WISCONSIN ELECTRIC

POWER COMPANY

POINT BEACH NUCLEAR PLANT

UNIT NOS. 1 AND 2

ANNUAL
MONITORING REPORT

JANUARY 1996 through DECEMBER 1996

U.S. Nuclear Regulatory
Commission
Docket Nos. 50-266 and 50-301
Facility Operating License Nos.
DPR-24 and DPR-27

ANNUAL MONITORING REPORT

January 1, 1996 to December 31, 1996

PREFACE

This Annual Monitoring Report for the period of January 1, 1996, through December 31, 1996, is submitted in accordance with Point Beach Nuclear Plant Unit Nos. 1 and 2 Technical Specification 15.7.8.4 and filed under Docket Nos. 50-266 and 50-301 for Facility Operation License Nos. DPR-24 and DPR-27, respectively.

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1.0 RADIOACTIVE LIQUID RELEASES

The total radioactive liquid release, excluding tritium for this reporting period, was 4.82E-02 curies. This included 1.91E-03 curies in processed radioactive waste, 1.31E-03 curies in Unit 1 steam generator blowdown, 4.46E-02 curies in Unit 2 steam generator blowdown and 3.49E-04 curies in retention pond effluent.

The total tritium release for this reporting period was 4.19E+02 curies. This included 4.12E+02 curies in processed radioactive waste, 1.09E-01 curies in Unit 1 steam generator blowdown, 5.11E+00 curies in Unit 2 steam generator blowdown and 2.09E+00 curies in retention pond effluent.

1.1 Circulating Water Radionuclide Release Summary

Releases During Current Reporting Period

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 1-1. Table 1-1 also contains the comparison between the annual Appendix I dose limits for liquid effluent and the corresponding highest doses calculated according to the ODCM using the annual isotopic composition of the liquid discharge.

1.2 Isotopic Composition of Circulating Water Discharges

Releases During Current Reporting Period

The isotopic composition of circulating water discharges during the current reporting period is presented in Table 1-2.

Table 1-1

SUMMARY OF CIRCULATING WATER DISCHARGE

JANUARY 1, 1996 THROUGH DECEMBER 31, 1996

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Activity Released [Ci]													
Gamma Scan plus Fe-55	5.49E-03	5.16E-03	5.37E-03	5.96E-03	6.59E-03	5.24E-03	3.84E-03	5.03E-03	3.36E-03	1.57E-03	3.90E-04	1.19E-04	4.81E-02
Gross Alpha					2.11E-06					2.03E-06	3.00E-06		7.14E-06
Tritium	5.99E+01	3.08E+01	6.19E+01	2.66E+01	4.29E+01	2.85E+01	7.55E+00	6.96E+01	3.30E+01	4.49E+01	5.10E+00	8.11E+00	4.19E+02
Strontium	3.05E-07	2.07E-07	6.07E-06	7.77E-06			1.46E-07			3.50E-05	2.07E-06		5.16E-05
Total Volume Released [gal]													
Processed Waste	6.21E+04	3.64E+04	1.18E+05	2.59E+05	7.46E+04	6.92E+04	2.96E+04	8.68E+04	4.71E+04	1.49E+05	7.82E+04	4.39E+04	1.05E+06
U1 Steam Generator Blowdown	2.20E+06	2.09E+06	2.29E+06	8.58E+05	3.56E+06	2.98E+06	2.67E+06	2.68E+06	2.57E+06	2.68E+06	2.56E+06	2.68E+06	2.98E+07
U2 Steam Generator Blowdown	2.64E+06	2.51E+06	2.66E+06	2.58E+06	2.79E+06	2.93E+06	2.85E+06	2.68E+06	2.57E+06	4.21E+05	0.00E+00	0.00E+00	2.46E+07
Retention Pond	2.68E+06	2.52E+06	2.66E+06	2.60E+06	3.88E+06	5.03E+06	4.05E+06	3.85E+06	3.50E+06	2.74E+06	2.14E+06	2.14E+06	3.78E+07
Total	7.58E+06	7.16E+06	7.73E+06	6.30E+06	1.03E+07	1.10E+07	9.60E+06	9.30E+06	8.69E+06	5.99E+06	4.78E+06	4.86E+06	9.33E+07
Volume of Dilution Water [cc]	3.31E+13	3.10E+13	3.31E+13	3.96E+13	5.45E+13	5.56E+13	5.75E+13	5.75E+13	5.56E+13	5.88E+13	3.54E+13	3.42E+13	5.46E+14
Avg. Diluted Discharge Conc. [uCi/cc]													
Gamma Scan plus Fe-55	1.66E-10	1.66E-10	1.62E-10	1.51E-10	1.21E-10	9.43E-11	6.67E-11	8.75E-11	6.04E-11	2.67E-11	1.10E-11	3.47E-12	8.81E-11
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.45E-14	8.47E-14	0.00E+00	1.31E-14
Tritium	1.81E-06	9.94E-07	1.87E-06	6.72E-07	7.87E-07	5.13E-07	1.31E-07	1.21E-06	5.94E-07	7.64E-07	1.44E-07	2.37E-07	7.67E-07
Strontium	9.21E-15	6.68E-15	1.83E-13	1.96E-13	0.00E+00	0.00E+00	2.54E-15	0.00E+00	0.00E+00	5.95E-13	5.85E-14	0.00E+00	9.45E-14
Maximum Discharge Conc. [uCi/cc]													
Gross Gamma	2.49E-10	3.27E-10	2.02E-10	5.10E-10	2.22E-10	2.01E-10	1.47E-10	1.50E-10	1.99E-10	1.48E-10	1.10E-10	1.72E-10	
Tritium	3.79E-05	3.69E-05	4.04E-05	2.48E-05	3.56E-05	4.24E-05	6.15E-06	4.29E-05	3.26E-05	2.57E-05	4.10E-06	2.78E-05	

Note: Dissolved noble gasses detected in liquid effluents are included in airborne release totals

COMPARISON OF 1996 LIQUID EFFLUENT DOSES TO ANNUAL APPENDIX I DOSE OBJECTIVES

Annual Limit [mrem]	January-December Highest Total Calculated Dose [mrem]	% of 10 CFR 50, Appendix I, Dose Objective
6 (whole body)	3.27E-03 (infant)	5.5E-02
20 (any organ)	3.46E-03 (infant thyroid)	1.7E-02

Table 1-2

ISOTOPIC COMPOSITION OF CIRCULATING WATER DISCHARGES

JANUARY 1, 1996 THROUGH DECEMBER 31, 1996

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Isotope	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]
H-3	5.99E+01	3.08E+01	6.19E+01	2.66E+01	4.29E+01	2.85E+01	7.55E+00	6.96E+01	3.30E+01	4.49E+01	5.10E+00	8.11E+00	4.19E+02
F-18	4.39E-03	4.03E-03	4.51E-03	4.40E-03	4.82E-03	3.97E-03	2.40E-03	3.28E-03	2.33E-03	3.17E-04	1.50E-04		3.46E-02
NA-24	7.52E-05				1.69E-04	1.87E-04				1.17E-04			5.48E-04
MN-54				2.07E-06									2.07E-06
CO-57				2.53E-06		1.52E-06							4.05E-06
CO-58	1.61E-05	1.07E-05	1.55E-05	1.41E-04	4.40E-05	2.69E-05		2.55E-05	1.72E-05	7.93E-05	5.90E-05	2.13E-05	4.57E-04
CO-60	2.16E-05	2.10E-05	6.58E-05	1.37E-04	4.97E-05	1.03E-04	3.44E-05	2.85E-05	1.64E-05	3.16E-05		1.57E-05	5.25E-04
SR-89											1.48E-06		1.48E-06
SR-90	3.05E-07	2.07E-07	6.07E-06	7.77E-06			1.46E-07			3.50E-05	5.92E-07		5.01E-05
NB-97			1.11E-05	1.04E-05	5.24E-06	4.97E-06							3.17E-05
ZR-97		4.67E-06						2.07E-06					6.74E-06
TC-99M				1.02E-06									1.02E-06
AG-110M	3.16E-05	6.98E-05	1.10E-05	1.16E-04	1.27E-05	1.46E-05	5.41E-06	8.52E-05	1.10E-04	2.55E-04	5.80E-05	7.95E-05	8.49E-04
SB-125							8.82E-05	7.33E-05					1.62E-04
TE-131							7.68E-05	6.38E-05					1.41E-04
TE-132		1.60E-06											1.60E-06
CS-137	8.36E-05	2.64E-04	7.53E-05	8.68E-06	3.54E-04	1.26E-05	5.32E-05	3.92E-04		2.80E-04	1.23E-04	2.08E-06	1.65E-03
I-131		1.09E-04		8.37E-05	5.56E-05					1.34E-04			3.92E-04
I-132				1.02E-04									1.02E-04
I-133	8.67E-04	6.50E-04	6.77E-04	9.60E-04	1.07E-03	9.23E-04	1.18E-03	1.08E-03	8.82E-04	3.54E-04			8.64E-03

Note: Dissolved noble gasses detected in liquid effluents are included in airborne release totals

1.3 Subsoil Drain System Releases of Tritium

Table 1-3 indicates that there were no tritium releases via the subsoil drain system during 1996.

TABLE 1-3

SUBSOIL SYSTEM DRAINS - TRITIUM SUMMARY
January 1, 1996 through December 31, 1996

	S1	S3	S9	S10	Total
First Quarter					
H-3 [uCi/cc]	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
Ave. Flow [gpd]	4.8E+02	2.4E+02	0.0E+00	1.3E+04	1.3E+06
Second Quarter					
H-3 [uCi/cc]	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
Ave. Flow [gpd]	1.8E+04	3.0E+03	9.0E+01	8.8E+03	2.7E+06
Third Quarter					
H-3 [uCi/cc]	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
Ave. Flow [gpd]	2.2E+03	1.0E+03	4.8E+02	2.1E+04	2.3E+06
Fourth Quarter					
H-3 [uCi/cc]	0.0E+00	0.0E+00	0.0E+00	0.0E+00	
Ave. Flow [gpd]	1.0E+04	1.6E+03	0.0E+00	1.9E+04	2.9E+06
Annual Totals					
Released [Ci]	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Flow [gal]	2.8E+06	5.4E+05	5.2E+04	5.7E+06	9.1E+06

1.4 Land Application of Sewage Sludge

The Wisconsin Department of Natural Resources has approved the land-application of sewage sludges on various Wisconsin Electric Power Company properties surrounding the Point Beach Nuclear Plant. These sewage sludges, which may contain trace amounts of radionuclides, are applied in accordance with methodologies approved on January 13, 1988, pursuant to 10 CFR 20.302(a). The amounts discharged in the sewage during this reporting period are presented in Table 1-4.

TABLE 1-4

SEWAGE SLUDGE LAND APPLICATIONS
January 1, 1996 through December 31, 1996

Date of Application	Gallons	Site	Activity Released [Ci]
June 28.1996	12,600	PB-02	<MDA
October 1, 1996	5,400	PB-02	<MDA

2.0 RADIOACTIVE AIRBORNE RELEASES

The release paths contributing to radioactive airborne release totals during this reporting period were the auxiliary building vent stack, drumming area vent stack, gas stripper building vent stack, Unit 1 containment purge stack, Unit 2 containment purge stack, combined air ejector decay duct exhaust and turbine building ventilation exhaust.

There were three gas decay tank releases during this reporting period.

2.1 Radioactive Airborne Release Summary

Radioactivity released in airborne effluents for the current reporting period are summarized in Table 2-1. Table 2-1 also contains the comparison of the annual Appendix I dose limits for atmospheric effluents to the highest organ dose and the noble gas doses calculated using ODCM methodology.

2.2 Isotopic Airborne Releases

The monthly isotopic airborne releases for 1996 are presented in Table 2.

TABLE 2-1

RADIOACTIVE AIRBORNE RELEASE SUMMARY
JANUARY 1, 1996 THROUGH DECEMBER 31, 1996

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Noble Gasses [Ci] [1]	1.05E-01	1.01E-01	1.41E-01	2.15E+00	2.12E-01	3.23E-01	1.52E-01	1.41E-01	3.80E-01	1.93E+00	5.90E-02	1.64E+00	7.33E+00
Total Radioiodines [Ci]	0.00E+00	0.00E+00	8.60E-06	4.89E-06	9.58E-05	1.35E-05	1.28E-07	1.36E-06	0.00E+00	1.30E-04	0.00E+00	0.00E+00	2.54E-04
Total Particulates [Ci]	5.78E-08	6.99E-07	3.47E-05	1.18E-06	1.84E-04	2.71E-08	8.52E-07	5.33E-06	1.10E-06	6.43E-08	3.31E-07	2.78E-07	2.28E-04
Alpha [Ci]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.89E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.86E-09	3.25E-09	2.78E-07	2.88E-07
Strontium [Ci]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-08	2.46E-08	1.56E-08	0.00E+00	0.00E+00	0.00E+00	5.95E-08
All Others [Ci]	5.78E-08	6.99E-07	3.47E-05	1.18E-06	1.84E-04	2.71E-08	8.32E-07	5.31E-06	1.08E-06	6.24E-08	3.28E-07	0.00E+00	2.28E-04
Total Tritium [Ci]	4.80E+00	3.99E+00	7.05E+00	1.52E+01	3.71E+00	4.11E+00	3.44E+00	1.57E+00	4.22E+00	1.08E+01	5.54E+00	8.62E+00	7.31E+01
Max Hourly Release [Ci/sec]	2.93E-09	7.12E-07	8.46E-07	2.00E-06	1.20E-05	1.18E-06	7.11E-07	1.04E-06	1.35E-06	4.67E-05	1.05E-05	1.11E-06	

[1] Includes noble gas contribution from liquid releases.

COMPARISON OF 1996 EFFLUENT DOSES TO APPENDIX I DOSE OBJECTIVES

Category	Annual Appendix I Dose Objective	January-December Calculated Dose [mrem]	Percent of Appendix I Dose Objective
Particulate	30 mrem/organ	1.41E-02	4.7E-02
Noble Gas	40 mrad (β air)	1.23E-03	3.1E-03
Noble Gas	20 mrad (γ air)	2.36E-03	1.2E-02
Noble Gas	30 mrem (skin)	1.57E-03	5.2E-02
Noble Gas	10 mrem (whole body)	2.86E-03	2.9E-02

TABLE 2-2

ISOTOPIC COMPOSITION OF 1996 AIRBORNE RELEASES
JANUARY 1, 1996 THROUGH DECEMBER 31, 1996

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Isotope	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]	[Ci]
H-3	4.80E+00	3.99E+00	7.05E+00	1.52E+01	3.71E+00	4.11E+00	3.44E+00	1.57E+00	4.22E+00	1.08E+01	5.54E+00	8.62E+00	7.31E+01
F-18			3.34E-05		1.89E-05		5.81E-07	5.27E-06					5.82E-05
NA-24					4.03E-05								4.03E-05
CO-58			3.47E-08	1.89E-08						6.05E-08			1.14E-07
CO-60					3.84E-07				1.08E-06				1.46E-06
BR-82		8.93E-10				6.62E-10	4.49E-10		9.82E-10	1.91E-09	1.21E-09		6.11E-09
SR-90							1.93E-08	2.46E-08	1.56E-08				5.95E-08
TC-99M			1.07E-06	3.27E-07									1.40E-06
CE-141											2.03E-07		2.03E-07
CE-144							2.51E-07						2.51E-07
TE-132					6.13E-08								6.13E-08
CS-137	5.78E-08	6.98E-07	2.42E-07	8.31E-07	1.24E-04			3.85E-08			1.24E-07		1.26E-04
CS-138						2.64E-08							2.64E-08
I-131				4.89E-06	2.94E-05	1.02E-06	1.28E-07	5.21E-07					3.60E-05
I-132					6.37E-08					1.30E-04			1.30E-04
I-133			8.60E-06		6.63E-05	1.25E-05		8.40E-07					8.82E-05
AR-41	7.26E-02	6.98E-02	8.93E-02	6.43E-01	8.70E-02	1.46E-01	8.22E-02	7.95E-02	1.17E-01	2.31E-01	3.83E-02	1.83E-01	1.84E+00
KR-85	0.00E+00	1.70E-02	1.94E-02	7.49E-03	1.55E-02	0.00E+00		1.75E-02	1.03E-02	7.34E-03	6.35E-03	3.63E-03	1.05E-01
KR-85M	1.84E-05	1.73E-04	1.04E-03	5.00E-02	3.59E-03	6.31E-03	2.31E-03	6.27E-04	8.78E-03	5.06E-02	2.85E-09	6.26E-02	1.86E-01
KR-87	4.12E-05	4.16E-04	2.51E-03	9.94E-02	8.23E-03	1.49E-02	4.23E-03	1.49E-03	2.11E-02	1.21E-01	6.87E-09	1.38E-01	4.11E-01
KR-88	4.53E-05	4.19E-04	2.58E-03	1.05E-01	8.83E-03	1.59E-02	4.43E-03	1.55E-03	2.21E-02	1.31E-01	7.06E-09	1.49E-01	4.41E-01
XE-133	2.91E-02	1.03E-02	7.76E-03	3.97E-01	1.81E-02	2.68E-02	2.30E-02	2.71E-02	3.40E-02	3.59E-01	1.43E-02	3.24E-02	9.79E-01
XE-133M	1.42E-03	6.01E-06	0.00E+00	1.00E-02	5.39E-03	8.47E-04	9.34E-05	7.16E-05	5.34E-04	7.63E-04	5.80E-11	5.14E-03	2.43E-02
XE-135	1.05E-03	7.94E-04	5.05E-03	2.25E-01	1.85E-02	2.97E-02	9.77E-03	4.69E-03	4.17E-02	2.85E-01	1.31E-08	2.82E-01	9.03E-01
XE-135M	5.39E-05	5.48E-04	3.24E-03	1.57E-01	1.15E-02	1.95E-02	5.97E-03	1.93E-03	2.92E-02	1.72E-01	9.32E-09	1.84E-01	5.85E-01
XE-138	1.75E-04	1.70E-03	1.01E-02	4.57E-01	3.51E-02	6.35E-02	2.03E-02	6.45E-03	9.51E-02	5.68E-01	2.93E-08	5.99E-01	1.86E+00

3.0 RADIOACTIVE SOLID WASTE SHIPMENTS

3.1 Type, volume, and activity of shipped solid waste

The following types, volumes, and activity of solid waste was shipped from PBNP for offsite disposal or burial during 1996. No irradiated fuel was shipped offsite. The volume, activity, and type of waste is listed in Table 3-1.

Table 3-1
QUANTITIES and TYPES of WASTE SHIPPED from PBNP

Type of waste	Units	Quantity
A. Spent resins, filter sludges, evaporator bottoms, etc.	m^3 (ft^3)	2.21E+01 (7.80E+02)
	Ci	1.51E+02
B. Dry compressible waste, contaminated equip, etc.[1]	m^3 (ft^3)	1.31E+01 (4.63E+02)
	Ci	1.16E+00.
C. Irradiated components, control rods, etc.		None.
D. Other (describe)		None.

[1] Volume after incineration or compaction

3.2 Major nuclide composition (by type of waste)

The major radionuclide content of the solid waste was determined by gamma isotopic analysis and by scaling to certain indicator radionuclides based on the measured isotopic content of representative waste stream samples. The estimated isotopic content is presented in Table 3-2 in decreasing order of activity.

3.3 Solid Waste Disposition

There were fourteen (14) solid waste solid waste shipments from PBNP to Barnwell, SC via truck. Six shipments went directly to Barnwell. Eight were sent for compaction or other treatment prior to being shipped to Barnwell by the vendor. Shipments were made on the dates listed below.

Directly to Barnwell: 8/4/96, 10/15/96, 10/22/96, 11/5/96, 12/19/96, and 12/20/96.

To Scientific Ecology Group for volume reduction prior to shipment to Barnwell: 4/10/96, 7/12/96, 10/18/96, 11/1/96, and 12/2/96.

To Frank W. Hake for scrap metal decontamination (only the contamination sent to Barnwell): 10/1/96, 10/17/96, and 11/9/96.

TABLE 3-2
ESTIMATED SOLID WASTE MAJOR RADIONUCLIDE COMPOSITION

Type A Spent resins, filter sludges, etc.		Type B Dry compressible waste, etc.	
Nuclide Name	Percent Abundance	Nuclide Name	Percent Abundance
Ni-63	2.77E+01	Fe -55	3.43E+01
Co-60	2.67E+01	Ni-63	2.54E+01
Fe-55	2.22E+01	Co-60	1.96E+01
Co-58	1.46E+01	Cs-137	9.56E+00
Cs-137	3.19E+00	Co-58	5.39E+00
Sb-125	1.85E+00	Sb-125	2.27E+00
Ag-110m	1.34E+00	C-14	1.67E+00
Mn-54	1.15E+00	Ag-110m	1.20E+00
C-14	4.98E-01	Pu-241	5.44E-01
H-3	1.75E-01	Sr-90	6.70E-01
Co-57	1.65E-01	Nb-95	4.80E-02
Pu-241	1.57E-01	Am-241	2.50E-02
Nb-95	1.15E-01	Zr-95	2.40E-02
Zr-95	8.40E-02	Cm-243/244	1.30E-02
Sb-124	7.40E-02	Pu-239/240	1.00E-02
Sr-90	5.90E-02	Pu-238	9.00E-03
Sn-113	5.10E-02	Cs-134	8.00E-03
Nb-94	3.90E-02	H-3	6.00E-03
Cr-51	2.40E-02	Zn-65	3.00E-03
Zn-65	1.80E-02	Mn-54	3.00E-03
Ni-59	1.40E-02	Cm-242	1.00E-03
Cs-134	9.00E-03	Ce-144	1.00E-03
Ce-144	6.00E-03		
Am-241	6.00E-03		
Fe-59	5.00E-03		
Cm-243/244	4.00E-03		
Pu-238	3.00E-03		
Pu-239/240	2.00E-03		
Cm-242	1.00E-03		

4.0 NEW AND SPENT FUEL SHIPMENTS AND RECEIPTS

During 1996 a total of 52 new fuel assemblies were received from Westinghouse Electric Corporation. Thirty-two (32) were received in March for the Unit 1 refueling and 20 were received in October for the Unit 2 refueling.

There were no spent fuel shipments made from Point Beach Nuclear Plant during this reporting period.

5.0 NONRADIOACTIVE CHEMICAL RELEASES

5.1 Scheduled Chemical Waste Releases

Scheduled chemical waste releases to the circulating water system from January 1, 1996, to December 31, 1996, included 8.19E+06 gallons of neutralized wastewater. The wastewater contained 3.05E+02 pounds of suspended solids and 6.89E+05 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 retention pond (based on effluent analyses) to the circulating water for January 1, 1996, to December 31, 1996, included 3.78E+07 gallons of clarified wastewater. The wastewater contained 1.95E+03 pounds of suspended solids.

Miscellaneous chemical waste released directly to the circulating water, based on amount of chemicals used from January 1, 1996, to December 31, 1996, included 2.51E+05 pounds of sodium bisulfite and 7.32E+04 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 1996

	UNIT	JAN	FEB	MAR	APR	MAY	JUN
Average Volume Cooling Water Discharge [Mgal/day][3]	1	282.2	282.2	282.2	268.0[1]	464.9	489.6
	2	282.2	279.2	282.2	348.1	459.4	486.6
Average Cooling Water Intake Temperature [°F]	1	37	36	35	44[1]	45	49
	2	37	36	35	40	45	49
Average Cooling Water Discharge Temperature [°F]	1	72	70	67	60[1]	66	69
	2	77	67	66	64	65	69
Average Ambient Lake Temperature [°F]		33	34	35	39	44	48

[1] Unit 1 refueling shutdown from April 1, 1996 to April 22, 1996
[3] For days with cooling water discharge flow

Table 6-1(continued)

CIRCULATING WATER SYSTEM OPERATION FOR 1996

	UNIT	JUL	AUG	SEP	OCT	NOV	DEC
Average Volume Cooling Water Discharge [Mgal/day][3]	1	489.6	490.1	489.6	501.3	311.0	291.8
	2	489.6	488.9	489.6	397.5[2]	0[2]	234.2[2]
Average Cooling Water Intake Temperature [°F]	1	52	56	62	47	37	35
	2	52	56	62	47[2]	[2]	34[2]
Average Cooling Water Discharge Temperature [°F]	1	72	76	82	65	67	65
	2	71	75	81	60[2]	[2]	34[2]
Average Ambient Lake Temperature [°F]		50	54	61	46	37	35

[2] Unit 2 refueling shutdown from October 7, 1996 through December 31, 1996

[3] For days with cooling water discharge flow

7.0 LEAK TESTING OF RADIOACTIVE SOURCES

During this reporting period, all applicable sealed radioactive sources were leak tested in accordance with Technical Specification 15.4.12. Leak test results were all <0.005 μCi.

8.0 MISCELLANEOUS REPORTING REQUIREMENTS

8.1 Revisions to the PBNP Office Dose Calculation Manual (ODCM) and Process Control Program (PCP)

There were no revisions to either the Environmental Manual or the ODCM during 1996.

8.2 Interlaboratory Comparison Program

The analytical laboratory contracted to perform the radioanalyses of the PBNP environmental samples participated in the EPA Interlaboratory Comparison Program during this reporting period.

8.3 Special Circumstances

No special circumstances report regarding operation of the explosive gas monitor for the waste gas holdup system was needed during 1996.

9.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

9.1 Introduction

The REMP results in this Annual Report are presented in the new format which was initiated with the January - June 1992 Semiannual Monitoring Report. Results are reported directly as

measured, including negative and zero values. This eliminates the distortion of the results and long-term trends which occurs when the LLD is used to censor results that are below the LLD. This reporting convention follows that recommended in Health Physics Society Committee Report HPSR-1 (1980) released as document EPA 520/1-80-012.

9.2 Objective

The objective of the PBNP REMP is to fulfill 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. 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.

For the water exposure pathway, the samples include water as well as the biological integrators, fish and filamentous algae. Because of their migratory behavior, fish are wide area integrators. In contrast, the filamentous algae periphyton are attached to shoreline rocks and concentrate nuclides from the water flowing by their point of attachment.

The air-grass-cow-milk exposure pathway is important because of the many dairy farms around PBNP. Therefore, the REMP includes samples of air, general grasses, and milk in the PBNP environs.

For the measurement of the levels of ambient environmental radiation that may be affected by direct radiation from PBNP, the REMP employs a series of TLDs which situated around PBNP.

9.3 Sampling Parameters

Samples are collected at the frequency indicated in Table 9-1 from the locations described in Table 9-2 and shown in Figures 9-1 and 9-2. Because of weather and air sample pump malfunctions, the following deviations from the scheduled sampling and frequency occurred:

9.3.1 No particulate air samples or radioiodine samples were obtained because the air pumps were found inoperable in the field at E-01, E-02, E-03, and E-08 on 5/28, 6/4, 10/1, and 10/15, respectively.

9.3.2 The fourth quarter TLDs at E-3, -5, -9, -12, -22, -23, and -31 were lost in the field due to weather. New TLD holders have been obtained for fastening these monitors to poles and other structures.

9.4 Analytical Parameters

The types of analyses and their frequencies are given in Table 9-3. The LLDs for the various analyses are found in Table 9-5 with the summary of the REMP results. All LLDs listed in Table 15.7.7-2 of the PBNP Technical Specifications were achieved during 1996.

9.5 Correction to 1995 REMP Summary Results

In the Annual Monitoring Report for 1995, the summary table from the July 1 - December 31,1994 Semiannual Monitoring Report was accidentally substituted for the January 1 - December 31, 1995 summary table (Table 9-4). The correct summary table is presented here in Table 9-4. Also, the corresponding discussion is repeated from the 1995 Report for the sake of clarity.

TABLE 9-1

PBNP RADIOLOGICAL ENVIRONMENTAL SAMPLE COLLECTION FREQUENCY

Sample Type	Sample Codes	Collection 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	Quarterly
Vegetation	E-01, -02, -03, -04, -06, -08, -09, -20	3x/yr as available
Algae	E-05, -12	3x/yr as available
Fish	E-13	3x/yr as available
Well Water	E-10	Quarterly
Lake Water	E-01, -05, -06, -09, -12	E-12 collected weekly for monthly composite. Others collected monthly.
Milk	E-11, -19, -21	Monthly
Air Filters charcoal sampler.	E-01, -02, -03, -04, -08, -20	Weekly particulate filters and canisters by continuous air
Soil	E-01, -02, -03, -04, -06, -08, -09, -20	2x/yr
Shoreline Sediment	E-01, -05, -06, -09, -12	2x/yr

TABLE 9-2

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

Location Code	Location Description
E-01	Meteorological Tower
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
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 Hwy. 163 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	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, Bishop Residence, about 0.25 miles North of Nuclear Road
E-17	North of Mishicot, Hwy. 163 and Assman Road, Northeast Corner of Intersection
E-18	Northwest of Two Creeks at Zander and Tannery Roads
E-19	Local Dairy Farm, about 0.2 miles West of Hwy. 42 on the North Side of Two Creeks Road (L. Engelbrecht)
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 Hwy. 163, North Side of Road
E-27	Intersection of Saxonburg and Nuclear Roads, Southwest Corner, about 4 Miles WSW
E-28	Nature Trail sign in parking lot on West side of EIC.
E-29	On tree on bluff overlooking Lake Michigan NE of Microwave Tower and due East of MET 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 1000 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-TC	Transportation Control; Reserved for TLDs

FIGURE 9-1

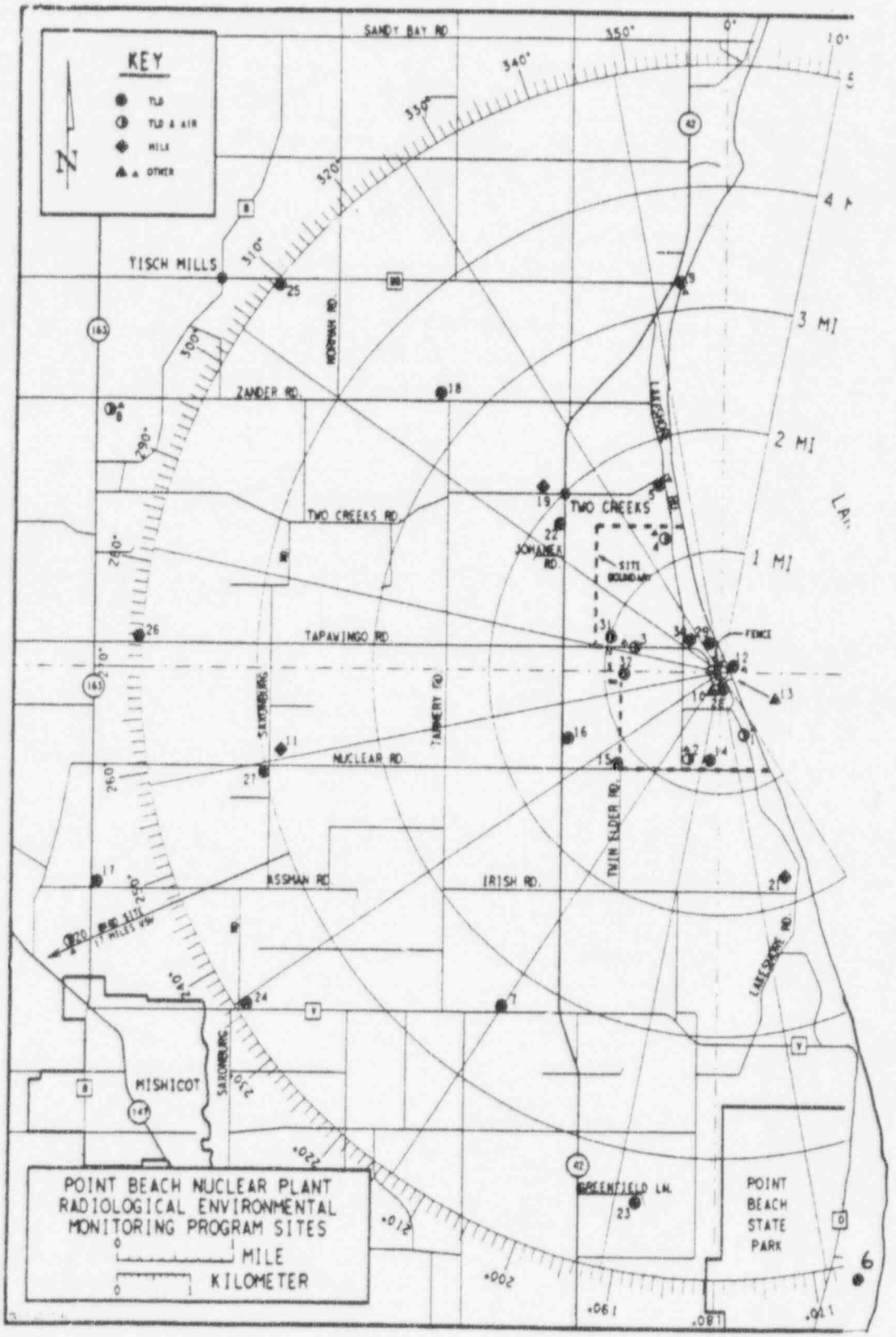
KEY
TLD
TLD & AIR
MILK
OTHER
N
SANDY BAY RD.
YISCH MILLS
ZANDER RD.
TWO CREEKS RD.
TWO CREEKS
SITE BOUNDARY
FENCE
TAPAWINGO RD.
NUCLEAR RD.
ASSMAN RD.
IRISH RD.
TWIN ELDER RD.
LAKESHORE RD.
MISHICOT
GREENFIELD LN.
POINT BEACH STATE PARK
1 MI
2 MI
3 MI
4 MI
POINT BEACH NUCLEAR PLANT
RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM SITES
MILE
KILOMETER

FIGURE 9-2

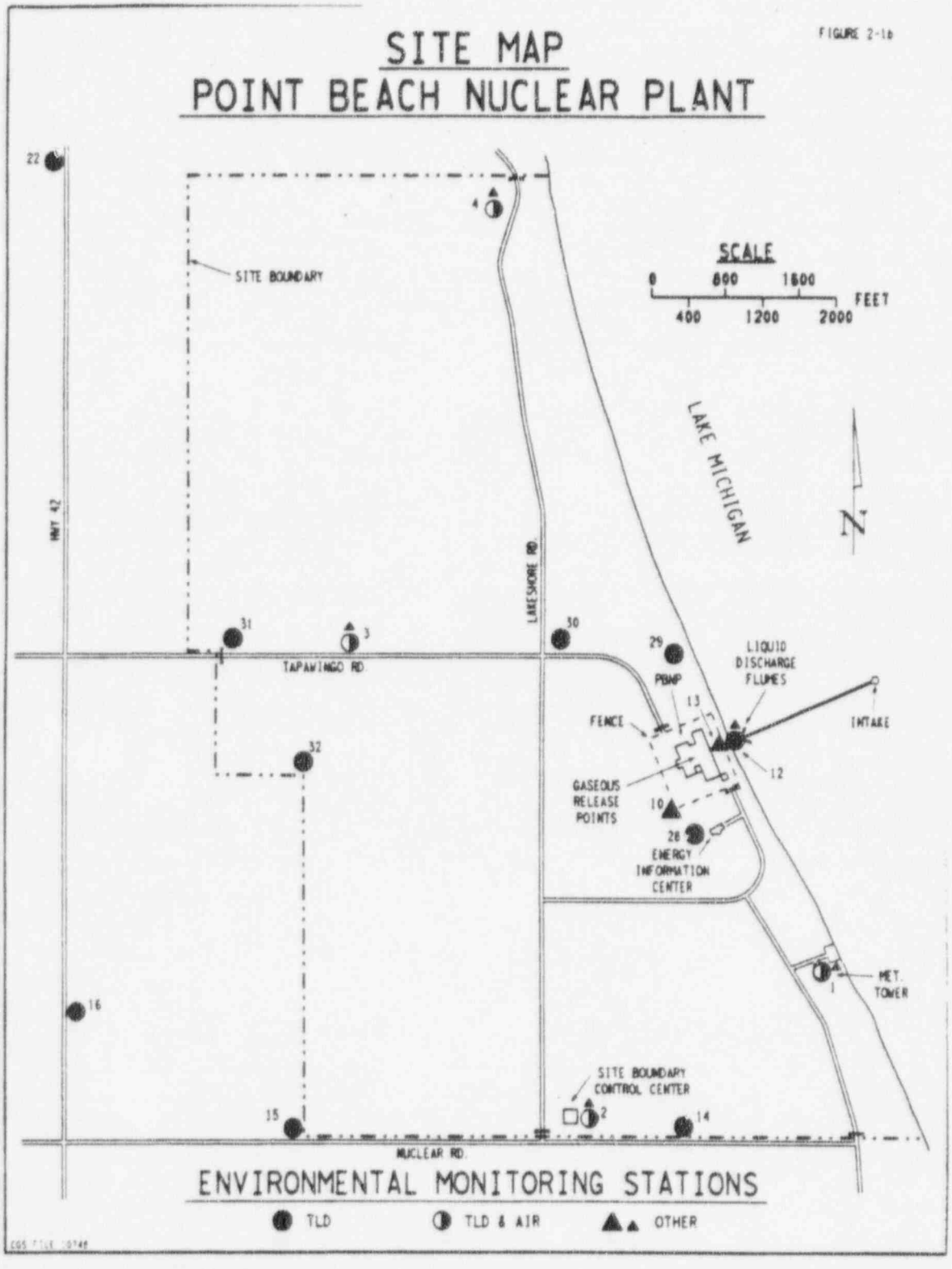
FIGURE 2-1b
SITE MAP
POINT BEACH NUCLEAR PLANT
SCALE
0 800 1600 FEET
400 1200 2000
SITE BOUNDARY
HWY 42
LAKESHORE RD
LAKE MICHIGAN
N
TAPAWINGO RD
NUCLEAR RD.
PUMP
FENCE
LIQUID DISCHARGE FLUMES
INTAKE
GASEOUS RELEASE POINTS
ENERGY INFORMATION CENTER
MET. TOWER
SITE BOUNDARY CONTROL CENTER
22
4
31
3
30
29
13
12
10
28
32
16
15
2
14
1
ENVIRONMENTAL MONITORING STATIONS
TLD
TLD & AIR
OTHER

TABLE 9-3

PBNP RADIOLOGICAL ENVIRONMENTAL 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, -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, -09, -12	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, -19, -21	Sr-89, 90 I-131 Gamma Isotopic Analysis	Monthly
Air Filters	E-01, -02, -03, -04, -08, -20	Gross Beta I-131 Gamma Isotopic Analysis	Weekly (particulate) Weekly (charcoal) Quarterly (on composite particulate filters)
Soil	E-01, -02, -03, -04, -06, -08, -09, -20	Gross Beta Gamma Isotopic Analysis	2x/yr
Shoreline Sediment	E-01, -05, -06, -09, -12, -33	Gross Beta Gamma Isotopic Analysis	2x/yr

9.5.1 Summary of 1995 REMP Results

A summary of the REMP results for 1995 are presented in Table 9-4. The table contains the following information:

Sample: the type of the sample medium
Description: the type of measurement
LLD: the a priori lower limit of detection
N: the number of samples analyzed
Low: the lowest measured value ± its associated 2s counting error
Average: the average value ± the standard deviation of N samples
High: the highest measured value ± its associated 2s counting error
Units: the units of measurement

Additional information also is presented in Table 9-4. Not all of the results in Table 9-4 are required by the PBNP radiological effluent technical specifications (RETS). Non-RETS items and values are noted by an asterisk (*). For certain analyses, an LLD which is lower than that required by RETS is used. For these analyses, both LLDs are listed with the RETS LLD given in parentheses. Occasionally, anomalous results are obtained which lie well outside of the range of expected values. These results will be investigated and discussed in the narrative portion of this section. Blank values have not been subtracted from the results presented in Table 9-4.

9.5.2 Discussion for 1995 Results

For the sake of continuity and clarity, the discussion for the 1995 results is repeated below to correspond to the insertion of the corrected summary table for the 1995 results.

Radiological environmental monitoring conducted at the Point Beach Nuclear Plant from January 1, 1995 through December 31, 1995 consisted of air filters, milk, lake water, well water, soil, fish, shoreline sediments, algae, vegetation, and TLDs.

All TLD results for the reporting period were within the normal range. Site E-12, located on the discharge flume pier continues to exhibit some of the lowest values whereas E-32, approximately 1 mile west of the plant, continues to exhibit some of the highest. The higher values at E-32 have been noted since TLDs were first located at this site. The reason for this result is not known and continues to be tracked. However, during 1995 the TLD results at E-32 have been lower than in the previous years. Therefore, the differences between TLD results from E-32 and from sites E-3 and E-31, located about 1200 feet north of E-32 at about the same distance from the plant, which typically have been 0.1 - 0.4 mR/week, were only 0.1 - 0.2 mR/week in 1995.

The analyses for individual radionuclides reveals that Sr-90 and Cs-137 continue to occur in environmental samples. Sr-90 continues to persist in milk and lakewater. Cs-137 occurs in shoreline sediment deposits, fish, algae, vegetation, and soil. These radionuclides routinely occur in environmental samples collected around the world and are attributable to the large scale atmospheric weapons tests of the 1960's and the less frequent testing in the 70's and 80's, and as well as to the Chernobyl accident. The highest Cs-137 concentrations in soil occurs at E-06, the Point Beach State Forest. This occurs because campfire ashes, from trees which incorporated fallout Cs-137 in the

TABLE 9-4

CORRECTED RADIOLOGICAL ENVIRONMENTAL MONITORING RESULTS FOR 1995

Sample	Description	LLD	N	Low	Average	High	Units
TLD	Environmental Radiation	(*)	108	0.62 ± 0.03	0.87 ± 0.13	1.19 ± 0.07	mR/7days
Air	Gross beta	0.01	318	0.008 ± 0.002	0.022 ± 0.007	0.044 ± 0.004	pCi/m^3
	Cs-137	0.01(0.06)	24	-0.0008±0.0005	-0.0000±0.0003	0.0007±0.0006	pCi/m^3
	Cs-134	0.05	24	-0.0010±0.0004	-0.0000±0.0004	0.0007±0.0008	pCi/m^3
	I-131	0.03(0.07)	318	-0.023 ± 0.017	0.000 ± 0.007	0.019 ± 0.015	pCi/m^3
	Other gamma emitters(*)	0.1(*)	24	-0.0003±0.0011	0.0002±0.0002	0.0007±0.0004	pCi/m^3
Milk	I-131	0.5	36	-0.13±0.13	0.04 ± 0.09	0.20 ± 0.26	pCi/l
	Sr-89(*)	5(*)	36	-2.1 ± 1.0	-0.1 ± 0.5	0.5 ± 0.6	pCi/l
	Sr-90(*)	1(*)	36	0.6 ± 0.5	1.4 ± 0.4	2.4 ± 0.5	pCi/l
	Cs-134	5(15)	36	-2.4 ± 2.6	0.2 ± 1.0	2.1 ± 2.8	pCi/l
	Cs-137	5(18)	36	-1.9 ± 2.8	0.4 ± 1.1	3.4 ± 2.8	pCi/l
	Ba-La-140	5(15)	36	-3.9 ± 3.8	-0.3 ± 1.0	1.4 ± 3.1	pCi/l
	Other gamma emitters(*)	15(*)	36	-1.9 ± 3.2	0.3 ± 1.4	2.7 ± 4.0	pCi/l
Lake water	Gross beta	4	60	1.5 ± 0.5	2.5 ± 0.8	4.6 ± 0.6	pCi/l
	I-131	0.5(2)	60	-0.30±0.12	0.05 ± 0.10	0.31 ± 0.31	pCi/l
	Mn-54	10(15)	60	-2.2 ± 2.0	-0.0 ± 0.9	2.9 ± 3.2	pCi/l
	Fe-59	30	60	-4.4 ± 8.2	0.0 ± 2.0	4.7 ± 7.6	pCi/l
	Co-58	10	60	-1.5 ± 2.2	0.2 ± 1.0	3.0 ± 3.1	pCi/l
	Co-60	10	60	-3.2 ± 2.5	0.4 ± 1.1	2.7 ± 3.3	pCi/l
	Zn-65	30	60	-8.1 ± 6.5	-0.3 ± 2.5	4.8 ± 5.0	pCi/l
	Zr-Nb-95	15	60	-4.2 ± 5.7	-0.4 ± 1.2	2.5 ± 3.6	pCi/l
	Cs-134	10(15)	60	-2.7 ± 2.3	0.3 ± 1.4	5.0 ± 3.8	pCi/l
	Cs-137	10(18)	60	-3.2 ± 3.7	0.4 ± 1.1	2.3 ± 3.1	pCi/l
	Ba-La-140	15	60	-16.9 ± 20.2	-0.4 ± 3.5	6.6 ± 7.5	pCi/l
	Other gamma emitters(*)	30(*)	60	-6.3 ± 3.9	-0.6 ± 1.5	4.1 ± 4.3	pCi/l
	H-3	500(3000)	20	66 ± 78	543 ± 1201	5459 ± 210	pCi/l
	Sr-89(*)	5(*)	20	-1.3 ± 0.9	-0.3 ± 0.5	0.3 ± 0.8	pCi/l
	Sr-90(*)	1(*)	20	0.3 ± 0.3	0.9 ± 1.2	1.64± 0.5	pCi/l
Algae	Gross beta	0.25	6	2.55 ± 0.19	3.33 ± 0.57	4.24 ± 0.94	pCi/g
	Co-58	0.25	6	-0.002±0.007	0.016 ± 0.017	0.043 ± 0.021	pCi/g
	Co-60	0.25	6	0.004±0.010	0.013 ± 0.010	0.029 ± 0.028	pCi/g
	Cs-134	0.25	6	-0.006±0.027	0.001 ± 0.004	0.006 ± 0.010	pCi/g
	Cs-137	0.25	6	0.012±0.008	0.050 ± 0.029	0.081 ± 0.022	pCi/g

TABLE 9-4(continued)

CORRECTED RADIOLOGICAL ENVIRONMENTAL MONITORING RESULTS FOR 1995

Sample	Description	LLD	N	Low	Average	High	Units
Fish	Gross beta(*)	0.5(*)	12	0.30 ± 0.02	2.18 ± 0.69	2.96 ± 0.10	pCi/g
	Mn-54	0.13	12	-0.008±0.006	0.001±0.003	0.005±0.012	pCi/g
	Fe-59	0.26	12	-0.011±0.023	-0.000±0.008	0.010±0.014	pCi/g
	Co-58	0.13	12	-0.008±0.010	0.002±0.003	0.002±0.013	pCi/g
	Co-60	0.13	12	-0.005±0.012	0.004±0.005	0.013±0.017	pCi/g
	Zn-65	0.26	12	-0.020±0.029	0.004±0.009	0.015±0.024	pCi/g
	Cs-134	0.13	12	-0.002±0.006	-0.002±0.003	0.007±0.008	pCi/g
	Cs-137	0.15	12	0.010±0.014	0.052±0.042	0.177±0.027	pCi/g
	Other gamma emitters(*)	0.5(*)	12	-0.005±0.015	-0.000±0.003	0.004±0.014	pCi/g
Well water	Gross beta	4	4	-1.3 ± 1.9	1.6 ± 2.3	4.1 ± 1.6	pCi/l
	I-131	0.5(2)	4	0.02 ± 0.12	0.09 ± 0.11	0.25 ± 0.25	pCi/l
	Mn-54	10(15)	4	-1.1 ± 1.5	-0.0 ± 0.7	0.5 ± 1.6	pCi/l
	Fe-59	30	4	-2.3 ± 4.4	-0.2 ± 1.7	1.6 ± 3.6	pCi/l
	Co-58	10	4	-0.9 ± 1.9	0.2 ± 1.0	1.2 ± 1.2	pCi/l
	Co-60	10	4	0.1 ± 1.4	0.6 ± 0.7	1.6 ± 1.9	pCi/l
	Zn-65	30	4	-2.1 ± 3.0	-0.7 ± 1.1	0.6 ± 3.4	pCi/l
	Zr-Nb-95	15	4	-0.7 ± 3.3	0.0 ± 1.0	1.5 ± 3.1	pCi/l
	Cs-134	10(15)	4	-0.3 ± 1.3	0.2 ± 0.5	0.6 ± 1.8	pCi/l
	Cs-137	10(18)	4	-1.8 ± 2.0	-0.4 ± 1.3	1.1 ± 1.8	pCi/l
	Ba-La-140	15	4	-3.9 ± 10.8	-0.7 ± 2.3	1.0 ± 2.3	pCi/l
	Other gamma emitters(*)	30(*)	4	-2.2 ± 2.1	-0.7 ± 1.2	0.6 ± 1.4	pCi/l
	H-3	500	4	-64.1 ± 80.7	-10.2 ± 46.1	39.9 ± 75.9	pCi/l
	Sr-89(*)	5(*)	4	-0.04 ± 0.42	0.27 ± 0.24	0.53 ± 0.47	pCi/l
	Sr-90(*)	1(*)	4	0.17 ± 0.17	0.10 ± 0.13	0.23 ± 0.40	pCi/l
Soil(*)	Gross beta	2	16	11.7 ± 2.2	18.9 ± 4.9	26.8 ± 3.0	pCi/g
	Cs-137	0.15	16	0.043 ± 0.015	0.296 ± 0.189	0.673 ± 0.049	pCi/g
Shoreline sediment(*)	Gross beta	2	10	3.5 ± 1.2	7.10 ± 2.71	11.7 ± 2.20	pCi/g
	Cs-137	0.15	10	0.026 ± 0.013	0.037 ± 0.006	0.045 ± 0.014	pCi/g
Vegetation	Gross beta(*)	0.25(*)	24	3.11± 0.11	5.32 ± 1.24	8.60 ± 0.29	pCi/g
	Cs-134	0.06	24	-0.014±0.016	0.002 ± 0.006	0.011 ± 0.015	pCi/g
	Cs-137	0.08	24	-0.013±0.015	0.009 ± 0.025	0.119 ± 0.024	pCi/g
	I-131	0.06	24	-0.013±0.027	0.003 ± 0.009	0.020 ± 0.024	pCi/g

1960s, is being scattered around various camp sites in the area. The occurrence of Cs-137 in tree ash has been observed in other areas of the United States.

Lake water tritium concentrations continue to be low. These samples are composited monthly for quarterly analysis. Most of the results are in the 100 - 250 pCi/l range. Three of the H-3 results are in the 950 - 5500 pCi/l range. Two of these results were obtained approximately 1.7 and 4 miles north of PBNP with the highest concentration the furthest north. The predominant current along this side of Lake Michigan is from north to south which indicates that PBNP is not the likely source of these elevated H-3 concentrations. One composite result of 1348 pCi/l from the discharge canal, E-12, included a monthly sample taken at the same time as a holdup tank was being discharged in November. Analyses of the monthly samples showed that the October and December H-3 concentrations were less than 175 pCi/l whereas the November concentration from the discharge canal was 3900 pCi/l. Over the past two years, tritium blanks have yielded results in the range of -74.6 ± 80.5 to 148 ± 101 pCi/l. Only the H-3 results from E-01 for the first quarter of 1995 and from E-12 for the 4th quarter appear to be attributable to PBNP discharges. Tritium, in addition to being produced by water-cooled reactors such as PBNP, also is a naturally occurring radionuclide.

All of the isotopic well water results are small positive and negative values indistinguishable from zero. Only the gross beta results, which are attributable to naturally occurring radionuclides, are significantly positive.

For the remaining suite of RETS specified radionuclides, measured concentrations occur as positive and negative values scattered around zero. Although the positive values are usually smaller than their associated error, small, non-zero values (below the associated LLDs) whose ±2s error does not overlap zero occur for Co-58 and Co-60 in algae. These cobalt concentrations are low, two to four times lower than the Cs-137 concentrations which are the result of fallout which circulates through the Lake Michigan ecosystem. The October Co-60 concentration is about two times the 2σ counting error at E-05 (0.023 ± 0.012), about 1.7 miles north of PBNP. This also occurs for Co-58 at the same site in both the August and October samples (0.017 ± 0.011 and 0.043 ± 0.021) and at E-12, near the PBNP discharge (0.029 ± 0.012), in August. Both of these radionuclides were discharged by PBNP during 1995: Co-60 every month during 1995 and Co-58 from March - December. However, as previously discussed with regard to H-3, most of the positive results are obtained north of PBNP and not near the discharge as expected if PBNP were the primary source of these cobalt isotopes. Although no measurable Co-58 or Co-60 were found in the water samples from E-05 during the year, it is known that filamentous algae have cobalt bioaccumulation factors on the order of 250 to 2800. Therefore, it is not surprising that the cobalt isotopes were found in the algae and not in the water. Freshwater fish have a bioaccumulation factor for Co-60 comparable to that of algae, about 1000. However, neither Co-58 nor Co-60 were observed in fish analyzed during the year. Therefore, it is possible that the algae results are false positives. Finally, it should be noted that the Co-58/60 levels found in the algae are at least ten times lower than the applicable LLDs and about 1000 times lower that the NRC notification levels.

9.6 Summary of 1996 REMP Results

A summary of the REMP results for 1996 are presented in Table 9-5. The table contains the following information:

Sample:	the type of the sample medium
Description:	the type of measurement
LLD:	the a priori lower limit of detection
N:	the number of samples analyzed
Low:	the lowest measured value ± its associated 2s counting error
Average	:the average value ± the standard deviation of N samples
High:	the highest measured value ± its associated 2s counting error
Units:	the units of measurement

Additional information also is presented in Table 9-5. Not all of the results in Table 9-5 are required by the PBNP radiological effluent technical specifications (RETS). Non-RETS items and values are noted by an asterisk (*). For certain analyses, an LLD which is lower than that required by RETS is used. For these analyses, both LLDs are listed with the RETS LLD given in parentheses. Occasionally, anomalous results are obtained which lie well outside of the range of expected values. These results will be investigated and discussed in the narrative portion of this section. Blank values have not been subtracted from the results presented in Table 9-5.

9.7 Discussion for 1996 Results

Radiological environmental monitoring conducted at the Point Beach Nuclear Plant from January 1, 1996 through December 31, 1996 consisted of air filters, milk, lake water, well water, soil, fish, shoreline sediments, algae, vegetation, and TLDs. The results are summarized in Table 9-5.

All TLD results for the reporting period were within the normal range. As in the past, Site E-12, located on the discharge flume pier continues to exhibit some of the lowest values whereas E-32, approximately 1 mile west of the plant, continues to exhibit some of the highest. The higher values at E-32 have been noted since TLDs were first located at this site. The reason for this result is not known and continues to be tracked. However, unlike previous years, during 1996 even the highest TLD results at E-32 were not statistically different from many of the other highest values observed during the year, including the background site some 17 miles WSW of PBNP.

The analyses for individual radionuclides reveals that Sr-90 and Cs-137 continue to occur in environmental samples as they are cycled through the biosphere. Sr-90 continues to persist in milk and lakewater. Cs-137 occurs in shoreline sediment deposits, fish, algae, vegetation, and soil. These radionuclides routinely occur in environmental samples collected around the world and are attributable to the large scale atmospheric weapons tests of the 1960's and the less frequent testing in the 70's and 80's, and as well as to the Chernobyl accident.

Tritium, in addition to being produced by water-cooled reactors such as PBNP, also is a naturally occurring radionuclide. Lake water tritium concentrations continue to be low. These samples are composites of monthly samples for quarterly analysis. Most of the results are in the <100 - 250 pCi/l range. The highest result, 862 ± 124 pCi/l, occurred approximately 4 miles north of PBNP. The predominant current along this side of Lake Michigan is from north to south which indicates

TABLE 9-5

RADIOLOGICAL ENVIRONMENTAL MONITORING RESULTS FOR 1996

Sample	Description	LLD	N	Low	Average	High	Units
TLD	Environmental Radiation	(*)	101	0.63 ± 0.06	0.83 ± 0.12	1.13 ± 0.05	mR/7days
Air	Gross beta	0.01	308	0.008 ± 0.002	0.021 ± 0.007	0.054 ± 0.005	pCi/m^3
	Cs-137	0.01(0.06)	24	-0.0003±0.0004	0.0000±0.0002	0.0003±0.0003	pCi/m^3
	Cs-134	0.05	24	-0.0020±0.0004	-0.0000±0.0001	0.0004±0.0007	pCi/m^3
	I-131	0.03(0.07)	308	-0.017 ± 0.012	0.000 ± 0.007	0.019 ± 0.016	pCi/m^3
	Other gamma emitters(*)	0.1(*)	24	-0.0005±0.0008	0.0002±0.0002	0.0006±0.0007	pCi/m^3
Milk	I-131	0.5	36	-0.18±0.14	0.08 ± 0.11	0.28 ± 0.28	pCi/l
	Sr-89(*)	5(*)	36	-1.6 ± 1.8	-0.2 ± 0.8	1.1 ± 1.2	pCi/l
	Sr-90(*)	1(*)	36	0.6 ± 0.3	1.1 ± 0.4	1.1 ± 0.4	pCi/l
	Cs-134	5(15)	36	-2.0 ± 2.7	0.2 ± 0.8	1.9 ± 3.4	pCi/l
	Cs-137	5(18)	36	-1.4 ± 3.7	0.6 ± 1.0	3.1 ± 2.5	pCi/l
	Ba-La-140	5(15)	36	-2.4 ± 1.7	-0.3 ± 1.2	5.3 ± 8.9	pCi/l
	Other gamma emitters(*)	15(*)	36	-1.5 ± 3.0	0.4 ± 1.0	3.0 ± 4.8	pCi/l
Lake water	Gross beta	4	60	1.3 ± 0.5	2.7 ± 0.7	5.1 ± 0.6	pCi/l
	I-131	0.5(2)	60	-0.28±0.26	0.06 ± 0.12	0.30 ± 0.37	pCi/l
	Mn-54	10(15)	60	-4.4 ± 3.3	0.1 ± 1.2	3.7 ± 2.8	pCi/l
	Fe-59	30	60	-6.3 ± 6.3	0.1 ± 2.4	8.5 ± 6.9	pCi/l
	Co-58	10	60	-3.8 ± 3.0	0.1 ± 1.1	1.8 ± 4.1	pCi/l
	Co-60	10	60	-3.2 ± 2.3	0.7 ± 1.4	4.1 ± 2.3	pCi/l
	Zn-65	30	60	-5.6 ± 5.6	-0.9 ± 2.1	4.9 ± 6.0	pCi/l
	Zr-Nb-95	15	60	-3.9 ± 4.2	-0.3 ± 1.5	3.1 ± 5.9	pCi/l
	Cs-134	10(15)	60	-3.5 ± 3.0	0.0 ± 1.1	2.6 ± 3.0	pCi/l
	Cs-137	10(18)	60	-2.9 ± 2.9	0.4 ± 1.2	3.1 ± 2.1	pCi/l
	Ba-La-140	15	60	-11.3 ± 12.7	-1.0 ± 3.4	8.4 ± 14.7	pCi/l
	Other gamma emitters(*)	30(*)	60	-4.2 ± 3.8	-0.4 ± 1.5	3.4 ± 5.0	pCi/l
	H-3	500(3000)	20	8 ± 94	162 ± 185	862 ± 124	pCi/l
	Sr-89(*)	5(*)	20	-1.4 ± 1.0	-0.5 ± 0.5	0.2 ± 1.0	pCi/l
	Sr-90(*)	1(*)	20	0.3 ± 0.2	0.7 ± 0.2	1.1 ± 0.4	pCi/l
Algae	Gross beta	0.25	5	3.50 ± 0.41	5.07 ± 1.37	6.96 ± 1.40	pCi/g
	Co-58	0.25	5	-0.010±0.000	-0.001 ± 0.006	0.003 ± 0.010	pCi/g
	Co-60	0.25	5	0.000±0.017	0.006 ± 0.005	0.011 ± 0.012	pCi/g
	Cs-134	0.25	5	0.003±0.003	0.007 ± 0.003	0.010 ± 0.007	pCi/g
	Cs-137	0.25	5	0.021±0.017	0.038 ± 0.016	0.059 ± 0.014	pCi/g

TABLE 9-5(continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING RESULTS FOR 1996

Sample	Description	LLD	N	Low	Average	High	Units
Fish	Gross beta(*)	0.5(*)	9	1.38 ± 0.06	2.50 ± 0.76	3.54 ± 0.07	pCi/g
	Mn-54	0.13	9	-0.003±0.007	0.001±0.003	0.005±0.004	pCi/g
	Fe-59	0.26	9	-0.006±0.017	-0.001±0.009	0.018±0.036	pCi/g
	Co-58	0.13	9	-0.009±0.018	-0.002±0.007	0.015±0.021	pCi/g
	Co-60	0.13	9	-0.017±0.022	0.001±0.009	0.016±0.020	pCi/g
	Zn-65	0.26	9	-0.051±0.046	-0.005±0.020	0.019±0.036	pCi/g
	Cs-134	0.13	9	-0.003±0.021	-0.005±0.003	0.006±0.005	pCi/g
	Cs-137	0.15	9	0.015±0.008	0.042±0.031	0.104±0.018	pCi/g
	Other gamma emitters(*)	0.5(*)	9	-0.001±0.009	0.001±0.007	0.019±0.034	pCi/g
Well water	Gross beta	4	4	-0.5 ± 1.5	1.0 ± 1.3	2.6 ± 0.1	pCi/l
	I-131	0.5(2)	4	-0.02 ± 0.18	0.14 ± 0.14	0.31± 0.31	pCi/l
	Mn-54	10(15)	4	-0.3 ± 1.6	0.4 ± 0.5	0.8 ± 2.1	pCi/l
	Fe-59	30	4	-1.8 ± 2.4	0.0 ± 1.4	1.2 ± 2.5	pCi/l
	Co-58	10	4	-0.6 ± 1.1	0.7 ± 1.2	2.2 ± 1.7	pCi/l
	Co-60	10	4	-0.5 ± 1.1	0.4 ± 0.6	0.9 ± 1.4	pCi/l
	Zn-65	30	4	-3.5 ± 4.4	-2.3 ± 1.2	-1.0 ± 2.1	pCi/l
	Zr-Nb-95	15	4	-1.9 ± 2.7	-0.3 ± 1.1	0.5 ± 2.2	pCi/l
	Cs-134	10(15)	4	-0.5 ± 2.3	0.3 ± 0.6	0.9 ± 1.2	pCi/l
	Cs-137	10(18)	4	-0.6 ± 2.4	0.7 ± 1.0	1.7 ± 1.2	pCi/l
	Ba-La-140	15	4	-2.0 ± 2.1	0.1 ± 2.1	3.0 ± 4.3	pCi/l
	Other gamma emitters(*)	30(*)	4	-1.8 ± 1.5	-1.2 ± 0.5	-0.8 ± 1.4	pCi/l
	H-3	500	4	-27.0 ± 76.0	21.3 ± 36.6	49.0 ± 83.0	pCi/l
	Sr-89(*)	5(*)	4	-0.54 ± 0.70	0.05 ± 0.40	0.36 ± 0.64	pCi/l
	Sr-90(*)	1(*)	4	-0.02 ± 0.14	0.10 ± 0.10	0.18 ± 0.21	pCi/l
Soil(*)	Gross beta	2	16	5.3 ± 1.9	19.4 ± 7.0	29.5 ± 3.1	pCi/g
	Cs-137	0.15	16	0.020 ± 0.018	0.201 ± 0.202	0.807 ± 0.041	pCi/g
Shoreline sediment(*)	Gross beta	2	10	4.40 ± 1.12	6.92 ± 1.44	8.41 ± 1.12	pCi/g
	Cs-137	0.15	10	0.019 ± 0.009	0.033 ± 0.011	0.051 ± 0.017	pCi/g
Vegetation	Gross beta(*)	0.25(*)	24	3.4 ± 0.2	4.9 ± 0.8	6.6 ± 0.2	pCi/g
	Cs-134	0.06	24	-0.004±0.013	0.003 ± 0.005	0.018 ± 0.019	pCi/g
	Cs-137	0.08	24	0.005±0.011	0.012 ± 0.030	0.150 ± 0.035	pCi/g
	I-131	0.06	24	-0.011±0.023	-0.000 ± 0.007	0.016 ± 0.032	pCi/g

that PBNP is not the likely source of this elevated H-3 concentration. Of the remaining 19 composite samples, six are statistically equal to zero at the 95% confidence level. Over the past three years, tritium blanks have yielded results in the range of -101.3 ± 70.2 to 148 ± 101 pCi/l. An additional eight sample results fall within the range of these blanks..

For the remaining suite of RETS specified radionuclides, measured concentrations occur as positive and negative values scattered around zero. Although the positive values are usually smaller than their associated error, small, non-zero values (below the associated LLDs) whose ±2s error does not overlap zero occur for Co-60, Mn-54, and Cs-137 in water. The Mn-54 (3.7±2.8 pCi/l) occurred in December. However, the only measured PBNP Mn-54 discharge occurred in April suggesting that the lake water result is a false positive. The positive Cs-137 result is consistent with the know cycling of fallout in the Great Lakes. Five occurrences of minute quantities of Co-60 were found in lake water during the months of April, May, and August. If these results represented actual lake water concentrations, the algae and fish (known to be long time integrators of these radionuclides with a bioaccumulation factors around 1000) in the same area should also have measurable Co-60. However, no Co-60 was detected in the algae or the fish. Note that the analyses of water "blanks" yield Co-60 results up to 1.7±1.6 pCi/l. Although the three occurrences in April correspond to the month with the maximum Co-60 discharge, the other two positive results (May and August) do not correspond to the second or third highest discharge months (March and May) when no Co-60 was detected in lake water. Therefore, while it may be possible that the observed Co-60 is real, it is concluded that the Co-60 values are false positives. Assuming the highest measured concentration value of 4.1±2.3 pCi/l to be real and consumed by the hypothetical maximumly exposed individual for one year, the resulting dose would be 9.2E-09 mrem which is orders of magnitude lower than the doses calculated for PBNP liquid releases for Appendix I compliance (Table 1-1).

All of the isotopic well water results are small positive and negative values indistinguishable from zero

9.8 Land Use Census

In accordance with the requirements of Technical Specification 15.7.7.D, a visual verification of animals grazing in the vicinity of the Point Beach Nuclear Plant site boundary was completed in July of 1996 to ensure that the milk sampling locations remain as conservative as practicable. No significant change in the use of pasture lands was noted. Although the size of the dairy herd at E-21 has increased, the cows have not move closer to the PBNP site boundary, the point the cows are assumed to exist for the purpose of dose calculations for Appendix I compliance. Therefore, the existing milk sampling program continues to be acceptable.

9.9 Conclusion

Based on the results of the PBNP REMP for 1996, PBNP effluents had a minimal affect on the PBNP environs.