

# **Point Beach-Kewaunee Environmental Radioactivity Survey**

**2019**



**WISCONSIN DEPARTMENT  
*of* HEALTH SERVICES**

**Division of Public Health  
Bureau of Environmental and Occupational Health  
Radiation Protection Section**

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## Executive Summary

Wisconsin Stat. § 254.41 mandates the Wisconsin Department of Health Services (DHS) to conduct environmental radiation monitoring around the nuclear power facilities that affect Wisconsin. This environmental monitoring report is for the Point Beach and Kewaunee nuclear generating plants for the calendar year January - December 2019 and provides a description and results of this environmental monitoring program.

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

## Program Summary

For 2019, all sample results from the Point Beach-Kewaunee environmental monitoring area were less than state and federal standards or guidelines.

The DHS environmental monitoring programs provide an ongoing baseline of radioactivity measurements to assess any Wisconsin health concerns from the operation of nuclear power generating facilities in or near Wisconsin or other radiological incidents that may occur within Wisconsin or worldwide. These monitoring programs show the following:

Environmental radioactivity levels have been trending downward since the 1950s–1960s atmospheric nuclear testing and radiological incidents like Chernobyl nuclear reactor incident of 1986 and Fukushima Daiichi incident in 2011.

- There were no reportable incidents during 2019 that required additional environmental monitoring.
- There is no radioactive problem with sampled types of food consumed in Wisconsin and no health problems related to radioactivity for Wisconsin citizens.
- The June surface water sample showed elevated tritium levels, but well below the reporting level of 30,000 pCi/liter (NUREG-1301 1991, page 64)

DHS's ongoing environmental monitoring programs will continue to provide assurances to the citizens of Wisconsin that the environment surrounding the Kewaunee Power Station and Point Beach nuclear power facilities will continue to be evaluated.

# Table of Contents

	<b>Page Number</b>
Introduction	1
DHS Point Beach-Kewaunee Environmental Monitoring Sampling Program	1
Program Modifications	1
Laboratory Services and Quality Assurance	1
Detection Limits	2
Reporting of Sample Analysis Results	2
Results and Discussion for the Wisconsin DHS Point Beach-Kewaunee Environmental Monitoring program	11
References	14
Sample Activity Summary	15
Appendices	38

## List of Tables

	<b>Page Number</b>
Table 1 Sample collection summary and required analyses for 2019.	3
Table 2 Wisconsin DHS Point Beach-Kewaunee environmental monitoring sampling sites.	4
Table 3 Missing sample or sample deviation report for 2019.	5
Table 4 Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring.	15
Table 5 Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.	18
Table 6 Wisconsin DHS gamma isotopic analysis results from the quarterly composites of air particulate filters collected from the Point Beach-Kewaunee environmental monitoring program.	22
Table 7 Wisconsin DHS TLD network for the Point Beach-Kewaunee environmental monitoring program.	24
Table 8 Wisconsin DHS analysis results for precipitation samples collected for the Point Beach-Kewaunee environmental monitoring program.	24
Table 9 Wisconsin DHS analysis results for fish samples collected for the Point Beach-Kewaunee environmental monitoring program.	26
Table 10 Wisconsin DHS analysis results for shoreline sediment samples collected for the Point Beach-Kewaunee environmental monitoring program.	27
Table 11 Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.	28
Table 12 Wisconsin DHS analysis results for well water samples collected for the Point Beach-Kewaunee environmental monitoring program.	30
Table 13 Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.	31
Table 14 Wisconsin DHS analysis results for vegetation samples collected for the Point Beach-Kewaunee environmental monitoring program.	34
Table 15 Wisconsin DHS analysis results for soil samples collected for the Point Beach-Kewaunee environmental monitoring program.	36

## List of Figures

Figure 1 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Kewaunee plant.	9
Figure 2 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Point Beach plant.	10

# Point Beach-Kewaunee

## Environmental Radioactivity Survey, 2019

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### Introduction

Wisconsin Stat. § 254.41 mandates the Wisconsin Department of Health Services (DHS) to conduct environmental radiation monitoring around the nuclear power facilities that impact Wisconsin. This environmental monitoring report is for the Point Beach and Kewaunee nuclear generating plants for the calendar year January - December 2019 and provides a description and results of this environmental monitoring program.

### DHS Point Beach-Kewaunee Environmental Monitoring Sampling Program

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 as measured by thermoluminescent dosimeters (TLD), surface water, fish, shoreline sediment, soil, milk, well water, and vegetation that are collected from selected locations at planned sampling intervals.

Table 1 provides a listing of types of samples collected, collection frequency, sites where samples are collected, number of samples collected, number of samples that were missed or had sample or analysis deviations, and a listing of the required analyses. Table 2 is a listing of sampling sites and includes a description, direction, and distance from the monitored power plants. Table 3 provides an explanation of missing samples or non-routine sample analyses. Figure 1 is a map showing the location of environmental sampling sites in relation to Kewaunee Power Station and Figure 2 is a map showing the location of environmental sampling sites in relation to the Point Beach power plant.

### Program Modifications

With the decommissioning of Kewaunee Power Station, a decision was made to discontinue two air monitoring stations and add two new air monitoring stations in closer proximity to Point Beach Nuclear Power Plant. In November of 2018 two new air monitoring sites were created, the first site was PBK-3 which was located at the northeast corner of the Two Creeks Town Hall. The second site (PBK-7) was relocated to Point Beach State Park along the southwest corner of the maintenance building. The location of these new air monitoring sites provided coverage to the north, east, and south of Point Beach.

In January of 2019, air monitoring sites PBK-1 and PBK-7 were discontinued due to the closing of Kewaunee Power Station.

Clarification of PBK-17's surface water collection is needed. The Green Bay water intake is located in Rostoc along the shore of Lake Michigan. The water is pumped to the Green Bay Filtration Plant located on Finger road in Humboldt, WI some 19 miles west of the intake. The water sample is taken at the filtration plant prior to any treatment.

### Laboratory Services and Quality Assurance

Analysis of the samples is performed under contract with the Wisconsin State Laboratory of Hygiene (WSLH). WSLH 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 instrumentation and conduct performance checks. Instrumentation quality control charts are maintained and available upon written request.

WSLH participates in the Environmental Resource Associates' Proficiency Testing program and has performed satisfactorily over the report period. In addition, WSLH participates in the Multi Analytical Performance Evaluation Program (MAPEP) for environmental matrix analysis. Proficiency testing results are available from the Wisconsin State Laboratory of Hygiene.

## Detection Limits

Detection limits, requested by DHS, are expressed as a lower limit of detection (LLD). The 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.
t	is for environmental samples, 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 are 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 -16 is an "a posteriori" calculation 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 Wisconsin DHS LLD indicating that the required 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  $\pm$ ).

Examples and explanations of data reporting are:

Example	Nuclide	Activity reported
1	$^{137}\text{Cs}$	< 10 pCi/liter
2	$^{137}\text{Cs}$	15 $\pm$ 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.

Table 1 Sample collection summary and required analyses for 2019.

Sample Type	Collection and Frequency	Site Locations	Number of Samples Collected	Number of Sample Deviations	Required Analyses
air particulate	C/W	3, 4, 17, 30	205	11	GA, GB, GI <sup>w</sup>
air iodine	C/W	3, 4, 17, 30	205	7	GI
precipitation	C/BW	1, 4	12	1	GB <sup>x,u</sup> , H <sup>x</sup>
TLD	G/Q	T1–T18, T20, T28–T31, T51–T58	124	0	ambient gamma
surface water	G/M	9, 17	24	1	GA <sup>u,v</sup> , GB <sup>u,v</sup> , GI, Sr <sup>z</sup> , H <sup>z</sup> , I <sup>y</sup>
surface water	G/SA	5, 12a, 29	6	3	GA <sup>u,v</sup> , GB <sup>u,v</sup> , GI, Sr, H
fish	G/Q	10a	8	0	GI
shoreline sediment	G/A	5, 10a, 12a, 12b, 12c, 26, 29	6	1	GA, GB, GI
vegetation	G/SA	1, 2, 3, 4, 5, 7, 8, 14, 17	18	0	GA, GB, GI
soil	G/SA	1, 2, 3, 4, 5, 7, 8, 14, 17	18	0	GA, GB, GI
well water	G/SA	3, 10b, 11, 12d N, 12d S	8	2	GA, GB, H
milk	G/M	24, 27, 28	36	0	GI, I <sup>y</sup> , 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

<sup>u</sup> = Soluble

<sup>v</sup> = Insoluble

<sup>w</sup> = A quarterly composite for each site

<sup>x</sup> = One monthly composite from 2 sites

<sup>y</sup> = The procedure is performed six (6) times per year for each sample site

<sup>z</sup> = The procedure is performed for each site on a quarterly composite (3-month composite)



Table 2 Wisconsin DHS Point Beach-Kewaunee environmental monitoring sampling sites.

Sample site	Distance and direction (miles)		Location description
	Kewaunee	Point Beach	
PBK-1	5.7 WSW	5.7 WNW	Francar residence
PBK-2	4.9 S	0.7 SSW	Southwest corner property line - Point Beach
PBK-3	4.3 SSW	1.5 W	Two Creeks Town Hall
PBK-4	3.1 S	1.2 NNW	Residence north property line - Point Beach
PBK-5	2.6 S	1.7 NNW	Two Creeks Park; NW corner of property
PBK-7	7.3 SSW	3.3 SSW	WPSC substation, Cty V
PBK-8	0.8 WNW	4.9 N	P Ihlenfeldt farm
PBK-9	4.7 S	0.5 SSE	Point Beach, meteorological tower
PBK-10a	4.2 S	0.1 E	Point Beach, effluent channel
PBK-10b	4.2 S	0.1 E	Point Beach, entrance
PBK-11	3.1 SSW	2.0 NW	Two Creeks International Harvester
PBK-12a	0.1 E	4.2 N	Kewaunee, effluent channel
PBK-12b	0.1 E	4.2 N	Kewaunee, effluent channel, 500 feet N
PBK-12c	0.1 E	4.2 N	Kewaunee, effluent channel, 500 feet S
PBK-12d	0.1 W	4.2 N	Kewaunee, well sites (North and South)
PBK-14	0.8 W	4.3 N	Nuclear Road – field east of parking lot
PBK-17	11.4 NNE	15.6 N	Green Bay Pumping Station - Rostok
PBK-24	2.6 N	6.9 N	L. Struck farm
PBK-26	8.3 NNE	12.6 N	Kewaunee – Selner Park beach
PBK-27	3.5 SSW	1.7 NW	R. Barta farm
PBK-28	6.0 S	1.8 SSE	Strutz Farms Inc
PBK-29	6.1 SSE	2.1 SSE	Irish Road – at Lake Michigan
PBK-30	9.1 SSE	4.9 SSE	Point Beach State Forest
PBK-(T1-T8)	4.0 S	0.6 NW	Point Beach ISFSI on outside of perimeter fence
PBK-T9	3.2 S	1.2 NNW	Point Beach north property line, Lakeshore Road
PBK-T10	5.1 S	0.8 SSE	Nuclear Road, 0.6 mile E of Lakeshore Road
PBK-T11	5.1 S	0.9 SSW	Nuclear Road, 0.1 mile E of Lakeshore Road
PBK-T12	5.0 SSW	1.4 WSW	Highway 42, 0.6 mile N of Nuclear Road
PBK-T13	4.0 SSW	1.4 WNW	Highway 42, 0.3 mile N of Tapawingo Road
PBK-T14	3.1 SSW	1.9 NW	Two Creeks Road, 0.1 mile E of Highway 42
PBK-T15	7.6 S	3.3 S	Junction of Lakeshore Road and Ravine Drive
PBK-T16	7.3 SSW	3.3 SW	Cty V, 0.5 mile W of Hwy 42
PBK-T17	5.6 SW	3.8 W	Junction of Saxonbury Road and Tapawingo Road
PBK-T18	3.2 SW	3.3 NW	Zander Road, 0.1 mile W on Tannery Road
PBK-T28	7.2 NNE	11.4 N	Kewaunee, South on Hwy 42
PBK-T29	12.4 S	8.1 SSW	Two Rivers, Junction of Hwy 42 and 34th Avenue
PBK-T30	16.0 SSW	11.9 SSW	Manitowoc, Hwy 42, Two Rivers Chamber of Commerce
PBK-T31	8.6 SW	5.6 WSW	Mishicot, Cty V, in front of house #653
PBK-T51-T58	0.1 NNW	4.4 N	KPS ISFSI on the inside of the perimeter fence

Table 3 Missing sample or sample deviation report for 2019.

Sample type	Date	Site	Explanation
Precipitation	10/05/19	Composite	Data not returned by the laboratory
Iodine	01/15/19	PBK-3	Data not returned by the laboratory
Air Particulate	07/30/19	PBK-3	Data not returned by the laboratory
Air Particulate	04/10/19	PBK-3	Data not returned by the laboratory
Air Particulate	06/06/19	PBK-3	Data not returned by the laboratory
Air Particulate	12/4/2019	PBK-3	Data not returned by the laboratory
Air Particulate	08/06/19	PBK-3	Low air volume during collection period
Air Particulate	08/19/19	PBK-3	Low air volume during collection period
Air Particulate	11/26/19	PBK-3	Low air volume during collection period
Air Particulate	02/18/19	PBK-4	Low air volume during collection period
Air Particulate	09/19/19	PBK-4	Low air volume during collection period
Air Particulate	11/26/19	PBK-4	Low air volume during collection period
Air Iodine	01/15/19	PBK-4	Data not returned by the laboratory
Air Iodine	06/20/19	PBK-4	Data not returned by the laboratory
Air Iodine	08/01/19	PBK-4	Data not returned by the laboratory
Air Iodine	07/03/19	PBK-4	Data not returned by the laboratory
Air Particulate	07/03/19	PBK-4	Data not returned by the laboratory
Air Particulate	11/05/19	PBK-4	Data not returned by the laboratory
Air Particulate	12/04/19	PBK-4	Data not returned by the laboratory
Air Iodine	09/26/19	PBK-4	LLD above 0.07 pC/liter
Air Particulate	05/31/19	PBK-17	Data not returned by the laboratory
Air Particulate	07/05/19	PBK-17	Data not returned by the laboratory
Air Particulate	11/01/19	PBK-17	Data not returned by the laboratory
Air Particulate	11/08/19	PBK-17	Data not returned by the laboratory
Air Particulate	03/29/19	PBK-17	LLD above 0.07 pC/liter
Air Particulate	09/18/19	PBK-17	Low air volume during collection period
Air Particulate	11/26/19	PBK-17	Low air volume during collection period
Air Particulate	05/02/19	PBK-30	Low air volume during collection period
Air Particulate	08/22/19	PBK-30	Low air volume during collection period
Air Particulate	10/03/19	PBK-30	Low air volume during collection period
Shoreline Sediment	06/25/19	PBK-12c	Erosion control measures have been taken making it impossible to get close to the effluent area
Surface Water	07/10/19	PBK-9	Gross Alpha & Beta not reported by the laboratory
Surface Water	12/13/19	PBK-9	Iodine - not reported by the laboratory
Surface Water	01/01/19	PBK-17	Gross Alpha suspended solids, Beta suspended solids and Iodine not reported by the laboratory
Surface Water	06/25/19	PBK-5	Data not returned by the laboratory
Surface Water	06/25/19	PBK-12a	Data not returned by the laboratory
Surface Water	06/25/19	PBK-29	Data not returned by the laboratory
Surface Water	09/24/19	PBK-5	Iodine - not reported by the laboratory
Surface Water	09/24/19	PBK-12a	Iodine - not reported by the laboratory
Surface Water	09/24/19	PBK-29	Iodine - not reported by the laboratory
Surface Water	06/12/19	PBK-9	Elevated Tritium level, but below reporting level
Surface Water	12/12/19	PBK-9	Elevated Tritium level, but below reporting level
Surface Water	01/07/19	PBK-17	Analyzed 180 day past holding time, alpha beta quality control issues
Surface Water	02/06/19	PBK-17	Analyzed 180 day past holding time
Surface Water	03/05/19	PBK-17	Analyzed 180 day past holding time
Surface Water	04/01/19	PBK-17	Analyzed 180 day past holding time
Surface Water	04/01/19	PBK-17	Iodine did not meet the minimum limit of detection
Surface Water	05/06/19	PBK-17	Analyzed 180 day past holding time

Table 3 (continued) Missing sample or sample deviation report for 2019.

Sample type	Date	Site	Explanation
Surface Water	06/03/19	PBK-17	Analyzed 180 day past holding time
Surface Water	06/03/19	PBK-17	Sr-89 spike fell outside of acceptable range
Surface Water	07/01/19	PBK-17	Analyzed 180 day past holding time
Surface Water	07/01/19	PBK-17	Did not reach detection limit on I-131
Surface Water	07/01/19	PBK-17	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	08/05/19	PBK-17	Analyzed 180 day past holding time
Surface Water	08/05/19	PBK-17	Sample did not meet minimum recovery threshold for I-131
Surface Water	08/05/19	PBK-17	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	09/11/19	PBK-17	Analyzed 180 day past holding time
Surface Water	09/11/19	PBK-17	Sr-90 did not meet control limits due to late analysis 03/23/20
Surface Water	09/11/19	PBK-17	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	10/07/19	PBK-17	Analyzed 180 day past holding time
Surface Water	10/07/19	PBK-17	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	12/03/19	PBK-17	Analyzed 180 day past holding time
Surface Water	12/03/19	PBK-17	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	12/03/19	PBK-17	Sr-89 do not reflect results – values are artificially inflated – at time of analysis more than 7 half-lives have occurred
Surface Water	01/08/19	PBK-9	Analyzed 180 day past holding time
Surface Water	02/15/19	PBK-9	Analyzed 180 day past holding time
Surface Water	03/12/19	PBK-9	Analyzed 180 day past holding time
Surface Water	04/09/19	PBK-9	Analyzed 180 day past holding time
Surface Water	04/09/19	PBK-9	Sample did not meet minimum recovery threshold for I-131
Surface Water	04/09/19	PBK-9	Sr-89 spike fell outside of acceptable range
Surface Water	06/12/19	PBK-9	Analyzed 180 day past holding time
Surface Water	07/10/19	PBK-9	Carrier was below lower limit for I-131
Surface Water	07/10/19	PBK-9	Alpha and Beta analysis was cancelled due to a lab accident
Surface Water	08/14/19	PBK-9	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	08/14/19	PBK-9	Sample did not meet minimum recovery threshold for I-131
Surface Water	08/14/19	PBK-9	Analyzed 180 day past holding time
Surface Water	09/11/19	PBK-9	Analyzed 180 day past holding time
Surface Water	09/11/19	PBK-9	Sr-90 did not meet control limits due to late analysis
Surface Water	09/11/19	PBK-9	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	10/07/19	PBK-9	Analyzed 180 day past holding time
Surface Water	10/07/19	PBK-9	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	11/13/19	PBK-9	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	11/13/19	PBK-9	Analyzed 180 day past holding time
Surface Water	12/12/19	PBK-9	Analyzed 180 day past holding time
Surface Water	12/12/19	PBK-9	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	09/24/19	PBK-5	Analyzed 180 day past holding time
Surface Water	09/24/19	PBK-5	Sr-90 did not meet control limits due to late analysis
Surface Water	09/24/19	PBK-5	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	09/24/19	PBK-12A	Analyzed 180 day past holding time
Surface Water	09/24/19	PBK-12A	Sr-90 did not meet control limits due to late analysis
Surface Water	09/24/19	PBK-12A	Gross alpha beta matrix did not meet acceptance criteria
Surface Water	09/24/19	PBK-29	Analyzed 180 day past holding time
Surface Water	09/24/19	PBK-29	Sr-90 did not meet control limits due to late analysis
Surface Water	09/24/19	PBK-29	Gross alpha beta matrix did not meet acceptance criteria
Milk	04/10/19	PBK-24	Zirconium 95 - Not reported by the laboratory

Table 3 (continued) Missing sample or sample deviation report for 2019.

Sample type	Date	Site	Explanation
Milk	03/13/19	PBK-24	Sr-90 quality accuracy fell outside of upper control limits
Milk	04/10/19	PBK-24	Sample does not contain true activity from 1-131
Milk	05/08/19	PBK-24	Sr-90 quality accuracy fell outside of upper control limits
Milk	05/08/19	PBK-24	I-131 analyzed 180 days past hold time
Milk	06/12/19	PBK-24	I-131 low iodine carrier recovery
Milk	06/12/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	07/10/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	08/14/19	PBK-24	I-131 low iodine carrier recovery
Milk	08/14/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	09/11/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	11/13/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	12/11/19	PBK-24	Sr-90 analyzed 180 days past hold time
Milk	04/10/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	04/10/19	PBK-27	Sample does not contain true activity from I-131
Milk	05/08/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	06/12/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	07/10/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	07/10/19	PBK-27	I-131 low iodine carrier recovery
Milk	08/14/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	08/14/19	PBK-27	I-131 analyzed 180 days past hold time
Milk	09/11/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	11/13/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	12/11/19	PBK-27	Sr-90 analyzed 180 days past hold time
Milk	03/13/19	PBK-28	Sr-90 outside of upper control limits.
Milk	04/10/19	PBK-28	Sr-90 analyzed 180 days past hold time and outside of upper limits
Milk	05/08/19	PBK-28	Sr-90 outside of upper control limits.
Milk	05/08/19	PBK-28	I-131 analyzed 180 days past hold time
Milk	06/12/19	PBK-28	I-131 low iodine carrier recovery
Milk	06/12/19	PBK-28	Sr-90 analyzed 180 days past hold time
Milk	07/10/19	PBK-28	I-131 low iodine carrier recovery
Milk	07/10/19	PBK-28	Sr-90 analyzed 180 days past hold time
Milk	08/14/19	PBK-28	I-131 low iodine carrier recovery
Milk	08/14/19	PBK-28	Sr-90 analyzed 180 days past hold time
Milk	09/11/19	PBK-28	Sr-90 analyzed 180 days past hold time
Milk	11/13/19	PBK-28	Sr-90 analyzed 180 days past hold time
Milk	12/11/19	PBK-28	Sr-90 analyzed 180 days past hold time
Precipitation	01/08/19	PBK-4	Analyzed past 180 days holding time
Precipitation	01/08/19	PBK-4	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	02/06/19	PBK-1	Analyzed past 180 days holding time
Precipitation	02/06/19	PBK-1	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	03/15/19	PBK-1	Analyzed past 180 days holding time
Precipitation	03/15/19	PBK-1	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	04/10/19	PBK-1	Analyzed past 180 days holding time
Precipitation	04/10/19	PBK-1	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	05/08/19	PBK-4	Analyzed past 180 days holding time
Precipitation	05/08/19	PBK-4	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	06/05/19	PBK-1	Analyzed past 180 days holding time
Precipitation	06/05/19	PBK-1	Goss alpha & beta accuracy failed to meet accuracy criteria

Table 3 (continued) Missing sample or sample deviation report for 2019.

Sample type	Date	Site	Explanation
Precipitation	07/17/19	PBK-1	Analyzed past 180 days holding time
Precipitation	07/17/19	PBK-1	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	08/08/19	PBK-4	Analyzed past 180 days holding time
Precipitation	08/08/19	PBK-4	Goss alpha & beta accuracy failed to meet accuracy criteria
Precipitation	09/04/19	PBK-1	Analyzed past 180 days holding time
Precipitation	11/06/19	PBK-1	Analyzed past 180 days holding time
Precipitation	12/04/19	PBK-1	Analyzed past 180 days holding time
Precipitation	12/04/19	PBK-1	Analyzed 359 days after collection for tritium
Soil	06/25/19	PBK-1	Analyzed past 180 days holding time
Soil	06/25/19	PBK-2	Analyzed past 180 days holding time
Soil	06/25/19	PBK-3	Analyzed past 180 days holding time
Soil	06/25/19	PBK-4	Analyzed past 180 days holding time
Soil	06/25/19	PBK-5	Analyzed past 180 days holding time
Soil	06/25/19	PBK-7	Analyzed past 180 days holding time
Soil	06/25/19	PBK-8	Analyzed past 180 days holding time
Soil	06/25/19	PBK-17	Analyzed past 180 days holding time
Soil	06/25/19	PBK-17	Detection limit not met for Nb-95
Soil	09/25/19	PBK-1	Analyzed past 180 days holding time
Soil	09/25/19	PBK-1	Gross beta quality control did not pass
Soil	09/25/19	PBK-2	Analyzed past 180 days holding time
Soil	09/25/19	PBK-2	Gross beta quality control did not pass
Soil	09/25/19	PBK-2	Nb-95 detection limit was not met
Soil	09/25/19	PBK-3	Analyzed past 180 days holding time
Soil	09/25/19	PBK-3	Gross beta quality control did not pass
Soil	09/25/19	PBK-3	Nb-95 detection limit was not met
Soil	09/24/19	PBK-4	Analyzed past 180 days holding time
Soil	09/24/19	PBK-4	Gross beta quality control did not pass
Soil	09/24/19	PBK-4	Nb-95 detection limit was not met
Soil	09/24/19	PBK-5	Analyzed past 180 days holding time
Soil	09/24/19	PBK-5	Gross beta quality control did not pass
Soil	09/25/19	PBK-7	Analyzed past 180 days holding time
Soil	09/25/19	PBK-7	Gross beta quality control did not pass
Soil	09/25/19	PBK-8	Analyzed past 180 days holding time
Soil	09/25/19	PBK-8	Gross beta quality control did not pass
Soil	09/25/19	PBK-8	Nb-95 detection limit was not met
Soil	09/24/19	PBK-14	Analyzed past 180 days holding time
Soil	09/24/19	PBK-14	Gross beta quality control did not pass
Soil	09/24/19	PBK-14	Nb-95 detection limit was not met
Soil	09/25/19	PBK-17	Analyzed past 180 days holding time
Soil	09/25/19	PBK-17	Gross beta quality control did not pass
Well Water	06/25/2019	PBK-12 S	Discontinued in July 1, 2018 due to reduce water needs



Figure 1 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Kewaunee plant.

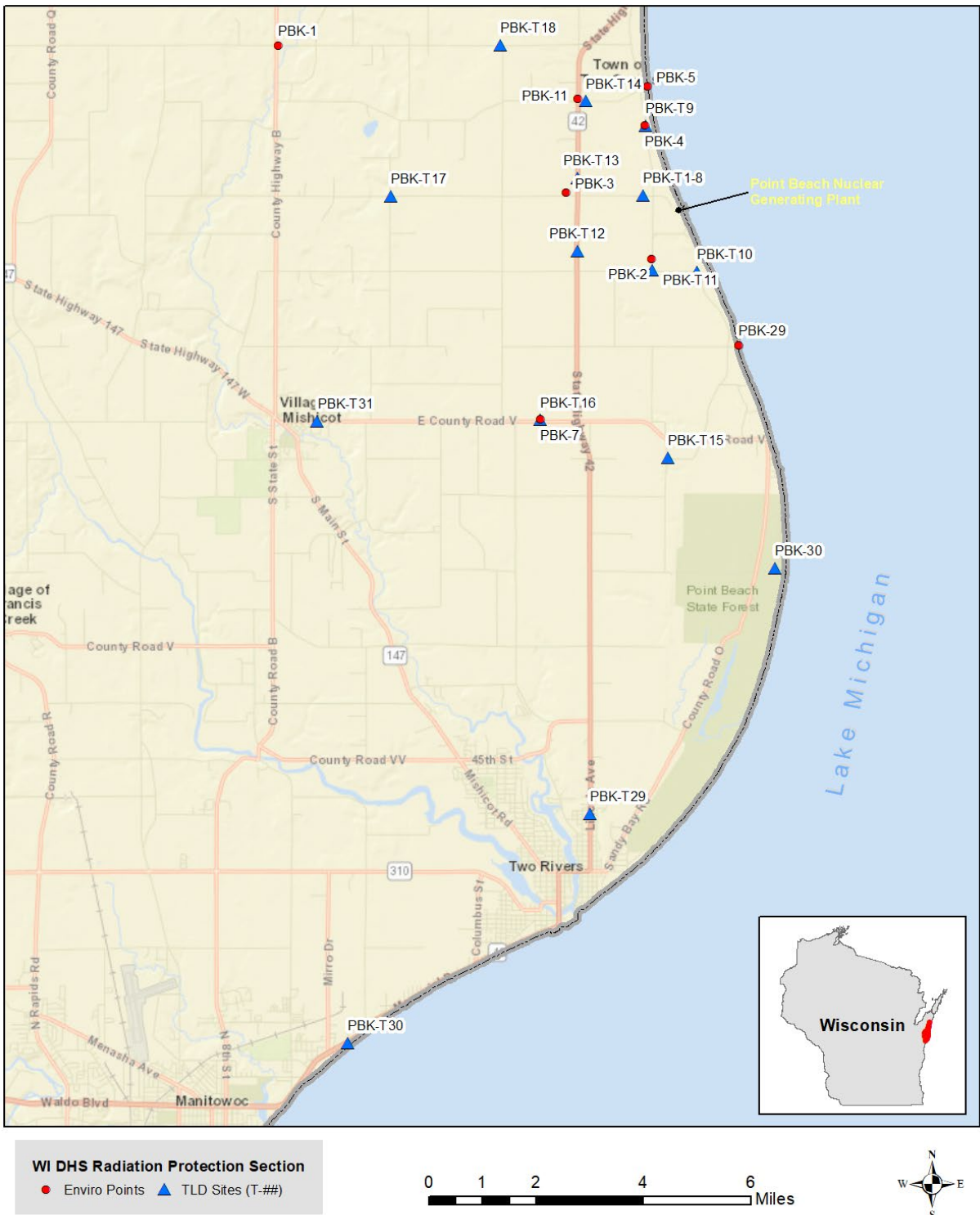


Figure 2 Point Beach-Kewaunee environmental monitoring sampling sites in relation to the Point Beach plant.

# Results and Discussion for the Wisconsin DHS Point Beach-Kewaunee Environmental Monitoring program

## Air Particulate

Table 4 provides a summary of reported activities by DHS for air particulate samples. Tables 5–6 provide results from the individual sample analyses.

From the gross beta activities listed in Table 4, it may be noted that there were no significant activity levels across the sampling area that could be attributed to either the Kewaunee or the Point Beach facilities. Although the gross beta activity was above the LLD, it was similar to previous years; and the increase in gross beta activity could not be attributed to Kewaunee Power Station or the Point Beach nuclear plant operation.

The gamma isotopic analysis of the quarterly air particulate filter composites detected only background levels of the radioisotopes listed in Table 6. All other radioisotopes were below their respective LLD. Beryllium-7 ( $^7\text{Be}$ ), 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 was detected in air composites from other areas of the state.

## Air Iodine

Table 4 provides a summary of reported activities by DHS for air iodine samples. Table 5 provides results from the individual sample analyses.

All but two air iodine measurements were below the LLD of  $0.07 \text{ pCi/m}^3$ . These two air iodine samples have been attributed to laboratory anomalies. Sample analysis suggests that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced air iodine levels during the reporting period.

## Ambient Gamma Radiation—Thermoluminescent Dosimeters (TLD)

Table 4 provides a summary of reported activities by DHS for ambient gamma radiation. Table 7 provides results from the individual sample analyses.

Analysis of samples taken at varying distances from either Kewaunee Power Station or Point Beach nuclear facilities did not yield significant differences in exposure for sites PBK-T9 through PBK-T31. Excluding the sites around the perimeter of the Point Beach ISFSI (PBK-T1 – PBK-T8) and Kewaunee Power Stations ISFSI (PBK-51 - PBK-58), the average quarterly exposure from the remaining 15 sites was  $14.8 \pm 2.2$  milliroentgens. The average quarterly exposure at the Point Beach ISFSI for 2019 was at background levels and was comparable to other areas in Wisconsin. In 2019 there was an increase in exposure readings for 4 TLD around the Kewaunee Power Station ISFSI. This increase corresponds to the placement of additional spent fuel on the ISFSI pad. Sample analysis indicates that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced ambient gamma radiation levels.

## Precipitation

Table 4 provides a summary of reported activities by DHS for precipitation. Table 8 provides results from the individual sample analyses. Sample analysis indicates that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced precipitation activity levels.

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

## Fish

Table 4 provides a summary of reported activities by DHS for fish samples. Table 9 provides results from the individual sample analyses. The fish samples showed no unusual activities. Second and third



quarter fish samples lacked sufficient volume to conduct gamma analysis and were combined into a composite sample.

## Shoreline Sediment

Table 4 provides a summary of reported activities by DHS for shoreline sediment samples. Table 10 provides results from the individual sample analyses.

Analysis of the shoreline samples showed no unusual activities. All samples indicated naturally occurring potassium-40 ( $^{40}\text{K}$ ). Previous years' reported activities also detected cesium-137 ( $^{137}\text{Cs}$ ), which was likely attributable to residual fallout from previous atmospheric nuclear weapons testing. Samples commonly detect naturally occurring radioisotopes from the uranium-238 ( $^{238}\text{U}$ ) and thorium-232 ( $^{232}\text{Th}$ ) decay series, but they have not been quantified or reported. Sample analysis indicates that neither the Kewaunee Power Station nor the Point Beach nuclear generating facilities influenced shoreline sediment activity levels.

## Surface Water

Table 4 provides a summary of reported activities by DHS for surface water samples. Table 11 provides results from individual sample analyses.

Gamma isotopic analysis found all radioisotopes were below their respective LLD. Nearly all activity for gross beta, gross beta suspended solids, and iodine were at background levels and were comparable to data from previous years. In June and December of 2019 an increased tritium concentration was observed in two surface water samples at PBK-9. Two samples showed elevated tritium readings to 1850 and 305 pCi/L from an average of ~90 pCi/L. Many Sr-89/90 samples showed elevated activity in surface water samples. However, extremely long hold times before analysis and the accuracy of the upper control limit of many samples have made some Sr-89/90 analysis results suspect.

Point Beach also recorded elevated tritium readings for their June sample and have it documented for their corrective action program. Even though the reported tritium values are higher than normal, they are well below reporting values of 30,000 pCi/L (NUREG-1301 1991, Page 64).

## Well Water

Table 4 provides a summary of reported activities by DHS for well water samples. Table 12 results from the individual sample analyses.

The well water samples showed no unusual gross alpha and gross beta activities and all activities for tritium ( $^3\text{H}$ ) were less than its LLD. The measured activities were all below state and federal standards. Influence on well water samples by the Kewaunee Power Station or Point Beach nuclear generating facilities is not evident.

## Milk

Table 4 provides a summary of reported activities by DHS for milk samples. Table 13 results from the individual sample analyses.

The analysis of milk samples detected no unusual activities. Naturally occurring potassium-40 ( $^{40}\text{K}$ ) was detected in all samples. The detection of strontium-90 ( $^{90}\text{Sr}$ ), is attributable to residual fallout from previous atmospheric nuclear weapons testing. Strontium-90 has also been detected in previous years at similar activity levels. Influence by the Kewaunee Power Station or Point Beach nuclear generating facilities is not evident from milk sample analysis.

## Vegetation

Table 4 provides a summary of reported activities by DHS for vegetation samples. Table 14 provides results from the individual sample analyses.

Analysis of the vegetation samples showed no unusual activities, even though gross beta was above the LLD the values were consistent with previous years. The gamma isotopic analysis detected naturally occurring potassium-40 ( $^{40}\text{K}$ ) and beryllium-7 ( $^7\text{Be}$ ) above the LLD, but the values were consistent with previous years samples. Influence by the Kewaunee or Point Beach nuclear generating facilities is not evident from vegetation sample analysis.

## Soil

Table 4 provides a summary of reported activities by DHS for soil samples. Table 15 provides results from the individual sample analyses.

Analysis of the soil samples showed no unusual activities. Even though nearly all gross beta and one gross alpha were above the LLD, the values were consistent with previous years. Naturally occurring potassium-40 ( $^{40}\text{K}$ ) was detected in all samples. The reported activities for cesium-137 ( $^{137}\text{Cs}$ ) were also detected in previous years and are attributable to residual fallout from previous atmospheric nuclear weapons testing. Naturally occurring radioisotopes from the uranium-238 ( $^{238}\text{U}$ ) and thorium-232 ( $^{232}\text{Th}$ ) decay series are commonly detected but have not been quantified or reported. Influence by the Kewaunee or Point Beach nuclear generating facilities is not evident from soil sample analysis.

## Point Beach Independent Spent Fuel Storage Installation

Table 7 provides a summary of reported activities by DHS for ambient gamma radiation monitored in the vicinity of the Point Beach Independent and Kewaunee Power Station Spent Fuel Storage Installation (ISFSI).

Thermoluminescent dosimeter (TLD) measurements detected ambient gamma exposure levels greater than background at all sites (T1–T8) located on the Point Beach ISFSI perimeter fence closest to the ventilated storage casks. TLD measurements did not detect an increase in ambient gamma exposure levels at sites T9 - T14 ( $15.2 \pm 2.4$  milliroentgens; 0.8 – 1.9 miles from the Point Beach ISFSI) or at sites T15–T31 ( $14.7 \pm 2.0$  milliroentgens; greater than 2 miles from the Point Beach ISFSI). These readings are consistent with previous years' data. In 2019 average standard quarterly ambient gamma exposure for sites T9 –T31 was  $14.9 \pm 2.2$  milliroentgens and for sites T1–T8 was  $41.6 \pm 16.9$  milliroentgens per standard quarter depending on the distance from the storage casks.

## Kewaunee Power Station Independent Spent Fuel Storage Installation

Table 7 provides a summary of reported activities by DHS for ambient gamma radiation monitored in the vicinity of the Kewaunee Power Station Independent Spent Fuel Storage Installation (ISFSI).

Thermoluminescent dosimeter (TLD) measurements did detect ambient gamma exposure above background at sites T51–T58, located on the Kewaunee Power Station ISFSI perimeter fence. TLD measurements did not detect an increase in ambient gamma exposure levels at sites T9, T18, and T20 ( $14.6 \pm 2.1$  milliroentgens; 1.4–3.1 miles from the Point Beach ISFSI). In 2019, average standard quarterly ambient gamma exposure for sites T9–T31 was  $15.0 \pm 2.3$  milliroentgens, and for sites T51–T58 was  $94.4 \pm 81.5$  milliroentgens per standard quarter, depending on the distance from the storage casks.

The increase in ambient gamma radiation coincides with the placement of spent nuclear fuel from the cooling pool to the ISFSI.

## 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 Point Beach or Kewaunee nuclear generating facilities are less than the limits as stated in these federal regulations.

The DHS limit for permissible levels of radiation exposure from external sources in unrestricted areas is defined in the [Wis. Admin. Code § DHS 157.23](#). Doses resulting from gaseous and liquid effluent

releases from the Point Beach or Kewaunee nuclear generating facilities are less than the limits as stated in Wis. Admin. Code § DHS 157.23.

## **References**

Wisconsin Admin. Code § DHS 157.23

State of Wisconsin, "FINAL ENVIRONMENTAL IMPACT STATEMENT, Point Beach Nuclear Power Plant Projects Proposed by Wisconsin Electric Power Company, Temporary Storage of Spent Nuclear Fuel in Dry Casks, PSC Docket 6630-CE-197, Unit 2 Steam Generator Replacement, PSC Docket 6630-CE-209, AUGUST 1994."

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.

NUREG-1301 1991, Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors, Supplement No. 1, Page 64

## Sample Activity Summary

Table 4 Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring.

Sample type (units)	LLD	Number of samples <sup>a</sup>	Analysis	Range
Air particulate (pCi/m <sup>3</sup> )	0.005	205 / 205	gross beta	< 0.034 - 0.042
			gamma isotopic	
	0.030	16 / 0	Barium 140	< 0.0042
	0.020	20 / 20	Beryllium 7	0.0459 – 0.0749
	0.002	20 / 0	Cerium 141	< 0.0008
	0.005	20 / 0	Cerium 144	< 0.0024
	0.002	20 / 0	Cesium 134	< 0.0004
	0.002	20 / 0	Cesium 137	< 0.0006
	0.002	20 / 0	Cobalt 58	< 0.0005
	0.002	20 / 0	Cobalt 60	< 0.0006
	0.020	20 / 0	Iodine 131	< 0.0018
	0.005	20 / 0	Iron 59	< 0.0011
	0.020	20 / 0	Lanthanum 140	< 0.0016
	0.002	20 / 0	Manganese 54	< 0.0004
	0.002	20 / 0	Niobium 95	< 0.0005
	0.002	20 / 0	Ruthenium 103	< 0.0005
	0.015	20 / 0	Ruthenium 106	< 0.0039
	0.005	20 / 0	Zinc 65	< 0.0010
0.005	20 / 0	Zirconium 95	< 0.0009	
Air iodine (pCi/m <sup>3</sup> )	0.07	204 / 2	I-131	< 0.092
Surface water (pCi/liter)	3.0	23 / 0	Gross Alpha Sus Sol	< 2.59 – 1.61
	3.0	26 / 1	Gross Beta Sus Sol	< 2.25 – 3.53
	3.0	26 / 0	Gross Alpha	< 1.77 - 1.12
	3.0	26 / 3	Gross Beta	< 2.01 – 3.89
	0.5	10 / 3	Iodine 131	< 0.67- 0.73
	300	15 / 2	Tritium	< 228 - 1850
	2.0	11 / 7	Strontium 89	< 12.5 – 49.3
	1.0	11 / 1	Strontium 90	< 1.06 - 0.358
			gamma isotopic	
	15	26 / 26	Barium 140	< 42.4
	15	26 / 0	Cesium 134	< 10.8
	30	26 / 0	Cesium 137	< 12.4
	15	26 / 0	Cobalt 58	< 9.96
	30	26 / 0	Cobalt 60	< 11.6
	15	26 / 0	Iodine 131	< 13.3
	30	26 / 0	Iron 59	< 18.3
	15	26 / 0	Lanthanum 140	< 14.9
	15	26 / 0	Manganese 54	< 9.97
	15	26 / 0	Niobium 95	< 11.3
	60	26 / 0	Zinc 65	< 24
15	26 / 6	Zirconium 95	< 19	

Table 4 (continued) Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring program.

Sample type (units)	LLD	Number of samples <sup>a</sup>	Analysis	Range
<b>Fish</b> (pCi/kg wet)			gamma isotopic	
	50	8 / 0	Cesium 134	< 6.01
	60	8 / 0	Cesium 137	6.05 – 25.2
	60	8 / 0	Cobalt 58	< 7.74
	70	8 / 0	Cobalt 60	< 6.36
	130	8 / 0	Iron 59	< 27.5
	50	8 / 0	Manganese 54	< 5.71
	50	8 / 0	Niobium 95	< 21.4
	800	8 / 8	Potassium 40	1540 - 2610
	130	8 / 0	Zinc 65	< 13.3
100	8 / 0	Zirconium 95	< 15.8	
<b>Shoreline sediment</b> (pCi/kg dry)	15000	6 / 0	gross alpha	< 4700 - 7270
	6000	6 / 2	gross beta	2980 - 6810
			gamma isotopic	
	80	6 / 0	Cs-134	< 11.2
	80	6 / 0	Cs-137	< 12.3 - 26.1
	90	6 / 0	Co-58	< 19.2
	90	6 / 0	Co-60	< 14.1
	600	6 / 0	Fe-59	< 105
	60	6 / 0	Mn-54	< 12.9
	100	6 / 0	Nb-95	< 99.4
	800	6 / 6	K-40	2730 - 7200
	300	6 / 0	Zn-65	< 33.9
	200	6 / 0	Zr-95	< 44.4
<b>Vegetation</b> (pCi/kg wet)	5000	18 / 0	Gross Alpha	< 5340
	4000	18 / 7	Gross Beta	1900 - 8830
			gamma isotopic	
	350	18 / 0	Barium 140	< 139
	600	18 / 17	Beryllium 7	599 - 9590
	80	18 / 0	Cesium 134	< 25
	90	18 / 0	Cesium 137	< 30.6
	600	18 / 0	Cobalt 58	< 26
	100	18 / 0	Cobalt 60	< 32.4
	80	18 / 0	Iodine 131	< 51.3
	200	18 / 0	Iron 59	< 64.2
	100	18 / 0	Lanthanum 140	< 37.3
	90	18 / 0	Manganese 54	< 25.1
	100	18 / 0	Niobium 95	< 27.2
	2000	18 / 18	Potassium 40	3640 - 6470
	250	18 / 0	Zinc 65	< 55.5
	200	18 / 0	Zirconium 95	< 53.8
<b>Precipitation</b> (nCi/m <sup>2</sup> )	1.5	12 / 1	gross beta	0.07 – 7.61
	300	11 / 0	H-3	< 36.70

Table 4 (continued) Sample activity summary for the Wisconsin DHS Point Beach-Kewaunee environmental monitoring program.

Sample type (units)	LLD	Number of samples <sup>a</sup>	Analysis	Range
<b>Soil</b> (pCi/kg dry)	15000	18 / 1	Gross Alpha	< 7650 – 24600
	6000	18 / 17	Gross Beta	< 2030 – 25300
			gamma isotopic	
	80	18 / 0	Cesium 134	< 17.2
	80	18 / 13	Cesium 137	30.4 – 261
	90	18 / 0	Cobalt 58	< 31.9
	90	18 / 0	Cobalt 60	< 18.7
	600	18 / 0	Iron 59	< 136
	60	18 / 0	Manganese 54	< 20.3
	100	18 / 8	Niobium 95	< 142
	800	18 / 18	Potassium 40	9560 – 22800
	300	18 / 0	Zinc 65	< 48.9
	250	18 / 0	Zirconium 95	< 67.8
	<b>Milk</b> (pCi/liter)	0.5	18 / 0	Iodine 131
1.5		36 / 1	Strontium 90	< 0.641 – 1.63
			gamma isotopic	
60		36 / 0	Barium 140	< 49.3
15		36 / 0	Cesium 134	< 11.7
15		36 / 0	Cesium 137	< 14.5
15		36 / 0	Cobalt 58	< 12.5
15		36 / 0	Cobalt 60	< 14.3
15		36 / 0	Iodine 131	< 14.3
40		36 / 0	Iron 59	< 26.8
15		36 / 0	Lanthanum 140	< 14.9
15		36 / 0	Manganese 54	< 14.1
15		36 / 0	Niobium 95	< 13.2
500		36 / 36	Potassium 40	932 - 1560
40		36 / 0	Zinc 65	< 31.8
40		35 / 0	Zirconium 95	< 25.5
<b>Well water</b> (pCi/liter)	5.0	8 / 1	gross alpha	< 5.08 - 3.28
	3.0	8 / 2	gross beta	< 4.19 - 3.06
	300	8 / 0	H-3	< 226
<b>Ambient radiation</b> (mR/Std Qtr)	1.0	125 / 125	exposure	11.2 – 265.4

a - Number of analyses / number of analyses detected above the WI DHS LLD.

b - LLD activities expressed in units of pCi/liter.

c - mR/TLD

d – Samples not analyzed due to laboratory error and delays, see result and discussion section.



Table 5 Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.  
Measurements in units of pCi/m<sup>3</sup>

Site: PBK-3

1st Qtr				3rd Qtr			
Collection End Date	Volume m <sup>3</sup>	Air Particulate	Iodine	Collection date	Volume m <sup>3</sup>	Air Particulate	Iodine
01/03/19	575.2	0.0179 ± 0.0016	< 0.0118	07/03/19	532.3	0.015 ± 0.0015	< 0.0331
01/09/19	498	0.0298 ± 0.0020	< 0.0135	07/10/19	534.5	0.0148 ± 0.0015	< 0.0279
01/15/19	498	0.0157 ± 0.0017	*a	07/15/19	379.9	0.0118 ± 0.0019	< 0.0319
01/22/19	603.1	0.0127 ± 0.0014	< 0.0159	07/23/19	379.9	0.0135 ± 0.0019	< 0.0472
01/29/19	613.9	0.0221 ± 0.0016	< 0.0114	07/30/19	*a	*a	< 0.0201
02/06/19	697.6	0.0222 ± 0.0015	< 0.016	08/06/19	532.3	0.0196 ± 0.0026	< 0.0392
02/14/19	684.7	0.0147 ± 0.0013	< 0.0128	08/14/19	534.5	0.0170 ± 0.0018	< 0.0698
02/18/19	343.4	0.0262 ± 0.0011	< 0.0159	08/19/19	379.9	0.0134 ± 0.0025	< 0.0492
02/26/19	684.7	0.0256 ± 0.0016	< 0.018	08/29/19	379.9	0.0129 ± 0.0014	< 0.0175
03/06/19	697.6	0.0231 ± 0.0015	< 0.0204	09/05/19	532.3	0.0170 ± 0.0020	< 0.0188
03/13/19	592.4	0.0303 ± 0.0018	< 0.0176	09/11/19	534.5	0.0088 ± 0.0014	< 0.0468
03/20/19	581.7	0.0198 ± 0.0016	< 0.0167	09/19/19	379.9	0.0207 ± 0.0019	< 0.024
03/25/19	420.7	0.0120 ± 0.0018	< 0.0331	09/26/19	379.9	0.0255 ± 0.0022	< 0.0262
mean +- s.d.		0.0209 ± 0.0062	< 0.0169	mean +- s.d.		0.01564 ± 0.0044	< 0.0347

2nd Qtr			
Collection End Date	Volume m <sup>3</sup>	Air Particulate	Iodine
04/03/19	755.5	0.0121 ± 0.0011	< 0.019
04/10/19	*a	*a	< 0.0307
04/15/19	418.6	0.0089 ± 0.0017	< 0.0365
04/23/19	663.2	0.0114 ± 0.0013	< 0.0109
05/02/19	755.5	0.0138 ± 0.0012	< 0.0318
05/08/19	495.8	0.0097 ± 0.0015	< 0.0328
05/13/19	414.3	0.0079 ± 0.0017	< 0.0193
05/20/19	579.5	0.0110 ± 0.0014	< 0.0244
05/29/19	738.4	0.0082 ± 0.0011	< 0.0147
06/06/19	*a	*a	< 0.0196
06/12/19	652.5	0.0144 ± 0.0013	< 0.016
06/20/19	641.8	0.0103 ± 0.0012	< 0.0513
06/26/19	482.9	0.00952 ± 0.0015	< 0.0343
mean ± s.d.		0.01065 ± 0.0022	< 0.0263

4th Qtr			
Collection date	Volume m <sup>3</sup>	Air Particulate	Iodine
10/03/19	414.3	0.0133 ± 0.0019	< 0.0305
10/09/19	358.5	0.0133 ± 0.0021	< 0.0456
10/17/19	474.4	0.0142 ± 0.0017	< 0.0141
10/23/19	364.9	0.0165 ± 0.0021	< 0.0525
10/30/19	422.8	0.0140 ± 0.0018	< 0.028
11/05/19	373.5	0.0197 ± 0.0010	< 0.0651
11/13/19	495.8	0.0198 ± 0.0018	< 0.0248
11/22/19	551.6	0.0290 ± 0.0019	< 0.0688
11/26/19	244.7	0.0235 ± 0.0014	< 0.0361
12/04/19	*a	*a	< 0.0164
12/11/19	446.5	0.0209 ± 0.0020	< 0.021
12/17/19	369.2	0.0333 ± 0.0026	< 0.0627
12/23/19	362.7	0.0418 ± 0.0028	< 0.0483
mean ± s.d.		0.02161 ± 0.0090	< 0.0395

\*a – Laboratory error

\*b – Error in recording data in the field

\*c = The original data sheet was not returned

\*d = Data sheet unavailable

Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m<sup>3</sup>

**Site: PBK-4**

1st Qtr				3rd Qtr			
Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine	Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine
01/03/19	601.6	0.0152 ± 0.0015	< 0.0238	07/03/19	*a	*a	*a
01/09/19	517.1	0.0282 ± 0.0019	< 0.0691	07/10/19	531.9	0.0129 ± 0.0015	< 0.0599
01/15/19	519.1	0.0130 ± 0.0016	*a	07/15/19	375.9	0.0127 ± 0.0020	< 0.0204
01/22/19	608.6	0.0117 ± 0.0013	< 0.0274	07/23/19	600.9	0.0117 ± 0.0014	< 0.0322
01/29/19	621.4	0.0200 ± 0.0015	< 0.0074	08/01/19	672.5	0.0148 ± 0.0013	*a
02/06/19	703.2	0.0217 ± 0.0015	< 0.0135	08/06/19	378.4	0.0160 ± 0.0021	< 0.0119
02/14/19	695.5	0.0155 ± 0.0013	< 0.0127	08/14/19	606	0.0147 ± 0.0014	< 0.0289
02/18/19	347.8	0.0234 ± 0.0011	< 0.0185	08/19/19	383.6	0.0126 ± 0.0020	< 0.0363
02/26/19	690.4	0.0255 ± 0.0016	< 0.0147	08/29/19	759.4	0.0104 ± 0.0011	< 0.0389
03/06/19	700.6	0.0211 ± 0.0014	< 0.0093	09/05/19	542.1	0.0155 ± 0.0016	< 0.0163
03/13/19	593.2	0.0301 ± 0.0018	< 0.0247	09/11/19	460.3	0.0102 ± 0.0016	< 0.011
03/20/19	485.8	0.0134 ± 0.0017	< 0.0235	09/19/19	12.8	< 0.0343	< 0.0327
03/25/19	419.3	0.0121 ± 0.0018	< 0.0122	09/26/19	537	0.0226 ± 0.0018	< 0.0702
mean ± s.d.		0.0193 ± 0.0063	< 0.0214	mean ± s.d.		0.0140 ± 0.0034	< 0.0283

2nd Qtr				4th Qtr			
Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine	Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine
04/03/19	749.2	0.0121 ± 0.0012	< 0.0298	10/03/19	542.1	0.0106 ± 0.0014	< 0.0275
04/10/19	585.6	0.0136 ± 0.0014	< 0.0273	10/09/19	473	0.0114 ± 0.0016	< 0.0367
04/15/19	416.8	0.0090 ± 0.0017	< 0.0203	10/17/19	636.7	0.0132 ± 0.0013	< 0.0074
04/23/19	664.8	0.0122 ± 0.0013	< 0.0152	10/23/19	488.4	0.0152 ± 0.0017	< 0.0417
05/02/19	746.6	0.0127 ± 0.0012	< 0.0182	10/30/19	570.2	0.0127 ± 0.0014	< 0.016
05/08/19	496.1	0.0100 ± 0.0015	< 0.0439	11/05/19	*a	*a	< 0.067
05/13/19	411.7	0.0082 ± 0.0017	< 0.0306	11/13/19	667.4	0.0154 ± 0.0014	< 0.0252
05/20/19	572.8	0.0112 ± 0.0014	< 0.0118	11/22/19	739	0.0222 ± 0.0014	< 0.0233
05/29/19	723.6	0.0086 ± 0.0011	< 0.0113	11/26/19	322.2	0.0203 ± 0.0011	< 0.036
06/04/19	478.2	0.0107 ± 0.0016	< 0.0251	12/04/19	*a	*a	< 0.031
06/12/19	639.3	0.0145 ± 0.0014	< 0.0162	12/11/19	600.9	0.0193 ± 0.0016	< 0.0296
06/20/19	649.5	0.0097 ± 0.0012	*a	12/17/19	501.2	0.0268 ± 0.0020	< 0.0579
06/26/19	480.7	0.0107 ± 0.0016	< 0.0232	12/23/19	485.8	0.0362 ± 0.0022	< 0.0438
mean ± s.d.		0.0110 ± 0.0019	< 0.0227	mean ± s.d.		0.0185 ± 0.0077	< 0.0341

\*a – Laboratory error

\*b – Error in recording data in the field

\*c = The original data sheet was not returned

\*d = Data sheet unavailable



Table 5 (continued) Wisconsin DHS air particulate gross beta and air iodine (I-131) analysis results from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m<sup>3</sup>

**Site: PBK-17**

1st Qtr				3rd Qtr			
Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine	Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine
01/04/19	563.3	0.0182 ± 0.0016	< 0.0666	07/05/19	568.3	*a	< 0.037
01/11/19	565.8	0.0221 ± 0.0016	< 0.0227	07/11/19	437	0.014 ± 0.0017	< 0.0434
01/18/19	560.7	0.014 ± 0.0014	< 0.0452	07/18/19	512.7	0.0137 ± 0.0015	< 0.0159
01/24/19	490	0.0127 ± 0.0016	< 0.0262	07/25/19	507.7	0.0121 ± 0.0015	< 0.0304
02/01/19	674.4	0.0236 ± 0.0015	< 0.0222	08/01/19	497.6	0.018 ± 0.0017	< 0.0173
02/08/19	560.7	0.0174 ± 0.0015	< 0.0162	08/08/19	502.6	0.0176 ± 0.0017	< 0.0206
02/15/19	565.8	0.0176 ± 0.0015	< 0.0157	08/15/19	505.2	0.0135 ± 0.0015	< 0.0688
02/22/19	568.3	0.0232 ± 0.0017	< 0.0175	08/22/19	505.2	0.0164 ± 0.0016	< 0.0673
03/01/19	563.3	0.0254 ± 0.0017	< 0.0218	08/24/19	517.8	0.00957 ± 0.0014	< 0.0369
03/08/19	578.4	0.0216 ± 0.0016	< 0.0282	09/05/19	520.3	0.016 ± 0.0016	< 0.0133
03/15/19	553.2	0.0301 ± 0.0019	< 0.0348	09/13/19	588.5	0.0122 ± 0.0013	< 0.0142
03/22/19	550.6	0.0192 ± 0.0016	< 0.0151	09/18/19	368.8	0.0179 ± 0.0021	< 0.0665
03/29/19	553.2	0.00978 ± 0.0013	< 0.0924	09/27/19	664.3	0.0233 ± 0.0015	< 0.0252
mean +- s.d.		0.0196 ± 0.0016	< 0.0327	mean +- s.d.		0.0154 ± 0.0016	< 0.0385

2nd Qtr				4th Qtr			
Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine	Collection End Date	Volume m <sup>3</sup>	Air particulate	Air iodine
04/05/19	545.6	0.0128 ± 0.0014	< 0.0663	10/04/19	522.9	0.0106 ± 0.0014	< 0.0561
04/12/19	540.5	0.0125 ± 0.0014	< 0.0268	10/10/19	454.7	0.0169 ± 0.0018	< 0.0435
04/19/19	543.1	0.00833 ± 0.0013	< 0.0275	10/18/19	608.7	0.0113 ± 0.0013	< 0.0589
04/26/19	538	0.0116 ± 0.0014	< 0.0245	10/25/19	533	0.0159 ± 0.0016	< 0.0343
05/02/19	459.7	0.0142 ± 0.0017	< 0.0501	11/01/19	538	*a	< 0.055
05/09/19	538	0.00892 ± 0.0013	< 0.0293	11/08/19	555.7	*a	< 0.0265
05/17/19	608.7	0.0103 ± 0.0013	< 0.025	11/15/19	550.6	0.0217 ± 0.0017	< 0.0199
05/24/19	533	0.00538 ± 0.0012	< 0.0235	11/21/19	464.8	0.0245 ± 0.002	< 0.0338
05/31/19	533	*a	< 0.0181	11/26/19	394	0.0188 ± 0.0021	< 0.0308
06/06/19	442	0.0118 ± 0.0017	< 0.0491	12/06/19	767.9	0.0119 ± 0.0011	< 0.0325
06/13/19	522.9	0.0121 ± 0.0015	< 0.0292	12/12/19	469.8	0.0209 ± 0.0019	< 0.0226
06/19/19	449.6	0.0123 ± 0.0017	< 0.0435	12/19/19	570.8	0.0272 ± 0.0018	< 0.0691
06/27/19	593.6	0.0108 ± 0.0013	< 0.0603	12/27/19	606.2	0.037 ± 0.0019	< 0.0175
mean +- s.d.		0.0109 ± 0.0015	< 0.0364	mean +- s.d.		0.0197 ± 0.0017	< 0.0385

\*a – Laboratory error

\*b – Error in recording data in the field

\*c = The original data sheet was not returned

\*d = Data sheet unavailable



Table 6 Wisconsin DHS gamma isotopic analysis results from the quarterly composites of air particulate filters collected from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m<sup>3</sup>

Site: PBK-3	1st quarter	2nd quarter	3rd quarter	4th quarter
Barium 140	< 0.0028	< 0.0011	< 0.0042	< 0.0029
Beryllium 7	0.0703 ± 0.0064	0.0716 ± 0.0059	0.0695 ± 0.0072	0.0653 ± 0.0046
Cerium 141	< 0.0004	< 0.0003	< 0.0006	< 0.0005
Cerium 144	< 0.0012	< 0.0011	< 0.0015	< 0.0015
Cesium 134	< 0.0002	< 0.0002	< 0.0004	< 0.0002
Cesium 137	< 0.0003	< 0.0001	< 0.0006 <sup>2</sup>	< 0.0002
Cobalt 58	< 0.0003	< 0.0002	< 0.0004	< 0.0002
Cobalt 60	< 0.0002	< 0.0002	< 0.0005	< 0.0002
Iodine 131	< 0.0017	< 0.0005	< 0.0018	< 0.0018
Iron 59	< 0.0006	< 0.0004	< 0.001	< 0.0005
Lanthanum 140	< 0.0013	< 0.0005	< 0.0015	< 0.0009
Manganese 54	< 0.0002	< 0.0002	< 0.0004	< 0.0002
Niobium 95	< 0.0003	< 0.0002	< 0.0004	< 0.0003
Ruthenium 103	< 0.0002	< 0.0001	< 0.0004	< 0.0003
Ruthenium 106	< 0.0022	< 0.0017	< 0.0038	< 0.0021
Zinc 65	< 0.0005	< 0.0005	< 0.0009	< 0.0004
Zirconium 95	< 0.0005	< 0.0003	< 0.0008	< 0.0004

**Site: PBK-4**

Barium 140	< 0.0033	< 0.0017	< 0.0021	< 0.002
Beryllium 7	0.0703 ± 0.0067	0.0666 ± 0.0063	0.0541 ± 0.0054	0.0466 ± 0.0047
Cerium 141	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Cerium 144	< 0.0012	< 0.0013	< 0.0013	< 0.001
Cesium 134	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Cesium 137	< 0.0004 <sup>2</sup>	< 0.0002	< 0.0002	< 0.0001
Cobalt 58	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Cobalt 60	< 0.0003	< 0.0002	< 0.0002	< 0.0002
Iodine 131	< 0.0014	< 0.0008	< 0.0011	< 0.0015
Iron 59	< 0.0009	< 0.0006	< 0.0001	< 0.0006
Lanthanum 140	< 0.0009	< 0.0006	< 0.0009	< 0.001
Manganese 54	< 0.0003	< 0.0003	< 0.0002	< 0.0001
Niobium 95	< 0.0003	< 0.0003	< 0.0004	< 0.0004
Ruthenium 103	< 0.0004	< 0.0002	< 0.0003	< 0.0002
Ruthenium 106	< 0.0023	< 0.0024	< 0.0025	< 0.0018
Zinc 65	< 0.0005	< 0.0006	< 0.0005	< 0.0005
Zirconium 95	< 0.0005	< 0.0005	< 0.0005	< 0.0005

**Site: PBK-17**

Barium 140	< 0.0017	< 0.0022	< 0.0021	< 0.0025
Beryllium 7	0.0674 ± 0.0064	0.0724 ± 0.0069	0.057 ± 0.0054	0.0459 ± 0.0046
Cerium 141	< 0.0005	< 0.0004	< 0.0004	< 0.0004
Cerium 144	< 0.0013	< 0.0014	< 0.0012	< 0.0011
Cesium 134	< 0.0003	< 0.0003	< 0.0002	< 0.0002
Cesium 137	< 0.0004 <sup>2</sup>	< 0.0003	< 0.0002	< 0.0004
Cobalt 58	< 0.0003	< 0.0002	< 0.0002	< 0.0002
Cobalt 60	< 0.0004	< 0.0003	< 0.0003	< 0.0003
Iodine 131	< 0.0013	< 0.0009	< 0.0011	< 0.001
Iron 59	< 0.0006	< 0.0007	< 0.0006	< 0.0005
Lanthanum 140	< 0.0015	< 0.0009	< 0.0006	< 0.0007
Manganese 54	< 0.0003	< 0.0003	< 0.0003	< 0.0002
Niobium 95	< 0.0004	< 0.0003	< 0.0003	< 0.0003
Ruthenium 103	< 0.0003	< 0.0004	< 0.0002	< 0.0002
Ruthenium 106	< 0.003	< 0.0028	< 0.0022	< 0.0022
Zinc 65	< 0.0004	< 0.0006	< 0.0005	< 0.0004
Zirconium 95	< 0.0005	< 0.0005	< 0.0005	< 0.0004

<sup>1</sup> – After receiving results >MDA sample was reanalyzed and gave results which remained >MDA.

<sup>2</sup> – After receiving results >MDA sample was reanalyzed and gave results <MDA.

Radioisotopes other than those reported were not detected

Table 6 (continued) Wisconsin DHS gamma isotopic analysis results from the quarterly composites of air particulate filters collected from the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/m<sup>3</sup>

Site: PBK-30	1st quarter	2nd quarter	3rd quarter	4th quarter
Barium 140	< 0.0026	< 0.0022	< 0.0015	< 0.0022
Beryllium 7	0.0737 ± 0.006	0.0715 ± 0.0065	0.0535 ± 0.0046	0.0749 ± 0.0065
Cerium 141	< 0.0006	< 0.0004	< 0.0002	< 0.0003
Cerium 144	< 0.0019	< 0.0011	< 0.0009	< 0.0012
Cesium 134	< 0.0003	< 0.0002	< 0.0002	< 0.0002
Cesium 137	< 0.0003	< 0.0003*	< 0.0001	< 0.0003
Cobalt 58	< 0.0003	< 0.0003	< 0.0002	< 0.0002
Cobalt 60	< 0.0003	< 0.0004	< 0.0001	< 0.0003
Iodine 131	< 0.0011	< 0.0012	< 0.0006	< 0.0009
Iron 59	< 0.0006	< 0.0006	< 0.0003	< 0.0006
Lanthanum 140	< 0.0009	< 0.0009	< 0.0007	< 0.0009
Manganese 54	< 0.0002	< 0.0002	< 0.0001	< 0.0002
Niobium 95	< 0.0003	< 0.0003	< 0.0002	< 0.0003
Ruthenium 103	< 0.0003	< 0.0002	< 0.0001	< 0.0002
Ruthenium 106	< 0.0025	< 0.0028	< 0.0014	< 0.0023
Zinc 65	< 0.0005	< 0.0005	< 0.0003	< 0.0005
Zirconium 95	< 0.0005	< 0.0004	< 0.0003	< 0.0005

Radioisotopes other than those reported were not detected.

Table 7 Wisconsin DHS TLD network for the Point Beach-Kewaunee environmental monitoring program.



	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Date Placed:	1/15-17/19	4/23-25/19	7/16-18/19	10/9-17/19
Date Removed:	4/23-25/19	7/16-18/19	10/9-17/19	1/15-17/20
Average Days in the Field:	96-99	84	85-91	91-100

Location: Individual quarterly data is reported as: mR / Standard Quarter +/- 2 sigma counting error.

TLD sites located at the Point Beach ISFSI

1	27.6 ± 1.9	29 ± 2.4	29.6 ± 2.2	32.2 ± 3.2
2	54.4 ± 2.1	56.7 ± 3.2	51.1 ± 4.5	57.2 ± 3.5
3	74.4 ± 4.1	69.9 ± 3.9	73.7 ± 4.3	70.8 ± 4.8
4	24.8 ± 1	28.1 ± 1.5	26.4 ± 2.1	28.6 ± 2
5	19.6 ± 1.2	24.6 ± 1.3	22.7 ± 0.8	25.6 ± 2
6	43.9 ± 2.1	46 ± 2.6	48.5 ± 1.9	46.9 ± 3.2
7	52.1 ± 2.1	53.4 ± 3.5	55.5 ± 2.7	49.6 ± 3.4
8	24.4 ± 1.5	27.9 ± 2	25.9 ± 1.7	29.4 ± 2.3
Quarterly average ± s.d.	40.2 ± 19.3	42 ± 16.9	41.7 ± 18.3	42.5 ± 16.2

TLD sites, excluding sites 1- 8, that are located 0 - 2 miles from either the Point Beach or the Kewaunee facility.

9	10.8 ± 0.6	13.1 ± 1.1	14.2 ± 1.2	14.9 ± 1.5
10	12.4 ± 1	17.8 ± 1.5	15.9 ± 1	17.4 ± 1.3
11	11.2 ± 0.6	15.5 ± 1.1	16 ± 0.9	17.3 ± 1.4
12	11.4 ± 0.8	17.7 ± 1.5	15.1 ± 1.1	16.6 ± 1.4
13	11.2 ± 0.7	17.9 ± 1.4	15.5 ± 1.1	18.4 ± 1.4
14	13.3 ± 0.7	17.6 ± 1	15.9 ± 0.6	16.8 ± 1.4
20	11.5 ± 0.6	15.8 ± 1.3	14.1 ± 0.7	15 ± 1.3
Quarterly average ± s.d.	11.7 ± 0.9	16.5 ± 1.8	15.2 ± 0.8	16.6 ± 1.3

TLD sites that are located 2 - 5 miles from either the Point Beach or the Kewaunee facility.

15	13.8 ± 0.7	18.1 ± 1.2	16.6 ± 0.9	18.4 ± 1.4
16	11.7 ± 1.1	13.6 ± 1.1	13.4 ± 1.2	13.8 ± 1.6
17	13.2 ± 0.9	17.3 ± 1.1	16.4 ± 1	17.3 ± 1.3
18	14.1 ± 0.5	17.8 ± 1.1	16.7 ± 0.5	17.1 ± 1.4
Quarterly average ± s.d.	13.2 ± 1.1	16.7 ± 2.1	15.8 ± 1.6	16.7 ± 2

TLD sites that are located greater than 5 miles from either the Point Beach or the Kewaunee facility.

28	11.2 ± 0.6	15.5 ± 1	13.3 ± 0.8	15.4 ± 1.4
29	11.2 ± 0.7	13.3 ± 0.8	13.4 ± 0.6	13 ± 1.1
30	13.2 ± 1.5	16 ± 0.7	16.4 ± 1	15.9 ± 1.1
31	11.6 ± 1.5	14.1 ± 1.1	13.8 ± 1.4	13.5 ± 1.4
Quarterly average ± s.d.	11.8 ± 1	14.7 ± 1.2	14.2 ± 1.5	14.5 ± 1.4

TLD sites that are located at the Kewaunee Power Station's (KPS) Independent Spent Fuel Installation (ISFSI).

51	28 ± 1.2	31.4 ± 1.6	33.9 ± 2	31 ± 1.6
52	67.1 ± 2.8	64.2 ± 1.2	69.2 ± 3.9	54.6 ± 1.9
53	171.4 ± 4.4	186.1 ± 3.1	169.7 ± 7	159.7 ± 2.9
54	265.4 ± 11.2	253.5 ± 11.3	242.2 ± 6.7	241 ± 12.1
55	153.1 ± 6.2	150.8 ± 1.8	151.1 ± 6.6	134.8 ± 3.3
56	51.3 ± 1.5	56.7 ± 3	54.2 ± 2	49.4 ± 2.9
57	22.1 ± 0.9	20.9 ± 0.9	22.5 ± 0.9	18.9 ± 1.1
58	16.3 ± 0.4	17.8 ± 1.2	16.8 ± 0.4	17.1 ± 1.2
Quarterly average ± s.d.	96.8 ± 90.2	97.7 ± 88.1	95 ± 82.7	88.3 ± 81.4

ND - No data; the TLD was lost in the field.



Table 8 Wisconsin DHS analysis results for precipitation samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of nCi/m<sup>2</sup>

monthly composite sample

Collection	Inches	Gross beta	Tritium
01/08/19	1.54	0.13 ± 0.03	< 9.58
02/06/19	3.09	0.33 ± 0.06	< 17.89
03/13/19	1.16	0.11 ± 0.02	< 6.69
4/10/2019	3.33	0.18 ± 0.05	< 19.28
05/08/19	4.13	7.61 ± 0.43	< 23.71
06/05/19	4.51	0.24 ± 0.12	< 25.77
7/17/2019	2.9	0.80 ± 0.08	< 16.43
08/08/19	4.03	0.07 ± 0.07	< 22.93
09/04/19	6.45	0.32 ± 0.13	< 36.70
10/05/19	3.33	*a	*a
11/06/19	2.83	1.11 ± 0.14	< 13.95
12/04/19	1.89	0.71 ± 0.09	< 5.81

\*a = data not reported back by the laboratory

Table 9 Wisconsin DHS analysis results for fish samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kg (wet)

Collection Type	01/17/19 BURBOT	01/17/19 CHINOOK SALMON	06/20/19 Species not identified	07/16/19 Species not identified	07/08/19 CATFISH
gamma isotopic					
Cesium 134	< 1.75	< 1.02	< 6.01	< 1.54	< 1.26
Cesium 137	16.3 ± 2.39	14.6 ± 1.11	19.2 ± 4.22	25.2 ± 2.3	11.8 ± 2.08
Cobalt 58	< 5.77	< 4.05	< 7.74	< 5.09	< 4.23
Cobalt 60	< 1.84	< 1.11	< 6.36	< 1.64	< 1.32
Iron 59	< 27.5	< 20.2	< 23.3	< 25.6	< 21.2
Manganese 54	< 1.98	< 1.37	< 5.71	< 1.91	< 2.02
Niobium 95	< 26	< 17.8	< 14.7	< 21.4	< 19.8
Potassium 40	1540 ± 247	2110 ± 336	2040 ± 339	2610 ± 415	1830 ± 291
Zinc 65	< 4.8	< 3.55	< 13.3	< 4.87	< 3.56
Zirconium 95	< 12.3	< 8.31	< 15.8	< 10.9	< 9.29

Collection Type	08/18/19 LAKE TROUT	10/23/19 CHINOOK SALMON	11/21/19 LAKE WHITE FISH
gamma isotopic			
Cesium 134	< 2.25	< 1.48	< 2.09
Cesium 137	16.6 ± 1.69	14.4 ± 1.15	6.05 ± 0.924
Cobalt 58	< 4.36	< 3.59	< 4.92
Cobalt 60	< 1.94	< 1.28	< 2.23
Iron 59	< 19	< 19.4	< 19.8
Manganese 54	< 2.41	< 1.69	< 2.32
Niobium 95	< 14.4	< 15	< 14.9
Potassium 40	2320 ± 370	2590 ± 412	2500 ± 399
Zinc 65	< 5.73	< 4.25	< 5.66
Zirconium 95	< 9.35	< 7.63	< 9.65

\*a – Insufficient sample size

Table 10 Wisconsin DHS analysis results for shoreline sediment samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kg (dry)

Location	PBK-5	PBK-10a	PBK-12a
Collection date	06/25/19	06/25/19	06/25/19
gross alpha	5810 ± 3650	< 4700	7270 ± 3020
gross beta	5740 ± 1270	6270 ± 905	4670 ± 887
gamma isotopic			
Cesium 134	< 11.2	< 4.79	< 5.23
Cesium 137	< 12.3	11.5 ± 2.41	11.7 ± 2.92
Cobalt 58	< 15.4	< 18.3	< 19.2
Cobalt 60	< 14.1	< 4.98	< 5.87
Iron 59	< 39.5	< 105	< 102
Manganese 54	< 12.9	< 6.14	< 6.71
Niobium 95	< 23.1	< 90.3	< 98.2
Potassium 40	6940 ± 1150	6210 ± 993	5780 ± 923
Zinc 65	< 33.9	< 15.7	< 18.1
Zirconium 95	< 28	< 41.1	< 41.3

Location	PBK-12b	PBK-12c	PBK-26	PBK-29
Collection date	06/25/19		06/26/19	06/25/19
gross alpha	7270 ± 2970	Unable to collect due to erosion control	5690 ± 3040	4770 ± 3140
gross beta	2980 ± 861		6810 ± 1200	5800 ± 1120
gamma isotopic				
Cesium 134	< 5.61		< 4.53	< 3.97
Cesium 137	26.1 ± 3.62		14.7 ± 2.54	12.4 ± 2.63
Cobalt 58	< 19		< 17.5	< 16.4
Cobalt 60	< 5.46		< 4.91	< 4.4
Iron 59	< 97.3		< 101	< 92.7
Manganese 54	< 6.61		< 6.47	< 5.99
Niobium 95	< 99.4		< 91.8	< 99.4
Potassium 40	2730 ± 442		7200 ± 1150	6270 ± 1000
Zinc 65	< 15.3		< 16.5	< 14.1
Zirconium 95	< 44.4		< 38.5	< 37.4

\*a – not reported by lab



Table 11 Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

**PBK-9; Point Beach meteorological tower**

Collection date	01/08/19	02/13/19	03/12/19	04/09/19	05/08/19	06/12/19
Gross Alpha	< 0.567	< 0.66	< 1.12	0.667 ± 0.413	< 0.603	0.895 ± 0.48
Gross Alpha Sus Sol	1.14 ± 0.678	< 0.772	< 0.889	< 1.28	< 0.652	< 0.679
Gross Beta	2.80 ± 0.626	1.70 ± 0.530	0.563 ± 0.517	2.27 ± 0.612	< 0.700	1.46 ± 0.516
Gross Beta Sus Sol	< 1.12	< 1.07	< 1.23	< 1.06	< 0.951	< 1.12
Iodine 131 *d	< 0.303			0.357 ± 0.124		< 0.296
Strontium 89 *a			< 1.58	< 0.98		
Strontium 90 *a			0.192 ± 0.102	< 0.16		
Tritium *a			< 228	< 227	< 225	1850 ± 167
Gamma isotopic						
Barium 140	< 37	< 30.5	< 24.5	< 29	< 38.8	< 30.3
Cesium 134	< 9.24	< 6.26	< 5.81	< 5.41	< 9.98	< 8.43
Cesium 137	< 9.16	< 6.04	< 5.14	< 6.31	< 12.4	< 9.24
Cobalt 58	< 8.87	< 6.85	< 4.94	< 5.77	< 8.1	< 9.25
Cobalt 60	< 8.1	< 6.82	< 5.63	< 5.24	< 10.2	< 8.23
Iodine 131	< 8.39	< 12.3	< 8.98	0.357 ± 0.124	< 12.4	< 9.8
Iron 59	< 13.5	< 15.1	< 9.33	< 10.8	< 17.2	< 16.2
Lanthanum 140	< 13.2	< 12.3	< 7.75	< 8.95	< 11.1	< 10.5
Manganese 54	< 9.23	< 7.1	< 5.66	< 5.66	< 8.64	< 9.72
Niobium 95	< 8.29	< 7.02	< 5.33	< 5.81	< 9.27	< 9.22
Zinc 65	< 13.8	< 16.5	< 12.9	< 12.3	< 14.3	< 17.2
Zirconium 95	< 14.2	< 12.6	< 10.1	< 9.84	< 16.3	< 13.5

Collection date	07/10/19	08/14/19	09/11/19	10/07/19	11/13/19	12/12/19
Gross Alpha	*c	< 0.518	0.556 ± 0.462	< 0.824	< 0.518	< 0.74
Gross Alpha Sus Sol	*c	< 1.21	1.61 ± 0.957	< 0.766	1.27 ± 0.931	1.61 ± 1.06
Gross Beta	*c	1.84 ± 0.637	3.51 ± 0.773	3.29 ± 0.731	3.28 ± 0.766	3.55 ± 0.744
Gross Beta Sus Sol	*c	1.71 ± 0.9	1.75 ± 0.959	< 1.32	< 1.77	< 1.59
Iodine 131 *d	< 0.466		< 0.403			*c
Strontium 89 *a			< 3.33			< 12.5
Strontium 90 *a			< 1.06			< 0.25
Tritium *a			< 223			305 ± 140
Gamma isotopic						
Barium 140	< 42.4	< 36	< 38.4	< 25.2	< 27.5	< 34.6
Cesium 134	< 10.5	< 10.1	< 10.3	< 6.81	< 6.26	< 6
Cesium 137	< 11.5	< 9.36	< 8.58	< 6.31	< 6.21	< 5.49
Cobalt 58	< 8.65	< 9.96	< 9.6	< 4.45	< 6.78	< 6.48
Cobalt 60	< 11.2	< 10.3	< 11.6	< 4.42	< 7.13	< 6.5
Iodine 131	< 11.1	< 0.432	< 13.3	< 10.4	< 10.5	< 9.17
Iron 59	< 18.3	< 10.7	< 18	< 10.7	< 13	< 11.6
Lanthanum 140	< 12.9	< 17.9	< 12.2	< 9.69	< 10.1	< 11.5
Manganese 54	< 9.14	< 12	< 9.97	< 5.42	< 6.24	< 5.68
Niobium 95	< 9.18	< 9.62	< 10.7	< 5.98	< 9.11	< 9.42
Zinc 65	< 19.8	< 10.3	< 21	< 12.3	< 13.7	< 9.08
Zirconium 95	< 15.9	< 24	< 19	< 9.29	< 10.5	< 12.8

\*a - The analysis is performed on a quarterly composite.

\*d - The analysis is performed 6 times per year

\*b - Sample not collected due to safety concerns

\*c - not reported by lab

radioisotopes other than those reported were not detected.

Table 11 (continued) Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program



Measurements in units of pCi/liter

**PBK-17; Green Bay Water Utility – Rostok – Finger Road**

Collection date:	01/01/19	02/05/19	03/05/19	04/01/19	05/06/19	06/03/19
Gross Alpha	0.846	0.865 ± 0.544	< 0.587	< 0.587	< 0.688	< 0.688
Gross Alpha Sus Sol	*c	< 0.769	< 0.759	< 0.737	< 0.658	< 0.769
Gross Beta	1.61 ± 1.16	0.90 ± 0.600	< 0.607	0.906 ± 0.570	1.60 ± 0.627	1.71 ± 0.717
Gross Beta Sus Sol	*c	< 1.32	< 1.1	< 0.907	< 0.9	< 1.2
Iodine 131 *d	*c			0.729 ± 0.266		< 0.5
Strontium 89 *a			< 1.48			< 0.387
Strontium 90 *a			0.166 ± 0.0966			< 0.094
Tritium *a			< 228			< 225
Gamma isotopic						
Barium 140	< 27.5	< 38.3	< 39.5	< 23.5	< 23.7	< 39.1
Cesium 134	< 5.43	< 7.64	< 8.78	< 5.98	< 6.85	< 10.7
Cesium 137	< 6.85	< 9.68	< 9.86	< 5.08	< 6.31	< 11.4
Cobalt 58	< 7.15	< 8.14	< 9.8	< 5.2	< 4.65	< 9.27
Cobalt 60	< 5.77	< 8.65	< 9.03	< 8.19	< 5.98	< 10.1
Iodine 131	< 8.25	< 10.9	< 11.2	< 6.7	< 7.96	< 11.9
Iron 59	< 13.5	< 15.6	< 15	< 14	< 9.59	< 17.6
Lanthanum 140	< 7.47	< 14.9	< 12.1	< 7.55	< 9.46	< 12.5
Manganese 54	< 6.21	< 9.72	< 9.29	< 6.7	< 6.24	< 9.85
Niobium 95	< 7.70	< 9.43	< 10.8	< 7.29	< 6.15	< 9.63
Zinc 65	< 12.5	< 15.1	< 19.5	< 11.8	< 12.4	< 19.8
Zirconium 95	< 11.6	< 14.9	< 16.6	< 11.9	< 9.49	< 14.6

Collection date:	07/01/19	08/05/19	09/10/19	10/07/19	11/12/19	12/03/19
Gross Alpha	< 0.824	< 1.05	< 0.679	< 1.77	< 0.523	1.12 ± 0.582
Gross Alpha Sus Sol	< 0.995	< 2.59	0.786 ± 0.73	< 2.42	< 0.758	< 0.93
Gross Beta	1.28 ± 0.541	1.37 ± 1.04	1.54 ± 0.714	< 1.26	1.98 ± 0.666	1.78 ± 0.629
Gross Beta Sus Sol	< 1.68	3.53 ± 2.37	< 1.32	< 2.25	< 1.25	< 1.77
Iodine 131 *d	< 0.668	< 0.476	0.456 ± 0.266			
Strontium 89 *a			< 3.58			49.3 ± 10.9
Strontium 90 *a			< 0.271			< 0.253
Tritium *a			< 223			< 122
Gamma isotopic						
Barium 140	< 31.1	< 21.7	< 24.1	< 19.1	< 37.7	< 36.6
Cesium 134	< 8.05	< 6.28	< 6.24	< 5.57	< 10.8	< 6.03
Cesium 137	< 9.22	< 5.87	< 6.38	< 4.38	< 11.9	< 5.18
Cobalt 58	< 7.13	< 5.12	< 7.08	< 6.75	< 9.25	< 6.34
Cobalt 60	< 8.28	< 6.99	< 6.81	< 6.49	< 8.68	< 7.35
Iodine 131	< 8.48	< 6.4	< 8.63	< 7.62	< 11.4	< 12.7
Iron 59	< 15.5	< 10.4	< 11.4	< 11.4	< 11.2	< 13.9
Lanthanum 140	< 13.4	< 7.2	< 8.63	< 7.85	< 10.6	< 10.1
Manganese 54	< 9.1	< 5.61	< 6.02	< 4.75	< 8.84	< 6.66
Niobium 95	< 7.42	< 6.18	< 5.77	< 7.81	< 11.3	< 7.42
Zinc 65	< 16.5	< 11.7	< 13.6	< 16.4	< 18.7	< 12.4
Zirconium 95	< 14	< 8.5	< 8.72	< 11.7	< 17.4	< 11.3

\*a - The analysis is performed on a quarterly composite.

\*d – The analysis is performed 6 times per year

\*b - Sample not collected due to safety concerns

\*c – not reported by lab

radioisotopes other than those reported were not detected.

Table 11 (continued) Wisconsin DHS analysis results for surface water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

Site:	PBK-5	PBK-12a	PBK-29	PBK-5	PBK-12a	PBK-29
Collection date:	06/25/19	06/25/19	06/25/19	09/24/19	09/24/19	09/24/19
Gross Alpha	< 1.41	< 1.48	< 1.48	< 0.679	< 0.635	< 0.680
Gross Alpha Sus Sol	*c	*c	*c	< 1.29	< 0.997	1.36 ± 0.997
Gross Beta	2.46 ± 1.02	1.63 ± 0.947	< 2.01	3.38 ± 0.858	2.18 ± 0.798	3.89 ± 0.888
Gross Beta Sus Sol	*c	*c	*c	< 1.7	< 1.59	1.69 ± 1.17
Iodine 131	*c	*c	*c	*c	*c	*c
Strontium 89	*c	*c	*c	< 3.82	< 2.22	< 3.66
Strontium 90	*c	*c	*c	< 0.337	< 0.432	0.358 ± 0.199
Tritium	< 224	< 224	< 224	< 224	< 224	*c
Gamma isotopic						
Barium 140	*c	*c	*c	< 25.6	< 29.1	< 25.7
Cesium 134	*c	*c	*c	< 6.39	< 5.83	< 6.75
Cesium 137	*c	*c	*c	< 5.29	< 6.05	< 6.21
Cobalt 58	*c	*c	*c	< 5.46	< 6.00	< 6.68
Cobalt 60	*c	*c	*c	< 5.43	< 7.15	< 5.43
Iodine 131	*c	*c	*c	< 11.1	< 10.1	< 8.61
Iron 59	*c	*c	*c	< 12.7	< 13.7	< 15.1
Lanthanum 140	*c	*c	*c	< 8.83	< 11.5	< 7.63
Manganese 54	*c	*c	*c	< 5.26	< 5.47	< 7.25
Niobium 95	*c	*c	*c	< 7.71	< 7.33	< 7.71
Zinc 65	*c	*c	*c	< 13.2	< 13.1	< 12.0
Zirconium 95	*c	*c	*c	< 12	< 9.48	< 12.6

\*a - The analysis is performed on a quarterly composite.

\*d - The analysis is performed 6 times per year

\*b - Sample not collected due to safety concerns

\*c - not reported by lab

radioisotopes other than those reported were not detected.

Table 12 Wisconsin DHS analysis results for well water samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/liter

Site:	PBK-3	PBK-10	PBK-11	PBK-12d N	PBK-12d S
Collection date:	06/25/19	4/09/19	06/25/19	06/25/19	Discontinued July 1, 2018
Gross Alpha	< 1.61	2.36 ± 1.40	< 1.79	< 2.3	
Gross Beta	< 1.38	3.06 ± 0.80	< 1.43	3.01 ± 0.664	*a
Tritium	< 224	< 226	< 224	< 224	*a

Site:	PBK-3	PBK-10	PBK-11	PBK-12d N	PBK-12d S
Collection date:	09/25/19	10/08/19	09/24/19	09/24/19	Discontinued July 1, 2018
Gross Alpha	< 1.81	< 5.08	< 1.84	3.28 ± 2.25	
Gross Beta	< 2.08	< 4.19	< 2.24	< 2.13	*a
Tritium	< 224	< 224	< 224	< 224	*a

\*a - The well was shut down due to reduced water needs

NS - A sample was unable to be collected.



Table 13 Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

**PBK-28 (E-21); Strutz farm**

Collection date:	01/09/19	02/13/19	03/13/19	04/10/19	05/08/19	06/12/19
Iodine 131 *b	< 0.221			< 0.168		< 0.465
Strontium 90	1.63 ± 0.284	0.75 ± 0.225	0.599 ± 0.327	< 0.799	< 0.562	< 0.641
gamma isotopic						
Barium 140	< 21.3	< 33.9	< 34.4	< 24.2	< 32.5	< 35.3
Cesium 134	< 5.71	< 6.14	< 6.97	< 6.03	< 6.83	< 8.67
Cesium 137	< 6.85	< 6.85	< 6.04	< 5.6	< 7.02	< 11.4
Cobalt 58	< 7.02	< 5.22	< 7.12	< 5.47	< 5.06	< 10.2
Cobalt 60	< 8.19	< 6.38	< 7.87	< 6.41	< 6.93	< 12.9
Iodine 131	< 7.74	< 12.2	< 10.6	< 8.94	< 12.3	< 11.5
Iron 59	< 16.2	< 16.8	< 15.7	< 10.3	< 13.8	< 23.1
Lanthanum 140	< 7.53	< 10.8	< 11.6	< 6.54	< 14.2	< 13
Manganese 54	< 6.7	< 7.7	< 6.92	< 5.83	< 7.62	< 11.2
Niobium 95	< 7.42	< 8.35	< 7.22	< 5.72	< 5.9	< 9.69
Potassium 40	1370 ± 264	1450 ± 277	1280 ± 250	1420 ± 250	1430 ± 259	1380 ± 290
Zinc 65	< 15.5	< 18.2	< 18.5	< 12.9	< 12.8	< 31.8
Zirconium 95	< 13.8	< 12.6	< 12.7	< 9.51	< 11.1	< 17.7

Collection date:	07/10/19	08/14/19	09/11/19	10/09/19	11/13/19	12/11/19
Iodine 131 *b	< 0.454	< 0.405	< 0.351			
Strontium 90	< 0.631	< 0.543	0.484 ± 0.27	0.614 ± 0.312	1.01 ± 0.297	< 0.479
gamma isotopic						
Barium 140	< 40.2	< 43	< 43.1	< 31.6	< 26.3	< 26.4
Cesium 134	< 10.7	< 11.4	< 10.6	< 7.1	< 7.33	< 7.09
Cesium 137	< 12.4	< 13.4	< 13.9	< 6.42	< 5.47	< 7.71
Cobalt 58	< 7.71	< 8.97	< 9.95	< 6.99	< 8.7	< 6.29
Cobalt 60	< 12.2	< 12.8	< 11.4	< 7.9	< 8.53	< 7.69
Iodine 131	< 12.3	< 13.9	< 13.7	< 11.4	< 10.5	< 8.02
Iron 59	< 18	< 23.3	< 21.2	< 13	< 15	< 11.6
Lanthanum 140	< 14	< 14	< 12.7	< 12.7	< 13.7	< 8.23
Manganese 54	< 9.25	< 11.3	< 11	< 7.46	< 6.83	< 6.49
Niobium 95	< 10.7	< 9.45	< 10.6	< 6.67	< 7.91	< 6.38
Potassium 40	1380 ± 270	1440 ± 283	1220 ± 257	1330 ± 246	1170 ± 240	1300 ± 241
Zinc 65	< 20.3	< 19.5	< 24.7	< 17.8	< 17.1	< 13.7
Zirconium 95	< 16.3	< 19.7	< 19.9	< 11.5	< 12.3	< 10.2

Radioisotopes other than those reported were not detected.

\*a – Not reported by laboratory

\*b - The analysis is performed bi-monthly



Table 13 (continued) Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/liter

**PBK-24; Struck farm**

Collection date:	01/09/19	02/14/19	03/13/19	04/10/19	05/08/19	06/12/19
Iodine 131 *b	< 0.232			< 0.31		< 0.404
Strontium 90	< 0.33	0.538 ± 0.205	0.744 ± 0.319	< 0.615	< 1.15	< 0.596
gamma isotopic						
Barium 140	< 30.1	< 20.6	< 24.8	< 19.8	< 29	< 24.9
Cesium 134	< 6.74	< 6.25	< 5.86	< 6.35	< 6.99	< 7.74
Cesium 137	< 6.85	< 6.54	< 5.08	< 5.6	< 7.33	< 5.83
Cobalt 58	< 7.85	< 5.98	< 7.21	< 4.54	< 7.16	< 5.29
Cobalt 60	< 7.17	< 8.19	< 7.17	< 5.78	< 9.64	< 8.66
Iodine 131	< 9.51	< 9.01	< 9.52	< 6.43	< 13.7	< 7.79
Iron 59	< 18.1	< 15.5	< 15	< 10.7	< 16.7	< 13.7
Lanthanum 140	< 6.92	< 9.59	< 6.77	< 7.7	< 9.94	< 8.89
Manganese 54	< 8.22	< 6.04	< 7.06	< 5.46	< 7.12	< 7.2
Niobium 95	< 9.72	< 7.07	< 8.26	< 4.45	< 9.36	< 6.97
Potassium 40	1430 ± 272	932 ± 193	1420 ± 270	1310 ± 232	1380 ± 275	1280 ± 239
Zinc 65	< 15.6	< 13.6	< 13.6	< 12.8	< 17.2	< 16.2
Zirconium 95	< 11.7	< 10.8	< 11	*a	< 13.4	< 10.8

Collection date:	07/10/19	08/14/19	09/11/19	10/09/19	11/13/19	12/11/19
Iodine 131 *b		< 0.358		< 0.474	< 0.48	
Strontium 90	0.533 ± 0.331	< 0.43	0.609 ± 0.337	< 0.47	0.542 ± 0.327	0.825 ± 0.311
gamma isotopic						
Barium 140	< 43.7	< 49.3	< 28.9	< 30.8	< 31.1	< 34.4
Cesium 134	< 9.85	< 11.5	< 6.39	< 8	< 6.23	< 7.44
Cesium 137	< 14.5	< 10.6	< 6.34	< 6.64	< 5.83	< 7.15
Cobalt 58	< 9.75	< 11.9	< 7.01	< 6.62	< 6.9	< 5.3
Cobalt 60	< 12.5	< 14.3	< 8.95	< 7.03	< 6.42	< 6.55
Iodine 131	< 14.3	< 13.1	< 7.42	< 10.6	< 9.94	< 10.2
Iron 59	< 21.5	< 26.8	< 15.8	< 14.8	< 14.2	< 11.5
Lanthanum 140	< 14.3	< 14.9	< 2.09	< 10.4	< 11.1	< 9.1
Manganese 54	< 11	< 11.9	< 8.57	< 8.67	< 6.49	< 6.2
Niobium 95	< 12.8	< 10.6	< 8.32	< 7.39	< 6.29	< 6.85
Potassium 40	1330 ± 272	987 ± 249	1260 ± 255	1230 ± 230	1330 ± 243	1340 ± 247
Zinc 65	< 24.2	< 26	< 16.2	< 18.9	< 15.7	< 14.1
Zirconium 95	< 17.6	< 25.5	< 13	< 11.4	< 11.4	< 9.81

Radioisotopes other than those reported were not detected.

\*a – Not reported by laboratory

\*b - The analysis is performed bi-monthly



Table 13 (continued) Wisconsin DHS analysis results for milk samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/liter

**PBK-27 (E-40); R. Barta farm**

Collection date:	01/09/19	02/13/19	03/13/19	04/10/19	05/08/19	06/12/19
Iodine 131 *b	< 0.233			0.253 ± 0.149		< 0.284
Strontium 90	1.43 ± 0.286	0.908 ± 0.224	1.21 ± 0.548	< 4.44	< 0.506	< 0.698
gamma isotopic						
Barium 140	< 34.8	< 34.6	< 46.2	< 26.3	< 29.8	< 25.1
Cesium 134	< 9.36	< 7.42	< 10.4	< 6.12	< 6.9	< 7.97
Cesium 137	< 10.9	< 6.38	< 8.6	< 5.55	< 6.97	< 7.05
Cobalt 58	< 9.58	< 6.91	< 9.9	< 5.27	< 6.82	< 6.51
Cobalt 60	< 11	< 6.38	< 10.6	< 6.59	< 6.16	< 7.89
Iodine 131	< 10.8	< 11.6	< 13.3	< 9.27	< 13.2	< 7.47
Iron 59	< 19	< 13.9	< 18.9	< 11.7	< 13.4	< 14.2
Lanthanum 140	< 14.1	< 9.21	< 12.4	< 8.96	< 10.8	< 10.5
Manganese 54	< 9.59	< 6.95	< 10.1	< 5.62	< 6.89	< 6.6
Niobium 95	< 10.4	< 8.15	< 13.2	< 5.63	< 8.68	< 5.94
Potassium 40	1240 ± 261	1560 ± 293	1340 ± 294	1360 ± 240	1300 ± 254	1450 ± 265
Zinc 65	< 23.9	0.908 ± 0.224	< 22.2	< 12.3	< 20.1	< 15.1
Zirconium 95	< 16.2	< 17.4	< 19.7	< 9.91	< 14.4	< 10.8

Collection date:	07/10/19	08/14/19	09/11/19	10/09/19	11/13/19	12/11/19
Iodine 131 *b	< 0.455	< 0.441		< 0.489		
Strontium 90	< 0.52	< 0.478	< 0.643	0.757 ± 0.264	0.137 ± 026	1.11 ± 0.36
gamma isotopic						
Barium 140	< 44.2	< 47.6	< 37.5	< 30.1	< 38.1	< 25
Cesium 134	< 11.7	< 9.98	< 7.66	< 7.53	< 7.75	< 8.12
Cesium 137	< 10.8	< 14.5	< 9.84	< 6.95	< 9.86	< 6.95
Cobalt 58	< 12.5	< 9.19	< 7.72	< 5.51	< 7.95	< 4.71
Cobalt 60	< 14.2	< 13.5	< 9.8	< 7.26	< 8.44	< 7.25
Iodine 131	< 13.2	< 13.9	< 13	< 10.9	< 13.9	< 8.72
Iron 59	< 21.1	< 21.5	< 16.3	< 13.3	< 17.1	< 14
Lanthanum 140	< 13.1	< 11.2	< 11.4	< 10.3	< 9.82	< 9.88
Manganese 54	< 14.1	< 11.1	< 8.43	< 7.56	< 7.84	< 7.85
Niobium 95	< 13	< 11	< 8.46	< 8.08	< 9.11	< 6.78
Potassium 40	1150 ± 277	1410 ± 285	1400 ± 258	1440 ± 262	1520 ± 275	1430 ± 261
Zinc 65	< 27.6	< 26.8	< 17.9	< 15.6	< 16.1	< 16.4
Zirconium 95	< 20	< 20.4	< 13.5	< 11.7	< 13.8	< 9.74

Radioisotopes other than those reported were not detected.

\*a – Not reported by laboratory

\*b - The analysis is performed bi-monthly



Table 14 Wisconsin DHS analysis results for vegetation samples collected for the Point Beach-Kewaunee environmental monitoring program.

Measurements in units of pCi/kilogram (wet)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	06/25/19	06/25/19	06/25/19	06/25/19	06/25/19
Gross Alpha	< 5340	< 1640	< 2100	< 2160	< 2190
Gross Beta	1900 ± 763	2320 ± 436	1940 ± 584	6500 ± 753	5870 ± 694
gamma isotopic					
Cesium 134	< 16.4	< 22.2	< 16.3	< 21.6	< 13.2
Barium 140	< 73.4	< 132	< 85.1	< 122	< 73.2
Beryllium 7	963 ± 132	< 779 ± 136	1350 ± 174	708 ± 128	1060 ± 149
Cesium 137	< 11.7	< 30.2	< 15.4	< 27.8	< 12.7
Cobalt 58	< 11.5	< 19.9	< 18.8	< 24.1	< 14.4
Cobalt 60	< 17.1	< 32.4	< 21.8	< 28.7	< 17.9
Iodine 131	< 28.7	< 43.6	< 25.2	< 42.3	< 24.1
Iron 59	< 32.3	< 54.5	< 40.1	< 45.6	< 32.9
Lanthanum 140	< 21.3	< 36.6	< 29.8	< 29.8	< 21.3
Manganese 54	< 15.6	< 22.2	< 16.9	< 22	< 15.4
Niobium 95	< 15	< 22.6	< 18.9	< 25	< 18.2
Potassium 40	4990 ± 857	5530 ± 973	5150 ± 922	5610 ± 984	5480 ± 957
Zinc 65	< 35.6	< 52.2	< 39.1	< 42.4	< 36
Zirconium 95	< 22.5	< 37.8	< 31.8	< 40.3	< 25.1

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	06/25/19	06/25/19	06/26/19	06/26/19
Gross Alpha	< 2670	< 2510	< 2120	< 2540
Gross Beta	4250 ± 804	4120 ± 700	4550 ± 591	6360 ± 784
gamma isotopic				
Cesium 134	< 25	< 14.8	< 10.3	< 5.42
Barium 140	< 122	< 64.4	< 48.2	< 31.5
Beryllium 7	1010 ± 179	1450 ± 155	1090 ± 114	599 ± 52
Cesium 137	< 24.2	< 14.2	< 9	< 4.98
Cobalt 58	< 23.2	< 11.8	< 10.4	< 5.02
Cobalt 60	< 29.1	< 15.2	< 11.4	< 6.01
Iodine 131	< 43.9	< 22.8	< 16.8	< 14.5
Iron 59	< 64.2	< 30.4	< 24	< 12.4
Lanthanum 140	< 37.2	< 20.8	< 16.3	< 10.2
Manganese 54	< 25.1	< 14.6	< 9.69	< 5.5
Niobium 95	< 26.6	< 14.7	< 10.2	< 6
Potassium 40	4430 ± 865	5280 ± 895	5790 ± 967	4930 ± 791
Zinc 65	< 55.5	< 27.6	< 24.3	< 12.7
Zirconium 95	< 40.5	< 22.8	< 17.8	< 8.91

Radioisotopes other than those reported were not detected.

Table 14 (continued) Wisconsin DHS analysis results for vegetation samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (wet)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	09/25/19	09/25/19	09/25/19	09/24/19	09/24/19
Gross Alpha	< 1780	< 2250	< 593	< 2010	< 1830
Gross Beta	4290 ± 500	6890 ± 587	2120 ± 166	3360 ± 473	7630 ± 507
gamma isotopic					
Barium 140	< 57.3	< 75.1	< 35.6	< 81.9	< 102
Beryllium 7	7470 ± 517	9220 ± 623	1570 ± 146	5660 ± 431	5880 ± 458
Cesium 134	< 17.2	< 16.5	< 8.81	< 20.2	< 16.3
Cesium 137	< 13.6	< 14.9	< 9.3	< 16.7	< 13.8
Cobalt 58	< 14.2	< 14.7	< 8.99	< 15	< 18.4
Cobalt 60	< 16.9	< 15.5	< 12.1	< 18.4	< 18.9
Iodine 131	< 26.8	< 29.7	< 14.3	< 36.9	< 34.9
Iron 59	< 32.7	< 28.7	< 19.6	< 29.6	< 43.5
Lanthanum 140	< 21.6	< 24.3	< 10.1	< 27.4	< 37.3
Manganese 54	< 13.6	< 16.5	< 8.25	< 16.6	< 15.4
Niobium 95	< 14.9	< 15.7	< 10.5	< 14.8	< 19.7
Zirconium 95	< 23.2	< 22.1	< 16.2	< 30.3	< 33.3
Zinc 65	< 36.4	< 36.3	< 24.1	< 41.7	< 41.2

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	09/25/19	09/25/19	09/24/19	09/25/19
Gross Alpha	< 1630	< 1390	< 1290	< 2230
Gross Beta	8830 ± 614	6730 ± 459	4750 ± 376	3280 ± 506
gamma isotopic				
Barium 140	< 69.8	< 139	< 66	< 73.4
Beryllium 7	2080 ± 197	8810 ± 629	4110 ± 313	9590 ± 669
Cesium 134	< 15.7	< 25	< 11.9	< 12.3
Cesium 137	< 12.6	< 30.6	< 12.1	< 12.1
Cobalt 58	< 11.4	< 26	< 12.3	< 16.3
Cobalt 60	< 17.1	< 27.8	< 12.9	< 17.1
Iodine 131	< 23.1	< 51.3	< 25.9	< 28.8
Iron 59	< 31.5	< 50.3	< 26.8	< 33.4
Lanthanum 140	< 20.3	< 31.8	< 17.5	< 23.8
Manganese 54	< 13.6	< 21.8	< 14.6	< 16.6
Niobium 95	< 15	< 27.2	< 13.3	< 15
Zirconium 95	< 23	< 38.5	< 21.6	< 28.6
Zinc 65	< 30	< 53.8	< 27.4	< 35.1

Radioisotopes other than those reported were not detected.



Table 15 Wisconsin DHS analysis results for soil samples collected for the Point Beach-Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (dry)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	06/25/19	06/25/19	06/25/19	06/25/19	06/25/19
Gross Alpha	11100 ± 3450	8710 ± 4460	24600 ± 6880	7430 ± 5100	< 7650
Gross Beta	15800 ± 1260	16500 ± 1970	< 2030	9840 ± 1850	15700 ± 1820
gamma isotopic					
Cesium 134	< 11.6	< 17.2	< 14.5	< 14.3	< 17.3
Cesium 137	102 ± 13.3	71.7 ± 11.3	59.8 ± 11.9	86.8 ± 12.4	62.3 ± 11.1
Cobalt 58	< 27	< 29.5	< 28.7	< 27.9	< 29.4
Cobalt 60	< 14	< 18.7	< 15.5	< 17.2	< 18.2
Iron 59	< 98.3	< 107	< 113	< 99.9	< 105
Manganese 54	< 17.5	< 20.3	< 20.3	< 18.3	< 19.2
Niobium 95	< 60.8	< 73.7	< 77.7	< 70.6	< 72.8
Potassium 40	15900 ± 2570	19500 ± 3130	15700 ± 2540	9560 ± 1560	14300 ± 2300
Zinc 65	< 44.7	< 48.2	< 48.9	< 36.9	< 48.1
Zirconium 95	< 54.2	< 67.8	< 65.6	< 56.2	< 67.0

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	06/25/19	06/25/19	06/25/19	06/25/19
Gross Alpha	7910 ± 4840	7440 ± 4060	8730 ± 5400	7270 ± 3960
Gross Beta	27500 ± 2060	20300 ± 1850	18300 ± 2350	13800 ± 1610
gamma isotopic				
Cesium 134	< 14.1	< 11.6	< 4.21	< 4.80
Cesium 137	< 46.4	< 21.8	< 5.62	111 ± 7.27
Cobalt 58	< 31.3	< 31.4	< 23.2	< 22.3
Cobalt 60	< 16.0	< 13.9	< 4.53	< 4.79
Iron 59	< 127	< 131	< 151	< 150
Manganese 54	< 18.9	< 15.4	< 6.94	< 6.46
Niobium 95	< 75.8	< 94.7	< 169	< 157
Potassium 40	23800 ± 3820	21500 ± 3430	19300 ± 3060	< 15700 ± 2480
Zinc 65	< 48	< 39.8	< 17.9	< 16.5
Zirconium 95	< 64	< 63.9	< 52	< 52.6

\*a – Not reported by laboratory

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

Radioisotopes other than those reported were not detected.

Table 15 (continued) Wisconsin DHS analysis results for soil samples collected for the Point Beach- Kewaunee environmental monitoring program.



Measurements in units of pCi/kilogram (dry)

Site:	PBK-1	PBK-2	PBK-3	PBK-4	PBK-5
Collection date:	09/25/19	09/25/19	09/25/19	09/24/19	09/24/19
Gross Alpha	< 7630	7910 ± 4840	14200 ± 4990	9450 ± 4280	9440 ± 4270
Gross Beta	16200 ± 1840	18000 ± 1730	23500 ± 1960	15900 ± 1740	18700 ± 1800
gamma isotopic					
Cesium 134	< 13.1	< 9.69	< 12.2	< 11.8	< 12.7
Cesium 137	261 ± 20.8	121 ± 12.5	145 ± 12.1	93.3 ± 9.87	30.4 ± 6.55
Cobalt 58	< 31.9	< 27.2	< 27.4	< 30.1	< 31.1
Cobalt 60	< 13.6	< 11.5	< 11.8	< 11.6	< 13.2
Iron 59	< 136	< 120	< 127	< 126	< 128
Manganese 54	< 16.4	< 19.5	< 14.1	< 16	< 17.6
Niobium 95	< 97.2	< 141	< 101	< 142	< 97.7
Potassium 40	14700 ± 2360	18400 ± 2940	22000 ± 3500	15900 ± 2540	19500 ± 3110
Zinc 65	< 42.8	< 35.6	< 36.3	< 36.8	< 37.7
Zirconium 95	< 65.2	< 54.8	< 59.6	< 63.3	< 65.1

Site:	PBK-7	PBK-8	PBK-14	PBK-17
Collection date:	09/25/19	09/25/19	09/24/19	09/25/19
Gross Alpha	11200 ± 4890	14300 ± 4670	14000 ± 4560	12400 ± 4610
Gross Beta	25300 ± 1860	21800 ± 1780	21900 ± 1820	16100 ± 1820
gamma isotopic				
Cesium 134	< 4.84	< 5.22	< 5.17	< 2.61
Cesium 137	102 ± 6.81	48.5 ± 3.87	136 ± 8.38	104 ± 6.3
Cobalt 58	< 18	< 21.3	< 21.1	< 11.9
Cobalt 60	< 4.96	< 5.6	< 5.4	< 2.79
Iron 59	< 106	< 118	< 125	< 65.5
Manganese 54	< 6.31	< 8.72	< 7.27	< 6.5
Niobium 95	< 95.7	< 117	< 114	< 72
Potassium 40	22800 ± 3620	16300 ± 2580	20100 ± 3190	13200 ± 2100
Zinc 65	< 16.9	< 19.5	< 18.9	< 10.4
Zirconium 95	< 40	< 47.6	< 50.1	< 26.7

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

Radioisotopes other than those reported were not detected.

## Appendices

Appendix A - Radionuclide Concentration Levels needing review by state radiological coordinator (SRC)

If radioactivity concentrations exceed SRC review levels for a given radionuclide, consult SRC or review and assessment.

Medium	Radionuclide	SRC Review Level <sup>a</sup>
Airborne Particulates or Gas (pCi/m <sup>3</sup> )	Gross Beta	1
	I-131 (Charcoal)	0.1
	Cs-134	1
	Cs-137	1
Precipitation (pCi/l)	H-3	1,000
Water (pCi/l)	Gross Alpha	10
	Gross Beta	30
	H-3	10,000
	Mn-54	100
	Fe-59	40
	Co-58	100
	Co-60	30
	Zn-65	30
	Zr-Nb-95	40
	I-131	1
	Cs-134	10
	Cs-137	20
	Ba-La-140	100
	Sr-89	8
Sr-90	8 <sup>d</sup>	
Milk (pCi/l)	I-131	1
	Cs-134	20
	Cs-137	20
	Ba-La-140	100
	Sr-89	10
Grass (Vegetation), Cattle Feed, and Vegetables (pCi/kg wet)	Gross Beta	30,000
	I-131	100
	Cs-134	200
	Cs-137	200
	Sr-89	1,000
	Sr-90	1,000
	Sr-90	1,000

Appendix A (continued) - Radionuclide Concentration Levels needing review by state radiological coordinator (SRC)

If radioactivity concentrations exceed SRC review levels for a given radionuclide, consult SRC or review and assessment.

Medium	Radionuclide	SRC Review Level <sup>a</sup>
Eggs (pCi/kg) wet)	Gross Beta	30,000
	Cs-134	200
	Cs-137	200
	Sr-89	1,000
Soil, Bottom Sediment (pCi/kg)	Gross Beta	5,000
	Cs-134	5,000
	Cs-137	5,000
	Sr-89	5,000
	Sr-90	5,000
Meat (pCi/kg)	Gross Beta (Flesh, Bones)	10,000
	Cs-134 (Flesh)	1,000
	Cs-137 (Flesh)	2,000
	Sr-89 (Bones)	2,000
	Sr-90 (Bones)	2,000
Fish (pCi/kg wet)	Gross Beta (Flesh, Bones)	10,000
	Mn-54	--
	Fe-59	--
	Co-58	--
	Co-60	--
	Cs-134 (Flesh)	1,000
	Cs-137 (Flesh)	2,000
	Sr-89 (Bones)	2,000
	Sr-90 (Bones)	2,000
	Zn-65 (Bones)	--
Thermoluminescent Dosimeter (mR/Std Qtr)	Direct Exposure	

- Radionuclides will be monitored by Wisconsin Dept. of Health Services, Radiation Protection Sections, Environmental Monitoring program and concentrations above the listed levels will be reported to the Wisconsin State Radiological Coordinator (SRC) for further review and assessment.
- For drinking water (well water) samples, this is a 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used. (NUREG-1301. Supplement No. 1, page 64, table 3.12-2)
- If no drinking water pathway exists, a value of 20 pCi/l may be used. (NUREG-1301. Supplement No. 1, page 64, table 3.12-2)
- Drinking Water values from Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA-600/4-80-032, August 1980.

## Appendix B—Sample Point Locations

The sample point locations.

Sample Point	Location Description	Latitude or Y	Longitude or X
PBK-1	Francar residence (soil & veg)	44.31273	-87.64391
PBK-2	Southwest corner property line - Point Beach	44.27170	-87.54323
PBK-3	Two Creeks Town Hall	44.28455	-87.56638
PBK-3	Two Creeks Town Hall	44.28419	-87.56558
PBK-4	Residence north property line - Point Beach	44.29741	-87.54500
PBK-5	Two Creeks Park; boat launch	44.30497	-87.54435
PBK-5	Two Creeks Park; NW corner of property	44.30584	-87.54646
PBK-7	WPSC substation, Cty V (soil & veg)	44.24071	-87.57323
PBK-8	P Ihlenfeldt farm	44.35174	-87.54321
PBK-9	Point Beach, meteorological tower	44.27477	-87.53120
PBK-10a	Point Beach, effluent channel	44.28133	-87.53549
PBK-10b	Point Beach, entrance	44.27964	-87.53686
PBK-11	Two Creeks International Harvester	44.30250	-87.56315
PBK-12a	Kewaunee, effluent channel	44.34245	-87.53385
PBK-12b	Kewaunee, effluent channel, 500 feet N	44.34345	-87.53421
PBK-12c	Kewaunee, effluent channel, 500 feet S	44.34152	-87.53314
PBK-12d(1)	Kewaunee , south well (discontinued July 1, 2018)	44.34273	-87.53818
PBK-12d(2)	Kewaunee , north well	44.34419	-87.53834
PBK-14	Nuclear Road – field east of parking lot	44.34209	-87.55209
PBK-17	Green Bay Pumping Station – Rostok (air)	44.50379	-87.48515
PBK-17	Green Bay Pumping Station – Rostok (soil & veg)	44.50370	-87.48645
PBK-17	Green Bay Filtration – Finger Road	44.48798	-87.771460
PBK-18	Kewaunee, meteorological tower	44.34047	-87.53631
PBK-24	L. Struck Farm	44.37997	-87.51994
PBK-26	Kewaunee – Selner Park	44.45584	-87.49985
PBK-27	Barta Farm	44.29703	-87.56319
PBK-28	Strutz Farm	44.255999	-87.522693
PBK-29	Irish Road – at Lake Michigan	44.25499	-87.51986
PBK-T1-8	Point Beach ISFSI on outside of perimeter fence	44.28533	-87.54587
PBK-T9	Point Beach north property line, Lakeshore Road	44.29741	-87.54495
PBK-T10	Nuclear Road, 0.6 mile E of Lakeshore Road	44.26935	-87.53113
PBK-T11	Nuclear Road, 0.1 mile E of Lakeshore Road	44.26961	-87.54318
PBK-T12	Highway 42, 0.6 mile N of Nuclear Road	44.27331	-87.56329
PBK-T13	Highway 42, 0.3 mile N of Tapawingo Road	44.28735	-87.56325
PBK-T14	Two Creeks Road, 0.1 mile E of Highway 42	44.30216	-87.56109

Appendix B (continued) - Sample Point Locations

The sample point locations.

Sample Point	Location Description	Latitude or Y	Longitude or X
PBK-T15	Junction of Lakeshore Road and Ravine Drive	44.23341	-87.53894
PBK-T16	Cty V, 0.5 mile W of Hwy 42	44.24072	-87.57332
PBK-T17	Junction of Saxonbury Road and Tapawingo Road	44.28387	-87.61360
PBK-T18	Zander Road, 0.1 mile W on Tannery Road	44.31300	-87.58396
PBK-T20	Junction of Cty BB and Ratajcsak Lane	44.32765	-87.55484
PBK-T28	Kewaunee, South on Hwy 42	44.44445	-87.50591
PBK-T29	Two Rivers, Junction of Hwy 42 and 34th Avenue	44.16469	-87.55987
PBK-T30	Manitowoc, Hwy 42, Two Rivers Chamber of Commerce	44.12039	-87.62514
PBK-T31	Mishicot, Cty V, in front of house #653	44.24052	-87.63330
PBK-51-58	KPS ISFSI on the inside of the perimeter fence	44.34421	-87.53651
PBK-T51	KPS ISFSI on the inside of the perimeter fence	44.34369	-87.53676
PBK-T52	KPS ISFSI on the inside of the perimeter fence	44.34389	-87.53570
PBK-T53	KPS ISFSI on the inside of the perimeter fence	44.34419	-87.53558
PBK-T54	KPS ISFSI on the inside of the perimeter fence	44.34450	-87.53592
PBK-T55	KPS ISFSI on the inside of the perimeter fence	44.34455	-87.53634
PBK-T56	KPS ISFSI on the inside of the perimeter fence	44.34442	-87.53704
PBK-T57	KPS ISFSI on the inside of the perimeter fence	44.34420	-87.53726
PBK-T58	KPS ISFSI on the inside of the perimeter fence	44.34377	-87.53726