 2.7	< 5.2	-1.7 ± 2.6	< 4.0	-	
Co-58	-		-1.0 ± 1.5	< 2.8	-1.1 ± 1.3	< 1.4	-	
Co-60	-		-0.2 ± 1.4	< 1.3	0.4 ± 1.4	< 1.1	-	
Zn-65	-		0.7 ± 2.7	< 2.5	-0.6 ± 2.8	< 2.4	-	
Zr-Nb-95	-		0.7 ± 1.6	< 3.0	0.7 ± 1.5	< 3.5	-	
Cs-134	-		0.1 ± 1.4	< 2.4	-0.9 ± 1.5	< 2.5	-	
Cs-137	-		2.0 ± 1.7	< 2.8	1.3 ± 1.6	< 2.9	-	
Ba-La-140	-		2.3 ± 1.1	< 3.1	1.6 ± 1.8	< 5.6	-	
Location	S-8		S-9		S-10		S-11	
Collection Date	08-05-15		08-05-15		08-05-15		08-05-15	
Lab Code	NF[a]		NF[a]		NF[a]		NF[a]	
Be-7	-		-		-		-	
Mn-54	-		-		-		-	
Fe-59	-		-		-		-	
Co-58	-		-		-		-	
Co-60	-		-		-		-	
Zn-65	-		-		-		-	
Zr-Nb-95	-		-		-		-	
Cs-134	-		-		-		-	
Cs-137	-		-		-		-	
Ba-La-140	-		-		-		-	
Location	S-1		S-3		S-7		S-8	
Collection Date	09-10-15		09-10-15		09-10-15		09-10-15	
Lab Code	EW- 4990		EW- 4991		NF[a]		NF[a]	
Be-7	25.4 ± 16.0	< 36.2	3.0 ± 11.6	< 26.7	-		-	
Mn-54	0.1 ± 1.5	< 2.9	0.6 ± 1.3	< 2.4	-		-	
Fe-59	-7.3 ± 3.9	< 4.9	1.4 ± 2.1	< 2.9	-		-	
Co-58	0.2 ± 1.4	< 3.3	-0.8 ± 1.3	< 2.3	-		-	
Co-60	-0.2 ± 1.7	< 1.0	0.5 ± 1.2	< 1.7	-		-	
Zn-65	2.2 ± 3.2	< 2.0	1.0 ± 2.7	< 3.8	-		-	
Zr-Nb-95	0.4 ± 1.4	< 3.5	1.1 ± 1.3	< 3.5	-		-	
Cs-134	0.3 ± 1.8	< 3.3	0.7 ± 1.2	< 2.5	-		-	
Cs-137	0.5 ± 1.7	< 3.6	0.8 ± 1.5	< 2.5	-		-	
Ba-La-140	7.7 ± 1.7	< 8.6	1.1 ± 1.5	< 6.7	-		-	

[a] "NF" = No flow.

POINT BEACH NUCLEAR PLANT

Beach Drains (cont.)

Units: = pCi\L								Gamma isotopic analysis
Location	S-9		S-10		S-11		S-1	
Collection Date	09-10-15		09-10-15		09-10-15		10-07-15	
Lab Code	NF[a]	MDC	NF[a]	MDC	NF[a]	MDC	EW- 5629	MDC
Be-7	-		-		-		-4.4 ± 21.7	< 29.4
Mn-54	-		-		-		1.1 ± 2.5	< 3.6
Fe-59	-		-		-		2.5 ± 5.5	< 4.9
Co-58	-		-		-		-2.5 ± 2.7	< 3.2
Co-60	-		-		-		1.3 ± 2.6	< 4.6
Zn-65	-		-		-		2.8 ± 6.3	< 5.1
Zr-Nb-95	-		-		-		2.7 ± 2.9	< 5.7
Cs-134	-		-		-		-0.6 ± 2.7	< 4.8
Cs-137	-		-		-		0.9 ± 2.8	< 4.2
Ba-La-140	-		-		-		4.9 ± 3.1	< 7.6
Location	S-3		S-7		S-8		S-9	
Collection Date	10-07-15		10-07-15		10-07-15		10-07-15	
Lab Code	EW- 5631		NF[a]		NF[a]		NF[a]	
Be-7	-33.1 ± 26.9	< 36.9	-		-		-	
Mn-54	0.0 ± 2.9	< 4.6	-		-		-	
Fe-59	-3.6 ± 5.3	< 4.9	-		-		-	
Co-58	-2.1 ± 2.8	< 4.0	-		-		-	
Co-60	1.0 ± 2.6	< 3.8	-		-		-	
Zn-65	-30.1 ± 9.8	< 11.9	-		-		-	
Zr-Nb-95	-13.5 ± 3.9	< 9.8	-		-		-	
Cs-134	-1.8 ± 2.7	< 4.6	-		-		-	
Cs-137	0.3 ± 3.2	< 5.7	-		-		-	
Ba-La-140	-0.7 ± 4.5	< 13.4	-		-		-	
Location	S-10		S-11		S-1		S-3	
Collection Date	10-07-15		10-07-15		11-05-15		11-05-15	
Lab Code	NF[a]		NF[a]		EW- 6408		EW- 6409	
Be-7	-		-		6.6 ± 21.4	< 38.8	8.3 ± 9.1	< 30.1
Mn-54	-		-		1.1 ± 2.7	< 4.2	0.6 ± 1.2	< 1.8
Fe-59	-		-		-8.9 ± 5.1	< 5.8	0.4 ± 2.0	< 5.8
Co-58	-		-		-2.1 ± 2.6	< 3.0	0.3 ± 1.1	< 2.4
Co-60	-		-		3.5 ± 2.8	< 5.3	0.7 ± 1.2	< 2.4
Zn-65	-		-		-4.5 ± 5.2	< 6.8	-2.3 ± 2.6	< 2.7
Zr-Nb-95	-		-		1.9 ± 2.9	< 5.6	0.6 ± 1.1	< 1.9
Cs-134	-		-		-1.9 ± 2.6	< 5.0	-0.5 ± 1.1	< 2.1
Cs-137	-		-		0.6 ± 3.0	< 5.3	-1.3 ± 1.3	< 1.1
Ba-La-140	-		-		-0.3 ± 3.2	< 8.0	-4.3 ± 1.4	< 6.8

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L

Gamma isotopic analysis

Location	S-7	MDC	S-8	S-9	S-10
Collection Date	11-05-15		11-05-15	11-05-15	11-05-15
Lab Code	NF[a]	MDC	NF[a]	NF[a]	NF[a]
Be-7	-		-	-	-
Mn-54	-		-	-	-
Fe-59	-		-	-	-
Co-58	-		-	-	-
Co-60	-		-	-	-
Zn-65	-		-	-	-
Zr-Nb-95	-		-	-	-
Cs-134	-		-	-	-
Cs-137	-		-	-	-
Ba-La-140	-		-	-	-

Location	S-11	S-1		S-3		S-7	
Collection Date	11-05-15	12-10-15		12-10-15		12-10-15	
Lab Code	NF[a]	EW- 6935	MDC	EW- 6936	MDC	NF[a]	MDC
Be-7	-	-1.0 ± 15.9	< 34.5	9.0 ± 13.1	< 17.2	-	
Mn-54	-	0.7 ± 1.6	< 2.5	0.1 ± 1.3	< 1.2	-	
Fe-59	-	1.5 ± 3.2	< 4.2	-0.4 ± 3.1	< 4.7	-	
Co-58	-	0.2 ± 1.6	< 2.3	0.6 ± 1.3	< 1.9	-	
Co-60	-	-1.0 ± 1.6	< 1.3	-0.1 ± 1.7	< 2.2	-	
Zn-65	-	3.9 ± 3.8	< 6.4	2.0 ± 3.1	< 2.7	-	
Zr-Nb-95	-	-1.8 ± 1.7	< 2.6	0.1 ± 1.4	< 2.6	-	
Cs-134	-	0.5 ± 1.5	< 2.9	0.2 ± 1.5	< 2.9	-	
Cs-137	-	-1.2 ± 2.1	< 2.9	0.5 ± 1.6	< 2.5	-	
Ba-La-140	-	0.3 ± 1.4	< 3.7	0.4 ± 1.7	< 6.2	-	

Location	S-8	S-9	S-10	S-11
Collection Date	12-10-15	12-10-15	12-10-15	12-10-15
Lab Code	NF[a]	NF[a]	NF[a]	NF[a]
Be-7	-	-	-	-
Mn-54	-	-	-	-
Fe-59	-	-	-	-
Co-58	-	-	-	-
Co-60	-	-	-	-
Zn-65	-	-	-	-
Zr-Nb-95	-	-	-	-
Cs-134	-	-	-	-
Cs-137	-	-	-	-
Ba-La-140	-	-	-	-

[a] "NF" = No flow.

Beach Drains (cont.)

Units: = pCi\L							Gamma isotopic analysis
Annual							
All locations	**Mean ± s.d.**		**Mean ± s.d.**		**Mean ± s.d.**		**Mean ± s.d.**
Be-7	**1.0 ± 9.6**	**Co-58**	**-0.3 ± 0.9**	**Zr/Nb-95**	**-0.4 ± 2.8**	**Ba/La-140**	**-0.2 ± 2.6**
Mn-54	**0.2 ± 0.7**	**Co-60**	**0.3 ± 0.9**	**Cs-134**	**-0.2 ± -0.8**		
Fe-59	**-0.5 ± 2.6**	**Zn-65**	**-1.2 ± 6.1**	**Cs-137**	**0.3 ± 0.8**		

Table 13. Groundwater Tritium Monitoring Program
(Quarterly Collections)
Units = pCi/L

Quarterly Wells

Sample ID	GW-05 (WH 6 Well)				GW-06 (SBCC Well)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-15-15	EWW- 142	36 ± 102	< 165	01-15-15	EWW- 143	39 ± 102	< 165
04-15-15	EWW- 1665	-47 ± 76	< 158	04-15-15	EWW- 1666	-76 ± 74	< 158
07-09-15	EWW- 3619	-44 ± 91	< 154	07-09-15	EWW- 3620	-48 ± 91	< 154
10-07-15	EWW- 5626	19 ± 75	< 149	10-07-15	EWW- 5627	-8 ± 73	< 149
Mean ± s.d.		-9 ± 43		Mean ± s.d.		-23 ± 50	

Sample ID	GW-11 (MW-1)				GW-12 (MW-2)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-21-15	EWW- 513	-10 ± 96	< 196	01-21-15		NS[a]	
04-24-15	EWW- 2036	-72 ± 80	< 159	04-24-15	EWW- 2038	-168 ± 75	< 159
07-09-15	EWW- 4155	130 ± 82	< 143	07-09-15	EWW- 4156	54 ± 78	< 143
10-19-15	EWW- 6214	108 ± 76	< 141	10-19-15	EWW- 6215	12 ± 71	< 141
Mean ± s.d.		39 ± 96		Mean ± s.d.			

Sample ID	GW-13 (MW-6)				GW-14A (MW-05A)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-21-15	EWW- 514	-83 ± 91	< 196	01-21-15	EWW- 515	29 ± 99	< 196
04-24-15	EWW- 2039	-145 ± 76	< 159	04-24-15	EWW- 2040	-101 ± 78	< 159
07-09-15	EWW- 4157	159 ± 83	< 143	07-09-15	EWW- 4158	139 ± 82	< 143
10-19-15	EWW- 6216	134 ± 77	< 141	10-19-15	EWW- 6217	91 ± 75	< 141
Mean ± s.d.		16 ± 153		Mean ± s.d.		39 ± 104	

Sample ID	GW-15A (MW-4)				GW-15B (MW-4)		
Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
01-21-15	EWW- 516	96 ± 103	< 196	01-21-15	EWW- 517	131 ± 105	< 196
04-24-15	EWW- 2041	-18 ± 83	< 159	04-24-15	EWW- 2042	-32 ± 82	< 159
07-09-15	EWW- 4160	284 ± 89	< 143	07-09-15	EWW- 4161	278 ± 89	< 143
10-19-15	EWW- 6219	187 ± 80	< 141	10-19-15	EWW- 6220	181 ± 80	< 141
Mean ± s.d.		137 ± 129		Mean ± s.d.		139 ± 130	

Sample ID	GW-16 (MW-3)		
Collection Date	Lab Code	Tritium	MDC
01-21-15	EWW- 518	147 ± 106	< 196
04-24-15	EWW- 2043	186 ± 81	< 152
07-09-15	EWW- 4162	199 ± 85	< 143
10-19-15	EWW- 6221	179 ± 80	< 141
Mean ± s.d.		178 ± 22	

[a] Water frozen.

Table 13. Groundwater Tritium Monitoring Program
(Quarterly Collections)
Units = pCi/L

Quarterly Wells (cont.)

Sample ID GW-18 (WH 7 Well)

Collection Date	Lab Code	Tritium	MDC
01-15-15	EWW- 144	62 ± 104	< 165
04-16-15	EWW- 1667	23 ± 80	< 158
07-09-15	EWW- 3621	-23 ± 92	< 154
10-07-15	EWW- 5628	19 ± 75	< 149
Mean ± s.d.		21 ± 35	

Façade Wells

Sample ID GW-09 1Z-361A / GW-09 1Z-361B

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-27-15	EWW- 867	307 ± 91	< 151	02-27-15	EWW- 868	147 ± 83	< 151
04-12-15	EWW- 2515	287 ± 107	< 183	04-12-15	EWW- 2516	91 ± 100	< 183
08-08-15	EWW- 4709	253 ± 87	< 150	08-08-15	EWW- 4710	50 ± 77	< 150
10-15-15	EWW- 6210	346 ± 88	< 141	10-15-15	EWW- 6211	51 ± 73	< 141
Mean ± s.d.		298 ± 39		Mean ± s.d.		85 ± 46	

Sample ID GW-10 2Z-361A / GW-10 2Z-361B

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
02-27-15		NS[a]		02-27-15	EWW- 869	68 ± 79	< 151
04-12-15	EWW- 2517	35 ± 98	< 183	04-12-15	EWW- 2518	64 ± 99	< 183
08-08-15	EWW- 4711	54 ± 77	< 150	08-08-15	EWW- 4712	101 ± 80	< 150
10-15-15	EWW- 6212	61 ± 74	< 141	10-15-15	EWW- 6213	120 ± 77	< 141
Mean ± s.d.		50 ± 14		Mean ± s.d.		88 ± 27	

(Annual Collections)
Units = pCi/L

Bogs

Sample ID GW-07 (North Bog) / GW-08 EIC Bog

Collection Date	Lab Code	Tritium	MDC	Collection Date	Lab Code	Tritium	MDC
05-06-15	EWW- 2224	135 ± 84	< 147	05-06-15	EWW- 2225	275 ± 91	< 147

[a] Water frozen.

Table 13. Groundwater Tritium Monitoring Program

Units = pCi/L

Manholes

Sample ID	MH Z-065A				MH Z-065B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH Z-065C				MH Z-065D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH Z-066A				MH Z-066B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15	EW- 2044	77 ± 76	< 152	04-23-15	EW- 2045	58 ± 75	< 152
09-28-15	EW- 5400	163 ± 83	< 149	09-28-15	EW- 5401	24 ± 75	< 149
Mean ± s.d.		120 ± 61		Mean ± s.d.		41 ± 24	

Sample ID	MH Z-066C				MH Z-066D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15	EW- 2046	38 ± 73	< 152	05-01-14	EW- 2047	153 ± 80	< 152
09-28-15	EW- 5402	153 ± 82	< 149	09-28-15	EW- 5403	212 ± 85	< 149
Mean ± s.d.		95 ± 81		Mean ± s.d.		182 ± 41	

Sample ID	MH Z-067A				MH Z-067B		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15	EW- 2048	139 ± 79	< 152	04-23-15	EW- 2049	248 ± 84	< 152
09-28-15	EW- 5404	209 ± 85	< 149	09-28-15	EW- 5405	34 ± 76	< 149
Mean ± s.d.		174 ± 50		Mean ± s.d.		141 ± 151	

[a] "NS" = No sample; not sent.

Manholes (cont.)

Sample ID	MH Z-067C				MH Z-067D		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15	EW- 2050	98 ± 77	< 152	04-23-15	EW- 2051	199 ± 82	< 152
09-28-15	EW- 5406	125 ± 81	< 149	09-28-15	EW- 5407	136 ± 81	< 149
Mean ± s.d.		111 ± 19		Mean ± s.d.		167 ± 44	

Sample ID	MH Z-068				MH-1		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15	EW- 2052	250 ± 85	< 152	04-23-15		NS[a]	
09-28-15	EW- 5408	220 ± 86	< 149	09-28-15		NS[a]	
Mean ± s.d.		235 ± 21		Mean ± s.d.			

Sample ID	MH-4				MH-6		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-7				MH-8		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-16				MH-2		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

Sample ID	MH-5A				MH-9		
Collection Date	Lab Code	Tritium	MDC (pCi/L)	Collection Date	Lab Code	Tritium	MDC (pCi/L)
04-23-15		NS[a]		04-23-15		NS[a]	
09-28-15		NS[a]		09-28-15		NS[a]	
Mean ± s.d.				Mean ± s.d.			

[a] "NS" = No sample; not sent.

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2015 through December, 2015

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via internal laboratory testing and by irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	$\pm 1\sigma = 169.85 \times (\text{known})^{0.0933}$ 10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤ 55 pCi/liter > 55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses [b]	---	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Date	Concentration (pCi/L) Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-1444	4/6/2015	Sr-89	59.71 ± 5.44	63.20	51.10 - 71.20	Pass
ERW-1444	4/6/2015	Sr-90	43.41 ± 2.43	41.90	30.80 - 48.10	Pass
ERW-1448	4/6/2015	Ba-133	77.75 ± 4.69	82.50	69.30 - 90.80	Pass
ERW-1448	4/6/2015	Cs-134	68.82 ± 3.08	75.70	61.80 - 83.30	Pass
ERW-1448	4/6/2015	Cs-137	191.9 ± 5.9	189.0	170.0 - 210.0	Pass
ERW-1448	4/6/2015	Co-60	85.05 ± 4.59	84.50	76.00 - 95.30	Pass
ERW-1448	4/6/2015	Zn-65	196.0 ± 12.0	203.0	183.0 - 238.0	Pass
ERW-1450	4/6/2015	Gr. Alpha	34.05 ± 1.90	42.60	22.10 - 54.00	Pass
ERW-1450	4/6/2015	G. Beta	26.93 ± 1.12	32.90	21.30 - 40.60	Pass
ERW-1453	4/6/2015	I-131	22.47 ± 0.83	23.80	19.70 - 28.30	Pass
ERW-1456	4/6/2015	Ra-226	8.20 ± 0.56	8.43	6.33 - 9.90	Pass
ERW-1456	4/6/2015	Ra-228	5.00 ± 0.67	4.39	2.56 - 6.01	Pass
ERW-1456	4/6/2015	Uranium	5.98 ± 0.31	6.59	4.99 - 7.83	Pass
ERW-1461	4/6/2015	H-3	3,254 ± 180	3280	2,770 - 3,620	Pass
ERW-5528	10/5/2015	Sr-89	34.76 ± 0.06	35.70	26.70 - 42.50	Pass
ERW-5528	10/5/2015	Sr-90	29.23 ± 0.06	31.10	22.70 - 36.10	Pass
ERW-5531	10/5/2015	Ba-133	30.91 ± 0.53	32.50	25.90 - 36.70	Pass
ERW-5531	10/5/2015	Cs-134	57.40 ± 2.57	62.30	50.69 - 68.50	Pass
ERW-5531	10/5/2015	Cs-137	163.1 ± 4.8	157.0	141.0 - 175.0	Pass
ERW-5531	10/5/2015	Co-60	73.41 ± 1.72	71.10	64.00 - 80.70	Pass
ERW-5531	10/5/2015	Zn-65	138.9 ± 5.7	126.0	113.0 - 149.0	Pass
ERW-5534	10/5/2015	Gr. Alpha	29.99 ± 0.08	51.60	26.90 - 64.70	Pass
ERW-5534	10/5/2015	G. Beta	27.52 ± 0.04	36.60	24.10 - 44.20	Pass
ERW-5537	10/5/2015	I-131	25.54 ± 0.60	26.30	21.90 - 31.00	Pass
ERW-5540	10/5/2015	Ra-226	7.32 ± 0.37	7.29	5.49 - 8.63	Pass
ERW-5540 [d]	10/5/2015	Ra-228	7.80 ± 0.02	4.25	2.46 - 5.85	Fail
ERW-5540 [e]	10/5/2015	Ra-228	4.45 ± 0.96	4.25	2.46 - 5.85	Pass
ERW-5540	10/5/2015	Uranium	53.30 ± 0.55	56.20	45.70 - 62.40	Pass
ERW-5543	10/5/2015	H-3	21,260 ± 351	21,300	18,700 - 23,400	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

[d] Ra-228 spike was at a level close to the detection level. The high result was likely caused by interference from short-lived Rn-222 daughters.

[e] The result of reanalysis (Compare to original result, footnoted "e" above).

TABLE A-2.1. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [a]

			mR			
Lab Code	Irradiation Date	Description	Known Value	Lab Result	Control Limits	Acceptance
Environmental, Inc.						
2015-1	6/24/2015	30 cm.	98.81	103.67 ± 6.05	69.20 - 128.50	Pass
2015-1	6/24/2015	30 cm.	98.81	111.32 ± 15.97	69.20 - 128.50	Pass
2015-1	6/24/2015	60 cm.	24.70	27.23 ± 1.33	17.30 - 32.10	Pass
2015-1	6/24/2015	60 cm.	24.70	26.98 ± 4.98	17.30 - 32.10	Pass
2015-1	6/24/2015	120 cm.	6.18	6.71 ± 1.77	4.30 - 8.00	Pass
2015-1	6/24/2015	120 cm.	6.18	6.78 ± 0.38	4.30 - 8.00	Pass
2015-1	6/24/2015	120 cm.	6.18	6.43 ± 2.00	4.30 - 8.00	Pass
2015-1	6/24/2015	150 cm.	3.95	4.13 ± 0.72	2.80 - 5.10	Pass
2015-1	6/24/2015	150 cm.	3.95	4.12 ± 1.36	2.80 - 5.10	Pass
2015-1	6/24/2015	150 cm.	3.95	4.50 ± 1.51	2.80 - 5.10	Pass
2015-1	6/24/2015	180 cm.	2.74	3.27 ± 0.28	1.90 - 3.60	Pass
2015-1	6/24/2015	180 cm.	2.74	3.05 ± 1.11	1.90 - 3.60	Pass
2015-1	6/24/2015	180 cm.	2.74	3.14 ± 0.18	1.90 - 3.60	Pass

TABLE A-2.2 Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [b]

Lab Code	Irradiation Date	Description	Delivered Dose (mrem)	Reported Dose (mrem)	Performance Quotient (P) [c]	Acceptance [d]
Environmental, Inc.						
2015-2	12/15/2015	Spike 1	138.0	118.5 ± 2.1	-0.14	Pass
2015-2	12/15/2015	Spike 2	138.0	120.0 ± 1.6	-0.13	Pass
2015-2	12/15/2015	Spike 3	138.0	121.9 ± 1.9	-0.12	Pass
2015-2	12/15/2015	Spike 4	138.0	124.5 ± 3.3	-0.10	Pass
2015-2	12/15/2015	Spike 5	138.0	126.5 ± 3.2	-0.08	Pass
2015-2	12/15/2015	Spike 6	138.0	140.0 ± 4.2	0.01	Pass
2015-2	12/15/2015	Spike 7	138.0	128.2 ± 1.2	-0.07	Pass
2015-2	12/15/2015	Spike 8	138.0	128.0 ± 4.0	-0.07	Pass
2015-2	12/15/2015	Spike 9	138.0	124.9 ± 5.1	-0.09	Pass
2015-2	12/15/2015	Spike 10	138.0	122.9 ± 3.0	-0.11	Pass
2015-2	12/15/2015	Spike 11	138.0	123.3 ± 3.0	-0.11	Pass
2015-2	12/15/2015	Spike 12	138.0	119.0 ± 3.4	-0.14	Pass
2015-2	12/15/2015	Spike 13	138.0	123.0 ± 2.7	-0.11	Pass
2015-2	12/15/2015	Spike 14	138.0	125.4 ± 2.0	-0.09	Pass
2015-2	12/15/2015	Spike 15	138.0	122.0 ± 3.1	-0.12	Pass
2015-2	12/15/2015	Spike 16	138.0	120.8 ± 2.0	-0.12	Pass
2015-2	12/15/2015	Spike 17	138.0	118.8 ± 1.1	-0.14	Pass
2015-2	12/15/2015	Spike 18	138.0	117.0 ± 2.3	-0.15	Pass
2015-2	12/15/2015	Spike 19	138.0	120.8 ± 2.6	-0.12	Pass
2015-2	12/15/2015	Spike 20	138.0	122.6 ± 3.0	-0.11	Pass
Mean (Spike 1-20)				123.4	0.11	Pass
Standard Deviation (Spike 1-20)				5.0	0.04	Pass

[a] TLD's were irradiated at Environmental Inc. Midwest Laboratory. (Table A-2.1)

[b] TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.(Table A-2.2)

[c] Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

[d] Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

e Tables A2.1 and A2.2 assume 1 roentgen = 1 rem (per NRC -Health Physics Positions Based on 10 CFR Part 20 - Question 96 - Page Last Reviewed/Updated Thursday, October 01, 2015).

TABLE A-3. In-House "Spiked" Samples

		Concentration (pCi/L)[a]				
Lab Code [b]	Date	Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
W-020315	2/3/2015	Ra-226	16.19 ± 0.42	16.70	13.36 - 20.04	Pass
W-021215	2/12/2015	Gr. Alpha	18.38 ± 0.39	20.10	16.08 - 24.12	Pass
W-021215	2/12/2015	Gr. Beta	27.98 ± 0.32	30.90	24.72 - 37.08	Pass
SPW-687	2/27/2015	Ni-63	239.6 ± 3.5	202.4	161.9 - 242.9	Pass
SPAP-689	3/2/2015	Gr. Beta	42.37 ± 3.50	43.61	34.89 - 52.33	Pass
SPAP-691	3/2/2015	Cs-134	1.77 ± 0.61	1.90	1.52 - 2.28	Pass
SPAP-691	3/2/2015	Cs-137	83.02 ± 2.60	97.20	77.76 - 116.64	Pass
SPW-693	3/2/2015	Cs-134	44.30 ± 2.53	53.40	42.72 - 64.08	Pass
SPW-693	3/2/2015	Cs-137	74.82 ± 3.50	73.80	59.04 - 88.56	Pass
SPW-693	3/2/2015	Sr-89	87.45 ± 3.62	87.48	69.98 - 104.98	Pass
SPW-693	3/25/2015	Sr-90	37.22 ± 1.55	38.10	30.48 - 45.72	Pass
SPMI-697	3/2/2015	Cs-134	96.67 ± 7.74	107.00	85.60 - 128.40	Pass
SPMI-697	3/2/2015	Cs-137	78.51 ± 7.02	73.84	59.07 - 88.61	Pass
SPMI-697	3/2/2015	Sr-89	72.98 ± 4.86	87.48	69.98 - 104.98	Pass
SPMI-697	3/2/2015	Sr-90	39.17 ± 1.51	38.10	30.48 - 45.72	Pass
SPW-699	3/2/2015	H-3	59,592 ± 703	58,445	46,756 - 70,134	Pass
W-031115	3/11/2015	Ra-226	13.73 ± 0.35	16.70	13.36 - 20.04	Pass
W-030215	3/2/2015	Ra-228	32.79 ± 2.31	31.44	25.15 - 37.73	Pass
SPF-1040	3/16/2015	Cs-134	787.5 ± 9.2	840.0	672.0 - 1,008.0	Pass
SPF-1040	3/16/2015	Cs-137	2,599 ± 24	2,360	1,888 - 2,832	Pass
SPW-1036	3/25/2015	Fe-55	1,792 ± 63	1961	1,569 - 2,353	Pass
SPW-1374	4/6/2015	U-238	46.03 ± 2.25	41.70	25.02 - 58.38	Pass
W-040815	4/8/2015	Gr. Alpha	20.18 ± 0.42	20.10	16.08 - 24.12	Pass
W-040815	4/8/2015	Gr. Beta	29.70 ± 0.33	30.90	24.72 - 37.08	Pass
SPW-1038	4/13/2015	C-14	3,497 ± 9	4,734	2,840 - 6,628	Pass
W-2165	4/20/2015	H-3	5550 ± 226	5,780	3,468 - 8,092	Pass
W-2165	4/20/2015	Sr-89	90.70 ± 8.20	108.70	65.22 - 152.18	Pass
W-2165	4/20/2015	Sr-90	76.80 ± 2.00	75.90	45.54 - 106.26	Pass
W-2165	4/20/2015	Cs-134	62.40 ± 6.40	57.30	34.38 - 80.22	Pass
W-2165	4/20/2015	Cs-137	91.30 ± 7.70	84.00	50.40 - 117.60	Pass
W-2392	4/13/2015	H-3	5032 ± 214	5780	3468 - 8092	Pass
W-2392	4/13/2015	Ni-63	222.4 ± 3.8	202.0	121.2 - 282.8	Pass
W-2392	4/13/2015	Cs-134	53.26 ± 5.01	57.30	34.38 - 80.22	Pass
W-2392	4/13/2015	Cs-137	91.90 ± 7.76	84.20	50.52 - 117.88	Pass
W-042415	4/24/2015	Ra-226	12.52 ± 0.39	16.70	10.02 - 23.38	Pass
W-050715	5/7/2015	Gr. Alpha	19.05 ± 0.41	20.10	12.06 - 28.14	Pass
W-050715	5/7/2015	Gr. Beta	27.30 ± 0.32	30.90	18.54 - 43.26	Pass
W-061215	6/12/2015	Gr. Alpha	20.72 ± 0.44	20.10	12.06 - 28.14	Pass
W-061215	6/12/2015	Gr. Beta	28.51 ± 0.33	30.90	18.54 - 43.26	Pass
U-2982	6/9/2015	Gr. Beta	500.1 ± 5.1	604.0	362.4 - 845.6	Pass
U-3200	6/9/2015	H-3	2229 ± 424	2346	1408 - 3284	Pass
W-70915	7/9/2015	Gr. Alpha	18.76 ± 0.40	20.10	12.1 - 28.1	Pass
W-70915	7/9/2015	Gr. Beta	29.71 ± 0.33	30.90	18.5 - 43.3	Pass
SPAP-3859	7/21/2015	Gr. Beta	41.59 ± 0.12	43.61	26.17 - 61.05	Pass
SPAP-3861	7/21/2015	Cs-134	1.69 ± 0.60	1.69	1.0 - 2.4	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPAP-3861	7/21/2015	Cs-137	93.71 ± 2.64	96.45	57.87 - 135.03	Pass
SPMI-3863	7/21/2015	Cs-134	38.21 ± 5.12	47.02	28.21 - 65.83	Pass
SPMI-3863	7/21/2015	Cs-137	78.65 ± 7.94	73.18	43.91 - 102.45	Pass
SPMI-3863	7/21/2015	Sr-90	41.05 ± 1.62	37.78	22.67 - 52.89	Pass
SPW-3871	7/21/2015	Cs-134	45.59 ± 6.39	47.02	28.21 - 65.83	Pass
SPW-3871	7/21/2015	Cs-137	78.73 ± 7.03	73.18	43.91 - 102.45	Pass
SPW-3871	7/21/2015	Sr-90	38.36 ± 1.58	37.78	22.67 - 52.89	Pass
SPW-3873	7/21/2015	H-3	60,034 ± 671	57,199	34,319 - 80,079	Pass
SPW-3875	7/21/2015	Ni-63	451.3 ± 3.3	403.7	242.2 - 565.2	Pass
SPW-3877	7/21/2015	Tc-99	483.0 ± 8.3	539.1	323.5 - 754.7	Pass
SPMI-3879	7/21/2015	C-14	4,921 ± 19	4,736	2,842 - 6,630	Pass
SPSO-4037	7/21/2015	Ni-63	42,458 ± 309	40,370	24,222 - 56,518	Pass
SPW-072515	7/17/2015	Ra-228	35.48 ± 3	31.44	18.86 - 44.02	Pass
SPF-4104	7/29/2015	Cs-134	661.5 ± 115.9	740.0	444.0 - 1036.0	Pass
SPF-4104	7/29/2015	Cs-137	2,469 ± 59	2,340	1,404 - 3,276	Pass
SPW-81015	8/10/2015	Gr. Alpha	21.59 ± 0.46	20.10	12.06 - 28.14	Pass
SPW-81015	8/10/2015	Gr. Beta	27.58 ± 0.32	30.90	18.54 - 43.26	Pass
SPW-81315	8/13/2015	Ra-226	15.05 ± 0.36	16.70	10.02 - 23.38	Pass
SPW-90615	9/6/2015	Gr. Alpha	18.32 ± 0.40	20.10	12.06 - 28.14	Pass
SPW-90615	9/6/2015	Gr. Beta	29.43 ± 0.33	30.90	18.54 - 43.26	Pass
W-091415	9/14/2016	Gr. Alpha	19.35 ± 0.51	20.10	12.06 - 28.14	Pass
W-091415	9/14/2016	Gr. Beta	31.53 ± 0.35	30.90	18.54 - 43.26	Pass
W-100815	10/8/2015	Ra-228	12.27 ± 0.33	16.70	10.02 - 23.38	Pass
W-100615	10/6/2016	Gr. Alpha	20.62 ± 0.43	20.10	12.06 - 28.14	Pass
W-100615	10/6/2016	Gr. Beta	29.35 ± 0.33	30.90	18.54 - 43.26	Pass
W-5277	10/16/2015	H-3	5,224 ± 218	5,466	3,280 - 7,652	Pass
W-5277	10/16/2015	Cs-134	99.40 ± 6.64	99.20	59.52 - 138.88	Pass
W-5277	10/16/2015	Cs-137	89.60 ± 6.64	83.20	49.92 - 116.48	Pass
W-110415	11/4/2015	Ra-226	12.27 ± 0.33	16.70	10.02 - 23.38	Pass
W-111115	11/11/2015	Ra-228	31.78 ± 2.48	31.44	18.86 - 44.02	Pass
W-6086,6087	11/18/2015	H-3	10,882 ± 309	11,231	6,738 - 15,723	Pass
W-6086,6087	11/18/2015	Cs-134	92.98 ± 7.29	96.25	57.75 - 134.75	Pass
W-6086,6087	11/18/2015	Cs-137	76.65 ± 7.81	82.94	49.76 - 116.12	Pass
W-112515	11/25/2015	Gr. Alpha	20.91 ± 0.52	20.10	12.06 - 28.14	Pass
W-112515	11/25/2015	Gr. Beta	31.59 ± 0.35	30.90	18.54 - 43.26	Pass
W-120715	12/7/2015	Fe-55	2,431 ± 97	2,319	1,391 - 3,247	Pass
W-120815	12/8/2015	Gr. Alpha	20.72 ± 0.43	20.10	12.06 - 28.14	Pass
W-120815	12/8/2015	Gr. Beta	29.50 ± 0.33	30.90	18.54 - 43.26	Pass
W-121515	12/15/2015	Ra-226	14.77 ± 0.42	16.70	10.02 - 23.38	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2s.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, cabbage is used for the spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
W-020315	Water	2/3/2015	Ra-226	0.03	0.03 ± 0.02	1
W-021215	Water	2/12/2015	Gr. Alpha	0.47	-0.37 ± 0.30	2
W-021215	Water	2/12/2015	Gr. Beta	0.76	-0.62 ± 0.51	4
SPW-686	Water	2/27/2015	Ni-63	2.36	-0.74 ± 1.42	20
SPAP-688	Air Particulate	3/2/2015	Gr. Beta	0.003	-0.001 ± 0.002	0.01
SPAP-690	Air Particulate	3/2/2015	Cs-134	0.006	0.428 ± 0.927	0.05
SPAP-690	Air Particulate	3/2/2015	Cs-137	0.006	-0.785 ± 1.146	0.05
W-030215	Water	3/2/2015	Ra-228	0.76	0.22 ± 0.38	2
SPW-692	Water	3/2/2015	Cs-134	6.70	-1.57 ± 3.55	10
SPW-692	Water	3/2/2015	Cs-137	6.18	-0.15 ± 3.20	10
SPW-692	Water	3/2/2015	Sr-89	0.61	-0.51 ± 0.51	5
SPW-692	Water	3/2/2015	Sr-90	0.60	0.38 ± 0.33	1
SPMI-696	Milk	3/2/2015	Cs-134	3.75	-0.25 ± 2.24	10
SPMI-696	Milk	3/2/2015	Cs-137	4.36	-0.25 ± 2.24	10
SPMI-696	Milk	3/2/2015	Sr-89	0.80	-0.40 ± 0.84	5
SPMI-696	Milk	3/2/2015	Sr-90	0.49	0.98 ± 0.32	1
SPW-698	Water	3/2/2015	H-3	144.0	28.6 ± 88.9	200
SPW-1035	Water	3/16/2015	Fe-55	599.7	72.6 ± 368.1	1000
SPW-1037	Water	3/16/2015	C-14	8.94	2.16 ± 5.47	200
SPF-1039	Fish	3/16/2015	Cs-134	13.54	-1.00 ± 6.80	100
SPF-1039	Fish	3/16/2015	Cs-137	9.80	4.87 ± 7.00	100
W-040615	Water	4/6/2015	Ra-226	0.04	0.01 ± 0.03	2
W-1373	Water	4/6/2015	U-238	0.08	0.01 ± 0.01	1
W-1375	Water	4/6/2015	Pu-238	0.03	0.00 ± 0.01	1
W-050715	Water	5/7/2015	Gr. Alpha	0.38	-0.10 ± 0.25	2
W-050715	Water	5/7/2015	Gr. Beta	0.74	-0.14 ± 0.51	4
W-061215	Water	6/12/2015	Gr. Alpha	0.42	-0.10 ± 0.29	2
W-061215	Water	6/12/2015	Gr. Beta	0.75	-0.04 ± 0.53	4
SPW-3858	Water	7/21/2015	Gr. Beta	0.003	0.004 ± 0.002	2
SPAP-3860	Air Particulate	7/21/2015	Cs-134	0.011	0.010 ± 0.005	0.05
SPAP-3860	Air Particulate	7/21/2015	Cs-137	0.009	0.000 ± 0.005	0.05
SPMI-3862	Milk	7/21/2015	Cs-134	3.13	1.56 ± 1.74	10
SPMI-3862	Milk	7/21/2015	Cs-137	3.20	1.69 ± 1.89	10
SPMI-3862	Milk	7/21/2015	Sr-89	2.17	-1.30 ± 2.05	5
SPMI-3862	Milk	7/21/2015	Sr-90	0.90	0.74 ± 0.50	1
SPW-3870	Water	7/21/2015	Cs-134	3.01	0.71 ± 1.66	10
SPW-3870	Water	7/21/2015	Cs-137	3.94	0.81 ± 1.86	10
SPW-3870	Water	7/21/2015	Sr-89	2.28	-0.42 ± 1.80	5
SPW-3870	Water	7/21/2015	Sr-90	0.84	0.25 ± 0.42	1

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a] Laboratory results (4.66σ) LLD	Activity[c]	Acceptance Criteria (4.66 σ)
SPW-3872	Water	7/21/2015	H-3	142.6	82.7 ± 79.4	200
SPW-3874	Water	7/21/2015	Ni-63	2.98	0.77 ± 1.82	20
SPW-3876	Water	7/21/2015	Tc-99	5.49	-3.81 ± 3.26	10
SPW-3878	Water	7/21/2015	C-14	17.06	8.52 ± 10.54	200
SPSO-4036	Soil	7/21/2015	Ni-63	135.7	51.3 ± 83.0	1000
SPF-4103	Fish	7/29/2015	Cs-134	14.17	-37.70 ± 9.67	100
SPF-4103	Fish	7/29/2015	Cs-137	12.39	1.13 ± 8.06	100
W-081015	Water	8/10/2015	Gr. Alpha	0.48	-0.10 ± 0.33	2
W-081015	Water	8/10/2015	Gr. Beta	0.78	-0.18 ± 0.54	4
W-081815	Water	8/18/2015	Ra-226	0.03	0.03 ± 0.02	2
W-090615	Water	9/6/2015	Gr. Alpha	0.40	0.00 ± 0.28	2
W-090615	Water	9/6/2015	Gr. Beta	0.77	0.22 ± 0.54	4
W-091415	Water	9/14/2015	Gr. Alpha	0.41	0.10 ± 0.30	2
W-091415	Water	9/14/2015	Gr. Beta	0.77	0.04 ± 0.54	4
W-100615	Water	10/6/2015	Gr. Alpha	0.41	-0.15 ± 0.27	2
W-100615	Water	10/6/2015	Gr. Beta	0.75	-0.12 ± 0.52	4
W-112515	Water	11/25/2015	Gr. Alpha	0.42	0.05 ± 0.30	2
W-112515	Water	11/25/2015	Gr. Beta	0.78	-0.31 ± 0.54	4
W-120815	Water	12/8/2015	Gr. Alpha	0.42	-0.08 ± 0.29	2
W-120815	Water	12/8/2015	Gr. Beta	0.76	0.17 ± 0.54	4
W-121515	Water	12/15/2015	Ra-226	0.01	0.01 ± 0.01	2

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
CF-62,63	1/7/2015	Gr. Beta	5.72 ± 0.12	5.78 ± 0.12	5.75 ± 0.42	Pass
CF-62,63	1/7/2015	Be-7	0.915 ± 0.135	0.919 ± 0.102	0.917 ± 0.15	Pass
CF-62,63	1/7/2015	K-40	3.97 ± 0.28	3.88 ± 0.23	3.92 ± 0.33	Pass
CF-62,63	1/7/2015	Sr-90	0.017 ± 0.006	0.011 ± 0.006	0.014 ± 0.004	Pass
SG-83,84	1/12/2015	K-40	10.11 ± 1.42	9.69 ± 1.20	9.90 ± 1.16	Pass
SG-83,84	1/12/2015	Tl-208	0.57 ± 0.07	0.56 ± 0.06	0.57 ± 0.05	Pass
SG-83,84	1/12/2015	Pb-212	1.73 ± 0.10	1.58 ± 0.09	1.65 ± 0.13	Pass
SG-83,84	1/12/2015	Pb-214	13.33 ± 0.33	13.88 ± 0.28	13.61 ± 0.22	Pass
SG-83,84	1/12/2015	Bi-214	13.48 ± 0.39	13.45 ± 0.29	13.47 ± 0.24	Pass
SG-83,84	1/12/2015	Ra-226	25.68 ± 2.19	26.22 ± 1.53	25.95 ± 1.34	Pass
SG-83,84	1/12/2015	Ac-228	13.33 ± 0.59	12.86 ± 0.43	13.09 ± 0.36	Pass
AP-011215A/B	1/12/2015	Gr. Beta	0.025 ± 0.004	0.023 ± 0.004	0.024 ± 0.003	Pass
WW-315,316	1/27/2015	H-3	1,961 ± 178	1,868 ± 174	1,915 ± 124	Pass
DW-60010,60011	1/28/2015	Ra-226	1.25 ± 0.14	1.40 ± 0.15	1.33 ± 0.10	Pass
DW-60010,60011	1/28/2015	Ra-228	2.00 ± 0.66	1.39 ± 0.60	1.70 ± 0.45	Pass
SG-336,337	1/30/2015	Bi-214	6.63 ± 0.20	6.45 ± 0.45	6.54 ± 0.21	Pass
SG-336,337	1/30/2015	Pb-214	6.45 ± 0.19	6.45 ± 0.37	6.45 ± 0.21	Pass
SG-336,337	1/30/2015	Ac-228	4.43 ± 0.24	4.20 ± 0.58	4.32 ± 0.31	Pass
AP-020415A/B	2/4/2015	Gr. Beta	0.021 ± 0.004	0.019 ± 0.035	0.035 ± 0.020	Pass
AP-021115A/B	2/11/2015	Gr. Beta	0.034 ± 0.004	0.040 ± 0.047	0.037 ± 0.003	Pass
DW-60023,60024	2/26/2015	Ra-226	1.52 ± 0.15	1.51 ± 0.15	1.52 ± 0.11	Pass
DW-60023,60024	2/26/2015	Ra-228	0.97 ± 0.48	1.66 ± 0.58	1.32 ± 0.38	Pass
S-799,800	2/26/2015	K-40	11.96 ± 0.98	11.49 ± 0.82	11.72 ± 0.64	Pass
S-799,800	2/26/2015	Tl-208	0.36 ± 0.04	0.31 ± 0.04	0.34 ± 0.03	Pass
S-799,800	2/26/2015	Pb-212	0.92 ± 0.06	0.91 ± 0.06	0.91 ± 0.05	Pass
S-799,800	2/26/2015	Bi-212	1.26 ± 0.45	1.50 ± 0.40	1.38 ± 0.30	Pass
S-799,800	2/26/2015	Ac-228	1.35 ± 0.22	1.23 ± 0.17	1.29 ± 0.14	Pass
SG-834,835	2/2/2015	Gr. Alpha	113.3 ± 6.3	117.2 ± 2.8	115.2 ± 3.4	Pass
SG-834,835	2/2/2015	Gr. Beta	82.27 ± 2.79	84.33 ± 2.74	83.30 ± 1.96	Pass
DW-60031,60032	3/4/2015	Gr. Alpha	185.4 ± 7.4	177.0 ± 7.2	181.2 ± 5.2	Pass
DW-60036,60037	3/4/2015	Ra-226	6.89 ± 0.34	6.88 ± 0.32	6.89 ± 0.23	Pass
DW-60036,60037	3/4/2015	Ra-228	4.43 ± 0.73	4.41 ± 0.72	4.42 ± 0.51	Pass
DW-60048,60049	3/4/2015	Ra-226	0.84 ± 0.10	0.94 ± 0.11	0.89 ± 0.07	Pass
DW-60048,60049	3/4/2015	Ra-228	0.68 ± 0.41	1.42 ± 0.58	1.05 ± 0.36	Pass
AP-1169,1170	3/19/2015	Be-7	0.20 ± 0.02	0.24 ± 0.10	0.22 ± 0.07	Pass
DW-60069,60070	4/8/2015	Gr. Alpha	3.58 ± 0.88	3.92 ± 0.88	3.75 ± 0.62	Pass
AP-040915	4/9/2015	Gr. Beta	0.027 ± 0.005	0.023 ± 0.005	0.025 ± 0.003	Pass
WW-2394,2395	4/13/2015	H-3	1,628 ± 139	1,695 ± 141	1,662 ± 99	Pass
SG-1847,1848	4/20/2015	K-40	3.24 ± 1.18	1.99 ± 0.76	2.62 ± 0.70	Pass
SG-1847,1848	4/20/2015	Pb-214	5.80 ± 0.22	6.23 ± 0.76	6.02 ± 0.40	Pass
SG-1847,1848	4/20/2015	Ac-228	5.26 ± 0.51	5.00 ± 0.42	5.13 ± 0.33	Pass
XWW-2267,2268	4/23/2015	H-3	6,584 ± 244	6,164 ± 237	6,374 ± 170	Pass
XWW-2078,2079	4/27/2015	H-3	359.0 ± 89.6	418.7 ± 92.3	388.9 ± 64.3	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
XWW-2162,2163	4/28/2015	H-3	4,408 ± 201	4,242 ± 198	4,325 ± 141	Pass
SG-1868,1869	4/28/2015	Gr. Alpha	47.57 ± 3.63	43.61 ± 3.58	45.59 ± 2.55	Pass
SG-1868,1869	4/28/2015	Gr. Beta	50.90 ± 1.94	51.90 ± 2.02	51.40 ± 1.40	Pass
SG-1868,1869	4/28/2015	Pb-214	13.80 ± 0.52	13.54 ± 0.62	13.67 ± 0.40	Pass
SG-1868,1869	4/28/2015	Ra-228	20.10 ± 0.92	22.10 ± 1.29	21.10 ± 0.79	Pass
AP-042915	4/29/2015	Gr. Beta	0.014 ± 0.003	0.014 ± 0.003	0.014 ± 0.002	Pass
DW-60076,60077	5/4/2015	Ra-228	2.89 ± 0.61	2.45 ± 0.57	2.67 ± 0.42	Pass
AP-050515	5/5/2015	Gr. Beta	0.026 ± 0.004	0.025 ± 0.004	0.026 ± 0.003	Pass
AP-051115	5/11/2015	Gr. Beta	0.006 ± 0.005	0.010 ± 0.005	0.008 ± 0.004	Pass
DW-60087,60088	5/14/2015	Ra-226	1.58 ± 0.17	1.52 ± 0.17	1.55 ± 0.12	Pass
DW-60087,60088	5/14/2015	Ra-228	0.94 ± 0.50	0.94 ± 0.50	0.94 ± 0.35	Pass
SG-2436,2437	5/15/2015	Pb-214	22.90 ± 2.31	24.10 ± 2.43	23.50 ± 1.68	Pass
SG-2436,2437	5/15/2015	Ra-228	47.95 ± 0.61	47.80 ± 0.71	47.88 ± 0.47	Pass
SG-2436,2437	5/15/2015	Gr. Alpha	267.8 ± 7.9	254.6 ± 7.6	261.2 ± 5.5	Pass
SG-2458,2459	5/19/2015	Pb-214	75.00 ± 1.66	77.70 ± 1.75	76.35 ± 1.21	Pass
SG-2458,2459	5/19/2015	Ra-228	41.10 ± 0.92	40.80 ± 0.83	40.95 ± 0.62	Pass
DW-60095,60096	5/26/2015	Gr. Alpha	1.34 ± 0.69	0.91 ± 0.62	1.13 ± 0.46	Pass
AP-052715	5/27/2015	Gr. Beta	0.010 ± 0.003	0.010 ± 0.003	0.010 ± 0.002	Pass
S-2627,2628	5/29/2015	Pb-214	0.85 ± 0.07	0.85 ± 0.07	0.85 ± 0.05	Pass
S-2627,2628	5/29/2015	Ac-228	0.85 ± 0.14	1.08 ± 0.12	0.97 ± 0.09	Pass
S-2627,2628	5/29/2015	Cs-137	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01	Pass
S-2605,2606	6/1/2015	Ac-228	0.42 ± 0.06	0.38 ± 0.07	0.40 ± 0.05	Pass
S-2605,2606	6/1/2015	Ra-226	0.44 ± 0.03	0.49 ± 0.03	0.47 ± 0.02	Pass
S-2605,2606	6/1/2015	K-40	10.89 ± 0.51	11.40 ± 0.48	11.15 ± 0.35	Pass
S-2605,2606	6/1/2015	Cs-137	0.05 ± 0.01	0.05 ± 0.01	0.05 ± 0.01	Pass
S-2858,2859	6/2/2015	Cs-137	34.30 ± 16.05	40.66 ± 17.79	37.48 ± 11.98	Pass
S-2858,2859	6/2/2015	Be-7	1501 ± 264	1171 ± 214	1336 ± 170	Pass
S-2858,2859	6/2/2015	K-40	22,122 ± 658	20,987 ± 600	21,555 ± 445	Pass
AP-060315	6/3/2015	Gr. Beta	0.022 ± 0.004	0.021 ± 0.004	0.022 ± 0.003	Pass
DW-30107,30108	6/8/2015	Gr. Alpha	1.34 ± 0.82	1.47 ± 0.85	1.41 ± 0.59	Pass
SG-2900,2901	6/9/2015	Ac-228	10.22 ± 1.36	8.32 ± 1.07	9.27 ± 0.87	Pass
SG-2900,2901	6/9/2015	Pb-214	7.55 ± 0.43	7.27 ± 0.41	7.41 ± 0.30	Pass
AP-061515	6/15/2015	Gr. Beta	0.022 ± 0.004	0.021 ± 0.004	0.022 ± 0.003	Pass
XWW-3173,3174	6/18/2015	H-3	841.9 ± 123.6	799.3 ± 122.4	820.6 ± 87.0	Pass
AP-062215	6/22/2015	Gr. Beta	0.023 ± 0.004	0.018 ± 0.004	0.020 ± 0.003	Pass
S-3216,3217	6/24/2015	K-40	10.38 ± 0.51	10.51 ± 0.53	10.45 ± 0.37	Pass
S-3216,3217	6/24/2015	Be-7	3.65 ± 0.24	3.38 ± 0.27	3.52 ± 0.18	Pass
VE-3300,3301	6/24/2015	Be-7	0.78 ± 0.15	0.83 ± 0.23	0.81 ± 0.14	Pass
VE-3300,3301	6/24/2015	K-40	29.12 ± 0.62	29.36 ± 0.64	29.24 ± 0.45	Pass
AP-062915	6/29/2015	Gr. Beta	0.023 ± 0.005	0.023 ± 0.005	0.023 ± 0.003	Pass
WW-3632,3633	6/30/2015	H-3	5,169 ± 225	5,058 ± 223	5,114 ± 158	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
AP-3822, 3823	7/1/2015	Be-7	0.075 ± 0.011	0.068 ± 0.012	0.072 ± 0.008	Pass
AP-3969, 3970	7/1/2015	Be-7	0.063 ± 0.008	0.064 ± 0.010	0.063 ± 0.006	Pass
WW-3632, 3633	7/6/2015	H-3	5,169 ± 225	5,058 ± 223	5,114 ± 159	Pass
W-4368, 4369	7/6/2015	Gr. Alpha	26.70 ± 4.00	24.10 ± 3.90	25.40 ± 2.79	Pass
W-4368, 4369	7/6/2015	Gr. Beta	34.62 ± 2.10	33.30 ± 2.02	33.96 ± 1.46	Pass
DW-60138, 60139	7/7/2015	Ra-226	0.07 ± 0.04	0.11 ± 0.05	0.09 ± 0.03	Pass
DW-60138, 60139	7/7/2015	Ra-228	1.04 ± 0.41	1.15 ± 0.47	1.10 ± 0.31	Pass
WW-4158, 4159	7/9/2015	H-3	138.8 ± 82.4	174.0 ± 84.1	156.4 ± 58.9	Pass
MI-2902, 2903	7/10/2015	K-40	1271 ± 118	1308 ± 115	1289 ± 82	Pass
SG-3533, 3534	7/10/2015	Gr. Alpha	238.0 ± 8.2	249.5 ± 8.5	243.8 ± 5.9	Pass
DW-60150, 60151	7/10/2015	Ra-226	1.53 ± 0.16	1.49 ± 0.12	1.51 ± 0.10	Pass
DW-60150, 60151	7/10/2015	Ra-228	2.68 ± 0.68	1.89 ± 0.62	2.29 ± 0.46	Pass
VE-3716, 3717	7/14/2015	K-40	3.85 ± 0.33	3.71 ± 0.31	3.78 ± 0.23	Pass
MI-3759, 3760	7/15/2015	K-40	1819 ± 127	1764 ± 140	1791 ± 94	Pass
MI-3759, 3760	7/15/2015	Sr-90	1.00 ± 0.36	0.61 ± 0.32	0.80 ± 0.24	Pass
AP-072115	7/21/2015	Gr. Beta	0.022 ± 0.004	0.027 ± 0.004	0.024 ± 0.003	Pass
VE-4053, 4054	7/21/2015	Be-7	0.52 ± 0.15	0.49 ± 0.11	0.50 ± 0.09	Pass
VE-4053, 4054	7/21/2015	K-40	8.00 ± 0.42	7.61 ± 0.31	7.81 ± 0.26	Pass
AP-4200, 4201	7/29/2015	Be-7	1.06 ± 0.12	0.96 ± 0.11	1.01 ± 0.08	Pass
AP-4200, 4201	7/29/2015	K-40	5.03 ± 0.24	4.96 ± 0.23	4.99 ± 0.16	Pass
W-4137, 4138	7/31/2015	Ra-226	0.58 ± 0.13	0.45 ± 0.14	0.52 ± 0.10	Pass
XWW-4431, 4432	8/5/2015	H-3	4,773 ± 213	4,915 ± 216	4,844 ± 152	Pass
SG-4305, 4306	8/6/2015	Ra-228	10.34 ± 0.58	11.46 ± 0.62	10.90 ± 0.42	Pass
AP-081015	8/10/2015	Gr. Beta	0.038 ± 0.005	0.039 ± 0.005	0.039 0.004	Pass
AP-081115	8/11/2015	Gr. Beta	0.024 ± 0.004	0.020 ± 0.004	0.022 0.003	Pass
VE-4452, 4453	8/11/2015	K-40	3.77 ± 0.29	3.78 ± 0.26	3.77 ± 0.20	Pass
AP-081715	8/17/2015	Gr. Beta	0.030 ± 0.005	0.030 ± 0.005	0.030 ± 0.003	Pass
DW-60195, 60196	8/17/2015	Ra-226	0.39 ± 0.10	0.37 ± 0.10	0.38 ± 0.07	Pass
DW-60195, 60196	8/17/2015	Ra-228	1.43 ± 0.51	1.97 ± 0.61	1.70 ± 0.40	Pass
DW-60198, 60199	8/17/2015	Gr. Alpha	2.93 ± 0.94	2.11 ± 0.96	2.52 ± 0.67	Pass
VE-4578, 4579	8/18/2015	K-40	4.14 ± 0.25	4.32 ± 0.24	4.23 ± 0.17	Pass
SW-4662, 4663	8/25/2015	H-3	351.3 ± 89.8	415.6 ± 92.8	383.4 ± 64.6	Pass
DW-60212, 60213	8/25/2015	Ra-226	0.09 ± 0.07	0.10 ± 0.08	0.10 ± 0.05	Pass
LW-4788, 4789	8/27/2015	Gr. Beta	0.97 ± 0.51	1.68 ± 0.59	1.32 ± 0.39	Pass
AP-083115	8/31/2015	Gr. Beta	0.032 ± 0.005	0.031 ± 0.005	0.031 ± 0.003	Pass
AP-4875, 4876	9/3/2015	Be-7	0.294 ± 0.125	0.202 ± 0.109	0.248 ± 0.083	Pass
VE-5083, 5084	9/14/2015	Be-7	0.47 ± 0.23	0.56 ± 0.19	0.52 ± 0.15	Pass
VE-5083, 5084	9/14/2015	K-40	6.20 ± 0.51	6.36 ± 0.50	6.28 ± 0.36	Pass
VE-5167, 5168	9/16/2015	Be-7	0.40 ± 0.11	0.41 ± 0.10	0.41 ± 0.07	Pass
VE-5167, 5168	9/16/2015	K-40	3.56 ± 0.27	3.91 ± 0.24	3.74 ± 0.18	Pass
BS-5188, 5189	9/16/2015	K-40	9.69 ± 0.51	10.51 ± 0.52	10.10 ± 0.36	Pass
F-5419, 5420	9/17/2015	K-40	3.48 ± 0.47	3.49 ± 0.56	3.49 ± 0.36	Pass
DW-60238, 60239	9/18/2015	Ra-226	1.93 ± 0.23	2.31 ± 0.26	2.12 ± 0.17	Pass
DW-60238, 60239	9/18/2015	Ra-228	4.44 ± 0.78	5.61 ± 0.84	5.03 ± 0.57	Pass
AP-092215A/B	9/22/2015	Gr. Beta	0.021 ± 0.004	0.025 ± 0.004	0.023 ± 0.00	Pass
WW-5398, 5399	9/22/2015	H-3	1,857 ± 145	1,846 ± 144	1,852 ± 102	Pass
AP-6007, 6008	9/28/2015	Be-7	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
XW-7490, 7491	9/29/2015	Ni-63	2,332 ± 233	2,108 ± 211	2,220 ± 157	Pass
WW-5377, 5378	9/30/2015	H-3	220.0 ± 84.6	197.0 ± 83.5	208.5 ± 59.4	Pass
AP-6028, 6029	9/30/2015	Be-7	0.073 ± 0.009	0.083 ± 0.012	0.078 ± 0.007	Pass
G-5461,2	10/1/2015	Be-7	2.02 ± 0.32	1.98 ± 0.25	2.00 ± 0.20	Pass
G-5461,2	10/1/2015	K-40	8.77 ± 0.66	9.31 ± 0.59	9.04 ± 0.44	Pass
SO-5482, 5483	10/1/2015	Ac-228	0.76 ± 0.12	0.74 ± 0.30	0.75 ± 0.16	Pass
SO-5482, 5483	10/1/2015	Bi-214	0.53 ± 0.04	0.52 ± 0.04	0.52 ± 0.03	Pass
SO-5482, 5483	10/1/2015	Cs-137	0.12 ± 0.03	0.12 ± 0.03	0.12 ± 0.02	Pass
SO-5482, 5483	10/1/2015	K-40	2.17 ± 0.73	2.10 ± 0.72	2.13 ± 0.51	Pass
SO-5482, 5483	10/1/2015	Pb-214	0.57 ± 0.04	0.55 ± 0.04	0.56 ± 0.03	Pass
SO-5482, 5483	10/1/2015	Ra-226	1.45 ± 0.27	1.46 ± 0.30	1.45 ± 0.20	Pass
SO-5482, 5483	10/1/2015	Tl-208	0.24 ± 0.03	0.25 ± 0.03	0.24 ± 0.02	Pass
WW-5524, 5525	10/5/2015	H-3	1,192 ± 123	1,318 ± 127	1,255 ± 89	Pass
AP-5881, 5882	10/5/2015	Be-7	0.078 ± 0.008	0.085 ± 0.011	0.082 ± 0.007	Pass
AP-5881, 5882	10/5/2015	K-40	0.009 ± 0.004	0.010 ± 0.006	0.010 ± 0.004	Pass
SG-6400,1	10/5/2015	Gr. Alpha	19.09 ± 3.14	19.45 ± 3.25	19.27 ± 2.26	Pass
SG-6400,1	10/5/2015	Gr. Beta	31.36 ± 2.08	29.80 ± 2.13	30.58 ± 1.49	Pass
VE-5923, 5924	10/12/2015	K-40	4.29 ± 0.29	4.13 ± 0.33	4.21 ± 0.22	Pass
SS-5818, 5819	10/14/2015	Ac-228	0.20 ± 0.06	0.24 ± 0.06	0.22 ± 0.04	Pass
SS-5818, 5819	10/14/2015	Cs-137	0.03 ± 0.02	0.02 ± 0.01	0.03 ± 0.01	Pass
SS-5818, 5819	10/14/2015	Gr. Beta	8.10 ± 0.87	8.08 ± 0.96	8.09 ± 0.65	Pass
SS-5818, 5819	10/14/2015	Pb-212	0.19 ± 0.03	0.17 ± 0.02	0.18 ± 0.02	Pass
SS-5818, 5819	10/14/2015	Ra-226	0.47 ± 0.24	0.45 ± 0.19	0.46 ± 0.15	Pass
SS-5818, 5819	10/14/2015	Tl-208	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01	Pass
DW-60251, 60252	10/15/2015	Ra-226	0.56 ± 0.12	0.50 ± 0.08	0.53 ± 0.07	Pass
DW-60251, 60252	10/15/2015	Ra-228	0.79 ± 0.48	1.16 ± 0.59	0.98 ± 0.38	Pass
SO-5944, 5945	10/21/2015	Ac-228	1.08 ± 0.15	1.14 ± 0.15	1.11 ± 0.10	Pass
SO-5944, 5945	10/21/2015	Bi-214	0.89 ± 0.08	0.82 ± 0.06	0.85 ± 0.05	Pass
SO-5944, 5945	10/21/2015	Cs-137	0.06 ± 0.02	0.08 ± 0.03	0.07 ± 0.02	Pass
SO-5944, 5945	10/21/2015	Pb-212	1.06 ± 0.06	0.99 ± 0.05	1.03 ± 0.04	Pass
SO-5944, 5945	10/21/2015	Pb-214	1.00 ± 0.09	0.89 ± 0.06	0.95 ± 0.05	Pass
SO-5944, 5945	10/21/2015	Ra-226	2.13 ± 0.43	2.16 ± 0.37	2.14 ± 0.28	Pass
SO-5944, 5945	10/21/2015	Tl-208	0.36 ± 0.04	0.34 ± 0.04	0.35 ± 0.03	Pass
S-6175, 6176	10/23/2015	K-40	16.86 ± 1.92	14.28 ± 1.66	15.57 ± 1.27	Pass
XWW-6196, 6197	10/26/2015	H-3	2,856 ± 170	2,815 ± 169	2,836 ± 120	Pass
SO-6259, 6260	10/28/2015	Ac-228	0.60 ± 0.10	0.53 ± 0.08	0.57 ± 0.07	Pass
SO-6259, 6260	10/28/2015	Bi-214	0.40 ± 0.06	0.50 ± 0.05	0.45 ± 0.04	Pass
SO-6259, 6260	10/28/2015	Cs-137	0.17 ± 0.03	0.19 ± 0.03	0.18 ± 0.02	Pass
SO-6259, 6260	10/28/2015	Gr. Beta	21.6 ± 1.1	23.36 ± 1.21	22.48 ± 0.82	Pass
SO-6259, 6260	10/28/2015	Pb-212	0.53 ± 0.04	0.49 ± 0.04	0.51 ± 0.03	Pass
SO-6259, 6260	10/28/2015	Tl-208	0.16 ± 0.03	0.19 ± 0.04	0.18 ± 0.02	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
LW-6280, 6281	10/29/2015	Gr. Beta	2.03 ± 0.91	1.97 ± 0.97	2.00 ± 0.67	Pass
MI-6484, 6485	11/11/2015	K-40	1,384 ± 82	1,432 ± 89	1,408 ± 60	Pass
SO-6841, 6842	11/24/2015	Cs-137	0.18 ± 0.03	0.16 ± 0.03	0.17 ± 0.02	Pass
SO-6841, 6842	11/24/2015	K-40	13.62 ± 0.76	13.67 ± 0.69	13.64 ± 0.51	Pass
WW-6978, 6979	11/30/2015	H-3	569.0 ± 97.7	480.3 ± 93.9	524.7 ± 67.8	Pass
SW-6936, 6937	12/10/2015	H-3	151.9 ± 80.0	176.2 ± 81.2	164.0 ± 57.0	Pass
SW-7017, 7018	12/10/2015	H-3	584.3 ± 98.7	451.6 ± 93.9	518.0 ± 68.1	Pass
LW-7020, 7021	12/10/2015	H-3	236.9 ± 84.2	285.6 ± 86.5	261.2 ± 60.3	Pass
AP-7351, 7352	12/29/2015	Be-7	0.099 ± 0.020	0.084 ± 0.018	0.091 ± 0.014	Pass
AP-7414, 7415	12/30/2015	Be-7	0.049 ± 0.013	0.048 ± 0.011	0.048 ± 0.008	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil, sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-975	2/1/2015	Ni-63	341 ± 18	448	314 - 582	Pass
MASO-975	2/1/2015	Sr-90	523 ± 12	653	457 - 849	Pass
MASO-975	2/1/2015	Tc-99	614 ± 12	867	607 - 1,127	Pass
MASO-975	2/1/2015	Cs-134	533 ± 6	678	475 - 881	Pass
MASO-975	2/1/2015	Cs-137	0.8 ± 2.5	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-57	0.5 ± 1.0	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-60	741 ± 8	817	572 - 1,062	Pass
MASO-975	2/1/2015	Mn-54	1,153 ± 9	1,198	839 - 1,557	Pass
MASO-975	2/1/2015	Zn-65	892 ± 18	1064	745 - 1,383	Pass
MAW-969	2/1/2015	Am-241	0.650 ± 0.078	0.654	0.458 - 0.850	Pass
MAW-969	2/1/2015	Cs-134	21.1 ± 0.3	23.5	16.5 - 30.6	Pass
MAW-969	2/1/2015	Cs-137	19.6 ± 0.3	19.1	13.4 - 24.8	Pass
MAW-969 [d]	2/1/2015	Co-57	10.2 ± 0.4	29.9	20.9 - 38.9	Fail
MAW-969	2/1/2015	Co-60	0.02 ± 0.05	0.00	NA [c]	Pass
MAW-969	2/1/2015	H-3	569 ± 13	563	394 - 732	Pass
MAW-969	2/1/2015	Fe-55	6.00 ± 6.60	6.88	4.82 - 8.94	Pass
MAW-969	2/1/2015	Mn-54	0.02 ± 0.07	0.00	NA [c]	Pass
MAW-969	2/1/2015	Ni-63	2.9 ± 3.0	0.00	NA [c]	Pass
MAW-969	2/1/2015	Zn-65	16.5 ± 0.9	18.3	12.8 - 23.8	Pass
MAW-969	2/1/2015	Tc-99	3.40 ± 0.60	3.18	2.23 - 4.13	Pass
MAW-969	2/1/2015	Pu-238	0.02 ± 0.03	0.01	NA [e]	Pass
MAW-969	2/1/2015	Pu-239/240	0.81 ± 0.10	0.83	0.58 - 1.08	Pass
MAW-969	2/1/2015	U-233/234	0.150 ± 0.040	0.148	0.104 - 0.192	Pass
MAW-969	2/1/2015	U-238	0.84 ± 0.09	0.97	0.68 - 1.26	Pass
MAW-969	2/1/2015	Sr-90	9.40 ± 1.30	9.48	6.64 - 12.32	Pass
MAW-950	2/1/2015	Gr. Alpha	0.66 ± 0.05	1.07	0.32 - 1.81	Pass
MAW-950	2/1/2015	Gr. Beta	2.72 ± 0.06	2.79	1.40 - 4.19	Pass
MAW-947	2/1/2015	I-129	1.26 ± 0.12	1.49	1.04 - 1.94	Pass
MAAP-978	2/1/2015	Am-241	0.069 ± 0.200	0.068	0.048 - 0.089	Pass
MAAP-978	2/1/2015	Cs-134	1.00 ± 0.04	1.15	0.81 - 1.50	Pass
MAAP-978	2/1/2015	Cs-137	0.004 ± 0.023	0.00	NA [c]	Pass
MAAP-978 [f]	2/1/2015	Co-57	0.04 ± 0.04	1.51	1.06 - 1.96	Fail
MAAP-978	2/1/2015	Co-60	0.01 ± 0.02	0.00	NA [c]	Pass
MAAP-978	2/1/2015	Mn-54	1.11 ± 0.08	1.02	0.71 - 1.33	Pass
MAAP-978	2/1/2015	Zn-65	0.83 ± 0.10	0.83	0.58 - 1.08	Pass
MAAP-978	2/1/2015	Pu-238	-0.003 ± 0.010	0.000	NA [c]	Pass
MAAP-978	2/1/2015	Pu-239/240	0.090 ± 0.022	0.085	0.06 - 0.11	Pass
MAAP-978	2/1/2015	U-233/234	0.020 ± 0.010	0.016	0.011 - 0.020	Pass
MAAP-978	2/1/2015	U-238	0.073 ± 0.018	0.099	0.069 - 0.129	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAAP-981	2/1/2015	Sr-89	38.1 ± 1.0	47.5	33.3 - 61.8	Pass
MAAP-981	2/1/2015	Sr-90	1.22 ± 0.13	1.06	0.74 - 1.38	Pass
MAAP-984	2/1/2015	Gr. Alpha	0.59 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-984	2/1/2015	Gr. Beta	0.95 ± 0.07	0.75	0.38 - 1.13	Pass
MAVE-972	2/1/2015	Cs-134	6.98 ± 0.13	7.32	5.12 - 9.52	Pass
MAVE-972	2/1/2015	Cs-137	9.73 ± 0.21	9.18	6.43 - 11.93	Pass
MAVE-972	2/1/2015	Co-57	0.01 ± 0.04	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Co-60	3.89 ± 0.20	5.55	3.89 - 7.22	Pass
MAVE-972	2/1/2015	Mn-54	0.04 ± 0.07	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Zn-65	0.09 ± 0.12	0.00	NA [c]	Pass
MAAP-978	2/1/2015	Pu-238	-0.003 ± 0.010	0.000	NA [c]	Pass
MAAP-978	2/1/2015	Pu-239/240	0.090 ± 0.022	0.085	0.059 - 0.110	Pass
MAAP-978	2/1/2015	U-233/234	0.020 ± 0.010	0.016	0.011 - 0.020	Pass
MAAP-978	2/1/2015	U-238	0.073 ± 0.018	0.099	0.069 - 0.129	Pass
MAAP-981	2/1/2015	Sr-89	38.1 ± 1.0	47.5	33.3 - 61.8	Pass
MAAP-981	2/1/2015	Sr-90	1.22 ± 0.13	1.06	0.74 - 1.38	Pass
MAAP-984	2/1/2015	Gr. Alpha	0.59 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-984	2/1/2015	Gr. Beta	0.95 ± 0.07	0.75	0.38 - 1.13	Pass
MAVE-972	2/1/2015	Cs-134	6.98 ± 0.13	7.32	5.12 - 9.52	Pass
MAVE-972	2/1/2015	Cs-137	9.73 ± 0.21	9.18	6.43 - 11.93	Pass
MAVE-972	2/1/2015	Co-57	0.01 ± 0.04	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Co-60	3.89 ± 0.20	5.55	3.89 - 7.22	Pass
MAVE-972	2/1/2015	Mn-54	0.04 ± 0.07	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Zn-65	0.09 ± 0.12	0.00	NA [c]	Pass
MASO-4903	8/1/2015	Ni-63	556 ± 18	682	477 - 887	Pass
MASO-4903 [g]	8/1/2015	Sr-90	231 ± 7	425	298 - 553	Fail
MASO-4903 [g]	8/1/2015	Sr-90	352 ± 10	425	298 - 553	Pass
MASO-4903 [h]	8/1/2015	Tc-99	411 ± 11	631	442 - 820	Fail
MASO-4903	8/1/2015	Cs-134	833 ± 10	1,010	707 - 1,313	Pass
MASO-4903	8/1/2015	Cs-137	808 ± 11	809.00	566 - 1,052	Pass
MASO-4903	8/1/2015	Co-57	1,052 ± 10	1,180	826 - 1,534	Pass
MASO-4903	8/1/2015	Co-60	2 ± 2	1.3	NA [e]	Pass
MASO-4903	8/1/2015	Mn-54	1,331 ± 13	1,340	938 - 1,742	Pass
MASO-4903	8/1/2015	Zn-65	686 ± 15	662	463 - 861	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAW-5007	8/1/2015	Cs-134	16.7 ± 0.4	23.1	16.2 - 30.0	Pass
MAW-5007	8/1/2015	Cs-137	-0.4 ± 0.1	0.0	NA [c]	Pass
MAW-5007	8/1/2015	Co-57	21.8 ± 0.4	20.8	14.6 - 27.0	Pass
MAW-5007	8/1/2015	Co-60	17.3 ± 0.3	17.1	12.0 - 22.2	Pass
MAW-5007	8/1/2015	H-3	227.5 ± 8.9	216.0	151.0 - 281.0	Pass
MAW-5007 [i]	8/1/2015	Fe-55	4.2 ± 14.1	13.1	9.2 - 17.0	Fail
MAW-5007	8/1/2015	Mn-54	16.6 ± 0.5	15.6	10.9 - 20.3	Pass
MAW-5007	8/1/2015	Ni-63	9.1 ± 2.6	8.6	6.0 - 11.1	Pass
MAW-5007	8/1/2015	Zn-65	15.5 ± 0.9	13.9	9.7 - 18.1	Pass
MAW-5007	8/1/2015	Tc-99	6.80 ± 0.60	7.19	5.03 - 9.35	Pass
MAW-5007	8/1/2015	Sr-90	4.80 ± 0.50	4.80	3.36 - 6.24	Pass
MAW-5007	8/1/2015	Gr. Alpha	0.41 ± 0.04	0.43	0.13 - 0.73	Pass
MAW-5007	8/1/2015	Gr. Beta	3.45 ± 0.07	3.52	1.76 - 5.28	Pass
MAW-5007	8/1/2015	I-129	1.42 ± 0.13	1.49	1.04 - 1.94	Pass
MAAP-4911	8/1/2015	Sr-89	3.55 ± 0.67	3.98	2.79 - 5.17	Pass
MAAP-4911	8/1/2015	Sr-90	0.94 ± 0.16	1.05	0.74 - 1.37	Pass
MAAP-4907	8/1/2015	Gr. Alpha	0.30 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-4907	8/1/2015	Gr. Beta	1.85 ± 0.09	1.56	0.78 - 2.34	Pass
MAVE-4901	8/1/2015	Cs-134	5.56 ± 0.16	5.80	4.06 - 7.54	Pass
MAVE-4901	8/1/2015	Cs-137	-0.02 ± 0.06	0.00	NA [c]	Pass
MAVE-4901	8/1/2015	Co-57	7.74 ± 0.18	6.62	4.63 - 8.61	Pass
MAVE-4901	8/1/2015	Co-60	4.84 ± 0.15	4.56	3.19 - 5.93	Pass
MAVE-4901	8/1/2015	Mn-54	8.25 ± 0.25	7.68	5.38 - 9.98	Pass
MAVE-4901	8/1/2015	Zn-65	5.78 ± 0.29	5.46	3.82 - 7.10	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Lab result was 27.84. Data entry error resulted in a non-acceptable result.

[e] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[f] Lab result was 1.58. Data entry error resulted in a non-acceptable result.

[g] The incomplete separation of calcium from strontium caused a failed low result. The result of reanalysis acceptable.

[h] The complex sample matrix is interfering with yield calculations causing a failed low result. An investigation is in process to determine a more reliable yield determination.

[i] The known activity was below the routine laboratory detection limits for the available aliquot fraction.

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

			Concentration (pCi/L) [b]			
Lab Code [b]	Date	Analysis	Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERAP-1091	3/16/2015	Am-241	46.8 ± 2.2	49.8	30.7 - 67.4	Pass
ERAP-1091	3/16/2015	Co-60	85.1 ± 2.9	79.1	61.2 - 98.8	Pass
ERAP-1091	3/16/2015	Cs-134	825.6 ± 34.7	909.0	578.0 - 1,130.0	Pass
ERAP-1091	3/16/2015	Cs-137	1,312 ± 12	1,170	879 - 1,540	Pass
ERAP-1091	3/16/2015	Fe-55	760.6 ± 48.2	836.0	259.0 - 1630.0	Pass
ERAP-1091	3/16/2015	Mn-54	<2.7	<50	0.0 - 50.0	Pass
ERAP-1091	3/16/2015	Pu-238	51.0 ± 3.9	52.1	35.7 - 68.5	Pass
ERAP-1091	3/16/2015	Pu-239/240	38.3 ± 1.3	40.3	29.20 - 52.70	Pass
ERAP-1091	3/16/2015	Sr-90	95.3 ± 11.4	96.6	47.2 - 145.0	Pass
ERAP-1091	3/16/2015	U-233/234	29.0 ± 1.2	34.3	21.3 - 51.7	Pass
ERAP-1091	3/16/2015	U-238	31.0 ± 1.1	34.0	22.0 - 47.0	Pass
ERAP-1091	3/16/2015	Zn-65	1099.3 ± 146.5	986.0	706.0 - 1360.0	Pass
ERAP-1094	3/16/2015	Gr. Alpha	73.7 ± 0.7	62.2	20.8 - 96.6	Pass
ERAP-1094	3/16/2015	Gr. Beta	69.6 ± 0.8	58.4	36.9 - 85.1	Pass
ERSO-1098	3/16/2015	Am-241	1571.8 ± 209.6	1,500	878 - 1,950	Pass
ERSO-1098	3/16/2015	Ac-228	1198.8 ± 140.4	1,250	802 - 1,730	Pass
ERSO-1098	3/16/2015	Bi-212	1420.1 ± 455.7	1,780	474 - 2,620	Pass
ERSO-1098	3/16/2015	Bi-214	3466.9 ± 86.9	4,430	2,670 - 6,380	Pass
ERSO-1098	3/16/2015	Co-60	1779.8 ± 41.0	1,880	1,270 - 2,590	Pass
ERSO-1098	3/16/2015	Cs-134	5204.6 ± 64.5	6,390	4,180 - 7,680	Pass
ERSO-1098	3/16/2015	Cs-137	1417.1 ± 41.9	1,490	1,140 - 1,920	Pass
ERSO-1098	3/16/2015	K-40	10,597 ± 380	10,700	7,810 - 14,400	Pass
ERSO-1098	3/16/2015	Mn-54	<62.2	< 1000	0.0 - 1,000	Pass
ERSO-1098	3/16/2015	Pb-212	1,032 ± 41	1,230	806 - 1,710	Pass
ERSO-1098	3/16/2015	Pb-214	3,629 ± 93	4,530	2,640 - 6,760	Pass
ERSO-1098	3/16/2015	Pu-238	942.9 ± 128.8	998.0	600.0 - 1,380.0	Pass
ERSO-1098	3/16/2015	Pu-239/240	1,185 ± 140	1,210	791 - 1,670	Pass
ERSO-1098	3/16/2015	Sr-90	1,724 ± 125	1,940	740 - 3,060	Pass
ERSO-1098	3/16/2015	Th-234	3,666 ± 948	3,890	1,230 - 7,320	Pass
ERSO-1098	3/16/2015	U-233/234	3,474 ± 226	3,920	2,400 - 5,020	Pass
ERSO-1098	3/16/2015	U-238	3,620 ± 232	3,890	2,410 - 4,930	Pass
ERSO-1098	3/16/2015	Zn-65	7,362 ± 145	7,130	5,680 - 9,470	Pass
ERW-1095	3/16/2015	Gr. Alpha	93.4 ± 11.5	119.0	42.2 - 184.0	Pass
ERW-1095	3/16/2015	Gr. Beta	145.2 ± 4.8	158.0	90.5 - 234.0	Pass
ERW-1110	3/16/2015	H-3	10,573 ± 78	10,300	6,900 - 14,700	Pass
ERVE-1100	3/16/2015	Am-241	4,537 ± 266	4,340	2,650 - 5,770	Pass
ERVE-1100	3/16/2015	Cm-244	1,338 ± 146	1,360	666 - 2,120	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code [b]	Date	Analysis	Concentration (pCi/L) [b] Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERVE-1100 [e]	3/16/2015	Co-60	1,030 ± 29	1,540	1,060 - 2,150	Fail
ERVE-1100 [f]	3/16/2015	Co-60	1,684 ± 48	1,540	1,060 - 2,150	Pass
ERVE-1100 [e]	3/16/2015	Cs-134	1,615 ± 27	2,650	1,700 - 3,440	Fail
ERVE-1100 [f]	3/16/2015	Cs-134	2,554 ± 49	2,650	1,700 - 3,440	Pass
ERVE-1100 [e]	3/16/2015	Cs-137	1,248 ± 29	1,810	1,310 - 2,520	Fail
ERVE-1100 [f]	3/16/2015	Cs-137	2,078 ± 68	1,810	1,310 - 2,520	Pass
ERVE-1100 [e]	3/16/2015	K-40	22,037 ± 463	30,900	22,300 - 43,400	Fail
ERVE-1100 [f]	3/16/2015	K-40	34,895 ± 764	30,900	22,300 - 43,400	Pass
ERVE-1100 [e]	3/16/2015	Mn-54	<13.8	<300	0.0 - 300.0	Pass
ERVE-1100 [f]	3/16/2015	Mn-54	<24.4	<300	0.0 - 300.0	Pass
ERVE-1100	3/16/2015	Pu-238	3,232 ± 232	3,680	2,190 - 5,040	Pass
ERVE-1100	3/16/2015	Pu-239/240	3,606 ± 240	4,180	2,570 - 5,760	Pass
ERVE-1100	3/16/2015	Sr-90	6,023 ± 326	6,590	3,760 - 8,740	Pass
ERVE-1100	3/16/2015	U-233/234	2,653 ± 153	3,150	2,070 - 4,050	Pass
ERVE-1100	3/16/2015	U-238	2,717 ± 163	3,130	2,090 - 3,980	Pass
ERVE-1100 [e]	3/16/2015	Zn-65	<94.6	1,090	786 - 1,530	Fail
ERVE-1100 [f]	3/16/2015	Zn-65	1,306 ± 75	1,090	786 - 1,530	Pass
ERW-1103	3/16/2015	Am-241	47.1 ± 4.0	46.0	31.0 - 61.7	Pass
ERW-1103	3/16/2015	Co-60	1,217 ± 17	1,250	1,090 - 1,460	Pass
ERW-1103	3/16/2015	Cs-134	1,121 ± 18	1,260	925 - 1,450	Pass
ERW-1103	3/16/2015	Cs-137	1,332 ± 31	1,360	1,150 - 1,630	Pass
ERW-1103	3/16/2015	Mn-54	<3.7	<100	0.00 - 100.00	Pass
ERW-1103	3/16/2015	Pu-238	54.5 ± 1.6	72.4	53.6 - 90.1	Pass
ERW-1103 [g]	3/16/2015	Pu-239/240	140.2 ± 7.8	184.0	143.0 - 232.0	Fail
ERW-3742 [h]	9/27/2012	Pu-239/240	89.3 ± 4.9	97.7	66.6 - 108.0	Pass
ERW-1103	3/16/2015	U-233/234	56.5 ± 6.4	61.8	46.4 - 79.7	Pass
ERW-1103	3/16/2015	U-238	58.4 ± 5.8	61.3	46.7 - 75.2	Pass
ERW-1103	3/16/2015	Zn-65	1,191 ± 136	1,180	984 - 1,490	Pass
ERW-1103	3/16/2015	Fe-55	1,149 ± 144	1,070	638 - 1,450	Pass
ERW-1103	3/16/2015	Sr-90	860.0 ± 37.0	912.0	594.0 - 1,210.0	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

[e] Technician error weighing sample caused submitted gamma results to be understated and outside the control limits.(low)

[f] The result of reanalysis with the correct sample volume (Compare to original result, footnoted "e" above).

[g] The results of reanalysis were outside the control limits (low).

[h] Sample ERW-3742 was ordered from ERA to determine why ERW-1103 results for Pu-239 were outside the acceptable range. The results for ERW-3742 were acceptable. No reason for the unacceptable results for ERW-3742 was determined.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

s = 2σ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: < L, where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: $< L$, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, $< L$ Reported result: $x \pm s$ if $x \geq L$; $< L$ otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n}\sum x \qquad s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Sampling Program and Locations

Sample Type	No.	Locations Codes (and Type)[a]	Collection Type (and Frequency)[b]	Analysis (and Frequency)[b]
Airborne Filters	6	E-1-4, 8, 20	Weekly	GB, GS, on QC for each location
Airborne Iodine	6	E-1-4, 8, 20	Weekly	I-131
Ambient Radiation (TLD's)	22	E-1-9, 12, 14-18, 20, 22-32, 34-36, 38,39	Quarterly	Ambient Gamma
Lake Water	5	E-1, 5, 6, 33	Monthly	GB, GS, I-131 on MC H-3, Sr-89-90 on QC
Well Water	1	E-10	Quarterly	GB, GS, H-3, Sr-89-90, I-131
Vegetation	8	E-1-4, 6, 9, 20	3x / year as available	GB, GS
Shoreline Silt	5	E-1, 5, 6, 12, 33	2x / year	GB, GS
Soil	8	E-1-4, 6, 8, 9, 20	2x / year	GB, GS
Milk	3	E-11, 40, 21	Monthly	GS, I-131, Sr-89-90
Algae	2	E-5, 12	3x / year as available	GB, GS
Fish	1	E-13	2x / year as available	GB, GS (in edible portions)

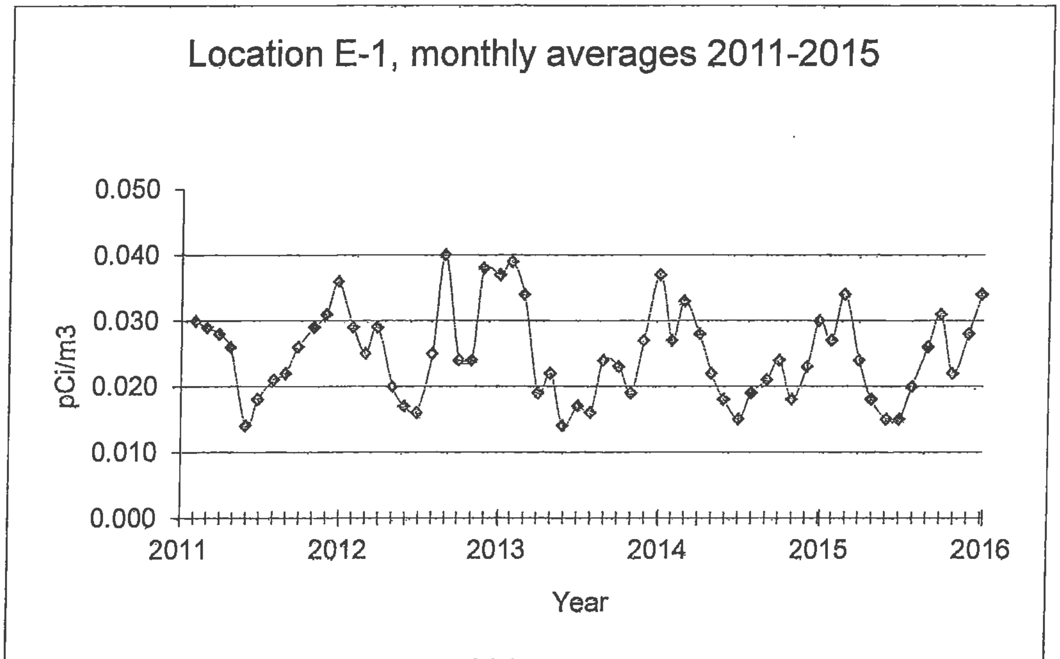
[a] Locations codes are defined in Table 2. Control Stations are indicated by (C). All other stations are indicators.

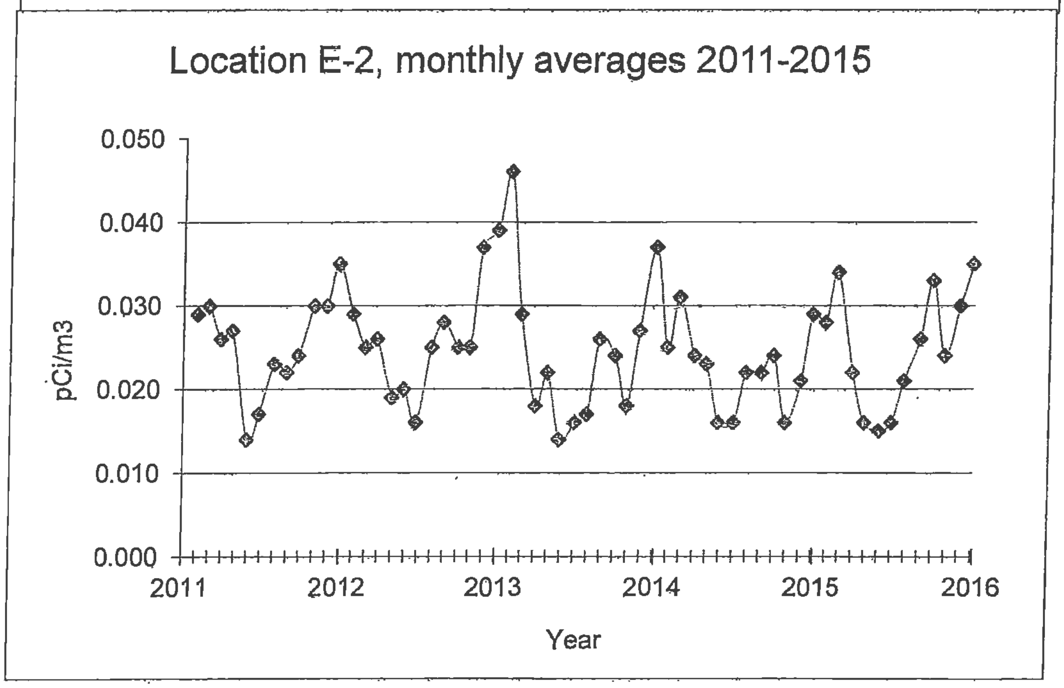
[b] Analysis type is coded as follows: GB = gross beta, GA = gross alpha, GS = gamma spectroscopy, H-3 = tritium, Sr-89 = strontium-89, Sr-90 = strontium-90, I-131 = iodine-131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

APPENDIX D

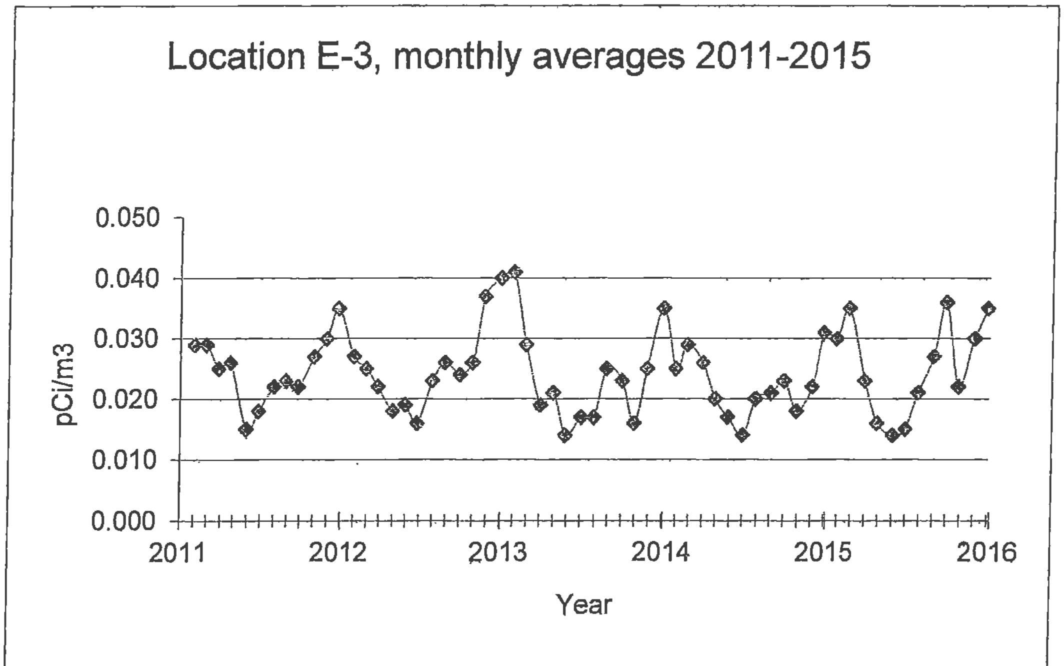
Graphs of Data Trends

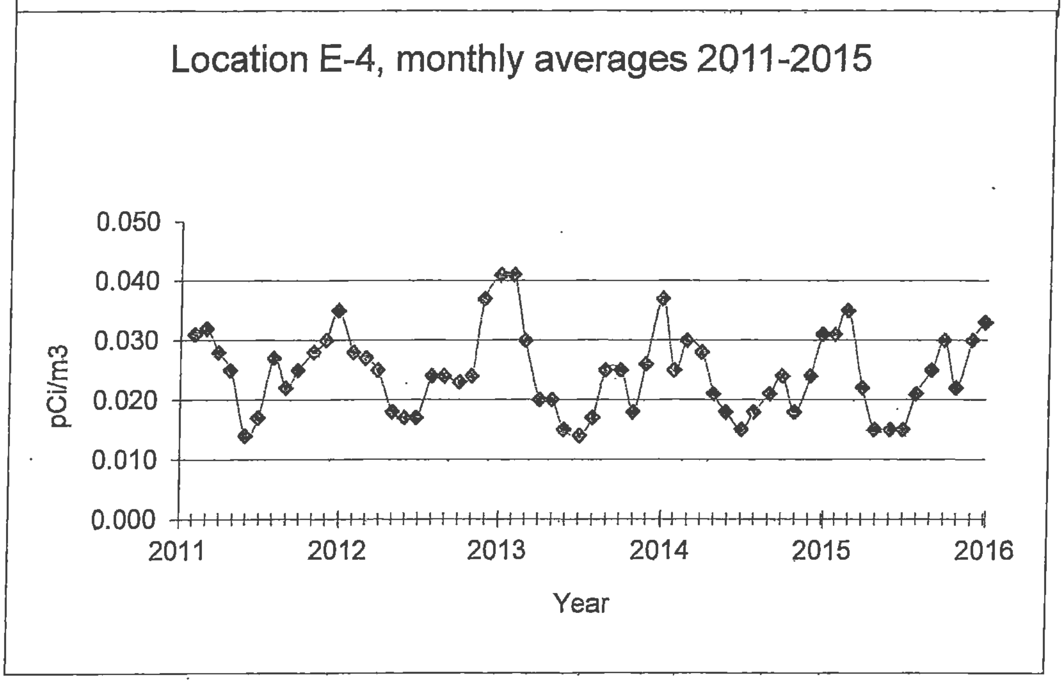
Air Particulates - Gross Beta



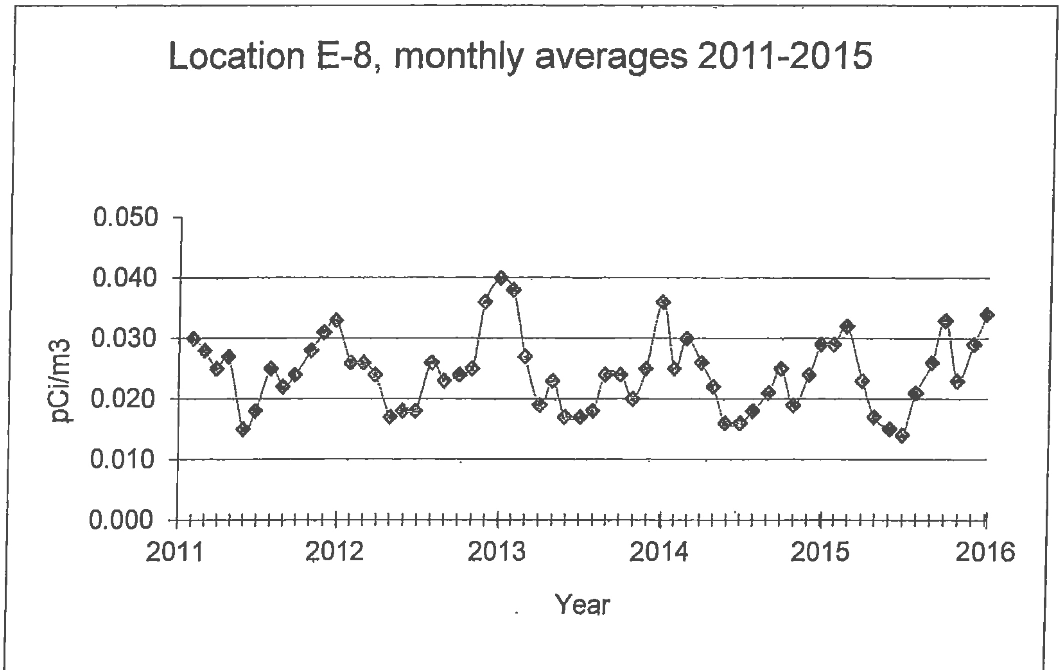


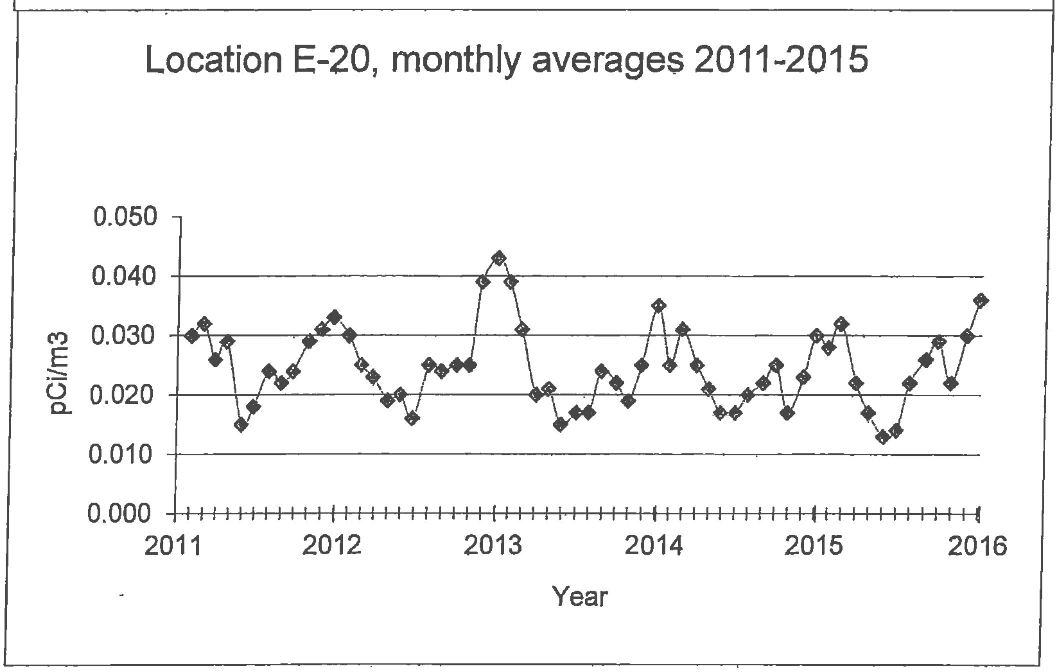
Air Particulates - Gross Beta





Air Particulates - Gross Beta





APPENDIX E

Supplemental Analyses

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	U2FSSDS		U2FSSDS		U2FSSDS	
Collection Date	01-20-15		02-15-15		03-26-15	
Lab Code	EWW- 508	MDC	EW- 993	MDC	EW- 1501	MDC
Be-7	2.4 ± 9.8	< 29.7	1.2 ± 11.3	< 26.7	-8.3 ± 8.8	< 15.3
Mn-54	0.3 ± 1.2	< 2.3	1.4 ± 1.4	< 3.0	-0.3 ± 1.2	< 2.6
Fe-59	3.5 ± 2.1	< 5.7	-0.8 ± 2.9	< 3.7	1.2 ± 2.0	< 4.4
Co-58	0.3 ± 1.2	< 3.3	0.8 ± 1.3	< 1.9	-0.4 ± 1.1	< 2.4
Co-60	0.4 ± 1.2	< 1.9	0.5 ± 1.5	< 2.2	-0.8 ± 1.3	< 2.1
Zn-65	-0.7 ± 2.2	< 4.7	0.7 ± 2.9	< 4.4	1.0 ± 2.3	< 4.7
Zr-Nb-95	-1.8 ± 1.3	< 2.7	-0.5 ± 1.4	< 4.0	-1.0 ± 1.2	< 2.4
Cs-134	0.5 ± 1.2	< 2.2	0.1 ± 1.4	< 2.4	1.1 ± 1.1	< 2.1
Cs-137	1.4 ± 1.4	< 2.6	0.6 ± 1.5	< 2.5	1.1 ± 1.4	< 2.7
Ba-La-140	-2.8 ± 1.5	< 7.7	1.3 ± 1.5	< 8.0	0.3 ± 1.3	< 4.6

Location	U2FSSDS		MH Z-067C Suspended solids		U2FSSDS	
Collection Date	04-30-15		04-23-15		06-02-15	
Lab Code	EW- 2227		EW- 2050		EW- 2747	
Be-7	-18.3 ± 13.8	< 29.7	-0.001 ± 0.016	< 0.033	-5.7 ± 13.7	< 29.2
Mn-54	0.4 ± 1.7	< 3.4	0.000 ± 0.002	< 0.004	1.8 ± 1.5	< 3.2
Fe-59	-0.7 ± 3.1	< 7.4	0.004 ± 0.004	< 0.014	1.7 ± 2.9	< 5.0
Co-58	-0.8 ± 1.6	< 2.2	0.001 ± 0.002	< 0.005	0.4 ± 1.5	< 2.1
Co-60	1.7 ± 1.6	< 2.9	-0.002 ± 0.002	< 0.003	3.1 ± 1.7	< 3.1
Zn-65	1.5 ± 3.4	< 2.2	-0.002 ± 0.005	< 0.007	1.6 ± 3.4	< 4.9
Zr-Nb-95	0.4 ± 1.5	< 2.6	-0.007 ± 0.002	< 0.010	-1.8 ± 1.8	< 3.0
Cs-134	1.2 ± 1.6	< 3.1	-0.001 ± 0.002	< 0.004	0.0 ± 1.6	< 2.7
Cs-137	-0.1 ± 1.7	< 2.9	0.001 ± 0.002	< 0.004	1.3 ± 1.8	< 3.4
Ba-La-140	-1.6 ± 1.8	< 3.4	-0.005 ± 0.002	< 0.036	-1.4 ± 2.0	< 3.4

Location	U2FSSDS		U2FSSDS		U2FSSDS	
Collection Date	06-30-15		08-31-15		09-30-15	
Lab Code	EW- 4025		EW- 4951		EWW- 6410	
Be-7	-1.6 ± 13.1	< 21.9	5.4 ± 10.8	< 27.7	8.0 ± 10.2	< 41.1
Mn-54	2.1 ± 1.6	< 3.3	-0.9 ± 1.4	< 3.1	1.2 ± 1.3	< 2.8
Fe-59	-1.5 ± 3.1	< 7.8	-2.3 ± 2.5	< 5.2	2.4 ± 2.4	< 8.2
Co-58	0.2 ± 1.5	< 2.8	-1.0 ± 1.3	< 2.1	-0.1 ± 1.3	< 3.5
Co-60	0.0 ± 1.6	< 1.8	-2.0 ± 1.5	< 2.3	0.2 ± 1.3	< 1.9
Zn-65	0.4 ± 3.4	< 4.6	0.4 ± 2.6	< 4.4	0.3 ± 2.7	< 4.7
Zr-Nb-95	-0.8 ± 1.7	< 3.6	-0.3 ± 1.5	< 3.2	-2.4 ± 1.3	< 3.5
Cs-134	0.5 ± 1.6	< 3.1	-0.3 ± 1.4	< 2.5	-0.7 ± 1.3	< 2.5
Cs-137	-0.8 ± 1.7	< 2.5	0.4 ± 1.5	< 2.6	2.3 ± 1.5	< 3.0
Ba-La-140	4.9 ± 1.8	< 6.7	-2.9 ± 1.6	< 5.5	-3.5 ± 1.5	< 19.7 [a]

[a] LLD not reached due to age of sample; received 11-06-15.

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	E-F1A		E-F1B		E-F2	
	Corn		Corn		Hay	
Collection Date	09-17-15		09-17-15		09-17-15	
Lab Code	EVE- 5135	MDC	EVE- 5136	MDC	EVE- 5137	MDC
Gross Beta	2.66 ± 0.06	< 0.025	2.82 ± 0.07	< 0.024	5.11 ± 0.15	< 0.073
Be-7	0.18 ± 0.10	-	0.12 ± 0.05	-	4.41 ± 0.25	-
K-40	2.60 ± 0.22	-	1.28 ± 0.15	-	2.88 ± 0.26	-
Mn-54	0.004 ± 0.004	< 0.005	0.000 ± 0.003	< 0.006	0.006 ± 0.007	< 0.015
Fe-59	0.001 ± 0.009	< 0.011	-0.001 ± 0.006	< 0.010	0.009 ± 0.015	< 0.028
Co-58	0.001 ± 0.004	< 0.006	0.000 ± 0.002	< 0.004	-0.001 ± 0.007	< 0.017
Co-60	0.006 ± 0.005	< 0.009	0.001 ± 0.003	< 0.002	-0.009 ± 0.007	< 0.009
Zn-65	0.008 ± 0.012	< 0.021	0.001 ± 0.007	< 0.009	0.002 ± 0.017	< 0.022
Zr-Nb-95	-0.004 ± 0.004	< 0.009	-0.004 ± 0.003	< 0.003	-0.005 ± 0.008	< 0.016
Cs-134	0.003 ± 0.004	< 0.009	0.001 ± 0.003	< 0.006	0.001 ± 0.008	< 0.016
Cs-137	0.002 ± 0.005	< 0.010	0.003 ± 0.003	< 0.006	0.005 ± 0.008	< 0.018
Ba-La-140	0.001 ± 0.004	< 0.010	-0.005 ± 0.003	< 0.005	0.000 ± 0.006	< 0.026

Location	E-F3		E-F4		E-F5	
	Hay		Corn		Alfalfa	
Collection Date	09-17-15		09-17-15		09-17-15	
Lab Code	EVE- 5138		EVE- 5139		EVE- 5140	
Gross Beta	8.12 ± 0.27	< 0.14	3.59 ± 0.09	< 0.032	6.70 ± 0.15	< 0.049
Be-7	6.21 ± 0.42	-	0.31 ± 0.11	-	0.70 ± 0.15	-
K-40	6.21 ± 0.51	-	2.47 ± 0.22	-	6.86 ± 0.40	-
Mn-54	-0.001 ± 0.011	< 0.019	0.003 ± 0.004	< 0.007	0.005 ± 0.006	< 0.013
Fe-59	0.012 ± 0.023	< 0.047	-0.002 ± 0.010	< 0.013	0.001 ± 0.013	< 0.025
Co-58	0.004 ± 0.011	< 0.024	0.002 ± 0.004	< 0.005	-0.002 ± 0.006	< 0.011
Co-60	-0.005 ± 0.012	< 0.014	0.000 ± 0.005	< 0.004	0.002 ± 0.008	< 0.012
Zn-65	-0.020 ± 0.030	< 0.028	0.004 ± 0.010	< 0.016	0.009 ± 0.016	< 0.032
Zr-Nb-95	0.004 ± 0.011	< 0.025	0.001 ± 0.004	< 0.008	0.000 ± 0.007	< 0.014
Cs-134	-0.007 ± 0.012	< 0.024	0.002 ± 0.004	< 0.009	0.003 ± 0.006	< 0.010
Cs-137	0.000 ± 0.013	< 0.022	0.000 ± 0.004	< 0.007	0.006 ± 0.007	< 0.012
Ba-La-140	0.001 ± 0.011	< 0.026	-0.002 ± 0.004	< 0.009	-0.004 ± 0.005	< 0.009

Location	E-F6		E-F7		E-F8	
	Alfalfa		Alfalfa		Soybeans	
Collection Date	09-17-15		09-17-15		09-17-15	
Lab Code	EVE- 5141		EVE- 5142		EVE- 5143	
Gross Beta	6.16 ± 0.14	< 0.054	6.40 ± 0.13	< 0.043	4.68 ± 0.12	< 0.048
Be-7	1.30 ± 0.18	-	0.35 ± 0.13	-	1.42 ± 0.20	-
K-40	5.98 ± 0.45	-	6.45 ± 0.39	-	3.74 ± 0.32	-
Mn-54	0.004 ± 0.007	< 0.012	0.003 ± 0.005	< 0.010	0.004 ± 0.006	< 0.011
Fe-59	0.002 ± 0.017	< 0.024	0.000 ± 0.013	< 0.018	0.003 ± 0.012	< 0.013
Co-58	0.001 ± 0.007	< 0.012	0.004 ± 0.006	< 0.011	0.002 ± 0.006	< 0.009
Co-60	-0.004 ± 0.008	< 0.011	0.003 ± 0.006	< 0.010	-0.001 ± 0.007	< 0.007
Zn-65	0.004 ± 0.020	< 0.022	-0.003 ± 0.017	< 0.023	-0.008 ± 0.014	< 0.011
Zr-Nb-95	0.004 ± 0.007	< 0.013	-0.001 ± 0.006	< 0.010	-0.004 ± 0.005	< 0.009
Cs-134	-0.001 ± 0.007	< 0.015	0.004 ± 0.005	< 0.011	-0.002 ± 0.005	< 0.010
Cs-137	-0.001 ± 0.008	< 0.014	0.009 ± 0.006	< 0.010	0.005 ± 0.005	< 0.008
Ba-La-140	-0.003 ± 0.007	< 0.023	0.002 ± 0.005	< 0.010	-0.014 ± 0.006	< 0.017

POINT BEACH NUCLEAR PLANT

Supplemental Analyses

Units: = pCi\L

Gamma isotopic analysis

Location	E-F9 Corn		U2FSSDS		U2FSSDS	
Collection Date	09-17-15		10-31-15		12-07-15	
Lab Code	EVE- 5144	MDC	EW- 6411	MDC	EW- 6978	MDC
Gross Beta	3.11 ± 0.08	< 0.033	a		a	
Be-7	1.58 ± 0.16	-	-3.9 ± 22.2	< 30.5	-0.7 ± 10.3	< 21.8
K-40	1.98 ± 0.21	-	a		a	
Mn-54	0.005 ± 0.005	< 0.009	-0.1 ± 2.4	< 2.4	-0.6 ± 1.3	< 2.0
Fe-59	0.012 ± 0.010	< 0.022	-1.5 ± 4.9	< 11.4	0.7 ± 2.5	< 4.6
Co-58	-0.005 ± 0.005	< 0.004	-0.2 ± 2.3	< 5.1	-1.4 ± 1.2	< 2.1
Co-60	0.004 ± 0.005	< 0.007	0.6 ± 2.6	< 2.3	1.2 ± 1.2	< 2.2
Zn-65	0.002 ± 0.010	< 0.015	-1.3 ± 5.7	< 9.6	0.0 ± 2.4	< 4.0
Zr-Nb-95	-0.003 ± 0.005	< 0.008	-2.6 ± 2.6	< 4.4	-0.5 ± 1.3	< 2.9
Cs-134	-0.001 ± 0.005	< 0.009	-0.3 ± 2.6	< 5.1	0.2 ± 1.3	< 2.5
Cs-137	-0.002 ± 0.005	< 0.006	0.9 ± 2.9	< 5.7	0.2 ± 1.5	< 2.5
Ba-La-140	0.000 ± 0.005	< 0.008	0.4 ± 2.8	< 7.5	0.2 ± 1.6	< 2.6

Location	U2FSSD	MDC
Collection Date	12-31-15	
Lab Code	EWW- 7465	
Be-7	-8.5 ± 10.1	< 54.1
Mn-54	0.9 ± 1.3	< 3.1
Fe-59	1.0 ± 2.3	< 14.0
Co-58	1.0 ± 1.2	< 5.2
Co-60	0.5 ± 1.4	< 2.8
Zn-65	-0.4 ± 2.5	< 6.6
Zr-Nb-95	-4.7 ± 1.3	< 6.2
Cs-134	0.5 ± 1.3	< 2.6
Cs-137	-0.8 ± 1.5	< 2.0
Ba-La-140	-36.2 ± 1.5	< 117.7

[a] Analysis not required.

[b] LLD not reached due to age of sample; sample received and counted 03-11-16.

POINT BEACH NUCLEAR PLANT

Facade Wells

Units: = pCi\L — Gamma isotopic analysis

Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	02-27-15		02-27-15		02-27-15		02-27-15	
Lab Code	EWW- 867	MDC	EWW- 868	MDC	ND[a]	MDC	EWW- 869	MDC
Be-7	0.4 ± 17.3	< 28.9	-3.9 ± 15.2	< 31.0	-		-2.1 ± 12.5	< 24.6
Mn-54	0.0 ± 1.8	< 3.0	0.7 ± 1.6	< 3.0	-		0.1 ± 1.6	< 3.4
Fe-59	-2.0 ± 3.7	< 5.7	2.2 ± 3.0	< 5.6	-		-1.8 ± 3.0	< 3.1
Co-58	1.5 ± 1.8	< 3.2	2.4 ± 2.3	< 6.8	-		0.1 ± 1.7	< 3.2
Co-60	0.3 ± 1.9	< 3.5	0.7 ± 1.7	< 2.7	-		2.2 ± 1.7	< 3.2
Zn-65	1.7 ± 4.0	< 6.2	1.1 ± 3.4	< 6.2	-		1.3 ± 3.3	< 6.7
Zr-Nb-95	-0.7 ± 1.9	< 3.9	-1.3 ± 1.7	< 3.0	-		0.1 ± 1.8	< 4.3
Cs-134	-0.2 ± 1.9	< 3.8	-1.4 ± 1.7	< 3.5	-		-0.2 ± 1.6	< 2.9
Cs-137	2.5 ± 2.0	< 3.7	1.3 ± 1.8	< 4.2	-		1.8 ± 1.8	< 3.6
Ba-La-140	-1.4 ± 2.2	< 5.1	0.6 ± 1.6	< 3.0	-		-0.1 ± 2.1	< 5.7
Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	04-12-15		04-12-15		04-12-15		04-12-15	
Lab Code	EWW- 2515		EWW- 2516		EWW- 2517		EWW- 2518	
Be-7	18.4 ± 14.6	< 42.6	7.9 ± 14.9	< 45.4	26.0 ± 15.3	< 47.5	23.3 ± 14.4	< 42.2
Mn-54	1.4 ± 1.8	< 4.1	1.1 ± 1.8	< 2.6	0.7 ± 1.9	< 3.8	1.9 ± 1.7	< 3.7
Fe-59	-1.1 ± 3.5	< 11.5	1.8 ± 3.8	< 13.0	-4.7 ± 3.8	< 11.9	1.9 ± 3.5	< 14.2
Co-58	1.3 ± 1.6	< 3.7	-1.5 ± 1.6	< 3.0	-0.1 ± 1.7	< 4.2	2.1 ± 1.9	< 5.2
Co-60	0.3 ± 2.0	< 2.9	-0.7 ± 2.1	< 4.1	-0.2 ± 2.0	< 3.7	1.1 ± 1.9	< 3.4
Zn-65	-0.9 ± 3.6	< 4.6	1.2 ± 3.8	< 7.1	2.4 ± 4.1	< 8.0	-0.5 ± 3.9	< 4.0
Zr-Nb-95	-0.7 ± 1.7	< 5.6	4.5 ± 1.6	< 6.7	-1.0 ± 1.9	< 4.6	-3.5 ± 1.8	< 5.2
Cs-134	0.2 ± 1.8	< 3.5	0.8 ± 1.7	< 3.4	-1.4 ± 1.8	< 3.5	-2.1 ± 1.9	< 3.4
Cs-137	0.9 ± 1.9	< 3.7	1.7 ± 1.9	< 3.7	-0.1 ± 1.8	< 2.9	-1.0 ± 1.9	< 4.0
Ba-La-140	7.6 ± 2.0	< 14.3	-6.8 ± 2.4	< 26.8 [b]	-2.3 ± 2.0	< 19.6 [b]	18.5 ± 2.2	< 37.2 [b]
Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	08-08-15		08-08-15		08-08-15		08-08-15	
Lab Code	EWW- 4709		EWW- 4710		EWW- 4711		EWW- 4712	
Be-7	-2.5 ± 17.1	< 38.4	5.4 ± 15.3	< 38.1	-4.9 ± 16.7	< 34.5	1.1 ± 15.4	< 23.3
Mn-54	1.0 ± 1.7	< 3.3	-0.1 ± 1.6	< 3.6	-0.4 ± 1.7	< 3.3	1.5 ± 1.6	< 3.5
Fe-59	0.4 ± 3.4	< 10.2	1.1 ± 2.9	< 8.2	-3.7 ± 3.5	< 6.0	-0.5 ± 2.8	< 7.7
Co-58	-0.7 ± 1.7	< 4.0	1.1 ± 1.6	< 4.4	-0.8 ± 1.7	< 4.0	-0.4 ± 1.6	< 3.5
Co-60	0.6 ± 1.9	< 2.9	0.2 ± 1.8	< 3.3	1.4 ± 1.8	< 1.8	-0.5 ± 1.8	< 3.3
Zn-65	-4.9 ± 4.0	< 5.8	-3.5 ± 3.1	< 5.0	-5.2 ± 4.3	< 6.4	0.2 ± 3.1	< 6.4
Zr-Nb-95	-2.5 ± 1.8	< 5.0	-2.7 ± 1.7	< 4.4	-1.1 ± 1.9	< 5.9	-1.2 ± 1.8	< 4.9
Cs-134	-0.2 ± 1.8	< 3.7	-1.3 ± 1.7	< 3.1	-0.8 ± 1.8	< 3.7	-0.4 ± 1.7	< 3.5
Cs-137	1.1 ± 2.0	< 4.0	0.3 ± 2.0	< 3.5	-0.6 ± 2.1	< 3.2	1.6 ± 1.9	< 4.0
Ba-La-140	-0.4 ± 1.9	< 10.8	-0.9 ± 2.0	< 11.3	-2.6 ± 1.8	< 13.5	-1.2 ± 2.1	< 16.0

[a] "ND" = No data; water frozen.

[b] LLD not reached due to age of sample and smaller sample volume (received 05-21-15/500 mL).

POINT BEACH NUCLEAR PLANT

Facade Wells

Units: = pCi\L

Gamma isotopic analysis

Location	GW-09 1Z-361A		GW-09 1Z-361B		GW-10 2Z-361A		GW-10 2Z-361B	
Collection Date	10-15-15		10-15-15		10-15-15		10-15-15	
Lab Code	EWW- 6210	MDC	EWW- 6211	MDC	EWW- 6212	MDC	EWW- 6213	MDC
Be-7	9.9 ± 12.0	< 34.3	-10.4 ± 10.0	< 29.4	5.6 ± 11.8	< 28.8	-1.3 ± 11.3	< 22.5
Mn-54	-0.2 ± 1.2	< 1.9	-0.2 ± 1.2	< 2.8	0.9 ± 1.2	< 2.3	-0.1 ± 1.1	< 2.2
Fe-59	2.5 ± 2.3	< 5.7	0.6 ± 2.3	< 4.5	0.2 ± 2.4	< 4.0	-0.7 ± 2.3	< 4.4
Co-58	0.1 ± 1.3	< 2.4	-0.7 ± 1.2	< 2.0	0.2 ± 1.2	< 1.9	1.7 ± 1.2	< 3.2
Co-60	0.9 ± 1.5	< 2.5	0.4 ± 1.2	< 2.1	0.4 ± 1.3	< 2.4	-0.5 ± 1.3	< 2.1
Zn-65	-1.0 ± 2.7	< 4.5	-1.8 ± 2.4	< 4.6	-2.7 ± 2.7	< 3.8	-0.7 ± 2.3	< 3.9
Zr-Nb-95	-1.1 ± 1.3	< 2.4	0.9 ± 1.3	< 3.4	0.7 ± 1.3	< 3.6	0.0 ± 1.3	< 3.2
Cs-134	-0.4 ± 1.3	< 2.6	0.1 ± 1.3	< 2.4	-0.5 ± 1.2	< 2.5	-1.4 ± 1.2	< 2.5
Cs-137	-1.4 ± 1.4	< 1.8	0.8 ± 1.4	< 2.5	-0.2 ± 1.3	< 2.3	0.1 ± 1.4	< 1.7
Ba-La-140	-0.7 ± 1.6	< 7.0	-0.9 ± 1.3	< 7.2	-1.4 ± 1.3	< 5.2	-0.9 ± 1.4	< 3.5

APPENDIX F

Special Analyses

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

Corrected Report

Mr. Richard Welty		LABORATORY REPORT NO.:	8006-100-1145C
Radiation Protection Mgr.		DATE:	07-29-15
Point Beach Nuclear Plant		SAMPLES RECEIVED:	04-02-15
NextEraEnergy		PURCHASE ORDER NO.:	
6610 Nuclear Road			
Two Rivers, WI 54241			

Below are the corrected results of the readout of supplemental TLDs deployed during the first quarter, 2015.

Period:	1st Quarter, 2015
Date Annealed:	12/11/14
Date Placed:	01/02/15
Date Removed:	04/01/15
Date Read:	04/14/15
Days in the Field:	89
Days from Annealing to Readout:	124
In-transit exposure:	5.20 ± 0.32 [a]

Location	Total mR	Net mR[a]	Net mR[a] Std Qtr	Net mR[a] per 7 days
SGSF-North	19.5 ± 0.8	14.3 ± 0.9	14.6 ± 0.9	1.13 ± 0.07
SGSF-East	16.8 ± 0.8	11.6 ± 0.8	11.8 ± 0.8	0.91 ± 0.06
SGSF-South	18.1 ± 1.0	12.9 ± 1.1	13.2 ± 1.1	1.02 ± 0.09
SGSF-West	17.4 ± 0.5	12.2 ± 0.6	12.5 ± 0.6	0.96 ± 0.04
ISFSI-North	37.6 ± 0.9	32.4 ± 1.0	33.1 ± 1.0	2.55 ± 0.08
ISFSI-East	45.8 ± 0.5	40.6 ± 0.6	41.6 ± 0.6	3.20 ± 0.05
ISFSI-South	20.0 ± 0.7	14.8 ± 0.8	15.1 ± 0.8	1.16 ± 0.06
ISFSI-West	60.9 ± 3.3	55.7 ± 3.4	56.9 ± 3.4	4.38 ± 0.26
Control	24.3 ± 0.7	19.1 ± 0.8	19.6 ± 0.8	1.50 ± 0.06

[a] original report dated 5/7/15 had an incorrect value for the in-transit exposure.
The incorrect value caused the each of the original net mR values to be overstated by approximately 1.3 mR per standard quarter.

Forrest G. Shaw III
Quality Assurance

APPROVED 7/29/15
Bronia Grob
Laboratory Manager

cc: K. Johansen

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

Mr. Richard Welty
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

LABORATORY REPORT NO.: 8006-100-1150
DATE: 07-29-15
SAMPLES RECEIVED: 07-03-15
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the second quarter, 2015.

Period:	2nd Quarter, 2015
Date Annealed:	03/24/15
Date Placed:	04/01/15
Date Removed:	07/01/15
Date Read:	07/06/15
Days in the Field:	91
Days from Annealing to Readout:	104
In-transit exposure:	1.78 ± 0.07

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	14.7 ± 0.4	12.9 ± 0.4	12.9 ± 0.4	0.99 ± 0.03
SGSF-East	13.1 ± 0.2	11.3 ± 0.2	11.3 ± 0.2	0.87 ± 0.01
SGSF-South	14.2 ± 0.5	12.4 ± 0.5	12.4 ± 0.5	0.96 ± 0.04
SGSF-West	14.3 ± 0.8	12.5 ± 0.8	12.5 ± 0.8	0.96 ± 0.06
ISFSI-North	28.2 ± 1.4	26.4 ± 1.4	26.4 ± 1.4	2.03 ± 0.11
ISFSI-East	44.1 ± 1.5	42.3 ± 1.5	42.3 ± 1.5	3.25 ± 0.12
ISFSI-South	16.6 ± 1.3	14.8 ± 1.3	14.8 ± 1.3	1.14 ± 0.10
ISFSI-West	59.3 ± 2.4	57.5 ± 2.4	57.5 ± 2.4	4.42 ± 0.19
Control	15.9 ± 0.7	14.1 ± 0.7	14.1 ± 0.7	1.09 ± 0.05

Forrest G. Shaw III
Quality Assurance

APPROVED 07/29/15
Bronia Grob
Laboratory Manager

cc: K. Johansen

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

Mr. Richard Welty
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

LABORATORY REPORT NO.: 8006-100-1164C
DATE: 12-04-15
SAMPLES RECEIVED: 09-28-15
PURCHASE ORDER NO.:

Corrected Report

Below are the results of the readout of supplemental TLDs deployed during the third quarter, 2015.[a]

Period:	3rd Quarter, 2015 [a]
Date Annealed:	06/08/15
Date Placed:	07/01/15
Date Removed:	09/24/15
Date Read:	10/01/15
Days in the Field:	85
Days from Annealing to Readout:	115
In-transit exposure:	4.09 ± 0.18

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	17.2 ± 0.9	13.1 ± 0.9	14.0 ± 0.9	1.08 ± 0.07
SGSF-East	15.0 ± 0.7	10.9 ± 0.7	11.7 ± 0.7	0.90 ± 0.06
SGSF-South	16.2 ± 0.3	12.1 ± 0.4	13.0 ± 0.4	1.00 ± 0.03
SGSF-West	15.6 ± 0.5	11.5 ± 0.6	12.3 ± 0.6	0.95 ± 0.05
ISFSI-North	34.2 ± 0.7	30.1 ± 0.7	32.2 ± 0.8	2.48 ± 0.06
ISFSI-East	40.7 ± 0.9	36.6 ± 0.9	39.2 ± 0.9	3.02 ± 0.07
ISFSI-South	17.9 ± 0.6	13.8 ± 0.6	14.8 ± 0.7	1.14 ± 0.05
ISFSI-West	54.3 ± 2.8	50.2 ± 2.8	53.7 ± 3.0	4.13 ± 0.23
Control	21.9 ± 0.8	17.8 ± 0.8	19.1 ± 0.8	1.47 ± 0.06

a The original report had a typographical error referencing the wrong period as footnoted above.
All other reported values were correct as originally reported.

Forrest G. Shaw III
Quality Assurance

APPROVED 12/4/15
Bronia Grob
Laboratory Manager

cc: K. Johansen

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

Mr. Richard Welty
Radiation Protection Mgr.
Point Beach Nuclear Plant
NextEraEnergy
6610 Nuclear Road
Two Rivers, WI 54241

LABORATORY REPORT NO.: 8006-100-1169
DATE: 02-01-16
SAMPLES RECEIVED: 01-07-16
PURCHASE ORDER NO.:

Below are the results of the readout of supplemental TLDs deployed during the fourth quarter, 2015.

Period:	4th Quarter, 2015
Date Annealed:	09/11/15
Date Placed:	09/24/15
Date Removed:	01/06/16
Date Read:	01/09/16
Days in the Field:	104
Days from Annealing to Readout:	120
In-transit exposure:	2.21 ± 0.20

Location	Total mR	Net mR	Net mR Std Qtr	Net mR per 7 days
SGSF-North	17.5 ± 0.4	15.3 ± 0.4	13.4 ± 0.4	1.03 ± 0.03
SGSF-East	16.1 ± 0.4	13.9 ± 0.5	12.2 ± 0.4	0.94 ± 0.03
SGSF-South	17.7 ± 0.7	15.4 ± 0.7	13.5 ± 0.6	1.04 ± 0.05
SGSF-West	18.2 ± 1.0	16.0 ± 1.0	14.0 ± 0.9	1.08 ± 0.07
ISFSI-North	34.6 ± 2.4	32.4 ± 2.4	28.3 ± 2.1	2.18 ± 0.16
ISFSI-East	53.7 ± 1.2	51.5 ± 1.2	45.1 ± 1.1	3.47 ± 0.08
ISFSI-South	20.6 ± 0.9	18.4 ± 0.9	16.1 ± 0.8	1.24 ± 0.06
ISFSI-West	69.0 ± 0.9	66.8 ± 0.9	58.4 ± 0.8	4.50 ± 0.06
Control	19.3 ± 0.5	17.1 ± 0.6	14.9 ± 0.5	1.15 ± 0.04

Forrest G. Shaw III
Quality Assurance

APPROVED 02/01/16
Bronia Grob
Laboratory Manager

cc: K. Johansen

ATI Environmental, Inc.
Midwest Laboratory
700 Landwehr Road • Northbrook, IL 60062-2310
phone (847) 564-0700 • fax (847) 564-4517

Dr. Kjell Johansen
NextEra Energy
Point Beach Nuclear Plant
6610 Nuclear Road
Two Rivers, Wisconsin 54241

LABORATORY REPORT NO.: 8006-100-1170
DATE: 02-08-2016
SAMPLES RECEIVED:
PURCHASE ORDER NO.:

Below are the results of the analyses for tritium in monthly lake water samples.

Sample Location	Collection Date	Lab Code	Concentration / MDC (pCi/L) H-3
E-05	10-14-15	ELW-5785	-47 ± 90 / < 152
E-05	11-05-15	ELW-6354	-10 ± 92 / < 152
E-05	12-10-15	ELW-6939	1,336 ± 139 / < 151
E-33	10-14-15	ELW-5787	-25 ± 91 / < 152
E-33	11-05-15	ELW-6356	68 ± 95 / < 152
E-33	12-10-15	ELW-6941	464 ± 111 / < 151
E-01	12-10-15	ELW-6938	76 ± 89 / < 141
E-06	12-10-15	ELW-6940	79 ± 89 / < 141

The error given is the probable counting error at the 95% confidence level. The less than (<) value, is based on 4.66 sigma counting error for the background sample.

E-mail: kjell.johansen@NextERAEnergy.com

Sincerely,

Bronia Grob,
Laboratory Manager

APPROVED BY: 2/8/16
Forrest G. Shaw III,
Quality Assurance Manager