

This document is made available electronically by the Minnesota Legislative Reference Library as part of an ongoing digital archiving project. <http://www.leg.state.mn.us/lrl/lrl.asp>



Minnesota Department of Health
Environmental Monitoring Report
2011 Data

Published October 23, 2012

Minnesota Department of Health Environmental Monitoring Tables

Table 1	Sample Summary
Table 2A	Monticello Environmental Sampling Sites
Table 2B	Prairie Island Environmental Sampling Sites
Table 3A	Monticello Area TLD Locations
Table 3B	Prairie Island Area TLD Locations
Table 4	Air Sampling Results for Monticello Nuclear Generating Plant
Table 5	Air Sampling Results for Prairie Island Nuclear Generating Plant
Table 6	Air Sampling Results for St Paul
Table 7	Surface Water Results for Monticello Nuclear Generating Plant
Table 8	Surface Water Results for Prairie Island Nuclear Generating Plant
Table 9	Milk Analysis Results for Monticello Nuclear Generating Power Plant
Table 10	Milk Analysis Results for Prairie Island Nuclear Generating Power Plant
Table 11	TLD Results
Table 12	Well Water Analysis Results
Table 13	Community Water Analysis Results
Table 14	Precipitation Water Analysis Results

Minnesota Department of Health Environmental Monitoring Program

The Minnesota Department of Health (MDH) maintains an environmental monitoring program for radioactivity around the two nuclear generating power plants in the state. The program is designed to provide an independent evaluation of the impact of the nuclear generating power plants to the environment and the public over a period of time. Data collected is used to verify compliance with appropriate standards, provide the public with reliable data regarding the environmental impact of the nuclear generating power plants, and establish trends. Annual reports are generated and available for public review. Sample data not included in the annual reports is available through the MDH Public Health Lab.

Monitoring for radioactivity began in Minnesota in 1953 in response to nuclear weapons testing. Over fifty years of monitoring radioactivity levels provides MDH with an excellent database. Long-term trends established for certain radionuclides continue to be confirmed by current environmental monitoring. Throughout the years the Minnesota Department of Health environmental monitoring program has transformed. Careful analysis of data generated and potential risks has lead MDH to make alterations in its sampling program from time to time. Some collection points and sample mediums have been discontinued while others added.

The major components of the Minnesota Department of Health environmental monitoring program are sample collection, data analysis, and interpretation. Around the Monticello Nuclear Generating Power Plant and the Prairie Island Nuclear Generating Power Plant samples that are collected include: air, surface water, and milk. Ambient gamma radiation doses are monitored through the use of thermoluminescent dosimeters. Well water samples are also collected only near the Prairie Island plant.

Besides those samplings, since 1995 MDH has received data from two pressurized ion chambers (PIC) located at the Prairie Island Nuclear Generating Power Plant near the Independent Spent Fuel Storage Installation (ISFSI). Data from the PICs is transmitted to a computer. Every fifteen minutes a modem relays that data, via phone line, to an MDH computer. The system also conveys alarm messages to MDH staff members if the radiation levels are significantly high or communication between the PIC and the computer is disrupted.

In the fall of 2008 Monticello began storing spent fuel in its own ISFSI on site. This ISFSI is monitored using an automatic switching, two Geiger-Mueller-tube based dose rate monitor called the Data Radiation Monitor (DRM). The DRM continuously measures gamma radiation dose rates. Readings are taken approximately every four seconds and transmitted via radio waves to a base computer. MDH connects to the base computer and receives dose rate readings. As with the Prairie Island monitoring system, alarm messages are sent if communication is disrupted or radiation levels are exceeded.

PROGRAM SUMMARY

In 2011, no sample results within the current environmental monitoring program areas were found to exceed any federal or state standards or guidelines.

AIR MONITORING

Continuous air monitoring allows the Minnesota Department of Health to determine the level of radioactive contamination that could expose the public through inhalation. Air sampler particulate filters and cartridges are collected weekly or every other week and analyzed for radioactive particulates in the air.

In 2011 air samples were collected from three locations in Minnesota; one at each of the nuclear power generating plants and one in downtown St. Paul. The air samplers at the nuclear generating power plants are located downwind of the plant based on predominant wind directions.

The location of the Prairie Island air sampler is near Lock and Dam No. 3, downstream from the Prairie Island Nuclear Power Generating Plant. The air sampler at Monticello is located near the Monticello Xcel Training Center, downstream from the Monticello Nuclear Power Generating Plant.

The St. Paul air sampler is located on the roof of the Freeman Building at 625 Robert Street North in St. Paul and is used as a standard for comparison.

Air sampler locations are shown in [Table 2A](#) Monticello Sampling Sites and [Table 2B](#) Prairie Island Sampling Sites. Air sample results for gross alpha, gross beta, and naturally occurring Beryllium-7 and Potassium-40 are shown in [Table 4](#) Air Sampling Results for Monticello Nuclear Generating Plant, [Table 5](#) Air Sampling Results for Prairie Island Nuclear Generating Plant, and [Table 6](#) Air Sampling Results for St. Paul.

Data Analysis: Data collected from the Prairie Island and Monticello air samplers are compared to data from the St. Paul sampler, historical data, EPA standards, and MDH Radioactive Material Rules, Chapter 4731.2750. Specific isotopes of interest are examined using the limits indicated in MDH Chapter 4731 designating concentrations such that a dose limit of 50 mrems per year is not exceeded for each isotope.

The majority of data for these radioisotopes are below MDH Public Health Lab's (PHL) detection levels. In instances where the detection levels exceeded the Chapter 4731 concentrations or established standards, review of the gross alpha and gross beta values were considered. It is understood that the gross alpha or gross beta values represent the maximum value any individual alpha or beta emitter could indicate. Gross alpha levels were below 0.0094 pCi/m³ at all locations. Gross beta levels were below 0.0383 pCi/m³ at all locations.

Whenever applicable, naturally occurring Potassium-40 and Beryllium-7 are tracked as a means of quality control for accuracy of lab data. It is expected that these levels will remain somewhat constant throughout time.

All air sample results for 2011 were within the EPA and MDH standards and guidelines.

SURFACE WATER MONITORING

Since surface water is the drinking water source for many cities in the state, MDH samples the river water downstream from both power plants. The results are compared to the EPA Safe Drinking Water Standards and MDH Chapter 4731.2750 for compliance. They are also measured against the historical data for changes that may have occurred due to releases from the power plant.

Water sample locations are shown in [Table 2A](#) Monticello Sampling Sites and [Table 2B](#) Prairie Island Sampling Sites. Water sample results for gross alpha, gross beta, and select radionuclides of interest are shown in [Table 7](#) Surface Water Results for Monticello Nuclear Generating Plant, and [Table 8](#) Surface Water Results for Prairie Island Nuclear Generating Plant.

Data Analysis: The EPA Safe Drinking Water Act (SDWA) is often the most restrictive limit for these samples. The radiological component of the SDWA limits gross alpha particles to 15 pCi/L (including combined Radium 226 and Radium 228 at 5 pCi/L), tritium to 20,000 pCi/L, and beta/photon emitters to doses equivalent to 4 mrem per year. Gross alpha values for 2011 were below 5.1 pCi/L at both locations. Tritium values were below 345 pCi/L at both locations.

The SWDA limits the total body or critical organ dose from a single beta/photon emitter to 4 mrems. Concentrations for 168 beta/photon emitters that will deliver a total body or critical organ dose of 4 mrems are compared to the isotopic analysis in the MDH samples. The majority of data for these radioisotopes falls below MDH Public Health Lab's (PHL) detection levels. In instances where the detection levels exceed the SDWA levels, review of the gross beta values were considered, since the gross beta value represents the maximum value any individual beta emitter could be.

All surface water sample results for 2011 were within the EPA and MDH standards and guidelines.

MILK MONITORING

Milk samples are collected monthly from a farm located near each power plant. Radiation contamination that may have been deposited in the fields and consumed by cows would be concentrated and forwarded to the milk. Since there are no standards for milk, except for emergency situations, sample analysis is compared to the EPA Safe Drinking Water Standards and MDH Chapter 4731.2750. Samples are also compared to historical data and reviewed for trends.

Milk sampling locations are shown in [Table 2A](#) Monticello Sampling Sites and [Table 2B](#) Prairie Island Sampling Sites. Milk sample results for select radionuclides of interest are shown in [Table 9](#) Milk Analysis Results for Monticello Nuclear Generating Power Plant and [Table 10](#) Milk Analysis Results for Prairie Island Nuclear Generating Power Plant.

Data Analysis: MDH recognizes that the EPA Safe Drinking Water Act (SDWA) is often a more restrictive limit for these samples because there are no specific standards for milk samples. However, by meeting these standards MDH continues to ensure that public health and safety is maintained. Due to the physical properties of milk, analyzing for gross alpha and gross beta values is difficult and highly unreliable; therefore these results are not available.

The SWDA limits the total body or critical organ dose from a single beta/photon emitter to 4 mrems. Concentrations for 168 beta/photon emitters that will deliver a total body or critical organ dose of 4 mrems are compared to the isotopic analysis in the MDH samples. Again, the majority of data for these radioisotopes are below MDH Public Health Lab's (PHL) detection levels. In instances where the detection levels exceed the SDWA levels, review of past air sample results were considered. It should be noted that if a release were to occur, before it would be observed in milk samples it would most likely be detected in air samples.

All milk sample results for 2011 were within the EPA and MDH standards and guidelines.

AMBIENT GAMMA RADIATION MONITORING

Ambient gamma radiation levels are measured around the power plants by using thermoluminescent dosimeters (TLDs). MDH has placed TLDs beyond the plant's boundaries to estimate the dose received by a member of the public if they were to be at that location continuously throughout the monitoring period. TLDs are changed and analyzed quarterly. In 2006, MDH transferred the analysis of the dosimeters from an internal evaluation to Mirion Technologies (formerly Global Dosimetry), a processor approved by the National Voluntary Laboratory Accreditation Program. These results are compared to control readings, historical data, and MDH regulatory limits.

TLD locations are shown in [Table 3A](#) Monticello Area TLD Locations and [Table 3B](#) Prairie Island Area TLD Locations. TLD results are shown in [Table 11](#) TLD Results.

Data Analysis: Mirion Technologies results from the field TLDs are compared to the control readings. Control badges are kept in St. Paul for the monitoring period so that control readings indicate background radiation levels.

All TLD results for 2011 were within MDH regulatory limits to members of the public.

WELL WATER AND COMMUNITY WATER MONITORING

Well water is periodically reviewed since radioactivity may seep through the soil and enter the water table. The collection point was selected to be a private farm located close to the Prairie Island nuclear power plant. Community Water samples are collected at Prairie Island as part of the EPA RADNET system. MDH also collects a sample to represent the community water supply at Prairie Island. These samples are collected quarterly and again compared to the EPA Safe Drinking Water Standards, MDH Chapter 4731.2750, and historical data.

Well water sample location is shown in [Table 2B](#) Prairie Island Sampling Sites. Community water samples are collected from the Dakota Station at Prairie Island. Well water sample results for gross alpha, gross beta, and select radionuclides of interest are shown in [Table 12](#) Well Water Analysis Results. Community Water sample results are shown in [Table 13](#) Community Water Analysis Results.

Data Analysis: Well water and community water data is analyzed similar to surface water. The EPA Safe Drinking Water Act (SDWA) is often the most restrictive limit for these samples. The radiological component of the SDWA limits gross alpha particles to 15 pCi/L (including combined Radium 226 and Radium 228 at 5 pCi/L), tritium to 20,000 pCi/L, and beta/photon emitters to doses equivalent to 4 mrem per year. Gross alpha values for 2011 were below 5.6 pCi/L. and Tritium values were below 202 pCi/L.

The SWDA limits the total body or critical organ dose from a single beta/photon emitter to 4 mrems. Concentrations for 168 beta/photon emitters that will deliver a total body or critical organ dose of 4 mrems are compared to the isotopic analysis in the MDH samples. In instances where the detection levels exceed the SDWA levels, review of the gross beta values were considered, since the gross beta value represents the maximum value any individual beta emitter could be.

All well water and community water sample results for 2011 were within the EPA and MDH standards and guidelines.

PRECIPITATION MONITORING

As part of the EPA RADNET program, MDH also collects precipitation samples at the air sampling location in St. Paul. These samples are collected when enough precipitation is in the collection bucket to fill an analysis container. Samples are split, one going to EPA RADNET and one to MDH PHL. Data collected is compared to the EPA Safe Drinking Water Standards, MDH Chapter 4731.2750 and historical data.

Data Analysis: Precipitation data is analyzed similar to surface water. The EPA Safe Drinking Water Act (SDWA) is often the most restrictive limit for these samples. The radiological component of the SDWA limits gross alpha particles to 15 pCi/L (including combined Radium 226 and Radium 228 at 5 pCi/L), tritium to 20,000 pCi/L, and beta/photon emitters to doses equivalent to 4 mrem per year. Gross alpha values for 2011 were below 3.0 pCi/L. and Tritium values were below 345 pCi/L.

The SWDA limits the total body or critical organ dose from a single beta/photon emitter to 4 mrems. Concentrations for 168 beta/photon emitters that will deliver a total body or critical organ dose of 4 mrems are compared to the isotopic analysis in the MDH samples. In instances where the detection levels exceed the SDWA levels, review of the gross beta values were considered, since the gross beta value represents the maximum value any individual beta emitter could be.

All precipitation sample results for 2011 were within the EPA and MDH standards and guidelines:

PROGRAM MODIFICATIONS

In 2011 the only Environmental Monitoring Program modification at Prairie Island was the change in location for milk sampling. The termination of the previous milk sampling site ended upon the selling of the dairy farm in September 2011. New milk sampling site was added to the Environmental Monitoring Program and sample collected in November 2011. The new milk sampling site was added to the Prairie Island Environmental Sampling map shown in [Table 2B](#).

In 2011 the Environmental Monitoring Program modifications at Monticello consisted of relocating three areas for TLD monitoring. The new TLD locations were added to the Monticello TLD Area location map shown in [Table 3A](#).

FUKUSHIMA DAIICHI NUCLEAR POWER PLANT RELEASE

On March 11, 2011 Fukushima Daiichi Nuclear Power Plant was struck by a 9.0 magnitude earthquake followed by a tsunami. As a result cooling of the reactor core was unable to be maintained and core damaged occurred. Radioactive material was released from the damaged core during this time. Minnesota Department of Health (MDH) air monitors that are located in St. Paul, Monticello, and Prairie Island were monitored closely during this event. The Fukushima Daiichi Nuclear Power Plant Monitoring Summary report below lists the levels of Iodine-131 detected at these locations during the event. No health impacts expected from the trace of amounts detected.

Drinking water samples were collected during the event in St. Paul on March 28, 2011 and at Prairie Island on March 29, 2011 and May 17, 2011. No radionuclides were found above detection limits. Non-potable water was collected from the Mississippi River in Red Wing on April 5, 2011 and in Monticello on April 12, 2011. No radionuclides were found above detection limits.

Milk samples were collected during the event in Monticello on March 29, 2011, April 12, 2001, April 26, 2011, and May 10, 2011; Prairie Island on March 22, 2011, April 5, 2011, April 20, 2011, May 3, 2011, May 17, 2011 and May 24, 2011. No radionuclides were found above detection limits.

Precipitation samples were collected during the event in St. Paul on April 26, 2011, May 3, 2011 and May 10, 2011. No radionuclides were found above detection limits.

MDH's findings are consistent with those of other agencies taking samples/conducting testing in Minnesota. Air monitoring by the Environmental Protection Agency (EPA) found slightly elevated levels of iodine around March 22, 2011. Sampling of rainwater in St. Paul by the EPA found a concentration of Iodine 131 on March 22, 2011 of 32 picoCuries/liter. It would take a concentration of 1,000 picoCuries/liter to produce a dose of 50 millirem per year.

The chart below represents air samples collected. The dose indicated in the last column of the chart below represent the additional dose to a person breathing air for one year with the amount of radiation detected. For comparison a typical chest x-ray results in a dose of approximately 4 -10 millirem.

**Minnesota Department of Health
Fukushima Daiichi Nuclear Power Plant Accident
Environmental Monitoring Summary for 2011**

<i>Sample Location</i>	<i>Date Collected</i>	<i>Isotope</i>	<i>Concentration Measured (picoCuries per cubic meter of air)</i>	<i>Estimated Radiation Dose per Year (millirem)</i>
St. Paul Monticello	3/1/2011	Iodine-131	<0.00355	<0.0009
	3/1/2011	Iodine-131	<0.00499*	<0.0012
St. Paul Prairie Island	3/9/2011	Iodine-131	<0.00415*	<0.0010
	3/9/2011	Iodine-131	<0.00278*	<0.0007
St. Paul Monticello	3/15/2011	Iodine-131	<0.00354*	<0.0009
	3/15/2011	Iodine-131	<0.00147*	<0.0004
St. Paul Prairie Island	3/22/2011	Iodine-131	0.0173	0.004
	3/22/2011	Iodine-131	0.0118	0.003
St. Paul Monticello	3/29/2011	Iodine-131	0.0450	0.011
	3/29/2011	Iodine-131	0.0225	0.006
St. Paul St. Paul	4/5/2011	Cesium-134	0.0041	0.001
	4/5/2011	Cesium-137	0.0063	0.002
St. Paul Prairie Island	4/5/2011	Iodine-131	0.0590	0.015
	4/5/2011	Iodine-131	0.0383	0.010
St. Paul	4/12/2011	Iodine-131	0.0173	0.004
Monticello	4/12/2011	Iodine-131	0.0234	0.006
St. Paul	4/20/2011	Iodine-131	0.0068	0.002
Prairie Island Prairie Island	4/20/11	Cesium-134	0.0028	0.001
	4/20/11	Cesium-137	0.0029	0.001
Prairie Island	4/20/11	Iodine-131	0.0075	0.002
St. Paul Monticello Monticello	4/26/2011	Iodine-131	<0.0047*	<0.001
	4/26/2011	Iodine-131	0.0042	0.001
	4/26/2011	Cesium-134	0.0035	0.001
St. Paul Prairie Island	5/3/2011	Iodine-131	<0.0037*	<0.001
	5/3/2011	Iodine-131	<0.0027*	<0.001
St. Paul Monticello	5/10/2011	Iodine-131	<0.0033*	<0.001
	5/10/2011	Iodine-131	<0.0020*	<0.001
St. Paul	5/17/2011	Iodine-131	<0.0036*	<0.001
St. Paul Monticello	5/24/2011	Iodine-131	<0.0040*	<0.001
	5/24/2011	Iodine-131	<0.0035*	<0.001

* This value represents the gamma counting system lowest detection concentration. The sample value measured below the detectable concentration.

NOTE: Estimated dose calculations were done using the method described in Minnesota Chapter 4731.2750 Subpart 4, Annual Limits on Intake and Derived Air Concentrations. Dose calculations assume the individual will be continuously exposed at this concentration for one year.

Table 1

Minnesota Department of Health
Sample Summary for 2011

Sample Type	Collection and Frequency	Number of Samples Collected	Analyses Performed
Air	C, W & BW	99	GA, GB, GI, Sr, I
Surface Water	G, Q	8	GA, GB, GI, Sr, H
Well Water	G, Q	4	GA, GB, GI, Sr, H
Community Water	G, Q	4	GA, GB, GI, Sr, H
Milk	G, M	27	GI, Sr, I
TLD	C, Q	68	Direct exposure
Precipitation	C	11	GA, GB, GI, Sr, H

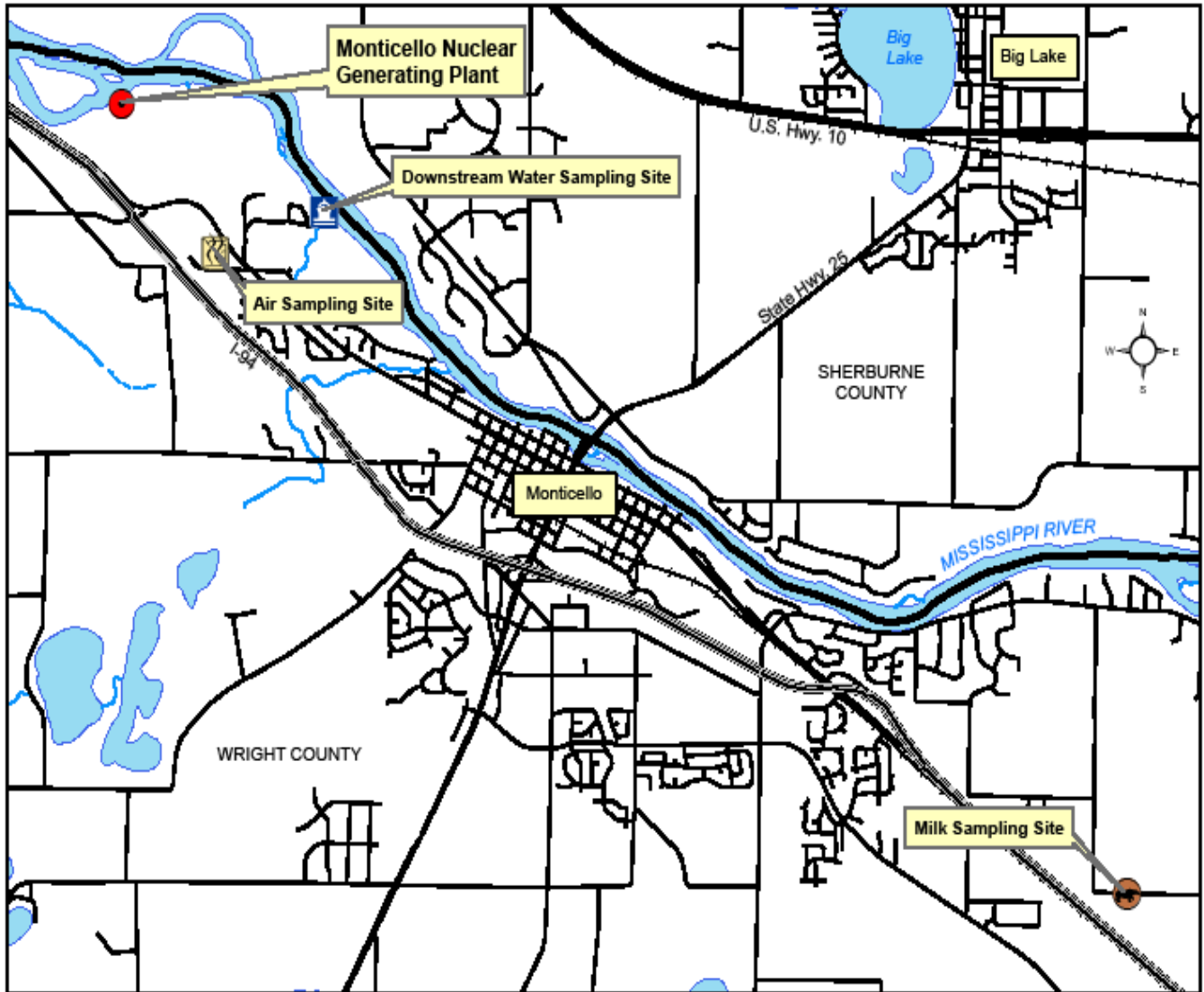
Collection type: C = continuous; G = grab

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

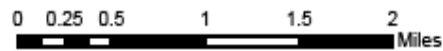
Analyses performed: GA = gross alpha; GB = gross beta; GI = gamma isotopic;
Sr = strontium; I = iodine; H = tritium

Minnesota Department of Health Monticello Environmental Sampling Sites

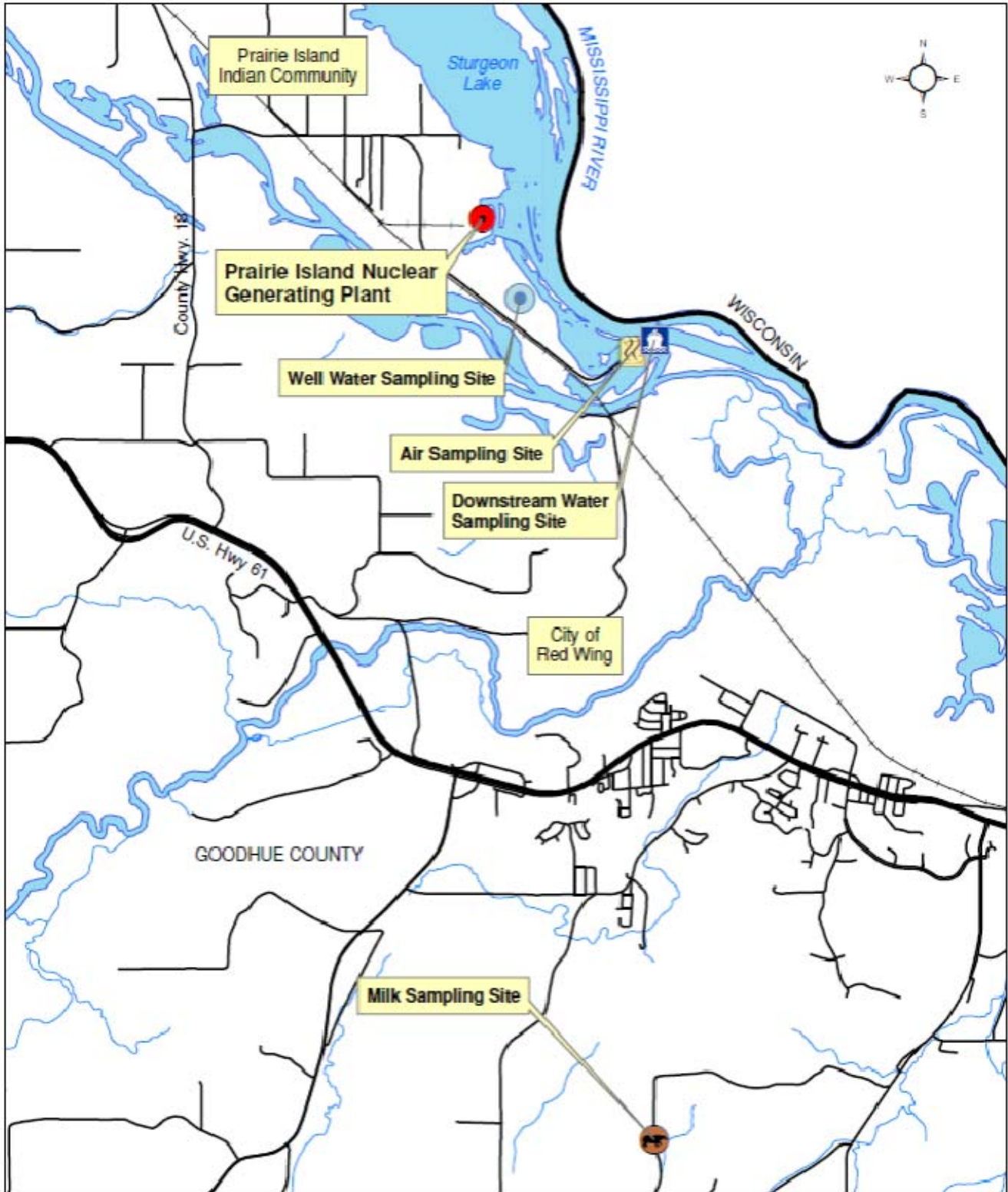
MONTICELLO NUCLEAR GENERATING PLANT AND SAMPLING SITE LOCATIONS



Source: MN Dep't. of Health, February 2009



Minnesota Department of Health
Prairie Island Environmental Sampling Sites



Minnesota Department of Health
Monticello Area TLD Locations

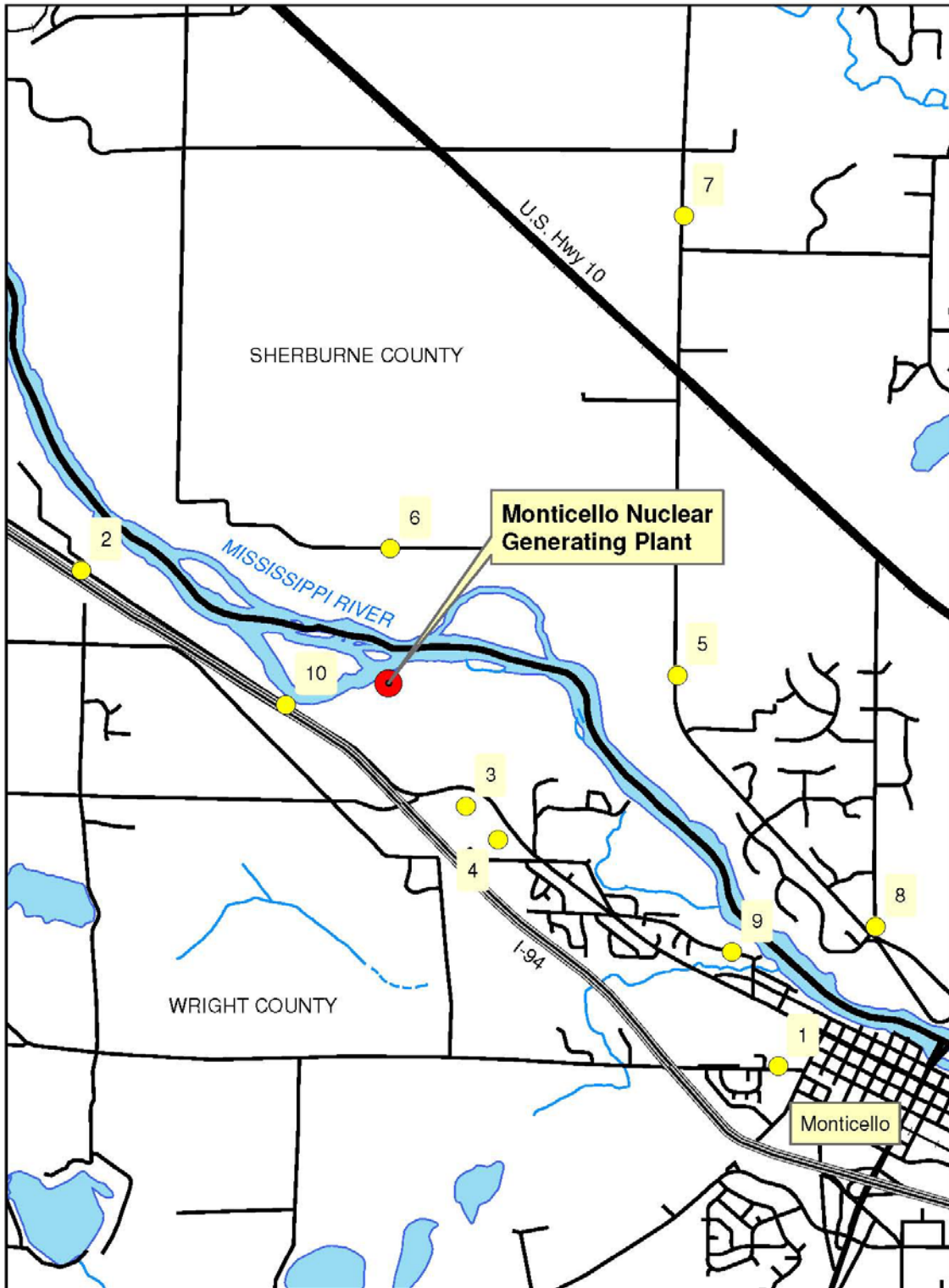


Table 3B

Minnesota Department of Health Prairie Island Area TLD Locations

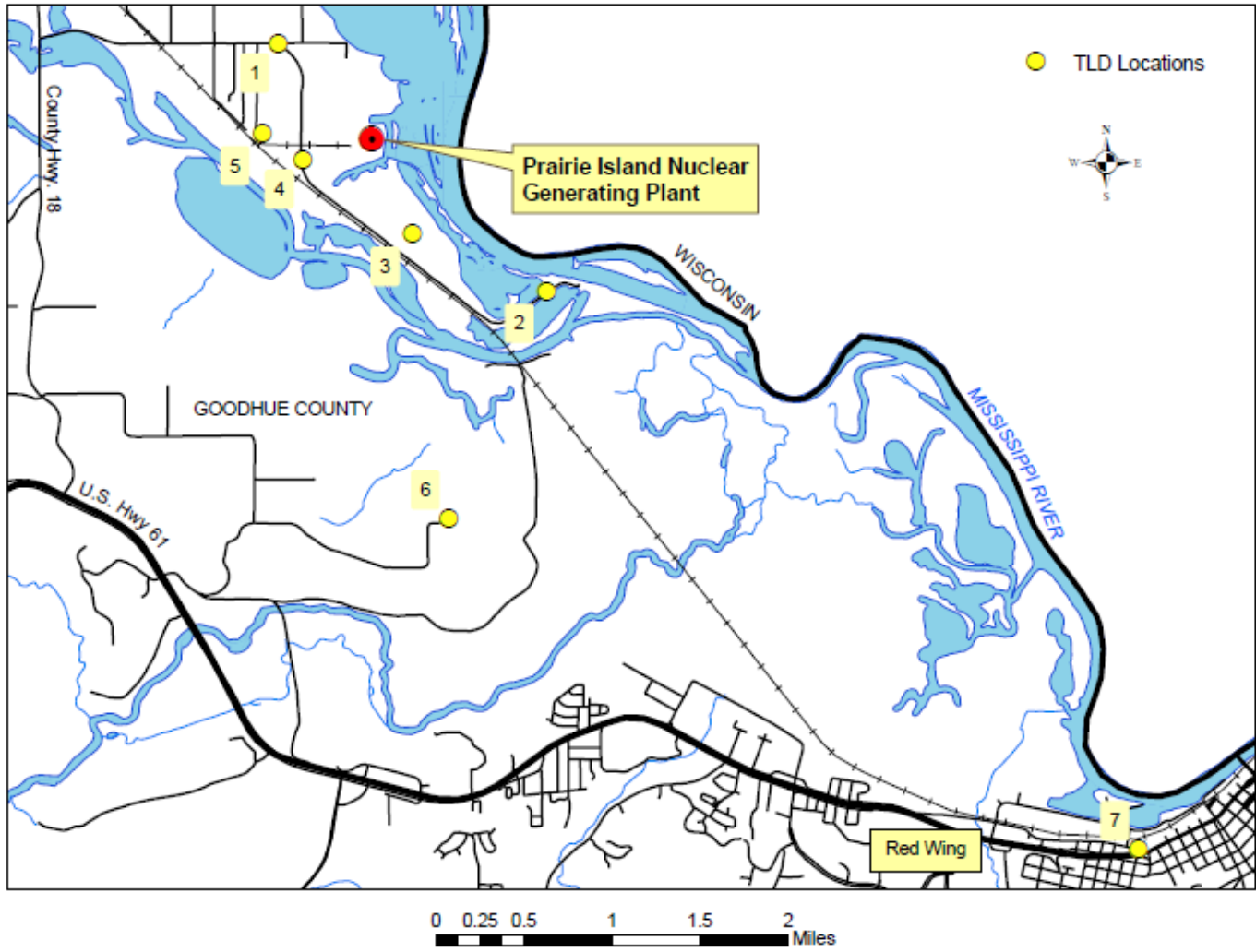


Table 4

Minnesota Department of Health
2011 Air Sampling Results for Monticello Nuclear Generating Plant
Results and Detection Limits in pCi/m³

Date Collected	Gross Alpha	Gross Beta	Be-7	K-40
1/4	0.0050	0.0160	0.0545	< 0.0685
1/18	0.0083	0.0310	0.0511	< 0.0725
2/1	0.0059	0.0281	0.0751	< 0.0779
2/15	0.0039	0.0238	0.1020	< 0.0633
3/1	0.0025	0.0231	0.0775	< 0.0768
3/15	0.0014	0.0208	0.0867	< 0.0563
3/29	0.0011	0.0193	0.0988	< 0.0673
4/12	0.0010	0.0188	0.1100	< 0.0593
4/26	0.0013	0.0218	0.1610	< 0.0709
5/10	0.0013	0.0096	0.1220	< 0.0714
5/24	0.0007	0.0087	0.0883	< 0.0794
6/7	0.0021	0.0088	0.1270	< 0.0534
6/21	0.0013	0.0074	0.0888	< 0.0749
7/5	0.0014	0.0082	0.0796	< 0.0616
7/19	0.0010	0.0127	0.0943	< 0.0741
8/3	0.0002	0.0039	0.1050	< 0.0723
8/16	0.0045	0.0106	0.0279	< 0.0790
8/30	0.0045	0.0135	0.1270	< 0.0769
9/13	0.0047	0.0135	0.0773	< 0.0562
9/27	0.0026	0.0085	0.0644	< 0.0690
10/13*	*	*	*	*
10/25	0.0047	0.0151	0.0354	< 0.0785
11/9	0.0034	0.0197	< 0.0248	< 0.0643
11/22	0.0057	0.0245	0.0505	< 0.0786
12/6	0.0066	0.0282	< 0.0248	< 0.0678
12/20	0.0084	0.0428	0.0623	< 0.0756

* Sample damage – no results reported.

Table 5

Minnesota Department of Health
2011 Air Sampling Result for Prairie Island Nuclear Generating Plant
Results and Detection Limits in pCi/m³

Date Collected	Gross Alpha	Gross Beta	Be-7	K-40
1/11	0.0088	0.0312	0.0626	< 0.0638
1/25	0.0073	0.0285	0.0578	< 0.0758
2/8	0.0047	0.0244	0.0679	< 0.0671
2/22	0.0018	0.0213	0.0632	< 0.0621
3/9	0.0023	0.0218	0.0810	< 0.0555
3/22	0.0014	0.0191	0.0642	< 0.0643
4/5	0.0009	0.0202	0.1140	< 0.0649
4/20	0.0009	0.0197	0.1300	< 0.0601
5/3	0.0014	0.0100	0.1080	< 0.0843
5/17	0.0011	0.0123	0.1070	< 0.0533
5/31	0.0009	0.0113	0.1620	< 0.0601
6/14	0.0020	0.0105	0.0972	< 0.0472
6/29	0.0015	0.0073	0.0812	< 0.0402
7/12	0.0017	0.0155	0.1300	< 0.0588
7/26	0.0003	0.0073	0.0909	< 0.0532
*	*	*	*	*
9/19	0.0025	0.0102	0.0929	< 0.1060
10/04	0.0035	0.0138	0.0503	< 0.0466
10/18	0.0034	0.0202	0.0574	< 0.0442
11/1	0.0029	0.0138	< 0.0175	< 0.0512
11/15	0.0041	0.0158	0.0301	< 0.0594
11/29	0.0066	0.0254	0.0243	< 0.0514
12/13	0.0055	0.0327	0.0409	< 0.0576
12/27	0.0020	0.0264	0.0403	< 0.0540

* No samples collected 7/26 – 9/19. Broken fuse on air sampler identified on 8/9 and sent to manufacturer for repair. Returned and re-installed 9/5.

Table 6

Minnesota Department of Health
2011 Air Sampling Results for St. Paul
Results and Detection Limits in pCi/m³

Date Collected	Gross Alpha	Gross Beta ¹	Be-7	K-40
1/4	0.0069	0.0262	0.0805	< 0.1060
1/11	0.0094	0.0322	0.0658	< 0.0983
1/25	0.0034	0.0140	0.0434	< 0.0566
2/1	0.0043	0.0224	0.0860	< 0.1100
2/8	0.0035	0.0194	0.0952	< 0.1150
2/15	0.0031	0.0223	0.0893	< 0.0943
2/22	0.0025	0.0192	0.0904	< 0.1230
3/1	0.0034	0.0253	0.0845	< 0.1070
3/9	0.0014	0.0162	0.0997	< 0.1020
3/15	0.0017	0.0182	0.0668	< 0.1240
3/22	0.0009	0.0155	0.0628	< 0.1040
3/29	0.0012	0.0233	0.1670	< 0.1090
4/5	0.0007	0.0292	0.1300	< 0.0969
4/12	0.0006	0.0151	0.1040	< 0.1060
4/20	0.0011	0.0196	0.1630	< 0.0956
4/26	0.0012	0.0129	0.1150	< 0.1370
5/3	0.0009	0.0064	0.0932	< 0.1120
5/10	0.0017	0.0114	0.1160	< 0.0997
5/17	0.0010	0.0112	0.1030	< 0.1110
5/24	0.0007	0.0094	0.1110	< 0.1300
5/31	0.0009	0.0109	0.1770	< 0.1090
6/7	0.0029	0.0131	0.1730	< 0.1100
6/14	0.0019	0.0073	0.1060	< 0.0981
6/21	0.0018	0.0102	0.0787	< 0.1030
6/29	0.0018	0.0087	0.1080	< 0.0912
7/5	0.0024	0.0163	0.1530	< 0.1250
7/12	0.0016	0.0154	0.1730	< 0.1160
7/19	0.0018	0.0183	0.0982	< 0.1140
7/26	< 0.0004	< 0.0009	0.1090	< 0.1080
8/2	< 0.0004	0.0013	0.1020	< 0.1030
8/9	0.0077	0.0153	0.0284	< 0.1060
8/16	0.0055	0.0135	0.1600	< 0.1200
8/24	0.0060	0.0159	0.1280	< 0.0964
8/30	0.0046	0.0112	0.1030	< 0.1370
9/6	0.0056	0.0152	0.0753	< 0.1080
9/13	0.0066	0.0220	0.1110	< 0.1070
9/19	0.0013	0.0034	0.0394	< 0.0599
9/27	0.0029	0.0092	0.0493	< 0.1080
10/4	0.0054	0.0170	0.0692	< 0.1040
10/12	0.0070	0.0274	0.1490	< 0.0921
10/18	0.0039	0.0137	0.0507	< 0.1380
10/25	0.0053	0.0183	< 0.0300	< 0.1200
11/1	0.0052	0.0174	0.0705	< 0.1040
11/9	0.0025	0.0108	0.0257	< 0.0480
11/15	0.0061	0.0328	0.1180	< 0.1440
11/22	0.0047	0.0205	< 0.0403	< 0.1060
11/29	0.0059	0.0335	< 0.0431	< 0.1150
12/6	0.0038	0.0244	0.0773	< 0.1230
12/13	0.0041	0.0383	0.1520	< 0.1190
12/20	0.0034	0.0376	0.0903	< 0.1260
12/27	< 0.0005	< 0.0009	0.0996	< 0.1310

Table 7

Minnesota Department of Health
2011 Surface Water Results for Monticello Nuclear Generating Plant
Results and Detection Limits in pCi/L

Date Collected	Gross Alpha	Gross Beta	Tritium	Sr-89¹	Sr-90¹	K-40
1/4	< 3.0	< 4.0	< 200	< 2.0	< 2.0	54.50
4/12	< 3.0	< 4.0	< 200	< 2.0	< 2.0	76.90
7/5	< 3.0	< 4.0	< 345	< 2.0	< 2.0	78.20
10/13	< 3.0	< 4.0	< 200	< 2.0	< 2.0	51.50

¹Sr-89 and Sr-90 were below the required detection limit of 2 pCi/L (§ 141.25)

Table 8

Minnesota Department of Health
2011 Surface Water Results for Prairie Island Nuclear Generating Plant
Results and Detection Limits in pCi/L

Date Collected	Gross Alpha	Gross Beta	Tritium	Sr-89¹	Sr-90¹	K-40
1/11	4.8	7.0	< 200	< 2.0	< 2.0	81.10
4/5	< 3.0	6.8	< 200	< 2.0	< 2.0	54.00
7/12	5.1	11.0	< 345	< 2.0	< 2.0	55.20
10/4	< 3.0	5.7	< 200	< 2.0	< 2.0	46.70

¹Sr-89 and Sr-90 were below the required detection limit of 2 pCi/L (§ 141.2)

Table 9

Minnesota Department of Health
2011 Milk Analysis Results for Monticello Nuclear Generating Plant
Results and Detection Limits in pCi/L

Date Collected	Sr-89 ¹	Sr-90 ¹	K-40
1/18	< 2.0	< 2.0	1280
2/15	< 2.0	< 2.0	1330
3/29	< 2.0	< 2.0	1290
4/12*	< 2.0	< 2.0	1350
4/26	< 2.0	< 2.0	1350
5/10*	< 2.0	< 2.0	1290
5/24	< 2.0	< 2.0	1290
6/21	< 2.0	< 2.0	1340
7/19	< 2.0	< 2.0	1320
8/30	< 2.0	< 2.0	1330
9/27	< 2.0	< 2.0	1270
10/25	< 2.0	< 2.0	1310
11/22	< 2.0	< 2.0	1330
12/20	< 2.0	< 2.0	1360

¹Sr-89 and Sr-90 were below the required detection limit of 2 pCi/L (§ 141.25).

* Additional milk samples taken in April and May following Fukushima Daiichi Nuclear Power Plant incident on March 11.

Table 10

Minnesota Department of Health
2011 Milk Analysis Results for Prairie Island Nuclear Generating Plant
Results and Detection Limits in pCi/L

Date Collected	Sr-89 ¹	Sr-90 ¹	K-40
1/25	< 2.0	< 2.0	1310
2/22	< 2.0	< 2.0	1280
3/22	< 2.0	< 2.0	1330
4/5*	< 2.0	< 2.0	1340
4/20	< 2.0	< 2.0	1330
5/3*	< 2.0	< 2.0	1290
5/17*	< 2.0	< 2.0	1350
5/31	< 2.0	< 2.0	1250
6/29	< 2.0	< 2.0	1270
7/26	< 2.0	< 2.0	1250
8/24	< 2.0	< 2.0	1280
11/29**	< 2.0	< 2.0	1310
12/27	< 2.0	< 2.0	1340

¹Sr-89 and Sr-90 were below the required detection limit of 2 pCi/L (§ 141.25).

* Additional milk samples taken in April and May following Fukushima Daiichi Nuclear Power Plant incident on March 11.

**NOTE: Milk sampling dairy farm was sold in September – no samples taken for September and October. New sampling location established in November.

Table 11

2011 Minnesota Department of Health TLD Results
Results in mrem

Monticello

<u>Location</u>	<u>Number on Table 3</u>	<u>1st Qtr</u>	<u>2nd Qtr</u>	<u>3rd Qtr</u>	<u>4th Qtr</u>	<u>Average</u>
Control		25	17	21	24	21.75
Control		25	17	20	23	21.25
City Office	1	25	19	24	26	23.50
CR75 Acacia	2	*	18	24	26	22.66
CR75 120 St Bridge	3	24	18	*	26	22.66
XCEL Training Center	4	28	19	23	26	24.00
East Pole 433	5	23	18	*	26	22.33
North Pole 485	6	23	22	24	26	23.75
Olson Farm	7	24	19	23	*	21.66
CR 50/CR11	8	23	18	22	30	23.25
CR 75 - Monticello	10	24	19	24	29	24.00
River Street	9	26	20	23	27	24.00

Prairie Island

<u>Location</u>		<u>1st Qtr</u>	<u>2nd Qtr</u>	<u>3rd Qtr</u>	<u>4th Qtr</u>	<u>Average</u>
Control		19	17	21	22	19.75
Control		19	17	20	22	19.50
Sturgeon Lake Rd	1	20	17	20	24	20.25
Lock & Dam 3	2	19	17	20	27	20.75
Suter Farm	3	18	19	21	27	21.25
ISFSI Wakonade	4	20	33	33	25	27.75
Tower	5	20	22	20	26	22.00
Gustafson Farm	6	20	19	23	28	22.50
Red Wing	7	19	21	20	26	21.50
Training Center	8	28	29	30	39	31.50

* TLD inadvertently removed during electrical and road construction around the Monticello Nuclear Generating Power Plant.

Table 12

Minnesota Department of Health
2011 Well Water Analysis Results—City of Redwing
Results and Detection Limits in pCi/L

Date Collected	Gross Alpha	Gross Beta	Tritium	K-40
2/8	< 3.0	4.8	< 200	54.32
5/17	< 3.0	< 4.0	< 202	71.43
8/9	< 3.0	4.7	< 202	49.48
11/1	< 3.0	5.3	< 200	71.20

Table 13

Minnesota Department of Health
2011 Community Water Analysis Results—City of Redwing
Results and Detection Limits in pCi/L

Date Collected	Gross Alpha	Gross Beta	Tritium	K-40
2/8	5.6	5.7	< 200	76.85
3/29	< 3.0	7.8	< 200	70.30
7/12	4.5	6.8	< 202	44.29
10/4	3.8	5.6	< 202	66.88

Table 14

Minnesota Department of Health
 2011 Precipitation Water Results for St. Paul
 Results and Detection Limits in pCi/L

Date Collected	Gross Alpha	Gross Beta	Tritium	Sr-89 ¹	Sr-90 ¹	K-40
4/26	< 3.0	< 4.0	< 200	< 2.0	< 2.0	< 103
5/3	< 3.0	< 4.0	< 200	< 2.0	< 2.0	< 79.3
5/10	< 3.0	4.4	< 200	< 2.0	< 2.0	73.9
6/21	< 3.0	< 4.0	< 345	< 2.0	< 2.0	46
6/29	< 3.0	< 4.0	< 345	< 2.0	< 2.0	68.2
7/12	< 3.0	< 4.0	< 345	< 2.0	< 2.0	49.5
7/19	< 3.0	< 4.0	< 345	< 2.0	< 2.0	77.5
7/26	< 3.0	< 4.0	< 345	< 2.0	< 2.0	52.9
8/2	< 3.0	< 4.0	< 200	< 2.0	< 2.0	69.3
8/24	< 3.0	< 4.0	< 200	< 2.0	< 2.0	72
10/18	< 3.0	< 4.0	< 200	< 2.0	< 2.0	101

¹Sr-89 and Sr-90 were below the required detection limit of 2 pCi/L (§ 141.25).