



Minnesota Department of Health
Environmental Monitoring Report
2013 Data

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Minnesota Department of Health Environmental Monitoring Tables

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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. A baseline for certain radionuclides has been established and current environmental monitoring continues to validate the natural background levels in Minnesota. Throughout the years the Minnesota Department of Health environmental monitoring program has transformed. Careful analysis of potential risks and data collected 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 2013, 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 2013 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 0.0267 pCi/m³ at all locations. Gross beta levels were below 0.0634 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 2013 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 2013 were below 3.1 pCi/L at both locations. Tritium values were below 722 pCi/L at both locations.

The SDWA 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 2013 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 2013 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.

Over the past 4 years MDH identified intermittent slightly elevated readings for the Prairie Island TLDs located at ISFSI Wakonade and Training Center. In order to determine the cause for the higher TLD readings MDH performed several investigations; including discussions with PINGPP personnel, comparison to PINGPP TLDs in close proximity, and surveys around the TLDs. It was discovered through discussion with dosimetry personnel at Mirion Technologies, the TLD company, that the type of TLD used and the process for analysis was the reason for the elevated readings.

According to Mirion Technologies the Type 17 Environmental (Lithium Fluoride (LiF) based) dosimeter is meant for ambient gamma radiation measurements. The lithium contained in this TLD although it is naturally occurring contains a percentage of both Li-7 and Li-6 isotopes. Because Li-6 responds to neutrons and the neutron component was not taken into account in the analysis, the reported ambient gamma readings appear elevated.

Mirion Technologies has recalculated the values for the TLDs at the ISFSI Wakonade and Training Center for 2012. The data in Table 11 reflects the recalculated numbers to remove the response to Li-6. In October of 2013 MDH replaced the Type 17 Environmental dosimeter with the Type 36 badge. With the Type 36 dosimeter Mirion Technologies has algorithms to calculate the neutron and gamma exposure contributions accurately.

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 2013 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 show in [Table 12](#) Well Water Analysis Results. Community Water sample results are shown in [Table13](#) 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 2013 were below at or below 3.0 pCi/L. and Tritium values were below 215 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 2013 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.

The EPA RADNET changed their procedures in October of 2013 to collect samples after every precipitation event. Because of this change MDH appears to be collecting more frequently to send to EPA RADNET. In doing so, often the sample is not large enough to collect for both EPA and MDH unless a measureable precipitation event occurs. Therefore, the number of precipitation samples collected may be fewer than in previous years. Data from the precipitation collected in St. Paul may also be review at the EPA RADNET website.

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 2013 were below 3.0 pCi/L. and Tritium values were below 324 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 2013 were within the EPA and MDH standards and guidelines:

PROGRAM MODIFICATIONS

Program modifications were made to the precipitation collection process in 2013 in accordance with the changes made by EPA as part of the national RADNET monitoring program.

Table 1

Minnesota Department of Health
Sample Summary for 2013

| Sample Type | Collection and Frequency | Number of Samples Collected | Analyses Performed |
|-----------------|--------------------------|-----------------------------|--------------------|
| Air | C, W & BW | 105 | 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 | 5 | GA, GB, GI, Sr, H |
| Milk | G, M | 24 | GI, Sr, I |
| TLD | C, Q | 72 | Direct exposure |
| Precipitation | C | 19 | GA, GB, GI, Sr, H |

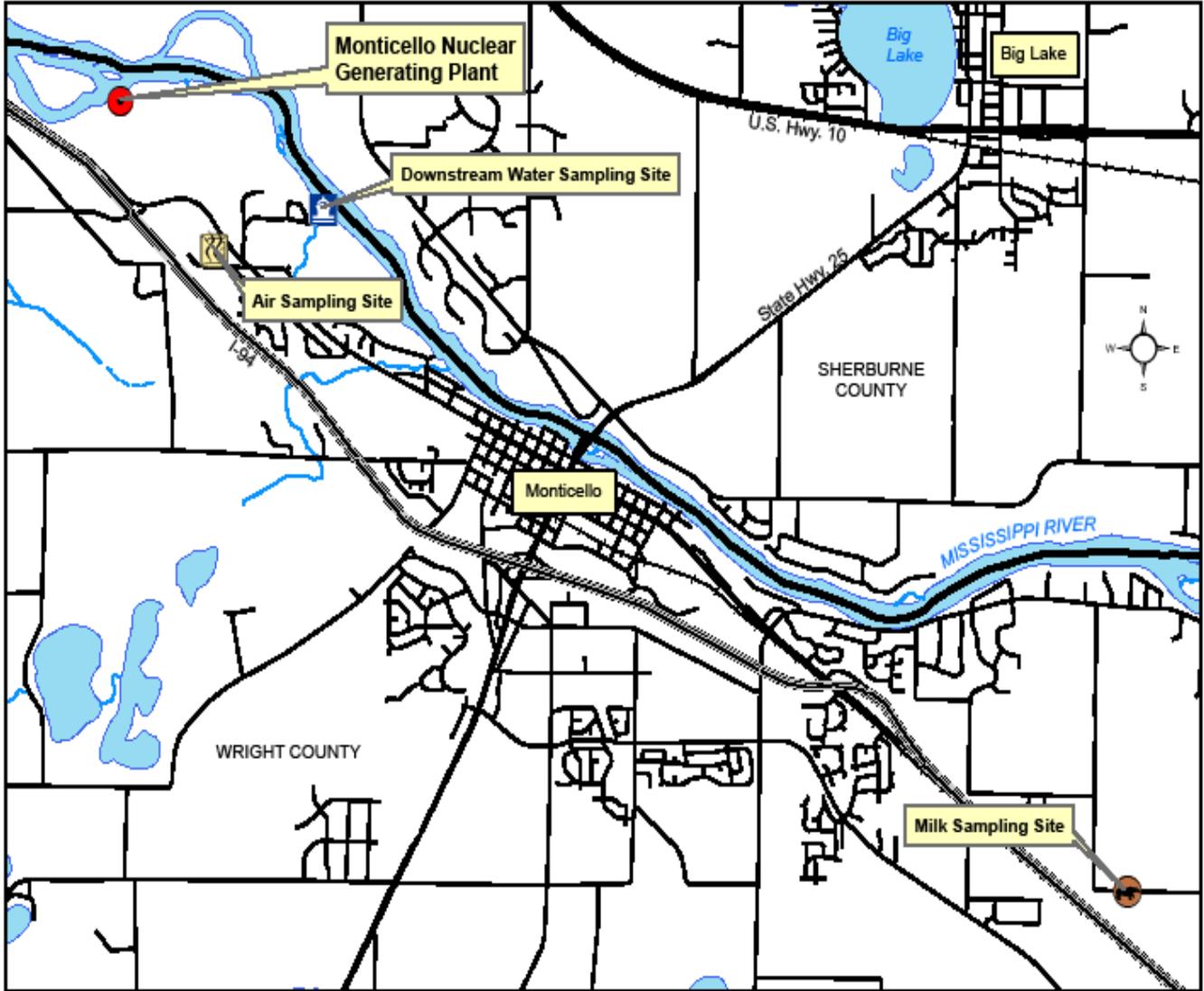
Collection type: C = continuous; G = grab

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

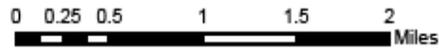
Analyses performed: GA = gross alpha; GB = gross beta; GI = gamma isotopic;
Sr = strontium; I = iodine; H = tritium

Minnesota Department of Health Monticello Environmental Sampling Sites

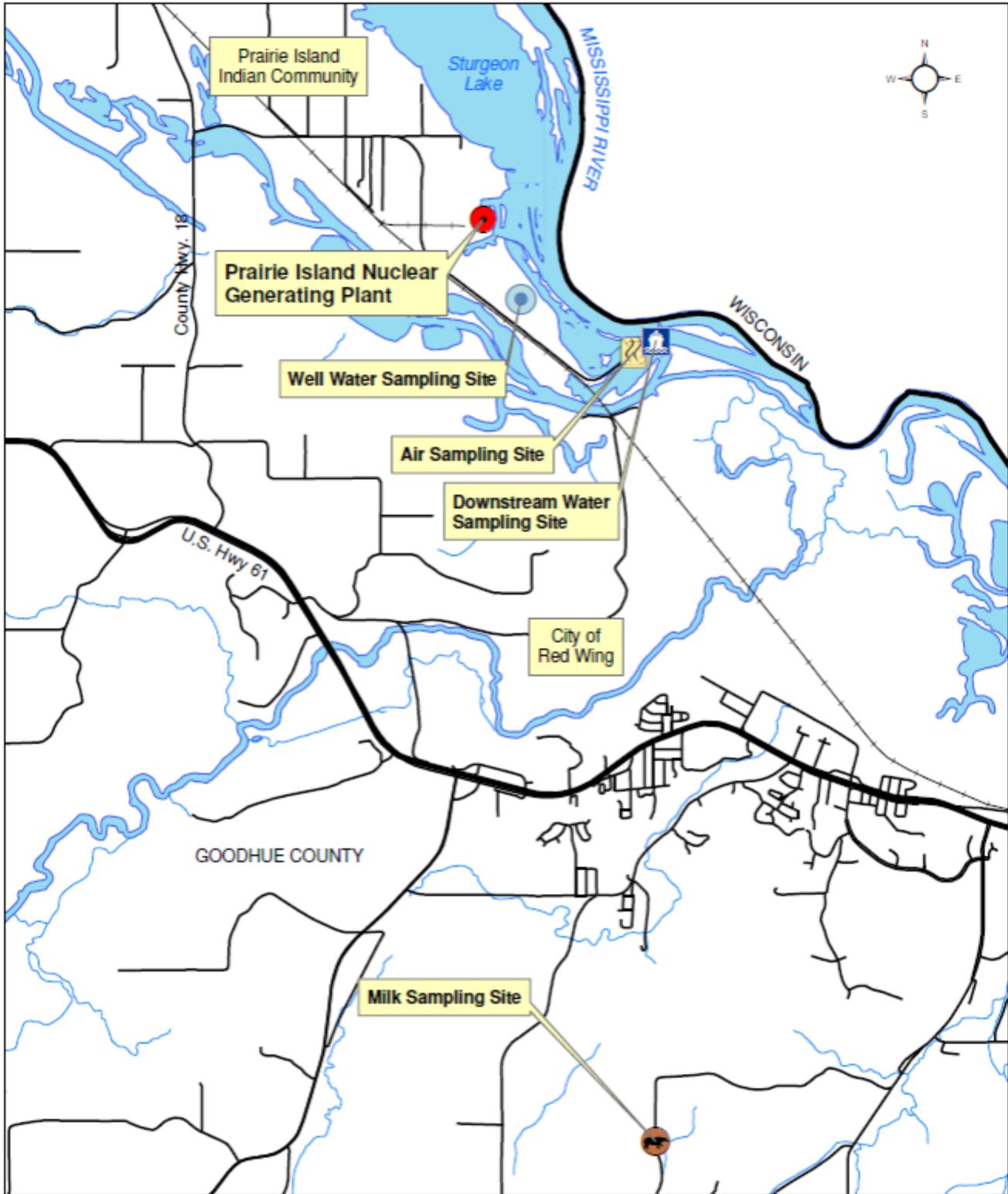
MONTICELLO NUCLEAR GENERATING PLANT AND SAMPLING SITE LOCATIONS



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

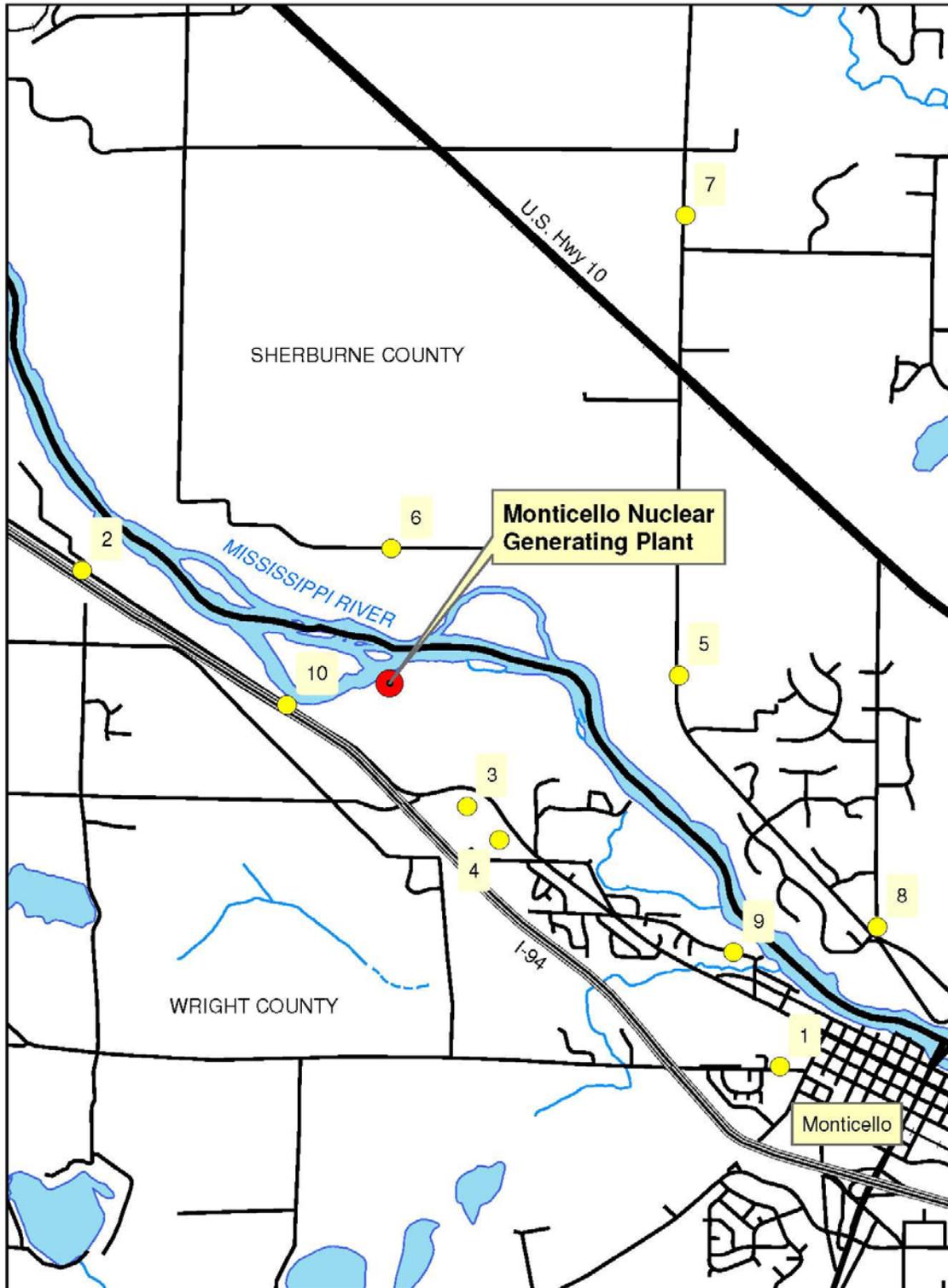


Table 3B

Minnesota Department of Health Prairie Island Area TLD Locations

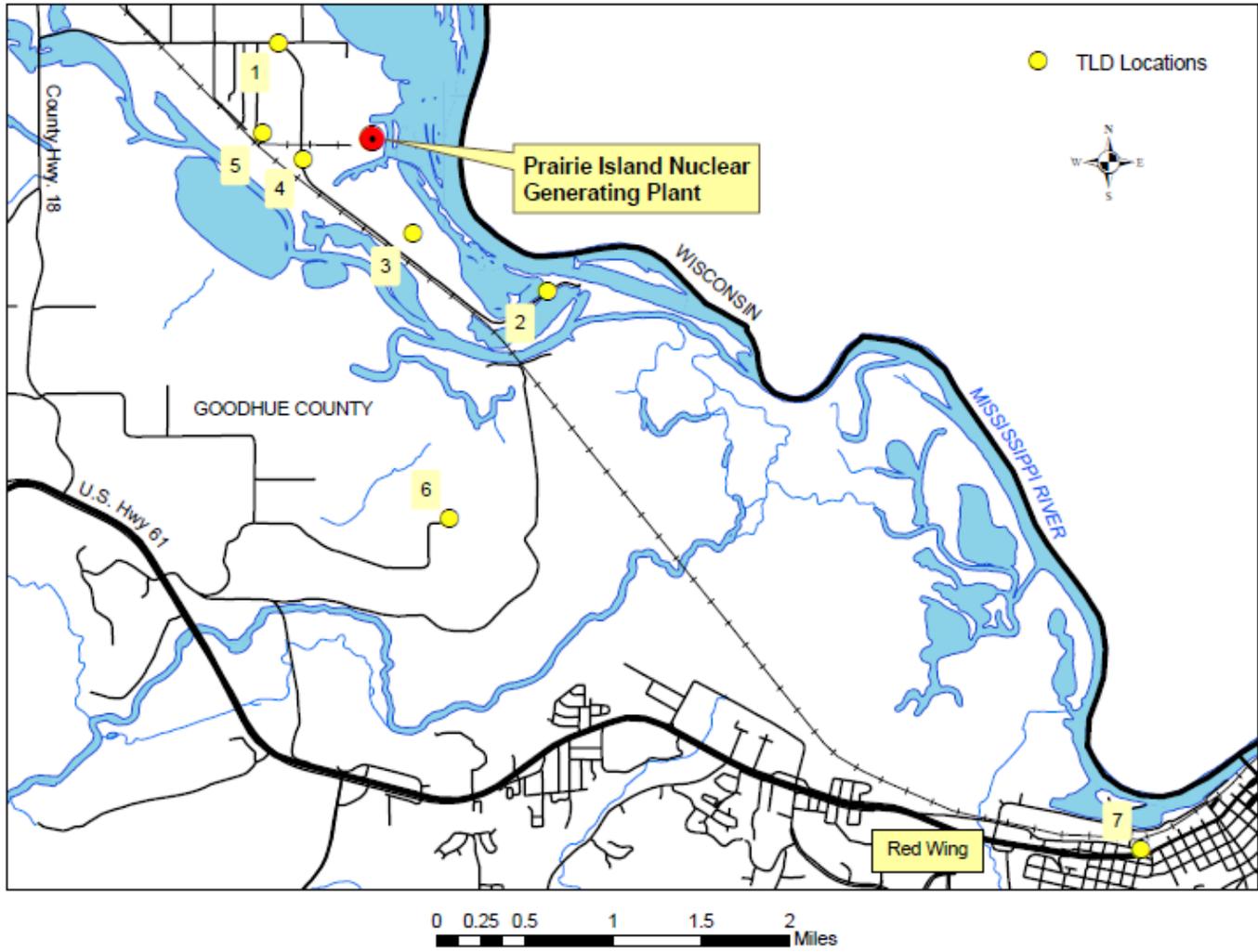


Table 4

Minnesota Department of Health
2013 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 |
|-----------------------|--------------------|-------------------|-------------|-------------|
| 01/02/13 | 0.01100 | 0.0405 | <0.0148 | <0.0440 |
| 01/16/13 | 0.00352 | 0.0230 | 0.0355 | <0.0464 |
| 01/25/13 | 0.00568 | 0.0208 | 0.0478 | <0.0804 |
| 02/12/13 | 0.00780 | 0.0373 | 0.0343 | <0.0326 |
| 02/25/13 | 0.00496 | 0.0281 | 0.0433 | <0.0485 |
| 03/12/13 | 0.00236 | 0.0140 | 0.0779 | <0.0448 |
| 03/27/13 | 0.00249 | 0.0201 | 0.0575 | <0.0440 |
| 04/09/13 | 0.00109 | 0.0174 | 0.1390 | <0.0581 |
| 04/23/13 | 0.00051 | 0.0070 | 0.0750 | <0.0515 |
| 05/08/13 | 0.00178 | 0.0132 | 0.0795 | <0.0483 |
| 05/21/13 | 0.00112 | 0.0137 | 0.1280 | <0.0565 |
| 06/04/13 | 0.00111 | 0.0088 | 0.0964 | <0.0494 |
| 06/18/13* | * | * | * | * |
| 07/02/13 | 0.00259 | 0.0094 | 0.0565 | <0.0492 |
| 07/16/13 | 0.00436 | 0.0178 | 0.0797 | <0.0468 |
| 07/29/13 | 0.00242 | 0.0104 | 0.0533 | <0.0445 |
| 08/13/13 | 0.00305 | 0.0119 | 0.0357 | <0.0426 |
| 08/26/13 | 0.00756 | 0.0243 | 0.0666 | <0.0536 |
| 09/10/13 | 0.00955 | 0.0213 | <0.0151 | <0.0466 |
| 09/24/13 | 0.01300 | 0.0268 | <0.0266 | <0.0998 |
| 10/09/13 | 0.00918 | 0.0212 | <0.0174 | <0.0535 |
| 10/22/13 | 0.00666 | 0.0134 | <0.0206 | <0.0721 |
| 11/06/13 | 0.00563 | 0.0145 | <0.0157 | <0.0550 |
| 11/19/13 | 0.00807 | 0.0222 | <0.0133 | <0.0421 |
| 12/03/13 | 0.02670 | 0.0549 | <0.0163 | <0.0522 |
| 12/17/13 | 0.01030 | 0.0232 | <0.0202 | <0.0614 |
| 12/31/13 | 0.01000 | 0.0238 | <0.0211 | <0.0616 |

* Sample damage – no results reported.

Table 5

Minnesota Department of Health
2013 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 |
|-----------------------|--------------------|-------------------|-------------|-------------|
| 01/08/13 | 0.00861 | 0.0358 | 0.0322 | <0.0523 |
| 01/22/13 | 0.00615 | 0.0262 | 0.0333 | <0.0496 |
| 02/05/13 | 0.00745 | 0.0353 | 0.0266 | <0.0441 |
| 02/19/13 | 0.00665 | 0.0370 | 0.0494 | <0.0555 |
| 03/06/13 | 0.00151 | 0.0181 | 0.0614 | <0.0450 |
| 03/19/13 | 0.00217 | 0.0182 | 0.0800 | <0.0475 |
| 04/03/13 | 0.00119 | 0.0137 | 0.0601 | <0.0369 |
| 04/16/13 | 0.00091 | 0.0110 | 0.1020 | <0.0556 |
| 04/30/13 | 0.00145 | 0.0155 | 0.1390 | <0.0601 |
| 05/14/13 | 0.00116 | 0.0106 | 0.0703 | <0.0507 |
| 05/28/13 | 0.00065 | 0.0098 | 0.0939 | <0.0549 |
| 06/12/13 | 0.00870 | 0.0109 | 0.0973 | <0.0447 |
| 06/25/13 | 0.00147 | 0.0097 | 0.0714 | <0.0458 |
| 07/10/13 | 0.00332 | 0.0130 | 0.0630 | <0.0506 |
| 07/23/13 | 0.00323 | 0.0132 | 0.0647 | <0.0489 |
| 08/06/13 | 0.00263 | 0.0100 | 0.0351 | <0.0472 |
| 08/20/13 | 0.00475 | 0.0139 | 0.0462 | <0.0385 |
| 09/03/13 | 0.00442 | 0.0155 | 0.0400 | <0.0385 |
| 09/17/13 | 0.00789 | 0.0175 | <0.0171 | <0.0470 |
| 10/02/13 | 0.00536 | 0.0122 | 0.0149 | <0.0470 |
| 10/15/13 | 0.00575 | 0.0142 | <0.0161 | <0.0565 |
| 10/29/13 | 0.00411 | 0.0095 | <0.0145 | <0.0581 |
| 11/13/13 | 0.00729 | 0.0177 | <0.0152 | <0.0506 |
| 11/26/13 | 0.01020 | 0.0235 | <0.0158 | <0.0548 |
| 12/10/13 | 0.01640 | 0.0404 | <0.0158 | <0.0460 |
| 12/24/13 | 0.01410 | 0.0322 | 0.0175 | <0.0487 |

Table 6

Minnesota Department of Health
2013 Air Sampling Results for St. Paul
Results and Detection Limits in pCi/m³

| Date Collected | Gross Alpha | Gross Beta | Be-7 | K-40 |
|-----------------------|--------------------|-------------------|-------------|-------------|
| 01/02/13 | 0.01390 | 0.0540 | 0.0353 | <0.0733 |
| 01/08/13 | 0.01590 | 0.0634 | 0.0410 | <0.0717 |
| 01/16/13 | 0.00095 | 0.0182 | 0.0344 | <0.0534 |
| 01/22/13 | 0.00750 | 0.0397 | 0.0564 | <0.0663 |
| 01/30/13 | 0.00499 | 0.0271 | 0.0391 | <0.0523 |
| 02/05/13 | 0.01430 | 0.0595 | 0.0490 | <0.0705 |
| 02/12/13 | 0.00243 | 0.0189 | 0.0299 | <0.0613 |
| 02/19/13 | 0.00363 | 0.0206 | 0.0711 | <0.0564 |
| 02/25/13 | 0.00151 | 0.0095 | 0.0513 | <0.0714 |
| 03/06/13 | 0.00143 | 0.0203 | 0.1070 | <0.0403 |
| 03/12/13 | 0.00180 | 0.0153 | 0.0997 | <0.0765 |
| 03/19/13 | 0.00534 | 0.0229 | 0.1090 | <0.0650 |
| 03/27/13 | 0.00151 | 0.0170 | 0.0361 | <0.0538 |
| 04/02/13 | 0.00096 | 0.0159 | 0.0997 | <0.0716 |
| 04/09/13 | 0.00086 | 0.0144 | 0.1340 | <0.0607 |
| 04/16/13 | 0.00078 | 0.0083 | 0.0949 | <0.0693 |
| 04/23/13 | 0.00063 | 0.0098 | 0.0976 | <0.0587 |
| 04/30/13 | 0.00181 | 0.0204 | 0.1920 | <0.0704 |
| 05/08/13 | 0.00076 | 0.0082 | 0.0487 | <0.0652 |
| 05/14/13 | 0.00122 | 0.0148 | 0.1530 | <0.0938 |
| 05/21/13 | 0.00085 | 0.0120 | 0.1210 | <0.0735 |
| 05/28/13 | 0.00049 | 0.0087 | 0.1180 | <0.0696 |
| 06/04/13 | 0.00103 | 0.0083 | 0.1070 | <0.0611 |
| 06/12/13 | 0.00091 | 0.0124 | 0.1030 | <0.0612 |
| 06/18/13 | 0.00142 | 0.0107 | 0.1120 | <0.0653 |
| 06/25/13 | 0.00137 | 0.0108 | 0.1020 | <0.0633 |
| 07/02/13 | 0.00235 | 0.0115 | 0.1020 | <0.0598 |
| 07/10/13 | 0.00310 | 0.0157 | 0.0841 | <0.0495 |
| 07/16/13 | 0.00486 | 0.0164 | 0.0978 | <0.0779 |
| 07/23/13 | 0.00062 | 0.0141 | 0.1200 | <0.0592 |
| 07/29/13 | 0.00130 | 0.0055 | 0.0378 | <0.0686 |
| 08/06/13 | 0.00294 | 0.0134 | 0.0644 | <0.0518 |
| 08/13/13 | 0.00307 | 0.0104 | 0.0494 | <0.0578 |
| 08/20/13 | 0.00635 | 0.0206 | 0.0848 | <0.0580 |
| 08/26/13 | 0.00162 | 0.0273 | 0.1640 | <0.0618 |
| 09/03/13 | 0.00569 | 0.0137 | <0.0161 | <0.0488 |
| 09/10/13 | 0.00978 | 0.0264 | <0.0222 | <0.0635 |
| 09/17/13 | 0.00503 | 0.0108 | <0.0195 | <0.0636 |
| 09/24/13 | 0.00711 | 0.0156 | <0.0175 | <0.0646 |
| 10/02/13 | 0.00821 | 0.0206 | 0.0195 | <0.0574 |
| 10/09/13 | 0.00646 | 0.0160 | <0.0223 | <0.0685 |
| 10/15/13 | 0.00627 | 0.0135 | <0.0222 | <0.0765 |
| 10/22/13 | 0.00566 | 0.0113 | <0.0205 | <0.0685 |
| 10/29/13 | 0.00416 | 0.0095 | <0.0150 | <0.0644 |
| 11/06/13 | 0.00752 | 0.0192 | <0.0188 | <0.0664 |
| 11/13/13 | 0.01290 | 0.0316 | <0.0353 | <0.1170 |
| 11/19/13 | 0.02070 | 0.0464 | 0.0445 | <0.0127 |
| 11/26/13 | 0.01380 | 0.0343 | <0.0361 | <0.1150 |
| 12/03/13 | 0.01700 | 0.0390 | <0.0388 | <0.0110 |
| 12/10/13 | 0.02270 | 0.0523 | <0.0353 | <0.1200 |
| 12/17/13 | 0.01870 | 0.0479 | <0.0357 | <0.0100 |
| 12/24/13 | 0.02310 | 0.0492 | <0.0436 | <0.1370 |
| 12/31/13 | 0.01010 | 0.0284 | <0.0424 | <0.1260 |

Table 7

Minnesota Department of Health
2013 Surface Water Results for Monticello Nuclear Generating Plant
Results and Detection Limits in pCi/L

| Date Collected | Gross Alpha | Gross Beta | Tritium | Sr-89 | Sr-90 | K-40 |
|-----------------------|--------------------|-------------------|----------------|--------------|--------------|-------------|
| 01/02/13 | <3.0 | <4.0 | <200 | <2.0 | <2.0 | <53.5 |
| 04/09/13 | <3.0 | <4.0 | <200 | <2.0 | <2.0 | <51.0 |
| 07/02/13 | <3.0 | <4.0 | <297 | <2.0 | <2.0 | <47.9 |
| 10/09/13 | <3.0 | <4.0 | <200 | <2.0 | <2.0 | <72.0 |

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

Table 8

Minnesota Department of Health
2013 Surface Water Results for Prairie Island Nuclear Generating Plant
Results and Detection Limits in pCi/L

| Date Collected | Gross Alpha | Gross Beta | Tritium | Sr-89 | Sr-90 | K-40 |
|-----------------------|--------------------|-------------------|----------------|--------------|--------------|-------------|
| 01/08/13 | <3.0 | <4.0 | <200 | <2.0 | <2.0 | <44.0 |
| 04/03/13 | <3.0 | 4.4 | <200 | <2.0 | <2.0 | <59.5 |
| 07/10/13 | 3.1 | 5.9 | <200 | <2.0 | <2.0 | <56.3 |
| 10/02/13 | <3.0 | 5.0 | 722 | <2.0 | <2.0 | <57.5 |

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

Table 9

Minnesota Department of Health
2013 Milk Analysis Results for Monticello Nuclear Generating Plant
Results and Detection Limits in pCi/L

| Date Collected | Sr-89 | Sr-90 | K-40 |
|-----------------------|--------------|--------------|-------------|
| 01/25/13 | <2.0 | <2.0 | 1350 |
| 02/25/13 | <2.0 | <2.0 | 1320 |
| 03/27/13 | <2.0 | <2.0 | 1300 |
| 04/23/13 | <2.0 | <2.0 | 1350 |
| 05/21/13 | <2.0 | <2.0 | 1360 |
| 06/18/13 | <2.0 | <2.0 | 1320 |
| 07/29/13 | <2.0 | <2.0 | 1280 |
| 08/26/13 | <2.0 | <2.0 | 1360 |
| 09/24/13 | <2.0 | <2.0 | 1330 |
| 10/22/13 | <2.0 | <2.0 | 1300 |
| 11/19/13 | <2.0 | <2.0 | 1330 |
| 12/17/13 | <2.0 | <2.0 | 1360 |

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

Table 10

Minnesota Department of Health
2013 Milk Analysis Results for Prairie Island Nuclear Generating Plant
Results and Detection Limits in pCi/L

| Date Collected | Sr-89 | Sr-90 | K-40 |
|-----------------------|--------------|--------------|-------------|
| 01/22/13 | <2.0 | <2.0 | 1360 |
| 02/19/13 | <2.0 | <2.0 | 1380 |
| 03/19/13 | <2.0 | <2.0 | 1350 |
| 04/30/13 | <2.0 | <2.0 | 1350 |
| 05/28/13 | <2.0 | <2.0 | 1280 |
| 06/25/13 | <2.0 | <2.0 | 1320 |
| 07/23/13 | <2.0 | <2.0 | 1320 |
| 08/20/13 | <2.0 | <2.0 | 1340 |
| 09/17/13 | <2.0 | <2.0 | 1330 |
| 10/29/13 | <2.0 | <2.0 | 1320 |
| 11/26/13 | <2.0 | <2.0 | 1320 |
| 12/24/13 | <2.0 | <2.0 | 1340 |

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

Table 11

**2013 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 | | 21 | 18 | 21 | * | |
| Control | | 22 | 17 | 19 | * | |
| City Office | 1 | 24 | 20 | 22 | 37 | |
| CR75 Acacia | 2 | 23 | 21 | 25 | 25 | |
| CR75 120 St Bridge | 3 | 24 | 20 | 24 | 26 | |
| XCEL Training Center | 4 | 23 | 20 | 22 | 29 | |
| East Pole 433 | 5 | 23 | 20 | 23 | 37 | |
| North Pole 485 | 6 | 22 | 21 | 24 | 29 | |
| Olson Farm | 7 | 23 | 20 | 21 | 25 | |
| CR 50/CR11 | 8 | 21 | 19 | 20 | 34 | |
| CR 75 - Monticello | 10 | 23 | 22 | 25 | 29 | |
| River Street | 9 | 22 | 20 | 22 | 37 | |

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 | 24 | 18 | * | |
| Control | | 19 | 20 | 21 | * | |
| Sturgeon Lake Rd | 1 | 19 | 19 | 19 | 23 | |
| Lock & Dam 3 | 2 | 21 | 21 | 17 | 21 | |
| Suter Farm | 3 | 20 | 22 | 21 | 25 | |
| ISFSI Wakonade | 4 | *22 | *20 | 59 | * | |
| Tower | 5 | 22 | 22 | 20 | 29 | |
| Gustafson Farm | 6 | 24 | 23 | 22 | 37 | |
| Red Wing | 7 | 23 | 21 | 22 | 27 | |
| Training Center | 8 | *20 | 25 | 33 | * | |

* TLDs recalculated by Mirion Technologies. For details, see explanation on page 5 under **AMBIENT GAMMA RADIATION MONITORING**.

Table 12

Minnesota Department of Health
 2013 Well Water Analysis Results—City of Redwing
 Results and Detection Limits in pCi/L

| Date Collected | Gross Alpha | Gross Beta | Tritium | K-40 |
|-----------------------|--------------------|-------------------|----------------|-------------|
| 02/05/13 | <3.0 | <4.0 | <215 | <58.70 |
| 05/14/13 | <3.0 | <4.0 | <211 | <59.97 |
| 08/06/13 | <3.0 | <4.0 | <211 | <56.49 |
| 11/13/13 | <3.0 | 9.2 | <211 | <69.34 |

Table 13

Minnesota Department of Health
2013 Community Water Analysis Results—City of Redwing
Results and Detection Limits in pCi/L

| Date Collected | Gross Alpha | Gross Beta | Tritium | K-40 |
|-----------------------|--------------------|-------------------|----------------|-------------|
| 01/08/13 | <3.0 | 4.8 | <215 | <48.79 |
| 04/03/13 | <3.0 | <4.0 | <215 | <59.24 |
| 07/10/13 | <3.0 | 4.8 | <211 | <57.09 |
| 10/02/13 | <3.0 | <4.0 | <211 | <54.02 |
| 11/13/13 | <3.0 | 9.2 | <211 | <69.34 |

Table 14

Minnesota Department of Health
2013 Precipitation Water Results for St. Paul
Results and Detection Limits in pCi/L

| Date Collected | Gross Alpha | Gross Beta | Be-7 | K-40 | Sr-89 | Sr-90 | Tritium |
|----------------|-------------|------------|-------|-------|-------|-------|---------|
| 03/12/13 | <3.0 | <4.0 | <19.5 | <45.9 | <2.0 | <2.0 | <200 |
| 04/09/13 | <3.0 | 4.2 | <25.6 | <50.4 | <2.0 | <2.0 | <200 |
| 04/16/13 | <3.0 | 4.8 | <26.2 | <65.2 | <2.0 | <2.0 | <200 |
| 04/23/13 | <3.0 | 4.0 | <26.9 | <68.6 | <2.0 | <2.0 | <200 |
| 05/08/13 | <3.0 | <4.0 | <22.1 | <51.8 | <2.0 | <2.0 | <200 |
| 05/21/13 | <3.0 | <4.0 | <21.3 | <65.7 | <2.0 | <2.0 | <200 |
| 06/04/13 | <3.0 | <4.0 | <18.1 | <47.8 | <2.0 | <2.0 | <297 |
| 06/12/13 | <3.0 | <4.0 | <21.1 | <50.0 | <2.0 | <2.0 | <297 |
| 06/18/13 | <3.0 | <4.0 | <20.4 | <53.3 | <2.0 | <2.0 | <297 |
| 06/25/13 | <3.0 | <4.0 | <24.1 | <51.2 | <2.0 | <2.0 | <297 |
| 07/02/13 | <3.0 | <4.0 | <19.6 | <48.7 | <2.0 | <2.0 | <297 |
| 07/10/13 | <3.0 | <4.0 | <26.2 | <51.1 | <2.0 | <2.0 | <297 |
| 07/16/13 | <3.0 | <4.0 | <18.3 | <39.4 | <2.0 | <2.0 | <200 |
| 09/03/13 | <3.0 | <4.0 | <24.2 | <56.0 | <2.0 | <2.0 | <200 |
| 09/17/13 | <3.0 | <4.0 | <25.9 | <68.7 | <2.0 | <2.0 | <200 |
| 09/24/13 | <3.0 | <4.0 | <25.8 | <77.9 | <2.0 | <2.0 | <200 |
| 10/09/13 | <3.0 | <4.0 | <17.8 | <54.4 | <2.0 | <2.0 | <200 |
| 10/15/13 | <3.0 | <4.0 | <19.1 | <59.5 | <2.0 | <2.0 | <324 |
| 10/22/13 | <3.0 | <4.0 | <21.4 | <52.3 | <2.0 | <2.0 | <324 |

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