Docket No: 50-461

CLINTON POWER STATION

Annual Radiological Environmental Operating Report

1 January Through 31 December 2012

Prepared By

Teledyne Brown Engineering

Environmental Services

Exelon Generation.

Clinton Power Station
Clinton, IL 61727

April 2013

Table Of Contents

Appendices

Figures

Tables

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 2012 through 31 December 2012. During that time period, 1,615 analyses were performed on 1,451 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 2012. 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 3.60 E-02 or 0.036 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 with 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. This change may result in a step change in readings, up or down, depending on site characteristics. 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 2012 through 31 December 2012.

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 2012. 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, white bass 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 2012. 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.

January 18, 2012. IR 1314960

During weekly sampling activities, ODCM air samplers CL-2 and CL-11 were found to have timer shortages of one hour and six hours, respectively. The timer shortages are an indication of power outages and loss of continuous sampling capability during the sampling period. The interruptions were most likely due to electrical storms in the area.

January 18, 2012. IR 1314958

During weekly sampling activities, the vendor technician found ODCM surface water compositor CL-91 unable to collect sample due to an apparent blockage in the sample line. Upon investigation, it was determined that the heat trace associated with the sample line had failed, resulting in an ice blockage. An alternate sample line with new heat trace was installed on 1/25/12 to return sampling capability at CL-91. Because of the sampling interruption, the January sample did not meet the definition of a composite.

January 20, 2012. IR 1316058

During a walkdown of sampling equipment by plant personnel, ODCM surface water compositor CL-90 was found with no power supplied to the enclosure. The Operations department was engaged and the breaker associated with the sampler enclosure was reset, returning sampling capability at CL-90. Because of the sampling interruption, the January sample from this location did not meet the definition of a composite.

January 24, 2012. IR 1317488

During a walkdown of sampling equipment by plant personnel, non-ODCM surface water compositor CL-99 was found to be incapable of sampling due to clearing of the program from the compositor memory due to an apparent loss of power during the sampling period. The vendor technician was contacted and the sampler was reprogrammed on 1/25/12, which reestablished sampling capability. This issue prevented the January sample from CL-99 from meeting the definition of a composite.

May 3, 2012. IR 1361977

During a walkdown of sampling equipment by plant personnel on 4/30/12, ODCM air sample stations CL-2 and CL-3 were found without power. An investigation by Ameren concluded that an underground fault was the cause of the loss of power. The fault was identified and repaired and power (and subsequently continuous sampling capability) was restored on 5/3/12.

June 5, 2012. IR 1375996

During a scheduled plant potable water system maintenance outage (duration 6/5/12 0830 to 6/6/12 1417), ODCM drinking water compositor CL-14 was unable to obtain hourly drinking water samples. This interruption of sampling capability prevented the June sample from CL-14 from meeting the definition of a composite.

July 11, 2012. IR 1387602

During weekly sampling activities, ODCM continuous air sample station CL-8 was found without power. Ameren was contacted for repair and sampling capability was restored the same day.

August 22, 2012. IR 1403663

During weekly sampling activities, ODCM continuous air sample station CL-3 was found with a timer reading shortage of approximately 28 hours, indicating a loss of power and sampling capability during the sampling period.

September 6, 2012. IR 1409637

During an emergent maintenance outage window impacting the

station 12kV bus (beginning 9/3/12 1700), ODCM air sample stations CL-2 and CL-3, as well as ODCM drinking water compositor CL-14, the sampling equipment was unable to obtain samples due to isolation of their power supplies. Sampling capability was returned to CL-14 on 9/5/12 and to CL-2 and CL-3 on 9/6/12.

October 11, 2012. IR 1425358

Emergent depressurization of the plant potable water distribution precluded ODCM drinking water compositor CL-14 from obtaining scheduled samples from 10/7/12 1410 to 10/11/12 1330. Because of this interruption to sampling capability, the October sample from CL-14 did not meet the definition of a composite.

October 17, 2012. IR 1427863

During weekly sampling activities, non-ODCM air sample station CL-1 was found with a timer reading shortage of approximately 2 hours, indicating a loss of power and subsequent continuous sampling capability during the sampling period.

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

A supplemental control location, designated as CL-058, was established for shoreline sediment. The new location is 50 miles South from CPS and approximately 100 yards south of the Wilborn Creek access area boat ramp on Lake Shelbyville.

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.

Iodine-131

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

Tritium

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 six of 48 samples. The concentration ranged from 41 to 94 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). No 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-7D. The concentration was 49 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, white bass 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 43 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 41 E–3 pCi/m^3 with a mean of 19 E–3 pCi/m^3. The results from the Control locations (Group III) ranged from 9 to 40 E–3 pCi/m^3 with a mean of 21 E–3

pCi/m^3. Comparison of the 2012 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 2012 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 all 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 all 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 2012. The average dose from the inner ring was 23.8 mR/quarter. The average dose from the outer ring was 24.0 mR/quarter. The average dose from the special interest group was 23.7 mR/quarter. The average dose from the supplemental group was 22.2 mR/quarter. The quarterly measurements

ranged from 18.1 to 29.3 mR/quarter.

The inner ring and outer ring measurements compared well to the Control Station, CL-11, which ranged from 19.4 mR/quarter to 23.1 mR/quarter with an average measurement of 20.6 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 July through October 2012 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 ft^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 Farm (km)
1 N	1.5	1.5	1.5
2 NNE	1.5	3.8	3.8
3 NE	2.1	7.0	> 8
4 ENE	2.9	2.9	> 8
5 E	1.7	1.7	> 8
6 ESE	5.1	5.3	> 8
7 SE	4.4	> 8	> 8
8 SSE	2.9	4.3	4.5
9 S	4.8	6.6	6.6
10 SSW	4.7	> 8	> 8
11 SW	1.2	5.6	> 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. 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, 12 out of 18 analytes met the specified acceptance criteria. Six analytes (Co-60, Gross Alpha, Gross Beta, Sr-89, Sr-90 and Zn-65) did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's MAPEP March 2012 Co-60 in soil result of 7.61 Bq/kg was higher than the known value of 1.56 Bq/kg, resulting in a found to known ratio of 4.88 on a sensitivity evaluation. NCR 12-08 was initiated to investigate this failure. No cause could be found for the failure. TBE is monitoring the Co-60 in soil analyses on a case-to-case basis.

2. Teledyne Brown Engineering's MAPEP March 2012 Zn-65 in AP result of 4.19 Bq/sample was higher than the known value of 2.99 Bq/sample, exceeding the upper control limit of 3.89 Bq/sample. NCR 12-08 was initiated to investigate this failure. No cause could be found for the failure and is considered an anomaly specific to the MAPEP sample. The first and second quarter 2012 Analytics AP Zn-65 analyses were acceptable.

3. Teledyne Brown Engineering's MAPEP September 2012 Sr-90 in water result of 19.6 pCi/L was higher than the known value of 12.2 pCi/L, exceeding the upper control limit of 15.9 pCi/L. NCR 12-11 was initiated to investigate this failure. An incorrect aliquot was entered into LIMS. Using the correct aliquot, the result would have fallen within the acceptance range.

4. Teledyne Brown Engineering's ERA May 2012 Gross Alpha in water result of 82.4 pCi/L was higher than the known value of 62.9 pCi/L, which exceeded the upper control limit of 78.0 pCi/L. NCR 12-05 was initiated to investigate this failure. The G-1 detector is slightly biased high for Th-230 based measurements. The G-1 detector is used only for ERA samples. The detector was recalibrated.

5. Teledyne Brown Engineering's ERA November 2012 Gross Beta in water result of 59.3 pCi/L was higher than the known value of 39.2 pCi/L, which exceeded the upper control limit of 46.7 pCi/L. NCR 12-13 was initiated to investigate this failure. The rerun result of 44.8 fell within the control limits. It appears an incorrect aliquot was entered into LIMS.

Teledyne Brown Engineering's ERA November 2012 Sr-89 in water result of 46.5 pCi/L was higher than the known value of 39.1 pCi/L, which exceeded the upper control limit of 46.1 pCi/L. NCR 12-13 was initiated to investigate this failure. The found to known ratio was 1.19, which TBE considers acceptable with warning. For the EIML laboratory, 12 out of 14 analytes met the specified acceptance criteria. Two analytes (Gross Beta and Co-57) did not meet the specified acceptance criteria for the following reason:

1. Environmental Inc., Midwest Laboratory's ERA April 2012 Gross Beta in water result of 76.2 pCi/L was higher than the known value

of 44.2 pCi/L, exceeding the upper control limit of 51.5 pCi/L. The rerun result of 38.3 fell within the control limits. A sample dilution problem is suspected.

2. Environmental Inc., Midwest Laboratory's MAPEP August 2012 Co-57 in vegetation result of 7.44 pCi/L was higher than the known value of 5.66 pCi/L, exceeding the upper control limit of 7.36 pCi/L. The recount result of 6.74 fell within the control limits. The sample was recounted using a geometry more closely matched to the MAPEP sample size.

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

1. American National Standards Institute, Inc., "Performance, Testing and Procedural Specifications for Thermoluminescent Dosimetry," ANSI N545-1975.
2. Code of Federal Regulations, Title 10, Part 20 (Nuclear Regulatory Commission).
3. CPS 2011 Annual Radioactive Effluent Release Report.
4. "Environmental Radioactivity," M. Eisenbud, 1987 (E187).
5. "Natural Radon Exposure in the United States," Donald T. Oakley, U.S. Environmental Protection Agency. ORP/SID 72-1, June 1972.
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.
10. National Council on Radiation Protection and Measurements, Report No. 22, "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational

Exposure," (Published as National Bureau of Standards Handbook 69, issued June 1959, superseding Handbook 52).

11. National Council on Radiation Protection and Measurements, Report No. 39, "Basic Radiation Protection Criteria," January 1971.

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

13. National Council on Radiation Protection and Measurements, Report No. 91, "Recommendations on Limits for Exposure to Ionizing Radiation," June 1987.

14. National Council on Radiation Protection and Measurements, Report No. 93, "Ionizing Radiation Exposure of the Population of the United States," September 1987.

15. National Research Council, 1990, Committee on Biological Effects of Ionizing Radiation (BEIR V), Board on Radiation Effects Research on Life Sciences, "The Effects of Exposure to Low Levels of Ionizing Radiation".

16. United States Nuclear Regulatory Commission, Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants," Revision 1, April 1975.

17. United States Nuclear Regulatory Commission, Regulatory Guide 4.13, "Performance, Testing and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications, "Revision 1, July 1977.

18. United States Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Dose to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, "Revision 1, October 1977.

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.

Intentionally left blank

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

Intentionally left blank

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD: 2012**

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
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	65 (2/24) (45/85)	66 (4/24) (41/94)	94 (1/12)	CL-99 CONTROL NORTH FORK ACCESS 3.5 MILES NNE 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)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE CLINTON POWER STATION, 2012

NAME OF FACILITY: CLINTON POWER STATION — **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL — **REPORTING PERIOD: 2012**

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)	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
DRINKING WATER (PCI/LITER)	GR-B	12	4	<LLD	NA	-		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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD: 2012**

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
DRINKING WATER (PCI/LITER)	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	<LLD	NA	-		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

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, 2012

NAME OF FACILITY: CLINTON POWER STATION
LOCATION OF FACILITY: DEWITT COUNTY IL
DOCKET NUMBER: 50-461
REPORTING PERIOD: 2012

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
DRINKING WATER (PCI/LITER)	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	I-131		15	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
	CE-144		NA	<LLD	NA	-		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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD: 2012**

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
WELL WATER (PCI/LITER)	H-3	12	2000	<LLD	NA	-		0
	GAMMA	12						
	BE-7		NA	<LLD	NA	-		0
	K-40		NA	49 (1/12)	NA	49 (1/4)	CL-7D INDICATOR MASCOUTIN RECREATION AREA 2.3 MILES ESE 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
	NB-95		15	<LLD	NA	-		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, 2012

NAME OF FACILITY: CLINTON POWER STATION
LOCATION OF FACILITY: DEWITT COUNTY IL
DOCKET NUMBER: 50-461
REPORTING PERIOD: 2012

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
WELL WATER (PCI/LITER)	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
	K-40		NA	3662 (8/8) (2595/4471)	3490 (8/8) (2770/4459)	3662 (8/8) (2595/4471)	CL-19 INDICATOR END OF DISCHARGE FLUME 3.4 MILES E 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, 2012

NAME OF FACILITY:	**CLINTON POWER STATION**			**DOCKET NUMBER:**		**50-461**		
LOCATION OF FACILITY:	**DEWITT COUNTY IL**			**REPORTING PERIOD:**		**2012**		
				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
FISH (PCI/KG WET)	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
	CS-137		150	<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, 2012

NAME OF FACILITY: CLINTON POWER STATION LOCATION OF FACILITY: DEWITT COUNTY IL				DOCKET NUMBER: REPORTING PERIOD:		50-461 2012		
				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
FISH (PCI/KG WET)	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	3						
	BE-7		NA	<LLD	<LLD	-		0
	K-40		NA	8608 (2/2) (7378/9837)	6661 (1/1)	8608 (2/2) (7378/9837)	CL-07B INDICATOR CLINTON LAKE 2.1 MILES SE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		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, 2012

NAME OF FACILITY: CLINTON POWER STATION — **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL — **REPORTING PERIOD: 2012**

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
SEDIMENT (PCI/KG DRY)	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
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER: 50-461**
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD: 2012**

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
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	530	10	20 (477/477) (7/43)	21 (53/53) (9/40)	21 (53/53) (9/40)	CL-11 CONTROL AMERENIP SUBSTATION 16 MILES S OF SITE	0
	GAMMA	40						
	BE-7		NA	71.7 (36/36) (25.8/132)	65.5 (4/4) (47.9/83.3)	84.3 (4/4) (62.9/132)	CL-2 INDICATOR CLINTON'S MAIN ACCESS ROAD 0.7 MILES NNE 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
	RU-103		NA	<LLD	<LLD	-		0
	RU-106		NA	<LLD	<LLD	-		0
	CS-134		50	<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, 2012

NAME OF FACILITY:	CLINTON POWER STATION			DOCKET NUMBER:		50-461		
LOCATION OF FACILITY:	DEWITT COUNTY IL			REPORTING PERIOD:		2012		
				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
AIR PARTICULATE (E-3 PCI/CU.METER)	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	530						
	I-131		70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	20	1	NA	<LLD	-		0
	GAMMA	20						
	BE-7		NA	NA	<LLD	-		0
	K-40		NA	NA	1206 (20/20) (1053/1403)	1206 (20/20) (1053/1403)	CL-116 CONTROL PASTURE IN RURAL KENNEY 14 MILES WSW OF SITE	0
	MN-54		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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD:** 2012

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
MILK (PCI/LITER)	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
	ZR-95		NA	NA	<LLD	-		0
	CS-134		15	NA	<LLD	-		0
	CS-137		18	NA	<LLD	-		0
	BA-140		60	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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD:** 2012

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)	LA-140		15	NA	<LLD	-		0
	CE-144		NA	NA	<LLD	-		0
VEGETATION (PCI/KG WET)	GAMMA	48						
	BE-7		NA	343.9 (33/36) (74.9/1072)	660.1 (11/12) (172.2/3039)	660.1 (11/12) (172.2/3039)	CL-114 CONTROL CISCO 12.5 MILES SSE OF SITE	0
	K-40		NA	5548.1 (36/36) (2235/11370)	5091.3 (12/12) (2455/8307)	7174.8 (12/12) (3072/11370)	CL-118 INDICATOR SITE'S MAIN ACCESS ROAD 0.7 MILES NNE OF SITE	0
	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

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, 2012

NAME OF FACILITY: CLINTON POWER STATION | DOCKET NUMBER: 50-461
LOCATION OF FACILITY: DEWITT COUNTY IL | REPORTING PERIOD: 2012

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)	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
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		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, 2012

NAME OF FACILITY: CLINTON POWER STATION **DOCKET NUMBER:** 50-461
LOCATION OF FACILITY: DEWITT COUNTY IL **REPORTING PERIOD:** 2012

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)	GAMMA	52						
	BE-7		NA	1997.4 (39/39) (188.9/3818)	2080.2 (13/13) (1461/3015)	2241.9 (13/13) (719.2/3791)	CL-01 INDICATOR CAMP QUEST 1.8 MILES W OF SITE	0
	K-40		NA	6702 (39/39) (4245/10100)	6415.6 (13/13) (4551/8185)	7195.3 (13/13) (5078/10100)	CL-08 INDICATOR DEWITT CEMETERY 2.2 MILES E OF SITE	0
	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

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, 2012

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

LOCATION OF FACILITY: DEWITT COUNTY IL | **REPORTING PERIOD: 2012**

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)	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
	CE-144		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-REM/QTR.)	OSLD-QUARTERLY	216	NA	23 (212/212) (18/28.6)	20.2 (4/4) (19.3/22.5)	25.1 (4/4) (23.7/28.6)	CL-51 INDICATOR 4.4 MILES NW	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)

Intentionally left blank

APPENDIX B

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

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Clinton Power Station, 2012

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, 2012

Location	Location Description	Distance & Direction From Site
J. Environmental Dosimetry - TLD		
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, 2012

Location	Location Description	Distance & Direction From Site
J. Environmental Dosimetry – TLD (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, 2012

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, 2012

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

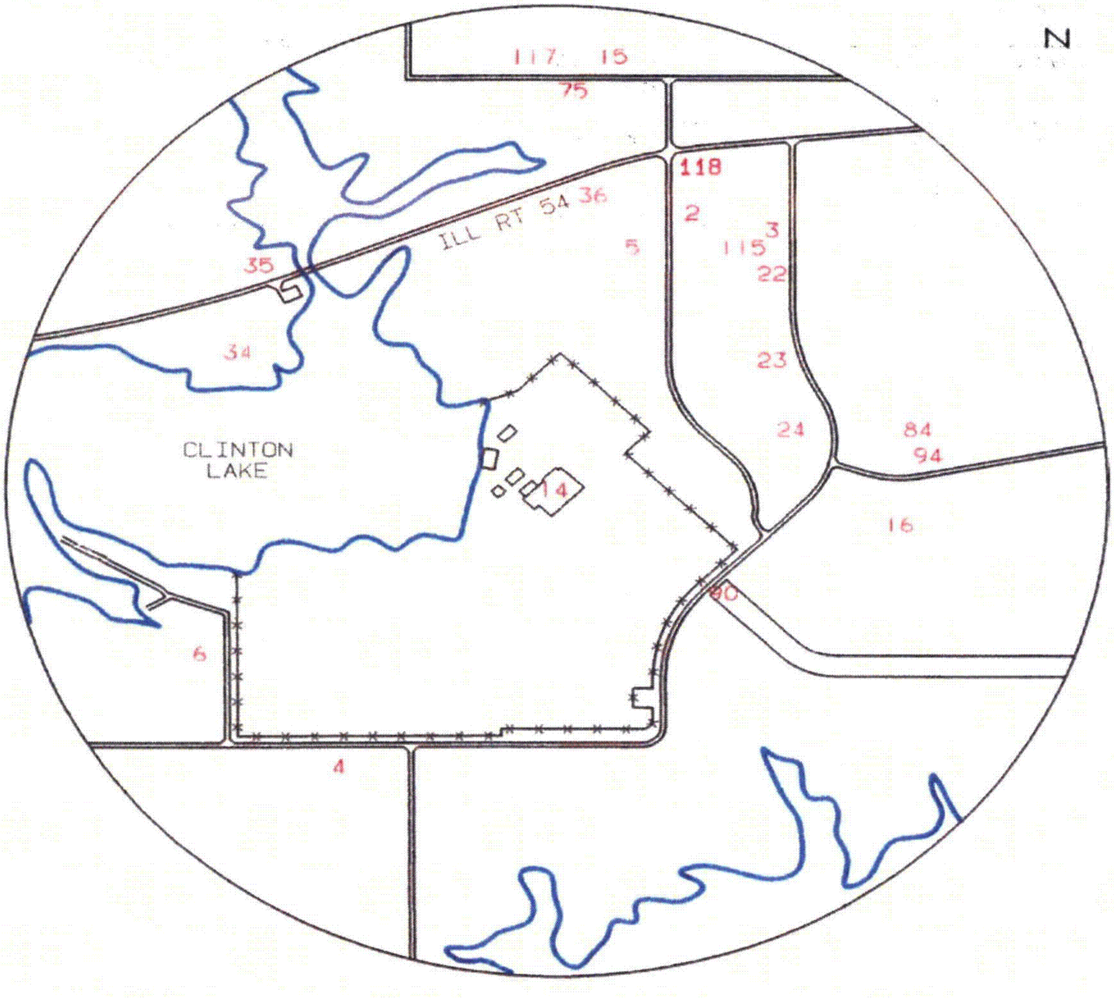


Figure B-1
Environmental Sampling Locations Within One
Mile of the Clinton Power Station, 2012

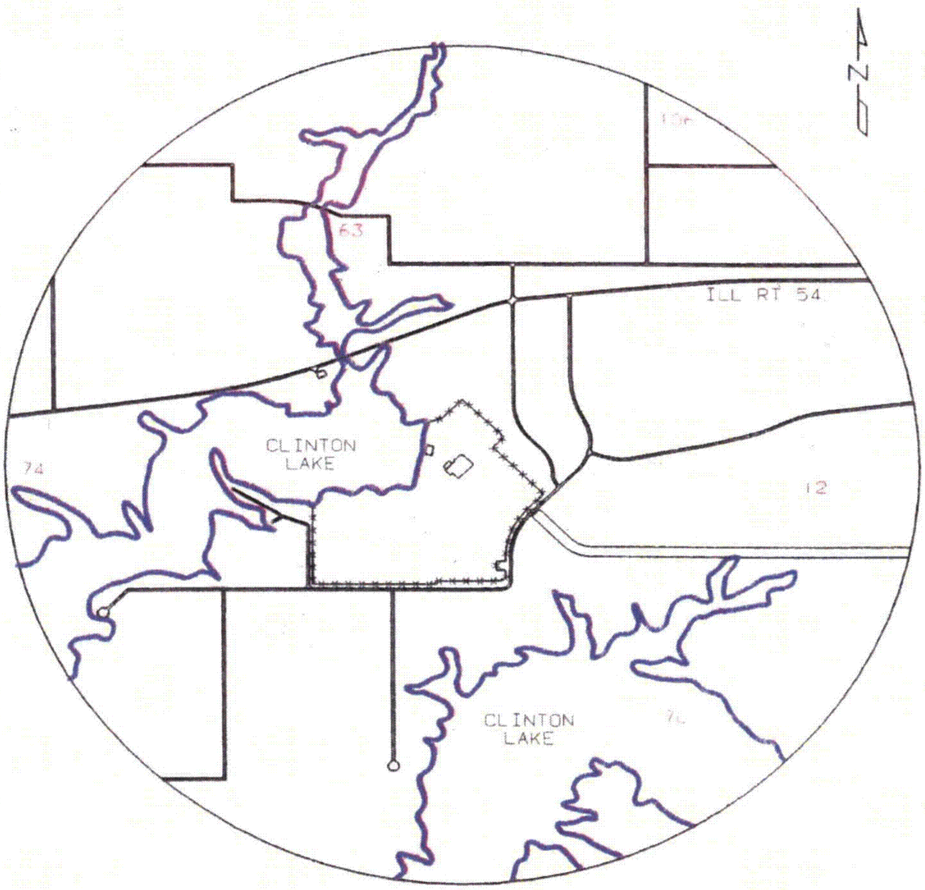


Figure B-2
Environmental Sampling Locations Between One and Two Miles of the Clinton Power Station, 2012

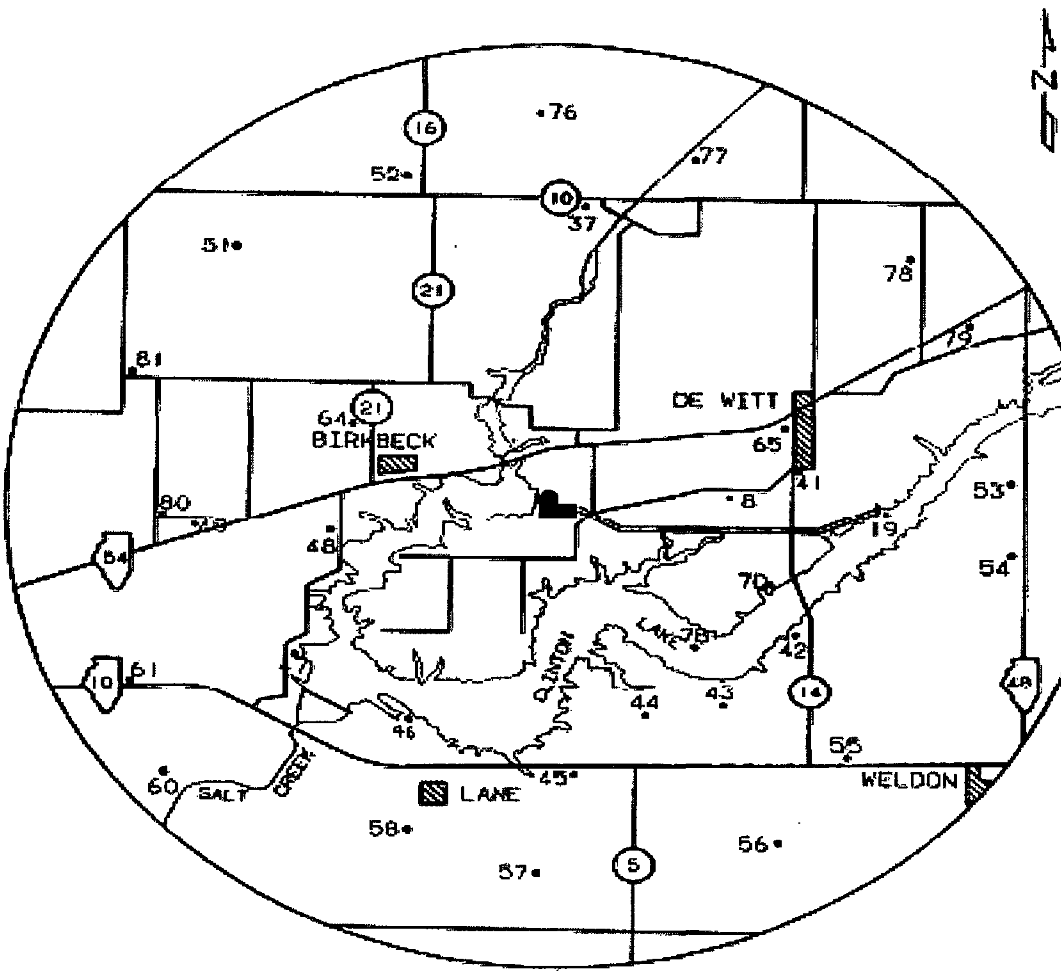


Figure B-3
Environmental Sampling Locations Between Two and Five Miles from the Clinton Power Station, 2012

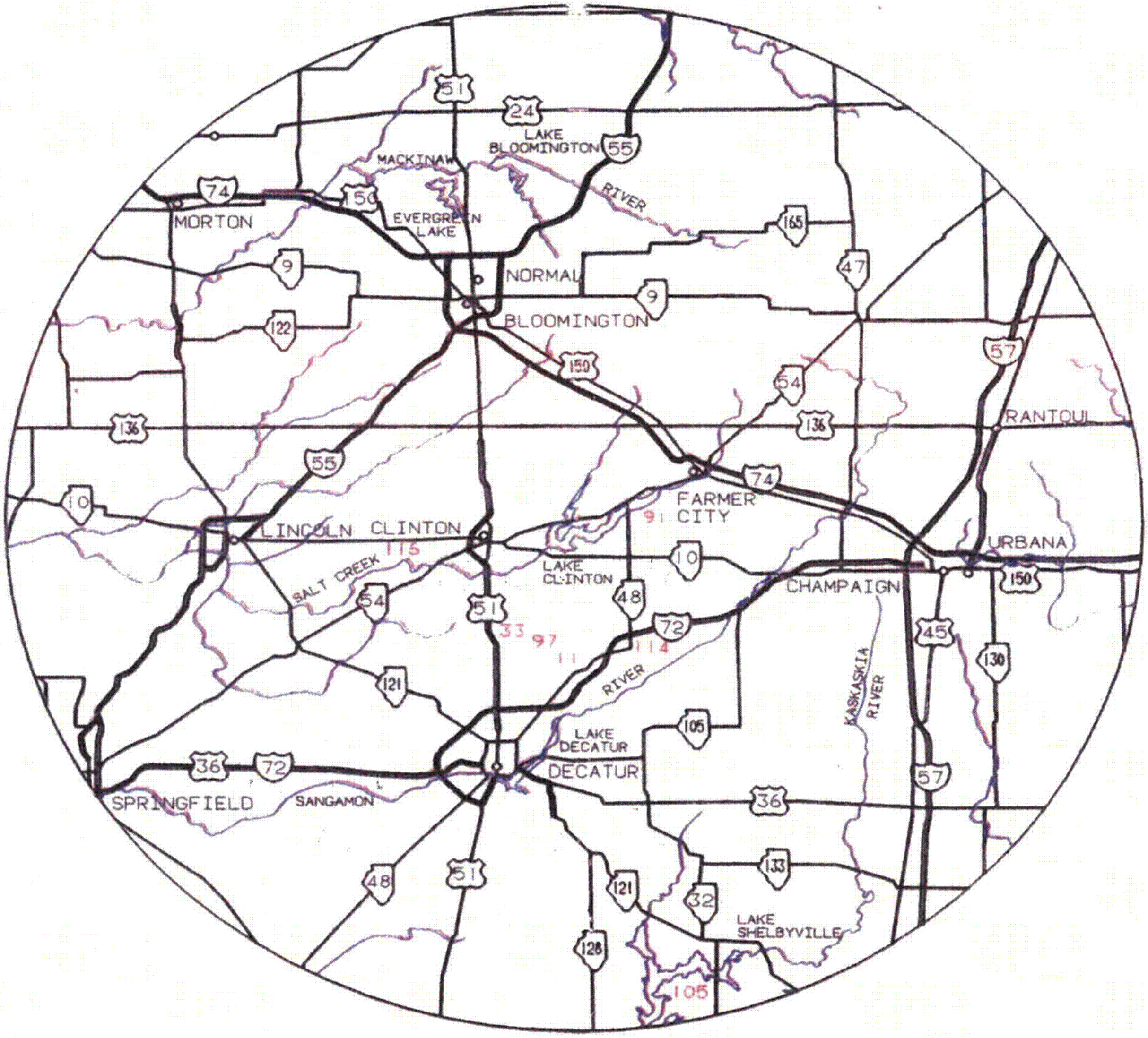


Figure B-4
Environmental Sampling Locations Greater Than Five
Miles of the Clinton Power Station, 2012

APPENDIX C

DATA TABLES AND FIGURES - PRIMARY LABORATORY

Intentionally left blank

Table C-I.1 **CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		CL-90
12/28/11 - 01/25/12	(1)	< 0.4
01/25/12 - 02/29/12		< 0.2
02/29/12 - 03/28/12		< 0.2
03/28/12 - 04/25/12		< 0.2
04/25/12 - 05/30/12		< 0.6
05/30/12 - 06/27/12		< 0.7
06/27/12 - 07/25/12		< 0.7
07/25/12 - 08/29/12		< 0.7
08/29/12 - 09/26/12		< 0.7
09/26/12 - 10/31/12		< 0.7
10/31/12 - 11/28/12		< 0.7
11/28/12 - 12/26/12		< 0.5
MEAN		-

Table C-I.2 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		CL-90	CL-13		CL-91		CL-99
01/25/12 - 03/28/12	(1)	< 120	< 191	(1)	< 117	(1)	< 114
04/25/12 - 06/27/12		< 149	< 182		< 149		< 150
07/25/12 - 09/26/12		< 161	< 160		< 159		< 168
10/31/12 - 12/26/12		< 183	< 185		< 188		< 181
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, 2012**

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	01/25/12 - 01/25/12	< 27	< 56	< 3	< 4	< 8	< 3	< 7	< 3	< 5	< 3	< 3	< 18	< 6	< 29
	02/29/12 - 02/29/12	< 46	< 59	< 6	< 5	< 8	< 5	< 10	< 6	< 8	< 4	< 5	< 29	< 6	< 41
	03/28/12 - 03/28/12	< 27	45 ± 33	< 3	< 3	< 7	< 3	< 6	< 3	< 5	< 3	< 3	< 13	< 4	< 26
	04/25/12 - 04/25/12	< 35	< 91	< 5	< 5	< 10	< 5	< 10	< 5	< 8	< 4	< 5	< 25	< 8	< 25
	05/30/12 - 05/30/12	< 45	< 124	< 5	< 6	< 10	< 6	< 11	< 5	< 9	< 5	< 6	< 27	< 6	< 40
	06/27/12 - 06/27/12	< 39	< 40	< 3	< 4	< 8	< 4	< 8	< 4	< 7	< 4	< 4	< 26	< 8	< 33
	07/25/12 - 07/25/12	< 64	< 135	< 7	< 7	< 14	< 6	< 14	< 7	< 11	< 6	< 8	< 30	< 7	< 57
	08/29/12 - 08/29/12	< 35	< 40	< 4	< 4	< 8	< 4	< 9	< 3	< 7	< 4	< 4	< 20	< 6	< 28
	09/26/12 - 09/26/12	< 32	< 53	< 3	< 3	< 7	< 3	< 5	< 3	< 6	< 3	< 3	< 26	< 8	< 23
	10/31/12 - 10/31/12	< 45	< 40	< 5	< 4	< 10	< 4	< 8	< 6	< 9	< 4	< 5	< 33	< 10	< 38
	11/28/12 - 11/28/12	< 35	< 82	< 4	< 4	< 8	< 5	< 10	< 5	< 7	< 4	< 5	< 20	< 5	< 31
	12/26/12 - 12/26/12	< 52	< 119	< 6	< 5	< 13	< 6	< 12	< 8	< 12	< 5	< 5	< 32	< 10	< 50
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-90	12/28/11 - 01/25/12 (1)	< 46	< 100	< 5	< 5	< 11	< 5	< 9	< 5	< 8	< 5	< 5	< 23	< 7	< 42
	01/25/12 - 02/29/12	< 67	< 28	< 8	< 8	< 15	< 5	< 11	< 4	< 15	< 7	< 8	< 30	< 10	< 58
	02/29/12 - 03/28/12	< 36	< 38	< 4	< 4	< 7	< 5	< 7	< 4	< 6	< 3	< 4	< 19	< 5	< 27
	03/28/12 - 04/25/12	< 57	< 107	< 6	< 6	< 11	< 5	< 11	< 7	< 9	< 6	< 6	< 22	< 8	< 42
	04/25/12 - 05/30/12	< 33	85 ± 59	< 2	< 3	< 7	< 4	< 6	< 4	< 7	< 3	< 4	< 25	< 8	< 27
	05/30/12 - 06/27/12	< 36	< 34	< 4	< 3	< 8	< 3	< 7	< 4	< 6	< 3	< 4	< 27	< 8	< 28
	06/27/12 - 07/25/12	< 42	< 88	< 5	< 6	< 9	< 5	< 9	< 4	< 8	< 5	< 6	< 24	< 8	< 42
	07/25/12 - 08/29/12	< 32	< 87	< 4	< 4	< 8	< 4	< 8	< 4	< 7	< 4	< 5	< 22	< 7	< 31
	08/29/12 - 09/26/12	< 21	< 20	< 2	< 3	< 6	< 2	< 4	< 2	< 4	< 2	< 2	< 21	< 7	< 13
	09/26/12 - 10/31/12	< 54	< 104	< 6	< 6	< 14	< 8	< 11	< 7	< 9	< 6	< 6	< 29	< 10	< 55
	10/31/12 - 11/28/12	< 44	< 37	< 4	< 4	< 9	< 4	< 9	< 4	< 8	< 4	< 4	< 20	< 6	< 33
	11/28/12 - 12/26/12	< 45	< 35	< 5	< 5	< 10	< 5	< 9	< 5	< 9	< 4	< 5	< 29	< 10	< 42
	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, 2012**

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	12/28/11 - 01/25/12 (1)	< 39	51 ± 43	< 4	< 5	< 11	< 6	< 10	< 5	< 8	< 5	< 5	< 25	< 8	< 35
	01/26/12 - 02/29/12	< 46	< 127	< 4	< 5	< 12	< 8	< 12	< 7	< 13	< 6	< 7	< 25	< 11	< 45
	02/29/12 - 03/28/12	< 32	< 65	< 3	< 4	< 8	< 3	< 7	< 4	< 7	< 3	< 4	< 17	< 5	< 29
	03/28/12 - 04/25/12	< 48	< 64	< 5	< 4	< 10	< 6	< 10	< 5	< 8	< 4	< 5	< 27	< 6	< 36
	04/25/12 - 05/30/12	< 36	77 ± 50	< 4	< 4	< 9	< 5	< 8	< 5	< 8	< 4	< 4	< 32	< 8	< 27
	05/30/12 - 06/27/12	< 32	< 64	< 3	< 4	< 8	< 4	< 7	< 4	< 7	< 3	< 4	< 28	< 9	< 30
	06/27/12 - 07/25/12	< 49	< 46	< 5	< 6	< 11	< 5	< 12	< 6	< 10	< 5	< 5	< 24	< 6	< 30
	07/25/12 - 08/29/12	< 40	< 37	< 4	< 5	< 9	< 5	< 11	< 5	< 8	< 5	< 5	< 23	< 7	< 28
	08/29/12 - 09/26/12	< 29	41 ± 39	< 3	< 3	< 7	< 3	< 6	< 3	< 5	< 3	< 3	< 24	< 9	< 23
	09/26/12 - 10/31/12	< 36	< 36	< 4	< 5	< 11	< 4	< 10	< 5	< 7	< 4	< 4	< 28	< 9	< 31
	10/31/12 - 11/28/12	< 44	< 43	< 4	< 4	< 9	< 6	< 9	< 6	< 8	< 5	< 5	< 24	< 6	< 41
	11/28/12 - 12/26/12	< 48	< 86	< 4	< 4	< 10	< 5	< 8	< 5	< 8	< 4	< 4	< 25	< 8	< 39
	MEAN	-	56 ± 37	-	-	-	-	-	-	-	-	-	-	-	-
CL-99	12/28/11 - 01/25/12 (1)	< 45	< 115	< 6	< 6	< 12	< 5	< 12	< 6	< 9	< 4	< 5	< 29	< 8	< 39
	01/27/12 - 02/29/12	< 63	< 148	< 7	< 8	< 14	< 10	< 15	< 7	< 14	< 6	< 9	< 32	< 10	< 56
	02/29/12 - 03/28/12	< 29	< 40	< 4	< 4	< 8	< 3	< 7	< 3	< 6	< 3	< 3	< 14	< 4	< 17
	03/28/12 - 04/25/12	< 53	< 100	< 5	< 5	< 10	< 4	< 10	< 6	< 10	< 6	< 6	< 27	< 9	< 43
	04/25/12 - 05/30/12	< 33	94 ± 57	< 3	< 3	< 8	< 4	< 6	< 4	< 7	< 4	< 4	< 28	< 10	< 20
	05/30/12 - 06/27/12	< 33	< 62	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 3	< 3	< 25	< 8	< 22
	06/27/12 - 07/25/12	< 59	< 49	< 7	< 6	< 11	< 4	< 13	< 7	< 11	< 6	< 7	< 30	< 8	< 58
	07/25/12 - 08/29/12	< 45	< 47	< 4	< 5	< 10	< 4	< 9	< 5	< 9	< 5	< 5	< 23	< 8	< 38
	08/29/12 - 09/26/12	< 29	< 52	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 27	< 7	< 25
	09/26/12 - 10/31/12	< 42	< 34	< 5	< 5	< 10	< 5	< 8	< 5	< 8	< 4	< 5	< 33	< 11	< 34
	10/31/12 - 11/28/12	< 44	< 44	< 5	< 5	< 9	< 5	< 9	< 5	< 8	< 5	< 6	< 24	< 7	< 45
	11/28/12 - 12/26/12	< 32	< 38	< 4	< 4	< 9	< 4	< 6	< 4	< 7	< 3	< 4	< 25	< 8	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* 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, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		CL-14
12/28/11 - 01/25/12		< 1.5
01/25/12 - 02/29/12		< 2.3
02/29/12 - 03/28/12		< 2.2
03/28/12 - 04/25/12		< 1.5
04/25/12 - 05/30/12		< 2.2
05/30/12 - 06/27/12	(1)	< 2.2
06/27/12 - 07/25/12		< 2.2
07/25/12 - 08/29/12		< 2.1
08/29/12 - 09/26/12	(1)	< 1.7
09/26/12 - 10/31/12	(1)	< 2.4
10/31/12 - 11/28/12		< 2.2
11/28/12 - 12/26/12		< 2.2
MEAN		-

Table C-II.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		CL-14
12/28/11 - 03/28/12		< 117
03/28/12 - 06/27/12	(1)	< 152
06/27/12 - 09/26/12	(1)	< 161
09/26/12 - 12/26/12	(1)	< 175
MEAN		-

Table C-II.3 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		CL-14
12/28/11 - 01/25/12		< 0.8
01/25/12 - 02/29/12		< 0.2
02/29/12 - 03/28/12		< 0.3
03/28/12 - 04/25/12		< 0.2
04/25/12 - 05/30/12		< 0.6
05/30/12 - 06/27/12	(1)	< 0.7
06/27/12 - 07/25/12		< 0.6
07/25/12 - 08/29/12		< 0.6
08/29/12 - 09/26/12	(1)	< 0.7
09/26/12 - 10/31/12	(1)	< 0.6
10/31/12 - 11/28/12		< 0.8
11/28/12 - 12/26/12		< 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, 2012**

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	I-131	Cs-134	Cs-137	Ba-140	La-140	Ce-144
CL-14	12/28/11 - 01/25/12	< 45	< 95	< 5	< 6	< 11	< 4	< 12	< 6	< 10	< 9	< 5	< 6	< 29	< 12	< 39
	01/25/12 - 02/29/12	< 61	< 126	< 7	< 8	< 19	< 7	< 11	< 6	< 15	< 10	< 7	< 9	< 28	< 9	< 50
	02/29/12 - 03/28/12	< 31	< 60	< 3	< 3	< 8	< 3	< 6	< 4	< 5	< 6	< 4	< 4	< 15	< 7	< 30
	03/28/12 - 04/25/12	< 50	< 90	< 5	< 6	< 11	< 5	< 9	< 6	< 8	< 9	< 5	< 6	< 25	< 8	< 41
	04/25/12 - 05/30/12	< 46	< 78	< 5	< 4	< 11	< 5	< 5	< 5	< 8	< 8	< 4	< 4	< 25	< 7	< 42
	05/30/12 - 06/27/12	(1) < 39	< 84	< 4	< 4	< 9	< 4	< 7	< 5	< 7	< 14	< 4	< 4	< 28	< 9	< 29
	06/27/12 - 07/25/12	< 46	< 111	< 5	< 6	< 11	< 7	< 10	< 6	< 11	< 8	< 5	< 6	< 27	< 8	< 43
	07/25/12 - 08/29/12	< 41	< 43	< 4	< 4	< 11	< 6	< 10	< 4	< 9	< 7	< 4	< 4	< 19	< 8	< 33
	08/29/12 - 09/26/12	< 32	< 61	< 3	< 4	< 7	< 3	< 6	< 4	< 6	< 15	< 3	< 3	< 29	< 8	< 21
	09/26/12 - 10/31/12	< 47	< 42	< 4	< 5	< 10	< 5	< 10	< 5	< 8	< 15	< 4	< 5	< 30	< 11	< 35
	10/31/12 - 11/28/12	< 43	< 31	< 5	< 5	< 10	< 5	< 8	< 5	< 9	< 8	< 4	< 5	< 21	< 6	< 30
	11/28/12 - 12/26/12	< 40	< 56	< 5	< 4	< 10	< 5	< 11	< 5	< 9	< 9	< 5	< 5	< 26	< 7	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(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, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CL-12R	CL-12T	CL-7D
03/28/12 - 03/28/12	< 172	< 175	< 176
06/27/12 - 06/27/12	< 192	< 190	< 189
09/26/12 - 09/26/12	< 169	< 164	< 169
12/26/12 - 12/26/12	< 191	< 189	< 189
MEAN	-	-	-

Table C-III.2 **CONCENTRATIONS OF GAMMA EMITTERS IN WELL WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	03/28/12	< 34	< 78	< 4	< 4	< 8	< 3	< 7	< 4	< 7	< 4	< 5	< 17	< 5	< 30
	06/27/12	< 37	< 25	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 4	< 4	< 30	< 10	< 30
	09/26/12	< 29	< 60	< 3	< 3	< 7	< 3	< 6	< 4	< 6	< 3	< 3	< 24	< 8	< 23
	12/26/12	< 39	< 39	< 4	< 4	< 9	< 4	< 9	< 4	< 7	< 4	< 4	< 24	< 7	< 36
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-12T	03/28/12	< 38	< 36	< 4	< 4	< 8	< 3	< 7	< 4	< 7	< 4	< 4	< 19	< 6	< 35
	06/27/12	< 18	< 46	< 2	< 2	< 3	< 1	< 3	< 2	< 3	< 1	< 2	< 12	< 3	< 12
	09/26/12	< 40	< 43	< 4	< 4	< 10	< 4	< 9	< 5	< 8	< 4	< 4	< 32	< 11	< 23
	12/26/12	< 44	< 48	< 5	< 5	< 10	< 5	< 10	< 6	< 9	< 5	< 5	< 26	< 10	< 41
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-7D	03/28/12	< 31	< 78	< 4	< 4	< 9	< 3	< 7	< 4	< 6	< 4	< 4	< 20	< 5	< 27
	06/27/12	< 37	49 ± 39	< 4	< 4	< 9	< 5	< 8	< 4	< 6	< 3	< 4	< 24	< 8	< 27
	09/26/12	< 33	< 31	< 3	< 3	< 8	< 3	< 6	< 4	< 6	< 3	< 3	< 26	< 9	< 27
	12/26/12	< 35	< 39	< 4	< 5	< 8	< 5	< 8	< 5	< 9	< 4	< 5	< 20	< 8	< 33
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1 **CONCENTRATIONS OF GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	04/03/12	< 813	3753 ± 1050	< 93	< 80	< 160	< 94	< 177	< 93	< 156	< 77	< 94	< 450	< 122	< 509
Carp	04/03/12	< 575	2780 ± 1011	< 61	< 64	< 116	< 62	< 111	< 69	< 123	< 60	< 70	< 357	< 106	< 335
Crappie	04/03/12	< 594	4459 ± 946	< 55	< 66	< 129	< 57	< 131	< 52	< 105	< 59	< 72	< 351	< 92	< 373
Largemouth bass	04/03/12	< 651	2770 ± 1007	< 72	< 69	< 116	< 75	< 164	< 80	< 141	< 72	< 67	< 357	< 135	< 434
Bluegill	10/03/12	< 1064	2819 ± 1184	< 88	< 88	< 201	< 97	< 177	< 116	< 153	< 92	< 108	< 883	< 205	< 719
Carp	10/03/12	< 594	3705 ± 878	< 61	< 59	< 136	< 62	< 131	< 69	< 127	< 55	< 69	< 526	< 130	< 367
Largemouth Mass	10/03/12	< 919	3351 ± 1177	< 100	< 103	< 150	< 88	< 139	< 100	< 188	< 80	< 84	< 850	< 151	< 515
White Bass/Crappie	10/03/12	< 854	4283 ± 1369	< 81	< 95	< 172	< 98	< 158	< 120	< 169	< 101	< 92	< 906	< 258	< 555
	MEAN	-	3490 ± 1347	-	-	-	-	-	-	-	-	-	-	-	-
CL-19															
Bluegill	04/03/12	< 558	4272 ± 1177	< 82	< 61	< 155	< 77	< 169	< 77	< 141	< 71	< 65	< 423	< 123	< 345
Carp	04/03/12	< 522	3909 ± 870	< 53	< 62	< 119	< 54	< 130	< 53	< 93	< 55	< 53	< 316	< 113	< 315
Channel catfish	04/03/12	< 538	4471 ± 1242	< 65	< 75	< 122	< 79	< 121	< 73	< 112	< 56	< 69	< 397	< 99	< 380
Largemouth bass	04/03/12	< 602	4094 ± 1160	< 77	< 75	< 130	< 74	< 172	< 84	< 148	< 64	< 67	< 355	< 152	< 457
Bluegill	10/03/12	< 787	2595 ± 1118	< 76	< 68	< 180	< 96	< 165	< 112	< 154	< 73	< 76	< 647	< 228	< 384
Carp	10/03/12	< 581	3468 ± 984	< 49	< 60	< 140	< 47	< 113	< 63	< 127	< 52	< 54	< 456	< 162	< 371
Channel Catfish	10/03/12	< 511	3323 ± 838	< 58	< 51	< 133	< 50	< 143	< 67	< 114	< 55	< 51	< 490	< 135	< 286
Largemouth Bass	10/03/12	< 453	3162 ± 815	< 47	< 47	< 131	< 57	< 112	< 61	< 78	< 49	< 39	< 457	< 110	< 259
	MEAN	-	3662 ± 1268	-	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1 **CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	04/03/12	< 304	7378 ± 796	< 32	< 31	< 83	< 45	< 90	< 42	< 71	< 31	< 36	< 188	< 61	< 206
	10/03/12	< 332	9837 ± 850	< 33	< 32	< 86	< 36	< 72	< 36	< 62	< 26	< 29	< 310	< 79	< 187
	MEAN	-	8608 ± 3478	-	-	-	-	-	-	-	-	-	-	-	-
CL-105	10/03/12 (1)	< 280	6661 ± 664	< 32	< 34	< 74	< 38	< 76	< 30	< 60	< 25	< 35	< 264	< 89	< 193
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-VI.1 **CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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
12/28/11 - 01/04/12	17 ± 4	13 ± 4	17 ± 4	17 ± 4	16 ± 4	18 ± 4
01/04/12 - 01/11/12	19 ± 5	21 ± 5	21 ± 5	18 ± 5	24 ± 5	24 ± 5
01/11/12 - 01/18/12	(1) 22 ± 5	18 ± 4	24 ± 5	25 ± 5	20 ± 4	18 ± 4
01/18/12 - 01/25/12	23 ± 5	25 ± 5	23 ± 5	21 ± 5	26 ± 5	25 ± 5
01/25/12 - 02/01/12	22 ± 5	19 ± 5	17 ± 5	14 ± 5	18 ± 5	28 ± 6
02/01/12 - 02/08/12	23 ± 4	13 ± 4	22 ± 4	18 ± 4	17 ± 4	21 ± 4
02/08/12 - 02/15/12	13 ± 4	12 ± 4	14 ± 4	17 ± 4	14 ± 4	17 ± 5
02/15/12 - 02/22/12	18 ± 4	19 ± 4	18 ± 4	20 ± 4	21 ± 4	16 ± 4
02/22/12 - 02/29/12	19 ± 4	20 ± 4	17 ± 4	21 ± 5	17 ± 4	20 ± 4
02/29/12 - 03/07/12	20 ± 4	15 ± 4	21 ± 4	21 ± 4	20 ± 4	18 ± 4
03/07/12 - 03/14/12	16 ± 4	14 ± 4	16 ± 4	19 ± 4	19 ± 4	12 ± 4
03/14/12 - 03/21/12	9 ± 4	7 ± 4	12 ± 4	7 ± 4	10 ± 4	11 ± 4
03/21/12 - 03/28/12	14 ± 4	16 ± 4	14 ± 4	12 ± 4	14 ± 4	12 ± 4
03/28/12 - 04/04/12	15 ± 4	17 ± 4	16 ± 4	15 ± 4	14 ± 4	13 ± 4
04/04/12 - 04/11/12	14 ± 4	15 ± 4	13 ± 4	15 ± 4	14 ± 4	15 ± 4
04/11/12 - 04/18/12	16 ± 4	18 ± 4	13 ± 4	17 ± 4	11 ± 4	8 ± 4
04/18/12 - 04/25/12	16 ± 5	13 ± 4	15 ± 4	12 ± 4	17 ± 5	12 ± 4
04/25/12 - 05/02/12	20 ± 9	16 ± 8	22 ± 5	20 ± 5	23 ± 5	17 ± 5
05/02/12 - 05/09/12	13 ± 5	13 ± 4	8 ± 4	13 ± 4	12 ± 4	14 ± 4
05/09/12 - 05/16/12	12 ± 4	12 ± 4	12 ± 4	11 ± 4	12 ± 4	12 ± 4
05/16/12 - 05/23/12	16 ± 4	19 ± 4	18 ± 4	16 ± 4	17 ± 4	17 ± 4
05/23/12 - 05/30/12	20 ± 3	18 ± 3	20 ± 3	17 ± 3	20 ± 3	21 ± 3
05/30/12 - 06/06/12	13 ± 4	15 ± 4	11 ± 4	12 ± 4	11 ± 4	11 ± 4
06/06/12 - 06/13/12	16 ± 4	16 ± 4	13 ± 4	13 ± 4	16 ± 4	17 ± 4
06/13/12 - 06/20/12	21 ± 4	18 ± 4	18 ± 4	18 ± 4	17 ± 4	16 ± 4
06/20/12 - 06/27/12	14 ± 4	15 ± 4	14 ± 4	12 ± 4	15 ± 4	14 ± 4
06/27/12 - 07/04/12	33 ± 5	38 ± 6	34 ± 6	33 ± 5	33 ± 6	37 ± 6
07/04/12 - 07/11/12	18 ± 5	21 ± 5	19 ± 5	14 ± 5	16 ± 5	20 ± 5
07/11/12 - 07/18/12	21 ± 4	20 ± 4	20 ± 4	20 ± 4	22 ± 5	21 ± 4
07/18/12 - 07/25/12	23 ± 5	24 ± 5	21 ± 5	20 ± 5	23 ± 5	23 ± 5
07/25/12 - 08/01/12	15 ± 4	18 ± 5	15 ± 4	15 ± 4	20 ± 5	19 ± 5
08/01/12 - 08/08/12	20 ± 4	21 ± 5	18 ± 4	20 ± 4	23 ± 5	21 ± 4
08/08/12 - 08/15/12	23 ± 5	24 ± 5	22 ± 5	19 ± 5	20 ± 5	21 ± 5
08/15/12 - 08/22/12	17 ± 4	(1) 23 ± 5	19 ± 4	19 ± 4	19 ± 5	17 ± 4
08/22/12 - 08/29/12	35 ± 5	33 ± 5	30 ± 5	29 ± 5	31 ± 5	35 ± 5
08/29/12 - 09/05/12	12 ± 5	19 ± 6	16 ± 5	19 ± 5	16 ± 4	16 ± 4
09/05/12 - 09/12/12	(1) 22 ± 5	(1) 18 ± 5	13 ± 4	21 ± 5	18 ± 4	18 ± 4
09/12/12 - 09/19/12	21 ± 5	23 ± 5	20 ± 5	23 ± 5	20 ± 5	23 ± 5
09/19/12 - 09/26/12	16 ± 4	15 ± 4	14 ± 4	19 ± 4	17 ± 4	17 ± 4
09/26/12 - 10/03/12	23 ± 5	25 ± 5	24 ± 5	23 ± 5	20 ± 5	21 ± 5
10/03/12 - 10/10/12	22 ± 5	20 ± 5	16 ± 4	23 ± 5	18 ± 5	26 ± 5
10/10/12 - 10/17/12	22 ± 5	30 ± 5	26 ± 5	30 ± 5	22 ± 5	26 ± 5
10/17/12 - 10/24/12	20 ± 4	21 ± 5	18 ± 4	15 ± 4	18 ± 4	18 ± 4
10/24/12 - 10/31/12	18 ± 4	18 ± 4	13 ± 4	17 ± 4	20 ± 4	17 ± 4
10/31/12 - 11/07/12	17 ± 5	20 ± 5	20 ± 5	19 ± 5	18 ± 5	21 ± 5
11/07/12 - 11/14/12	24 ± 5	27 ± 5	20 ± 5	19 ± 5	18 ± 5	22 ± 5
11/14/12 - 11/21/12	39 ± 6	40 ± 6	34 ± 5	41 ± 6	35 ± 5	32 ± 5
11/21/12 - 11/28/12	33 ± 6	35 ± 5	38 ± 6	33 ± 6	34 ± 6	34 ± 5
11/28/12 - 12/05/12	34 ± 5	33 ± 5	34 ± 5	33 ± 5	33 ± 5	33 ± 5
12/05/12 - 12/12/12	20 ± 5	22 ± 5	21 ± 5	22 ± 5	22 ± 5	23 ± 5
12/12/12 - 12/19/12	38 ± 6	36 ± 6	38 ± 6	40 ± 6	34 ± 5	35 ± 5
12/19/12 - 12/26/12	33 ± 5	24 ± 5	27 ± 5	26 ± 5	26 ± 5	27 ± 5
12/26/12 - 01/02/13	36 ± 6	33 ± 6	35 ± 6	38 ± 6	43 ± 6	37 ± 6
MEAN	21 ± 14	21 ± 14	20 ± 14	20 ± 15	20 ± 14	20 ± 14

(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, 2012**

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

COLLECTION PERIOD	GROUP II			GROUP III
	CL-1	CL-7	CL-8	CL-11
12/28/11 - 01/04/12	16 ± 4	18 ± 5	20 ± 5	19 ± 5
01/04/12 - 01/11/12	20 ± 5	21 ± 5	18 ± 5	19 ± 5
01/11/12 - 01/18/12	22 ± 5	23 ± 5	19 ± 4	(1) 23 ± 5
01/18/12 - 01/25/12	23 ± 5	18 ± 4	21 ± 5	24 ± 5
01/25/12 - 02/01/12	18 ± 5	12 ± 5	22 ± 5	15 ± 5
02/01/12 - 02/08/12	20 ± 4	22 ± 5	17 ± 4	22 ± 4
02/08/12 - 02/15/12	16 ± 4	12 ± 4	14 ± 4	12 ± 4
02/15/12 - 02/22/12	18 ± 4	18 ± 4	20 ± 4	20 ± 4
02/22/12 - 02/29/12	22 ± 5	18 ± 4	22 ± 5	19 ± 4
02/29/12 - 03/07/12	20 ± 4	17 ± 4	17 ± 4	17 ± 4
03/07/12 - 03/14/12	16 ± 4	16 ± 4	20 ± 4	19 ± 5
03/14/12 - 03/21/12	7 ± 4	8 ± 4	12 ± 4	9 ± 4
03/21/12 - 03/28/12	15 ± 4	9 ± 4	11 ± 4	13 ± 4
03/28/12 - 04/04/12	13 ± 4	17 ± 4	15 ± 4	15 ± 4
04/04/12 - 04/11/12	15 ± 4	10 ± 4	12 ± 4	16 ± 4
04/11/12 - 04/18/12	15 ± 4	13 ± 4	14 ± 4	13 ± 4
04/18/12 - 04/25/12	11 ± 4	15 ± 5	14 ± 4	12 ± 4
04/25/12 - 05/02/12	14 ± 5	19 ± 5	20 ± 5	21 ± 5
05/02/12 - 05/09/12	11 ± 4	9 ± 4	9 ± 3	12 ± 4
05/09/12 - 05/16/12	13 ± 4	11 ± 4	13 ± 4	16 ± 4
05/16/12 - 05/23/12	16 ± 4	12 ± 4	16 ± 4	24 ± 5
05/23/12 - 05/30/12	18 ± 3	15 ± 3	23 ± 3	23 ± 3
05/30/12 - 06/06/12	14 ± 4	11 ± 4	15 ± 4	9 ± 4
06/06/12 - 06/13/12	13 ± 4	15 ± 4	17 ± 4	16 ± 4
06/13/12 - 06/20/12	18 ± 4	16 ± 4	16 ± 4	16 ± 4
06/20/12 - 06/27/12	14 ± 4	13 ± 4	15 ± 4	16 ± 4
06/27/12 - 07/04/12	35 ± 6	41 ± 6	36 ± 6	36 ± 6
07/04/12 - 07/11/12	18 ± 5	14 ± 5	18 ± 11	23 ± 5
07/11/12 - 07/18/12	22 ± 5	17 ± 4	17 ± 4	18 ± 4
07/18/12 - 07/25/12	17 ± 5	21 ± 5	21 ± 5	21 ± 5
07/25/12 - 08/01/12	19 ± 5	13 ± 4	18 ± 5	18 ± 5
08/01/12 - 08/08/12	17 ± 4	17 ± 4	20 ± 4	22 ± 4
08/08/12 - 08/15/12	19 ± 4	17 ± 4	17 ± 4	19 ± 4
08/15/12 - 08/22/12	19 ± 5	18 ± 5	19 ± 4	20 ± 5
08/22/12 - 08/29/12	30 ± 5	28 ± 5	33 ± 5	28 ± 5
08/29/12 - 09/05/12	20 ± 5	15 ± 4	15 ± 4	17 ± 5
09/05/12 - 09/12/12	18 ± 4	17 ± 4	16 ± 4	18 ± 4
09/12/12 - 09/19/12	19 ± 5	18 ± 4	23 ± 5	22 ± 5
09/19/12 - 09/26/12	18 ± 4	16 ± 4	16 ± 4	17 ± 4
09/26/12 - 10/03/12	23 ± 5	17 ± 5	21 ± 5	24 ± 5
10/03/12 - 10/10/12	20 ± 5	17 ± 5	19 ± 5	21 ± 5
10/10/12 - 10/17/12	(1) 27 ± 5	25 ± 5	26 ± 5	32 ± 5
10/17/12 - 10/24/12	18 ± 4	21 ± 5	21 ± 4	18 ± 4
10/24/12 - 10/31/12	15 ± 4	15 ± 4	18 ± 4	19 ± 4
10/31/12 - 11/07/12	18 ± 5	17 ± 5	22 ± 5	18 ± 5
11/07/12 - 11/14/12	19 ± 5	22 ± 5	24 ± 5	21 ± 5
11/14/12 - 11/21/12	32 ± 5	40 ± 6	35 ± 5	40 ± 6
11/21/12 - 11/28/12	33 ± 6	34 ± 6	32 ± 5	34 ± 6
11/28/12 - 12/05/12	31 ± 5	31 ± 5	25 ± 5	30 ± 5
12/05/12 - 12/12/12	20 ± 5	23 ± 5	23 ± 5	22 ± 5
12/12/12 - 12/19/12	35 ± 5	37 ± 5	31 ± 5	38 ± 6
12/19/12 - 12/26/12	25 ± 5	22 ± 5	27 ± 5	25 ± 5
12/26/12 - 01/02/13	32 ± 6	34 ± 6	31 ± 6	39 ± 6
MEAN	19 ± 13	19 ± 15	20 ± 12	21 ± 14

(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, 2012**

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
12/28/11 - 02/01/12	13	28	20 ± 7	12/28/11 - 02/01/12	12	23	19 ± 6	12/28/11 - 02/01/12	15	24	20 ± 7
02/01/12 - 02/29/12	12	23	18 ± 6	02/01/12 - 02/29/12	12	22	18 ± 6	02/01/12 - 02/29/12	12	22	18 ± 9
02/29/12 - 03/28/12	7	21	14 ± 8	02/29/12 - 03/28/12	7	20	14 ± 9	02/29/12 - 03/28/12	9	19	14 ± 9
03/28/12 - 05/02/12	8	23	15 ± 6	03/28/12 - 05/02/12	10	20	14 ± 6	03/28/12 - 05/02/12	12	21	15 ± 7
05/02/12 - 05/30/12	8	21	15 ± 7	05/02/12 - 05/30/12	9	23	14 ± 8	05/02/12 - 05/30/12	12	24	19 ± 12
05/30/12 - 06/27/12	11	21	15 ± 5	05/30/12 - 06/27/12	11	18	14 ± 4	05/30/12 - 06/27/12	9	16	14 ± 7
06/27/12 - 08/01/12	14	38	23 ± 13	06/27/12 - 08/01/12	13	41	22 ± 17	06/27/12 - 08/01/12	18	36	23 ± 15
08/01/12 - 08/29/12	17	35	23 ± 11	08/01/12 - 08/29/12	17	33	21 ± 11	08/01/12 - 08/29/12	19	28	22 ± 8
08/29/12 - 09/26/12	12	23	18 ± 6	08/29/12 - 09/26/12	15	23	18 ± 5	08/29/12 - 09/26/12	17	22	19 ± 4
09/26/12 - 10/31/12	13	30	21 ± 8	09/26/12 - 10/31/12	15	27	20 ± 7	09/26/12 - 10/31/12	18	32	23 ± 11
10/31/12 - 11/28/12	17	41	28 ± 17	10/31/12 - 11/28/12	17	40	27 ± 15	10/31/12 - 11/28/12	18	40	28 ± 21
11/28/12 - 01/02/13	20	43	31 ± 13	11/28/12 - 01/02/13	20	37	28 ± 11	11/28/12 - 01/02/13	22	39	31 ± 15
12/28/11 - 01/02/13	7	43	20 ± 14	12/28/11 - 01/02/13	7	41	19 ± 13	12/28/11 - 01/02/13	9	40	21 ± 14

* THE MEAN AND TWO STANDARD DEVIATIONS ARE CALCULATED USING POSITIVE VALUES

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	12/28/11 - 03/28/12	72 ± 23	< 49	< 3	< 3	< 5	< 4	< 27	< 3	< 3	< 4	< 11
	03/28/12 - 06/27/12	120 ± 29	< 35	< 2	< 4	< 7	< 3	< 23	< 3	< 2	< 4	< 13
	06/27/12 - 09/26/12	55 ± 30	< 44	< 3	< 4	< 9	< 5	< 24	< 3	< 3	< 8	< 12
	09/26/12 - 01/02/13	50 ± 18	< 39	< 3	< 3	< 5	< 3	< 18	< 3	< 2	< 4	< 12
	MEAN	74 ± 64	-	-	-	-	-	-	-	-	-	-
CL-11	12/28/11 - 03/28/12 (1)	48 ± 21	< 24	< 2	< 3	< 5	< 3	< 22	< 3	< 3	< 3	< 11
	03/28/12 - 06/27/12	73 ± 21	< 42	< 2	< 3	< 5	< 3	< 16	< 2	< 2	< 4	< 9
	06/27/12 - 09/26/12	83 ± 26	< 36	< 4	< 6	< 9	< 8	< 31	< 4	< 3	< 12	< 19
	09/26/12 - 01/02/13	58 ± 30	< 46	< 3	< 3	< 5	< 3	< 24	< 3	< 2	< 4	< 12
	MEAN	66 ± 31	-	-	-	-	-	-	-	-	-	-
CL-15	12/28/11 - 03/28/12	66 ± 18	< 24	< 3	< 2	< 5	< 2	< 10	< 2	< 2	< 3	< 8
	03/28/12 - 06/27/12	98 ± 28	< 25	< 2	< 4	< 7	< 5	< 26	< 3	< 3	< 5	< 13
	06/27/12 - 09/26/12	60 ± 26	< 35	< 2	< 4	< 8	< 4	< 16	< 3	< 2	< 7	< 10
	09/26/12 - 01/02/13	67 ± 24	< 43	< 3	< 3	< 6	< 4	< 20	< 3	< 2	< 4	< 11
	MEAN	73 ± 35	-	-	-	-	-	-	-	-	-	-
CL-2	12/28/11 - 03/28/12 (1)	71 ± 23	< 50	< 2	< 4	< 5	< 4	< 30	< 4	< 4	< 5	< 15
	03/28/12 - 06/27/12	132 ± 27	< 40	< 3	< 4	< 5	< 3	< 18	< 2	< 2	< 4	< 10
	06/27/12 - 09/26/12	71 ± 22	< 44	< 3	< 3	< 5	< 4	< 20	< 2	< 2	< 6	< 10
	09/26/12 - 01/02/13	63 ± 20	< 37	< 2	< 3	< 4	< 3	< 25	< 3	< 3	< 4	< 11
	MEAN	84 ± 64	-	-	-	-	-	-	-	-	-	-
CL-3	12/28/11 - 03/28/12	57 ± 21	< 48	< 3	< 4	< 7	< 3	< 21	< 3	< 3	< 4	< 11
	03/28/12 - 06/27/12	115 ± 35	< 49	< 3	< 4	< 6	< 4	< 19	< 3	< 3	< 4	< 9
	06/27/12 - 09/26/12	73 ± 31	< 49	< 2	< 5	< 10	< 6	< 23	< 3	< 2	< 8	< 12
	09/26/12 - 01/02/13	64 ± 22	< 51	< 3	< 2	< 3	< 3	< 23	< 2	< 2	< 4	< 9
	MEAN	77 ± 51	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	12/28/11 - 03/28/12	71 ± 19	< 34	< 2	< 2	< 3	< 2	< 17	< 2	< 2	< 3	< 9
	03/28/12 - 06/27/12	93 ± 29	< 45	< 2	< 4	< 5	< 4	< 32	< 3	< 3	< 5	< 9
	06/27/12 - 09/26/12	99 ± 33	< 45	< 2	< 4	< 7	< 6	< 24	< 3	< 2	< 8	< 13
	09/26/12 - 01/02/13	74 ± 19	< 47	< 3	< 3	< 5	< 4	< 23	< 3	< 2	< 4	< 10
	MEAN	84 ± 27	-	-	-	-	-	-	-	-	-	-
CL-6	12/28/11 - 03/28/12	41 ± 19	< 19	< 3	< 3	< 5	< 3	< 26	< 2	< 3	< 4	< 10
	03/28/12 - 06/27/12	109 ± 22	< 28	< 3	< 2	< 5	< 3	< 18	< 3	< 2	< 4	< 8
	06/27/12 - 09/26/12	69 ± 31	< 57	< 4	< 5	< 9	< 6	< 24	< 3	< 3	< 6	< 10
	09/26/12 - 01/02/13	52 ± 18	< 50	< 3	< 3	< 5	< 3	< 18	< 3	< 2	< 4	< 10
	MEAN	68 ± 60	-	-	-	-	-	-	-	-	-	-
CL-7	12/28/11 - 03/28/12	44 ± 20	< 49	< 3	< 4	< 5	< 4	< 21	< 3	< 3	< 4	< 10
	03/28/12 - 06/27/12	85 ± 27	< 42	< 3	< 4	< 5	< 4	< 28	< 4	< 2	< 5	< 11
	06/27/12 - 09/26/12	56 ± 24	< 41	< 2	< 4	< 5	< 5	< 19	< 3	< 2	< 7	< 13
	09/26/12 - 01/02/13	40 ± 20	< 44	< 2	< 3	< 5	< 3	< 25	< 3	< 2	< 3	< 12
	MEAN	56 ± 41	-	-	-	-	-	-	-	-	-	-
CL-8	12/28/11 - 03/28/12	62 ± 25	< 54	< 4	< 3	< 5	< 4	< 32	< 4	< 3	< 5	< 15
	03/28/12 - 06/27/12	77 ± 24	< 42	< 3	< 3	< 6	< 3	< 14	< 3	< 2	< 5	< 11
	06/27/12 - 09/26/12	72 ± 33	< 44	< 3	< 4	< 6	< 5	< 27	< 3	< 3	< 7	< 13
	09/26/12 - 01/02/13	26 ± 20	< 27	< 2	< 2	< 4	< 3	< 24	< 2	< 2	< 4	< 11
	MEAN	59 ± 47	-	-	-	-	-	-	-	-	-	-
CL-94	12/28/11 - 03/28/12	59 ± 19	< 41	< 3	< 3	< 6	< 3	< 22	< 3	< 3	< 4	< 11
	03/28/12 - 06/27/12	84 ± 27	< 21	< 4	< 3	< 4	< 4	< 24	< 3	< 2	< 5	< 11
	06/27/12 - 09/26/12	56 ± 29	< 49	< 2	< 4	< 6	< 5	< 18	< 3	< 3	< 7	< 10
	09/26/12 - 01/02/13	75 ± 21	< 43	< 3	< 2	< 5	< 3	< 18	< 3	< 2	< 4	< 10
	MEAN	69 ± 27	-	-	-	-	-	-	-	-	-	-

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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

Table C-VII.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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

COLLECTION PERIOD	GROUP II			GROUP III
	CL-1	CL-7	CL-8	CL-11
12/28/11 - 01/04/12	< 22	< 29	< 54	< 54
01/04/12 - 01/11/12	< 36	< 34	< 33	< 21
01/11/12 - 01/18/12	< 26	< 27	< 49	< 51
01/18/12 - 01/25/12	< 15	< 30	< 30	< 31
01/25/12 - 02/01/12	< 22	< 18	< 32	< 32
02/01/12 - 02/08/12	< 22	< 36	< 34	< 34
02/08/12 - 02/15/12	< 25	< 20	< 61	< 61
02/15/12 - 02/22/12	< 23	< 5	< 14	< 14
02/22/12 - 02/29/12	< 7	< 15	< 36	< 35
02/29/12 - 03/07/12	< 43	< 18	< 42	< 44
03/07/12 - 03/14/12	< 15	< 21	< 40	< 41
03/14/12 - 03/21/12	< 13	< 35	< 28	< 28
03/21/12 - 03/28/12	< 16	< 16	< 30	< 30
03/28/12 - 04/04/12	< 62	< 25	< 46	< 45
04/04/12 - 04/11/12	< 18	< 15	< 36	< 35
04/11/12 - 04/18/12	< 47	< 15	< 33	< 34
04/18/12 - 04/25/12	< 15	< 16	< 36	< 37
04/25/12 - 05/02/12	< 24	< 19	< 52	< 47
05/02/12 - 05/09/12	< 23	< 18	< 42	< 44
05/09/12 - 05/16/12	< 22	< 52	< 22	< 53
05/16/12 - 05/23/12	< 14	< 18	< 33	< 33
05/23/12 - 05/30/12	< 24	< 57	< 58	< 23
05/30/12 - 06/06/12	< 19	< 16	< 37	< 37
06/06/12 - 06/13/12	< 15	< 44	< 41	< 41
06/13/12 - 06/20/12	< 22	< 23	< 62	< 60
06/20/12 - 06/27/12	< 29	< 43	< 43	< 43
06/27/12 - 07/04/12	< 11	< 12	< 30	< 29
07/04/12 - 07/11/12	< 18	< 20	< 26	< 49
07/11/12 - 07/18/12	< 23	< 19	< 55	< 54
07/18/12 - 07/25/12	< 32	< 14	< 25	< 25
07/25/12 - 08/01/12	< 17	< 13	< 35	< 35
08/01/12 - 08/08/12	< 32	< 12	< 30	< 30
08/08/12 - 08/15/12	< 18	< 15	< 35	< 35
08/15/12 - 08/22/12	< 44	< 17	< 39	< 40
08/22/12 - 08/29/12	< 13	< 16	< 39	< 40
08/29/12 - 09/05/12	< 12	< 21	< 57	< 56
09/05/12 - 09/12/12	< 19	< 21	< 46	< 48
09/12/12 - 09/19/12	< 44	< 16	< 39	< 39
09/19/12 - 09/26/12	< 17	< 16	< 38	< 38
09/26/12 - 10/03/12	< 42	< 24	< 59	< 43
10/03/12 - 10/10/12	< 19	< 22	< 52	< 52
10/10/12 - 10/17/12	< 24	< 59	< 26	< 60
10/17/12 - 10/24/12	< 15	< 18	< 42	< 43
10/24/12 - 10/31/12	< 12	< 26	< 25	< 14
10/31/12 - 11/07/12	< 13	< 10	< 29	< 30
11/07/12 - 11/14/12	< 19	< 42	< 43	< 45
11/14/12 - 11/21/12	< 20	< 20	< 38	< 38
11/21/12 - 11/28/12	< 14	< 40	< 39	< 40
11/28/12 - 12/05/12	< 15	< 19	< 37	< 37
12/05/12 - 12/12/12	< 18	< 18	< 52	< 50
12/12/12 - 12/19/12	< 27	< 13	< 31	< 31
12/19/12 - 12/26/12	< 32	< 24	< 45	< 44
12/26/12 - 01/02/13	< 25	< 29	< 67	< 69
MEAN	-	-	-	-

Table C-VIII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM CL-116
01/25/12	< 0.4
02/29/12	< 0.6
03/28/12	< 0.3
04/25/12	< 0.6
05/09/12	< 0.5
05/23/12	< 0.6
06/06/12	< 0.6
06/20/12	< 0.8
07/04/12	< 0.7
07/18/12	< 0.5
08/01/12	< 0.7
08/15/12	< 0.6
08/29/12	< 0.7
09/12/12	< 0.6
09/26/12	< 0.8
10/10/12	< 0.8
10/24/12	< 0.5
11/07/12	< 0.8
11/28/12	< 0.9
12/26/12	< 0.5
MEAN	-

Table C-VIII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	01/25/12	< 50	1386 ± 157	< 6	< 7	< 16	< 8	< 14	< 7	< 11	< 6	< 6	< 29	< 6	< 46
	02/29/12	< 37	1156 ± 110	< 4	< 4	< 11	< 5	< 11	< 4	< 8	< 4	< 5	< 19	< 6	< 30
	03/28/12	< 47	1306 ± 137	< 6	< 5	< 14	< 7	< 12	< 6	< 9	< 5	< 6	< 26	< 7	< 41
	04/25/12	< 50	1138 ± 135	< 6	< 6	< 14	< 7	< 14	< 5	< 11	< 5	< 6	< 28	< 8	< 44
	05/09/12	< 58	1090 ± 145	< 6	< 6	< 15	< 8	< 16	< 8	< 12	< 6	< 7	< 30	< 10	< 53
	05/23/12	< 35	1138 ± 113	< 4	< 4	< 11	< 3	< 10	< 5	< 7	< 3	< 4	< 31	< 9	< 28
	06/06/12	< 64	1403 ± 168	< 7	< 8	< 18	< 7	< 18	< 8	< 13	< 7	< 6	< 54	< 14	< 49
	06/20/12	< 55	1053 ± 133	< 6	< 6	< 14	< 8	< 15	< 7	< 10	< 6	< 7	< 31	< 9	< 57
	07/04/12	< 54	1293 ± 124	< 5	< 6	< 15	< 6	< 12	< 6	< 11	< 5	< 6	< 39	< 12	< 45
	07/18/12	< 56	1266 ± 160	< 6	< 6	< 14	< 7	< 13	< 7	< 10	< 6	< 6	< 31	< 10	< 41
	08/01/12	< 56	1082 ± 151	< 6	< 7	< 18	< 8	< 15	< 7	< 13	< 6	< 7	< 35	< 13	< 49
	08/15/12	< 39	1203 ± 110	< 5	< 5	< 12	< 6	< 14	< 5	< 8	< 4	< 5	< 27	< 9	< 35
	08/29/12	< 36	1243 ± 107	< 4	< 4	< 12	< 6	< 10	< 5	< 8	< 4	< 5	< 24	< 7	< 31
	09/12/12	< 51	1100 ± 190	< 6	< 7	< 17	< 8	< 13	< 7	< 12	< 5	< 6	< 46	< 13	< 32
	09/26/12	< 52	1150 ± 128	< 5	< 5	< 14	< 7	< 15	< 7	< 12	< 5	< 6	< 36	< 11	< 38
	10/10/12	< 51	1379 ± 150	< 5	< 7	< 16	< 9	< 15	< 6	< 10	< 6	< 7	< 47	< 13	< 43
	10/24/12	< 43	1256 ± 132	< 5	< 6	< 13	< 7	< 13	< 6	< 11	< 5	< 6	< 23	< 7	< 38
	11/07/12	< 44	1133 ± 147	< 6	< 6	< 14	< 6	< 15	< 6	< 10	< 5	< 6	< 27	< 5	< 40
	11/28/12	< 80	1173 ± 157	< 8	< 9	< 15	< 10	< 15	< 9	< 16	< 7	< 10	< 48	< 10	< 75
	12/26/12	< 51	1163 ± 157	< 7	< 8	< 16	< 8	< 13	< 6	< 11	< 6	< 6	< 30	< 9	< 43
	MEAN	-	1206 ± 212	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	06/27/12	Cabbage	172 ± 56	4606 ± 155	< 5	< 6	< 14	< 6	< 12	< 6	< 11	< 25	< 5	< 6	< 49	< 11	< 39
	06/27/12	Rhubarb	485 ± 73	6530 ± 182	< 7	< 7	< 16	< 8	< 15	< 7	< 12	< 30	< 6	< 6	< 54	< 12	< 46
	06/27/12	Swiss Chard	279 ± 57	7137 ± 151	< 6	< 6	< 15	< 7	< 13	< 6	< 11	< 24	< 5	< 5	< 46	< 11	< 37
	07/25/12	Cabbage	< 132	3631 ± 284	< 11	< 14	< 29	< 14	< 27	< 13	< 20	< 34	< 11	< 13	< 76	< 18	< 85
	07/25/12	Rhubarb	853 ± 239	6467 ± 663	< 22	< 19	< 47	< 22	< 53	< 22	< 43	< 59	< 18	< 23	< 140	< 37	< 128
	07/25/12	Swiss Chard	198 ± 172	8307 ± 601	< 22	< 23	< 54	< 29	< 58	< 24	< 44	< 53	< 20	< 24	< 146	< 30	< 141
	08/29/12	Cabbage	307 ± 131	3626 ± 385	< 25	< 28	< 51	< 32	< 67	< 24	< 48	< 49	< 28	< 24	< 131	< 30	< 157
	08/29/12	Pumpkin Leaves	1002 ± 245	5429 ± 562	< 23	< 22	< 63	< 31	< 61	< 26	< 43	< 47	< 21	< 26	< 134	< 39	< 168
	08/29/12	Swiss Chard	332 ± 130	5261 ± 456	< 26	< 27	< 69	< 37	< 70	< 27	< 43	< 55	< 28	< 29	< 131	< 40	< 162
	09/26/12	Cabbage	230 ± 177	2455 ± 355	< 18	< 15	< 39	< 16	< 42	< 17	< 32	< 44	< 17	< 17	< 110	< 27	< 108
	09/26/12	Pumpkin Leaves	3039 ± 267	3974 ± 388	< 21	< 18	< 46	< 23	< 44	< 21	< 33	< 59	< 21	< 23	< 132	< 40	< 130
	09/26/12	Swiss Chard	364 ± 98	3673 ± 351	< 14	< 11	< 37	< 17	< 36	< 15	< 19	< 37	< 12	< 14	< 88	< 26	< 83
	MEAN		660 ± 1667	5091 ± 3483	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-115	06/27/12	Cabbage	194 ± 40	3372 ± 123	< 4	< 5	< 13	< 6	< 11	< 5	< 9	< 21	< 4	< 4	< 40	< 10	< 27
	06/27/12	Lettuce	206 ± 55	4022 ± 150	< 4	< 5	< 12	< 6	< 11	< 5	< 9	< 19	< 4	< 4	< 38	< 11	< 21
	06/27/12	Swiss Chard	203 ± 43	4258 ± 125	< 4	< 5	< 12	< 6	< 11	< 5	< 9	< 22	< 4	< 4	< 38	< 11	< 33
	07/25/12	Cabbage	199 ± 110	2554 ± 249	< 10	< 11	< 29	< 14	< 25	< 13	< 24	< 28	< 10	< 12	< 72	< 18	< 69
	07/25/12	Lettuce	< 202	5162 ± 441	< 16	< 17	< 38	< 22	< 34	< 18	< 35	< 53	< 16	< 20	< 113	< 26	< 209
	07/25/12	Swiss Chard	172 ± 104	3384 ± 305	< 9	< 11	< 25	< 13	< 23	< 9	< 18	< 21	< 8	< 10	< 59	< 11	< 46
	08/29/12	Cabbage	< 87	2235 ± 294	< 11	< 8	< 25	< 12	< 18	< 10	< 16	< 19	< 10	< 9	< 52	< 13	< 50
	08/29/12	Lettuce	509 ± 354	6389 ± 833	< 23	< 29	< 65	< 32	< 68	< 28	< 53	< 49	< 20	< 28	< 132	< 41	< 119
	08/29/12	Swiss Chard	271 ± 114	3951 ± 397	< 15	< 14	< 28	< 15	< 29	< 14	< 24	< 26	< 14	< 14	< 87	< 19	< 107
	09/26/12	Cabbage	284 ± 127	2840 ± 348	< 16	< 16	< 41	< 16	< 37	< 17	< 29	< 42	< 15	< 16	< 100	< 16	< 125
	09/26/12	Spinach	236 ± 147	3377 ± 319	< 16	< 15	< 29	< 14	< 28	< 17	< 28	< 52	< 16	< 15	< 110	< 18	< 150
	09/26/12	Swiss Chard	220 ± 93	2888 ± 284	< 10	< 11	< 29	< 14	< 26	< 13	< 21	< 28	< 8	< 10	< 70	< 21	< 72
	MEAN		249 ± 195	3703 ± 2337	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-117	06/27/12	Cabbage	75 ± 34	4174 ± 147	< 6	< 7	< 16	< 7	< 14	< 7	< 12	< 28	< 5	< 6	< 54	< 15	< 37
	06/27/12	Lettuce	219 ± 81	5403 ± 202	< 8	< 8	< 19	< 9	< 18	< 9	< 15	< 35	< 7	< 8	< 70	< 19	< 46
	06/27/12	Swiss Chard	304 ± 41	8474 ± 149	< 5	< 5	< 13	< 6	< 12	< 5	< 9	< 21	< 4	< 5	< 41	< 9	< 32
	07/25/12	Cabbage	283 ± 83	3895 ± 280	< 12	< 10	< 28	< 16	< 28	< 12	< 18	< 27	< 10	< 11	< 58	< 21	< 63
	07/25/12	Lettuce	517 ± 178	9404 ± 648	< 24	< 23	< 58	< 28	< 52	< 25	< 40	< 50	< 20	< 22	< 131	< 27	< 129
	07/25/12	Swiss Chard	425 ± 126	7901 ± 441	< 18	< 18	< 44	< 22	< 44	< 17	< 30	< 44	< 16	< 16	< 95	< 24	< 125
	08/29/12	Cabbage	< 176	3465 ± 410	< 15	< 16	< 38	< 21	< 38	< 18	< 29	< 29	< 18	< 19	< 92	< 19	< 83
	08/29/12	Lettuce	646 ± 240	6952 ± 650	< 22	< 23	< 62	< 33	< 57	< 24	< 40	< 47	< 22	< 24	< 117	< 21	< 132
	08/29/12	Swiss Chard	210 ± 110	5882 ± 372	< 13	< 11	< 32	< 15	< 33	< 13	< 22	< 24	< 11	< 13	< 67	< 14	< 87
	09/26/12	Brussel Sprouts	317 ± 143	4802 ± 346	< 17	< 16	< 41	< 18	< 33	< 17	< 31	< 57	< 17	< 17	< 114	< 24	< 135
	09/26/12	Cabbage	375 ± 144	4205 ± 384	< 16	< 22	< 38	< 20	< 43	< 20	< 41	< 58	< 17	< 20	< 125	< 25	< 147
	09/26/12	Swiss Chard	340 ± 153	4645 ± 356	< 15	< 16	< 32	< 17	< 31	< 20	< 31	< 55	< 18	< 16	< 110	< 20	< 168
	MEAN		337 ± 310	5767 ± 3937	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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-118	06/27/12	Cabbage	111 ± 50	5786 ± 165	< 5	< 5	< 13	< 6	< 11	< 6	< 9	< 25	< 5	< 5	< 48	< 12	< 32
	06/27/12	Lettuce	235 ± 95	7484 ± 255	< 7	< 8	< 20	< 9	< 18	< 9	< 14	< 35	< 6	< 7	< 66	< 20	< 35
	06/27/12	Swiss Chard	431 ± 62	9887 ± 201	< 7	< 8	< 19	< 9	< 17	< 8	< 14	< 37	< 6	< 7	< 66	< 13	< 51
	07/25/12	Cabbage	360 ± 180	6275 ± 512	< 20	< 22	< 57	< 25	< 48	< 20	< 40	< 54	< 18	< 21	< 125	< 35	< 143
	07/25/12	Lettuce	708 ± 224	9132 ± 869	< 18	< 26	< 60	< 30	< 47	< 29	< 37	< 51	< 19	< 25	< 142	< 45	< 93
	07/25/12	Swiss Chard	443 ± 243	11370 ± 642	< 24	< 24	< 53	< 29	< 57	< 23	< 44	< 55	< 19	< 22	< 137	< 28	< 143
	08/29/12	Cabbage	275 ± 143	5306 ± 493	< 18	< 17	< 41	< 22	< 34	< 18	< 32	< 36	< 17	< 16	< 90	< 24	< 116
	08/29/12	Lettuce	1072 ± 270	7411 ± 654	< 19	< 21	< 43	< 25	< 49	< 22	< 35	< 48	< 20	< 22	< 103	< 20	< 153
	08/29/12	Swiss Chard	348 ± 102	8040 ± 574	< 15	< 17	< 45	< 28	< 49	< 19	< 27	< 32	< 14	< 17	< 69	< 23	< 94
	09/26/12	Cabbage	240 ± 142	3072 ± 349	< 15	< 16	< 27	< 17	< 36	< 14	< 30	< 39	< 13	< 17	< 98	< 27	< 79
	09/26/12	Spinach	456 ± 160	6190 ± 554	< 23	< 22	< 62	< 28	< 54	< 23	< 36	< 57	< 19	< 24	< 162	< 33	< 134
	09/26/12	Swiss Chard	467 ± 173	6144 ± 459	< 16	< 19	< 41	< 25	< 46	< 21	< 31	< 53	< 15	< 18	< 105	< 29	< 132
	MEAN		429 ± 506	7175 ± 4463	-	-	-	-	-	-	-	-	-	-	-	-	-

* 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, 2012**

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	05/09/12	719 ± 341	4925 ± 665	< 25	< 23	< 50	< 28	< 51	< 23	< 41	< 40	< 21	< 26	< 110	< 43	< 111
	05/23/12	1593 ± 214	6223 ± 528	< 18	< 21	< 50	< 26	< 50	< 20	< 35	< 29	< 20	< 21	< 90	< 29	< 118
	06/06/12	2918 ± 284	5088 ± 500	< 19	< 20	< 49	< 28	< 49	< 21	< 38	< 31	< 21	< 19	< 102	< 21	< 136
	06/20/12	3392 ± 338	8281 ± 604	< 21	< 23	< 54	< 31	< 51	< 20	< 39	< 59	< 20	< 20	< 143	< 37	< 160
	07/04/12	2749 ± 144	5830 ± 246	< 10	< 11	< 24	< 13	< 23	< 12	< 20	< 30	< 9	< 10	< 67	< 21	< 72
	07/18/12	2793 ± 139	5946 ± 228	< 6	< 7	< 16	< 7	< 13	< 7	< 11	< 33	< 6	< 6	< 60	< 15	< 38
	08/01/12	3791 ± 145	6686 ± 237	< 10	< 10	< 25	< 12	< 23	< 11	< 20	< 31	< 10	< 10	< 69	< 16	< 70
	08/15/12	1436 ± 76	5580 ± 171	< 7	< 7	< 18	< 8	< 16	< 7	< 13	< 23	< 6	< 7	< 50	< 14	< 44
	08/29/12	1922 ± 90	5255 ± 189	< 7	< 7	< 15	< 8	< 16	< 7	< 12	< 12	< 6	< 7	< 33	< 10	< 48
	09/12/12	1342 ± 111	6334 ± 273	< 9	< 10	< 22	< 11	< 23	< 10	< 16	< 17	< 9	< 10	< 44	< 12	< 62
	09/26/12	1085 ± 190	6223 ± 534	< 19	< 20	< 55	< 27	< 45	< 20	< 36	< 58	< 19	< 20	< 138	< 32	< 105
	10/10/12	1801 ± 75	4420 ± 137	< 5	< 5	< 13	< 6	< 12	< 6	< 10	< 16	< 5	< 5	< 35	< 9	< 36
	10/24/12	3603 ± 345	5461 ± 507	< 23	< 22	< 44	< 22	< 48	< 21	< 30	< 35	< 19	< 21	< 92	< 27	< 138
	MEAN	2242 ± 2035	5866 ± 1931	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-02	05/09/12	1935 ± 587	5507 ± 1030	< 28	< 27	< 83	< 38	< 67	< 30	< 62	< 55	< 28	< 36	< 151	< 53	< 162
	05/23/12	987 ± 174	6061 ± 493	< 20	< 19	< 39	< 25	< 47	< 22	< 35	< 33	< 20	< 19	< 89	< 27	< 136
	06/06/12	1534 ± 352	7002 ± 753	< 23	< 25	< 47	< 37	< 66	< 27	< 49	< 40	< 20	< 31	< 124	< 33	< 159
	06/20/12	1880 ± 263	9734 ± 577	< 22	< 21	< 59	< 32	< 58	< 27	< 47	< 58	< 20	< 27	< 144	< 37	< 135
	07/04/12	2173 ± 183	8472 ± 382	< 16	< 16	< 37	< 20	< 38	< 17	< 30	< 47	< 15	< 16	< 108	< 30	< 94
	07/18/12	1850 ± 234	7760 ± 374	< 9	< 11	< 23	< 10	< 21	< 11	< 20	< 57	< 10	< 11	< 106	< 25	< 69
	08/01/12	3465 ± 215	9703 ± 412	< 18	< 18	< 42	< 23	< 41	< 19	< 36	< 53	< 17	< 19	< 124	< 33	< 116
	08/15/12	3595 ± 177	7772 ± 313	< 14	< 13	< 34	< 16	< 30	< 15	< 24	< 45	< 13	< 13	< 98	< 25	< 86
	08/29/12	1707 ± 157	4245 ± 283	< 12	< 13	< 26	< 13	< 27	< 13	< 23	< 26	< 13	< 14	< 69	< 17	< 110
	09/12/12	1427 ± 147	7017 ± 356	< 13	< 13	< 31	< 17	< 33	< 13	< 23	< 23	< 11	< 12	< 66	< 17	< 79
	09/26/12	981 ± 206	5463 ± 463	< 19	< 20	< 48	< 23	< 45	< 20	< 33	< 57	< 17	< 17	< 119	< 27	< 143
	10/10/12	1304 ± 79	7245 ± 201	< 7	< 8	< 18	< 9	< 18	< 8	< 14	< 23	< 7	< 8	< 51	< 13	< 54
	10/24/12	2808 ± 370	5605 ± 560	< 28	< 25	< 54	< 26	< 55	< 26	< 47	< 41	< 26	< 27	< 115	< 27	< 188
	MEAN	1973 ± 1692	7045 ± 3325	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.2 CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012

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	05/09/12	2170 ± 487	5414 ± 938	< 30	< 34	< 74	< 39	< 70	< 34	< 60	< 54	< 30	< 36	< 148	< 42	< 150
	05/23/12	1956 ± 267	7129 ± 677	< 19	< 18	< 46	< 22	< 39	< 18	< 32	< 31	< 15	< 19	< 88	< 25	< 89
	06/06/12	2168 ± 362	7224 ± 797	< 35	< 30	< 63	< 45	< 82	< 32	< 64	< 54	< 32	< 34	< 166	< 36	< 205
	06/20/12	2197 ± 237	10100 ± 484	< 18	< 18	< 47	< 22	< 41	< 19	< 33	< 48	< 17	< 19	< 109	< 27	< 123
	07/04/12	2339 ± 135	7496 ± 277	< 10	< 10	< 23	< 12	< 22	< 11	< 18	< 28	< 9	< 10	< 67	< 17	< 62
	07/18/12	189 ± 77	7469 ± 232	< 4	< 4	< 11	< 5	< 9	< 4	< 7	< 18	< 3	< 4	< 33	< 8	< 16
	08/01/12	359 ± 66	8787 ± 210	< 7	< 7	< 18	< 9	< 17	< 8	< 13	< 20	< 6	< 7	< 44	< 12	< 45
	08/15/12	1506 ± 100	8897 ± 220	< 7	< 8	< 19	< 9	< 18	< 8	< 14	< 24	< 6	< 7	< 54	< 12	< 49
	08/29/12	3818 ± 137	6446 ± 248	< 10	< 10	< 22	< 13	< 20	< 10	< 16	< 17	< 9	< 10	< 46	< 12	< 59
	09/12/12	1793 ± 221	6385 ± 453	< 14	< 12	< 31	< 17	< 33	< 14	< 23	< 23	< 12	< 12	< 66	< 18	< 58
	09/26/12	863 ± 295	5078 ± 543	< 16	< 16	< 37	< 23	< 37	< 17	< 32	< 47	< 14	< 17	< 101	< 31	< 76
	10/10/12	1620 ± 111	7560 ± 267	< 8	< 8	< 20	< 10	< 18	< 8	< 14	< 20	< 7	< 8	< 49	< 14	< 35
	10/24/12	2131 ± 353	5554 ± 717	< 23	< 24	< 51	< 26	< 48	< 20	< 40	< 34	< 22	< 23	< 102	< 24	< 110
	MEAN	1778 ± 1879	7195 ± 2929	-	-	-	-	-	-	-	-	-	-	-	-	-
CL-116	05/09/12	2251 ± 464	5743 ± 937	< 33	< 34	< 53	< 31	< 63	< 31	< 46	< 58	< 26	< 34	< 148	< 44	< 136
	05/23/12	1461 ± 239	5605 ± 482	< 22	< 22	< 46	< 24	< 46	< 20	< 37	< 32	< 21	< 21	< 88	< 21	< 130
	06/06/12	2322 ± 369	7223 ± 695	< 26	< 26	< 53	< 25	< 56	< 29	< 40	< 36	< 21	< 28	< 107	< 28	< 146
	06/20/12	2126 ± 282	7191 ± 637	< 19	< 22	< 47	< 24	< 48	< 21	< 38	< 50	< 18	< 19	< 121	< 38	< 98
	07/04/12	2545 ± 178	6810 ± 305	< 14	< 14	< 32	< 16	< 32	< 15	< 26	< 45	< 14	< 15	< 99	< 25	< 102
	07/18/12	3015 ± 156	7252 ± 250	< 7	< 7	< 17	< 7	< 14	< 7	< 12	< 34	< 6	< 6	< 62	< 15	< 34
	08/01/12	1773 ± 161	6701 ± 332	< 10	< 11	< 24	< 12	< 24	< 11	< 20	< 26	< 9	< 10	< 64	< 18	< 45
	08/15/12	1815 ± 254	4551 ± 405	< 16	< 19	< 41	< 19	< 38	< 19	< 31	< 58	< 16	< 17	< 122	< 35	< 80
	08/29/12	1944 ± 89	5285 ± 185	< 8	< 7	< 16	< 9	< 17	< 8	< 13	< 14	< 7	< 8	< 37	< 10	< 55
	09/12/12	1599 ± 171	6867 ± 391	< 8	< 10	< 20	< 12	< 21	< 9	< 15	< 15	< 7	< 9	< 44	< 12	< 38
	09/26/12	1470 ± 262	8185 ± 579	< 19	< 22	< 51	< 27	< 48	< 22	< 42	< 57	< 18	< 22	< 129	< 24	< 118
	10/10/12	2289 ± 111	5805 ± 194	< 7	< 8	< 18	< 9	< 17	< 9	< 13	< 23	< 7	< 8	< 49	< 14	< 48
	10/24/12	2432 ± 311	6185 ± 617	< 25	< 22	< 52	< 26	< 54	< 27	< 45	< 41	< 24	< 24	< 123	< 27	< 175
	MEAN	2080 ± 916	6416 ± 1984	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-X.1 QUARTERLY OSLD RESULTS FOR CLINTON POWER STATION, 2012

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
CL-01	22.2 ± 3.0	21.2	24.4	22.1	21.2
CL-02	23.7 ± 4.7	22.1	27.1	23.6	22.1
CL-03	22.6 ± 3.5	21.1	24.6	23.5	21.1
CL-04	21.9 ± 2.7	20.8	23.4	22.6	20.8
CL-05	24.1 ± 4.5	22.4	27.2	24.2	22.4
CL-06	20.4 ± 2.4	19.6	22.2	20.2	19.6
CL-07	21.1 ± 4.9	19.6	24.7	20.8	19.6
CL-08	22.2 ± 4.3	20.4	24.8	23.1	20.4
CL-11	20.2 ± 3.0	19.3	22.5	20.0	19.3
CL-15	20.9 ± 4.7	19.5	24.4	20.1	19.5
CL-22	23.7 ± 3.8	22.5	26.5	23.4	22.5
CL-23	24.0 ± 3.5	22.8	26.5	24.0	22.8
CL-24	24.0 ± 3.6	22.8	26.6	23.7	22.8
CL-33	23.2 ± 3.0	22.0	24.9	24.0	22.0
CL-34	24.2 ± 3.6	22.7	26.3	25.0	22.7
CL-35	22.2 ± 5.1	20.4	25.8	22.2	20.4
CL-36	23.0 ± 4.6	21.6	26.4	22.6	21.6
CL-37	22.4 ± 3.7	21.3	25.1	21.8	21.3
CL-41	23.6 ± 3.6	22.1	25.7	24.5	22.1
CL-42	22.8 ± 2.4	21.9	24.4	23.1	21.9
CL-43	24.4 ± 3.1	23.3	26.6	24.3	23.3
CL-44	23.5 ± 5.4	21.9	27.6	22.9	21.9
CL-45	25.0 ± 2.8	24.6	27.0	23.9	24.6
CL-46	24.7 ± 4.8	23.2	28.2	24.5	23.2
CL-47	23.5 ± 4.2	21.9	26.4	23.9	21.9
CL-48	23.5 ± 2.3	23.0	25.2	23.0	23.0
CL-49	24.5 ± 4.5	22.9	27.7	24.3	22.9
CL-51	25.1 ± 4.7	23.7	28.6	24.4	23.7
CL-52	24.1 ± 4.3	22.6	27.2	23.8	22.6
CL-53	22.8 ± 3.9	21.4	25.5	23.0	21.4
CL-54	23.6 ± 4.9	21.8	27.0	23.8	21.8
CL-55	23.6 ± 1.9	23.0	25.0	23.2	23.0
CL-56	24.1 ± 5.1	22.3	27.8	24.2	22.3
CL-57	24.4 ± 4.4	22.7	27.2	25.2	22.7
CL-58	24.0 ± 4.4	22.3	26.9	24.7	22.3
CL-60	24.0 ± 4.2	22.4	26.8	24.6	22.4
CL-61	24.0 ± 4.4	22.5	27.2	23.7	22.5
CL-63	20.5 ± 3.0	19.6	22.7	20.1	19.6
CL-64	23.1 ± 4.1	21.8	26.1	22.5	21.8
CL-65	23.5 ± 3.8	22.6	26.3	22.6	22.6
CL-74	21.3 ± 3.9	20.5	24.2	20.0	20.5
CL-75	23.4 ± 4.3	22.2	26.6	22.7	22.2
CL-76	23.6 ± 3.8	22.6	26.5	22.8	22.6
CL-77	21.6 ± 5.1	19.9	25.2	21.3	19.9
CL-78	22.3 ± 3.4	21.2	24.8	22.0	21.2
CL-79	23.7 ± 3.0	22.6	25.8	23.9	22.6
CL-80	22.4 ± 5.1	20.4	25.7	23.1	20.4
CL-81	23.2 ± 4.1	21.6	25.9	23.8	21.6
CL-84	23.6 ± 5.2	22.0	27.4	23.2	22.0
CL-90	19.4 ± 2.9	18.2	21.2	19.9	18.2
CL-91	21.8 ± 3.3	20.7	24.2	21.6	20.7
CL-97	23.6 ± 3.9	22.2	26.3	23.8	22.2
CL-99	18.9 ± 2.9	18.0	21.1	18.7	18.0
CL-114	22.5 ± 2.2	21.9	24.2	22.1	21.9

TABLE C-X.2 MEAN QUARTLY OSLD RESULTS FOR THE INNER RING, OUTER RING, SPECIAL INTEREST, SUPPLEMENTAL AND CONTROL LOCATIONS FOR CLINTON POWER STATION, 2012

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

COLLECTION PERIOD	INNER RING ± 2 S.D.	OUTER RING	SPECIAL INTEREST	SUPPLEMENTAL	CONTROL
JAN-MAR	22.2 ± 2.4	22.0 ± 2.0	21.9 ± 1.6	20.6 ± 2.8	19.3 ± 0.0
APR-JUN	26.1 ± 2.7	26.4 ± 2.1	26.0 ± 2.2	24.3 ± 3.8	22.5 ± 0.0
JUL-SEP	23.3 ± 2.4	23.6 ± 2.0	22.6 ± 3.0	21.9 ± 3.4	20.0 ± 0.0
OCT-DEC	22.2 ± 2.4	22.0 ± 2.0	21.9 ± 1.6	20.6 ± 2.8	19.3 ± 0.0

TABLE C-X.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR CLINTON POWER STATION, 2012

RESULTS IN UNITS OF MILLIREM/QUARTER

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.	PRE-OP MEAN, ± 2 S.D., ALL LOCATIONS
INNER RING	64	19.6	28.2	23.5 ± 4.0	
OUTER RING	64	19.9	28.6	23.5 ± 4.1	18.0 ± 2.4
SPECIAL INTEREST	28	20.0	27.7	23.1 ± 4.0	
SUPPLEMENTAL	56	18.0	27.4	21.8 ± 4.4	
CONTROL	4	19.3	22.5	20.2 ± 3.0	

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, 2012

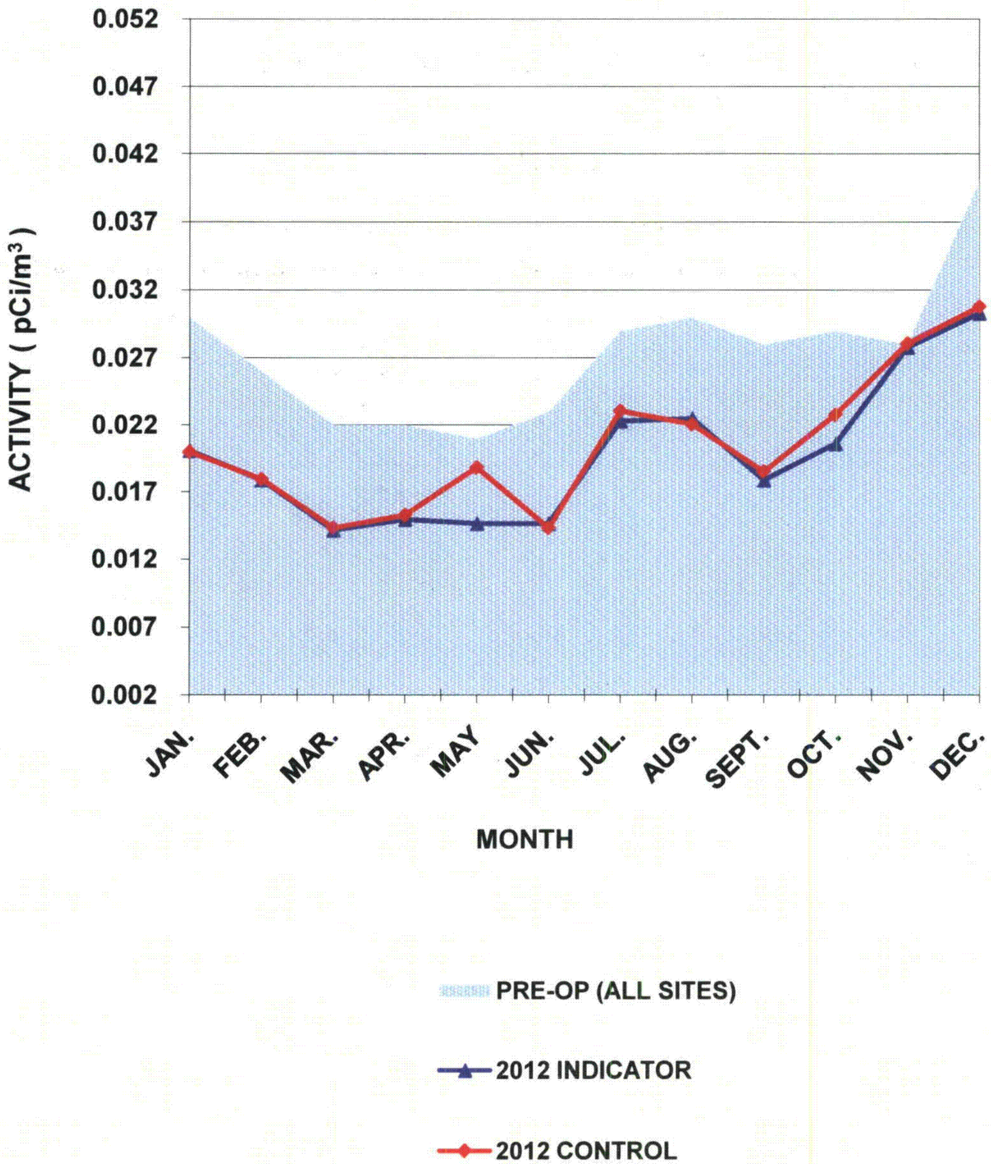
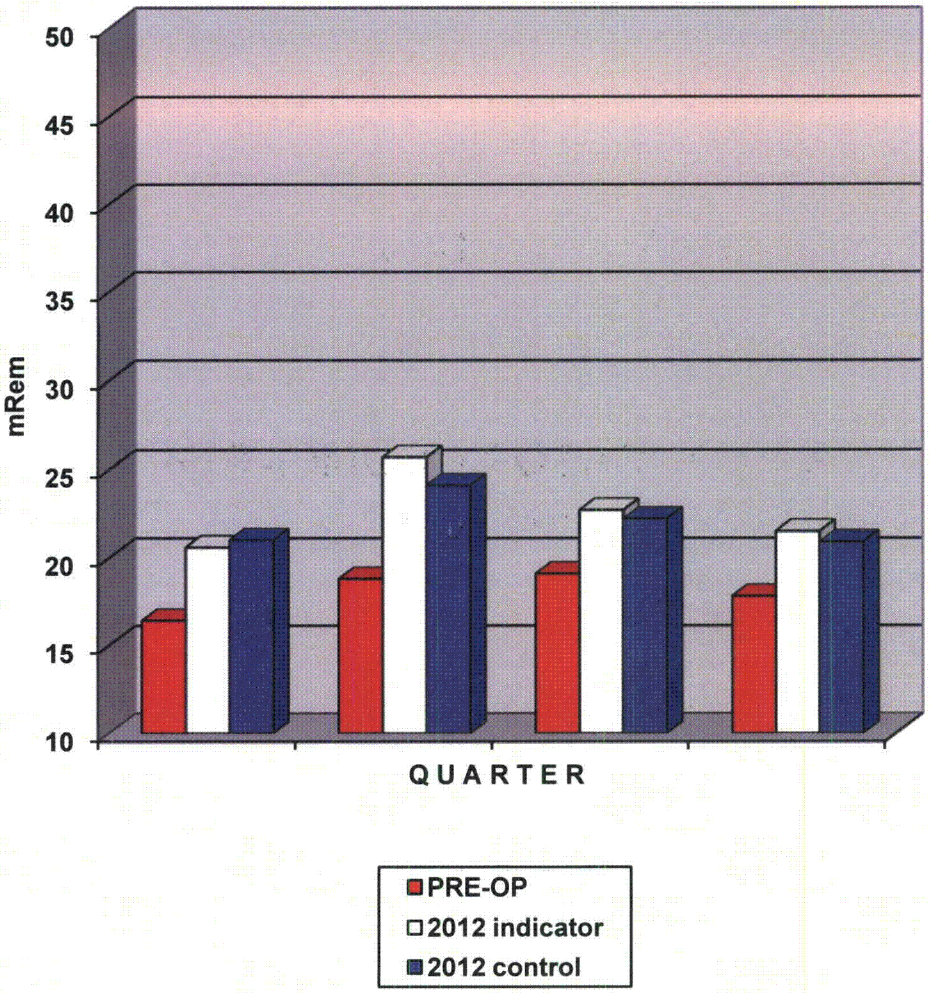


FIGURE C-2
MEAN QUARTERLY AMBIENT GAMMA RADIATION LEVELS (OSLD) IN THE VICINITY OF CPS, 2012



APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

Intentionally left blank

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2012	E10066	Milk	Sr-89	pCi/L	101	94.8	1.07	A
			Sr-90	pCi/L	11.7	13.5	0.87	A
	E10067	Milk	I-131	pCi/L	87.5	92.5	0.95	A
			Ce-141	pCi/L	247	260	0.95	A
			Cr-51	pCi/L	435	436	1.00	A
			Cs-134	pCi/L	133	149	0.89	A
			Cs-137	pCi/L	156	159	0.98	A
			Co-58	pCi/L	127	132	0.96	A
			Mn-54	pCi/L	190	195	0.97	A
			Fe-59	pCi/L	179	168	1.07	A
			Zn-65	pCi/L	327	333	0.98	A
			Co-60	pCi/L	274	279	0.98	A
	E10069	AP	Ce-141	pCi	167	164	1.02	A
			Cr-51	pCi	310	276	1.12	A
			Cs-134	pCi	107	94.5	1.13	A
			Cs-137	pCi	109	101	1.08	A
			Co-58	pCi	87.6	83.5	1.05	A
			Mn-54	pCi	133	123	1.08	A
			Fe-59	pCi	113	106	1.07	A
			Zn-65	pCi	226	210	1.08	A
			Co-60	pCi	185	176	1.05	A
	E10068	Charcoal	I-131	pCi	92.8	94.2	0.99	A
	E10070	Water	Fe-55	pCi/L	1800	1570	1.15	A
June 2012	E10198	Milk	Sr-89	pCi/L	86.1	99.8	0.86	A
			Sr-90	pCi/L	9.2	12.7	0.72	W
	E10199	Milk	I-131	pCi/L	88.9	99.7	0.89	A
			Ce-141	pCi/L	72.8	82.2	0.89	A
			Cr-51	pCi/L	394	402	0.98	A
			Cs-134	pCi/L	159	174	0.91	A
			Cs-137	pCi/L	206	212	0.97	A
			Co-58	pCi/L	89.5	92.3	0.97	A
			Mn-54	pCi/L	129	132	0.98	A
			Fe-59	pCi/L	129	128	1.01	A
			Zn-65	pCi/L	193	199	0.97	A
			Co-60	pCi/L	342	355	0.96	A
	E10201	AP	Ce-141	pCi	73.2	75.1	0.97	A
			Cr-51	pCi	367	366	1.00	A
			Cs-134	pCi	165	159	1.04	A
			Cs-137	pCi	205	193	1.06	A
			Co-58	pCi	84.7	84.2	1.01	A
			Mn-54	pCi	118	121	0.98	A
			Fe-59	pCi	125	117	1.07	A
			Zn-65	pCi	181	182	0.99	A
			Co-60	pCi	338	324	1.04	A
	E10200	Charcoal	I-131	pCi	101	96.6	1.05	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2012	E10202	Water	Fe-55	pCi/L	1890	1580	1.20	A
September 2012	E10296	Milk	Sr-89	pCi/L	106	99.6	1.06	A
			Sr-90	pCi/L	13.6	16.0	0.85	A
	E10297	Milk	I-131	pCi/L	89.8	99.6	0.90	A
			Ce-141	pCi/L	160	164	0.98	A
			Cr-51	pCi/L	230	248	0.93	A
			Cs-134	pCi/L	101	108	0.94	A
			Cs-137	pCi/L	174	174	1.00	A
			Co-58	pCi/L	97.2	100	0.97	A
			Mn-54	pCi/L	188	196	0.96	A
			Fe-59	pCi/L	159	152	1.05	A
			Zn-65	pCi/L	195	192	1.02	A
			Co-60	pCi/L	155	152	1.02	A
	E10299	AP	Ce-141	pCi	145	135	1.07	A
			Cr-51	pCi	219	205	1.07	A
			Cs-134	pCi	94.1	89.4	1.05	A
			Cs-137	pCi	140	144	0.97	A
			Co-58	pCi	88.3	83.0	1.06	A
			Mn-54	pCi	173	162	1.07	A
			Fe-59	pCi	136	125	1.09	A
			Zn-65	pCi	165	159	1.04	A
			Co-60	pCi	133	125	1.06	A
	E10298	Charcoal	I-131	pCi	95.5	97.2	0.98	A
	E10300	Water	Fe-55	pCi/L	1630	1900	0.86	A
December 2012	E10334	Milk	Sr-89	pCi/L	101	96.6	1.05	A
			Sr-90	pCi/L	11.3	13.8	0.82	A
	E10335	Milk	I-131	pCi/L	93.1	90.0	1.03	A
			Ce-141	pCi/L	52.5	51.0	1.03	A
			Cr-51	pCi/L	373	348	1.07	A
			Cs-134	pCi/L	157	165	0.95	A
			Cs-137	pCi/L	113	117	0.97	A
			Co-58	pCi/L	94.1	98.5	0.96	A
			Mn-54	pCi/L	116	116	1.00	A
			Fe-59	pCi/L	124	116	1.07	A
			Zn-65	pCi/L	190	186	1.02	A
			Co-60	pCi/L	172	170	1.01	A
	E10337A	AP	Ce-141	pCi	51.8	49.6	1.04	A
			Cr-51	pCi	372	338	1.10	A
			Cs-134	pCi	165	161	1.02	A
			Cs-137	pCi	113	114	0.99	A
			Co-58	pCi	96.5	95.8	1.01	A
			Mn-54	pCi	118	112	1.05	A
			Fe-59	pCi	105	112	0.94	A
			Zn-65	pCi	166	181	0.92	A
			Co-60	pCi	179	165	1.08	A

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM

TELEDYNE BROWN ENGINEERING, 2012

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2012	E10336	Charcoal	I-131	pCi	73.1	72.7	1.01	A
	E10333	Water	Fe-55	pCi/L	1550	1750	0.89	A

(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, 2012
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2012	RAD-89	Water	Sr-89	pCi/L	63.4	58.5	46.9 - 66.3	A
			Sr-90	pCi/L	33.5	37.4	27.4 - 43.1	A
			Ba-133	pCi/L	89.2	82.3	69.1 - 90.5	A
			Cs-134	pCi/L	66.5	74.2	60.6 - 81.6	A
			Cs-137	pCi/L	152	155	140 - 172	A
			Co-60	pCi/L	73.3	72.9	65.6 - 82.6	A
			Zn-65	pCi/L	109	105	94.5 - 125	A
			Gr-A	pCi/L	82.4	62.9	33.0 - 78.0	N (1)
			Gr-B	pCi/L	43.6	44.2	29.6 - 51.5	A
			I-131	pCi/L	25.9	27.1	22.5 - 31.9	A
			H-3	pCi/L	15433	15800	13800 - 17400	A
	MRAD-16	Filter	Gr-A	pCi/filter	39.5	77.8	26.1 - 121	A
November, 2012	RAD-91	Water	Sr-89	pCi/L	46.5	39.1	29.7 - 46.1	N (2)
			Sr-90	pCi/L	16.6	20.1	14.4 - 23.8	A
			Ba-133	pCi/L	85.2	84.8	71.3 - 93.3	A
			Cs-134	pCi/L	76.9	76.6	62.6 - 84.3	A
			Cs-137	pCi/L	177	183	165 - 203	A
			Co-60	pCi/L	77.4	78.3	70.5 - 88.5	A
			Zn-65	pCi/L	209	204	184 - 240	A
			Gr-A	pCi/L	50.6	58.6	30.6 - 72.9	A
			Gr-B	pCi/L	59.3	39.2	26.0 - 46.7	N (2)
			I-131	pCi/L	22.9	24.8	20.6 - 29.4	A
			H-3	pCi/L	5020	4890	4190 - 5380	A
	MRAD-17	Filter	Gr-A	pCi/filter	59.6	87.5	29.3 - 136	A

(1) Detector G1 is slightly biased high for Th-230 based measurements used only for ERA Gross Alpha samples. NCR 12-05
(2) The Sr-89 found to known ratio was 1.19, which TBE considers acceptable. It appears the aliquot was entered incorrectly for the Gross Beta NCR 12-13
(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, 2012

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2012	12-MaW26	Water	Cs-134	Bq/L	-0.0045		(1)	A
			Cs-137	Bq/L	37.5	39.9	27.9 - 51.9	A
			Co-57	Bq/L	30.8	32.9	23.0 - 42.8	A
			Co-60	Bq/L	22.4	23.72	16.60 - 30.84	A
			H-3	Bq/L	456	437	306 - 568	A
			Mn-54	Bq/L	31.0	31.8	22.3 - 41.3	A
			K-40	Bq/L	144	142	99 - 185	A
			Sr-90	Bq/L	-0.0084		(1)	A
			Zn-65	Bq/L	-0.369		(1)	A
	12-GrW26	Water	Gr-A	Bq/L	2.06	2.14	0.64 - 3.64	A
			Gr-B	Bq/L	7.48	6.36	3.18 - 9.54	A
	12-MaS26	Soil	Cs-134	Bq/kg	831	828	580 - 1076	A
			Cs-137	Bq/kg	0.145		(1)	A
			Co-57	Bq/kg	1270	1179	825 - 1533	A
			Co-60	Bq/kg	7.61	1.56	(2)	N (3)
			Mn-54	Bq/kg	634	558	391 - 725	A
			K-40	Bq/kg	1690	1491	1044 - 1938	A
			Sr-90	Bq/kg	328	392	274 - 540	A
			Zn-65	Bq/kg	753	642	449 - 835	A
	12-RdF26	AP	Cs-134	Bq/sample	2.31	2.38	1.67 - 3.09	A
			Cs-137	Bq/sample	2.15	1.79	1.25 - 2.33	W
			Co-57	Bq/sample	-0.0701		(1)	A
			Co-60	Bq/sample	2.62	2.182	1.527 - 2.837	W
			Mn-54	Bq/sample	4.13	3.24	2.27 - 4.21	W
			Sr-90	Bq/sample	0.0185		(1)	A
			Zn-65	Bq/sample	4.19	2.99	2.09 - 3.89	N (3)
	12-GrF26	AP	Gr-A	Bq/sample	0.365	1.2	0.4 - 2.0	A
			Gr-B	Bq/sample	2.31	2.4	1.2 - 3.6	A
	12-RdV26	Vegetation	Cs-134	Bq/sample	8.72	8.43	5.90 - 10.96	A
			Cs-137	Bq/sample	0.0424		(1)	A
			Co-57	Bq/sample	15.5	12.0	8.4 - 15.6	W
			Co-60	Bq/sample	6.80	6.05	4.24 - 7.87	A
			Mn-54	Bq/sample	0.0057		(1)	A
			Sr-90	Bq/sample	2.24	2.11	1.48 - 2.74	A
			Zn-65	Bq/sample	10.5	8.90	6.23 - 11.57	A
September 2012	12-MaW27	Water	Cs-134	Bq/L	21.4	23.2	16.2 - 30.2	A
			Cs-137	Bq/L	17.0	16.7	11.7 - 21.7	A
			Co-57	Bq/L	28.7	29.3	20.5 - 38.1	A
			Co-60	Bq/L	0.179		(1)	A
			H-3	Bq/L	387	334	234 - 434	A
			Mn-54	Bq/L	18.1	17.8	12.5 - 23.1	A
			K-40	Bq/L	139	134	94 - 174	A
			Sr-90	Bq/L	19.6	12.2	8.5 - 15.9	N (4)
			Zn-65	Bq/L	27.2	25.9	18.1 - 33.7	A
	12-GrW27	Water	Gr-A	Bq/L	0.966	1.79	0.54 - 3.04	A
			Gr-B	Bq/L	10.0	9.1	4.6 - 13.7	A

TABLE D-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2012

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2012	12-MaS27	Soil	Cs-134	Bq/kg	880	939	657 - 1221	A
			Cs-137	Bq/kg	1220	1150	805 - 1495	A
			Co-57	Bq/kg	1330	1316	921 - 1711	A
			Co-60	Bq/kg	552	531	372 - 690	A
			Mn-54	Bq/kg	1000	920	644 - 1196	A
			K-40	Bq/kg	674	632	442 - 822	A
			Sr-90	Bq/kg	528	508	356 - 660	A
			Zn-65	Bq/kg	665	606	424 - 788	A
	12-RdF27	AP	Cs-134	Bq/sample	2.760	2.74	1.92 - 3.56	A
			Cs-137	Bq/sample	0.0415		(1)	A
			Co-57	Bq/sample	2.00	191.00	1.34 - 2.48	A
			Co-60	Bq/sample	1.78	1.728	1.210 - 2.246	A
			Mn-54	Bq/sample	2.40	2.36	1.65 - 3.07	A
			Sr-90	Bq/sample	0.931	1.03	0.72 - 1.34	A
			Zn-65	Bq/sample	-0.688		(1)	A
	12-GrF27	AP	Gr-A	Bq/sample	0.434	0.97	0.29 - 1.65	A
			Gr-B	Bq/sample	1.927	1.92	0.96 - 2.88	A
	12-RdV27	Vegetation	Cs-134	Bq/sample	6.28	6.51	4.56 - 8.46	A
			Cs-137	Bq/sample	4.62	4.38	3.07 - 5.69	A
			Co-57	Bq/sample	6.51	5.66	3.96 - 7.36	A
			Co-60	Bq/sample	5.32	5.12	3.58 - 6.66	A
			Mn-54	Bq/sample	3.59	3.27	2.29 - 4.25	A
			Sr-90	Bq/sample	0.0012		(1)	A
			Zn-65	Bq/sample	-0.046		(1)	A

(1) *False positive test.*
(2) *Sensitivity evaluation*
(3) *No cause was found for the failed high soil Co-60 sensitivity test or the high Zn-65 in AP, which TBE considers an anomaly. NCR 12-08*
(4) Sr-90 in water high due to incorrect aliquot entered in LIMS. 12-11
(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

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

Intentionally left blank

Docket No: 50-461

CLINTON POWER STATION

Annual Radiological Groundwater Protection Program Report

1 January through 31 December 2012

Prepared By

Teledyne Brown Engineering
Environmental Services

Exelon Generation.

Clinton Power Station
Clinton, IL 61727

April 2013

Intentionally left blank

Table Of Contents

Appendices

Appendix A	Location Designation of the Annual Radiological Groundwater Protection Program Report (ARGPPR)

<u>Tables</u>

<u>Figures</u>

Appendix B	Data Tables of the Annual Radiological Groundwater Protection Program Report (ARGPPR)

<u>Tables</u>

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 2012. During that time period, 230 analyses were performed on 100 samples from 28 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 2012.

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, 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 212 ± 129 pCi/L to 415 ± 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 2012. Gross Alpha (dissolved) was detected at one of the 17 groundwater locations at a concentration of 1.6 pCi/L. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in all groundwater locations. The concentrations ranged from 1.4 to 9.7 pCi/L. Gross Beta (suspended) was detected in 1 of 17 groundwater locations at a concentration of 23.7 pCi/L.

Hard-To-Detect analyses were performed on two groundwater location 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. The isotopes U-234 and U-238 were detected in one of the two groundwater monitoring locations. The U-234 had a concentration of 0.33 pCi/L. The U-238 had a concentration of 0.38 pCi/L. The levels detected are considered background.

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 2012.

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 2012.

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 2012.

2. Missed Samples

There were no missed samples in 2012.

B. Program Changes

Starting in 2012, monitoring well MW-CL-14S was designated as an "elevated" well, resulting in additional analysis requirements. This change in designation from "detection" was made due to the consistent low level tritium activity detected at this location. This matter is discussed in detail in section IV.I of this report.

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 200 pCi/l to 415 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 in 2012. Gross Alpha (dissolved) was detected at one of the 17 groundwater locations at a concentration of 1.6 pCi/L. Gross Alpha (suspended) was not detected at any of the groundwater locations. Gross Beta (dissolved) was detected in all groundwater locations. The concentrations ranged from 1.4 to 9.7 pCi/L. Gross Beta (suspended) was detected in 1 of 17 groundwater locations at a concentration of 23.7 pCi/L (Table B–I.1 Appendix B).

Gamma Emitters

No 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. The isotopes U-234 and U-238 were detected in one of the two groundwater monitoring locations. The U-234 had a concentration of 0.33 pCi/L. The U-238 had a concentration of 0.38 pCi/L. All hard-to-detect nuclides were not detected at concentrations greater than their respective MDCs (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.

Tritium

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.

Strontium

Strontium was not analyzed in 2012 (Table B–II.1 Appendix B).

Gamma Emitters

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 fourth quarter of 2012. Analytical results are discussed below. No anomalies were noted during the year.

Tritium

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

Low level tritium activity was detected in all four quarters of 2012 for monitoring well MW-CL-14S. The activity seen in MW-CL-14S is attributed to the natural migration of the only known tritium plume at Clinton Power Station. Clinton Power Station has historically seen consistently positive tritium analysis results in only one well, MW-CL-21S. This activity is attributed to historical maintenance practices regarding the Cycled Condensate storage tank. MW-CL-14S is the closest well to, and down-gradient from, MW-CL-21S.

The tritium concentration in MW-CL-21S has shown an overall downward trend since 2008, when the activity peaked at 901 pCi/L. The uptrend in MW-CL-14S appears to be due to this plume migrating with the natural flow of groundwater. Concurrence with this evaluation was obtained from AMO Environmental Decisions, a vendor that compiles and evaluates RGPP ground water data for the Exelon fleet. The trend in MW-CL-14S tritium activity does not require any action and will continue to be monitored as dictated by 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 2012.

4. Installation of Monitoring Wells

   No new wells were installed during the 2012.

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)

Intentionally left blank

TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Clinton Power Station, 2012

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

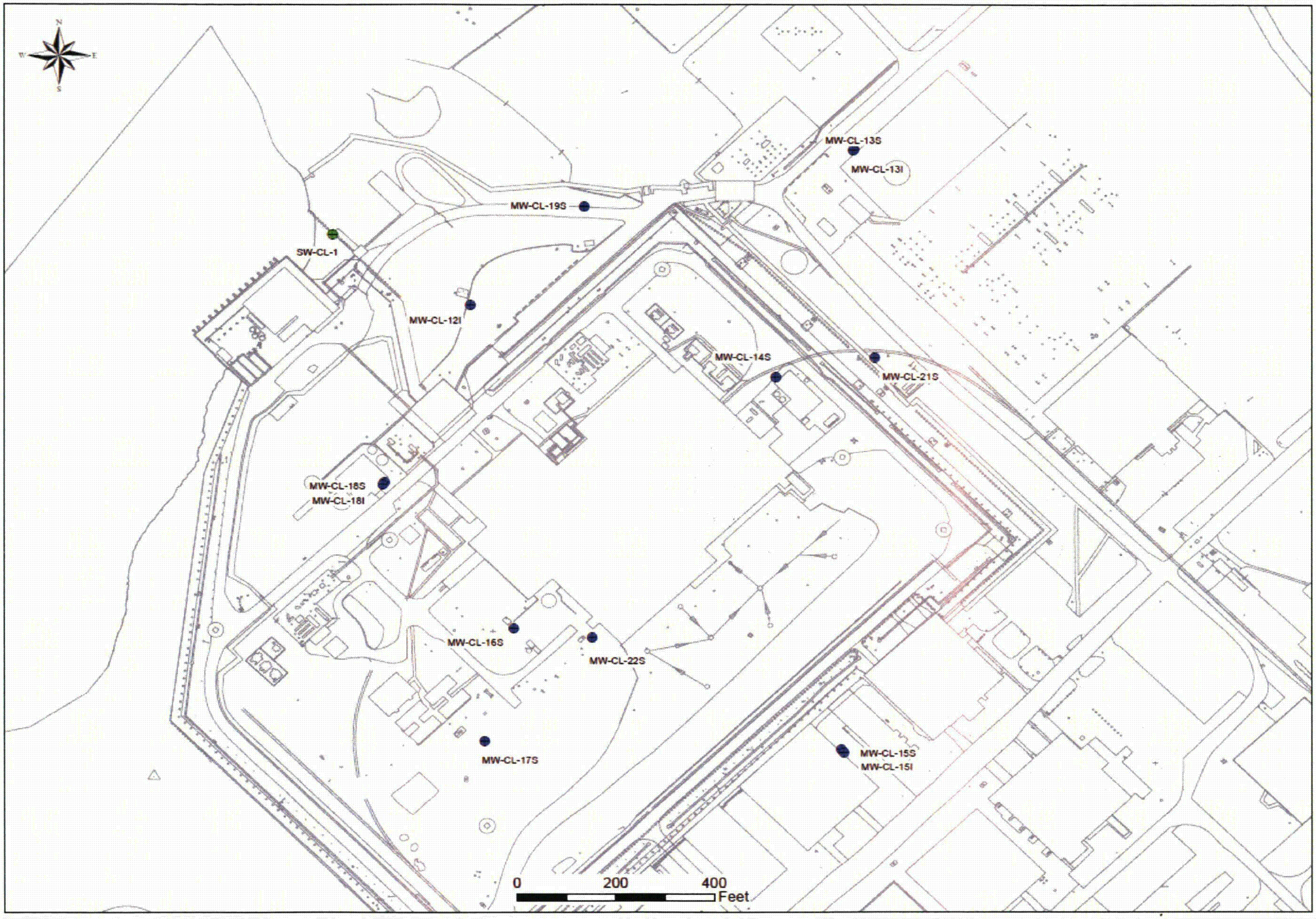


Figure A – 1
Onsite Sampling Locations at Clinton Power Station

Figure A – 2
Sampling Locations South of Clinton Power Station

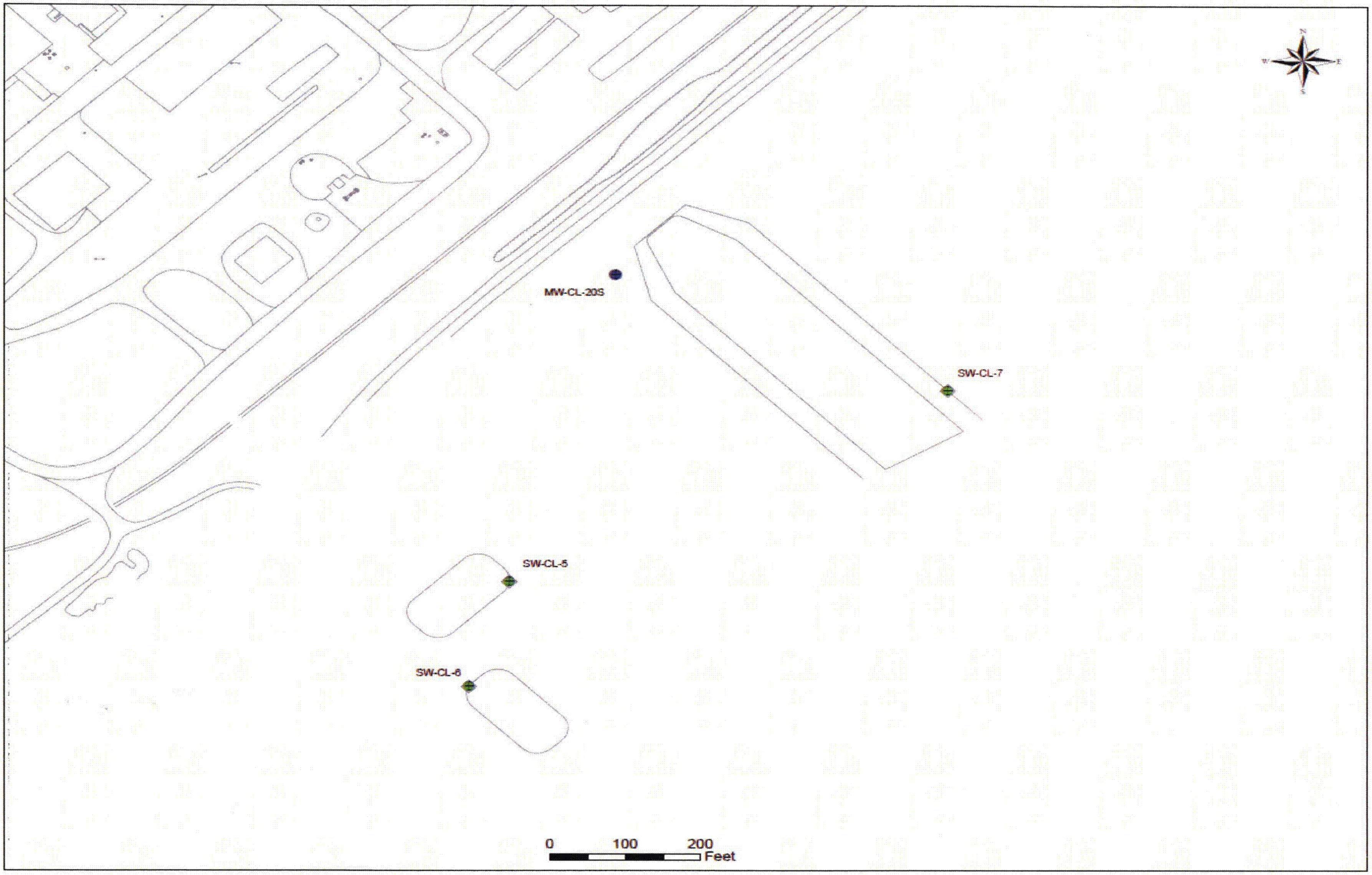


Figure A – 3
Sampling Locations East of Clinton Power Station

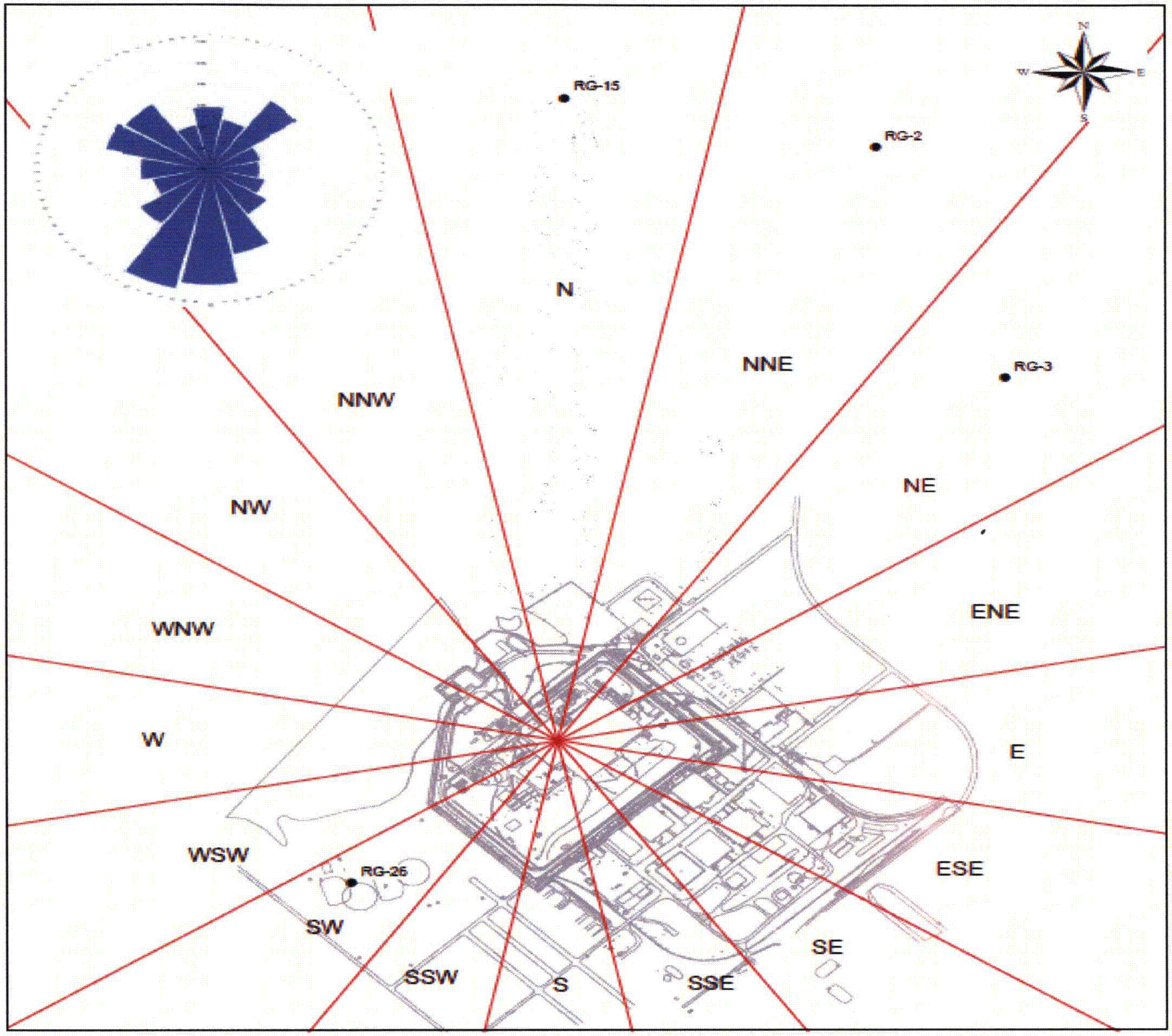


Figure A – 4
Recapture Sampling Locations of Clinton Power Station

APPENDIX B

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

Intentionally left blank

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012

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	03/12/12	< 194						
B-3	06/11/12	< 192						
B-3	09/05/12	< 182	< 3.8	< 0.7	< 1.1	< 0.9	2.5 ± 1.1	< 1.6
B-3	11/05/12	< 192						
MW-CL-1	03/12/12	< 196						
MW-CL-1	06/11/12	< 190						
MW-CL-1	09/05/12	< 180	< 3.9	< 0.6	< 0.9	< 0.9	2.3 ± 1.0	< 1.6
MW-CL-1	11/05/12	< 196						
MW-CL-12I	03/12/12	< 188						
MW-CL-12I	06/11/12	< 192						
MW-CL-12I	09/05/12	< 181	< 4.2	< 0.5	< 1.0	< 0.8	3.1 ± 1.0	< 1.6
MW-CL-12I	11/05/12	< 193						
MW-CL-13I	03/12/12	< 190						
MW-CL-13I	06/11/12	< 191						
MW-CL-13I	09/05/12	< 178	< 4.5	< 0.8	< 1.1	< 0.9	3.5 ± 1.1	< 1.6
MW-CL-13I	11/05/12	< 190						
MW-CL-13S	03/12/12	212 ± 129						
MW-CL-13S	06/11/12	< 195						
MW-CL-13S	09/05/12	218 ± 123	< 8.9	< 0.8	< 0.9	< 1.0	2.7 ± 1.1	< 1.6
MW-CL-13S	11/05/12	< 191						
MW-CL-14S	03/13/12	231 ± 129						
MW-CL-14S	06/12/12	324 ± 138						
MW-CL-14S	09/04/12	415 ± 141	< 8.1	< 0.7	< 1.4	< 1.0	5.4 ± 1.3	< 1.6
MW-CL-14S	11/06/12	285 ± 137						
MW-CL-15I	03/12/12	< 193						
MW-CL-15I	06/11/12	< 196						
MW-CL-15I	09/05/12	< 188	< 7.3	< 0.6	< 0.5	< 1.0	1.4 ± 0.7	< 1.6
MW-CL-15I	11/05/12	< 195						
MW-CL-15S	03/12/12	< 189						
MW-CL-15S	06/11/12	< 197						
MW-CL-15S	09/05/12	< 177	< 8.2	< 0.6	< 0.6	< 1.0	1.6 ± 0.7	< 1.6
MW-CL-15S	11/05/12	< 195						
MW-CL-16S	03/13/12	< 190						
MW-CL-16S	06/12/12	< 189						
MW-CL-16S	09/05/12	< 195	< 9.4	< 0.7	1.6 ± 0.7	< 1.0	4.6 ± 1.0	< 1.6
MW-CL-16S	11/06/12	< 192						
MW-CL-17S	03/13/12	< 187						
MW-CL-17S	06/12/12	< 191						
MW-CL-17S	09/04/12	< 196	< 8.8	< 0.8	< 1.6	< 0.6	2.1 ± 1.1	< 1.7
MW-CL-17S	11/06/12	< 195						
MW-CL-18I	03/13/12	< 189						
MW-CL-18I	06/12/12	< 194						
MW-CL-18I	09/05/12	< 195	< 7.2	< 0.6	< 1.1	< 0.6	3.8 ± 1.1	< 1.7
MW-CL-18I	11/06/12	< 192						
MW-CL-18S	03/13/12	< 187						
MW-CL-18S	06/12/12	< 190						
MW-CL-18S	09/05/12	< 194	< 9.3	< 0.7	< 1.4	< 0.6	3.8 ± 1.2	< 1.7
MW-CL-18S	11/06/12	< 198						
MW-CL-19S	03/12/12	< 192						
MW-CL-19S	06/11/12	< 194						
MW-CL-19S	09/05/12	< 197	< 8.6	< 0.7	< 2.5	< 0.7	4.5 ± 1.4	< 1.7
MW-CL-19S	11/05/12	< 197						

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012

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-2	03/12/12	< 193						
MW-CL-2	06/11/12	< 192						
MW-CL-2	09/05/12	< 182	< 4.5	< 0.7	< 1.2	< 2.1	3.6 ± 1.1	23.7 ± 2.9
MW-CL-2	11/05/12	< 197						
MW-CL-20S	03/12/12	< 192						
MW-CL-20S	06/11/12	< 194						
MW-CL-20S	09/05/12	< 197	< 9.4	< 0.7	< 1.3	< 0.6	3.2 ± 1.1	< 1.7
MW-CL-20S	11/05/12	< 197						
MW-CL-21S	03/12/12	241 ± 129						
MW-CL-21S	06/11/12	354 ± 137						
MW-CL-21S	09/05/12	378 ± 140	< 6.9	< 0.7	< 1.2	< 0.8	1.9 ± 1.1	< 1.6
MW-CL-21S	11/05/12	343 ± 141						
MW-CL-22S	03/13/12	< 186						
MW-CL-22S	06/12/12	< 193						
MW-CL-22S	09/04/12	< 198	< 8.5	< 0.7	< 1.4	< 0.9	9.7 ± 1.4	< 1.6
MW-CL-22S	11/06/12	< 195						

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 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	09/05/12	< 33	< 39	< 4	< 4	< 8	< 4	< 9	< 4	< 6	< 3	< 4	< 23	< 6
MW-CL-1	09/05/12	< 51	< 74	< 4	< 5	< 12	< 5	< 10	< 7	< 10	< 5	< 6	< 30	< 10
MW-CL-12I	09/05/12	< 42	< 84	< 4	< 4	< 9	< 4	< 9	< 5	< 8	< 4	< 5	< 26	< 10
MW-CL-13I	09/05/12	< 46	< 55	< 5	< 6	< 11	< 5	< 12	< 6	< 9	< 5	< 5	< 32	< 9
MW-CL-13S	09/05/12	< 40	< 70	< 4	< 5	< 9	< 4	< 8	< 5	< 6	< 4	< 4	< 26	< 9
MW-CL-14S	06/12/12	< 40	< 41	< 4	< 4	< 9	< 4	< 8	< 5	< 7	< 4	< 4	< 31	< 9
MW-CL-14S	09/04/12	< 41	< 39	< 4	< 4	< 9	< 5	< 8	< 5	< 8	< 4	< 5	< 28	< 10
MW-CL-15I	09/05/12	< 40	< 37	< 4	< 4	< 11	< 4	< 8	< 5	< 9	< 4	< 4	< 29	< 10
MW-CL-15S	09/05/12	< 45	< 91	< 4	< 5	< 11	< 6	< 9	< 6	< 9	< 5	< 5	< 29	< 10
MW-CL-16S	09/05/12	< 47	< 81	< 5	< 5	< 10	< 4	< 9	< 6	< 8	< 5	< 5	< 31	< 8
MW-CL-17S	09/04/12	< 42	< 74	< 5	< 4	< 11	< 5	< 9	< 5	< 8	< 4	< 5	< 30	< 8
MW-CL-18I	09/05/12	< 36	< 64	< 4	< 4	< 9	< 4	< 7	< 5	< 8	< 4	< 4	< 24	< 9
MW-CL-18S	09/05/12	< 41	< 84	< 4	< 4	< 10	< 5	< 9	< 4	< 8	< 4	< 5	< 27	< 8
MW-CL-19S	09/05/12	< 34	< 29	< 3	< 4	< 8	< 4	< 8	< 3	< 6	< 3	< 4	< 24	< 6
MW-CL-2	09/05/12	< 52	< 44	< 5	< 5	< 11	< 6	< 11	< 7	< 8	< 5	< 5	< 31	< 11
MW-CL-20S	09/05/12	< 38	< 88	< 4	< 4	< 8	< 4	< 9	< 5	< 7	< 4	< 4	< 26	< 9
MW-CL-21S	06/11/12	< 35	< 38	< 4	< 4	< 11	< 4	< 8	< 4	< 8	< 4	< 4	< 30	< 9
MW-CL-21S	09/05/12	< 30	< 58	< 3	< 3	< 7	< 3	< 6	< 4	< 5	< 3	< 3	< 20	< 6
MW-CL-22S	9/4/2012	< 29	< 32	< 3	< 3	< 7	< 4	< 8	< 4	< 7	< 3	< 3	< 21	< 8

TABLE B-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

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	09/04/12	< 0.10	< 0.09	< 0.03	< 0.14	< 0.04	0.33 ± 0.13	< 0.02	0.38 ± 0.14	< 133	< 4
MW-CL-21S	09/05/12	< 0.11	< 0.06	< 0.01	< 0.12	< 0.08	< 0.10	< 0.05	< 0.11	< 126	< 4

TABLE B-II.1 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
SW-CL-1	03/12/12	< 185
SW-CL-1	06/11/12	< 191
SW-CL-1	09/05/12	< 165
SW-CL-1	11/05/12	< 193
SW-CL-2	03/12/12	< 191
SW-CL-2	06/11/12	< 191
SW-CL-2	09/05/12	< 191
SW-CL-2	11/05/12	< 195
SW-CL-4	03/12/12	< 191
SW-CL-4	06/11/12	< 192
SW-CL-4	09/05/12	< 195
SW-CL-4	11/05/12	< 194
SW-CL-5	03/12/12	< 186
SW-CL-5	06/11/12	< 167
SW-CL-5	09/05/12	< 199
SW-CL-5	11/05/12	< 196
SW-CL-6	03/12/12	< 191
SW-CL-6	06/11/12	< 165
SW-CL-6	09/05/12	< 192
SW-CL-6	11/05/12	< 192
SW-CL-7	03/12/12	< 190
SW-CL-7	06/11/12	< 169
SW-CL-7	09/05/12	< 193
SW-CL-7	11/05/12	< 197
Sewage Treatment Plant	03/12/12	< 191
Sewage Treatment Plant	06/11/12	< 164
Sewage Treatment Plant	09/05/12	< 196
Sewage Treatment Plant	11/05/12	< 196

TABLE B-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 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	09/05/12	< 32	< 31	< 3	< 3	< 7	< 3	< 7	< 4	< 6	< 3	< 4	< 23	< 8
SW-CL-2	09/05/12	< 35	< 30	< 3	< 3	< 7	< 4	< 7	< 4	< 6	< 3	< 4	< 24	< 7
SW-CL-4	09/05/12	< 38	< 31	< 4	< 4	< 8	< 3	< 8	< 4	< 6	< 4	< 4	< 24	< 7
SW-CL-5	09/05/12	< 36	< 65	< 3	< 3	< 8	< 3	< 8	< 4	< 6	< 3	< 3	< 22	< 7
SW-CL-6	09/05/12	< 27	< 27	< 3	< 3	< 6	< 3	< 5	< 3	< 5	< 3	< 3	< 20	< 6
SW-CL-7	09/05/12	< 34	< 67	< 4	< 4	< 9	< 3	< 9	< 4	< 6	< 3	< 4	< 23	< 7
Sewage Treatment Plant	09/05/12	< 34	< 74	< 4	< 4	< 10	< 4	< 9	< 4	< 7	< 4	< 3	< 26	< 10

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED IN THE VICINITY OF CLINTON POWER STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
RG-15	10/05/12	< 189
RG-2	10/05/12	< 195
RG-26	10/05/12	< 192
RG-3	10/05/12	< 191