Exelon Generation.

Clinton Power Station
8401 Power Road
Clinton, IL 61727

U-604172
April 24, 2014

U.S. Nuclear Regulatory Commission
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Washington, DC 20555

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Clinton Power Station 2013 Annual Radiological Environmental Operating Report

Exelon Generating Company, LLC (Exelon), Clinton Power Station is submitting the 2013 Annual Radiological Environmental Operating Report. This report is submitted in accordance with Technical Specification 5.6.2, "Annual Radiological Environmental Operating Report," and covers the period from January 1, 2013 through December 31, 2013.

This reports provides the results of the Radiological Environmental Monitoring Program as specific in Section 5.0 and 7.1 of the Offsite Dose Calculation Manual.

There are no regulatory commitments contained within this letter.

Questions on this letter may be directed to Mr. Rick Bair, Chemistry Manager, at 217-937-3200.

Respectfully,

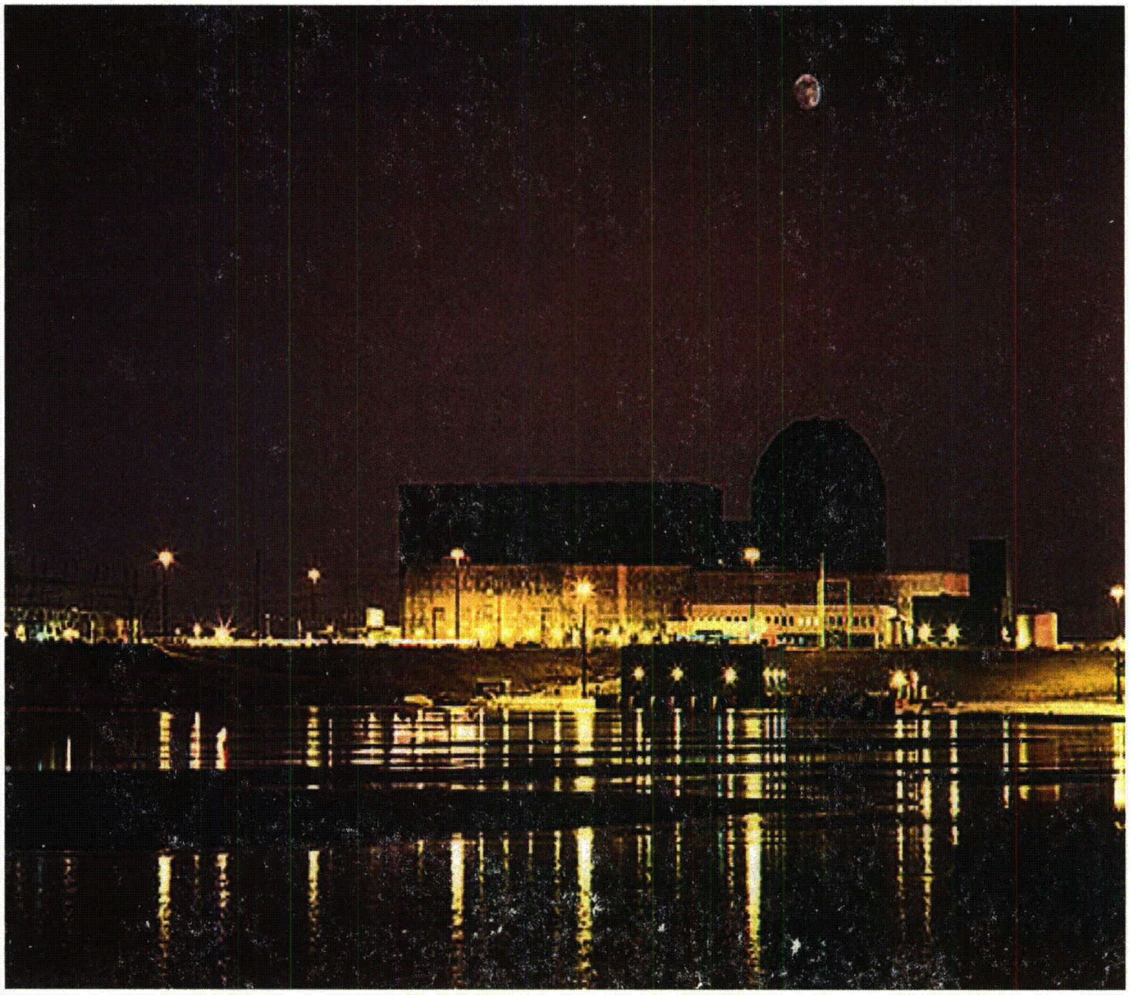
B. Keith Taber
Site Vice President
Clinton Power Station

DRA/blf

Attachment

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector - Clinton Power Station
Office of Nuclear Facility Safety – Illinois Emergency Management Agency

IE25
NRR



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Docket No: 50-461

CLINTON POWER STATION

Annual Radiological Environmental Operating Report

1 January Through 31 December 2013

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon Generation.

Clinton Power Station
Clinton, IL 61727

April 2014

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Appendices

I. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program (REMP) conducted for the Clinton Power Station (CPS) by Exelon Generation Company, LLC (Exelon) covers the period 1 January 2013 through 31 December 2013. During that time period, 1,596 analyses were performed on 1,468 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of CPS had no adverse radiological impact on the environment.

There were zero (0) radioactive liquid releases from CPS during 2013. Releases of gaseous radioactive materials were accurately measured in plant effluents. There were no gaseous effluent releases that approached the limits specified in the CPS Offsite Dose Calculation Manual (ODCM). The highest calculated offsite dose received by a member of the public due to the release of gaseous effluents from CPS was 2.65 E-02 or 0.027 mRem.

Surface, drinking, and well water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Drinking water samples were also analyzed for concentrations of gross beta and I-131. Naturally occurring K-40 was detected at levels consistent with those detected in previous years. No fission or activation products were detected. No tritium or gross beta activity was detected and the required lower limit of detection (LLD) was met.

Fish and shoreline sediment samples were analyzed for concentrations of gamma emitting nuclides. No fission or activation products were detected in fish or shoreline sediment samples.

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Cosmogenic Be-7 was detected at a level consistent with those detected in previous years. No fission or activation products were detected.

High sensitivity I-131 analyses were performed on weekly air samples. All results were less than the minimum detectable concentration for I-131.

Cow milk samples were analyzed for concentrations of I-131 and gamma emitting nuclides. All results were below the required LLDs for I-131. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were found.

Food product samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of cosmogenically produced Be-7 and naturally occurring K-40 were consistent with those detected in previous years. No fission or activation products were detected.

Grass samples were analyzed for concentrations of gamma emitting nuclides. Concentrations of cosmogenically produced Be-7 and naturally occurring K-40 were consistent with those detected in previous years. 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 Dosimetry (OSLD) were deployed and Thermo-luminescent Dosimetry (TLD) were discontinued. A step change increase on the order of 10% has been observed as a result of the application of the alternate methodology. 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 Clinton Power Station (CPS), consisting of one approximately 1,140 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Exelon and became operational in 1987. Unit No. 1 went critical on 15 February 1987. The site encloses approximately 13,730 acres. This includes the 4,895 acre, man-made cooling lake and about 452 acres of property not owned by Exelon. The plant is situated on approximately 150 acres. The cooling water discharge flume – which discharges to the eastern arm of the lake – occupies an additional 130 acres. Although the nuclear reactor, supporting equipment and associated electrical generation and distribution equipment lie in Harp Township, portions of the aforementioned 13,730 acre plot reside within Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

A Radiological Environmental Monitoring Program (REMP) for CPS was initiated in 1987. The preoperational period for most media covers the periods May 1980 through 27 February 1987 and was summarized in a separate report. This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Landauer on samples collected during the period 1 January 2013 through 31 December 2013.

A. Objectives 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.

III. Program Description

A. Sample Collection

This section describes the general collection methods used by Environmental Inc. (Midwest Labs) to obtain environmental samples for the CPS REMP in 2013. Sample locations and descriptions can be found in Tables B–1 and B–2, and Figures B–1 through B–3, Appendix B. The sampling methods used by Environmental Inc. (Midwest Labs) are listed in Table B-2.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, well water, fish, and shoreline sediment. Two gallon water samples were collected monthly from continuous samplers located at three surface water locations (CL-90, CL-91 and CL-99) and one drinking water location (CL-14). A monthly grab sample was obtained from one surface water location (CL-13). Quarterly samples were obtained from two well water locations (CL-7D and CL-12). All samples were collected in new unused plastic bottles, which were rinsed at least twice with source water prior to collection. Fish samples comprising the flesh of largemouth bass, crappie, carp, bluegill, and channel catfish, the species most commonly harvested from the lakes by sporting fishermen, were collected semiannually at two locations, CL-19 and CL-105. CL-105 was the control location. Shoreline sediment samples composed of recently deposited substrate were collected at two locations semiannually (CL-7B and CL-105 (control)).

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate, airborne iodine, milk, food produce and grass. Airborne iodine and particulate samples were collected and analyzed weekly at ten locations (CL-1, CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-11, CL-15 and CL-94). CL-11 was the control location. 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 filters were replaced weekly and sent to the laboratory for analysis.

Milk samples were collected biweekly at one location (CL-116) from May through November and monthly from December through April to coincide with the grazing season. All samples were collected in new unused plastic bottles from the bulk tank at that location, preserved with sodium bisulfite and shipped promptly to the laboratory.

Food products were collected once a month from June through September at four locations (CL-114, CL-115, CL-117 and CL-118). The control location was CL-114. Various broadleaf vegetable samples were collected and placed in new unused plastic bags, and sent to the laboratory for analysis.

Grass samples were collected biweekly at four locations (CL-1, CL-2, CL-8 and CL-116) from May through October. CL-116 was the control location. All samples were collected in new unused plastic bags and sent to the laboratory for analysis.

Ambient Gamma Radiation

Direct radiation measurements were made using Al_2O_3:C Optically Stimulated Luminescence Dosimetry (OSLD). Each location consisted of 2 OSLD sets. The OSLDs were exchanged quarterly and sent to Landauer for analysis. The OSLD locations were placed around the CPS site as follows:

An inner ring consisting of 16 locations (CL-1, CL-5, CL-22, CL-23, CL-24, CL-34, CL-35, CL-36, CL-42 CL-43, CL-44, CL-45, CL-46, CL-47, CL-48 and CL-63).

An outer ring consisting of 16 locations (CL-51, CL-52, CL-53, CL-54, CL-55, CL-56, CL-57, CL-58, CL-60, CL-61, CL-76, CL-77, CL-78, CL-79, CL-80 and CL-81). CL-58MM was installed as part of a volunteer comparison study extending to approximately 5 miles from the site.

A special interest set consisting of seven locations (CL-37, CL-41, CL-49, CL-64, CL65, CL-74 and CL-75) representing special interest areas.

A supplemental set consisting of 14 locations (CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-15, CL-33, CL-84, CL-90, CL-91, CL-97, CL-99 and CL-114).

CL-11 represents the control location for all environmental TLDs.

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 1/2 degree sectors around the site,where estimated annual dose from CPS, if any, would be most significant;

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

4. And near the closest dwelling to the HVAC and VG stacks in the prevailing downwind direction.

Each location has two OSLDs in a vented PVC conduit located approximately three feet above ground level. The OSLDs were exchanged quarterly and sent to Landauer for analysis.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE and Environmental Inc. (Midwest Labs) to analyze the environmental samples for radioactivity for the CPS REMP in 2013. The analytical procedures used by the laboratories 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 drinking water and air particulates.

2. Concentrations of gamma emitters in surface, drinking and well water, air particulates, milk, fish, grass, sediment and vegetables.

3. Concentrations of tritium in surface, drinking and well water.

4. Concentrations of I-131 in air, milk, drinking water and surface water.

5. Ambient gamma radiation levels at various on-site and off-site environs.

C. Data Interpretation

The radiological and direct radiation data collected prior to CPS becoming operational was used as a baseline with which these operational data were compared. For the purpose of this report, CPS 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) was 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 was intended as a before the fact estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criteria for the presence of activity. All analyses were designed to achieve the required CPS detection capabilities for environmental sample analysis.

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

   Net activity for a sample was 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 resulting in a negative number. A minimum detectable concentration (MDC) was 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, well water, fish, sediment, and milk 14 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140, La-140 and Ce-144 were reported.

   For drinking water, grass, and vegetation 15 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, La-140 and Ce-144 were reported.

   For air particulate 11 nuclides, Be-7, K-40, Co-60, Nb-95, Zr-95, Ru-103, Ru-106, Cs-134, Cs-137, Ce-141 and Ce-144, were reported.

   The mean and standard deviation of the results were calculated. The standard deviation represents the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

The exceptions described below are those that are considered 'deviations' from the Radiological Environmental Monitoring Program as required by the Station's ODCM. By definition, 'deviations' are permitted as delineated within NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants", October 1978, and within Radiological Assessment Branch Technical Position, Revision 1, November 1979, which states...."Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons".... The below section addresses the reporting requirements found within Section 7.1 of the Station's ODCM.

<u>Exceptions/Anomalies</u>

January 16, 2013. IR 1463444

During weekly sampling activities ODCM air sampler CL-15 and non-ODCM air samplers CL-7, CL-8, and CL-94 were found to have timer shortages. Sampling locations CL-7 and CL-8 were short by nine hours and locations CL-15 and CL-94 were short by six hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. These interruptions were likely the result of inclement winter weather.

January 23, 2013. IR 1524569

Sampling at non-ODCM liquid compositor location CL-99 was not possible due to freezing of the North Fork Creek. Grab sample was not attainable due to unsafe conditions. This prevented the January sample from CL-99 from meeting the definition of a composite sample.

April 10, 2013. IR 1500173

During weekly sampling activities, ODCM continuous air sample station CL-8 was found without power. The power outage was likely due to electrical storms in the area. The local utility company was contacted to restore power.

May 15, 2013. IR 1514611

During weekly sampling activities, ODCM continuous air sample station CL-8 was found without power. The local utility company was contacted to restore power. The power outage was attributed to a faulty electrical transformer.

May 22, 2013. IR 1524546

During weekly sampling activities ODCM air sampler CL-8 was found to have a timer shortage of four hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. The power outage was attributed to electrical storms in the area.

May 29, 2013. IR 1519075

During weekly sampling activities non-ODCM air sampler CL-1 was found to have a timer shortage of two hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. The power outage was attributed to electrical storms in the area.

June 5, 2013. IR 1521841

During weekly sampling activities ODCM air samplers CL-11 and CL-15 along with non-ODCM air samplers CL-7, CL-8, and CL-94 were found to have timer shortages. Sampling locations CL-7, CL-8, and CL-11 were short by sixteen hours. Sample location CL-15 was short by six hours and sample location CL-94 was short by eight hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. Loss of power is attributed to electrical storms in the area.

June 12, 2013. IR 1616987

During sampling activities, the vendor technician found non-ODCM surface water compositor CL-99 incapable of sampling due to a loss of power. The compositor was reset and normal collection was recommenced. This issue prevented the June sample from CL-99 from meeting the definition of a composite sample.

June 26, 2013. IR 1529965

During sampling activities, the vendor technician found ODCM surface water compositor CL-90 incapable of sampling due to a loss of power. Power was restored on 06/27/13. The compositor was reset and normal collection was recommenced. This issue prevented the June sample from CL-90 from meeting the definition of a composite sample.

July 03, 2013. IR 1532191

During weekly sampling activities non-ODCM air samplers CL-4 and CL-6 were found to have a timer shortages of two hours. Additionally non-ODCM surface water compositor CL-99 was found to have a shortage of two hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. The power outage was attributed to electrical storms in the area.

July 17, 2013. IR 1537315 and 1617014

During weekly sampling activities on 07/17/13, non-ODCM surface water compositor CL-99 was identified as not functioning properly. A redundant compositor was installed and proper functionality was verified the following sampling week. Because of the interruption, the July sample from CL-99 did not meet the definition of a composite sample.

August 07, 2013. IR 1617021

During weekly sampling activities non-ODCM air samplers CL-6 was found to have a timer shortage of approximately 6 hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. The power outage was attributed to electrical storms in the area.

September 19, 2013. IR 1561484

Due to emergent potable water work in the service building at Clinton Power Station, potable water compositor CL-14 was secured for approximately 1 hour. This issue prevented the September sample from CL-14 from meeting the definition of a composite sampler.

September 25, 2013. IR 1563652

During weekly sampling activities non-ODCM air samplers CL-4 and CL-6 were found to have no power. The power outages resulted in a loss of continuous sampling capability during the sampling period. The power outage was attributed to electrical storms in the area.

September 25, 2013. IR1649272

During the monthly vegetation sampling , sufficient leafy vegetation was unobtainable for one of the three required samples due to late season unavailability. Tree leaves were substituted to supplement the obtainable sample.

October 23, 2013. IR 1575875

During weekly sampling activities non-ODCM air samplers CL-7 and CL-94 along with ODCM air samplers CL-8 and CL-15 were found to have a timer shortages of two hours. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period.

December 11, 2013. IR 1595805

During weekly sampling activities non-ODCM air samplers CL-6 was found without power. This represents a loss of continuous sampling capability during the sampling period. Also noted was the inability to collect sample from non-ODCM surface water compositor CL-99 due to freezing of sampling lines.

December 18, 2013. IR 1604301

During weekly sampling activities non-ODCM air samplers CL-6 was found with a timer shortage of approximately 9 hours due to power outage identified on 12/18/13. Also noted was the inability to collect sample from non-ODCM surface water compositor CL-99 due to freezing of the North Fork Creek. This represents a loss of continuous sampling capability during the sampling period.

Missed Samples

December 26, 2013. IR 1608879

Sampling was not possible at air sampling location CL-7. The sampler is located on the property of Mascoutin State Park and the park was closed for the holidays. The sampl was obtained on 12/27/13. This sampling time lies outside the grace period for sampling and is therefore considered a missed sample.

Program exceptions were reviewed to understand the causes of the exception and to return to ODCM sample compliance before the next sampling frequency period.

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

E. Program Changes

The corporate procedure CY-AA-170-1000 Radiological Environmental Monitoring Program and Meteorological Program Implementation was revised. The changes made were non-impactful and included additional guidance for clarification regarding REMP air sampling equipment.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken hourly from a continuous compositor at three locations (CL-90, CL-91 and CL-99) on a monthly schedule and grab samples were taken monthly from one location (CL-13). The following analyses were performed.

<u>Iodine-131</u>

Monthly samples from location CL-90 were analyzed for I-131 activity (Table C-I.1, Appendix C). No I-131 was detected in any samples and the required LLD was met.

<u>Tritium</u>

Monthly samples from all locations were composited quarterly and analyzed for tritium activity (Table C–I.2, Appendix C). No tritium was detected in any samples and the required LLD was met.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–I.3, Appendix C). Naturally occurring K-40 was found in nine of 48 samples. The concentration ranged from 22 to 84 pCi/L. No other nuclides were detected and all required LLDs were met.

2. Drinking Water

Monthly samples were collected from a continuous compositor at one location (CL-14). The following analyses were performed:

Gross Beta

Monthly samples were analyzed for concentrations of gross beta (Tables C–II.1, Appendix C). No Gross beta was detected in any of the samples.

Tritium

Monthly samples were composited quarterly and analyzed for tritium activity (Table C–II.2, Appendix C). No tritium was detected in any samples and the required LLD was met.

Iodine-131

Monthly samples from location CL-14 were analyzed for I-131 activity (Table C-II.3, Appendix C). No I-131 was detected in any samples and the required LLD was met.

Gamma Spectrometry

Monthly samples were analyzed for gamma emitting nuclides (Table C–II.4, Appendix C). Naturally occurring K-40 was detected in two samples. The concentrations ranged from 68 to 71 pCi/L. No other nuclides were detected and all required LLDs were met.

3. Well Water

Quarterly grab samples were collected at two locations (CL-7D and CL-12, consisting of CL-12R [a raw water sample from this well] and CL-12T [same well water, but after treatment and available for consumption]). The following analyses were performed:

Tritium

Samples from all locations were analyzed for tritium activity (Table C–III.1, Appendix C). No tritium was detected in any samples and the required LLD was met.

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–III.2, Appendix C). Naturally occurring K-40 was found in one of four samples for location CL-12T. The concentration was 67 pCi/l. No other nuclides were detected in any of the samples and all required LLDs were met.

4. Fish

Fish samples comprised of carp, largemouth bass, bluegill, crappie, and channel catfish were collected at two locations (CL-19 and CL-105) semiannually. The following analysis was performed:

Gamma Spectrometry

The edible portion of fish samples from both locations was analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). Naturally occurring K-40 was found at both locations. No fission or activation products were found. No other nuclides were detected and the required LLDs were met.

5. Shoreline Sediment

Aquatic shoreline sediment samples were collected at CL-7B semiannually and CL-105 annually. The following analysis was performed:

Gamma Spectrometry

Shoreline sediment samples were analyzed for gamma emitting nuclides (Table C–V.1, Appendix C). Naturally occurring K-40 was detected in all samples. No fission or activation products were found. No other nuclides were detected and the required LLDs were met.

B. Atmospheric Environment

1. Airborne

a. Air Particulates

Continuous air particulate samples were collected from 10 locations on a weekly basis. The 10 locations were separated into three groups: Group I represents locations within one mile of the CPS site boundary (CL-2, CL-3, CL-4, CL-6, CL-15 and CL-94); Group II represents the locations at an intermediate distance within one to five miles of CPS (CL-1, CL-7 and CL-8); and Group III represents the control location greater than five miles from CPS (CL-11). The following analyses were performed:

Gross Beta

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

Detectable gross beta activity was observed at all locations. Comparison of results among the three groups aid in determining the effects, if any, resulting from the operation of CPS. The results from the On-Site locations (Group I) ranged from 7 to 53 E–3 pCi/m^3 with a mean of 20 E–3 pCi/m^3. The results from the Intermediate Distance location (Group II) ranged from 7 to 57 E–3 pCi/m^3 with a mean of 20 E–3 pCi/m^3. The results from the Control locations (Group III) ranged from 8 to 51 E–3 pCi/m^3 with a mean of 21 E–3 pCi/m^3. Comparison of the 2013 air particulate data with previous years data indicate no effects from the operation of CPS (Figure C–5, Appendix C). In addition, a comparison of the weekly mean values for 2013 indicate no notable differences among the three groups.

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma emitting nuclides (Table C–VI.3, Appendix C). Naturally occurring cosmogenically produced Be-7 due to cosmic ray activity was detected in 38 of 40 samples. No other nuclides were detected and all required LLDs were met.

b. Airborne Iodine

Continuous air samples were collected from 10 locations (CL-1, CL-2, CL-3, CL-4, CL-6, CL-7, CL-8, CL-11, CL-15 and CL-94) and analyzed weekly for I-131 (Table C-VII.1, Appendix C). All results were less than the MDC and the required LLD was met.

2. Terrestrial

a. Milk

Samples were collected from CL-116 biweekly May through November and monthly December through April to coincide with the grazing season. The following analyses were performed:

Iodine-131

Milk samples were analyzed for concentrations of I-131 (Table C–VIII.1, Appendix C). Iodine-131 was not detected in any of the samples. The required LLD was met.

Gamma Spectrometry

Each milk sample was analyzed for concentrations of gamma emitting nuclides (Table C–VIII.2, Appendix C). Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

b. Food Products

Broadleaf vegetation samples were collected from four locations (CL-114, CL-115, CL-117 and CL-118) monthly June through September to coincide with the harvest season. The following analysis were performed:

Gamma Spectrometry

Each food product sample was analyzed for concentrations of gamma emitting nuclides (Table C–IX.1, Appendix C).

Cosmogenically produced Be–7 due to cosmic ray activity was detected in most samples. Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

c. Grass

Samples were collected from four locations (CL-1, CL-2, CL-8, and CL-116) biweekly May through October. The following analysis were performed:

Gamma Spectrometry

Each grass sample was analyzed for concentrations of gamma emitting nuclides (Table C–IX.2, Appendix C).

Cosmogenically produced Be–7 due to cosmic ray activity was detected in most samples. Naturally occurring K-40 activity was found in all samples. No other nuclides were detected and all required LLDs were met.

C. Ambient Gamma Radiation

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

A total of 216 OSLD measurements were made in 2013. The average dose from the inner ring was 23.1 mR/quarter. The average dose from the outer ring was 23.2 mR/quarter. The average dose from the special interest group was 22.9 mR/quarter. The average dose from the supplemental group was 21.8 mR/quarter. The quarterly measurements ranged from 18.2 to 27.0 mR/quarter.

The inner ring and outer ring measurements compared well to the Control Station, CL-11, which ranged from 20.5 mR/quarter to 23.3 mR/quarter with an average measurement of 21.5 mR/quarter. A comparison of the Inner Ring and Outer Ring data to the Control Location data indicate that the ambient gamma radiation levels from all the locations were comparable. The historical ambient gamma radiation data from the control location were plotted along with similar data from the Inner and Outer Ring Locations (Figure C–2, Appendix C).

D. Land Use Survey

A Land Use Survey conducted during the June through September 2013 growing season around the Clinton Power Station (CPS) was performed by Environmental Inc. (Midwest Labs) for Exelon to comply with Clinton's Offsite Dose Calculation Manual, section 5.2. The purpose of the survey was to document the nearest resident, milk producing animal and garden of greater than 538 m^2 in each of the sixteen 22 ½ degree sectors around the site. The distance and direction of all locations from the CPS Station HVAC vent stack were positioned using Global Positioning System (GPS) technology. There were no changes required to the CPS REMP as a result of this survey. The results of this survey are summarized below.

Distance in Kilometers from the CPS Station HVAC Vent Stack			
Sector	Residence (km)	Garden (km)	Milk Animal (km)
1 N	1.5	1.5	1.5
2 NNE	1.5	4.8	4.8
3 NE	2.1	7.0	> 8
4 ENE	2.9	2.9	6.6
5 E	1.7	1.7	> 8
6 ESE	5.1	5.1	> 8
7 SE	4.4	7.1	> 8
8 SSE	2.9	4.5	> 8
9 S	4.8	6.6	6.6
10 SSW	4.7	> 8	5.5
11 SW	1.2	5.9	> 8
12 WSW	3.6	3.7	5.5
13 W	2.0	3.2	> 8
14 WNW	2.6	2.6	> 8
15 NW	2.7	4.7	> 8
16 NNW	2.1	2.1	2.1

E. Errata Data

Teledyne Brown Engineering (TBE) provides data results [activity, uncertainty and minimum detectable concentration {MDC}]. We are required to calculate the MDC using a multiplier of 4.66.

$$MDA = \frac{4.66\sqrt{\frac{\beta}{\Delta t}}}{2.22\,(v)(y)\,(a)(\varepsilon)}$$

Where:

Δt = counting time for sample (minutes)

β = background rate of instrument blank (cpm)

2.22 = dpm/pCi or : 2.22×10^6 dpm/μCi

v = volume or mass of sample analyzed

y = chemical yield

ε = efficiency of the counter

The formulas for calculating the activity, uncertainty and MDC are contained in the software of the counting equipment. For the gamma system, when the new detector number 08 was added to the system in January 2012, the default value of 3.29 was used to calculated the MDCs on detector 08. The activity and uncertainty were not affected. The multiplier has been changed from 3.29 to the required 4.66.

When the MDCs are recalculated using 4.66, the MDC values will increase by 41.6%. The greatest impact will be on the short-lived nuclides which have an LLD requirement, e.g. I-131, Ba-140 and La-140. Which means there could be some missed LLDs which will be identified in the Errata Data Appendix table of the 2013 annual report. This is not a reportable issue for the NRC. There is also the possibility that naturally produced nuclides that were detected would become a non-detect, e.g Th-228, Th-230, etc.

F. Summary of Results – Inter-Laboratory Comparison Program

The primary laboratory analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation and water matrices for 19 analytes (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 TBE's result 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, 178 out of 185 analyses performed met the specified acceptance criteria. Seven analyses (Sr-89 and Sr-90 in milk, Co-57, Zn-65 and Sr-90 in soil, Cs-134 in air particulate and Sr-90 in vegetation [two low warning in a row]) did not meet the specified acceptance criteria or internal QA requirements for the following reason:

1. Teledyne Brown Engineering's Analytics September 2013 Sr-89 in milk result of 63.9 pCi/L was lower than the known value of 96.0 pCi/L. The failure was a result of analyst error and was specific to the Analytics sample. Client samples for the associated time period were evaluated and no client samples were affected by this failure. NCR 13-15

2. Teledyne Brown Engineering's Analytics September 2013 Sr-90 in milk result of 8.88 pCi/L was lower than the known value of 13.2 pCi/L. The failure was a result of analyst error and was specific to the Analytics sample. Client samples for the associated time period were evaluated and no client samples were affected by this failure. NCR 13-15

3. & 4. Teledyne Brown Engineering's MAPEP September 2013 Co-57 and Zn-65 in soil were evaluated as failing the false positive test. While MAPEP evaluated the results as failures, the gamma software listed the results as non identified nuclides. The two nuclides would never have been reported as detected nuclides to a client. MAPEP does not allow laboratories to put in qualifiers for the submitted data nor "less than" results. MAPEP evaluates results based on the relationship between the activity and the uncertainty. MAPEP spiked the soil sample with an extremely large concentration of Eu-152, which was identified by the gamma software as an interfering nuclide, resulting in forced activity results that were evaluated by MAPEP as detected Co-57 and Zn-65. No client samples were affected by these failures. NCR 13-14

5. Teledyne Brown Engineering's MAPEP September 2013 Sr-90 in soil result of 664 Bq/kg was higher than the known value of 460 Bq/kg, exceeding the upper control limit of 598 Bq/kg. An incorrect Sr-90 result was entered into the MAPEP database. The correct Sr-90 activity of 322 Bq/kg would have been evaluated as acceptable with warning. No client samples were affected by this failure. NCR 13-14

6. Teledyne Brown Engineering's MAPEP September 2013 Cs-134 in air particulate activity of -0.570 Bq/sample was evaluated as a failed false positive test, based on MAPEP's evaluation of the result as a significant negative value at 3 standard deviations. A negative number would never have been reported as a detected nuclide to a client, therefore no client samples were affected by this failure. NCR 13-14

7. Teledyne Brown Engineering's MAPEP September 2013 Sr-90 in vegetation result was investigated due to two low warnings in a row. It appears the September sample was double spiked with carrier, resulting in a low activity. With a recovery of around 50% lower, the Sr-90 result would have fallen within the acceptance range. No client samples were affected by this issue. NCR 13-14

For the EIML laboratory, 89 of 92 analyses met the specified acceptance criteria. Three analyses (AP - Gross Alpha, Soil - Sr-90 and Co-57) did not meet the specified acceptance criteria for the following reasons:

1. Environmental Inc., Midwest Laboratory's MAPEP February 2013 air particulate gross alpha result of 0.14 Bq/total sample was lower than the known value of 1.20 Bq/total sample, exceeding the lower control limit of 0.36 Bq/total sample. The filter was recounted overnight. No significant activity could be detected.

2. Environmental Inc., Midwest Laboratory's MAPEP February 2013 soil Co-57 result of 408.40 Bq/kg was lower than the known value of 628.0 Bq/kg, exceeding the lower control limit of 440.0 Bq/kg. The sample was reanalyzed using additional fuming nitric separations. The reanalysis result of 574.4 fell within the control limits.
3. Environmental Inc., Midwest Laboratory's MAPEP August 2013 soil Co-57 result of 699.60 Bq/kg was higher than the known value of 0.00 Bq/kg, exceeding the upper control limit of 5.00 Bq/kg. Interference from Eu-152 resulted in misidentification of Co-57.

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

V. References

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3. CPS 2011 Annual Radioactive Effluent Release Report.
4. "Environmental Radioactivity," M. Eisenbud, 1987 (E187).
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6. Federal Radiation Council Report No. 1, "Background Material for the Development of Radiation Protection Standards," May 13, 1960.
7. International Commission on Radiation Protection, Publication 2, "Report of Committee II on Permissible Dose for Internal Radiation," (1959) with 1962 Supplement issued in ICRP Publication 6; Publication 9, "Recommendations on Radiation Exposure," (1965); ICRP Publication 7 (1965), amplifying specific recommendations of Publication 26 (1977).
8. International Commission on Radiation Protection, Publication No. 39 (1984), "Principles of Limiting Exposure to the Public to Natural Sources of Radiation".
9. "Radioactivity in the Environment: Sources, Distribution and Surveillance," Ronald L. Kathren, 1984.
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Concentrations of Radionuclides in Air and Water for Occupational Exposure," (Published as National Bureau of Standards Handbook 69, issued June 1959, superseding Handbook 52).

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12. National Council on Radiation Protection and Measurements, Report No. 44, "Krypton-85 in the Atmosphere – Accumulation, Biological Significance, and Control Technology," July 1975.

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19. United States Nuclear Regulatory Commission Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program," Revision 1, November 1979.

20. United States Nuclear Regulatory Commission, Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Norm Operations) – Effluent Streams and the Environment," Revision 1, February 1979.

21. Technical Specifications, Clinton Power Station, Unit No. 1, Docket No. 50-461, Office of Nuclear Reactor Regulation, 1986. Facility Operating License Number NPF-62.

22. Clinton Power Station, Updated Safety Analysis Report.

23. Clinton Power Station, Unit 1, Off-Site Dose Calculation Manual.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER:** 50-461 2013
LOCATION OF FACILITY: DEWITT COUNTY, IL **REPORTING PERIOD:**

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)	I-131	12	1	<LLD	NA			0
	H-3	16	2000	<LLD	<LLD	-		0
	GAMMA	48						
	BE-7		NA	<LLD	<LLD	-		0
	K-40		NA	53 (3/24) (22/80)	62 (6/24) (35/84)	67 (3/12) (62/72)	CL-91 CONTROL PARNELL BOAT ACCESS 6.1 MILES ENE OF SITE	0
	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 PARENTHESES (F)

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LOCATION OF FACILITY: DEWITT COUNTY, IL **REPORTING PERIOD:**

				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<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
	CE-144		NA	<LLD	<LLD	-		0

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				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
DRINKING WATER (PCI/LITER)	GR-B	12	4	<LLD	NA	-		0
	H-3	4	2000	<LLD	NA	-		0
	I-131	12	1	<LLD	NA	-		0
	GAMMA	12						
	BE-7		NA	<LLD	NA	-		0
	K-40		NA	69 (2/12) (68/71)	NA	69 (2/12) (68/71)	CL-14 INDICATOR STATION PLANT SERVICE BLDG ONSITE	0
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0

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DRINKING WATER (PCI/LITER)	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<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
	CE-144		NA	<LLD	NA	-		0

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WELL WATER (PCI/LITER)	H-3	12	2000	<LLD	NA	-		0
	GAMMA	12						
	BE-7		NA	<LLD	NA	-		0
	K-40		NA	67 (1/12)	NA	67 (1/4)	CL-12T INDICATOR DEWITT PUMP HOUSE 1.6 MILES E OF SITE	0
	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

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WELL WATER (PCI/LITER)	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<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
	CE-144		NA	<LLD	NA	-		0
FISH (PCI/KG WET)	GAMMA	16						
	BE-7		NA	<LLD	<LLD	-		0

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FISH (PCI/KG WET)	K-40		NA	3639 (8/8) (2920/4494)	3690 (8/8) (1324/6694)	3690 (8/8) (1324/6694)	CL-105 CONTROL LAKE SHELBYVILLE 50 MILES S OF SITE	0
	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
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0

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FISH (PCI/KG WET)	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	4						
	BE-7		NA	<LLD	<LLD	-		0
	K-40		NA	7657 (2/2) (7632/7681)	10282 (2/2) (7834/12730)	10282 (2/2) (7834/12730)	CL-105 CONTROL LAKE SHELBYVILLE 50 MILES S OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0

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				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (PCI/KG DRY)	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		150	<LLD	<LLD	-		0
	CS-137		180	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0

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SEDIMENT (PCI/KG DRY)	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	520	10	20 (466/468) (7/57)	21 (52/52) (8/51)	21 (52/52) (9/51)	CL-94 INDICATOR OLD CLINTON ROAD 0.6 MILES E OF SITE	0
	GAMMA	40						
	BE-7		NA	70 (34/36) (35/103)	79 (4/4) (57/98)	88 (4/4) (53/103)	CL-4 INDICATOR RESIDENCE NEAR RECREATION AREA 0.8 MILES SW OF SITE	0
	K-40		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0

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AIR PARTICULATE (E-3 PCI/CU.METER)	RU-103		NA	<LLD	<LLD	-		0
	RU-106		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0
	CE-141		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA	520						
	I-131		70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	20	1	NA	<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 PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION
LOCATION OF FACILITY: DEWITT COUNTY, IL
DOCKET NUMBER: 50-461 2013
REPORTING PERIOD:

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	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (PCI/LITER)	GAMMA	20						
	BE-7		NA	NA	<LLD	-		0
	K-40		NA	NA	1242 (20/20) (1019/1412)	1242 (20/20) (1019/1412)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	MN-54		NA	NA	<LLD	-		0
	CO-58		NA	NA	<LLD	-		0
	FE-59		NA	NA	<LLD	-		0
	CO-60		NA	NA	<LLD	-		0
	ZN-65		NA	NA	<LLD	-		0
	NB-95		NA	NA	<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 PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:		50-461 2013		
LOCATION OF FACILITY:	DEWITT COUNTY, IL			REPORTING PERIOD:				
				INDICATOR LOCATIONS	CONTROL LOCATION	LOCATION WITH HIGHEST ANNUAL MEAN (M)		
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (PCI/LITER)	ZR-95		NA	NA	<LLD	-		0
	CS-134		15	NA	<LLD	-		0
	CS-137		18	NA	<LLD	-		0
	BA-140		60	NA	<LLD	-		0
	LA-140		15	NA	<LLD	-		0
	CE-144		NA	NA	<LLD	-		0
VEGETATION (PCI/KG WET)	GAMMA	48						
	BE-7		NA	283 (32/36) (73/731)	314 (12/12) (46/653)	320 (11/12) (96/582)	CL-118 INDICATOR SITE'S MAIN ACCESS ROAD 0.7 MILES NNE OF SITE	0
	K-40		NA	5053 (36/36) (2177/10940)	5583 (12/12) (2804/8335)	6166 (12/12) (2289/10940)	CL-118 INDICATOR SITE'S MAIN ACCESS ROAD 0.7 MILES NNE OF SITE	0

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

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION | **DOCKET NUMBER: 50-461 2013**

LOCATION OF FACILITY: DEWITT COUNTY, IL | **REPORTING PERIOD:**

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
VEGETATION (PCI/KG WET)	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	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
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<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 PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION — DOCKET NUMBER: 50-461 2013
LOCATION OF FACILITY: DEWITT COUNTY, IL — REPORTING PERIOD:

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	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION (PCI/KG WET)	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
GRASS (PCI/KG WET)	GAMMA	52						
	BE-7		NA	1635 (37/39) (221/3930)	1836 (13/13) (628/3244)	1836 (13/13) (628/3244)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	K-40		NA	5982 (39/39) (3416/10380)	5227 (13/13) (3568/6460)	6991 (13/13) (4895/10380)	CL-08 INDICATOR DEWITT CEMETERY 2.2 MILES E OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<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 PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION   DOCKET NUMBER: 50-461 2013
LOCATION OF FACILITY: DEWITT COUNTY, IL   REPORTING PERIOD:

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	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS (PCI/KG WET)	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
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<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 PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2013

NAME OF FACILITY: CLINTON POWER STATION — DOCKET NUMBER: 50-461 2013

LOCATION OF FACILITY: DEWITT COUNTY, IL — REPORTING PERIOD:

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
GRASS (PCI/KG WET)	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-ROENTGEN/QTR.)	OSLD-QUARTERLY	216	NA	23 (212/212) (18.2/27.0)	22 (4/4) (20.5/23.3)	25 (4/4) (22.2/26.9)	CL-56 INDICATOR 4.1 MILES SSE	0

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

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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, Clinton Power Station, 2013

Location	Location Description	Distance & Direction From Site
A. Surface Water		
Cl-13	Salt Creek Bridge on Rt. 10 (indicator)	3.6 miles SW
CL-90	Discharge Flume (indicator)	0.4 miles SE
CL-91	Parnell Boat Access (control)	6.1 miles ENE
CL-99	North Fork Access (control)	3.5 miles NNE
B. Drinking (Potable) Water		
CL-14	Station Plant Service Bldg (indicator)	Onsite
C. Well Water		
CL-7D	Mascoutin Recreation Area (indicator)	2.3 miles ESE
CL-12T	DeWitt Pump House (indicator)	1.6 miles E
CL-12R	DeWitt Pump House (indicator)	1.6 miles E
D. Milk - bi-weekly / monthly		
CL-116	Dement Dairy (control)	14 miles WSW
E. Air Particulates / Air Iodine		
CL-1	Camp Quest	1.8 miles W
CL-2	Clinton's Main Access Road	0.7 miles NNE
CL-3	Clinton's Secondary Access Road	0.7 miles NE
CL-4	Residence Near Recreation Area	0.8 miles SW
CL-6	Clinton's Recreation Area	0.7 miles WSW
CL-7	Mascoutin Recreation Area	2.3 miles SE
CL-8	DeWitt Cemetery	2.2 miles E
CL-11	Illinois Power Substation (Control)	16 miles S
CL-15	Rt. 900N Residence	0.9 miles N
CL-94	Old Clinton Road	0.6 miles E
F. Fish		
CL-19	End of Discharge Flume (indicator)	3.4 miles E
CL-105	Lake Shelbyville (control)	50 miles S
G. Shoreline Sediment		
CL-7B	Clinton Lake (indicator)	2.1 miles SE
CL-105	Lake Shelbyville (control)	50 miles S
H. Food Products		
CL-114	Cisco (Control)	12.5 miles SSE
CL-115	Site's Secondary Access Road	0.7 miles NE
CL-117	Residence North of Site	0.9 miles N
CL-118	Site's Main Access Road	0.7 miles NNE
I. Grass		
CL-1	Camp Quest	1.8 miles W
CL-2	Clinton's Main Access Road	0.7 miles NNE
CL-8	DeWitt Cemetery	2.2 miles E
CL-116	Pasture in Rural Kenney	14 miles WSW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2013

Location	Location Description	Distance & Direction From Site
J. Environmental Dosimetry - OSLD		
Inner Ring		
CL-1		1.8 miles W
CL-5		0.7 miles NNE
CL-22		0.6 miles NE
CL-23		0.5 miles ENE
CL-24		0.5 miles E
CL-34		0.8 miles WNW
CL-35		0.7 miles NW
CL-36		0.6 miles N
CL-42		2.8 miles ESE
CL-43		2.8 miles SE
CL-44		2.3 miles SSE
CL-45		2.8 miles S
CL-46		2.8 miles SSW
CL-47		3.3 miles SW
CL-48		2.3 miles WSW
CL-63		1.3 miles NNW
Outer Ring		
CL-51		4.4 miles NW
CL-52		4.3 miles NNW
CL-53		4.3 miles E
CL-54		4.6 miles ESE
CL-55		4.1 miles SE
CL-56		4.1 miles SSE
CL-57		4.6 miles S
CL-58		4.3 miles SSW
CL-60		4.5 miles SW
CL-61		4.5 miles WSW
CL-76		4.6 miles N
CL-77		4.5 miles NNE
CL-78		4.8 miles NE
CL-79		4.5 miles ENE
CL-80		4.1 miles W
CL-81		4.5 miles WNW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2013

Location	Location Description	Distance & Direction From Site
J. Environmental Dosimetry – OSLD (cont.)		
Special Interest		
CL-37		3.4 miles N
CL-41		2.4 miles E
CL-49		3.5 miles W
CL-64		2.1 miles WNW
CL-65		2.6 miles ENE
CL-74		1.9 miles W
CL-75		0.9 miles N
Supplemental		
CL-2		0.7 miles NNE
CL-3		0.7 miles NE
CL-4		0.8 miles SW
CL-6		0.8 miles WSW
CL-7		2.3 miles SE
CL-8		2.2 miles E
CL-15		0.9 miles N
CL-33		11.7 miles SW
CL-84		0.6 miles E
CL-90		0.4 miles SE
CL-91		6.1 miles ENE
CL-97		10.3 miles SW
CL-99		3.5 miles NNE
CL-114		12.5 miles SE
Control		
CL-11		16 miles S

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2013

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Surface Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Surface Water	I-131	Monthly composite from a continuous water compositor.	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor.	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Drinking Water	I-131	Quarterly composite from a continuous water compositor.	TBE, TBE-2031 Radioactive Iodine in Drinking Water Env. Inc., SPM-1 Sampling Procedure Manual
Well Water	Gamma Spectroscopy	Quarterly composite from a continuous water compositor.	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Well Water	Tritium	Quarterly composite from a continuous water compositor.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation Env. Inc., SPM-1 Sampling Procedure Manual
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
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 Env. Inc., SPM-1 Sampling Procedure Manual
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE-2007 Gamma emitting radioisotope analysis Env. Inc., SPM-1 Sampling Procedure Manual

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Clinton Power Station, 2013

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Food Products	Gross Beta	Monthly grab, June through September	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices Env. Inc., SPM-1 Sampling Procedure Manual
Food Products	Gamma Spectroscopy	Monthly grab June through September	TBE, TBE-2007 Gamma emitting radioisotopes analysis Env. Inc., SPM-1 Sampling Procedure Manual
Grass	Gamma Spectroscopy	Biweekly May through October	TBE, TBE-2007 Gamma emitting radioisotopes analysis Env. Inc., SPM-1 Sampling Procedure Manual
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	Landauer Incorporated

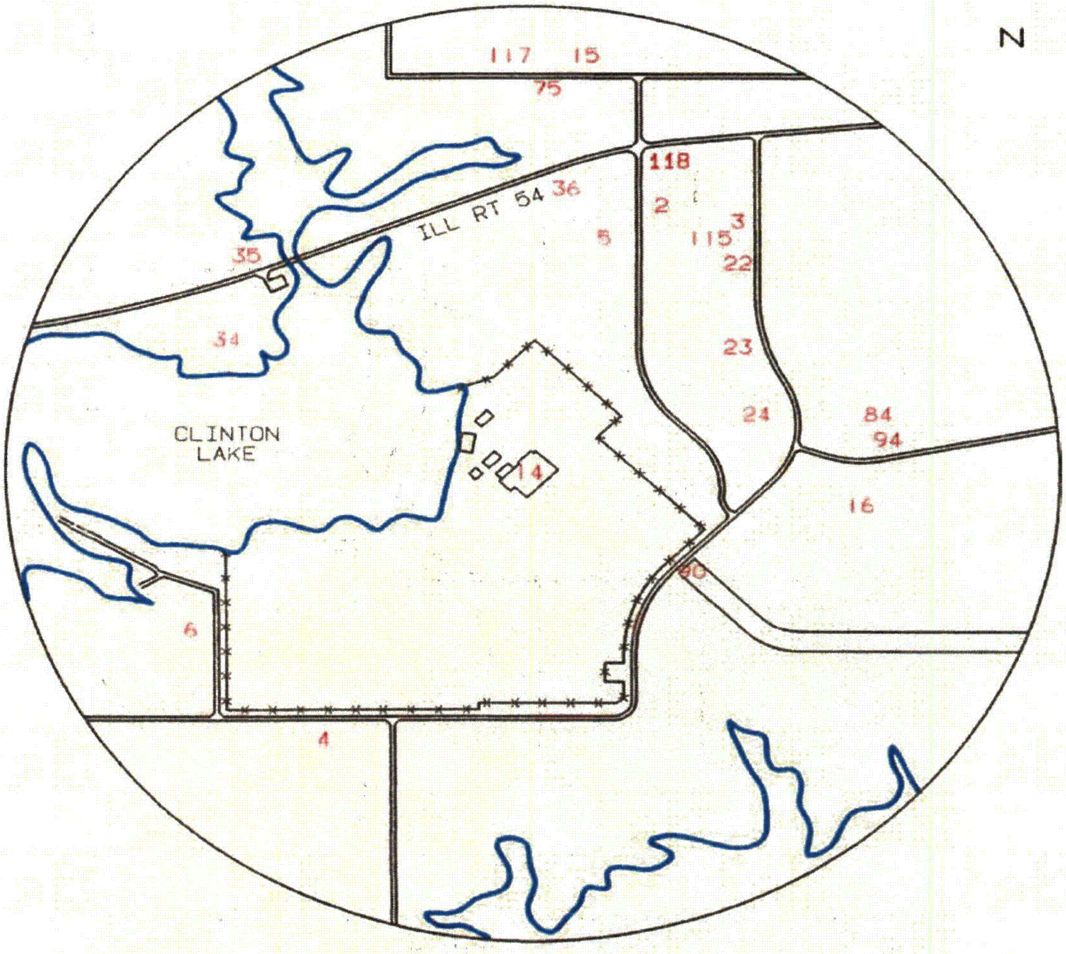

Figure B-1
Environmental Sampling Locations Within One
Mile of the Clinton Power Station, 2013

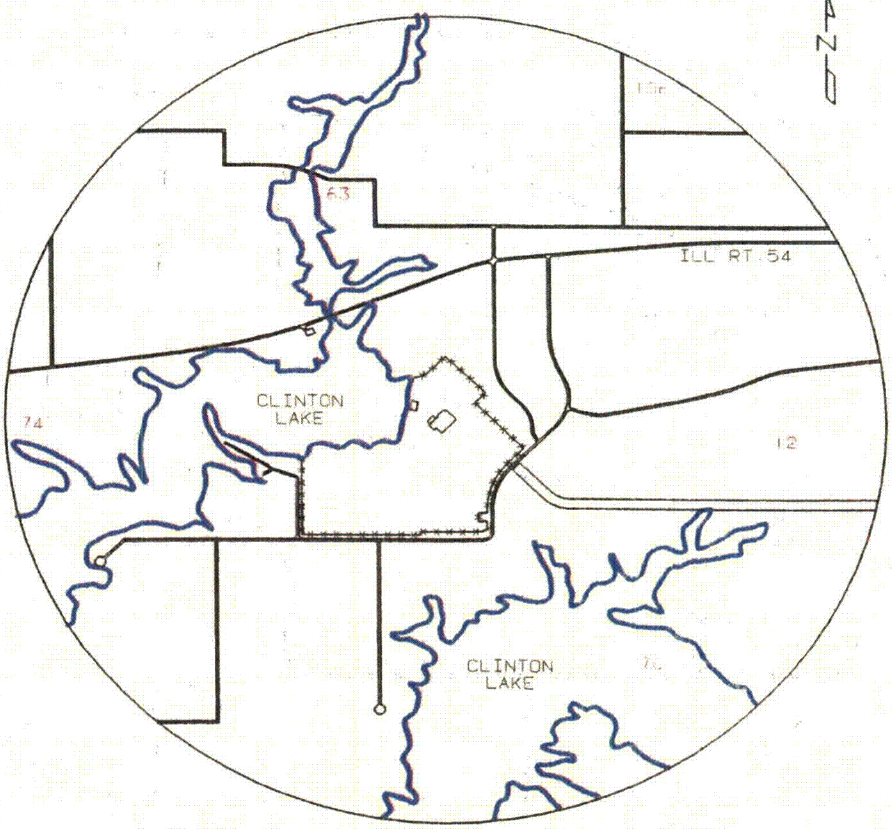

Figure B-2
Environmental Sampling Locations Between One and Two
Miles of the Clinton Power Station, 2013

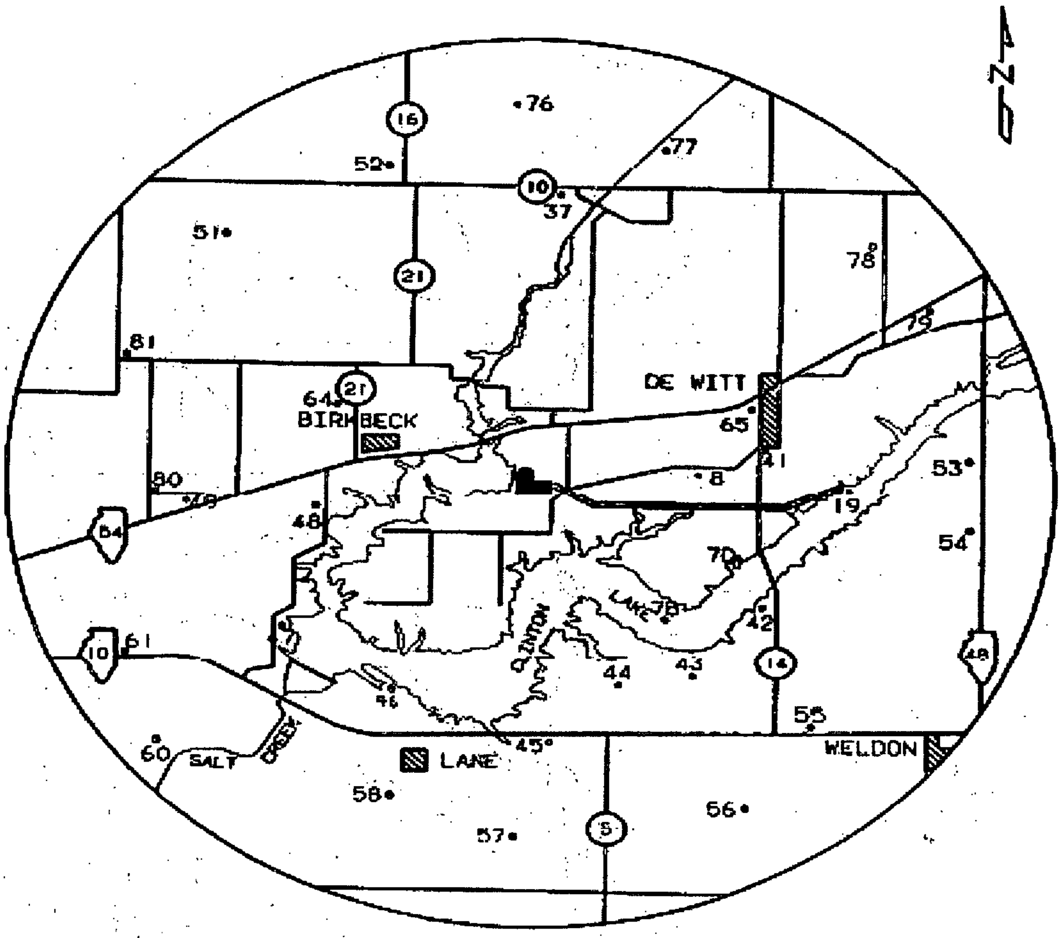

Figure B-3
Environmental Sampling Locations Between Two and Five Miles from the Clinton Power Station, 2013

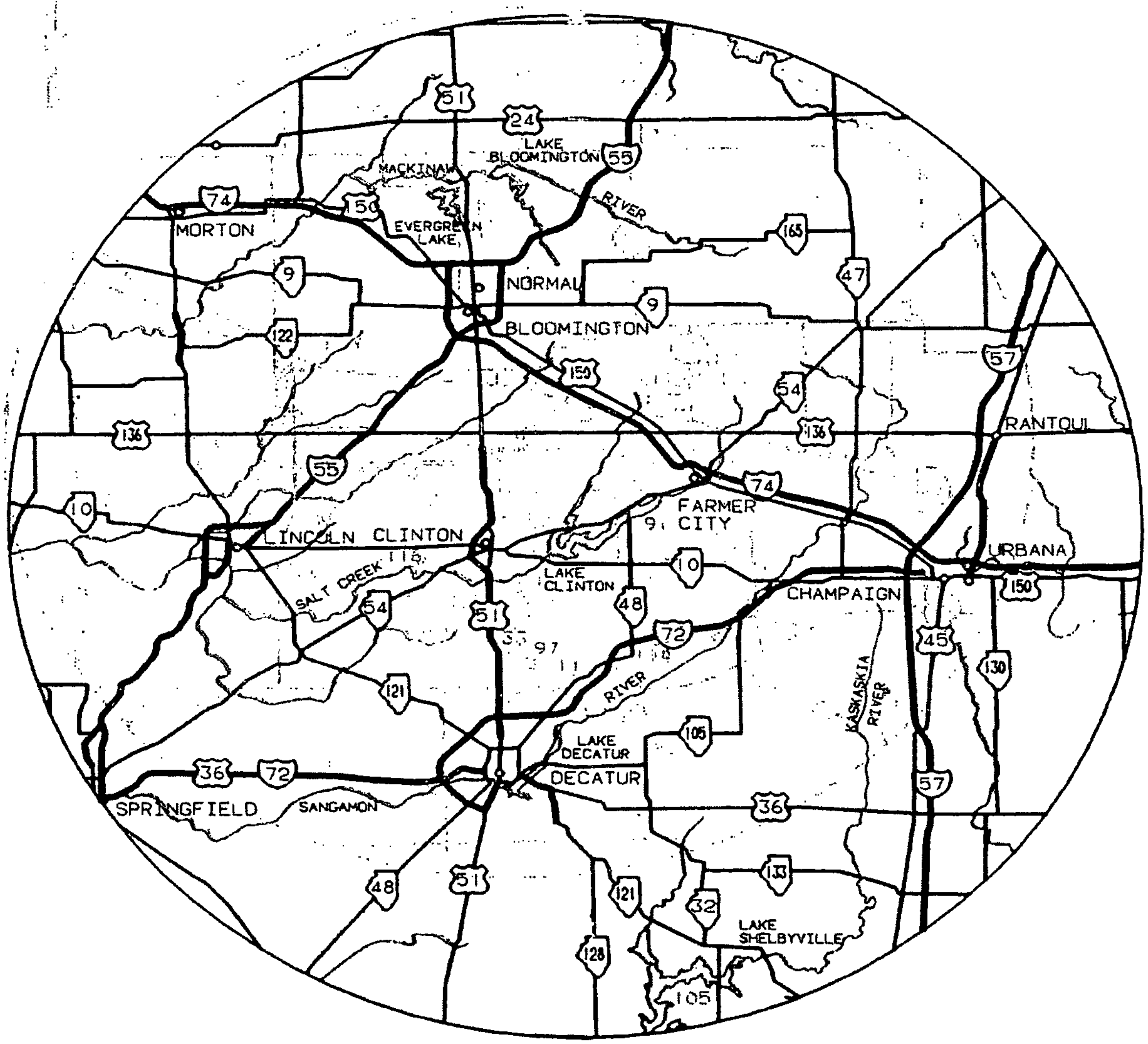

Figure B-4
Environmental Sampling Locations Greater Than Five
Miles of the Clinton Power Station, 2013

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APPENDIX C

DATA TABLES AND FIGURES - PRIMARY LABORATORY

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Table C-I.1 **CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90
12/26/12 - 01/30/13	< 0.5
01/30/13 - 02/27/13	< 0.5
02/27/13 - 03/27/13	< 0.7
03/27/13 - 04/24/13	< 0.7
04/24/13 - 05/29/13	< 0.6
05/29/13 - 06/26/13	< 0.5 (1)
06/26/13 - 07/31/13	< 0.6
07/31/13 - 08/28/13	< 0.7
08/28/13 - 09/25/13	< 0.5
09/25/13 - 10/30/13	< 0.6
10/30/13 - 11/27/13	< 0.7
11/27/13 - 12/26/13	< 0.4
MEAN	-

Table C-I.2 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-90	CL-13	CL-91	CL-99
01/30/13 - 03/27/13	< 182	< 183	< 182	< 182 (1)
04/24/13 - 06/26/13	< 191 (1)	< 193	< 194	< 190 (1)
07/31/13 - 09/25/13	< 163	< 167	< 165	< 166 (1)
10/30/13 - 12/26/13	< 163	< 167	< 166	< 167 (1)
MEAN	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-I.3 CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-13	01/30/13 - 01/30/13	< 61	< 48	< 5	< 5	< 13	< 5	< 10	< 6	< 10	< 6	< 6	< 30	< 10	< 55
	02/27/13 - 02/27/13	< 28	< 77	< 3	< 3	< 7	< 3	< 7	< 3	< 6	< 3	< 3	< 12	< 6	< 24
	03/27/13 - 03/27/13	< 30	< 58	< 3	< 3	< 7	< 3	< 6	< 4	< 6	< 3	< 3	< 23	< 8	< 21
	04/24/13 - 04/24/13	< 34	57 ± 42	< 4	< 3	< 8	< 4	< 5	< 4	< 7	< 3	< 4	< 26	< 8	< 27
	05/29/13 - 05/29/13	< 32	< 44	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 4	< 4	< 17	< 6	< 33
	06/26/13 - 06/26/13	< 17	< 29	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 5	< 12
	07/31/13 - 07/31/13	< 33	< 81	< 4	< 4	< 6	< 4	< 8	< 4	< 6	< 4	< 4	< 17	< 4	< 29
	08/28/13 - 08/28/13	< 15	22 ± 19	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 1	< 15	< 5	< 12
	09/25/13 - 09/25/13	< 48	< 49	< 5	< 5	< 12	< 6	< 10	< 6	< 10	< 4	< 5	< 34	< 10	< 30
	10/30/13 - 10/30/13	< 35	< 31	< 4	< 4	< 7	< 4	< 8	< 4	< 8	< 4	< 4	< 28	< 7	< 30
	11/27/13 - 11/27/13	< 40	80 ± 51	< 4	< 4	< 10	< 5	< 9	< 5	< 7	< 4	< 4	< 31	< 11	< 41
	12/26/13 - 12/26/13	< 34	< 69	< 3	< 4	< 7	< 3	< 7	< 4	< 6	< 3	< 4	< 23	< 8	< 25
	MEAN	-	53 ± 58	-	-	-	-	-	-	-	-	-	-	-	-
CL-90	12/26/12 - 01/30/13	< 48	< 44	< 4	< 4	< 7	< 4	< 13	< 4	< 8	< 6	< 5	< 26	< 5	< 41
	01/30/13 - 02/27/13	< 33	< 72	< 3	< 3	< 8	< 4	< 7	< 4	< 7	< 3	< 4	< 16	< 6	< 25
	02/27/13 - 03/27/13	< 42	< 81	< 4	< 4	< 11	< 5	< 9	< 5	< 8	< 4	< 5	< 34	< 11	< 28
	03/27/13 - 04/24/13	< 35	< 65	< 3	< 3	< 7	< 3	< 7	< 4	< 6	< 3	< 4	< 28	< 7	< 29
	04/24/13 - 05/29/13	< 32	< 37	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 4	< 4	< 21	< 6	< 33
	05/29/13 - 06/26/13 (1)	< 15	< 32	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 2	< 12	< 4	< 11
	06/26/13 - 07/31/13	< 29	< 62	< 3	< 3	< 8	< 4	< 7	< 4	< 6	< 3	< 4	< 17	< 5	< 25
	07/31/13 - 08/28/13	< 22	< 38	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 23	< 6	< 19
	08/28/13 - 09/25/13	< 36	< 35	< 4	< 4	< 9	< 4	< 9	< 5	< 7	< 3	< 4	< 26	< 10	< 28
	09/25/13 - 10/30/13	< 37	< 56	< 2	< 4	< 12	< 5	< 7	< 3	< 8	< 4	< 4	< 29	< 8	< 23
	10/30/13 - 11/27/13	< 38	< 34	< 4	< 4	< 11	< 4	< 9	< 5	< 9	< 4	< 4	< 33	< 11	< 33
	11/27/13 - 12/26/13	< 34	< 77	< 3	< 4	< 8	< 3	< 7	< 4	< 7	< 3	< 4	< 25	< 7	< 32
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-91	12/26/12 - 01/30/13	< 55	< 59	< 7	< 7	< 15	< 6	< 13	< 6	< 12	< 6	< 6	< 33	< 9	< 38
	01/30/13 - 02/27/13	< 33	< 43	< 4	< 4	< 8	< 4	< 8	< 4	< 7	< 3	< 4	< 16	< 5	< 31
	02/27/13 - 03/27/13	< 35	72 ± 47	< 4	< 4	< 10	< 4	< 9	< 5	< 8	< 4	< 4	< 29	< 10	< 31
	03/27/13 - 04/24/13	< 42	69 ± 51	< 4	< 5	< 9	< 4	< 9	< 5	< 9	< 4	< 4	< 34	< 11	< 29
	04/24/13 - 05/29/13	< 61	< 72	< 7	< 8	< 14	< 6	< 16	< 8	< 13	< 7	< 7	< 30	< 10	< 35
	05/29/13 - 06/26/13	< 21	< 45	< 2	< 2	< 5	< 2	< 5	< 3	< 4	< 2	< 2	< 17	< 6	< 12
	06/26/13 - 07/31/13	< 66	< 62	< 7	< 6	< 16	< 7	< 11	< 7	< 12	< 7	< 8	< 33	< 13	< 43
	07/31/13 - 08/28/13	< 17	< 16	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 17	< 6	< 12
	08/28/13 - 09/25/13	< 42	< 49	< 5	< 5	< 12	< 5	< 10	< 6	< 10	< 5	< 5	< 38	< 11	< 26
	09/25/13 - 10/30/13	< 34	< 38	< 4	< 4	< 10	< 4	< 8	< 4	< 7	< 4	< 4	< 26	< 7	< 28
	10/30/13 - 11/27/13	< 43	62 ± 50	< 4	< 4	< 9	< 5	< 8	< 5	< 8	< 4	< 5	< 28	< 9	< 29
	11/27/13 - 12/26/13	< 41	< 36	< 4	< 4	< 9	< 4	< 7	< 5	< 7	< 4	< 4	< 31	< 8	< 37
	MEAN	-	67 ± 10	-	-	-	-	-	-	-	-	-	-	-	-
CL-99	12/26/12 - 01/30/13 (1)	< 42	< 65	< 4	< 5	< 10	< 5	< 9	< 5	< 9	< 4	< 5	< 24	< 6	< 34
	01/30/13 - 02/27/13	< 30	48 ± 45	< 4	< 3	< 7	< 4	< 6	< 3	< 6	< 3	< 4	< 15	< 6	< 25
	02/27/13 - 03/27/13	< 42	< 35	< 4	< 4	< 9	< 4	< 8	< 4	< 7	< 4	< 4	< 30	< 10	< 34
	03/27/13 - 04/24/13	< 34	< 35	< 4	< 4	< 8	< 4	< 6	< 4	< 7	< 4	< 4	< 30	< 9	< 26
	04/24/13 - 05/29/13	< 46	< 43	< 5	< 5	< 10	< 5	< 10	< 5	< 9	< 4	< 6	< 25	< 9	< 42
	05/29/13 - 06/26/13 (1)	< 18	< 15	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 14	< 4	< 13
	06/26/13 - 07/31/13 (1)	< 50	< 115	< 4	< 5	< 11	< 5	< 8	< 6	< 9	< 6	< 6	< 24	< 6	< 42
	07/31/13 - 08/28/13	< 18	35 ± 33	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 19	< 7	< 11
	08/28/13 - 09/25/13	< 40	84 ± 52	< 4	< 5	< 9	< 4	< 8	< 5	< 8	< 4	< 4	< 30	< 8	< 33
	09/25/13 - 10/30/13	< 36	< 70	< 3	< 4	< 8	< 4	< 8	< 4	< 8	< 4	< 4	< 24	< 7	< 29
	10/30/13 - 11/27/13	< 39	< 88	< 5	< 4	< 10	< 5	< 9	< 5	< 9	< 4	< 5	< 34	< 11	< 32
	11/27/13 - 12/11/13 (1)	< 14	< 27	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 1	< 1	< 21	< 7	< 9
	MEAN	-	56 ± 50	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-II.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/26/12 - 01/30/13	< 2.1
01/30/13 - 02/27/13	< 2.3
02/27/13 - 03/27/13	< 1.7
03/27/13 - 04/24/13	< 1.5
04/24/13 - 05/29/13	< 1.9
05/29/13 - 06/26/13	< 2.1
06/26/13 - 07/31/13	< 2.0
07/31/13 - 08/28/13	< 2.0
08/28/13 - 09/25/13	< 1.6 (1)
09/25/13 - 10/30/13	< 1.7
10/30/13 - 11/27/13	< 2.6
11/27/13 - 12/26/13	< 1.4
MEAN	-

Table C-II.2 CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/26/12 - 03/27/13	< 185
03/27/13 - 06/26/13	< 194
06/26/13 - 09/25/13	< 166 (1)
09/25/13 - 12/11/13	< 183
MEAN	-

Table C-II.3 CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-14
12/26/12 - 01/30/13	< 0.5
01/30/13 - 02/27/13	< 0.7
02/27/13 - 03/27/13	< 0.6
03/27/13 - 04/24/13	< 0.7
04/24/13 - 05/29/13	< 0.5
05/29/13 - 06/26/13	< 0.6
06/26/13 - 07/31/13	< 0.6
07/31/13 - 08/28/13	< 0.8
08/28/13 - 09/25/13	< 0.5 (1)
09/25/13 - 10/30/13	< 0.6
10/30/13 - 11/27/13	< 0.8
11/27/13 - 12/26/13	< 0.6
MEAN	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-14	12/26/12 - 01/30/13	< 53	< 60	< 5	< 5	< 10	< 6	< 10	< 6	< 8	< 6	< 6	< 25	< 10	< 36
	01/30/13 - 02/27/13	< 37	< 96	< 4	< 4	< 8	< 5	< 10	< 5	< 9	< 4	< 5	< 21	< 6	< 31
	02/27/13 - 03/27/13	< 31	< 35	< 3	< 4	< 8	< 3	< 5	< 4	< 6	< 3	< 3	< 26	< 8	< 26
	03/27/13 - 04/24/13	< 35	< 32	< 3	< 4	< 8	< 4	< 7	< 4	< 7	< 3	< 3	< 27	< 7	< 27
	04/24/13 - 05/29/13	< 46	71 ± 56	< 5	< 5	< 11	< 5	< 10	< 5	< 9	< 5	< 5	< 26	< 8	< 37
	05/29/13 - 06/26/13	< 22	< 46	< 2	< 2	< 5	< 2	< 5	< 2	< 4	< 2	< 2	< 17	< 5	< 17
	06/26/13 - 07/31/13	< 35	< 76	< 4	< 4	< 7	< 4	< 7	< 4	< 7	< 4	< 5	< 19	< 6	< 36
	07/31/13 - 08/28/13	< 20	< 33	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 21	< 7	< 14
	08/28/13 - 09/25/13 (1)	< 38	< 76	< 4	< 5	< 10	< 4	< 8	< 4	< 9	< 4	< 4	< 30	< 10	< 35
	09/25/13 - 10/30/13	< 25	< 84	< 3	< 3	< 4	< 3	< 8	< 3	< 6	< 3	< 3	< 18	< 7	< 24
	10/30/13 - 11/27/13	< 48	68 ± 57	< 5	< 6	< 12	< 5	< 9	< 6	< 10	< 5	< 5	< 37	< 11	< 38
	11/27/13 - 12/26/13	< 33	< 20	< 3	< 3	< 8	< 3	< 6	< 3	< 8	< 3	< 4	< 27	< 6	< 28
	MEAN	-	69 ± 4	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-III.1 **CONCENTRATIONS OF TRITIUM IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-12R	CL-12T	CL-7D
03/27/13 - 03/27/13	< 160	< 160	< 161
06/26/13 - 06/26/13	< 186	< 184	< 175
09/25/13 - 09/25/13	< 178	< 176	< 177
12/27/13 - 12/27/13	< 183	< 186	< 183
MEAN	-	-	-

Table C-III.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-12R	03/27/13	< 36	< 35	< 4	< 4	< 7	< 4	< 6	< 4	< 7	< 4	< 4	< 31	< 8	< 34
	06/26/13	< 18	< 15	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 14	< 4	< 14
	09/25/13	< 43	< 46	< 5	< 5	< 11	< 4	< 10	< 5	< 8	< 4	< 4	< 30	< 10	< 37
	12/26/13	< 44	< 39	< 4	< 5	< 9	< 4	< 8	< 5	< 8	< 4	< 5	< 29	< 7	< 36
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-12T	03/27/13	< 37	67 ± 53	< 3	< 5	< 7	< 4	< 8	< 4	< 8	< 4	< 4	< 29	< 9	< 20
	06/26/13	< 20	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 16	< 5	< 17
	09/25/13	< 36	< 74	< 4	< 4	< 10	< 4	< 7	< 4	< 7	< 4	< 4	< 28	< 11	< 30
	12/26/13	< 44	< 34	< 5	< 5	< 10	< 6	< 10	< 6	< 8	< 5	< 5	< 29	< 12	< 35
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-7D	03/27/13	< 39	< 37	< 4	< 4	< 9	< 4	< 8	< 4	< 6	< 4	< 4	< 28	< 9	< 29
	06/26/13	< 17	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 4	< 2	< 2	< 13	< 4	< 13
	09/25/13	< 44	< 42	< 4	< 4	< 9	< 5	< 9	< 5	< 8	< 4	< 4	< 31	< 9	< 34
	12/27/13	< 50	< 117	< 5	< 6	< 9	< 6	< 12	< 6	< 9	< 5	< 6	< 35	< 10	< 29
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1 **CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-105															
Bluegill	04/22/13	< 926	3058 ± 1090	< 92	< 86	< 175	< 77	< 143	< 88	< 171	< 75	< 80	< 937	< 161	< 591
Carp	04/22/13	< 689	4348 ± 878	< 58	< 57	< 157	< 54	< 127	< 71	< 125	< 65	< 63	< 699	< 185	< 418
Crappie	04/22/13	< 719	3475 ± 875	< 65	< 76	< 165	< 74	< 146	< 77	< 123	< 64	< 65	< 844	< 227	< 415
Largemouth Bass	04/22/13	< 398	4128 ± 882	< 48	< 41	< 136	< 50	< 99	< 56	< 69	< 33	< 49	< 566	< 209	< 230
Bluegill	10/01/13	< 777	2622 ± 698	< 70	< 83	< 199	< 84	< 148	< 74	< 140	< 57	< 73	< 1122	< 360	< 485
Carp	10/01/13	< 275	1324 ± 742	< 35	< 27	< 105	< 34	< 53	< 37	< 64	< 27	< 32	< 489	< 163	< 234
Crappie	10/01/13	< 1166	6694 ± 1402	< 86	< 124	< 216	< 108	< 174	< 134	< 211	< 77	< 99	< 1550	< 386	< 895
Largemouth bass	10/01/13	< 601	3874 ± 664	< 54	< 70	< 151	< 63	< 125	< 73	< 114	< 59	< 53	< 1017	< 248	< 359
	MEAN	-	3690 ± 3105	-	-	-	-	-	-	-	-	-	-	-	-
CL-19															
Bluegill	04/22/13	< 496	2920 ± 779	< 41	< 53	< 133	< 39	< 94	< 60	< 100	< 48	< 46	< 456	< 138	< 254
Carp	04/22/13	< 561	4404 ± 905	< 60	< 81	< 149	< 65	< 137	< 81	< 134	< 64	< 65	< 727	< 271	< 323
Channel Catfish	04/22/13	< 570	4102 ± 1048	< 57	< 66	< 128	< 57	< 123	< 64	< 126	< 49	< 53	< 577	< 195	< 240
Largemouth Bass	04/22/13	< 512	3656 ± 725	< 48	< 54	< 126	< 62	< 117	< 62	< 112	< 49	< 53	< 673	< 170	< 233
Bluegill	10/01/13	< 619	3039 ± 813	< 54	< 68	< 139	< 58	< 112	< 65	< 124	< 45	< 50	< 917	< 302	< 273
Carp	10/01/13	< 650	4494 ± 818	< 61	< 76	< 164	< 56	< 131	< 71	< 131	< 46	< 62	< 995	< 414	< 446
Channel Catfish	10/01/13	< 615	3056 ± 823	< 57	< 70	< 154	< 46	< 95	< 69	< 145	< 60	< 54	< 945	< 294	< 618
Largemouth Bass	10/01/13	< 687	3439 ± 1040	< 67	< 68	< 181	< 66	< 147	< 84	< 132	< 70	< 69	< 1149	< 418	< 338
	MEAN	-	3639 ± 1262	-	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1 **CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-07B	04/22/13	< 332	7632 ± 902	< 35	< 33	< 65	< 42	< 88	< 35	< 60	< 27	< 32	< 291	< 82	< 179
	10/01/13	< 498	7681 ± 857	< 49	< 50	< 144	< 45	< 114	< 61	< 103	< 41	< 45	< 933	< 265	< 264
	MEAN	-	7657 ± 69	-	-	-	-	-	-	-	-	-	-	-	-
CL-105	04/22/13	< 429	12730 ± 1106	< 47	< 43	< 106	< 62	< 107	< 54	< 90	< 38	< 44	< 301	< 93	< 307
	10/01/13	< 386	7834 ± 794	< 34	< 46	< 108	< 41	< 84	< 43	< 74	< 30	< 30	< 654	< 156	< 184
	MEAN	-	10282 ± 6924	-	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

COLLECTION	GROUP I					
PERIOD	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94
01/02/13 - 01/09/13	49 ± 6	47 ± 6	53 ± 6	51 ± 6	47 ± 6	51 ± 6
01/09/13 - 01/16/13	24 ± 5	22 ± 5	20 ± 5	20 ± 4	22 ± 5 (1)	22 ± 5 (1)
01/16/13 - 01/23/13	20 ± 5	23 ± 5	19 ± 5	22 ± 5	20 ± 5	21 ± 5
01/23/13 - 01/30/13	31 ± 5	37 ± 6	36 ± 6	39 ± 6	35 ± 6	32 ± 5
01/30/13 - 02/06/13	33 ± 5	32 ± 5	32 ± 5	32 ± 5	28 ± 5	35 ± 5
02/06/13 - 02/13/13	20 ± 4	21 ± 4	24 ± 5	19 ± 4	22 ± 4	25 ± 5
02/13/13 - 02/20/13	20 ± 4	19 ± 4	15 ± 4	21 ± 4	21 ± 4	20 ± 4
02/20/13 - 02/27/13	15 ± 4	13 ± 4	18 ± 4	16 ± 5	13 ± 4	17 ± 5
02/27/13 - 03/06/13	15 ± 4	9 ± 4	14 ± 4	14 ± 4	16 ± 4	13 ± 4
03/06/13 - 03/13/13	16 ± 4	15 ± 4	14 ± 4	25 ± 5	14 ± 4	14 ± 4
03/13/13 - 03/20/13	17 ± 5	21 ± 5	14 ± 5	16 ± 5	18 ± 5	22 ± 5
03/20/13 - 03/27/13	12 ± 4	14 ± 4	14 ± 4	12 ± 4	12 ± 4	12 ± 4
03/27/13 - 04/03/13	18 ± 4	17 ± 5	21 ± 5	15 ± 4	18 ± 4	20 ± 5
04/03/13 - 04/10/13	17 ± 4	17 ± 5	20 ± 5	19 ± 5	17 ± 4	23 ± 5
04/10/13 - 04/17/13	12 ± 4	7 ± 4	10 ± 4	10 ± 4	7 ± 4	14 ± 4
04/17/13 - 04/24/13	12 ± 4	11 ± 4	12 ± 4	14 ± 4	14 ± 4	14 ± 4
04/24/13 - 05/01/13	16 ± 5	21 ± 5	19 ± 5	16 ± 5	18 ± 4	18 ± 5
05/01/13 - 05/08/13	12 ± 4	14 ± 4	12 ± 4	13 ± 4	10 ± 4	14 ± 4
05/08/13 - 05/15/13	15 ± 5	11 ± 4	14 ± 4	18 ± 5	12 ± 4	11 ± 4
05/15/13 - 05/22/13	19 ± 4	18 ± 4	21 ± 4	23 ± 5	18 ± 4	21 ± 4
05/22/13 - 05/29/13	10 ± 4	14 ± 4	8 ± 4	15 ± 4	7 ± 4	10 ± 4
05/29/13 - 06/05/13	9 ± 4	8 ± 4	9 ± 4	< 6	10 ± 4 (1)	9 ± 4 (1)
06/05/13 - 06/12/13	18 ± 5	16 ± 4	14 ± 4	21 ± 5	19 ± 5	21 ± 5
06/12/13 - 06/19/13	14 ± 4	11 ± 4	11 ± 4	12 ± 4	15 ± 4	17 ± 4
06/19/13 - 06/26/13	13 ± 4	21 ± 5	21 ± 5	23 ± 5	13 ± 4	18 ± 5
06/26/13 - 07/03/13	15 ± 4	15 ± 4	15 ± 4 (1)	9 ± 4 (1)	12 ± 4	13 ± 4
07/03/13 - 07/10/13	8 ± 4	15 ± 5	11 ± 5	14 ± 5	11 ± 5	15 ± 5
07/10/13 - 07/17/13	13 ± 4	12 ± 4	11 ± 4	9 ± 3	14 ± 4	13 ± 4
07/17/13 - 07/24/13	15 ± 4	14 ± 4	13 ± 4	14 ± 4	15 ± 4	19 ± 4
07/24/13 - 07/31/13	14 ± 4	14 ± 4	13 ± 4	10 ± 4	15 ± 4	17 ± 4
07/31/13 - 08/07/13	21 ± 4	23 ± 5	24 ± 5	20 ± 4 (1)	19 ± 4	21 ± 4
08/07/13 - 08/14/13	18 ± 4	19 ± 4	17 ± 4	20 ± 4	16 ± 4	16 ± 4
08/14/13 - 08/21/13	30 ± 5	25 ± 5	21 ± 4	15 ± 4	24 ± 5	28 ± 5
08/21/13 - 08/28/13	24 ± 5	20 ± 5	18 ± 5	21 ± 5	22 ± 5	21 ± 5
08/28/13 - 09/04/13	16 ± 4	23 ± 5	22 ± 5	20 ± 4	20 ± 4	26 ± 5
09/04/13 - 09/11/13	36 ± 5	30 ± 5	39 ± 5	31 ± 5	31 ± 5	33 ± 5
09/11/13 - 09/18/13	15 ± 4	16 ± 4	15 ± 4	13 ± 4	17 ± 4	16 ± 5
09/18/13 - 09/25/13	19 ± 5	20 ± 5	20 ± 5 (1)	22 ± 5 (1)	20 ± 5	22 ± 5
09/25/13 - 10/02/13	22 ± 5	25 ± 5	29 ± 5	24 ± 5	26 ± 5	25 ± 5
10/02/13 - 10/09/13	21 ± 4	20 ± 4	15 ± 4	15 ± 4	15 ± 4	15 ± 4
10/09/13 - 10/16/13	24 ± 5	22 ± 5	23 ± 4	23 ± 5	22 ± 4	24 ± 5
10/16/13 - 10/23/13	16 ± 4	14 ± 4	18 ± 4	19 ± 4	15 ± 4 (1)	15 ± 4 (1)
10/23/13 - 10/30/13	20 ± 4	19 ± 4	20 ± 4	23 ± 4	21 ± 4	20 ± 4
10/30/13 - 11/06/13	30 ± 5	26 ± 5	32 ± 5	27 ± 5	25 ± 5	23 ± 5
11/06/13 - 11/13/13	14 ± 4	18 ± 4	17 ± 4	17 ± 4	14 ± 4	16 ± 4
11/13/13 - 11/20/13	18 ± 5	11 ± 4	17 ± 4	14 ± 4	14 ± 4	12 ± 4
11/20/13 - 11/27/13	16 ± 4	19 ± 4	19 ± 4	23 ± 5	22 ± 4	24 ± 5
11/27/13 - 12/04/13	38 ± 6	43 ± 6	43 ± 6	40 ± 6	36 ± 5	40 ± 6
12/04/13 - 12/11/13	29 ± 5	32 ± 5	36 ± 5	34 ± 5 (1)	35 ± 5	33 ± 5
12/11/13 - 12/18/13	35 ± 5	40 ± 6	39 ± 6	35 ± 6 (1)	35 ± 5	31 ± 5
12/18/13 - 12/26/13	29 ± 4	26 ± 4	28 ± 4	25 ± 4	22 ± 4	25 ± 4
12/26/13 - 01/01/14	28 ± 6	31 ± 6	33 ± 6	26 ± 5	29 ± 6	28 ± 6
MEAN	20 ± 17	20 ± 17	21 ± 19	20 ± 17	19 ± 16	21 ± 16

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

Table C-VI.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

COLLECTION	GROUP II			GROUP III
PERIOD	CL-1	CL-7	CL-8	CL-11
01/02/13 - 01/09/13	48 ± 6	57 ± 6	47 ± 6	51 ± 6
01/09/13 - 01/16/13	21 ± 5	23 ± 5 (1)	19 ± 5 (1)	20 ± 4
01/16/13 - 01/23/13	20 ± 5	22 ± 5	22 ± 5	18 ± 4
01/23/13 - 01/30/13	27 ± 5	33 ± 6	35 ± 6	30 ± 5
01/30/13 - 02/06/13	31 ± 5	31 ± 5	35 ± 5	32 ± 5
02/06/13 - 02/13/13	20 ± 4	22 ± 4	24 ± 5	19 ± 4
02/13/13 - 02/20/13	21 ± 4	21 ± 4	19 ± 4	20 ± 4
02/20/13 - 02/27/13	14 ± 4	19 ± 5	19 ± 5	19 ± 4
02/27/13 - 03/06/13	19 ± 5	13 ± 4	9 ± 4	16 ± 4
03/06/13 - 03/13/13	14 ± 4	12 ± 4	14 ± 4	13 ± 4
03/13/13 - 03/20/13	23 ± 5	17 ± 5	14 ± 5	16 ± 5
03/20/13 - 03/27/13	11 ± 4	14 ± 4	11 ± 4	14 ± 4
03/27/13 - 04/03/13	19 ± 4	17 ± 4	15 ± 4	16 ± 4
04/03/13 - 04/10/13	17 ± 4	18 ± 4	17 ± 7 (1)	22 ± 5
04/10/13 - 04/17/13	11 ± 4	9 ± 4	7 ± 4	8 ± 4
04/17/13 - 04/24/13	10 ± 4	11 ± 4	10 ± 4	12 ± 4
04/24/13 - 05/01/13	15 ± 4	16 ± 5	18 ± 5	22 ± 5
05/01/13 - 05/08/13	12 ± 4	12 ± 4	10 ± 4	13 ± 4
05/08/13 - 05/15/13	13 ± 4	12 ± 4	11 ± 5 (1)	19 ± 5
05/15/13 - 05/22/13	23 ± 4	21 ± 4	15 ± 4 (1)	19 ± 4
05/22/13 - 05/29/13	11 ± 4 (1)	11 ± 4	11 ± 4	11 ± 4
05/29/13 - 06/05/13	8 ± 4	< 6 (1)	10 ± 5 (1)	10 ± 4 (1)
06/05/13 - 06/12/13	14 ± 4	16 ± 4	15 ± 4	14 ± 4
06/12/13 - 06/19/13	11 ± 4	8 ± 4	12 ± 4	11 ± 4
06/19/13 - 06/26/13	13 ± 4	14 ± 4	17 ± 5	14 ± 4
06/26/13 - 07/03/13	14 ± 4	10 ± 4	11 ± 4	12 ± 4
07/03/13 - 07/10/13	12 ± 5	12 ± 5	17 ± 5	11 ± 5
07/10/13 - 07/17/13	12 ± 4	9 ± 3	13 ± 4	13 ± 4
07/17/13 - 07/24/13	14 ± 4	14 ± 4	14 ± 4	18 ± 4
07/24/13 - 07/31/13	13 ± 4	11 ± 4	16 ± 4	15 ± 4
07/31/13 - 08/07/13	17 ± 4	20 ± 4	20 ± 4	21 ± 4
08/07/13 - 08/14/13	20 ± 4	21 ± 4	21 ± 4	18 ± 4
08/14/13 - 08/21/13	21 ± 4	21 ± 4	28 ± 5	30 ± 5
08/21/13 - 08/28/13	22 ± 5	18 ± 5	22 ± 5	21 ± 5
08/28/13 - 09/04/13	18 ± 4	17 ± 4	21 ± 5	20 ± 4
09/04/13 - 09/11/13	33 ± 5	32 ± 5	37 ± 5	38 ± 5
09/11/13 - 09/18/13	14 ± 4	11 ± 4	14 ± 4	16 ± 4
09/18/13 - 09/25/13	15 ± 4	22 ± 5	18 ± 4	23 ± 5
09/25/13 - 10/02/13	21 ± 5	19 ± 4	23 ± 5	27 ± 5
10/02/13 - 10/09/13	16 ± 4	15 ± 4	19 ± 4	19 ± 4
10/09/13 - 10/16/13	24 ± 5	24 ± 5	24 ± 5	26 ± 5
10/16/13 - 10/23/13	14 ± 4	15 ± 4 (1)	15 ± 4 (1)	16 ± 4
10/23/13 - 10/30/13	17 ± 4	21 ± 4	23 ± 4	26 ± 5
10/30/13 - 11/06/13	27 ± 5	26 ± 5	23 ± 5	30 ± 5
11/06/13 - 11/13/13	18 ± 4	19 ± 4	16 ± 4	17 ± 4
11/13/13 - 11/20/13	14 ± 4	13 ± 4	17 ± 4	15 ± 4
11/20/13 - 11/27/13	22 ± 4	18 ± 4	23 ± 4	21 ± 4
11/27/13 - 12/04/13	39 ± 6	38 ± 6	43 ± 6	40 ± 6
12/04/13 - 12/11/13	27 ± 5	34 ± 5	37 ± 5	36 ± 5
12/11/13 - 12/18/13	44 ± 6	34 ± 5	31 ± 5	40 ± 6
12/18/13 - 12/26/13	25 ± 4	29 ± 4	24 ± 4	24 ± 4
12/26/13 - 01/01/14	29 ± 6	26 ± 6	25 ± 5	24 ± 5
MEAN	19 ± 17	19 ± 18	20 ± 17	21 ± 17

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

Table C-VI.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

GROUP I - ON-SITE LOCATIONS				GROUP II - INTERMEDIATE DISTANCE LOCATIONS				GROUP III - CONTROL LOCATIONS			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
01/02/13 - 01/30/13	19	53	32 ± 24	01/02/13 - 01/30/13	19	57	31 ± 26	01/02/13 - 01/30/13	18	51	29 ± 30
01/30/13 - 02/27/13	13	35	22 ± 13	01/30/13 - 02/27/13	14	35	23 ± 13	01/30/13 - 02/27/13	19	32	22 ± 13
02/27/13 - 04/03/13	9	25	16 ± 7	02/27/13 - 04/03/13	9	23	15 ± 7	02/27/13 - 04/03/13	13	16	15 ± 3
04/03/13 - 05/01/13	7	23	15 ± 9	04/03/13 - 05/01/13	7	18	13 ± 8	04/03/13 - 05/01/13	8	22	16 ± 13
05/01/13 - 05/29/13	7	23	14 ± 8	05/01/13 - 05/29/13	10	23	13 ± 9	05/01/13 - 05/29/13	11	19	15 ± 9
05/29/13 - 07/03/13	8	23	14 ± 9	05/29/13 - 07/03/13	8	17	12 ± 6	05/29/13 - 07/03/13	10	14	12 ± 4
07/03/13 - 07/31/13	8	19	13 ± 5	07/03/13 - 07/31/13	9	17	13 ± 4	07/03/13 - 07/31/13	11	18	14 ± 6
07/31/13 - 09/04/13	15	30	21 ± 7	07/31/13 - 09/04/13	17	28	20 ± 5	07/31/13 - 09/04/13	18	30	22 ± 9
09/04/13 - 10/02/13	13	39	23 ± 14	09/04/13 - 10/02/13	11	37	22 ± 17	09/04/13 - 10/02/13	16	38	26 ± 19
10/02/13 - 10/30/13	14	24	19 ± 7	10/02/13 - 10/30/13	14	24	19 ± 8	10/02/13 - 10/30/13	16	26	22 ± 10
10/30/13 - 12/04/13	11	43	23 ± 20	10/30/13 - 12/04/13	13	43	24 ± 19	10/30/13 - 12/04/13	15	40	24 ± 21
12/04/13 - 01/01/14	22	40	31 ± 9	12/04/13 - 01/01/14	24	44	30 ± 12	12/04/13 - 01/01/14	24	40	31 ± 16
01/02/13 - 01/01/14	7	53	20 ± 17	01/02/13 - 01/01/14	7	57	20 ± 17	01/02/13 - 01/01/14	8	51	21 ± 17

Table C-VI.3 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

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

SITE	COLLECTION PERIOD	Be-7	K-40	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-1	01/02/13 - 04/03/13	54 ± 36	< 35	< 2	< 4	< 6	< 8	< 17	< 2	< 2	< 10	< 9
	04/03/13 - 07/03/13	68 ± 22	< 43	< 2	< 3	< 4	< 3	< 23	< 2	< 3	< 5	< 10
	07/03/13 - 10/02/13	89 ± 30	< 48	< 3	< 4	< 7	< 4	< 15	< 2	< 2	< 6	< 14
	10/02/13 - 01/01/14	62 ± 19	< 38	< 2	< 3	< 5	< 4	< 20	< 2	< 2	< 5	< 13
	MEAN	68 ± 30	-	-	-	-	-	-	-	-	-	-
CL-11	01/02/13 - 04/03/13	70 ± 44	< 62	< 3	< 7	< 12	< 11	< 31	< 4	< 4	< 14	< 15
	04/03/13 - 07/03/13	90 ± 23	< 39	< 2	< 3	< 4	< 2	< 23	< 2	< 2	< 4	< 8
	07/03/13 - 10/02/13	98 ± 29	< 50	< 3	< 5	< 7	< 4	< 25	< 3	< 3	< 7	< 15
	10/02/13 - 01/01/14	57 ± 30	< 50	< 2	< 3	< 6	< 4	< 18	< 2	< 2	< 5	< 11
	MEAN	79 ± 37	-	-	-	-	-	-	-	-	-	-
CL-15	01/02/13 - 04/03/13	80 ± 29	< 42	< 2	< 4	< 9	< 5	< 18	< 2	< 2	< 12	< 10
	04/03/13 - 07/03/13	59 ± 27	< 21	< 3	< 3	< 5	< 3	< 18	< 2	< 2	< 7	< 16
	07/03/13 - 10/02/13	61 ± 21	< 43	< 3	< 3	< 6	< 5	< 23	< 3	< 2	< 7	< 12
	10/02/13 - 01/01/14	35 ± 18	< 41	< 2	< 3	< 4	< 2	< 17	< 1	< 1	< 4	< 9
	MEAN	59 ± 37	-	-	-	-	-	-	-	-	-	-
CL-2	01/02/13 - 04/03/13	< 80	< 27	< 4	< 5	< 10	< 10	< 23	< 3	< 3	< 14	< 16
	04/03/13 - 07/03/13	84 ± 22	< 44	< 3	< 3	< 6	< 4	< 23	< 3	< 2	< 6	< 15
	07/03/13 - 10/02/13	88 ± 24	< 35	< 3	< 3	< 6	< 3	< 17	< 2	< 2	< 4	< 8
	10/02/13 - 01/01/14	70 ± 27	< 54	< 4	< 4	< 8	< 4	< 20	< 3	< 3	< 6	< 13
	MEAN	80 ± 19	-	-	-	-	-	-	-	-	-	-
CL-3	01/02/13 - 04/03/13	53 ± 32	< 37	< 2	< 4	< 9	< 5	< 20	< 2	< 2	< 10	< 9
	04/03/13 - 07/03/13	79 ± 29	< 54	< 4	< 3	< 4	< 5	< 24	< 2	< 3	< 5	< 11
	07/03/13 - 10/02/13	47 ± 33	< 33	< 4	< 5	< 8	< 5	< 35	< 3	< 4	< 8	< 15
	10/02/13 - 01/01/14	53 ± 41	< 31	< 4	< 5	< 9	< 6	< 27	< 4	< 4	< 8	< 17
	MEAN	58 ± 29	-	-	-	-	-	-	-	-	-	-

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

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

SITE	COLLECTION PERIOD	Be-7	K-40	Co-60	Nb-95	Zr-95	Ru-103	Ru-106	Cs-134	Cs-137	Ce-141	Ce-144
CL-4	01/02/13 - 04/03/13	100 ± 30	< 34	< 3	< 6	< 11	< 8	< 26	< 3	< 3	< 12	< 11
	04/03/13 - 07/03/13	98 ± 32	< 71	< 4	< 3	< 9	< 5	< 34	< 4	< 3	< 6	< 14
	07/03/13 - 10/02/13	103 ± 30	< 41	< 2	< 3	< 5	< 4	< 28	< 3	< 3	< 6	< 13
	10/02/13 - 01/01/14	53 ± 19	< 39	< 1	< 2	< 6	< 4	< 16	< 2	< 2	< 5	< 11
	MEAN	88 ± 47	-	-	-	-	-	-	-	-	-	-
CL-6	01/02/13 - 04/03/13	< 75	< 64	< 4	< 10	< 15	< 13	< 37	< 4	< 4	< 14	< 15
	04/03/13 - 07/03/13	89 ± 27	< 39	< 3	< 3	< 6	< 3	< 24	< 2	< 3	< 5	< 11
	07/03/13 - 10/02/13	60 ± 25	< 21	< 3	< 4	< 7	< 5	< 28	< 3	< 3	< 6	< 12
	10/02/13 - 01/01/14	47 ± 20	< 32	< 2	< 3	< 7	< 4	< 25	< 3	< 3	< 5	< 12
	MEAN	66 ± 43	-	-	-	-	-	-	-	-	-	-
CL-7	01/02/13 - 04/03/13	70 ± 33	< 40	< 2	< 4	< 9	< 8	< 27	< 2	< 2	< 14	< 12
	04/03/13 - 07/03/13	72 ± 25	< 52	< 3	< 4	< 6	< 3	< 26	< 3	< 3	< 5	< 11
	07/03/13 - 10/02/13	85 ± 25	< 49	< 2	< 4	< 7	< 6	< 34	< 3	< 3	< 8	< 17
	10/02/13 - 01/01/14	48 ± 19	< 39	< 3	< 3	< 3	< 3	< 13	< 2	< 2	< 4	< 10
	MEAN	69 ± 31	-	-	-	-	-	-	-	-	-	-
CL-8	01/02/13 - 04/03/13	94 ± 40	< 21	< 3	< 6	< 13	< 10	< 18	< 3	< 3	< 14	< 12
	04/03/13 - 07/03/13	52 ± 26	< 63	< 4	< 5	< 8	< 4	< 27	< 4	< 3	< 8	< 17
	07/03/13 - 10/02/13	75 ± 21	< 37	< 3	< 3	< 6	< 4	< 21	< 3	< 2	< 5	< 11
	10/02/13 - 01/01/14	42 ± 18	< 38	< 2	< 3	< 6	< 4	< 21	< 3	< 2	< 5	< 12
	MEAN	66 ± 46	-	-	-	-	-	-	-	-	-	-
CL-94	01/02/13 - 04/03/13	63 ± 31	< 32	< 2	< 3	< 10	< 7	< 28	< 2	< 2	< 12	< 12
	04/03/13 - 07/03/13	94 ± 27	< 37	< 2	< 3	< 4	< 2	< 19	< 2	< 2	< 4	< 13
	07/03/13 - 10/02/13	82 ± 22	< 49	< 2	< 3	< 5	< 4	< 14	< 2	< 2	< 5	< 11
	10/02/13 - 01/01/14	61 ± 30	< 31	< 3	< 4	< 8	< 5	< 35	< 4	< 3	< 6	< 13
	MEAN	75 ± 32	-	-	-	-	-	-	-	-	-	-

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

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

COLLECTION PERIOD	GROUP I					
	CL-2	CL-3	CL-4	CL-6	CL-15	CL-94
01/02/13 - 01/09/13	< 18	< 48	< 46	< 48	< 33	< 33
01/09/13 - 01/16/13	< 32	< 32	< 33	< 32	< 42 (1)	< 42 (1)
01/16/13 - 01/23/13	< 34	< 13	< 34	< 34	< 34	< 33
01/23/13 - 01/30/13	< 29	< 30	< 30	< 32	< 36	< 34
01/30/13 - 02/06/13	< 37	< 37	< 14	< 36	< 31	< 31
02/06/13 - 02/13/13	< 38	< 38	< 38	< 38	< 68	< 66
02/13/13 - 02/20/13	< 25	< 26	< 25	< 9	< 30	< 30
02/20/13 - 02/27/13	< 47	< 47	< 45	< 48	< 38	< 39
02/27/13 - 03/06/13	< 33	< 34	< 36	< 37	< 27	< 27
03/06/13 - 03/13/13	< 46	< 46	< 45	< 32	< 21	< 21
03/13/13 - 03/20/13	< 34	< 36	< 34	< 35	< 42	< 42
03/20/13 - 03/27/13	< 36	< 36	< 36	< 36	< 44	< 44
03/27/13 - 04/03/13	< 47	< 49	< 47	< 48	< 44	< 44
04/03/13 - 04/10/13	< 23	< 23	< 22	< 27	< 19	< 18
04/10/13 - 04/17/13	< 30	< 31	< 30	< 30	< 18	< 48
04/17/13 - 04/24/13	< 40	< 40	< 40	< 39	< 45	< 43
04/24/13 - 05/01/13	< 41	< 42	< 40	< 41	< 40	< 18
05/01/13 - 05/08/13	< 48	< 49	< 48	< 49	< 43	< 43
05/08/13 - 05/15/13	< 35	< 34	< 34	< 34	< 31	< 30
05/15/13 - 05/22/13	< 52	< 52	< 52	< 52	< 45	< 44
05/22/13 - 05/29/13	< 20	< 53	< 51	< 53	< 50	< 50
05/29/13 - 06/05/13	< 51	< 50	< 50	< 51	< 43 (1)	< 42 (1)
06/05/13 - 06/12/13	< 59	< 23	< 61	< 62	< 28	< 27
06/12/13 - 06/19/13	< 49	< 49	< 49	< 49	< 49	< 48
06/19/13 - 06/26/13	< 38	< 41	< 15	< 40	< 44	< 43
06/26/13 - 07/03/13	< 49	< 49	< 50 (1)	< 49 (1)	< 53	< 52
07/03/13 - 07/10/13	< 65	< 65	< 65	< 27	< 66	< 66
07/10/13 - 07/17/13	< 36	< 38	< 36	< 35	< 36	< 34
07/17/13 - 07/24/13	< 45	< 45	< 45	< 47	< 50	< 50
07/24/13 - 07/31/13	< 46	< 45	< 44	< 43	< 37	< 35
07/31/13 - 08/07/13	< 55	< 56	< 56	< 58 (1)	< 67	< 67
08/07/13 - 08/14/13	< 54	< 54	< 53	< 54	< 42	< 43
08/14/13 - 08/21/13	< 57	< 58	< 55	< 21	< 53	< 52
08/21/13 - 08/28/13	< 22	< 22	< 23	< 23	< 40	< 42
08/28/13 - 09/04/13	< 52	< 52	< 53	< 53	< 26	< 64
09/04/13 - 09/11/13	< 57	< 58	< 56	< 56	< 56	< 54
09/11/13 - 09/18/13	< 17	< 17	< 18	< 18	< 18	< 12
09/18/13 - 09/25/13	< 66	< 65	< 66 (1)	< 67 (1)	< 58	< 59
09/25/13 - 10/02/13	< 63	< 65	< 61	< 64	< 63	< 63
10/02/13 - 10/09/13	< 46	< 46	< 44	< 46	< 48	< 49
10/09/13 - 10/16/13	< 15	< 36	< 35	< 37	< 49	< 51
10/16/13 - 10/23/13	< 51	< 50	< 49	< 51	< 45 (1)	< 47 (1)
10/23/13 - 10/30/13	< 63	< 24	< 62	< 60	< 58	< 56
10/30/13 - 11/06/13	< 59	< 59	< 58	< 59	< 54	< 55
11/06/13 - 11/13/13	< 57	< 58	< 22	< 57	< 52	< 51
11/13/13 - 11/20/13	< 61	< 61	< 60	< 60	< 58	< 55
11/20/13 - 11/27/13	< 65	< 65	< 66	< 26	< 55	< 53
11/27/13 - 12/04/13	< 11	< 31	< 30	< 30	< 25	< 26
12/04/13 - 12/11/13	< 38	< 39	< 38	< 41 (1)	< 44	< 42
12/11/13 - 12/18/13	< 62	< 62	< 61	< 64 (1)	< 66	< 64
12/18/13 - 12/26/13	< 66	< 65	< 64	< 66	< 69	< 70
12/26/13 - 01/01/14	< 33	< 33	< 31	< 33	< 37	< 37
MEAN	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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

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

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VIII.1 **CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM CL-116
01/30/13	< 0.9
02/27/13	< 0.6
03/27/13	< 0.8
04/24/13	< 0.5
05/08/13	< 0.6
05/22/13	< 0.8
06/05/13	< 0.6
06/19/13	< 0.7
07/03/13	< 0.7
07/17/13	< 0.9
07/31/13	< 0.7
08/14/13	< 0.8
08/28/13	< 1.0
09/11/13	< 0.4
09/25/13	< 0.5
10/09/13	< 0.6
10/23/13	< 0.7
11/06/13	< 0.9
11/27/13	< 0.7
12/26/13	< 0.6
MEAN	-

Table C-VIII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-116	01/30/13	< 54	1293 ± 138	< 6	< 7	< 14	< 6	< 14	< 7	< 10	< 5	< 6	< 39	< 10	< 45
	02/27/13	< 48	1187 ± 125	< 6	< 6	< 12	< 8	< 11	< 6	< 10	< 5	< 6	< 28	< 7	< 43
	03/27/13	< 37	1261 ± 117	< 5	< 6	< 11	< 5	< 10	< 5	< 9	< 5	< 5	< 31	< 9	< 42
	04/24/13	< 58	1181 ± 121	< 6	< 6	< 15	< 7	< 12	< 7	< 12	< 6	< 7	< 41	< 12	< 56
	05/08/13	< 60	1116 ± 125	< 5	< 6	< 17	< 7	< 14	< 6	< 12	< 5	< 5	< 50	< 15	< 31
	05/22/13	< 52	1195 ± 131	< 6	< 6	< 14	< 7	< 11	< 6	< 10	< 6	< 6	< 42	< 11	< 40
	06/05/13	< 41	1126 ± 107	< 4	< 5	< 10	< 5	< 11	< 5	< 8	< 4	< 5	< 25	< 7	< 34
	06/19/13	< 52	1201 ± 163	< 6	< 6	< 15	< 10	< 15	< 7	< 12	< 6	< 7	< 30	< 11	< 41
	07/03/13	< 36	1019 ± 105	< 5	< 5	< 9	< 5	< 10	< 5	< 7	< 4	< 4	< 30	< 9	< 33
	07/17/13	< 51	1346 ± 139	< 6	< 5	< 13	< 8	< 12	< 5	< 10	< 6	< 6	< 27	< 7	< 40
	07/31/13	< 52	1412 ± 131	< 6	< 5	< 13	< 7	< 15	< 6	< 10	< 5	< 7	< 30	< 9	< 48
	08/14/13	< 73	1374 ± 156	< 7	< 8	< 16	< 9	< 17	< 8	< 12	< 7	< 7	< 36	< 11	< 68
	08/28/13	< 49	1325 ± 120	< 6	< 6	< 15	< 7	< 13	< 6	< 10	< 5	< 7	< 41	< 11	< 40
	09/11/13	< 50	1322 ± 143	< 5	< 6	< 16	< 7	< 14	< 7	< 13	< 5	< 6	< 38	< 14	< 35
	09/25/13	< 53	1067 ± 156	< 6	< 6	< 15	< 6	< 15	< 7	< 11	< 5	< 6	< 42	< 12	< 39
	10/09/13	< 54	1214 ± 132	< 6	< 7	< 15	< 7	< 15	< 6	< 12	< 5	< 7	< 33	< 10	< 33
	10/23/13	< 58	1351 ± 124	< 6	< 7	< 15	< 6	< 15	< 7	< 12	< 6	< 6	< 50	< 12	< 48
	11/06/13	< 60	1188 ± 163	< 8	< 8	< 15	< 9	< 19	< 9	< 14	< 6	< 7	< 38	< 12	< 44
	11/27/13	< 37	1322 ± 108	< 4	< 5	< 11	< 5	< 8	< 4	< 7	< 3	< 4	< 35	< 11	< 28
	12/26/13	< 50	1335 ± 122	< 5	< 5	< 13	< 7	< 13	< 7	< 10	< 5	< 6	< 38	< 11	< 30
	MEAN	-	1242 ± 217	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCi/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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	Ce-144
CL-114	06/26/13 Cabbage	462 ± 140	4836 ± 305	< 14	< 15	< 31	< 16	< 32	< 15	< 23	< 45	< 13	< 14	< 104	< 28	< 92
	06/26/13 Lettuce	353 ± 94	3755 ± 270	< 10	< 10	< 28	< 12	< 26	< 12	< 19	< 34	< 8	< 9	< 77	< 25	< 54
	06/26/13 Swiss Chard	541 ± 149	7816 ± 402	< 15	< 17	< 40	< 19	< 35	< 18	< 30	< 50	< 13	< 15	< 109	< 23	< 111
	07/31/13 Cabbage	197 ± 89	3372 ± 270	< 11	< 10	< 26	< 14	< 23	< 11	< 19	< 19	< 10	< 12	< 60	< 15	< 69
	07/31/13 Lettuce	293 ± 177	5415 ± 463	< 20	< 17	< 40	< 22	< 39	< 18	< 30	< 35	< 15	< 22	< 91	< 24	< 112
	07/31/13 Swiss Chard	392 ± 111	5332 ± 397	< 13	< 13	< 30	< 19	< 33	< 13	< 22	< 19	< 11	< 11	< 56	< 15	< 77
	08/28/13 Cabbage	46 ± 27	2804 ± 102	< 4	< 4	< 11	< 5	< 10	< 5	< 8	< 19	< 4	< 4	< 35	< 10	< 28
	08/28/13 Kale	67 ± 41	3552 ± 130	< 5	< 6	< 14	< 7	< 12	< 6	< 11	< 23	< 5	< 5	< 46	< 13	< 34
	08/28/13 Swiss Chard	376 ± 58	8335 ± 195	< 5	< 6	< 17	< 8	< 15	< 6	< 11	< 23	< 4	< 5	< 44	< 12	< 31
	09/25/13 Cabbage	207 ± 93	6999 ± 292	< 8	< 10	< 23	< 10	< 19	< 10	< 16	< 52	< 8	< 8	< 92	< 20	< 55
	09/25/13 Swiss Chard	181 ± 100	7630 ± 291	< 10	< 11	< 28	< 13	< 25	< 11	< 20	< 58	< 9	< 10	< 103	< 31	< 55
	09/25/13 Tree leaves (1)	653 ± 156	7145 ± 286	< 9	< 10	< 24	< 10	< 20	< 11	< 19	< 55	< 9	< 10	< 96	< 30	< 54
	MEAN	314 ± 370	5583 ± 3904	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-115	06/26/13 Cabbage	357 ± 200	4931 ± 413	< 20	< 20	< 49	< 21	< 39	< 19	< 36	< 59	< 17	< 17	< 144	< 38	< 87
	06/26/13 Lettuce	528 ± 135	4372 ± 314	< 12	< 14	< 29	< 17	< 31	< 14	< 23	< 42	< 10	< 13	< 92	< 25	< 71
	06/26/13 Swiss Chard	405 ± 128	7159 ± 402	< 13	< 13	< 37	< 20	< 35	< 14	< 25	< 48	< 12	< 13	< 95	< 28	< 93
	07/31/13 Cabbage	118 ± 74	2177 ± 207	< 9	< 8	< 22	< 13	< 19	< 8	< 16	< 15	< 8	< 8	< 43	< 14	< 59
	07/31/13 Lettuce	305 ± 126	2840 ± 333	< 15	< 15	< 33	< 19	< 33	< 15	< 30	< 26	< 13	< 13	< 80	< 18	< 81
	07/31/13 Swiss Chard	334 ± 121	4495 ± 357	< 13	< 14	< 34	< 18	< 34	< 13	< 26	< 22	< 11	< 13	< 74	< 20	< 88
	08/28/13 Cabbage	< 46	2680 ± 148	< 5	< 5	< 14	< 6	< 11	< 5	< 10	< 21	< 4	< 5	< 44	< 12	< 24
	08/28/13 Kale	< 45	3993 ± 119	< 5	< 5	< 12	< 6	< 11	< 6	< 9	< 22	< 4	< 5	< 43	< 11	< 32
	08/28/13 Swiss Chard	114 ± 43	4958 ± 139	< 4	< 5	< 11	< 5	< 10	< 4	< 8	< 20	< 4	< 4	< 36	< 9	< 26
	09/25/13 Cabbage	< 55	3714 ± 135	< 6	< 6	< 15	< 7	< 13	< 7	< 12	< 35	< 5	< 6	< 58	< 17	< 41
	09/25/13 Kale	202 ± 102	6148 ± 269	< 9	< 11	< 26	< 11	< 21	< 11	< 19	< 52	< 8	< 9	< 94	< 28	< 43
	09/25/13 Swiss Chard	241 ± 52	5279 ± 159	< 5	< 6	< 16	< 7	< 13	< 6	< 10	< 32	< 4	< 5	< 54	< 16	< 37
	MEAN	289 ± 271	4396 ± 2893	-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

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

Table C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD		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	Ce-144
CL-117	06/26/13	Cabbage	194 ± 137	3265 ± 316	< 15	< 14	< 34	< 17	< 33	< 15	< 25	< 42	< 14	< 14	< 91	< 29	< 67
	06/26/13	Lettuce	731 ± 136	4873 ± 301	< 13	< 13	< 32	< 16	< 28	< 15	< 22	< 50	< 13	< 14	< 98	< 22	< 86
	06/26/13	Swiss Chard	285 ± 116	4304 ± 289	< 12	< 12	< 30	< 14	< 28	< 13	< 22	< 44	< 11	< 12	< 89	< 28	< 77
	07/31/13	Cabbage	276 ± 77	2852 ± 244	< 10	< 10	< 26	< 11	< 21	< 11	< 20	< 18	< 9	< 11	< 48	< 16	< 59
	07/31/13	Lettuce	456 ± 181	5634 ± 504	< 19	< 22	< 49	< 30	< 51	< 24	< 40	< 47	< 23	< 25	< 120	< 22	< 192
	07/31/13	Swiss Chard	195 ± 86	4520 ± 275	< 9	< 9	< 22	< 13	< 25	< 9	< 17	< 17	< 8	< 10	< 48	< 14	< 68
	08/28/13	Cabbage	142 ± 65	4060 ± 151	< 5	< 5	< 14	< 6	< 11	< 6	< 10	< 23	< 5	< 5	< 43	< 11	< 31
	08/28/13	Kale	101 ± 69	4825 ± 194	< 6	< 7	< 17	< 8	< 15	< 7	< 12	< 30	< 5	< 6	< 56	< 16	< 30
	08/28/13	Swiss Chard	79 ± 36	5704 ± 146	< 5	< 5	< 14	< 7	< 13	< 5	< 9	< 20	< 4	< 4	< 37	< 11	< 26
	09/25/13	Cabbage	206 ± 68	5360 ± 167	< 6	< 7	< 18	< 7	< 15	< 7	< 12	< 51	< 5	< 6	< 77	< 20	< 41
	09/25/13	Kale	73 ± 38	4450 ± 127	< 5	< 6	< 15	< 7	< 12	< 6	< 10	< 39	< 4	< 5	< 60	< 16	< 28
	09/25/13	Swish Chard	190 ± 60	5326 ± 156	< 5	< 6	< 18	< 7	< 13	< 7	< 11	< 45	< 5	< 5	< 70	< 17	< 37
	MEAN		244 ± 373	4598 ± 1785	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-118	06/26/13	Cabbage	< 102	2289 ± 199	< 9	< 11	< 22	< 10	< 22	< 10	< 20	< 34	< 10	< 10	< 76	< 18	< 57
	06/26/13	Lettuce	365 ± 118	3876 ± 316	< 15	< 14	< 31	< 15	< 32	< 15	< 23	< 46	< 12	< 13	< 97	< 30	< 80
	06/26/13	Swiss Chard	582 ± 154	10390 ± 416	< 14	< 14	< 41	< 19	< 37	< 15	< 27	< 50	< 13	< 14	< 106	< 30	< 93
	07/31/13	Cabbage	167 ± 83	2376 ± 225	< 7	< 8	< 12	< 10	< 15	< 8	< 11	< 12	< 7	< 8	< 39	< 13	< 47
	07/31/13	Lettuce	406 ± 114	4183 ± 342	< 14	< 13	< 31	< 17	< 32	< 14	< 21	< 24	< 11	< 11	< 57	< 14	< 66
	07/31/13	Swiss Chard	440 ± 129	6830 ± 398	< 12	< 14	< 34	< 18	< 31	< 13	< 21	< 24	< 10	< 13	< 63	< 14	< 75
	08/28/13	Cabbage	143 ± 57	4141 ± 154	< 6	< 6	< 15	< 7	< 14	< 6	< 12	< 29	< 5	< 6	< 55	< 14	< 40
	08/28/13	Lettuce	365 ± 104	8340 ± 287	< 11	< 11	< 29	< 14	< 27	< 12	< 20	< 37	< 9	< 11	< 81	< 19	< 70
	08/28/13	Swiss Chard	275 ± 54	10310 ± 233	< 6	< 7	< 21	< 10	< 18	< 8	< 12	< 29	< 5	< 6	< 59	< 14	< 39
	09/25/13	Cabbage	96 ± 46	4011 ± 128	< 5	< 6	< 16	< 6	< 12	< 6	< 11	< 44	< 5	< 5	< 67	< 17	< 34
	09/25/13	Kale	230 ± 44	6309 ± 134	< 5	< 6	< 16	< 7	< 13	< 6	< 10	< 40	< 4	< 5	< 63	< 17	< 28
	09/25/13	Swiss Chard	445 ± 79	10940 ± 235	< 7	< 8	< 21	< 10	< 19	< 8	< 14	< 41	< 6	< 7	< 77	< 18	< 45
	MEAN		319 ± 300	6166 ± 6333	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-IX.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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	Ce-144
CL-01	05/08/13	765 ± 58	5810 ± 144	< 5	< 6	< 14	< 6	< 12	< 6	< 10	< 34	< 4	< 5	< 54	< 13	< 35
	05/22/13	648 ± 207	5569 ± 433	< 16	< 17	< 40	< 21	< 44	< 17	< 30	< 52	< 15	< 15	< 123	< 26	< 101
	06/05/13	1565 ± 258	4999 ± 499	< 20	< 17	< 53	< 25	< 44	< 22	< 39	< 44	< 18	< 22	< 121	< 27	< 137
	06/19/13	1329 ± 234	5654 ± 613	< 24	< 24	< 59	< 33	< 55	< 25	< 55	< 46	< 25	< 25	< 131	< 35	< 145
	07/03/13	3527 ± 193	7170 ± 310	< 11	< 12	< 29	< 15	< 27	< 13	< 23	< 41	< 11	< 12	< 86	< 25	< 75
	07/17/13	2266 ± 395	5116 ± 727	< 30	< 34	< 65	< 42	< 71	< 34	< 57	< 58	< 30	< 34	< 167	< 53	< 155
	07/31/13	1732 ± 256	3980 ± 459	< 21	< 20	< 49	< 23	< 46	< 25	< 39	< 46	< 22	< 24	< 103	< 28	< 144
	08/14/13	221 ± 162	5635 ± 474	< 18	< 19	< 49	< 26	< 42	< 16	< 28	< 26	< 15	< 18	< 87	< 28	< 76
	08/28/13	< 196	5544 ± 438	< 21	< 21	< 47	< 28	< 49	< 20	< 41	< 50	< 18	< 18	< 131	< 39	< 78
	09/11/13	547 ± 92	6774 ± 202	< 6	< 7	< 19	< 9	< 16	< 8	< 14	< 48	< 6	< 7	< 78	< 19	< 43
	09/25/13	2727 ± 131	5234 ± 220	< 10	< 10	< 24	< 11	< 21	< 11	< 18	< 39	< 10	< 10	< 77	< 20	< 70
	10/09/13	1272 ± 244	3570 ± 491	< 17	< 18	< 44	< 21	< 39	< 20	< 28	< 56	< 16	< 17	< 117	< 15	< 74
	10/23/13	2645 ± 131	3416 ± 184	< 9	< 10	< 22	< 10	< 19	< 10	< 17	< 56	< 8	< 8	< 88	< 27	< 52
	MEAN	1604 ± 2030	5267 ± 2213	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-02	05/08/13	527 ± 60	5493 ± 141	< 5	< 6	< 16	< 7	< 12	< 6	< 11	< 37	< 5	< 5	< 60	< 15	< 38
	05/22/13	1049 ± 152	5353 ± 314	< 14	< 14	< 31	< 17	< 33	< 15	< 23	< 44	< 13	< 13	< 97	< 28	< 86
	06/05/13	1292 ± 234	4353 ± 495	< 20	< 20	< 52	< 31	< 54	< 26	< 44	< 48	< 23	< 24	< 124	< 30	< 144
	06/19/13	1490 ± 293	6149 ± 610	< 21	< 25	< 57	< 30	< 52	< 24	< 44	< 47	< 25	< 27	< 130	< 27	< 172
	07/03/13	2933 ± 164	5110 ± 266	< 12	< 12	< 30	< 14	< 25	< 14	< 22	< 43	< 11	< 12	< 86	< 25	< 82
	07/17/13	1868 ± 246	6398 ± 571	< 23	< 22	< 48	< 30	< 46	< 23	< 41	< 49	< 23	< 24	< 125	< 24	< 200
	07/31/13	2336 ± 290	3687 ± 503	< 26	< 28	< 59	< 28	< 56	< 27	< 33	< 44	< 22	< 25	< 135	< 39	< 130
	08/14/13	1233 ± 248	5391 ± 588	< 24	< 22	< 56	< 34	< 58	< 25	< 37	< 45	< 22	< 23	< 110	< 41	< 142
	08/28/13	< 260	6745 ± 621	< 25	< 23	< 69	< 26	< 61	< 27	< 49	< 60	< 22	< 26	< 163	< 43	< 129
	09/11/13	429 ± 97	7403 ± 221	< 8	< 8	< 21	< 10	< 18	< 9	< 15	< 52	< 7	< 8	< 88	< 24	< 41
	09/25/13	2466 ± 137	7449 ± 258	< 10	< 10	< 26	< 13	< 25	< 11	< 19	< 37	< 9	< 10	< 74	< 20	< 59
	10/09/13	2748 ± 263	5636 ± 403	< 10	< 12	< 31	< 15	< 24	< 12	< 23	< 53	< 11	< 12	< 103	< 20	< 67
	10/23/13	2353 ± 152	4792 ± 223	< 8	< 9	< 23	< 9	< 19	< 10	< 16	< 52	< 8	< 8	< 92	< 21	< 55
	MEAN	1727 ± 1695	5689 ± 2239	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Table C-IX.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	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	Ce-144
CL-08	05/08/13	838 ± 50	5255 ± 118	< 4	< 4	< 13	< 6	< 11	< 5	< 8	< 26	< 4	< 4	< 44	< 11	< 23
	05/22/13	337 ± 179	4895 ± 403	< 19	< 19	< 44	< 20	< 40	< 19	< 32	< 52	< 16	< 18	< 138	< 31	< 78
	06/05/13	856 ± 198	5836 ± 489	< 20	< 17	< 40	< 26	< 46	< 22	< 30	< 37	< 19	< 17	< 97	< 26	< 116
	06/19/13	808 ± 294	5437 ± 619	< 31	< 31	< 80	< 34	< 66	< 32	< 55	< 54	< 27	< 28	< 148	< 55	< 130
	07/03/13	3930 ± 202	6851 ± 339	< 14	< 15	< 34	< 17	< 32	< 16	< 27	< 52	< 13	< 15	< 105	< 28	< 92
	07/17/13	2459 ± 274	8317 ± 609	< 23	< 24	< 57	< 29	< 63	< 27	< 41	< 49	< 22	< 24	< 121	< 31	< 166
	07/31/13	694 ± 193	5651 ± 499	< 21	< 21	< 44	< 28	< 43	< 19	< 32	< 35	< 18	< 19	< 96	< 30	< 126
	08/14/13	2126 ± 207	6383 ± 413	< 17	< 16	< 38	< 20	< 43	< 18	< 30	< 32	< 17	< 15	< 84	< 23	< 114
	08/28/13	578 ± 186	10380 ± 674	< 21	< 24	< 54	< 28	< 55	< 20	< 45	< 59	< 19	< 21	< 131	< 29	< 143
	09/11/13	583 ± 103	9937 ± 269	< 8	< 10	< 25	< 11	< 21	< 10	< 17	< 56	< 7	< 8	< 94	< 25	< 39
	09/25/13	2622 ± 167	8402 ± 313	< 13	< 14	< 29	< 15	< 29	< 15	< 25	< 53	< 13	< 14	< 109	< 24	< 96
	10/09/13	2020 ± 206	6664 ± 373	< 12	< 15	< 33	< 16	< 32	< 16	< 25	< 55	< 12	< 15	< 109	< 27	< 77
	10/23/13	2688 ± 147	6874 ± 258	< 9	< 10	< 25	< 11	< 21	< 11	< 19	< 59	< 9	< 10	< 100	< 24	< 64
	MEAN	1580 ± 2243	6991 ± 3530	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-116	05/08/13	819 ± 55	5488 ± 141	< 6	< 6	< 17	< 7	< 14	< 6	< 11	< 34	< 5	< 5	< 59	< 16	< 27
	05/22/13	638 ± 170	4485 ± 321	< 14	< 16	< 35	< 19	< 33	< 16	< 28	< 48	< 15	< 14	< 108	< 27	< 94
	06/05/13	1340 ± 219	5232 ± 500	< 16	< 17	< 37	< 24	< 38	< 19	< 30	< 36	< 17	< 19	< 94	< 21	< 120
	06/19/13	1827 ± 320	6343 ± 617	< 23	< 26	< 56	< 36	< 74	< 25	< 47	< 44	< 25	< 24	< 129	< 33	< 178
	07/03/13	3144 ± 158	5229 ± 287	< 11	< 12	< 28	< 13	< 26	< 12	< 20	< 41	< 11	< 11	< 87	< 22	< 76
	07/17/13	3244 ± 349	6118 ± 568	< 23	< 27	< 66	< 32	< 65	< 28	< 47	< 51	< 25	< 26	< 130	< 36	< 126
	07/31/13	2200 ± 276	3849 ± 425	< 20	< 19	< 41	< 17	< 44	< 21	< 32	< 38	< 21	< 20	< 97	< 32	< 136
	08/14/13	2896 ± 273	4723 ± 428	< 20	< 20	< 45	< 22	< 41	< 21	< 38	< 41	< 18	< 19	< 108	< 21	< 141
	08/28/13	628 ± 166	6124 ± 476	< 18	< 20	< 50	< 25	< 38	< 22	< 27	< 46	< 15	< 17	< 108	< 27	< 103
	09/11/13	707 ± 93	5447 ± 210	< 7	< 8	< 19	< 8	< 16	< 8	< 14	< 55	< 7	< 7	< 85	< 20	< 45
	09/25/13	1504 ± 118	6460 ± 245	< 11	< 12	< 28	< 14	< 24	< 13	< 22	< 39	< 10	< 11	< 86	< 25	< 52
	10/09/13	2492 ± 197	4886 ± 335	< 11	< 11	< 27	< 12	< 25	< 11	< 19	< 48	< 10	< 10	< 92	< 29	< 63
	10/23/13	2433 ± 132	3568 ± 181	< 9	< 10	< 23	< 9	< 19	< 10	< 18	< 59	< 8	< 9	< 96	< 24	< 69
	MEAN	1836 ± 1941	5227 ± 1831	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-X.1 QUARTERLY OSLD RESULTS FOR CLINTON POWER STATION, 2013

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
CL-01	22.5 ± 2.7	20.5	23.5	22.6	23.3
CL-02	22.9 ± 2.8	21.4	24.5	22.1	23.4
CL-03	22.7 ± 2.2	21.3	23.6	22.4	23.6
CL-04	22.3 ± 2.1	20.9	22.5	22.4	23.4
CL-05	22.1 ± 5.3	22.0	18.4	23.5	24.4
CL-06	20.7 ± 3.0	18.6	21.3	20.8	22.1
CL-07	21.1 ± 2.4	20.2	22.1	19.9	22.1
CL-08	22.7 ± 2.8	20.6	23.2	23.6	23.4
CL-11	21.5 ± 2.5	20.5	23.3	21.3	20.8
CL-15	21.0 ± 3.3	19.4	23.1	20.1	21.4
CL-22	23.8 ± 2.9	21.7	24.9	24.7	23.7
CL-23	24.5 ± 4.1	22.0	24.1	24.7	27.0
CL-24	24.1 ± 3.7	21.8	25.4	23.4	25.8
CL-33	23.9 ± 2.7	21.9	24.6	24.1	24.9
CL-34	24.3 ± 2.5	22.7	24.3	24.4	25.7
CL-35	21.9 ± 2.4	20.1	22.6	22.2	22.6
CL-36	22.1 ± 1.9	21.1	22.0	21.8	23.4
CL-37	21.6 ± 3.2	19.9	22.9	20.5	23.0
CL-41	23.4 ± 1.6	22.2	23.5	23.8	24.0
CL-42	22.3 ± 3.5	20.5	23.8	21.2	23.8
CL-43	23.6 ± 2.1	22.2	24.2	23.5	24.6
CL-44	23.0 ± 2.6	21.3	24.5	23.2	22.9
CL-45	24.7 ± 2.8	22.9	25.1	24.4	26.3
CL-46	24.6 ± 3.6	22.1	26.5	24.9	24.8
CL-47	23.6 ± 3.8	21.1	25.7	23.3	24.2
CL-48	22.8 ± 3.5	20.3	24.4	23.1	23.3
CL-49	24.7 ± 3.2	22.7	26.6	24.6	25.0
CL-51	23.7 ± 2.6	22.0	25.1	23.6	24.1
CL-52	23.3 ± 2.4	21.8	23.8	22.9	24.6
CL-53	21.9 ± 2.8	20.0	22.3	22.0	23.4
CL-54	23.4 ± 2.9	21.6	25.1	23.7	23.3
CL-55	23.7 ± 3.4	21.5	24.2	23.4	25.6
CL-56	24.9 ± 4.0	22.2	26.9	24.5	25.8
CL-57	24.4 ± 3.4	22.0	25.6	24.6	25.5
CL-58	23.9 ± 3.3	22.0	25.6	23.0	24.8
CL-60	23.6 ± 2.5	21.8	24.5	24.0	24.2
CL-61	22.9 ± 3.1	21.0	24.0	22.4	24.3
CL-63	20.6 ± 1.9	19.5	21.4	20.0	21.4
CL-64	23.3 ± 4.2	20.7	25.6	22.6	24.3
CL-65	23.9 ± 2.7	22.3	25.3	23.3	24.7
CL-74	20.9 ± 2.0	19.6	22.0	20.6	21.3
CL-75	22.7 ± 2.7	20.7	23.8	23.0	23.3
CL-76	23.2 ± 3.2	21.1	24.9	22.9	23.9
CL-77	22.3 ± 3.5	20.4	24.2	21.4	23.3
CL-78	22.2 ± 3.2	20.8	24.0	20.8	23.0
CL-79	23.0 ± 2.0	22.0	23.1	22.6	24.4
CL-80	22.7 ± 3.3	20.4	24.2	22.8	23.4
CL-81	22.7 ± 2.9	20.9	23.7	22.2	24.0
CL-84	23.2 ± 2.9	21.2	23.9	23.2	24.5
CL-90	19.6 ± 2.3	18.3	20.4	18.9	20.7
CL-91	21.4 ± 1.7	20.3	22.0	21.0	22.1
CL-97	23.6 ± 3.3	22.2	25.5	22.2	24.3
CL-99	19.2 ± 1.8	18.2	20.2	18.6	19.6
CL-114	21.7 ± 2.1	20.5	21.1	22.7	22.5

TABLE C-X.2 MEAN QUARTLY OSLD RESULTS FOR THE INNER RING, OUTER RING, SPECIAL INTEREST, SUPPLEMENTAL AND CONTROL LOCATIONS FOR CLINTON POWER STATION, 2013

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS

COLLECTION PERIOD	INNER RING ± 2 S.D.	OUTER RING	SPECIAL INTEREST	SUPPLEMENTAL	CONTROL
JAN-MAR	21.4 ± 2.0	21.3 ± 1.4	21.2 ± 2.5	20.4 ± 2.6	20.5 ± 0.0
APR-JUN	23.8 ± 3.9	24.5 ± 2.2	24.2 ± 3.3	22.7 ± 3.2	23.3 ± 0.0
JUL-SEP	23.2 ± 2.7	22.9 ± 2.1	22.6 ± 3.1	21.6 ± 3.4	21.3 ± 0.0
OCT-DEC	24.2 ± 2.9	24.2 ± 1.7	23.7 ± 2.5	22.7 ± 3.0	20.8 ± 0.0

TABLE C-X.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR CLINTON POWER STATION, 2013

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER ± 2 STANDARD DEVIATIONS

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.	PRE-OP MEAN, ± 2 S.D., ALL LOCATIONS
INNER RING	64	18.4	27.0	23.1 ± 3.6	
OUTER RING	64	20.0	26.9	23.2 ± 3.1	18.0 ± 2.4
SPECIAL INTEREST	28	19.6	26.6	22.9 ± 3.6	
SUPPLEMENTAL	56	18.2	25.5	21.8 ± 3.6	
CONTROL	4	20.5	23.3	21.5 ± 2.5	

INNER RING STATIONS - CL-01, CL-05, CL-22, CL-23, CL-24, CL-34, CL-35, CL-36, CL-42, CL-43, CL-44, CL-45, CL-46, CL-47, CL-48, CL-63

OUTER RING STATIONS - CL-51, CL-52, CL-53, CL-54, CL-55, CL-56, CL-57, CL-58, CL-60, CL-61, CL-76, CL-77, CL-78, CL-79, CL-80, CL-81

SPECIAL INTEREST STATIONS - CL-37, CL-41, CL-49, CL-64, CL-65, CL-74, CL-75

SUPPLEMENTAL STATIONS - CL-02, CL-03, CL-04, CL-06, CL-07, CL-08, CL-114, CL-15, CL-33, CL-84, CL-90, CL-91, CL-97, CL-99

CONTROL STATIONS - CL-11

FIGURE C-1
MEAN MONTHLY GROSS BETA CONCENTRATION IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CPS, 2013

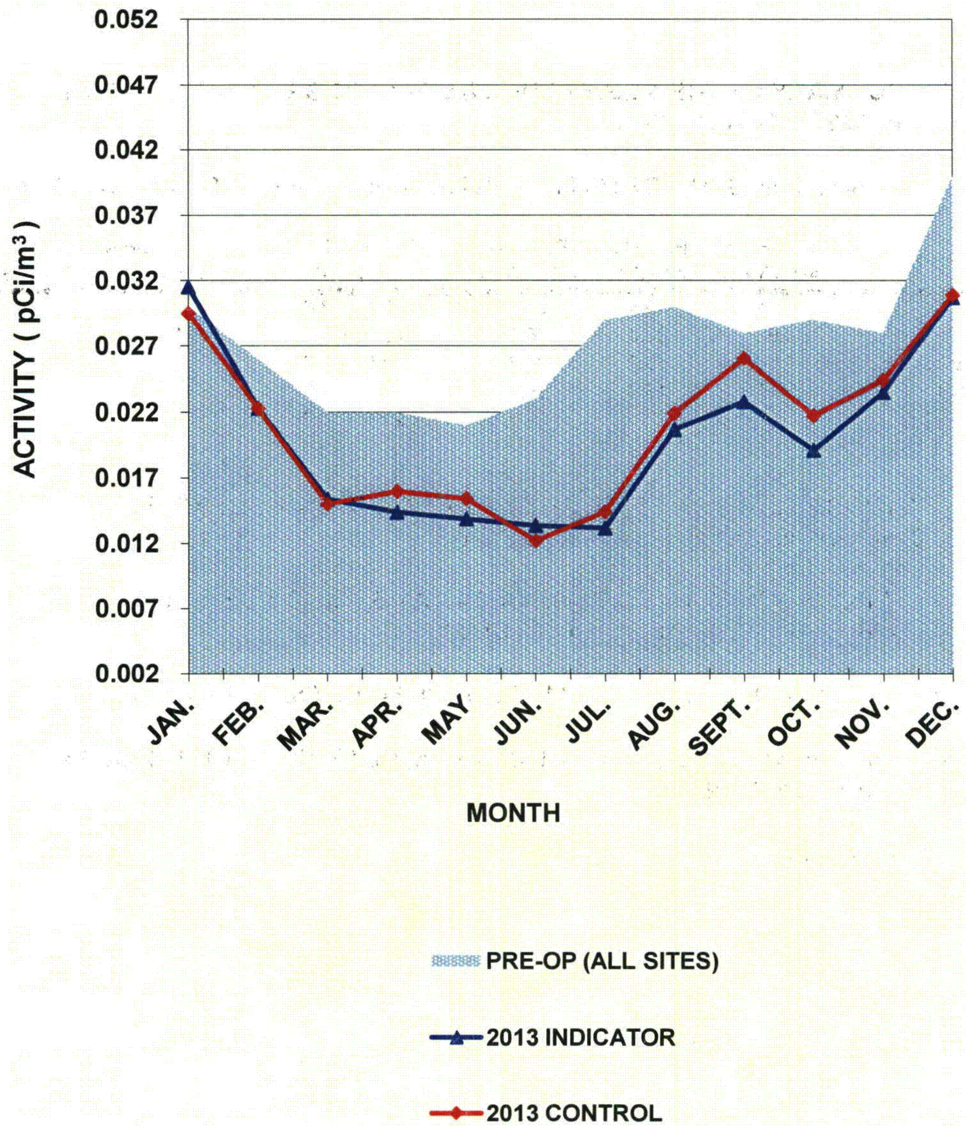
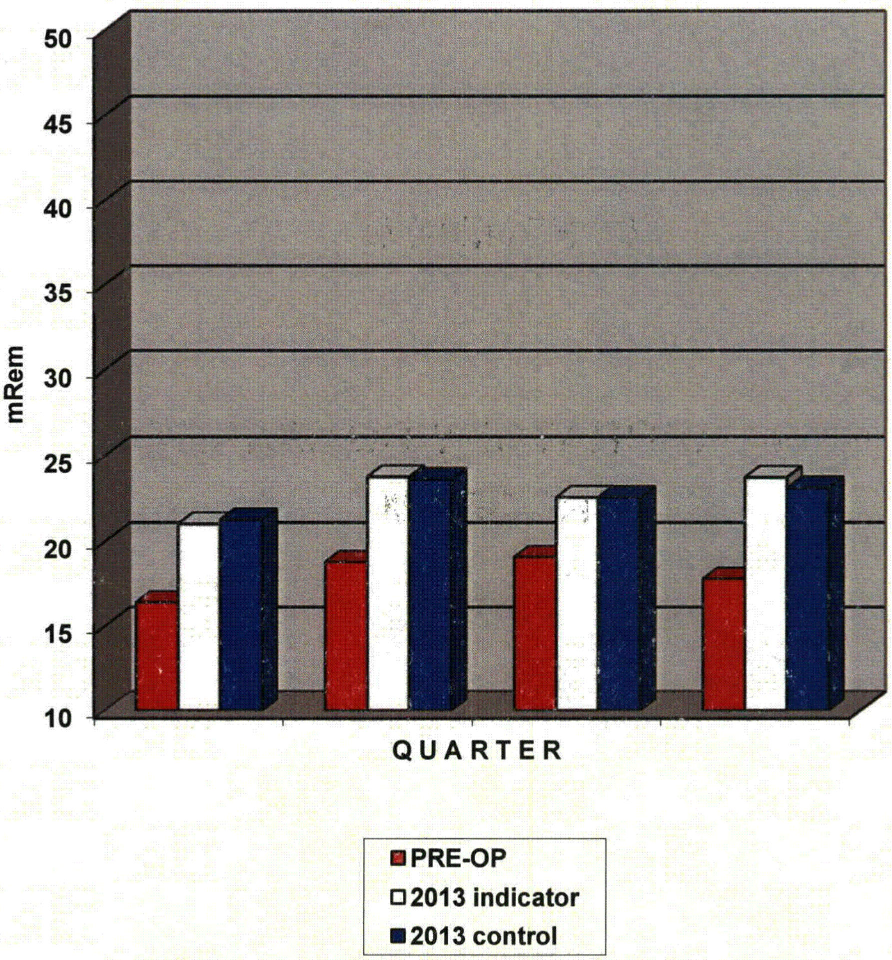


FIGURE C-2
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (TLD) IN THE VICINITY OF CPS, 2013



APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2013	E10477	Milk	Sr-89	pCi/L	120	99.7	1.20	A
			Sr-90	pCi/L	9.21	11.0	0.84	A
	E10478	Milk	I-131	pCi/L	87.1	100	0.87	A
			Ce-141	pCi/L	186	187	0.99	A
			Cr-51	pCi/L	463	472	0.98	A
			Cs-134	pCi/L	201	214	0.94	A
			Cs-137	pCi/L	262	266	0.98	A
			Co-58	pCi/L	200	208	0.96	A
			Mn-54	pCi/L	215	208	1.03	A
			Fe-59	pCi/L	266	252	1.06	A
			Zn-65	pCi/L	311	301	1.03	A
			Co-60	pCi/L	384	400	0.96	A
	E10480	AP	Ce-141	pCi	95.3	95.6	1.00	A
			Cr-51	pCi	264	241	1.10	A
			Cs-134	pCi	123	109	1.13	A
			Cs-137	pCi	142	136	1.04	A
			Co-58	pCi	112	106	1.06	A
			Mn-54	pCi	115	106	1.08	A
			Fe-59	pCi	139	129	1.08	A
			Zn-65	pCi	163	153	1.07	A
			Co-60	pCi	212	204	1.04	A
	E10479	Charcoal	I-131	pCi	90.1	92.6	0.97	A
	E10481	Water	Fe-55	pCi/L	1840	1890	0.97	A
June 2013	E10564	Milk	Sr-89	pCi/L	110	95.0	1.16	A
			Sr-90	pCi/L	15.8	17.0	0.93	A
	E10545	Milk	I-131	pCi/L	92.6	95.5	0.97	A
			Ce-141	pCi/L	83.1	90.4	0.92	A
			Cr-51	pCi/L	253	250	1.01	A
			Cs-134	pCi/L	118	125	0.94	A
			Cs-137	pCi/L	143	151	0.95	A
			Co-58	pCi/L	87.1	94.0	0.93	A
			Mn-54	pCi/L	171	172	0.99	A
			Fe-59	pCi/L	125	120	1.04	A
			Zn-65	pCi/L	220	217	1.01	A
			Co-60	pCi/L	169	175	0.97	A
	E10547	AP	Ce-141	pCi	56.8	56.7	1.00	A
			Cr-51	pCi	168	157	1.07	A
			Cs-134	pCi	85.2	78.4	1.09	A
			Cs-137	pCi	101	94.6	1.07	A
			Co-58	pCi	62.7	58.9	1.06	A
			Mn-54	pCi	125	108	1.16	A
			Fe-59	pCi	85.7	75.0	1.14	A
			Zn-65	pCi	169	136	1.24	W
			Co-60	pCi	116	110	1.05	A
	E10546	Charcoal	I-131	pCi	86.5	89.7	0.96	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2013	E10549	Water	Fe-55	pCi/L	1610	1610	1.00	A
September 2013	E10646	Milk	Sr-89	pCi/L	63.9	96.0	0.67	N (1)
			Sr-90	pCi/L	8.88	13.2	0.67	N (1)
	E10647	Milk	I-131	pCi/L	93.9	98.3	0.96	A
			Ce-141	pCi/L				NA (2)
			Cr-51	pCi/L	272	277	0.98	A
			Cs-134	pCi/L	150	172	0.87	A
			Cs-137	pCi/L	125	131	0.95	A
			Co-58	pCi/L	105	108	0.97	A
			Mn-54	pCi/L	138	139	0.99	A
			Fe-59	pCi/L	125	130	0.96	A
			Zn-65	pCi/L	264	266	0.99	A
			Co-60	pCi/L	187	196	0.95	A
	E10672	AP	Ce-141	pCi				NA (2)
			Cr-51	pCi	208	223	0.93	A
			Cs-134	pCi	143	139	1.03	A
			Cs-137	pCi	106	105	1.01	A
			Co-58	pCi	97.0	86.5	1.12	A
			Mn-54	pCi	116	112	1.04	A
			Fe-59	pCi	98.6	105	0.94	A
			Zn-65	pCi	219	214	1.02	A
			Co-60	pCi	166	158	1.05	A
	E10648	Charcoal	I-131	pCi	76.3	71.7	1.06	A
	E10673	Water	Fe-55	pCi/L	1790	1690	1.06	A
December 2013	E10774	Milk	Sr-89	pCi/L	97.3	93.8	1.04	A
			Sr-90	pCi/L	13.3	12.9	1.03	A
	E10775	Milk	I-131	pCi/L	89.7	96.1	0.93	A
			Ce-141	pCi/L	99.8	110	0.91	A
			Cr-51	pCi/L	297	297	1.00	A
			Cs-134	pCi/L	129	142	0.91	A
			Cs-137	pCi/L	126	126	1.00	A
			Co-58	pCi/L	116	112	1.04	A
			Mn-54	pCi/L	167	168	0.99	A
			Fe-59	pCi/L	117	110	1.06	A
			Zn-65	pCi/L	757	741	1.02	A
			Co-60	pCi/L	141	147	0.96	A
	E10777	AP	Ce-141	pCi	85.1	88.0	0.97	A
			Cr-51	pCi	278	238	1.17	A
			Cs-134	pCi	123	114	1.08	A
			Cs-137	pCi	102	101	1.01	A
			Co-58	pCi	84.4	89.9	0.94	A
			Mn-54	pCi	132	135	0.98	A
			Fe-59	pCi	101	88.3	1.14	A
			Zn-65	pCi	506	595	0.85	A
			Co-60	pCi	118	118	1.00	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2013	E10776	Charcoal	I-131	pCi	84.7	80.5	1.05	A
	E10778	Water	Fe-55	pCi/L	2010	1910	1.05	A

(1) Milk, Sr-89/90 - The failure was due to analyst error. No client samples were affected by this failure. NCR 13-15
(2) The sample was not spiked with Ce-141
(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 ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2013	RAD-93	Water	Sr-89	pCi/L	48.3	41.3	31.6 - 48.4	A
			Sr-90	pCi/L	19.3	23.9	17.2 - 28.0	A
			Ba-133	pCi/L	81.9	82.1	69.0 - 90.3	A
			Cs-134	pCi/L	40.9	42.8	34.2 - 47.1	A
			Cs-137	pCi/L	44.0	41.7	37.0 - 48.8	A
			Co-60	pCi/L	61.9	65.9	59.3 - 75.0	A
			Zn-65	pCi/L	202	189	170 - 222	A
			Gr-A	pCi/L	34.2	40.8	21.1 - 51.9	A
			Gr-B	pCi/L	18.0	21.6	13.0 - 29.7	A
			I-131	pCi/L	23.8	23.8	19.7 - 28.3	A
			U-Nat	pCi/L	60.4	61.2	49.8 - 67.9	A
			H-3	pCi/L	3970	4050	3450 - 4460	A
	MRAD-18	Filter	Gr-A	pCi/filter	Lost during processing			
November 2013	RAD-95	Water	Sr-89	pCi/L	25.5	21.9	14.4 - 28.2	A
			Sr-90	pCi/L	14.3	18.1	12.8 - 21.5	A
			Ba-133	pCi/L	57.2	54.2	44.7 - 59.9	A
			Cs-134	pCi/L	83.3	86.7	71.1 - 95.4	A
			Cs-137	pCi/L	201	206	185 - 228	A
			Co-60	pCi/L	104	102	91.8 - 114	A
			Zn-65	pCi/L	361	333	300 - 389	A
			Gr-A	pCi/L	29.5	42.8	22.2 - 54.3	A
			Gr-B	pCi/L	30.1	32.2	20.8 - 39.9	A
			I-131	pCi/L	23.1	23.6	19.6 - 28.0	A
			U-Nat	pCi/L	5.53	6.24	47.0 - 7.44	A
			H-3	pCi/L	17650	17700	15500 - 19500	A
	MRAD-19	Filter	Gr-A	pCi/filter	33.0	83.0	27.8 - 129	A

(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-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2013	13-MaW28	Water	Cs-134	Bq/L	21.0	24.4	17.1 - 31.7	A
			Cs-137	Bq/L	0.0446		(1)	A
			Co-57	Bq/L	28.3	30.9	21.6 - 40.2	A
			Co-60	Bq/L	18.2	19.56	13.69 - 25.43	A
			H-3	Bq/L	506	507	355 - 659	A
			Mn-54	Bq/L	25.7	27.4	19.2 - 35.6	A
			K-40	Bq/L	2.09		(1)	A
			Sr-90	Bq/L	10.5	10.5	7.4 - 13.7	A
			Zn-65	Bq/L	29.2	30.4	21.3 - 39.5	A
	13-GrW28	Water	Gr-A	Bq/L	2.74	2.31	0.69 - 3.93	A
			Gr-B	Bq/L	15.6	13.0	6.5 - 19.5	A
	13-MaS28	Soil	Cs-134	Bq/kg	859	887	621 - 1153	A
			Cs-137	Bq/kg	633	587	411 - 763	A
			Co-57	Bq/kg	0.256		(1)	A
			Co-60	Bq/kg	738	691	484 - 898	A
			Mn-54	Bq/kg	0.671		(1)	A
			K-40	Bq/kg	714	625.3	437.7 - 812.9	A
			Sr-90	Bq/kg	442	628	440 - 816	W
			Zn-65	Bq/kg	1057	995	697 - 1294	A
	13-RdF28	AP	Cs-134	Bq/sample	1.73	1.78	1.25 - 2.31	A
			Cs-137	Bq/sample	2.73	2.60	1.82 - 3.38	A
			Co-57	Bq/sample	2.38	2.36	1.65 - 3.07	A
			Co-60	Bq/sample	0.0302		(1)	A
			Mn-54	Bq/sample	4.36	4.26	2.98 - 5.54	A
			Sr-90	Bq/sample	1.43	1.49	1.04 - 1.94	A
			Zn-65	Bq/sample	3.14	3.13	2.19 - 4.07	A
	13-GrF28	AP	Gr-A	Bq/sample	0.767	1.20	0.36 - 2.04	A
			Gr-B	Bq/sample	0.871	0.85	0.43 - 1.28	A
	13-RdV28	Vegetation	Cs-134	Bq/sample	-0.197		(1)	A
			Cs-137	Bq/sample	7.39	6.87	4.81 - 8.93	A
			Co-57	Bq/sample	9.87	8.68	6.08 - 11.28	A
			Co-60	Bq/sample	6.08	5.85	4.10 - 7.61	A
			Mn-54	Bq/sample	-0.0104		(1)	A
			Sr-90	Bq/sample	1.28	1.64	1.15 - 2.13	W
			Zn-65	Bq/sample	6.84	6.25	4.38 - 8.13	A
September 2013	13-MaW29	Water	Cs-134	Bq/L	29.1	30.0	21.0 - 39.0	A
			Cs-137	Bq/L	34.5	31.6	22.1 - 41.1	A
			Co-57	Bq/L	0.0358		(1)	A
			Co-60	Bq/L	24.6	23.58	16.51 - 30.65	A
			H-3	Bq/L	2.45		(1)	A
			Mn-54	Bq/L	0.0337		(1)	A
			K-40	Bq/L	0.193		(1)	A
			Sr-90	Bq/L	9.12	7.22	5.05 - 9.39	W
			Zn-65	Bq/L	38.1	34.6	24.2 - 45.0	A
	13-GrW29	Water	Gr-A	Bq/L	1.13	0.701	0.210 - 1.192	A
			Gr-B	Bq/L	7.61	5.94	2.97 - 8.91	A

TABLE D-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2013	13-MaS29	Soil	Cs-134	Bq/kg	1150	1172	820 - 1524	A
			Cs-137	Bq/kg	1100	977	684 - 1270	A
			Co-57	Bq/kg	670		(1)	N (2)
			Co-60	Bq/kg	502	451	316 - 586	A
			Mn-54	Bq/kg	758	674	472 - 876	A
			K-40	Bq/kg	796	633	443 - 823	W
			Sr-90	Bq/kg	664	460	322 - 598	N (2)
			Zn-65	Bq/kg	210		(1)	N (2)
	13-RdF29	AP	Cs-134	Bq/sample	-0.570		(1)	N (2)
			Cs-137	Bq/sample	2.85	2.7	1.9 - 3.5	A
			Co-57	Bq/sample	3.30	3.4	2.4 - 4.4	A
			Co-60	Bq/sample	2.41	2.3	1.6 - 3.0	A
			Mn-54	Bq/sample	3.65	3.5	2.5 - 4.6	A
			Sr-90	Bq/sample	1.40	1.81	1.27 - 2.35	W
			Zn-65	Bq/sample	2.90	2.7	1.9 - 3.5	A
	13-GrF29	AP	Gr-A	Bq/sample	0.872	0.9	0.3 - 1.5	A
			Gr-B	Bq/sample	1.57	1.63	0.82 - 2.45	A
	13-RdV29	Vegetation	Cs-134	Bq/sample	5.29	5.20	3.64 - 6.76	A
			Cs-137	Bq/sample	7.48	6.60	4.62 - 8.58	A
			Co-57	Bq/sample	0.0129		(1)	A
			Co-60	Bq/sample	0.0523		(1)	A
			Mn-54	Bq/sample	8.78	7.88	5.52 - 10.24	A
			Sr-90	Bq/sample	1.63	2.32	1.62 - 3.02	W (2)
			Zn-65	Bq/sample	3.18	2.63	1.84 - 3.42	W

(1) False positive test.

(2) Soil, Co-57 & Zn-65 identified by gamma software as not detected, MAPEP evaluated as failing the false positive test. A large concentration of Eu-152 was spiked into the sample, causing interference in the analysis. Gamma software recognized the interference and identified them as not detected. MAPEP does not allow clients to enter non-detect designation. NCR 13-04
Soil, Sr-90 - incorrect results were submitted to MAPEP. Actual result was 332 bq/kg, which is with the acceptance range. NCR 13-04
AP, Cs-134 - MAPEP evaluated the -0.570 as a failed false positive test. No client samples were affected by these failures. NCR 13-04
Vegetation, Sr-90 - it appears that the carrier was double spiked into the sample, resulting in the low activity for this sample. NCR 13-04

(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.

APPENDIX E

ERRATA DATA

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Due to an incorrect setting on gamma detector 08, 3.29 rather than 4.66 was used in the MDC calculation. Nonconformance 13-07 was initiated and corrective actions have been implemented to address this issue. All samples counted on detector 08 were reprocessed using the correct calculation. As a result, all MDCs for these samples have increased by 41.6%. The previously reported activities and uncertainties were not affected. In some cases, the increased MDC resulted in missed LLDs. All samples with MDCs affected by this issue are listed below. The samples with missed LLDs are shown in the table for 2011, 2012, and 2013. All other required LLDs were met.

2011

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
4Q11 CL-1	9/28/2011	12/28/11	Air Particulate				
4Q11 CL-6	9/28/2011	12/28/11	Air Particulate				

2012

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
CL-99	02/29/12	03/28/12	Surface Water				
2Q12 CL-3	03/28/12	06/27/12	Air Particulate				
2Q12 CL-4	03/28/12	06/27/12	Air Particulate				
CL-13	04/25/12	04/25/12	Surface Water				
CL-99	04/25/12	05/30/12	Surface Water	I-131	<15	<18.6	pCi/l
CL-01	05/09/12	05/09/12	Grass				
CL-02	05/09/12	05/09/12	Grass	I-131	<60	<78.03	pCi/Kg Wet
CL-08	05/09/12	05/09/12	Grass	I-131	<60	<77.13	pCi/Kg Wet
CL-116	05/09/12	05/09/12	Grass	I-131	<60	<82.32	pCi/Kg Wet
CL-08	05/23/12	05/23/12	Grass				
CL-MW-CL-21S	06/11/12	06/11/12	RGPP	I-131	<15	<18.73	pCi/l
CL-116	06/20/12	06/20/12	Grass	I-131	<60	<71.34	pCi/Kg Wet
3Q12 CL-6	06/27/12	09/26/12	Air Particulate				
CL-115 (Lettuce)	06/27/12		Vegetation				
CL-118 (Lettuce)	06/27/12		Vegetation				
CL-91	06/27/12	07/25/12	Surface Water				
CL-08	07/18/12	07/18/12	Grass				
CL-115 (Swiss Chard)	07/25/12	07/25/12	Vegetation				
CL-118 (Lettuce)	07/25/12	07/25/12	Vegetation	I-131	<60	<72.15	pCi/Kg Wet
CL-91	07/25/12	08/29/12	Surface Water				
CL-116	08/01/12	08/01/12	Grass				
CL-116	08/15/12	08/15/12	Grass	I-131	<60	<82.5	pCi/Kg Wet
CL-115 (Cabbage)	08/29/12		Vegetation				
CL-115 (Lettuce)	08/29/12		Vegetation	I-131	<60	<69.94	pCi/Kg Wet
CL-90	08/29/12	09/26/12	Surface Water	I-131	<15	<15.79	pCi/l
CL-MW-CL-14S	09/04/12	09/04/12	RGPP	I-131	<15	<16.02	pCi/l
CL-MW-CL-22S	09/04/12	09/04/12	RGPP				
SWTP	09/05/12	09/05/12	RGPP				
CL-08	09/12/12	09/12/12	Grass				
CL-116	09/12/12	09/12/12	Grass				
CL-116	09/12/12	09/12/12	Milk	BA-140	<60	<65.48	pCi/l
CL-116	09/12/12	09/12/12	Milk	LA-140	<15	<18.91	pCi/l
CL-08	09/26/12	09/26/12	Grass	I-131	<60	<66.77	pCi/Kg Wet
CL-12T	09/26/12	09/26/12	Ground Water	I-131	<15	<19.39	pCi/l
CL-12T	09/26/12	09/26/12	Ground Water	LA-140	<15	<15.02	pCi/l
CL-01	10/10/12	10/10/12	Grass				
CL-08	10/10/12	10/10/12	Grass				
CL-08	10/24/12	10/24/12	Grass				

2012

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
CL-14	10/31/12	11/28/12	Drinking Water				
CL-14	11/28/12	12/26/12	Drinking Water				

2013

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
CL-91	12/26/12	01/30/13	Surface Water				

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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Docket No: 50-461

CLINTON POWER STATION

Annual Radiological
Groundwater Protection Program Report

1 January through 31 December 2013

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon Generation.

Clinton Power Station
Clinton, IL 61727

April 2014

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Appendices

I. Summary and Conclusions

In 2006, Exelon instituted a comprehensive program to evaluate the impact of station operations on groundwater and surface water in the vicinity of Clinton Power Station (CPS). This evaluation involved numerous station personnel and contractor support personnel. This report covers groundwater and surface water samples, collected outside of the Licensee required Off-Site Dose Calculation Manual (ODCM) requirements, both on and off station property in 2013. During that time period, 240 analyses were performed on 108 samples from 32 locations. The monitoring was conducted in four phases.

In assessing all the data gathered for this report, it was concluded that the operation of CPS had no adverse radiological impact on the environment, and there are no known active releases into the groundwater or surface water at CPS. No program changes occurred during the sampling year of 2013.

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 NUREG-1302 in any of the groundwater or surface water samples. In the case of tritium, Exelon specified that the independent laboratory achieve a lower limit of detection 10 times lower than that required by the United States Environmental Protection Agency (USEPA) regulation.

Strontium-89 was not detected in any samples above the LLD of 10 pCi/L. Strontium-90 was not detected in any samples above the LLD of 1 pCi/L.

Tritium was not detected in any of the groundwater, surface water, or precipitation water samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Background levels of tritium were detected at concentrations greater than the self-imposed LLD of 200 pCi/L in 3 of 17 groundwater monitoring locations. The tritium concentrations ranged from 198 ± 122 pCi/L to 348 ± 141 pCi/L. Tritium was not detected in any surface water or precipitation water.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater samples during the third quarter of sampling in 2013. Gross Alpha (dissolved) was detected in two of the 17 groundwater locations. The concentrations ranged from 2.2 to 2.5 pCi/L. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in 15 of 17 groundwater locations. The concentrations ranged from 2.2 to 10.9 pCi/L. Gross Beta (suspended) was not detected in any of the groundwater locations.

Hard-To-Detect analyses were performed on two groundwater locations to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs.

II. Introduction

The Clinton Power Station (CPS), consisting of one approximately 1,140 MW gross electrical power output boiling water reactor is located in Harp Township, DeWitt County, Illinois. CPS is owned and operated by Exelon and became operational in 1987. Unit No. 1 went critical on 15 February 1987. The site encloses approximately 13,730 acres. This includes the 4,895 acre, man-made cooling lake and about 452 acres of property not owned by Exelon. The plant is situated on approximately 150 acres. The cooling water discharge flume – which discharges to the eastern arm of the lake – occupies an additional 130 acres. Although the nuclear reactor, supporting equipment and associated electrical generation and distribution equipment lie in Harp Township, portions of the aforementioned 13,730 acre plot reside within Wilson, Rutledge, DeWitt, Creek, Nixon and Santa Anna Townships.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2013.

A. Objectives of the Radiological Groundwater Protection Program (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 Clinton 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 Connestoga Rovers and Associates (CRA) and the results and conclusions were made available to state and federal regulators as well as the public in station specific reports.

2. The Clinton 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. Clinton Power Station will continue to perform routine sampling and radiological analysis of water from selected locations.

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

5. Clinton 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 and A–2, Appendix A.

<u>Groundwater, Surface Water and Precipitation Water</u>

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures following regulatory methods. Groundwater, surface water, and precipitation 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, and shipment of samples, as well as in documentation of sampling events. Analytical laboratories are subject to internal quality assurance programs and 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.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." The chemical properties of tritium are essentially those of ordinary hydrogen.

Tritiated water behaves the same as ordinary water in both the environment and the body. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, essentially all tritium is cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity, and in special production reactors, where the isotopes lithium-7 and/or boron-10 are activated to produce tritium. Like normal water, tritiated water is colorless and odorless. Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to helium-3 (3He). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the least dangerous radionuclides because it emits very weak beta radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by TBE and EIML to analyze the environmental samples for radioactivity for the

Clinton Power Station RGPP in 2013.

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, surface water and precipitation water.
4. Concentrations 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 Clinton Power Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Clinton Power Station was considered operational at initial criticality. 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 specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. <u>Laboratory Measurements Uncertainty</u>

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

For groundwater and surface water 13 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140 and La-140 were reported.

C. Background Analysis

A pre-operational radiological environmental monitoring program (pre-operational REMP) was conducted to establish background radioactivity levels prior to operation of the Station. The environmental media sampled and analyzed during the pre-operational REMP were atmospheric radiation, fall-out, domestic water, surface water, marine life, milk, and vegetation. The results of the monitoring were detailed in the report entitled, Environmental Radiological Monitoring for Clinton Power Nuclear Power Station, Illinois Power Company, Annual Report 1987, May 1988.

The pre-operational REMP contained analytical results from samples collected from the surface water and groundwater.

1. Background Concentrations of Tritium

The purpose of the following discussion is to summarize background measurements of tritium in various media performed by others.

a. Tritium Production

Tritium is created in the environment from naturally occurring processes both cosmic and subterranean, as well as from anthropogenic (i.e., man-made) sources. In the upper atmosphere, "Cosmogenic" tritium is produced from the bombardment of stable nuclides and combines with oxygen to form tritiated water, which will then enter the hydrologic cycle. Below ground, "lithogenic" tritium is produced by the bombardment of natural lithium present in crystalline rocks by neutrons produced by the radioactive decay of naturally abundant uranium and thorium. Lithogenic production of tritium is usually negligible compared to other sources due to the limited abundance of lithium in rock. The lithogenic tritium is introduced directly to groundwater.

A major anthropogenic source of tritium and strontium-90 comes from the former atmospheric testing of thermonuclear weapons. Levels of tritium in precipitation increased significantly during the 1950s and early 1960s, and later with additional testing, resulting in the release of significant amounts of tritium to the atmosphere. The Canadian heavy water nuclear power reactors, other commercial power reactors, nuclear research and weapons production continue to influence tritium concentrations in the environment.

b. Precipitation Data

Precipitation samples are routinely collected at stations around the world for the analysis of tritium and other radionuclides. Two publicly available databases that provide tritium concentrations in precipitation are Global Network of Isotopes in Precipitation (GNIP) and USEPA's RadNet database. GNIP provides tritium precipitation concentration data for samples collected world wide from 1960 to 2006. RadNet provides tritium precipitation concentration data for samples collected at stations through out the U.S. from 1960 up to and including 2006. Based on GNIP data for sample stations located in the U.S. Midwest, tritium concentrations peaked around 1963. This peak, which approached 10,000 pCi/L for some stations, coincided with the atmospheric testing of thermonuclear weapons. Tritium concentrations in surface water showed a sharp decline up until 1975, followed by a gradual decline since that time. Tritium concentrations in Midwest precipitation have typically been below 100 pCi/L since around 1980. Tritium concentrations in wells may still be above the 200 pCi/L detection limit from the external causes described above.

c. Surface Water Data

Tritium concentrations are routinely measured in Clinton Lake.

According to the USEPA, surface water data typically has an uncertainty ± 70 to 100 pCi/L 95% confidence bound on each given measurement. Therefore, the typical background data provided may be subject to measurement uncertainty of approximately ± 70 to 100 pCi/L.

The radio-analytical laboratory is counting tritium results to an Exelon specified LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 – 240 pCi/L or 140 ± 100 pCi/L. Clearly, these sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

A. Program Exceptions

1. Sample Anomalies

There were no samples anomalies in 2013.

2. Missed Samples

There were no missed samples in 2013.

B. Program Changes

There were no sampling program changes in 2013.

C. Groundwater Results

Groundwater

Baseline samples were collected from off-site wells during four (4) phases at the station. Analytical results are discussed below. No anomalies were noted during the year.

Tritium

Samples from 17 locations were analyzed for tritium activity (Table B–I.1 Appendix B). Tritium values ranged from below the Exelon imposed LLD of 198 pCi/l to 348 pCi/l.

Strontium

Strontium-89 was not detected in any of the 17 samples analyzed and the required LLD of 10 pCi/L was met. Strontium-90 was also not detected in any of the 17 samples analyzed and the required LLD of 1 pCi/L was met. (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 were performed on groundwater samples during the third quarter of sampling in 2013. Gross Alpha (dissolved) was detected in two of the 17 groundwater locations. The concentrations ranged from 2.2 to 2.5 pCi/L. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in 15 of 17 groundwater locations. The concentrations ranged from 2.2 to 10.9 pCi/L. Gross Beta (suspended) was not detected in any of the groundwater locations (Table B–I.1 Appendix B).

Gamma Emitters

Naturally occurring K-40 was detect in two samples. The concentrations ranged from 32 to 62 pCi/L. No other gamma emitting nuclides were detected (Table B–I.2, Appendix B).

Hard-To-Detect

Hard-To-Detect analyses were performed on two groundwater locations to establish background levels. The analyses included Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs. Occasionally, the isotopes of U-234 and U-238 are detected at low levels and indistinguishable from background (Table B–I.3 Appendix B).

D. Surface Water Results

Surface Water

Baseline samples were collected from on-site surface waters during four (4) phases at the station. Analytical results are discussed below. No anomalies were noted during the year.

<u>Tritium</u>

Samples from seven locations were analyzed for tritium activity (Table B–II.1 Appendix B). Tritium was not detected at concentrations greater than the LLD.

<u>Strontium</u>

Strontium was not analyzed in 2013 (Table B–II.1 Appendix B).

<u>Gamma Emitters</u>

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

E. Precipitation Water Results

Precipitation Water

Precipitation water samples were collected during the first quarter of 2013. Analytical results are discussed below. No anomalies were noted during the year.

<u>Tritium</u>

Tritium was not detected at concentrations greater than the LLD (Table B–III.1 Appendix B).

F. Recapture

Clinton Power Station conducted recapture precipitation sampling and analysis per the Radiological Groundwater Protection Program. No consistent indication of recapture was identified.

G. Summary of Results – Inter-Laboratory Comparison Program

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

H. Leaks, Spills, and Releases

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

I. Trends

The historic low level tritium activity detected at MW- CL-14S and MW-CL-21S has continued to decrease over the course of 2013. All sampling well locations are currently indicating tritium levels less than the required LLD of 200 pCi/l. All wells will continue to be sampled in accordance with the RGPP.

J. Investigations

Currently no investigations are on-going.

K. Actions Taken

3. Compensatory Actions

There have been no station events requiring compensatory actions at the Clinton Power Station in 2013.

4. Installation of Monitoring Wells

No new wells were installed during the 2013.

5. Actions to Recover/Reverse Plumes

No actions were required to recover or reverse groundwater plumes.

APPENDIX A

LOCATION DESIGNATION OF THE ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Clinton Power Station, 2013

Site	Site Type
B-3	Monitoring Well
MW-CL-1	Monitoring Well
MW-CL-2	Monitoring Well
MW-CL-12I	Monitoring Well
MW-CL-13I	Monitoring Well
MW-CL-13S	Monitoring Well
MW-CL-14S	Monitoring Well
MW-CL-15I	Monitoring Well
MW-CL-15S	Monitoring Well
MW-CL-16S	Monitoring Well
MW-CL-17S	Monitoring Well
MW-CL-18I	Monitoring Well
MW-CL-18S	Monitoring Well
MW-CL-19S	Monitoring Well
MW-CL-20S	Monitoring Well
MW-CL-21S	Monitoring Well
MW-CL-22S	Monitoring Well
Sewage Treatment Plant	Surface Water
SW-CL-1	Surface Water
SW-CL-2	Surface Water
SW-CL-4	Surface Water
SW-CL-5	Surface Water
SW-CL-6	Surface Water
SW-CL-7	Surface Water
RG-2	Precipitation Water
RG-3	Precipitation Water
RG-15	Precipitation Water
RG-26	Precipitation Water
RG-N	Precipitation Water
RG-NE	Precipitation Water
RG-NNE	Precipitation Water
MPT-1	Precipitation Water

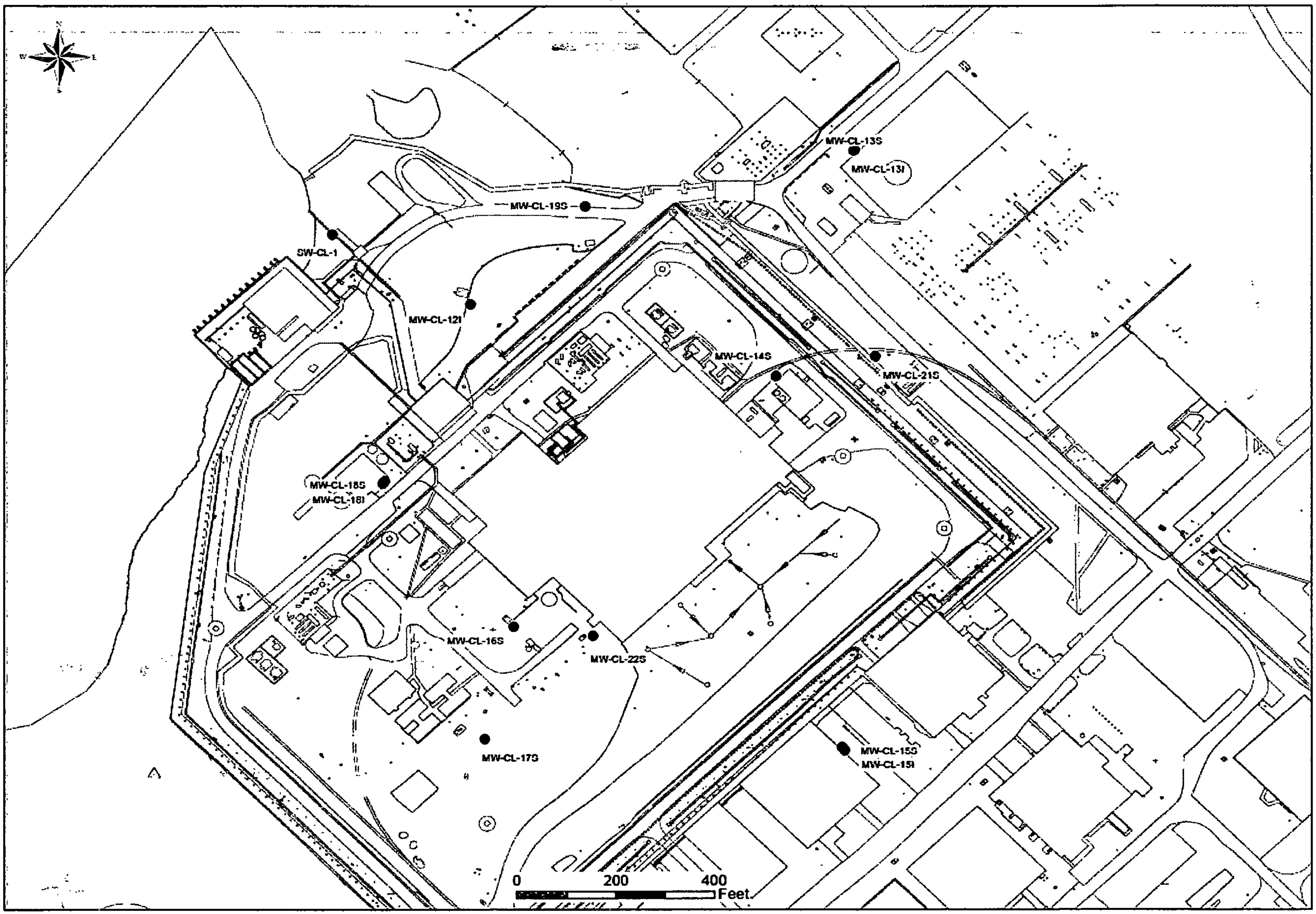

Figure A – 1
Onsite Sampling Locations at Clinton Power Station

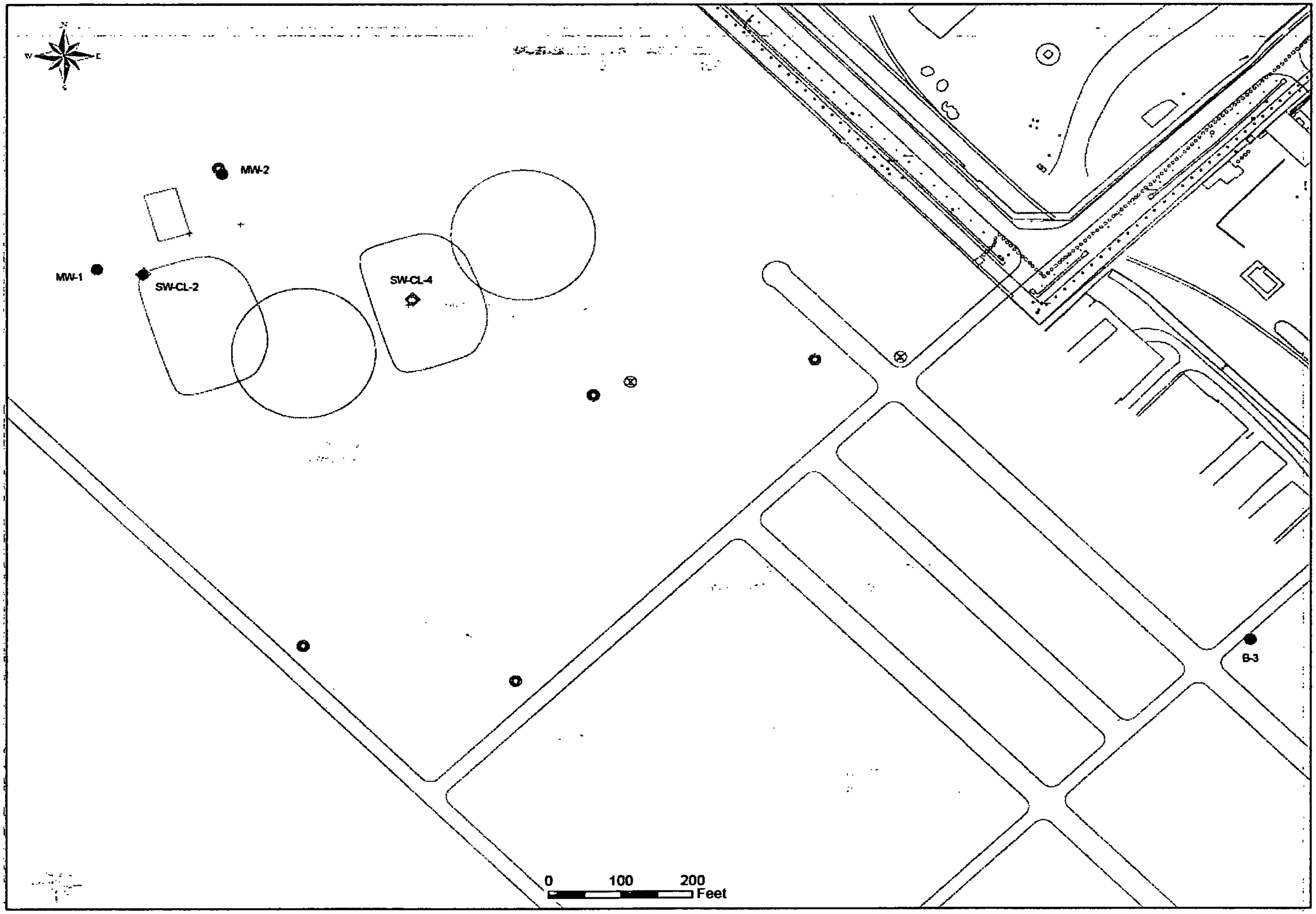

Figure A – 2
Sampling Locations South of Clinton Power Station

A-4

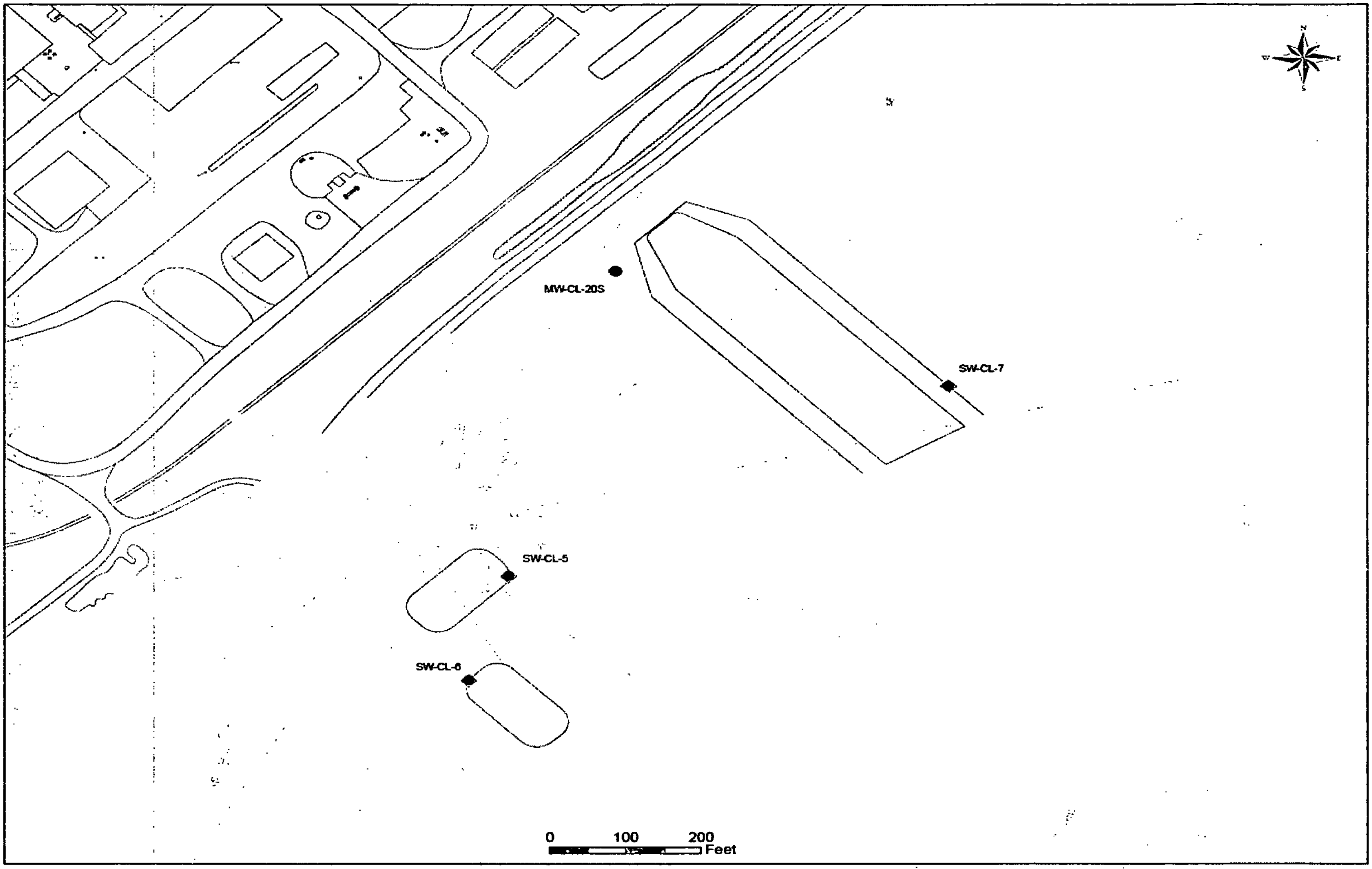

Figure A – 3
Sampling Locations East of Clinton Power Station

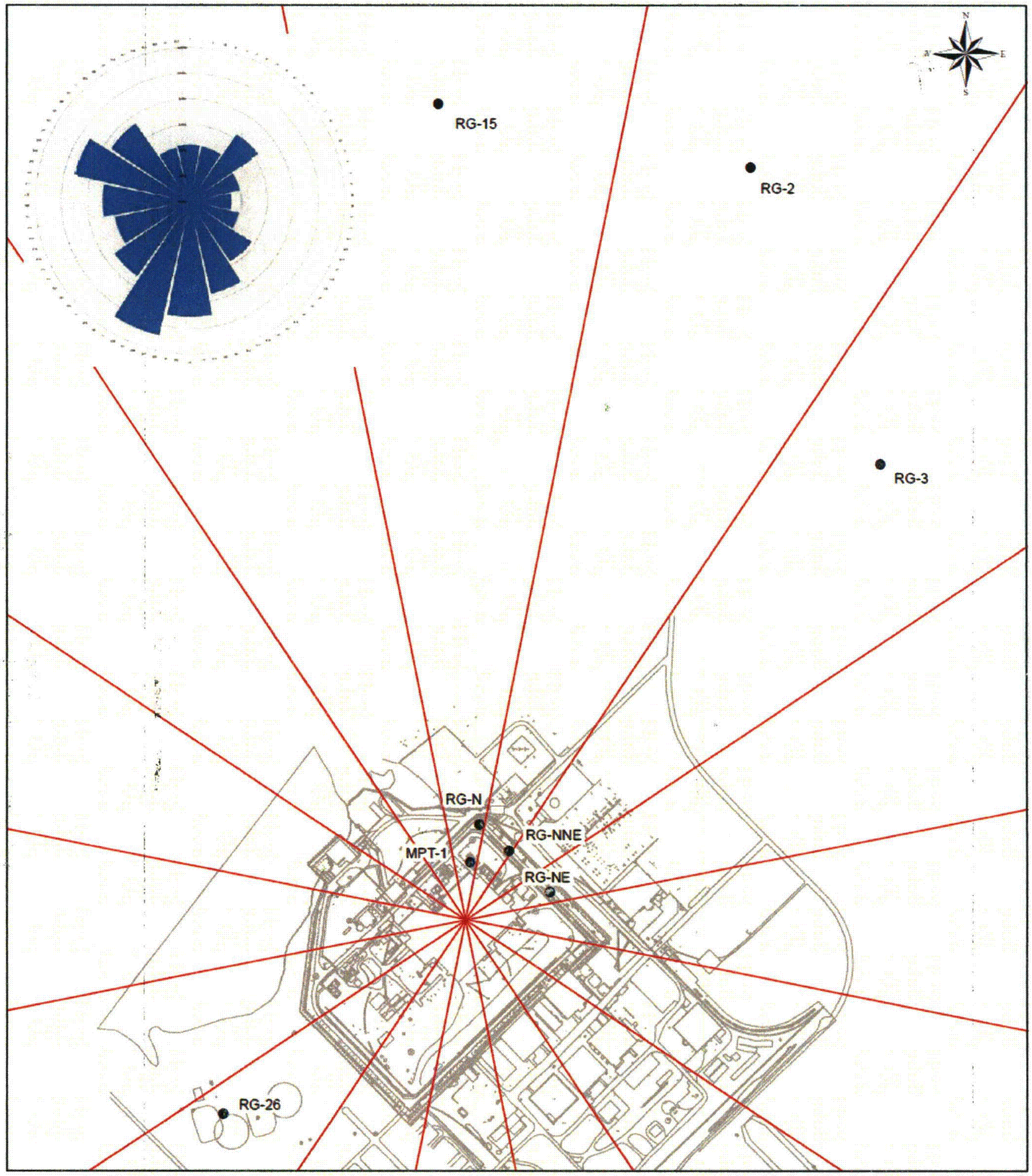

Figure A – 4
Recapture Sampling Locations of Clinton Power Station

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APPENDIX B

DATA TABLES OF THE ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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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 CLINTON POWER STATION, 2013

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)
B-3	03/11/13	< 194						
B-3	05/28/13	< 166						
B-3	08/26/13	< 189	< 3.6	< 0.6	2.5 ± 1.3	< 0.9	4.4 ± 1.2	< 1.7
B-3	11/11/13	< 182						
MW-CL-1	03/11/13	< 193						
MW-CL-1	05/28/13	< 163						
MW-CL-1	08/26/13	< 197	< 4.5	< 0.8	< 1.7	< 0.9	3.3 ± 1.1	< 1.7
MW-CL-1	11/11/13	< 182						
MW-CL-12I	02/19/13	348 ± 141						
MW-CL-12I	03/11/13	< 175						
MW-CL-12I	05/28/13	< 168						
MW-CL-12I	08/26/13	< 175	< 4.1	< 0.8	< 1.4	< 0.9	7.6 ± 1.3	< 1.7
MW-CL-12I	11/11/13	< 181						
MW-CL-13I	03/11/13	< 176						
MW-CL-13I	05/28/13	< 169						
MW-CL-13I	08/26/13	< 189	< 4.5	< 0.7	< 1.3	< 0.8	3.3 ± 1.2	< 1.6
MW-CL-13I	11/11/13	< 183						
MW-CL-13S	03/11/13	< 181						
MW-CL-13S	05/28/13	< 180						
MW-CL-13S	08/26/13	< 189	< 4.2	< 0.7	< 1.2	< 0.8	2.7 ± 1.1	< 1.6
MW-CL-13S	11/11/13	< 182						
MW-CL-14S	02/19/13	343 ± 141						
MW-CL-14S	03/12/13	329 ± 126						
MW-CL-14S	05/29/13	198 ± 122						
MW-CL-14S	08/27/13	235 ± 131	< 4.2	< 0.6	< 2.0	< 0.8	5.9 ± 1.4	< 1.6
MW-CL-14S	11/12/13	< 181						
MW-CL-15I	03/11/13	< 176						
MW-CL-15I	05/28/13	< 180						
MW-CL-15I	08/26/13	< 194	< 4.3	< 0.7	< 1.3	< 0.8	< 1.7	< 1.6
MW-CL-15I	11/11/13	< 183						
MW-CL-15S	03/11/13	< 194						
MW-CL-15S	05/28/13	< 183						
MW-CL-15S	08/26/13	< 197	< 4.4	< 0.7	< 0.8	< 0.8	< 1.2	< 1.6
MW-CL-15S	11/11/13	< 183						
MW-CL-16S	03/12/13	< 198						
MW-CL-16S	05/29/13	< 183						
MW-CL-16S	08/27/13	< 193	< 4.5	< 0.7	< 2.1	< 0.4	7.3 ± 1.4	< 1.7
MW-CL-16S	11/12/13	< 182						
MW-CL-17S	03/12/13	< 196						
MW-CL-17S	05/29/13	< 181						
MW-CL-17S	08/27/13	< 194	< 5.1	< 0.9	< 2.1	< 0.4	2.2 ± 1.2	< 1.7
MW-CL-17S	11/12/13	< 181						
MW-CL-18I	02/19/13	< 190						
MW-CL-18I	03/12/13	< 192						
MW-CL-18I	05/29/13	< 180						
MW-CL-18I	08/27/13	< 192	< 3.8	< 0.8	2.2 ± 1.2	< 0.4	3.9 ± 1.2	< 1.7
MW-CL-18I	11/12/13	< 183						
MW-CL-18S	02/19/13	< 188						
MW-CL-18S	03/12/13	< 195						
MW-CL-18S	05/29/13	< 179						

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

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-CL-18S	08/27/13	< 195	< 4.1	< 0.8	< 1.9	< 0.4	3.9 ± 1.2	< 1.7
MW-CL-18S	11/12/13	< 184						
MW-CL-19S	03/11/13	< 191						
MW-CL-19S	05/28/13	< 180						
MW-CL-19S	08/26/13	< 190	< 4.2	< 0.9	< 3.0	< 0.4	5.3 ± 1.5	< 1.7
MW-CL-19S	11/11/13	< 181						
MW-CL-2	03/11/13	< 192						
MW-CL-2	05/28/13	< 163						
MW-CL-2	08/26/13	< 188	< 4.3	< 0.7	< 1.9	< 0.9	3.0 ± 1.1	< 1.7
MW-CL-2	11/11/13	< 181						
MW-CL-20S	03/11/13	< 196						
MW-CL-20S	05/28/13	< 182						
MW-CL-20S	08/26/13	< 196	< 4.6	< 0.8	< 1.6	< 0.6	4.5 ± 1.2	< 1.9
MW-CL-20S	11/11/13	< 182						
MW-CL-21S	03/11/13	256 ± 132						
MW-CL-21S	05/28/13	< 179						
MW-CL-21S	08/26/13	< 191	< 5.1	< 0.8	< 1.3	< 0.6	2.9 ± 1.1	< 1.9
MW-CL-21S	11/11/13	< 181						
MW-CL-22S	03/12/13	< 191						
MW-CL-22S	05/29/13	< 182						
MW-CL-22S	08/27/13	< 194	< 4.4	< 0.9	< 1.8	< 0.6	10.9 ± 1.4	< 1.9
MW-CL-22S	11/12/13	< 183						

Table B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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	Cs-134	Cs-137	Ba-140	La-140
B-3	08/26/13	< 34	< 24	< 3	< 3	< 8	< 3	< 7	< 3	< 7	< 3	< 4	< 23	< 8
MW-CL-1	08/26/13	< 39	< 72	< 4	< 4	< 10	< 4	< 9	< 5	< 7	< 4	< 4	< 31	< 8
MW-CL-12I	08/26/13	< 40	< 86	< 4	< 5	< 11	< 5	< 8	< 6	< 9	< 4	< 4	< 32	< 12
MW-CL-13I	08/26/13	< 44	< 44	< 5	< 5	< 11	< 6	< 10	< 5	< 10	< 5	< 5	< 31	< 12
MW-CL-13S	08/26/13	< 33	< 27	< 3	< 3	< 8	< 3	< 7	< 3	< 6	< 3	< 3	< 22	< 7
MW-CL-14S	03/12/13	< 41	< 102	< 5	< 5	< 10	< 5	< 9	< 5	< 8	< 4	< 5	< 29	< 9
MW-CL-14S	05/29/13	< 40	< 70	< 4	< 4	< 8	< 4	< 6	< 4	< 7	< 4	< 4	< 29	< 7
MW-CL-14S	08/27/13	< 47	< 41	< 4	< 5	< 12	< 4	< 11	< 6	< 8	< 5	< 5	< 33	< 11
MW-CL-15I	08/26/13	< 36	< 33	< 4	< 4	< 8	< 3	< 8	< 4	< 7	< 4	< 4	< 29	< 8
MW-CL-15S	08/26/13	< 31	< 57	< 4	< 4	< 8	< 3	< 7	< 4	< 7	< 3	< 3	< 25	< 8
MW-CL-16S	08/27/13	< 25	< 24	< 2	< 3	< 5	< 2	< 6	< 3	< 4	< 3	< 2	< 17	< 5
MW-CL-17S	08/27/13	< 30	< 33	< 3	< 3	< 7	< 4	< 6	< 4	< 5	< 3	< 4	< 22	< 9
MW-CL-18I	08/27/13	< 33	< 71	< 3	< 4	< 9	< 4	< 7	< 4	< 7	< 4	< 4	< 27	< 9
MW-CL-18S	08/27/13	< 22	32 ± 21	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 5
MW-CL-19S	08/26/13	< 28	< 48	< 3	< 3	< 7	< 3	< 6	< 3	< 6	< 3	< 3	< 24	< 8
MW-CL-2	08/26/13	< 39	< 78	< 4	< 4	< 8	< 5	< 9	< 4	< 8	< 3	< 4	< 25	< 9
MW-CL-20S	08/26/13	< 30	< 67	< 3	< 3	< 7	< 3	< 6	< 3	< 6	< 3	< 3	< 23	< 6
MW-CL-21S	03/11/13	< 39	< 71	< 3	< 4	< 9	< 4	< 7	< 4	< 8	< 3	< 4	< 28	< 10
MW-CL-21S	05/28/13	< 38	< 41	< 4	< 4	< 8	< 3	< 8	< 4	< 7	< 4	< 4	< 29	< 10
MW-CL-21S	08/26/13	< 27	< 29	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 20	< 7
MW-CL-22S	08/27/13	< 28	62 ± 34	< 3	< 3	< 7	< 3	< 6	< 3	< 5	< 3	< 3	< 20	< 7

TABLE B-I.3 CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

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
MW-CL-14S	08/27/13	< 0.18	< 0.06	< 0.12	< 0.12	< 0.20	< 0.17	< 0.12	< 0.17	< 62	< 4.2
MW-CL-21S	08/26/13	< 0.08	< 0.02	< 0.04	< 0.04	< 0.11	< 0.06	< 0.06	< 0.06	< 76	< 4.3

TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
SEWAGE TREATMENT PLANT	03/11/13	< 196
SEWAGE TREATMENT PLANT	05/28/13	< 183
SEWAGE TREATMENT PLANT	08/26/13	< 193
SEWAGE TREATMENT PLANT	11/11/13	< 186
SW-CL-1	03/11/13	< 190
SW-CL-1	05/28/13	< 182
SW-CL-1	08/26/13	< 194
SW-CL-1	11/11/13	< 185
SW-CL-2	03/11/13	< 195
SW-CL-2	05/28/13	< 185
SW-CL-2	08/26/13	< 188
SW-CL-2	11/11/13	< 186
SW-CL-4	03/11/13	< 196
SW-CL-4	05/28/13	< 183
SW-CL-4	08/26/13	< 190
SW-CL-4	11/11/13	< 184
SW-CL-5	03/11/13	< 193
SW-CL-5	05/28/13	< 182
SW-CL-5	08/26/13	< 185
SW-CL-5	11/11/13	< 187
SW-CL-6	03/11/13	< 190
SW-CL-6	05/28/13	< 184
SW-CL-6	08/26/13	< 193
SW-CL-6	11/11/13	< 187
SW-CL-7	03/11/13	< 195
SW-CL-7	05/28/13	< 184
SW-CL-7	08/26/13	< 191
SW-CL-7	11/11/13	< 185

Table B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013**

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	Cs-134	Cs-137	Ba-140	La-140
SW-CL-1	08/26/13	< 29	< 23	< 3	< 3	< 7	< 3	< 6	< 3	< 6	< 3	< 3	< 22	< 6
SW-CL-2	08/26/13	< 30	< 26	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 21	< 7
SW-CL-4	08/26/13	< 21	< 20	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 17	< 6
SW-CL-5	08/26/13	< 30	< 31	< 3	< 3	< 8	< 3	< 6	< 4	< 6	< 3	< 3	< 24	< 7
SW-CL-6	08/26/13	< 32	< 70	< 3	< 3	< 8	< 3	< 6	< 3	< 6	< 3	< 3	< 25	< 8
SW-CL-7	08/26/13	< 25	< 23	< 3	< 3	< 7	< 4	< 6	< 3	< 5	< 2	< 3	< 23	< 9
SEWAGE TREATMENT PLANT	08/26/13	< 35	< 41	< 3	< 4	< 9	< 3	< 7	< 4	< 7	< 3	< 4	< 28	< 9

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2013

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
MPT-1	02/27/13	< 179
RG-15	02/27/13	< 170
RG-2	02/27/13	< 171
RG-26	02/27/13	< 176
RG-3	02/27/13	< 180
RG-N	02/27/13	< 177
RG-NE	02/27/13	< 181
RG-NNE	02/27/13	< 178