NEXTera ENERGY
POINT BEACH

April 30, 2009

NRC 2009-0046
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

2008 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, 2008.

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 and miscellaneous monitoring activities which occurred in 2008. 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.

Enclosure 2 contains the PBNP Environmental Manual which was revised in November 2008.

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

Very truly yours,

NextEra Energy Point Beach, LLC

James Costedio
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

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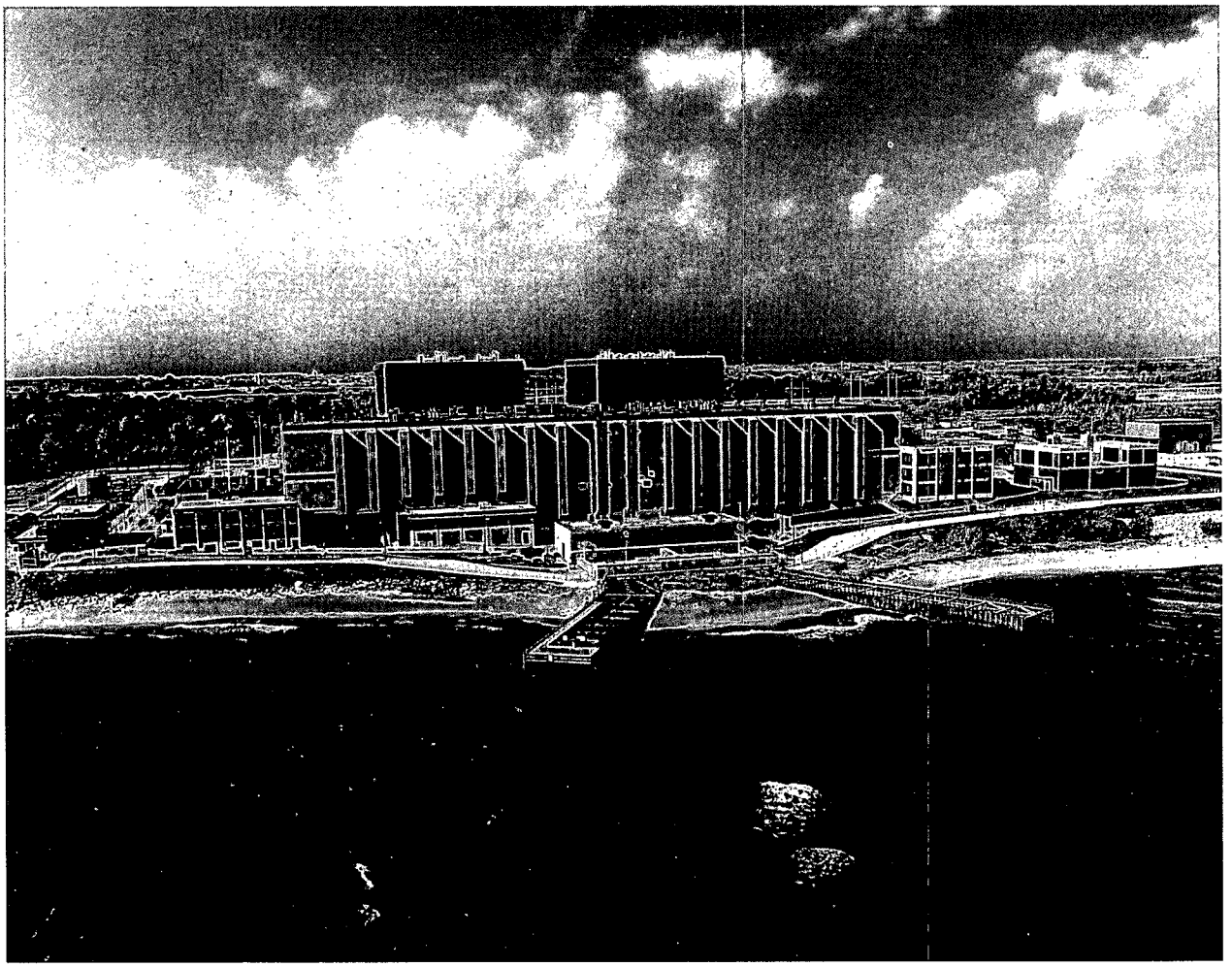
Enclosure 1

ANNUAL MONITORING REPORT 2008

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, 2008, through December 31, 2008

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SUMMARY

The Annual Monitoring Report for the period of January 1, 2008, through December 31, 2008, 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 2008 the following Curies (Ci) of radioactive material were released via the liquid and atmospheric pathways:

	Liquid	Atmospheric
Tritium (Ci)	534	64.2
Particulate[1] (Ci)	0.120	0.00002
Noble Gas (Ci)	(-)	1.11

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

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	0.0065 mrem	6 mrem
Organ dose	0.0116 mrem	6 mrem

ATMOSPHERIC RELEASES

Dose Category	Calculated Dose	Appendix I Dose
Organ dose	0.0254 mrem	30 mrem
Noble gas beta air dose	0.00013 mrad	40 mrad
Noble gas gamma ray air dose	0.00026 mrad	20 mrad
Noble gas dose to the skin	0.00039 mrem	30 mrem
Noble gas dose to the whole body	0.00025 mrem	10 mrem

The results show that during 2008, the doses from PBNP effluents were a small percentage (0.11% at the most) of the Appendix I design objectives. Therefore, operation of PBNP 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.

The 2008 Radiological Environmental Monitoring Program (REMP) collected 806 samples for radiological analyses and 116 sets of thermoluminescent dosimeters (TLDs) to measure ambient radiation in the vicinity of PBNP and the ISFSI. Air monitoring from six different sites showed only background radioactivity from naturally occurring radionuclides. 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.

There were no dry storage casks added to the ISFSI in 2008. The total number remains at 25 dry storage casks. Sixteen are the ventilated, vertical storage casks (VSC-24) and nine are the 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 2008 confirmed that the effluent control program at PBNP ensured a minimal impact on the environment.

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 appropriate ALARA design objectives upon 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 NextEra Point Beach 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.

A General License was granted, pursuant to 10 CFR 72.210, for an Independent Spent Fuel Storage Installation (ISFSI) facility. The 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. Per 10 CFR 72.44(d) (3), the results of radiological effluent monitoring are to be reported annually.* 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 critical organ. The dose from naturally occurring radon and its decay products are exempt. The doses from effluents due to the loading process will be assessed and quantified as part of the PBNP Radiological Effluent Control Program,

* Holders of a Part 72 license are allowed to submit the report required by 72.44(d)(3) concurrent with the effluent report required by 10 CFR 50.36a(a)(2). (Reference: 64 FR 33178)

because the loading of the storage casks occurs within the primary auxiliary building of PBNP.

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 2008 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)	0.0065	0.11 %
20 (any organ)	0.0116	0.06 %

2.2 2008 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 and presented in 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, and the Unit 1 and 2 facade sumps.

2.3 2008 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 isotopic distribution shows slight change from 2007, with tritium (H-3) down slightly from 2006 and 2007 values and close to 2005 value. Tritium continues to be the major radionuclide released via liquid discharges.

2.4 Beach Drain System Releases Tritium Summary

The quarterly results of monitoring the beach drains are presented in Table 2-4. These six drains are sampled once a month. The total monthly flow is calculated assuming that the flow rate at the time of sampling persists for the whole month. During 2008, no tritium was observed in any of the beach drains at the effluent LLDs used to detect and quantify tritium released from discreet volumes such as hold up tanks and waste distillate tanks. However, these drains are subject to ground water inleakage so they are sampled as part of the ground water monitoring program. Results range from not detected (52 ± 96 pCi/l) to a high of 1103 ± 124 pCi/l. Most results are in the 200 - 400 pCi/l range. Based on the environmental analyses of beach drain discharges and the associated monthly flows, 0.017 Ci of H-3 would be added to the 534 Ci released via discharges for which permits are used. Ground water monitoring results are presented in Part D of this Annual Monitoring Report.

Table 2-2
Summary of Circulating Water Discharge
January 1, 2008, through December 31, 2008

	Jan	Feb	Mar	Apr	May	Jun	Total Jan-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
Total Activity Released (Ci)														
Gamma Scan (+Fe-55)	1.13E-03	2.44E-03	1.60E-03	3.23E-03	2.48E-02	1.67E-03	3.49E-02	2.39E-03	4.40E-03	4.07E-03	3.73E-03	5.91E-02	1.17E-02	1.20E-01
Gross Alpha	0.00E+00	1.27E-13	2.02E-06	0.00E+00	6.55E-06	0.00E+00	8.57E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-06	0.00E+00	2.56E-05
Tritium	1.29E+02	1.45E+02	5.63E+01	1.35E+01	4.02E+01	1.52E+01	3.99E+02	2.32E+01	3.57E+01	2.52E+01	2.34E+01	1.95E+01	7.98E+00	5.34E+02
Strontium (89/90/92)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.37E-06	5.43E-07	4.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.41E-06	0.00E+00	1.03E-05
Total Vol Released (gal)														
Processed Waste	5.75E+04	9.44E+04	1.05E+05	8.30E+04	1.44E+05	3.34E+04	5.17E+05	3.36E+04	3.99E+04	5.03E+04	6.39E+04	1.10E+05	4.16E+04	8.57E+05
Waste Water Effluent*	4.78E+06	3.99E+06	4.49E+06	4.34E+06	3.54E+06	3.28E+06	2.44E+07	3.37E+06	3.99E+06	3.47E+06	3.91E+06	4.41E+06	5.10E+06	4.87E+07
U1 SG Blowdown	1.17E+06	2.27E+06	2.60E+06	2.51E+06	2.62E+06	2.41E+06	1.36E+07	2.68E+06	2.67E+06	2.59E+06	5.22E+05	3.49E+06	5.12E+06	3.07E+07
U2 SG Blowdown	2.55E+06	2.47E+06	2.30E+06	2.00E+06	2.64E+06	2.31E+06	1.43E+07	2.36E+06	2.34E+06	2.43E+06	2.53E+06	2.16E+06	2.55E+06	2.86E+07
Total Gallons	8.56E+06	8.82E+06	9.50E+06	8.93E+06	8.95E+06	8.02E+06	5.28E+07	8.44E+06	9.04E+06	8.54E+06	7.02E+06	1.02E+07	1.28E+07	1.09E+08
Total cc	3.24E+10	3.34E+10	3.60E+10	3.38E+10	3.39E+10	3.04E+10	2.00E+11	3.19E+10	3.42E+10	3.23E+10	2.66E+10	3.86E+10	4.84E+10	4.12E+11
Dilution vol(cc)**	6.62E+13	6.20E+13	6.62E+13	5.59E+13	9.60E+13	1.11E+14	4.57E+14	1.15E+14	1.15E+14	1.11E+14	6.78E+13	8.90E+13	6.68E+13	1.70E+15
Avg diluted discharge conc (µCi/cc)														
Gamma Scan (+Fe-55)	1.71E-11	3.95E-11	2.42E-11	5.78E-11	2.58E-10	1.50E-11		2.08E-11	3.83E-11	3.67E-11	5.00E-12	6.64E-10	1.75E-10	
Gross Alpha	0.00E+00	1.27E-13	3.05E-14	0.00E+00	6.82E-14	0.00E+00		0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-13	0.00E+00	
Tritium	1.95E-06	2.34E-06	8.50E-07	2.42E-07	4.19E-07	1.37E-07		2.02E-07	3.11E-07	2.27E-07	3.45E-07	2.20E-07	1.19E-07	
Strontium (89/90/92)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.55E-14	4.90E-15		0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.08E-14	0.00E+00	
Max Batch Discharge Conc (µCi/cc)														
Tritium	4.05E-05	3.94E-05	2.04E-05	9.22E-06	1.24E-05	1.31E-05		1.33E-05	1.53E-05	9.85E-06	1.21E-05	7.74E-06	9.62E-06	
Gamma Scan	1.16E-09	3.75E-09	1.36E-09	2.50E-09	9.99E-09	1.37E-09		1.42E-09	2.12E-09	2.22E-09	2.03E-09	1.77E-08	5.62E-09	

* The waste water effluent system replaced the Retention Pond which was taken out of service in September 2002.
** 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 1, 2008, through December 31, 2008

							Total							Total
Nuclide	Jan	Feb	Mar	Apr	May	Jun	Jan-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan-Dec
H-3	1.29E+02	1.45E+02	5.63E+01	1.35E+01	4.02E+01	1.52E+01	3.99E+02	2.32E+01	3.57E+01	2.52E+01	2.34E+01	1.95E+01	7.98E+00	5.34E+02
F-18	0.00E+00	2.08E-04	3.53E-04	1.69E-04	2.64E-04	2.07E-04	1.20E-03	1.67E-04	1.59E-04	2.50E-05	1.65E-05	1.26E-04	2.81E-04	1.97E-03
Cr-51	2.78E-05	2.29E-05	1.90E-05	2.87E-04	8.25E-03	1.13E-04	8.72E-03	1.66E-04	1.59E-04	1.58E-04	3.88E-05	1.01E-02	1.25E-03	2.06E-02
Mn-54	0.00E+00	6.70E-06	6.29E-06	2.21E-06	2.66E-04	9.42E-06	2.91E-04	1.22E-05	1.49E-05	9.57E-06	5.86E-07	2.44E-04	8.95E-05	6.62E-04
Fe-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.19E-04	0.00E+00	8.19E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.95E-03	1.73E-03	5.50E-03
Fe-59	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.95E-05	0.00E+00	9.95E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.80E-04	4.15E-05	5.21E-04
Co-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.83E-07	0.00E+00	5.83E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.17E-05	2.14E-05	2.72E-04
Co-58	9.73E-06	1.30E-04	4.75E-05	1.07E-04	2.82E-03	8.36E-05	3.20E-03	7.87E-05	7.11E-05	3.83E-05	3.25E-04	3.02E-02	3.90E-03	3.70E-02
Co-60	5.66E-05	4.97E-04	5.35E-04	4.48E-04	4.14E-03	4.25E-04	6.10E-03	4.62E-04	4.59E-04	3.06E-04	1.30E-04	2.43E-03	1.09E-03	1.10E-02
Zn-65	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-04	0.00E+00	1.27E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.83E-05	0.00E+00	1.55E-04
As-76	0.00E+00	0.00E+00	0.00E+00	7.09E-06	0.00E+00	0.00E+00	7.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.09E-06
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	4.37E-06	5.43E-07	4.91E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.41E-06	0.00E+00	1.03E-05
Nb-95	0.00E+00	0.00E+00	3.01E-06	1.92E-05	1.34E-03	3.55E-05	1.40E-03	3.67E-05	4.20E-05	3.86E-05	1.05E-05	1.78E-03	6.09E-04	3.92E-03
Nb-97	7.14E-07	0.00E+00	2.45E-06	0.00E+00	4.65E-06	7.20E-06	1.50E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-05
Zr-95	0.00E+00	0.00E+00	0.00E+00	3.64E-06	7.13E-04	1.15E-05	7.28E-04	1.06E-05	1.78E-05	4.53E-06	0.00E+00	1.06E-03	3.04E-04	2.12E-03
Ag-110m	8.95E-06	5.83E-04	5.57E-05	1.17E-04	6.96E-04	1.63E-04	1.62E-03	2.33E-05	4.47E-05	5.75E-05	7.10E-05	3.00E-04	5.54E-04	2.67E-03
Sn-113	1.24E-06	4.55E-06	0.00E+00	5.24E-06	2.10E-04	0.00E+00	2.21E-04	0.00E+00	5.65E-06	0.00E+00	0.00E+00	8.07E-04	1.87E-04	1.22E-03
Sn-117m	2.66E-05	4.42E-05	0.00E+00	2.42E-04	2.05E-03	4.67E-05	2.41E-03	1.31E-04	4.33E-05	1.45E-04	1.65E-04	1.22E-03	2.22E-04	4.34E-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	7.04E-06	0.00E+00	0.00E+00	3.01E-04	0.00E+00	3.08E-04	0.00E+00	0.00E+00	0.00E+00	6.51E-05	5.99E-04	2.24E-04	1.20E-03
Sb-125	9.99E-04	9.35E-04	5.65E-04	1.80E-03	2.71E-03	5.66E-04	7.58E-03	1.31E-03	3.39E-03	3.28E-03	2.89E-03	6.75E-03	1.21E-03	2.64E-02
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	9.32E-07	0.00E+00	0.00E+00	9.32E-07
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	1.10E-05	0.00E+00	0.00E+00	1.10E-05
I-133	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	1.53E-06	0.00E+00	0.00E+00	0.00E+00	1.53E-06
Te-132	0.00E+00	0.00E+00	0.00E+00	2.43E-06	0.00E+00	0.00E+00	2.43E-06	0.00E+00	0.00E+00	0.00E+00	1.14E-05	0.00E+00	0.00E+00	1.38E-05
Cs-137	0.00E+00	4.75E-06	9.76E-06	1.47E-05	5.82E-06	2.38E-06	3.74E-05	0.00E+00	0.00E+00	0.00E+00	8.29E-06	4.20E-05	5.85E-06	9.35E-05
Ru-103	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	2.05E-05	0.00E+00	2.05E-05
Te-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
Na-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-06	0.00E+00	5.50E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.50E-06

Note: The dissolved noble gases detected in liquid effluents (e.g., Xe-133, Xe-135, etc.) are added to the atmospheric release summaries.

Table 2-4
Subsoil System Drains - Tritium Summary
January 1, 2008, through December 31, 2008

	S-1	S-3	S-7	S-8	S-9	S-10
1st Qtr						
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Volume (gal)	6.22E+06	1.24E+06	3.35E+05	4.46E+04	4.46E+04	4.46+05
2nd Qtr						
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Volume (gal)	1.17E+06	5.12E+05	0.00E+00	5.18E+05	0.00E+00	0.00E+00
3rd Qtr						
H-3 (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Volume (gal)	3.76E+05	2.47E+05	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
Volume (gal)	1.44E+05	8.86E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2.6 Land Application of Sewage Sludge

The Wisconsin Department of Natural Resources has approved the disposal of PBNP sewage by land application on various NextEra Energy Point Beach properties surrounding the plant. This sewage sludge, which may contain trace amounts of radionuclides, is to be applied in accordance with methodologies approved by the NRC on January 13, 1988, pursuant to 10 CFR 20.302(a). The approved methodology requires analyses prior to every disposal. Based upon an investigation of the source of the radionuclides, a combination of engineering modifications and administrative controls has eliminated plant generated radiological inputs to the sewage. This was verified by sludge analyses using the environmental lower level of detection (LLD) criteria. No byproduct radionuclides were found in the sludge after the controls and modifications were completed. Sludge is routinely monitored and no radionuclides attributable to PBNP have been found.

There was no disposal of sewage by land application during 2008. All disposals were done at the Manitowoc Sewage Treatment Plant.

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, the locations of the exposure pathways (e.g., cow milk, vegetable gardens and residences), 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. 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 2008 are summarized in Table 3-2.

3.3 Isotopic Airborne Releases

The monthly isotopic airborne releases for 2008, from which the airborne doses were calculated, are presented in Table 3-3. When both the equipment hatch and the Elevation 66' hatch are open during an outage, there is a measurable, convective flow out the upper hatch. Because this air is not filtered, whatever is measured in containment air (particulates, tritium, noble gases, radioiodine) is assumed to be carried out the hatch, through the façade, and into the environment thereby contributing to the effluent and the calculated dose.

Table 3-1
Comparison of 2008 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	0.0254 mrem	0.088
Noble gas	40 mrad (beta air)	0.00013 mrad	0.0003
Noble gas	20 mrad (gamma air)	0.00026 mrad	0.0013
Noble gas	30 mrem/skin	0.00039 mrem	0.0012
Noble gas	10 mrem (whole body)	0.00025 mrem	0.0025

Table 3-2
Radioactive Airborne Effluent Release Summary
January 1, 2008, through December 31, 2008

							Total							
	Jan	Feb	Mar	Apr	May	Jun	J-Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total NG from Liq (Ci)	2.39E-03	4.72E-03	7.16E-03	5.19E-04	4.21E-03	5.72E-05	1.91E-02	8.76E-05	8.76E-05	8.09E-05	6.09E-04	0.00E+00	1.05E-04	2.00E-02
Total Noble Gas (Ci)1	6.48E-02	8.12E-02	3.79E-01	4.66E-02	8.13E-02	4.99E-02	7.03E-01	5.30E-02	4.27E-02	4.46E-02	1.04E-01	7.03E-02	8.78E-02	1.11E+00
Total Radioiodines (Ci)	0.00E+00	0.00E+00	0.00E+00	3.20E-06	0.00E+00	0.00E+00	3.20E-06	0.00E+00	0.00E+00	0.00E+00	2.10E-07	0.00E+00	0.00E+00	3.41E-06
Total Particulate (Ci)2	0.00E+00	0.00E+00	0.00E+00	1.99E-05	1.43E-07	3.88E-06	2.39E-05	0.00E+00	0.00E+00	0.00E+00	4.60E-07	5.68E-07	0.00E+00	2.50E-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)	0.00E+00	0.00E+00	0.00E+00	1.99E-05	1.43E-07	3.88E-06	2.39E-05	0.00E+00	0.00E+00	0.00E+00	4.60E-07	5.68E-07	0.00E+00	2.50E-05
Total Tritium (Ci)	6.37E+00	4.42E+00	4.84E+00	8.81E+00	3.17E+00	2.70E+00	3.03E+01	2.70E+00	4.68E+00	4.32E+00	5.83E+00	5.22E+00	1.11E+01	6.42E+01
Max NG H'rly Rel.(Ci/sec)	5.68E-08	2.19E-06	4.64E-07	4.14E-08	1.18E-07	6.49E-08		3.82E-08	3.71E-08	5.55E-08	3.68E-08	6.39E-08	5.89E-07	

[1] Total noble gas (airborne + liquid releases).
[2] Total Particulate is the sum of alpha, strontium, and others. It does not include radioiodines or F-18. F-18 and other airborne particulates with half-lives less than 8 days are not considered for dose calculations. Airborne radioiodines only include I-131 and I-133.

TABLE 3-3
Isotopic Composition of Airborne Releases
January 1, 2008, through December 31, 2008

	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	6.37E+00	4.42E+00	4.84E+00	8.81E+00	3.17E+00	2.70E+00	3.03E+01	2.70E+00	4.68E+00	4.32E+00	5.83E+00	5.22E+00	1.11E+01	6.42E+01
Ar-41	4.10E-02	4.86E-02	6.07E-02	2.05E-02	3.46E-02	3.56E-02	2.41E-01	4.52E-02	3.69E-02	3.69E-02	2.32E-02	5.17E-02	6.30E-02	4.98E-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	1.37E-03	1.37E-03
Kr-85m	0.00E+00	1.15E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.32E-04	8.47E-04
Kr-87	0.00E+00	2.38E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.38E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-03	2.10E-03
Kr-88	0.00E+00	7.94E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.94E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.06E-03	1.65E-03	6.50E-03
Xe-131m	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	1.67E-03	3.02E-05	1.70E-03
Xe-133	2.35E-02	2.82E-02	4.93E-02	2.54E-02	4.60E-02	1.37E-02	1.86E-01	7.28E-03	5.66E-03	6.94E-03	8.10E-02	1.28E-02	1.68E-03	3.01E-01
Xe-133m	2.02E-04	0.00E+00	1.05E-04	1.19E-05	5.57E-06	0.00E+00	3.24E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.48E-06	3.32E-04
Xe-135	1.00E-04	1.78E-03	2.68E-01	7.56E-04	7.32E-04	4.21E-04	2.72E-01	4.93E-04	2.12E-04	8.04E-04	8.17E-05	0.00E+00	3.74E-03	2.77E-01
Xe-135m	0.00E+00	4.03E-04	0.00E+00	0.00E+00	0.00E+00	1.29E-04	5.32E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.68E-05	3.45E-03	4.05E-03
Xe-138	0.00E+00	1.13E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.13E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-02	1.14E-02
Cr-51	0.00E+00	0.00E+00	0.00E+00	9.36E-06	0.00E+00	0.00E+00	9.36E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.36E-06
Mn-54	0.00E+00	0.00E+00	0.00E+00	2.23E-07	0.00E+00	0.00E+00	2.23E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.23E-07
Co-57	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	0.00E+00	0.00E+00	0.00E+00	4.91E-06	1.43E-07	0.00E+00	5.05E-06	0.00E+00	0.00E+00	0.00E+00	2.87E-07	1.99E-07	0.00E+00	5.54E-06
Co-60	0.00E+00	0.00E+00	0.00E+00	8.64E-06	0.00E+00	0.00E+00	8.64E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.64E-06
Nb-95	0.00E+00	0.00E+00	0.00E+00	2.93E-06	0.00E+00	0.00E+00	2.93E-06	0.00E+00	0.00E+00	0.00E+00	3.78E-16	2.23E-07	0.00E+00	3.15E-06
Zr-95	0.00E+00	0.00E+00	0.00E+00	1.58E-06	0.00E+00	0.00E+00	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.03E-08	0.00E+00	1.67E-06
Ag-110m	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	1.91E-07	0.00E+00	0.00E+00	1.91E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-07
Sb-124	0.00E+00	0.00E+00	0.00E+00	5.73E-07	0.00E+00	0.00E+00	5.73E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.73E-07
Sb-125	0.00E+00	0.00E+00	0.00E+00	2.54E-08	0.00E+00	0.00E+00	2.54E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.54E-08
I-131	0.00E+00	0.00E+00	0.00E+00	3.20E-06	0.00E+00	0.00E+00	3.20E-06	0.00E+00	0.00E+00	0.00E+00	2.10E-07	0.00E+00	0.00E+00	3.41E-06
I-133	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	1.07E-07	2.57E-08	0.00E+00	1.33E-07
Sn-117m	0.00E+00	0.00E+00	0.00E+00	1.14E-07	0.00E+00	0.00E+00	1.14E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.14E-07
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	6.57E-08	0.00E+00	0.00E+00	6.57E-08

Note: The Noble Gases listed above include the liquid contribution

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 2008. There was no type C shipments and 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

Type of Waste	Quantity	Activity
A. Spent resins, filter sludge, evaporator bottoms, etc.	7.50 m^3	73.220 Ci
	263.20 ft^3	
B. Dry compressible waste, contaminated equipment, etc.	224.60 m^3	44.478 Ci
	7,930.60 ft^3	
C. Irradiated components, control rods, etc.	N/A	
	N/A	
D. Other (Steam Generator Chemical Cleaning Solvent)	151.70 m^3	0.001 Ci
	5,356.16 ft^3	

4.2 Major Nuclide Composition (by Type of Waste)

The major radionuclide content of the 2008 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 4-2.

Table 4-2
2008 Estimated Solid Waste Major Radionuclide Composition

TYPE A		TYPE B		TYPE C		TYPE D	
Nuclide	Percent Abundance	Nuclide	Percent Abundance	Nuclide	Percent Abundance	Nuclide	Percent Abundance
Ni-63	70.6%	Co-60	56.54%			Fe-55	61.76%
Co-60	16.0%	Ni-63	32.51%			Co-60	24.02%
Fe-55	4.5%	Fe-55	7.73%			Zn-65	12.19%
H-3	3.1%	Sb-125	1.58%			Ce-144	1.62%
Sb-125	1.9%	Ag-110m	0.46%			Cs-137	0.41%
Cs-137	1.2%	Nb-95	0.32%				
Mn-54	0.9%	Cs-137	0.25%				
Ni-59	0.7%	Mn-54	0.20%				
Co-58	0.4%	Ru-106	0.09%				
Co-57	0.3%	Co-58	0.09%				
Pu-241	0.2%	Zr-95	0.05%				
Ag-110m	0.1%	H-3	0.05%				
Ce-144	0.1%	Tc-99	0.04%				
Sr-90	0.0%	Zn-65	0.02%				
Tc-99	0.0%	C-14	0.01%				
Cm-243	0.0%	Ce-144	0.01%				
Am-241	0.0%	Pu-241	0.01%				
C-14	0.0%	Am-241	0.00%				
Pu-239	0.0%	Sr-90	0.00%				
Pu-238	0.0%	Ag-108m	0.00%				
Sr-89	0.0%	Ni-59	0.00%				
Cm-242	0.0%	Co-57	0.00%				
		Pu-239	0.00%				
		Sr-89	0.00%				
		Cm-243	0.00%				
		Pu-238	0.00%				
		Cm-244	0.00%				
		Cs-134	0.00%				
		Pu-240	0.00%				
		Cm-242	0.00%				
		Cr-51	0.00%				
		U-235	0.00%				
		Nb-94	0.00%				
		Np-237	0.00%				
		Sn-113	0.00%				
		Sb-124	0.00%				

4.3 Solid Waste Disposition

There were sixteen (16) solid waste shipments from PBNP during 2008. The dates and destinations are shown in Table 4-3. There were four (4) separate shipments on 11/21/08 and on 12/1/08.

Table 4-3
2008 PBNP Radioactive Waste Shipments

Date	Destination	Total Volume (ft^3)
02/20/08	Oak Ridge, TN	183.2
03/03/08	Erwin, TN	80.0
04/01/08	Oak Ridge, TN	2160.0
04/24/08	Oak Ridge, TN	1720.0
06/24/08	Barnwell	120.3
06/27/08	Barnwell	120.3
09/15/08	Oak Ridge, TN	2360.0
10/29/08	Oak Ridge, TN	1450.0
11/21/2008 (4)	Richland, WA	2909.0
12/1/2008 (4)	Richland, WA	2447.2

5.0 NONRADIOACTIVE CHEMICAL RELEASES

5.1 Scheduled Chemical Waste Releases

Scheduled chemical waste releases to the circulating water system from January 1, 2008, to June 30, 2008, included 3.59E+06 gallons of neutralized wastewater. The wastewater contained 1.74E+02 pounds of suspended solids and 4.51E+03 pounds of dissolved solids.

Scheduled chemical waste releases to the circulating water system from July 1, 2008, to December 31, 2008, included 4.32E+06 gallons of neutralized wastewater. The wastewater contained 3.0E+01 pounds of suspended solids and 2.92E+01 pounds 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, 2008, to June 30, 2008, included 2.43E+07 gallons of clarified wastewater. The wastewater contained 2.69E+03 pounds of suspended solids.

Miscellaneous chemical waste releases from the Wastewater Effluent (based on effluent analyses) to the circulating water for July 1, 2008, to December 31, 2008, included 2.44E+07 gallons of clarified wastewater. The wastewater contained 3.14E+03 pounds of suspended solids.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from January 1, 2008, to June 30, 2008, included 2.14E+05 pounds of sodium bisulfite and 1.80E+05 pounds of sodium hypochlorite.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from July 1, 2008, to December 31, 2008, included 2.72E+05 pounds of sodium bisulfite and 3.21E+05 pounds of sodium hypochlorite.

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 2008
January 1, 2008, through June 30, 2008

	UNIT	JAN	FEB	MAR	APR*	MAY*	JUN
Average Volume Cooling	1	282.2	282.2	282.5	433.2	480.5	487.1
Water Discharge [million gal/day]**	2	282.2	282.2	282.5	252.6	417.2	489.7
Average Cooling Water	1	36.4	37.1	37.3	42.4	48.1	48.9
Intake Temperature [°F]	2	36.3	37.7	38.3	42.2	49.1	49.9
Average Cooling Water	1	52.9	64.7	69.0	64.8	66.9	67.7
Discharge Temperature [°F]	2	70.6	71.5	70.5	63.7	64.1	68.1
Average Ambient Lake Temperature [°F]		33.2	32.9	33.4	38.4	44.0	44.7

* Unit 1 outage April 5, 2008 – May 5, 2008.
** For days with cooling water discharge flow.

Table 6-1 (continued)
Circulating Water System Operation for 2008
July 1, 2008, through December 31, 2008

	UNIT	JUL	AUG	SEP	OCT*	NOV*	DEC
Average Volume Cooling	1	489.6	489.6	487.0	358.4	394.8	284.5
Water Discharge [million gal/day]**	2	489.6	489.6	487.3	495.4	495.3	284.5
Average Cooling Water	1	52.8	68.5	60.2	59.0	42.1	36.9
Intake Temperature [°F]	2	53.9	69.6	61.2	52.4	43.1	38.1
Average Cooling Water	1	71.8	88.0	79.5	70.0	55.5	68.4
Discharge Temperature [°F]	2	72.4	93.6	85.7	76.6	66.3	76.4
Average Ambient Lake Temperature [°F]		55.7	65.5	60.6	49.6	45.0	33.6

* Unit 2 outage October 4, 2008 – November 12, 2008
** For days with cooling water discharge flow.

Part B
Miscellaneous Reporting Requirements

7.0 ADDITIONAL REPORTING REQUIREMENTS

7.1 Revisions to the PBNP Effluent and Environmental Programs

The Offsite Dose Calculation Manual (ODCM) was not revised in 2008. The Environmental Manual (EM) was revised in November 2008 to identify specific valves used for sampling the site well (Enclosure 2).

7.2 Inter-Laboratory Comparison Program

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 2008. 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 this Annual Monitoring Report (AMR).

7.3 Special Circumstances

No special circumstances report regarding operation of the explosive gas monitor for the waste gas holdup system was needed during 2008.

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 this end, the REMP collects and analyzes air, water, milk, soil, vegetation, and fish samples for radionuclides and uses TLDs to determine the ambient radiation background. 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. Therefore, the REMP collects samples from various environmental media in order to provide data on measurable levels of radiation and radioactive materials in the principal pathways of environmental exposure.

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, thermoluminescent dosimeters (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. As a result 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 conducted 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 is 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 are reported as averages of the measurements made throughout the calendar year plus/minus the associated standard deviation. If all of the 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 all 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. As a result 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 artificially inflates the calculated average value, whether negative or as small positive values below the LLD. 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.

Just because a result is statistically greater than zero does not necessarily indicate that the radionuclide is present in an environmental sample. False positives may be obtained by fluctuations in background during the counting process. This phenomenon is most prevalent for concentrations at or near the LLD. Therefore, other information such as PBNP emissions records and

radionuclide half-life must be used to evaluate whether the result is real or a statistical artifact.

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 Services maintains a radiological environmental monitoring program to confirm the results from the PBNP REMP. PBNP personnel also collect 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

No changes were made to the REMP during 2008. Changes to the Ground Water Monitoring Program are discussed in Part D.

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, -17, -18, -20, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31, -32, -38, -39, -TC	TLD	Quarterly
Vegetation	E-01, -02, -03, -04, -06, -08, -09, -20,	Gross Beta	3x/yr as available
		Gamma Isotopic Analysis	Gamma Isotopic Analysis
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 (on total solids)	Quarterly
Lake Water	E-01, -05, -06, -33	Gross Beta	Monthly / Quarterly composite of monthly collections
		I-131	Monthly
		Gamma Isotopic Analysis (on total solids)	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	Weekly (particulate)
		I-131	Weekly (charcoal)
		Gamma Isotopic Analysis	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	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	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 2nd and 3rd 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-TC	Transportation Control; Reserved for TLDs

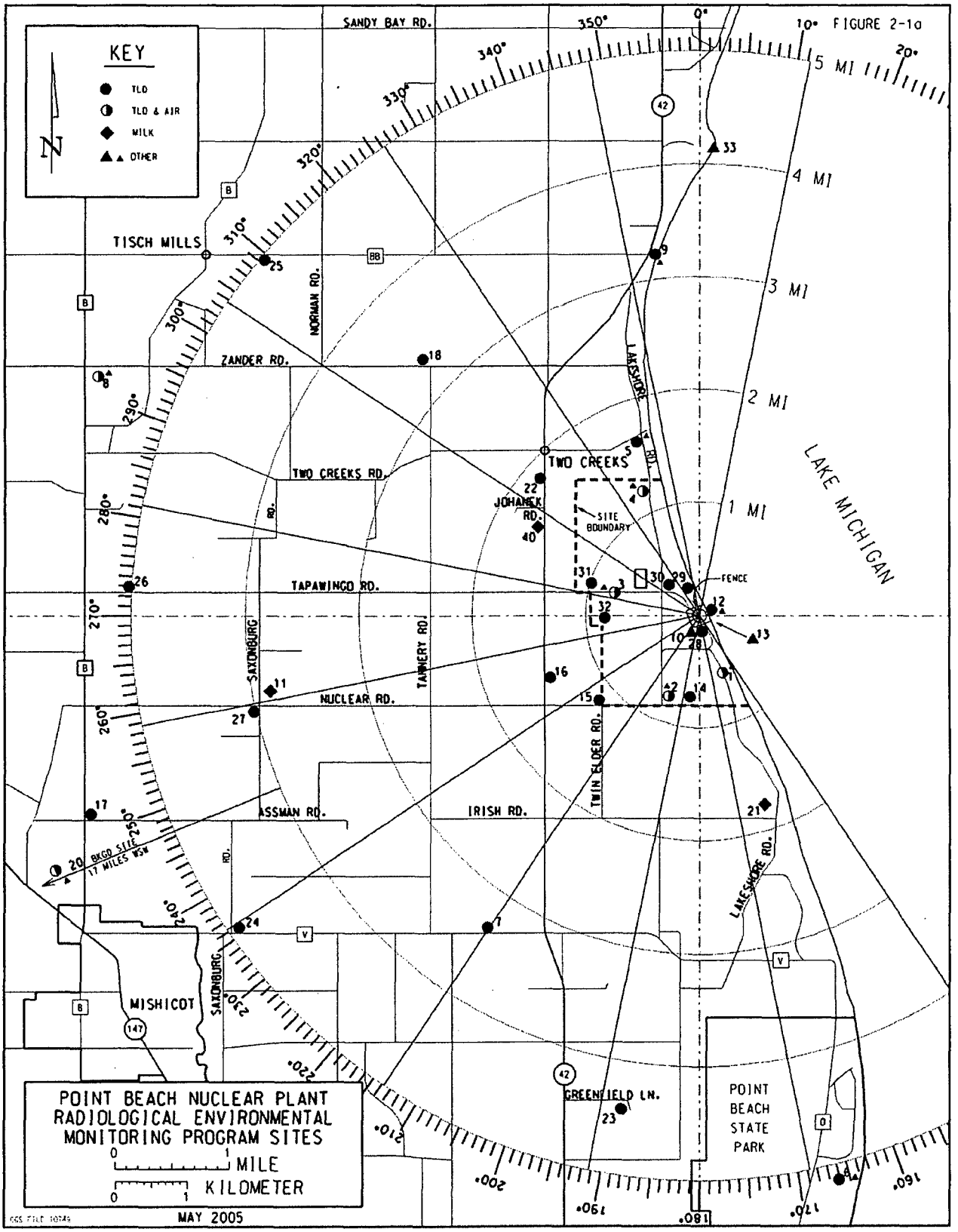


Figure 9-1
PBNP REMP Sampling Sites

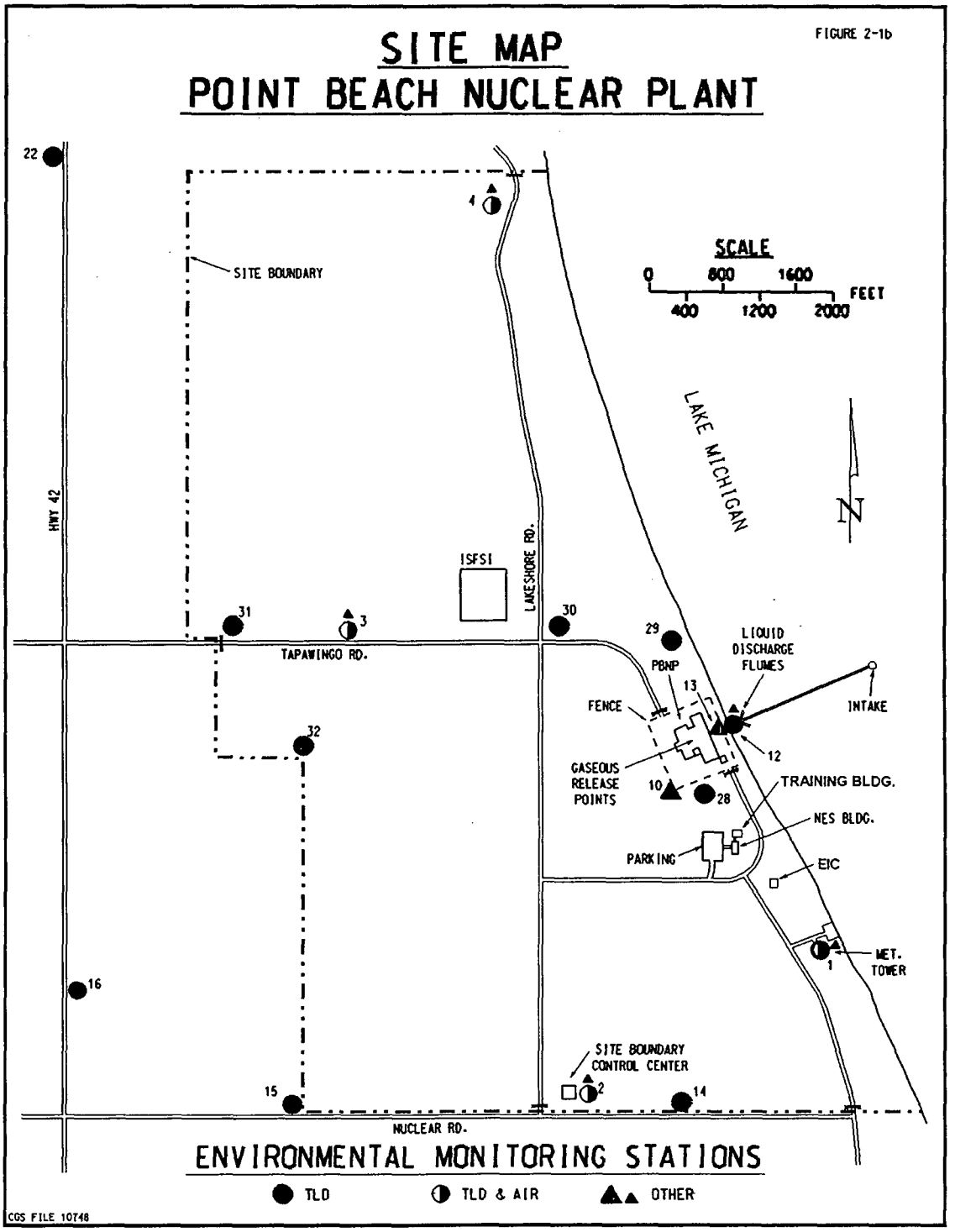


Figure 9-2
Map of REMP Sampling Sites Located Around PBNP

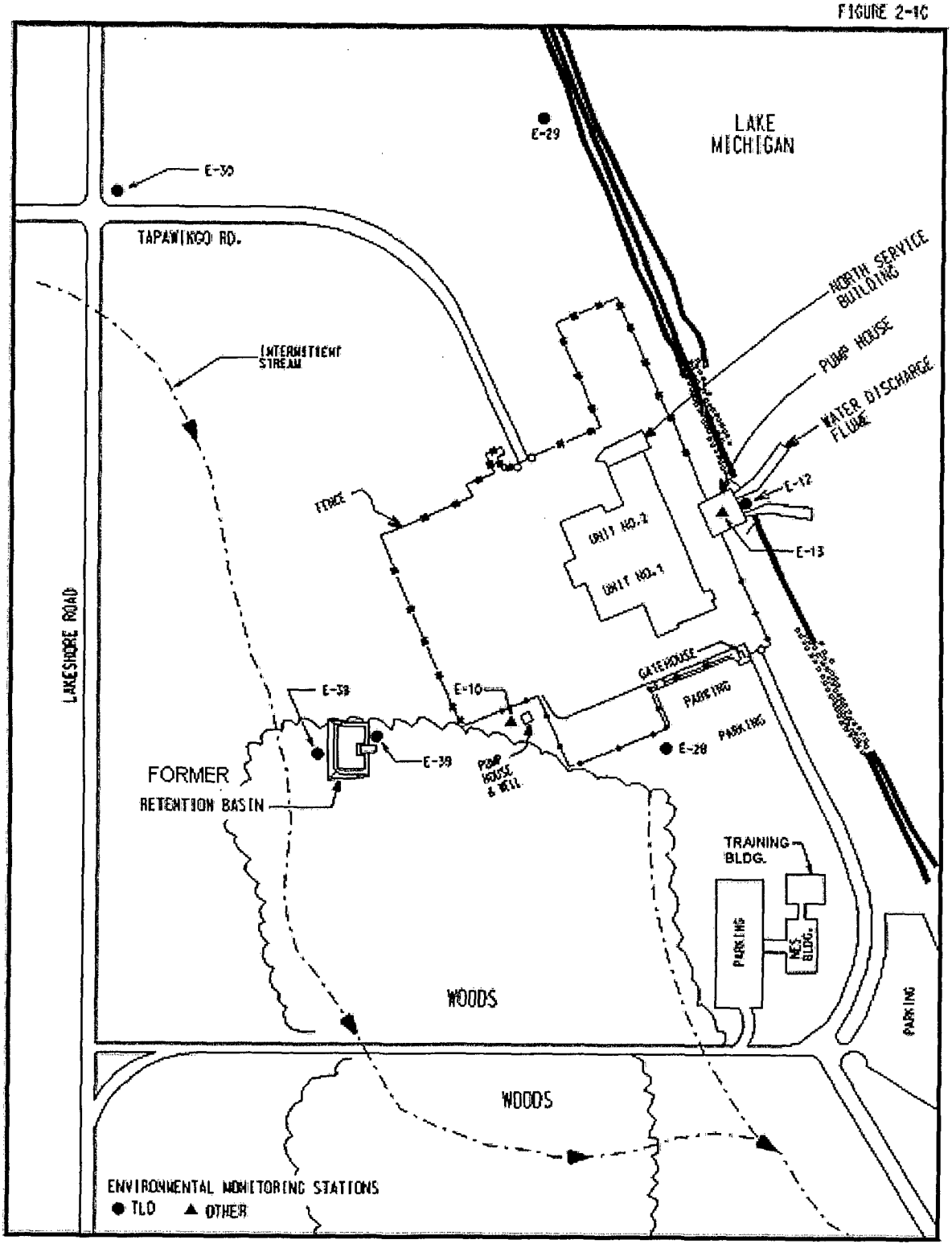


Figure 9-3
Enhanced Map Showing REMP Sampling Sites Closest to PBNP

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 m^3 (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

Sample Type	Location	Collection Date	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	E-02 E-02 E-03 E-04	03/19/2008 09/03/2008 12/30/2008 06/1920/08	Pump Not Running Equipment failure Power loss Power loss	GFI failure, replace GFI Replace pump Restore power Restore power
Lake Water	E-01	12/17/08	Lake Frozen	Samples Collected Next Month After Thaw
	E-06	12/17/08	Lake Frozen	Samples Collected Next Month After Thaw

Table 9-6
Sample Collections for State of Wisconsin

Sample Type	Location	Frequency
Lake Water	E-01	Weekly, Composited 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-19	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 2008.

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 this 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 and gamma isotopic analytical results for water are obtained by measurements on the solids remaining after evaporation of the unfiltered sample to dryness. Hence, the results are indicated as "on total solids" in Table 10-1.

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 canisters for radioiodine are counted as soon as possible so the I-131 will undergo only minimal decay prior to

analyses. The weekly charcoal canisters are screened for I-131 by counting them at the same time to achieve a lower LLD. If a positive result is obtained, each canister is counted individually.

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.

9.7.6 Environmental Radiation Exposure

The 2008 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 were obtained using three lithium fluoride (LiF) TLD chips sealed in black plastic. The difference in material types can impact the amount of exposure measured. As seen in 2001, the Environmental Inc. TLD cards typically produce a slightly higher measured exposure value, although within the uncertainty of that value recorded by the TLD chips.

The reported field exposure is the arithmetic average of the four exposure values obtained minus the 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

Although the ISFSI fence TLDs are not considered part of the REMP because of their location directly on site, 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.

10.0 RESULTS

Summary of 2008 REMP Results

Radiological environmental monitoring conducted at PBNP from January 1, 2008, through December 31, 2008, consisted of analysis of air filters, milk, lake water, well water, soil, fish, shoreline sediments, algae, vegetation and TLDs. The results summarized in Table 10-1 include 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 time required to obtain the LLDs for radionuclides that are more difficult to detect. For these analyses, both LLDs are listed with the 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 the individual results obtained from the contracted analytical laboratory is presented in Appendix 1, along with the results from the laboratory's radioanalytical quality assurance and the Interlaboratory Crosscheck Program.

In Table 10-1, no results are reported as <LLD. A ND radionuclide is one for which none of the individual measurements was statistically different from zero. When one or more of the measured radionuclide concentrations was positive and statistically different from zero, the average reported in Table 10-1 is the average ± one standard deviation. Both the positive and negative results were used to calculate the average and standard deviation. Some of the reported averages are negative because many of the measured concentrations for that sample category were negative. The highest positive value and its 2-sigma error are reported only when one or more measured values are statistically greater than zero based on counting statistics.

The method of determining averages is provided 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.

Table 10-2 contains the ISFSI fence TLD results.

Table 10-1
Summary of Radiological Environmental Monitoring Results for 2008

Sample	Description	N	LLD (a)	Average ± Standard Deviation (b)	High ± 2 sigma	Units
TLD	Environmental Radiation	112	1 mrem	1.05 ± 0.17	1.50 ± 0.11	mR/7days
	Control (E-20)	4	1 mrem	1.03 ± 0.20	1.24 ± 0.10	mR/7days
Air	Gross Beta	256	0.01	0.023 ± 0.010	0.053 ± 0.004	pCi/m3
	Control (E-20) Gross beta	52	0.01	0.025 ± 0.011	0.060 ± 0.004	pCi/m3
	I-131	256	0.030 (0.07)	ND	-	pCi/m3
	Control (E-20) I-131	52	0.030 (0.07)	ND	-	pCi/m3
	Cs-134	20	0.05	ND	-	pCi/m3
	Control (E-20) Cs-134	4	0.05	ND	-	pCi/m3
	Cs-137	20	0.06	ND	-	pCi/m3
	Control (E-20) Cs-137	4	0.06	ND	-	pCi/m3
	Other gamma emitters	20	0.1	0.0001 ± 0.0003	0.0010 ± 0.0007	pCi/m3
	Control (E-20) Other	4	0.1	ND	-	pCi/m3
Milk	Sr-89	36	5	ND	-	pCi/L
	Sr-90	36	1	0.9 ± 0.4	1.8 ± 0.4	pCi/L
	I-131	36	0.5	ND	-	pCi/L
	Cs-134	36	5 (15)	ND	-	pCi/L
	Cs-137	36	5 (15)	ND	-	pCi/L
	Ba-La-140	36	5 (15)	-0.3 ± 1.7	2.6 ± 2.1	pCi/L
	Other gamma emitters	36	15	0.1 ± 1.3	3.6 ± 2.4	pCi/L
Well	Gross beta	4	4	0.9 ± 0.6	1.5 ± 0.5	pCi/L
Water	H-3	4	500 (3000)	ND	-	pCi/L
	Sr-89	4	10	ND	-	pCi/L
	Sr-90	4	1 (2)	ND	-	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	15	ND	-	pCi/L
	Co-60	4	15	ND	-	pCi/L
	Zn-65	4	30	ND	-	pCi/L
	Zr-Nb-95	4	15	ND	-	pCi/L
	Cs-134	4	15	ND	-	pCi/L
	Cs-137	4	18	ND	-	pCi/L
	Ba-La-140	4	15	ND	-	pCi/L
	Other gamma emitters	4	30	ND	-	pCi/L
Algae	Gross beta	6	0.25	8.68 ± 2.28	10.55 ± 1.23	pCi/g
	Co-58	6	0.25	0.006 ± 0.005	0.015 ± 0.007	pCi/g
	Co-60	6	0.25	0.006 ± 0.008	0.019 ± 0.007	pCi/g
	Cs-134	6	0.25	ND	-	pCi/g
	Cs-137	6	0.25	0.025 ± 0.011	0.038 ± 0.017	pCi/g

(a) The required LLD per the PBNP REMP is enclosed in the parentheses.
(b) "ND" indicates that the sample result is Not Detectable, i.e., sample concentrations were statistically equivalent to zero.

Table 10-1 (continued)
Summary of Radiological Environmental Monitoring Results for 2008

Sample	Description	N	LLD (a)	Average ± Standard Deviation (b)	High ± 2 sigma	Units
Lake Water	Gross beta	46	4	1.6 ± 0.9	3.4 ± 1.0	pCi/L
	I-131	46	0.5 (2)	0.01 ± 0.1	0.32 ± 0.26	pCi/L
	Mn-54	46	10 (15)	0.1 ± 1.1	2.8 ± 1.7	pCi/L
	Fe-59	46	30	0.0 ± 2.2	4.5 ± 3.6	pCi/L
	Co-58	46	15	0.2 ± 1.1	2.8 ± 2.7	pCi/L
	Co-60	46	15	ND	-	pCi/L
	Zn-65	46	30	ND	-	pCi/L
	Zr-Nb-95	46	15	ND	-	pCi/L
	Cs-134	46	10 (15)	ND	-	pCi/L
	Cs-137	46	10 (18)	0.0 ± 1.2	4.8 ± 3.0	pCi/L
	Ba-La-140	46	15	-0.1 ± 2.1	4.3 ± 4.0	pCi/L
	Ru-103 (Other gamma)	46	30	-0.5 ± 1.2	4.0 ± 2.8	pCi/L
	Sr-89	16	5	ND	-	pCi/L
	Sr-90	16	1 (2)	0.34 ± 0.12	0.57 ± 0.27	pCi/L
	H-3	16	500 (3000)	137 ± 301	1251 ± 132	pCi/L
Fish	Gross beta	8	0.5	3.82 ± 0.56	4.34 ± 0.16	pCi/g
	Mn-54	8	0.13	ND	-	pCi/g
	Fe-59	8	0.26	0.001 ± 0.020	0.040 ± 0.026	pCi/g
	Co-58	8	0.13	ND	-	pCi/g
	Co-60	8	0.13	ND	-	pCi/g
	Zn-65	8	0.26	ND	-	pCi/g
	Cs-134	8	0.13	-0.002 ± 0.008	0.010 ± 0.009	pCi/g
	Cs-137	8	0.15	0.033 ± 0.022	0.070 ± 0.025	pCi/g
	Other gamma emitters	8	0.5	0.000 ± 0.008	0.011 ± 0.009	pCi/g
Shoreline	Gross beta	10	2	13.86 ± 6.10	25.60 ± 2.70	pCi/g
Sediment	Cs-137	10	0.15	0.025 ± 0.011	0.038 ± 0.015	pCi/g
Soil	Gross beta	16	2	30.03 ± 8.19	41.37 ± 3.30	pCi/g
	Cs-137	16	0.15	0.16 ± 0.09	0.35 ± 0.03	pCi/g
Vegetation	Gross beta	24	0.25	7.61 ± 2.03	9.89 ± 0.30	pCi/g
	I-131	24	0.06	0.004 ± 0.010	0.026 ± 0.014	pCi/g
	Cs-134	24	0.06	0.000 ± 0.006	0.014 ± 0.012	pCi/g
	Cs-137	24	0.08	0.005 ± 0.008	0.019 ± 0.013	pCi/g
	Other gamma emitters	24	0.06	0.001 ± 0.006	0.018 ± 0.016	pCi/g

(a) The required LLD per the PBNP REMP is enclosed in the parentheses.
(b) "ND" indicates that the sample result is Not Detectable, i.e., sample concentrations were statistically equal to zero.

Other gamma emitters typically refer to Co-60 if not specifically called out in the analyses. See explanation on Page 1 of the Environmental Inc., report which is Appendix A of this Annual Monitoring Report

Table 10-2
ISFSI Fence TLD Results for 2008

Fence Location	Average	Standard Deviation	Units
North	2.64	0.25	mR/7 days
East	2.37	0.26	mR/7 days
South	1.36	0.17	mR/7 days
West	5.36	0.46	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 of the indicator TLD cards is 1.05 mR/7-days and 1.03 mR/7-days at the control location. These results are not significantly different from each other nor from those observed from 2001 through 2008 (tabulated below in Table 11-1). The change in TLD types in 2001 accounts for the increase in average TLD readings (i.e. prior to third quarter 2001 TLD LiF chips were used versus the TLD cards (see Section 9.7.6 for additional information) from 2000 to 2001. Therefore, the operation of the plant has had no effect on the ambient gamma radiation.

Table 11-1
Average Indicator TLD Results from 1993 – 2008

Year	Average	Std. Dev*	Units
1993	0.82	0.15	mR/7 days
1994	0.90	0.12	mR/7 days
1995	0.87	0.13	mR/7 days
1996	0.85	0.12	mR/7 days
1997	0.87	0.11	mR/7 days
1998	0.79	0.13	mR/7 days
1999	0.79	0.21	mR/7 days
2000	0.91	0.15	mR/7 days
2001	1.06	0.19	mR/7 days
2002	1.17	0.21	mR/7 days
2003	1.10	0.20	mR/7 days
2004	1.10	0.22	mR/7 days
2005	1.04	0.21	mR/7 days
2006	1.14	0.21	mR/7 days
2007	1.08	0.20	mR/7 days

*Std. Dev = Standard Deviation

There were no new cask additions in 2008 with no significant change in the average annual ISFSI fence TLD results (Table 11-2) The North and West fence TLDs continue to record higher doses than the South and East fence TLDs (Table 11-2) corresponding to the location of the storage units at the NW corner of the site. Compared to the background site (E-20), most of the indicator sites for the ISFSI (Table 11-3) show increases with the placement of casks at the ISFSI with the highest values at E-03 which is the closest to the ISFSI [see Figs. 9-1 and 9-2 for locations]. The results near the site boundary (E-31, 1.12 ± 0.07; E-32, 1.03 ± 0.14) are comparable to the background site E-20 (1.00 ± 0.16) within the associated measurement error, indicating no measurable increase in ambient gamma radiation at the site boundary due to the operation of the ISFSI.

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

	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

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

	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

* Pre-operation 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.

11.2 Milk

Except for Sr-90, the annual average radionuclide concentrations in milk continue to be statistically not different from zero. The Sr-90 concentrations result from the cycling of this radionuclide in the biosphere after the atmospheric weapons tests of the '50s, '60s, and '70s and the Chernobyl accident. Although these tests also introduced Cs-137 into the environment, Cs-137 binds more strongly to soils and is therefore less likely to be ingested by cows. As summarized in Table 3-2, PBNP did not release airborne Sr-90 in 2008. The 2008 average Sr-90 concentration of 0.9 ± 0.4 pCi/l is statistically identical to the 2007 average and comparable to previous years (see below):

Year	Annual Average Sr-90 Concentration (pCi/l)	Year	Annual Average Sr-90 Concentration (pCi/l)
1997	1.2 ± 0.5	2003	1.1 ± 0.4
1998	1.1 ± 0.5	2004	1.1 ± 0.4
1999	1.0 ± 0.3	2005	0.9 ± 0.4
2000	1.2 ± 0.6	2006	0.9 ± 0.3
2001	1.2 ± 0.5	2007	0.8 ± 0.4
2002	1.1 ± 0.7	2008	0.9 ± 0.4

Based upon the above data, it is concluded that the milk data for 2008 show no radiological effects of PBNP operation.

11.3 Air

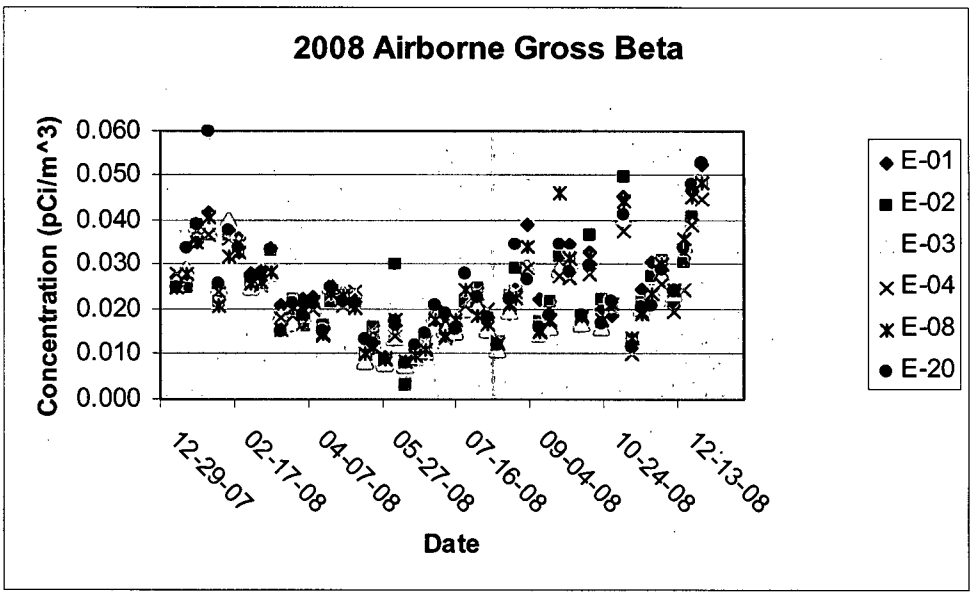
The average annual gross beta concentrations (plus/minus the one-sigma uncertainty) in weekly airborne particulates at the indicator and control locations were 0.023 ± 0.010 pCi/m^3 and 0.025 ± 0.011 pCi/m^3, respectively, and are similar to levels observed from 1993 through 2007 (Table 11-4).

Table 11-4
Average Gross Beta Measurements in Air

Year	Average (pCi/m3)	Year	Average (pCi/m3)
1993	0.022	2001	0.023
1994	0.022	2002	0.023
1995	0.021	2003	0.023
1996	0.021	2004	0.021
1997	0.021	2005	0.024
1998	0.022	2006	0.021
1999	0.024	2007	0.025
2000	0.022	2008	0.023

The gross beta concentration variation over the year usually reveals higher concentrations in the fall and winter as compared to the spring and summer. This is present again during 2008. However, for 2008, as in previous years, more scatter is observed during July-September (Figure 11-1). The cause for this scatter is likely due to a shift in land use or weather patterns .

Figure 11-1
2008 Airborne Gross Beta Concentration (pCi/m^3) vs. Time



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 0.007 pCi/m^3 to 0.029 pCi/m^3. The LLD analysis 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, results in the actual LLD to be about six times lower than the programmatic value given in Table 10-1. Similarly, the actual MDA is about one-sixth of that reported, or in the range of 0.001 pCi/m^3 to 0.005 pCi/m^3. Based upon the absence of any I-131 detected, the release of small amounts of radioiodine during April and October (Table 3-2) had no measurable impact on the environment.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Except for location E-04 near the site north boundary, no other indicator location or the control location shows results which are significantly different than zero. The second quarter result has a small, positive value for Co-60 ("Other"). About 9 µCi

of airborne Co-60 was released in April (Table 3-3) of the second quarter. The observed result is likely a false positive as evidenced by the prevailing wind direction and the absence of Co-58 which was also released during the same month of that quarter. By comparison, the measured concentration of naturally occurring Be-7 was 0.075 pCi/m^3 in the E-04 sample, as well as at the background site E-20. Be-7 is not required to be measured by the PBNP REMP; however, it serves as a means to monitor the internal consistency of the vendor's analytical program and for comparisons to radionuclides that may be in PBNP airborne effluent.

In summary, the 2008 air data do not demonstrate a significant environmental impact from the operation of PBNP.

11.4 Lake Water

For the suite of 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 Point Beach (see Figure 9-1). Only 46 lake water samples were collected because environmental conditions precluded sample collection at site E-01 and E-06 during December.

There were nine positive indications of gamma emitters during 2008. Of the 46 lake water samples 1 of 46 was statistically greater than zero for radionuclides Co-58, Mn-54, I-131, Ru-103, and Cs-137, while 2 of 46 were positive for Fe-59 and Ba/La-140. By comparison to liquid effluents for those months in which the positive lake water results were obtained, the Fe-59, Co-58, Ru-103, Ba/La-140, and I-131 are false positives, as none of these radionuclides were discharged in the months these samples were collected. In addition, positive results were detected for Fe-59, Mn-54, Co-58, and Cs-137 in various locations upstream of PBNP and hence are not attributable to PBNP. It should be noted that positive Cs-137 results are obtained for Lake Michigan water both north and south of PBNP due to the recycling of this long-lived radionuclide in the environment. Its source is the atmospheric weapons testing of the fifties and sixties with additional inputs from the Chernobyl accident. Based on these results and their occurrences, it is concluded that these results do not indicate a measurable impact of PBNP liquid discharges on Lake Michigan.

Aliquots of the monthly samples are composted quarterly and analyzed for Sr-89/90 and for tritium. Sr-90, like Cs-137, still persists in Lake Michigan from radioactive fallout. Therefore it is not surprising that positive results still occur. Nine of the sixteen composites were positive. No Sr-89 was detected in the samples. Tritium, in addition to being produced by water-cooled reactors such as PBNP, also is a naturally occurring radionuclide. The quarterly composite lake water samples collected and analyzed for H-3 in 2008 ranged from non-detectable to 1251 pCi/l. Only 4 of the 16 composites showed a detectable H-3 concentration and 3 of the 4 positives were north or upstream of PBNP. The individual months used to composite the sample yielding 1251 pCi/l were individually analyzed. Two of the months had non-detectable H-3. The April

result was 4,057 pCi/l indicating the sample was obtained on the day of a discharge from the Kewaunee Power Station.

11.5 Algae

Filamentous algae attached to rocks along the Lake Michigan shoreline are known to concentrate radionuclides from the water with concentration factor over a thousand for certain radionuclides. All six samples had small, positive concentrations of Cs-137. Co-58 and Co-60 were positive only in the June sample obtained near the PBNP discharge. All three radionuclides had been discharged the previous months. Since Cs-137 also occurrs north of the plant, it is likely that the Cs-137 detected is that which remains in the lake from atmospheric weapons testing conducted decades ago. By contrast, no cobalts were found in the algae in the August and October samples even though both cobalt isotopes had been discharged at comparable levels from January - October. Typically, the only fission product observed in algae is Cs-137. This year's average Cs-137 of 0.025 ± 0.011 pCi/g, is consistent with previous results (see below).

Year	Cs-137 Activity (pCi/g)	Year	Cs-137 Activity (pCi/g)
1995	0.034	2002	0.019
1996	0.05	2003	0.010
1997	0.03	2004	0.018
1998	0.027	2005	0.014
1999	0.031	2006	ND
2000	0.027	2007	0.014
2001	0.019	2008	0.025

By contrast, the concentrations of naturally occurring Be-7 and K-40 are higher: 1.49 pCi/g and 2.73 pCi/g, respectively. These results indicate only a minor, if any, effect by PBNP upon the environs.

11.6 Fish

No specified fission/corrosion radionuclide concentrations in fish greater than the required LLD were found in 2008. There were 2 fish with small, positive results for Cs-134. Because no Cs-134 was released during 2008, these results are considered to be false positives. Similarly, the one occurrence of Fe-59 also is interpreted as a false positive because the first discharge of Fe-59 occurred after the fish sample was obtained. The short half-life of Fe-59 makes it unlikely that positive result resulted from previous Fe-59 discharges which occurred in the second quarter of 2007. One fish did show a small amount of Ru-103, small quantities of which had been released in November 2008. Statistically positive Cs-137 concentrations were found in 7 of the 8 fish. The high Cs-137 value of 0.070 ± 0.025 pCi/g is comparable to the 0.049 and 0.055 pCi/g found in 2007 and 2006 but is lower than the high of 0.172 pCi/g in 2005 and considerably lower than the 2.8 pCi/g seen in PBNP samples obtained in the mid-1970s during the Chinese weapons tests. However, the Cs-137 results in fish are consistent with accumulation due to the recycling of atmospheric weapons

testing fallout of Cs-137 in Lake Michigan. By comparison, the concentration of naturally occurring K-40 (1.63–4.34 pCi/g) is about 20-60 times higher than the highest Cs-137 concentration. Based on these results, it is concluded that there is but a minor indication of a plant effect.

11.7 Well Water

No plant-related radionuclides were detected in well water during 2008 as all results were not significantly different from zero. The gross beta values result from naturally occurring radionuclides. There is no evidence of PBNP effluents reaching the aquifer supplying drinking water to PBNP.

11.8 Soil

Cs-137 is present in the soils throughout North America and the world. The main contributor to this worldwide distribution is the weapons testing in the 1950s and 1960s with lesser amounts from Chinese atmospheric nuclear tests in the 1970s and the 1986 Chernobyl accident. 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. The main modifiers of soil Cs-137 concentration levels are erosion and radioactive decay. The PBNP REMP results indicate that low levels of Cs-137 from fallout continue to be present in soil samples at about 1% of the levels of naturally occurring K-40. Fifteen of the 16 samples have Cs-137 concentrations statistically greater than zero ranging from 0.07 ± 0.02 to 0.35 ± 0.03 pCi/g. Gross beta for 2008 is consistent with the results for the last few years but higher than the averages from the 1990s (Table 11-5). Also, the results are quite uniform with the result close to the plant (E-01: 26 - 36 pCi/g) not being different from the background site some 17 miles away in the lowest χ/Q sector (E-20: 34 pCi/g). Therefore, there is no indication of a plant effect base on the comparison of indicator and background results.

Table 11-5
Average Gross Beta Concentrations in Soil

Year	Activity (pCi/g)	Year	Activity (pCi/g)
1993	23.6	2001	23.5
1994	19.4	2002	21.9
1995	18.0	2003	22.5
1996	19.4	2004	24.3
1997	22.8	2005	29.1
1998	20.0	2006	27.4
1999	23.1	2007	31.0
2000	22.1	2008	30.0

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. All 10 samples have Cs-137 concentrations statistically different from zero. The Cs-137 concentrations of the shoreline sediment are about one-tenth of that found in soils. This is expected because Cs-137 in the geological media is bound to clay as opposed to the sand found on the beach. Wave action winnows clay particles from the beach leaving the heavier sand; hence the lower Cs-137 concentrations in beach samples. In contrast to K-40 which is actually part of the minerals making up the clay and sand, Cs-137 is attached to soil/sand particle surfaces and is present at concentrations 1% or less of the naturally occurring concentrations of K-40. Lake Michigan sediments are a known reservoir of fallout Cs-137. In conclusion, the shoreline sediment data indicate no radiological effects from plant operation.

11.10 Vegetation

The naturally occurring radionuclides Be-7 and K-40 are found in all of the 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. In contrast, K-40 is a primordial radionuclide which is incorporated into vegetation from the soil during the growing process. Cs-137 can represent both pathways. Fresh Cs-137 fallout is associated, like Be-7, with deposition on the plant surface. Old fallout from the fifties and sixties is now being incorporated into growing plants in the same manner as potassium because it is in the same chemical family as potassium. Cs-137 has been consistently present in vegetation from E-06, a campground area in the Point Beach State Forest. As has been demonstrated at other sites in the United States which are far from any nuclear plants, Cs-137 fallout from the 1950s and 1960s is present in the ash produced by burning the wood in fireplaces. Typically, campground fires are put out using water and the ashes are spread on the ground. The ash acts as a fertilizer, releasing the cesium and potassium into the soil where they are available for uptake by growing plants and trees. The Cs-137 results from E-06 demonstrate that Cs-137 fallout from the Chernobyl accident and from atmospheric weapons tests continues to be recycled in the environment by the spreading of wood ash at camp sites. It is concluded that the Cs-137 found in the 4 of the 5 vegetation samples are not due to PBNP emissions because Cs-137 was not found in air samples where Be-7 was detected.

The two remaining programmatically specified radionuclides, I-131and Cs-134, had positive results 6 of 24 and 1 of 24 times, respectively. Cs-134 is a false positive because there were no airborne Cs-134 releases. Even though small amounts of I-131 were released during April and October, the results are determined to be false positives because I-131 was not detected in the air samples from the same locations as the vegetation, and because the concentrations at the indicator site are equal to the background site. Had the I-131 originated from the plant, the concentrations at the background site would be several orders of magnitude lower, based on the dilution which occurs during

the transport. Supporting this conclusion is the absence of Cs-137 in air samples obtained at these sites. Based on the 2008 vegetation sampling results, no effect from PBNP effluents are noted.

11.11 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 2008. No significant change in the use of pasturelands or grazing herds was noted. Therefore, the existing milk-sampling program continues to be acceptable and the use of the PBNP south site boundary for calculating doses via the grass-cow-milk pathway remains conservative.

12.0 REMP CONCLUSION

Based on the analytical results from the 806 environmental samples and from 116 sets of TLDs that comprised the PBNP REMP for 2008, PBNP effluents had no discernable, permanent effect on the surrounding environs. These results demonstrate that PBNP continues to have good controls on fuel integrity and on effluent releases. The control of effluents from PBNP continues to be acceptable pursuant to the ALARA criteria of 10 CFR 50.34a.

Part D
GROUNDWATER MONITORING

13.0 PROGRAM DESCRIPTION

The Point Beach Nuclear Plant monitors groundwater for tritium. During 2008 the sampling program consisted of six beach drains, five intermittent creek and bog locations, four drinking water wells, four façade wells, eight yard electrical manholes, six ground water monitoring wells, and the Unit 2 facade subsurface drainage system sump.

In the 1980s, 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 the observation that after modifications were made to the pool, the tritium concentrations decreased below detectability. 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.

The intermittent streams and the Energy Center (EC) 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. 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 site's meteorological tower. The intermittent stream samples track H-3 in the surface groundwater.

The groundwater monitoring program also includes two bogs or 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, three 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 EC well located south of the plant. 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 - 350 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.

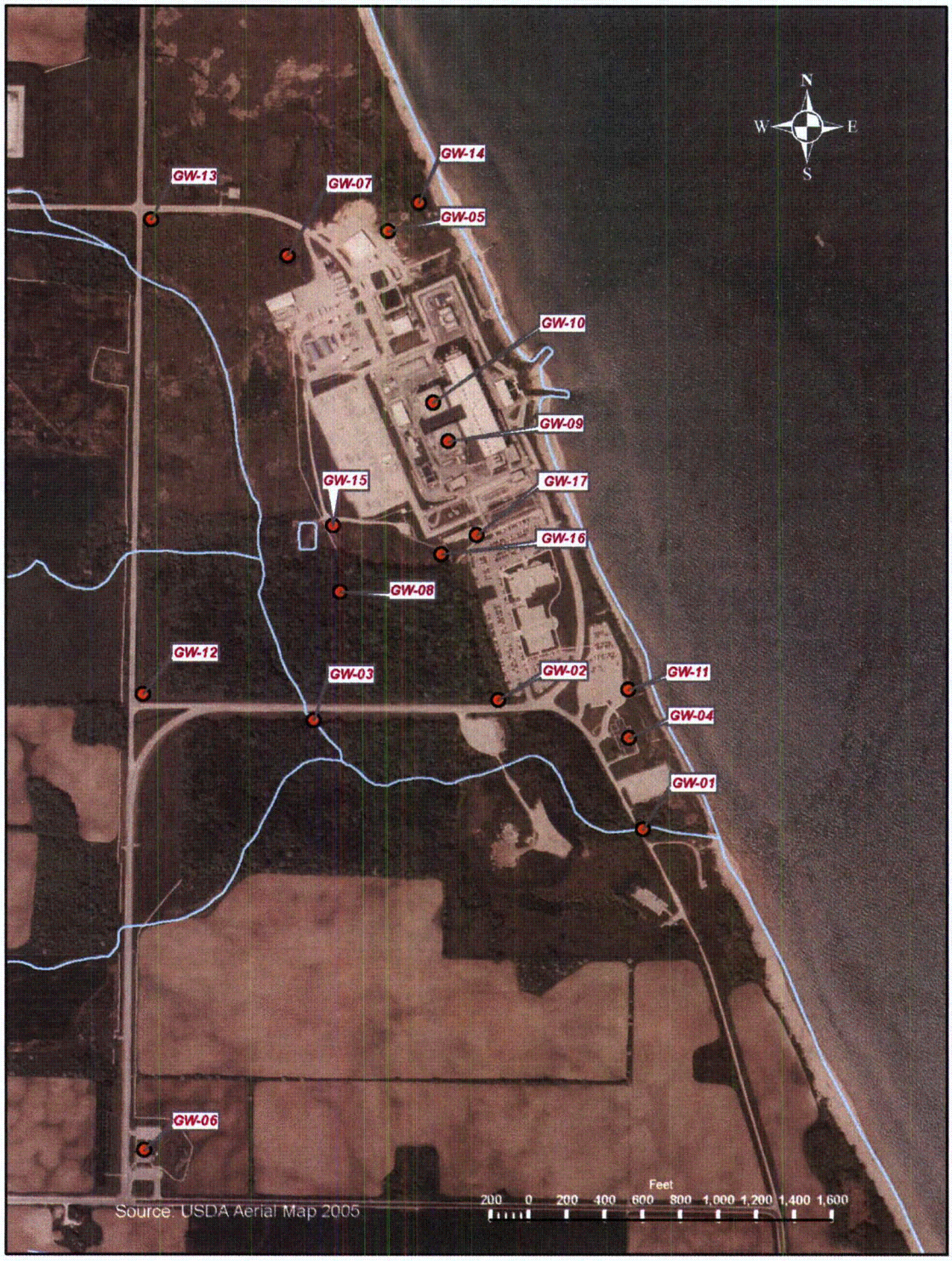
Manholes in the plant yard and for the subsurface drainage (SSD) system under the plant are available for obtaining ground water samples. The plant yard manholes for accessing electrical conduits are susceptible to ground water in-leakage. Therefore, a number of these were sampled. The SSD were designed to control 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. A monthly composite from this sump is analyzed as well as part of the program.

In the 1990s, two wells were sunk in each units façade to monitor the groundwater levels and look 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. Beginning in 2007, samples for the groundwater program were drawn as well. These wells are sampled at least three times a year.

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

14.1 Streams and Bogs

The results from the 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. There are more positive values for the East Creek than for the West Creek or for the confluence of the two creeks south of the plant near Lake Michigan. GW-08 is a bog near the former 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		MDA
	Creek Confluence	E. Creek	W. Creek	STP	GW-07	GW-08	
Jan	±	±	±	±			
Feb	±	±	±	±			
Mar	ND ±	276 ± 101	135 ± 96	252 ± 100	±	±	171
Apr	ND ±	342 ± 107	ND ±	123 ± 99	±	±	178
May	ND ±	ND ±	168 ± 80	±	ND ±	ND ±	145
Jun	ND ±	165 ± 92	ND ±	±	±	±	172
Jul	ND ±	ND ±	ND ±	±	±	±	150
Aug	±	±	±	±	±	±	152
			ND	±			
Sep	±	ND ±	ND ±	±	±	±	147
Oct	ND ±	141 ± 83	ND ±	180 ± 85	±	±	153
Nov	ND ±	ND ±	±	ND ±	±	±	147
Dec	±	±	±	±	±	±	133

1. A blank indicates no sample was available. Streams are sampled monthly; bogs, annually.
2. Values are presented as the measured value and the 95% confidence level counting error.
3. ND = not statistically different from zero at the 95% confidence level.

14.2 Beach Drains and SSD Sump

The results for the beach drains (Table 14-2) show low H-3 concentrations with most results in the 200 - 400 pCi/l range with one outlier, S-3, at 1100 pCi/l. The drain data from left to right in the table are in the order of the drains from north to south. S-1 exhibits the most consistent and uniform H-3 concentration. Based on the flow direction of the intermittent streams around the former retention pond, S-3 would be the drain most susceptible to contain tritiated groundwater in-leakage from the area around the former retention pond. S-1 is connected to the SSD sump in the Unit 2 façade and also is impacted by groundwater in-leakage. The monthly SSD sump composite results (Table 14-3) are generally higher than the S-1 results (Table 14-2). Beach drains S-7 and S-10 are fed by runoff from the Unit 2 and Unit 1 roofs respectively. Flow is not expected unless there is precipitation on the sampling day or there is melt-off of accumulated snow. S-8 and S-9 drain the small yard area between the plant and the lake. It is not known why the only occurrence of water flow from either S-8 or S-9 should have a measurable amount of H-3. However, it may be associated with groundwater in-leakage as electrical manholes M-1 and M-2 in the area have been found to contain low concentrations of H-3.

The reason for the high H-3 concentration at S-3 in January is unknown. However, recounts gave results at the comparable level: 1257 ± 130 and 1301 ± 137 pCi/l. A gamma scan of the sample for the radionuclides required for lake water did not detect Cs, Fe, Mn, Zn, Co, or other gamma emitters. Further analyses for Sr-89/90 also did not detect these strontium isotopes.

TABLE 14-2
2008 BEACH DRAIN TRITIUM
H-3 CONCENTRATION (pCi/l)

Month	S-1			S-7			S-8			S-9			S-10			S-3		
Jan	355	±	97	187	±	90	194	±	102	ND	±		320	±	107	1103	±	124
Feb	302	±	77	NF	±		NF	±		NF	±		NF	±		NF	±	
Mar	300	±	107	NF	±		NF	±		NF	±		NF	±		317	±	108
Apr	391	±	96	NF	±		215	±	89	NF	±		NF	±		401	±	97
May	275	±	93	NF	±		NF	±		NF	±		NF	±		266	±	92
Jun	357	±	101	NF	±		NF	±		NF	±		NF	±		425	±	103
Jul	352	±	95	NF	±		NF	±		NF	±		NF	±		142	±	86
Aug	292	±	88	NF	±		NF	±		NF	±		NF	±		277	±	87
Sep	78	±	77	NF	±		NF	±		NF	±		NF	±		356	±	89
Oct	350	±	111	NF	±		NF	±		NF	±		NF	±		127	±	102
Nov	313	±	88	NF	±		NF	±		NF	±		NF	±		254	±	85
Dec	NF	±		NF	±		NF	±		NF	±		NF	±		NF	±	
Average =	306						205									367		
Std dev =	83						15									277		

NF = no sample due to no flow

Table 14-3
U2 FACADE SUBSURFACE
DRAIN SUMP
H-3 CONCENTRATION (pCi/l)

Month	pCi/l		2σ
Jan	462	±	112
Feb	322	±	92
Mar	566	±	107
Apr	482	±	112
May	387	±	91
Jun	452	±	103
Jul	424	±	96
Aug	394	±	113
Sep	485	±	116
Oct	509	±	113
Nov	393	±	89
Dec	610	±	124

Samples are monthly composites.

14.3 Electrical Manholes

The manhole sample locations selected during 2008, are shown in Table 14-4. Manholes for access to below ground electrical facilities are susceptible to groundwater in-leakage as is evident by very low concentrations of H-3. MH-6, MH-7, and MH-8 collect groundwater draining from the switch yard.

Table 14-4
YARD MANHOLE TRITIUM
Activity (pCi/l)

Man Hole	pCi/l	±	2σ
MH-6	ND	±	
MH-7	242	±	105
MH-8	139	±	101
MH-67A	247	±	96
MH-67B	309	±	99
MH-67C	241	±	96
MH-67D	155	±	92
MH-68	223	±	95
Average =	198	±	87

ND = not detected

The manhole series M-67 A-D run from south to north on the east side of the Unit 2 Turbine Building. M-67A is located near the U2 truck bay and M-67D is

just east of the EDG Building. MH-68 is in the west side of this building, opposite MH-67D. Except for MH-6, in which no H-3 was detected, there is no statistical difference in the H-3 concentrations found in these manholes.

14.4 Façade Wells

Two wells are located in each unit's façade, one on each side of containment approximately 180° apart. Results for 2008 finds that the concentrations have been fairly constant in 2008 with slight decreasing trends in wells, 1Z-361A and 2Z-361B (Table 14-5).

Table 14-5
2008 FACADE WELL WATER TRITIUM
H-3 Concentration (pCi/l)

	UNIT 1		UNIT 2	
Month	**1Z-361A**	**1Z-361B**	**2Z-361A**	**2Z-361B**
Jan				
Feb				
Mar				
Apr	1169±122	210±87 ND	ND	268 ±88
May				
Jun				
Jul	1066±118	83±81	ND	464±97
Aug				
Sep				
Oct	929±117	102±82	ND	110±82
Nov				
Dec				

ND = not detected

By comparison to 2007, the 2008 H-3 concentrations in 1Z-361A (on the SE side of the U1 containment) are down about 400 pCi/l from their high of 1,525 pCi/l in 2007 whereas the concentrations at 1Z-361B (on the NE side of U1 containment) remain comparable, but slightly lower that the 2007 results. The biggest change occurred in 2Z-361B which has decreased from a 2007 high of 4,200 pCi/l to the current 110 pCi/l. What also remains apparent is the difference between the H-3 concentrations on opposite sides of each containment. This difference indicates that the groundwater H-3 is not uniformly distributed under the plant.

14.5 Potable Water and Monitoring Wells

In addition to the main plant well (Section 11.7), nine other wells are monitored for H-3. These consist of three potable water wells, GW-04, GW-05, and GW-06, and six H-3 groundwater monitoring wells, GW-11 through GW-16 installed

in 2007 (Figure 13-1). The monitoring wells are located at the periphery of the area affected by diffusion from the former retention pond and known spent fuel pool leakage during the 1970s. Two of the potable water wells are for buildings close to the plant (GW-04 and GW-05); the other (GW-06) is at the Site Boundary Control Center 3200 feet from the former retention pond. The potable water wells are from the deep aquifer whereas the monitoring wells are in the shallow (< 30 feet), surface water aquifer above the thick, impermeable clay layer separating the two. The EC well is sampled monthly and the other two potable wells, quarterly.

The results are presented in Table 14-6 show that two of the potable water results (GW-04 and GW-06) are considered positive, *i.e.* detected. However, the two positive results do not meet the minimum detectable activity (>MDA) criterion for being sufficiently different from background at the 95% confidence level. In conclusion, potable water wells GW-04, GW-05 and GW-06 had no statistically detectable H-3. Also analyses for gamma emitters, I-131, and Sr-90, did not find any of the radionuclides in GW-05 and GW-06 well water.

Table 14-6
2008 WELL WATER TRITIUM
H-3 Concentration (pCi/l)

Month	EIC WELL GW-04	Warehouse 6 Well GW-05	SBCC Well GW-06	MW-01 GW-11	MW-02 GW-12	MW-06 GW-13	MW-05 GW-14	MW-04 GW-15	MW-03 GW-16
Jan	ND	ND	ND	ND	ND	110±96	96±96	456±109	NS
Feb	ND			ND	ND	ND	96±92	404±105	204±97
Mar	ND			138±93	ND	108±91	124±92	450±105	232±97
Apr	ND	ND	107±84	ND	ND	ND	86±82	466±98	182±86
May	ND			108±77	ND	125±78	189±81	450±93	262±85
Jun	ND			124±91	ND	102±90	138±91	533±107	334±99
Jul	ND	ND	ND	97±82	ND	ND	ND	433±94	198±84
Aug	ND			86±80	ND	104±81	96±81	507±100	150±83
Sep	ND			ND	ND	ND	ND	434±111	202±102
Oct	ND	ND	ND	106±85	ND	ND	ND	542±104	151±87
Nov	ND			ND	ND	ND	ND	344±88	ND
Dec	121±106			ND	85±74	79±74	ND	396±88	213±80

ND = not detected, NS = no sample
April gamma scans, I-131, and Sr analyses of GW-05 and GW-06 found no activity
July gamma scans, I-131, and Sr analyses of GW-05 and GW-06 found no activity

Applying the same statistical criteria to samples from monitoring wells GW-11 through GW-14 reveals that for GW-14, the only positive result which met >MDA occurred in May. All of the measured concentrations at GW-15 and all of GW-16, except for August and November, met the >MDA criterion. The highest H-3 concentration occurred at GW-15, the well nearest the location of the former retention pond. This well is near the area where the pond pre-remediation groundwater survey found a tritium concentration of 14,000 pCi/l. Although

GW-16 is eastward of GW-15 in the direction groundwater would flow, the concentrations are lower.

14.6 Miscellaneous Sampling

In addition to groundwater, analyses have been made of rainwater. Rainwater H-3 measurements were undertaken in order to obtain information on potential background levels of tritium. Another reason for sampling the rainwater is to determine whether it is possible to see the outwash of atmospheric H-3 releases from PBNP. Therefore, a sampler was placed at the Site Boundary Control Center (E-04), which is located in the highest χ/Q sector and near the western (E-03) and northern (E-04) boundaries. Results do not indicate significant washout of H-3 at the site boundary (Table 14-7).

Table 14-7
2008 PRECIPITATION H-3

Collection Date	E-02		E-03		E-04	
	pCi/l	2σ	pCi/l	2σ	pCi/l	2σ
1/23/2008	62	52	-	-	-	-
4/3/2008	94	52	54	52	66	52
5/8/2008	76	52	50	52	67	52
9/10/2008	44	52	31	52	40	52
10/9/2008	52	52	69	52	61	52
11/6/2008	<19	52	34	52	34	52
12/3/2008	66	52	48	52	<19	52

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. Except for the monitoring wells downstream from the former retention pond, the monitoring well tritium concentrations are not different from zero.

Results will continue to be evaluated to determine whether additional groundwater monitoring sites are needed.

ENCLOSURE 2

NEXTERA ENERGY POINT BEACH, LLC
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

2008 ANNUAL MONITORING REPORT

ENVIRONMENTAL MANUAL
REVISION 20
NOVEMBER 11, 2008

36 pages follow

EM

ENVIRONMENTAL MANUAL

DOCUMENT TYPE:	Controlled Reference
REVISION:	20
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OWNER GROUP:	Chemistry

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1.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ADMINISTRATION

1.1 Definition and Basis

1.1.1 Definition

Radiological environmental monitoring is the measurement of radioactivity in samples collected from the atmospheric, aquatic and terrestrial environment around the Point Beach Nuclear Plant (PBNP). Monitoring radioactivity in effluent streams at or prior to the point of discharge to the environment is not part of the Radiological Environmental Monitoring Program (REMP).

1.1.2 Basis

The REMP is designed to fulfill the requirements of 10 CFR 20.1302, PBNP 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.

No significant radionuclide concentrations of plant origin are expected in the plant environs because radioactivity in plant effluent is continuously monitored to ensure that releases are well below levels which are considered safe upper limits. The REMP is conducted to demonstrate compliance with applicable standards, to assess the radiological environmental impact of PBNP operations, and to monitor the efficacy of inplant effluent controls. The REMP, as outlined in Tables 2-2 through 2-4 is designed to provide sufficient sample types and locations to detect and to evaluate changes in environmental radioactivity.

Radioactivity is released in liquid and gaseous effluents. Air samplers and thermoluminescent dosimeters placed at various locations provide means of detecting changes in environmental radioactivity as a result of plant releases to the atmosphere. Because the land area around PBNP is used primarily for farming and dairy operations, sampling of vegetation is conducted to detect changes in radiological conditions at the base of the food chain. Sampling of area-produced milk is conducted because dairy farming is a major industry in the area.

Water, periphyton, and fish are analyzed to monitor radionuclide levels in Lake Michigan in the vicinity of PBNP. Periphyton, attached algae, along with lake water samples, provide a means of detecting changes which may have a potential impact on the radionuclide concentrations in Lake Michigan fish. Because of the migratory behavior of fish, fish sampling is of minimal value for determining radiological impact specifically related to the operation of the Point Beach Nuclear Plant. However, fish sampling is carried out as a conservative measure with emphasis on species which are of intermediate trophic level and which exhibit minimal migration in order to monitor the status of radioactivity in fish.

Vegetation, algae, and fish sampling frequencies are qualified on an "as available" basis recognizing that certain biological samples may occasionally be unavailable due to environmental conditions.

1.2 Responsibilities for Program Implementation

1.2.1 Chemistry Functions

Chemistry together with Regulatory Affairs (RA) provides the Plant Manager with the technical, regulatory, licensing, and administrative support necessary for the implementation of the program. The Chemistry administrative functions relating to the REMP fall into the six broad areas outlined below.

a. Program scope

The scope of the REMP is determined by the cognizant Chemist based on sound radiological principles for the fulfillment of PBNP Technical Specifications (TS) and the applicable Federal Regulations. Based on the scope, the Environmental Manual (EM) is written to accomplish the collection and analyses of the necessary environmental samples. The EM is revised as necessary to conform to changes in procedures and scope. Chemistry monitors the REMP effectiveness and compliance with TS and with the procedures and directives in the EM. In order to verify compliance with TS, Nuclear Oversight arranges for program audits and Supplier Assessments of the contracted radioanalytical laboratory.

b. Record keeping

The monthly radioanalytical results from the contracted laboratory are reviewed by Chemistry and one copy of the monthly radioanalytical results from the contracted laboratory is kept for the lifetime of the plant.

c. Data monitoring

Chemistry reviews and interprets all program analytical results on a monthly basis as they are reported. Trends, if any, are noted. Any resulting corrections, modifications and additions to the data are made by Chemistry . Inconsistencies are investigated by Chemistry with the cooperation of Radiation Protection (RP) and contractor personnel, as required. Unusual results as evidenced by radioactivity levels exceeding administrative notification levels are also investigated. Results of the investigation will be conveyed to the Plant Manager. Chemistry will promptly inform the Plant Manager of any sample exceeding Nuclear Regulatory Commission (NRC) regulatory notification levels and will initiate an investigation. A formal report shall be provided to the Plant Manager upon completion of the investigation.

d. Data summary

REMP results shall be summarized annually for inclusion in the PBNP Annual Monitoring Report. This summary advises the Plant Manager of the radiological status of the environment in the vicinity of PBNP. The summary shall include the numbers and types of samples as well as the averages, statistical confidence limits and the ranges of analytical results. Methods used in summarizing data are at the discretion of Chemistry.

e. Contractor communications

Communication with the contractor regarding data, analytical procedures, lower limits of detection, notification levels and contractual matters are normally conducted by Chemistry. Communication regarding sample shipment may be done by either RP or Chemistry as appropriate.

f. Reportable items

1. Chemistry shall generate all technically-specified reports related to the operation of the REMP. The material included shall be sufficient to fulfill the objectives outlined in Sections IV.B.2 and IV.B.3 of Appendix I to 10 CFR 50. The following items and occurrences, are required to be reported in the PBNP Annual Monitoring Report:

   (a) Summary and discussion of monitoring results including number and type of samples and measurements, and all detected radionuclides, except for naturally occurring radionuclides;

   (b) Unavailable, missing, and lost samples and plans to prevent recurrence and comments on any significant portion of the REMP not conducted as indicated in Tables 2-3 through 2-4.

   (c) New or relocated sampling locations and reason for change;

   (d) LLDs that are higher than specified in Table 2-2 and factors contributing to inability to achieve specified LLDs;

   (e) Notification that the analytical laboratory does not participate in an interlaboratory comparison program and corrective action taken to preclude a recurrence; and

   (f) Results of the annual milk sampling program land use census "milk survey" to visually verify that the location of grazing animals in the vicinity of the PBNP site boundary so as to ensure that the milk sampling program remains as conservative as practicable.

2. The following items are required to be reported to the NRC within 30 days of occurrence pursuant to the criteria of Section 2.2.4:

   (a) Confirmed environmental radionuclide concentrations, attributable to PBNP effluents, in excess of notification levels;

   (b) Confirmed results of weighted sum calculations involving radionuclide concentrations, attributable to PBNP effluents, in environmental samples in excess of the specified notification level; and

(c) The report shall, to the extent possible, identify the cause(s) for exceeding the limit(s) and define the corrective actions taken to reduce radioactivity in effluents so that the potential dose to a member of the public will not exceed the annual limits.

3. The annual results from the contracted REMP analytical laboratory as well as the laboratories analytical QA/QC results, in-house blanks, interlaboratory comparisons, etc., shall be transmitted to the NRC, Region III, with, or as a separate concurrent submittal, the Annual Monitoring Report.

4. The Annual Monitoring Report for the previous 12 month period, or fraction thereof, ending December 31, shall be submitted to the NRC by April 30 of the following year.

1.2.2 Non-Chemistry Functions

The primary responsibility for the implementation of the PBNP REMP and for any actions to be taken at PBNP, based on the results of the program, resides with the Plant Manager.

a. Manual control and distribution

The distribution of the PBNP Environmental Manual is the responsibility of Document Control.

b. Program coordination

The daily operation of the program is conducted by PBNP Radiation Protection personnel, and other qualified personnel as required, under the supervision of an RP staff member who consults, as needed, with Chemistry. The daily administrative functions of the RP Management Employee address those functions required for the effective operation of the PBNP Radiological Environmental Monitoring Program. These administrative functions include the following:

1. Ensuring that samples are obtained in accordance with the type and frequency in Table 2-4 following procedures outlined in this manual;

2. Ensuring adequate sampling supplies and calibrated, operable equipment are available at all times;

3. Ensuring that air sampling pumps are maintained, repaired and calibrated as required and that an adequate number of backup pumps are readily available at all times;

4. Reporting lost or unavailable samples as well as other potential deviations from the sampling regime in Table 2-4 via the Corrective Action Program and notifying the cognizant Chemist.

5. Assisting the State of Wisconsin in obtaining samples at co-located and other sampling sites based upon a yearly, renewable agreement; and

6. Assisting Chemistry, as necessary, with investigations into elevated radioactivity levels in environmental samples.

1.3 Quality Assurance/Quality Control

Quality assurance considerations are an integral part of PBNP's Radiological Environmental Monitoring Program. The program involves the interaction of Chemistry, site quality assurance and the contracted analytical vendor. The contracted vendor shall participate in an interlaboratory comparison program. The laboratory is audited periodically, either by PBNP or by an independent third party.

Quality control for the PBNP portion of the Radiological Environmental Monitoring Program is achieved by following the procedures contained in this manual. Health Physics Technologists (HPTs) collect, package and ship environmental samples under the supervision of Radiation Protection supervisors. They are advised by Radiation Protection Management who has immediate responsibility for the overall technical operation of the environmental sampling functions. The HPTs receive classroom training as well as on-the-job training in carrying out these procedures.

An audit of the PBNP Radiological Environmental Monitoring Program and its results shall be completed periodically as a means of monitoring program effectiveness and assuring compliance with program directives. The audit shall be performed in accordance with Section 1.4 of the ODCM.

1.4 Program Revisions

This manual describes the current scope of the PBNP Radiological Environmental Monitoring Program. Program items or procedures periodically may be updated or changed, consistent with good radiologically monitoring practices, either to reflect new conditions or to improve program effectiveness. Technical and program features described in this manual may be changed with the approval of the PORC and Plant Manager pursuant to the requirements stated in the ODCM.

2.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

2.1 Program Overview

2.1.1 Purpose

No significant or unexpected radionuclide concentrations of plant origin are expected because each normal effluent pathway at PBNP is monitored at or before the release point. However, the REMP is conducted to verify that plant operations produce no significant radiological impact on the environment and to demonstrate compliance with applicable standards.

2.1.2 Samples

Samples for the REMP are obtained from the aquatic, terrestrial and atmospheric environment. The sample types represent key indicators or critical pathways identified by applying sound radiological principles to the PBNP environment.

2.1.3 Monitoring sensitivity

The effectiveness of the REMP in fulfilling its purpose depends upon the ability to accurately determine the nature and origins of fluctuations in low levels of environmental radioactivity. This requires a high degree of sensitivity so that it is possible to correctly discriminate between fluctuations in background radiation levels and levels of radioactivity that may be attributable to the operation of PBNP. Therefore, personnel actively participating in the monitoring program should make every effort to minimize the possibility of contaminating environmental samples and to obtain samples of the appropriate size.

2.2 Program Parameters

2.2.1 Contamination avoidance

Contamination prevents the accurate quantification of environmental radioactivity and the correct differentiation between fluctuating background radioactivity and levels of radioactivity attributable to the operation of PBNP. Therefore, it is necessary that all personnel associated with collecting and handling radiological environmental samples take the appropriate precautions to minimize the possibility of contaminating the samples. Some of the precautions that should be taken and which will help to minimize contamination are listed below:

a. Equipment which has been on the controlled side, even if released clean, should not normally be used in conjunction with radiological environmental monitoring. An exception to this is the HPTI equipment used to calibrate the air flow calibrator.

b. Store sampling equipment in radiologically clean areas only;

c. Store radiological environmental samples only in radiologically clean areas when samples cannot be shipped to the contractor on the same day they are collected;

d. Treat each sample as a possible source of contamination for other samples so as to minimize the possibility of cross-contamination;

e. Radiological environmental monitoring equipment should be repaired in clean-side shops;

f. Contamination avoidance for environmental TLDs is covered in Section 2.4.2; and

g. Avoid entering contaminated areas prior to collecting environmental samples.

2.2.2 Sample size

Sample size affects the sensitivity achievable in quantifying low levels of environmental radioactivity. Therefore, sampling personnel must attempt to attain the quantities of sample specified in Table 2-1. When a range is given, every effort should be made to obtain a quantity at the upper part of the range.

2.2.3 Lower limit of detection

The sensitivity required for a specific analysis of an environmental sample is defined in terms of the lower limit of detection (LLD). The LLD is the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with a 95% probability and have only a 5% probability of falsely concluding that a blank observation represents a real signal. Mathematically, the LLD is defined by the formula

$$LLD = \frac{4.66\, S_b}{E \times V \times 2.22 \times Y \times EXP(-\lambda \Delta T)}$$

Where

LLD	=	the a priori lower limit of detection in picocuries per unit volume or mass, as applicable;
S_b	=	the standard deviation of the background counting rate or the counting rate of a blank sample, as appropriate, in counts per minutes;
E	=	counting efficiency in counts per disintegration;
V	=	sample size in units of volume or mass, as applicable;
2.22	=	number of disintegrations per minute per picocurie;
Y	=	the fractional chemical yield as applicable;
λ	=	the radioactive decay constant for the particular radionuclide; and
ΔT	=	the elapsed time between sample collection, or the end of the collection period, and the time of counting.

Typical values of E, V, Y, and ΔT are used to calculate the LLD. As defined, the LLD is an a priori limit representing the capability of a measuring system and not an a posteriori limit for a particular measurement.

The required analysis for each environmental sample and the highest acceptable LLD associated with each analysis are listed in Table 2-2. Whenever LLD values lower than those specified in Table 2-2 are reasonably achievable, the analytical contractor for the radiological environmental samples will do so. When the LLDs listed in Table 2-2 are not achieved, a description of the factors contributing to the higher LLD shall be reported in the next PBNP Annual Monitoring Report.

2.2.4 Notification levels

The Notification Level (NL) is that measured quantity of radioactivity in an environmental sample which, when exceeded, requires a notification of such an occurrence be made to the appropriate party. Regulatory and administrative notification levels are listed in Table 2-2.

a. Regulatory notification levels

The regulatory notification levels listed in Table 2-2 represent the concentration levels at which NRC notification is required. If a measured level of radioactivity in any radiological environmental monitoring program sample exceeds the regulatory notification level listed in Table 2-2, resampling and/or reanalysis for confirmation shall be completed within 30 days of the determination of the anomalous result. If the confirmed measured level of radioactivity remains above the notification level, a written report shall be submitted to the NRC. If more than one of the radionuclides listed in Table 2-2 are detected in any environmental medium, a weighted sum calculation shall be performed if the measured concentration of a detected radionuclide is greater than 25% of the notification levels. For those radionuclides with LLDs in excess of 25% of the notification level, a weighted sum calculation needs to be performed only if the reported value exceeds the LLD. Radionuclide concentration levels, called Weighted Sum Action Levels, which trigger a weighted sum calculation are listed in Table 2-2.

The weighted sum is calculated as follows:

$$\frac{\text{concentration (1)}}{\text{notification level (1)}} + \frac{\text{concentration (2)}}{\text{notification level (2)}} + \ldots = \text{weighted sum}$$

If the calculated weighted sum is equal to or greater than 1, resampling and/or reanalysis for confirmation shall be completed within 30 days of the determination of the anomalous result. If the confirmed calculated weighted sum remains equal to or greater than 1, a written report shall be submitted to the NRC. This calculation requirement and report is not required if the measured level of radioactivity was not the result of plant effluents.

b. Administrative notification levels

The administrative notification levels are the concentration levels at which the contracted analytical laboratory promptly notifies the cognizant Chemistry Specialist by phone, followed by a formal written communication. The administrative notification levels are set lower than the NRC regulatory notification levels and lower than, or equal to, the weighted sum action levels so that the nature and origin of the increased level of environmental radioactivity may be expeditiously ascertained and corrective actions taken if required.

2.2.5 Sampling locations

A list of sampling locations and the corresponding location codes appear in Table 2-3. The locations also are shown in Figures 2-1a, 2-1b, and 2-1c. It is conceivable that samples may become unavailable from specified sample locations. If this were to occur, new locations for obtaining replacement samples shall be identified and added to the Radiological Environmental Monitoring Program. If milk or vegetation samples become unavailable from the specified sampling locations, new sampling locations will be identified within 30 days. The specific locations where samples were unavailable may be deleted from the monitoring program. A formal, written reason for the new site and its location shall be transmitted to Chemistry who will make the appropriate changes to the Environmental Manual. Any significant changes in existing sampling location and the criteria for the change shall be reported in the Annual Monitoring Report for the period in which the change occurred. Additional sampling locations may be designated if deemed necessary by cognizant company personnel. Figures and tables in this manual shall be revised to reflect the changes.

2.2.6 Sampling media and frequency

The sampling frequency for the environmental media required by the PBNP REMP is found in Table 2-4. In addition to samples required by the former Technical Specifications, the Radiological Environmental Monitoring Program also includes the sampling of soil and shoreline sediment. To ensure that all samples are obtained at the appropriate times, a checklist is used. The checklist provides a month-by-month indication of all samples, to be obtained at each sampling location (PBF-4121a through 4121l). These checklists also identify the schedule for the annual milk survey and provides space for recording the date samples were shipped offsite for analysis. In addition, the checklist lists each sampling location to identify all samples, to be obtained and the collection date. Because the weekly air samples require additional information, a separate checklist is used for each individual air sampling location for calculations and other information as shown in PBF-4078.

It is recognized that on occasions samples will be lost or that samples cannot be collected at the specified frequency because of hazardous conditions, seasonable unavailability, automatic sampling equipment malfunctions and other legitimate reasons. Reasonable efforts will be made to recover lost or missed samples if warranted and appropriate. If samples are not obtained at the indicated frequency or location, the reasons or explanations for deviations from the sampling frequency specified in Table 2-4 shall be submitted to the PBNP Corrective Action Program.

2.2.7 Sample labeling

All samples must be properly labeled to ensure that the necessary information is conveyed to the analytical contractor and that the results are associated with the correct geographical location. Each label (PBF-4026) must contain the following:

a. Sample type;

b. Sample location from Table 2-3;

c. Date and time (as appropriate) collected;

d. Air samples must show the total volume in m^3; volumes for water and milk are in gallons; vegetation, sediment, soil, and algae are indicated as $\leq$1000 grams; and fish $\geq$1000 grams;

e. Analyses for routine samples are indicated as "per contract." For special samples, the Radiation Protection manager or another Radiation Protection Management Employee will designate the analyses required; and

f. Name of person collecting the sample.

A permanent or indelible ink type felt-tip marker shall be used.

A separate sample label is needed for each sample type and location. Labels are securely attached to each sample container. In addition to sample labels, other identifying markings may be placed on sample containers as appropriate.

2.2.8 Sample shipping

All environmental samples are shipped to a contractor for analysis. The samples shall be packaged and shipped in such a way as to minimize the possibility of cross-contamination, loss, spoilage and leakage. Each sample shipment shall have a typed cover letter and, when appropriate, a contractor data collection sheet. Included in the letter shall be the same information required for the sample labels as well as the specific analyses required. The original cover letter and data collection sheet shall be sent to the contractor under separate cover; one copy of each is to be used as a packing list and a copy of each shall be kept in the appropriate PBNP file.

2.2.9 Sample analyses and frequency

The PBNP REMP samples shall be analyzed for designated parameters at the frequency listed in Table 2-4. Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to effluents from PBNP. Typically, this entails the scanning of the spectrum from 80 to 2048 keV and decay correcting identified radionuclides to the time of collection. The analysis specifically includes, but is not limited to, Mn-54, Fe-59, Zn-65, Co-58, Co-60, Zr-Nb-95, Ru-103, I-131, Cs-134, Cs-137, Ba-La-140, Ce-141, and Ce-144.

2.2.10 Analytical laboratory

The analyses shall be performed by a laboratory that participates in an interlaboratory crosscheck program. If the laboratory is not participating in such a program, a report shall be made pursuant to 1.2.1.f.1.(e). The current laboratory is:

Environmental Incorporated Midwest Laboratory
700 Landwehr Road
Northbrook, IL 60062-4517
(847) 564-0700

This laboratory performs the analyses in such a manner as to attain the desired LLDs. The contracted laboratory participates in an inter-laboratory comparison crosscheck program.

The contractor is responsible for providing prompt notification to the cognizant Chemist regarding any samples found to exceed the administrative notification levels as identified in Table 2-2.

2.3 Assistance to the State of Wisconsin

As a courtesy and convenience, PBNP personnel obtain certain environmental samples for the Section of Radiation Protection, Department of Health and Family Services of the State of Wisconsin as listed in Table 2-5. A checklist is used. In addition, a State of Wisconsin air sampling data sheet is submitted with each sample obtained at Wisconsin air sampling locations serviced by PBNP personnel.

State of Wisconsin precipitation samples collected twice a month (or as available) require a state sample tag to be placed in a box with the quart cubitainer. State supplied labels for air particulate filters require start and stop time, date and beginning and ending volume. Fish sent to the state identify only the quarter and the year using a PBNP label (PBF-4026). The monthly lake water sample may be picked up by state personnel and in which case these samples require only that the date and location be written on the box for the cubitainer. The well water samples, 2 times/year, may be picked similar to lake water samples.

Samples obtained for the State of Wisconsin are either given directly to state personnel or shipped as required. The department address is:

State Lab of Hygiene
Radiochemistry Unit
2601 Agriculture Dr.
PO Box 7996
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2.4 Specification of Sampling Procedures

General radiological environmental sampling procedures follow the directives presented in Sections 2.1 and 2.2. Specific information for handling individual sample types follow.

2.4.1 Vegetation

Vegetation samples consist of green, growing grasses and weeds and are obtained three times per year, as available, from specified locations. New growth, not dead vegetation, should be used because these samples are indicators of recent atmospheric deposition. Use a scissors or other sharp cutting tool to cut the grasses and weeds off as close to the ground as possible. Do not include plant roots and take care not to contaminate the sample with soil. Total sample collected should exceed 500 grams and ideally should be 1000 grams. Place entire sample in an appropriate container, such as a plastic bag (tape the bag shut) and label the container as described in Section 2.2.7.

2.4.2 Thermoluminescent dosimeters (TLDs)

TLDs capable of multiple, independent measurements of the same exposure are posted at locations specified in Table 2-4 and are changed quarterly. The utmost care in handling is required to minimize unnecessary exposure during transit, storage and posting because the TLDs begin recording all radiation from the moment they are annealed (heated to rezero) at the contractor's laboratory. Packages of TLDs in transit should be marked "DO NOT X-RAY."

Transportation control (TLDs) shall accompany the new batch in transit from the contractor's laboratory to the plant. The control TLDs shall accompany the batch during brief storage and subsequent posting. The same control TLDs shall accompany the "old" or exposed batch on its way back to the contractor. Therefore, each control represents the sum of approximately half the in-transit exposure of the two batches. This control system is able to identify any unusual in-transit exposure.

Environmental TLDs should never be brought into the plant RCA or any other area with elevated radiation, but may be stored for brief periods in a shielded enclosure in the RP Office Area or other low background area, such as the Energy Information Center or the Site Boundary Control Center. The contractor is to time shipments to coincide as closely as possible with the beginning of a calendar quarter. TLDs should be shipped back to the contractor immediately or within 24 hours of removal. The contractor is instructed to process the samples immediately upon receipt. The contractor shall report removal data and cumulative readings in mR for all locations and control, correct for in-transit exposure and express results in net mR/7 days. Labels of the exposed set for shipment to contractor should show both posting and removal dates.

2.4.3 Lake water

Lake water samples are obtained monthly at specified locations. The contractor is responsible for the compositing for quarterly analyses. Collect approximately 8000 ml of lake water in the required number of cubitainers, or other appropriate containers, at each location and label as directed in Section 2.2.7.

Also, lake water is collected for the State of Wisconsin pursuant to Table 2-5. The sample is collected, labeled, and forwarded to the appropriate State agency.

2.4.4 Well water

Well water samples are obtained quarterly from the single onsite well.

Sample should be obtained from PW-80, T-90 Hydro-pneumatic Tank Drain

After purging 8 gallons, collect approximately 8000 ml of well water using the required number of cubitainers or other appropriate containers. Label as directed in Section 2.2.7.

2.4.5 Air

a. Sample collection

Air filters are changed weekly at specified locations and placed in glassine envelopes for shipment to the vendor for analyses. Take precautions to avoid loss of collected material and to avoid contamination when handling filters. Washing hands before leaving the plant to change filters is a recommended practice.

Both particulate filters and charcoal cartridges are employed at each sampling location. Particulate filters are analyzed for gross beta activity after waiting for at least 24 hours to allow for the decay of short-lived radon and thoron daughter products. The contractor makes quarterly composites of the weekly particulate samples for gamma isotopic analyses.

A regulated pump (Eberline Model RAS-1 or equivalent) is used at each air sampling location. Because of the automatic flow regulation, rotameter readings at the beginning and ending of the sampling period should be nearly identical. Substantial differences in readings usually require some investigation to determine the cause. The rotameters attached to the pumps are calibrated in liters per minute. When new filters are installed, flow rate should be about 28-30 lpm. Flow rates less than 26 lpm or greater than 32 lpm require that the pump regulator be readjusted. The correct flow rate is determined by multiplying the rotameter reading by the correction factor indicated on the calibration sticker affixed to the rotameter.

Some pumps are equipped with an elapsed time meter which reads in hours. Form PBF-4078 is used for recording pertinent air sampling data for each location. At a normal filter change, the following procedure will apply:

1. Record "date off" and "time off."

2. Record rotameter reading for end of period (R_2).

3. Turn off pump, if necessary, and record hour meter reading or actual time for end of period (t_2).

4. Before removing the filter, label the sample envelope as directed in Section 2.2.7. Also enter any other pertinent information at this time. Always write data on the envelope before inserting the particulate filter in the envelope.

5. Remove particulate filter being careful to handle filter only by edges, place in the glassine envelope.

6. Remove charcoal cartridge, place in plastic bag, and label as directed in Section 2.2.7.

7. Install new charcoal cartridge and particulate filter being sure to check the charcoal cartridge for breaks and the particulate filter for holes in the filter surface. Discard unacceptable filter media.

8. Record "date on."

9. Record hour meter reading or time for beginning of period (t_1).

10. Turn pump on (if necessary).

11. Perform weekly gross leak test by blocking the air flow with a large rubber stopper. (For this test only, the rotameter ball may register zero or drop all the way to the bottom. The difference between zero and the bottom is not significant.)

12. Record rotameter reading for beginning of period (R_1).

13. Record correction factor as indicated on calibration sticker affixed to rotameter (C).

14. Observe that the starting rotameter reading (R_1) is close to the previous ending reading (R_2). A substantial difference indicates need for further investigation because the regulator will generally maintain constant flow regardless of filter loading.

15. Calculate total volume for period and enter on data sheet (m^3). (This step may be performed at a later time.)

16. Any unusual conditions or observations should be referenced under (*) and recorded under "*NOTES" at the bottom of the data sheet.

    Air samples are collected for the State of Wisconsin at two locations, one of which is co-located with a PBNP air sampling site. They are handled in a manner similar to PBNP samples except that no charcoal cartridges are involved. However, state samplers are equipped with volume integrating meters. Therefore, clock time must be recorded in addition to the ending and beginning volumes. Label and forward samples to the State.

b. Air sampling system description

The air monitoring equipment for the PBNP air sampling program consists of a Regulated Rate Control System. The Regulated Rate Control System is used at PBNP because of its simplicity and reliability. It is designed to minimize both calibration difficulties and the potential for leaks. The regulated rate control system includes a pump, a flow regulator, the appropriate filter holders and a minimum of tubing. Also, it may include an elapsed time meter. In this system, the total volume sampled can be calculated simply and accurately from the elapsed time and the flow rate which is kept constant by the regulator regardless of filter loading.

The air samplers are Eberline Model RAS-1 (or equivalent) and have built-in rotameters which read in liters per minute. The systems also include an Eberline WPH-1 (or equivalent) weatherproof housing and an iodine cartridge holder and mounting kit and may include an electric hour meter. Glass fiber, 47 mm diameter, particulate filters capable of collecting 95% of 1 micron diameter particles and iodine impregnated charcoal cartridges (Scott or equivalent) constitute the filter media.

c. Calibration

Calibrate the pump rotameter at initial installation and at yearly intervals thereafter by connecting a laboratory-quality reference flow meter with NIST traceable calibration to the filter face with the particulate filter and charcoal cartridge in position. Upon completion, a calibration sticker indicating the correction factor is affixed to, or near, the built-in rotameter. The results are recorded on Form PBF-4020.

d. Inspection and maintenance

Weekly gross leak checks shall be accomplished as indicated in the appropriate PBNP procedure.

For normal operation, the regulators should be adjusted to maintain a true flow rate of 28-30 liters per minute. Adjustments are made by turning the screw marked FLOW ADJUST located on the side of the regulator body: counterclockwise increases flow, clockwise decreases flow. Flow rates should be observed at all filter changes. Flow rates less than 26 lpm or more than 32 lpm require readjustment of the regulator. Particular attention should be paid to flow rate readings with the "old," loaded filter and with new, unused filters in position. Because of the regulator, the difference in flow should be barely perceptible, perhaps no more than one lpm. Significant differences in flow rates require further investigation to determine the cause.

Preventive maintenance shall be performed as indicated in the appropriate PBNP procedure on all environmental air samplers and the results recorded on Form PBF-4020.

e. Pump repair and replacement

The pumps can operate for long periods of time with minimal or no maintenance. The vane assembly of the pump is most susceptible to failure, indicated by excessive noise or inability to maintain sufficient flow across loaded filters. At least one standby pump should be available for temporary service during the repair period. In the event of motor failures due to causes other than defective connections, complete replacement of the unit may be necessary. All pump repairs should be done in a clean-side shop with clean tools.

2.4.6 Milk

Because of iodine decay and protein binding of iodine in aging milk samples, speed is imperative in processing and samples must be kept cool to avoid degradation and spoilage of the samples. Milk samples are obtained monthly in conjunction with the State of Wisconsin Milk Sampling Program from three individual dairy farmers located north, south, and west of the site. Milk sampling data can also be obtained from the Kewaunee Nuclear Power Plant, whose radiological environmental monitoring program includes samples taken from a dairy in Green Bay, WI. This location could act as a control location.

Because two of the three sites are co-located, the PBNP pickup is coordinated to coincide with the State arranged schedule. The pickup usually will be the first Wednesday of the month.

The following sequence should be followed:

a. After verifying the State milk pickup date with the Manitowoc Public Health Department (Mr. Mark Chatenka, phone number 683-4454), notify Mr. Leon Strutz (755-2060) of the pickup date. This must be done because the Strutz farm (PBNP sampling location E-21) is not a State of Wisconsin sampling site.

b. Because the milk must be kept cool, but not frozen, fill enough cubitainers, or other appropriate containers, with water and freeze to be able to put one in each shipping container. Fill the containers with water and freeze the day preceding the pickup.

c. The milk from the Strutz farm (E-21) must be picked up before 0900 because that is the time the Strutz milk is shipped. A late arrival may mean a missed sample. Milk from sites E-11 and E-40 may be picked up any time after the Strutz pickup.

d. Identify yourself and the nature of your business at each milk pickup site. Collect two one-gallon samples from each site, using a funnel if necessary. If shipment cannot occur on the collection day, store the milk in a clean-side refrigerator overnight. DO NOT FREEZE.

e. Complete a PBNP sample tag according to Section 2.2.7 for each gallon sample and place in the box with the sample. Do not seal the box. Place the samples in insulated containers and turn them over to Ready Stores personnel for shipment. Make sure that the cover letter and, as appropriate, the contractor data collection sheets are sent according to Section 2.2.8 of this manual.

2.4.7 Algae

Filamentous algae are collected from pilings or rocks three times per year, as available, from two locations. The long, grassy, dark green algae can normally be cut with scissors. The shorter, light green algae normally must be scraped from rocks or pilings. When scraping algae, be careful not to include pieces of rock in the sample. The sample can be lightly rinsed in the same medium in which it is growing. This rinse will help rid the sample of pieces of rock and gravel that may have been inadvertently collected with the sample. Because rocks and sediment contain naturally occurring radioactive materials, their inclusion may give false sample results. Collect between 100 and 1000 gm of algae. A sample greater than 500 gm is preferred. Place the algae in a wide-mouth poly bottle or other appropriate container and label the container as director in Section 2.2.7. The algae must be kept cool to prevent spoilage.

2.4.8 Fish

Fish are obtained three times per year (March, August and December) as available either from the traveling screens as washed into the fish basket or by other methods as required. For any given sampling period, three fish, or a sufficient number to yield at least 1000 gm of fillets, should be provided.

Place fish in plastic bags and tape and/or tie tightly closed. Fish are stored briefly in a radiologically clean freezer. It may be desirable in warm weather to coordinate milk and fish sampling, thereby allowing simultaneous shipment in insulated containers. Pack fish samples with ice if needed. Label bags as directed in Section 2.2.7, being sure to indicate fish species when possible. Following packaging of fish, remove and discard any fish left in the freezer. This avoids sending fish that are not representative of the sampling period.

Fish are obtained four times per year (March, June, September and December) for the State of Wisconsin. Fish sampling for the State is performed in the same manner as that for the plant. Approximately four fish should be sent to the state at each sampling period.

2.4.9 Soil

Soil integrates atmospheric deposition and acts as a reservoir for long-lived radionuclides. Although soil sampling is a poor technique for assessing small incremental releases and for monitoring routine releases, it does provide a means of monitoring long-term trends in atmospheric deposition in the vicinity of PBNP. Therefore, soil samples are obtained two times per year from specified locations.

Clear the vegetation from a 6" x 6" area, being careful to leave the top layer of soil relatively intact. Remove root bound soil by shaking the soil onto the cleared area or into the sample container before discarding the roots. When necessary, it is preferable to leave some roots in the soil rather than to lose the top layer of soil.

Remove the soil to a depth of three inches. If necessary, expand the area, instead of digging deeper, to obtain the required amount of sample. If an area larger than 6" x 6" is used, notify Chemistry of the area used. The minimum acceptable quantity is 500 grams. Place the entire soil sample in a wide-mouth poly bottle or another appropriate container. If a plastic bag is used, seal the bag with tape. Label the sample as directed in Section 2.2.7.

This procedure assumes that the samples are obtained from undisturbed land; land that has not been plowed within approximately the last 25 years. If the land has been plowed, the soil should be sampled to the plow depth which typically is eight inches. Place the soil in a clean bucket or appropriate size plastic bag, homogenize the soil and place 1000 grams of the well mixed soil sample in a plastic bag, or other appropriate container, and label as described above.

2.4.10 Shoreline Sediment

Shoreline sediment consisting of sand and smaller grain size material is sampled two times per year from specified locations. The 1000 gram sample is collected, from beach areas near the water ridge. At each location collect representative samples of sediment types roughly in proportion to their occurrence. For example, at E-06 avoid collecting a sample which consists exclusively of the dark-brown to black sediments which occur in layers up to several inches thick. Package the sample in a wide-mouth poly bottle or other appropriate container and label as described in Section 2.2.7.

2.5 Milk Survey

The milk sampling program is reviewed annually, including a visual verification of animal grazing in the vicinity of the site boundary, to ensure that sampling locations remain as conservative as practicable. The verification is conducted each summer by cognizant PBNP personnel. Because it is already assumed that milk animals may graze up to the site boundary, it is only necessary to verify that these animals have not moved onto the site. No animal census is required. Upon completion of the visual check, RP personnel will notify Chemistry in writing. To ensure performance of the annual verification, "milk review" is identified on the sampling checklist (i.e., the PBF-4121a-l series).

TABLE 2-1
RECOMMENDED MINIMUM SAMPLE SIZES

Sample Type	Size
Vegetation	100-1000 gm
Lake Water	8 liters (2 gal)
Air Filters	250 m^3
Well Water	8 liters (2 gal)
Milk	8 liters (2 gal)
Algae	100-1000 gm
Fish (edible portions)	1000 gm
Soil	500-1000 gm
Shoreline Sediment	500-1000 gm

TABLE 2-2
SAMPLE TYPES AND ASSOCIATED LOWER LEVEL OF DETECTION (LLD) AND NOTIFICATION LEVEL VALUES

SAMPLE TYPE	REPORTING UNIT	PARAMETER	LLD[a]	NOTIFICATION LEVELS NRC (Regulatory)	NOTIFICATION LEVELS PBNP[b] (Admin.)	WEIGHTED SUM ACTION LEVEL
Vegetation	pCi/g wet	Gross Beta	0.25	---	60	---
		Cs-137	0.08	2	0.40	0.50
		Cs-134	0.06	1	0.20	0.25
		I-131	0.06	0.1	0.06	0.06
		Other[c]	0.25	---	2.0	---
Shoreline Sediment and Soil	pCi/g dry	Gross Beta	2.0	---	100	---
		Cs-137	0.15	---	20	---
		Other[c]	0.15	---	20	---
Algae	pCi/g wet	Gross Beta	0.25	---	12	---
		Cs-137	0.25	10	1	2.5
		Cs-134	0.25	10	1	2.5
		Co-58	0.25	10	1	2.5
		Co-60	0.25	10	1	2.5
		Other[c]	0.25	---	1	---
Fish	pCi/g wet	Gross Beta	0.5	---	125	---
		Cs-137	0.15	2	0.40	0.50
		Cs-134	0.13	1	0.20	0.25
		Co-58	0.13	30	3	7.5
		Co-60	0.13	10	1	2.5
		Mn-54	0.13	30	3	7.5
		Fe-59	0.26	10	1	2.5
		Zn-65	0.26	20	2	5.0
		Other[c]	0.5	---	6	---
TLDs	mR/7 days	Gamma Exposure	1mR/TLD	---	5mR/7 days	---
Lakewater[e] and Well Water	pCi/L-T.S.[d]	Gross Beta	4	---	100	---
		Cs-134	15	30	15	15
		Cs-137	18	50	18	18
		Fe-59	30	400	40	100
		Zn-65	30	300	30	75
		Zr-Nb-95	15	400	40	100
		Ba-La-140	15	200	20	50
		Co-58	15	1,000	100	250
		Co-60	15	300	30	75

TABLE 2-2

Lakewater and Well Water (Continued)	pCi/L-T.S.[d]	Mn-54	15	1,000	100	250
		I-131	2	---	2	---
		Other	30	---	100	---
		H-3	3,000	30,000	3,000	7,500
		Sr-89	10	---	50	---
		Sr-90	2	---	20	---
Milk	pCi/L	Sr-89	5	---	100	---
		Sr-90	1	---	100	---
		I-131	0.5	3	0.5	0.75
		Cs-134	15	60	15	15
		Cs-137	18	70	18	18
		Ba-La-140	15	300	30	75
		Other[c]	15	---	30	---
Air Filter	pCi/m^3	Gross Beta	0.01	---	1.0	---
		I-131	0.07	0.9	0.09	0.2
		Cs-137	0.06	20	2.0	5.0
		Cs-134	0.05	10	1.0	2.5
		Other[c]	0.1	---	1.0	---

(a) The LLDs in this column are the maximum acceptable values.
(b) The values in this column are not technical specifications.
(c) Other refers to non-specified identifiable gamma emitters.
(d) T.S. = total solids.
(e) No drinking water

TABLE 2-3
RADIOLOGICAL ENVIRONMENTAL 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 - Water and shoreline sediment samples at the Coast Guard Station; soil and vegetation from the Point Beach State Park campground area N of the Coast Guard Station and on the W side of County Road O; TLD located South of lighthouse on telephone pole.
E-07	WPSC Substation on County Rt. V, about 0.5 Miles West of Hwy. 42
E-08	G. J. Francar Property, at the Southeast Corner of the Intersection of Cty. B and Zander Road
E-09	Nature Conservancy
E-10	PBNP Site Well
E-11	Dairy Farm (W. Funk), about 3.75 Miles West of Site
E-12	On fence at U-2 discharge flume
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	WSW, Hwy. 42, 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 (L. Strutz) 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	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 on westernmost pole between the 2nd and 3rd parking lots,
E-29	On fence near propane tank NE of Warehouse #8
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

TABLE 2-3

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 in line with first designated treeline 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 SE corner of KNPP parking lot. Sample south of creek.
E-38	On tree W of former Retention Pond site
E-39	On tree E of former Retention Pond site
E-40	Local Dairy Farm, about 1.8 miles north of intersection of Highway 42 and Nuclear Road (Manitowoc County), on West side of Highway 42.
E-TC	Transportation Control; Reserved for TLDs

TABLE 2-4
PBNP RADIOLOGICAL ENVIRONMENTAL SAMPLE COLLECTION AND ANALYSIS FREQUENCY

Sample Type	Sample Codes	Analyses	Frequency
Environmental Radiation Exposure	E-01, -02, -03, -04, -05, -06, -07, -08, -09, -12, -14, -15, -16, -17, -18, -20, -22, -23, -24, -25, -26, -27, -28, -29, -30, -31, -32, -38, -39, -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 (on total solids)	Quarterly
Lake Water	E-01, -05, -06, -33	Gross Beta H-3, Sr-89, 90 I-131 Gamma Isotopic Analysis (on total solids)	Monthly Quarterly composite of monthly collections Monthly Monthly
Milk	E-11, -21, -40	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

TABLE 2-5
SAMPLES COLLECTED FOR STATE OF WISCONSIN

	Sample Type	Location	Frequency
1.	Lake Water	E-01	Monthly
2.	Air Filters	E-07 E-08	Weekly
3.	Fish	E-13	Quarterly, As Available
4.	Precipitation	E-04 E-08	Twice a month, As Available
5.	Milk	E-11 E-40	Monthly
6.	Well Water	E-10	2 times/year

FIGURE 2-1a
RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

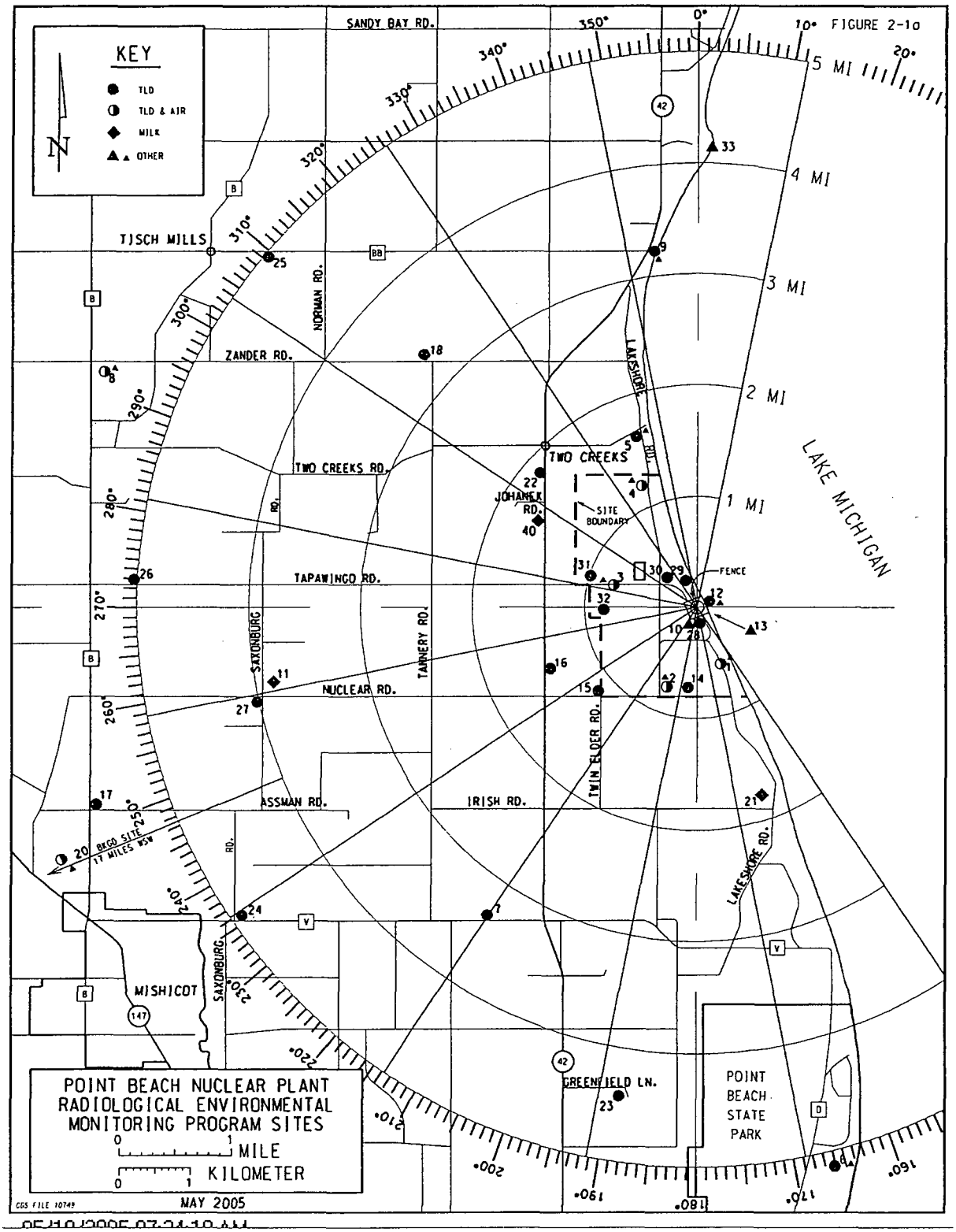

FIGURE 2-1b
RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

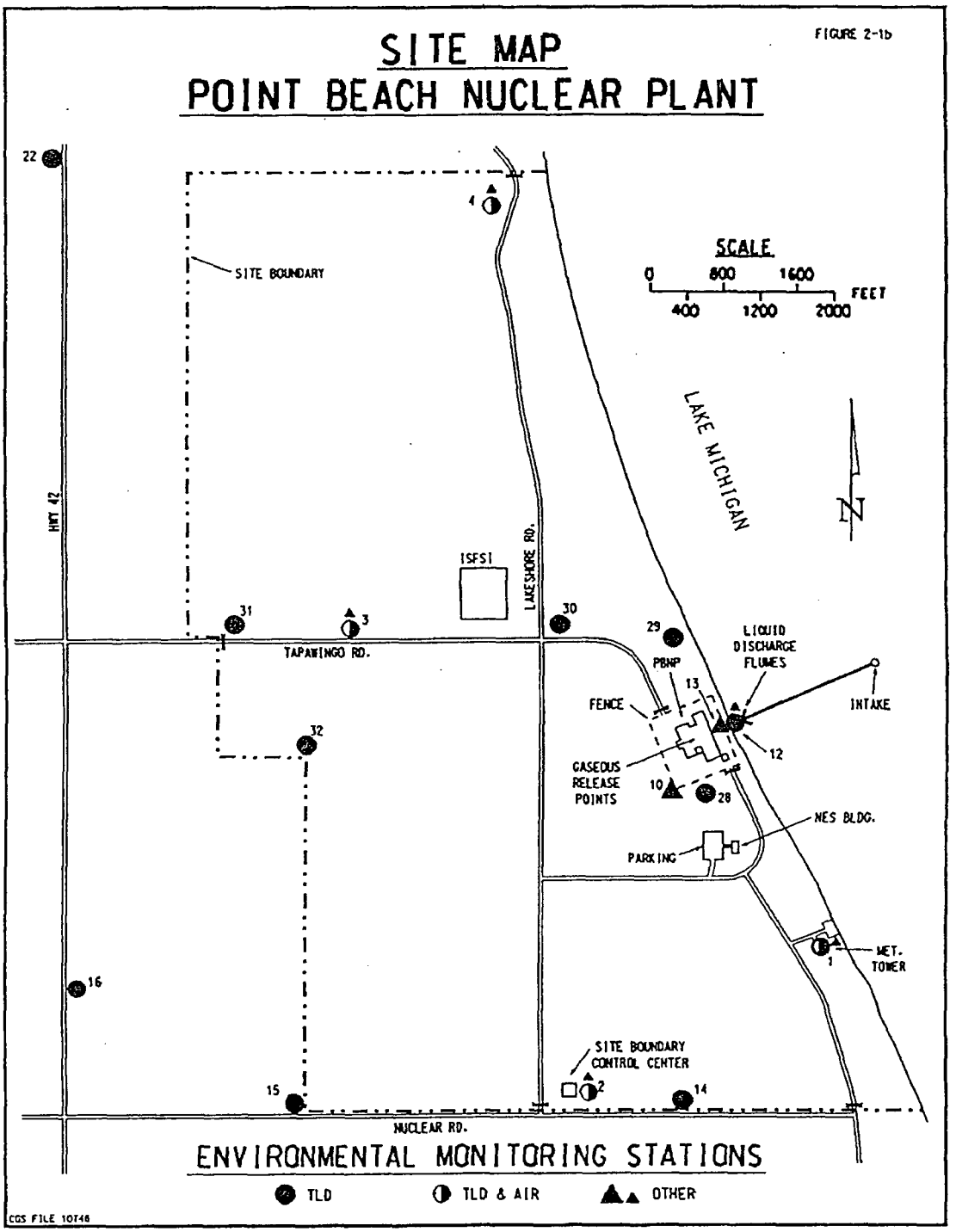

FIGURE 2-1c
RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS