

State of Wisconsin

2008

Prairie Island

Environmental Radioactivity Survey

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2-7

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Introduction

Wisconsin Public Health Statutes 254.41 mandates the Department of Health Services to conduct environmental radiation monitoring around the nuclear power facilities that impact Wisconsin. This environmental monitoring report is for the Prairie Island nuclear generating plant for the calendar year January - December 2008 and provides a description and results of this environmental monitoring program.

WI DHS Prairie Island Environmental Monitoring Sampling Program

The WI DHS environmental monitoring program consists of the collection of various types of samples from the air, water and terrestrial exposure pathways. The sampling program included samples of air, precipitation, ambient gamma radiation (TLD), surface water, fish, soil, milk, well water and vegetation that are collected from selected locations at planned sampling intervals.

Table 1 is a listing of sampling sites and includes a description, direction and distance from the monitored power plant. Table 2 provides a listing of types of samples collected, sites where samples are collected, the number of samples collected, number of samples that were missed and a listing of the required analyses. Table 3 provides an explanation of missing samples or non-routine sample analyses. Figure 1 is a map showing the location of each environmental sampling site.

Program Modifications

There were no program modifications for 2008.

Laboratory Services and Quality Assurance

The analysis of the samples is performed under contract with the State Laboratory of Hygiene (SLH). SLH maintains a quality assurance program. Analytical procedures provide for routine replicate analyses to verify methods and instrument operation. Traceable sources are used to regularly calibrate the counters and daily performance checks are made between calibrations. In addition, quality control charts are maintained on the counters.

SLH participates in the Environmental Resource Associates' Proficiency Testing program and has performed satisfactorily over the report period. Proficiency testing results are available from the State Laboratory of Hygiene.

Detection Limits

Detection limits, required by WI DHS, will be expressed as a lower limit of detection (LLD). The required WI DHS LLD as indicated in Table 4 under the heading "LLD" is an "a priori" estimate of the capability for detecting an activity concentration by a given measurement system, procedure, and type of sample. Counting statistics of the appropriate instrument background are used to compute the LLD for each specific analysis. Using 4.66 times the standard deviation (s_b) of the instrument background, the LLD for each specific analysis is defined at the 95% Confidence Level.

The LLD for each radioisotope listed in Table 4 has been calculated from the following equation:

$$LLD = \frac{4.66 s_b}{E * V * 2.22 * Y * S * \exp(-dt)}$$

Where:

- LLD is the "a priori" lower limit of detection as defined above, as picocuries per unit mass or volume,
- s_b is the standard deviation of the background counting rate or of the counting rate of blank sample as appropriate, as counts per minute,
- E is the counting efficiency, as counts per disintegration,
- V is the sample size in units of mass or volume,
- 2.22 is the number of disintegrations per minute per picocurie,
- Y is the fractional radiochemical yield, when applicable,
- S is the self-absorption correction factor,
- d is the radioactive decay constant for the particular radionuclide, and
- t for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting.

Typical values for E, V, Y and dt have been used to calculate the LLD.

Reporting of Sample Analysis Results

Results for specific analyses will be reported as either a "less than" (<) value or an actual activity value. The reporting of results in Table 4 under the heading "Range" and in Tables 5-14 are "a posteriori" calculations based on the actual analysis performed using the actual sample values for E, V, Y and dt. Typically the reported "less than" (<) results are lower than the required WI DHS LLD indicating that the required WI DHS LLD has been met.

An actual activity value will be accompanied by an uncertainty term for that analysis. The uncertainty term is a plus or minus counting uncertainty term at the 2 sigma (95%) confidence interval and is printed as (+- or ±). Examples and explanations of data reporting are:

<u>Example</u>	<u>Nuclide</u>	<u>Activity reported</u>
1	¹³⁷ Cs	< 10 pCi/liter
2	¹³⁷ Cs	15 ± 3 pCi/liter

In example 1 we can be 95% confident that the sample activity, if any, is less than the LLD of 10 pCi/liter. In example 2 we can be 95% confident that the actual sample activity is greater than the LLD for that analysis and is between 12 and 18 pCi/liter.

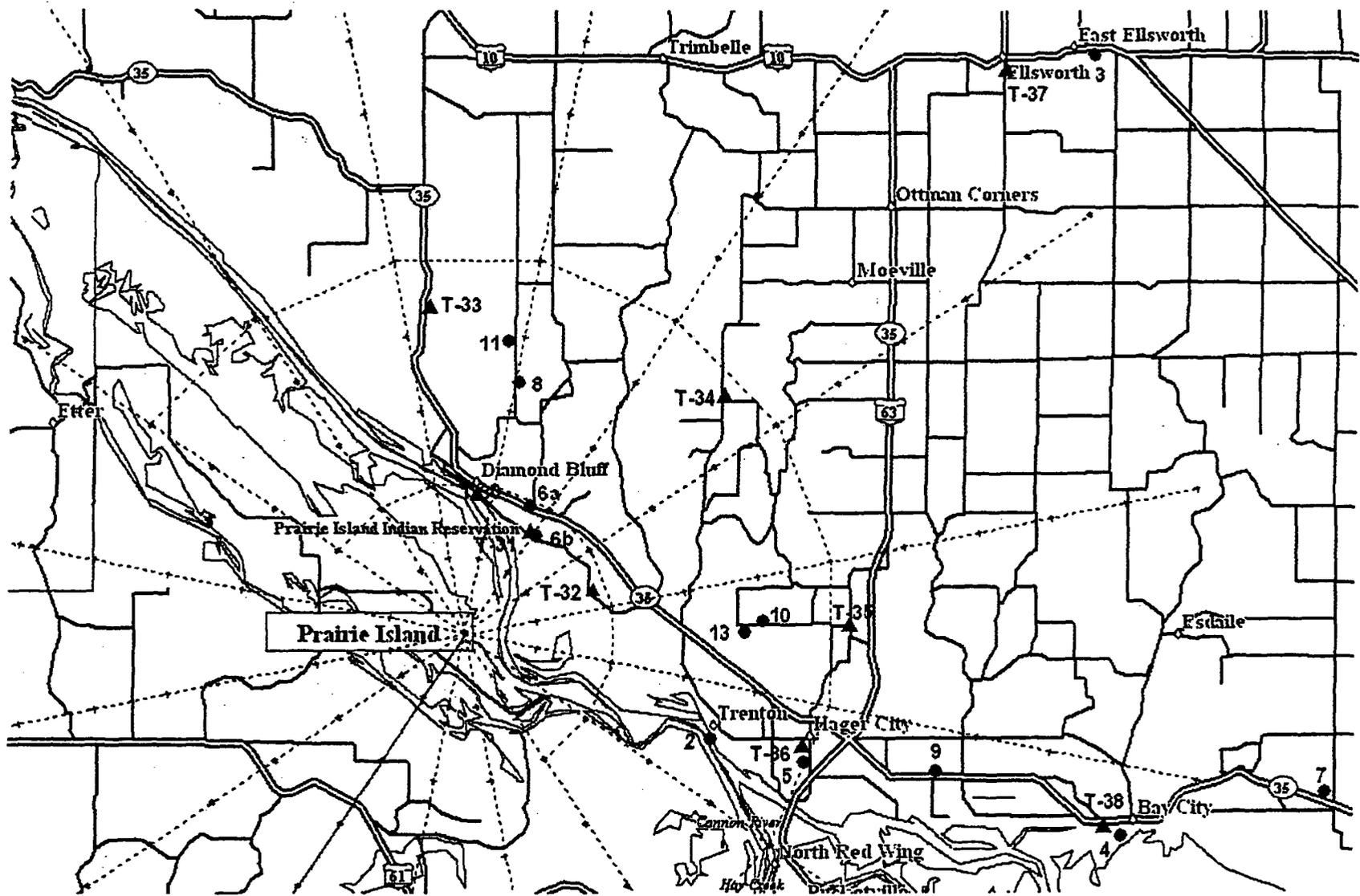


Figure 1. Location of WI DHS environmental monitoring sites for the Prairie Island monitoring program

Table 1. WI DHS Prairie Island environmental monitoring sampling sites.

Sample site	Distance and direction (miles)	Location description
PRI-1a	11.6 NW	Prescott; air site
PRI-1b	11.6 NW	Prescott; harbor area
PRI-2	3.6 ESE	Trenton
PRI-3	10.9 NE	Ellsworth (discontinued 07/01/96)
PRI-4a	8.7 ESE	Bay City park
PRI-4b	8.7 ESE	Bay City, Hwy 35
PRI-5	4.8 ESE	Hager City
PRI-6a	1.9 NNE	Diamond Bluff; Pierce County highway shed
PRI-6b	1.8 NNE	Diamond Bluff cemetery
PRI-7	11.9 E	Junction of Hwy 35 & Cty D (discontinued 07/01/96)
PRI-8	3.4 N	Station 2 - farm
PRI-9	6.6 ESE	Bay City substation on Hwy 35
PRI-10	2.6 NE	Weich farm
PRI-11	4.0 NNE	D. Dosdall farm (discontinued in March, 1995)
PRI-12	11.1 NNW	S. Rohl farm (discontinued in October, 1999)
PRI-13	3.8 E	Christiansen farm
PRI-14	13.8 N	A. Huppert farm (discontinued in February 2004)
PRI-15	13.9 N	R. Peterson farm
PRI-T30	1.9 N	Diamond Bluff
PRI-T31	1.7 NNE	Diamond Bluff
PRI-T32	1.8 ENE	290th Avenue
PRI-T33	4.4 N	Hwy 35, Thomas Killian residence
PRI-T34	4.7 NE	Cty K and 840th Street
PRI-T35	5.2 E	Cty VV and 790th Street
PRI-T36	4.8 ESE	Hager City
PRI-T37	10.3 NE	Ellsworth
PRI-T38	8.9 ESE	Bay City, Hwy 35
PRI-T39	11.6 NW	Prescott

Table 2. Sample collection summary and required analyses for 2008.

Sample Type	Collection and Frequency	Site locations	Number of Samples Collected	Number of Sample Deviations	Required Analyses
air particulate	C/BW	1a, 6a, 9	78	0	GA, GB, GI
air iodine	C/BW	1a, 6a, 9	78	0	GI
precipitation	C/BW	1a, 9	12	0	GB, H
TLD	C/Q	T30 – T39	40	0	direct exposure
surface water	G/SA	1b, 2, 4a	6	0	GA, GB, GI, Sr, H
fish	G/SA	upstream, downstream	4	0	GI
vegetation	G/SA	1b, 4b, 5, 6a, 8, 9	12	0	GA, GB, GI
soil	G/SA	1b, 4b, 5, 6a, 8, 9	12	0	GA, GB, GI
well water	G/SA	4a, 5, 6b	6	0	GA, GB, H
milk	G/M	10, 13, 15	24	0	GI, I, Sr

Collection type: C/ = continuous; G/ = grab

Frequency: /W = weekly; /M = monthly; /Q = quarterly; /A = annually; /BW = bi-weekly; /SA = semi-annually

Required analyses: GA = gross alpha; GB = gross beta; GI = gamma isotopic; Sr = strontium; I = iodine; H = tritium

Table 3. WI DHS missing sample report or non-routine analyses for 2008.

Sample type	Date	Site	Explanation
			There were no missed samples or non-routine analyses for 2008.

Results And Discussion

Air Particulate

A summary of reported activities by WI DHS for air particulate samples is included in Table 4. Results from the individual sample analyses are listed in Tables 5-6.

From the individual activities or quarterly averages for gross beta activities it may be noted that there are no significant differences between sites at different distances from the Prairie Island facility. With no significant difference with distance from the Prairie Island site, an increase in gross beta activity attributable to the Prairie Island plant operation is not evident.

The gamma isotopic analysis of the quarterly air particulate filter composites detected only small amounts of the radioisotopes listed in Table 4. Beryllium-7 (^7Be), detected in all composites, is a naturally occurring radioisotope that is constantly produced through nuclear reactions between cosmic rays and nuclei in the atmosphere and is detected in air composites from other areas of the state.

Influence by the Prairie Island nuclear generating facility on air quality is not evident from air particulate analysis.

Air Iodine

A summary of reported activities by WI DHS for air iodine samples is included in Table 4. Results from the individual sample analyses are listed in Table 5.

Air iodine measurements were all below the LLD of 0.07 pCi/m^3 for all sites.

Direct Radiation - Thermoluminescent Dosimeters (TLD's)

A summary of reported activities by WI DHS for direct radiation is included in Table 4. Results from the individual sample analyses are listed in Table 7.

Direct radiation (TLD) data for 2008 from the WI DHS network was comparable for all sites. Significant differences in exposure were not noticed at different distances from the Prairie Island nuclear facility. The average quarterly exposure from the ten sites located within Wisconsin was 15.2 ± 2.1 milliroentgens. The average quarterly exposure for 2008 is at background levels and is comparable to other areas within Wisconsin.

Precipitation

A summary of reported activities by WI DHS for precipitation is included in Table 4. Results from the individual sample analyses are listed in Table 8.

The gross beta activity in precipitation was within the normal range of activity when compared to previous year's data.

Surface Water

A summary of reported activities by WI DHS for surface water samples is included in Table 4. Results from the individual sample analyses are listed in Table 9.

The surface water samples showed no unusual activities and are at background levels comparable to previous years. From the gamma isotopic analysis all radioisotopes were below their respective LLD. All reported activities for gross beta, gross alpha and tritium (^3H), except for one tritium (^3H) activity at site PRI-2, are at background levels. The reported activity at PRI-2 is a site closest to the plant and could possibly be attributed to a Prairie Island waste release. The surface water samples uniformly show activities well below state or federal standards.

Fish

A summary of reported activities by WI DHS for fish samples is included in Table 4. Results from the individual sample analyses are listed in Table 10.

The fish samples showed no unusual activities. Naturally occurring potassium-40 (^{40}K) was detected in all samples. All other radioisotopes were below their respective LLD.

Well Water

A summary of reported activities by WI DHS for well water samples is included in Table 4. Results from the individual sample analyses are listed in Table 11.

The well water samples showed no unusual gross alpha and gross beta activities and all activities for tritium (^3H) were less than its LLD. The activity levels are all below state and federal standards.

Milk

A summary of reported activities by WI DHS for milk samples is included in Table 4. Results from the individual sample analyses are listed in Table 12.

Analysis of the milk samples showed no unusual activities. Naturally occurring potassium-40 (^{40}K) was detected in all samples. The detected activities for strontium-90 (^{90}Sr) are attributable to residual fallout from previous atmospheric nuclear weapons testing and were also detected in previous years at similar activity levels.

Vegetation

A summary of reported activities by WI DHS for vegetation samples is included in Table 4. Results from the individual sample analyses are listed in Tables 13.

Analysis of the vegetation samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of the naturally occurring radioisotopes beryllium-7 (^7Be) and potassium-40 (^{40}K) listed in Table 4. All other radioisotopes were below their respective LLD.

Soil

A summary of reported activities by WI DHS for soil samples is included in Table 4. Results from the individual sample analyses are listed in Table 14.

Analysis of the soil samples showed no unusual activities. The gamma isotopic analysis detected only small amounts of the radionuclides listed in Table 4. Potassium-40 (^{40}K) is a naturally occurring radioisotope. The reported activities for cesium-137 (^{137}Cs) were also detected in previous years and are largely attributable to fallout from previous atmospheric nuclear weapons testing. Naturally occurring radioisotopes such as radium-226 (^{226}Ra), bismuth-214 (^{214}Bi), lead-214 (^{214}Pb), actinium-228 (^{228}Ac), bismuth-212 (^{212}Bi) and lead-212 (^{212}Pb) from the naturally occurring uranium-238 (^{238}U) and thorium-232 (^{232}Th) decay series are commonly detected but have not been quantified or reported.

Dose to an Average Individual

Federal regulations 10 CFR 20, 10 CFR 50 Appendix I and 40 CFR 190 restrict the annual exposure of the population from all parts of the nuclear fuel cycle, including nuclear power plants. Doses resulting from gaseous and liquid effluent releases from the Prairie Island nuclear generating facilities are less than the limits as stated in these Federal regulations.

The WI DHS limits for permissible levels of radiation exposure from external sources in unrestricted areas is defined in the Wis. Adm. Code section HFS 157.23. Doses resulting from gaseous and liquid effluent releases from the Prairie Island nuclear generating facilities are less than the limits as stated in Wis. Adm. Code section HFS 157.23.

References

State of Wisconsin, Wisconsin Administrative Code, HFS 157.23

U.S. Environmental Protection Agency, Environmental Radiation Requirements for Normal Operations of Activities in the Uranium Fuel Cycle, EPA 520/4-76-016, 40 CFR Part 190, November 1976.

U.S. Nuclear Regulatory Commission, Title 10, Part 20.

U.S. Nuclear Regulatory Commission, Title 10, Part 50, Appendix I.

Table 4. Sample activity summary for the Prairie Island environmental monitoring program for 2008.

Sample type (units)	LLD	Number of samples ^a	Analysis	Range
air particulate (pCi/m ³)	0.005	78 / 78	gross beta	0.009 - 0.039
			gamma isotopic	
	0.020	12 / 12	Be-7	0.042 - 0.081
	0.002	12 / 0	Mn-54	< 0.0005
	0.002	12 / 0	Co-58	< 0.0005
	0.005	12 / 0	Fe-59	< 0.0013
	0.002	12 / 0	Co-60	< 0.0005
	0.005	12 / 0	Zn-65	< 0.0013
	0.002	12 / 0	Nb-95	< 0.0007
	0.005	12 / 0	Zr-95	< 0.0011
	0.002	12 / 0	Ru-103	< 0.0005
	0.015	12 / 0	Ru-106	< 0.0038
	0.020	12 / 0	I-131	< 0.0022
	0.002	12 / 0	Cs-134	< 0.0004
	0.002	12 / 0	Cs-137	< 0.0005
	0.030	12 / 0	Ba-140	< 0.0035
	0.020	12 / 0	La-140	< 0.0020
0.002	12 / 0	Ce-141	< 0.0007	
0.005	12 / 0	Ce-144	< 0.0024	
air iodine (pCi/m ³)	0.07	78 / 0	I-131	< 0.030
surface water (pCi/liter)	3.0	6 / 5	gross beta (sol)	< 2.6 - 4.7
	3.0	6 / 1	gross beta (insol)	< 2.4 - 1.6
	3.0	6 / 3	gross alpha (sol)	< 2.1 - 4.0
	3.0	6 / 0	gross alpha (insol)	< 1.3
	300	6 / 2	H-3	< 180 - 1790
	2.0	6 / 0	Sr-89	< 0.8
	1.0	6 / 0	Sr-90	< 0.4
			gamma isotopic	
	15	6 / 0	Mn-54	< 8
	15	6 / 0	Co-58	< 9
	30	6 / 0	Fe-59	< 19
	15	6 / 0	Co-60	< 11
	30	6 / 0	Zn-65	< 22
	15	6 / 0	Nb-95	< 9
	30	6 / 0	Zr-95	< 14
	15	6 / 0	I-131	< 10
	15	6 / 0	Cs-134	< 9
	15	6 / 0	Cs-137	< 8
	60	6 / 0	Ba-140	< 29
15	6 / 0	La-140	< 14	

Table 4. Sample activity summary for the Prairie Island environmental monitoring program for 2008.

Sample type (units)	LLD	Number of samples ^a	Analysis	Range
fish (pCi/kg wet)	800	4 / 4	gamma isotopic	
	50	4 / 0	K-40	2190 - 3100
	60	4 / 0	Mn-54	< 20
	130	4 / 0	Co-58	< 35
	60	4 / 0	Fe-59	< 120
	130	4 / 0	Co-60	< 31
	50	4 / 0	Zn-65	< 110
	100	4 / 0	Nb-95	< 46
	50	4 / 0	Zr-95	< 60
	60	4 / 0	Cs-134	< 27
			Cs-137	< 28
precipitation (nCi/m ²)	1.5 ^b	12 / 8	gross beta	< 0.16 - 0.24
	300 ^b	12 / 0	H-3	< 24
well water (pCi/liter)	3.0	6 / 2	gross beta	< 1.6 - 1.7
	3.0	6 / 0	gross alpha	< 2.7
	300	6 / 0	H-3	< 180
vegetation (pCi/kg wet)	5000	12 / 1	gross alpha	< 3000 - 3000
	4000	12 / 12	gross beta	5300 - 10000
			gamma isotopic	
	600	12 / 10	Be-7	< 410 - 1600
	2000	12 / 12	K-40	4300 - 6400
	90	12 / 0	Mn-54	< 70
	100	12 / 0	Co-58	< 80
	200	12 / 0	Fe-59	< 170
	100	12 / 0	Co-60	< 90
	250	12 / 0	Zn-65	< 250
	100	12 / 0	Nb-95	< 70
	200	12 / 0	Zr-95	< 110
	80	12 / 0	I-131	< 80
	80	12 / 0	Cs-134	< 70
90	12 / 0	Cs-137	< 80	
350	12 / 0	Ba-140	< 260	
100	12 / 0	La-140	< 100	

Table 7. WI DHS TLD network for the Prairie Island environmental monitoring program.

Date Placed:	01/09/08	04/09/08	07/09/08	10/08/08
Date Removed:	04/09/08	07/09/08	10/08/08	01/14/09
Days in the Field:	91	91	91	98
Individual quarterly date is reported as : mR / Standard Quarter + 2 sigma counting error.				
TLD sites that are located 0 – 2 miles from the Prairie island facility.				
T30	13.5 +- 0.7	13.9 +- 0.7	13.5 +- 0.7	16.5 +- 0.5
T31	13.1 +- 0.9	13.9 +- 0.9	12.9 +- 0.7	16.0 +- 0.7
T32	13.7 +- 0.9	14.0 +- 1.0	14.4 +- 0.6	16.5 +- 1.1
Quarterly average +- s.d.	13.4 +- 0.3	13.9 +- 0.1	13.6 +- 0.8	16.3 +- 0.3
TLD sites that are located 2– 5 miles from the Prairie island facility				
T33	16.7 +- 0.6	17.3 +- 0.7	16.4 +- 0.6	19.8 +- 0.5
T34	17.0 +- 0.7	17.7 +- 0.6	17.4 +- 0.5	20.4 +- 0.5
T35	15.2 +- 0.6	15.7 +- 1.0	16.2 +- 0.6	18.2 +- 1.1
T36	13.0 +- 0.6	16.5 +- 0.9	13.8 +- 0.4	19.2 +- 0.7
Quarterly average +- s.d.	15.5 +- 1.8	16.8 +- 0.9	16.0 +- 1.5	19.4 +- 0.9
TLD sites that are located greater than 5 miles from the Prairie island facility				
T37	13.7 +- 1.0	14.3 +- 0.7	14.2 +- 1.3	17.1 +- 0.6
T38	13.3 +- 0.5	12.3 +- 0.8	13.0 +- 0.4	14.8 +- 0.8
T39	12.9 +- 0.8	12.4 +- 0.8	12.9 +- 0.9	14.9 +- 0.9
Quarterly average +- s.d.	13.3 +- 0.4	13.0 +- 1.1	13.4 +- 0.7	15.6 +- 1.3

Table 8. WI DHS analysis results for precipitation samples collected for the Prairie Island environmental monitoring program.

Measurements in units of nCi/m2			
monthly composite sample			
Collection	inches	gross beta	tritium
01/23/08	0.55	0.13 +- 0.03	< 2.5
02/22/08	0.27	0.05 +- 0.01	< 1.2
03/19/08	0.64	0.23 +- 0.03	< 2.9
04/16/08	2.57	< 0.16	< 12
05/18/08	4.23	0.19 +- 0.10	< 19
06/29/08	5.15	0.24 +- 0.14	< 24
07/26/08	2.73	< 0.10	< 12
08/22/08	1.59	< 0.10	< 7.7
09/17/08	2.55	< 0.16	< 12
10/17/08	1.79	0.12 +- 0.07	< 8.6
11/17/08	1.65	0.13 +- 0.07	< 8.0
12/27/08	1.02	0.13 +- 0.05	< 4.9

Table 9. WI DHS analysis results for surface water samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Site:	PRI-1	PRI-2	PRI-4	PRI-1	PRI-2	PRI-4
Collection date:	06/03/08	06/03/08	06/03/08	09/16/08	09/16/08	09/16/08
gross alpha-sol	< 2.1	4.0 +- 2.0	4.0 +- 2.0	< 1.9	< 2.0	4.0 +- 2.0
gross beta-sol	1.7 +- 1.1	3.5 +- 0.8	2.9 +- 0.9	< 2.6	4.2 +- 1.3	4.7 +- 1.4
gross alpha-insol	< 1.1	< 1.1	< 1.3	< 1.1	< 1.1	< 1.1
gross beta-insol	< 1.2	< 1.1	1.6 +- 0.8	< 2.4	< 2.4	< 2.4
H-3 *	< 180	< 180	< 180	< 180	1790 +- 140	350 +- 120
Sr-89 *	< 0.7	< 0.8	< 0.6	< 0.4	< 0.4	< 0.4
Sr-90 *	< 0.1	< 0.4	< 0.4	< 0.4	< 0.3	< 0.3
gamma isotopic						
Mn-54	< 6	< 8	< 6	< 6	< 7	< 8
Co-58	< 6	< 8	< 6	< 6	< 6	< 9
Fe-59	< 11	< 19	< 13	< 14	< 12	< 15
Co-60	< 7	< 8	< 7	< 8	< 7	< 11
Zn-65	< 15	< 22	< 17	< 17	< 17	< 21
Nb-95	< 6	< 8	< 6	< 6	< 7	< 9
Zr-95	< 11	< 12	< 11	< 11	< 10	< 14
I-131	< 8	< 8	< 6	< 8	< 8	< 10
Cs-134	< 7	< 8	< 6	< 7	< 7	< 9
Cs-137	< 6	< 7	< 6	< 7	< 6	< 8
Ba-140	< 27	< 29	< 18	< 23	< 25	< 27
La-140	< 9	< 14	< 11	< 11	< 11	< 14

Radioisotopes other than those reported were not detected.

Table 10. WI DHS analysis results for fish samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Collection	05/12/08	05/15/08	09/15/08	09/17/08
Location	downstream	upstream	downstream	upstream
Type	white bass	white bass	white bass	white bass
gamma isotopic				
K-40	2610 +- 120	2190 +- 130	3000 +- 200	3100 +- 200
Mn-54	< 17	< 20	< 18	< 17
Co-58	< 22	< 27	< 35	< 27
Fe-59	< 70	< 80	< 80	< 120
Co-60	< 8	< 21	< 29	< 31
Zn-65	< 44	< 60	< 80	< 110
Nb-95	< 44	< 46	< 45	< 26
Zr-95	< 39	< 47	< 60	< 33
Cs-134	< 15	< 18	< 27	< 22
Cs-137	< 13	< 14	< 28	< 19

Radioisotopes other than those reported were not detected.

Table 11. WI DHS analysis results for well water samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

	PRI-4	PRI-5	PRI-6	PRI-4	PRI-5	PRI-6
Collection date:	06/03/08	06/03/08	06/03/08	09/16/08	09/16/08	09/16/08
gross alpha	< 2.4	< 2.5	< 2.7	< 1.9	< 1.9	< 2.0
gross beta	1.6 +- 0.9	1.7 +- 0.8	< 1.6	< 1.4	< 1.1	< 1.1
H-3	< 180	< 180	< 180	< 180	< 180	< 180

Table 12. WI DHS analysis results for milk samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Location	PRI-13	PRI-10	PRI-13	PRI-10	PRI-13	PRI-10
Collection date:	01/10/08	02/06/08	03/26/08	04/10/08	05/13/08	06/12/08
I-131	< 0.3	< 0.4		< 0.2	< 0.4	
Sr-90	1.1 +/- 0.2	1.1 +/- 0.3	0.9 +/- 0.3	0.4 +/- 0.2	0.9 +/- 0.3	< 0.4
gamma isotopic						
K-40	1320 +/- 90	1500 +/- 80	1370 +/- 80	1330 +/- 60	1420 +/- 60	1440 +/- 60
Mn-54	< 14	< 10	< 11	< 7	< 7	< 6
Co-58	< 12	< 10	< 10	< 8	< 6	< 6
Fe-59	< 24	< 20	< 25	< 17	< 14	< 14
Co-60	< 12	< 14	< 11	< 7	< 8	< 7
Zn-65	< 29	< 32	< 31	< 21	< 18	< 16
Nb-95	< 10	< 10	< 11	< 8	< 6	< 7
Zr-95	< 25	< 19	< 18	< 12	< 11	< 11
I-131	< 11	< 10	< 13	< 9	< 7	< 10
Cs-134	< 11	< 10	< 12	< 7	< 7	< 6
Cs-137	< 11	< 12	< 10	< 8	< 8	< 5
Ba-140	< 37	< 34	< 42	< 31	< 23	< 30
La-140	< 12	< 14	< 14	< 15	< 9	< 15
Location	PRI-13	PRI-10	PRI-13	PRI-10	PRI-13	PRI-10
Collection date:	07/21/08	08/12/08	09/09/08	10/14/08	11/11/08	12/16/08
I-131	< 0.2			< 0.6	< 0.2	< 0.2
Sr-90	1.2 +/- 0.3	0.8 +/- 0.3	0.8 +/- 0.2	0.5 +/- 0.2	1.0 +/- 0.3	< 0.4
gamma isotopic						
K-40	1450 +/- 60	1690 +/- 100	1490 +/- 60	1500 +/- 70	1430 +/- 60	1560 +/- 150
Mn-54	< 6	< 14	< 7	< 7	< 7	< 14
Co-58	< 6	< 13	< 5	< 6	< 7	< 10
Fe-59	< 14	< 23	< 12	< 15	< 14	< 27
Co-60	< 7	< 12	< 7	< 8	< 9	< 15
Zn-65	< 17	< 34	< 16	< 18	< 15	< 30
Nb-95	< 7	< 10	< 5	< 6	< 6	< 13
Zr-95	< 10	< 21	< 9	< 11	< 10	< 19
I-131	< 8	< 13	< 6	< 6	< 6	< 11
Cs-134	< 7	< 12	< 5	< 6	< 6	< 8
Cs-137	< 6	< 13	< 5	< 7	< 6	< 11
Ba-140	< 27	< 44	< 20	< 21	< 20	< 42
La-140	< 8	< 12	< 9	< 9	< 11	< 14

Radioisotopes other than those reported were not detected.

Table 12. WI DHS analysis results for milk samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/liter

Location: PRI-15

Collection date:	01/10/08	02/06/08	03/26/08	04/10/08	05/13/08	06/12/08
I-131	< 0.4	< 0.3		< 0.2	< 0.4	
Sr-90	1.1 +- 0.2	1.0 +- 0.3	1.2 +- 0.3	0.7 +- 0.3	1.4 +- 0.4	0.5 +- 0.2
gamma isotopic						
K-40	1520 +- 70	1530 +- 50	1560 +- 80	1530 +- 80	1500 +- 60	1490 +- 60
Mn-54	< 10	< 4	< 10	< 9	< 7	< 6
Co-58	< 10	< 4	< 11	< 9	< 7	< 7
Fe-59	< 22	< 9	< 21	< 19	< 16	< 18
Co-60	< 10	< 5	< 13	< 11	< 9	< 6
Zn-65	< 24	< 10	< 33	< 27	< 19	< 19
Nb-95	< 11	< 4	< 10	< 10	< 7	< 7
Zr-95	< 14	< 6	< 15	< 18	< 11	< 13
I-131	< 12	< 4	< 10	< 10	< 8	< 14
Cs-134	< 9	< 3	< 10	< 10	< 8	< 6
Cs-137	< 9	< 4	< 11	< 10	< 7	< 6
Ba-140	< 37	< 13	< 34	< 34	< 27	< 41
La-140	< 13	< 6	< 15	< 9	< 11	< 14
Collection date:	07/21/08	08/12/08	09/09/08	10/14/08	11/11/08	12/16/08
I-131	< 0.2			0.9 +- 0.4	< 0.2	< 0.2
Sr-90	0.8 +- 0.2	1.2 +- 0.3	1.3 +- 0.3	0.9 +- 0.3	1.1 +- 0.2	0.8 +- 0.3
gamma isotopic						
K-40	1500 +- 80	1630 +- 90	1570 +- 70	1400 +- 80	1430 +- 60	1480 +- 130
Mn-54	< 11	< 10	< 6	< 10	< 6	< 10
Co-58	< 11	< 11	< 7	< 11	< 5	< 8
Fe-59	< 24	< 25	< 17	< 24	< 13	< 13
Co-60	< 14	< 12	< 7	< 14	< 8	< 12
Zn-65	< 29	< 32	< 16	< 28	< 16	< 22
Nb-95	< 12	< 10	< 7	< 10	< 6	< 13
Zr-95	< 20	< 18	< 12	< 17	< 10	< 17
I-131	< 13	< 13	< 10	< 10	< 6	< 9
Cs-134	< 13	< 11	< 5	< 10	< 6	< 10
Cs-137	< 11	< 10	< 6	< 10	< 6	< 12
Ba-140	< 46	< 40	< 28	< 39	< 22	< 29
La-140	< 15	< 15	< 13	< 15	< 10	< 15

Radioisotopes other than those reported were not detected.

Table 13. WI DHS analysis results for vegetation samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Site	PRI-1	PRI-4	PRI-5	PRI-6	PRI-8	PRI-9
Collection date:	06/03/08	06/03/08	06/03/08	06/03/08	06/03/08	06/03/08
gross alpha	< 2400	< 1900	< 2000	< 2300	< 2300	< 2700
gross beta	10000 +/- 1000	7300 +/- 1100	5300 +/- 1000	7000 +/- 1200	6700 +/- 1200	6200 +/- 1400
gamma isotopic						
Be-7	490 +/- 110	< 410	< 400	580 +/- 90	570 +/- 150	550 +/- 140
K-40	5000 +/- 400	4700 +/- 400	4300 +/- 400	5500 +/- 400	4900 +/- 400	5500 +/- 400
Mn-54	< 51	< 45	< 50	< 36	< 56	< 50
Co-58	< 49	< 51	< 60	< 45	< 60	< 56
Fe-59	< 110	< 120	< 130	< 60	< 130	< 170
Co-60	< 60	< 70	< 60	< 60	< 49	< 90
Zn-65	< 130	< 160	< 250	< 100	< 120	< 130
Nb-95	< 49	< 60	< 50	< 48	< 60	< 70
Zr-95	< 80	< 100	< 90	< 70	< 110	< 90
I-131	< 60	< 60	< 49	< 40	< 60	< 80
Cs-134	< 60	< 60	< 38	< 37	< 60	< 60
Cs-137	< 54	< 53	< 41	< 36	< 70	< 60
Ba-140	< 150	< 230	< 140	< 160	< 190	< 260
La-140	< 90	< 70	< 90	< 100	< 80	< 70
Collection date:	09/16/08	09/16/08	09/16/08	09/16/08	09/16/08	09/16/08
gross alpha	< 3000	< 2300	3000 +/- 2000	< 2000	< 2400	< 3000
gross beta	7400 +/- 1400	7000 +/- 1300	5700 +/- 1200	6200 +/- 1300	6700 +/- 1300	5500 +/- 1600
gamma isotopic						
Be-7	1300 +/- 200	540 +/- 120	1200 +/- 100	1100 +/- 200	1600 +/- 200	1500 +/- 100
K-40	5700 +/- 500	6400 +/- 400	5800 +/- 400	5200 +/- 400	6000 +/- 500	5900 +/- 400
Mn-54	< 60	< 60	< 52	< 70	< 46	< 70
Co-58	< 80	< 50	< 54	< 39	< 30	< 39
Fe-59	< 110	< 120	< 150	< 130	< 120	< 100
Co-60	< 48	< 60	< 33	< 60	< 52	< 53
Zn-65	< 180	< 160	< 160	< 140	< 150	< 130
Nb-95	< 70	< 47	< 47	< 46	< 41	< 52
Zr-95	< 90	< 100	< 80	< 60	< 90	< 70
I-131	< 52	< 57	< 40	< 58	< 44	< 51
Cs-134	< 70	< 52	< 42	< 56	< 58	< 58
Cs-137	< 60	< 52	< 45	< 80	< 50	< 60
Ba-140	< 170	< 150	< 190	< 120	< 220	< 180
La-140	< 100	< 70	< 80	< 53	< 80	< 80

Radioisotopes other than those reported were not detected.

Table 14. WI DHS analysis results for soil samples collected for the Prairie Island environmental monitoring program.

Measurements in units of pCi/kilogram (dry)

Site	PRI-1	PRI-4	PRI-5	PRI-6	PRI-8	PRI-9
Collection date:	06/03/08	06/03/08	06/03/08	06/03/08	06/03/08	06/03/08
gross alpha	< 8000	< 8000	< 8000	10000 +- 8000	14000 +- 8000	< 8000
gross beta	12000 +- 4000	13000 +- 4000	14000 +- 4000	22000 +- 4000	24000 +- 4000	14000 +- 4000
gamma isotopic						
K-40	11300 +- 500	11400 +- 600	12400 +- 500	15500 +- 600	15800 +- 600	10700 +- 400
Mn-54	< 33	< 34	< 50	< 46	< 51	< 16
Co-58	< 42	< 27	< 36	< 48	< 49	< 20
Fe-59	< 120	< 47	< 110	< 120	< 130	< 52
Co-60	< 41	< 34	< 70	< 55	< 55	< 25
Zn-65	< 140	< 80	< 180	< 210	< 250	< 43
Nb-95	< 48	< 36	< 39	< 46	< 50	< 25
Zr-95	< 70	< 55	< 80	< 80	< 70	< 34
Cs-134	< 60	< 28	< 60	< 60	< 80	< 20
Cs-137	420 +- 20	163 +- 16	170 +- 20	260 +- 20	90 +- 20	190 +- 12
Collection date:	09/16/08	09/16/08	09/16/08	09/16/08	09/16/08	09/16/08
gross alpha	< 8000	< 8000	< 8000	< 8000	11000 +- 8000	< 8000
gross beta	17000 +- 4000	16000 +- 4000	13000 +- 4000	16000 +- 4000	20000 +- 4000	14000 +- 4000
gamma isotopic						
K-40	15100 +- 600	12600 +- 400	11700 +- 400	15000 +- 500	14600 +- 500	12200 +- 400
Mn-54	< 56	< 13	< 14	< 16	< 18	< 13
Co-58	< 44	< 12	< 13	< 16	< 15	< 12
Fe-59	< 130	< 30	< 30	< 43	< 35	< 33
Co-60	< 60	< 11	< 14	< 16	< 18	< 15
Zn-65	< 250	< 34	< 40	< 42	< 41	< 31
Nb-95	< 48	< 13	< 15	< 18	< 18	< 14
Zr-95	< 80	< 18	< 22	< 31	< 28	< 25
Cs-134	< 70	< 9	< 10	< 12	< 12	< 9
Cs-137	150 +- 20	170 +- 10	140 +- 10	206 +- 14	130 +- 13	190 +- 11

Naturally occurring radioisotopes such as radium-226 (²²⁶Ra), bismuth-214 (²¹⁴Bi), lead-214 (²¹⁴Pb), actinium-228 (²²⁸Ac), bismuth-212 (²¹²Bi), lead-212 (²¹²Pb) from the naturally occurring uranium-238 (²³⁸U) and thorium-232 (²³²Th) decay series are commonly detected but have not been quantified or reported.

Radioisotopes other than those reported were not detected.