Xcel Energy®

Monticello Nuclear Generating Plant
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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Monticello Nuclear Generating Plant
Docket 50-263
Renewed Facility Operating License No. DPR-22

2015 Annual Radiological Environmental Operating Report

Pursuant to 10 CFR 50, Appendix I, Section IV.B.2, IV.B.3, IV.C and, in accordance with Monticello Nuclear Generating Plant (MNGP) Technical Specifications 5.6.1, the Northern States Power Company, a Minnesota corporation (NSPM), d/b/a Xcel Energy, is submitting the Annual Radiological Environmental Operating Report, under MNGP's "Radiological Environmental Monitoring Program," for year 2015.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

Peter A. Gardner
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures (1)

cc: Administrator, Region III, USNRC
Project Manager, Monticello,
Resident Inspector, Monticello
Minnesota Department of Commerce

ENCLOSURE 1

RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
JANUARY 1 – DECEMBER 31, 2015

100 Pages to Follow

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XCEL ENERGY CORPORATION

MONTICELLO NUCLEAR GENERATING PLANT
DOCKET NO. 50-263 LICENSE NO. DPR-22

ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiological Environmental Monitoring Program

January 1 to December 31, 2015

Prepared under Contract by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8010

Approved: _____

Bronia Grob, M.S.
Laboratory Manager

PREFACE

The staff of Environmental, Inc., Midwest Laboratory was responsible for the acquisition of data presented in this report. Samples were collected by personnel of the Monticello Nuclear Generating Plant, operated by Northern States Power Co., Minnesota for XCEL Energy Corporation. This report was prepared by Environmental, Inc., Midwest Laboratory.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program (REMP) conducted by Environmental, Inc., Midwest Laboratory for the Monticello Nuclear Generating Plant, Monticello, Minnesota, during the period January - December, 2015. This Program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the Plant on its surroundings.

Tabulations of the individual analyses made during the year are included in Part II of this report.

The Monticello Nuclear Generating Plant is a boiling water reactor with a nominal generating capacity of 681 MWe. It is located on the Mississippi River in Wright County, Minnesota, owned by Xcel Energy Corporation and operated by Northern States Power Co. Minnesota. Initial criticality was achieved on December 10, 1970. Full power was achieved March 5, 1971 and commercial operation began on June 30, 1971.

2.0 SUMMARY

The Radiological Environmental Monitoring Program (REMP) is described; this program is required by the U.S. Nuclear Regulatory Commission (NRC) as well as Technical Specifications and the Offsite Dose Calculation Manual (ODCM) for the Monticello Nuclear Generating Plant. Results for the year 2015 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Monticello Nuclear Generating Plant.

3.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.2 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program (REMP) at the Monticello Nuclear Generating Plant is to assess the impact of the Plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLD's).

Sources of environmental radiation include the following:

(1) Natural background radiation arising from cosmic rays and primordial radionuclides;
(2) Fallout from atmospheric nuclear detonations;
(3) Releases from nuclear power plants;
(4) Industrial and medical radioactive waste; and
(5) Fallout from nuclear accidents.

In interpreting the data, effects due to the Plant must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the Monticello Plant which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A plant effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in environmental samples collected from the Plant site. The Plant's monitoring program includes analyses for tritium and iodine-131. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, cerium-144, beryllium-7, and potassium-40. The first three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products 10 days after reactor shutdown. On the other hand, 10 days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud, 1963). Beryllium-7 is of cosmogenic origin and potassium-40 is a naturally-occurring isotope. They were chosen as calibration monitors and should not be considered as radiological impact indicators. The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the final group, manganese-54, iron-59, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of a nuclear power plant's effluents, but are not produced in significant quantities by nuclear detonations.

Other means of distinguishing sources of environmental radiation are employed in interpreting the data. Current radiation levels are compared with previous levels, including those measured before the plant became operational. Results of the Plant's Monitoring Program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.3 Program Description

The sampling and analysis schedule for the Radiological Environmental Monitoring Program (REMP) at the Monticello Plant is summarized in Table 5.1 and briefly reviewed below. Table 5.2 defines the sampling location codes used in Table 5.1 and specifies for each location its type (indicator or control) and its distance, direction, and sector relative to the plant site. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Monticello Generating Plant REMP Surveillances, Current Revision). Maps of sampling locations are included in Appendix D.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at five locations. Also, airborne iodine is collected by continuous pumping through charcoal filters at all of these locations. Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are determined by gamma spectroscopy. One of the five locations is a control (M-1), and four are indicators (M-2, M-3, M-4, M-5). One of the indicators is located in the geographical sector expected to be most susceptible to any atmospheric emissions from the Plant (highest D/Q sector).

Ambient gamma radiation is monitored at forty locations, using $CaSO_4$:Dy dosimeters with four sensitive areas at each location: fourteen in an inner ring in the general area of the site boundary, sixteen in the outer ring within 4-5 mile radius, six at special interest locations and four control locations, outside a 10 mile radius from the plant. They are replaced and measured quarterly.

As substitute for dairy sampling, vegetation is collected from locations M-41, M-42 and M-43 (C). The samples are analyzed for iodine-131 and other gamma emitting isotopes.

Corn and potatoes are collected annually if fields are irrigated by water in which liquid radioactive effluent has been discharged. Analysis is done for gamma-emitting isotopes.

Well water is monitored by quarterly collections from three off-site locations (one control and two indicators) and one on-site Plant well. To detect possible groundwater contamination due to plant operations, samples from nineteen on-site monitoring wells are collected and analyzed for tritium and gamma emitting isotopes. The Ground Water Monitoring Program is further described in Appendix E.

Quarterly collections of storm water runoff were added to monitor another possible pathway to the groundwater aquifer. The samples are also analyzed for tritium and gamma emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant and one downstream. Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

Drinking water is collected weekly from the City of Minneapolis water supply, which is taken from the Mississippi River downstream of the Plant. Monthly composites are analyzed for gross beta, iodine-131, and gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

The aquatic environment is also monitored by semi-annual upstream and downstream collections of fish, invertebrates, and shoreline sediments. Shoreline sediment is also collected from one downstream recreational location. All samples are analyzed for gamma-emitting isotopes.

3.4 Program Execution

The Program was executed as described in the preceding section with the following exceptions:

(1) Air Particulates / Air Iodine:

M-05, No air particulate / air iodine sample was available for the week ending January 28, 2015, there was a power loss at the sample station.

M-02, No air particulate / air iodine sample was available for the week ending February 4, 2015, due to a malfunctioning switch on the air sampler. The air sampler was replaced.

M-02, No air particulate / air iodine sample was available for the week ending May 6, 2015, due to a malfunctioning switch on the air sampler. The air sampler was replaced.

M-04, Air sampler was found with GFCI tripped for the week ending June 10, 2015 and the GFCI was reset; the sample duration was determined to be approximately a full week and the analysis result is included in the Complete Data Analysis Tables for this report.

M-04, No air particulate / air iodine sample was available for the week ending June 24, 2015. The GFCI was tripped. The GFCI was reset.

(2) Surface Water:

Surface water was not collected at location M-08 for the months of January or February, 2015, or for the weeks of March 4, March 11, and December 30, 2015 due to unsafe ice conditions.

(3) TLD's:

One TLD samples was found missing for the second quarter at Outer Ring location M-06B.

Deviations from the program are summarized in Table 5.3.

3.5 Program Modifications

No modifications were made to the MNGP Radiological Environmental Monitoring Program in 2015.

3.6 Laboratory Procedures

The iodine-131 analyses in drinking water were made using a sensitive radiochemical procedure which involves separation of the iodine using an ion-exchange method and solvent extraction and subsequent beta counting.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. Levels of iodine-131 in natural vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Tritium concentrations are determined by liquid scintillation.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2012). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in the crosscheck programs are presented in Appendix A.

3.7 Land Use Census

In accordance with the MNGP Chemistry Manual, Procedure I.05.41, "Annual Land Use Census and Critical Receptor Identification", a land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence, and the nearest garden of greater than 500 ft^2 producing fresh leafy vegetables, in each of the 16 meteorological sectors within a 5 mile radius. The census shall also identify the locations of all milk animals, meat animals and all gardens of greater than 500 ft^2 producing broad leaf vegetation in each of the meteorological sectors within a distance of three miles. This census shall be conducted at least once per year between the dates of May 1 and October 31. New locations shall be added to the radiation environmental monitoring program within 30 days and sampling locations having lower calculated doses or a lower dose commitment may be deleted from this monitoring program after October 31 of the year in which the land use census was conducted.

The 2015 land use census was conducted between September 14 and September 24, 2015.

This is the third year using improved GPS software. The GPS software provides more accurate distance and direction plotting for identified locations than previous methodologies.

There were three sectors in which the highest D/Q values for gardens increased by greater than 20%. The change in all three sectors was due to a closer residence planting a garden in 2015 where there was no garden in 2014. There were no sectors where the highest D/Q values for the nearest residence changed by more than 20%. Meat animals were identified during the performance of the 2015 census. There currently are no milking animals within a five mile radius of the plant. Vegetation sampling is currently being performed in lieu of milk sampling.

The Critical Receptor for 2015 remained the same as 2014 (Child, Thyroid located 1.15 mi SSE with exposure to Ground, Plume, Inhalation and Vegetable Pathways). Details of the land use census are contained in the Land Use Census and Critical Receptor Report, Monticello Nuclear Generating Plant, Chemistry and Radiation Protection Department.

4.1 RESULTS AND DISCUSSION

All of the scheduled collections and analyses were made except those listed in Table 5.3.

All results are summarized in Table 5.4 in a format recommended by the Nuclear Regulatory Commission in Regulatory Guide 4.8. For each type of analysis of each sampled medium, this table lists the mean and range for all indicator locations and for all control locations. The locations with the highest mean and range are also shown.

4.2 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported accidents involving significant release to the environment at nuclear reactor facilities in 2015. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2015. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.3 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Monticello Nuclear Generating Plant during the years 1968 to 1970, to determine background levels expected in the environment, and provided, where applicable, as a means for comparison with present day levels. Strict comparisons, however, are difficult to make, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout averaged 20,600 pCi/m^3 in 1969 and 12,000 pCi/m^3 in 1970. These levels are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.1 mRem/4 weeks during preoperational studies (1970). Gross beta in air particulates in 1969 and 1970 averaged 0.20 pCi/m^3. Present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels of 0.03 pCi/m^3

In the terrestrial environment of 1968 to 1970, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137 and Sr-90 were detected. Cs-137 levels averaged 16.7 pCi/L. Soybean crop measurements in 1969 averaged 35.5 pCi/g for gross beta and 0.3 pCi/g for Cs-137. Gross beta measured in soil averaged 51.7 pCi/g . Present day measurements for cesium-137 are below detection levels in milk and agricultural crops.

The aqueous environment was monitored by testing of river water, bottom sediments, fish, aquatic vegetation, and periphyton. Specific location comparison of drinking, river, and well water concentrations for tritium and gross beta are not possible. However, tritium background levels, measured at seven separate locations from 1968 to 1970, averaged 970 pCi/L. Present day environmental samples measure below detection levels. Values for gross beta, measured from 1968 to 1970, averaged 9.8 pCi/L in upstream and downstream Mississippi River water, 4.4 pCi/L for well waters, and 18.6 pCi/L for lake waters. Gamma emitters were below the lower limit of detection (LLD). In shoreline sediments, gross beta background levels in 1970 averaged 49.8 pCi/g for both upstream and downstream samples. Cs-137 activity averaged 0.10 pCi/g for both upstream and downstream samples. Low levels of Cs-137, occasionally observed today can still be attributed to residual activity from atmospheric fallout. Gross beta levels in fish flesh averaged 5.3 pCi/g in 1968 and 1969. Cs-137, measured in 1969 and 1970, averaged 0.044 pCi/g. Gross beta background levels, in 1970, for aquatic vegetation, algae, and periphyton samples measured 86.7 pCi/g, 76.5 pCi/g, and 28.1 pCi/g respectively.

4.4 Program Findings

Results obtained show background levels of radioactivity in environmental samples collected outside of the Site Protected Area in 2015.

Tritium was identified in some groundwater samples collected within the site Protected Area, but not in offsite or domestic well samples.

Ambient Radiation (TLD's)

Ambient radiation was measured in the general area of the site boundary, at an outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at four control locations. The means were similar for both inner and outer rings (14.8 and 14.2 mRem/91 days, respectively). The mean for special interest locations was 14.7 mRem/91 days and the mean for the control locations was 14.3 mRem/91 days. Dose rates measured at the inner and outer ring locations were similar to those observed from 1999 through 2014 and are tabulated below. No plant effect on ambient gamma radiation is indicated (Figure 5-1).

Year	Inner Ring	Outer Ring
	Dose rate (mRem/91 days)	
1999	15.1	14.3
2000	15.1	14.5
2001	14.3	13.7
2002	15.9	14.8
2003	15.6	15.0
2004	16.0	15.4
2005	15.6	15.2
2006	16.5	15.6
2007	16.1	15.1
2008	15.2	14.6
2009	14.9	14.4
2010	14.7	14.3
2011	14.8	14.3
2012	16.2	15.5
2013	14.4	14.0
2014	13.5	12.9
2015	14.8	14.2

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates, Inner vs. Outer Ring locations

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were almost identical at both indicator and control locations (0.030 and 0.028 pCi/m^3,respectively), similar to levels observed from 1999 through 2014. The results are tabulated below.

Year	Indicators	Control
	Concentration (pCi/m^3)	
1999	0.023	0.025
2000	0.027	0.026
2001	0.027	0.026
2002	0.028	0.028
2003	0.027	0.027
2004	0.024	0.024
2005	0.025	0.025
2006	0.024	0.025
2007	0.027	0.028
2008	0.028	0.029
2009	0.029	0.030
2010	0.026	0.026
2011	0.029	0.027
2012	0.032	0.031
2013	0.029	0.032
2014	0.027	0.028
2015	0.030	0.028

Average annual gross beta concentrations in airborne particulates.

Typically, the highest average readings occur during the months of January and December, and the first and fourth quarters, as observed in 1999 through 2015.

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.070 pCi/m^3 for the indicator locations and 0.066 pCi/m^3 for the control locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m^3 in all samples.

River Water and Drinking Water

Tritium activity measured below 500 pCi/L in all samples. Gamma isotopic results were all below detection limits. Gross beta activity in Minneapolis drinking water averaged 2.3 pCi/L and was similar to average levels observed from 1998 through 2012. Gross beta averages are tabulated below. No indication plant operational effects were indicated.

Year	Gross Beta (pCi/L)		Year	Gross Beta (pCi/L)
1999	2.2		2008	2.1
2000	2.5		2009	2.3
2001	2.5		2010	2.9
2002	2.9		2011	2.2
2003	3.0		2012	2.4
2004	2.7		2013	2.6
2005	2.8		2014	2.8
2006	2.1		2015	2.3
2007	2.8			

Average annual concentrations; Gross beta in drinking water.

Well Water

At the four indicator and control locations, tritium was below the detection limit for all samples. Gamma isotopic results were also below detection limits.

The data for 2015 were consistent with previous year's results and no plant operational effects were indicated.

Vegetation in lieu of Milk Sampling

Vegetation samples were collected in July, August and September, 2015. Iodine-131 concentrations measured below 0.043 pCi/g wet weight in all samples. These samples are required when milk samples are not available. With the exceptions of naturally-occurring beryllium-7 and potassium-40, no other gamma-emitting isotopes were detected.

Crops

A vegetation collection was not required for 2015. No crops within five miles of the plant were found using irrigation water from the Mississippi River, and the plant did not discharge radioactive liquid effluents.

Fish

Eight fish were analyzed in 2015 consisting of two fish collected from upstream locations and two collected from downstream locations in June and then again in September. Flesh was separated from the bones and analyzed by gamma spectroscopy. Only naturally-occurring potassium-40 was found with an average of 3.31 pCi/g wet for four upstream samples and 3.39 pCi/g wet weight for the four downstream samples. Other gamma-emitting isotopes remained below detection limits. There was no indication of a plant effect.

Invertebrates

Samples were collected in August and October, 2015, and analyzed by gamma spectroscopy. All gamma-emitting isotopes, with the exception of naturally-occurring potassium-40 were below detection limits. There was no indication of any plant effect.

Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediment collections were made in August and October, 2015, and analyzed for gamma-emitting isotopes. Low levels of cesium-137 were detected in two downstream samples (M-9), at an average concentration of 0.029 pCi/g dry weight. Similar levels of activity have been observed since 1978, and are indicative of the influence of fallout deposition. Naturally-occurring beryllium-7 and potassium-40 were also detected. There was no indication of a plant effect.

Groundwater Monitoring Program (On-site monitoring wells)

Measurable tritium was detected in 47 of 118 samples collected from the nineteen on-site monitoring wells. The activities ranged from 144 to 6,493 pCi/L. Only six samples from MW-09A indicated tritium activity greater than 500 pCi/L. The highest level detected (6,493 pCi/l), is comparable to the highest level detected from 2014 (5,911 pCi/L), which also was collected from well MW-09A. The current results are consistent with those from previous years, indicating presence of a tritium plume under the Turbine Building that is considered to be remaining onsite. See Appendix E for full Groundwater monitoring well results and discussion.

Gamma isotopic measurements were below detection limits.

Starting in 2016, Onsite Groundwater Monitoring Program results will be published only in the Effluent report (ARERR). This is to align with guidelines of NEI 07-07 and industry practice.

Storm Water Run-off (on-site)

One of five storm water runoff samples indicated detectible tritium at 157 pCi/L; the remaining four samples were below detection limits. Gamma isotopic analysis results also measured below detection limits for all five samples analyzed in 2015.

ISFSI TLD Monitoring

Gamma and Neutron TLDs are located around the Independent Spent Fuel Storage Installation (ISFSI) to monitor direct radiation from stored fuel. Results for gamma monitoring are included in the Complete Data Analysis Tables. In addition, neutron TLDs are included at certain Special Interest locations and at the Control locations. Neutron TLD results were analyzed according to methodology presented at the 2009 RETS/REMP Workshop by Scannell, Giard, and Raimondi, and it was found that neutron TLDs surrounding the ISFSI do indicate a net signal due to neutron dose, but all neutron dosimeters at or beyond the site boundary do not indicate that neutron dose was detected. Neutron dosimetry uses the different responses from two lithium borate TLDs, one depleted of ^{6}Li and ^{10}B (gamma-sensitive only), with the other at natural abundances (neutron and gamma sensitive). The net response is scaled using a site-specific Neutron Correction Factor (NCF) to determine dose. The NCF is not available for Monticello's ISFSI at this time and it would not be correct, nor prudent, to report the neutron TLD results in the Complete Data Analysis Tables. It is intended that neutron results will be reported starting in 2016.

5.0 FIGURES AND TABLES

Table 5.1. Sample collection and analysis program, Monticello Nuclear Generating Plant.

Medium	No.	Location Codes (and Type) [a]	Collection Type and Frequency [b]	Analysis Type and Frequency [c]
REMP Ambient radiation(TLDs)	40	M-01A - M-14A, M-01B - M-16B M-01S - M-06S, M-01C - M-04C	C/Q	Ambient gamma
ISFSI Ambient radiation (TLDs)	20	ISFSI-1 to ISFSI-16,	C/Q	Neutron Dose
		Neutron Control A, B, C, D	C/Q	
	13	I-01 to I-13	C/Q	Ambient Gamma
Airborne Particulates	5	M-1(C), M-2, M-3, M-4, M-5	C/W	GB, GS (QC of each location)
Airborne Iodine	5	M-1(C), M-2, M-3, M-4, M-5	C/W	I-131
Pasture grass, Vegetation [d]	3	M-41, M-42, M-43(C)	3x/year	GS
Surface water	2	M-8(C), M-9	G/W	GS(MC), H-3(QC)
Drinking water	1	M-14	G/W	GB(MC), I-131(MC) GS (MC), H-3 (QC)
Well water	4	M-11, M-12, M-55, M-43(C)	G/Q	H-3, GS
Fish (two species, edible portion)	2	M-8(C), M-9	G/SA	GS
Periphyton or invertebrates	2	M-8(C), M-9	G/SA	GS
Shoreline sediment	3	M-8(C), M-9, M-15	G/SA	GS

[a] Location codes are defined in Table 5.2. Control stations are indicated by (C). All other stations are indicators.

[b] Collection type is coded as follows: C/ = continuous, G/ = grab. Collection frequency is coded as follows: W= weekly, M = monthly, Q = quarterly, SA = semiannually, A = annually.

[c] Analysis type is coded as follows: GB = gross beta, GS = gamma spectroscopy, H-3 = tritium, I-131 = iodine-131. Analysis frequency is coded as follows: MC = monthly composite, QC = quarterly composite.

[d] Pasture grass and vegetation collections added to supplement dairy sampling.

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type [a]	Collection Site	Sample Type [b]	Distance and Direction from Reactor
M-1	C	Air Station M-1	AP, AI	11.0 mi @ 307°/NW
M-2		Air Station M-2	AP, AI	0.8 mi @ 140°/SE
M-3		Air Station M-3	AP, AI	0.6 mi @ 104°/ESE
M-4		Air Station M-4	AP, AI	0.8 mi @ 147°/SSE
M-5		Air Station M-5	AP, AI	2.6 mi @ 134°/SE
M-8	C	Upstream of Plant Intake	SW, SS, BO, F	< 1000' upstream
M-9		Downstream of Plant Discharge	SW, SS, BO, F	< 1000' downstream
M-11		City of Monticello	WW	3.3 mi @ 127°/SE
M-12		Plant Well #11	WW	0.26 mi @ 252°/WSW
M-14		City of Minneapolis	DW	37.0 mi @ 132°/SE
M-15		Montissippi Park	SS	1.27 mi @ 114°/ESE
M-27		Highest D/Q garden		1.15 mi @ 148°/SSE
M-41		Training Center	VE	0.8 mi @ 151°/SSE
M-42		Biology Station Road	VE	0.6 mi @ 134°/SE
M-43	C	Imholte Farm	VE, WW	12.3 mi @ 313°/NW
M-55		Hasbrouck Residence	WW	1.60 mi @ 255°/WSW

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
General Area of the Site Boundary				
M-01A		Sherburne Ave. So.	TLD	0.75 mi @ 353°/N
M-02A		Sherburne Ave. So.	TLD	0.79 mi @ 23°/NNE
M-03A		Sherburne Ave. So.	TLD	1.29 mi @ 56°/NE
M-04A		Biology Station Road	TLD	0.5 mi @ 92°/E
M-05A		Biology Station Road	TLD	0.48 mi @ 122°/ESE
M-06A		Biology Station Road	TLD	0.54 mi @ 138°/SE
M-07A		County Road 75	TLD	0.47 mi @ 158°/SSE
M-08A		County Road 75	TLD	0.45 mi @ 175°/S
M-09A		County Road 75	TLD	0.38 mi @ 206°/SSW
M-10A		County Road 75	TLD	0.38 mi @ 224°/SW
M-11A		County Road 75	TLD	0.4 mi @ 237°/WSW
M-12A		County Road 75	TLD	0.5 mi @ 262°/W
M-13A		North Boundary Road	TLD	0.89 mi @ 322°/NW
M-14A		North Boundary Road	TLD	0.78 mi @ 335°/NNW
Approximately 4 to 5 miles Distant from the Plant				
M-01B		117th Street	TLD	4.65 mi @ 01°/N
M-02B		County Road 11	TLD	4.4 mi @ 18°/NNE
M-03B		County Road 73 & 81	TLD	4.3 mi @ 51°/NE
M-04B		County Road 73 (196th St.)	TLD	4.2 mi @ 67°/ENE
M-05B		City of Big Lake	TLD	4.3 mi @ 89°/E
M-06B		County Road 14 and 196th St.	TLD	4.3 mi @ 117°/ESE
M-07B		Monticello Industrial Drive	TLD	4.3 mi @ 136°/SE
M-08B		Residence, Hwy 25 & Davidson Ave.	TLD	4.6 mi @ 162°/SSE
M-09B		Weinand Farm	TLD	4.7 mi @ 178°/S
M-10B		Reisewitz Farm, Acacia Ave.	TLD	4.2 mi @ 204°/SSW
M-11B		Vanlith Farm, 97th Ave.	TLD	4.0 mi @ 228°/SW
M-12B		Lake Maria State Park	TLD	4.2 mi @ 254°/WSW
M-13B		Bridgewater Station	TLD	4.1 mi @ 270°/W
M-14B		Anderson Residence, Cty Rd. 111	TLD	4.3 mi @ 289°/WNW
M-15B		Red Oak Wild Bird Farm	TLD	4.3 mi @ 309°/NW
M-16B		Sand Plain Research Farm	TLD	4.4 mi @ 341°/NNW

Table 5.2. Sampling locations, Monticello Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
Special Interest Locations				
M-01S		Osowski Fun Market	TLD	0.66 mi @ 241°/WSW
M-02S		Krone Residence	TLD	0.5 mi @ 220°/SW
M-03S		Big Oaks Park	TLD	1.53 mi @ 103°/ESE
M-04S		Pinewood School	TLD	2.3 mi @ 131°/SE
M-05S		Rivercrest Christian Academy	TLD	3.0 mi @ 118°/ESE
M-06S		Monticello Public Works	TLD	2.6 mi @ 134°/SE
M-01C	C	Kirchenbauer Farm	TLD	11.5 mi @ 323°/NW
M-02C	C	County Roads 4 and 15	TLD	11.2 mi @ 47°/NE
M-03C	C	County Rd 19 and Jason Ave.	TLD	11.6 mi @ 130°/SE
M-04C	C	Maple Lake Water Tower	TLD	10.3 mi @ 226°/ SW
ISFSI TLD Locations				
ISFSI-1		ISFSI-1 (neutron) and I-01 (gamma)	TLD	NE corner of ISFSI
ISFSI-2		ISFSI-2 (neutron) and I-02 (gamma)	TLD	North side of ISFSI, center
ISFSI-3		ISFSI-3 (neutron) and I-03 (gamma)	TLD	NW corner of ISFSI
ISFSI-4		ISFSI-4 (neutron) and I-04 (gamma)	TLD	West side of ISFSI, middle
ISFSI-5		ISFSI-5 (neutron) and I-05 (gamma)	TLD	West side of ISFSI, at center of array
ISFSI-6		ISFSI-6 (neutron) and I-06 (gamma)	TLD	SW corner of ISFSI
ISFSI-7		ISFSI-7 (neutron) and I-07 (gamma)	TLD	South side of ISFSI, center
ISFSI-8		ISFSI-8 (neutron) and I-08 (gamma)	TLD	SE corner of ISFSI
ISFSI-9		ISFSI-9 (neutron) and I-09 (gamma)	TLD	East side of ISFSI, at center of array
ISFSI-10		ISFSI-10 (neutron) and I-10 (gamma)	TLD	East side of ISFSI, middle
ISFSI-11		ISFSI-11 (neutron) and I-11 (gamma)	TLD	OCA fence south, on exit road
ISFSI-12		ISFSI-12 (neutron) and I-12 (gamma)	TLD	OCA fence middle, on exit road
ISFSI-13		ISFSI-13 (neutron) and I-13 (gamma)	TLD	OCA fence north, on exit road
ISFSI-14		ISFSI-14 (neutron)	TLD	Posted with TLD M12A
ISFSI-15		ISFSI-15 (neutron)	TLD	Posted with TLD M10A
ISFSI-16		ISFSI-16 (neutron)	TLD	Posted with TLD M02S
Neutron Control A	C		TLD	Posted with TLD M03C
Neutron Control B	C		TLD	Posted with TLD M04C
Neutron Control C	C		TLD	Posted with TLD M02C
Neutron Control D	C		TLD	Posted with TLD M01C

[a] "C" denotes control location. All other locations are indicators.

[b] Sample Codes:

AP	Airborne particulates	F	Fish
AI	Airborne Iodine	SW	River Water
BS	Bottom (river) sediments	SS	Shoreline Sediments
BO	Bottom organisms	TLD	Thermoluminescent Dosimeter
DW	Drinking Water	VE	Vegetation / vegetables
		WW	Well Water

[c] Collected only if the plant discharges radioactive effluent into the river, then only from river irrigated fields.

Table 5.3 Missed Collections and Analyses.

All required samples were collected and analyzed as scheduled with the following exceptions:					
Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	Beta, I-131	M-005	1/28/2015	Power loss at sample station.	Power was reset
SW	Gamma	M-008	January '15	Water frozen entire month; no composite.	None
AP/AI	Beta, I-131	M-002	2/4/2015	Air sampler not running due to bad switch.	Replaced air sampler.
SW	Gamma	M-008	February '15	Water frozen entire month; no composite.	None
SW	Gamma	M-008	3/4/15	Water frozen	None
SW	Gamma	M-008	3/11/15	Water frozen	None
AP/AI	Beta, I-131	M-002	5/6/2015	Air sampler not running.	Replaced air sampler.
TLD	Gamma	M-06B	2nd Qtr '15	TLD missing in field.	Replaced TLD
AP/AI	Beta, I-131	M-004	6/10/15	GFCI tripped	Reset GFCI
AP/AI	Beta, I-131	M-004	6/24/2015	GFCI tripped	Reset GFCI
SW	Gamma	M-008	12/30/15	Water frozen	None

Figure 5-1. Offsite Ambient Radiation (TLDs); Inner Ring versus Outer Ring locations.

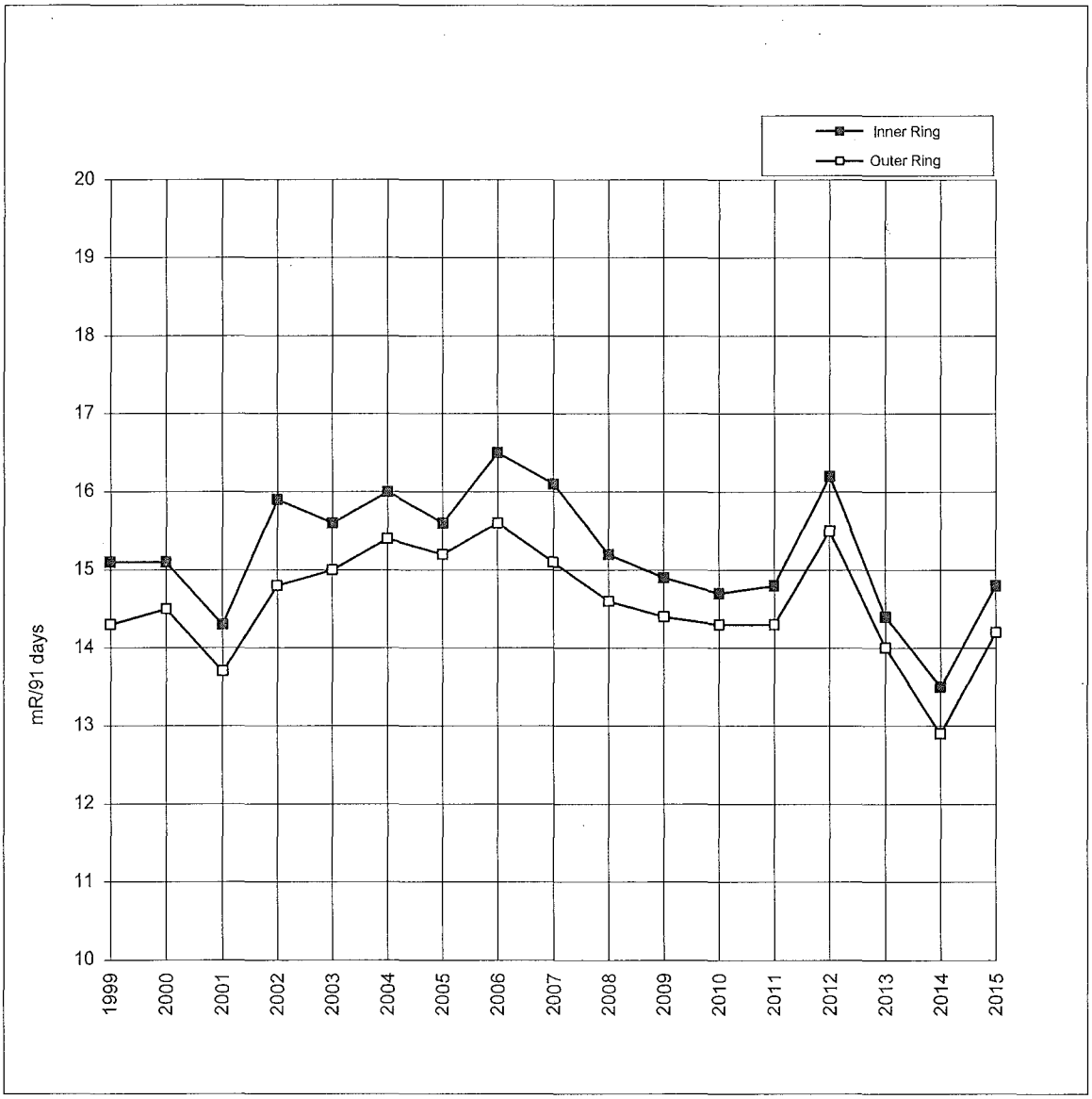

Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.

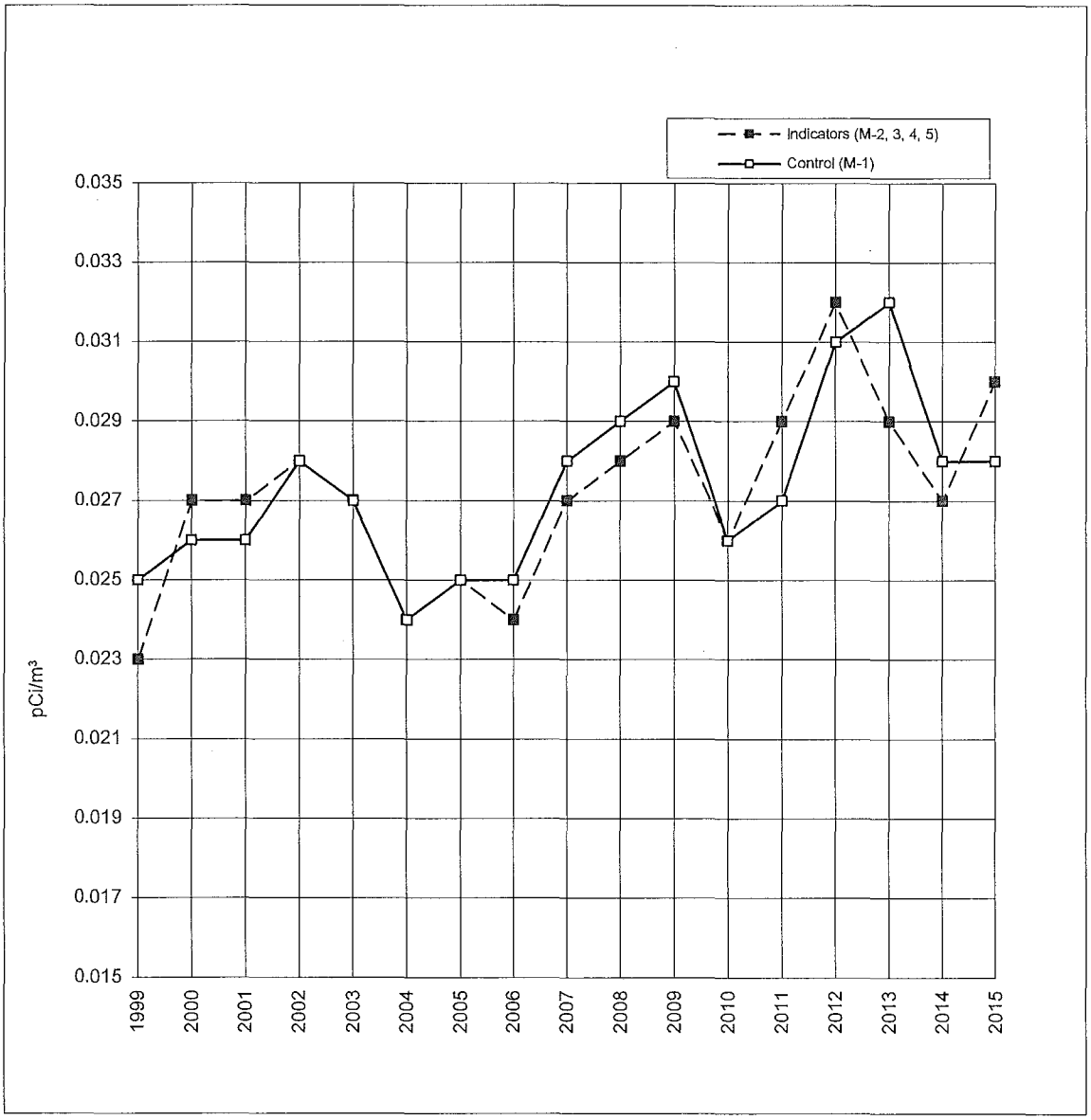

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota	Reporting Period	January-December, 2015
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean		Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
				Location[d]	Mean (F)[c] Range[c]		
Direct Radiation							
TLD (Inner Ring, General Area at Site Boundary) mRem/91 days)	Gamma 56	3.0	14.8 (56/56) (9.6-19.6)	M-11A, County Rd 75, 0.4 mi @ 250°/WSW	17.1 (4/4) (15.8-19.6)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mRem/91 days)	Gamma 63	3.0	14.2 (63/63) (11.0-19.6)	M-14B 4.5 mi @ 228°/NW	16.6 (4/4) (14.7-19.6)	(See Control below.)	0
TLD (Special Interest Areas) mRem/91 days)	Gamma 24	3.0	14.7 (24/24) (9.4-18.8)	M-04S 2.3 mi @ 132°/SE	16.4 (4/4) (14.4-17.6)	(See Control below.)	0
TLD (Control) mRem/91 days)	Gamma 16	3.0	None	M-02C 11.2 mi @ 47°/NE	17.5 (4/4) (15.9-20.3)	15.3 (16/16) (11.8-20.3)	0
Airborne Pathway							
Airborne Particulates (pCi/m^3)	GB 256	0.002	0.030 (204/204) (0.007-0.088)	M-5, Air Station 2.6 mi @ 134°/SE	0.031 (51/51) (0.009-0.088)	0.028 (52/52) (0.008-0.062)	0
	GS 20						
	Be-7	0.015	0.070 (16/16) (0.049-0.087)	M-5, Air Station 2.6 mi @ 134°/SE	0.073 (4/4) (0.049-0.087)	0.066 (4/4) (0.043-0.077)	0
	Mn-54	0.0008	< LLD	-	-	< LLD	0
	Co-58	0.0008	< LLD	-	-	< LLD	0
	Co-60	0.0009	< LLD	-	-	< LLD	0
	Zn-65	0.0019	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0014	< LLD	-	-	< LLD	0
	Ru-103	0.0013	< LLD	-	-	< LLD	0
	Ru-106	0.0085	< LLD	-	-	< LLD	0
	Cs-134	0.0010	< LLD	-	-	< LLD	0
	Cs-137	0.0010	< LLD	-	-	< LLD	0
	Ba-La-140	0.0026	< LLD	-	-	< LLD	0
	Ce-141	0.0020	< LLD	-	-	< LLD	0
	Ce-144	0.0046	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 256	0.03	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Monticello Nuclear Generating Plant — Docket No.: 50-263
Location of Facility: Wright, Minnesota (County, State) — Reporting Period: January-December,2015

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Waterborne Pathway							
River Water (pCi/L)	H-3 8	500	< LLD	-	-	< LLD	0
	GS 22						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	39	< LLD	-	-	< LLD	0
Drinking Water (pCi/L)	GB 12	1.0	2.3 (12/12) (1.2-3.5)	M-14, Minneapolis 37.0 mi. @ 132° /SE	2.3 (12/12) (1.2-3.5)	None	0
	I-131 12	1.0	< LLD	-	-	None	0
	H-3 4	500	< LLD	-	-	None	0
	GS 12						
	Mn-54	10	< LLD	-	-	None	0
	Fe-59	30	< LLD	-	-	None	0
	Co-58	10	< LLD	-	-	None	0
	Co-60	10	< LLD	-	-	None	0
	Zn-65	30	< LLD	-	-	None	0
	Zr-Nb-95	15	< LLD	-	-	None	0
	Cs-134	10	< LLD	-	-	None	0
	Cs-137	10	< LLD	-	-	None	0
	Ba-La-140	15	< LLD	-	-	None	0
	Ce-144	35	< LLD	-	-	None	0
Well Water (pCi/L)	H-3 16	500	< LLD	-	-	< LLD	0
	GS 16						
	Mn-54	10	< LLD	-	-	< LLD	0
	Fe-59	30	< LLD	-	-	< LLD	0
	Co-58	10	< LLD	-	-	< LLD	0
	Co-60	10	< LLD	-	-	< LLD	0
	Zn-65	30	< LLD	-	-	< LLD	0
	Zr-Nb-95	15	< LLD	-	-	< LLD	0
	Cs-134	10	< LLD	-	-	< LLD	0
	Cs-137	10	< LLD	-	-	< LLD	0
	Ba-La-140	15	< LLD	-	-	< LLD	0
	Ce-144	49	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Monticello Nuclear Generating Plant — Docket No.: 50-263
Location of Facility: Wright, Minnesota (County, State) — Reporting Period: January-December, 2015

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean: Location[d]	Location with Highest Annual Mean: Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Waterborne Pathway							
Invertebrates (pCi/g wet)	GS 4						
	Be-7	1.49	< LLD	-	-	< LLD	0
	K-40	1.91	< LLD	-	-	< LLD	0
	Mn-54	0.088	< LLD	-	-	< LLD	0
	Fe-59	0.24	< LLD	-	-	< LLD	0
	Co-58	0.145	< LLD	-	-	< LLD	0
	Co-60	0.085	< LLD	-	-	< LLD	0
	Zn-65	0.18	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.23	< LLD	-	-	< LLD	0
	Ru-103	0.217	< LLD	-	-	< LLD	0
	Ru-106	0.55	< LLD	-	-	< LLD	0
	Cs-134	0.076	< LLD	-	-	< LLD	0
	Cs-137	0.085	< LLD	-	-	< LLD	0
	Ba-La-140	1.35	< LLD	-	-	< LLD	0
	Ce-144	0.39	< LLD	-	-	< LLD	0
Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.33	< LLD	-	-	< LLD	0
	K-40	0.10	10.24 (4/4) (9.49-10.54)	M-08, Upstream < 1000' of discharge	11.55 (2/2) (11.53-11.58)	11.55 (2/2) (11.53-11.58)	0
	Mn-54	0.021	< LLD	-	-	< LLD	0
	Fe-59	0.076	< LLD	-	-	< LLD	0
	Co-58	0.026	< LLD	-	-	< LLD	0
	Co-60	0.017	< LLD	-	-	< LLD	0
	Zn-65	0.044	< LLD	-	-	< LLD	0
	Nb-95	0.051	< LLD	-	-	< LLD	0
	Zr-95	0.052	< LLD	-	-	< LLD	0
	Ru-103	0.041	< LLD	-	-	< LLD	0
	Ru-106	0.13	< LLD	-	-	< LLD	0
	Cs-134	0.017	< LLD	-	-	< LLD	0
	Cs-137	0.021	0.029 (2/4) (0.024-0.034)	M-09, Downstream < 1000' of discharge	-	< LLD	0
	Ba-La-140	0.21	< LLD	-	-	< LLD	0
	Ce-144	0.13	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota (County, State)	Reporting Period	January-December, 2015

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean Location[d]	Location with Highest Annual Mean Mean (F)[c] Range[c]	Control Locations Mean (F)[c] Range[c]	Number Non-Routine Results[e]
Ingestion Pathway							
Vegetation	GS 9						
(Pasture Grass, Weeds, Leaves)	Mn-54	0.014	< LLD	-	-	< LLD	0
	Fe-59	0.033	< LLD	-	-	< LLD	0
	Co-58	0.014	< LLD	-	-	< LLD	0
(pCi/gwet)	Co-60	0.019	< LLD	-	-	< LLD	0
	Zn-65	0.029	< LLD	-	-	< LLD	0
	Nb-95	0.020	< LLD	-	-	< LLD	0
	I-131	0.043	< LLD	-	-	< LLD	0
	Cs-134	0.015	< LLD	-	-	< LLD	0
	Cs-137	0.014	< LLD	-	-	< LLD	0
Fish	GS 8						
(pCi/g wet)	K-40	0.10	3.39 (4/4) (3.08-3.71)	M-09, Downstream < 1000' of discharge	3.39 (4/4) (3.08-3.71)	3.31 (4/4) (2.56-3.65)	0
	Mn-54	0.025	< LLD	-	-	< LLD	0
	Fe-59	0.056	< LLD	-	-	< LLD	0
	Co-58	0.025	< LLD	-	-	< LLD	0
	Co-60	0.025	< LLD	-	-	< LLD	0
	Zn-65	0.070	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.031	< LLD	-	-	< LLD	0
	Cs-134	0.025	< LLD	-	-	< LLD	0
	Cs-137	0.020	< LLD	-	-	< LLD	0
	Ba-La-140	0.122	< LLD	-	-	< LLD	0
	Ce-144	0.141	< LLD	-	-	< LLD	0

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified: (1) by name, and/or station code and (2) by distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten time the typical preoperational value for the medium or location.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January, 2015 through December, 2015

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via internal laboratory testing and by irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	$\pm 1\sigma = 169.85 \times (\text{known})^{0.0933}$ 10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129[b]	≤ 55 pCi/liter > 55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-63[b] Technetium-99[b]	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55[b]	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses [b]	---	20% of known value

[a] From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

[b] Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-1444	4/6/2015	Sr-89	59.71 ± 5.44	63.20	51.10 - 71.20	Pass
ERW-1444	4/6/2015	Sr-90	43.41 ± 2.43	41.90	30.80 - 48.10	Pass
ERW-1448	4/6/2015	Ba-133	77.75 ± 4.69	82.50	69.30 - 90.80	Pass
ERW-1448	4/6/2015	Cs-134	68.82 ± 3.08	75.70	61.80 - 83.30	Pass
ERW-1448	4/6/2015	Cs-137	191.9 ± 5.9	189.0	170.0 - 210.0	Pass
ERW-1448	4/6/2015	Co-60	85.05 ± 4.59	84.50	76.00 - 95.30	Pass
ERW-1448	4/6/2015	Zn-65	196.0 ± 12.0	203.0	183.0 - 238.0	Pass
ERW-1450	4/6/2015	Gr. Alpha	34.05 ± 1.90	42.60	22.10 - 54.00	Pass
ERW-1450	4/6/2015	G. Beta	26.93 ± 1.12	32.90	21.30 - 40.60	Pass
ERW-1453	4/6/2015	I-131	22.47 ± 0.83	23.80	19.70 - 28.30	Pass
ERW-1456	4/6/2015	Ra-226	8.20 ± 0.56	8.43	6.33 - 9.90	Pass
ERW-1456	4/6/2015	Ra-228	5.00 ± 0.67	4.39	2.56 - 6.01	Pass
ERW-1456	4/6/2015	Uranium	5.98 ± 0.31	6.59	4.99 - 7.83	Pass
ERW-1461	4/6/2015	H-3	3,254 ± 180	3280	2,770 - 3,620	Pass
ERW-5528	10/5/2015	Sr-89	34.76 ± 0.06	35.70	26.70 - 42.50	Pass
ERW-5528	10/5/2015	Sr-90	29.23 ± 0.06	31.10	22.70 - 36.10	Pass
ERW-5531	10/5/2015	Ba-133	30.91 ± 0.53	32.50	25.90 - 36.70	Pass
ERW-5531	10/5/2015	Cs-134	57.40 ± 2.57	62.30	50.69 - 68.50	Pass
ERW-5531	10/5/2015	Cs-137	163.1 ± 4.8	157.0	141.0 - 175.0	Pass
ERW-5531	10/5/2015	Co-60	73.41 ± 1.72	71.10	64.00 - 80.70	Pass
ERW-5531	10/5/2015	Zn-65	138.9 ± 5.7	126.0	113.0 - 149.0	Pass
ERW-5534	10/5/2015	Gr. Alpha	29.99 ± 0.08	51.60	26.90 - 64.70	Pass
ERW-5534	10/5/2015	G. Beta	27.52 ± 0.04	36.60	24.10 - 44.20	Pass
ERW-5537	10/5/2015	I-131	25.54 ± 0.60	26.30	21.90 - 31.00	Pass
ERW-5540	10/5/2015	Ra-226	7.32 ± 0.37	7.29	5.49 - 8.63	Pass
ERW-5540 [d]	10/5/2015	Ra-228	7.80 ± 0.02	4.25	2.46 - 5.85	Fail
ERW-5540 [e]	10/5/2015	Ra-228	4.45 ± 0.96	4.25	2.46 - 5.85	Pass
ERW-5540	10/5/2015	Uranium	53.30 ± 0.55	56.20	45.70 - 62.40	Pass
ERW-5543	10/5/2015	H-3	21,260 ± 351	21,300	18,700 - 23,400	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

[b] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[c] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

[d] Ra-228 spike was at a level close to the detection level. The high result was likely caused by interference from short-lived Rn-222 daughters.

[e] The result of reanalysis (Compare to original result, footnoted "e" above).

TABLE A-2.1. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [a]

			mR			
Lab Code	Irradiation Date	Description	Known Value	Lab Result	Control Limits	Acceptance
Environmental, Inc.						
2015-1	6/24/2015	30 cm.	98.81	103.67 ± 6.05	69.20 - 128.50	Pass
2015-1	6/24/2015	30 cm.	98.81	111.32 ± 15.97	69.20 - 128.50	Pass
2015-1	6/24/2015	60 cm.	24.70	27.23 ± 1.33	17.30 - 32.10	Pass
2015-1	6/24/2015	60 cm.	24.70	26.98 ± 4.98	17.30 - 32.10	Pass
2015-1	6/24/2015	120 cm.	6.18	6.71 ± 1.77	4.30 - 8.00	Pass
2015-1	6/24/2015	120 cm.	6.18	6.78 ± 0.38	4.30 - 8.00	Pass
2015-1	6/24/2015	120 cm.	6.18	6.43 ± 2.00	4.30 - 8.00	Pass
2015-1	6/24/2015	150 cm.	3.95	4.13 ± 0.72	2.80 - 5.10	Pass
2015-1	6/24/2015	150 cm.	3.95	4.12 ± 1.36	2.80 - 5.10	Pass
2015-1	6/24/2015	150 cm.	3.95	4.50 ± 1.51	2.80 - 5.10	Pass
2015-1	6/24/2015	180 cm.	2.74	3.27 ± 0.28	1.90 - 3.60	Pass
2015-1	6/24/2015	180 cm.	2.74	3.05 ± 1.11	1.90 - 3.60	Pass
2015-1	6/24/2015	180 cm.	2.74	3.14 ± 0.18	1.90 - 3.60	Pass

TABLE A-2.2 Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards). [b]

Lab Code	Irradiation Date	Description	Delivered Dose (mrem)	Reported Dose (mrem)	Performance Quotient (P) [c]	Acceptance [d]
Environmental, Inc.						
2015-2	12/15/2015	Spike 1	138.0	118.5 ± 2.1	-0.14	Pass
2015-2	12/15/2015	Spike 2	138.0	120.0 ± 1.6	-0.13	Pass
2015-2	12/15/2015	Spike 3	138.0	121.9 ± 1.9	-0.12	Pass
2015-2	12/15/2015	Spike 4	138.0	124.5 ± 3.3	-0.10	Pass
2015-2	12/15/2015	Spike 5	138.0	126.5 ± 3.2	-0.08	Pass
2015-2	12/15/2015	Spike 6	138.0	140.0 ± 4.2	0.01	Pass
2015-2	12/15/2015	Spike 7	138.0	128.2 ± 1.2	-0.07	Pass
2015-2	12/15/2015	Spike 8	138.0	128.0 ± 4.0	-0.07	Pass
2015-2	12/15/2015	Spike 9	138.0	124.9 ± 5.1	-0.09	Pass
2015-2	12/15/2015	Spike 10	138.0	122.9 ± 3.0	-0.11	Pass
2015-2	12/15/2015	Spike 11	138.0	123.3 ± 3.0	-0.11	Pass
2015-2	12/15/2015	Spike 12	138.0	119.0 ± 3.4	-0.14	Pass
2015-2	12/15/2015	Spike 13	138.0	123.0 ± 2.7	-0.11	Pass
2015-2	12/15/2015	Spike 14	138.0	125.4 ± 2.0	-0.09	Pass
2015-2	12/15/2015	Spike 15	138.0	122.0 ± 3.1	-0.12	Pass
2015-2	12/15/2015	Spike 16	138.0	120.8 ± 2.0	-0.12	Pass
2015-2	12/15/2015	Spike 17	138.0	118.8 ± 1.1	-0.14	Pass
2015-2	12/15/2015	Spike 18	138.0	117.0 ± 2.3	-0.15	Pass
2015-2	12/15/2015	Spike 19	138.0	120.8 ± 2.6	-0.12	Pass
2015-2	12/15/2015	Spike 20	138.0	122.6 ± 3.0	-0.11	Pass
Mean (Spike 1-20)				123.4	0.11	Pass
Standard Deviation (Spike 1-20)				5.0	0.04	Pass

[a] TLD's were irradiated at Environmental Inc. Midwest Laboratory. (Table A-2.1)

[b] TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.(Table A-2.2)

[c] Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

[d] Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

e Tables A2.1 and A2.2 assume 1 roentgen = 1 rem (per NRC -Health Physics Positions Based on 10 CFR Part 20 - Question 96 - Page Last Reviewed/Updated Thursday, October 01, 2015).

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration (pCi/L)[a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
W-020315	2/3/2015	Ra-226	16.19 ± 0.42	16.70	13.36 - 20.04	Pass
W-021215	2/12/2015	Gr. Alpha	18.38 ± 0.39	20.10	16.08 - 24.12	Pass
W-021215	2/12/2015	Gr. Beta	27.98 ± 0.32	30.90	24.72 - 37.08	Pass
SPW-687	2/27/2015	Ni-63	239.6 ± 3.5	202.4	161.9 - 242.9	Pass
SPAP-689	3/2/2015	Gr. Beta	42.37 ± 3.50	43.61	34.89 - 52.33	Pass
SPAP-691	3/2/2015	Cs-134	1.77 ± 0.61	1.90	1.52 - 2.28	Pass
SPAP-691	3/2/2015	Cs-137	83.02 ± 2.60	97.20	77.76 - 116.64	Pass
SPW-693	3/2/2015	Cs-134	44.30 ± 2.53	53.40	42.72 - 64.08	Pass
SPW-693	3/2/2015	Cs-137	74.82 ± 3.50	73.80	59.04 - 88.56	Pass
SPW-693	3/2/2015	Sr-89	87.45 ± 3.62	87.48	69.98 - 104.98	Pass
SPW-693	3/25/2015	Sr-90	37.22 ± 1.55	38.10	30.48 - 45.72	Pass
SPMI-697	3/2/2015	Cs-134	96.67 ± 7.74	107.00	85.60 - 128.40	Pass
SPMI-697	3/2/2015	Cs-137	78.51 ± 7.02	73.84	59.07 - 88.61	Pass
SPMI-697	3/2/2015	Sr-89	72.98 ± 4.86	87.48	69.98 - 104.98	Pass
SPMI-697	3/2/2015	Sr-90	39.17 ± 1.51	38.10	30.48 - 45.72	Pass
SPW-699	3/2/2015	H-3	59,592 ± 703	58,445	46,756 - 70,134	Pass
W-031115	3/11/2015	Ra-226	13.73 ± 0.35	16.70	13.36 - 20.04	Pass
W-030215	3/2/2015	Ra-228	32.79 ± 2.31	31.44	25.15 - 37.73	Pass
SPF-1040	3/16/2015	Cs-134	787.5 ± 9.2	840.0	672.0 - 1,008.0	Pass
SPF-1040	3/16/2015	Cs-137	2,599 ± 24	2,360	1,888 - 2,832	Pass
SPW-1036	3/25/2015	Fe-55	1,792 ± 63	1961	1,569 - 2,353	Pass
SPW-1374	4/6/2015	U-238	46.03 ± 2.25	41.70	25.02 - 58.38	Pass
W-040815	4/8/2015	Gr. Alpha	20.18 ± 0.42	20.10	16.08 - 24.12	Pass
W-040815	4/8/2015	Gr. Beta	29.70 ± 0.33	30.90	24.72 - 37.08	Pass
SPW-1038	4/13/2015	C-14	3,497 ± 9	4,734	2,840 - 6,628	Pass
W-2165	4/20/2015	H-3	5550 ± 226	5,780	3,468 - 8,092	Pass
W-2165	4/20/2015	Sr-89	90.70 ± 8.20	108.70	65.22 - 152.18	Pass
W-2165	4/20/2015	Sr-90	76.80 ± 2.00	75.90	45.54 - 106.26	Pass
W-2165	4/20/2015	Cs-134	62.40 ± 6.40	57.30	34.38 - 80.22	Pass
W-2165	4/20/2015	Cs-137	91.30 ± 7.70	84.00	50.40 - 117.60	Pass
W-2392	4/13/2015	H-3	5032 ± 214	5780	3468 - 8092	Pass
W-2392	4/13/2015	Ni-63	222.4 ± 3.8	202.0	121.2 - 282.8	Pass
W-2392	4/13/2015	Cs-134	53.26 ± 5.01	57.30	34.38 - 80.22	Pass
W-2392	4/13/2015	Cs-137	91.90 ± 7.76	84.20	50.52 - 117.88	Pass
W-042415	4/24/2015	Ra-226	12.52 ± 0.39	16.70	10.02 - 23.38	Pass
W-050715	5/7/2015	Gr. Alpha	19.05 ± 0.41	20.10	12.06 - 28.14	Pass
W-050715	5/7/2015	Gr. Beta	27.30 ± 0.32	30.90	18.54 - 43.26	Pass
W-061215	6/12/2015	Gr. Alpha	20.72 ± 0.44	20.10	12.06 - 28.14	Pass
W-061215	6/12/2015	Gr. Beta	28.51 ± 0.33	30.90	18.54 - 43.26	Pass
U-2982	6/9/2015	Gr. Beta	500.1 ± 5.1	604.0	362.4 - 845.6	Pass
U-3200	6/9/2015	H-3	2229 ± 424	2346	1408 - 3284	Pass
W-70915	7/9/2015	Gr. Alpha	18.76 ± 0.40	20.10	12.1 - 28.1	Pass
W-70915	7/9/2015	Gr. Beta	29.71 ± 0.33	30.90	18.5 - 43.3	Pass
SPAP-3859	7/21/2015	Gr. Beta	41.59 ± 0.12	43.61	26.17 - 61.05	Pass
SPAP-3861	7/21/2015	Cs-134	1.69 ± 0.60	1.69	1.0 - 2.4	Pass

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration (pCi/L)[a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPAP-3861	7/21/2015	Cs-137	93.71 ± 2.64	96.45	57.87 - 135.03	Pass
SPMI-3863	7/21/2015	Cs-134	38.21 ± 5.12	47.02	28.21 - 65.83	Pass
SPMI-3863	7/21/2015	Cs-137	78.65 ± 7.94	73.18	43.91 - 102.45	Pass
SPMI-3863	7/21/2015	Sr-90	41.05 ± 1.62	37.78	22.67 - 52.89	Pass
SPW-3871	7/21/2015	Cs-134	45.59 ± 6.39	47.02	28.21 - 65.83	Pass
SPW-3871	7/21/2015	Cs-137	78.73 ± 7.03	73.18	43.91 - 102.45	Pass
SPW-3871	7/21/2015	Sr-90	38.36 ± 1.58	37.78	22.67 - 52.89	Pass
SPW-3873	7/21/2015	H-3	60,034 ± 671	57,199	34,319 - 80,079	Pass
SPW-3875	7/21/2015	Ni-63	451.3 ± 3.3	403.7	242.2 - 565.2	Pass
SPW-3877	7/21/2015	Tc-99	483.0 ± 8.3	539.1	323.5 - 754.7	Pass
SPMI-3879	7/21/2015	C-14	4,921 ± 19	4,736	2,842 - 6,630	Pass
SPSO-4037	7/21/2015	Ni-63	42,458 ± 309	40,370	24,222 - 56,518	Pass
SPW-072515	7/17/2015	Ra-228	35.48 ± 3	31.44	18.86 - 44.02	Pass
SPF-4104	7/29/2015	Cs-134	661.5 ± 115.9	740.0	444.0 - 1036.0	Pass
SPF-4104	7/29/2015	Cs-137	2,469 ± 59	2,340	1,404 - 3,276	Pass
SPW-81015	8/10/2015	Gr. Alpha	21.59 ± 0.46	20.10	12.06 - 28.14	Pass
SPW-81015	8/10/2015	Gr. Beta	27.58 ± 0.32	30.90	18.54 - 43.26	Pass
SPW-81315	8/13/2015	Ra-226	15.05 ± 0.36	16.70	10.02 - 23.38	Pass
SPW-90615	9/6/2015	Gr. Alpha	18.32 ± 0.40	20.10	12.06 - 28.14	Pass
SPW-90615	9/6/2015	Gr. Beta	29.43 ± 0.33	30.90	18.54 - 43.26	Pass
W-091415	9/14/2015	Gr. Alpha	19.35 ± 0.51	20.10	12.06 - 28.14	Pass
W-091415	9/14/2015	Gr. Beta	31.53 ± 0.35	30.90	18.54 - 43.26	Pass
W-100815	10/8/2015	Ra-228	12.27 ± 0.33	16.70	10.02 - 23.38	Pass
W-100615	10/6/2015	Gr. Alpha	20.62 ± 0.43	20.10	12.06 - 28.14	Pass
W-100615	10/6/2015	Gr. Beta	29.35 ± 0.33	30.90	18.54 - 43.26	Pass
W-5277	10/16/2015	H-3	5,224 ± 218	5,466	3,280 - 7,652	Pass
W-5277	10/16/2015	Cs-134	99.40 ± 6.64	99.20	59.52 - 138.88	Pass
W-5277	10/16/2015	Cs-137	89.60 ± 6.64	83.20	49.92 - 116.48	Pass
W-110415	11/4/2015	Ra-226	12.27 ± 0.33	16.70	10.02 - 23.38	Pass
W-111115	11/11/2015	Ra-228	31.78 ± 2.48	31.44	18.86 - 44.02	Pass
W-6086,6087	11/18/2015	H-3	10,882 ± 309	11,231	6,738 - 15,723	Pass
W-6086,6087	11/18/2015	Cs-134	92.98 ± 7.29	96.25	57.75 - 134.75	Pass
W-6086,6087	11/18/2015	Cs-137	76.65 ± 7.81	82.94	49.76 - 116.12	Pass
W-112515	11/25/2015	Gr. Alpha	20.91 ± 0.52	20.10	12.06 - 28.14	Pass
W-112515	11/25/2015	Gr. Beta	31.59 ± 0.35	30.90	18.54 - 43.26	Pass
W-120715	12/7/2015	Fe-55	2,431 ± 97	2,319	1,391 - 3,247	Pass
W-120815	12/8/2015	Gr. Alpha	20.72 ± 0.43	20.10	12.06 - 28.14	Pass
W-120815	12/8/2015	Gr. Beta	29.50 ± 0.33	30.90	18.54 - 43.26	Pass
W-121515	12/15/2015	Ra-226	14.77 ± 0.42	16.70	10.02 - 23.38	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2s.

NOTE: For fish, Jello is used for the spike matrix. For vegetation, cabbage is used for the spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
W-020315	Water	2/3/2015	Ra-226	0.03	0.03 ± 0.02	1
W-021215	Water	2/12/2015	Gr. Alpha	0.47	-0.37 ± 0.30	2
W-021215	Water	2/12/2015	Gr. Beta	0.76	-0.62 ± 0.51	4
SPW-686	Water	2/27/2015	Ni-63	2.36	-0.74 ± 1.42	20
SPAP-688	Air Particulate	3/2/2015	Gr. Beta	0.003	-0.001 ± 0.002	0.01
SPAP-690	Air Particulate	3/2/2015	Cs-134	0.006	0.428 ± 0.927	0.05
SPAP-690	Air Particulate	3/2/2015	Cs-137	0.006	-0.785 ± 1.146	0.05
W-030215	Water	3/2/2015	Ra-228	0.76	0.22 ± 0.38	2
SPW-692	Water	3/2/2015	Cs-134	6.70	-1.57 ± 3.55	10
SPW-692	Water	3/2/2015	Cs-137	6.18	-0.15 ± 3.20	10
SPW-692	Water	3/2/2015	Sr-89	0.61	-0.51 ± 0.51	5
SPW-692	Water	3/2/2015	Sr-90	0.60	0.38 ± 0.33	1
SPMI-696	Milk	3/2/2015	Cs-134	3.75	-0.25 ± 2.24	10
SPMI-696	Milk	3/2/2015	Cs-137	4.36	-0.25 ± 2.24	10
SPMI-696	Milk	3/2/2015	Sr-89	0.80	-0.40 ± 0.84	5
SPMI-696	Milk	3/2/2015	Sr-90	0.49	0.98 ± 0.32	1
SPW-698	Water	3/2/2015	H-3	144.0	28.6 ± 88.9	200
SPW-1035	Water	3/16/2015	Fe-55	599.7	72.6 ± 368.1	1000
SPW-1037	Water	3/16/2015	C-14	8.94	2.16 ± 5.47	200
SPF-1039	Fish	3/16/2015	Cs-134	13.54	-1.00 ± 6.80	100
SPF-1039	Fish	3/16/2015	Cs-137	9.80	4.87 ± 7.00	100
W-040615	Water	4/6/2015	Ra-226	0.04	0.01 ± 0.03	2
W-1373	Water	4/6/2015	U-238	0.08	0.01 ± 0.01	1
W-1375	Water	4/6/2015	Pu-238	0.03	0.00 ± 0.01	1
W-050715	Water	5/7/2015	Gr. Alpha	0.38	-0.10 ± 0.25	2
W-050715	Water	5/7/2015	Gr. Beta	0.74	-0.14 ± 0.51	4
W-061215	Water	6/12/2015	Gr. Alpha	0.42	-0.10 ± 0.29	2
W-061215	Water	6/12/2015	Gr. Beta	0.75	-0.04 ± 0.53	4
SPW-3858	Water	7/21/2015	Gr. Beta	0.003	0.004 ± 0.002	2
SPAP-3860	Air Particulate	7/21/2015	Cs-134	0.011	0.010 ± 0.005	0.05
SPAP-3860	Air Particulate	7/21/2015	Cs-137	0.009	0.000 ± 0.005	0.05
SPMI-3862	Milk	7/21/2015	Cs-134	3.13	1.56 ± 1.74	10
SPMI-3862	Milk	7/21/2015	Cs-137	3.20	1.69 ± 1.89	10
SPMI-3862	Milk	7/21/2015	Sr-89	2.17	-1.30 ± 2.05	5
SPMI-3862	Milk	7/21/2015	Sr-90	0.90	0.74 ± 0.50	1
SPW-3870	Water	7/21/2015	Cs-134	3.01	0.71 ± 1.66	10
SPW-3870	Water	7/21/2015	Cs-137	3.94	0.81 ± 1.86	10
SPW-3870	Water	7/21/2015	Sr-89	2.28	-0.42 ± 1.80	5
SPW-3870	Water	7/21/2015	Sr-90	0.84	0.25 ± 0.42	1

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-3872	Water	7/21/2015	H-3	142.6	82.7 ± 79.4	200
SPW-3874	Water	7/21/2015	Ni-63	2.98	0.77 ± 1.82	20
SPW-3876	Water	7/21/2015	Tc-99	5.49	-3.81 ± 3.26	10
SPW-3878	Water	7/21/2015	C-14	17.06	8.52 ± 10.54	200
SPSO-4036	Soil	7/21/2015	Ni-63	135.7	51.3 ± 83.0	1000
SPF-4103	Fish	7/29/2015	Cs-134	14.17	-37.70 ± 9.67	100
SPF-4103	Fish	7/29/2015	Cs-137	12.39	1.13 ± 8.06	100
W-081015	Water	8/10/2015	Gr. Alpha	0.48	-0.10 ± 0.33	2
W-081015	Water	8/10/2015	Gr. Beta	0.78	-0.18 ± 0.54	4
W-081815	Water	8/18/2015	Ra-226	0.03	0.03 ± 0.02	2
W-090615	Water	9/6/2015	Gr. Alpha	0.40	0.00 ± 0.28	2
W-090615	Water	9/6/2015	Gr. Beta	0.77	0.22 ± 0.54	4
W-091415	Water	9/14/2015	Gr. Alpha	0.41	0.10 ± 0.30	2
W-091415	Water	9/14/2015	Gr. Beta	0.77	0.04 ± 0.54	4
W-100615	Water	10/6/2015	Gr. Alpha	0.41	-0.15 ± 0.27	2
W-100615	Water	10/6/2015	Gr. Beta	0.75	-0.12 ± 0.52	4
W-112515	Water	11/25/2015	Gr. Alpha	0.42	0.05 ± 0.30	2
W-112515	Water	11/25/2015	Gr. Beta	0.78	-0.31 ± 0.54	4
W-120815	Water	12/8/2015	Gr. Alpha	0.42	-0.08 ± 0.29	2
W-120815	Water	12/8/2015	Gr. Beta	0.76	0.17 ± 0.54	4
W-121515	Water	12/15/2015	Ra-226	0.01	0.01 ± 0.01	2

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
CF-62,63	1/7/2015	Gr. Beta	5.72 ± 0.12	5.78 ± 0.12	5.75 ± 0.42	Pass
CF-62,63	1/7/2015	Be-7	0.915 ± 0.135	0.919 ± 0.102	0.917 ± 0.15	Pass
CF-62,63	1/7/2015	K-40	3.97 ± 0.28	3.88 ± 0.23	3.92 ± 0.33	Pass
CF-62,63	1/7/2015	Sr-90	0.017 ± 0.006	0.011 ± 0.006	0.014 ± 0.004	Pass
SG-83,84	1/12/2015	K-40	10.11 ± 1.42	9.69 ± 1.20	9.90 ± 1.16	Pass
SG-83,84	1/12/2015	Tl-208	0.57 ± 0.07	0.56 ± 0.06	0.57 ± 0.05	Pass
SG-83,84	1/12/2015	Pb-212	1.73 ± 0.10	1.58 ± 0.09	1.65 ± 0.13	Pass
SG-83,84	1/12/2015	Pb-214	13.33 ± 0.33	13.88 ± 0.28	13.61 ± 0.22	Pass
SG-83,84	1/12/2015	Bi-214	13.48 ± 0.39	13.45 ± 0.29	13.47 ± 0.24	Pass
SG-83,84	1/12/2015	Ra-226	25.68 ± 2.19	26.22 ± 1.53	25.95 ± 1.34	Pass
SG-83,84	1/12/2015	Ac-228	13.33 ± 0.59	12.86 ± 0.43	13.09 ± 0.36	Pass
AP-011215A/B	1/12/2015	Gr. Beta	0.025 ± 0.004	0.023 ± 0.004	0.024 ± 0.003	Pass
WW-315,316	1/27/2015	H-3	1,961 ± 178	1,868 ± 174	1,915 ± 124	Pass
DW-60010,60011	1/28/2015	Ra-226	1.25 ± 0.14	1.40 ± 0.15	1.33 ± 0.10	Pass
DW-60010,60011	1/28/2015	Ra-228	2.00 ± 0.66	1.39 ± 0.60	1.70 ± 0.45	Pass
SG-336,337	1/30/2015	Bi-214	6.63 ± 0.20	6.45 ± 0.45	6.54 ± 0.21	Pass
SG-336,337	1/30/2015	Pb-214	6.45 ± 0.19	6.45 ± 0.37	6.45 ± 0.21	Pass
SG-336,337	1/30/2015	Ac-228	4.43 ± 0.24	4.20 ± 0.58	4.32 ± 0.31	Pass
AP-020415A/B	2/4/2015	Gr. Beta	0.021 ± 0.004	0.019 ± 0.035	0.035 ± 0.020	Pass
AP-021115A/B	2/11/2015	Gr. Beta	0.034 ± 0.004	0.040 ± 0.047	0.037 ± 0.003	Pass
DW-60023,60024	2/26/2015	Ra-226	1.52 ± 0.15	1.51 ± 0.15	1.52 ± 0.11	Pass
DW-60023,60024	2/26/2015	Ra-228	0.97 ± 0.48	1.66 ± 0.58	1.32 ± 0.38	Pass
S-799,800	2/26/2015	K-40	11.96 ± 0.98	11.49 ± 0.82	11.72 ± 0.64	Pass
S-799,800	2/26/2015	Tl-208	0.36 ± 0.04	0.31 ± 0.04	0.34 ± 0.03	Pass
S-799,800	2/26/2015	Pb-212	0.92 ± 0.06	0.91 ± 0.06	0.91 ± 0.05	Pass
S-799,800	2/26/2015	Bi-212	1.26 ± 0.45	1.50 ± 0.40	1.38 ± 0.30	Pass
S-799,800	2/26/2015	Ac-228	1.35 ± 0.22	1.23 ± 0.17	1.29 ± 0.14	Pass
SG-834,835	2/2/2015	Gr. Alpha	113.3 ± 6.3	117.2 ± 2.8	115.2 ± 3.4	Pass
SG-834,835	2/2/2015	Gr. Beta	82.27 ± 2.79	84.33 ± 2.74	83.30 ± 1.96	Pass
DW-60031,60032	3/4/2015	Gr. Alpha	185.4 ± 7.4	177.0 ± 7.2	181.2 ± 5.2	Pass
DW-60036,60037	3/4/2015	Ra-226	6.89 ± 0.34	6.88 ± 0.32	6.89 ± 0.23	Pass
DW-60036,60037	3/4/2015	Ra-228	4.43 ± 0.73	4.41 ± 0.72	4.42 ± 0.51	Pass
DW-60048,60049	3/4/2015	Ra-226	0.84 ± 0.10	0.94 ± 0.11	0.89 ± 0.07	Pass
DW-60048,60049	3/4/2015	Ra-228	0.68 ± 0.41	1.42 ± 0.58	1.05 ± 0.36	Pass
AP-1169,1170	3/19/2015	Be-7	0.20 ± 0.02	0.24 ± 0.10	0.22 ± 0.07	Pass
DW-60069,60070	4/8/2015	Gr. Alpha	3.58 ± 0.88	3.92 ± 0.88	3.75 ± 0.62	Pass
AP-040915	4/9/2015	Gr. Beta	0.027 ± 0.005	0.023 ± 0.005	0.025 ± 0.003	Pass
WW-2394,2395	4/13/2015	H-3	1,628 ± 139	1,695 ± 141	1,662 ± 99	Pass
SG-1847,1848	4/20/2015	K-40	3.24 ± 1.18	1.99 ± 0.76	2.62 ± 0.70	Pass
SG-1847,1848	4/20/2015	Pb-214	5.80 ± 0.22	6.23 ± 0.76	6.02 ± 0.40	Pass
SG-1847,1848	4/20/2015	Ac-228	5.26 ± 0.51	5.00 ± 0.42	5.13 ± 0.33	Pass
XWW-2267,2268	4/23/2015	H-3	6,584 ± 244	6,164 ± 237	6,374 ± 170	Pass
XWW-2078,2079	4/27/2015	H-3	359.0 ± 89.6	418.7 ± 92.3	388.9 ± 64.3	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
XWW-2162,2163	4/28/2015	H-3	4,408 ± 201	4,242 ± 198	4,325 ± 141	Pass
SG-1868,1869	4/28/2015	Gr. Alpha	47.57 ± 3.63	43.61 ± 3.58	45.59 ± 2.55	Pass
SG-1868,1869	4/28/2015	Gr. Beta	50.90 ± 1.94	51.90 ± 2.02	51.40 ± 1.40	Pass
SG-1868,1869	4/28/2015	Pb-214	13.80 ± 0.52	13.54 ± 0.62	13.67 ± 0.40	Pass
SG-1868,1869	4/28/2015	Ra-228	20.10 ± 0.92	22.10 ± 1.29	21.10 ± 0.79	Pass
AP-042915	4/29/2015	Gr. Beta	0.014 ± 0.003	0.014 ± 0.003	0.014 ± 0.002	Pass
DW-60076,60077	5/4/2015	Ra-228	2.89 ± 0.61	2.45 ± 0.57	2.67 ± 0.42	Pass
AP-050515	5/5/2015	Gr. Beta	0.026 ± 0.004	0.025 ± 0.004	0.026 ± 0.003	Pass
AP-051115	5/11/2015	Gr. Beta	0.006 ± 0.005	0.010 ± 0.005	0.008 ± 0.004	Pass
DW-60087,60088	5/14/2015	Ra-226	1.58 ± 0.17	1.52 ± 0.17	1.55 ± 0.12	Pass
DW-60087,60088	5/14/2015	Ra-228	0.94 ± 0.50	0.94 ± 0.50	0.94 ± 0.35	Pass
SG-2436,2437	5/15/2015	Pb-214	22.90 ± 2.31	24.10 ± 2.43	23.50 ± 1.68	Pass
SG-2436,2437	5/15/2015	Ra-228	47.95 ± 0.61	47.80 ± 0.71	47.88 ± 0.47	Pass
SG-2436,2437	5/15/2015	Gr. Alpha	267.8 ± 7.9	254.6 ± 7.6	261.2 ± 5.5	Pass
SG-2458,2459	5/19/2015	Pb-214	75.00 ± 1.66	77.70 ± 1.75	76.35 ± 1.21	Pass
SG-2458,2459	5/19/2015	Ra-228	41.10 ± 0.92	40.80 ± 0.83	40.95 ± 0.62	Pass
DW-60095,60096	5/26/2015	Gr. Alpha	1.34 ± 0.69	0.91 ± 0.62	1.13 ± 0.46	Pass
AP-052715	5/27/2015	Gr. Beta	0.010 ± 0.003	0.010 ± 0.003	0.010 ± 0.002	Pass
S-2627,2628	5/29/2015	Pb-214	0.85 ± 0.07	0.85 ± 0.07	0.85 ± 0.05	Pass
S-2627,2628	5/29/2015	Ac-228	0.85 ± 0.14	1.08 ± 0.12	0.97 ± 0.09	Pass
S-2627,2628	5/29/2015	Cs-137	0.07 ± 0.02	0.07 ± 0.02	0.07 ± 0.01	Pass
S-2605,2606	6/1/2015	Ac-228	0.42 ± 0.06	0.38 ± 0.07	0.40 ± 0.05	Pass
S-2605,2606	6/1/2015	Ra-226	0.44 ± 0.03	0.49 ± 0.03	0.47 ± 0.02	Pass
S-2605,2606	6/1/2015	K-40	10.89 ± 0.51	11.40 ± 0.48	11.15 ± 0.35	Pass
S-2605,2606	6/1/2015	Cs-137	0.05 ± 0.01	0.05 ± 0.01	0.05 ± 0.01	Pass
S-2858,2859	6/2/2015	Cs-137	34.30 ± 16.05	40.66 ± 17.79	37.48 ± 11.98	Pass
S-2858,2859	6/2/2015	Be-7	1501 ± 264	1171 ± 214	1336 ± 170	Pass
S-2858,2859	6/2/2015	K-40	22,122 ± 658	20,987 ± 600	21,555 ± 445	Pass
AP-060315	6/3/2015	Gr. Beta	0.022 ± 0.004	0.021 ± 0.004	0.022 ± 0.003	Pass
DW-30107,30108	6/8/2015	Gr. Alpha	1.34 ± 0.82	1.47 ± 0.85	1.41 ± 0.59	Pass
SG-2900,2901	6/9/2015	Ac-228	10.22 ± 1.36	8.32 ± 1.07	9.27 ± 0.87	Pass
SG-2900,2901	6/9/2015	Pb-214	7.55 ± 0.43	7.27 ± 0.41	7.41 ± 0.30	Pass
AP-061515	6/15/2015	Gr. Beta	0.022 ± 0.004	0.021 ± 0.004	0.022 ± 0.003	Pass
XWW-3173,3174	6/18/2015	H-3	841.9 ± 123.6	799.3 ± 122.4	820.6 ± 87.0	Pass
AP-062215	6/22/2015	Gr. Beta	0.023 ± 0.004	0.018 ± 0.004	0.020 ± 0.003	Pass
S-3216,3217	6/24/2015	K-40	10.38 ± 0.51	10.51 ± 0.53	10.45 ± 0.37	Pass
S-3216,3217	6/24/2015	Be-7	3.65 ± 0.24	3.38 ± 0.27	3.52 ± 0.18	Pass
VE-3300,3301	6/24/2015	Be-7	0.78 ± 0.15	0.83 ± 0.23	0.81 ± 0.14	Pass
VE-3300,3301	6/24/2015	K-40	29.12 ± 0.62	29.36 ± 0.64	29.24 ± 0.45	Pass
AP-062915	6/29/2015	Gr. Beta	0.023 ± 0.005	0.023 ± 0.005	0.023 ± 0.003	Pass
WW-3632,3633	6/30/2015	H-3	5,169 ± 225	5,058 ± 223	5,114 ± 158	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
AP-3822, 3823	7/1/2015	Be-7	0.075 ± 0.011	0.068 ± 0.012	0.072 ± 0.008	Pass
AP-3969, 3970	7/1/2015	Be-7	0.063 ± 0.008	0.064 ± 0.010	0.063 ± 0.006	Pass
WW-3632, 3633	7/6/2015	H-3	5,169 ± 225	5,058 ± 223	5,114 ± 159	Pass
W-4368, 4369	7/6/2015	Gr. Alpha	26.70 ± 4.00	24.10 ± 3.90	25.40 ± 2.79	Pass
W-4368, 4369	7/6/2015	Gr. Beta	34.62 ± 2.10	33.30 ± 2.02	33.96 ± 1.46	Pass
DW-60138, 60139	7/7/2015	Ra-226	0.07 ± 0.04	0.11 ± 0.05	0.09 ± 0.03	Pass
DW-60138, 60139	7/7/2015	Ra-228	1.04 ± 0.41	1.15 ± 0.47	1.10 ± 0.31	Pass
WW-4158, 4159	7/9/2015	H-3	138.8 ± 82.4	174.0 ± 84.1	156.4 ± 58.9	Pass
MI-2902, 2903	7/10/2015	K-40	1271 ± 118	1308 ± 115	1289 ± 82	Pass
SG-3533, 3534	7/10/2015	Gr. Alpha	238.0 ± 8.2	249.5 ± 8.5	243.8 ± 5.9	Pass
DW-60150, 60151	7/10/2015	Ra-226	1.53 ± 0.16	1.49 ± 0.12	1.51 ± 0.10	Pass
DW-60150, 60151	7/10/2015	Ra-228	2.68 ± 0.68	1.89 ± 0.62	2.29 ± 0.46	Pass
VE-3716, 3717	7/14/2015	K-40	3.85 ± 0.33	3.71 ± 0.31	3.78 ± 0.23	Pass
MI-3759, 3760	7/15/2015	K-40	1819 ± 127	1764 ± 140	1791 ± 94	Pass
MI-3759, 3760	7/15/2015	Sr-90	1.00 ± 0.36	0.61 ± 0.32	0.80 ± 0.24	Pass
AP-072115	7/21/2015	Gr. Beta	0.022 ± 0.004	0.027 ± 0.004	0.024 ± 0.003	Pass
VE-4053, 4054	7/21/2015	Be-7	0.52 ± 0.15	0.49 ± 0.11	0.50 ± 0.09	Pass
VE-4053, 4054	7/21/2015	K-40	8.00 ± 0.42	7.61 ± 0.31	7.81 ± 0.26	Pass
AP-4200, 4201	7/29/2015	Be-7	1.06 ± 0.12	0.96 ± 0.11	1.01 ± 0.08	Pass
AP-4200, 4201	7/29/2015	K-40	5.03 ± 0.24	4.96 ± 0.23	4.99 ± 0.16	Pass
W-4137, 4138	7/31/2015	Ra-226	0.58 ± 0.13	0.45 ± 0.14	0.52 ± 0.10	Pass
XWW-4431, 4432	8/5/2015	H-3	4,773 ± 213	4,915 ± 216	4,844 ± 152	Pass
SG-4305, 4306	8/6/2015	Ra-228	10.34 ± 0.58	11.46 ± 0.62	10.90 ± 0.42	Pass
AP-081015	8/10/2015	Gr. Beta	0.038 ± 0.005	0.039 ± 0.005	0.039 0.004	Pass
AP-081115	8/11/2015	Gr. Beta	0.024 ± 0.004	0.020 ± 0.004	0.022 0.003	Pass
VE-4452, 4453	8/11/2015	K-40	3.77 ± 0.29	3.78 ± 0.26	3.77 ± 0.20	Pass
AP-081715	8/17/2015	Gr. Beta	0.030 ± 0.005	0.030 ± 0.005	0.030 ± 0.003	Pass
DW-60195, 60196	8/17/2015	Ra-226	0.39 ± 0.10	0.37 ± 0.10	0.38 ± 0.07	Pass
DW-60195, 60196	8/17/2015	Ra-228	1.43 ± 0.51	1.97 ± 0.61	1.70 ± 0.40	Pass
DW-60198, 60199	8/17/2015	Gr. Alpha	2.93 ± 0.94	2.11 ± 0.96	2.52 ± 0.67	Pass
VE-4578, 4579	8/18/2015	K-40	4.14 ± 0.25	4.32 ± 0.24	4.23 ± 0.17	Pass
SW-4662, 4663	8/25/2015	H-3	351.3 ± 89.8	415.6 ± 92.8	383.4 ± 64.6	Pass
DW-60212, 60213	8/25/2015	Ra-226	0.09 ± 0.07	0.10 ± 0.08	0.10 ± 0.05	Pass
LW-4788, 4789	8/27/2015	Gr. Beta	0.97 ± 0.51	1.68 ± 0.59	1.32 ± 0.39	Pass
AP-083115	8/31/2015	Gr. Beta	0.032 ± 0.005	0.031 ± 0.005	0.031 ± 0.003	Pass
AP-4875, 4876	9/3/2015	Be-7	0.294 ± 0.125	0.202 ± 0.109	0.248 ± 0.083	Pass
VE-5083, 5084	9/14/2015	Be-7	0.47 ± 0.23	0.56 ± 0.19	0.52 ± 0.15	Pass
VE-5083, 5084	9/14/2015	K-40	6.20 ± 0.51	6.36 ± 0.50	6.28 ± 0.36	Pass
VE-5167, 5168	9/16/2015	Be-7	0.40 ± 0.11	0.41 ± 0.10	0.41 ± 0.07	Pass
VE-5167, 5168	9/16/2015	K-40	3.56 ± 0.27	3.91 ± 0.24	3.74 ± 0.18	Pass
BS-5188, 5189	9/16/2015	K-40	9.69 ± 0.51	10.51 ± 0.52	10.10 ± 0.36	Pass
F-5419, 5420	9/17/2015	K-40	3.48 ± 0.47	3.49 ± 0.56	3.49 ± 0.36	Pass
DW-60238, 60239	9/18/2015	Ra-226	1.93 ± 0.23	2.31 ± 0.26	2.12 ± 0.17	Pass
DW-60238, 60239	9/18/2015	Ra-228	4.44 ± 0.78	5.61 ± 0.84	5.03 ± 0.57	Pass
AP-092215A/B	9/22/2015	Gr. Beta	0.021 ± 0.004	0.025 ± 0.004	0.023 ± 0.00	Pass
WW-5398, 5399	9/22/2015	H-3	1,857 ± 145	1,846 ± 144	1,852 ± 102	Pass
AP-6007, 6008	9/28/2015	Be-7	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
XW-7490, 7491	9/29/2015	Ni-63	2,332 ± 233	2,108 ± 211	2,220 ± 157	Pass
WW-5377, 5378	9/30/2015	H-3	220.0 ± 84.6	197.0 ± 83.5	208.5 ± 59.4	Pass
AP-6028, 6029	9/30/2015	Be-7	0.073 ± 0.009	0.083 ± 0.012	0.078 ± 0.007	Pass
G-5461,2	10/1/2015	Be-7	2.02 ± 0.32	1.98 ± 0.25	2.00 ± 0.20	Pass
G-5461,2	10/1/2015	K-40	8.77 ± 0.66	9.31 ± 0.59	9.04 ± 0.44	Pass
SO-5482, 5483	10/1/2015	Ac-228	0.76 ± 0.12	0.74 ± 0.30	0.75 ± 0.16	Pass
SO-5482, 5483	10/1/2015	Bi-214	0.53 ± 0.04	0.52 ± 0.04	0.52 ± 0.03	Pass
SO-5482, 5483	10/1/2015	Cs-137	0.12 ± 0.03	0.12 ± 0.03	0.12 ± 0.02	Pass
SO-5482, 5483	10/1/2015	K-40	2.17 ± 0.73	2.10 ± 0.72	2.13 ± 0.51	Pass
SO-5482, 5483	10/1/2015	Pb-214	0.57 ± 0.04	0.55 ± 0.04	0.56 ± 0.03	Pass
SO-5482, 5483	10/1/2015	Ra-226	1.45 ± 0.27	1.46 ± 0.30	1.45 ± 0.20	Pass
SO-5482, 5483	10/1/2015	Tl-208	0.24 ± 0.03	0.25 ± 0.03	0.24 ± 0.02	Pass
WW-5524, 5525	10/5/2015	H-3	1,192 ± 123	1,318 ± 127	1,255 ± 89	Pass
AP-5881, 5882	10/5/2015	Be-7	0.078 ± 0.008	0.085 ± 0.011	0.082 ± 0.007	Pass
AP-5881, 5882	10/5/2015	K-40	0.009 ± 0.004	0.010 ± 0.006	0.010 ± 0.004	Pass
SG-6400,1	10/5/2015	Gr. Alpha	19.09 ± 3.14	19.45 ± 3.25	19.27 ± 2.26	Pass
SG-6400,1	10/5/2015	Gr. Beta	31.36 ± 2.08	29.80 ± 2.13	30.58 ± 1.49	Pass
VE-5923, 5924	10/12/2015	K-40	4.29 ± 0.29	4.13 ± 0.33	4.21 ± 0.22	Pass
SS-5818, 5819	10/14/2015	Ac-228	0.20 ± 0.06	0.24 ± 0.06	0.22 ± 0.04	Pass
SS-5818, 5819	10/14/2015	Cs-137	0.03 ± 0.02	0.02 ± 0.01	0.03 ± 0.01	Pass
SS-5818, 5819	10/14/2015	Gr. Beta	8.10 ± 0.87	8.08 ± 0.96	8.09 ± 0.65	Pass
SS-5818, 5819	10/14/2015	Pb-212	0.19 ± 0.03	0.17 ± 0.02	0.18 ± 0.02	Pass
SS-5818, 5819	10/14/2015	Ra-226	0.47 ± 0.24	0.45 ± 0.19	0.46 ± 0.15	Pass
SS-5818, 5819	10/14/2015	Tl-208	0.06 ± 0.02	0.06 ± 0.02	0.06 ± 0.01	Pass
DW-60251, 60252	10/15/2015	Ra-226	0.56 ± 0.12	0.50 ± 0.08	0.53 ± 0.07	Pass
DW-60251, 60252	10/15/2015	Ra-228	0.79 ± 0.48	1.16 ± 0.59	0.98 ± 0.38	Pass
SO-5944, 5945	10/21/2015	Ac-228	1.08 ± 0.15	1.14 ± 0.15	1.11 ± 0.10	Pass
SO-5944, 5945	10/21/2015	Bi-214	0.89 ± 0.08	0.82 ± 0.06	0.85 ± 0.05	Pass
SO-5944, 5945	10/21/2015	Cs-137	0.06 ± 0.02	0.08 ± 0.03	0.07 ± 0.02	Pass
SO-5944, 5945	10/21/2015	Pb-212	1.06 ± 0.06	0.99 ± 0.05	1.03 ± 0.04	Pass
SO-5944, 5945	10/21/2015	Pb-214	1.00 ± 0.09	0.89 ± 0.06	0.95 ± 0.05	Pass
SO-5944, 5945	10/21/2015	Ra-226	2.13 ± 0.43	2.16 ± 0.37	2.14 ± 0.28	Pass
SO-5944, 5945	10/21/2015	Tl-208	0.36 ± 0.04	0.34 ± 0.04	0.35 ± 0.03	Pass
S-6175, 6176	10/23/2015	K-40	16.86 ± 1.92	14.28 ± 1.66	15.57 ± 1.27	Pass
XWW-6196, 6197	10/26/2015	H-3	2,856 ± 170	2,815 ± 169	2,836 ± 120	Pass
SO-6259, 6260	10/28/2015	Ac-228	0.60 ± 0.10	0.53 ± 0.08	0.57 ± 0.07	Pass
SO-6259, 6260	10/28/2015	Bi-214	0.40 ± 0.06	0.50 ± 0.05	0.45 ± 0.04	Pass
SO-6259, 6260	10/28/2015	Cs-137	0.17 ± 0.03	0.19 ± 0.03	0.18 ± 0.02	Pass
SO-6259, 6260	10/28/2015	Gr. Beta	21.6 ± 1.1	23.36 ± 1.21	22.48 ± 0.82	Pass
SO-6259, 6260	10/28/2015	Pb-212	0.53 ± 0.04	0.49 ± 0.04	0.51 ± 0.03	Pass
SO-6259, 6260	10/28/2015	Tl-208	0.16 ± 0.03	0.19 ± 0.04	0.18 ± 0.02	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
LW-6280, 6281	10/29/2015	Gr. Beta	2.03 ± 0.91	1.97 ± 0.97	2.00 ± 0.67	Pass
MI-6484, 6485	11/11/2015	K-40	1,384 ± 82	1,432 ± 89	1,408 ± 60	Pass
SO-6841, 6842	11/24/2015	Cs-137	0.18 ± 0.03	0.16 ± 0.03	0.17 ± 0.02	Pass
SO-6841, 6842	11/24/2015	K-40	13.62 ± 0.76	13.67 ± 0.69	13.64 ± 0.51	Pass
WW-6978, 6979	11/30/2015	H-3	569.0 ± 97.7	480.3 ± 93.9	524.7 ± 67.8	Pass
SW-6936, 6937	12/10/2015	H-3	151.9 ± 80.0	176.2 ± 81.2	164.0 ± 57.0	Pass
SW-7017, 7018	12/10/2015	H-3	584.3 ± 98.7	451.6 ± 93.9	518.0 ± 68.1	Pass
LW-7020, 7021	12/10/2015	H-3	236.9 ± 84.2	285.6 ± 86.5	261.2 ± 60.3	Pass
AP-7351, 7352	12/29/2015	Be-7	0.099 ± 0.020	0.084 ± 0.018	0.091 ± 0.014	Pass
AP-7414, 7415	12/30/2015	Be-7	0.049 ± 0.013	0.048 ± 0.011	0.048 ± 0.008	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil, sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-975	2/1/2015	Ni-63	341 ± 18	448	314 - 582	Pass
MASO-975	2/1/2015	Sr-90	523 ± 12	653	457 - 849	Pass
MASO-975	2/1/2015	Tc-99	614 ± 12	867	607 - 1,127	Pass
MASO-975	2/1/2015	Cs-134	533 ± 6	678	475 - 881	Pass
MASO-975	2/1/2015	Cs-137	0.8 ± 2.5	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-57	0.5 ± 1.0	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-60	741 ± 8	817	572 - 1,062	Pass
MASO-975	2/1/2015	Mn-54	1,153 ± 9	1,198	839 - 1,557	Pass
MASO-975	2/1/2015	Zn-65	892 ± 18	1064	745 - 1,383	Pass
MAW-969	2/1/2015	Am-241	0.650 ± 0.078	0.654	0.458 - 0.850	Pass
MAW-969	2/1/2015	Cs-134	21.1 ± 0.3	23.5	16.5 - 30.6	Pass
MAW-969	2/1/2015	Cs-137	19.6 ± 0.3	19.1	13.4 - 24.8	Pass
MAW-969 [d]	2/1/2015	Co-57	10.2 ± 0.4	29.9	20.9 - 38.9	Fail
MAW-969	2/1/2015	Co-60	0.02 ± 0.05	0.00	NA [c]	Pass
MAW-969	2/1/2015	H-3	569 ± 13	563	394 - 732	Pass
MAW-969	2/1/2015	Fe-55	6.00 ± 6.60	6.88	4.82 - 8.94	Pass
MAW-969	2/1/2015	Mn-54	0.02 ± 0.07	0.00	NA [c]	Pass
MAW-969	2/1/2015	Ni-63	2.9 ± 3.0	0.00	NA [c]	Pass
MAW-969	2/1/2015	Zn-65	16.5 ± 0.9	18.3	12.8 - 23.8	Pass
MAW-969	2/1/2015	Tc-99	3.40 ± 0.60	3.18	2.23 - 4.13	Pass
MAW-969	2/1/2015	Pu-238	0.02 ± 0.03	0.01	NA [e]	Pass
MAW-969	2/1/2015	Pu-239/240	0.81 ± 0.10	0.83	0.58 - 1.08	Pass
MAW-969	2/1/2015	U-233/234	0.150 ± 0.040	0.148	0.104 - 0.192	Pass
MAW-969	2/1/2015	U-238	0.84 ± 0.09	0.97	0.68 - 1.26	Pass
MAW-969	2/1/2015	Sr-90	9.40 ± 1.30	9.48	6.64 - 12.32	Pass
MAW-950	2/1/2015	Gr. Alpha	0.66 ± 0.05	1.07	0.32 - 1.81	Pass
MAW-950	2/1/2015	Gr. Beta	2.72 ± 0.06	2.79	1.40 - 4.19	Pass
MAW-947	2/1/2015	I-129	1.26 ± 0.12	1.49	1.04 - 1.94	Pass
MAAP-978	2/1/2015	Am-241	0.069 ± 0.200	0.068	0.048 - 0.089	Pass
MAAP-978	2/1/2015	Cs-134	1.00 ± 0.04	1.15	0.81 - 1.50	Pass
MAAP-978	2/1/2015	Cs-137	0.004 ± 0.023	0.00	NA [c]	Pass
MAAP-978 [f]	2/1/2015	Co-57	0.04 ± 0.04	1.51	1.06 - 1.96	Fail
MAAP-978	2/1/2015	Co-60	0.01 ± 0.02	0.00	NA [c]	Pass
MAAP-978	2/1/2015	Mn-54	1.11 ± 0.08	1.02	0.71 - 1.33	Pass
MAAP-978	2/1/2015	Zn-65	0.83 ± 0.10	0.83	0.58 - 1.08	Pass
MAAP-978	2/1/2015	Pu-238	-0.003 ± 0.010	0.000	NA [c]	Pass
MAAP-978	2/1/2015	Pu-239/240	0.090 ± 0.022	0.085	0.059 - 0.110	Pass
MAAP-978	2/1/2015	U-233/234	0.020 ± 0.010	0.016	0.011 - 0.020	Pass
MAAP-978	2/1/2015	U-238	0.073 ± 0.018	0.099	0.069 - 0.129	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAAP-981	2/1/2015	Sr-89	38.1 ± 1.0	47.5	33.3 - 61.8	Pass
MAAP-981	2/1/2015	Sr-90	1.22 ± 0.13	1.06	0.74 - 1.38	Pass
MAAP-984	2/1/2015	Gr. Alpha	0.59 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-984	2/1/2015	Gr. Beta	0.95 ± 0.07	0.75	0.38 - 1.13	Pass
MAVE-972	2/1/2015	Cs-134	6.98 ± 0.13	7.32	5.12 - 9.52	Pass
MAVE-972	2/1/2015	Cs-137	9.73 ± 0.21	9.18	6.43 - 11.93	Pass
MAVE-972	2/1/2015	Co-57	0.01 ± 0.04	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Co-60	3.89 ± 0.20	5.55	3.89 - 7.22	Pass
MAVE-972	2/1/2015	Mn-54	0.04 ± 0.07	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Zn-65	0.09 ± 0.12	0.00	NA [c]	Pass
MAAP-978	2/1/2015	Pu-238	-0.003 ± 0.010	0.000	NA [c]	Pass
MAAP-978	2/1/2015	Pu-239/240	0.090 ± 0.022	0.085	0.059 - 0.110	Pass
MAAP-978	2/1/2015	U-233/234	0.020 ± 0.010	0.016	0.011 - 0.020	Pass
MAAP-978	2/1/2015	U-238	0.073 ± 0.018	0.099	0.069 - 0.129	Pass
MAAP-981	2/1/2015	Sr-89	38.1 ± 1.0	47.5	33.3 - 61.8	Pass
MAAP-981	2/1/2015	Sr-90	1.22 ± 0.13	1.06	0.74 - 1.38	Pass
MAAP-984	2/1/2015	Gr. Alpha	0.59 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-984	2/1/2015	Gr. Beta	0.95 ± 0.07	0.75	0.38 - 1.13	Pass
MAVE-972	2/1/2015	Cs-134	6.98 ± 0.13	7.32	5.12 - 9.52	Pass
MAVE-972	2/1/2015	Cs-137	9.73 ± 0.21	9.18	6.43 - 11.93	Pass
MAVE-972	2/1/2015	Co-57	0.01 ± 0.04	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Co-60	3.89 ± 0.20	5.55	3.89 - 7.22	Pass
MAVE-972	2/1/2015	Mn-54	0.04 ± 0.07	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Zn-65	0.09 ± 0.12	0.00	NA [c]	Pass
MASO-4903	8/1/2015	Ni-63	556 ± 18	682	477 - 887	Pass
MASO-4903 [g]	8/1/2015	Sr-90	231 ± 7	425	298 - 553	Fail
MASO-4903 [g]	8/1/2015	Sr-90	352 ± 10	425	298 - 553	Pass
MASO-4903 [h]	8/1/2015	Tc-99	411 ± 11	631	442 - 820	Fail
MASO-4903	8/1/2015	Cs-134	833 ± 10	1,010	707 - 1,313	Pass
MASO-4903	8/1/2015	Cs-137	808 ± 11	809.00	566 - 1,052	Pass
MASO-4903	8/1/2015	Co-57	1,052 ± 10	1,180	826 - 1,534	Pass
MASO-4903	8/1/2015	Co-60	2 ± 2	1.3	NA [e]	Pass
MASO-4903	8/1/2015	Mn-54	1,331 ± 13	1,340	938 - 1,742	Pass
MASO-4903	8/1/2015	Zn-65	686 ± 15	662	463 - 861	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAW-5007	8/1/2015	Cs-134	16.7 ± 0.4	23.1	16.2 - 30.0	Pass
MAW-5007	8/1/2015	Cs-137	-0.4 ± 0.1	0.0	NA [c]	Pass
MAW-5007	8/1/2015	Co-57	21.8 ± 0.4	20.8	14.6 - 27.0	Pass
MAW-5007	8/1/2015	Co-60	17.3 ± 0.3	17.1	12.0 - 22.2	Pass
MAW-5007	8/1/2015	H-3	227.5 ± 8.9	216.0	151.0 - 281.0	Pass
MAW-5007 [i]	8/1/2015	Fe-55	4.2 ± 14.1	13.1	9.2 - 17.0	Fail
MAW-5007	8/1/2015	Mn-54	16.6 ± 0.5	15.6	10.9 - 20.3	Pass
MAW-5007	8/1/2015	Ni-63	9.1 ± 2.6	8.6	6.0 - 11.1	Pass
MAW-5007	8/1/2015	Zn-65	15.5 ± 0.9	13.9	9.7 - 18.1	Pass
MAW-5007	8/1/2015	Tc-99	6.80 ± 0.60	7.19	5.03 - 9.35	Pass
MAW-5007	8/1/2015	Sr-90	4.80 ± 0.50	4.80	3.36 - 6.24	Pass
MAW-5007	8/1/2015	Gr. Alpha	0.41 ± 0.04	0.43	0.13 - 0.73	Pass
MAW-5007	8/1/2015	Gr. Beta	3.45 ± 0.07	3.52	1.76 - 5.28	Pass
MAW-5007	8/1/2015	I-129	1.42 ± 0.13	1.49	1.04 - 1.94	Pass
MAAP-4911	8/1/2015	Sr-89	3.55 ± 0.67	3.98	2.79 - 5.17	Pass
MAAP-4911	8/1/2015	Sr-90	0.94 ± 0.16	1.05	0.74 - 1.37	Pass
MAAP-4907	8/1/2015	Gr. Alpha	0.30 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-4907	8/1/2015	Gr. Beta	1.85 ± 0.09	1.56	0.78 - 2.34	Pass
MAVE-4901	8/1/2015	Cs-134	5.56 ± 0.16	5.80	4.06 - 7.54	Pass
MAVE-4901	8/1/2015	Cs-137	-0.02 ± 0.06	0.00	NA [c]	Pass
MAVE-4901	8/1/2015	Co-57	7.74 ± 0.18	6.62	4.63 - 8.61	Pass
MAVE-4901	8/1/2015	Co-60	4.84 ± 0.15	4.56	3.19 - 5.93	Pass
MAVE-4901	8/1/2015	Mn-54	8.25 ± 0.25	7.68	5.38 - 9.98	Pass
MAVE-4901	8/1/2015	Zn-65	5.78 ± 0.29	5.46	3.82 - 7.10	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: MAW (water), MAAP (air filter), MASO (soil), MAVE (vegetation).

[c] MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Lab result was 27.84. Data entry error resulted in a non-acceptable result.

[e] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[f] Lab result was 1.58. Data entry error resulted in a non-acceptable result.

[g] The incomplete separation of calcium from strontium caused a failed low result. The result of reanalysis acceptable.

[h] The complex sample matrix is interfering with yield calculations causing a failed low result. An investigation is in process to determine a more reliable yield determination.

[i] The known activity was below the routine laboratory detection limits for the available aliquot fraction.

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code [b]	Date	Analysis	Concentration (pCi/L) [b] Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERAP-1091	3/16/2015	Am-241	46.8 ± 2.2	49.8	30.7 - 67.4	Pass
ERAP-1091	3/16/2015	Co-60	85.1 ± 2.9	79.1	61.2 - 98.8	Pass
ERAP-1091	3/16/2015	Cs-134	825.6 ± 34.7	909.0	578.0 - 1,130.0	Pass
ERAP-1091	3/16/2015	Cs-137	1,312 ± 12	1,170	879 - 1,540	Pass
ERAP-1091	3/16/2015	Fe-55	760.6 ± 48.2	836.0	259.0 - 1630.0	Pass
ERAP-1091	3/16/2015	Mn-54	<2.7	<50	0.0 - 50.0	Pass
ERAP-1091	3/16/2015	Pu-238	51.0 ± 3.9	52.1	35.7 - 68.5	Pass
ERAP-1091	3/16/2015	Pu-239/240	38.3 ± 1.3	40.3	29.20 - 52.70	Pass
ERAP-1091	3/16/2015	Sr-90	95.3 ± 11.4	96.6	47.2 - 145.0	Pass
ERAP-1091	3/16/2015	U-233/234	29.0 ± 1.2	34.3	21.3 - 51.7	Pass
ERAP-1091	3/16/2015	U-238	31.0 ± 1.1	34.0	22.0 - 47.0	Pass
ERAP-1091	3/16/2015	Zn-65	1099.3 ± 146.5	986.0	706.0 - 1360.0	Pass
ERAP-1094	3/16/2015	Gr. Alpha	73.7 ± 0.7	62.2	20.8 - 96.6	Pass
ERAP-1094	3/16/2015	Gr. Beta	69.6 ± 0.8	58.4	36.9 - 85.1	Pass
ERSO-1098	3/16/2015	Am-241	1571.8 ± 209.6	1,500	878 - 1,950	Pass
ERSO-1098	3/16/2015	Ac-228	1198.8 ± 140.4	1,250	802 - 1,730	Pass
ERSO-1098	3/16/2015	Bi-212	1420.1 ± 455.7	1,780	474 - 2,620	Pass
ERSO-1098	3/16/2015	Bi-214	3466.9 ± 86.9	4,430	2,670 - 6,380	Pass
ERSO-1098	3/16/2015	Co-60	1779.8 ± 41.0	1,880	1,270 - 2,590	Pass
ERSO-1098	3/16/2015	Cs-134	5204.6 ± 64.5	6,390	4,180 - 7,680	Pass
ERSO-1098	3/16/2015	Cs-137	1417.1 ± 41.9	1,490	1,140 - 1,920	Pass
ERSO-1098	3/16/2015	K-40	10,597 ± 380	10,700	7,810 - 14,400	Pass
ERSO-1098	3/16/2015	Mn-54	<62.2	< 1000	0.0 - 1,000	Pass
ERSO-1098	3/16/2015	Pb-212	1,032 ± 41	1,230	806 - 1,710	Pass
ERSO-1098	3/16/2015	Pb-214	3,629 ± 93	4,530	2,640 - 6,760	Pass
ERSO-1098	3/16/2015	Pu-238	942.9 ± 128.8	998.0	600.0 - 1,380.0	Pass
ERSO-1098	3/16/2015	Pu-239/240	1,185 ± 140	1,210	791 - 1,670	Pass
ERSO-1098	3/16/2015	Sr-90	1,724 ± 125	1,940	740 - 3,060	Pass
ERSO-1098	3/16/2015	Th-234	3,666 ± 948	3,890	1,230 - 7,320	Pass
ERSO-1098	3/16/2015	U-233/234	3,474 ± 226	3,920	2,400 - 5,020	Pass
ERSO-1098	3/16/2015	U-238	3,620 ± 232	3,890	2,410 - 4,930	Pass
ERSO-1098	3/16/2015	Zn-65	7,362 ± 145	7,130	5,680 - 9,470	Pass
ERW-1095	3/16/2015	Gr. Alpha	93.4 ± 11.5	119.0	42.2 - 184.0	Pass
ERW-1095	3/16/2015	Gr. Beta	145.2 ± 4.8	158.0	90.5 - 234.0	Pass
ERW-1110	3/16/2015	H-3	10,573 ± 78	10,300	6,900 - 14,700	Pass
ERVE-1100	3/16/2015	Am-241	4,537 ± 266	4,340	2,650 - 5,770	Pass
ERVE-1100	3/16/2015	Cm-244	1,338 ± 146	1,360	666 - 2,120	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].

Lab Code [b]	Date	Analysis	Concentration (pCi/L) [b] Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
ERVE-1100 [e]	3/16/2015	Co-60	1,030 ± 29	1,540	1,060 - 2,150	Fail
ERVE-1100 [f]	3/16/2015	Co-60	1,684 ± 48	1,540	1,060 - 2,150	Pass
ERVE-1100 [e]	3/16/2015	Cs-134	1,615 ± 27	2,650	1,700 - 3,440	Fail
ERVE-1100 [f]	3/16/2015	Cs-134	2,554 ± 49	2,650	1,700 - 3,440	Pass
ERVE-1100 [e]	3/16/2015	Cs-137	1,248 ± 29	1,810	1,310 - 2,520	Fail
ERVE-1100 [f]	3/16/2015	Cs-137	2,078 ± 68	1,810	1,310 - 2,520	Pass
ERVE-1100 [e]	3/16/2015	K-40	22,037 ± 463	30,900	22,300 - 43,400	Fail
ERVE-1100 [f]	3/16/2015	K-40	34,895 ± 764	30,900	22,300 - 43,400	Pass
ERVE-1100 [e]	3/16/2015	Mn-54	<13.8	<300	0.0 - 300.0	Pass
ERVE-1100 [f]	3/16/2015	Mn-54	<24.4	<300	0.0 - 300.0	Pass
ERVE-1100	3/16/2015	Pu-238	3,232 ± 232	3,680	2,190 - 5,040	Pass
ERVE-1100	3/16/2015	Pu-239/240	3,606 ± 240	4,180	2,570 - 5,760	Pass
ERVE-1100	3/16/2015	Sr-90	6,023 ± 326	6,590	3,760 - 8,740	Pass
ERVE-1100	3/16/2015	U-233/234	2,653 ± 153	3,150	2,070 - 4,050	Pass
ERVE-1100	3/16/2015	U-238	2,717 ± 163	3,130	2,090 - 3,980	Pass
ERVE-1100 [e]	3/16/2015	Zn-65	<94.6	1,090	786 - 1,530	Fail
ERVE-1100 [f]	3/16/2015	Zn-65	1,306 ± 75	1,090	786 - 1,530	Pass
ERW-1103	3/16/2015	Am-241	47.1 ± 4.0	46.0	31.0 - 61.7	Pass
ERW-1103	3/16/2015	Co-60	1,217 ± 17	1,250	1,090 - 1,460	Pass
ERW-1103	3/16/2015	Cs-134	1,121 ± 18	1,260	925 - 1,450	Pass
ERW-1103	3/16/2015	Cs-137	1,332 ± 31	1,360	1,150 - 1,630	Pass
ERW-1103	3/16/2015	Mn-54	<3.7	<100	0.00 - 100.00	Pass
ERW-1103	3/16/2015	Pu-238	54.5 ± 1.6	72.4	53.6 - 90.1	Pass
ERW-1103 [g]	3/16/2015	Pu-239/240	140.2 ± 7.8	184.0	143.0 - 232.0	Fail
ERW-3742 [h]	9/27/2012	Pu-239/240	89.3 ± 4.9	97.7	66.6 - 108.0	Pass
ERW-1103	3/16/2015	U-233/234	56.5 ± 6.4	61.8	46.4 - 79.7	Pass
ERW-1103	3/16/2015	U-238	58.4 ± 5.8	61.3	46.7 - 75.2	Pass
ERW-1103	3/16/2015	Zn-65	1,191 ± 136	1,180	984 - 1,490	Pass
ERW-1103	3/16/2015	Fe-55	1,149 ± 144	1,070	638 - 1,450	Pass
ERW-1103	3/16/2015	Sr-90	860.0 ± 37.0	912.0	594.0 - 1,210.0	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

[d] Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

[e] Technician error weighing sample caused submitted gamma results to be understated and outside the control limits.(low)

[f] The result of reanalysis with the correct sample volume (Compare to original result, footnoted "e" above).

[g] The results of reanalysis were outside the control limits (low).

[h] Sample ERW-3742 was ordered from ERA to determine why ERW-1103 results for Pu-239 were outside the acceptable range. The results for ERW-3742 were acceptable. No reason for the unacceptable results for ERW-3742 was determined.

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

$s = 2\sigma$ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: $< L$, where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: $< L$, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, $< L$ Reported result: $x \pm s$ if $x \geq L$; $< L$ otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40[c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

Sampling Location Maps

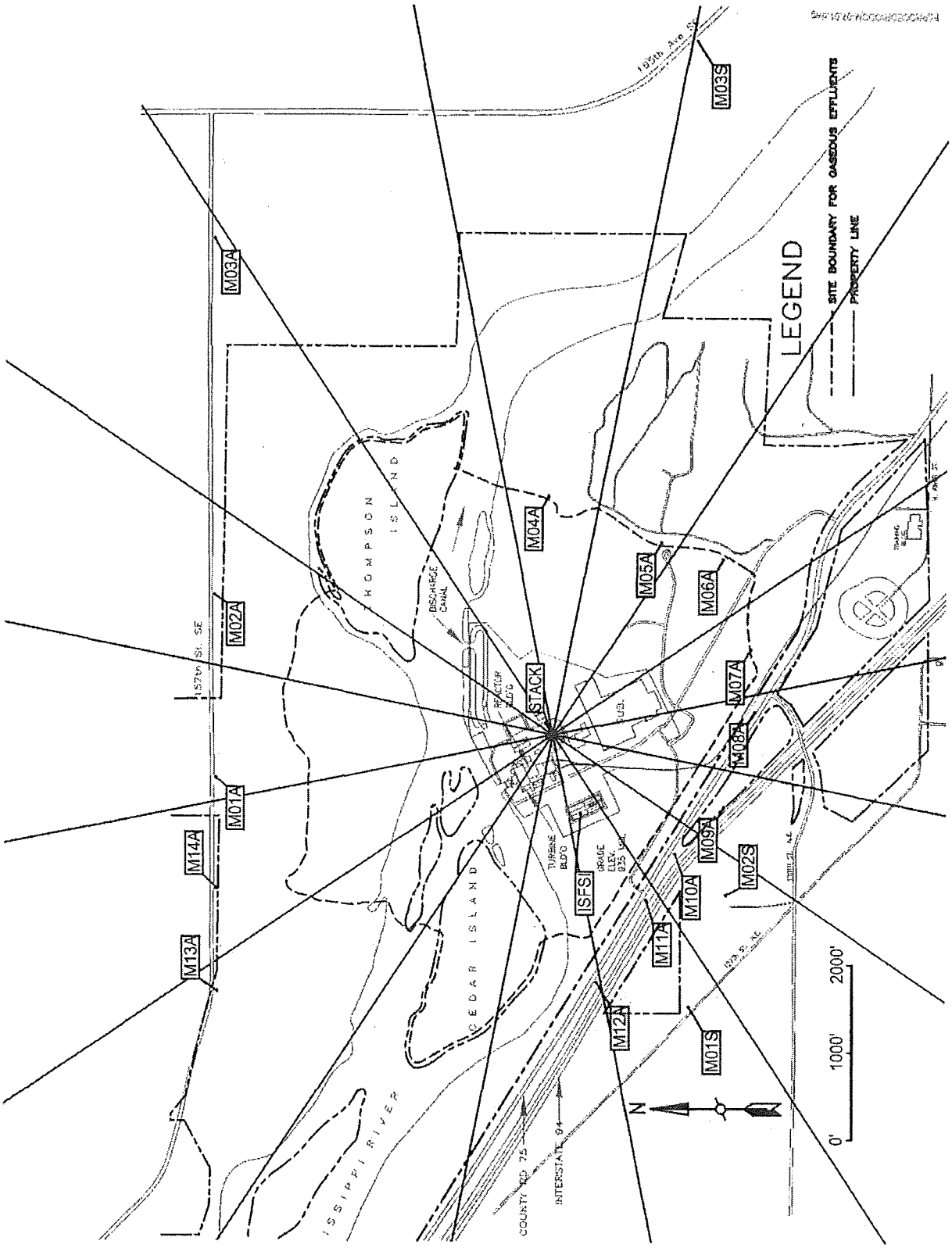

Figure D-1, Sample Collection and Analysis Program: TLD locations, Inner Ring (Table 5.2)

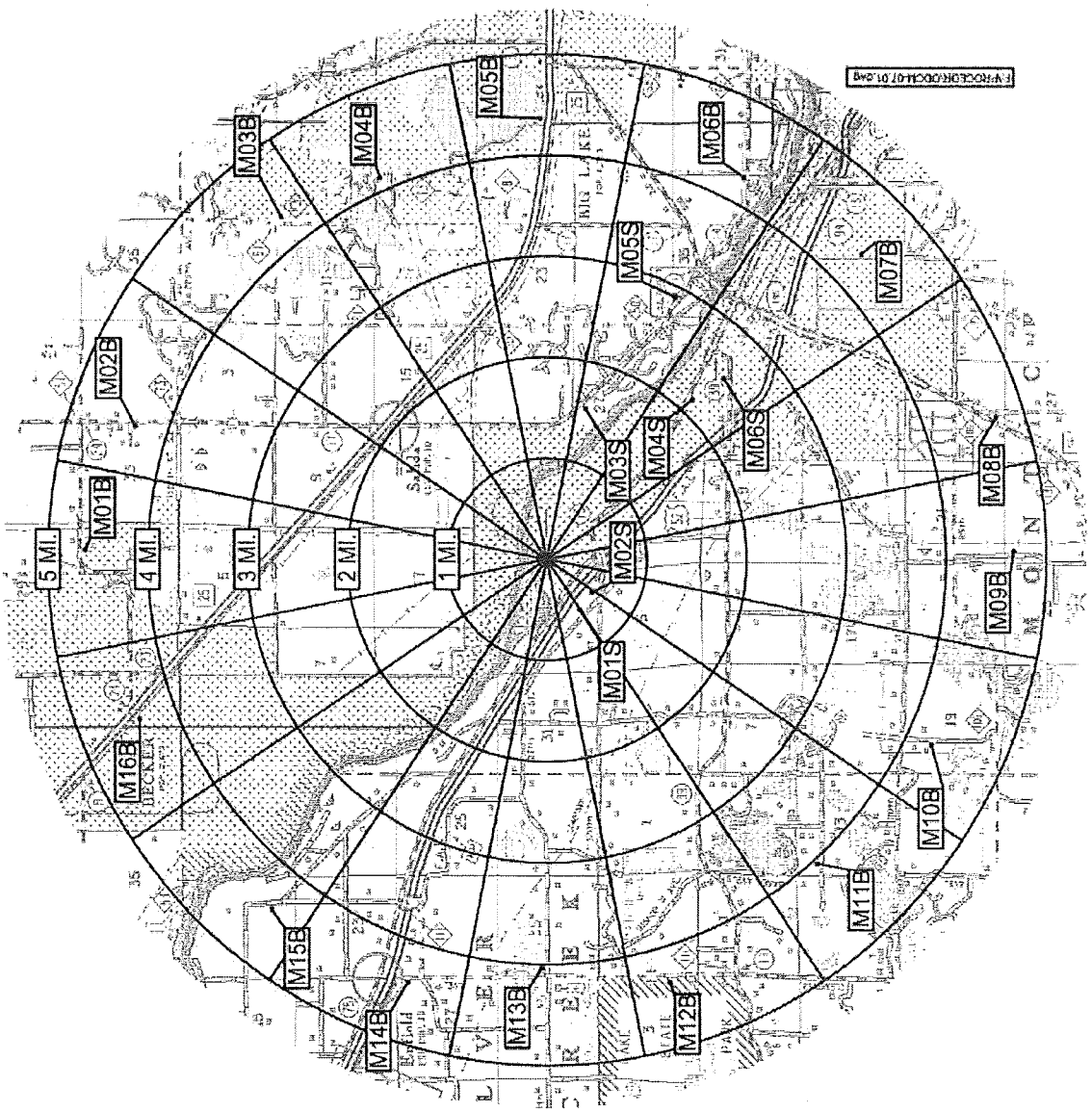

Figure D-2, Sample Collection and Analysis Program: TLD locations, Outer Ring. (Table 5.2)

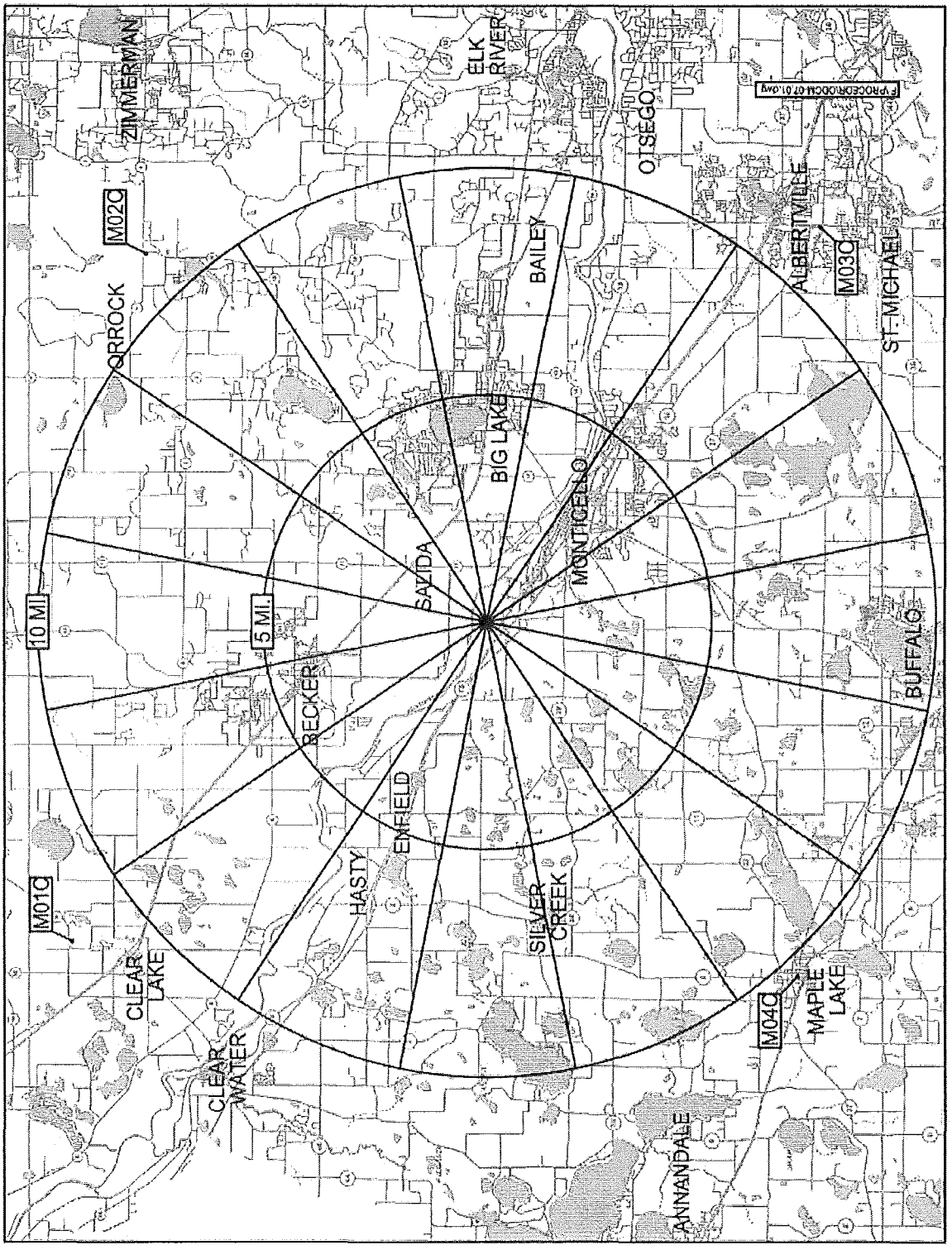

Figure D-3, Sample Collection and Analysis Program: TLD locations, Controls. (Table 5.2)

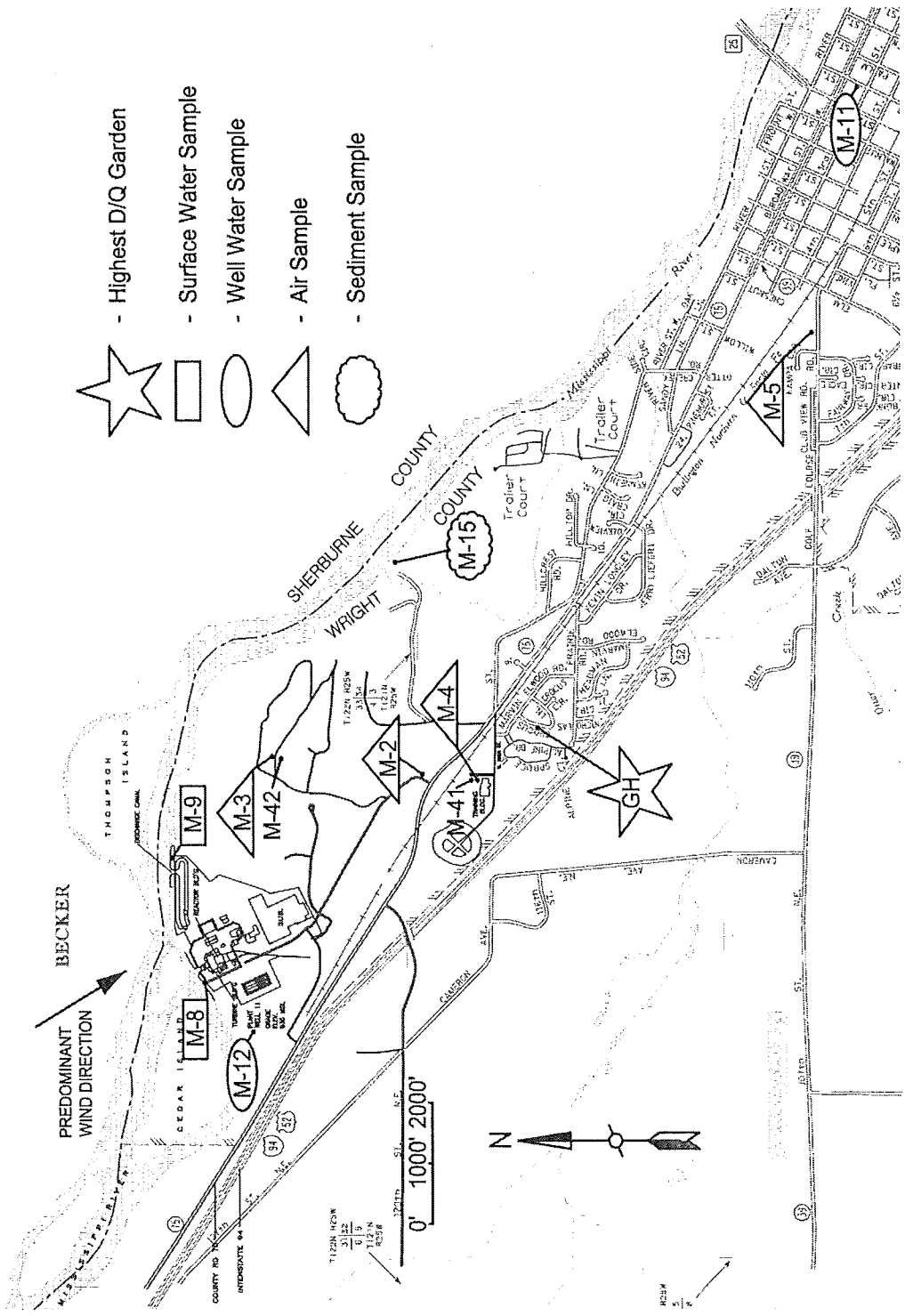

Figure D-4, Sample Collection and Analysis Program: Radiological Environmental Monitoring Program, Well Water and Shoreline sampling locations. (Table 5.2)

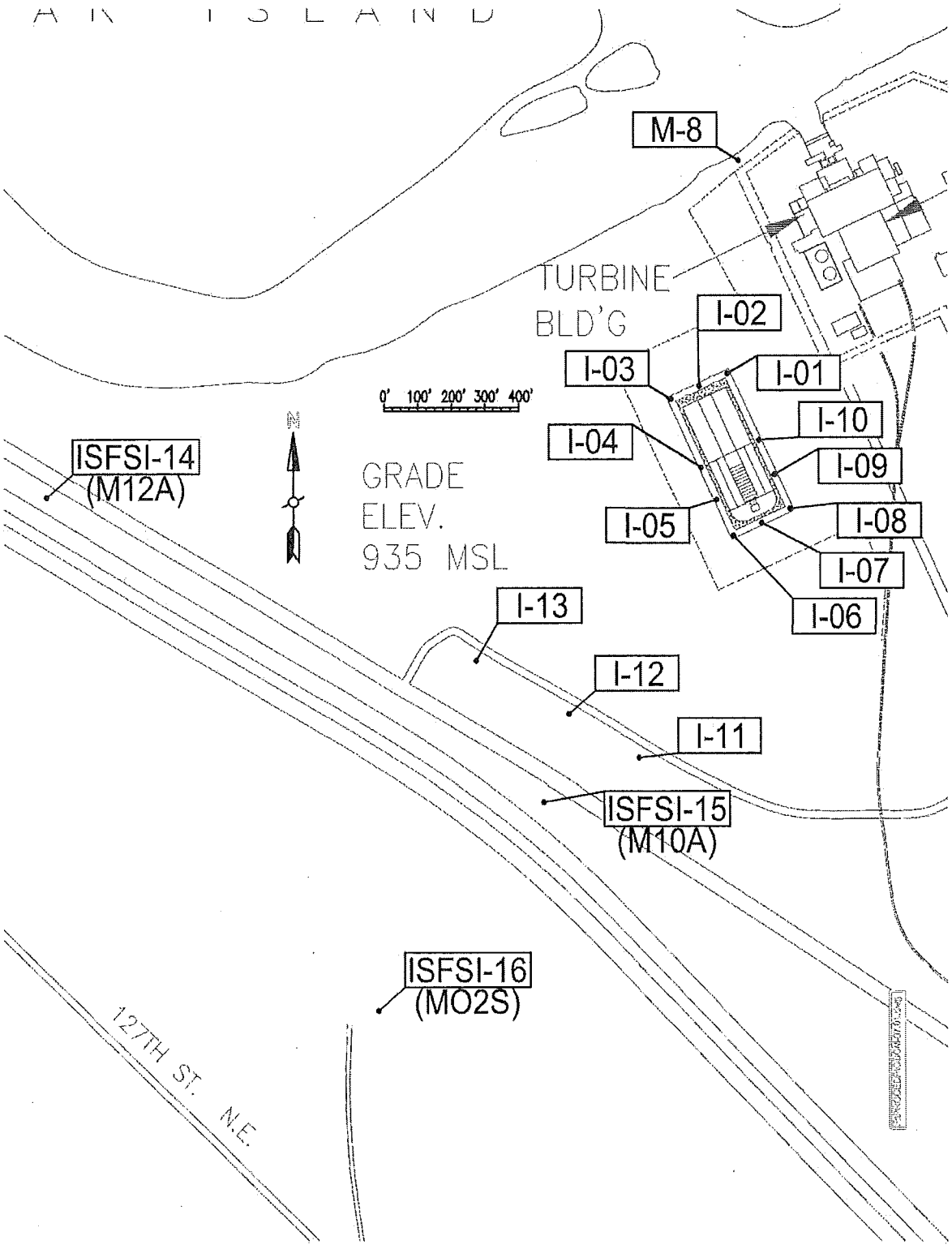

Figure D-5, Sample Collection and analysis program: TLD locations, ISFSI TLD Locations. (Table 5.2)

APPENDIX E

Ground Water Monitoring Well Samples

1.0 INTRODUCTION

This appendix to the Radiological Environmental Monitoring Program Annual Report to the United States Nuclear Regulatory Commission summarizes and interprets results of the Ground Water Monitoring Program samples taken at the Monticello Nuclear Plant, Monticello, Minnesota, during the period January – December 2015. This sampling program was established in October of 2006 following the industry initiative on ground water monitoring.

2.0 SUMMARY

Onsite groundwater is monitored at MNGP in accordance with the guidance presented in NEI 07-07. This initiative was developed by the Nuclear Energy Institute (NEI) and nuclear industry stakeholders to address a gap in industry guidance and practices for monitoring groundwater and responding to inadvertent releases of radioactive material with the potential to contaminate groundwater. The initiative sets forth voluntary requirements for evaluating and monitoring Systems, Structures and Components (SSCs) with a high risk of contaminating groundwater. Additionally, the guidance specifies reporting requirements for onsite groundwater sample results that exceed REMP reporting thresholds and that all onsite groundwater results are reported in either the ARERR (Effluent) or AREOR (REMP) reports.

Previously, all groundwater sample results have been reported in the REMP report. It has been determined that onsite groundwater monitoring results are more appropriately reported in the Effluent report, while the true REMP well water sample results belong in the REMP report. For 2015, the results for onsite groundwater monitoring wells will be reported in both reports. Subsequent reports are planned to include only REMP well water samples in the REMP report and only onsite groundwater monitoring samples in the Effluent report.

The current groundwater monitoring program includes wells at 15 locations with four of those locations in a "nested" configuration, where one sample is taken at the level of the water table (locations ending with an 'A') while a second sample can be taken from deeper water (locations ending with a 'B'). Sample Frequency for Groundwater Wells is summarized in Table E-1, locations relative to the plant stack are provided in Table E-2, and a map of monitoring well locations is provided in Figure E-1. Several wells are considered sentinel wells that would indicate if radioactive material were migrating offsite into the Mississippi River; wells MW-2, -3, -4, -14, -15A & -15B fit into the sentinel well category.

Additional sampling performed under the guidance of the Groundwater Protection Program includes sampling water from storm drains. These samples periodically indicate elevated tritium activities due to recapture of tritium from gaseous effluents.

The GWPP includes an LLD requirement of 300 pCi/L for tritium, which is significantly lower than the REMP LLD of 2000 pCi/L. The LLD was set conservatively lower in order to ensure that any indication of potential leaks or spills would be quickly identified and to ensure that concentrations of tritium are well characterized. In practice, samples were counted to an even lower level, approximately 150 pCi/L.

Program findings for 2015 detected low levels of tritium in monitoring wells located on the plant property. Monitoring well MW-9A results indicate tritium activities ranging from 6,493 pCi/L to less than 147 pCi/L; this peak concentration is comparable to the 2014 peak concentration 5,911 pCi/L. Monitoring well MW-10 results indicate tritium activities ranging from 453 pCi/L down to 155 pCi/L and is also consistent with 2014 results for this well. All other monitoring well and storm water runoff samples indicated tritium activities that were less than 300 pCi/L. All GWPP tritium results for 2015 were below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L and present no harm to members of the public.

No gamma emitting isotopes were identified in groundwater or storm water runoff samples in 2015.

A summation of the 2015 analytical results for groundwater monitoring well and storm water runoff samples is provided in Table E-3, and complete results are available in Table E-4.

3.0 Ground Water Sampling Program

3.1 Program Design and Data Interpretation

The purpose of this sampling program is to ensure timely detection of inadvertent radiological releases to ground water at MNGP. For this purpose, water samples are collected and analyzed for tritium content and presence of gamma-emitting radionuclides.

3.2 Program Description

The sampling and analysis schedule for the Ground Water Monitoring Program is summarized in Table E-1 and briefly reviewed below. Table E-2 defines the additional sample locations and codes for the Ground Water Sampling Program.

Sampling from the groundwater monitoring wells was conducted monthly at fourteen locations and quarterly for five locations.

3.3 Program Execution

Groundwater sample results are summarized in Table E-3. Results of individual analyses are reported in Table E-4. The Program was executed as described with the following exceptions:

Two groundwater samples were missed in 2015. The July sample for MW-13B was missed due to a broken sample pump. The March sample for MW-14 was missed due to a frozen column of water blocking the monitoring well cavity.

Additional analyses for gamma emitting isotopes were performed on samples from each of the nineteen monitoring wells.

3.4 Program Modifications

There were no additional on-site monitoring wells added to the ground water program and no changes to sampling frequency or other GWPP requirements in 2015.

3.5 Results and Discussions

Results for 2015 indicate that no gamma emitting isotopes were identified in groundwater samples. Monitoring well MW-9A results indicate activities ranging from 6,493 ± 237 pCi/l to <147 pCi/l; this peak concentration is comparable to the 2014 peak concentration 5,911 ± 279 pCi/l. Monitoring well MW-10 results indicate tritium activities ranging from 453 ± 98 pCi/l to 155 ± 79 pCi/l and is also consistent with 2014 results for this well. All other monitoring well and storm water samples indicated activities that were less than 300 pCi/l.

Historically, monitoring Well MW-9A has indicated elevated tritium levels that vary seasonally since 2009. It is understood that there is likely a plume of water containing tritium under the Turbine Building that moves tritium activity into, and out from, the monitoring well depending upon the hydraulic gradient at the time of sampling; the plume is considered to be stagnant under the turbine building, based on results from surrounding wells. Evidence indicates that the activity in the plume originated from process water containing tritium that leached through the turbine building concrete base mat. Potential sources of tritium were thoroughly evaluated in the Corrective Action Program and all identified sources that were potentially contributing tritium to the turbine building base mat were corrected during the 2011 refueling outage. Corrective actions taken included lining sumps and discontinuing use of embedded piping that were identified as potential sources of the tritium found in the plume.

Tritium is also regularly identified in samples from MW-10. Levels of tritium activity in this well are more consistent throughout the year and at a significantly lower level than the levels of activity observed in MW-9A.

The Lower Limit of Detection (LLD) for groundwater monitoring of tritium at MNGP during 2015 was less than 300 pCi/l, in accordance with station processes and procedures; this LLD is far below the required REMP LLD (2,000 pCi/l) and very far below the REMP reporting threshold for water samples (20,000 pCi/l). The site has chosen to use this low LLD in order to quickly identify and characterize any potential contamination sources. The LLD as reported represents the activity at which there is a 95% chance that a sample containing that level of activity would be characterized as detected with only a 5% chance that the sample would be characterized as a blank.

The Xcel Energy Groundwater Protection Program has established a Baseline Threshold Level for tritium, defined as the 95% Confidence Level determined using Student's t and a statistical mean of ten or more sample results; at this level the a sample would be considered to be statistically different from background, based on analytical results. For wells that consistently indicate near or below LLD, the Baseline Threshold Level is 400 pCi/l. The program also provides an Action Level of 3-times the Baseline Threshold Level, or 1200 pCi/l for these wells; at this level, additional action is taken to evaluate the cause of the change in activity and work through the Corrective Action process to address the concern. Note that this Action Level is still below the required REMP LLD of 2000 pCi/l. No statistically significant concentrations of tritium were identified in sentinel wells in 2015; therefore no tritium discharge to ground water is reported.

Table E-1. Sample Collection and Analysis Program, Ground Water.

Medium	Number	Sample Codes	Collection type	Analysis Type
Ground Water Quarterly	32	MW-1, MW-2, MW-3, MW-4, MW-9B, MW-11, MW-12A, MW-12B,	Grab	H-3
Ground Water Monthly	82[a]	MW-9A, MW-10, MW-13A, MW-13B, MW-14, MW-15A MW-15B,	Grab	H-3
Ground Water Annual	4	MW-5, MW-6, MW-7, MW-8	Grab	H-3

[a] Two ground water samples were missed in 2015. The July sample for MW-13B was missed due to a broken sampling pump. The March sample for MW-14 was missed due to ice plugging the well.

Table E-2. Sampling locations for Ground Water Monitoring Wells.

Sample Type	Vendor Code	Well Number	Distance from Stack (miles)	Compass Heading from Stack	Sector
Ground Water	M-33	MW-1	0.11	299	WNW
Ground Water	M-34	MW-2	0.14	301	WNW
Ground Water	M-35	MW-3	0.15	305	NW
Ground Water	M-36	MW-4	0.1	25	NNE
Ground Water	M-37	MW-5	0.1	253	WSW
Ground Water	M-38	MW-6	229 Feet	228	SW
Ground Water	M-39	MW-7	0.2	66	ENE
Ground Water	M-40	MW-8	0.3	150	SSE
Ground Water	M-44	MW-9A	0.1	310	NW
Ground Water	M-51	MW-9B	0.1	310	NW
Ground Water	M-45	MW-10	0.1	292	WNW
Ground Water	M-46	MW-11	0.1	283	WNW
Ground Water	M-47	MW-12A	0.1	330	NW
Ground Water	M-48	MW-12B	0.1	326	NW
Ground Water	M-49	MW-13A	0.12	316	NW
Ground Water	M-50	MW-13B	0.12	316	NW
Ground Water	M-52	MW-14	0.17	306	NW
Ground Water	M-53	MW-15A	0.14	14	NNE
Ground Water	M-54	MW-15B	0.14	14	NNE

Table E-3. Ground Water Monitoring Program Summary.

Name of Facility	Monticello Nuclear Generating Plant	Docket No.	50-263
Location of Facility	Wright, Minnesota	Reporting Period	January-December, 2015
	(County, State)		

Sample Type (Units)	Type and Number of Analyses[a]	LLD[b]	Indicator Locations Mean (F)[c] Range[c]	Location with Highest Annual Mean	
				Location[d]	Mean (F)[c] Range[c]
Groundwater Monitoring Wells (pCi/L)	H-3 118	300	603 (47/118) (144-6493)	MW-9A, On-site, 0.1 mi @ 310°/NW	1985 (10/13) (182-6493)
Stormwater Runoff (pCi/L)	H-3 4	300	157(1/4)	SD-006 On-site	157(1/4)
	GS 4				
	Mn-54	10	< LLD	-	-
	Fe-59	30	< LLD	-	-
	Co-58	10	< LLD	-	-
	Co-60	10	< LLD	-	-
	Zn-65	30	< LLD	-	-
	Zr-Nb-95	15	< LLD	-	-
	I-131	30	< LLD	-	-
	Cs-134	10	< LLD	-	-
	Cs-137	10	< LLD	-	-
	Ba-La-140	15	< LLD	-	-
	Ce-144	43	< LLD	-	-
Sewer Lift Station (pCi/L)	H-3 2	300	< LLD	-	-
	GS 2				
	Mn-54	10	< LLD	-	-
	Fe-59	30	< LLD	-	-
	Co-58	10	< LLD	-	-
	Co-60	10	< LLD	-	-
	Zn-65	30	< LLD	-	-
	Zr-Nb-95	15	< LLD	-	-
	I-131	30	< LLD	-	-
	Cs-134	10	< LLD	-	-
	Cs-137	10	< LLD	-	-
	Ba-La-140	15	< LLD	-	-
	Ce-144	43	< LLD	-	-

[a] GB = gross beta, GS = gamma scan.

[b] LLD = nominal lower limit of detection based on a 4.66 sigma counting error for background sample.

[c] Mean and range are based on detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified: (1) by name, and/or station code and (2) by distance (miles) and direction relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value. If no control station value is available, the result is considered non-routine if it exceeds ten time the typical preoperational value for the medium or location.

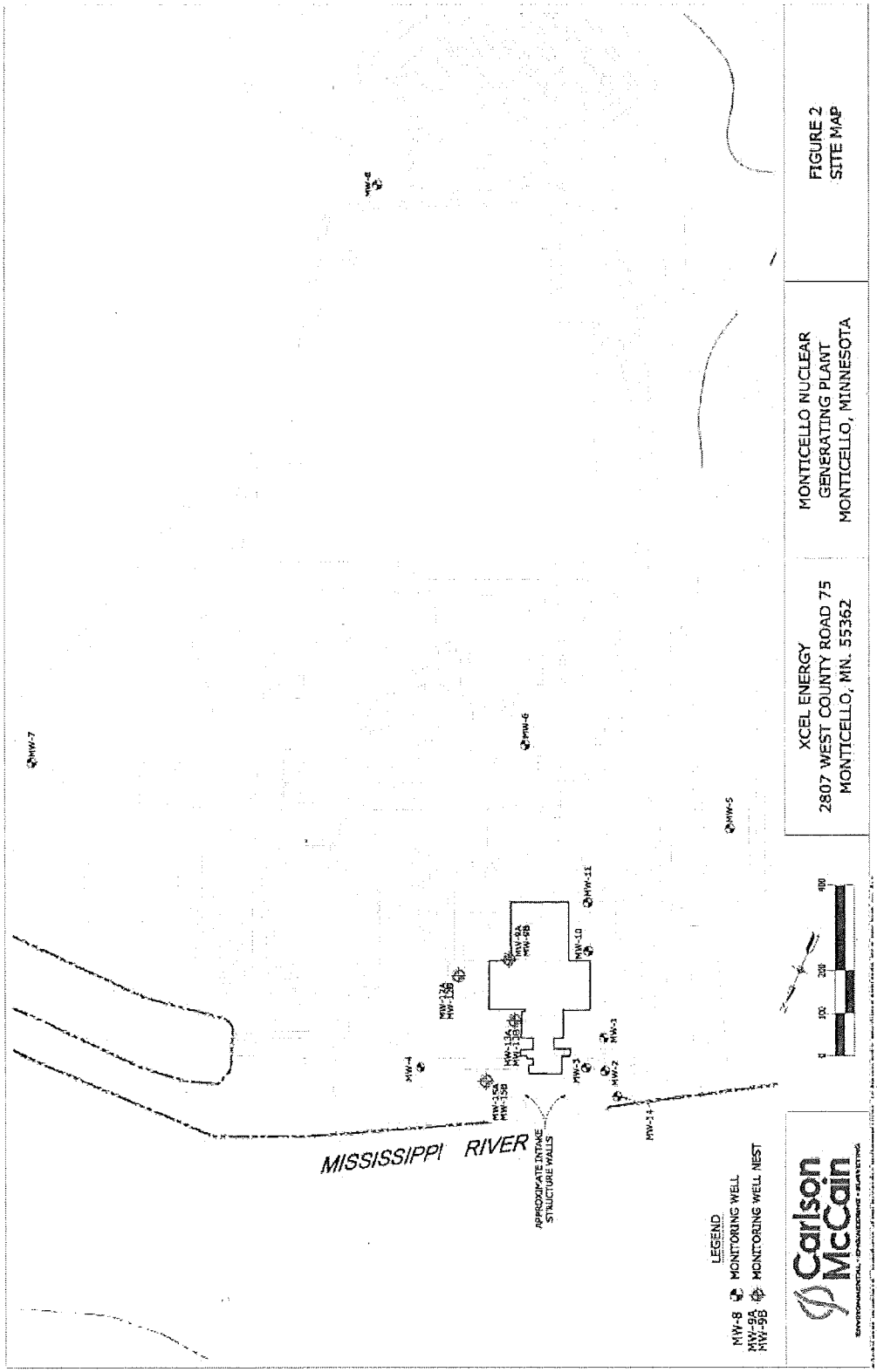

Figure E-1. On-site groundwater monitoring well locations. (From 2014 Annual Groundwater Monitoring Report, Monticello Nuclear Generating Plant; prepared by Carlson McCain, Inc.)

Table E-4. Ground water, analyses for tritium and gamma-emitting isotopes.

Lab Code	Collection Date	Concentration (pCi/L) ^{3}H	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	$^{95}ZrNb$	^{134}Cs	^{137}Cs	$^{140}BaLa$	^{144}Ce
						Monitoring Well #1 (M-33)						
MWW- 705	02/24/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
MWW- 2562	05/21/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
MWW- 4755	08/24/15	< 150	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
MWW- 6609	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 15
						Monitoring Well #2 (M-34)						
MWW- 706	02/24/15	169 ± 80	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 25
MWW- 2563	05/21/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 33
MWW- 4756	08/24/15	< 150	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
MWW- 6610	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 47
						Monitoring Well #3 (M-35)						
MWW- 707	02/24/15	218 ± 82	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 33
MWW- 2565	05/21/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 16
MWW- 4757	08/24/15	< 150	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 35
MWW- 6612	11/18/15	248 ± 90	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 46
						Monitoring Well #4 (M-36)						
MWW- 708	02/20/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 37
MWW- 2566	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 34
MWW- 5243	09/23/15	< 144	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 56
MWW- 6613	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 29
						Monitoring Well #5 (M-37)						
MWW- 4758	08/24/15	< 150	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
						Monitoring Well #6 (M-38)						
MWW- 4759	08/24/15	< 150	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 10
						Monitoring Well #7 (M-39)						
MWW- 4760	08/24/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 18
						Monitoring Well #8 (M-40)						
MWW- 4761	08/24/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26

Table E-4. Ground water, analyses for tritium and gamma-emitting isotopes (continued).

Lab Code	Collection Date	Concentration (pCi/L)										
		^{3}H	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	$^{95}ZrNb$	^{134}Cs	^{137}Cs	$^{140}BaLa$	^{144}Ce
		Monitoring Well #9A (M-44)										
MWW- 250	01/21/15	2556 ± 199										[a]
MWW- 709	02/20/15	667 ± 103	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 23
MWW- 1199	03/17/15	282 ± 85										
MWW- 1896	04/22/15	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
MWW- 2567	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
MWW- 3147	06/18/15	361 ± 89										
MWW- 4087	07/21/15	5443 ± 226										
MWW- 4772	08/21/15	6493 ± 237	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
MWW- 5398	09/22/15	1857 ± 145										
MWW- 6096	10/20/15	353 ± 95										
MWW- 6614	11/17/15	182 ± 87	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 27
MWW- 7260	12/15/15	1652 ± 135										
		Monitoring Well #9B (M-51)										
MWW- 710	02/20/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 23
MWW- 2568	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 18
MWW- 4773	08/21/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 20
MWW- 6615	11/17/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 18
		Monitoring Well #10 (M-45)										
MWW- 252	01/21/15	251 ± 110										
MWW- 711	02/24/15	381 ± 90	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
MWW- 1138	03/17/15	453 ± 98										
MWW- 1897	04/22/15	283 ± 88										
MWW- 2569	05/21/15	352 ± 106	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 20
MWW- 3148	06/18/15	250 ± 84										
MWW- 4273	07/23/15	180 ± 88										
MWW- 4762	08/24/15	236 ± 100	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
MWW- 5244	09/23/15	293 ± 86										
MWW- 5938	10/20/15	270 ± 90										
MWW- 6616	11/18/15	258 ± 91	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 34
MWW- 7061	12/15/15	155 ± 79										
		Monitoring Well #11 (M-46)										
MWW- 712	02/24/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 47
MWW- 2570	05/21/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
MWW- 4763	08/24/15	260 ± 101	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 33
MWW- 6617	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
		Monitoring Well #12A (M-47)										
MWW- 713	02/20/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 27
MWW- 2571	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 16
MWW- 4764	08/25/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
MWW- 6618	11/17/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 30

[a] Station duplicate sent. MWW-251 result = 2523±198 pCi/L.

Table E-4. Ground water, analyses for tritium and gamma-emitting isotopes (continued).

Lab Code	Collection Date	Concentration (pCi/L)										
		^{3}H	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	$^{95}ZrNb$	^{134}Cs	^{137}Cs	$^{140}BaLa$	^{144}Ce
		Monitoring Well #12B (M-48)										
MWW- 714	02/20/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 25
MWW- 2572	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
MWW- 4765	08/25/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 32
MWW- 6619	11/17/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
		Monitoring Well #13A (M-49)										
MWW- 254	01/21/15	< 182										
MWW- 715	02/24/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
MWW- 1139	03/17/15	< 153										
MWW- 1898	04/22/15	< 147										
MWW- 2573	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 27
MWW- 3149	06/18/15	< 143										
MWW- 4274	07/27/15	153 ± 87										
MWW- 4766	08/25/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
MWW- 5245	09/23/15	255 ± 84										
MWW- 5939	10/20/15	161 ± 85										
MWW- 6620	11/18/15	182 ± 87	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
MWW- 7062	12/15/15	< 146										
		Monitoring Well #13B (M-50)										
MWW- 255	01/21/15	< 182										
MWW- 717	02/24/15	203 ± 81	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 33
MWW- 1140	03/17/15	220 ± 87										
MWW- 1899	04/22/15	240 ± 85										
MWW- 2574	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 18
MWW- 3893	06/18/15	215 ± 88										
MWW- 4767	08/25/15	172 ± 83	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
MWW- 5246	09/23/15	184 ± 81										
MWW- 5940	10/20/15	169 ± 86										
MWW- 6621	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 20
MWW- 7064	12/15/15	< 146										
		Monitoring Well #14 (M-52)										
MWW- 256	01/21/15	< 182										
MWW- 718	02/16/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 45
MWW- 1900	04/21/15	< 147										
MWW- 2575	05/19/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 18
MWW- 3150	06/16/15	< 143										
MWW- 4275	07/20/15	< 151										
MWW- 4769	08/17/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 27
MWW- 5247	09/23/15	< 142										
MWW- 5941	10/20/15	< 147										
MWW- 6622	11/16/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
MWW- 7065	12/14/15	< 146										

Table E-4. Ground water, analyses for tritium and gamma-emitting isotopes (continued).

Lab Code	Collection Date	Concentration (pCi/L)										
		^{3}H	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	$^{95}ZrNb$	^{134}Cs	^{137}Cs	$^{140}BaLa$	^{144}Ce
		Monitoring Well #15A (M-53)										
MWW- 257	01/21/15	< 182										
MWW- 719	02/20/15	< 146	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 32
MWW- 1141	03/17/15	< 153										
MWW- 1901	04/22/15	< 147										
MWW- 2576	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
MWW- 3151	06/18/15	< 143										
MWW- 4276	07/23/15	< 151										
MWW- 4770	08/25/15	< 173	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 22
MWW- 5248	09/23/15	< 142										
MWW- 5942	10/20/15	< 147										
MWW- 6623	11/18/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
MWW- 7066	12/15/15	< 146										
		Monitoring Well #15B (M-54)										
MWW- 258	01/21/15	206 ± 108										
MWW- 720	02/20/15	180 ± 80	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
MWW- 1142	03/17/15	203 ± 87										
MWW- 1902	04/22/15	228 ± 85										
MWW- 2577	05/20/15	< 151	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 27
MWW- 3152	06/18/15	144 ± 79										
MWW- 4277	07/24/15	275 ± 92										
MWW- 4771	08/25/15	199 ± 99	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
MWW- 5249	09/23/15	249 ± 84										
MWW- 5943	10/20/15	161 ± 85										
MWW- 6624	11/18/15	217 ± 89	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
MWW- 7067	12/15/15	< 146										
		Storm Water Run-off (SD-006)										
MXW- 2384	04/24/15	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 8
MXW- 2385	04/24/15	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 10 [a]
MXW- 4163	07/28/15	157 ± 85	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 17
MXW- 6250	10/23/15	< 143	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 32
		Storm Water Run-off (Sewer Lift Station)										
MXW- 2091	04/27/15	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 16
MXW- 6887	12/03/15	< 145	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 15

[a] Station duplicate.

Table E-4. Ground water, analyses for hard to detect isotopes.

Lab Code	Collection Date	Location	Concentration (pCi/L) Gross Alpha	^{89}Sr	^{90}Sr	^{55}Fe	^{63}Ni
MWW- 1896	04/22/15	MW-9a	< 1.6	< 4.1	< 3.3	< 674	< 101

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XCEL ENERGY CORPORATION

MONTICELLO NUCLEAR GENERATING PLANT
DOCKET NO 50-263 LICENSE NO DPR-22

ANNUAL REPORT
TO THE
UNITED STATES NUCLEAR REGULATORY COMMISSION
PART II

Radiological Environmental Monitoring Program
Complete Analyses Data Tables

January - December, 2015

Prepared under contract by

ENVIRONMENTAL, INC
MIDWEST LABORATORY

PROJECT NO 8010

Reviewed and
Approved

Bronia Grob, MS
Laboratory Manager

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10 INTRODUCTION

The following constitutes the final 2015 report for the Environmental Radiological Monitoring Program conducted at the Monticello Nuclear Generating Plant in Monticello, Minnesota Results of completed analyses are presented in the attached tables

All concentrations, except gross beta, are decay corrected to the time of collection

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples

20 LISTING OF MISSED SAMPLES

All required samples were collected and analyzed as scheduled with the following exceptions:					
Sample Type	Analysis	Location	Collection Date or Period	Reason for not conducting REMP as required	Plans for Preventing Recurrence
AP/AI	Beta, I-131	M-005	1/28/2015	Power loss at sample station	Power was reset
SW	Gamma	M-008	January '15	Water frozen entire month; no composite	None
AP/AI	Beta, I-131	M-002	2/4/2015	Air sampler not running due to bad switch	Replaced air sampler
SW	Gamma	M-008	February '15	Water frozen entire month; no composite	None
SW	Gamma	M-008	3/4/15	Water frozen	None
SW	Gamma	M-008	3/11/15	Water frozen	None
AP/AI	Beta, I-131	M-002	5/6/2015	Air sampler not running	Replaced air sampler
TLD	Gamma	M-06B	2nd Qtr '15	TLD missing in field	Replaced TLD
AP/AI	Beta, I-131	M-004	6/10/15	GFCI tripped	Reset GFCI
AP/AI	Beta, I-131	M-004	6/24/2015	GFCI tripped	Reset GFC
SW	Gamma	M-008	12/30/15	Water frozen	None

30 DATA TABLES

Table 1. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD's).

Location	mRem/91 days 1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Annual Average
			Indicators (Inner Ring, General Area of Site Boundary)			
M-01A	15.6 ± 0.8	14.3 ± 1.2	16.7 ± 1.5	16.6 ± 2.1	15.8	13.7
M-02A	13.4 ± 1.2	13.8 ± 0.5	13.9 ± 1.2	15.3 ± 1.0	14.1	14.2
M-03A	14.8 ± 1.3	13.2 ± 1.0	13.3 ± 1.3	16.4 ± 1.7	14.4	13.4
M-04A	9.6 ± 0.9	15.3 ± 0.7	10.9 ± 1.5	17.9 ± 1.8	13.4	13.5
M-05A	14.2 ± 0.6	12.2 ± 0.5	15.2 ± 0.8	13.2 ± 1.0	13.7	12.6
M-06A	15.3 ± 0.5	16.5 ± 0.5	15.7 ± 1.1	18.9 ± 1.1	16.6	14.0
M-07A	9.8 ± 0.6	13.7 ± 0.5	11.1 ± 0.9	15.3 ± 1.0	12.5	11.6
M-08A	12.1 ± 0.7	15.1 ± 0.5	14.9 ± 0.9	17.4 ± 0.9	14.9	13.4
M-09A	14.3 ± 0.5	12.4 ± 0.8	13.7 ± 0.9	16.0 ± 1.2	14.1	12.4
M-10A	12.9 ± 1.0	13.7 ± 0.6	13.9 ± 0.9	16.2 ± 1.3	14.2	13.4
M-11A	15.8 ± 0.8	16.3 ± 0.9	16.8 ± 1.1	19.6 ± 1.4	17.1	14.5
M-12A	14.7 ± 0.8	15.9 ± 0.5	15.7 ± 1.3	19.3 ± 1.0	16.4	13.9
M-13A	13.8 ± 0.9	14.6 ± 0.9	15.0 ± 1.2	16.8 ± 1.2	15.1	14.5
M-14A	15.2 ± 0.8	13.4 ± 0.5	15.4 ± 0.8	15.1 ± 1.1	14.8	13.7
Mean ± s.d.	13.7 ± 2.0	14.3 ± 1.4	14.4 ± 1.8	16.7 ± 1.8	14.8	13.5
			Indicators (Outer Ring, 4-5 Miles Distant)			
M-01B	12.2 ± 1.2	14.9 ± 0.9	15.1 ± 1.0	16.9 ± 1.5	14.8	12.2
M-02B	11.7 ± 0.7	15.6 ± 1.0	13.0 ± 0.9	16.3 ± 1.1	14.2	12.8
M-03B	11.1 ± 0.8	11.0 ± 0.6	11.2 ± 0.9	13.5 ± 1.2	11.7	11.1
M-04B	12.4 ± 0.7	12.1 ± 0.4	15.0 ± 0.9	14.8 ± 1.0	13.6	11.9
M-05B	11.9 ± 0.5	12.6 ± 0.6	12.7 ± 0.9	14.7 ± 1.1	13.0	12.4
M-06B	13.0 ± 1.2	ND[a]	15.3 ± 1.2	17.0 ± 0.9	15.1	13.3
M-07B	14.2 ± 0.7	13.0 ± 0.7	15.9 ± 1.2	16.1 ± 1.2	14.8	13.7
M-08B	12.5 ± 0.7	13.3 ± 0.7	14.2 ± 1.1	15.6 ± 1.4	13.9	14.2
M-09B	12.4 ± 0.7	15.1 ± 1.1	12.7 ± 1.2	17.8 ± 1.1	14.5	13.0
M-10B	14.4 ± 1.0	13.2 ± 0.8	16.0 ± 0.9	15.6 ± 1.4	14.8	13.6
M-11B	14.3 ± 1.3	13.9 ± 0.7	15.2 ± 1.5	15.7 ± 1.2	14.8	13.4
M-12B	13.7 ± 1.0	14.9 ± 0.6	15.2 ± 1.9	17.2 ± 1.1	15.3	14.2
M-13B	11.1 ± 0.7	11.9 ± 0.5	12.6 ± 1.2	13.5 ± 1.1	12.3	11.8
M-14B	14.7 ± 1.3	16.7 ± 0.6	15.3 ± 1.6	19.6 ± 1.1	16.6	14.4
M-15B	12.2 ± 0.5	12.7 ± 0.9	13.5 ± 1.0	16.3 ± 1.3	13.7	12.1
M-16B	14.3 ± 0.6	11.7 ± 0.8	14.8 ± 0.8	13.4 ± 1.2	13.5	12.2
Mean ± s.d.	12.9 ± 1.2	13.5 ± 1.6	14.2 ± 1.4	15.9 ± 1.7	14.2	12.9

[a] "ND" = No data; see Table 2.0, Listing of Missed Samples.

Table 1. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD's), (continued).

Location	mRem/91 days 1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Annual Average
			Control			
M-01C	11.8 ± 1.5	13.2 ± 0.8	12.5 ± 1.5	16.0 ± 1.3	13.4	14.4
M-02C	15.9 ± 0.8	16.6 ± 1.4	17.4 ± 0.9	20.3 ± 1.1	17.5	14.1
M-03C	13.2 ± 0.4	14.8 ± 0.6	15.2 ± 0.9	17.6 ± 1.1	15.2	14.3
M-04C	14.7 ± 1.7	14.0 ± 0.5	15.1 ± 1.6	16.6 ± 1.0	15.1	14.2
Mean ± s.d.	13.9 ± 1.8	14.6 ± 1.5	15.1 ± 2.0	17.6 ± 1.9	15.3	14.3
			Indicators (Special Interest Areas)			
M-01S	10.4 ± 1.0	12.5 ± 0.5	9.4 ± 1.4	13.9 ± 0.9	11.6	10.3
M-02S	13.5 ± 1.0	13.2 ± 0.6	14.5 ± 1.5	15.9 ± 1.1	14.3	11.7
M-03S	12.2 ± 0.7	14.7 ± 0.7	13.2 ± 1.1	17.0 ± 1.2	14.3	13.0
M-04S	16.6 ± 1.1	14.4 ± 0.8	17.6 ± 1.2	17.0 ± 1.1	16.4	14.6
M-05S	14.5 ± 0.6	14.9 ± 0.8	15.3 ± 1.1	17.9 ± 1.3	15.6	14.1
M-06S	15.2 ± 0.7	15.5 ± 0.5	15.2 ± 1.1	18.8 ± 1.1	16.2	15.6
Mean ± s.d.	13.7 ± 2.2	14.2 ± 1.1	14.2 ± 2.8	16.7 ± 1.7	14.7	13.2
			ISFSI TLDs			
M-I-01	39.4 ± 1.2	26.7 ± 2.0	42.8 ± 2.0	41.7 ± 2.4	37.7	36.1
M-I-02	36.4 ± 1.2	24.3 ± 0.6	38.1 ± 1.2	36.9 ± 1.1	33.9	29.8
M-I-03	29.6 ± 1.0	23.2 ± 1.1	32.4 ± 1.3	31.9 ± 1.3	29.3	25.6
M-I-04	36.7 ± 2.6	34.4 ± 2.4	29.2 ± 2.6	37.7 ± 2.7	34.5	35.6
M-I-05	80.3 ± 5.0	67.3 ± 3.1	68.3 ± 4.6	79.5 ± 2.1	73.9	65.9
M-I-06	30.3 ± 2.4	21.6 ± 0.8	30.0 ± 2.2	25.4 ± 1.3	26.8	25.0
M-I-07	30.3 ± 1.4	27.5 ± 1.7	31.1 ± 2.7	32.8 ± 1.6	30.4	27.7
M-I-08	28.9 ± 2.9	24.1 ± 0.5	29.6 ± 3.0	28.7 ± 2.7	27.9	26.6
M-I-09	234.8 ± 12.1	220.1 ± 3.7	70.5 ± 4.1	61.3 ± 2.7	146.6	170.5
M-I-10	43.3 ± 1.7	28.6 ± 1.3	41.6 ± 1.2	35.3 ± 1.6	37.2	33.2
M-I-11	12.4 ± 1.7	15.1 ± 0.5	13.1 ± 1.7	16.7 ± 1.2	14.3	13.9
M-I-12	14.1 ± 0.7	14.3 ± 0.6	15.2 ± 0.9	15.4 ± 1.3	14.7	13.9
M-I-13	17.1 ± 1.3	12.8 ± 0.8	15.6 ± 2.0	16.6 ± 1.6	15.5	13.5
Mean ± s.d.	48.7 ± 58.4	41.5 ± 55.4	35.2 ± 17.9	35.4 ± 18.1	40.2	39.8

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-1 (C)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-07-15	319	0.041 ± 0.004	07-08-15	443	0.022 ± 0.003
01-14-15	321	0.042 ± 0.004	07-15-15	443	0.024 ± 0.003
01-21-15	323	0.036 ± 0.004	07-22-15	441	0.018 ± 0.002
01-28-15	315	0.021 ± 0.003	07-29-15	439	0.026 ± 0.003
02-04-15	357	0.029 ± 0.003	08-05-15	440	0.019 ± 0.003
02-11-15	389	0.033 ± 0.003	08-12-15	305	0.027 ± 0.004
02-18-15	354	0.044 ± 0.004	08-19-15	353	0.031 ± 0.004
02-25-15	354	0.062 ± 0.004	08-26-15	337	0.022 ± 0.003
			09-02-15	353	0.038 ± 0.004
03-04-15	352	0.036 ± 0.004			
03-11-15	353	0.025 ± 0.004	09-09-15	352	0.028 ± 0.003
03-18-15	392	0.019 ± 0.003	09-16-15	302	0.033 ± 0.004
03-25-15	352	0.024 ± 0.003	09-23-15	352	0.025 ± 0.003
04-01-15	354	0.018 ± 0.003	09-30-15	326	0.039 ± 0.004
1st Quarter Mean ± s.d.		0.033 ± 0.012	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-08-15	357	0.023 ± 0.003	10-07-15	325	0.023 ± 0.003
04-15-15	351	0.021 ± 0.003	10-14-15	324	0.031 ± 0.004
04-22-15	355	0.014 ± 0.003	10-21-15	301	0.035 ± 0.004
04-29-15	355	0.021 ± 0.003	10-28-15	336	0.022 ± 0.003
05-06-15	443	0.021 ± 0.003	11-04-15	397	0.025 ± 0.003
05-13-15	440	0.008 ± 0.002	11-11-15	351	0.039 ± 0.004
05-20-15	447	0.010 ± 0.002	11-18-15	353	0.033 ± 0.004
05-27-15	435	0.018 ± 0.003	11-25-15	387	0.022 ± 0.003
06-03-15	442	0.018 ± 0.002	12-02-15	382	0.044 ± 0.004
06-10-15	441	0.016 ± 0.002	12-09-15	350	0.061 ± 0.005
06-17-15	441	0.013 ± 0.002	12-16-15	353	0.016 ± 0.003
06-24-15	351	0.021 ± 0.003	12-23-15	354	0.044 ± 0.004
07-01-15	441	0.019 ± 0.003	12-30-15	384	0.040 ± 0.004
2nd Quarter Mean ± s.d.		0.017 ± 0.005	4th Quarter Mean ± s.d.		0.034 ± 0.012
			Cumulative Average		0.028
			Previous Annual Average		0.032

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

Table 3. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-2

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-07-15	352	0.038 ± 0.004	07-08-15	341	0.025 ± 0.003
01-14-15	326	0.038 ± 0.004	07-15-15	341	0.023 ± 0.003
01-21-15	329	0.031 ± 0.003	07-22-15	325	0.019 ± 0.003
01-28-15	321	0.021 ± 0.003	07-29-15	350	0.024 ± 0.003
02-04-15		ND[b]	08-05-15	353	0.017 ± 0.003
02-11-15	322	0.040 ± 0.004	08-12-15	330	0.025 ± 0.003
02-18-15	325	0.048 ± 0.004	08-19-15	342	0.031 ± 0.004
02-25-15	326	0.073 ± 0.005	08-26-15	326	0.025 ± 0.003
			09-02-15	342	0.038 ± 0.004
03-04-15	324	0.035 ± 0.004			
03-11-15	351	0.027 ± 0.004	09-09-15	348	0.027 ± 0.003
03-18-15	328	0.025 ± 0.004	09-16-15	318	0.033 ± 0.004
03-25-15	323	0.027 ± 0.004	09-23-15	337	0.024 ± 0.003
04-01-15	352	0.019 ± 0.003	09-30-15	318	0.037 ± 0.004
1st Quarter Mean ± s.d.		0.035 ± 0.015	3rd Quarter Mean ± s.d.		0.027 ± 0.006
04-08-15	330	0.023 ± 0.003	10-07-15	314	0.023 ± 0.003
04-15-15	349	0.027 ± 0.003	10-14-15	315	0.027 ± 0.004
04-22-15	325	0.017 ± 0.003	10-21-15	314	0.029 ± 0.004
04-29-15	329	0.021 ± 0.003	10-28-15	263	0.028 ± 0.004
05-06-15		ND[b]	11-04-15	353	0.027 ± 0.003
05-13-15	351	0.010 ± 0.002	11-11-15	352	0.045 ± 0.004
05-20-15	358	0.011 ± 0.002	11-18-15	326	0.037 ± 0.004
05-27-15	347	0.019 ± 0.003	11-25-15	327	0.025 ± 0.004
06-03-15	351	0.019 ± 0.003	12-02-15	327	0.051 ± 0.005
06-10-15	353	0.019 ± 0.003	12-09-15	328	0.066 ± 0.005
06-17-15	352	0.014 ± 0.003	12-16-15	326	0.021 ± 0.003
06-24-15	354	0.018 ± 0.003	12-23-15	304	0.051 ± 0.005
07-01-15	340	0.020 ± 0.003	12-30-15	324	0.050 ± 0.005
2nd Quarter Mean ± s.d.		0.018 ± 0.005	4th Quarter Mean ± s.d.		0.037 ± 0.014
			Cumulative Average		0.029
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

[b] "ND" = No data, see Table 2.0, Listing of Missed Samples.

Table 4. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-3

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-07-15	326	0.041 ± 0.004	07-08-15	409	0.019 ± 0.003
01-14-15	353	0.042 ± 0.004	07-15-15	409	0.019 ± 0.003
01-21-15	357	0.034 ± 0.003	07-22-15	380	0.021 ± 0.003
01-28-15	348	0.020 ± 0.003	07-29-15	324	0.030 ± 0.004
02-04-15	357	0.029 ± 0.003	08-05-15	407	0.021 ± 0.003
02-11-15	351	0.057 ± 0.004	08-12-15	369	0.027 ± 0.003
02-18-15	353	0.048 ± 0.004	08-19-15	342	0.033 ± 0.004
02-25-15	353	0.066 ± 0.004	08-26-15	339	0.022 ± 0.003
			09-02-15	342	0.044 ± 0.004
03-04-15	378	0.035 ± 0.004			
03-11-15	379	0.024 ± 0.003	09-09-15	342	0.028 ± 0.003
03-18-15	383	0.022 ± 0.003	09-16-15	344	0.031 ± 0.004
03-25-15	350	0.028 ± 0.004	09-23-15	337	0.025 ± 0.003
04-01-15	352	0.020 ± 0.003	09-30-15	346	0.037 ± 0.004
1st Quarter Mean ± s.d.		0.036 ± 0.015	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-08-15	358	0.023 ± 0.003	10-07-15	340	0.025 ± 0.003
04-15-15	349	0.024 ± 0.003	10-14-15	315	0.035 ± 0.004
04-22-15	352	0.015 ± 0.003	10-21-15	314	0.031 ± 0.004
04-29-15	357	0.020 ± 0.003	10-28-15	316	0.028 ± 0.004
05-06-15	350	0.025 ± 0.003	11-04-15	329	0.030 ± 0.004
05-13-15	380	0.007 ± 0.002	11-11-15	329	0.047 ± 0.004
05-20-15	385	0.012 ± 0.002	11-18-15	304	0.041 ± 0.004
05-27-15	400	0.018 ± 0.003	11-25-15	328	0.025 ± 0.004
06-03-15	378	0.017 ± 0.003	12-02-15	328	0.053 ± 0.005
06-10-15	380	0.019 ± 0.003	12-09-15	306	0.082 ± 0.006
06-17-15	352	0.013 ± 0.003	12-16-15	331	0.019 ± 0.003
06-24-15	382	0.018 ± 0.003	12-23-15	387	0.041 ± 0.004
07-01-15	340	0.021 ± 0.003	12-30-15	301	0.057 ± 0.005
2nd Quarter Mean ± s.d.		0.018 ± 0.005	4th Quarter Mean ± s.d.		0.040 ± 0.017
			Cumulative Average		0.030
			Previous Annual Average		0.027

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

Table 5. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-4

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-07-15	352	0.035 ± 0.003	07-08-15	409	0.021 ± 0.003
01-14-15	353	0.040 ± 0.004	07-15-15	406	0.024 ± 0.003
01-21-15	356	0.033 ± 0.003	07-22-15	383	0.018 ± 0.003
01-28-15	347	0.021 ± 0.003	07-29-15	405	0.027 ± 0.003
02-04-15	355	0.034 ± 0.003	08-05-15	407	0.018 ± 0.003
02-11-15	350	0.042 ± 0.004	08-12-15	329	0.027 ± 0.003
02-18-15	326	0.047 ± 0.004	08-19-15	328	0.039 ± 0.004
02-25-15	327	0.070 ± 0.005	08-26-15	326	0.024 ± 0.003
			09-02-15	352	0.044 ± 0.004
03-04-15	350	0.039 ± 0.004			
03-11-15	350	0.023 ± 0.003	09-09-15	351	0.030 ± 0.003
03-18-15	330	0.028 ± 0.004	09-16-15	331	0.037 ± 0.004
03-25-15	324	0.029 ± 0.004	09-23-15	350	0.027 ± 0.003
04-01-15	326	0.021 ± 0.003	09-30-15	329	0.044 ± 0.004
1st Quarter Mean ± s.d.		0.036 ± 0.013	3rd Quarter Mean ± s.d.		0.029 ± 0.009
04-08-15	331	0.024 ± 0.003	10-07-15	327	0.026 ± 0.003
04-15-15	323	0.025 ± 0.003	10-14-15	327	0.040 ± 0.004
04-22-15	327	0.014 ± 0.003	10-21-15	327	0.033 ± 0.004
04-29-15	329	0.023 ± 0.003	10-28-15	329	0.031 ± 0.004
05-06-15	407	0.023 ± 0.003	11-04-15	356	0.032 ± 0.004
05-13-15	405	0.009 ± 0.002	11-11-15	350	0.038 ± 0.004
05-20-15	413	0.011 ± 0.002	11-18-15	352	0.039 ± 0.004
05-27-15	401	0.019 ± 0.003	11-25-15	352	0.024 ± 0.003
06-03-15	407	0.018 ± 0.003	12-02-15	352	0.050 ± 0.004
06-10-15	391	0.017 ± 0.003	12-09-15	352	0.068 ± 0.005
06-17-15	404	0.014 ± 0.002	12-16-15	351	0.022 ± 0.003
06-24-15		ND[b]	12-23-15	328	0.051 ± 0.005
07-01-15	397	0.019 ± 0.003	12-30-15	350	0.054 ± 0.004
2nd Quarter Mean ± s.d.		0.018 ± 0.005	4th Quarter Mean ± s.d.		0.039 ± 0.013
			Cumulative Average		0.031
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

[b] "ND" No data; see Table 2.0, Listing of Missed Samples.

Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: M-5

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010			0.010
01-07-15	323	0.046 ± 0.004	07-08-15	370	0.023 ± 0.003
01-14-15	324	0.042 ± 0.004	07-15-15	370	0.021 ± 0.003
01-21-15	323	0.038 ± 0.004	07-22-15	352	0.019 ± 0.003
01-28-15		ND[b]	07-29-15	351	0.027 ± 0.003
02-04-15	356	0.031 ± 0.003	08-05-15	382	0.021 ± 0.003
02-11-15	352	0.038 ± 0.004	08-12-15	341	0.024 ± 0.003
02-18-15	294	0.054 ± 0.005	08-19-15	352	0.032 ± 0.004
02-25-15	324	0.071 ± 0.005	08-26-15	324	0.022 ± 0.003
			09-02-15	326	0.047 ± 0.004
03-04-15	351	0.034 ± 0.004			
03-11-15	352	0.023 ± 0.003	09-09-15	271	0.037 ± 0.004
03-18-15	326	0.024 ± 0.004	09-16-15	301	0.035 ± 0.004
03-25-15	292	0.030 ± 0.004	09-23-15	325	0.028 ± 0.004
04-01-15	352	0.018 ± 0.003	09-30-15	298	0.045 ± 0.005
1st Quarter Mean ± s.d.		0.038 ± 0.015	3rd Quarter Mean ± s.d.		0.029 ± 0.009
04-08-15	298	0.024 ± 0.004	10-07-15	298	0.025 ± 0.004
04-15-15	291	0.027 ± 0.004	10-14-15	298	0.039 ± 0.004
04-22-15	324	0.016 ± 0.003	10-21-15	297	0.036 ± 0.004
04-29-15	326	0.022 ± 0.003	10-28-15	326	0.025 ± 0.004
05-06-15	384	0.022 ± 0.003	11-04-15	359	0.029 ± 0.003
05-13-15	381	0.009 ± 0.002	11-11-15	367	0.043 ± 0.004
05-20-15	387	0.011 ± 0.002	11-18-15	252	0.032 ± 0.005
05-27-15	378	0.016 ± 0.003	11-25-15	354	0.025 ± 0.003
06-03-15	382	0.019 ± 0.003	12-02-15	323	0.050 ± 0.005
06-10-15	382	0.017 ± 0.003	12-09-15	323	0.088 ± 0.006
06-17-15	380	0.012 ± 0.002	12-16-15	353	0.015 ± 0.003
06-24-15	353	0.020 ± 0.003	12-23-15	295	0.048 ± 0.005
07-01-15	368	0.019 ± 0.003	12-30-15	352	0.050 ± 0.004
2nd Quarter Mean ± s.d.		0.018 ± 0.005	4th Quarter Mean ± s.d.		0.039 ± 0.018
			Cumulative Average		0.031
			Previous Annual Average		0.031

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless otherwise noted.

[b] "ND" = No data, see Table 2.0, Listing of Missed Samples.

Table 7. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima.

January

Location	Average	Minima	Maxima
Control	0.035	0.021	0.042
M-1	0.035	0.021	0.042
Indicators	0.035	0.020	0.046
M-2	0.032	0.021	0.038
M-3	0.034	0.020	0.042
M-4	0.032	0.021	0.040
M-5	0.042	0.038	0.046

February

Location	Average	Minima	Maxima
Control	0.042	0.029	0.062
M-1	0.042	0.029	0.062
Indicators	0.050	0.029	0.073
M-2	0.054	0.040	0.073
M-3	0.050	0.029	0.066
M-4	0.048	0.034	0.070
M-5	0.049	0.031	0.071

March

Location	Average	Minima	Maxima
Control	0.024	0.018	0.036
M-1	0.024	0.018	0.036
Indicators	0.027	0.018	0.039
M-2	0.027	0.019	0.035
M-3	0.026	0.020	0.035
M-4	0.028	0.021	0.039
M-5	0.026	0.018	0.034

April

Location	Average	Minima	Maxima
Control	0.020	0.014	0.023
M-1	0.020	0.014	0.023
Indicators	0.022	0.014	0.027
M-2	0.022	0.017	0.027
M-3	0.020	0.015	0.024
M-4	0.022	0.014	0.025
M-5	0.022	0.016	0.027

May

Location	Average	Minima	Maxima
Control	0.015	0.008	0.021
M-1	0.015	0.008	0.021
Indicators	0.015	0.007	0.025
M-2	0.015	0.010	0.019
M-3	0.016	0.007	0.025
M-4	0.016	0.009	0.023
M-5	0.016	0.009	0.022

June

Location	Average	Minima	Maxima
Control	0.017	0.013	0.021
M-1	0.017	0.013	0.021
Indicators	0.017	0.012	0.021
M-2	0.018	0.014	0.020
M-3	0.018	0.013	0.021
M-4	0.017	0.014	0.019
M-5	0.017	0.012	0.020

Note: unless otherwise specified, samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 7. Airborne particulate data, gross beta analyses, monthly averages, minima and maxima.

July

Location	Average	Minima	Maxima
Control	0.023	0.018	0.026
M-1	0.023	0.018	0.026
Indicators	0.022	0.018	0.030
M-2	0.023	0.019	0.025
M-3	0.022	0.019	0.030
M-4	0.022	0.018	0.027
M-5	0.022	0.019	0.026

August

Location	Average	Minima	Maxima
Control			
M-1	0.027	0.019	0.038
Indicators	0.029	0.017	0.047
M-2	0.027	0.017	0.038
M-3	0.029	0.021	0.044
M-4	0.031	0.018	0.044
M-5	0.029	0.021	0.047

September

Location	Average	Minima	Maxima
Control			
M-1	0.031	0.025	0.039
Indicators	0.033	0.024	0.045
M-2	0.030	0.024	0.037
M-3	0.030	0.025	0.037
M-4	0.034	0.027	0.044
M-5	0.036	0.028	0.045

October

Location	Average	Minima	Maxima
Control	0.028	0.022	0.035
M-1	0.028	0.022	0.035
Indicators	0.030	0.023	0.040
M-2	0.027	0.023	0.029
M-3	0.030	0.025	0.035
M-4	0.032	0.026	0.040
M-5	0.031	0.025	0.039

November

Location	Average	Minima	Maxima
Control	0.033	0.022	0.044
M-1	0.033	0.022	0.044
Indicators	0.037	0.024	0.053
M-2	0.037	0.025	0.051
M-3	0.039	0.025	0.053
M-4	0.037	0.024	0.050
M-5	0.036	0.025	0.050

December

Location	Average	Minima	Maxima
Control	0.040	0.016	0.061
M-1	0.040	0.016	0.061
Indicators	0.049	0.015	0.088
M-2	0.048	0.021	0.066
M-3	0.050	0.019	0.082
M-4	0.048	0.022	0.068
M-5	0.050	0.015	0.088

Note: unless otherwise specified, samples collected on the first, second or third day of the month are grouped with data of the previous month.

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

	Activity (pCi/m^3)					
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
			M-1 (C)			
Lab Code	MAP- 1842	MAP- 3819	MAP- 6030	MAP- 7410		
Volume(m^3)	4534	5299	4884	4597		
Be-7	0.065 ± 0.013	0.077 ± 0.010	0.077 ± 0.012	0.043 ± 0.010	0.066	0.068
Mn-54	< 0.0005	< 0.0004	< 0.0005	< 0.0003	<0.0005	<0.0008
Co-58	< 0.0007	< 0.0004	< 0.0005	< 0.0004	<0.0007	<0.0010
Co-60	< 0.0009	< 0.0004	< 0.0005	< 0.0002	<0.0009	<0.0006
Zn-65	< 0.0011	< 0.0005	< 0.0012	< 0.0010	<0.0012	<0.0011
Zr-Nb-95	< 0.0007	< 0.0006	< 0.0008	< 0.0008	<0.0008	<0.0015
Ru-103	< 0.0008	< 0.0008	< 0.0008	< 0.0005	<0.0008	<0.0008
Ru-106	< 0.0049	< 0.0027	< 0.0036	< 0.0043	<0.0049	<0.0063
Cs-134	< 0.0006	< 0.0006	< 0.0005	< 0.0006	<0.0006	<0.0011
Cs-137	< 0.0006	< 0.0005	< 0.0006	< 0.0004	<0.0006	<0.0007
Ba-La-140	< 0.0017	< 0.0017	< 0.0015	< 0.0014	<0.0017	<0.0021
Ce-141	< 0.0010	< 0.0008	< 0.0015	< 0.0010	<0.0015	<0.0016
Ce-144	< 0.0033	< 0.0034	< 0.0028	< 0.0022	<0.0034	<0.0046
			M-2			
Lab Code	MAP- 1843	MAP- 3820	MAP- 6031	MAP- 7411		
Volume(m^3)	4338	4138	4370	4173		
Be-7	0.070 ± 0.011	0.079 ± 0.013	0.072 ± 0.013	0.051 ± 0.012	0.068	0.064
Mn-54	< 0.0006	< 0.0008	< 0.0008	< 0.0011	<0.0008	<0.0008
Co-58	< 0.0004	< 0.0005	< 0.0008	< 0.0006	<0.0008	<0.0010
Co-60	< 0.0004	< 0.0005	< 0.0007	< 0.0004	<0.0007	<0.0008
Zn-65	< 0.0017	< 0.0007	< 0.0008	< 0.0014	<0.0017	<0.0015
Zr-Nb-95	< 0.0009	< 0.0011	< 0.0007	< 0.0010	<0.0011	<0.0010
Ru-103	< 0.0007	< 0.0006	< 0.0012	< 0.0010	<0.0012	<0.0014
Ru-106	< 0.0061	< 0.0085	< 0.0074	< 0.0046	<0.0085	<0.0077
Cs-134	< 0.0007	< 0.0009	< 0.0008	< 0.0008	<0.0009	<0.0010
Cs-137	< 0.0006	< 0.0006	< 0.0010	< 0.0005	<0.0010	<0.0008
Ba-La-140	< 0.0015	< 0.0019	< 0.0024	< 0.0021	<0.0024	<0.0042
Ce-141	< 0.0017	< 0.0010	< 0.0018	< 0.0011	<0.0018	<0.0015
Ce-144	< 0.0033	< 0.0026	< 0.0046	< 0.0048	<0.0046	<0.0040

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

	Activity (pCi/m^3)					
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
			M-3			
Lab Code	MAP- 1844	MAP- 3821	MAP- 6032	MAP- 7412		
Volume(m^3)	4636	4761	4689	4227		
Be-7	0.064 ± 0.016	0.077 ± 0.013	0.075 ± 0.011	0.052 ± 0.012	0.067	0.065
Mn-54	< 0.0007	< 0.0005	< 0.0004	< 0.0008	<0.0007	<0.0009
Co-58	< 0.0006	< 0.0004	< 0.0004	< 0.0009	<0.0006	<0.0008
Co-60	< 0.0006	< 0.0003	< 0.0005	< 0.0006	<0.0006	<0.0007
Zn-65	< 0.0006	< 0.0006	< 0.0014	< 0.0010	<0.0014	<0.0009
Zr-Nb-95	< 0.0007	< 0.0008	< 0.0010	< 0.0007	<0.0010	<0.0008
Ru-103	< 0.0004	< 0.0006	< 0.0009	< 0.0009	<0.0009	<0.0011
Ru-106	< 0.0061	< 0.0061	< 0.0041	< 0.0082	<0.0061	<0.0068
Cs-134	< 0.0007	< 0.0006	< 0.0006	< 0.0009	<0.0007	<0.0009
Cs-137	< 0.0006	< 0.0004	< 0.0004	< 0.0007	<0.0006	<0.0006
Ba-La-140	< 0.0018	< 0.0012	< 0.0013	< 0.0043	<0.0018	<0.0016
Ce-141	< 0.0010	< 0.0011	< 0.0013	< 0.0018	<0.0013	<0.0018
Ce-144	< 0.0022	< 0.0035	< 0.0025	< 0.0035	<0.0035	<0.0055
			M-4			
Lab Code	MAP- 1845	MAP- 3822	MAP- 6033	MAP- 7413		
Volume(m^3)	4447	4534	4703	4452		
Be-7	0.062 ± 0.013	0.075 ± 0.011	0.086 ± 0.011	0.058 ± 0.012	0.070	0.058
Mn-54	< 0.0007	< 0.0008	< 0.0005	< 0.0006	<0.0008	<0.0008
Co-58	< 0.0008	< 0.0007	< 0.0005	< 0.0005	<0.0008	<0.0011
Co-60	< 0.0006	< 0.0008	< 0.0004	< 0.0005	<0.0008	<0.0008
Zn-65	< 0.0019	< 0.0019	< 0.0005	< 0.0013	<0.0019	<0.0009
Zr-Nb-95	< 0.0014	< 0.0011	< 0.0008	< 0.0012	<0.0014	<0.0010
Ru-103	< 0.0013	< 0.0007	< 0.0008	< 0.0008	<0.0013	<0.0009
Ru-106	< 0.0062	< 0.0073	< 0.0026	< 0.0062	<0.0073	<0.0060
Cs-134	< 0.0010	< 0.0007	< 0.0006	< 0.0007	<0.0010	<0.0008
Cs-137	< 0.0010	< 0.0005	< 0.0005	< 0.0006	<0.0010	<0.0010
Ba-La-140	< 0.0017	< 0.0026	< 0.0010	< 0.0015	<0.0026	<0.0030
Ce-141	< 0.0013	< 0.0012	< 0.0009	< 0.0015	<0.0013	<0.0017
Ce-144	< 0.0040	< 0.0034	< 0.0019	< 0.0046	<0.0040	<0.0035

Table 8. Airborne particulates, quarterly composites from each location, analysis for gamma-emitting isotopes.

	Activity (pCi/m^3)					
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Cumulative Average	Previous Average
			M-5			
Lab Code	MAP- 1846	MAP- 3824	MAP- 6034	MAP- 7414		
Volume(m^3)	3969	4632	4363	4197		
Be-7	0.086 ± 0.014	0.070 ± 0.011	0.087 ± 0.012	0.049 ± 0.013	0.073	0.072
Mn-54	< 0.0005	< 0.0005	< 0.0008	< 0.0006	<0.0008	<0.0009
Co-58	< 0.0007	< 0.0002	< 0.0006	< 0.0004	<0.0007	<0.0006
Co-60	< 0.0004	< 0.0005	< 0.0005	< 0.0006	<0.0005	<0.0006
Zn-65	< 0.0009	< 0.0007	< 0.0007	< 0.0008	<0.0009	<0.0008
Zr-Nb-95	< 0.0014	< 0.0006	< 0.0007	< 0.0013	<0.0014	<0.0011
Ru-103	< 0.0012	< 0.0006	< 0.0009	< 0.0008	<0.0012	<0.0011
Ru-106	< 0.0040	< 0.0042	< 0.0072	< 0.0062	<0.0072	<0.0065
Cs-134	< 0.0009	< 0.0006	< 0.0007	< 0.0008	<0.0009	<0.0008
Cs-137	< 0.0006	< 0.0004	< 0.0007	< 0.0007	<0.0007	<0.0007
Ba-La-140	< 0.0016	< 0.0010	< 0.0023	< 0.0015	<0.0023	<0.0019
Ce-141	< 0.0020	< 0.0013	< 0.0015	< 0.0014	<0.0020	<0.0023
Ce-144	< 0.0038	< 0.0031	< 0.0041	< 0.0026	<0.0041	<0.0047

Table 9. Pasture grass, vegetation, analysis for gamma-emitting isotopes.
Collection: 3x per year

	Sample Description and Concentration (pCi/g wet)			Annual Average	Previous Annual Average
Location:	M-41 (Training Center)				
Date Collected	07-15-15	08-12-15	09-09-15		
Lab Code	MVE- 3772	MVE- 4464	MVE- 4966		
Mn-54	< 0.009	< 0.007	< 0.006	< 0.009	< 0.010
Fe-59	< 0.024	< 0.020	< 0.020	< 0.024	< 0.031
Co-58	< 0.008	< 0.010	< 0.014	< 0.014	< 0.009
Co-60	< 0.010	< 0.008	< 0.006	< 0.010	< 0.009
Zn-65	< 0.024	< 0.017	< 0.016	< 0.024	< 0.024
Nb-95	< 0.007	< 0.005	< 0.006	< 0.007	< 0.011
I-131	< 0.026	< 0.021	< 0.025	< 0.026	< 0.038
Cs-134	< 0.013	< 0.010	< 0.010	< 0.013	< 0.011
Cs-137	< 0.009	< 0.014	< 0.010	< 0.014	< 0.011
Location:	M-42 (Biology Station Road)				
Date Collected	07-15-15	08-12-15	09-09-15		
Lab Code	MVE- 3773	MVE- 4465	MVE- 4967		
Mn-54	< 0.009	< 0.014	< 0.009	< 0.014	< 0.008
Fe-59	< 0.017	< 0.026	< 0.023	< 0.026	< 0.022
Co-58	< 0.009	< 0.011	< 0.011	< 0.011	< 0.008
Co-60	< 0.006	< 0.007	< 0.007	< 0.007	< 0.008
Zn-65	< 0.022	< 0.018	< 0.020	< 0.022	< 0.024
Nb-95	< 0.009	< 0.012	< 0.009	< 0.012	< 0.012
I-131	< 0.029	< 0.027	< 0.041	< 0.041	< 0.030
Cs-134	< 0.011	< 0.012	< 0.011	< 0.012	< 0.011
Cs-137	< 0.012	< 0.013	< 0.013	< 0.013	< 0.010
Location:	M-43 (Imholte Farm, Control)				
Date Collected	07-15-15	08-12-15	09-09-15		
Lab Code	MVE- 3894	MVE- 4466	MVE- 4968		
Mn-54	< 0.012	< 0.009	< 0.009	< 0.012	< 0.012
Fe-59	< 0.021	< 0.033	< 0.027	< 0.033	< 0.030
Co-58	< 0.008	< 0.012	< 0.006	< 0.012	< 0.013
Co-60	< 0.019	< 0.007	< 0.010	< 0.019	< 0.014
Zn-65	< 0.029	< 0.014	< 0.016	< 0.029	< 0.029
Nb-95	< 0.020	< 0.013	< 0.010	< 0.020	< 0.015
I-131	< 0.032	< 0.029	< 0.043	< 0.043	< 0.037
Cs-134	< 0.015	< 0.014	< 0.012	< 0.015	< 0.014
Cs-137	< 0.013	< 0.010	< 0.013	< 0.013	< 0.013

Table 10. River water, analysis of monthly composites for gamma-emitting isotopes.
Location: M-8 (C)
Collection: Weekly

Sample Description and Concentration (pCi/L)					
Period Collected	January	February	March	April	May
Lab Code	NS[a]	NS[a]	MSW-1766	MSW-2440	MSW-2952
Mn-54	-	-	< 10	< 10	< 10
Fe-59	-	-	< 30	< 30	< 30
Co-58	-	-	< 10	< 10	< 10
Co-60	-	-	< 10	< 10	< 10
Zn-65	-	-	< 30	< 30	< 30
Zr-Nb-95	-	-	< 15	< 15	< 15
Cs-134	-	-	< 10	< 10	< 10
Cs-137	-	-	< 10	< 10	< 10
Ba-La-140	-	-	< 15	< 15	< 15
Ce-144	-	-	< 10	< 10	< 24
Period Collected	June	July	August	September	October
Lab Code	MSW-3660	MSW-4496	MSW-5158	MSW-5669	MSW-6328
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 22	< 22	< 12	< 39	< 23
Period Collected	November	December [b]		Cumulative	Previous Annual
Lab Code	MSW-6947	MSW-7322		Average	Average
Mn-54	< 10	< 10		< 10	< 10
Fe-59	< 30	< 30		< 30	< 30
Co-58	< 10	< 10		< 10	< 10
Co-60	< 10	< 10		< 10	< 10
Zn-65	< 30	< 30		< 30	< 30
Zr-Nb-95	< 15	< 15		< 15	< 15
Cs-134	< 10	< 10		< 10	< 10
Cs-137	< 10	< 10		< 10	< 10
Ba-La-140	< 15	< 15		< 15	< 15
Ce-144	< 25	< 17		< 39	< 30

[a] "NS" = No sample; see Table 2.0, Listing of Missed Samples.

[b] Water frozen 12-30-15.

Table 10. River water, analysis of monthly composites for gamma-emitting isotopes.
Location: M-9
Collection: Weekly

Sample Description and Concentration (pCi/L)					
Period Collected	January	February	March	April	May
Lab Code	MSW-326	MSW-1130	MSW-1767	MSW-2441	MSW-2953
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 12	< 20	< 11	< 11	< 19
Period Collected	June	July	August	September	October
Lab Code	MSW-3661	MSW-4497	MSW-5159	MSW-5670	MSW-6329
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 23	< 29	< 15	< 30	< 25
Period Collected	November	December		Cumulative	Previous Annual
Lab Code	MSW-6948	MSW-7323		Average	Average
Mn-54	< 10	< 10		< 10	< 10
Fe-59	< 30	< 30		< 30	< 30
Co-58	< 10	< 10		< 10	< 10
Co-60	< 10	< 10		< 10	< 10
Zn-65	< 30	< 30		< 30	< 30
Zr-Nb-95	< 15	< 15		< 15	< 15
Cs-134	< 10	< 10		< 10	< 10
Cs-137	< 10	< 10		< 10	< 10
Ba-La-140	< 15	< 15		< 15	< 15
Ce-144	< 24	< 33		< 33	< 33

Table 11. Drinking water, City of Minneapolis, M-14, analysis of monthly composites for gross beta, iodine-131, and gamma-emitting isotopes.
Collection: Weekly

Sample Description and Concentration (pCi/L)

Period Collected Lab Code	January MDW-523	February MDW-871	March MDW-1502	April MDW-2354	May MDW-2777
Gross beta	3.2 ± 1.1	3.3 ± 1.0	2.5 ± 0.9	2.3 ± 0.8	3.5 ± 0.7
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 16	< 29	< 9	< 11	< 24

Period Collected Lab Code	June MDW-3662	July MDW-4346	August MDW-5010	September MDW-5678	October MDW-6447
Gross beta	1.5 ± 0.6	1.2 ± 0.5	1.4 ± 0.6	1.3 ± 0.6	3.2 ± 1.0
I-131	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Mn-54	< 10	< 10	< 10	< 10	< 10
Fe-59	< 30	< 30	< 30	< 30	< 30
Co-58	< 10	< 10	< 10	< 10	< 10
Co-60	< 10	< 10	< 10	< 10	< 10
Zn-65	< 30	< 30	< 30	< 30	< 30
Zr-Nb-95	< 15	< 15	< 15	< 15	< 15
Cs-134	< 10	< 10	< 10	< 10	< 10
Cs-137	< 10	< 10	< 10	< 10	< 10
Ba-La-140	< 15	< 15	< 15	< 15	< 15
Ce-144	< 29	< 23	< 27	< 35	< 14

Period Collected Lab Code	November MDW-6946	December MDW-7269		Cumulative Average	Previous Average
Gross beta	2.2 ± 0.6	1.4 ± 0.9		2.3	2.8
I-131	< 1.0	< 1.0		< 1.0	< 1.0
Mn-54	< 10	< 10		< 10	< 10
Fe-59	< 30	< 30		< 30	< 30
Co-58	< 10	< 10		< 10	< 10
Co-60	< 10	< 10		< 10	< 10
Zn-65	< 30	< 30		< 30	< 30
Zr-Nb-95	< 15	< 15		< 15	< 15
Cs-134	< 10	< 10		< 10	< 10
Cs-137	< 10	< 10		< 10	< 10
Ba-La-140	< 15	< 15		< 15	< 15
Ce-144	< 26	< 16		< 35	< 46

Table 12. River water and drinking water, analysis of quarterly composites for tritium.
Collection: Quarterly composites of weekly collections.

Sample Type, Location and Collection Period	Lab Code	Concentration (pCi/L) H-3	
River Water Upstream, M-8 (C)		Required LLD	
1st Quarter[a]	MSW - 1770	< 500	< 152
2nd Quarter	MSW - 3663	< 500	< 154
3rd Quarter	MSW - 5675	< 500	< 152
4th Quarter[b]	MSW - 7326	< 500	< 146
Cumulative Average		< 500	< 151
Previous Annual Average		< 500	< 165
River Water Downstream, M-9			
1st Quarter	MSW - 1771	< 500	< 152
2nd Quarter	MSW - 3664	< 500	< 154
3rd Quarter	MSW - 5676	< 500	< 152
4th Quarter	MSW - 7327	< 500	< 146
Cumulative Average		< 500	< 151
Previous Annual Average		< 500	< 157
Drinking Water Minneapolis, M-14			
1st Quarter	MDW - 1768	< 500	< 152
2nd Quarter	MDW - 3665	< 500	< 154
3rd Quarter	MDW - 5677	< 500	< 152
4th Quarter	MDW - 7339	< 500	< 146
Cumulative Average		< 500	< 151
Previous Annual Average		< 500	< 157

[a] Composite of two samples for quarter - 03-18 and 03-25-15. Water frozen remainder of quarter.
[b] Water frozen 12-30-15.

Table 13. Well water, analysis for tritium and gamma-emitting isotopes.

Sample Description and Concentration (pCi/L)												
Date Collected	Lab Code	H-3 (< 500 pCi/L)	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-Nb-95	Cs-134	Cs-137	Ba-La-140	Ce-144
			Monticello (M-11)									
1/21/2015	MWW- 240	< 182	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 45
4/15/2015	MWW- 1703	< 152	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 29
7/22/2015	MWW- 4031	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 34
10/21/2015	MWW- 5964	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 26
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 45
			Plant Well No. 1 (M-12)									
1/21/2015	MWW- 241	< 182	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 31
4/15/2015	MWW- 1704	< 152	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
7/22/2015	MWW- 4032	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 35
10/22/2015	MWW- 6097	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 35
			Hasbrouck (M-55)									
1/21/2015	MWW- 242	< 182	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 38
4/15/2015	MWW- 1705	< 152	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 21
7/22/2015	MWW- 4034	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 38
10/21/2015	MWW- 5965	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 28
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 38
			Imholte (M-43C)									
1/21/2015	MWW- 243	< 182	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 36
4/15/2015	MWW- 1706	< 152	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 39
7/22/2015	MWW- 4035	< 147	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 49
10/21/2015	MWW- 5967	< 149	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 17
Cumulative Averages		< 500	< 10	< 30	< 10	< 10	< 30	< 15	< 10	< 10	< 15	< 49

Table 14. Fish, analysis of edible portions for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)

Upstream 1000' M-8 (C)

Date Collected	05-26-15	05-26-15	09-22-15	09-22-15
Lab Code	MF- 2724	MF- 2725	MF- 5239	MF- 5240
Sample Type	Shorthead Redhorse	Smallmouth Bass	Shorthead Redhorse	Smallmouth Bass
K-40	2.56 ± 0.35	3.46 ± 0.44	3.58 ± 0.42	3.65 ± 0.46
Mn-54	< 0.013	< 0.017	< 0.017	< 0.016
Fe-59	< 0.043	< 0.041	< 0.031	< 0.056
Co-58	< 0.016	< 0.018	< 0.017	< 0.019
Co-60	< 0.012	< 0.018	< 0.011	< 0.010
Zn-65	< 0.029	< 0.026	< 0.018	< 0.033
Nb-95	< 0.022	< 0.031	< 0.027	< 0.030
Zr-95	< 0.024	< 0.025	< 0.043	< 0.043
Cs-134	< 0.015	< 0.016	< 0.014	< 0.020
Cs-137	< 0.015	< 0.018	< 0.011	< 0.017
Ba-La-140	< 0.045	< 0.035	< 0.045	< 0.073
Ce-144	< 0.130	< 0.127	< 0.105	< 0.119

	Cumulative Average	Previous Average
K-40	3.31	2.72
Mn-54	< 0.017	< 0.019
Fe-59	< 0.056	< 0.059
Co-58	< 0.019	< 0.023
Co-60	< 0.018	< 0.020
Zn-65	< 0.033	< 0.034
Nb-95	< 0.031	< 0.057
Zr-95	< 0.043	< 0.055
Cs-134	< 0.020	< 0.019
Cs-137	< 0.018	< 0.020
Ba-La-140	< 0.073	< 0.272
Ce-144	< 0.130	< 0.150

Table 14. Fish, analysis of edible portions for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)

	Downstream 1000' M-9			
Date Collected	05-26-15	05-26-15	09-22-15	09-22-15
Lab Code	MF- 2726	MF- 2727	MF- 5241	MF- 5242
Sample Type	Shorthead Redhorse	Smallmouth Bass	Shorthead Redhorse	Smallmouth Bass
K-40	3.08 ± 0.45	3.20 ± 0.64	3.56 ± 0.42	3.71 ± 0.43
Mn-54	< 0.016	< 0.025	< 0.015	< 0.015
Fe-59	< 0.043	< 0.019	< 0.046	< 0.033
Co-58	< 0.020	< 0.025	< 0.013	< 0.021
Co-60	< 0.014	< 0.025	< 0.013	< 0.008
Zn-65	< 0.029	< 0.070	< 0.031	< 0.050
Nb-95	< 0.021	< 0.030	< 0.018	< 0.029
Zr-95	< 0.031	< 0.058	< 0.039	< 0.032
Cs-134	< 0.018	< 0.025	< 0.014	< 0.017
Cs-137	< 0.014	< 0.020	< 0.010	< 0.017
Ba-La-140	< 0.031	< 0.122	< 0.057	< 0.056
Ce-144	< 0.102	< 0.141	< 0.108	< 0.068

Date Collected Lab Code Sample Type	Cumulative Average	Previous Average
K-40	3.39	3.03
Mn-54	< 0.025	< 0.018
Fe-59	< 0.046	< 0.059
Co-58	< 0.025	< 0.028
Co-60	< 0.025	< 0.021
Zn-65	< 0.070	< 0.035
Nb-95	< 0.030	< 0.043
Zr-95	< 0.058	< 0.046
Cs-134	< 0.025	< 0.020
Cs-137	< 0.020	< 0.017
Ba-La-140	< 0.122	< 0.217
Ce-144	< 0.141	< 0.126

Table 15. Aquatic invertebrates, analysis for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g wet)			Cumulative Average	Previous Average
	Upstream 1000' M-8 (C)[a]			
Date Collected	08-06-15	10-07-15		
Lab Code	MBO- 4344	MBO- 5607		
Be-7	< 1.49	< 0.36	< 1.49	< 0.57
K-40	< 1.91	< 0.66	< 1.91	< 0.84
Mn-54	< 0.088	< 0.042	< 0.088	< 0.024
Fe-59	< 0.24	< 0.090	< 0.24	< 0.13
Co-58	< 0.15	< 0.031	< 0.15	< 0.068
Co-60	< 0.085	< 0.029	< 0.085	< 0.052
Zn-65	< 0.18	< 0.059	< 0.18	< 0.094
Zr-Nb-95	< 0.23	< 0.062	< 0.23	< 0.064
Ru-103	< 0.22	< 0.072	< 0.22	< 0.075
Ru-106	< 0.55	< 0.30	< 0.55	< 0.39
Cs-134	< 0.076	< 0.033	< 0.076	< 0.040
Cs-137	< 0.085	< 0.023	< 0.085	< 0.049
Ba-La-140	< 1.35	< 0.14	< 1.35	< 0.41
Ce-144	< 0.39	< 0.22	< 0.39	< 0.20
	Downstream 1000' M-9			
Date Collected	08-06-15	10-07-15		
Lab Code	MBO- 4345	MBO- 5608		
Be-7	< 0.67	< 0.60	< 0.67	< 0.55
K-40	< 0.95	< 1.24	< 1.24	< 0.91
Mn-54	< 0.053	< 0.044	< 0.053	< 0.046
Fe-59	< 0.22	< 0.12	< 0.22	< 0.13
Co-58	< 0.078	< 0.064	< 0.078	< 0.046
Co-60	< 0.039	< 0.047	< 0.047	< 0.041
Zn-65	< 0.079	< 0.097	< 0.097	< 0.077
Zr-Nb-95	< 0.13	< 0.11	< 0.13	< 0.067
Ru-103	< 0.13	< 0.087	< 0.13	< 0.070
Ru-106	< 0.48	< 0.33	< 0.48	< 0.38
Cs-134	< 0.050	< 0.043	< 0.050	< 0.041
Cs-137	< 0.039	< 0.038	< 0.039	< 0.040
Ba-La-140	< 1.15	< 0.32	< 1.15	< 0.22
Ce-144	< 0.25	< 0.23	< 0.25	< 0.24

Table 16. Shoreline (SS) sediments, analysis for gamma-emitting isotopes.
Collection: Semiannually

Sample Description and Concentration (pCi/g dry)			Cumulative Average	Previous Average
	Upstream 1000' M-8 (C)			
Date Collected	08-06-15	10-07-15		
Lab Code	MSS- 4416	MSS- 5604		
Be-7	< 0.29	< 0.27	< 0.29	< 0.16
K-40	11.58 ± 0.54	11.53 ± 0.51	11.55	9.12
Mn-54	< 0.017	< 0.014	< 0.017	< 0.016
Fe-59	< 0.073	< 0.068	< 0.073	< 0.052
Co-58	< 0.022	< 0.011	< 0.022	< 0.016
Co-60	< 0.016	< 0.013	< 0.016	< 0.014
Zn-65	< 0.044	< 0.032	< 0.044	< 0.034
Nb-95	< 0.024	< 0.035	< 0.035	< 0.015
Zr-95	< 0.048	< 0.046	< 0.048	< 0.028
Ru-103	< 0.039	< 0.018	< 0.039	< 0.018
Ru-106	< 0.083	< 0.13	< 0.13	< 0.075
Cs-134	< 0.013	< 0.014	< 0.014	< 0.012
Cs-137	< 0.017	< 0.015	< 0.017	< 0.012
Ba-La-140	< 0.21	< 0.085	<0.21	< 0.081
Ce-144	< 0.12	< 0.092	<0.12	< 0.081
	Downstream 1000' M-9			
Date Collected	08-06-15	10-07-15		
Lab Code	MSS- 4417	MSS- 5605		
Be-7	< 0.26	< 0.30	< 0.30	< 0.27
K-40	10.51 ± 0.54	10.41 ± 0.54	10.46	10.58
Mn-54	< 0.018	< 0.016	< 0.018	< 0.018
Fe-59	< 0.041	< 0.076	< 0.076	< 0.068
Co-58	< 0.021	< 0.026	< 0.026	< 0.027
Co-60	< 0.017	< 0.013	< 0.017	< 0.016
Zn-65	< 0.039	< 0.039	< 0.039	< 0.040
Nb-95	< 0.030	< 0.051	< 0.051	< 0.044
Zr-95	< 0.052	< 0.027	< 0.052	< 0.042
Ru-103	< 0.036	< 0.032	< 0.036	< 0.030
Ru-106	< 0.12	< 0.11	< 0.12	< 0.16
Cs-134	< 0.012	< 0.017	< 0.017	< 0.015
Cs-137	0.034 ± 0.016	0.024 ± 0.014	0.029	0.035
Ba-La-140	< 0.10	< 0.14	< 0.14	< 0.11
Ce-144	< 0.11	< 0.13	< 0.13	< 0.12

Table 16. Shoreline (SS) sediments, analysis for gamma-emitting isotopes (continued).

Sample Description and Concentration (pCi/g dry)			Cumulative Average	Previous Average
		Montissippi Park M-15		
Date Collected	08-06-15	10-07-15		
Lab Code	MSS- 4418	MSS- 5606		
Be-7	< 0.33	< 0.22	< 0.33	< 0.22
K-40	9.49 ± 0.51	10.54 ± 0.54	10.01	10.89
Mn-54	< 0.021	< 0.018	< 0.021	< 0.017
Fe-59	< 0.068	< 0.050	< 0.068	< 0.040
Co-58	< 0.022	< 0.019	< 0.022	< 0.017
Co-60	< 0.014	< 0.011	< 0.014	< 0.013
Zn-65	< 0.041	< 0.038	< 0.041	< 0.045
Nb-95	< 0.031	< 0.028	< 0.031	< 0.025
Zr-95	< 0.046	< 0.026	< 0.046	< 0.039
Ru-103	< 0.041	< 0.016	< 0.041	< 0.026
Ru-106	< 0.13	< 0.13	< 0.13	< 0.102
Cs-134	< 0.014	< 0.016	< 0.016	< 0.014
Cs-137	< 0.017	< 0.021	< 0.021	0.059
Ba-La-140	< 0.20	< 0.11	< 0.20	< 0.092
Ce-144	< 0.11	< 0.11	< 0.11	< 0.088