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XCEL ENERGY CORPORATION

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

ANNUAL REPORT
to the
UNITED STATES NUCLEAR REGULATORY COMMISSION

Radiological Environmental Monitoring Program

January 1 to December 31, 2013

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Approved: _____

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PREFACE

The staff of Environmental, Inc., Midwest Laboratory was responsible for the acquisition of data presented in this report. Samples were collected by members of the staff of the Prairie Island Nuclear Generating Plant, operated by Northern States Power Co. –Minnesota, for XCEL Energy Corporation. The 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 at the Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2013. 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 not included in this report. These data are included in a reference document (Environmental, Inc., Midwest Laboratory, 2014b available at Prairie Island Nuclear Generating Plant.

Prairie Island Nuclear Generating Plant is located on the Mississippi River in Goodhue County, Minnesota, owned by Xcel Energy Corporation and operated by Northern States Power Co.-Minnesota. The plant has two 575 MWe pressurized water reactors. Unit 1 achieved initial criticality on 1 December 1973. Commercial operation at full power began on 16 December 1973. Unit 2 achieved initial criticality on 17 December 1974. Commercial operation at full power began on 21 December 1974.

2.0 SUMMARY

The Radiological Environmental Monitoring Program (REMP) required by the U.S. Nuclear Regulatory Commission (NRC) Offsite Dose Calculation Manual for the Prairie Island Nuclear Generating Plant and the Independent Spent Fuel Storage Installation (ISFSI) is described. Results for 2013 are summarized and discussed.

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

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program (REMP) at the Prairie Island 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 (TLDs).

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 Prairie Island 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 the environmental samples collected from the plant site. The plant's monitoring program includes analyses for tritium and iodine-131. Most samples are 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 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.

3.1 Program Design and Data Interpretation (continued)

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.

3.2 Program Description

The sampling and analysis schedule for the radiological environmental monitoring program at Prairie Island 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 reactor site or ISFSI facility, as appropriate. To assure that sampling is carried out in a reproducible manner, detailed sampling procedures have been prescribed (Prairie Island Nuclear Generating Plant, 2013). Maps of fixed sampling locations are included in Appendix D.

To monitor the airborne environment, air is sampled by continuous pumping at six stations, four site boundary indicators (P-2, P-3, P-4 and P-7), located in the highest calculated D/Q sectors, one community indicator (P-6), and one control (P-1). The particulates are collected on membrane filters, airborne iodine is trapped by activated charcoal. Particulate filters are analyzed for gross beta activity and charcoal filters for iodine-131. Quarterly composites of particulate filters from each location are analyzed for gamma emitting isotopes.

Offsite ambient gamma radiation is monitored at thirty-four locations, using $CaSO_4$:Dy dosimeters with four sensitive areas at each location: ten in an inner ring in the general area of the site boundary, fifteen in the outer ring within a 4-5 mile radius, eight at special interest locations, and one control location, 11.1 miles distant from the plant. They are replaced and measured quarterly.

Ambient gamma radiation is monitored at the Independent Spent Fuel Storage Installation (ISFSI) Facility by twenty $CaSO_4$:Dy dosimeters. Twelve dosimeters are located inside of the earthen berm in direct line of sight from the storage casks and eight dosimeters are located outside of the earthen berm. They are replaced and measured quarterly.

Milk samples are collected monthly from three farms (two indicators and one control) and analyzed for iodine-131 and gamma-emitting isotopes. The milk is collected biweekly during the growing season (May - October), because the milk animals may be on pasture.

For additional monitoring of the terrestrial environment, green leafy vegetables (cabbage) are collected annually from the highest D/Q garden and a control location (P-38), and analyzed for gamma-emitting isotopes, including iodine-131. Corn is collected annually only if fields are irrigated with river water and analyzed for gamma-emitting isotopes. Well water and ground water are collected quarterly from four locations near the plant and analyzed for tritium and gamma-emitting isotopes.

River water is collected weekly at two locations, one upstream of the plant (P-5) and one downstream (P-6, Lock and Dam No.3). Monthly composites are analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

3.2 Program Description (continued)

Drinking water is collected weekly from the City of Red Wing well. 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, periphyton or invertebrates, and bottom sediments. Shoreline sediment is collected semi-annually from three locations. All samples are analyzed for gamma-emitting isotopes.

3.3 Program Execution

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

(1) Airborne Particulates / Airborne Iodine:

No air particulate / air iodine sample was available from location P-06 for the week ending May 7, 2013. There was no indication of flow through the air sampler.

A partial sample was collected from location P-04 for the week ending 7/16/13. Sampler run-time was reduced by approximately 20 hours.

Air samples were not collected from the site boundary location with the highest calculated annual average ground level D/Q from January through the first three weeks of October, 2013. In 2011, annual average ground level D/Q values were updated, and identified the West sector as the highest D/Q location. A new air station (P-7) was installed in the sector and became operational during the last week of October, 2013.

(2) Thermoluminescent Dosimeters:

The TLD for location PI-03A was missing in the field for the first quarter, 2013.

The TLD for location PI-07S was missing in the field for the second quarter, 2013.

(3) Vegetation:

No broadleaf vegetation sample was available from location P-38 for the September collection. The farmer was not available for contact.

Deviations from the program are summarized in Table 5.3.

3.4 Laboratory Procedures

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

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. Levels of iodine-131 in cabbage and 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.

3.5 Program Modifications

Air station P-7, (0.5 mi @ 271°/W) was added in the fourth quarter, 2013.

3.6 Land Use Census

In accordance with the Prairie Island Nuclear Generating Plant Offsite Dose Calculation Manual, H4, (ODCM) a land use census is conducted in order to 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 distance of 5 miles. This census is conducted at least once per 12 months between the dates of May 1 and October 31. If new locations yield a calculated dose or dose equivalent (via the same exposure pathway) twenty percent greater than the required locations per the ODCM, then the new locations are added to the radiological 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.

This land use census insures the updating of the radiological environmental monitoring program should sampling locations change within the 5 mile radius from the plant.

The Land Use Census was completed in October, 2013. There were no changes to any of the highest D/Q locations for nearest milk animal, garden sites, or nearest residence.

No downstream irrigation of corn was discovered within 5 miles of the Prairie Island Plant. Therefore, no corn samples were collected for analysis.

4.0 RESULTS AND DISCUSSION

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

The 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.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported accidents involving significant release to the environment at nuclear reactor facilities in 2013. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2013. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.2 Summary of Preoperational Data

The following constitutes a summary of preoperational studies conducted at the Prairie Island Nuclear Power Plant during the years 1970 to 1973, 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, since background levels of radiation were much higher in these years due to radioactive fallout from the atmosphere. Gross beta measurements in fallout declined yearly from a level of 12,167 pCi/ m^3 to 1,020 pCi/ m^3, and these declining values are reflected throughout the various media tested.

In the air environment, ambient gamma radiation (TLDs) averaged 9.4 mR/4 weeks during pre-operational studies. Gross beta in air particulates declined from levels of 0.38 to 0.037 pCi/m^3. Average present day levels have stabilized at around 0.025 pCi/m^3. Airborne radioiodine remained below detection levels.

In the terrestrial environment of 1970 to 1973, milk, agricultural crops, and soil were monitored. In milk samples, low levels of Cs-137, I-131, and Sr-90 were detected. Cs-137 levels declined from 16.5 to 8.6 pCi/L. Present day measurements for both Cs-137 and I-131 are below detection levels. Agricultural crop measurements averaged 57.7 pCi/g for gross beta and 0.47 pCi/g for Cs-137. Gross beta measured in soil averaged 52 pCi/g.

The aqueous environment was monitored by testing of river, well and lake waters, 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 eight separate locations, declined steadily from an average concentration of 1020 pCi/L to 490 pCi/L. Present day environmental levels of tritium measure below a detection limit of approximately 160 pCi/L. Values for gross beta, measured from 1970 to 1973, averaged 9.9 pCi/L in downstream Mississippi River water, 8.2 pCi/L for well water, and 11.0 pCi/L for lake water. Gamma emitters were below the lower limit of detection (LLD). In bottom sediments, gross beta background levels were determined at 51.0 pCi/g. Cs-137 activity during preoperational studies in 1973 measured 0.25 pCi/g upstream and 0.21 pCi/g downstream. The lower levels occasionally observed today can still be attributed to residual activity from atmospheric fallout. Gross beta in fish, measured in both flesh and skeletal samples, averaged 7.3 and 11.7 pCi/g, respectively. Gross beta background levels in aquatic vegetation, algae and periphyton samples measured 76.0 pCi/g , 46.0 pCi/g, and 13.6 pCi/g, respectively.

4.3 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected in the vicinity of the Prairie Island Nuclear Generating Plant.

Ambient Radiation (TLDs)

Ambient radiation was measured in the general area of the site boundary, at the outer ring 4 - 5 mi. distant from the Plant, at special interest areas and at one control location. The means ranged from 15.0 mR/91 days at inner ring locations to 15.2 mR/91 days at outer ring locations. The mean at special interest locations was 13.8 mR/91 days and 16.0 mR/91 days at the control location. Dose rates measured at the inner and outer ring and the control locations were slightly lower than those observed from 1998 through 2012. The results are tabulated below. No plant effect on ambient gamma radiation measurements was indicated (Figure 5-1).

Year	Average (Inner and Outer Rings)	Control		Year	Average (Inner and Outer Rings)	Control
1998	16.7	17.3		2006	16.6	16.6
1999	16.6	17.5		2007	17.5	17.7
2000	17.0	17.1		2008	16.9	17.1
2001	16.8	17.2		2009	15.9	16.3
2002	17.4	16.9		2010	16.0	16.0
2003	16.2	16.0		2011	15.7	15.7
2004	17.6	17.6		2012	16.5	16.2
2005	16.8	16.3		2013	15.1	16.0

Ambient gamma radiation as measured by thermoluminescent dosimetry.
Average quarterly dose rates (mR/91 days).

ISFSI Facility Operations Monitoring

Ambient radiation was measured inside the ISFSI earth berm, outside the ISFSI earth berm and at two special locations between the plant ISFSI and the Prairie Island Indian Community. The mean dose rates averaged 122.6 mR/91 days inside the ISFSI earth berm and 24.0 mR/91 days outside the ISFSI earth berm. Six additional casks were placed on the ISFSI pad in 2013, a total of thirty-five loaded casks remain. The higher levels inside the earth berm are expected, due to the loaded spent fuel casks being in direct line-of-sight of the TLDs.

The 2013 fourth quarter TLD results for ISFSI monitoring locations P-01IB, P-02IB, P-03IB and P-08IB (located north and east of the ISFSI berm) were elevated. The higher doses were due to the temporary use of the adjacent area for preparing steam generators for shipment. Now that the steam generators have been shipped, doses are expected to return to their previous levels during the first quarter of 2014.

Ambient radiation levels measured outside the earth berm show a slight increase as compared to other offsite dose rates around the plant. The cumulative average of the two special Prairie Island Indian Community TLDs measured 14.1 and 13.7 mR/91 days. Although the skyshine neutron dose rates are not directly measured, the neutron levels measured next to the casks are below the levels predicted in the ISFSI SAR Report, Table 7A-4, "TN-40 Dose Rates at Short Distances". Therefore, the skyshine dose rates at farther distances from the casks should be at or below the calculated dose rates. No spent fuel storage effect on offsite ambient gamma radiation was indicated (Fig. 5-1).

Airborne Particulates

Typically, the highest averages for gross beta occur during the months of January and December, and the first and fourth quarters, as in 1996 through 2006, and also in 2008 through 2010. The elevated activity observed in 2007 was attributed to construction activity in the area, an increase in dust and consequent heavier particulate filter loading.

Average annual gross beta concentrations in airborne particulates were 0.027 pCi/m^3 at the indicators and 0.028 pCi/m^3 at the control location and similar to levels observed from 1998 through 2006 and 2008 to 2012. The results are tabulated below.

Year	Average of Indicators	Control
	Concentration (pCi/ m^3)	
1998	0.022	0.018
1999	0.024	0.022
2000	0.025	0.025
2001	0.023	0.023
2002	0.028	0.023
2003	0.027	0.025
2004	0.025	0.026
2005	0.027	0.025
2006	0.026	0.025
2007	0.037	0.031
2008	0.028	0.027
2009	0.029	0.029
2010	0.025	0.025
2011	0.026	0.027
2012	0.031	0.032
2013	0.027	0.028

Average annual gross beta concentrations in airborne particulates.

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 0.069 pCi/m^3 for all locations. All other isotopes were below the lower limit of detection.

There was no indication of a plant effect.

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. There was no indication of a plant effect.

Milk

Iodine-131 results were below a detection limit of 0.5 pCi/L in all samples.

Cs-137 results were below 5 pCi/L in all samples. No other gamma-emitting isotopes, except naturally occurring potassium-40, were detected in any milk sample. In general, radiocontaminants from cattlefeed are not found in milk, due to the selective metabolism of the cow. The common exceptions are isotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

In summary, the data for 2013 show no radiological effects of the plant operation.

Drinking Water

In drinking water from the City of Red Wing well, tritium activity measured below a detection limit of 184 pCi/L for all samples.

Gross beta concentrations averaged 12.2 pCi/L throughout the year, ranging from 8.0–15.7 pCi/L. These concentrations are consistent with levels observed from 1998 through 2012. The most likely contribution is the relatively high levels of naturally-occurring radium. Gamma spectroscopy indicates the presence of lead and bismuth isotopes, which are daughters of the radium decay chain. There is no indication from the 2013 data of any effect of plant operation.

Year		Gross Beta (pCi/L)
1998		5.4
1999		5.3
2000		10.1
2001		8.3
2002		8.7
2003		9.9
2004		9.8
2005		11.5
2006		13.4
2007		11.6
2008		11.6
2009		11.4
2010		11.7
2011		12.4
2012		11.8
2013		12.2

Average annual concentrations; Gross beta in drinking water.

River Water

The third quarter, 2013, river water composite from downstream location P-6, tested positive for tritium at a level of 500 pCi/L. Further analyses confirmed that the activity was due to the September 24, 2013 sample collection, and coincided with a scheduled plant release. All other river water samples measured below an LLD level of 182 pCi/L.

Gamma-emitting isotopes were below detection limits in all samples.

In summary, the data for 2013 show no radiological effects from the plant operation.

Well Water

Water samples tested from the control well, P-43 (Peterson Farm) and from four indicator wells (P-8, Community Center, P-6, Lock and Dam No. 3, P-9, Plant Well No. 2 and P-24, Suter Farm) showed no tritium detected above a detection limit of 155 pCi/L. Gamma-emitting isotopes were below detection limits in all samples.

In summary, well water data for 2013 show no radiological effects of the plant operation.

Crops

Two samples of broadleaf vegetation, cabbage leaves, were collected in September, 2013 and analyzed for gamma-emitting isotopes, including iodine-131. The I-131 level was below 0.016 pCi/g wet weight in all samples. With exceptions for naturally-occurring beryllium-7 and potassium-40, all other gamma-emitting isotopes were below their respective detection limits. There was no indication of a plant effect.

Field sampling personnel conducted an annual land use survey and found no river water taken for irrigation into fields within 5 miles downstream from the Prairie Island Plant. The collection and analysis of corn samples was not required.

Fish

Fish were collected in May and September, 2013 and analyzed for gamma emitting isotopes. Only naturally-occurring potassium-40 was detected, and there was no significant difference between upstream and downstream results. There was no indication of a plant effect.

Aquatic Insects or Periphyton

Aquatic insects (invertebrates) or periphyton were collected in May and September, 2013 and analyzed for gamma-emitting isotopes. All gamma-emitting isotopes measured below detection limits. There was no indication of any plant effect.

Bottom and Shoreline Sediments

Upstream, downstream and downstream recreational area shoreline sediments were sampled in May, September and November, 2013 and analyzed for gamma-emitting isotopes. The only gamma-emitting isotope detected was naturally-occurring potassium-40.

There was no indication of a plant effect.

5.0 FIGURES AND TABLES

Figure 5-1. Offsite Ambient Radiation (TLDs); average of inner and outer ring indicator locations versus control location.

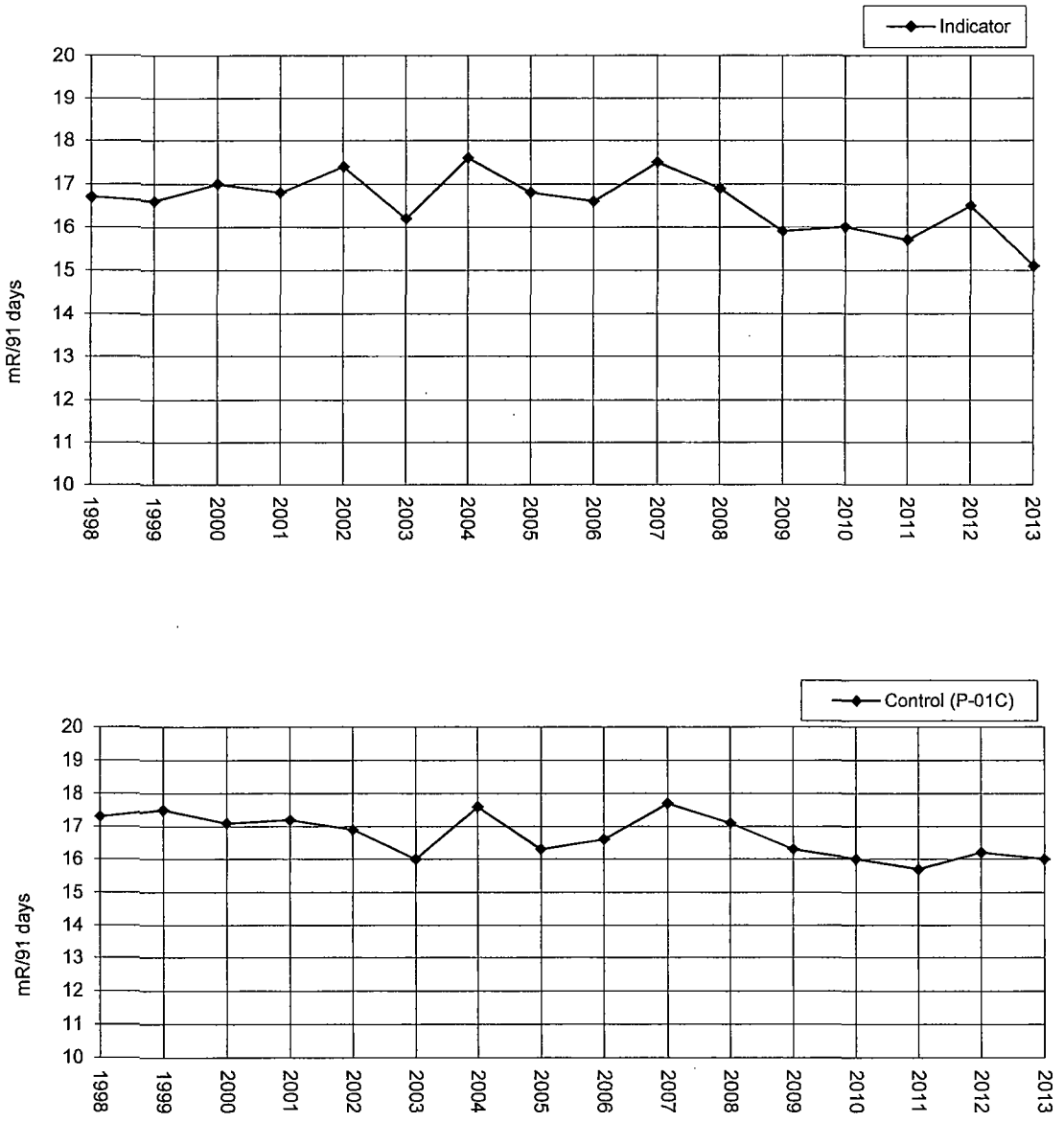
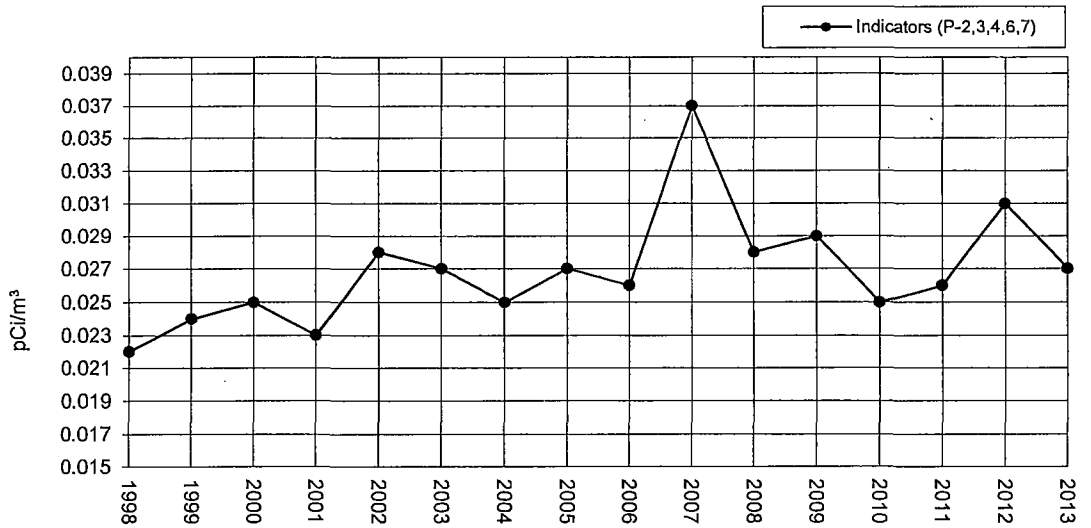


Figure 5-2. Airborne Particulates; analysis for gross beta, average mean of all indicator locations versus control location.



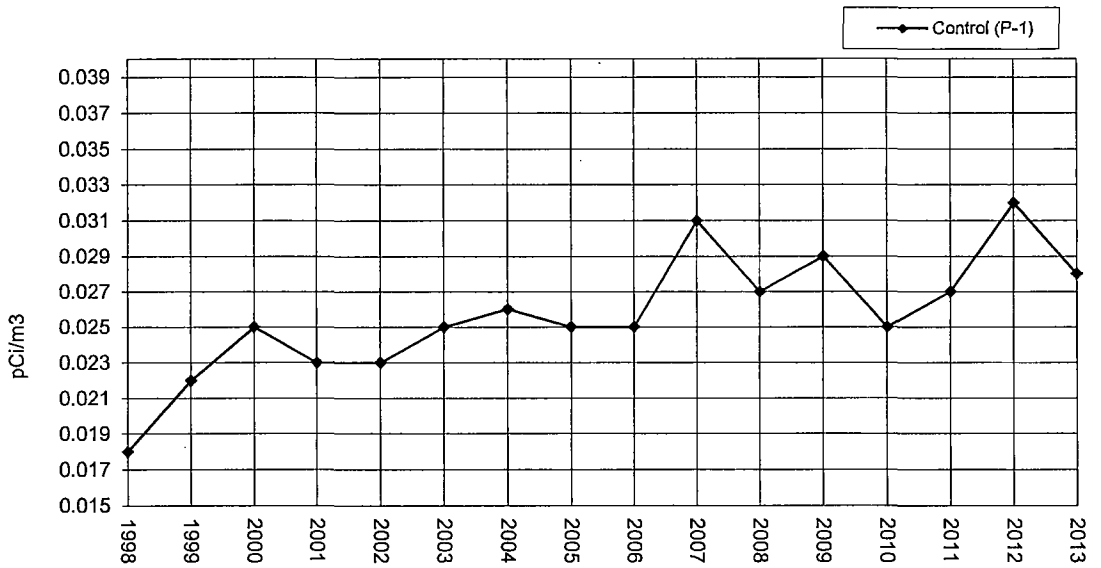


Table 5.1. Sample collection and analysis program, Prairie Island Nuclear Generating Plant.

Medium	Location No.	Location Codes (and Type)[a]	Collection Type and Frequency[b]	Analysis Type and Frequency[c]
Ambient radiation (TLD's)	54	P-01A - P-10A P-01B - P-15B P-01S - P-08S P-01IA - P-08IA P-01IB - P-08IB P-01IX- P-04IX, P-01C	C/Q	Ambient gamma
Airborne Particulates	5	P-1(C), P-2, P-3, P-4, P-6, P-7	C/W	GB, GS (QC of each location)
Airborne Iodine	5	P-1(C), P-2, P-3, P-4, P-6, P-7	C/W	I-131
Milk	4	P-18, P-37, P-43 (C)	G/M[d]	I-131, GS
River water	2	P-5(C), P-6	G/W	GS(MC), H-3(QC)
Drinking water	1	P-11	G/W	GB(MC), I-131(MC) GS (MC), H-3 (QC)
Well water	5	P-6, P-8, P-9, P-24, P-43 (C)	G/Q	H-3, GS
Edible cultivated crops - leafy green vegetables	3	P-28, P-38(C), P-45	G/A	GS (I-131)
Fish (one species, edible portion)	2	P-19(C), P-13	G/SA	GS
Periphyton or invertebrates	2	P-40(C), P-6	G/SA	GS
Bottom sediment	2	P-20(C), P-6	G/SA	GS
Shoreline sediment	1	P-12	G/SA	GS

[a] Location codes are defined in Table D-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] Milk is collected biweekly during the grazing season (May - October).

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant.

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
P-1	C	Air Station P-1	AP, AI	11.8 mi @ 316°/NNW
P-2		Air Station P-2	AP, AI	0.5 mi @ 294°/WNW
P-3		Air Station P-3	AP, AI	0.8 mi @ 313°/NW
P-4		Air Station P-4	AP, AI	0.4 mi @ 359°/N
P-5	C	Upstream of Plant	RW	1.8 mi @ 11°/N
P-6		Lock and Dam #3 & Air Station P-6	AP, AI, RW	
			WW, BS, BO[c]	1.6 mi @ 129°/SE
P-7		Air Station P-7	AP, AI	0.5 mi @ 271°/W
P-8		Community Center	WW	1.0 mi @ 321°/WNW
P-9		Plant Well #2	WW	0.3 mi @ 306°/NW
P-11		Red Wing Service Center	DW	3.3 mi @ 158°/SSE
P-12		Downstream of Plant	SS	3.0 mi @ 116°/ESE
P-13		Downstream of Plant	F[c]	3.5 mi @ 113°/ESE
P-18		Christiansen Farm	M	3.8 mi @ 88°/E
P-19	C	Upstream of Plant	F[c]	1.3 mi @ 0°/N
P-20	C	Upstream of Plant	BS	0.9 mi @ 45°/NE
P-24		Suter Residence	WW	0.6 mi @ 158°/SSE
P-28		Allyn Residence	VE	1.0 mi @ 152°/SSE
P-37		Welsch Farm	M	4.1 mi @ 87°/E
P-38	C	Cain Residence	VE	14.2 mi @ 359°/N
P-40	C	Upstream of Plant	BO[c]	0.4 mi @ 0°/N
P-43	C	Peterson Farm	M, WW	13.9 mi. @ 355°/N
P-45		Glazier Residence	VE	0.6 mi. @ 341°/NNW
General Area of the Site Boundary				
P-01A		Property Line	TLD	0.4 mi @ 359°/N
P-02A		Property Line	TLD	0.3 mi @ 10°/N
P-03A		Property Line	TLD	0.5 mi @ 183°/S
P-04A		Property Line	TLD	0.4 mi @ 204°/SWW
P-05A		Property Line	TLD	0.4 mi @ 225°/SW
P-06A		Property Line	TLD	0.4 mi @ 249°/WSW
P-07A		Property Line	TLD	0.4 mi @ 268°/W
P-08A		Property Line	TLD	0.4 mi @ 291°/WNW
P-09A		Property Line	TLD	0.7 mi @ 317°/NW
P-10A		Property Line	TLD	0.5 mi @ 333°/NNW

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from Reactor
Approximately 4 to 5 miles Distant from the Plant				
P-01B		Thomas Killian Residence	TLD	4.7 mi @ 355°/N
P-02B		Roy Kinneman Residence	TLD	4.8 mi @ 17°/NNE
P-03B		Wayne Anderson Farm	TLD	4.9 mi @ 46°/NE
P-04B		Nelson Drive (Road)	TLD	4.2 mi @ 61°/ENE
P-05B		County Road E and Coulee	TLD	4.2 mi @ 102°/ESE
P-06B		William Hauschiblt Residence	TLD	4.4 mi @ 112°/ESE
P-07B		Red Wing Public Works	TLD	4.7 mi @ 140°/SE
P-08B		David Wnuk Residence	TLD	4.1 mi @ 165°/SSE
P-09B		Highway 19 South	TLD	4.2 mi @ 187°/S
P-10B		Cannondale Farm	TLD	4.9 mi @ 200°/SSW
P-11B		Wallace Weberg Farm	TLD	4.5 mi @ 221°/SW
P-12B		Ray Gergen Farm	TLD	4.6 mi @ 251°/WSW
P-13B		Thomas O'Rourke Farm	TLD	4.4 mi @ 270°/W
P-14B		David J. Anderson Farm	TLD	4.9 mi @ 306°/NW
P-15B		Holst Farms	TLD	3.8 mi @ 345°/NNW
Special Interest Locations				
P-01S		Federal Lock & Dam #3	TLD	1.6 mi @ 129°/SE
P-02S		Charles Suter Residence	TLD	0.5 mi @ 155°/SSE
P-03S		Carl Gustafson Farm	TLD	2.2 mi @ 173°/S
P-04S		Richard Burt Residence	TLD	2.0 mi @ 202°/SSW
P-05S		Kinney Store	TLD	2.0 mi @ 270°/W
P-06S		Earl Flynn Farm	TLD	2.5 mi @ 299°/WNW
P-07S		Indian Community	TLD	0.7 mi @ 271°/W
P-08S		Indian Community	TLD	0.7 mi @ 287°/NWW
P-01C	C	Robert Kinneman Farm	TLD	11.1 mi @ 331°/NNW

Table 5.2. Sampling locations, Prairie Island Nuclear Generating Plant (continued).

Code	Type[a]	Collection Site	Sample Type[b]	Distance and Direction from ISFSI Center.
ISFSI Area Inside Earth Berm				
P-01IA		ISFSI Nuisance Fence	TLD	190' @ 45°/NE
P-02IA		ISFSI Nuisance Fence	TLD	360' @ 82°/E
P-03IA		ISFSI Nuisance Fence	TLD	370' @ 100°/E
P-04IA		ISFSI Nuisance Fence	TLD	200' @ 134°/SE
P-05IA		ISFSI Nuisance Fence	TLD	180' @ 219°/SW
P-06IA		ISFSI Nuisance Fence	TLD	320' @ 258°/WSW
P-07IA		ISFSI Nuisance Fence	TLD	320' @ 281°/WNW
P-08IA		ISFSI Nuisance Fence	TLD	190' @ 318°/NW
P-01IX		ISFSI Nuisance Fence	TLD	140' @ 180°/S
P-02IX		ISFSI Nuisance Fence	TLD	310' @ 270°/W
P-03IX		ISFSI Nuisance Fence	TLD	140' @ 0°/N
P-04IX		ISFSI Nuisance Fence	TLD	360' @ 90°/E
ISFSI Area Outside Earth Berm				
P-01IB		ISFSI Berm Area	TLD	340' @ 3°/N
P-02IB		ISFSI Berm Area	TLD	380' @ 28°/NNE
P-03IB		ISFSI Berm Area	TLD	560' @ 85°/E
P-04IB		ISFSI Berm Area	TLD	590' @ 165°/SSE
P-05IB		ISFSI Berm Area	TLD	690' @ 186°/S
P-06IB		ISFSI Berm Area	TLD	720' @ 201°/SSW
P-07IB		ISFSI Berm Area	TLD	610' @ 271°/W
P-08IB		ISFSI Berm Area	TLD	360' @ 332°/NNW

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

[b] Sample Codes:

AP	Airborne particulates	F	Fish
AI	Airborne Iodine	M	Milk
BS	Bottom (river) sediments	SS	Shoreline Sediments
BO	Bottom organisms (periphyton or macroinvertebrates)	SW	Surface Water
		VE	Vegetation/vegetables
DW	Drinking water	WW	Well water

[c] Distance and direction data for fish and bottom organisms are approximate since availability of sample specimen may vary at any one location.

Table 5.3. Missed collections and analyses at the Prairie Island Nuclear Generating Plant.

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
TLD	Gamma	PI-3A	1st Qtr 2013	TLD missing in field.	None required.
AP/AI	Beta, I-131	P-6	5/7/2013	No air flow through sampler.	Replaced pump.
TLD	Gamma	PI-7S	2nd Qtr 2013	TLD missing in field.	None required.
AP/AI	Beta, I-131	P-4	7/16/2013	Partial sample due to tripped breaker.	Add cautionary note to breaker work order.
VE	Gamma (I-131)	P-38	09/01/13	Unable to contact farmer.	Find new control location.
AP/AI	Beta, I-131	P-7	2013	Station was not operational until last week in October.	None required.

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station
Location of Facility: Goodhue, Minnesota (County, State)
Docket No.: 50-282, 50-306
Reporting Period: January-December, 2013

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]
Direct Radiation							
TLD (Inner Ring, Area at Site Boundary) mR/91 days)	Gamma 39	3.0	15.0 (39/39) (10.1-18.4)	P-06A 0.4 mi @ 249° /WSW	16.2 (4/4) (14.8-18.2)	(See Control below.)	0
TLD (Outer Ring, 4-5 mi. distant) mR/91 days)	Gamma 60	3.0	15.2 (60/60) (10.0-22.4)	P-04B, Nelson Dr., 4.2 mi @ 61° /ENE	19.7 (4/4) (16.5-22.4)	(See Control below.)	0
TLD (Special Interest Areas) mR/91 days)	Gamma 31	3.0	13.8 (31/31) (10.0-18.1)	P-03S, Gustafson Farm, 2.2 mi @ 173° /S	16.4 (4/4) (14.8-18.1)	(See Control below.)	0
TLD (Control) mR/91 days)	Gamma 4	3.0	None	P-01C, Robert Kinneman 11.1 mi @ 331° /NNW	16.0 (4/4) (15.1-17.6)	16.0 (4/4) (15.1-17.6)	0
Airborne Pathway							
Airborne Particulates (pCi/m^3)	GB 269	0.005	0.027 (217/217) (0.011-0.063)	P-07, Air Station 0.5 mi W	0.033 (10 /10) (0.016-0.050)	0.028 (52/52) (0.012-0.059)	0
	GS 21						
	Be-7	0.015	0.069 (17/17) (0.042-0.084)	P-02, Air Station 0.5 mi @ 294° /WNW	0.072 (4/4) (0.042-0.084)	0.069 (4/4) (0.049-0.079)	0
	Mn-54	0.0007	< LLD	-	-	< LLD	0
	Co-58	0.0008	< LLD	-	-	< LLD	0
	Co-60	0.0008	< LLD	-	-	< LLD	0
	Zn-65	0.0012	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.0010	< LLD	-	-	< LLD	0
	Ru-103	0.0011	< LLD	-	-	< LLD	0
	Ru-106	0.0069	< LLD	-	-	< LLD	0
	Cs-134	0.0007	< LLD	-	-	< LLD	0
	Cs-137	0.0008	< LLD	-	-	< LLD	0
	Ba-La-140	0.0034	< LLD	-	-	< LLD	0
	Ce-141	0.0016	< LLD	-	-	< LLD	0
	Ce-144	0.0041	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 269	0.030	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station — Docket No.: 50-282, 50-306

Location of Facility: Goodhue, Minnesota (County, State) — Reporting Period: January-December, 2013

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]
Terrestrial Pathway							
Milk (pCi/L)	I-131 54	0.5	< LLD	-	-	< LLD	0
	GS 54						
	K-40	200	1414 (36/36) (1274-1574)	P-43 (C), Peterson Farm 13.9 mi @ 355° /N	1456 (18 /18) (1324-1543)	1456 (18/18) (1324-1543)	0
	Cs-134	5	< LLD	-	-	< LLD	0
	Cs-137	5	< LLD	-	-	< LLD	0
	Ba-La-140	5	< LLD	-	-	< LLD	0
Crops - Cabbage (pCi/gwet)	I-131 2	0.016	< LLD	-	-	< LLD	0
Well Water (pCi/L)	H-3 20	155	< LLD	-	-	< LLD	0
	GS 20						
	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	47	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station — Docket No.: 50-282, 50-306

Location of Facility: Goodhue, Minnesota (County, State) — Reporting Period: January-December, 2013

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							
Drinking Water (pCi/L)	GB 12	1.0	12.2 (12/12) (8.0-15.7)	P-11, Red Wing S.C. 3.3 mi @ 158° /SSE	12.2 (12/12) (8.0-15.7)	None	0
	I-131 12	1.0	< LLD	-	-	None	0
	H-3 4	182	< 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	42	< LLD	-	-	None	0
River Water (pCi/L)	H-3 8	182	500 (1/4)	P-6, Lock and Dam #3, 1.6 mi @ 129° /SE	500 (1/4)	< LLD	0
	GS 24						
	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	46	< LLD	-	-	< LLD	0
Fish (pCi/g wet)	GS 12						
	K-40	0.10	2.80 (6/6) (2.55-3.15)	P-19, Upstream 1.3 mi @ 0° /N	2.96 (6/6) (2.62-3.31)	2.96 (6/6) (2.62-3.31)	0
	Mn-54	0.029	< LLD	-	-	< LLD	0
	Fe-59	0.087	< LLD	-	-	< LLD	0
	Co-58	0.041	< LLD	-	-	< LLD	0
	Co-60	0.017	< LLD	-	-	< LLD	0
	Zn-65	0.050	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.072	< LLD	-	-	< LLD	0
	Cs-134	0.022	< LLD	-	-	< LLD	0
	Cs-137	0.020	< LLD	-	-	< LLD	0
	Ba-La-140	0.58	< LLD	-	-	< LLD	0

Table 5.4 Radiological Environmental Monitoring Program Summary

Name of Facility: Prairie Island Nuclear Power Station
Location of Facility: Goodhue, Minnesota (County, State)
Docket No.: 50-282, 50-306
Reporting Period: January-December, 2013

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	0.62	< LLD	-	-	< LLD	0
	K-40	0.98	< LLD	-	-	< LLD	0
	Mn-54	0.046	< LLD	-	-	< LLD	0
	Co-58	0.063	< LLD	-	-	< LLD	0
	Co-60	0.045	< LLD	-	-	< LLD	0
	Zn-65	0.10	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.13	< LLD	-	-	< LLD	0
	Ru-103	0.10	< LLD	-	-	< LLD	0
	Ru-106	0.31	< LLD	-	-	< LLD	0
	Cs-134	0.033	< LLD	-	-	< LLD	0
	Cs-137	0.032	< LLD	-	-	< LLD	0
	Ba-La-140	0.96	< LLD	-	-	< LLD	0
	Ce-141	0.16	< LLD	-	-	< LLD	0
	Ce-144	0.23	< LLD	-	-	< LLD	0
Bottom and Shoreline Sediments (pCi/g dry)	GS 6						
	Be-7	0.35	< LLD	-	-	< LLD	0
	K-40	0.10	7.66 (4/4) (4.59-9.24)	P-20, Upstream 0.9 mi. @ 45° /NE	9.87 (2/2) (8.95-10.78)	9.87 (2/2) (8.95-10.78)	0
	Mn-54	0.019	< LLD	-	-	< LLD	0
	Co-58	0.019	< LLD	-	-	< LLD	0
	Co-60	0.015	< LLD	-	-	< LLD	0
	Zn-65	0.055	< LLD	-	-	< LLD	0
	Zr-Nb-95	0.039	< LLD	-	-	< LLD	0
	Ru-103	0.036	< LLD	-	-	< LLD	0
	Ru-106	0.15	< LLD	-	-	< LLD	0
	Cs-134	0.014	< LLD	-	-	< LLD	0
	Cs-137	0.020	< LLD	-	-	< LLD	0
	Ba-La-140	0.21	< LLD	-	-	< LLD	0
	Ce-141	0.10	< LLD	-	-	< LLD	0
	Ce-144	0.17	< 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 times 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 through December, 2013

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its 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 International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

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	Concentration (pCi/L) Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-76	01/07/13	Ra-226	10.04 ± 0.55	9.91	7.42 - 11.60	Pass
ERW-76	01/07/13	Ra-228	6.11 ± 1.29	5.22	3.14 - 6.96	Pass
ERW-76	01/07/13	Uranium	5.90 ± 0.58	5.96	4.47 - 7.13	Pass
ERW-1593	04/08/13	Sr-89	43.60 ± 4.32	41.30	31.60 - 48.40	Pass
ERW-1593	04/08/13	Sr-90	23.20 ± 1.70	23.90	17.20 - 28.00	Pass
ERW-1596	04/08/13	Ba-133	74.80 ± 4.00	82.10	69.00 - 90.30	Pass
ERW-1596	04/08/13	Co-60	65.50 ± 3.42	65.90	59.30 - 75.00	Pass
ERW-1596	04/08/13	Cs-134	41.10 ± 3.47	42.80	34.20 - 47.10	Pass
ERW-1596	04/08/13	Cs-137	42.30 ± 4.03	41.70	37.00 - 48.80	Pass
ERW-1596	04/08/13	Zn-65	200.3 ± 10.1	189.0	170.0 - 222.0	Pass
ERW-1598	04/08/13	Gr. Alpha	34.30 ± 1.98	40.80	21.10 - 51.90	Pass
ERW-1598	04/08/13	Gr. Beta	18.70 ± 0.98	21.60	13.00 - 29.70	Pass
ERW-1600	04/08/13	I-131	23.00 ± 1.10	23.80	19.70 - 28.30	Pass
ERW-1600	04/08/13	I-131(G)	23.48 ± 9.44	23.80	19.70 - 28.30	Pass
ERW-1605	04/08/13	Ra-226	16.30 ± 0.70	15.40	11.50 - 17.70	Pass
ERW-1605	04/08/13	Ra-228	5.32 ± 1.30	4.36	2.54 - 5.98	Pass
ERW-1605	04/08/13	Uranium	57.30 ± 4.20	61.20	49.80 - 67.90	Pass
ERW-1606	04/08/13	H-3	4041 ± 194	4050	3450 - 4460	Pass
ERW-6009	10/07/13	Sr-89	22.00 ± 2.80	21.90	14.40 ± 28.20	Pass
ERW-6009	10/07/13	Sr-90	17.10 ± 2.55	18.10	12.80 ± 21.50	Pass
ERW-6012	10/07/13	Ba-133	48.20 ± 4.29	54.20	44.70 ± 59.90	Pass
ERW-6012	10/07/13	Co-60	100.8 ± 4.7	102.0	91.80 ± 114.00	Pass
ERW-6012	10/07/13	Cs-134	87.30 ± 4.35	86.70	71.10 ± 95.40	Pass
ERW-6012	10/07/13	Cs-137	199.6 ± 7.4	206.0	185.0 - 228.0	Pass
ERW-6012	10/07/13	Zn-65	356.2 ± 13.2	333.0	300.0 - 389.0	Pass
ERW-6015	10/07/13	Gr. Alpha	30.70 ± 11.90	42.80	22.20 ± 54.30	Pass
ERW-6015	10/07/13	Gr. Beta	25.70 ± 6.48	32.20	20.80 ± 39.90	Pass
ERW-6019	10/07/13	I-131	22.50 ± 1.01	23.60	19.60 ± 28.00	Pass
ERW-6022	10/07/13	Ra-226	12.70 ± 1.62	12.10	9.04 ± 14.00	Pass
ERW-6022 [d]	10/07/13	Ra-228	5.70 ± 0.56	4.02	2.30 ± 5.59	Fail
ERW-6022	10/07/13	Uranium	6.59 ± 0.38	6.24	4.70 ± 7.44	Pass
ERW-6024	10/07/13	H-3	18397 ± 695	17700	15500 - 19500	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] The reported result was obtained in the first cycle of counting. It can be positively biased due to extra beta counts contributed by Pb-214 and Bi-214 daughters of Rn-222. Result of second cycle of counting 4.47 pCi/L.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).

Lab Code	Date	Description	Known Value (mR)	Lab Result ± 2 sigma (mR)	Control Limits (mR)	Acceptance
Environmental, Inc.						
2013-1	5/6/2013	40 cm.	34.26	39.92 ± 2.67	23.98 - 44.54	Pass
2013-1	5/6/2013	50 cm.	21.93	25.44 ± 3.31	15.35 - 28.51	Pass
2013-1	5/6/2013	60 cm.	15.23	15.88 ± 1.12	10.66 - 19.80	Pass
2013-1	5/6/2013	70 cm.	11.19	10.89 ± 0.66	7.83 - 14.55	Pass
2013-1	5/6/2013	80 cm.	8.57	9.21 ± 0.41	6.00 - 11.14	Pass
2013-1	5/6/2013	90 cm.	6.77	6.52 ± 0.34	4.74 - 8.80	Pass
2013-1	5/6/2013	100 cm.	5.48	5.02 ± 0.53	3.84 - 7.12	Pass
2013-1	5/6/2013	110 cm.	4.53	4.51 ± 0.34	3.17 - 5.89	Pass
2013-1	5/6/2013	120 cm.	3.81	4.28 ± 0.35	2.67 - 4.95	Pass
2013-1	5/6/2013	135 cm.	3.01	2.64 ± 0.18	2.11 - 3.91	Pass
2013-1	5/6/2013	150 cm.	2.44	2.10 ± 0.25	1.71 - 3.17	Pass
2013-1	5/6/2013	180 cm.	1.69	1.78 ± 0.33	1.18 - 2.20	Pass
Environmental, Inc.						
2013-2	11/18/2013	50 cm.	19.93	22.75 ± 3.67	13.95 - 25.91	Pass
2013-2	11/18/2013	60 cm.	13.84	15.75 ± 1.94	9.69 - 17.99	Pass
2013-2	11/18/2013	70 cm.	10.17	11.24 ± 0.88	7.12 - 13.22	Pass
2013-2	11/18/2013	75 cm.	8.86	9.18 ± 1.23	6.20 - 11.52	Pass
2013-2	11/18/2013	80 cm.	7.79	7.81 ± 1.10	5.45 - 10.13	Pass
2013-2	11/18/2013	90 cm.	6.15	5.98 ± 0.90	4.31 - 8.00	Pass
2013-2	11/18/2013	100 cm.	4.98	5.13 ± 0.73	3.49 - 6.47	Pass
2013-2	11/18/2013	110 cm.	4.12	3.87 ± 0.32	2.88 - 5.36	Pass
2013-2	11/18/2013	120 cm.	3.46	3.11 ± 0.39	2.42 - 4.50	Pass
2013-2	11/18/2013	135 cm.	2.73	2.71 ± 0.83	1.91 - 3.55	Pass
2013-2	11/18/2013	150 cm.	2.21	2.11 ± 0.63	1.55 - 2.87	Pass
2013-2	11/18/2013	180 cm.	1.54	1.81 ± 0.10	1.08 - 2.00	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
SPW-66	1/9/2013	Tc-99	1009 ± 5	1078	754.9 - 1402.0	Pass
SPW-1891	1/18/2013	Ra-228	35.60 ± 2.75	30.85	21.60 - 40.11	Pass
SPSO-12313S	1/23/2013	Tc-99	103.5 ± 2.2	107.8	75.46 - 140.14	Pass
SPMI-264	1/25/2013	Cs-134	110.9 ± 6.7	107.5	96.73 - 118.23	Pass
SPMI-264	1/25/2013	Cs-137	82.84 ± 7.47	77.48	67.48 - 87.48	Pass
SPMI-264	1/25/2013	Sr-90	38.19 ± 1.49	40.11	32.09 - 48.13	Pass
SPW-266	1/25/2013	Co-60	46.89 ± 4.68	44.48	34.48 - 54.48	Pass
SPW-266	1/25/2013	Cs-134	105.9 ± 8.0	107.5	96.73 - 118.23	Pass
SPW-266	1/25/2013	Cs-137	42.17 ± 5.65	39.49	29.49 - 49.49	Pass
SPW-266	1/25/2013	Sr-90	39.84 ± 1.65	40.11	32.09 - 48.13	Pass
SPAP-376	2/1/2013	Gr. Beta	44.20 ± 0.11	45.68	27.41 - 63.95	Pass
SPAP-378	2/1/2013	Cs-134	3.71 ± 0.65	3.87	2.32 - 5.42	Pass
SPAP-378	2/1/2013	Cs-137	97.47 ± 2.50	102.9	92.61 - 113.19	Pass
SPW-391	2/1/2013	H-3	63719 ± 703	65626	52501 - 78751	Pass
SPW-380	2/10/2013	Ni-63	217.0 ± 3.7	205.3	143.7 - 266.9	Pass
W-30413	3/4/2013	Gr. Alpha	19.77 ± 0.40	20.00	10.00 - 30.00	Pass
W-30413	3/4/2013	Gr. Beta	30.48 ± 0.34	30.90	20.90 - 40.90	Pass
W-30713	3/7/2013	Ra-226	18.06 ± 0.51	16.70	11.69 - 21.71	Pass
W-42713	4/27/2013	Gr. Alpha	20.67 ± 0.40	20.00	10.00 - 30.00	Pass
W-42713	4/27/2013	Gr. Beta	28.44 ± 0.32	30.90	20.90 - 40.90	Pass
WW-2870	5/7/2013	Co-60	166.1 ± 7.4	161.6	145.4 - 177.8	Pass
WW-2870	5/7/2013	Cs-137	161.2 ± 9.3	149.0	134.1 - 163.9	Pass
WW-2870	5/7/2013	H-3	6853 ± 250	6735	5388 - 8082	Pass
W-53113	5/31/2013	Ra-226	16.83 ± 0.41	16.70	11.69 - 21.71	Pass
SPAP-3332	6/19/2013	Am-241	4.60 ± 0.14	4.00	2.40 - 5.60	Pass
SPW-3334	6/19/2013	Th-230	4.36 ± 0.34	4.00	2.40 - 5.60	Pass
SPW-3458	6/24/2013	C-14	3825 ± 13	4736	2842 - 6630	Pass
SPAP-3529	6/27/2013	Cs-134	3.49 ± 1.26	3.30	1.98 - 4.62	Pass
SPAP-3529	6/27/2013	Cs-137	102.0 ± 2.9	101.1	90.99 - 111.21	Pass
SPAP-3531	6/27/2013	Gr. Beta	45.64 ± 0.11	45.42	27.25 - 63.59	Pass
SPF-3533	6/27/2013	Cs-134	1.31 ± 0.14	1.50	0.90 - 2.10	Pass
SPF-3533	6/27/2013	Cs-137	2.77 ± 0.27	2.43	1.46 - 3.40	Pass
SPW-3535	6/27/2013	Ni-63	204.3 ± 3.5	204.8	143.4 - 266.2	Pass
SPW-3537	6/27/2013	Tc-99	104.5 ± 1.7	107.8	75.46 - 140.14	Pass
SPW-3539	6/27/2013	Fe-55	97015 ± 860	90677	72542 - 108812	Pass
SPW-1893	6/28/2013	Ra-228	30.16 - 2.73	30.85	21.60 - 40.11	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
SPW-72913S	7/29/2013	Tc-99	126.6 ± 2.2	107.8	75.46 ± 140.14	Pass
SPW-4373	7/31/2013	Cs-134	91.71 ± 6.02	90.94	80.94 ± 100.94	Pass
SPW-4373	7/31/2013	Cs-137	83.05 ± 7.20	76.57	66.57 ± 86.57	Pass
SPW-4373	7/31/2013	Sr-90	39.28 ± 1.77	39.64	31.71 ± 47.57	Pass
SPW-4374	7/31/2013	Sr-90	42.17 ± 1.71	39.64	31.71 ± 47.57	Pass
SPMI-4376	7/31/2013	Cs-134	82.22 - 7.23	90.94	80.94 ± 100.94	Pass
SPMI-4376	7/31/2013	Cs-137	83.31 - 8.29	76.57	66.57 ± 86.57	Pass
SPMI-4376A	7/31/2013	Sr-90	35.00 ± 1.63	39.64	31.71 ± 47.57	Pass
W-73113	7/31/2013	Ra-226	17.61 ± 0.41	16.70	11.69 ± 21.71	Pass
SPS-4514	8/5/2013	Sr-90	78.63 ± 2.95	79.28	63.42 ± 95.14	Pass
W-82013	8/20/2013	Gr. Alpha	21.53 ± 0.45	20.00	10.00 ± 30.00	Pass
W-82013	8/20/2013	Gr. Beta	28.03 ± 0.32	30.90	20.90 ± 40.90	Pass
SPW-1894	8/28/2013	Ra-228	32.49 ± 3.00	30.85	21.60 ± 40.11	Pass
W-90913	9/9/2013	Gr. Alpha	19.08 ± 0.51	20.10	10.05 ± 30.15	Pass
W-90913	9/9/2013	Gr. Beta	32.12 ± 0.35	32.10	22.10 ± 42.10	Pass
WW-5623	10/3/2013	Co-60	157.0 ± 7.0	155.3	139.8 - 170.8	Pass
WW-5623	10/3/2013	Cs-137	156.0 ± 8.8	148.1	133.3 - 162.9	Pass
WW-5623	10/3/2013	H-3	6590 ± 245	6322	5058 - 7586	Pass
WW-5750	10/3/2013	Co-60	87.00 ± 7.80	77.40	77.00 ± 97.00	Pass
WW-5750	10/3/2013	Cs-137	82.30 ± 7.80	78.80	68.80 ± 88.80	Pass
WW-5750	10/3/2013	H-3	6181 ± 238	6322	5058 - 7586	Pass
W-102813	10/28/2013	Ra-226	15.69 ± 0.37	16.70	11.69 ± 21.71	Pass
SPW-1898	12/17/2013	Ra-228	28.15 ± 2.37	30.85	21.60 ± 40.11	Pass
W-122313	12/23/2013	Gr. Alpha	20.96 ± 0.47	20.10	10.05 ± 30.15	Pass
W-122313	12/23/2013	Gr. Beta	31.00 ± 0.34	32.10	22.10 ± 42.10	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/m^3), 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)
SPW-67	Water	1/9/2013	Tc-99	1.10	0.69 ± 0.68	10
SPW-190	Water	1/18/2013	Ra-228	0.74	0.66 ± 0.43	2
SPW-1901	Water	1/18/2013	Ra-228	0.74	0.66 ± 0.43	2
SPMI-263	Milk	1/25/2013	Sr-90	0.64	0.31 ± 0.34	1
SPMI-263	Milk	1/25/2013	Sr-90	0.64	0.31 ± 0.34	1
SPW-265	Water	1/25/2013	Co-60	2.86	2.10 ± 1.72	10
SPW-265	Water	1/25/2013	Cs-134	2.98	2.25 ± 1.57	10
SPW-265	Water	1/25/2013	Cs-137	2.71	0.44 ± 1.61	10
SPW-266	Water	1/25/2013	Sr-90	0.72	-0.12 ± 0.32	1
SPAP-375	Air Filter	2/1/2013	Gr. Beta	0.003	0.016 ± 0.003	0.010
SPAP-377	Air Filter	2/1/2013	Co-60	2.31	-0.34 ± 1.75	100
SPAP-377	Air Filter	2/1/2013	Cs-134	2.72	1.22 ± 1.62	100
SPAP-377	Air Filter	2/1/2013	Cs-137	1.50	-0.52 ± 1.80	100
SPW-391	Water	2/1/2013	H-3	92.04	-29.44 ± 69.24	200
SPW-379	Water	2/10/2013	Ni-63	2.11	0.91 ± 1.30	20
W-30413	Water	3/4/2013	Gr. Alpha	0.35	0.08 ± 0.26	1
W-30413	Water	3/4/2013	Gr. Beta	0.73	0.10 ± 0.51	3.2
W-30713	Water	3/7/2013	Ra-226	0.031	0.032 ± 0.024	1
W-42713	Water	4/27/2013	Gr. Alpha	0.45	-0.14 ± 0.30	1
W-42713	Water	4/27/2013	Gr. Beta	0.72	-0.23 ± 0.50	3.2
W-53113	Water	5/31/2013	Ra-226	0.03	0.01 ± 0.02	1
SPW-3335	Water	6/19/2013	Th-230	0.01	0.01 ± 0.01	1
SPW-3459	Water	6/24/2013	C-14	10.89	10.44 ± 6.82	200
SPAP-3528	Air Filter	6/27/2013	Cs-134	2.10	-0.98 ± 1.11	100
SPAP-3528	Air Filter	6/27/2013	Cs-137	2.71	-0.24 ± 1.36	100
SPAP-3530	Air Filter	6/27/2013	Gr. Beta	0.004	0.018 ± 0.003	0.010
SPF-3532	Fish	6/27/2013	Cs-134	8.38	-1.39 ± 5.69	100
SPF-3532	Fish	6/27/2013	Cs-137	8.37	-1.88 ± 6.41	100
SPW-3534	Water	6/27/2013	Ni-63	2.47	-1.04 ± 1.48	20
SPW-3536	Water	6/27/2013	Tc-99	1.15	-1.11 ± 0.68	10
SPW-3538	water	6/27/2013	Fe-55	170.27	-17.50 ± 102.70	1000
SPW-1903	Water	6/28/2013	Ra-228	0.85	-0.02 ± 0.39	2

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-72913B	Water	7/29/2013	Tc-99	1.44	-0.33 ± 0.87	10
SPW-4372	Water	7/31/2013	Co-60	1.41	-1.42 ± 3.00	10
SPW-4372	Water	7/31/2013	Cs-134	3.68	-2.66 ± 3.46	10
SPW-4372	Water	7/31/2013	Cs-137	3.53	0.29 ± 3.31	10
SPMI-4375	Milk	7/31/2013	Co-60	3.92	2.65 ± 2.26	10
SPMI-4375	Milk	7/31/2013	Cs-134	4.67	0.68 ± 2.54	10
SPMI-4375	Milk	7/31/2013	Cs-137	4.79	1.30 ± 2.68	10
SPMI-4375	Milk	7/31/2013	Sr-90	0.57	0.32 ± 0.30	1
W-73113	Water	7/31/2013	Ra-226	0.02	0.04 ± 0.02	1
SPS-4515	Powder	8/5/2013	Sr-90	0.09	-0.01 ± 0.04	1
W-82013	Water	8/20/2013	Gr. Alpha	0.42	-0.15 ± 0.28	1
W-82013	Water	8/20/2013	Gr. Beta	0.74	-0.24 ± 0.51	3.2
SPW-1904	Water	8/28/2013	Ra-228	0.96	0.85 ± 0.56	2
CHW-90913	Water	9/9/2013	Gr. Alpha	0.25	0.20 ± 0.29	1
CHW-90913	Water	9/9/2013	Gr. Beta	0.49	-0.18 ± 0.53	3.2
CHW-102013	Water	10/20/2013	Gr. Alpha	0.29	0.24 ± 0.33	1
CHW-102013	Water	10/20/2013	Gr. Beta	0.54	-0.32 ± 0.54	3.2
W-102813	Water	10/28/2013	Ra-226	0.02	0.02 ± 0.01	1
SPW-1908	Water	12/17/2013	Ra-228	0.69	0.55 ± 0.39	2
CHW-122313	Water	12/23/2013	Gr. Alpha	0.25	-0.09 ± 0.26	1
CHW-122313	Water	12/23/2013	Gr. Beta	0.48	0.05 ± 0.53	3.2
CHW-122713	Water	12/27/2013	Gr. Alpha	0.28	0.04 ± 0.31	1
CHW-122713	Water	12/27/2013	Gr. Beta	0.49	-0.33 ± 0.53	3.2

[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-41, 42	1/2/2013	Gr. Beta	8.45 ± 0.37	7.90 ± 0.35	8.17 ± 0.26	Pass
CF-41, 42	1/2/2013	Sr-90	0.030 ± 0.015	0.029 ± 0.014	0.030 ± 0.010	Pass
SWT-8243, 8244	1/2/2013	Gr. Beta	1.07 ± 0.54	0.98 ± 0.51	1.03 ± 0.37	Pass
AP-8454, 8455	1/2/2013	Be-7	0.053 ± 0.010	0.042 ± 0.010	0.048 ± 0.007	Pass
AP-8517, 8518	1/3/2013	Be-7	0.051 ± 0.015	0.049 ± 0.017	0.050 ± 0.011	Pass
MI-62, 63	1/8/2013	K-40	1317.70 ± 91.70	1351.90 ± 72.50	1334.80 ± 58.45	Pass
WW-151, 152	1/8/2013	H-3	222.70 ± 81.00	289.70 ± 84.10	256.20 ± 58.38	Pass
SG-107, 108	1/11/2013	Ra-226	55.20 ± 5.53	58.60 ± 5.94	56.90 ± 4.06	Pass
SG-107, 108	1/11/2013	Ra-228	71.60 ± 1.10	74.30 ± 1.70	72.95 ± 1.01	Pass
SG-130, 131	1/14/2013	Ra-226	3.91 ± 0.20	3.45 ± 0.27	3.68 ± 0.17	Pass
SG-130, 131	1/14/2013	Ra-228	2.40 ± 0.33	2.70 ± 0.39	2.55 ± 0.26	Pass
WW-277, 278	1/17/2013	H-3	159.71 ± 77.91	196.57 ± 79.72	178.14 ± 55.73	Pass
WW-256, 257	1/22/2013	H-3	502.70 ± 93.40	483.30 ± 92.60	493.00 ± 65.76	Pass
DW-40010, 40011	1/24/2013	Ra-226	2.55 ± 0.18	2.86 ± 0.20	2.71 ± 0.13	Pass
DW-40010, 40011	1/24/2013	Ra-228	1.78 ± 0.62	2.22 ± 0.62	2.00 ± 0.44	Pass
SWT-361, 362	1/29/2013	Gr. Beta	0.90 ± 0.40	1.01 ± 0.38	0.96 ± 0.28	Pass
DW-484, 485	1/29/2013	Gr. Beta	14.85 ± 1.93	14.81 ± 2.06	14.83 ± 1.41	Pass
S-945, 946	1/29/2013	Cs-137	14.50 ± 0.18	14.45 ± 0.19	14.48 ± 0.13	Pass
S-945, 946	1/29/2013	K-40	7.90 ± 0.74	8.00 ± 0.73	7.95 ± 0.52	Pass
S-340, 341	1/31/2013	Cs-137	0.16 ± 0.05	0.15 ± 0.06	0.15 ± 0.04	Pass
S-340, 341	1/31/2013	K-40	17.35 ± 1.34	19.75 ± 1.25	18.55 ± 0.92	Pass
AP-463, 464	1/31/2013	Be-7	0.27 ± 0.10	0.26 ± 0.10	0.26 ± 0.07	Pass
MI-631, 632	2/13/2013	K-40	1350.50 ± 105.20	1413.70 ± 85.94	1382.10 ± 67.92	Pass
WW-769, 770	2/25/2013	Gr. Beta	1.20 ± 0.33	1.35 ± 0.34	1.28 ± 0.24	Pass
DW-736, 737	2/26/2013	Gr. Beta	1.09 ± 0.54	1.57 ± 0.58	1.33 ± 0.40	Pass
SWU-790, 791	2/26/2013	Gr. Beta	2.68 ± 0.96	2.08 ± 0.95	2.38 ± 0.67	Pass
W-925, 926	2/27/2013	H-3	2265.00 ± 153.00	2329.00 ± 154.00	2297.00 ± 108.54	Pass
AP-1034, 1035	3/7/2013	Be-7	0.17 ± 0.08	0.16 ± 0.09	0.17 ± 0.06	Pass
MI-1076, 1077	3/13/2013	K-40	1347.70 ± 99.32	1396.10 ± 108.00	1371.90 ± 73.36	Pass
CH-1118, 1119	3/14/2013	I-131(G)	109.41 ± 5.69	103.88 ± 7.76	106.65 ± 4.81	Pass
WW-1221, 1222	3/14/2013	H-3	452.11 ± 97.43	403.29 ± 95.46	427.70 ± 68.20	Pass
P-1368, 1369	3/15/2013	H-3	735.24 ± 113.99	666.04 ± 111.41	700.64 ± 79.70	Pass
DW-40017, 40018	3/19/2013	Gr. Alpha	1.43 ± 0.94	1.61 ± 1.00	1.52 ± 0.69	Pass
MI-1473, 1474	4/1/2013	K-40	1618.00 ± 107.00	1767.00 ± 129.00	1692.50 ± 83.80	Pass
AP-2014, 2015	4/1/2013	Be-7	0.055 ± 0.008	0.057 ± 0.006	0.056 ± 0.005	Pass
DW-40023, 40024	4/1/2013	Ra-226	2.29 ± 0.18	2.54 ± 0.20	2.42 ± 0.13	Pass
DW-40023, 40024	4/1/2013	Ra-228	2.99 ± 0.69	2.96 ± 0.67	2.98 ± 0.48	Pass
SWU-736, 737	4/2/2013	Gr. Beta	4.80 ± 0.95	4.43 ± 0.86	4.62 ± 0.64	Pass
AP-2035, 2036	4/2/2013	Be-7	0.070 ± 0.013	0.065 ± 0.013	0.068 ± 0.009	Pass
BS-1680, 1681	4/8/2013	K-40	1995.30 ± 265.70	1992.00 ± 289.40	1993.65 ± 196.44	Pass
SW-1638, 1639	4/9/2013	H-3	1350.77 ± 130.08	1320.45 ± 129.25	1335.61 ± 91.69	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
WW-2394, 2395	4/9/2013	H-3	348.08 ± 88.40	302.43 ± 86.41	325.25 ± 61.81	Pass
DW-40035, 40036	4/12/2013	Ra-226	1.36 ± 0.15	1.29 ± 0.13	1.33 ± 0.10	Pass
DW-40035, 40036	4/12/2013	Ra-228	1.22 ± 0.49	1.38 ± 0.53	1.30 ± 0.36	Pass
MI-1825, 1826	4/15/2013	K-40	1290.20 ± 113.80	1378.60 ± 91.99	1334.40 ± 73.17	Pass
MI-1825, 1826	4/15/2013	Sr-90	0.68 ± 0.32	0.46 ± 0.31	0.57 ± 0.22	Pass
DW-40049, 40050	4/15/2013	Gr. Alpha	1.88 ± 0.69	2.51 ± 0.71	2.20 ± 0.50	Pass
WW-1909, 1910	4/16/2013	H-3	2145.68 ± 156.65	2108.32 ± 155.80	2127.00 ± 110.47	Pass
DW-40064, 40065	4/23/2013	Gr. Alpha	1.95 ± 0.79	1.80 ± 0.81	1.88 ± 0.57	Pass
DW-40066, 40067	4/23/2013	Ra-226	1.98 ± 0.17	1.66 ± 0.16	1.82 ± 0.12	Pass
DW-40066, 40067	4/23/2013	Ra-228	2.30 ± 0.59	2.32 ± 0.59	2.31 ± 0.42	Pass
F-2225, 2226	5/1/2013	K-40	2.81 ± 0.37	2.67 ± 0.39	2.74 ± 0.27	Pass
BS-2267, 2268	5/1/2013	K-40	13.46 ± 0.64	13.59 ± 0.62	13.52 ± 0.45	Pass
SG-2235, 2236	5/2/2013	Ac-228	18.30 ± 0.60	18.50 ± 0.60	18.40 ± 0.42	Pass
SG-2235, 2236	5/2/2013	Gr. Alpha	54.00 ± 3.70	51.90 ± 3.40	52.95 ± 2.51	Pass
SG-2235, 2236	5/2/2013	Pb-214	11.30 ± 0.30	11.20 ± 0.20	11.25 ± 0.18	Pass
AP-2288, 2289	5/2/2013	Be-7	0.19 ± 0.10	0.19 ± 0.08	0.19 ± 0.07	Pass
WW-3091, 3092	5/2/2013	H-3	1107.91 ± 153.49	1263.37 ± 157.43	1185.64 ± 109.94	Pass
SW-2373, 2374	5/8/2013	H-3	324.80 ± 86.81	364.61 ± 88.53	344.71 ± 62.00	Pass
W-2352, 2353	5/9/2013	Ra-226	0.91 ± 0.20	1.29 ± 0.22	1.10 ± 0.15	Pass
W-2352, 2353	5/9/2013	Ra-228	1.28 ± 0.87	1.03 ± 0.94	1.16 ± 0.64	Pass
CF-2499, 2500	5/13/2013	K-40	11.52 ± 0.45	12.55 ± 0.61	12.04 ± 0.38	Pass
F-3987, 3988	5/20/2013	K-40	3.07 ± 0.48	3.05 ± 0.43	3.06 ± 0.32	Pass
BS-4113, 4114	5/20/2013	K-40	8.06 ± 0.44	7.99 ± 0.44	8.02 ± 0.31	Pass
SO-2902, 2903	5/22/2013	Th-228	0.57 ± 0.07	0.51 ± 0.06	0.54 ± 0.05	Pass
SO-2902, 2903	5/22/2013	Th-230	0.39 ± 0.06	0.40 ± 0.05	0.40 ± 0.04	Pass
SO-2902, 2903	5/22/2013	Th-232	0.55 ± 0.07	0.62 ± 0.06	0.59 ± 0.05	Pass
WW-2776, 2777	5/23/2013	H-3	261.76 ± 100.85	283.17 ± 101.68	272.46 ± 71.61	Pass
WW-2818, 2819	5/23/2013	H-3	999.35 ± 126.15	880.63 ± 122.43	939.99 ± 87.90	Pass
S-7271, 7272	5/27/2013	Cs-137	2.82 ± 0.10	2.91 ± 0.09	2.86 ± 0.07	Pass
S-7271, 7272	5/27/2013	K-40	21.52 ± 0.97	21.13 ± 1.02	21.32 ± 0.70	Pass
P-2923, 2924	5/29/2013	H-3	441.31 ± 92.75	374.30 ± 89.94	407.80 ± 64.60	Pass
WW-3133, 3134	6/1/2013	H-3	278.42 ± 86.54	209.45 ± 83.44	243.93 ± 60.11	Pass
WW-3049, 3050	6/5/2013	H-3	156.08 ± 79.16	244.66 ± 83.86	200.37 ± 57.66	Pass
DW-40079, 40080	6/5/2013	Ra-226	6.67 ± 0.30	7.03 ± 0.35	6.85 ± 0.23	Pass
DW-40079, 40080	6/5/2013	Ra-228	5.55 ± 0.75	6.11 ± 0.77	5.83 ± 0.54	Pass
DW-40089, 40090	6/5/2013	Gr. Alpha	6.82 ± 0.90	5.64 ± 1.02	6.23 ± 0.68	Pass
DW-40091, 40092	6/5/2013	Ra-226	3.44 ± 0.19	3.66 ± 0.19	3.55 ± 0.13	Pass
DW-40091, 40092	6/5/2013	Ra-228	3.70 ± 0.68	4.69 ± 0.73	4.20 ± 0.50	Pass
DW-40103, 40104	6/5/2013	Ra-226	0.98 ± 0.22	0.62 ± 0.15	0.80 ± 0.13	Pass
MI-3154, 3155	6/12/2013	K-40	1513.00 ± 128.10	1456.70 ± 110.30	1484.85 ± 84.52	Pass
P-3385, 3386	6/14/2013	H-3	236.88 ± 87.87	242.87 ± 88.14	239.88 ± 62.23	Pass
F-3776, 3777	6/16/2013	Cs-137	0.039 ± 0.015	0.048 ± 0.019	0.044 ± 0.012	Pass
F-3776, 3777	6/16/2013	Gr. Beta	4.52 ± 0.09	4.63 ± 0.09	4.57 ± 0.06	Pass
F-3776, 3777	6/16/2013	K-40	3.40 ± 0.41	3.52 ± 0.39	3.46 ± 0.29	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
S-3238, 3239	6/17/2013	Be-7	1139.80 ± 215.00	1102.00 ± 194.70	1120.90 ± 145.03	Pass
S-3238, 3239	6/17/2013	Cs-134	26.23 ± 13.23	39.91 ± 11.73	33.07 ± 8.84	Pass
S-3238, 3239	6/17/2013	Cs-137	72.75 ± 25.99	85.91 ± 22.58	79.33 ± 17.21	Pass
S-3238, 3239	6/17/2013	K-40	21847.00 ± 656.50	22158.00 ± 622.80	22002.50 ± 452.46	Pass
SO-3343, 3344	6/17/2013	Cs-137	0.087 ± 0.022	0.084 ± 0.017	0.086 ± 0.014	Pass
SO-3343, 3344	6/17/2013	K-40	8.90 ± 0.53	9.47 ± 0.49	9.19 ± 0.36	Pass
DW-40118, 40119	6/26/2013	Gr. Alpha	3.56 ± 1.07	4.51 ± 0.96	4.04 ± 0.72	Pass
DW-40118, 40119	6/26/2013	Ra-226	2.52 ± 0.22	2.48 ± 0.19	2.50 ± 0.15	Pass
DW-40118, 40119	6/26/2013	Ra-228	2.75 ± 0.71	2.86 ± 0.75	2.81 ± 0.52	Pass
WW-3583, 3584	6/27/2013	H-3	6732.57 ± 246.74	6807.94 ± 247.98	6770.26 ± 174.91	Pass
AP-4092, 4093	6/28/2013	Be-7	0.078 ± 0.015	0.083 ± 0.017	0.080 ± 0.011	Pass
E-3608, 3609	7/1/2013	K-40	1.28 ± 0.13	1.29 ± 0.11	1.28 ± 0.09	Pass
MI-3629, 3630	7/1/2013	K-40	1840.70 ± 130.10	1804.90 ± 143.00	1822.80 ± 96.66	Pass
AP-4050, 4051	7/1/2013	Be-7	0.094 ± 0.009	0.093 ± 0.009	0.093 ± 0.006	Pass
DW-40134, 40135	7/1/2013	Ra-226	1.75 ± 0.15	1.56 ± 0.15	1.66 ± 0.11	Pass
DW-40134, 40135	7/1/2013	Ra-228	2.07 ± 0.60	1.61 ± 0.57	1.84 ± 0.41	Pass
AP-4071, 4072	7/3/2013	Be-7	0.066 ± 0.009	0.069 ± 0.011	0.067 ± 0.007	Pass
DW-40144, 40145	7/9/2013	Gr. Alpha	3.66 ± 0.85	2.85 ± 0.79	3.26 ± 0.58	Pass
DW-40146, 40147	7/9/2013	Ra-226	0.70 ± 0.11	0.72 ± 0.11	0.71 ± 0.08	Pass
DW-40146, 40147	7/9/2013	Ra-228	1.00 ± 0.58	0.70 ± 0.52	0.85 ± 0.39	Pass
VE-3818, 3819	7/9/2013	Be-7	0.41 ± 0.11	0.46 ± 0.18	0.43 ± 0.11	Pass
VE-3818, 3819	7/9/2013	K-40	4.67 ± 0.30	4.52 ± 0.43	4.60 ± 0.26	Pass
XW-4646, 4647	7/15/2013	H-3	465.00 ± 111.00	525.00 ± 114.00	495.00 ± 79.56	Pass
WW-4134, 4135	7/16/2013	H-3	315.86 ± 123.54	264.98 ± 121.78	290.42 ± 86.73	Pass
AP-4155, 4156	7/18/2013	Be-7	0.20 ± 0.11	0.16 ± 0.09	0.18 ± 0.07	Pass
MI-4218, 4219	7/22/2013	K-40	1426.80 ± 117.50	1335.70 ± 110.60	1381.25 ± 80.68	Pass
MI-4218, 4219	7/22/2013	Sr-90	0.62 ± 0.32	0.67 ± 0.32	0.65 ± 0.23	Pass
WW-4239, 4240	7/23/2013	H-3	223.71 ± 92.64	221.74 ± 92.56	222.73 ± 65.48	Pass
WW-4394, 4395	7/30/2013	Gr. Alpha	2.63 ± 1.49	2.57 ± 1.11	2.60 ± 0.93	Pass
WW-4394, 4395	7/30/2013	Gr. Beta	3.72 ± 1.17	2.63 ± 1.29	3.18 ± 0.87	Pass
WW-4394, 4395	7/30/2013	H-3	271.50 ± 91.30	297.60 ± 91.50	284.55 ± 64.63	Pass
SWU-4478, 4479	7/30/2013	Gr. Beta	2.07 ± 0.54	2.24 ± 0.55	2.16 ± 0.39	Pass
DW-40159, 40160	7/31/2013	Ra-226	3.39 ± 0.63	2.39 ± 0.45	2.89 ± 0.39	Pass
DW-40159, 40160	7/31/2013	Ra-228	3.29 ± 0.73	2.94 ± 0.68	3.12 ± 0.50	Pass
VE-4436, 4437	8/1/2013	Be-7	0.98 ± 0.21	0.89 ± 0.17	0.94 ± 0.14	Pass
VE-4436, 4437	8/1/2013	K-40	3.95 ± 0.39	3.75 ± 0.31	3.85 ± 0.25	Pass
G-4457, 4458	8/1/2013	Be-7	0.78 ± 0.19	0.67 ± 0.16	0.72 ± 0.12	Pass
G-4457, 4458	8/1/2013	Gr. Beta	6.15 ± 0.14	6.10 ± 0.14	6.13 ± 0.10	Pass
G-4457, 4458	8/1/2013	K-40	4.25 ± 0.36	4.60 ± 0.41	4.42 ± 0.27	Pass
VE-4520, 4521	8/1/2013	K-40	2.20 ± 0.16	2.09 ± 0.17	2.15 ± 0.12	Pass
WW-4772, 4773	8/6/2013	H-3	143.80 ± 86.70	157.80 ± 87.30	150.80 ± 61.52	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
VE-4709, 4710	8/8/2013	Gr. Beta	31.40 ± 1.00	30.70 ± 1.00	31.05 ± 0.71	Pass
VE-4709, 4710	8/8/2013	H-3	1504.00 ± 132.00	1468.00 ± 131.00	1486.00 ± 92.99	Pass
VE-4709, 4710	8/8/2013	U-233/4	0.009 ± 0.002	0.005 ± 0.002	0.007 ± 0.001	Pass
VE-4709, 4710	8/8/2013	U-238	0.005 ± 0.002	0.004 ± 0.001	0.005 ± 0.001	Pass
WW-4562, 4563	8/8/2013	H-3	208.82 ± 105.55	213.13 ± 105.73	210.97 ± 74.70	Pass
SG-4651, 4652	8/13/2013	Gr. Alpha	29.00 ± 3.10	28.80 ± 3.20	28.90 ± 2.23	Pass
SG-4651, 4652	8/13/2013	Gr. Beta	34.10 ± 1.80	34.00 ± 1.80	34.05 ± 1.27	Pass
SG-4651, 4652	8/13/2013	Ra-226	9.00 ± 0.20	8.70 ± 0.20	8.85 ± 0.14	Pass
VE-4835, 4836	8/13/2013	K-40	3.01 ± 0.24	3.08 ± 0.28	3.04 ± 0.19	Pass
WW-4877, 4878	8/14/2013	H-3	217.35 ± 87.57	276.63 ± 90.20	246.99 ± 62.86	Pass
LW-4856, 4857	8/15/2013	Gr. Beta	0.96 ± 0.40	0.94 ± 0.38	0.95 ± 0.28	Pass
W-4982, 4983	8/16/2013	H-3	757.43 ± 112.40	767.56 ± 112.76	762.50 ± 79.60	Pass
VE-4919, 4920	8/19/2013	K-40	4891.90 ± 407.90	4907.40 ± 350.40	4899.65 ± 268.87	Pass
VE-4919, 4920	8/19/2013	Be-7	470.50 ± 159.60	325.10 ± 104.10	397.80 ± 95.27	Pass
DW-40184, 40185	8/19/2013	Ra-228	2.35 ± 0.72	2.53 ± 0.70	2.44 ± 0.50	Pass
DW-40184, 40185	8/19/2013	Ra-228	1.44 ± 0.35	2.30 ± 0.56	1.87 ± 0.33	Pass
AP-5003, 5004	8/22/2013	Be-7	0.23 ± 0.10	0.21 ± 0.10	0.22 ± 0.07	Pass
LW-5229, 5230	8/29/2013	Gr. Beta	1.09 ± 0.86	2.28 ± 0.96	1.69 ± 0.64	Pass
SS-5333, 5334	9/3/2013	Cs-137	89.20 ± 41.60	97.80 ± 34.60	93.50 ± 27.05	Pass
SS-5333, 5334	9/3/2013	K-40	11893.00 ± 681.30	12353.00 ± 778.90	12123.00 ± 517.41	Pass
VE-5313, 5314	9/3/2013	K-40	1.84 ± 0.20	1.85 ± 0.20	1.85 ± 0.14	Pass
VE-5313, 5314	9/3/2013	Gr. Beta	2.38 ± 0.04	2.43 ± 0.04	2.41 ± 0.03	Pass
WW-5617, 5618	9/5/2013	H-3	1987.00 ± 147.00	2094.00 ± 150.00	2040.50 ± 105.01	Pass
AP-5355, 5356	9/5/2013	Be-7	0.22 ± 0.12	0.27 ± 0.14	0.25 ± 0.09	Pass
XW-5694, 5695	9/8/2013	C-14	0.94 ± 0.09	0.78 ± 0.10	0.86 ± 0.07	Pass
VE-5409, 5410	9/9/2013	K-40	3.60 ± 0.26	3.33 ± 0.29	3.46 ± 0.19	Pass
AP-5430, 5431	9/12/2013	Be-7	0.26 ± 0.10	0.26 ± 0.10	0.26 ± 0.07	Pass
MI-5401, 5402	9/12/2013	K-40	1404.60 ± 114.10	1356.10 ± 128.60	1380.35 ± 85.96	Pass
WW-5451, 5452	9/12/2013	H-3	196.66 ± 84.44	200.78 ± 84.64	198.72 ± 59.78	Pass
MI-5484, 5485	9/16/2013	K-40	1398.50 ± 88.93	1364.60 ± 113.30	1381.55 ± 72.02	Pass
WW-5568, 5569	9/17/2013	H-3	274.69 ± 87.95	203.72 ± 84.71	239.20 ± 61.05	Pass
BS-5764, 5765	9/20/2013	Cs-137	0.40 ± 0.03	0.37 ± 0.02	0.39 ± 0.02	Pass
BS-5764, 5765	9/20/2013	K-40	17.97 ± 0.59	17.54 ± 0.55	17.76 ± 0.40	Pass
VE-5638, 5639	9/23/2013	K-40	4.15 ± 0.33	4.46 ± 0.38	4.31 ± 0.25	Pass
WW-5596, 5597	9/23/2013	Gr. Beta	5.97 ± 1.39	5.95 ± 1.45	5.96 ± 1.01	Pass
G-5680, 5681	9/25/2013	Be-7	0.36 ± 0.13	0.35 ± 0.09	0.35 ± 0.08	Pass
G-5680, 5681	9/25/2013	Gr. Beta	3.81 ± 0.11	3.77 ± 0.11	3.79 ± 0.08	Pass
G-5680, 5681	9/25/2013	K-40	3.23 ± 0.32	2.99 ± 0.24	3.11 ± 0.20	Pass
S-5659, 5660	9/26/2013	Ac-228	1.19 ± 0.21	1.06 ± 0.21	1.13 ± 0.15	Pass
S-5659, 5660	9/26/2013	Cs-137	0.13 ± 0.04	0.14 ± 0.05	0.14 ± 0.03	Pass
S-5659, 5660	9/26/2013	K-40	16.08 ± 1.39	16.65 ± 1.46	16.37 ± 1.01	Pass
S-5659, 5660	9/26/2013	Pb-214	0.97 ± 0.15	1.10 ± 0.16	1.04 ± 0.11	Pass
AP-6345, 6346	9/30/2013	Be-7	0.077 ± 0.010	0.081 ± 0.008	0.079 ± 0.006	Pass
AP-6366, 6367	9/30/2013	Be-7	0.078 ± 0.012	0.083 ± 0.014	0.081 ± 0.009	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
DW-5701, 5702	9/30/2013	Gr. Beta	14.48 ± 2.04	13.32 ± 1.84	13.90 ± 1.37	Pass
SG-5722, 5723	9/30/2013	Ra-226	12.41 ± 0.47	11.98 ± 0.59	12.20 ± 0.38	Pass
SG-5722, 5723	9/30/2013	Ra-228	7.84 ± 0.71	8.13 ± 0.97	7.99 ± 0.60	Pass
G-5806, 5807	10/1/2013	Be-7	3.26 ± 0.30	3.11 ± 0.13	3.19 ± 0.16	Pass
G-5806, 5807	10/1/2013	K-40	6.65 ± 0.21	6.68 ± 0.50	6.67 ± 0.27	Pass
SG-5827, 5828	10/1/2013	Ac-228	4.08 ± 0.33	3.92 ± 0.40	4.00 ± 0.26	Pass
SG-5827, 5828	10/1/2013	K-40	2.55 ± 0.65	2.37 ± 0.63	2.46 ± 0.45	Pass
SG-5827, 5828	10/1/2013	Pb-214	3.82 ± 0.17	3.93 ± 0.20	3.88 ± 0.13	Pass
VE-5848, 5849	10/1/2013	K-40	1.62 ± 0.16	1.57 ± 0.14	1.60 ± 0.11	Pass
AP-6408, 6409	10/3/2013	Be-7	0.072 ± 0.015	0.063 ± 0.012	0.068 ± 0.010	Pass
f-5954, 5955	10/3/2013	K-40	2.74 ± 0.36	3.02 ± 0.34	2.88 ± 0.25	Pass
P-6035, 6036	10/7/2013	H-3	198.41 ± 85.00	288.60 ± 89.15	243.51 ± 61.59	Pass
SG-6115, 6116	10/8/2013	Ac-228	5.22 ± 0.50	4.87 ± 0.48	5.05 ± 0.35	Pass
SG-6115, 6116	10/8/2013	K-40	5.61 ± 1.08	6.61 ± 1.04	6.11 ± 0.75	Pass
SG-6115, 6116	10/8/2013	Pb-214	4.29 ± 0.24	4.24 ± 0.20	4.27 ± 0.16	Pass
VE-6136, 6137	10/8/2013	Be-7	0.55 ± 0.18	0.60 ± 0.15	0.58 ± 0.12	Pass
VE-6136, 6137	10/8/2013	K-40	2.78 ± 0.35	2.61 ± 0.33	2.69 ± 0.24	Pass
WW-6198, 6199	10/8/2013	H-3	12973.70 ± 332.60	12757.80 ± 330.00	12865.75 ± 234.27	Pass
VE-6240, 6241	10/9/2013	K-40	14.29 ± 0.29	14.95 ± 0.54	14.62 ± 0.31	Pass
W-5996, 5997	10/9/2013	Gr. Alpha	3.87 ± 1.18	4.07 ± 1.08	3.97 ± 0.80	Pass
W-5996, 5997	10/9/2013	Gr. Beta	9.82 ± 0.85	8.53 ± 0.82	9.18 ± 0.59	Pass
W-5996, 5997	10/9/2013	Ra-228	3.42 ± 1.02	3.39 ± 1.01	3.41 ± 0.72	Pass
DW-40224, 40225	10/11/2013	Ra-226	0.62 ± 0.10	0.76 ± 0.10	0.69 ± 0.07	Pass
DW-40224, 40225	10/11/2013	Ra-228	0.87 ± 0.55	1.00 ± 0.54	0.94 ± 0.39	Pass
WW-6219, 6220	10/11/2013	H-3	455.41 ± 111.54	354.66 ± 107.84	405.03 ± 77.57	Pass
CF-6261, 6262	10/14/2013	Be-7	1.97 ± 0.24	2.06 ± 0.22	2.01 ± 0.16	Pass
CF-6261, 6262	10/14/2013	K-40	11.55 ± 0.56	12.06 ± 0.61	11.80 ± 0.41	Pass
MI-6303, 6304	10/14/2013	K-40	1507.30 ± 110.80	1482.40 ± 110.00	1494.85 ± 78.07	Pass
VE-6534, 6535	10/17/2013	K-40	15.96 ± 0.17	16.16 ± 0.36	16.06 ± 0.20	Pass
S-6471, 6472	10/18/2013	Ac-228	0.94 ± 0.19	0.78 ± 0.18	0.86 ± 0.13	Pass
S-6471, 6472	10/18/2013	K-40	12.82 ± 1.05	12.90 ± 1.17	12.86 ± 0.79	Pass
S-6471, 6472	10/18/2013	Pb-214	0.88 ± 0.11	0.72 ± 0.12	0.80 ± 0.08	Pass
VE-6597, 6598	10/22/2013	K-40	2.46 ± 0.22	2.58 ± 0.20	2.52 ± 0.15	Pass
WW-6576, 6577	10/22/2013	H-3	745.60 ± 110.70	663.30 ± 107.60	704.45 ± 77.19	Pass
LW-6681, 6682	10/29/2013	Gr. Beta	2.00 ± 0.92	2.17 ± 0.98	2.09 ± 0.67	Pass
SWU-6765, 6766	10/29/2013	Gr. Beta	3.07 ± 0.61	2.90 ± 0.65	2.99 ± 0.45	Pass
WW-6849, 6850	10/29/2013	H-3	863.00 ± 113.80	826.60 ± 112.50	844.80 ± 80.01	Pass
MI-6786, 6787	10/30/2013	K-40	1370.60 ± 109.60	1449.20 ± 105.50	1409.90 ± 76.06	Pass
SO-6744, 6745	10/30/2013	Ac-228	0.46 ± 0.11	0.51 ± 0.11	0.48 ± 0.08	Pass
SO-6744, 6745	10/30/2013	Bi-214	0.48 ± 0.10	0.30 ± 0.10	0.39 ± 0.07	Pass
SO-6744, 6745	10/30/2013	Cs-137	0.21 ± 0.04	0.24 ± 0.04	0.23 ± 0.03	Pass
SO-6744, 6745	10/30/2013	Gr. Beta	27.40 ± 1.14	27.44 ± 1.11	27.42 ± 0.80	Pass
SO-6744, 6745	10/30/2013	K-40	14.93 ± 0.88	15.20 ± 0.90	15.07 ± 0.63	Pass
SO-6744, 6745	10/30/2013	Pb-212	0.43 ± 0.04	0.40 ± 0.05	0.42 ± 0.03	Pass
SO-6744, 6745	10/30/2013	Ra-226	1.47 ± 0.35	1.31 ± 0.36	1.39 ± 0.25	Pass
SO-6744, 6745	10/30/2013	Tl-208	0.16 ± 0.04	0.16 ± 0.04	0.16 ± 0.03	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
DW-40238, 40239	10/31/2013	Ra-228	0.94 ± 0.41	1.60 ± 0.55	1.27 ± 0.34	Pass
WW-7018, 7019	11/1/2013	H-3	593.09 ± 104.72	648.69 ± 106.89	620.89 ± 74.82	Pass
CF-6870, 6871	11/4/2013	K-40	12.67 ± 0.49	13.30 ± 0.47	12.98 ± 0.34	Pass
XW-6828, 6829	11/4/2013	K-40	97.99 ± 55.33	160.21 ± 74.99	129.10 ± 46.60	Pass
BS-6891, 6892	11/5/2013	Cs-137	0.018 ± 0.010	0.018 ± 0.009	0.018 ± 0.007	Pass
BS-6891, 6892	11/5/2013	Gr. Beta	12.41 ± 1.74	9.97 ± 1.57	11.19 ± 1.17	Pass
BS-6891, 6892	11/5/2013	K-40	6.49 ± 0.33	6.28 ± 0.40	6.39 ± 0.26	Pass
WW-6912, 6913	11/5/2013	Gr. Alpha	2.87 ± 1.30	4.46 ± 1.47	3.67 ± 0.98	Pass
WW-6912, 6913	11/5/2013	Gr. Beta	3.18 ± 0.87	3.18 ± 0.87	3.18 ± 0.62	Pass
WW-6912, 6913	11/5/2013	H-3	349.01 ± 101.42	430.14 ± 98.06	389.58 ± 70.54	Pass
SO-6954, 6955	11/6/2013	Cs-137	0.14 ± 0.03	0.12 ± 0.02	0.13 ± 0.02	Pass
SO-6954, 6955	11/6/2013	K-40	15.16 ± 0.72	14.11 ± 0.64	14.64 ± 0.48	Pass
S-6976, 6977	11/13/2013	K-40	22.36 ± 0.69	22.62 ± 0.72	22.49 ± 0.50	Pass
DW-40246, 40247	11/15/2013	Gr. Alpha	15.00 ± 3.41	20.31 ± 4.00	17.65 ± 2.63	Pass
CF-7102, 7103	11/18/2013	Be-7	17.79 ± 0.51	18.09 ± 0.80	17.94 ± 0.48	Pass
DW-40250, 40251	11/18/2013	Ra-226	27.77 ± 2.84	26.15 ± 2.67	26.96 ± 1.95	Pass
DW-40250, 40251	11/18/2013	Ra-228	7.91 ± 0.94	6.32 ± 0.84	7.12 ± 0.63	Pass
WW-7164, 7165	11/19/2013	H-3	266.90 ± 91.10	268.90 ± 91.20	267.90 ± 64.45	Pass
SS-7334, 7335	11/20/2013	K-40	15.51 ± 0.72	14.14 ± 0.80	14.83 ± 0.54	Pass
WW-7558, 7559	11/22/2013	H-3	229.86 ± 83.89	191.77 ± 82.05	210.82 ± 58.67	Pass
LW-7292, 7293	11/26/2013	Gr. Beta	1.92 ± 0.75	2.38 ± 0.77	2.15 ± 0.54	Pass
W-7229, 7230	12/1/2013	Ra-226	0.87 ± 0.23	0.88 ± 0.25	0.88 ± 0.17	Pass
W-7229, 7230	12/1/2013	Ra-228	3.00 ± 0.98	3.27 ± 1.16	3.14 ± 0.76	Pass
SG-7313, 7314	12/2/2013	Ac-228	6.33 ± 0.23	6.69 ± 0.30	6.51 ± 0.19	Pass
SG-7313, 7314	12/2/2013	K-40	5.47 ± 0.61	6.24 ± 0.74	5.86 ± 0.48	Pass
SG-7313, 7314	12/2/2013	Pb-214	5.60 ± 0.14	5.37 ± 0.16	5.49 ± 0.11	Pass
W-7432, 7433	12/4/2013	Gr. Beta	5.35 ± 1.20	3.89 ± 1.23	4.62 ± 0.86	Pass
WW-7516, 7517	12/10/2013	H-3	369.30 ± 95.64	269.22 ± 91.35	319.26 ± 66.13	Pass
SG-7579, 7580	12/20/2013	Ra-226	3.72 ± 0.11	3.85 ± 0.30	3.79 ± 0.16	Pass
SG-7579, 7580	12/20/2013	Ra-228	2.38 ± 0.18	2.77 ± 0.44	2.58 ± 0.24	Pass
LW-7684, 7685	12/23/2013	Gr. Beta	0.84 ± 0.51	1.96 ± 0.61	1.40 ± 0.40	Pass
DW-40261, 40262	12/27/2013	Ra-226	0.54 ± 0.10	0.67 ± 0.10	0.61 ± 0.07	Pass
DW-40261, 40262	12/27/2013	Ra-228	1.09 ± 0.51	1.12 ± 0.43	1.11 ± 0.33	Pass
SWU-7663, 7664	12/30/2013	Gr. Beta	2.85 ± 0.71	3.88 ± 0.77	3.37 ± 0.52	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), 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
MAAP-738	02/01/13	Am-241	0.10 ± 0.02	0.10	0.07 - 0.14	Pass
MAAP-738	02/01/13	Co-57	2.58 ± 0.06	2.36	1.65 - 3.07	Pass
MAAP-738	02/01/13	Co-60	0.01 ± 0.03	0.00	NA [c]	Pass
MAAP-738	02/01/13	Cs-134	1.82 ± 0.13	1.78	1.25 - 2.31	Pass
MAAP-738	02/01/13	Cs-137	2.93 ± 0.10	2.60	1.82 - 3.38	Pass
MAAP-738	02/01/13	Mn-54	4.87 ± 0.13	4.26	2.98 - 5.54	Pass
MAAP-738	02/01/13	Pu-238	0.12 ± 0.02	0.13	0.09 - 0.17	Pass
MAAP-738	02/01/13	Pu-239/40	0.11 ± 0.02	0.12	0.09 - 0.16	Pass
MAAP-738	02/01/13	Sr-90	1.39 ± 0.14	1.49	1.04 - 1.94	Pass
MAAP-738	02/01/13	U-233/4	0.03 ± 0.01	0.03	0.02 - 0.04	Pass
MAAP-738	02/01/13	U-238	0.23 ± 0.03	0.23	0.16 - 0.30	Pass
MAAP-738	02/01/13	Zn-65	3.84 ± 0.20	3.13	2.19 - 4.07	Pass
MAAP-738 [e]	02/01/13	Gr. Alpha	0.14 ± 0.03	1.20	0.36 - 2.04	Fail
MAAP-738	02/01/13	Gr. Beta	0.93 ± 0.06	0.85	0.43 - 1.28	Pass
MAW-806	02/01/13	Am-241	0.71 ± 0.08	0.69	0.48 - 0.90	Pass
MAW-806	02/01/13	Co-57	31.20 ± 0.40	30.90	21.60 - 40.20	Pass
MAW-806	02/01/13	Co-60	19.70 ± 0.30	16.56	13.69 - 25.43	Pass
MAW-806	02/01/13	Cs-134	23.20 ± 0.50	24.40	17.10 - 31.70	Pass
MAW-806	02/01/13	Cs-137	0.03 ± 0.12	0.00	NA [c]	Pass
MAW-806	02/01/13	Fe-55	34.00 ± 3.30	44.00	30.80 - 57.20	Pass
MAW-806	02/01/13	H-3	511.60 ± 12.50	507.00	355.00 - 659.00	Pass
MAW-806	02/01/13	K-40	2.20 ± 0.90	0.00	NA [c]	Pass
MAW-806	02/01/13	Mn-54	27.60 ± 0.50	27.40	19.20 - 35.60	Pass
MAW-806	02/01/13	Ni-63	34.30 ± 2.80	33.40	23.40 - 43.40	Pass
MAW-806	02/01/13	Pu-238	0.83 ± 0.10	0.88	0.62 - 1.15	Pass
MAW-806	02/01/13	Pu-239/40	0.02 ± 0.02	0.01	NA [d]	Pass
MAW-806	02/01/13	Sr-90	9.30 ± 0.80	10.50	7.40 - 13.70	Pass
MAW-806	02/01/13	Tc-99	10.25 ± 0.40	13.10	9.20 - 17.00	Pass
MAW-806	02/01/13	U-233/4	0.31 ± 0.05	0.32	0.22 - 0.41	Pass
MAW-806	02/01/13	U-238	1.91 ± 0.13	1.95	1.37 - 2.54	Pass
MAW-806	02/01/13	Zn-65	31.60 ± 0.80	30.40	21.30 - 39.50	Pass
MAW-811	02/01/13	Gr. Alpha	1.87 ± 0.09	2.31	0.69 - 3.93	Pass
MAW-811	02/01/13	Gr. Beta	13.04 ± 0.13	13.00	6.50 - 19.50	Pass
MAW-811	02/01/13	I-129	4.60 ± 0.19	6.06	4.24 - 7.88	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
MASO-739	02/01/13	Am-241	106.90 ± 11.40	113.00	79.00 - 147.00	Pass
MASO-739	02/01/13	Co-57	0.60 ± 0.50	0.00	NA [c]	Pass
MASO-739	02/01/13	Co-60	739.20 ± 28.50	691.00	484.00 - 898.00	Pass
MASO-739	02/01/13	Cs-134	863.30 ± 34.10	887.00	621.00 - 1153.00	Pass
MASO-739	02/01/13	Cs-137	661.80 ± 25.70	587.00	411.00 - 763.00	Pass
MASO-739	02/01/13	K-40	745.80 ± 33.30	625.30	437.70 - 812.90	Pass
MASO-739	02/01/13	Mn-54	1.10 ± 1.00	0.00	NA [c]	Pass
MASO-739	02/01/13	Zn-65	1109.60 ± 44.10	995.00	697.00 - 1294.00	Pass
MASO-744	02/01/13	Ni-63	682.60 ± 16.80	670.00	469.00 - 871.00	Pass
MASO-744	02/01/13	Pu-238	0.20 ± 0.90	0.52	NA [d]	Pass
MASO-744	02/01/13	Pu-239/40	88.30 ± 9.00	79.50	55.70 - 103.40	Pass
MASO-744 [f]	02/01/13	Sr-90	408.40 ± 14.00	628.00	440.00 - 816.00	Fail
MASO-744	02/01/13	Tc-99	380.50 ± 16.80	444.00	311.00 - 577.00	Pass
MASO-744	02/01/13	U-233/4	53.20 ± 4.80	62.50	43.80 - 81.30	Pass
MASO-744	02/01/13	U-238	242.10 ± 10.20	281.00	197.00 - 365.00	Pass
MAVE-747	02/01/13	Co-57	10.37 ± 0.17	8.68	6.08 - 11.28	Pass
MAVE-747	02/01/13	Co-60	6.48 ± 0.17	5.85	4.10 - 7.61	Pass
MAVE-747	02/01/13	Cs-134	0.02 ± 0.04	0.00	NA [c]	Pass
MAVE-747	02/01/13	Cs-137	7.79 ± 0.21	6.87	4.81 - 8.93	Pass
MAVE-747	02/01/13	Mn-54	0.00 ± 0.05	0.00	NA [c]	Pass
MAVE-747	02/01/13	Zn-65	7.29 ± 0.33	6.25	4.38 - 8.13	Pass
MASO-5043	08/01/13	Am-241	1.40 ± 1.70	0.00	NA [c]	Pass
MASO-5043 [g]	08/01/13	Co-57	699.60 ± 3.90	0.00	NA [c]	Fail
MASO-5043	08/01/13	Cs-134	1191.70 ± 23.00	1172.00	820.00 - 1524.00	Pass
MASO-5043	08/01/13	Cs-137	1072.00 ± 5.10	977.00	684.00 - 1270.00	Pass
MASO-5043	08/01/13	K-40	760.00 ± 16.20	633.00	443.00 - 823.00	Pass
MASO-5043	08/01/13	Mn-54	753.80 ± 4.90	674.00	472.00 - 876.00	Pass
MASO-5043	08/01/13	Ni-63	560.00 ± 23.70	571.00	400.00 - 742.00	Pass
MASO-5043	08/01/13	Pu-238	68.40 ± 7.50	61.50	43.10 - 80.00	Pass
MASO-5043	08/01/13	Pu-239/40	0.40 ± 0.80	0.36	NA [d]	Pass
MASO-5043	08/01/13	Sr-90	383.90 ± 14.50	460.00	322.00 - 598.00	Pass
MASO-5043	08/01/13	Tc-99	-1.00 ± 10.50	0.00	NA [c]	Pass
MASO-5043	08/01/13	U-233/4	23.80 ± 3.30	30.00	21.00 - 39.00	Pass
MASO-5043	08/01/13	U-238	26.80 ± 3.50	34.00	23.80 - 44.20	Pass
MASO-5043	08/01/13	Zn-65	-351.50 ± 5.50	0.00	NA [c]	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-5052	08/01/13	I-129	2.75 ± 0.20	3.79	2.65 - 4.93	Pass
MAW-5094	08/01/13	Am-241	0.00 ± 0.01	0.00	NA [c]	Pass
MAW-5094	08/01/13	Co-57	0.01 ± 0.09	0.00	NA [c]	Pass
MAW-5094	08/01/13	Co-60	23.20 ± 0.32	23.58	16.51 - 30.65	Pass
MAW-5094	08/01/13	Cs-134	27.60 ± 0.58	30.40	21.00 - 39.00	Pass
MAW-5094	08/01/13	Cs-137	32.31 ± 0.52	31.60	22.10 - 41.10	Pass
MAW-5094	08/01/13	Fe-55	39.20 ± 3.50	53.30	37.30 - 69.30	Pass
MAW-5094	08/01/13	Gr. Alpha	0.54 ± 0.05	0.70	0.21 - 1.19	Pass
MAW-5094	08/01/13	Gr. Beta	5.85 ± 0.09	5.94	2.97 - 8.91	Pass
MAW-5094	08/01/13	H-3	1.20 ± 3.00	0.00	NA [c]	Pass
MAW-5094	08/01/13	K-40	2.22 ± 0.90	0.00	NA [c]	Pass
MAW-5094	08/01/13	Mn-54	0.01 ± 0.11	0.00	NA [c]	Pass
MAW-5094	08/01/13	Ni-63	21.80 ± 3.30	26.40	18.50 - 34.30	Pass
MAW-5094	08/01/13	Pu-238	1.30 ± 0.11	1.22	0.85 - 1.58	Pass
MAW-5094	08/01/13	Pu-239/40	0.98 ± 0.09	1.00	0.70 - 1.30	Pass
MAW-5094	08/01/13	Sr-90	6.40 ± 0.60	7.22	5.05 - 9.39	Pass
MAW-5094	08/01/13	Tc-99	13.10 ± 0.70	16.20	11.30 - 21.10	Pass
MAW-5094	08/01/13	U-233/4	0.08 ± 0.02	0.07	NA [d]	Pass
MAW-5094	08/01/13	U-238	0.03 ± 0.01	0.03	NA [d]	Pass
MAW-5094	08/01/13	Zn-65	35.30 ± 0.90	34.60	24.20 - 45.00	Pass
MAVE-5046	08/01/13	Co-57	0.01 ± 0.03	0.00	NA [c]	Pass
MAVE-5046	08/01/13	Co-60	0.00 ± 0.04	0.00	NA [c]	Pass
MAVE-5046	08/01/13	Cs-134	5.71 ± 0.23	5.20	3.64 - 6.76	Pass
MAVE-5046	08/01/13	Cs-137	7.64 ± 0.20	6.60	4.62 - 8.58	Pass
MAVE-5046	08/01/13	Mn-54	9.08 ± 0.24	7.88	5.52 - 10.24	Pass
MAVE-5046	08/01/13	Zn-65	2.92 ± 0.25	2.63	1.84 - 3.42	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-5046	08/01/13	Am-241	0.01 ± 0.02	0.00	NA [c]	Pass
MAAP-5046	08/01/13	Co-57	3.48 ± 0.14	3.40	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Co-60	2.44 ± 0.08	3.40	1.60 - 3.00	Pass
MAAP-5046	08/01/13	Cs-134	0.01 ± 0.03	0.00	NA [c]	Pass
MAAP-5046	08/01/13	Cs-137	3.09 ± 0.13	2.70	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Gr. Alpha	0.28 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-5046	08/01/13	Gr. Beta	1.90 ± 0.08	1.63	0.82 - 2.45	Pass
MAAP-5046	08/01/13	Mn-54	3.95 ± 0.12	3.50	2.50 - 4.60	Pass
MAAP-5046	08/01/13	Pu-238	0.14 ± 0.028	0.12	0.087 - 0.16	Pass
MAAP-5046	08/01/13	Pu-239/40	0.10 ± 0.022	0.092	0.064 - 0.12	Pass
MAAP-5046	08/01/13	Sr-90	1.69 ± 4.10	1.81	1.27 - 2.35	Pass
MAAP-5046 [h]	08/01/13	U-233/4	0.04 ± 0.01	0.03	0.02 - 0.04	Fail
MAAP-5046	08/01/13	U-238	0.19 ± 0.027	0.21	0.14 - 0.27	Pass
MAAP-5046	08/01/13	Zn-65	3.27 ± 0.18	2.70	2.50 - 4.60	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] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[e] The filter was recounted overnight, no significant alpha activity could be detected.

[f] The sample was reanalyzed using additional fuming nitric separations. Result of reanalysis: 574.4 ± 35.2 Bq/kg.

[g] Interference from Eu-152 resulted in misidentification of Co-57.

[h] Result of repeat analysis: 0.031 ± 0.013 pCi/filter.

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-1174	03/18/13	Am-241	65.2 ± 4.4	66.8	41.2 - 90.4	Pass
ERAP-1174	03/18/13	Co-60	226.5 ± 4.1	214.0	166.0 - 267.0	Pass
ERAP-1174	03/18/13	Cs-134	1101.2 ± 23.6	1110.0	706.0 - 1380.0	Pass
ERAP-1174	03/18/13	Cs-137	1065.6 ± 21.4	940.0	706.0 - 1230.0	Pass
ERAP-1174	03/18/13	Fe-55	178.8 ± 88.0	225.0	69.8 - 440.0	Pass
ERAP-1174	03/18/13	Mn-54	< 3.1	0.0	0.0 - 50.0	Pass
ERAP-1174	03/18/13	Pu-238	50.0 ± 3.0	51.1	34.3 - 65.9	Pass
ERAP-1174	03/18/13	Pu-239/40	65.7 ± 2.6	65.2	47.2 - 85.2	Pass
ERAP-1174	03/18/13	U-233/4	54.0 ± 2.5	59.4	36.8 - 89.6	Pass
ERAP-1174	03/18/13	U-238	55.6 ± 2.6	58.9	38.1 - 81.4	Pass
ERAP-1174	03/18/13	Uranium	112.0 ± 5.6	121.0	67.0 - 184.0	Pass
ERAP-1174	03/18/13	Zn-65	236.6 ± 13.8	199.0	142.0 - 275.0	Pass
ERAP-1175	03/18/13	Gr. Alpha	52.3 ± 2.8	42.3	14.2 - 65.7	Pass
ERAP-1175	03/18/13	Gr. Beta	36.2 ± 2.0	25.1	15.9 - 36.6	Pass
ERSO-1176	03/18/13	Am-241	293.1 ± 97.4	229.0	134.0 - 297.0	Pass
ERSO-1176	03/18/13	Pu-238	909.0 ± 180.0	788.0	474.0 - 1090.0	Pass
ERSO-1176	03/18/13	Pu-239/40	432.0 ± 120.0	366.0	239.0 - 506.0	Pass
ERSO-1176	03/18/13	Sr-90	8050.8 ± 376.0	8530.0	3250.0 - 13500.0	Pass
ERSO-1176	03/18/13	U-233/4	1662.6 ± 150.0	1920.0	1170.0 - 2460.0	Pass
ERSO-1176	03/18/13	U-238	1682.8 ± 160.0	1900.0	1180.0 - 2410.0	Pass
ERSO-1176	03/18/13	Uranium	3404.0 ± 330.5	3920.0	2130.0 - 5170.0	Pass
ERSO-1176	03/18/13	Ac-228	1335.0 ± 132.0	1240.0	795.0 - 1720.0	Pass
ERSO-1176	03/18/13	Bi-212	1420.0 ± 311.0	1240.0	330.0 - 1820.0	Pass
ERSO-1176	03/18/13	Bi-214	2626.0 ± 60.0	3660.0	2200.0 - 5270.0	Pass
ERSO-1176	03/18/13	Co-60	7951.0 ± 45.4	7920.0	5360.0 - 10900.0	Pass
ERSO-1176	03/18/13	Cs-134	5785.0 ± 51.0	6370.0	4160.0 - 7650.0	Pass
ERSO-1176	03/18/13	Cs-137	6106.0 ± 47.9	6120.0	4690.0 - 7870.0	Pass
ERSO-1176	03/18/13	K-40	11756.0 ± 284.3	10300.0	7520.0 - 13800.0	Pass
ERSO-1176	03/18/13	Mn-54	< 28.0	0.0	0.0 - 1000.0	Pass
ERSO-1176	03/18/13	Pb-212	1096.0 ± 29.1	1240.0	812.0 - 1730.0	Pass
ERSO-1176	03/18/13	Pb-214	2875.0 ± 60.0	3660.0	2140.0 - 5460.0	Pass
ERSO-1176	03/18/13	Th-234	2404.0 ± 218.3	1900.0	601.0 - 3570.0	Pass
ERSO-1176	03/18/13	Zn-65	1542.0 ± 56.4	1400.0	1110.0 - 1860.0	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-1180	03/18/13	Am-241	569.8 ± 81.7	553.0	338.0 - 735.0	Pass
ERVE-1180	03/18/13	Cm-244	1260.9 ± 107.3	1340.0	657.0 - 2090.0	Pass
ERVE-1180	03/18/13	Co-60	2130.5 ± 48.0	1920.0	1320.0 - 2680.0	Pass
ERVE-1180	03/18/13	Cs-134	1296.5 ± 68.0	1240.0	797.0 - 1610.0	Pass
ERVE-1180	03/18/13	Cs-137	600.1 ± 34.3	544.0	394.0 - 757.0	Pass
ERVE-1180	03/18/13	K-40	34078.0 ± 787.0	31900.0	23000.0 - 44800.0	Pass
ERVE-1180	03/18/13	Mn-54	< 28.7	0.0	0.0 - 300.0	Pass
ERVE-1180	03/18/13	Pu-238	2476.5 ± 259.4	1980.0	1180.0 - 2710.0	Pass
ERVE-1180	03/18/13	Pu-239/40	2659.3 ± 273.2	2260.0	1390.0 - 3110.0	Pass
ERVE-1180	03/18/13	Sr-90	3809.7 ± 420.5	3840.0	2190.0 - 5090.0	Pass
ERVE-1180	03/18/13	U-233/4	2460.6 ± 205.0	2460.0	1620.0 - 3160.0	Pass
ERVE-1180	03/18/13	U-238	2319.1 ± 189.6	2440.0	1630.0 - 3100.0	Pass
ERVE-1180	03/18/13	Uranium	4866.3 ± 375.6	5010.0	3390.0 - 6230.0	Pass
ERVE-1180	03/18/13	Zn-65	1052.5 ± 82.1	878.0	633.0 - 1230.0	Pass
ERW-1184	03/18/13	Am-241	114.5 ± 8.1	118.0	79.5 - 158.0	Pass
ERW-1184	03/18/13	Co-60	2221.8 ± 17.0	2270.0	1970.0 - 2660.0	Pass
ERW-1184	03/18/13	Cs-134	1309.4 ± 58.4	1400.0	1030.0 - 1610.0	Pass
ERW-1184	03/18/13	Cs-137	1865.9 ± 22.0	1880.0	1600.0 - 2250.0	Pass
ERW-1184	03/18/13	Fe-55	503.1 ± 105.0	712.0	424.0 - 966.0	Pass
ERW-1184	03/18/13	Mn-54	< 9.4	0.0	0.0 - 100.0	Pass
ERW-1184	03/18/13	Pu-238	98.4 ± 5.6	98.8	73.1 - 123.0	Pass
ERW-1184	03/18/13	Pu-239/40	184.5 ± 7.7	185.0	144.0 - 233.0	Pass
ERW-1184	03/18/13	Sr-90	125.7 ± 6.0	137.0	89.2 - 181.0	Pass
ERW-1184	03/18/13	U-233/4	44.9 ± 3.4	48.8	36.7 - 62.9	Pass
ERW-1184	03/18/13	U-238	46.5 ± 3.5	48.4	36.9 - 59.4	Pass
ERW-1184	03/18/13	Uranium	93.3 ± 7.1	99.5	73.1 - 129.0	Pass
ERW-1184	03/18/13	Zn-65	412.8 ± 32.0	384.0	320.0 - 484.0	Pass
ERW-1186	03/18/13	Gr. Alpha	109.1 ± 5.7	130.0	46.2 - 201.0	Pass
ERW-1186	03/18/13	Gr. Beta	74.5 ± 6.4	78.9	45.2 - 117.0	Pass
ERW-1188	03/18/13	H-3	12279.0 ± 319.0	12300.0	8240.0 - 17500.0	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.

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 = 2σ 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:

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

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.

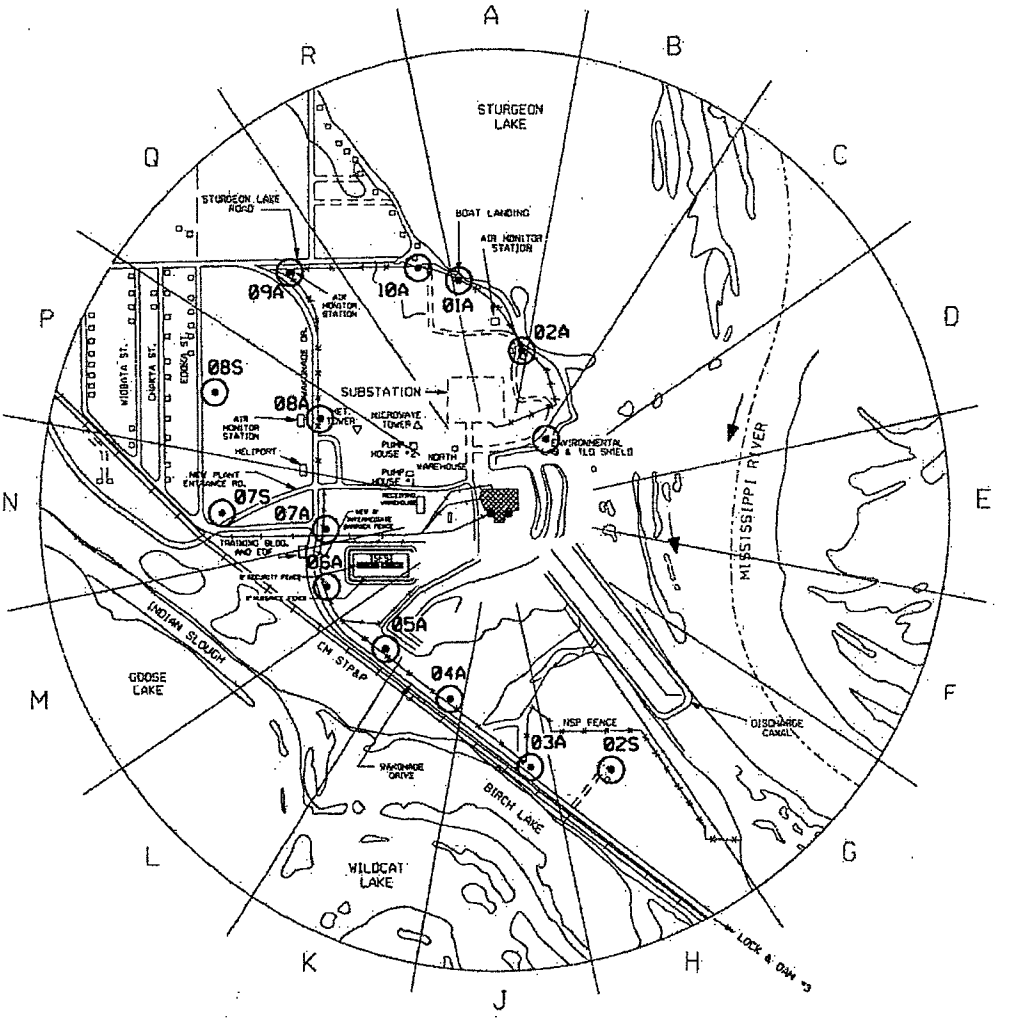
[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

APPENDIX D

Sample Collection and Analysis Program

TLD LOCATIONS
ONE MILE RADIUS

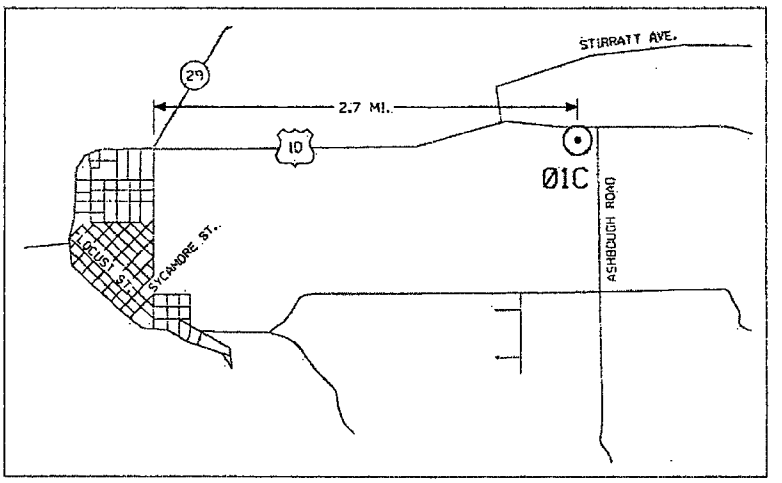


PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]
[NO SCALE]

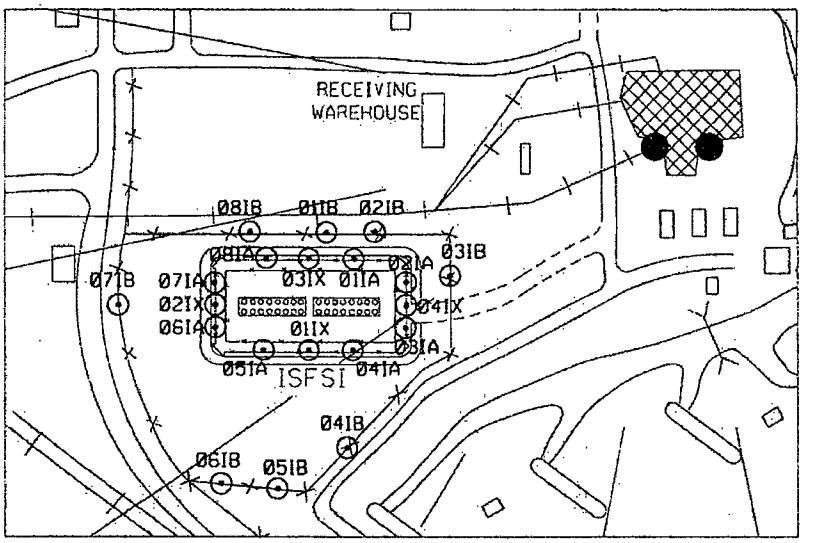
MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS



CONTROL POINTS
PRESCOTT, WISCONSIN



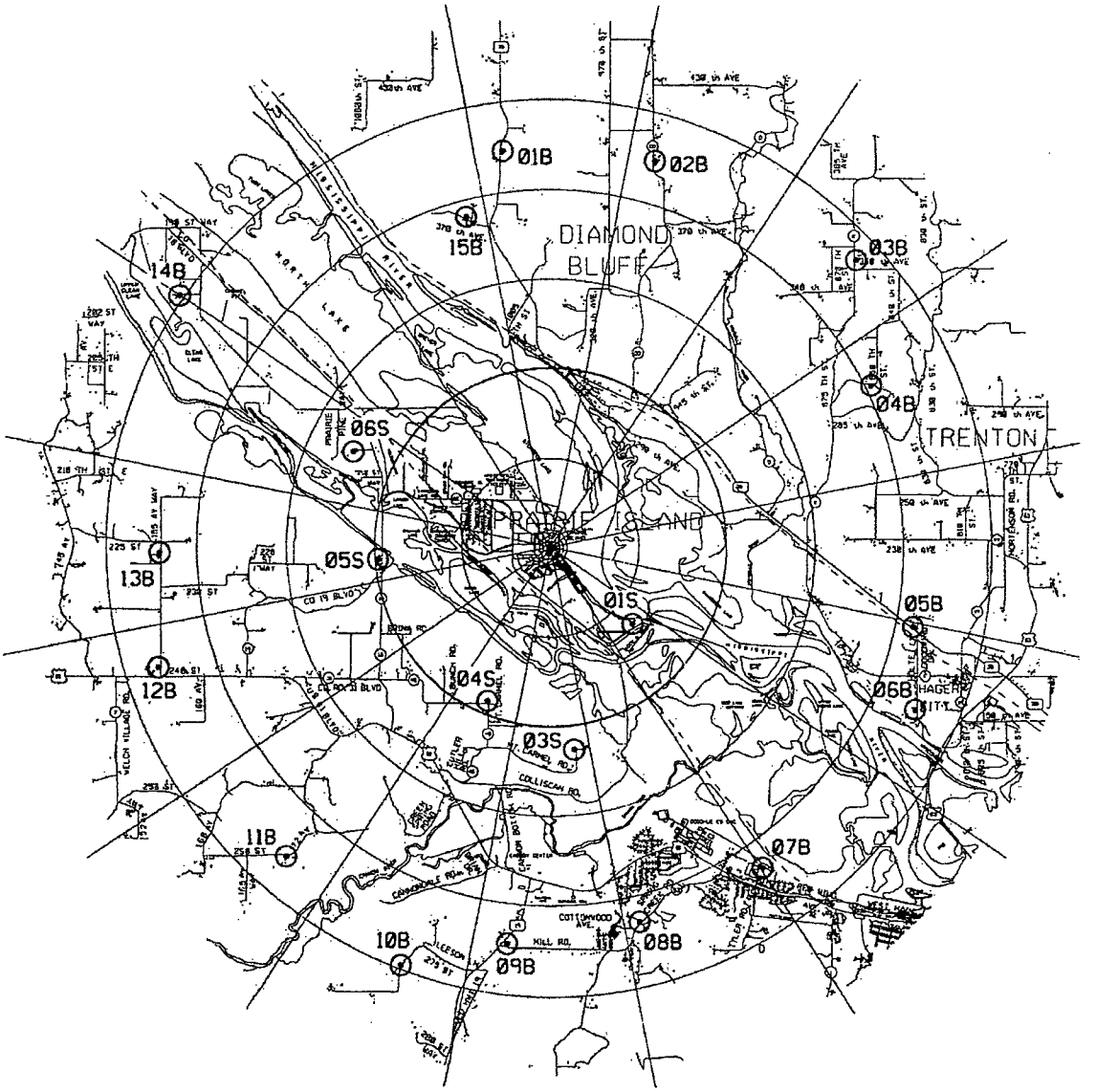
ISFSI AREA TLD LOCATIONS

MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

TLD LOCATIONS

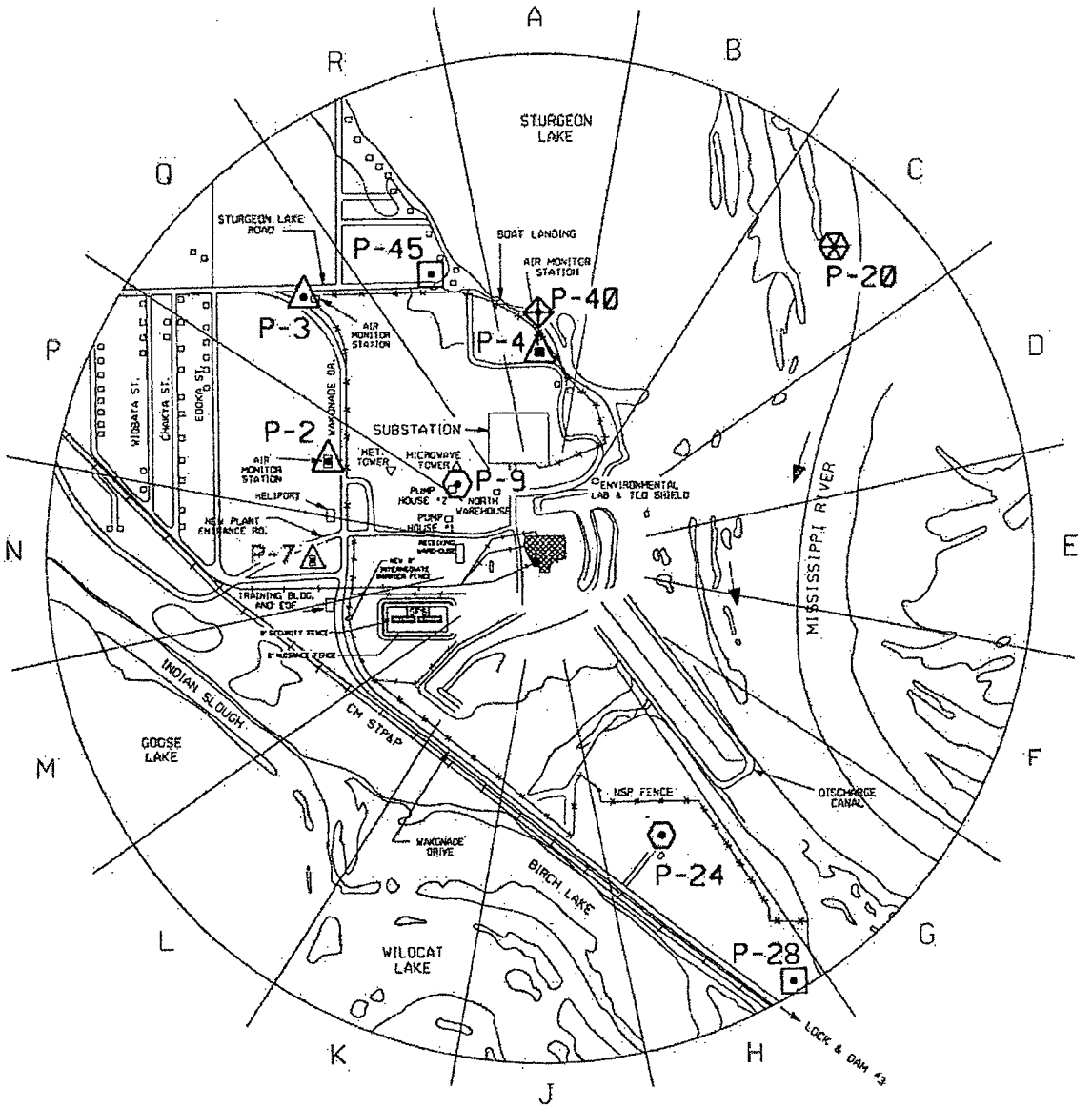
FIVE MILE RADIUS



MONITORING LEGEND:

⊙ PRAIRIE ISLAND TLD POINTS

ENVIRONMENTAL SAMPLING POINTS
ONE MILE RADIUS



PLANT AREA ENLARGED PLAN [1.00 MILE RADIUS]

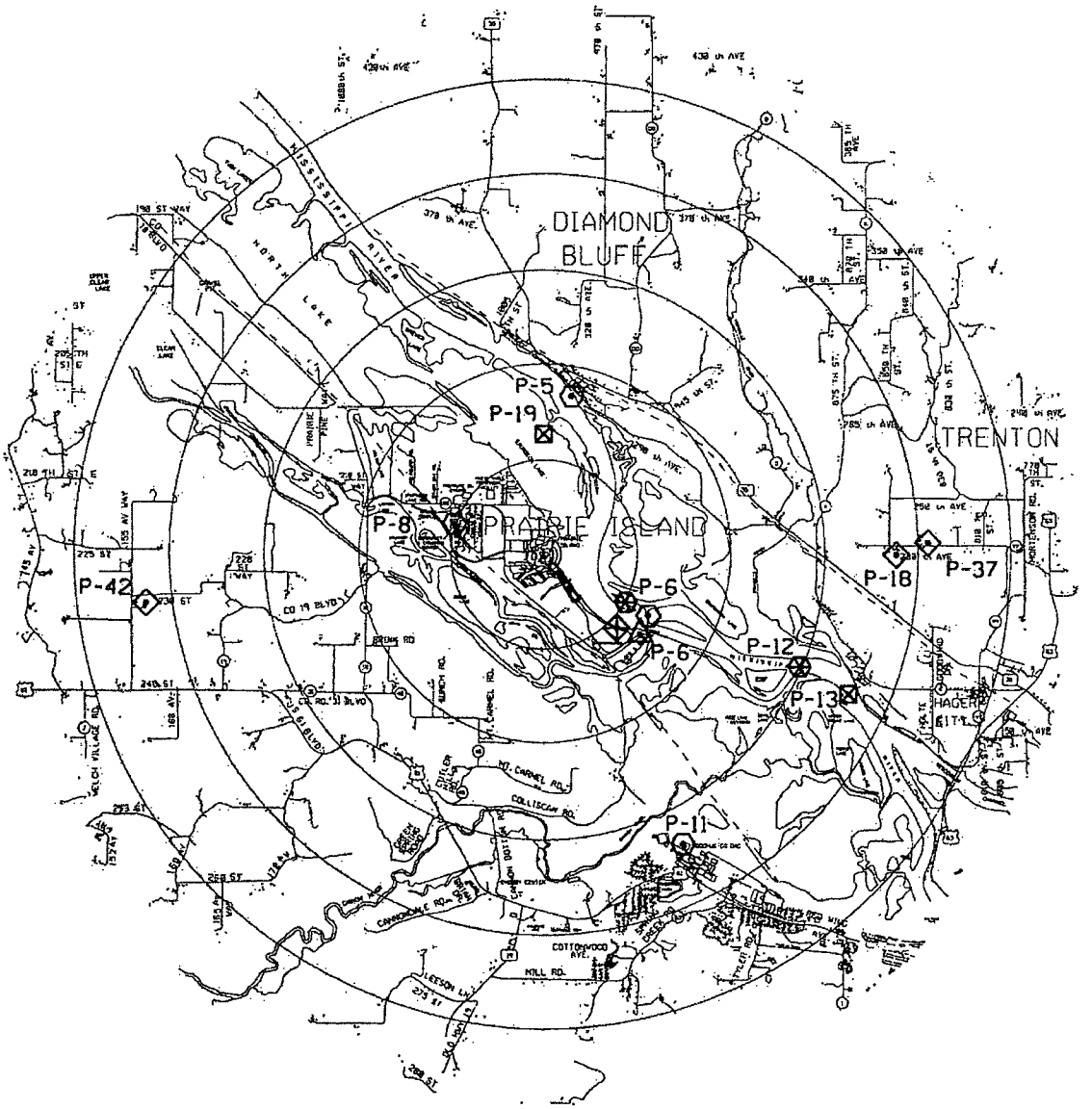
[NO SCALE]

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS P-18, P-37, P-43
- AIR SAMPLING POINT ID NUMBERS P-1, P-2, P-3, P-4, P-6, P-7
- WATER SAMPLING POINT ID NUMBERS P-5, P-6, P-8, P-9, P-11, P-24, P-43
- VEGETATION / VEGETABLES ID NUMBERS P-28, P-38, P-45
- FISH SAMPLING POINT ID NUMBERS P-13, P-19
- INVERTEBRATES POINT ID NUMBERS P-6, P-40
- SEDIMENT SAMPLING POINT ID NUMBERS P-6, P-12, P-20

ENVIRONMENTAL SAMPLING POINTS

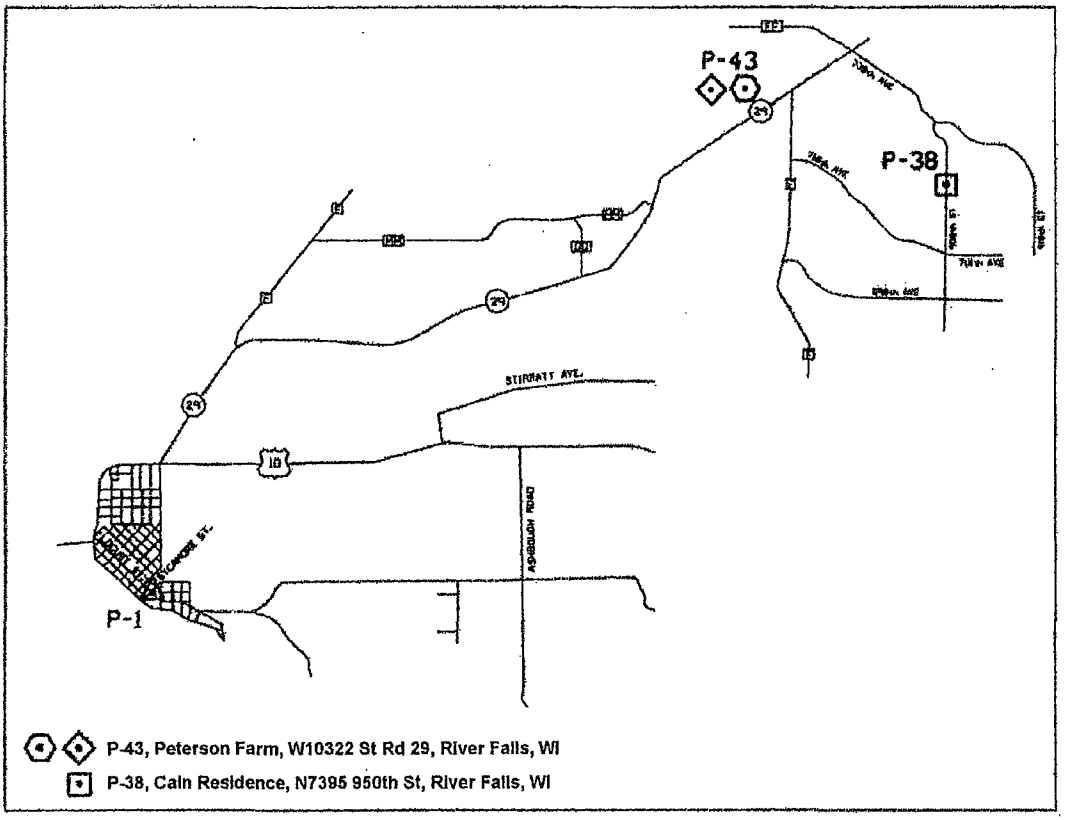
FIVE MILE RADIUS



MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS
  P-18, P-37, P-42, P-43
- AIR SAMPLING POINT ID NUMBERS
  P-1, P-2, P-3, P-4, P-6, P-7
- WATER SAMPLING POINT ID NUMBERS
  P-5, P-6, P-8, P-9, P-11, P-24, P-43
- VEGETATION / VEGETABLES ID NUMBERS
  P-28, P-38, P-45
- FISH SAMPLING POINT ID NUMBERS
  P-13, P-19
- INVERTEBRATES POINT ID NUMBERS
  P-6, P-40
- SEDIMENT SAMPLING POINT ID NUMBERS
  P-6, P-12, P-20

ENVIRONMENTAL SAMPLING POINTS



CONTROL POINTS
PRESCOTT, WISCONSIN

MONITORING LEGEND

- MILK SAMPLING POINT ID NUMBERS
  P-18, P-37, P-41, P-42, P-43
- AIR SAMPLING POINT ID NUMBERS
  P-1, P-2, P-3, P-4, P-6, P-7
- WATER SAMPLING POINT ID NUMBERS
  P-5, P-6, P-8, P-9, P-11, P-43
- VEGETATION / VEGETABLES ID NUMBERS
  P-28, P-38, P-45

APPENDIX E

Special Well and

Surface Water Samples

1.0 INTRODUCTION

This appendix to the Radiation Environmental Monitoring Program Annual Report to the United States Nuclear Regulatory Commission summarizes and interprets results of the special well and surface water samples taken at the Prairie Island Nuclear Generating Plant, Red Wing, Minnesota, during the period January - December, 2013. This supplemental special sampling program was established in December of 1989 when higher than expected levels of tritium were detected in a nearby residence well sample.

Tabulations of the special sampling program individual analyses made during the year are included in this appendix. A summary table of tritium analyses is also included in this appendix.

2.0 SUMMARY

This special sampling program was established following the detection of tritium in a residence well water sample south of the PINGP during 1989. This program is described and the results for 2013 are summarized and discussed.

Program findings for 2013 detected low levels of tritium in nearby residence wells, ground water, and surface samples at or near the expected natural background levels with the exception of ground water sample well MW-8. The 2013 sample results (except for MW-8) ranged from <19 pCi/L to 100 pCi/L. Sample well MW-8 ranged from 266 pCi/L to 378 pCi/L. All tritium results are far below the Environmental Protection Agency's drinking water standard of 20,000 pCi/L and present no harm to any members of the public.

None of the water samples monitored for gamma-emitting isotopes showed any activity greater than the LLD.

3.0 Special Tritium Sampling Program

3.1 Program Design and Data Interpretation

The purpose of this sampling program is to assess the impact of any tritium leaching into the environment (ground water system) from the PINGP. For this purpose, special water samples are collected and analyzed for tritium content.

3.2 Program Description

The sampling and analysis schedule for the special water sampling program is summarized in Table E-4.1 and briefly reviewed below. Table E-4.2 defines the additional sample locations and codes for the special water sampling program.

Special well, tank, and surface water samples were collected quarterly (spring, summer, fall) at seven locations, quarterly at one location, monthly at six locations, semi-annually at five locations, and annually at forty-two locations. The Peterson (P-43) and Hanson (SW-1) farm wells are used as control locations for these special samples.

To detect low levels of tritium at or below natural background levels, analyses of the samples have been contracted to a laboratory (University of Waterloo Laboratories) capable of detecting tritium concentrations down to 19 pCi/L. Waterloo Laboratories report tritium analyses results in Tritium Units (1 TU = 3.2 pCi/L). The tritium results in this report are indicated in pCi/L.

3.3 Program Execution

The special water sampling program was executed as described in the preceding section with the following exceptions:

- No samples were available from wells P-8, PIIC-02, PIIC-03, PIIC-19, PIIC-20, PIIC-21, PIIC-22, PIIC-23, PIIC-24, PIIC-26, PIIC-27, and PIIC-28 in 2013.
- An annual (versus a semi-annual) sample was taken from locations 11 CST, 12 CST, and 13 CST. The second collection was missed.

3.4 Program Modifications

Changes to the program in 2013 include:

- Samples taken from wells P-10 and MW-8 and stormwater runoff from S-6 and S-7 were sent to ATI Environmental, Incorporated for analysis of hard-to-detect nuclides, in accordance with American Nuclear Insurers recommendations (Table E-4.5).
- Samples were not collected from the warehouse septic or the D5 Fuel Oil Storage Tank vault. Sampling is not required.

3.5 Results and Discussion

Results show tritium in well water and ground water samples at or near expected natural background levels except the MW-8 ground water sample well. Table E-4.4 provides the complete data table of results for each period and sampling location.

The tritium level annual averages have shown a downward trend since the special sampling began in 1989.

Except for sample well MW-8, the 2013 sample results are within the range of expected background tritium levels in shallow ground water and surface water due to tritium concentrations measured in precipitation. Sampling points in North America have shown tritium concentrations in precipitation ranging from 5 pCi/L to 157 pCi/L (Environmental Isotope Data No. 10; World Survey of Isotope Concentration in Precipitation (1988-1991)).

The higher level results at the Suter residence and Birch Lake in 1989 were possibly due to seepage from the PINGP discharge canal water into the ground water. This is thought to occur due to the elevation difference between the Vermillion River and the discharge canal. The Suter residence is located between the discharge canal and Birch Lake, which connects to the Vermillion River. The PINGP discharge canal piping was lengthened during 1991, so that liquid discharges from the plant are released near the end of the discharge canal, diffused and discharged to the Mississippi River. In 1992, the underground liquid discharge pipe from the plant to the discharge canal piping was replaced with a double walled leak detectable piping system. This year's sample results continue to indicate that these modifications have eliminated the suspected radioactive effluent flow into the local ground water.

The elevated tritium levels in sample well MW-8 in 2013 may be due to prior leakage from the PINGP liquid radwaste discharge pipe, discharge of turbine building sump water into the landlocked area, or discharge of heating steam condensate from the main warehouse in 1978/1979. The liquid radwaste discharge pipe was replaced in 1992 and the discharge to the landlocked area has been terminated, the last discharge took place on 11/14/2009. The main warehouse heating system was repaired in 1979. An additional discharge of approximately one gallon of heating steam condensate was released in 2013 from the maintenance warehouse. Corrective actions were taken to repair the steam isolation valve. The heating steam system was not used in the outer plant buildings during the 2013 – 2014 heating season.

None of the water samples monitored for gamma-emitting isotopes showed any activity greater than the LLD.

Table E-4.1. Sample collection and analysis program for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2013.

Medium	No.	Location codes and type [a]	Collection type and frequency [b]	Analysis type [c]
Well water Annual	17	P-8, REMP P-6, PIIC-02, PIIC-03, PIIC-19, PIIC-20, PIIC-21, PIIC-22, PIIC-23, PIIC-24, PIIC-26, PIIC-27, PIIC-28, P-7, P-11, PZ-1, PZ-2, PZ-4, PZ-5, PZ-7, MW-6, P-26, P-30, SW-3, SW-4, SW-5, SW-6, SW-7, P-9	G/A	H-3
Well water quarterly	4	P-24D	G/Q	H-3
Well water quarterly'	18	P-2, P-3, P-5, P-6, PZ-8, MW-4, MW-5	G/Q'	H-3
Well water monthly	60	P-43(C), SW-1(C), MW-7, MW-8, P-10	G/M	H-3
Surface water	9	S-1, S-2, S-3, S-4, S-5, S-6, S-7, P-31	G/A[d]	H-3
Storage Tank	7	11 CST, 21 CST, 22 CST, U1/U2 Demin Hdr	G/S	H-3
Storage Tank	12	Septic Tank	G/M	H-3
Snow	5	S-6, S-7, S-8, S-9, P-43(C)	G/A	H-3

[a] Location codes are defined in table D-4.2. Control Stations are indicated by (C). All other stations are indicators.

[b] Collection type is codes as follows: G/ = grab. Collection frequency is coded as follows: M = monthly; Q = quarterly; Q' = quarterly (spring, summer, and fall), S= semiannually: A = annually.

[c] Analysis type is coded as follows: H-3 = tritium.

[d] Location S-6 and S-7 are sampled semi-annually.

Table E-4.2. Sampling locations for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2013.

Code	Collection site	Type of sample [a]	Distance and direction from reactor
P-8	PI Community well	WW	1.0 mi. @ 321°/WNW
REMP P-6	Lock & Dam #3 well	WW	1.6 mi. @ 129°/SE
PIIC-02	2077 Other Day Road	WW	1.4 mi. @ 315°/NW
PIIC-03	6096 Whipple Way	WW	1.4 mi. @ 310°/NW
PIIC-19	6372 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-20	2158 Holmquist Road	WW	1.6 mi @ 300°/WNW
PIIC-21	1802 Messiah Road	WW	0.9 mi @ 281°/W
PIIC-22	1773 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-23	2.7 miles NW	WW	2.7 mi @315°/NW
PIIC-24	6424 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-26	1771 Buffalo Slough Rd	WW	1 mi. @ 315°/NW
PIIC-27	6372 Sturgeon Lake Rd	WW	1.7 mi. @ 293°/WNW
PIIC-28	1960 Larson Lane	WW	1.5 mi @ 288°/WNW
P-24D	Suter residence	WW	0.6 mi. @ 158°/SSE
P-43	Peterson Farm (Control)	WW	13.9 mi. @ 355°/N
SW-1	Hanson Farm (Control)	WW	2.2 mi. @ 315°/NW
P-2	Sample well	WW	See map
P-3	Sample well	WW	See map
P-5	Sample well	WW	See map
P-6	Sample well	WW	See map
P-7	Sample well	WW	See map
P-10	Sample well	WW	See map
P-11	Sample well	WW	See map
PZ-1	Sample well	WW	See map
PZ-2	Sample well	WW	See map
PZ-4	Sample well	WW	See map
PZ-5	Sample well	WW	See map
PZ-7	Sample well	WW	See map
PZ-8	Sample well	WW	See map
MW-4	Sample well	WW	See map
MW-5	Sample well	WW	See map
MW-6	Sample well	WW	See map
MW-7	Sample well	WW	See map
MW-8	Sample well	WW	See map
P-26	PITC well	WW	0.4 mi. @ 258°/WSW
P-30	Environ lab well	WW	0.2 mi. @ 32°/NNE

Table E-4.2. Sampling locations for special well, storage tank, and surface water samples, Prairie Island Nuclear Generating Plant, 2013 (continued).

Code	Collection site	Type of sample [a]	Distance and direction from reactor
SW-3	Cooling Tower pump	WW	See map
SW-4	New Admin Bldg	WW	0.05 mi. @ 315°/NW
SW-5	Plant Screenhouse well	WW	0.05 mi. @ 0°/N
SW-6	Restroom Trailer well	WW	0.2 mi @ 310°/NW
SW-7	Distribution Center	WW	0.35 mi @ 271°/W
P-9	Plant well # 2	WW	0.3 mi. @ 306°/NW
S-1	Upstream Miss. River	SW	See map
S-2	Recirc/Intake canal	SW	See map
S-3	Cooling water canal	SW	See map
S-4	Discharge Canal (end)	SW	See map
S-5	Mid Discharge Canal	SW	See map
S-6	Roof Stormwater Runoff (also snow)	SW	0.05 mi. @ 0°/N
S-7	Parking Lot Stormwater (also snow)	SW	0.3 mi @ 306°/NW
S-8	P-10 area snow	SW	See map
S-9	MW-7/8 area snow	SW	See map
P-31	Birch Lake Seepage	SW	
11 CST	Storage Tank	ST	Turbine Building
21 CST	Storage Tank	ST	Turbine Building
22 CST	Storage Tank	ST	Turbine Building
Unit 1/2 demin hdr	Storage Tank	ST	Turbine Building
Septic System	Storage Tank	ST	Outside #1 Warehouse
Warehouse Septic	Storage Tank	ST	Outside #1 Warehouse
D5 Vault	Concrete Vault	ST	Outside Turbine Bldg

[a] Sample codes: WW = Well water; SW = Surface Water: ST = Storage Tank.

Table E-4.3 Radiation Environmental Monitoring Program Summary: Special well, storage tank, and surface water samples.

Name of Facility Prairie Island Nuclear Power Station Docket No. 50-282, 50-306

Location of Facility Goodhue, Minnesota (County, State) Reporting Period January – December, 2013

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]
Offsite Well Water (pCi/L)	H-3 5	19	23 (1/5) (23)	P-24D	23 (1/4) (23)	(See Control Below)	0
Onsite Well Water (pCi/L)	H-3 73	19	111 (60/73) (21-378)	MW-8	320 (12/12) (266-378)	(See Control Below)	12
Onsite Surface Water (pCi/L)	H-3 13	19	58 (10/13) (21-160)	S-7	94 (2/2) (28-160)	(See Control Below)	0
Onsite Storage Tank (pCi/L)	H-3 19	19	98 (17/19) (24-293)	Septic System	121 (12/12) (29-293)	(See Control Below)	1
Control (offsite well water)	H-3 25	19	none	SW-1	27 (4/12) (24-30)	25 (5/25) (21-30)	0

[a] H-3 = tritium
[b] LLD = Nominal lower limit of detection based on 4.66 sigma error for background sample. Value shown is lowest for the period.
[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 by code.
[e] Non-routine results are those which exceed ten times the control station value.

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2013.

SAMPLE DATES (2013)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STATION CODE	LOCATION-OFFSITE WELLS	H-3 Concentration (pCi/L)											
P-8	PI Community Well												
REMP P-6	Lock & Dam #3 well								<19				
PIIC-02	2077 Other Day Road												
PIIC-03	6096 Whipple Way												
PIIC-19	6372 Sturgeon Lake Rd												
PIIC-20	2158 Holmquist Rd												
PIIC-21	1802 Messiah Road												
PIIC-22	1773 Buffalo Slough Rd												
PIIC-23	2.7 miles NW of plant												
PIIC-24	6424 Sturgeon Lake Rd												
PIIC-26	1771 Buffalo Slough Rd												
PIIC-27	6372 Sturgeon Lake Rd												
PIIC-28	1960 Larson Lane												
P-24D	Suter residence	<19			<19			23			<19		
P-43	Peterson Farm (Control)	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19/21* *snow	<19
SW-1	Hanson Farm (Control)	<19	<19	<19	<19	27	<19	<19	<19	25	30	24	<19

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2013 (continued).

SAMPLE DATES (2013)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STATION CODE	LOCATION- ONSITE WELLS	H-3 Concentration (pCi/L)											
P-2	Sample well				34			100			60		
P-3	Sample well				57					29	63		
P-5	Sample well				84			98			71		
P-6	Sample well				33			<19			68		
P-7	Sample well							76					
P-10	Sample well	82	55	31	55	58	69	74	44	55	94	74	86
P-11	Sample well							80					
PZ-1	Sample well							22					
PZ-2	Sample well							29					
PZ-4	Sample well							67					
PZ-5	Sample well							33					
PZ-7	Sample well							21					
PZ-8	Sample well				<19			47			44		
MW-4	Sample well				<19			50			<19		
MW-5	Sample well				<19			52			45		
MW-6	Sample well							47					
MW-7	Sample well	52	85	25	59	47	77	74	55	56	71	74	68
MW-8	Sample well	337	378	314	369	298	308	284	293	316	336	336	266
P-26	PITC well							<19					
P-30	Env. lab well							<19					
SW-3	Cooling Tower pump							<19					
P-9	Plant well # 2							<19					
SW-4	New Admin Bldg.							<19					
SW-5	Plant Screenhouse Well							<19					
SW-6	Restroom Trailer							<19					
SW-7	Distribution Center							<19					

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2013 (continued).

SAMPLE DATES (2013)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STATION CODE	LOCATION- ONSITE SURFACE WATER	H-3 Concentration (pCi/L)											
S-1	Mississippi River upstream								31				
S-2	Recirculation/Intake canal								<19				
S-3	Cooling water canal								<19				
S-4	Discharge Canal (end)								<19				
S-5	Discharge Canal (midway)								21				
S-6	Stormwater runoff							89				61*	
S-7	Parking Lot runoff							160				28*	
S-8	P-10 area snow											24*	
S-9	MW-7/8 area snow											76*	
P-31	Birch Lake Seepage									33	56		

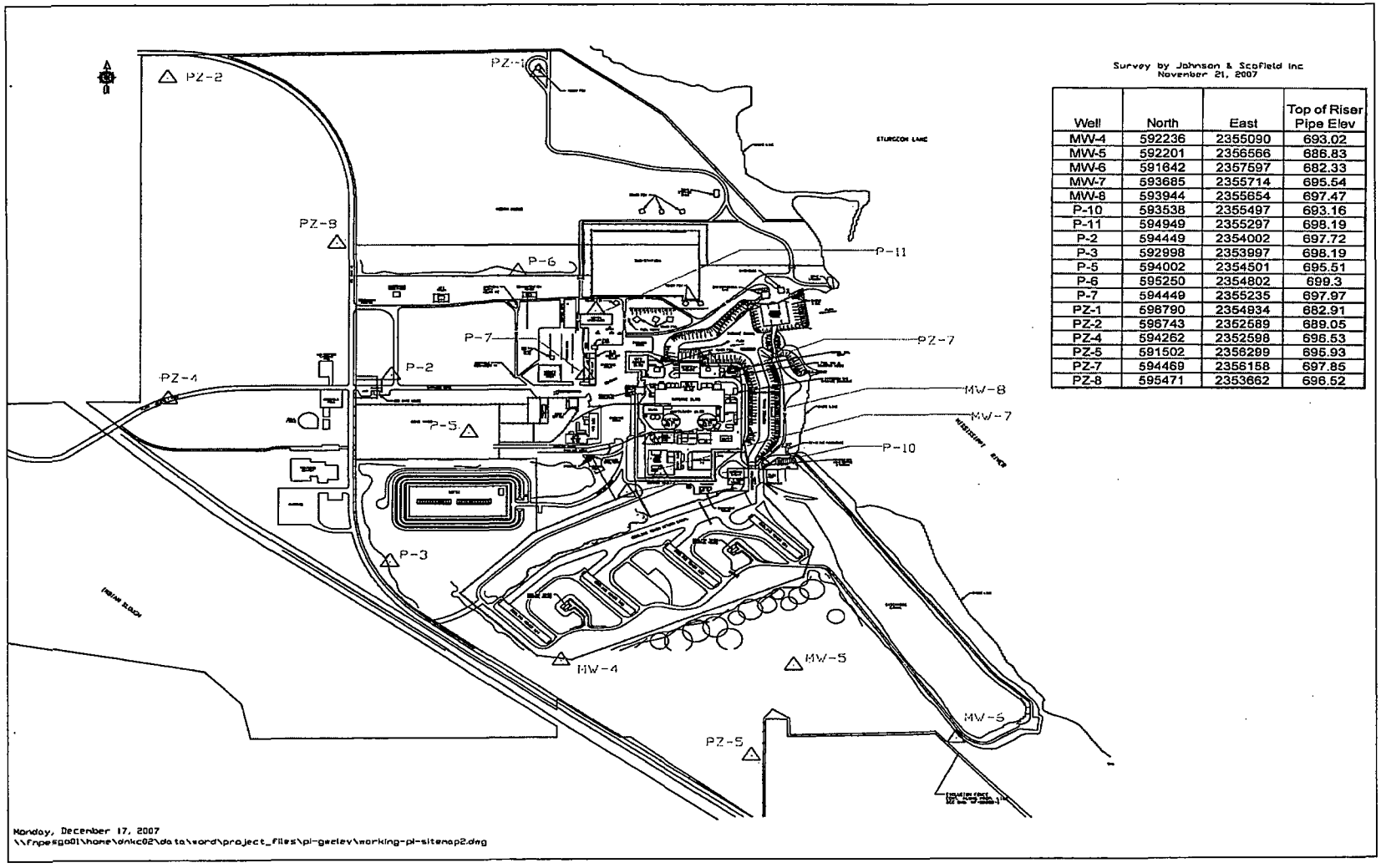
* snow samples

Table E-4.4 Radiological Environmental Monitoring Program , Complete Data Table, 2013 (continued).

SAMPLE DATES (2013)		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
STATION CODE	LOCATION- ONSITE STORAGE TANKS	H-3 Concentration (pCi/L)											
11 CST	Storage tank						<19						
21 CST	Storage tank						31						
22 CST	Storage tank						<19						
U1/U2 Demin Header	Storage tank						24/40				68/61		
Septic System	Storage tank	29	63	46	128	49	175	67	60	225	144	169	293

Table E-4.5. Results of analyses for iron-55, nickel-63, strontium-90, isotopic plutonium, americium-241 and isotopic curium.

Location Collection Date	P-10 Well 09-16-13	MW-8 Well 09-16-13	S-6 OAB Roof 09-16-13	S-7 Parking Lot 09-16-13
Lab Code	PXW-5493	PXW-5494	PXW-5495	PXW-5496
Isotope		Concentration (µCi/mL)		
Fe-55	< 7.4 E-07	< 7.9 E-07	< 7.5 E-07	< 7.6 E-07
Ni-63	< 1.1 E-08	< 1.2 E-08	< 1.3 E-08	< 1.3 E-08
Sr-90	< 4.2 E-10	< 4.4 E-10	< 5.4 E-10	< 5.4 E-10
Pu-238	< 1.0 E-10	< 2.3 E-10	< 1.7 E-10	< 2.0 E-10
Pu-239/240	< 5.9 E-11	< 2.1 E-10	< 1.2 E-10	< 1.2 E-10
Am-241	< 8.2 E-11	< 1.1 E-10	< 1.3 E-10	< 7.8 E-11
Cm-242	< 8.2 E-11	< 1.9 E-10	< 1.1 E-10	< 1.1 E-10
Cm-243/244	< 1.8 E-10	< 2.3 E-10	< 2.0 E-10	< 2.1 E-10



Survey by Johnson & Scofield Inc
November 21, 2007

Well	North	East	Top of Riser Pipe Elev
MW-4	592236	2355090	693.02
MW-5	592201	2356566	686.83
MW-6	591642	2357597	682.33
MW-7	593685	2355714	695.54
MW-8	593944	2355654	697.47
P-10	593538	2355497	693.16
P-11	594949	2355297	698.19
P-2	594449	2354002	697.72
P-3	592998	2353997	698.19
P-5	594002	2354501	695.51
P-6	595250	2354802	699.3
P-7	594449	2355235	697.97
PZ-1	596790	2354934	682.91
PZ-2	596743	2352689	689.05
PZ-4	594262	2352598	696.53
PZ-5	591502	2356289	695.93
PZ-7	594469	2356158	697.86
PZ-8	595471	2353662	698.52

Groundwater Monitoring Well Locations