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QUAD CITIES NUCLEAR POWER STATION UNITS 1 and 2

Annual Radiological Environmental Operating Report

1 January Through 31 December 2015

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I. Summary and Conclusions

In 2015, the Quad Cities Generating Station released to the environment through the radioactive effluent liquid and gaseous pathways approximately 124 curies of noble gas, 1.18E-02 curies of fission and activation products, 29 curies of Carbon-14 and approximately 85 curies of tritium. The dose from both liquid and gaseous effluents was conservatively calculated for the Maximum Exposed Member of the Public. The results of those calculations and their comparison to the allowable limits were as follows:

NOTE: Percent of applicable limits are for Unit 1 and Unit 2 combined (Site)

Gaseous and liquid radiation doses to members of the public at locations								
Effluents	Applicable Organ	Estimated Dose	Age Group	Location		% of Applicable Limit	Site Limit	Unit
				Distance (meters)	Direction (toward)			
Noble Gas	Gamma - Air Dose	2.76E-03	All	1029	NNE	1.38E-02	20	mRad
Noble Gas	Beta – Air Dose	3.27E-04	All	1029	NNE	8.18E-04	40	mRad
Iodine, Particulate C-14 & Tritium	Total Body	4.29E-02	Child	1029	NNE	4.29E-01	10	mrem
Iodine, Particulate C-14 & Tritium	Bone	3.42E-01	Child	1029	NNE	1.14E+00	30	mrem
Liquid	Total Body	8.71E-06	Adult	Mississippi River		1.45E-04	6	mrem
Liquid	Liver	1.30E-05	Teen	Mississippi River		6.50E-05	20	mrem
Skyshine	Total Body	7.72E+00	All	800	N	3.09E+01	25	mrem
40CFR190	Total Body (Gas + Liq+ Skyshine)	7.76E+00	All	800	N	3.10E+01	25	mrem

The doses as a result of the radiological effluents released from the Quad Cities Generating Station were a very small percentage of the allowable limits, with the exception of 40CFR190 whole body radiation which was calculated to be 31.0% of the 25 mrem/yr limit. The largest component of 40CFR190 dose is attributable to BWR skyshine from N-16. This value is conservatively calculated for the hypothetical maximum exposed member of the public.

This report on the Radiological Environmental Monitoring Program (REMP) conducted for the Quad Cities Nuclear Power Station (QCNPS) by Exelon covers the period 01 January 2015 through 31 December 2015. During that time period, 1556 analyses were performed on 1444 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of QCNPS had no adverse radiological impact on the environment.

Surface water samples were analyzed for concentrations of gross beta, tritium, iron, nickel and gamma emitting nuclides. Ground water samples were analyzed for concentrations of tritium and gamma emitting nuclides. No fission or activation products were detected. Gross beta activities detected were consistent with those detected in previous years and consistent with the control stations.

Fish (commercially and recreationally important species) and sediment samples were analyzed for concentrations of gamma emitting nuclides. No fission or activation products were detected in fish samples. Cesium-137 was not detected above the required LLD in any sediment samples.

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. No fission or activation products were detected.

High sensitivity I-131 analyses were performed on air samples. No I-131 was detected.

Cow milk samples were analyzed for concentrations of I-131 and gamma emitting nuclides. No I-131 was detected. Concentrations of naturally occurring isotopes (K-40 approximately 1200 pCi/L) were consistent with those detected in previous years. No fission or activation products were detected.

Food product samples were analyzed for concentrations of gamma emitting nuclides. No fission or activation products were detected.

Environmental gamma radiation measurements were performed quarterly using Optically Stimulated Luminescence Dosimeters (OSLD). Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimeters were deployed and Thermoluminescent Dosimeters (TLD) were discontinued. The relative comparison to control locations remains valid. OSLD technology is different than that used in a TLD but has the same purpose (to measure direct radiation).

II. Introduction

The Quad Cities Nuclear Power Station (QCNPS), consisting of two 2,957 MWth boiling water reactors owned and operated by Exelon Corporation, is located in Cordova, Illinois along the Mississippi River. Unit No. 1 went critical on 16 March 1972. Unit No. 2 went critical on 02 December 1973. The site is located in northwestern Illinois, approximately 182 miles west of Chicago, Illinois.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Landauer on samples collected during the period 1 January 2015 through 31 December 2015.

A. Objective of the REMP

The objectives of the REMP are to:

1. Provide data on measurable levels of radiation and radioactive materials in the site environs.

2. Evaluate the relationship between quantities of radioactive material released from the plant and resultant radiation doses to individuals from principal pathways of exposure.

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.

2. Establishing baseline radiological data of media within those pathways.

3. Continuously monitoring those media before and during Station operation to assess Station radiological effects (if any) on man and the environment.

C. Radiation and Radioactivity

All matter is made of atoms. An atom is the smallest part into which matter can be broken down and still maintain all its chemical properties. Nuclear radiation is energy, in the form of waves or particles that is given off by unstable, radioactive atoms. Radioactive material exists naturally and has always been a part of our environment. The earth's crust, for example, contains radioactive uranium, radium, thorium and potassium. Some radioactivity is a result of nuclear weapons testing. Examples of radioactive fallout that is normally present in environmental samples are cesium-137 and strontium-90. Some examples of radioactive materials released from a nuclear power plant are cesium-137, iodine-131, strontium-90 and cobalt-60. Radiation is measured in units of millirem; much like temperature is measured in degrees. A millirem is a measure of the biological effect of the energy deposited in tissue. The natural and man-made radiation dose received in one year by the average American is 300 to 400 mrem (References 2, 3, 4 in Table II.D-1 below). Radioactivity is measured in curies. A curie is that amount of radioactive material needed to produce 37,000,000,000 nuclear disintegrations per second. This is an extremely large amount of radioactivity in comparison to environmental radioactivity. That is why radioactivity in the environment

is measured in picocuries. One picocurie is equal to one trillionth of a curie.

D. Sources of Radiation

As mentioned previously, naturally occurring radioactivity has always been a part of our environment. Table II D-1 shows the sources and doses of radiation from natural and man-made sources.

Table II.D-1

Radiation Sources and Corresponding Doses (1)

NATURAL		MAN-MADE	
Source	Radiation Dose (millirem/year)	Source	Radiation Dose (millirem/year)
Internal, inhalation (2)	228	Medical (3)	300
External, space	33	Consumer (4)	13
Internal, ingestion	29	Industrial(5)	0.3
External, terrestrial	21	Occupational	0.5
		Weapons Fallout	<1
		Nuclear Power Plants	<1
Approximate Total	311	Approximate Total	314

(1) Information from NCRP Reports 160 and 94

(2) Primarily from airborne radon and its radioactive progeny

(3) Includes CT (147 mrem), nuclear medicine (77 mrem), interventional fluoroscopy (43 mrem) and conventional radiography and fluoroscopy (33 mrem)

(4) Primarily from cigarette smoking (4.6 mrem), commercial air travel (3.4 mrem), building materials (3.5 mrem), and mining and agriculture (0.8 mrem)

(5) Industrial, security, medical, educational, and research

Cosmic radiation from the sun and outer space penetrates the earth's atmosphere and continuously bombards us with rays and charged particles. Some of this cosmic radiation interacts with gases and particles in the atmosphere, making them radioactive in turn. These radioactive byproducts from cosmic ray bombardment are referred to as cosmogenic radionuclides. Isotopes such as beryllium-7 and carbon-14 are formed in this way. Exposure to cosmic and cosmogenic sources of radioactivity results in about 33 mrem of radiation dose per year.

Additionally, natural radioactivity is in our body and in the food we eat (about 29 millirem/yr), the ground we walk on (about 21 millirem/yr) and

the air we breathe (about 228 millirem/yr). The majority of a person's annual dose results from exposure to radon and thoron in the air we breathe. These gases and their radioactive decay products arise from the decay of naturally occurring uranium, thorium and radium in the soil and building products such as brick, stone and concrete. Radon and thoron levels vary greatly with location, primarily due to changes in the concentration of uranium and thorium in the soil. Residents at some locations in Colorado, New York, Pennsylvania and New Jersey have a higher annual dose as a result of higher levels of radon/thoron gases in these areas. In total, these various sources of naturally-occurring radiation and radioactivity contribute to a total dose of about 311 mrem per year.

In addition to natural radiation, we are normally exposed to radiation from a number of man-made sources. The single largest doses from man-made sources result from therapeutic and diagnostic applications of x-rays and radiopharmaceuticals. The annual dose to an individual in the U.S. from medical and dental exposure is about 300 mrem. Consumer products, such as televisions and smoke detectors, contribute about 13 mrem/yr. Much smaller doses result from weapons fallout (less than 1 mrem/yr) and nuclear power plants. Typically, the average person in the United States receives about 314 mrem per year from man-made sources.

III. Program Description

A. Sample Collection

Samples for the QCNPS REMP were collected for Exelon Nuclear by ATI Environmental Inc. (Midwest Labs). This section describes the general sampling methods used by Environmental Inc. to obtain environmental samples for the QCNPS REMP in 2015. Sample locations and descriptions can be found in Table B–1 and Figures B–1 and B–2, Appendix B.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, ground water, fish and sediment. Surface water samples were collected weekly from two locations, Q-33 and Q-34 (Control). Ground water samples were collected quarterly from two locations, Q-35 and Q-36. All water samples were collected in new containers, which were rinsed with source water prior to collection.

Fish samples comprising the edible portions of commercially and

recreationally important species were collected semiannually at two locations, Q-24 and Q-29 (Control). Sediment samples composed of recently deposited substrate were collected at two locations semiannually, Q-39 and Q-40 (Control).

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate, and airborne iodine. Airborne iodine and particulate samples were collected and analyzed at ten locations (Q-01, Q-02, Q-03, Q-04, Q-13, Q-16, Q-37, Q-38, Q-41 and Q-42 (control)). Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The air particulate filters and air iodine samples were replaced weekly and sent to the laboratory for analysis.

Terrestrial Environment

The terrestrial environment was evaluated by performing radiological analyses on samples of milk and food product. Milk samples were collected biweekly at one location (Q-26) from May through October, and monthly from November through April. All samples were collected in new plastic containers from the bulk tank, preserved with sodium bisulfite, and shipped promptly to the laboratory.

Food products were collected annually in July at five locations (Q-Control, Q-Quad 1, Q-Quad 2, Q-Quad 3, and Q-Quad 4). Various types of broadleaf and root vegetables were collected and placed in new plastic bags, and sent to the laboratory for analysis.

Ambient Gamma Radiation

Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimeters (OSLD) were deployed and Thermoluminescent Dosimeters (TLD) were discontinued. The relative comparison to control locations remains valid. OSLD technology is different than that used in a TLD but has the same purpose (to measure direct radiation).

Each location consisted of 2 OSLD sets. The OSLD locations were placed on and around the QCNPS site as follows: An inner ring consisting of 15 locations (Q-101, Q-102, Q-103, Q-104, Q-105, Q-106, Q-107, Q-108, Q-109, Q-111, Q-112, Q-113, Q-114, Q-115 and Q-116).

These OSLDs are located in 15 of the 16 meteorological sectors in the general area of the site boundary (approximately 0.1 – 3 miles from the site). There are no OSLDs located in the SSW sector because this sector is located over water.

An outer ring consisting of 16 locations (Q-201, Q-202, Q-203, Q-204, Q-205, Q-206, Q-207, Q-208, Q-209, Q-210, Q-211, Q-212, Q-213, Q-214, Q-215 and Q-216). These OSLDs are located in each of the 16 meteorological sectors (approximately 6.0 – 8.0 km from the site)

An other set consisting of nine locations (Q-01, Q-02, Q-03, Q-04, Q-13, Q-16, Q-37, Q-38 and Q-41). The locations are at each of the air sample stations around the site.

The balance of one location (Q-42) is the control site.

The specific OSLD locations were determined by the following criteria:

1. The presence of relatively dense population;

2. Site meteorological data taking into account distance and elevation for each of the sixteen 22.5 degree sectors around the site, where estimated annual dose from QCNPS, if any, would be most significant;

3. On hills free from local obstructions and within sight of the stack (where practical);

4. Near the closest dwelling to the stack in the prevailing downwind direction.

The OSLDs were exchanged quarterly and sent to Landauer for analysis.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE to analyze the environmental samples for radioactivity for the QCNPS REMP in 2015 and the type of analyses. The analytical procedures used by the TBE laboratory are listed in Table B-2.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of beta emitters in surface water and air particulates.

2. Concentrations of gamma emitters in ground and surface water, air particulates, milk, fish, sediment and vegetation.
3. Concentrations of tritium in ground and surface water.
4. Concentrations of I-131 in air and milk.
5. Ambient gamma radiation levels at various site environs.
6. Concentrations of Fe-55 and Ni-63 in surface water.

C. Data Interpretation

The radiological and direct radiation data collected prior to Quad Cities Nuclear Power Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Quad Cities Nuclear Power Station was considered operational at initial criticality. In addition, data were compared to previous years' operational data for consistency and trending. Several factors were important in the interpretation of the data:

1. <u>Lower Limit of Detection and Minimum Detectable Concentration</u>

The lower limit of detection (LLD) is defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is intended as an *a priori* (a before the fact) estimate of a system (including instrumentation, procedure and sample type) and not as an *a posteriori* (after the fact) criteria for the presence of activity. All analyses were designed to achieve the required QCNPS detection capabilities for environmental sample analysis.

The minimum detectable concentration (MDC) is defined above with the exception that the measurement is an *a posteriori* (after the fact) estimate of the presence of activity.

2. <u>Net Activity Calculation and Reporting of Results</u>

Net activity for a sample is calculated by subtracting background activity from the sample activity. Since the REMP measures extremely small changes in radioactivity in the environment, background variations may result in sample activity being lower than the background activity effecting a negative number. An MDC is reported in all cases where positive activity was not detected. Gamma spectroscopy results for each type of sample were grouped as follows:

For surface water, groundwater and vegetation 12 nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For fish, sediment, air particulate and milk 11 nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137 and Ba-140 and La-140 were reported.

For air iodine, one nuclide, I-131 was reported

Means and standard deviations of the results were calculated. The standard deviations represent the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

For 2015 the QCNPS REMP had a sample recovery rate in excess of 99%. Sample anomalies and missed samples are listed in the tables below:

Table D-1 LISTING OF SAMPLE ANOMALIES

Sample Type	Location Code	Collection Date	Reason

There were no anomalies in 2015.

Table D-2 LISTING OF MISSED SAMPLES

Sample Type	Location Code	Collection Date	Reason
SW	Q-33	01/01/15 – 03/05/15	No sample; water frozen.
SW	Q-34	01/01/15 – 03/05/15	No sample; water frozen.
AI	Q-04	04/17/15 –	Iodine cartridge lost in shipment.
SW	Q-33	12/31/15	Sample collected 12/31/15. Container leaked; collector returned for new sample on 01/02/16; water frozen.

Table D-2 LISTING OF MISSED SAMPLES (continued)

Sample Type	Location Code	Collection Date	Reason
OSLD	Q-115-2	12/31/15	OSLD found missing during quarterly change out
OSLD	Q-107-2, Q-Q205-4	12/31/15	OSLDs were lost in transit to Landauer.

The overall sample recovery rate indicates that the appropriate procedures and equipment are in place to assure reliable program implementation.

E. Program Changes

There were no program changes in 2015.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken weekly and composited monthly at two locations (Q-33 and Q-34). Of these locations only Q-33, located downstream, could be affected by Quad Cities' effluent releases. The following analyses were performed:

Gross Beta

Samples from all locations were analyzed for concentrations of gross beta (Table C–I.1, Appendix C). Gross beta activity was detected in 19 of 20 samples. The values ranged from 2.6 to 5.3 pCi/L. Concentrations detected were consistent with those detected in previous years (Figure C–1, Appendix C). The required LLD was met.

Tritium

Quarterly composites of weekly collections were analyzed for tritium activity (Table C–I.2, Appendix C). No tritium activity was detected (Figure C–2, Appendix C). The 2000 pCi/L OCDM and contractually required 200 pCi/L LLDs were met.

Iron and Nickel

Quarterly composites of monthly collections were analyzed for Fe-55 and Ni-63 (Table C–I.2, Appendix C). No Fe-55 or Ni-63 were detected. The required LLDs were met.

Gamma Spectrometry

Samples from both locations were analyzed monthly for gamma emitting nuclides (Table C–I.3, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

2. Ground Water

Quarterly grab samples were collected at two locations (Q-35 and Q-36). Both locations could be affected by Quad Cities' effluent releases. The following analyses were performed:

Tritium

Quarterly grab samples from the locations were analyzed for tritium activity (Table C–II.1, Appendix C). No tritium activity was detected (Figure C–3, Appendix C). The 2000 pCi/L OCDM and contractually required 200 pCi/L LLDs were met.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–II.2, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

3. Fish

Fish samples comprised of various commercially and recreationally important species were collected at two locations (Q-24 and Q-29) semiannually. Location Q-24 could be affected by Quad Cities' effluent releases. The following analysis was performed:

Gamma Spectrometry

The edible portion of fish samples from both locations were analyzed for gamma emitting nuclides (Table C–III.1, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

4. Sediment

Aquatic sediment samples were collected at two locations (Q-39 and Q-40) semiannually. The location Q-39, located downstream, could be affected by Quad Cities' effluent releases. The following analysis was performed:

Gamma Spectrometry

Sediment samples from Q-39 and Q-40 were analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). Cesium-137 was not detected in any of the samples. No other nuclides potentially associated with QCNPS were detected and all required LLDs were met.

B. Atmospheric Environment

1. Airborne

a. Air Particulates

Continuous air particulate samples were collected from ten locations on a weekly basis. The ten locations were separated into three groups: Near-field samplers within 4 km (2.5 miles) of the site (Q-01, Q-02, Q-03 and Q-04), far-field samplers between 4 and 10 km (2.5 – 6.2 miles) from the site (Q-13, Q-16, Q-37, Q-38 and Q-41) and the Control sampler between 10 and 30 km (6.2 – 18.6 miles) from the site (Q-42). The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–V.1 and C–V.2, Appendix C).

Comparison of results among the four groups aid in determining the effects, if any, resulting from the operation of QCNPS. The results from the near-field locations (Group I) ranged from 5 to 34 E–03 pCi/m^3 with a mean of 17 E–03 pCi/m^3. The results from the far-field locations (Group II) ranged from 5 to 33 E–03 pCi/m^3 with a mean of 17 E–03 pCi/m^3. The results from the Control location (Group III) ranged from 7 to 35 E–03 pCi/m^3 with a mean of 18 E–03 pCi/m^3. Comparison of the 2015 air particulate data with previous year's data indicate no effects from the operation of

QCNPS. In addition comparisons of the weekly mean values for 2015 indicate no notable differences among the three groups (Figures C–4 through C–9, Appendix C).

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma emitting nuclides (Table C–V.3, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

b. Airborne Iodine

Continuous air samples were collected from ten locations (Q-01, Q-02, Q-03, Q-04, Q-13, Q-16, Q-37, Q-38, Q-41 and Q-42) and analyzed weekly for I-131 (Table C–VI.1, Appendix C). All results were less than the LLD for I-131.

2. Terrestrial

a. Milk

Samples were collected from one location (Q-26) biweekly May through October and monthly November through April. The following analyses were performed:

Iodine-131

Milk samples from the location were analyzed for concentrations of I-131 (Table C–VII.1, Appendix C). No I-131 was detected and the LLD was met.

Gamma Spectrometry

Each milk sample was analyzed for concentrations of gamma emitting nuclides (Table C–VII.2, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

b. Food Products

Food product samples were collected at four locations plus a control location (Q-Control, Q-Quad 1, Q-Quad 2, Q-Quad 3 and Q-Quad 4) annually during growing season. Four locations, (Q-Quad 1, Q-Quad 2, Q-Quad 3 and Q-Quad 4) could be affected by Quad Cities' effluent releases. The following analysis was performed:

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–VIII.1, Appendix C). No nuclides associated with QCNPS were detected and all required LLDs were met.

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing optically stimulated luminescence dosimeters. Forty-one OSLD locations were established around the site. Results of OSLD measurements are listed in Tables C-IX.1 to C–IX.3, Appendix C.

All of the OSLD measurements were below 30 mRem/quarter, with a range of 17.1 to 29.0 mRem/quarter. A comparison of the Inner Ring, Outer Ring and Other data to the Control Location data, indicate that the ambient gamma radiation levels from all the locations were comparable.

D. Independent Spent Fuel Storage Installation

QCNPS commenced use of an Independent Spent Fuel Storage Installation (ISFSI) in Dec 2005. There are no measurable changes in ambient gamma radiation levels as a result of ISFSI operations.

E. Land Use Survey

A Land Use Survey conducted during August 2015 around QCNPS was performed by ATI Environmental Inc. (Midwest Labs) for Exelon Nuclear to comply with the Quad Cities' Offsite Dose Calculation Manual. The purpose of the survey was to document the nearest resident and milk producing animals in each of the sixteen 22.5 degree sectors around the site. The results from the land use census have not identified any locations, which yield a calculated dose or dose commitment, via the same pathway, that is at least 20% greater than at a location from which samples are currently being obtained. The results of this survey are summarized below:

Distance in Miles from QCNPS			
Sector	Residence Miles	Livestock Miles	Milk Farm Miles
N	0.6	2.7	-
NNE	1.2	3.1	-
NE	1.3	3.2	-
ENE	2.9	2.9	-
E	2.0	4.5	-
ESE	2.8	3.1	3.1
SE	1.7	5.3	-
SSE	1.1	4.0	6.6, 11.5
S	0.8	1.6	-
SSW	3.2	3.5	-
SW	2.9	3.3	-
WSW	2.2	2.7	-
W	2.6	4.3	-
WNW	2.7	3.8	-
NW	2.6	4.7	-
NNW	2.1	2.2	-

Of the above listed Milk Farms, only the farm located at 3.1 miles ESE of QCNPS, listed in the sample results section as Bill Stanley Dairy, has elected to participate in the QCNPS REMP program. Participation by local farmers is voluntary.

F. Errata Data

There is no errata data for 2015.

G. Summary of Results – Inter-Laboratory Comparison Program

The primary and secondary laboratories analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation and water matrices (Appendix D). The PE samples, supplied by Analytics Inc., Environmental Resource Associates (ERA) and DOE's Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

1. Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of laboratory results and Analytics' known value. Since flag values are not assigned by Analytics, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, NELAC, state specific PT program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values.

The MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable when a mean result for the specified analyte is ± 20% of the reference value. Performance is acceptable with warning when a mean result falls in the range from ±20% to ±30% of the reference value (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

For the TBE laboratory, 129 out of 139 analyses performed met the specified acceptance criteria. Ten analyses (AP - Cr-51, U-234/233, Gr A, Sr-90; Soil Sr-90; Water - Ni-63, Sr-89, Sr-90, U natural; Vegetation Sr-90 samples) did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program:

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

1. Teledyne Brown Engineering's Analytics' June 2015 air particulate Cr-51 result of 323 ± 45.5 pCi was higher than the known value of 233 pCi with a ratio of 1.39. The upper ratio of 1.30 (acceptable with warning) was exceeded. The air particulate sample is counted at a distance above the surface of the detector to avoid detector summing which could alter the results. Chromium-51 has the shortest half-life (27.7 days) and the lowest gamma energy (320.08 keV) of this mixed nuclide sample. Additionally, Cr-51 has only one gamma energy and also has a low intensity (9.38 gamma photons produced per 100 disintegrations). This geometry produces a

larger error for the Cr-51 and other gamma emitters as any distance from the detector decreases the counting rate and the probability of accurately detecting the nuclide energy. Taking into consideration the uncertainty, the activity of Cr-51 overlaps with the known value at a ratio of 1.19, which would statistically be considered acceptable. NCR 15-18

2. Teledyne Brown Engineering's MAPEP March 2015 soil Sr-90 result of 286 Total Bq/kg was lower than the known value of 653 Bq/kg, exceeding the lower acceptance range of 487 Bq/kg. The failure was due to incomplete digestion of the sample. Incomplete digestion of samples causes some of the sample to be left behind and is not present in the digested sample utilized for analysis. The procedure has been updated to include a more robust digestion using stirring during the heating phase. The MAPEP September 2014 soil Sr-90 series prior to this study was evaluated as acceptable with a result of 694 and an acceptance range of 601 – 1115 Bq/kg. The MAPEP September 2015 series soil Sr-90 after this study was evaluated as acceptable with a result of 429 and an acceptance range of 298 – 553 Bq/kg. We feel the issue is specific to the March 2015 MAPEP sample. NCR 15-13

3. Teledyne Brown Engineering's MAPEP March 2015 air particulate U-234/233 result of 0.0211 ± 0.0120 Bq/sample was higher than the known value of 0.0155 Bq/sample, exceeding the upper acceptance range of 0.0202 Bq/sample. Although evaluated as a failure, taking into consideration the uncertainty, TBE's result would overlap with the known value, which is statistically considered acceptable. MAPEP spiked the sample with significantly more U-238 activity (a found to known ratio of 0.96) than the normal U-234/233. Due to the extremely low activity, it was difficult to quantify the U-234/233. NCR 15-13

4. Teledyne Brown Engineering's MAPEP March 2015 air particulate gross alpha result of 0.448 Bq/sample was lower than the known value of 1.77 Bq/sample, exceeding the lower acceptance range of 0.53 Bq/sample. The instrument efficiency used for gross alpha is determined using a non-attenuated alpha standard. The MAPEP filter has the alphas embedded in the filter, requiring an attenuated efficiency. When samples contain alpha particles that are embedded in the sample media, due to the size of the alpha particle, some of the alpha particles are absorbed by the media and cannot escape to be counted. When the sample media absorbs the alpha particles this is known as self-absorption or attenuation. The calibration must include a similar configuration/media to correct for the attenuation. In order to correct the low bias, TBE will

create an attenuated efficiency for MAPEP air particulate filters. The MAPEP September series air particulate gross alpha result of 0.47 Bq/sample was evaluated as acceptable with a range of 0.24 – 1.53 Bq/sample. Unlike the MAPEP samples, air particulate Gross alpha analyses for power plants are not evaluated as a direct count sample. Power plant air particulate filters for gross alpha go through an acid digestion process prior to counting and the digested material is analyzed. NCR 15-13

5. Teledyne Brown Engineering's MAPEP September water Ni-63 result of 11.8 ± 10.8 Bq/L was higher than the known value of 8.55 Bq/L, exceeding the upper acceptance range of 11.12 Bq/L. The Ni-63 half-life is approximately 100 years. Nickel-63 is considered to be a "soft" or low energy beta emitter, which means that the beta energy is very low. The maximum beta energy for Ni-63 is approximately 65 keV, much lower than other more common nuclides such as Co-60 (maximum beta energy of 1549 keV). The original sample was run with a 10 mL aliquot which was not sufficient for the low level of Ni-63 in the sample. The rerun aliquot of 30 mL produced an acceptable result of 8.81 Bq/L. NCR 15-21

6. Teledyne Brown Engineering's MAPEP September air particulate Sr-90 result of 1.48 Bq/sample was lower than the known value of 2.18 Bq/sample, exceeding the lower acceptance range of 1.53 Bq/sample. In the past, MAPEP has added substances (unusual compounds found in DOE complexes) to various matrices that have resulted in incomplete removal of the isotope of interest for the laboratories analyzing the cross checks. TBE suspects that this may be the cause of this error. Many compounds, if not properly accounted for or removed in the sample matrix, can cause interferences to either indicate lower activity or higher activity. TBE will no longer analyze the air particulate Sr-90 through MAPEP but will participate in the Analytics cross check program to perform both Sr-89 and Sr-90 in the air particulate matrix. NCR 15-21

7. Teledyne Brown Engineering's MAPEP September vegetation Sr-90 result of 0.386 Bq/sample was lower than the known value of 1.30 Bq/sample, exceeding the lower acceptance range of 0.91 Bq/sample. In the past, MAPEP has added substances (unusual compounds found in DOE complexes) to various matrices that have resulted in incomplete removal of the isotope of interest for the laboratories analyzing the cross checks. TBE suspects that this maybe the cause of this error. Many compounds, if not properly accounted for or removed in the sample matrix, can cause interferences to either indicate lower activity or higher activity.

Results from previous performance evaluations were reviewed and shown to be acceptable. NCR 15-21

8. & 9. Teledyne Brown Engineering's ERA May water Sr-89/90 results of 45.2 and 28.0 pCi/L, respectively were lower than the known values of 63.2 and 41.9 pCi/L, respectively, exceeding the lower acceptance limits of 51.1 and 30.8 pCi/L, respectively. The yields were on the high side of the TBE acceptance range, which indicates the present of excess calcium contributed to the yield, resulting in low results. NCR 15-09

10. Teledyne Brown Engineering's ERA November water Uranium natural result of 146.9 pCi/L was higher than the known value of 56.2 pCi/L, exceeding the upper acceptance limit of 62.4 pCi/L. The technician failed to dilute the original sample, but used the entire 12 mL sample. When the results were recalculated without the dilution and using the 12 mL aliquot, the result of 57.16 agreed with the assigned value of 56.2. NCR 15-19

For the ATI EIML laboratory, 90 of 94 analyses met the specified acceptance criteria. Four analyses (Water – Co-57, Fe-55; AP – Co-57; Soil – Sr-90) did not meet the specified acceptance criteria for the following reasons:

1. The Environmental Inc., Midwest Laboratory's MAPEP February 2015 water Co-57 result of 10.2 Bq/L was lower than the known value of 29.9 Bq/L, exceeding the lower control limit of 20.9 Bq/L. The reported value should have been 27.84, which would have been evaluated as acceptable. A data entry error resulted in a non-acceptable result.

2. The Environmental Inc., Midwest Laboratory's MAPEP February 2015 AP Co-57 result of 0.04 Bq/sample was lower than the known value of 1.51 Bq/ sample, exceeding the lower control limit of 1.06 Bq/sample. The reported value should have been 1.58 Bq/sample, which would have been evaluated as acceptable. A data entry error resulted in a non-acceptable result.

3. The Environmental Inc., Midwest Laboratory's MAPEP August 2015 soil Sr-90 result of 231 Bq/kg was lower than the known value of 425 Bq/kg, exceeding the lower control limit of 298 Bq/kg. The incomplete separation of calcium from strontium caused a failed low result. The reanalysis result of 352 Bq/kg fell within acceptance criteria.

4. The Environmental Inc., Midwest Laboratory's MAPEP August 2015 water Fe-55 result of 4.2 Bq/L was lower than the known

value of 13.1 Bq/L, exceeding the lower control limit of 9.2 Bq/L. The known activity was below the routine laboratory detection limits for the available aliquot fraction.

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR QUAD CITIES NUCLEAR POWER STATION, 2015

NAME OF FACILITY: QUAD CITIES
LOCATION OF FACILITY: CORDOVA IL

DOCKET NUMBER: 50-254 &50-265
REPORTING PERIOD: ANNUAL 2015

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M): MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M): STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	GR-B	20	4	3.6 (10/10) (2.9/4.9)	3.9 (9/10) (2.6/5.3)	3.9 (9/10) (2.6/5.3)	Q-34 CONTROL CAMANCHE - UPSTREAM 4.4 MILES NNE OF SITE	0
	H-3	8	2000	<LLD	<LLD	-		0
	FE-55	8	200	<LLD	<LLD	-		0
	NI-63	8	5	<LLD	<LLD	-		0
	GAMMA	20						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES
FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESIS (F)

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	ZN-65		30	<LLD	<LLD	-		0
SURFACE WATER (PCI/LITER)	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
GROUND WATER (PCI/LITER)	H-3	8	2000	<LLD	NA	-		0

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GROUND WATER (PCI/LITER)	GAMMA	8						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	I-131		15	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0

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	CS-137		18	<LLD	NA	-		0
GROUND WATER (PCI/LITER)	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
FISH (PCI/KG WET)	GAMMA	8						
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0

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	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
FISH (PCI/KG WET)	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	4						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0

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	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0

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AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	520	10	17 (465/468) (5/37)	18 (52/52) (7/35)	18 (52/52) (7/35)	Q-42 CONTROL LECLAIRE 8.7 MILES SSW OF SITE	0
	GAMMA	40						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
AIR PARTICULATE (E-3 PCI/CU.METER)	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0

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	CS-137		60	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA I-131	519	70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	20	1	<LLD	NA	-		0
	GAMMA MN-54	20	NA	<LLD	NA	-		0
	CO-58		NA	<LLD	NA	-		0
	FE-59		NA	<LLD	NA	-		0

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	CO-60		NA	<LLD	NA	-		0
	ZN-65		NA	<LLD	NA	-		0
	NB-95		NA	<LLD	NA	-		0
MILK (PCI/LITER)	ZR-95		NA	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0

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VEGETATION (PCI/KG WET)	GAMMA	20						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
VEGETATION (PCI/KG WET)	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0

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	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLIREM/QTR.)	OSLD-QUARTERLY	325	NA	20.7 (317/317) (14.9/29.4)	22.8 (8/8) (18.7/29.7)	25.4 (4/4) (22.5/29.4)	Q-211-2 INDICATOR 4.5 MILES SW	0

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APPENDIX B

LOCATION DESIGNATION, DISTANCE & DIRECTION, AND SAMPLE COLLECTION & ANALYTICAL METHODS

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TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Quad Cities Nuclear Power Station, 2015

Location	Location Description	Distance & Direction From Site
A.	Surface Water	
Q-33	Cordova (indicator)	3.1 miles SSW
Q-34	Camanche, Upstream (control)	4.4 miles NNE
B.	Ground/Well Water	
Q-35	McMillan Well (indicator)	1.5 miles S
Q-36	Cordova Well (indicator)	3.3 miles SSW
C.	Milk - bi-weekly / monthly	
Q-26	Bill Stanley Dairy (indicator)	3.1 miles ESE
D.	Air Particulates / Air Iodine	
Q-01	Onsite 1 (indicator)	0.5 miles N
Q-02	Onsite 2 (indicator)	0.4 miles ENE
Q-03	Onsite 3 (indicator)	0.6 miles S
Q-04	Nitrin (indicator)	1.7 miles NE
Q-13	Princeton (indicator)	4.7 miles SW
Q-16	Low Moor (indicator)	5.7 miles NNW
Q-37	Meredosia Road (indicator)	4.4 miles ENE
Q-38	Fuller Road (indicator)	4.7 miles E
Q-41	Camanche (indicator)	4.3 miles NNE
Q-42	LeClaire (control)	8.7 miles SSW
E.	Fish	
Q-24	Pool #14 of Mississippi River, Downstream (indicator)	0.5 miles SW
Q-29	Mississippi River, Upstream (control)	1.0 miles N
F.	Sediment	
Q-39	Cordova, Downstream on Mississippi River (indicator)	0.8 miles SSW
Q-40	North of Albany, Upstream on Mississippi River(control)	8.9 miles NE
G.	Food Products	
Quadrant 1	Ken DeBaille	2.3 miles ENE
Quadrant 2	Dale Nimmic	3.0 miles ESE
Quadrant 3	Amy Johnston	1.8 miles S
Quadrant 4	Mike Fawcett	4.5 miles NW
Control	Charles Leavens	9.5 miles NE
H.	Environmental Dosimetry - OSLD	
Inner Ring		
Q-101-1		0.6 miles N
Q-101-2		0.9 miles N
Q-102-1		1.3 miles NNE
Q-102-3		1.4 miles NNE
Q-103-1 and -2		1.2 miles NE
Q-104-1		1.1 miles ENE
Q-104-2		0.9 miles ENE
Q-105-1 and -2		0.8 miles E
Q-106-2 and -3		0.7 miles ESE
Q-107-2		0.7 miles SE
Q-107-3		0.8 miles SE
Q-108-1		1.0 miles SSE
Q-108-2		0.9 miles SSE

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Quad Cities Nuclear Power Station, 2015

Location	Location Description	Distance & Direction From Site
H.	Environmental Dosimetry – OSLD (continued)	
Inner Ring		
Q-109-1		0.9 miles S
Q-109-2		1.2 miles S
Q-111-1		2.6 miles SW
Q-111-2		2.5 miles SW
Q-112-1		2.5 miles WSW
Q-112-2		2.2 miles WSW
Q-113-1 and -2		2.5 miles W
Q-114-1		2.1 miles WNW
Q-114-2		2.5 miles WNW
Q-115-1		2.6 miles NW
Q-115-2		2.3 miles NW
Q-116-1		2.3 miles NNW
Q-116-3		2.4 miles NNW
Outer Ring		
Q-201-1 and -2		4.2 miles N
Q-202-1		4.4 miles NNE
Q-202-2		4.8 miles NNE
Q-203-1		4.7 miles NE
Q-203-2		5.0 miles NE
Q-204-1		4.7 miles ENE
Q-204-2		4.5 miles ENE
Q-205-1		4.7 miles E
Q-205-4		4.8 miles E
Q-206-1 and -2		4.8 miles ESE
Q-207-1 and -4		4.7 miles SE
Q-208-1		4.3 miles SSE
Q-208-2		4.9 miles SSE
Q-209-1 and -4		4.7 miles S
Q-210-1 and -4 *		4.1 miles SSW
Q-210-5		3.3 miles SSW
Q-211-1 and -2		4.5 miles SW
Q-212-1		5.4 miles WSW
Q-212-2		4.4 miles WSW
Q-213-1		4.3 miles W
Q-213-2		4.8 miles W
Q-214-1		4.7 miles WNW
Q-214-2		4.4 miles WNW
Q-215-1		5.0 miles NW
Q-215-2		4.2 miles NW
Q-216-1		4.6 miles NNW
Q-216-2		4.3 miles NNW
Other		
Q-01	Onsite 1 (indicator)	0.5 miles N
Q-02	Onsite 2 (indicator)	0.4 miles ENE
Q-03	Onsite 3 (indicator)	0.6 miles S
Q-04	Nitrin (indicator)	1.7 miles NE
Q-13	Princeton (indicator)	4.7 miles SW
Q-16	Low Moor (indicator)	5.7 miles NNW
Q-37	Meredosia Road (indicator)	4.4 miles ENE
Q-38	Fuller Road (indicator)	4.7 miles E
Q-41	Camanche (indicator)	4.3 miles NNE

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Quad Cities Nuclear Power Station, 2015

Location	Location Description	Distance & Direction From Site
H.	Environmental Dosimetry – OSLD (continued)	
Control		
Q-42	LeCLaire	8.7 miles SSW

* Removed from ODCM in December 2006 and replaced by Q-210-5. Q-210-4 is for trending only

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Quad Cities Nuclear Power Station, 2015

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from weekly grab samples	TBE, TBE-2007 Gamma emitting radioisotope analysis
Surface Water	Gross Beta	Monthly composite from weekly grab samples	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices
Surface Water	Tritium	Quarterly composite from weekly grab samples	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation
Surface Water	Iron and Nickel	Quarterly composite from weekly grab samples	TBE, TBE-2006 Iron-55 in various matrices TBE, TBE-2013 Radionickel in various matrices
Ground Water	Gamma Spectroscopy	Quarterly grab samples	TBE, TBE-2007 Gamma emitting radioisotope analysis
Ground Water	Tritium	Quarterly grab samples	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	TBE-2007 Gamma emitting radioisotope analysis
Sediment	Gamma Spectroscopy	Semi-annual grab samples	TBE, TBE-2007 Gamma emitting radioisotope analysis
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2007 Gamma emitting radioisotope analysis
Air Iodine	Gamma Spectroscopy	Weekly composite of continuous air sampling through charcoal filter	TBE, TBE-2007 Gamma emitting radioisotope analysis
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2012 Radioiodine in various matrices
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2007 Gamma emitting radioisotope analysis
Food Products	Gamma Spectroscopy	Annual grab samples	TBE, TBE-2007 Gamma emitting radioisotope analysis
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements	Landauer Incorporated

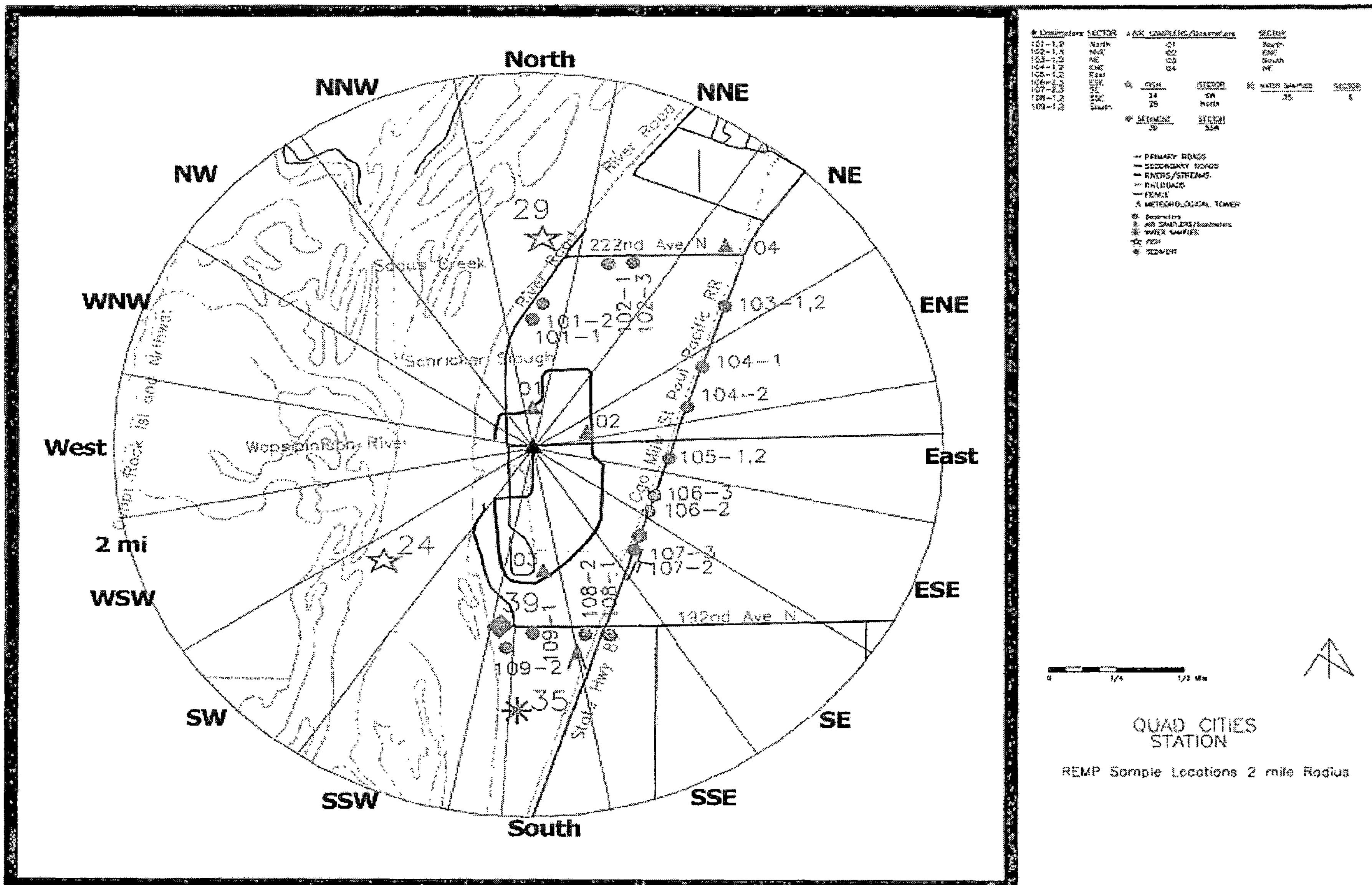


Figure B-1 Map
Quad Cities REMP Sampling Locations – 2 Mile Radius, 2015

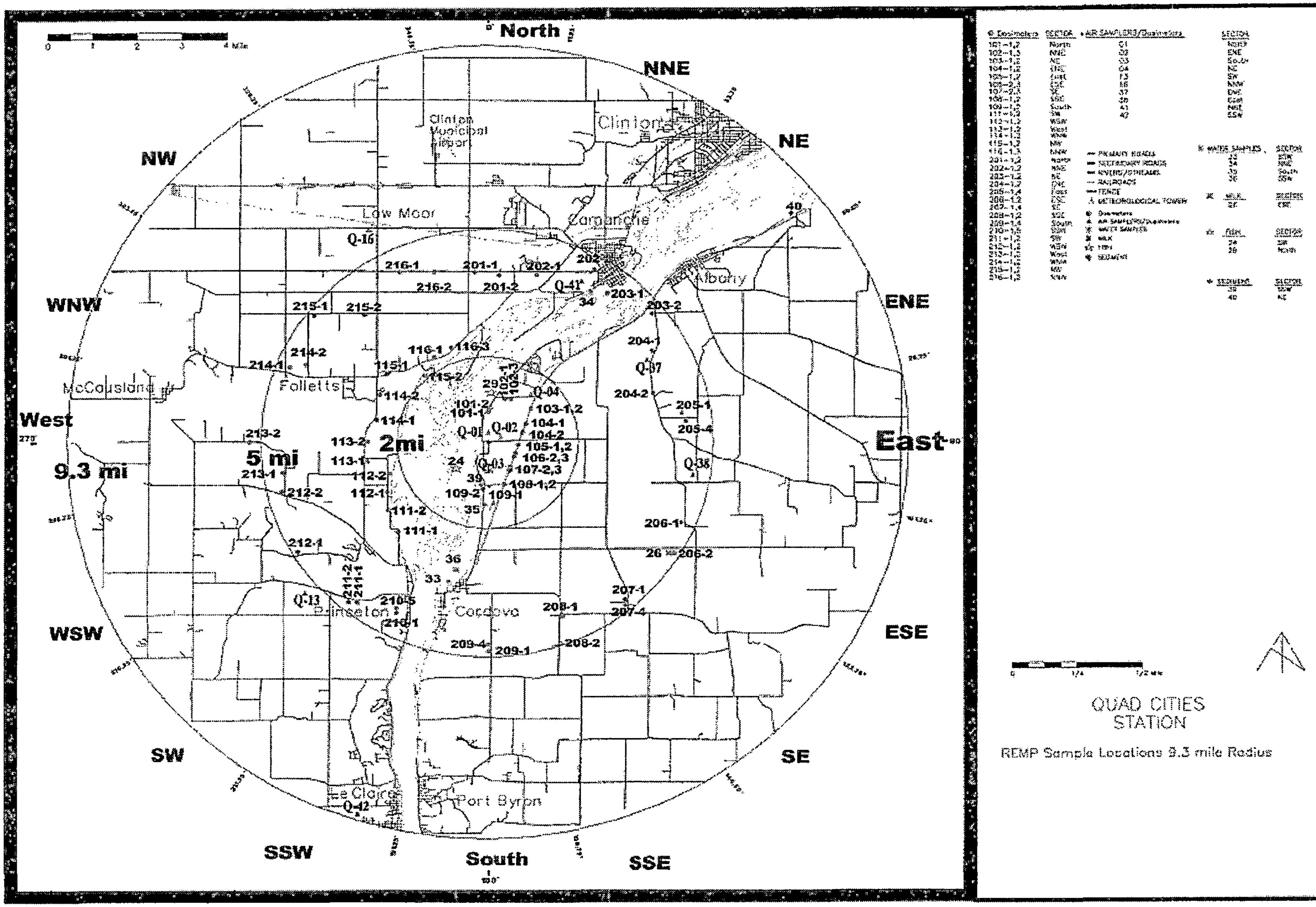


Figure B-2 Map
Quad Cities REMP Sampling Locations – 9.3 Mile Radius, 2015

APPENDIX C

DATA TABLES AND FIGURES
PRIMARY LABORATORY

Table C-I.1 CONCENTRATIONS OF GROSS BETA IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q-33	Q-34
01/03/14 - 01/30/14	(1)	(1)
02/07/14 - 02/28/14	(1)	(1)
03/12/15 - 03/27/15	3.4 ± 1.5	5.3 ± 1.7
04/03/15 - 04/30/15	3.6 ± 1.6	3.3 ± 1.6
05/07/15 - 05/29/15	3.1 ± 1.6	2.6 ± 1.6
06/04/15 - 06/26/15	3.7 ± 1.7	4.4 ± 1.8
07/02/15 - 07/30/15	2.9 ± 1.6	3.2 ± 1.6
08/07/15 - 08/27/15	3.4 ± 1.8	3.5 ± 1.8
09/03/15 - 09/24/15	3.6 ± 1.6	< 2.3
10/01/15 - 10/29/15	4.7 ± 2.1	4.2 ± 2.0
11/05/15 - 11/27/15	3.3 ± 1.7	4.6 ± 2.1
12/04/15 - 12/31/15	4.9 ± 1.5	4.5 ± 1.5
MEAN	3.6 ± 1.3	3.9 ± 1.7

Table C-I.2 CONCENTRATIONS OF TRITIUM, IRON, AND NICKEL IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	H-3 (DIST)	FE-55	NI-63
Q-33	03/12/15 - 03/27/15	< 197	< 118	< 4.2
	04/03/15 - 06/26/15	< 189	< 177	< 3.9
	07/02/15 - 09/24/15	< 192	< 116	< 3.9
	10/01/15 - 12/25/15	< 189	< 156	< 3.3
	MEAN	-	-	-
Q-34	03/12/15 - 03/27/15	< 169	< 141	< 4.0
	04/03/15 - 06/26/15	< 182	< 111	< 3.8
	07/02/15 - 09/24/15	< 199	< 174	< 4.0
	10/01/15 - 12/31/15	< 186	< 129	< 3.3
	MEAN	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION
THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

Table C-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
Q-33	01/03/15 - 01/30/15 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	02/07/15 - 02/28/15 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	03/12/15 - 03/27/15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 11	< 1	< 2	< 18	< 5
	04/03/15 - 04/30/15	< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 15	< 2	< 2	< 26	< 7
	05/07/15 - 05/29/15	< 2	< 3	< 6	< 3	< 5	< 3	< 5	< 12	< 2	< 2	< 21	< 7
	06/04/15 - 06/26/15	< 4	< 5	< 9	< 4	< 8	< 5	< 9	< 15	< 5	< 5	< 30	< 8
	07/02/15 - 07/30/15	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 12	< 2	< 2	< 21	< 6
	08/07/15 - 08/27/15	< 4	< 4	< 10	< 5	< 9	< 5	< 8	< 14	< 4	< 5	< 32	< 10
	09/03/15 - 09/24/15	< 13	< 8	< 19	< 8	< 21	< 8	< 14	< 13	< 8	< 9	< 44	< 12
	10/01/15 - 10/29/15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 9	< 2	< 2	< 16	< 5
	11/05/15 - 11/27/15	< 5	< 5	< 14	< 7	< 10	< 6	< 10	< 14	< 5	< 6	< 26	< 11
	12/04/15 - 12/25/15	< 3	< 4	< 7	< 4	< 5	< 3	< 6	< 14	< 3	< 3	< 30	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-34	01/03/15 - 01/30/15 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	02/07/15 - 02/28/15 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	03/12/15 - 03/27/15	< 1	< 1	< 3	< 1	< 2	< 1	< 3	< 9	< 1	< 2	< 15	< 5
	04/03/15 - 04/30/15	< 3	< 3	< 6	< 3	< 5	< 3	< 6	< 14	< 2	< 3	< 27	< 9
	05/07/15 - 05/29/15	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 21	< 7
	06/04/15 - 06/26/15	< 5	< 4	< 10	< 5	< 8	< 5	< 8	< 14	< 4	< 5	< 36	< 9
	07/02/15 - 07/30/15	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 18	< 5
	08/07/15 - 08/27/15	< 4	< 5	< 10	< 4	< 9	< 6	< 9	< 15	< 4	< 5	< 28	< 11
	09/03/15 - 09/24/15	< 8	< 8	< 13	< 9	< 14	< 5	< 13	< 11	< 5	< 7	< 34	< 11
	10/01/15 - 10/29/15	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 18	< 6
	11/05/15 - 11/27/15	< 5	< 5	< 9	< 4	< 8	< 5	< 10	< 12	< 5	< 6	< 37	< 9
	12/04/15 - 12/31/15	< 5	< 5	< 10	< 5	< 9	< 5	< 8	< 14	< 5	< 4	< 30	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-II.1 CONCENTRATIONS OF TRITIUM IN GROUND WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q-35	Q-36
01/09/15 - 01/09/15	< 170	< 173
04/10/15 - 04/10/15	< 194	< 195
07/09/15 - 07/09/15	< 180	< 182
10/08/15 - 10/08/15	< 198	< 196
MEAN	-	-

Table C-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUND WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
Q-35	01/09/15 - 01/09/15	< 4	< 5	< 10	< 5	< 9	< 4	< 8	< 13	< 5	< 5	< 31	< 8
	04/10/15 - 04/10/15	< 5	< 6	< 12	< 6	< 11	< 6	< 10	< 15	< 5	< 5	< 30	< 15
	07/09/15 - 07/09/15	< 4	< 4	< 10	< 5	< 8	< 5	< 8	< 10	< 5	< 5	< 28	< 9
	10/08/15 - 10/08/15	< 6	< 7	< 17	< 8	< 15	< 9	< 12	< 13	< 6	< 8	< 41	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-36	01/09/15 - 01/09/15	< 4	< 4	< 8	< 4	< 7	< 4	< 8	< 13	< 5	< 4	< 28	< 6
	04/10/15 - 04/10/15	< 4	< 4	< 9	< 5	< 8	< 5	< 8	< 13	< 4	< 4	< 27	< 9
	07/09/15 - 07/09/15	< 5	< 5	< 11	< 5	< 9	< 6	< 10	< 10	< 5	< 6	< 25	< 8
	10/08/15 - 10/08/15	< 5	< 6	< 13	< 7	< 13	< 7	< 10	< 12	< 6	< 7	< 30	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 **CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PC/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q-24												
Channel Catfish	05/27/15	< 73	< 69	< 155	< 80	< 75	< 81	< 150	< 73	< 67	< 558	< 127
Freshwater Drum	05/27/15	< 52	< 76	< 122	< 74	< 155	< 90	< 148	< 66	< 78	< 620	< 243
Common Carp	10/14/15	< 59	< 35	< 107	< 57	< 144	< 47	< 103	< 46	< 58	< 366	< 118
Largemouth Bass	10/14/15	< 55	< 51	< 138	< 61	< 116	< 72	< 137	< 60	< 63	< 322	< 86
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-29												
Quillback	05/27/15	< 80	< 82	< 154	< 73	< 133	< 99	< 107	< 73	< 92	< 542	< 80
Walleye	05/27/15	< 61	< 52	< 129	< 41	< 120	< 67	< 129	< 53	< 61	< 429	< 113
Common Carp	10/14/15	< 89	< 78	< 139	< 92	< 169	< 114	< 157	< 95	< 91	< 383	< 120
Shorthead Redhorse	10/14/15	< 58	< 44	< 106	< 63	< 97	< 66	< 110	< 55	< 61	< 318	< 96
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1 **CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PC/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q-39	05/16/15	< 43	< 51	< 134	< 44	< 106	< 52	< 94	< 38	< 48	< 352	< 93
	10/22/15	< 51	< 42	< 105	< 42	< 139	< 55	< 109	< 49	< 83	< 344	< 118
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-40	05/16/15	< 43	< 53	< 119	< 40	< 116	< 57	< 93	< 47	< 53	< 360	< 114
	10/22/15	< 86	< 79	< 202	< 101	< 147	< 106	< 182	< 85	< 129	< 566	< 173
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION	GROUP I				GROUP II					GROUP III
PERIOD	Q-01	Q-02	Q-03	Q-04	Q-13	Q-16	Q-37	Q-38	Q-41	Q-42
01/01/15 - 01/09/15	23 ± 5	26 ± 5	27 ± 5	26 ± 5	31 ± 5	24 ± 4	21 ± 5	15 ± 4	11 ± 4	30 ± 5
01/09/15 - 01/15/15	19 ± 4	24 ± 5	27 ± 5	25 ± 5	22 ± 5	23 ± 5	20 ± 4	20 ± 4	23 ± 5	24 ± 5
01/15/15 - 01/22/15	15 ± 4	17 ± 4	17 ± 4	16 ± 4	22 ± 5	17 ± 4	17 ± 4	17 ± 4	20 ± 4	25 ± 5
01/22/15 - 01/29/15	8 ± 4	14 ± 4	15 ± 4	12 ± 4	11 ± 4	11 ± 4	14 ± 4	11 ± 4	12 ± 4	17 ± 4
01/29/15 - 02/05/15	16 ± 4	20 ± 4	19 ± 4	20 ± 4	19 ± 4	15 ± 4	15 ± 4	18 ± 4	18 ± 4	18 ± 4
02/05/15 - 02/12/15	15 ± 4	24 ± 5	26 ± 5	24 ± 5	24 ± 5	22 ± 5	20 ± 5	21 ± 5	24 ± 5	25 ± 5
02/12/15 - 02/20/15	19 ± 4	27 ± 5	28 ± 5	29 ± 5	28 ± 4	24 ± 4	26 ± 5	25 ± 5	31 ± 5	28 ± 4
02/20/15 - 02/26/15	23 ± 4	33 ± 5	29 ± 5	31 ± 5	27 ± 5	30 ± 5	25 ± 5	27 ± 5	37 ± 6	35 ± 6
02/26/15 - 03/05/15	19 ± 4	21 ± 4	16 ± 4	21 ± 4	18 ± 4	16 ± 4	15 ± 4	23 ± 4	23 ± 4	22 ± 4
03/05/15 - 03/12/15	12 ± 3	17 ± 4	17 ± 4	15 ± 4	13 ± 4	11 ± 4	12 ± 3	14 ± 3	17 ± 4	18 ± 4
03/12/15 - 03/19/15	13 ± 5	20 ± 5	19 ± 5	16 ± 5	17 ± 4	16 ± 4	15 ± 5	14 ± 4	19 ± 4	21 ± 5
03/19/15 - 03/27/15	15 ± 4	12 ± 4	11 ± 4	16 ± 4	11 ± 3	12 ± 3	11 ± 4	12 ± 4	15 ± 4	15 ± 4
03/27/15 - 04/03/15	13 ± 4	15 ± 4	14 ± 4	20 ± 4	14 ± 4	12 ± 4	13 ± 4	14 ± 4	15 ± 4	13 ± 4
04/03/15 - 04/10/15	11 ± 4	14 ± 4	14 ± 4	14 ± 4	10 ± 3	13 ± 4	10 ± 3	12 ± 4	16 ± 4	17 ± 4
04/10/15 - 04/17/15	16 ± 4	14 ± 4	15 ± 4	15 ± 4	14 ± 4	16 ± 4	9 ± 4	16 ± 4	18 ± 5	14 ± 4
04/17/15 - 04/23/15	12 ± 4	10 ± 3	11 ± 3	9 ± 3	13 ± 4	12 ± 4	13 ± 4	10 ± 3	12 ± 4	12 ± 4
04/23/15 - 05/01/15	12 ± 3	9 ± 3	11 ± 3	10 ± 3	15 ± 4	15 ± 4	10 ± 3	10 ± 3	11 ± 3	12 ± 3
05/01/15 - 05/07/15	7 ± 4	10 ± 4	9 ± 4	10 ± 4	10 ± 4	9 ± 4	6 ± 4	7 ± 4	11 ± 4	11 ± 4
05/07/15 - 05/15/15	8 ± 3	10 ± 3	7 ± 3	9 ± 3	11 ± 3	9 ± 3	6 ± 3	9 ± 3	10 ± 3	12 ± 3
05/15/15 - 05/21/15	7 ± 4	6 ± 3	8 ± 4	11 ± 4	< 7	< 6	6 ± 3	7 ± 3	7 ± 4	7 ± 4
05/21/15 - 05/29/15	12 ± 4	11 ± 4	12 ± 4	15 ± 4	14 ± 4	12 ± 3	11 ± 4	12 ± 4	14 ± 4	12 ± 3
05/29/15 - 06/04/15	9 ± 3	10 ± 3	11 ± 4	13 ± 4	12 ± 4	14 ± 4	11 ± 3	9 ± 3	8 ± 4	15 ± 4
06/04/15 - 06/11/15	13 ± 4	15 ± 4	14 ± 4	15 ± 4	15 ± 4	15 ± 4	10 ± 4	15 ± 4	18 ± 4	16 ± 4
06/11/15 - 06/18/15	6 ± 3	7 ± 3	8 ± 3	10 ± 3	10 ± 4	7 ± 3	5 ± 3	8 ± 3	8 ± 3	9 ± 3
06/18/15 - 06/26/15	9 ± 3	12 ± 3	9 ± 3	13 ± 3	15 ± 4	10 ± 3	8 ± 3	10 ± 3	15 ± 3	13 ± 3
06/26/15 - 07/02/15	11 ± 4	14 ± 4	12 ± 4	12 ± 4	10 ± 4	13 ± 4	10 ± 4	10 ± 4	12 ± 4	15 ± 4
07/02/15 - 07/09/15	12 ± 4	11 ± 4	17 ± 4	14 ± 4	15 ± 4	12 ± 4	10 ± 3	12 ± 4	11 ± 4	15 ± 4
07/09/15 - 07/17/15	5 ± 3	15 ± 4	16 ± 4	16 ± 4	13 ± 3	15 ± 4	13 ± 4	14 ± 4	15 ± 4	15 ± 4
07/17/15 - 07/23/15	11 ± 4	13 ± 4	13 ± 4	12 ± 4	17 ± 5	14 ± 5	7 ± 4	10 ± 4	13 ± 5	11 ± 4
07/23/15 - 07/31/15	13 ± 4	20 ± 4	18 ± 4	15 ± 4	20 ± 4	18 ± 4	13 ± 4	15 ± 4	15 ± 4	18 ± 4
07/31/15 - 08/07/15	13 ± 4	13 ± 4	19 ± 5	23 ± 5	20 ± 4	18 ± 4	13 ± 4	19 ± 5	14 ± 4	19 ± 4
08/07/15 - 08/14/15	16 ± 4	22 ± 5	21 ± 4	13 ± 4	21 ± 5	< 5	12 ± 4	22 ± 5	16 ± 4	18 ± 4
08/14/15 - 08/21/15	17 ± 4	20 ± 4	27 ± 5	17 ± 4	18 ± 4	33 ± 5	15 ± 4	12 ± 4	17 ± 4	19 ± 4
08/21/15 - 08/27/15	10 ± 4	16 ± 4	16 ± 4	15 ± 4	12 ± 5	11 ± 5	10 ± 4	15 ± 4	10 ± 5	10 ± 4
08/27/15 - 09/03/15	27 ± 5	34 ± 6	27 ± 5	27 ± 5	32 ± 5	30 ± 5	21 ± 5	31 ± 5	25 ± 5	32 ± 5
09/03/15 - 09/11/15	22 ± 4	24 ± 4	28 ± 5	22 ± 4	30 ± 5	27 ± 4	20 ± 4	25 ± 4	25 ± 4	24 ± 4
09/11/15 - 09/17/15	19 ± 4	20 ± 4	19 ± 4	19 ± 4	23 ± 5	18 ± 5	8 ± 3	18 ± 4	21 ± 5	20 ± 5
09/17/15 - 09/24/15	11 ± 4	14 ± 4	15 ± 4	13 ± 4	17 ± 4	18 ± 4	10 ± 4	15 ± 4	11 ± 4	14 ± 4
09/24/15 - 10/01/15	18 ± 4	10 ± 3	18 ± 4	16 ± 3	16 ± 4	22 ± 4	16 ± 3	20 ± 4	23 ± 4	22 ± 4
10/01/15 - 10/08/15	17 ± 4	13 ± 4	23 ± 5	22 ± 5	14 ± 4	15 ± 4	12 ± 4	14 ± 4	17 ± 4	14 ± 4
10/08/15 - 10/16/15	13 ± 4	16 ± 4	12 ± 4	11 ± 4	18 ± 4	18 ± 4	14 ± 4	13 ± 4	13 ± 3	12 ± 3
10/16/15 - 10/23/15	28 ± 5	26 ± 5	30 ± 5	29 ± 5	31 ± 5	26 ± 5	25 ± 5	30 ± 5	29 ± 5	26 ± 5
10/23/15 - 10/29/15	18 ± 4	17 ± 4	16 ± 4	16 ± 4	18 ± 5	14 ± 4	15 ± 3	16 ± 4	15 ± 4	17 ± 4
10/29/15 - 11/05/15	13 ± 4	22 ± 5	17 ± 4	17 ± 4	18 ± 4	18 ± 4	17 ± 4	18 ± 4	20 ± 4	18 ± 4
11/05/15 - 11/13/15	23 ± 5	21 ± 4	26 ± 5	24 ± 5	23 ± 4	22 ± 4	21 ± 5	30 ± 5	24 ± 4	22 ± 4
11/13/15 - 11/19/15	13 ± 3	14 ± 3	8 ± 3	14 ± 3	16 ± 4	19 ± 5	13 ± 3	16 ± 4	20 ± 5	19 ± 5
11/19/15 - 11/27/15	15 ± 5	14 ± 5	19 ± 5	13 ± 4	12 ± 4	14 ± 4	15 ± 5	15 ± 5	15 ± 4	15 ± 4
11/27/15 - 12/04/15	19 ± 4	19 ± 4	8 ± 3	21 ± 4	22 ± 4	19 ± 4	18 ± 4	21 ± 4	22 ± 4	20 ± 4
12/04/15 - 12/10/15	28 ± 5	26 ± 5	24 ± 4	28 ± 5	31 ± 5	31 ± 5	30 ± 5	26 ± 5	31 ± 5	31 ± 5
12/10/15 - 12/17/15	13 ± 4	17 ± 4	12 ± 4	14 ± 4	14 ± 4	14 ± 4	16 ± 4	12 ± 4	14 ± 4	11 ± 4
12/17/15 - 12/25/15	25 ± 5	29 ± 5	30 ± 5	28 ± 5	30 ± 5	27 ± 4	27 ± 5	18 ± 4	29 ± 5	27 ± 5
12/25/15 - 12/31/15	19 ± 4	19 ± 4	22 ± 4	20 ± 4	15 ± 4	12 ± 4	17 ± 4	26 ± 5	10 ± 4	17 ± 5
MEAN	15 ± 11	17 ± 13	17 ± 13	17 ± 12	18 ± 13	17 ± 13	14 ± 12	16 ± 12	17 ± 13	18 ± 13

THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

Table C-V.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

GROUP I - NEAR-SITE LOCATIONS				GROUP II - FAR-FIELD LOCATIONS				GROUP III - CONTROL LOCATION			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
01/01/15 - 01/29/15	8	27	19 ± 12	01/01/15 - 01/30/15	11	31	18 ± 11	01/01/15 - 01/29/15	17	30	24 ± 11
01/29/15 - 02/26/15	15	33	24 ± 11	01/29/15 - 02/27/15	15	37	24 ± 11	01/29/15 - 02/26/15	18	35	26 ± 14
02/26/15 - 04/03/15	11	21	16 ± 6	02/26/15 - 04/03/15	11	23	15 ± 7	02/26/15 - 04/03/15	13	22	18 ± 8
04/03/15 - 05/01/15	9	16	12 ± 5	04/03/15 - 05/01/15	9	18	13 ± 5	04/03/15 - 04/30/15	12	17	14 ± 5
05/01/15 - 05/29/15	6	15	10 ± 5	04/30/15 - 05/29/15	6	14	9 ± 5	04/30/15 - 05/29/15	7	12	11 ± 4
05/29/15 - 07/02/15	6	15	11 ± 5	05/29/15 - 07/03/15	5	18	11 ± 6	05/29/15 - 07/02/15	9	16	14 ± 6
07/02/15 - 07/31/15	5	20	14 ± 7	07/02/15 - 08/01/15	7	20	13 ± 6	07/02/15 - 07/31/15	11	18	15 ± 6
07/31/15 - 09/03/15	10	34	20 ± 12	07/31/15 - 09/04/15	10	36	19 ± 15	07/31/15 - 09/03/15	10	32	20 ± 16
09/03/15 - 10/01/15	10	28	18 ± 10	09/03/15 - 10/03/15	8	30	19 ± 11	09/03/15 - 10/01/15	14	24	20 ± 9
10/01/15 - 10/29/15	11	30	19 ± 13	10/01/15 - 10/31/15	12	31	18 ± 12	10/01/15 - 10/29/15	12	26	17 ± 12
10/29/15 - 12/04/15	8	26	17 ± 10	10/29/15 - 12/04/15	12	30	19 ± 8	10/29/15 - 12/04/15	15	22	19 ± 5
12/04/15 - 12/31/15	12	30	22 ± 12	12/04/15 - 01/01/16	10	31	21 ± 16	12/04/15 - 12/31/15	11	31	22 ± 18
01/02/15 - 01/01/16	5	34	17 ± 12	01/01/15 - 01/01/16	5	37	17 ± 13	01/01/15 - 12/31/15	7	35	18 ± 13

Table C-V.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q-01	01/02/15 - 04/03/15	< 3	< 5	< 14	< 4	< 7	< 5	< 10	< 4	< 4	< 156	< 44
	04/03/15 - 07/03/15	< 2	< 3	< 6	< 2	< 4	< 3	< 5	< 2	< 2	< 65	< 16
	07/03/15 - 10/03/15	< 2	< 4	< 9	< 2	< 6	< 4	< 7	< 3	< 2	< 77	< 25
	10/03/15 - 01/01/16	< 2	< 2	< 4	< 1	< 3	< 2	< 3	< 1	< 1	< 11	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-02	01/02/15 - 04/03/15	< 3	< 5	< 9	< 4	< 9	< 6	< 8	< 3	< 3	< 147	< 46
	04/03/15 - 07/03/15	< 3	< 3	< 11	< 3	< 7	< 3	< 6	< 2	< 2	< 94	< 41
	07/03/15 - 10/03/15	< 3	< 3	< 10	< 2	< 3	< 3	< 6	< 3	< 2	< 76	< 40
	10/03/15 - 01/01/16	< 3	< 2	< 6	< 2	< 5	< 3	< 5	< 2	< 2	< 25	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-03	01/02/15 - 04/03/15	< 3	< 5	< 11	< 3	< 8	< 4	< 7	< 3	< 3	< 144	< 43
	04/03/15 - 07/03/15	< 2	< 3	< 8	< 2	< 6	< 4	< 5	< 2	< 2	< 73	< 26
	07/03/15 - 10/03/15	< 3	< 4	< 15	< 2	< 9	< 4	< 8	< 4	< 4	< 107	< 38
	10/03/15 - 01/01/16	< 1	< 2	< 5	< 1	< 2	< 2	< 3	< 2	< 2	< 23	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-04	01/02/15 - 04/03/15	< 3	< 4	< 7	< 2	< 6	< 4	< 6	< 3	< 2	< 107	< 42
	04/03/15 - 07/03/15	< 4	< 5	< 14	< 5	< 7	< 6	< 11	< 4	< 4	< 119	< 46
	07/03/15 - 10/03/15	< 3	< 3	< 7	< 2	< 8	< 4	< 6	< 2	< 2	< 79	< 33
	10/03/15 - 01/01/16	< 3	< 4	< 8	< 3	< 4	< 3	< 5	< 3	< 2	< 29	< 7
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-13	01/01/15 - 04/03/15	< 5	< 6	< 12	< 6	< 9	< 8	< 14	< 4	< 5	< 162	< 63
	04/03/15 - 07/02/15	< 3	< 4	< 9	< 3	< 8	< 4	< 8	< 3	< 3	< 77	< 39
	07/02/15 - 10/01/15	< 2	< 4	< 10	< 3	< 5	< 4	< 7	< 3	< 2	< 98	< 30
	10/08/15 - 12/31/15	< 3	< 3	< 4	< 3	< 7	< 3	< 5	< 3	< 2	< 34	< 11
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-V.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q-16	01/01/15 - 04/03/15	< 4	< 4	< 12	< 3	< 9	< 5	< 8	< 3	< 3	< 159	< 55
	04/03/15 - 07/02/15	< 4	< 5	< 13	< 3	< 8	< 5	< 8	< 4	< 3	< 128	< 40
	07/02/15 - 10/01/15	< 3	< 4	< 8	< 2	< 5	< 3	< 6	< 2	< 2	< 75	< 34
	10/08/15 - 12/31/15	< 1	< 2	< 6	< 2	< 4	< 3	< 4	< 2	< 2	< 25	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-37	01/02/15 - 04/03/15	< 4	< 6	< 19	< 4	< 11	< 7	< 10	< 5	< 4	< 197	< 66
	04/03/15 - 07/03/15	< 2	< 3	< 8	< 3	< 5	< 3	< 5	< 2	< 2	< 71	< 26
	07/03/15 - 10/03/15	< 3	< 4	< 10	< 3	< 8	< 4	< 6	< 3	< 3	< 111	< 27
	10/03/15 - 01/01/16	< 2	< 2	< 3	< 2	< 4	< 3	< 5	< 2	< 2	< 34	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-38	01/02/15 - 04/03/15	< 4	< 5	< 14	< 2	< 11	< 4	< 9	< 3	< 4	< 175	< 45
	04/03/15 - 07/03/15	< 2	< 2	< 7	< 2	< 4	< 2	< 5	< 2	< 2	< 65	< 29
	07/03/15 - 10/03/15	< 1	< 0	< 2	< 3	< 5	< 1	< 4	< 1	< 0	< 65	< 22
	10/03/15 - 01/01/16	< 2	< 2	< 7	< 3	< 5	< 2	< 5	< 2	< 2	< 24	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-41	01/01/15 - 04/03/15	< 3	< 4	< 13	< 3	< 7	< 4	< 9	< 3	< 3	< 145	< 66
	04/03/15 - 07/02/15	< 2	< 4	< 7	< 2	< 5	< 4	< 5	< 2	< 2	< 110	< 49
	07/02/15 - 10/01/15	< 3	< 5	< 10	< 3	< 10	< 5	< 10	< 4	< 3	< 141	< 50
	10/08/15 - 12/31/15	< 1	< 2	< 2	< 2	< 4	< 2	< 2	< 1	< 1	< 18	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q-42	01/01/15 - 04/03/15	< 4	< 6	< 12	< 4	< 12	< 6	< 11	< 5	< 4	< 202	< 33
	04/03/15 - 07/02/15	< 3	< 4	< 11	< 3	< 6	< 4	< 6	< 2	< 3	< 77	< 25
	07/02/15 - 10/01/15	< 2	< 4	< 11	< 2	< 5	< 4	< 5	< 2	< 2	< 71	< 57
	10/08/15 - 12/31/15	< 1	< 2	< 5	< 2	< 5	< 3	< 2	< 2	< 2	< 33	< 17
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VI-.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION	GROUP I				GROUP II					GROUP III
PERIOD	Q-01	Q-02	Q-03	Q-04	Q-13	Q-16	Q-37	Q-38	Q-41	Q-42
01/01/15 - 01/09/15	< 33	< 61	< 59	< 59	< 65	< 34	< 68	< 68	< 63	< 61
01/09/15 - 01/15/15	< 21	< 53	< 52	< 52	< 63	< 65	< 29	< 53	< 67	< 64
01/15/15 - 01/22/15	< 17	< 41	< 39	< 39	< 45	< 21	< 33	< 33	< 39	< 38
01/22/15 - 01/29/15	< 18	< 47	< 45	< 45	< 48	< 20	< 45	< 45	< 49	< 48
01/29/15 - 02/05/15	< 22	< 50	< 49	< 49	< 54	< 46	< 41	< 23	< 48	< 46
02/05/15 - 02/12/15	< 24	< 63	< 61	< 61	< 67	< 61	< 56	< 56	< 27	< 62
02/12/15 - 02/20/15	< 23	< 53	< 52	< 52	< 42	< 14	< 48	< 48	< 41	< 39
02/20/15 - 02/26/15	< 22	< 51	< 50	< 50	< 63	< 54	< 43	< 43	< 55	< 30
02/26/15 - 03/05/15	< 23	< 58	< 56	< 56	< 60	< 22	< 50	< 50	< 55	< 53
03/05/15 - 03/12/15	< 20	< 53	< 51	< 51	< 68	< 31	< 42	< 42	< 58	< 56
03/12/15 - 03/19/15	< 22	< 57	< 55	< 55	< 51	< 23	< 59	< 59	< 56	< 55
03/19/15 - 03/27/15	< 20	< 8	< 19	< 19	< 16	< 7	< 20	< 20	< 18	< 17
03/27/15 - 04/03/15	< 22	< 56	< 54	< 54	< 57	< 22	< 51	< 51	< 53	< 53
04/03/15 - 04/10/15	< 20	< 52	< 50	< 50	< 47	< 20	< 51	< 51	< 49	< 48
04/10/15 - 04/17/15	< 64	< 64	< 62	< 62	< 25	< 49	< 48	< 48	< 51	< 21
04/17/15 - 04/23/15	< 57	< 57	< 55	(1)	< 65	< 36	< 48	< 48	< 60	< 57
04/23/15 - 05/01/15	< 44	< 44	< 42	< 42	< 65	< 66	< 62	< 53	< 58	< 56
05/01/15 - 05/07/15	< 61	< 61	< 59	< 23	< 69	< 69	< 63	< 38	< 43	< 42
05/07/15 - 05/15/15	< 55	< 55	< 53	< 53	< 18	< 20	< 24	< 22	< 19	< 19
05/15/15 - 05/21/15	< 63	< 63	< 61	< 62	< 35	< 46	< 62	< 41	< 37	< 40
05/21/15 - 05/29/15	< 58	< 58	< 56	< 48	< 41	< 40	< 62	< 62	< 53	< 52
05/29/15 - 06/04/15	< 37	< 38	< 36	< 53	< 67	< 25	< 53	< 53	< 68	< 66
06/04/15 - 06/11/15	< 55	< 55	< 53	< 53	< 68	< 68	< 65	< 62	< 69	< 65
06/11/15 - 06/18/15	< 49	< 49	< 47	< 52	< 59	< 58	< 52	< 57	< 65	< 64
06/18/15 - 06/26/15	< 62	< 62	< 60	< 60	< 63	< 61	< 60	< 48	< 48	< 49
06/26/15 - 07/02/15	< 57	< 58	< 56	< 56	< 54	< 52	< 48	< 58	< 62	< 63
07/02/15 - 07/09/15	< 15	< 38	< 37	< 37	< 41	< 17	< 37	< 37	< 40	< 39
07/09/15 - 07/17/15	< 61	< 62	< 60	< 59	< 23	< 41	< 45	< 45	< 41	< 22
07/17/15 - 07/23/15	< 53	< 53	< 22	< 51	< 64	< 23	< 48	< 48	< 59	< 58
07/23/15 - 07/31/15	< 55	< 30	< 53	< 53	< 58	< 52	< 49	< 19	< 52	< 52
07/31/15 - 08/07/15	< 28	< 64	< 64	< 63	< 57	< 52	< 33	< 60	< 52	< 53
08/07/15 - 08/14/15	< 53	< 52	< 53	< 53	< 22	< 53	< 52	< 52	< 54	< 22
08/14/15 - 08/21/15	< 14	< 36	< 36	< 36	< 35	< 66	< 70	< 70	< 67	< 28
08/21/15 - 08/27/15	< 34	< 13	< 33	< 33	< 48	< 55	< 38	< 38	< 23	< 55
08/27/15 - 09/03/15	< 67	< 65	< 65	< 65	< 26	< 64	< 69	< 69	< 25	< 65
09/03/15 - 09/11/15	< 36	< 35	< 35	< 35	< 12	< 40	< 45	< 45	< 40	< 17
09/11/15 - 09/17/15	< 36	< 19	< 35	< 35	< 44	< 59	< 49	< 49	< 59	< 30
09/17/15 - 09/24/15	< 14	< 36	< 36	< 36	< 38	< 51	< 49	< 49	< 51	< 21
09/24/15 - 10/01/15	< 18	< 44	< 44	< 44	< 63	< 61	< 44	< 44	< 61	< 25
10/01/15 - 10/08/15	< 11	< 28	< 28	< 28	< 32	< 13	< 28	< 28	< 32	< 32
10/08/15 - 10/16/15	< 26	< 66	< 66	< 66	< 64	< 28	< 70	< 70	< 66	< 69
10/16/15 - 10/23/15	< 18	< 44	< 44	< 44	< 39	< 15	< 42	< 42	< 35	< 37
10/23/15 - 10/29/15	< 13	< 33	< 33	< 33	< 53	< 61	< 39	< 39	< 26	< 62
10/29/15 - 11/05/15	< 12	< 30	< 30	< 30	< 28	< 18	< 48	< 48	< 43	< 45
11/05/15 - 11/13/15	< 26	< 60	< 59	< 59	< 53	< 22	< 68	< 62	< 54	< 55
11/13/15 - 11/19/15	< 13	< 32	< 32	< 32	< 52	< 27	< 40	< 40	< 63	< 65
11/19/15 - 11/27/15	< 28	< 70	< 70	< 70	< 54	< 17	< 56	< 56	< 41	< 44
11/27/15 - 12/04/15	< 67	< 65	< 25	< 65	< 66	< 51	< 51	< 51	< 21	< 52
12/04/15 - 12/10/15	< 44	< 17	< 43	< 43	< 55	< 57	< 47	< 19	< 57	< 59
12/10/15 - 12/17/15	< 34	< 33	< 13	< 33	< 36	< 42	< 40	< 40	< 18	< 43
12/17/15 - 12/25/15	< 63	< 24	< 61	< 61	< 55	< 25	< 70	< 70	< 60	< 63
12/25/15 - 12/31/15	< 16	< 41	< 41	< 40	< 55	< 58	< 46	< 19	< 58	< 60
MEAN	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VII.1 **CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	INDICATOR FARM Q-26
01/02/15	< 0.7
02/06/15	< 0.7
03/06/15	< 0.8
04/03/15	< 0.5
05/01/15	< 1.0
05/15/15	< 0.4
05/29/15	< 0.5
06/12/15	< 0.6
06/27/15	< 0.6
07/10/15	< 0.7
07/24/15	< 0.5
08/07/15	< 0.4
08/21/15	< 0.7
09/04/15	< 0.5
09/18/15	< 0.4
10/07/15	< 0.7
10/17/15	< 0.9
10/31/15	< 0.7
11/13/15	< 0.8
12/04/15	< 0.4
MEAN	-

Table C-VII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q-26	01/02/15	< 9	< 9	< 18	< 7	< 18	< 9	< 16	< 7	< 8	< 52	< 10
	02/06/15	< 5	< 5	< 16	< 5	< 15	< 7	< 9	< 5	< 5	< 46	< 9
	03/06/15	< 5	< 6	< 15	< 5	< 16	< 6	< 10	< 4	< 5	< 31	< 14
	04/03/15	< 5	< 5	< 12	< 5	< 12	< 6	< 8	< 5	< 6	< 32	< 10
	05/01/15	< 7	< 7	< 14	< 6	< 16	< 7	< 11	< 6	< 7	< 39	< 11
	05/15/15	< 5	< 6	< 15	< 6	< 13	< 6	< 9	< 5	< 6	< 42	< 13
	05/29/15	< 5	< 5	< 11	< 5	< 11	< 5	< 9	< 4	< 5	< 28	< 9
	06/12/15	< 7	< 5	< 16	< 7	< 14	< 7	< 11	< 6	< 5	< 33	< 11
	06/27/15	< 6	< 7	< 16	< 6	< 13	< 7	< 11	< 6	< 7	< 32	< 5
	07/10/15	< 7	< 7	< 17	< 7	< 17	< 7	< 14	< 8	< 7	< 35	< 8
	07/24/15	< 4	< 4	< 8	< 4	< 9	< 4	< 6	< 4	< 4	< 22	< 6
	08/07/15	< 9	< 12	< 23	< 10	< 17	< 8	< 17	< 9	< 9	< 53	< 13
	08/21/15	< 6	< 8	< 17	< 9	< 14	< 8	< 13	< 7	< 9	< 32	< 10
	09/04/15	< 6	< 8	< 20	< 8	< 20	< 6	< 13	< 7	< 10	< 42	< 13
	09/18/15	< 8	< 9	< 21	< 7	< 20	< 9	< 16	< 8	< 10	< 39	< 9
	10/07/15	< 8	< 9	< 17	< 9	< 23	< 8	< 16	< 7	< 9	< 39	< 7
	10/17/15	< 6	< 7	< 20	< 7	< 20	< 9	< 16	< 7	< 7	< 34	< 8
	10/31/15	< 6	< 6	< 13	< 6	< 17	< 8	< 12	< 6	< 7	< 44	< 12
	11/13/15	< 6	< 6	< 13	< 7	< 14	< 6	< 12	< 6	< 7	< 26	< 8
	12/04/15	< 8	< 7	< 18	< 10	< 18	< 7	< 15	< 7	< 8	< 42	< 14
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VIII.1 **CONCENTRATIONS OF GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
Q-CONTROL													
Cucumbers	07/22/15	< 8	< 11	< 29	< 9	< 21	< 10	< 18	< 66	< 10	< 10	< 124	< 23
Dill	07/22/15	< 13	< 15	< 38	< 13	< 36	< 14	< 25	< 58	< 12	< 14	< 120	< 29
Horseradish	07/22/15	< 11	< 11	< 30	< 11	< 26	< 12	< 21	< 58	< 9	< 11	< 104	< 31
Rhubarb leaves	07/22/15	< 13	< 14	< 34	< 12	< 27	< 13	< 22	< 59	< 11	< 12	< 112	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-QUAD 1													
Arugula	07/21/15	< 12	< 13	< 38	< 12	< 28	< 14	< 25	< 58	< 11	< 12	< 114	< 29
Potatoes	07/21/15	< 12	< 12	< 31	< 11	< 28	< 14	< 23	< 59	< 11	< 11	< 104	< 29
Radishes	07/21/15	< 7	< 8	< 21	< 8	< 17	< 8	< 14	< 51	< 6	< 8	< 80	< 24
Red Oak leaves	07/21/15	< 11	< 11	< 31	< 11	< 28	< 11	< 22	< 58	< 10	< 12	< 94	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-QUAD 2													
Cucumbers	07/22/15	< 11	< 13	< 23	< 10	< 25	< 12	< 21	< 63	< 10	< 12	< 124	< 33
Onions	07/22/15	< 4	< 4	< 11	< 5	< 12	< 6	< 8	< 26	< 4	< 6	< 40	< 11
Peppers	07/22/15	< 3	< 4	< 10	< 5	< 9	< 4	< 8	< 21	< 4	< 3	< 36	< 11
Tomatoes	07/22/15	< 10	< 10	< 25	< 9	< 21	< 10	< 17	< 46	< 8	< 9	< 82	< 22
Zucchini	07/22/15	< 10	< 11	< 25	< 9	< 23	< 11	< 21	< 52	< 8	< 11	< 100	< 25
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-QUAD 3													
Brussel Sprouts	07/21/15	< 8	< 8	< 22	< 9	< 18	< 11	< 15	< 59	< 7	< 10	< 93	< 16
Horseradish	07/21/15	< 8	< 8	< 13	< 6	< 17	< 7	< 13	< 42	< 7	< 10	< 65	< 16
Lettuce	07/21/15	< 9	< 8	< 30	< 10	< 21	< 11	< 20	< 57	< 8	< 8	< 104	< 24
Sun Chokes	07/21/15	< 10	< 10	< 23	< 8	< 20	< 10	< 18	< 52	< 8	< 11	< 92	< 24
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
Q-QUAD 4													
Cabbage	07/21/15	< 7	< 8	< 20	< 7	< 16	< 8	< 15	< 42	< 7	< 7	< 76	< 20
Carrots	07/21/15	< 8	< 9	< 22	< 8	< 19	< 10	< 18	< 58	< 8	< 8	< 88	< 21
Potatoes	07/21/15	< 7	< 9	< 21	< 8	< 19	< 9	< 15	< 46	< 7	< 8	< 80	< 23
Rhubarb leaves	07/21/15	< 12	< 13	< 30	< 12	< 29	< 16	< 24	< 58	< 11	< 11	< 108	< 26
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.1 QUARTERLY OSLD RESULTS FOR QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF MILLIREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
Q-01-1	21.3 ± 3.0	19.3	21.0	21.9	22.8
Q-01-2	21.1 ± 4.2	18.3	23.3	21.6	21.2
Q-02-1	21.3 ± 3.9	18.5	23.1	21.9	21.6
Q-02-2	21.5 ± 5.0	18.2	20.8	23.4	23.5
Q-03-1	19.8 ± 3.6	17.6	19.1	21.0	21.5
Q-03-2	21.0 ± 3.2	19.1	22.9	20.5	21.6
Q-04-1	21.1 ± 1.8	20.3	22.2	20.5	21.5
Q-04-2	22.1 ± 4.3	19.0	23.5	22.2	23.6
Q-13-1	22.5 ± 3.5	19.9	23.6	23.5	23.0
Q-13-2	22.3 ± 4.2	20.0	21.2	23.4	24.6
Q-16-1	20.1 ± 4.5	17.3	22.0	19.2	21.9
Q-16-2	20.9 ± 5.2	17.1	23.0	21.2	22.1
Q-37-1	22.8 ± 3.4	20.3	24.0	23.9	22.8
Q-37-2	23.1 ± 4.3	20.0	24.8	24.1	23.5
Q-38-1	24.5 ± 8.1	19.5	23.4	29.0	26.1
Q-38-2	24.4 ± 4.3	21.3	26.1	25.5	24.5
Q-41-1	23.8 ± 4.2	20.6	24.6	25.0	24.9
Q-41-2	23.4 ± 4.7	19.9	24.2	24.1	25.2
Q-42-1	23.7 ± 5.2	20.1	26.2	24.6	23.8
Q-42-2	24.1 ± 4.7	21.1	26.2	23.4	25.8
Q-101-1	21.9 ± 2.4	20.1	22.6	22.2	22.6
Q-101-2	21.9 ± 4.9	18.2	22.7	23.2	23.3
Q-102-1	23.1 ± 3.5	20.5	24.1	24.1	23.7
Q-102-3	21.6 ± 3.1	20.0	22.9	21.4	23.3
Q-103-1	20.6 ± 2.1	19.0	21.2	21.2	20.8
Q-103-2	20.3 ± 3.3	17.8	20.7	21.1	21.4
Q-104-1	20.4 ± 2.7	19.5	20.1	19.6	22.4
Q-104-2	21.4 ± 3.4	18.9	21.8	22.8	21.9
Q-105-1	20.8 ± 4.3	17.6	22.5	21.3	21.6
Q-106-2	21.7 ± 4.0	18.7	23.2	22.2	22.5
Q-106-3	21.3 ± 3.8	18.6	22.4	21.2	22.8
Q-107-2	20.9 ± 4.7	18.2	22.2	22.3	(1)
Q-107-3	21.3 ± 1.9	20.1	21.6	21.2	22.4
Q-108-1	21.4 ± 4.8	18.0	23.1	23.1	21.5
Q-108-2	21.7 ± 0.7	21.8	21.9	21.8	21.1
Q-109-1	22.5 ± 5.5	18.7	25.3	22.5	23.3
Q-109-2	21.9 ± 4.6	19.4	24.6	20.7	22.7
Q-111-1	22.0 ± 2.8	20.2	22.1	22.2	23.6
Q-111-2	22.2 ± 3.4	19.8	23.7	22.6	22.7
Q-112-1	22.5 ± 4.0	19.8	23.7	22.3	24.3
Q-112-2	20.8 ± 2.0	20.2	21.2	19.8	22.0

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.1 QUARTERLY OSLD RESULTS FOR QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF MILLIREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
Q-113-1	21.3 ± 2.7	19.3	22.0	21.8	22.1
Q-113-2	20.7 ± 4.6	18.1	21.4	19.8	23.5
Q-114-1	21.2 ± 2.5	19.9	21.5	20.7	22.8
Q-114-2	21.8 ± 4.5	19.0	21.2	24.3	22.7
Q-115-1	22.1 ± 4.3	19.0	23.3	22.4	23.7
Q-115-2	21.7 ± 2.2	20.6	21.7	22.8	(1)
Q-116-1	22.7 ± 2.8	21.4	24.4	23.3	21.8
Q-116-3	22.6 ± 3.9	20.3	24.9	23.2	22.0
Q-201-1	23.2 ± 5.5	19.1	24.1	24.6	24.9
Q-201-2	23.4 ± 2.7	21.4	24.0	23.9	24.3
Q-202-1	22.6 ± 3.8	20.0	24.3	22.2	23.7
Q-202-2	22.6 ± 6.7	17.8	25.4	22.8	24.2
Q-203-1	22.3 ± 2.6	20.5	22.8	22.2	23.6
Q-203-2	25.6 ± 3.6	22.9	27.0	26.3	26.0
Q-204-1	23.8 ± 3.2	21.4	24.6	24.9	24.3
Q-204-2	25.0 ± 3.2	22.9	24.6	26.2	26.2
Q-205-1	24.3 ± 5.4	20.5	26.8	24.7	25.2
Q-205-4	23.9 ± 3.7	22.5	23.2	26.0	(1)
Q-206-1	22.6 ± 3.4	20.1	23.5	23.9	22.9
Q-206-2	21.5 ± 2.7	19.7	23.0	21.3	21.8
Q-207-1	22.9 ± 2.6	21.1	23.3	22.9	24.2
Q-207-4	23.9 ± 2.4	22.1	24.7	24.4	24.4
Q-208-1	23.6 ± 5.7	21.3	26.2	21.0	26.0
Q-208-2	24.5 ± 3.5	22.4	26.0	25.8	23.7
Q-209-1	22.8 ± 1.8	21.7	23.2	23.7	22.4
Q-209-4	23.2 ± 3.2	21.0	23.2	23.9	24.7
Q-210-1	24.5 ± 1.0	23.9	25.1	24.5	24.5
Q-210-4	24.4 ± 3.4	21.9	25.1	24.8	25.8
Q-210-5	20.4 ± 2.2	18.8	21.3	20.4	21.0
Q-211-1	26.1 ± 2.8	24.3	26.5	25.9	27.6
Q-211-2	26.5 ± 2.6	25.1	28.2	26.6	25.9
Q-212-1	22.2 ± 2.2	21.0	22.9	21.5	23.3
Q-212-2	20.0 ± 2.3	18.4	19.8	20.6	21.0
Q-213-1	21.7 ± 1.8	20.7	21.1	22.6	22.3
Q-213-2	21.0 ± 2.6	19.1	21.6	21.4	21.9
Q-214-1	22.1 ± 4.8	19.0	24.9	21.9	22.4
Q-214-2	21.8 ± 3.6	19.1	22.6	22.3	23.1
Q-215-1	21.9 ± 2.0	20.9	21.2	22.3	23.1
Q-215-2	24.1 ± 4.2	21.4	26.2	25.2	23.4
Q-216-1	25.1 ± 4.1	22.1	26.4	26.1	25.9
Q-216-2	23.5 ± 1.8	22.7	24.5	24.0	22.8

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-IX.2 MEAN QUARTERLY OSLD RESULTS FOR THE INNER RING, OUTER RING, OTHER AND CONTROL LOCATION FOR QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF MILLIREM/QUARTER ±/- 2 STANDARD DEVIATION OF THE STATION DATA

COLLECTION PERIOD	INNER RING ± 2 S.D.	OUTER RING	OTHER	CONTROL
JAN-MAR	19.4 ± 2.1	21.1 ± 3.4	19.2 ± 2.4	20.6 ± 1.4
APR-JUN	22.6 ± 2.6	24.2 ± 3.9	22.9 ± 3.3	26.2 ± 0.0
JUL-SEP	22.0 ± 2.4	23.7 ± 3.7	22.9 ± 4.6	24.0 ± 1.7
OCT-DEC	22.5 ± 1.8	24.0 ± 3.2	23.1 ± 3.0	24.8 ± 2.8

TABLE C-IX.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF MILLIREM/QUARTER

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
INNER RING	114	17.6	25.3	21.6 ± 3.4
OUTER RING	131	17.8	28.2	23.2 ± 4.3
OTHER	72	17.1	29.0	22.0 ± 4.7
CONTROL	8	20.1	26.2	23.9 ± 4.6

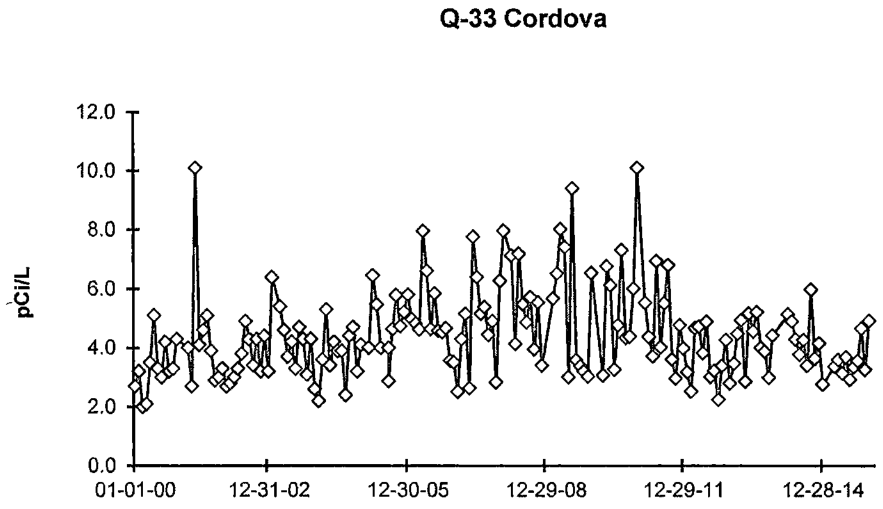
INNER RING STATIONS - Q-101-1, Q-101-2, Q-102-1, Q-102-3, Q-103-1, Q-103-2, Q-104-1, Q-104-2, Q-105-1, Q-105-2, Q-106-2, Q-106-3, Q-107-2, Q-107-3, Q-108-1, Q-108-2, Q-109-1, Q-109-2, Q-111-1, Q-111-2, Q-112-1, Q-112-2, Q-113-1, Q-113-2, Q-114-1, Q-114-2, Q-115-1, Q-115-2, Q-116-1, Q-116-3

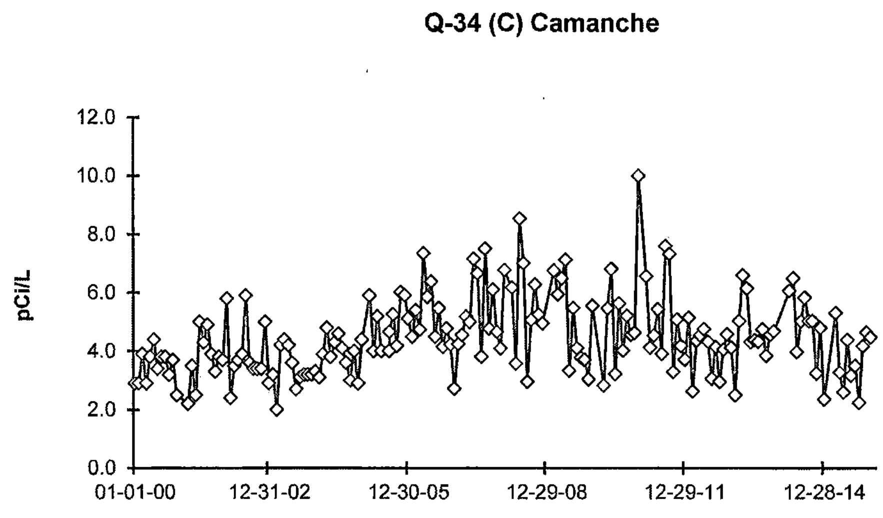
OUTER RING STATIONS - Q-201-1, Q-201-2, Q-202-1, Q-202-2, Q-203-1, Q-203-2, Q-204-1, Q-204-2, Q-205-1, Q-205-4, Q-206-1, Q-206-2, Q-207-1, Q-207-4, Q-208-1, Q-208-2, Q-209-1, Q-209-4, Q-210-1, Q-210-4, Q-210-5, Q-211-1, Q-211-2, Q-212-1, Q-212-2, Q-213-1, Q-213-2, Q-214-1, Q-214-2, Q-215-1, Q-215-2, Q-216-1, Q-216-2

OTHER STATIONS - Q-01-1, Q-01-2, Q-02-1, Q-02-2, Q-03-1, Q-03-2, Q-04-1, Q-04-2, Q-13-1, Q-13-2, Q-16-1, Q-16-2, Q-37-1, Q-37-2, Q-38-1, Q-38-2, Q-41-1, Q-41-2

CONTROL STATIONS - Q-42-1, Q-42-2

FIGURE C-1
Surface Water - Gross Beta - Stations Q-33 and Q-34 (C) Collected in the Vicinity of QCNPS, 2000 - 2015

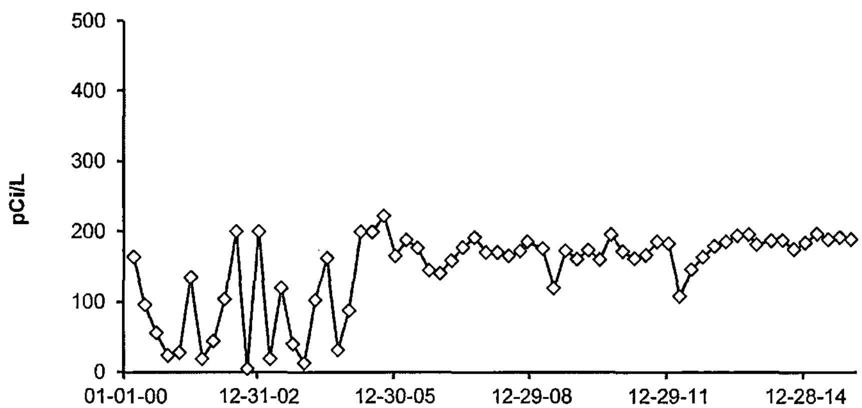




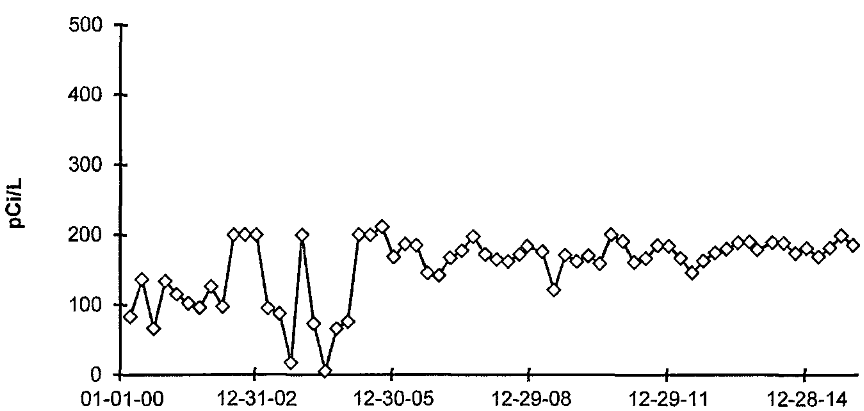
DUE TO VENDOR CHANGE, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JULY 2005

FIGURE C-2
Surface Water - Tritium - Stations Q-33 and Q-34 (C) Collected in the Vicinity of QCNPS, 2000 - 2015

Q-33 Cordova

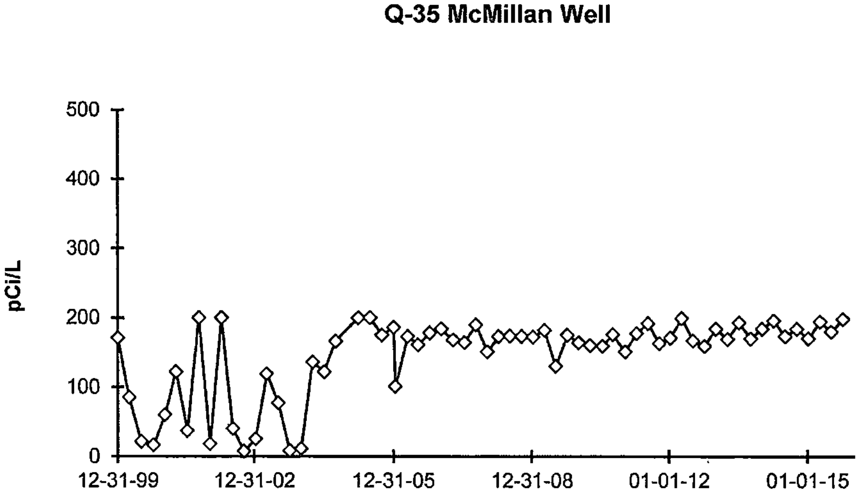


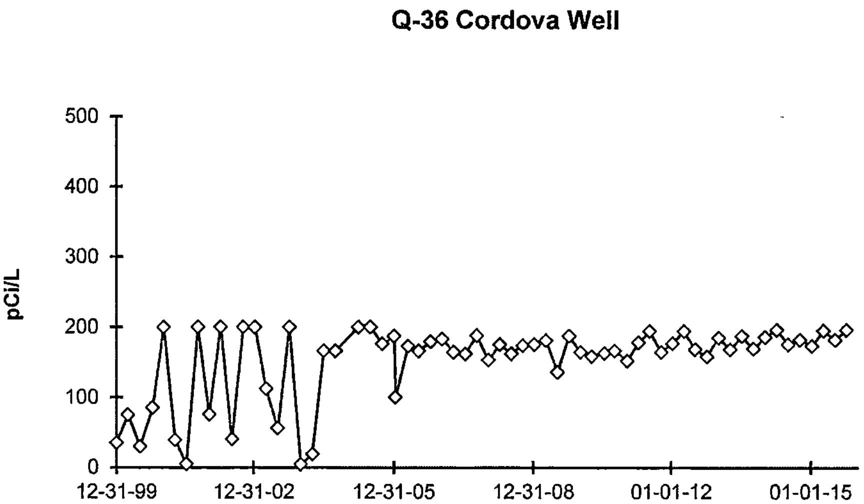
Q-34 (C) Camanche



DUE TO VENDOR CHANGE, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JULY 2005

FIGURE C-3
Ground Water - Tritium - Stations Q-35 and Q-36 Collected in the Vicinity of QCNPS, 2000 - 2015

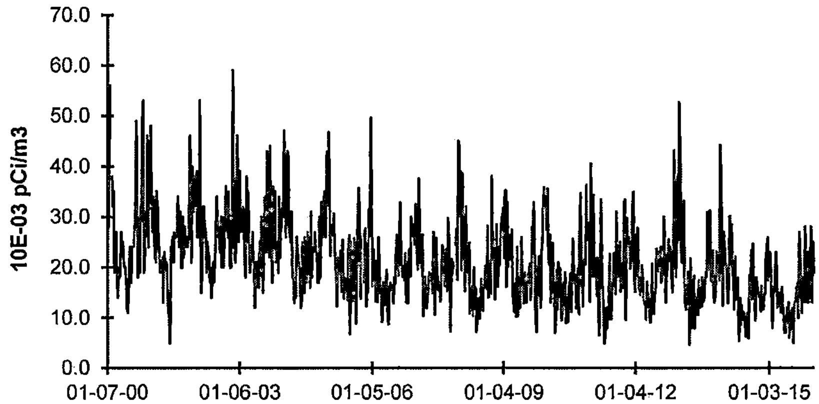




DUE TO VENDOR CHANGE, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JULY 2005

FIGURE C-4
Air Particulates - Gross Beta- Stations Q-01 and Q-02 Collected in the Vicinity of QCNPS, 2000 - 2015

Q-01 Onsite No. 1



Q-02 Onsite No. 2

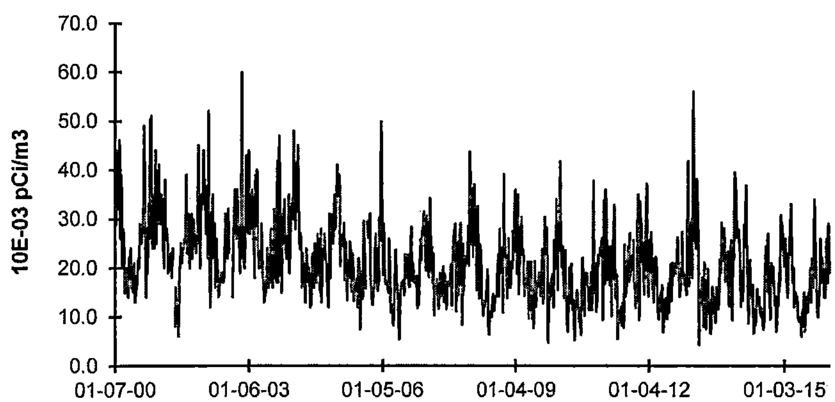
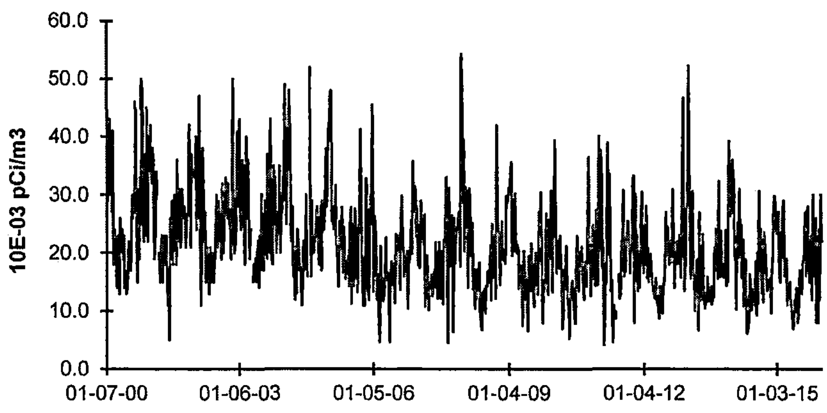


FIGURE C-5
Air Particulates - Gross Beta- Stations Q-03 and Q-04 Collected in the Vicinity of QCNPS, 2000 - 2015

Q-03 Onsite No. 3



Q-04 Nitrin

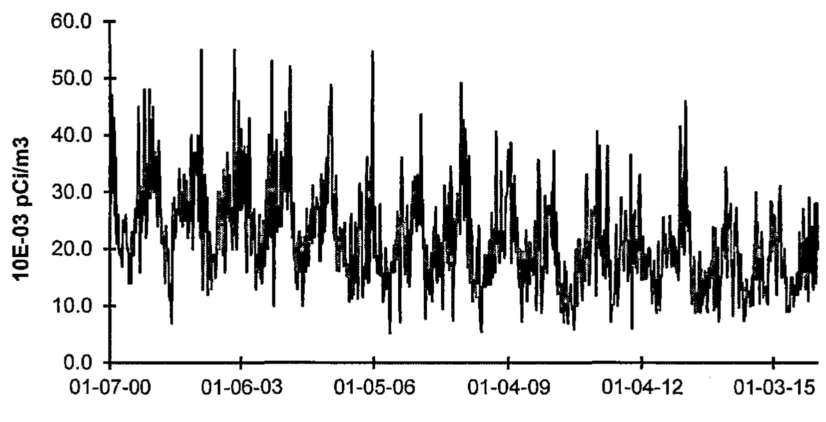
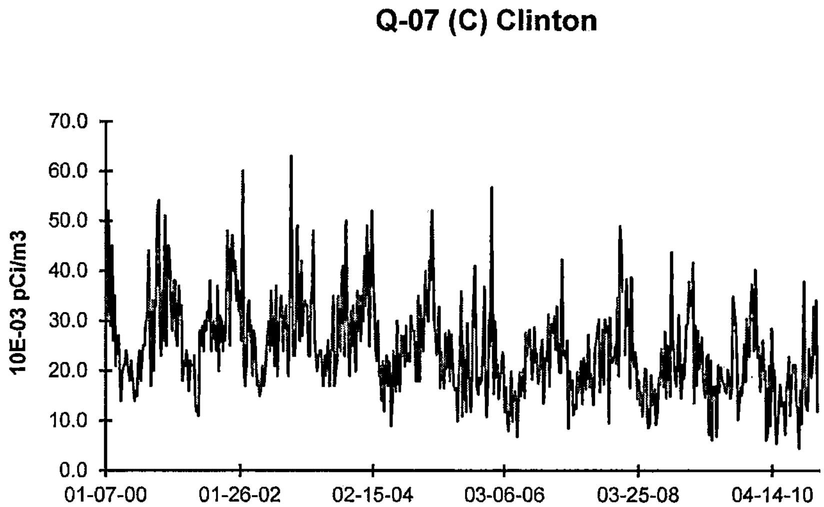


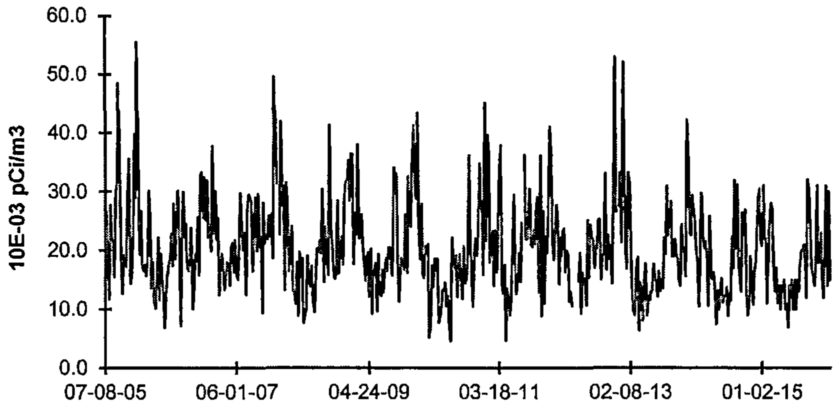
FIGURE C-6
Air Particulates - Gross Beta- Station Q-07 (C) Collected in the Vicinity of QCNPS, 2000 - 2010



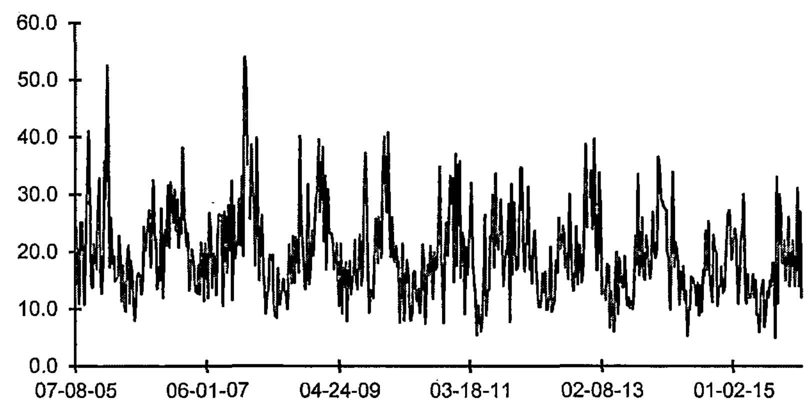
This location was removed from the program in January 2011 due to updated annual average meteorology.
This data is retained in the report for historical comparision.

FIGURE C-7
Air Particulates - Gross Beta- Stations Q-13 and Q-16 Collected in the Vicinity of QCNPS, 2005 - 2015

Q-13 Princeton



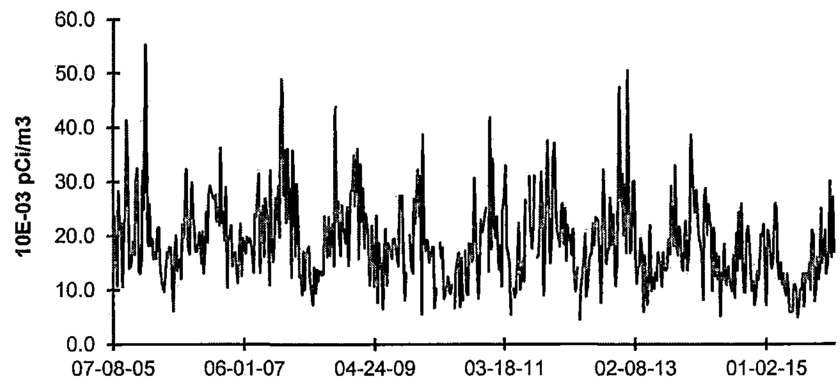
Q-16 Low Moor



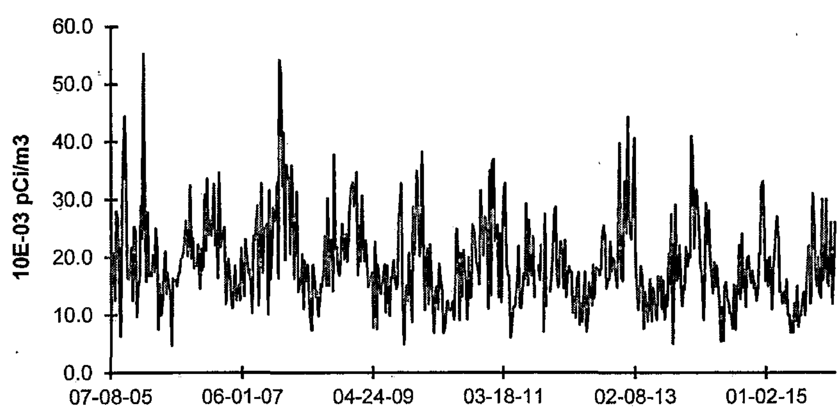
AIR PARTICULATE GROSS BETA ANALYSES OF FAR FIELD LOCATIONS STARTED IN JULY 2005

FIGURE C-8
Air Particulates - Gross Beta- Stations Q-37 and Q-38 Collected in the Vicinity of QCNPS, 2005 - 2015

Q-37 Meredosia Road

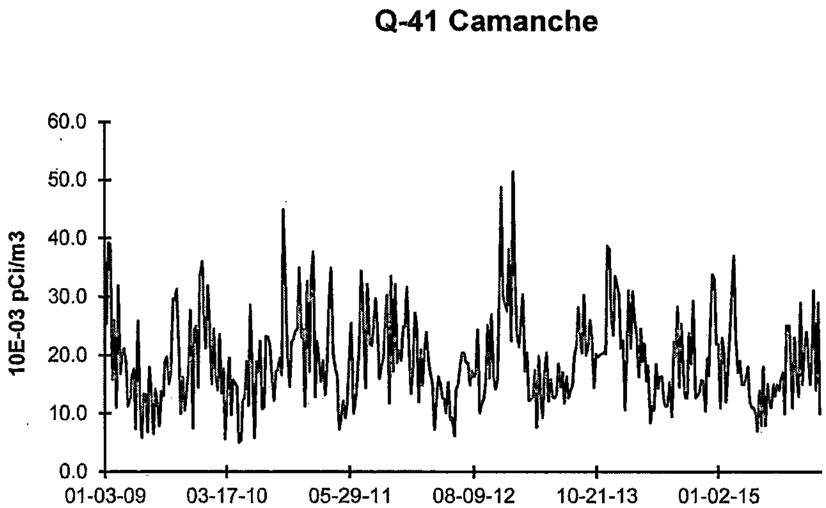


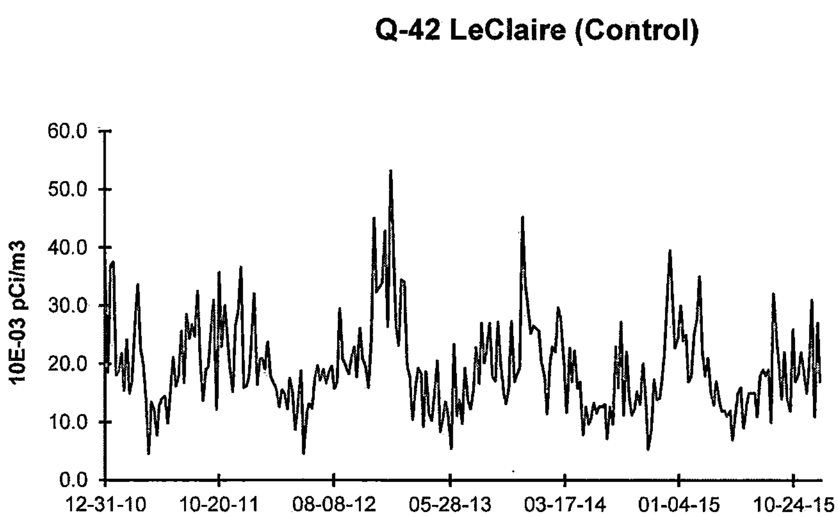
Q-38 Fuller Road



AIR PARTICULATE GROSS BETA ANALYSES OF FAR FIELD LOCATIONS STARTED IN JULY 2005

FIGURE C-9
Air Particulates - Gross Beta- Stations Q-41 and Q-42 (C) Collected in the Vicinity of QCNPS, 2009 - 2015





APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2015
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2015	E11181	Milk	Sr-89	pCi/L	88.9	97.2	0.91	A
			Sr-90	pCi/L	12.2	17.4	0.70	W
	E11182	Milk	I-131	pCi/L	61.3	65.1	0.94	A
			Ce-141	pCi/L	104	113	0.92	A
			Cr-51	pCi/L	265	276	0.96	A
			Cs-134	pCi/L	138	154	0.90	A
			Cs-137	pCi/L	205	207	0.99	A
			Co-58	pCi/L	178	183	0.97	A
			Mn-54	pCi/L	187	188	0.99	A
			Fe-59	pCi/L	182	177	1.03	A
			Zn-65	pCi/L	345	351	0.98	A
			Co-60	pCi/L	379	405	0.94	A
	E11184	AP	Ce-141	pCi	107	85.0	1.26	W
			Cr-51	pCi	261	224	1.17	A
			Cs-134	pCi	74.6	77.0	0.97	A
			Cs-137	pCi	99.6	102	0.98	A
			Co-58	pCi	99.8	110	0.91	A
			Mn-54	pCi	99.2	96.9	1.02	A
			Fe-59	pCi	109	119	0.92	A
			Zn-65	pCi	188	183	1.03	A
			Co-60	pCi	200	201	1.00	A
	E11183	Charcoal	I-131	pCi	82.9	85.4	0.97	A
	E11185	Water	Fe-55	pCi/L	1950	1900	1.03	A
June 2015	E11234	Milk	Sr-89	pCi/L	94.9	92.6	1.02	A
			Sr-90	pCi/L	14.3	12.7	1.13	A
	E11238	Milk	I-131	pCi/L	93.2	95.9	0.97	A
			Ce-141	pCi/L	Not provided for this study			
			Cr-51	pCi/L	349	276	1.26	W
			Cs-134	pCi/L	165	163	1.01	A
			Cs-137	pCi/L	143	125	1.14	A
			Co-58	pCi/L	82.0	68.4	1.20	A
			Mn-54	pCi/L	113	101	1.12	A
			Fe-59	pCi/L	184	151	1.22	W
			Zn-65	pCi/L	269	248	1.08	A
			Co-60	pCi/L	208	193	1.08	A
	E11237	AP	Ce-141	pCi	Not provided for this study			
			Cr-51	pCi	323	233	1.39	N (1)
			Cs-134	pCi	139	138	1.01	A
			Cs-137	pCi	111	106	1.05	A
			Co-58	pCi	54.0	57.8	0.93	A
			Mn-54	pCi	96.8	84.9	1.14	A
			Fe-59	pCi	162	128	1.27	W
			Zn-65	pCi	198	210	0.94	A
			Co-60	pCi	178	163	1.09	A
	E11236	Charcoal	I-131	pCi	93.9	80	1.17	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2015
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2015	E11238	Water	Fe-55	pCi/L	1890	1790	1.06	A
September 2015	E11289	Milk	Sr-89	pCi/L	95.7	99.1	0.97	A
			Sr-90	pCi/L	15.4	16.4	0.94	A
	E11290	Milk	I-131	pCi/L	94.9	99.9	0.95	A
			Ce-141	pCi/L	228	213	1.07	A
			Cr-51	pCi/L	499	538	0.93	A
			Cs-134	pCi/L	208	212	0.98	A
			Cs-137	pCi/L	270	255	1.06	A
			Co-58	pCi/L	275	263	1.05	A
			Mn-54	pCi/L	320	290	1.10	A
			Fe-59	pCi/L	255	226	1.13	A
			Zn-65	pCi/L	392	353	1.11	A
			Co-60	pCi/L	350	330	1.06	A
	E11292	AP	Ce-141	pCi	104	85.1	1.22	W
			Cr-51	pCi	262	215	1.22	W
			Cs-134	pCi	86.1	84.6	1.02	A
			Cs-137	pCi	93	102	0.91	A
			Co-58	pCi	106	105	1.01	A
			Mn-54	pCi	117	116	1.01	A
			Fe-59	pCi	94.8	90.2	1.05	A
			Zn-65	pCi	160	141	1.13	A
			Co-60	pCi	146	132	1.11	A
	E11291	Charcoal	I-131	pCi	85.9	81.7	1.05	A
	E11293	Water	Fe-55	pCi/L	2090	1800	1.16	A
	E11294	Soil	Ce-141	pCi/kg	209	222	0.94	A
			Cr-51	pCi/kg	463	560	0.83	A
			Cs-134	pCi/kg	231	221	1.05	A
			Cs-137	pCi/kg	311	344	0.90	A
			Co-58	pCi/kg	245	274	0.89	A
			Mn-54	pCi/kg	297	302	0.98	A
			Fe-59	pCi/kg	248	235	1.06	A
			Zn-65	pCi/kg	347	368	0.94	A
			Co-60	pCi/kg	328	344	0.95	A
December 2015	E11354	Milk	Sr-89	pCi/L	96.2	86.8	1.11	A
			Sr-90	pCi/L	14.8	12.5	1.18	A
	E11355	Milk	I-131	pCi/L	95.1	91.2	1.04	A
			Ce-141	pCi/L	117	129	0.91	A
			Cr-51	pCi/L	265	281	0.94	A
			Cs-134	pCi/L	153	160	0.96	A
			Cs-137	pCi/L	119	115	1.03	A
			Co-58	pCi/L	107	110	0.97	A
			Mn-54	pCi/L	153	145	1.06	A
			Fe-59	pCi/L	117	108	1.08	A
			Zn-65	pCi/L	261	248	1.05	A
			Co-60	pCi/L	212	213	1.00	A

TABLE D-1 **ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**

TELEDYNE BROWN ENGINEERING, 2015

(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2015	E11357	AP	Ce-141	pCi	89.9	84.0	1.07	A
			Cr-51	pCi	215	184	1.17	A
			Cs-134	pCi	103	105	0.98	A
			Cs-137	pCi	76.6	74.8	1.02	A
			Co-58	pCi	76.2	71.9	1.06	A
			Mn-54	pCi	91.4	94.4	0.97	A
			Fe-59	pCi	78.6	70.3	1.12	A
			Zn-65	pCi	173	162	1.07	A
			Co-60	pCi	138	139	0.99	A
	E11422	AP	Sr-89	pCi	98.0	96.9	1.01	A
			Sr-90	pCi	10.0	14.0	0.71	W
	E11356	Charcoal	I-131	pCi	74.9	75.2	1.00	A
	E11358	Water	Fe-55	pCi/L	2160	1710	1.26	W
	E11353	Soil	Ce-141	pCi/kg	252	222	1.14	A
			Cr-51	pCi/kg	485	485	1.00	A
			Cs-134	pCi/kg	319	277	1.15	A
			Cs-137	pCi/kg	292	276	1.06	A
			Co-58	pCi/kg	193	190	1.02	A
			Mn-54	pCi/kg	258	250	1.03	A
			Fe-59	pCi/kg	218	186	1.17	A
			Zn-65	pCi/kg	457	429	1.07	A
			Co-60	pCi/kg	381	368	1.04	A

(1) AP Cr-51 - Cr-51 has the shortest half-life and the weakest gamma energy of the mixed nuclide sample, which produces a large error. Taking into account the error, the lowest value would be 119% of the reference value, which would be considered acceptable. NCR 15-18

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable, reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning, reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable, reported result falls outside the ratio limits of < 0.70 and > 1.30.

TABLE D-2 **DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**
TELEDYNE BROWN ENGINEERING, 2015
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2015	15-MaW32	Water	Am-241	Bq/L	0.632	0.654	0.458 - 0.850	A
			Ni-63	Bq/L	2.5		(1)	A
			Pu-238	Bq/L	0.0204	0.0089	(2)	A
			Pu-239/240	Bq/L	0.9	0.8	0.582 - 1.082	A
	15-MaS32	Soil	Ni-63	Bq/kg	392	448.0	314 - 582	A
			Sr-90	Bq/kg	286	653	487 - 849	N (3)
	15-RdF32	AP	Sr-90	Bq/sample	-0.0991		(1)	A
			U-234/233	Bq/sample	0.0211	0.0155	0.0109 - 0.0202	N (3)
			U-238	Bq/sample	0.095	0.099	0.069 - 0.129	A
	15-GrF32	AP	Gr-A	Bq/sample	0.448	1.77	0.53 - 3.01	N (3)
			Gr-B	Bq/sample	0.7580	0.75	0.38 - 1.13	A
	15-RdV32	Vegetation	Cs-134	Bq/sample	8.08	7.32	5.12 - 9.52	A
			Cs-137	Bq/sample	11.6	9.18	6.43 - 11.93	W
			Co-57	Bq/sample	-0.0096		(1)	A
			Co-60	Bq/sample	6.53	5.55	3.89 - 7.22	A
			Mn-54	Bq/sample	0.0058		(1)	A
			Sr-90	Bq/sample	0.999	1.08	0.76 - 1.40	A
			Zn-65	Bq/sample	-0.108		(1)	A
September 2015	15-MaW33	Water	Am-241	Bq/L	1.012	1.055	0.739 - 1.372	A
			Ni-63	Bq/L	11.8	8.55	5.99 - 11.12	N (4)
			Pu-238	Bq/L	0.727	0.681	0.477 - 0.885	A
			Pu-239/240	Bq/L	0.830	0.900	0.630 - 1.170	A
	15-MaS33	Soil	Ni-63	Bq/kg	635	682	477 - 887	A
			Sr-90	Bq/kg	429	425	298 - 553	A
	15-RdF33	AP	Sr-90	Bq/sample	1.48	2.18	1.53 - 2.83	N (4)
			U-234/233	Bq/sample	0.143	0.143	0.100 - 0.186	A
			U-238	Bq/sample	0.149	0.148	0.104 - 0.192	A
	15-GrF33	AP	Gr-A	Bq/sample	0.497	0.90	0.27 - 1.53	A
			Gr-B	Bq/sample	1.34	1.56	0.78 - 2.34	A
	15-RdV33	Vegetation	Cs-134	Bq/sample	6.10	5.80	4.06 - 7.54	A
			Cs-137	Bq/sample	0.0002		(1)	A
			Co-57	Bq/sample	8.01	6.62	4.63 - 8.61	W
			Co-60	Bq/sample	4.97	4.56	3.19 - 5.93	A
			Mn-54	Bq/sample	8.33	7.68	5.38 - 9.98	A
			Sr-90	Bq/sample	0.386	1.30	0.91 - 1.69	N (4)
			Zn-65	Bq/sample	6.07	5.46	3.82 - 7.10	A

(1) False positive test.
(2) Sensitivity evaluation.
(3) Soil Sr-90 - incomplete digestion of the sample resulted in low results; AP U-234/233 - extremely low activity was difficult to quantify AP Gr-A - the MAPEP filter has the activity embedded in the filter. To corrected the low bias, TBE will create an attenuated efficiency for MAPEP samples. NCR 15-13
(4) Water Ni-63 extremely low activity was difficult to quantify; AP & Vegetation Sr-90 was lost during separation, possible from substance added by MAPEP NCR 15-21.
(a) Teledyne Brown Engineering reported result.
(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE D-3 **ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**

TELEDYNE BROWN ENGINEERING, 2015

(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2015	RAD-101	Water	Sr-89	pCi/L	45.2	63.2	51.1 - 71.2	N (1)
			Sr-90	pCi/L	28.0	41.9	30.8 - 48.1	N (1)
			Ba-133	pCi/L	80.6	82.5	63.9 - 90.8	A
			Cs-134	pCi/L	71.7	75.7	61.8 - 83.3	A
			Cs-137	pCi/L	187	189	170 - 210	A
			Co-60	pCi/L	85.7	84.5	76.0 - 95.3	A
			Zn-65	pCi/L	197	203	183 - 238	A
			Gr-A	pCi/L	26.1	42.6	22.1 - 54.0	A
			Gr-B	pCi/L	28.8	32.9	21.3 - 40.6	A
			I-131	pCi/L	23.5	23.8	19.7 - 28.3	A
			U-Nat	pCi/L	6.19	6.59	4.99 - 7.83	A
			H-3	pCi/L	3145	3280	2770 - 3620	A
November 2015	RAD-103	Water	Sr-89	pCi/L	40.9	35.7	26.7 - 42.5	A
			Sr-90	pCi/L	29.3	31.1	22.7 - 36.1	A
			Ba-133	pCi/L	31.5	32.5	25.9 - 36.7	A
			Cs-134	pCi/L	59.65	62.3	50.6 - 68.5	A
			Cs-137	pCi/L	156	157	141 - 175	A
			Co-60	pCi/L	70.6	71.1	64.0 - 80.7	A
			Zn-65	pCi/L	145	126	113 - 149	A
			Gr-A	pCi/L	38.2	51.6	26.9 - 64.7	A
			Gr-B	pCi/L	42.0	36.6	24.1 - 44.2	A
			I-131	pCi/L	24.8	26.3	21.9 - 31.0	A
			U-Nat	pCi/L	146.90	56.2	45.7 - 62.4	N (2)
			H-3	pCi/L	21100	21300	18700 - 23400	A

(1) Yield on the high side of our acceptance range indicates possibility of calcium interference. NCR 15-09

(2) Technician failed to dilute original sample. If dilulted, the result would have been 57.1, which fell within the acceptance limits. NCR 15-19

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

TABLE D-4 ERA STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a]
ENVIRONMENTAL, INC., 2015
(Page 1 of 1)

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-1444	04/06/15	Sr-89	59.71 ± 5.44	63.20	51.10 - 71.20	Pass
ERW-1444	04/06/15	Sr-90	43.41 ± 2.43	41.90	30.80 - 48.10	Pass
ERW-1448	04/06/15	Ba-133	77.75 ± 4.69	82.50	69.30 - 90.80	Pass
ERW-1448	04/06/15	Cs-134	68.82 ± 3.08	75.70	61.80 - 83.30	Pass
ERW-1448	04/06/15	Cs-137	- 191.92 ± 5.9	189	- 170.00 - 210.0	Pass
ERW-1448	04/06/15	Co-60	85.05 ± 4.59	84.50	76.00 - 95.30	Pass
ERW-1448	04/06/15	Zn-65	- 195.97 ± 12.0	203	- 183.00 - 238.0	Pass
ERW-1450	04/06/15	Gr. Alpha	34.05 ± 1.90	42.60	22.10 - 54.00	Pass
ERW-1450	04/06/15	Gr. Beta	26.93 ± 1.12	32.90	21.30 - 40.60	Pass
ERW-1453	04/06/15	I-131	22.47 ± 0.83	23.80	19.70 - 28.30	Pass
ERW-1456	04/06/15	Uranium	5.98 ± 0.31	6.59	4.99 - 7.83	Pass
ERW-1461	04/06/15	H-3	3,254 ± 180	3280	2,770 - 3620	Pass
ERW-5528	10/05/15	Sr-89	34.76 ± 0.06	35.70	26.70 - 42.50	Pass
ERW-5528	10/05/15	Sr-90	29.23 ± 0.06	31.10	22.70 - 36.10	Pass
ERW-5531	10/05/15	Ba-133	30.91 ± 0.53	32.50	25.90 - 36.70	Pass
ERW-5531	10/05/15	Cs-134	57.40 ± 2.57	62.30	50.69 - 68.50	Pass
ERW-5531	10/05/15	Cs-137	- 163.12 ± 4.8	157	- 141.00 - 175.0	Pass
ERW-5531	10/05/15	Co-60	73.41 ± 1.72	71.10	64.00 - 80.70	Pass
ERW-5531	10/05/15	Zn-65	- 138.94 ± 5.7	126	- 113.00 - 149.0	Pass
ERW-5534	10/05/15	Gr. Alpha	29.99 ± 0.08	51.60	26.90 - 64.70	Pass
ERW-5534	10/05/15	G. Beta	27.52 ± 0.04	36.60	24.10 - 44.20	Pass
ERW-5537	10/05/15	I-131	25.54 ± 0.60	26.30	21.90 - 31.00	Pass
ERW-5540	10/05/15	Uranium	53.30 ± 0.55	56.20	45.70 - 62.40	Pass
ERW-5543	10/05/15	H-3	21,260 ± 351	21,300	18,700 - 23400.0	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.

TABLE D-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) ENVIRONMENTAL, INC., 2015

(Page 1 of 2)

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-975	2/1/2015	Ni-63	341 ± 18	448	314 - 582	Pass
MASO-975	2/1/2015	Sr-90	523 ± 12	653	457 - 849	Pass
MASO-975	2/1/2015	Cs-134	533 ± 6	678	475 - 881	Pass
MASO-975	2/1/2015	Cs-137	0.8 ± 2.5	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-57	0.5 ± 1	0.0	NA [c]	Pass
MASO-975	2/1/2015	Co-60	741 ± 8	817	572 - 1062	Pass
MASO-975	2/1/2015	Mn-54	1,153 ± 9	1,198	839 - 1557	Pass
MASO-975	2/1/2015	Zn-65	892 ± 18	1064	745 - 1383	Pass
MAW-969	2/1/2015	Am-241	0.650 ± 0.078	0.654	0.458 - 0.850	Pass
MAW-969	2/1/2015	Cs-134	21.09 ± 0.25	23.5	16.5 - 30.6	Pass
MAW-969	2/1/2015	Cs-137	19.63 ± 0.34	19.1	13.4 - 24.8	Pass
MAW-969 [d]	2/1/2015	Co-57	10.2 ± 0.4	29.9	20.9 - 38.9	Fail
MAW-969	2/1/2015	Co-60	0.02 ± 0.05	0.00	NA [c]	Pass
MAW-969	2/1/2015	H-3	569 ± 13	563	394 - 732	Pass
MAW-969	2/1/2015	Fe-55	6.00 ± 6.60	6.88	4.82 - 8.94	Pass
MAW-969	2/1/2015	Mn-54	0.02 ± 0.07	0.00	NA [c]	Pass
MAW-969	2/1/2015	Ni-63	2.9 ± 3	0.00	NA [c]	Pass
MAW-969	2/1/2015	Zn-65	16.54 ± 0.85	18.3	12.8 - 23.8	Pass
MAW-969	2/1/2015	Pu-238	0.02 ± 0.03	0.01	NA [e]	Pass
MAW-969	2/1/2015	Pu-239/240	0.81 ± 0.10	0.83	0.58 - 1.08	Pass
MAW-969	2/1/2015	Sr-90	9.40 ± 1.30	9.48	6.64 - 12.32	Pass
MAW-950	2/1/2015	Gr. Alpha	0.66 ± 0.05	1.07	0.32 - 1.81	Pass
MAW-950	2/1/2015	Gr. Beta	2.72 ± 0.06	2.79	1.40 - 4.19	Pass
MAAP-978	2/1/2015	Cs-134	1.00 ± 0.04	1.15	0.81 - 1.50	Pass
MAAP-978	2/1/2015	Cs-137	0.004 ± 0.023	0.00	NA [c]	Pass
MAAP-978 e	2/1/2015	Co-57	0.04 ± 0.04	1.51	1.06 - 1.96	Fail
MAAP-978	2/1/2015	Co-60	0.01 ± 0.02	0.00	NA [c]	Pass
MAAP-978	2/1/2015	Mn-54	1.11 ± 0.08	1.02	0.71 - 1.33	Pass
MAAP-978	2/1/2015	Zn-65	0.83 ± 0.10	0.83	0.58 - 1.08	Pass
MAAP-981	2/1/2015	Sr-89	38.12 ± 1.01	47.5	33.3 - 61.8	Pass
MAAP-981	2/1/2015	Sr-90	1.22 ± 0.13	1.06	0.74 - 1.38	Pass
MAAP-984	2/1/2015	Gr. Alpha	0.59 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-984	2/1/2015	Gr. Beta	0.95 ± 0.07	0.75	0.38 - 1.13	Pass
MAVE-972	2/1/2015	Cs-134	6.98 ± 0.13	7.32	5.12 - 9.52	Pass
MAVE-972	2/1/2015	Cs-137	9.73 ± 0.21	9.18	6.43 - 11.93	Pass
MAVE-972	2/1/2015	Co-57	0.01 ± 0.04	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Co-60	3.89 ± 0.20	5.55	3.89 - 7.22	Pass
MAVE-972	2/1/2015	Mn-54	0.04 ± 0.07	0.00	NA [c]	Pass
MAVE-972	2/1/2015	Zn-65	0.09 ± 0.12	0.00	NA [c]	Pass

TABLE D-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
ENVIRONMENTAL, INC., 2015
(Page 2 of 2)

			Concentration [a]			
Lab Code [b]	Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-4903	8/1/2015	Ni-63	556 ± 18	682	477 - 887	Pass
MASO-4903 f	8/1/2015	Sr-90	231 ± 7	425	298 - 553	Fail
MASO-4903 f	8/1/2015	Sr-90	352 ± 10	425	298 - 553	Pass
MASO-4903	8/1/2015	Cs-134	833 ± 10	1,010	707 - 1313	Pass
MASO-4903	8/1/2015	Cs-137	808 ± 11	809.00	566 - 1052	Pass
MASO-4903	8/1/2015	Co-57	1,052 ± 10	1,180	826 - 1534	Pass
MASO-4903	8/1/2015	Co-60	2 ± 2	1.3	NA [e]	Pass
MASO-4903	8/1/2015	Mn-54	1,331 ± 13	1,340	938 - 1742	Pass
MASO-4903	8/1/2015	Zn-65	686 ± 15	662	463 - 861	Pass
MAW-5007	8/1/2015	Cs-134	16.7 ± 0.4	23.1	16.2 - 30	Pass
MAW-5007	8/1/2015	Cs-137	-0.36 ± 0.13	0	NA [c]	Pass
MAW-5007	8/1/2015	Co-57	21.8 ± 0.4	20.8	14.6 - 27	Pass
MAW-5007	8/1/2015	Co-60	17.3 ± 0.3	17.1	12 - 22.2	Pass
MAW-5007	8/1/2015	H-3	227.5 ± 8.9	216	151 - 281	Pass
MAW-5007 g	8/1/2015	Fe-55	4.2 ± 14.1	13.1	9.2 - 17	Fail
MAW-5007	8/1/2015	Mn-54	16.6 ± 0.5	15.6	10.9 - 20.3	Pass
MAW-5007	8/1/2015	Ni-63	9.1 ± 2.6	8.55	5.99 - 11.12	Pass
MAW-5007	8/1/2015	Zn-65	15.5 ± 0.9	13.9	9.7 - 18.1	Pass
MAW-5007	8/1/2015	Sr-90	4.80 ± 0.50	4.80	3.36 - 6.24	Pass
MAW-5007	8/1/2015	Gr. Alpha	0.41 ± 0.04	0.43	0.13 - 0.73	Pass
MAW-5007	8/1/2015	Gr. Beta	3.45 ± 0.07	3.52	1.76 - 5.28	Pass
MAAP-4911	8/1/2015	Sr-89	3.55 ± 0.67	3.98	2.79 - 5.17	Pass
MAAP-4911	8/1/2015	Sr-90	0.94 ± 0.16	1.05	0.74 - 1.37	Pass
MAAP-4907	8/1/2015	Gr. Alpha	0.30 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-4907	8/1/2015	Gr. Beta	1.85 ± 0.09	1.56	0.78 - 2.34	Pass
MAVE-4901	8/1/2015	Cs-134	5.56 ± 0.16	5.80	4.06 - 7.54	Pass
MAVE-4901	8/1/2015	Cs-137	-0.02 ± 0.06	0.00	NA [c]	Pass
MAVE-4901	8/1/2015	Co-57	7.74 ± 0.18	6.62	4.63 - 8.61	Pass
MAVE-4901	8/1/2015	Co-60	4.84 ± 0.15	4.56	3.19 - 5.93	Pass
MAVE-4901	8/1/2015	Mn-54	8.25 ± 0.25	7.68	5.38 - 9.98	Pass
MAVE-4901	8/1/2015	Zn-65	5.78 ± 0.29	5.46	3.82 - 7.10	Pass

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

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

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

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

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

f The incomplete separation of calcium from strontium caused a failed low result. The result of reanalysis acceptable.

g The known activity was below the routine laboratory detection limits for the available aliquot fraction.

APPENDIX E

ERRATA DATA

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There is no errata data for 2015.

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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Docket No: 50-254
50-265

QUAD CITIES NUCLEAR POWER STATION UNITS 1 and 2

Annual Radiological Groundwater Protection Program Report

1 January Through 31 December 2015

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon Generation.

Quad Cities Nuclear Power Station
Cordova, IL 61242

May 2016

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Table Of Contents

Appendices

I. Summary and Conclusions

This report on the Radiological Groundwater Protection Program (RGPP) conducted for the Quad Cities Nuclear Power Station (QCNPS) by Exelon Nuclear covers the period 01 January 2015 through 31 December 2015.

In 2006, Exelon undertook a Fleetwide Assessment of groundwater at and in the vicinity of its nuclear power generating facilities for the presence of radionuclides. The data collected from the Quad Cities Station as part of the Fleetwide Assessment was summarized in a report entitled "Hydrogeologic Investigation Report, Fleetwide Assessment, Quad Cities Generation Station, Cordova, Illinois", dated September 2006. This report was submitted to the Illinois Environmental Protection Agency (IEPA) in September 2006. The Quad Cities Hydrogeologic Investigation Report concluded that tritium had not migrated off Site at detectable concentrations.

Following the Fleetwide Assessment, Exelon continued groundwater monitoring for radionuclides at the Site. As a result of this monitoring, Exelon detected higher than expected tritium levels in the vicinity of the station's Service Building and Turbine Building. Quad Cities undertook supplemental investigative activities to determine and characterize the source of the tritium. These investigative activities included completion of an aquifer pumping test, installation of sentinel monitoring wells in the vicinity of the Service Building and Turbine Building, and several additional rounds of hydraulic monitoring and groundwater sampling. The collected groundwater data was utilized to assist with an extensive underground piping inspection program to locate the source of the tritium.

In May 2008, during the underground piping inspection program, Exelon located a small leak in the Unit 1 Residual Heat Removal (RHR) suction line located near the Service Building/ Turbine Building area. The line was isolated and through further testing, Exelon determined it to be a source of the monitored tritium levels. In June 2008, the line was repaired, thereby eliminating this source of tritiated water.

In a letter dated June 5, 2008, Exelon informed the Illinois Environmental Protection Agency (IEPA) of its plan to prepare a Migration Control Plan (MCP) to minimize migration of the tritium plume offsite. The MCP was submitted to the IEPA July 17, 2008. The MCP listed Monitored Natural Attenuation as the preferred remediation option.

In 2012 Conestoga-Rovers & Associates (CRA) completed a five-year update hydrogeologic investigation report for the Station (*NEI 07-07, Hydrogeologic Investigation Report*, dated November 2012). The referenced report summarized station activities since the 2006 hydrogeologic investigation report, including

changes at the Station as well as RGPP sampling activities and groundwater flow.

A 2011 change to the RGPP consisted of designating wells into categories. Well designation categories include background, detection, elevated, long-term shut down, plume and idle. The RGPP also requires the sampling of surface water locations that may be impacted due to a spill or release.

This report covers groundwater samples, collected from the environment on station property in 2015. During that time period, RGPP samples were collected from 43 locations.

2015 sample locations included thirty-six designated monitoring wells, two surface water monitoring points and five production wells (two of which are used for site drinking water). Sample frequency and analysis varies with well designation. Typical frequency/analysis include quarterly for tritium and annual for gamma, gross alpha, gross beta, strontium, select transuranics and Fe 55/Ni 63. Samples from eighteen of the designated monitoring wells and two surface water sample points were collected by a contractor (Environmental Inc.) and analyzed by a contract lab (Teledyne Brown). The remaining sample locations are collected by site personnel and analyzed for tritium/gamma onsite by station personnel or by Teledyne Brown for tritium/gamma and other parameters.

Tritium concentrations ranged from less than the LLD of 200 pCi/L at the site boundaries up to 36,900 pCi/L in a monitoring well. Tritium was detected in one of the eight surface water samples at a concentration of 295 pCi/L.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in the Offsite Dose Calculation Manual (ODCM) in any of the groundwater samples. In the case of tritium, Exelon specified that its contract laboratories achieve a lower limit of detection 10 times lower than that required by federal regulation. Most of the tritium that was detected in groundwater at the Station is on the south and west side of the Reactor/Turbine buildings.

Strontium-89 was not detected at concentrations greater than the Lower Limit of Detection (LLD) of 10.0 pCi/L. Strontium-90 was not detected at concentrations great than the Lower Limit of Detection (LLD) of 1.0 pCi/L.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on 10 designated groundwater locations during the first quarter sampling in 2015.

Gross Alpha (dissolved) was not detected at any of the groundwater locations.

Gross Alpha (suspended) was not detected at any of the groundwater locations.

Gross Beta (dissolved) was detected in nine of 10 groundwater locations. The concentrations ranged from 2.8 to 43.1 pCi/L.

Gross Beta (suspended) was not detected at any of the groundwater locations.

Select Transuranics/Hard-To-Detect analyses was performed on one monitoring well designated as "elevated" (QC-GP-15). The analyses included Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235, U-238, Fe-55 and Ni-63. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs.

In assessing all the data gathered for this report, it was concluded that the operation of QCNPS had no adverse radiological impact on the environment offsite of QCNPS.

II. Introduction

The Quad Cities Nuclear Power Station (QCNPS), consisting of two 2957 MWth boiling water reactor owned and operated by Exelon Corporation, is located in Cordova, Illinois along the Mississippi River. Unit No. 1 went critical on 16 March 1972. Unit No. 2 went critical on 02 December 1973. The site is located in northern Illinois, approximately 182 miles west of Chicago, Illinois.

A. Objective of the RGPP

The long-term objectives of the RGPP are as follows:

1. Identify suitable locations to monitor and evaluate potential impacts from station operations before significant radiological impact to the environment and potential drinking water sources.

2. Understand the local hydrogeologic regime in the vicinity of the station and maintain up-to-date knowledge of flow patterns on the surface and shallow subsurface.

3. Perform routine water sampling and radiological analysis of water from selected locations.

4. Report new leaks, spills, or other detections with potential radiological significance to stakeholders in a timely manner.

5. Regularly assess analytical results to identify adverse trends.

6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Quad Cities Nuclear Power Station as discussed below:

1. Exelon and its consultant identified locations as described in the Phase 1 study. Phase 1 studies were conducted by Conestoga Rovers and Associates (CRA) and the results and conclusions were made available to state and federal regulators in station specific reports.

2. The Quad Cities Nuclear Power Station reports describe the local hydrogeologic regime. Periodically, the flow patterns on the surface and shallow subsurface are updated based on ongoing measurements.

3. Quad Cities Nuclear Power Station will continue to perform routine sampling and radiological analysis of water from selected locations.

4. Quad Cities Nuclear Power Station has implemented procedures to identify and report leaks, spills, or other detections with potential radiological significance in a timely manner.

5. Quad Cities Nuclear Power Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends.

C. Program Description

1. Sample Collection

Sample locations can be found in Table A-1 and Figures A-1 & A-2, Appendix A.

<u>Groundwater and Surface Water</u>

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures following regulatory methods. Both groundwater and surface water are collected. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection, preservation management, analysis and shipment of samples, as well as in documentation of sampling events. Analytical laboratories are subject to internal quality assurance programs, inter-laboratory cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all

analytical data deliverables after initial review by the contractor.

Analytical data results are reviewed by both station personnel and an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

III. Program Description

This section covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2015.

A. Sample Analysis

This section describes the general analytical methodologies used by TBE and station personnel to analyze the environmental samples for radioactivity for the Quad Cities Nuclear Power Station RGPP in 2015.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gamma emitters in groundwater and surface water.
2. Concentrations of strontium in groundwater.
3. Concentrations of tritium in groundwater and surface water.
4. Concentration of gross alpha and gross beta in groundwater.
5. Concentrations of Am-241 in groundwater.
6. Concentrations of Cm-242 and Cm-243/244 in groundwater.
7. Concentrations of Pu-238 and PU-239/240 in groundwater.
8. Concentrations of U-234, U-235 and U-238 in groundwater.
9. Concentrations of Fe-55 in groundwater.
10. Concentrations of Ni-63 in groundwater.

B. Data Interpretation

The radiological data collected prior to Quad Cities Nuclear Power Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Quad

Cities Nuclear Power Station was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

   The lower limit of detection (LLD) is specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. Laboratory Measurements Uncertainty

   The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value.

   Statistically, the exact value of a measurement is expressed as a range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from calibration standards, sample volume or weight measurements, sampling uncertainty and other factors. Exelon reports the uncertainty of a measurement created by statistical process (counting error) as well as all sources of error (Total Propagated Uncertainty or TPU). Each result has two values calculated. Exelon reports the TPU by following the result with plus or minus ± the estimated sample standard deviation, as TPU, that is obtained by propagating all sources of analytical uncertainty in measurements.

   Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the Annual Radiological Environmental Operating Report (AREOR).

   Gamma spectroscopy results for each type of sample were grouped as follows:

   For groundwater and surface water 14 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, I-131, Cs-134, Cs-137, Ba-140 and La-140 were reported.

IV. Results and Discussion

A. Groundwater Results

Groundwater

Samples were collected from on-site wells in accordance with the

station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Samples from all locations were analyzed for tritium activity (Table B–I.1 & B-III.1 Appendix B). Tritium values ranged from the detection limit to 36,900 pCi/l. All samples obtained at the site boundaries were less then the detection limit of 200 pCi/L, with the exception of MW-QC-112I sampled on 3/9/15 which showed activity of 403 pCi/L. Subsequent resample of MW-QC-112I on 4/10/15 was less than detection limit of 200 pCi/L. The location most representative of potential offsite user of drinking water was <200 pCi/L.

Strontium

Strontium-89 was not detected above the Lower Limit of Detection of 10.0 pCi/L. Strontium-90 was not detected above the Lower Limit of Detection (LLD) of 1.0 pCi/L (Table B–I.1 Appendix B)

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions performed on designated groundwater locations during the 1st quarter in 2015.

Gross Alpha (dissolved) was not detected at any of the groundwater locations.

Gross Alpha (suspended) was not detected at any of the groundwater locations.

Gross Beta (dissolved) was detected in nine of 10 groundwater locations. The concentrations ranged from 2.8 to 43.1 pCi/L.

Gross Beta (suspended) was not detected at any of the groundwater locations (Table B-I.1 Appendix B).

Gamma Emitters

No gamma emitting nuclides were detected other than naturally occurring K-40 in two samples at concentration of 27 pCi/L and 158 pCi/L (Table B–I.2, Appendix B).

Select Transuranics/Hard-To-Detect

Select Transuranics/Hard-To-Detect analyses was performed on one groundwater location. The analyses included Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235, U-238, Fe-55 and Ni-63. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs. (Table B–I.3 Appendix B).

B. Surface Water Results

Surface Water

Tritium

Samples from two locations were analyzed for tritium activity. Tritium was detected in one of the eight samples at a concentration of 295 pCi/L. (Table B–II.1 Appendix B).

Gamma Emitters

No gamma emitting nuclides were detected (Table B–II.2, Appendix B).

C. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE are presented in the Annual Radiological Environmental Operating Report.

D. Leaks, Spills, and Releases

No leaks, spills or releases were identified during the year.

E. Trends

Overall, groundwater tritium concentrations have been decreasing over time at the Station.

F. Investigations

Currently no investigations are on-going.

G. Actions Taken

1. Compensatory Actions

There have been no station events requiring compensatory actions at the Quad Cities Nuclear Power Station in 2015.

2. Actions to Recover/Reverse Plumes

   No actions were required to recover or reverse groundwater plumes. Quad Cities Station Migration Control Plan (MCP) continues to employ Monitored Natural Attenuation for remediation of H-3 plume.

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APPENDIX A

LOCATION DESIGNATION

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TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Quad Cities Nuclear Power Station, 2015

Site	Site Type	Well Designation	Minimum Sample Frequency
MW-QC-1	Monitoring Well	Plume	Quarterly
MW-QC-2	Monitoring Well	Plume	Quarterly
MW-QC-3	Monitoring Well	Plume	Quarterly
MW-QC-101I	Monitoring Well	Idle	Not Required
MW-QC-101S	Monitoring Well	Idle	Not Required
MW-QC-102D	Monitoring Well	Plume	Quarterly
MW-QC-102I	Monitoring Well	Plume	Quarterly
MW-QC-102S	Monitoring Well	Plume	Quarterly
MW-QC-103I	Monitoring Well	Detection	Quarterly
MW-QC-104S	Monitoring Well	Detection	Quarterly
MW-QC-105I	Monitoring Well	Plume	Quarterly
MW-QC-106I	Monitoring Well	Plume	Quarterly
MW-QC-106S	Monitoring Well	Plume	Quarterly
MW-QC-107I	Monitoring Well	Background	Annual
MW-QC-108D	Monitoring Well	Plume	Quarterly
MW-QC-108I	Monitoring Well	Plume	Quarterly
MW-QC-108S	Monitoring Well	Plume	Quarterly
MW-QC-109I	Monitoring Well	Plume	Quarterly
MW-QC-109S	Monitoring Well	Plume	Quarterly
MW-QC-110I	Monitoring Well	Idle	Not Required
MW-QC-111D1	Monitoring Well	Idle	Not Required
MW-QC-111D2	Monitoring Well	Idle	Not Required
MW-QC-111I	Monitoring Well	Idle	Not Required
MW-QC-112I	Monitoring Well	Plume	Quarterly
MW-QC-113I	Monitoring Well	Idle	Not Required
MW-QC-114I	Monitoring Well	Idle	Not Required
MW-QC-115S	Monitoring Well	Idle	Not Required
MW-QC-116S	Monitoring Well	Idle	Not Required
SURFACE WATER #1	Surface Water	Surface Water	Quarterly
SURFACE WATER #2	Surface Water	Surface Water	Quarterly
WELL #1	Production Well	Idle	Not Required
WELL #5	Production Well	Idle	Not Required
WELL #6 LITTLE FISH	Production Well	Idle	Not Required
WELL #7 BIG FISH WELL	Production Well	Plume	Quarterly
WELL #8 FIRE TRAINING WELL	Production Well	Idle	Not Required
WELL #9 Dry Cask Storage	Production Well	Background	Annual
WELL #10 FISH HOUSE WELL	Production Well	Idle	Not Required
WELL #11 SPRAY CANAL WELL	Production Well	Idle	Not Required
STP SAND POINT WELL	Production Well	Idle	Not Required
QC-GP-1	Sentinel Well	Plume	Quarterly
QC-GP-2	Sentinel Well	Plume	Quarterly
QC-GP-3	Sentinel Well	Idle	Not Required
QC-GP-4	Sentinel Well	Plume	Quarterly
QC-GP-5	Sentinel Well	Plume	Quarterly
QC-GP-6	Sentinel Well	Plume	Quarterly
QC-GP-7	Sentinel Well	Plume	Quarterly
QC-GP-8	Sentinel Well	Idle	Not Required
QC-GP-9	Sentinel Well	Plume	Quarterly
QC-GP-10	Sentinel Well	Detection	Quarterly
QC-GP-11	Sentinel Well	Detection	Quarterly
QC-GP-12	Sentinel Well	Detection	Quarterly
QC-GP-13	Sentinel Well	Plume	Quarterly
QC-GP-14	Sentinel Well	Detection	Quarterly
QC-GP-15	Sentinel Well	Elevated	Quarterly
QC-GP-16	Sentinel Well	Detection	Quarterly
QC-GP-17	Sentinel Well	Plume	Quarterly
QC-GP-18	Sentinel Well	Plume	Quarterly

Note: Idle designated wells are not required to be sampled as part of the RGPP

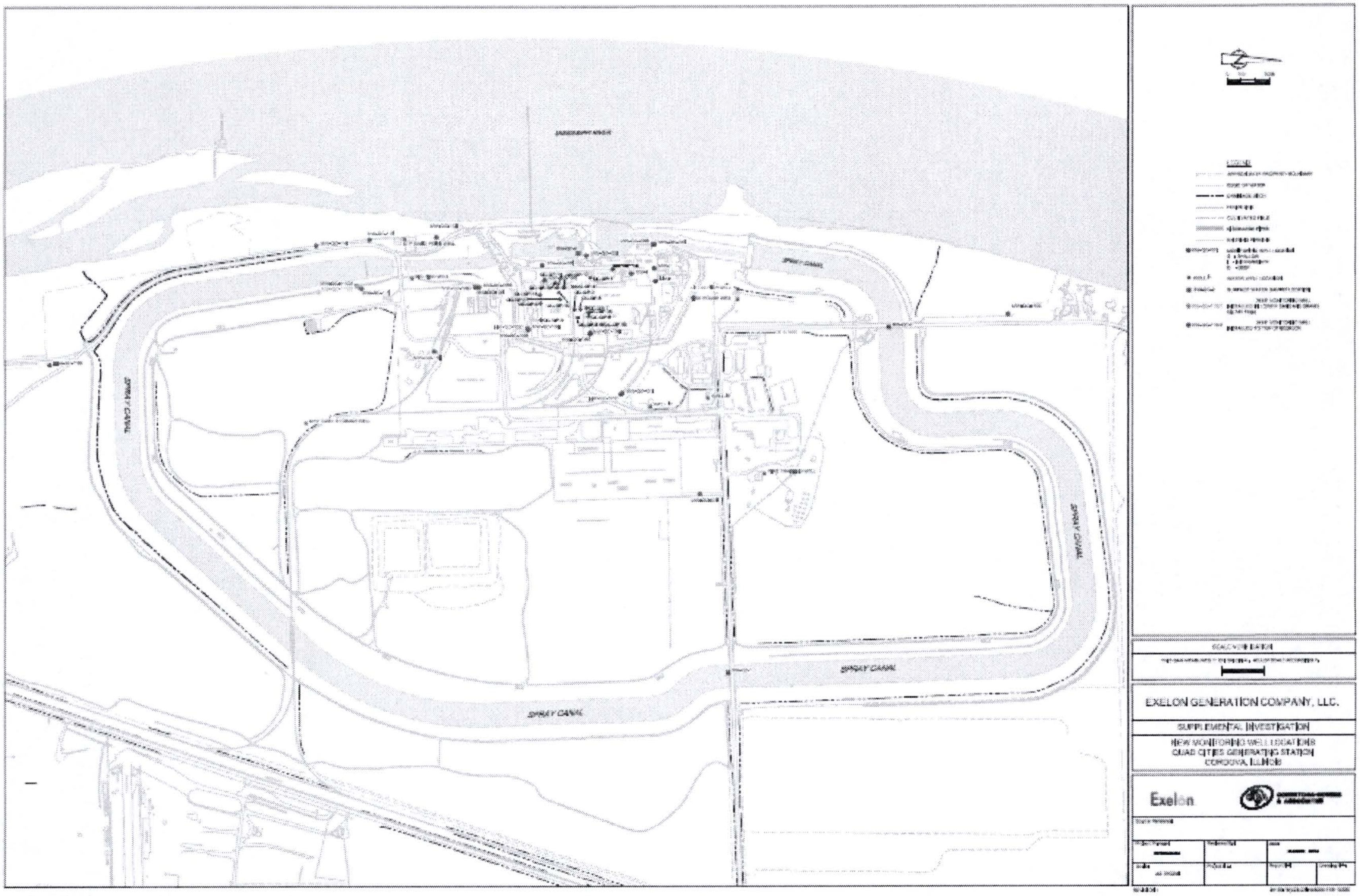

FIGURE A-1
Sampling Locations Near the Site Boundary of the Quad Cities Nuclear Power Station, 2015

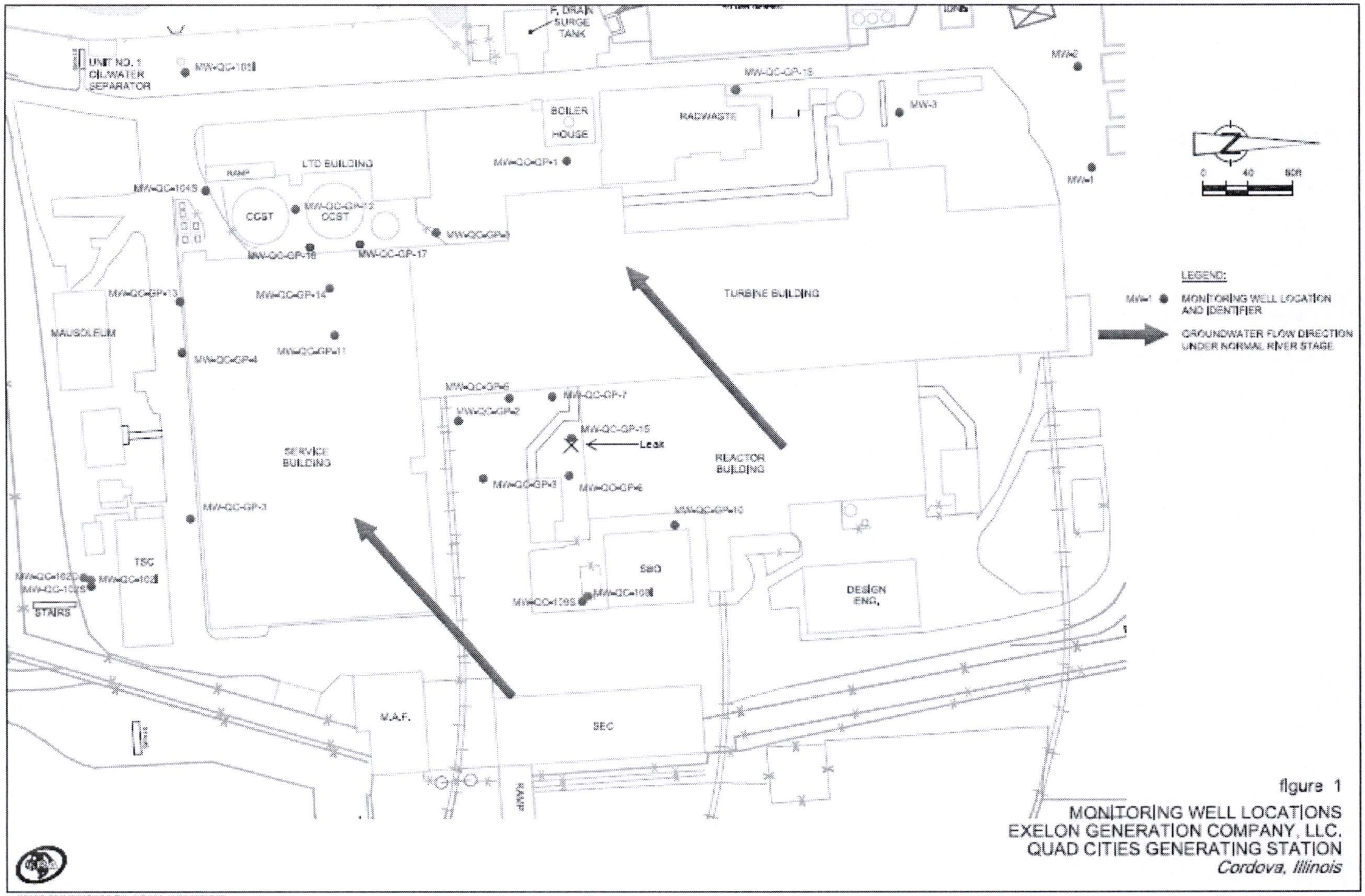

FIGURE A-2
Sentinel Monitoring Point Locations, Quad Cities Nuclear Power Station, 2015

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APPENDIX B

DATA TABLES

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TABLE B-I.1 **CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)	Gr-B (Dis)	Gr-B (Sus)
MW-QC-1	03/10/15		< 183						
MW-QC-1	05/19/15		< 185						
MW-QC-1	08/25/15		< 189						
MW-QC-1	11/10/15		220 ± 124						
MW-QC-102D	03/10/15		982 ± 167						
MW-QC-102D	05/19/15		678 ± 151						
MW-QC-102D	08/25/15		886 ± 160						
MW-QC-102D	11/10/15		721 ± 153						
MW-QC-102I	03/10/15		379 ± 137						
MW-QC-102I	05/19/15		333 ± 134						
MW-QC-102I	08/25/15		< 191						
MW-QC-102I	11/10/15		< 195						
MW-QC-102S	03/10/15		< 187						
MW-QC-102S	05/19/15		< 189						
MW-QC-102S	08/25/15		< 191						
MW-QC-102S	11/10/15		< 196						
MW-QC-103I	03/10/15		< 187	< 3.7	< 0.9	< 1.6	< 0.5	8.3 ± 1.3	< 1.6
MW-QC-103I	05/19/15		< 189						
MW-QC-103I	08/25/15		< 191						
MW-QC-103I	11/10/15		< 194						
MW-QC-104S	03/10/15		< 183	< 3.7	< 0.9	< 2.1	< 0.5	< 2.5	< 1.6
MW-QC-104S	05/19/15		< 188						
MW-QC-104S	08/25/15		< 190						
MW-QC-104S	11/10/15		< 195						
MW-QC-105I	03/10/15		507 ± 142						
MW-QC-105I	05/19/15		< 190						
MW-QC-105I	08/25/15		< 188						
MW-QC-105I	11/10/15		< 191						
MW-QC-106I	03/10/15		< 180						
MW-QC-106I	05/19/15		< 192						
MW-QC-106I	08/25/15		< 190						
MW-QC-106I	11/10/15		< 195						
MW-QC-106S	03/10/15		< 191						
MW-QC-106S	05/19/15		< 191						
MW-QC-106S	08/25/15		< 190						
MW-QC-106S	11/10/15		< 196						
MW-QC-107I	03/09/15		< 185						
MW-QC-108D	03/10/15		1500 ± 207						
MW-QC-108D	05/20/15		1280 ± 192						
MW-QC-108D	08/26/15		1240 ± 187						
MW-QC-108D	11/11/15		1360 ± 205						
MW-QC-108I	03/10/15		564 ± 141						
MW-QC-108I	05/20/15	Original	3110 ± 367						
MW-QC-108I	08/26/15		2430 ± 301						
MW-QC-108I	11/11/15		1620 ± 228						
MW-QC-108S	03/10/15		< 185						
MW-QC-108S	05/20/15	Original	475 ± 138						
MW-QC-108S	08/26/15		< 189						
MW-QC-108S	11/11/15		< 193						
MW-QC-109I	03/10/15		< 185						
MW-QC-109I	05/19/15		< 186						
MW-QC-109I	08/25/15		< 191						
MW-QC-109I	11/10/15		< 195						
MW-QC-109S	03/10/15		< 186						

TABLE B-I.1 **CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)	Gr-B (Dis)	Gr-B (Sus)
MW-QC-109S	05/19/15		< 195						
MW-QC-109S	08/25/15		< 188						
MW-QC-109S	11/10/15		< 194						
MW-QC-112I	03/09/15	Original	403 ± 137						
MW-QC-112I	05/18/15		< 191						
MW-QC-112I	08/24/15		< 192						
MW-QC-112I	11/09/15		< 194						
MW-QC-2	03/10/15		< 184						
MW-QC-2	05/19/15		< 192						
MW-QC-2	08/25/15		< 189						
MW-QC-2	11/10/15		< 193						
MW-QC-3	03/15/15		19900 ± 2030	< 6.0	< 0.6	< 1.3	< 0.3	8.7 ± 1.3	< 1.6
MW-QC-3	11/10/15		6890 ± 741						
QC-GP-10	03/09/15		< 193	< 3.9	< 0.8	< 5.4	< 0.6	15.4 ± 1.8	< 1.5
QC-GP-11	03/09/15		1360 ± 197	< 4.0	< 0.9	< 5.7	< 0.6	8.4 ± 1.6	< 1.5
QC-GP-12	03/10/15		< 190	< 8.3	< 0.9	< 1.1	< 0.6	2.8 ± 0.7	< 1.5
QC-GP-14	03/09/15		4060 ± 456	< 5.3	< 1.0	< 1.4	< 0.3	6.0 ± 1.3	< 1.6
QC-GP-15	03/09/15		< 192	< 3.1	< 0.8	< 5.6	< 0.6	16.3 ± 2.1	< 1.5
QC-GP-15	07/28/15		< 188						
QC-GP-16	03/09/15		17300 ± 1770	< 3.9	< 0.7	< 1.1	< 0.3	4.2 ± 1.0	< 1.6
QC-GP-18	03/09/15		31200 ± 3150	< 4.0	< 0.8	< 3.5	< 0.3	43.1 ± 2.7	< 1.6
WELL #9 DRY CASK STORAGE	03/11/15		< 193						

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
MW-QC-103I	03/10/15	< 49	< 48	< 6	< 6	< 11	< 6	< 9	< 6	< 10	< 14	< 6	< 6	< 33	< 4
MW-QC-104S	03/10/15	< 43	< 53	< 4	< 4	< 8	< 5	< 11	< 5	< 8	< 10	< 4	< 4	< 22	< 9
MW-QC-107I	03/09/15	< 51	< 108	< 5	< 6	< 11	< 5	< 11	< 7	< 10	< 14	< 6	< 5	< 34	< 9
QC-GP-10	03/09/15	< 15	< 34	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 13	< 1	< 1	< 18	< 6
QC-GP-11	03/09/15	< 17	< 32	< 1	< 2	< 5	< 2	< 3	< 2	< 3	< 14	< 1	< 2	< 21	< 6
QC-GP-12	03/10/15	< 14	< 26	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 11	< 1	< 1	< 17	< 5
QC-GP-14	03/09/15	< 16	158 ± 30	< 1	< 2	< 3	< 2	< 3	< 2	< 3	< 14	< 1	< 1	< 21	< 6
QC-GP-15	03/09/15	< 16	< 13	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 12	< 1	< 2	< 20	< 6
QC-GP-15	07/28/15	< 44	< 83	< 4	< 4	< 8	< 5	< 10	< 5	< 9	< 14	< 4	< 5	< 34	< 10
QC-GP-16	03/09/15	< 11	< 27	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 11	< 1	< 1	< 16	< 5
QC-GP-18	03/09/15	< 9	27 ± 17	< 1	< 1	< 2	< 1	< 2	< 1	< 2	< 9	< 1	< 1	< 12	< 4
QC-MW-3	03/15/15	< 18	< 28	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 12	< 2	< 2	< 20	< 6
WELL #9 DRY CASK STORAGE	03/11/15	< 17	< 35	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 12	< 2	< 2	< 19	< 6

TABLE B-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Am-241	Cm-242	Cm-243/244	Pu-238	Pu-239/240	U-234	U-235	U-238	Fe-55	Ni-63
QC-GP-15	03/09/15	< 0.08	< 0.09	< 0.02	< 0.07	< 0.18	< 0.02	< 0.07	< 0.04	< 160	< 4.7

TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
QC-SW-1	3/31/2015	295 ± 134
QC-SW-1	08/25/15	< 188
QC-SW-1	11/09/15	< 193
QC-SW-2	3/31/2015	< 188
QC-SW-2	08/25/15	< 189
QC-SW-2	11/09/15	< 193

TABLE B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF QUAD CITIES NUCLEAR POWER STATION, 2015**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
QC-SW-1	03/31/15	< 72	< 170	< 8	< 7	< 15	< 7	< 17	< 9	< 14	< 12	< 7	< 7	< 32	< 12
QC-SW-2	03/31/15	< 49	< 60	< 6	< 6	< 9	< 6	< 10	< 7	< 12	< 13	< 6	< 7	< 33	< 12

TABLE B-III.1 **CONCENTRATIONS OF TRITIUM IN GROUNDWATER SAMPLES COLLECTED AND ANALYZED BY QUAD CITIES STATION PERSONNEL, 2015**

RESULTS IN UNITS OF PCI/LITER

SITE	COLLECTION DATE	ACTIVITY	AQUIFER
QC-GP-1	03/09/15	9,776	Sentinel Well
QC-GP-1	05/18/15	5,170	Sentinel Well
QC-GP-1	08/24/15	9,240	Sentinel Well
QC-GP-1	11/10/15	5,180	Sentinel Well
QC-GP-2	03/11/15	<2,000	Sentinel Well
QC-GP-2	05/20/15	<2,000	Sentinel Well
QC-GP-2	08/26/15	<2,000	Sentinel Well
QC-GP-2	11/10/15	<2,000	Sentinel Well
QC-GP-3	03/09/15	<2,000	Sentinel Well
QC-GP-4	03/09/15	23,900	Sentinel Well
QC-GP-4	05/18/15	22,000	Sentinel Well
QC-GP-4	08/25/15	11,700	Sentinel Well
QC-GP-4	11/12/15	10,800	Sentinel Well
QC-GP-5	03/09/15	<2,000	Sentinel Well
QC-GP-5	05/20/15	<2,000	Sentinel Well
QC-GP-5	08/26/15	<2,000	Sentinel Well
QC-GP-5	11/09/15	<2,000	Sentinel Well
QC-GP-6	03/09/15	<2,000	Sentinel Well
QC-GP-6	05/18/15	<2,000	Sentinel Well
QC-GP-6	07/28/15	<2,000	Sentinel Well
QC-GP-6	11/09/15	<2,000	Sentinel Well
QC-GP-7	03/09/15	<2,000	Sentinel Well
QC-GP-7	05/20/15	<2,000	Sentinel Well
QC-GP-7	07/28/15	<2,000	Sentinel Well
QC-GP-7	11/09/15	<2,000	Sentinel Well
QC-GP-8	03/09/15	<2,000	Sentinel Well
QC-GP-9	03/09/15	23,400	Sentinel Well
QC-GP-9	05/18/15	10,500	Sentinel Well
QC-GP-9	08/24/15	21,400	Sentinel Well
QC-GP-9	11/11/15	27,300	Sentinel Well
QC-GP-10	03/09/15	<2,000	Sentinel Well
QC-GP-10	05/20/15	<2,000	Sentinel Well
QC-GP-10	08/26/15	<2,000	Sentinel Well
QC-GP-10	11/09/15	<2,000	Sentinel Well
QC-GP-11	03/09/15	<2,000	Sentinel Well
QC-GP-11	05/19/15	2,580	Sentinel Well
QC-GP-11	08/26/15	<2,000	Sentinel Well
QC-GP-11	11/09/15	<2,000	Sentinel Well
QC-GP-12	03/09/15	<2,000	Sentinel Well
QC-GP-12	05/19/15	<2,000	Sentinel Well
QC-GP-12	08/24/15	<2,000	Sentinel Well
QC-GP-12	11/11/15	<2,000	Sentinel Well
QC-GP-13	03/10/15	18,300	Sentinel Well
QC-GP-13	05/19/15	7,030	Sentinel Well
QC-GP-13	08/25/15	13,000	Sentinel Well
QC-GP-13	11/11/15	12,600	Sentinel Well
QC-GP-14	03/09/15	4,400	Sentinel Well
QC-GP-14	05/19/15	7,030	Sentinel Well
QC-GP-14	08/26/15	5,590	Sentinel Well
QC-GP-14	11/09/15	4,200	Sentinel Well
QC-GP-15	03/09/15	<2,000	Sentinel Well
QC-GP-15	05/20/15	<2,000	Sentinel Well
QC-GP-15	07/28/15	<2,000	Sentinel Well
QC-GP-15	11/09/15	<2,000	Sentinel Well

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN GROUNDWATER SAMPLES COLLECTED AND ANALYZED BY QUAD CITIES STATION PERSONNEL, 2015

RESULTS IN UNITS OF PCI/LITER

SITE	COLLECTION DATE	ACTIVITY	AQUIFER
QC-GP-16	03/09/15	21,400	Sentinel Well
QC-GP-16	05/18/15	<2,000	Sentinel Well
QC-GP-16	08/24/15	<2,000	Sentinel Well
QC-GP-16	11/11/15	2,610	Sentinel Well
QC-GP-17	03/09/15	6,000	Sentinel Well
QC-GP-17	05/18/15	2,420	Sentinel Well
QC-GP-17	08/24/15	3,290	Sentinel Well
QC-GP-17	11/11/15	<2,000	Sentinel Well
QC-GP-18	03/09/15	36,900	Sentinel Well
QC-GP-18	05/18/15	6,810	Sentinel Well
QC-GP-18	08/24/15	2,030	Sentinel Well
QC-GP-18	11/10/15	6,630	Sentinel Well
MW-QC-3	05/18/15	10,500	Monitoring Well
MW-QC-3	08/24/15	14,700	Monitoring Well
MW-QC-112I	04/10/15	<200	Monitoring Well
Well #1	03/12/15	<200	Production Well
Well #1	09/15/15	<200	Production Well
Well #5	03/12/15	<200	Production Well
Well #5	09/15/15	<200	Production Well
Well #7	03/12/15	<2000	Production Well
Well #7	05/18/15	<2000	Production Well
Well #7	09/15/15	<200	Production Well
Well #7	11/11/15	<2,000	Production Well
Well #10	03/12/15	<200	Production Well
QC-SW-1	05/22/15	<200	Surface Water
QC-SW-2	05/22/15	<200	Surface Water