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Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: 2013 Annual Radiological Environmental Operating Report (AREOR)

In accordance with Technical Specification 5.6.2, "Annual Radiological Environmental Operating Report," we are submitting the Annual Radiological Environmental Operating Report (AREOR) for Byron Station. This report is required to be submitted to the NRC by May 15th of each year and contains the results of the radiological environmental and meteorological monitoring programs. The Radioactive Effluent Release Report was submitted under separate cover. Also included are the results of groundwater monitoring conducted in accordance with Exelon's Radiological Groundwater Protection Program (RGPP), which is a voluntary program implemented in 2006. This information is being reported in accordance with a nuclear industry initiative.

If you have any questions regarding this information, please contact Steven Gackstetter, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,

Faber A. Kearney
Site Vice President
Byron Nuclear Generating Station

FAK/JG/LZ/sg

Attachment: AREOR Report

cc: Regional Administrator – NRC Region III

Docket No: 50-454
50-455

BYRON NUCLEAR GENERATING STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

1 January Through 31 December 2013

Prepared By

Teledyne Brown Engineering
Environmental Services

Byron Nuclear Generating Station
Byron, IL 61010

May 2014

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Appendices

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I. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program conducted for the Byron Nuclear Generating Station by Exelon covers the period 1 January 2013 through 31 December 2013. During that time period, 1,443 analyses were performed on 1,308 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of BNGS had no adverse radiological impact on the environment.

Surface water samples were analyzed for concentrations of gross beta, tritium, Nickel-63 (Ni-63), and gamma emitting nuclides. Ground water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Gross beta activities detected were consistent with those detected in previous years. All surface water samples analyzed for Ni-63 were less than the minimum detectable concentration. Tritium detected in downstream surface water was well below reportable limits and consistent with expected levels as a result of permitted liquid discharges.

Fish (commercially and/or recreationally important species) and sediment samples were analyzed for concentrations of gamma emitting nuclides. Non-plant produced Cesium-137 activity was detected at both sediment locations. Low levels of Cs-137 are detected occasionally and are consistent with data from previous years and are not a result of plant effluents.

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

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

Cow milk samples were analyzed for concentrations of I-131 and gamma emitting nuclides. All I-131 results were below the minimum detectable activity. No fission or activation products were found.

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

Environmental gamma radiation measurements were performed quarterly using Optically Stimulated Luminescence Dosimeters (OSLD). Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimetry were deployed and Thermoluminescent 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).

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II. Introduction

Byron Station, a two-unit PWR station, is located about two miles east of the Rock River and approximately three miles southwest of Byron in Ogle County, Illinois. The reactors are designed to have capacities of 1,268 and 1,241 MW gross, respectively. Unit One loaded fuel in November 1984 and went on line February 2, 1985. Unit Two went on line January 9, 1987. The station has been designed to keep releases to the environment at levels below those specified in the codes of federal regulations.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Landauer on samples collected during the period 1 January 2013 through 31 December 2013.

A. Objectives of the REMP

The objectives of the REMP are to:

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

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

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.

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

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

III. Program Description

A. Sample Collection

Samples for the BNGS REMP were collected for Exelon Nuclear by Environmental Inc. (Midwest Labs). This section describes the general collection methods used by Environmental Inc. to obtain environmental

samples for the BNGS REMP in 2013. Sample locations and descriptions can be found in Table B–1 and Figures B–1 through B–4, Appendix B.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, ground water, fish and sediment. Two gallon water samples were collected weekly from two surface water locations (BY-12 and BY-29 [Control location]) and quarterly from six ground water locations (BY-14-1, BY-18-1, BY-32, BY-35, BY-36 and BY-37). All samples were collected in new unused plastic bottles, which were rinsed with source water prior to collection. Fish samples comprising the flesh of shorthead redhorse**,** quillback, channel catfish and common carp were collected semiannually at two locations, BY-29 (control) and BY-31. Sediment samples composed of recently deposited substrate were collected at two locations semiannually, BY-12 and BY-34 (control).

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate, and airborne iodine. Airborne iodine and particulate samples were collected and analyzed weekly at eight locations (BY-01, BY-04, BY-06, BY-08, BY-21, BY-22, BY-23 and BY-24). The control location was BY-08. Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The air filters and air iodine samples were replaced weekly and sent to the laboratory for analysis.

Terrestrial Environment

The terrestrial environment was evaluated by performing radiological analyses on samples of milk and food products. Milk samples were collected monthly from January through April and November through December, and biweekly May through October. The control locations were BY-26-1 and BY-26-2 and the indicator location was BY-20-1. All samples were collected in new unused two gallon plastic bottles from the bulk tank at each location, preserved with sodium bisulfate and shipped promptly to the laboratory.

Food products were collected annually in September at five locations (BY-Control, BY-Quad 1, BY-Quad 2, BY-Quad 3 and BY-Quad 4). Various types of samples were collected and placed in new unused plastic bags, and sent to the laboratory for analysis.

Ambient Gamma Radiation

Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimetry (OSLD) were deployed and Thermoluminescent 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).

Each location consisted of 2 OSLD sets. The OSLDs were exchanged quarterly and sent to Landauer for analysis. The OSLDs were placed at locations on and around the BNGS Station site as follows:

An inner ring consisting of 16 locations (BY-101, BY-102, BY-103, BY-104, BY-105, BY-106, BY-107, BY-108, BY-109, BY-110, BY-111, BY-112, BY-113, BY-114, BY-115 and BY-116) near and within the site perimeter representing fence post doses (i.e., at locations where the doses will be potentially greater than maximum annual off–site doses) from BNGS releases.

An outer ring consisting of 16 locations (BY-201, BY-202, BY-203, BY-204, BY-205, BY-206, BY-207, BY-208, BY-209, BY-210, BY-211, BY-212, BY-213, BY-214, BY-215 and BY-216) extending to approximately 5 miles from the site designed to measure possible exposures to close-in population.

A special interest set consisting of seven locations (BY-301-1, BY-302-1, BY-309-1, BY-309-2, BY-309-3, BY-309-4 and BY-314-1) to measure possible exposures from on-site storage facilities.

An other set consisting of seven locations (BY-01, BY-04, BY-06, BY-21, BY-22, BY-23 and BY-24) at locations where air samplers are present.

The balance of one location (BY-08) representing the control area.

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 BNGS, 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 vents in the prevailing downwind direction.

Two OSLDs were placed at each location located at a minimum of five 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 to analyze the environmental samples for radioactivity for the BNGS REMP in 2013. The analytical procedures used by the laboratory are listed in Table B-2.

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

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

2. Concentrations of gamma emitters in ground and surface water, air particulates, milk, fish, sediment and vegetation.

3. Concentrations of tritium in ground and surface water.

4. Concentrations of I-131 in air and milk.

5. Concentrations of Nickel-63 in surface water, fish and sediment.

6. Ambient gamma radiation levels at various site environs.

C. Data Interpretation

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

1. Lower Limit of Detection and Minimum Detectable Concentration

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 BNGS detection capabilities for environmental sample analysis. The minimum detectable concentration (MDC) is defined above with the exception that the measurement is an after-the-fact estimate of the presence of activity.

2. Net Activity Calculation and Reporting of Results

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 effecting a negative number. An 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, ground water and vegetation twelve nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, I-131, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For fish, sediment, air particulate and milk eleven nuclides, 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.

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

D. Program Exceptions

For 2013 the BNGS REMP had a sample recovery rate in excess of 99%. Sample anomalies and missed samples are listed in the tables below:

Table D-1 LISTING OF SAMPLE ANOMALIES

Sample Type	Location Code	Collection Date	Reason
A/I	BY-21	01/08/13	Low reading of 136.4 due to power outage of approximately 7 hours on 01/05/13.
A/I	BY-06	01/15/13	Low reading of 166.5 hours due to maintenance work at air sampler.
A/I	BY-04, BY-06, BY-08, BY-21, BY-22	03/04/13	Air particulate filters light; filters found with holes or small tears; iodine cartridges with heavy particulate collection matching holes in filter paper.
A/I	BY-01, BY-06	03/08/13	Filter found with small hole; replaced on 03/08/13 with new lot number.
A/I	BY-04	03/08/13	Filter light and torn; replaced on 03/08/13 with new lot number.
A/I	BY-08	03/08/13	Filter torn; replaced on 03/08/13 with new lot number.
A/I	BY-04	05/21/13	Timer meter would not reset; collector replaced timer.
A/I	BY-24	10/08/13	Low reading of 68.6 hours due to tripped circuit breaker, possibly due to storms in area; collector reset breaker.
OSLD	BY-23-1	11/19/13	OSLD BY-23-1 found on ground; plastic torn. Collector rehung.

Table D-2 LISTING OF MISSED SAMPLES

Sample Type	Location Code	Collection Date	Reason
SW	BY-12, BY-29	01/02/13	No sample; water frozen.
SW	BY-12, BY-29	01/08/13	No sample; water frozen.
WW	BY-18-1	01/08/13	No sample; homeowner absent; water shut off.

Table D-2 LISTING OF MISSED SAMPLES (continued)

Sample Type	Location Code	Collection Date	Reason
SW	BY-12, BY-29	01/15/13	No sample; water frozen.
SW	BY-12, BY-29	01/22/13	No sample; water frozen.
SW	BY-29	01/29/13	No sample; water frozen.
SW	BY-12, BY-29	02/05/13	No sample; water frozen.
SW	BY-12, BY-29	02/12/13	No sample; water frozen.
SW	BY-12, BY-29	02/19/13	No sample; water frozen.
SW	BY-29	02/26/13	No sample; water frozen.
SW	BY-29	03/04/13	No sample; water frozen.
MI	BY-26-1	03/04/13	Farmer no longer milking.
VE	Quad 2	09/16/13	After diligent search of quadrant, collector was unable to find root vegetation.
SW	BY-12, BY-29	12/10/13	No sample; water frozen.
SW	BY-12, BY-29	12/17/13	No sample; water frozen.
SW	BY-12, BY-29	12/23/13	No sample; water frozen.
SW	BY-12, BY-29	12/31/13	No sample; water frozen.

Each program exception was reviewed to understand the causes of the program exception. Sampling and maintenance errors were reviewed with the personnel involved to prevent recurrence. Occasional equipment breakdowns and power outages were unavoidable.

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

E. Program Changes

1. In March, milk control sample location BY-26-1 (Herbert Dairy) went out of business and was replaced with location BY-26-2 (Akins Dairy).
2. In 2013, BNGS began analyzing Nickel-63 in surface water, fish, and sediment samples.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken weekly and composited monthly at two locations (BY-12 and BY-29). Of these locations only BY-12 located downstream, could be affected by Byron Nuclear Generating Station's effluent releases. The following analyses were performed.

Gross Beta

Samples from both locations were analyzed for concentrations of gross beta (Table C–I.1, Appendix C). The values ranged from 2.7 to 6.1 pCi/l. Concentrations detected were consistent with those detected in previous years (Figure C–1, Appendix C).

Tritium

Quarterly composites of weekly collections were analyzed for tritium activity (Table C–I.2, Appendix C). Tritium was detected in one sample at a concentration of 2,230 pCi/L (Figure C–2, Appendix C). Tritium detected in downstream surface water was well below reportable limits and consistent with expected levels as a result of permitted liquid discharges.

Nickel

Samples from both locations were analyzed for concentration of Ni-63 (Table C–I.3, Appendix C). All results were less than the minimum detectable concentration.

Gamma Spectrometry

Samples from both locations were analyzed for gamma emitting nuclides (Table C–I.4, Appendix C). No nuclides were detected, and all required LLDs were met.

2. Ground Water

Quarterly grab samples were collected at six locations (BY-14-1, BY-18-1, BY-32, BY-35, BY-36 and BY-37). These locations could be affected by Byron Nuclear Generating Station's effluent releases. The following analyses were performed:

Tritium

Quarterly grab samples from the locations were analyzed for tritium activity (Table C–II.1, Appendix C). No tritium was detected, and the required LLD was met (Figures C–3 through C–7, Appendix C).

Gamma Spectrometry

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

3. Fish

Fish samples comprised of shorthead redhorse, quillback, channel catfish and common carp were collected at two locations (BY-29 and BY-31) semiannually. Location BY-31 could be affected by Byron Nuclear Generating Station's effluent releases. The following analysis was performed:

Gamma Spectrometry

The edible portion of fish samples from both locations was analyzed for Nickel-63 and gamma emitting nuclides (Table C–III.1, Appendix C). No nuclides were detected, and all required LLDs were met.

4. Sediment

Aquatic sediment samples were collected at two locations (BY-12 and BY-34) semiannually. BY-12, located downstream, could be affected by Byron Nuclear Generating Station's effluent releases. The following analysis was performed:

Gamma Spectrometry

Sediment samples from both locations were analyzed for Nickel-63 and gamma emitting nuclides (Table C–IV.1, Appendix C). Cesium-137 was detected in two samples. The concentrations were 100 and 127 pCi/L. Concentrations detected were consistent with those detected in previous years and are not a result of plant effluents. No other nuclides were detected, and all required LLDs were met.

B. Atmospheric Environment

1. Airborne

a. Air Particulates

Continuous air particulate samples were collected from eight locations on a weekly basis. The eight locations were separated into three groups: Nearsite samplers within 4 km of the site (BY-21, BY-22, BY-23 and BY-24), Far Field samplers between 4 and 10 km of the site (BY-01, BY-04 and BY-06) and the Control sampler between 10 and 30 km from the site (BY-08). The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–V.1 and C–V.2, Appendix C). 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 BNGS. The results from the Nearsite locations (Group I) ranged from 5 to 55 E–3 pCi/m^3 with a mean of 19 E–3 pCi/m^3. The results from the Far Field locations (Group II) ranged from 5 to 49 E–3 pCi/m^3 with a mean of 19 E–3 pCi/m^3. The results from the Control location (Group III) ranged from 7 to 47 E–3 pCi/m^3 with a mean of 20 E–3 pCi/m^3. Comparison of the 2013 air particulate data with previous years data indicate no effects from the operation of BNGS. In addition a comparison of the weekly mean values for 2013 indicate no notable differences among the three groups (Figures C–8 through C-12, Appendix C).

Gamma Spectrometry

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

b. Airborne Iodine

Continuous air samples were collected from eight locations (BY-01, BY-04, BY-06, BY-08, BY-21, BY-22, BY-23 and BY-24) and analyzed weekly for I-131 (Table C–VI.1, Appendix C). All results were less than the minimum

detectable concentration for I-131.

2. Terrestrial

a. Milk

Samples were collected from one location (BY-26-1) monthly from January through February, from two locations (BY-20-1 and BY-26-2) monthly from January to April and November through December, and biweekly May through October. The following analyses were performed:

Iodine-131

Milk samples from all locations were analyzed for concentrations of I-131 (Table C–VII.1, Appendix C). No nuclides were detected, and all required LLDs were met.

Gamma Spectrometry

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

b. Vegetation

Vegetation samples were collected at five locations (BY-Control, BY-Quad 1, BY-Quad 2, BY-Quad 3 and BY-Quad 4) when available. Four locations (BY-Quad 1, BY-Quad 2, BY-Quad 3 and BY-Quad 4) could be affected by Byron Nuclear Generating Station's effluent releases. The following analysis was performed:

Gamma Spectrometry

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

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing OSLDs.

Ninety-one OSLD locations were established around the site. Results of OSLD measurements are listed in Tables C–X.1 to C–X.3, Appendix C.

All OSLD measurements were below 30 mR/standard quarter, with a range of 15.2 to 29.4 mR/standard quarter. A comparison of the Inner Ring, Outer Ring, Special Interest, Other and Control Location data indicate that the ambient gamma radiation levels were comparable among the groups.

D. Land Use Survey

A Land Use Survey conducted during August 2013 around the Byron Nuclear Generating Station (BNGS) was performed by Environmental Inc. (Midwest Labs) for Exelon Nuclear to comply with the Byron Nuclear Generating Station's Offsite Dose Calculation Manual. The purpose of the survey was to document the nearest resident, livestock, and milk producing animals in each of the sixteen 22 ½ degree sectors and garden in each of the four 90 degree quadrants around the site. The results of this survey are summarized below.

Distance in Miles from the BNGS Vent Stacks				
Sector		Residence Miles	Livestock Miles	Milk Farm Miles
A	N	1.2	5.9	-
B	NNE	1.6	1.6	-
C	NE	1.1	4.5	-
D	ENE	1.0	3.5	-
E	E	1.2	4.2	-
F	ESE	1.5	1.3	-
G	SE	1.7	1.9	-
H	SSE	0.7	3.2	-
J	S	0.6	0.7	-
K	SSW	0.7	2.7	-
L	SW	0.8	2.0	-
M	WSW	1.6	1.7	4.5
N	W	1.8	3.2	-
P	WNW	1.6	3.5	11.5
Q	NW	0.9	3.8	-
R	NNW	0.9	1.4	-

E. Errata Data

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

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

Where:

Δt = counting time for sample (minutes)

β = background rate of instrument blank (cpm)

2.22 = dpm/pCi or : 2.22 x 10^6 dpm/μCi

v = volume or mass of sample analyzed

y = chemical yield

ε = efficiency of the counter

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

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

F. Summary of Results – Inter-Laboratory Comparison Program

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

1. Analytics Evaluation Criteria

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

2. ERA Evaluation Criteria

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

3. DOE Evaluation Criteria

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

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

For the TBE laboratory, 178 out of 185 analyses performed met the specified acceptance criteria. Seven analyses (Sr-89 and Sr-90 in milk, Co-57, Zn-65 and Sr-90 in soil, Cs-134 in air particulate and Sr-90 in vegetation [two low warning in a row]) did not meet the specified acceptance criteria or internal QA requirements for the following reason:

1. Teledyne Brown Engineering's Analytics September 2013 Sr-89 in milk result of 63.9 pCi/L was lower than the known value of 96.0 pCi/L. The failure was a result of analyst error and was specific to the Analytics sample. Client samples for the associated time period were evaluated and no client samples were affected by this failure. NCR 13-15
2. Teledyne Brown Engineering's Analytics September 2013 Sr-90 in milk result of 8.88 pCi/L was lower than the known value of 13.2 pCi/L. The failure was a result of analyst error and was specific to the Analytics sample. Client samples for the associated time period were evaluated and no client samples were affected by this failure. NCR 13-15

3. & 4. Teledyne Brown Engineering's MAPEP September 2013 Co-57 and Zn-65 in soil were evaluated as failing the false positive test.

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

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

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

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

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

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APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BYRON NUCLEAR GENERATION STATION, 2013

NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	GR-B	22	4	5 (11/12) (2.7/6.1)	4.6 (9/10) (3.5/5.5)	5 (11/12) (2.7/6.1)	BY-12 INDICATOR OREGON POOL OF ROCK RIVER - DOWNSTREAM 4.5 MILES SSW OF SITE	0
	H-3	8	200	2230 (1/4)	<LLD	2230 (1/4)	BY-12 INDICATOR OREGON POOL OF ROCK RIVER - DOWNSTREAM 4.5 MILES SSW OF SITE	0
	NI-63	6	30	<LLD	<LLD	-		0
	GAMMA	22						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BYRON NUCLEAR GENERATION STATION, 2013

NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	I-131		15	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0

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LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	LA-140		15	<LLD	<LLD	-		0
GROUND WATER (PCI/LITER)	H-3	23	200	<LLD	NA	-		0
	GAMMA	23						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BYRON NUCLEAR GENERATION STATION, 2013

NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROUND WATER (PCI/LITER)	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

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BYRON NUCLEAR GENERATION STATION, 2013

NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
FISH (PCI/KG WET)	NI-63	4	260	<LLD	<LLD	-		0
	GAMMA	8						
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0

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NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

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FISH (PCI/KG WET)	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	NI-63	2	260	<LLD	<LLD	-		0
	GAMMA	4						
	MN-54		NA	<LLD	<LLD	-		0

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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
SEDIMENT (PCI/KG DRY)	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
	CS-134		150	<LLD	<LLD	-		0

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NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (PCI/KG DRY)	CS-137		180	100 (1/2)	127 (1/2)	127 (1/2)	BY-34 CONTROL ROCK RIVER UPSTREAM OF DISCHARGE 2.6 MILES WNW OF SITE	0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	424	10	19 (366/371) (5/55)	20 (52/53) (7/47)	20 (51/53) (5/44)	BY-21 INDICATOR BYRON NEARSITE NORTH 0.3 MILES N OF SITE	0
	GAMMA	32						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0

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NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE (E-3 PCI/CU.METER)	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0

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AIR PARTICULATE (E-3 PCI/CU.METER)	LA-140		NA	<LLD	<LLD	-		0
AIR IODINE (E-3 PCI/CU.METER)	GAMMA I-131	416	70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	38	1	<LLD	<LLD	-		0
	GAMMA MN-54	38	NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0

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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-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		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0

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MILK (PCI/LITER)	LA-140		15	<LLD	<LLD	-		0
VEGETATION (PCI/KG WET)	GAMMA	9						
	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

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BYRON NUCLEAR GENERATION STATION, 2013

NAME OF FACILITY: BYRON **DOCKET NUMBER: 50-454 & 50-455 2013**

LOCATION OF FACILITY: BYRON, IL **REPORTING PERIOD:**

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION (PCI/KG WET)	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
DIRECT RADIATION (MREM/QTR.)	OSLD-QUARTERLY	364	NA	22.3 (356/356) (15.2/29.4)	19.8 (8/8) (17.6/22.0)	25.6 (4/4) (22.7/27.2)	BY-209-4 INDICATOR 4.0 MILES S	0

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FRACTION OF DETECTABLE MEASUREMENTS AT SPECIFIED LOCATIONS IS INDICATED IN PARENTHESES (F)

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APPENDIX B

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

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TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Byron Nuclear Generating Station, 2013

Location	Location Description	Distance & Direction From Site
A. Surface Water		
BY-12	Oregon Pool of Rock River, Downstream	4.5 miles SSW
BY-29	Byron, Upstream (control)	3.0 miles N
B. Ground/Well Water		
BY-14-1	3200 North German Church Road	1.0 miles SSE
BY-18-1	Calhoun	0.7 miles SSW
BY-32	Ron Wolford Well	1.9 miles W
BY-35	Vancko Well	1.9 miles WNW
BY-36	Blanchard Well	0.8 miles NW
BY-37	Alexander Well	2.0 miles WNW
C. Milk		
BY-20-1	Ron Snodgrass Farm	4.8 miles WSW
BY-26-1	Dennis Herbert (control)	12.8 miles N
BY-26-2	Joseph Akins Farm (control)	12.2 miles WNW
D. Air Particulates / Air Iodine		
BY-01	Byron	3.0 miles N
BY-04	Paynes Point	5.0 miles SE
BY-06	Oregon	4.7 miles SSW
BY-08	Leaf River (control)	7.0 miles WNW
BY-21	Byron Nearsite North	0.3 miles N
BY-22	Byron Nearsite Southeast	0.4 miles SE
BY-23	Byron Nearsite South	0.6 miles S
BY-24	Byron Nearsite Southwest	0.7 miles SW
E. Fish		
BY-29	Byron, Upstream (control)	3.0 miles N
BY-31	Byron, Discharge	2.6 miles WNW
F. Sediment		
BY-12	Oregon Pool of Rock River, Downstream	4.6 miles SSW
BY-34	Rock River, Upstream of Discharge (control)	2.6 miles WNW
G. Vegetation		
Quadrant 1	5186 N. Cox Road, Stillman Valley	4.8 miles ENE
Quadrant 2	Intersection of Limerick Road & Marrill Road, Oregon	3.8 miles SE
Quadrant 3	2002 Deer Path Road, Oregon	0.9 miles SW
Quadrant 4	880 Equestrian Drive, Byron	1.8 miles W
Control	3933 South Bend Road, New Mulford	10.7 miles NE
H. Environmental Dosimetry - OSLD		
Inner Ring		
BY-101-1 and -2		0.3 miles N
BY-102-1		1.0 miles NNE
BY-102-2		1.0 miles NNE

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Byron Nuclear Generating Station, 2013

Location	Location Description	Distance & Direction From Site
H. Environmental Dosimetry – OSLD (continued)		
Inner Ring		
BY-103-1 and -2		1.7 miles NE
BY-103-3		0.4 miles NE
BY-104-1 and -2		1.4 miles ENE
BY-104-3		0.3 miles ENE
BY-105-1 and -2		1.3 miles E
BY-106-1 and -2		1.4 miles ESE
BY-107-1 and -2		1.4 miles SE
BY-107-3		0.4 miles SE
BY-108-1		0.7 miles SSE
BY-108-2		0.6 miles SSE
BY-109-1 and -2		0.6 miles S
BY-110-1 and -2		0.7 miles SSW
BY-111-3		0.8 miles SW
BY-111-4		0.9 miles SW
BY-112-3 and -4		0.8 miles WSW
BY-113-1 and -2		0.7 miles W
BY-114-1 and -2		0.8 miles WNW
BY-115-1 and -2		1.0 miles NW
BY-116-1 and -2		1.4 miles NNW
BY-116-3		0.9 miles NNW
Outer Ring		
BY-201-3		4.4 miles N
BY-201-4		4.4 miles N
BY-202-1		4.4 miles NNE
BY-202-2		4.8 miles NNE
BY-203-1		4.8 miles NE
BY-203-2		4.7 miles NE
BY-204-1		4.1 miles ENE
BY-204-2		4.0 miles ENE
BY-205-1 and -2		3.8 miles E
BY-206-1		4.0 miles ESE
BY-206-2		4.3 miles ESE
BY-207-1		4.2 miles SE
BY-207-2		3.9 miles SE
BY-208-1		4.0 miles SSE
BY-208-2		3.8 miles SSE
BY-209-1 and -4		4.0 miles S
BY-210-3 and -4		3.9 miles SSW
BY-211-1 and -4		4.9 miles SW
BY-212-1 and -4		4.7 miles WSW
BY-213-1		4.7 miles W
BY-213-4		4.7 miles W
BY-214-1		4.7 miles WNW
BY-214-4		4.6 miles WNW
BY-215-1		4.2 miles NW
BY-215-4		4.2 miles NW
BY-216-1		4.5 miles NNW
BY-216-2		4.7 miles NNW

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Byron Nuclear Generating Station, 2013

Location	Location Description	Distance & Direction From Site
Special Interest		
BY-301-1		0.3 miles N
BY-302-1		0.1 miles NNE
BY-309-1		0.3 miles S
BY-309-2		0.4 miles S
BY-309-3		0.4 miles S
BY-309-4		0.4 miles SSW
BY-314-1		0.3 miles WNW
Other		
BY-01-1 and -2		3.0 miles N
BY-04-1 and -2		5.0 miles SE
BY-06-1 and -2		4.7 miles SSW
BY-21-1 and -2		0.3 miles N
BY-22-1 and -2		0.4 miles SE
BY-23-1 and -2		0.6 miles S
BY-24-1 and -2		0.7 miles SW
Control		
BY-08-1 and -2		7.0 miles WNW

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

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from weekly grab samples.	TBE, TBE-2007 Gamma emitting radioisotope analysis
Surface Water	Gross Beta	Monthly composite from weekly grab samples.	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices
Surface Water	Nickel-63	Monthly composite from weekly grab samples.	TBE, TBE-2013 Radionickel activity in various matrices
Surface Water	Tritium	Quarterly composite from weekly grab samples.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation
Ground Water	Gamma Spectroscopy	Quarterly grab samples.	TBE, TBE-2007 Gamma emitting radioisotope analysis
Ground Water	Tritium	Quarterly grab samples.	TBE, TBE-2011 Tritium analysis in drinking water by liquid scintillation
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	TBE-2007 Gamma emitting radioisotope analysis
Fish	Nickel-63	Semi-annual samples collected via electroshocking or other techniques	TBE, TBE-2013 Radionickel activity in various matrices
Sediment	Gamma Spectroscopy	Semi-annual grab samples	TBE, TBE-2007 Gamma emitting radioisotope analysis
Sediment	Nickel-63	Semi-annual grab samples	TBE, TBE-2013 Radionickel activity in various matrices
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	TBE, TBE-2008 Gross Alpha and/or gross beta activity in various matrices
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2007 Gamma emitting radioisotope analysis
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	TBE, TBE-2007 Gamma emitting radioisotope analysis
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2012 Radioiodine in various matrices
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	TBE, TBE-2007 Gamma emitting radioisotope analysis
Vegetation	Gamma Spectroscopy	Annual grab samples.	TBE, TBE-2007 Gamma emitting radioisotope analysis
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	Landauer Incorporated

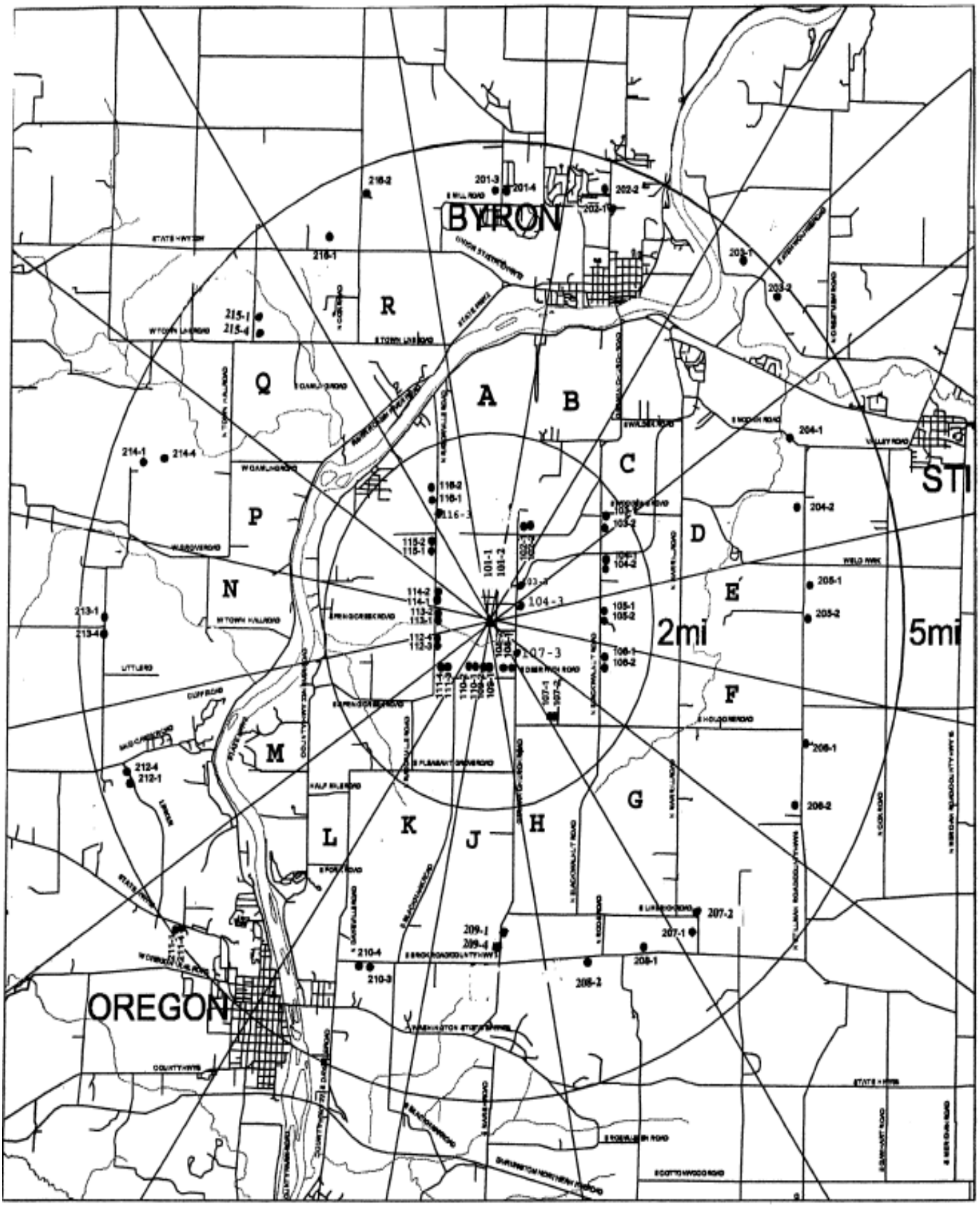

Figure B-1
Inner and Outer Ring OSLD Locations of the
Byron Nuclear Generating Station, 2013

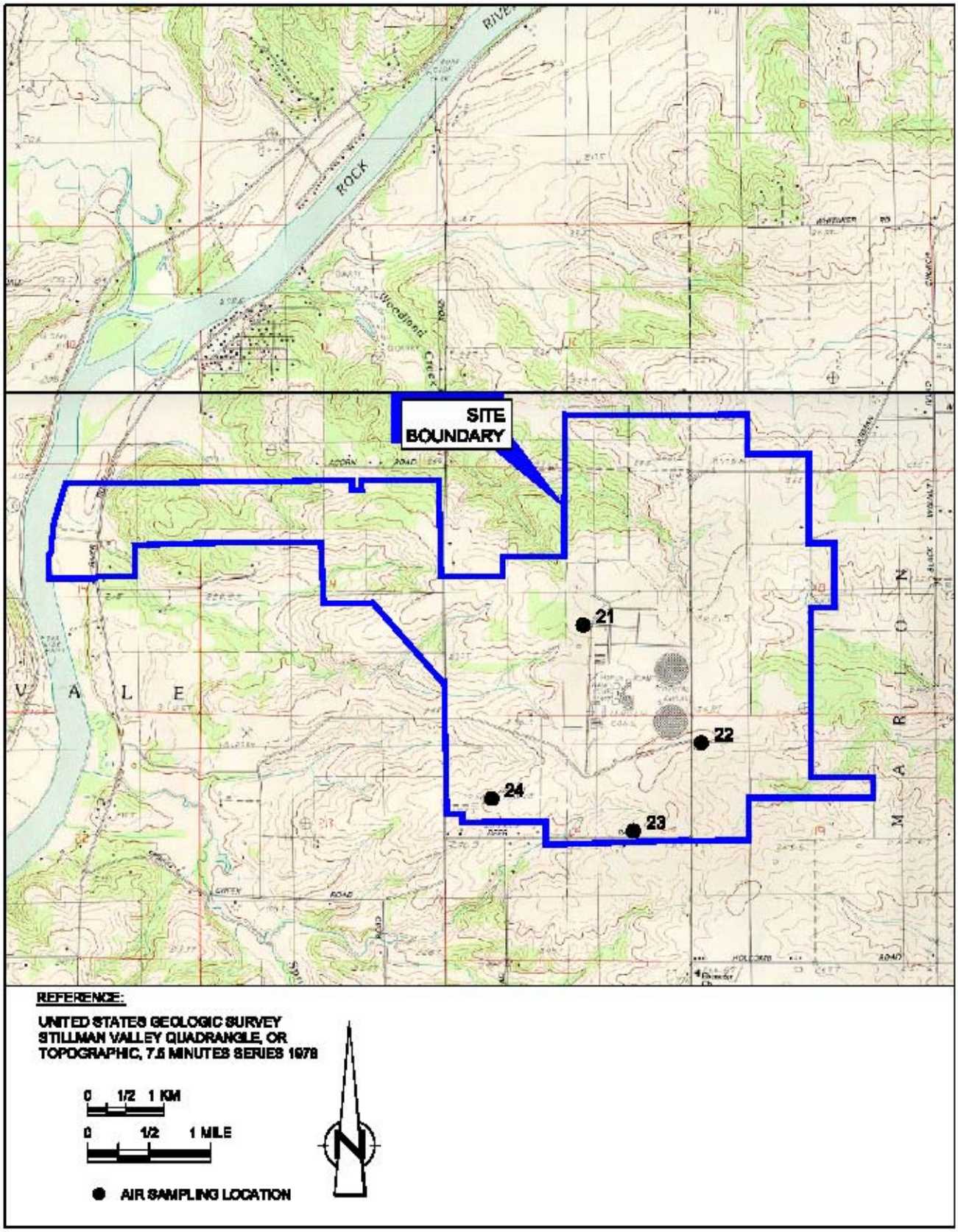

Figure B-2
Onsite Air Sampling Locations of the
Byron Nuclear Generating Station, 2013

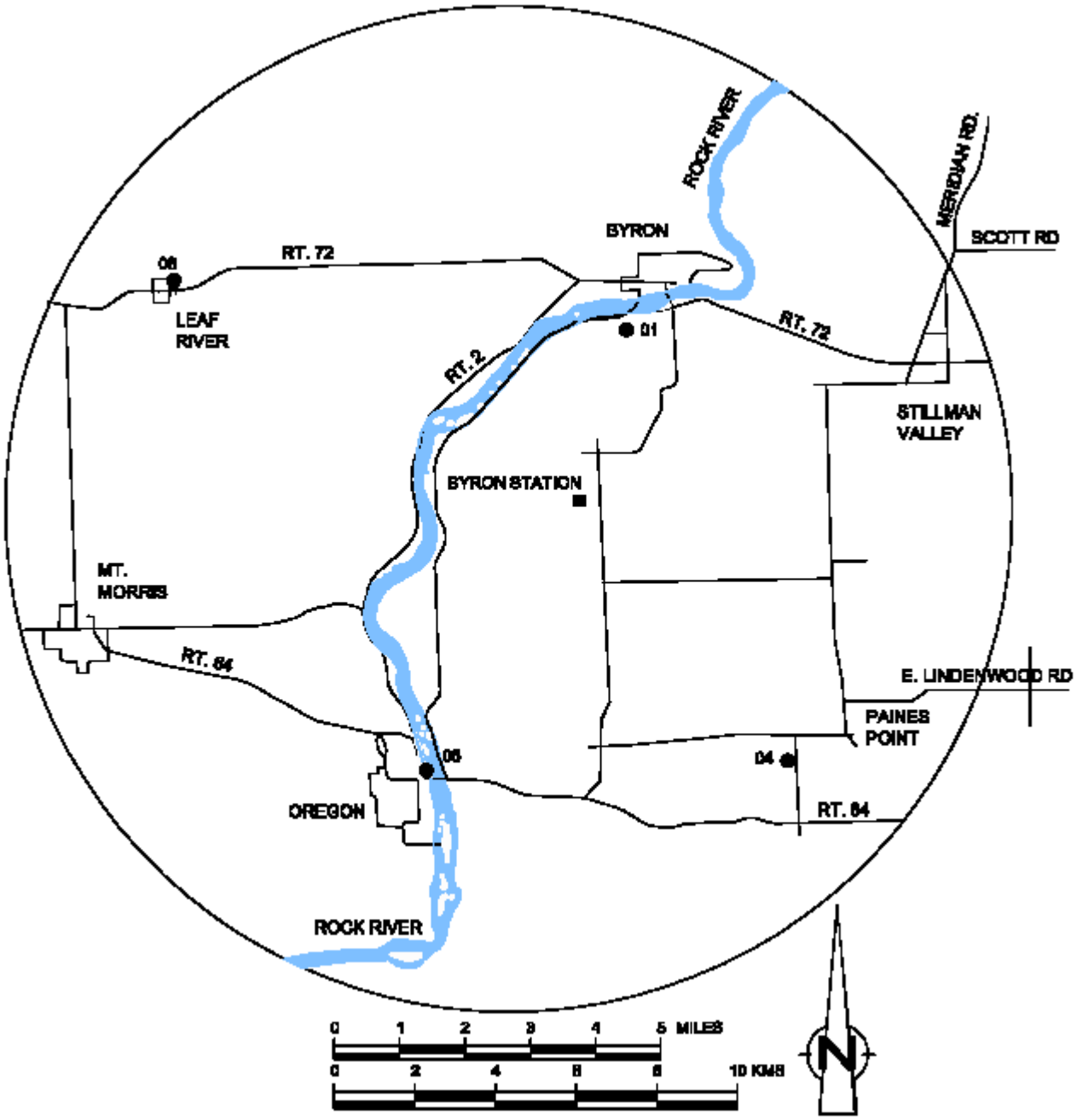

Figure B-3
Offsite Air Sampling Locations of the
Byron Nuclear Generating Station, 2013

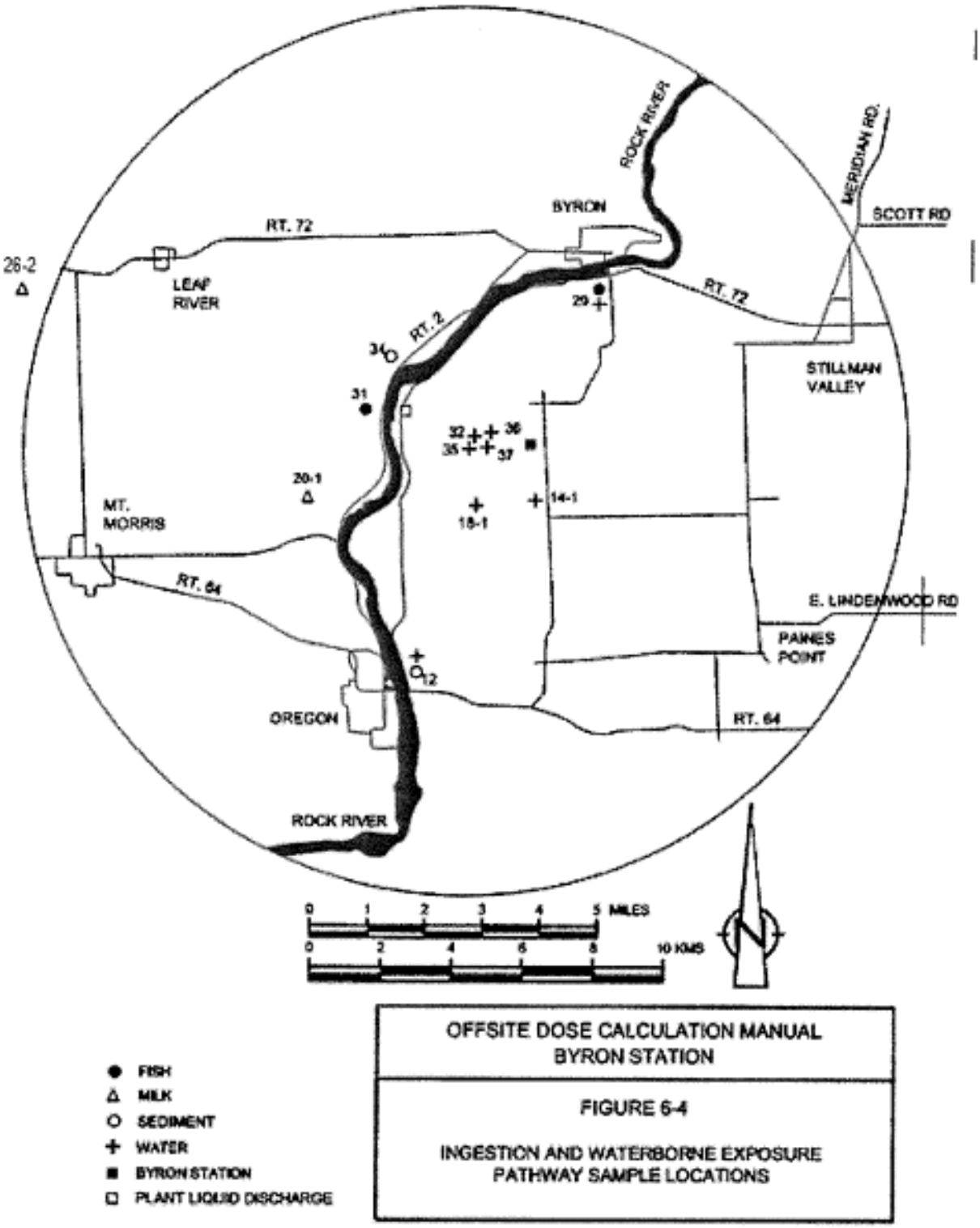

Figure B-4
Ingestion and Waterborne Exposure Pathway Sampling Locations
of the Byron Nuclear Generating Station, 2013

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APPENDIX C

DATA TABLES AND FIGURES
PRIMARY LABORATORY

Table C-I.1 **CONCENTRATIONS OF GROSS BETA IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12		BY-29	
01/29/13 - 01/29/13	< 2.8	(1)		(1)
02/26/13 - 02/26/13	6.1 ± 1.5	(1)		(1)
03/04/13 - 03/26/13	2.7 ± 1.3		4.4 ± 1.4	(1)
04/02/13 - 04/30/13	5.4 ± 1.5		4.8 ± 1.5	
05/07/13 - 05/29/13	4.9 ± 1.7		4.1 ± 1.6	
06/04/13 - 06/25/13	3.0 ± 1.4		4.8 ± 1.5	
07/02/13 - 07/30/13	5.5 ± 1.6		4.4 ± 1.5	
08/06/13 - 08/27/13	5.8 ± 1.8		5.5 ± 1.6	
09/03/13 - 09/24/13	5.3 ± 1.5		3.5 ± 1.4	
10/01/13 - 10/29/13	5.1 ± 1.5		5.1 ± 1.5	
11/05/13 - 11/25/13	5.6 ± 1.7		4.4 ± 1.7	
12/03/13 - 12/03/13	6.0 ± 2.4	(1)	< 3.3	
MEAN	5.0 ± 2.3		4.6 ± 1.1	

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

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12		BY-29	
01/29/13 - 03/26/13	< 196	(1)	< 197	(1)
04/02/13 - 06/25/13	2230 ± 278		< 194	
07/02/13 - 09/24/13	< 182		< 184	
10/01/13 - 12/03/13	< 178	(1)	< 170	(1)
MEAN	-		-	

Table C-I.3 **CONCENTRATIONS OF NICKEL-63 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12	BY-29
10/01/13 - 10/29/13	< 4.3	< 4.3
11/05/13 - 11/25/13	< 4.7	< 4.7
12/03/13 - 12/03/13	< 13.6	< 13.8
MEAN	-	-

THE MEAN AND 2 STANDARD DEVATION ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION
(2) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-I.4 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BY-12	01/29/13 - 01/29/13	(1)	< 6	< 6	< 15	< 5	< 9	< 7	< 10	< 13	< 5	< 6	< 33	< 13
	02/26/13 - 02/26/13	(1)	< 5	< 4	< 9	< 5	< 9	< 4	< 7	< 8	< 4	< 5	< 23	< 7
	03/04/13 - 03/26/13		< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 8	< 2	< 2	< 16	< 5
	04/02/13 - 04/30/13		< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 12	< 2	< 2	< 21	< 6
	05/07/13 - 05/29/13		< 3	< 3	< 7	< 3	< 5	< 3	< 5	< 15	< 3	< 3	< 25	< 9
	06/04/13 - 06/25/13		< 1	< 1	< 2	< 1	< 1	< 1	< 2	< 11	< 1	< 1	< 13	< 4
	07/02/13 - 07/30/13		< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 11	< 2	< 2	< 18	< 6
	08/06/13 - 08/27/13		< 2	< 3	< 7	< 3	< 6	< 3	< 5	< 13	< 2	< 3	< 23	< 7
	09/03/13 - 09/24/13		< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 21	< 7
	10/01/13 - 10/29/13		< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 11	< 2	< 2	< 19	< 6
	11/05/13 - 11/25/13		< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 9	< 2	< 2	< 15	< 5
	12/03/13 - 12/03/13	(1)	< 1	< 2	< 3	< 1	< 3	< 2	< 3	< 9	< 1	< 1	< 37	< 11
	MEAN		-	-	-	-	-	-	-	-	-	-	-	-
BY-29	01/29/13 - 01/29/13	(1)	-	-	-	-	-	-	-	-	-	-	-	-
	02/26/13 - 02/26/13	(1)	-	-	-	-	-	-	-	-	-	-	-	-
	03/12/13 - 03/26/13		< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 6	< 1	< 2	< 11	< 4
	04/02/13 - 04/30/13		< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 22	< 6
	05/07/13 - 05/29/13		< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 15	< 2	< 3	< 26	< 9
	06/04/13 - 06/25/13		< 1	< 1	< 3	< 1	< 1	< 1	< 2	< 14	< 1	< 1	< 16	< 4
	07/02/13 - 07/30/13		< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 10	< 1	< 1	< 16	< 5
	08/06/13 - 08/27/13		< 3	< 3	< 6	< 2	< 5	< 3	< 5	< 14	< 3	< 3	< 26	< 8
	09/03/13 - 09/24/13		< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 15	< 2	< 2	< 24	< 8
	10/01/13 - 10/29/13		< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 11	< 2	< 2	< 18	< 6
	11/05/13 - 11/25/13		< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 12	< 2	< 2	< 23	< 7
	12/03/13 - 12/03/13	(1)	< 1	< 1	< 4	< 1	< 2	< 1	< 2	< 13	< 1	< 1	< 34	< 12
	MEAN		-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-II.1 **CONCENTRATIONS OF TRITIUM IN GROUND WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-14-1	BY-18-1	BY-32	BY-35	BY-36	BY-37
01/08/13 - 01/08/13	< 157	(1)	< 158	< 159	< 163	< 165
04/09/13 - 04/16/13	< 182	< 173	< 183	< 182	< 186	< 184
07/09/13 - 07/09/13	< 196	< 197	< 197	< 195	< 198	< 188
10/08/13 - 10/08/13	< 165	< 162	< 168	< 165	< 166	< 164
MEAN	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUND WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BY-14-1	01/08/13 - 01/08/13	< 7	< 7	< 14	< 7	< 14	< 7	< 12	< 12	< 6	< 7	< 33	< 11
	04/09/13 - 04/09/13	< 5	< 6	< 11	< 5	< 11	< 6	< 9	< 9	< 5	< 6	< 28	< 8
	07/09/13 - 07/09/13	< 5	< 4	< 10	< 4	< 9	< 5	< 10	< 8	< 5	< 6	< 26	< 9
	10/08/13 - 10/08/13	< 7	< 6	< 14	< 6	< 13	< 7	< 11	< 13	< 6	< 6	< 31	< 11
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-18-1	01/08/13 - 01/08/13 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	04/16/13 - 04/16/13	< 3	< 4	< 9	< 4	< 6	< 4	< 7	< 12	< 3	< 3	< 24	< 8
	07/09/13 - 07/09/13	< 6	< 5	< 12	< 6	< 10	< 6	< 8	< 10	< 5	< 6	< 23	< 7
	10/08/13 - 10/08/13	< 5	< 5	< 10	< 5	< 10	< 6	< 9	< 10	< 5	< 6	< 24	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-32	01/08/13 - 01/08/13	< 5	< 5	< 8	< 4	< 9	< 5	< 8	< 10	< 6	< 6	< 23	< 8
	04/09/13 - 04/09/13	< 5	< 5	< 10	< 6	< 13	< 6	< 11	< 9	< 6	< 6	< 26	< 9
	07/09/13 - 07/09/13	< 6	< 6	< 14	< 7	< 12	< 7	< 12	< 9	< 7	< 7	< 30	< 9
	10/08/13 - 10/08/13	< 5	< 5	< 12	< 5	< 13	< 6	< 9	< 10	< 5	< 6	< 29	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-35	01/08/13 - 01/08/13	< 6	< 5	< 12	< 6	< 11	< 6	< 11	< 10	< 6	< 6	< 31	< 8
	04/09/13 - 04/09/13	< 5	< 5	< 12	< 5	< 9	< 5	< 9	< 9	< 5	< 5	< 26	< 7
	07/09/13 - 07/09/13	< 5	< 5	< 11	< 5	< 12	< 5	< 9	< 7	< 5	< 5	< 26	< 10
	10/08/13 - 10/08/13	< 5	< 5	< 13	< 4	< 8	< 6	< 10	< 13	< 6	< 5	< 29	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-II.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUND WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BY-36	01/08/13 - 01/08/13	< 6	< 5	< 13	< 6	< 10	< 7	< 11	< 11	< 6	< 6	< 25	< 7
	04/09/13 - 04/09/13	< 5	< 5	< 11	< 5	< 11	< 6	< 9	< 7	< 5	< 6	< 24	< 9
	07/09/13 - 07/09/13	< 5	< 5	< 10	< 6	< 8	< 5	< 9	< 10	< 5	< 6	< 27	< 8
	10/08/13 - 10/08/13	< 5	< 5	< 12	< 6	< 11	< 6	< 10	< 11	< 5	< 6	< 28	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-37	01/08/13 - 01/08/13	< 6	< 6	< 12	< 6	< 13	< 7	< 11	< 11	< 6	< 6	< 30	< 10
	04/09/13 - 04/09/13	< 4	< 5	< 9	< 5	< 10	< 5	< 9	< 8	< 4	< 6	< 21	< 7
	07/09/13 - 07/09/13	< 4	< 4	< 12	< 5	< 11	< 5	< 8	< 8	< 6	< 5	< 18	< 7
	10/08/13 - 10/08/13	< 5	< 5	< 11	< 5	< 9	< 5	< 10	< 9	< 5	< 6	< 28	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 (1) **CONCENTRATIONS OF NICKEL-63 AND GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Ni-63	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-29													
Quillback	05/07/13		< 54	< 69	< 131	< 53	< 104	< 61	< 105	< 47	< 47	< 885	< 259
Common Carp	05/07/13		< 54	< 70	< 170	< 58	< 116	< 59	< 110	< 46	< 54	< 786	< 257
Channel Catfish	10/02/13	< 155	< 44	< 54	< 120	< 61	< 95	< 58	< 110	< 41	< 46	< 714	< 206
Common Carp	10/02/13	< 168	< 43	< 65	< 126	< 48	< 97	< 60	< 88	< 45	< 46	< 701	< 136
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-31													
Channel Catfish	05/07/13		< 54	< 60	< 152	< 59	< 132	< 85	< 143	< 53	< 68	< 1017	< 212
Common Carp	05/07/13		< 69	< 85	< 236	< 75	< 171	< 89	< 173	< 72	< 56	< 1258	< 256
Shorthead Redhorse	10/02/13	< 203	< 35	< 48	< 107	< 45	< 93	< 55	< 64	< 30	< 39	< 457	< 161
Channel Catfish	10/02/13	< 176	< 55	< 62	< 146	< 49	< 114	< 67	< 105	< 48	< 43	< 709	< 187
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANTION

Table C-IV.1 (1) **CONCENTRATIONS OF NICKEL-63 AND GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Ni-63	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-12	05/21/13		< 83	< 81	< 204	< 93	< 158	< 91	< 177	< 84	< 89	< 476	< 162
	10/01/13	< 182	< 89	< 91	< 214	< 92	< 225	< 102	< 183	< 80	100 ± 88	< 867	< 232
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-34	05/21/13		< 103	< 88	< 206	< 117	< 169	< 111	< 164	< 107	127 ± 95	< 580	< 147
	10/01/13	< 220	< 49	< 49	< 119	< 55	< 100	< 58	< 103	< 41	< 55	< 426	< 129
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013

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

COLLECTION	GROUP I				GROUP II			GROUP III
PERIOD	BY-21	BY-22	BY-23	BY-24	BY-01	BY-04	BY-06	BY-08
01/02/13 - 01/08/13	44 ± 7	55 ± 7	41 ± 6	49 ± 7	47 ± 7	49 ± 7	45 ± 6	47 ± 7
01/08/13 - 01/15/13	34 ± 6	(1) 24 ± 5	24 ± 5	24 ± 5	19 ± 5	22 ± 5	19 ± 5	25 ± 5
01/15/13 - 01/22/13	23 ± 5	22 ± 5	23 ± 5	19 ± 5	22 ± 5	23 ± 5	16 ± 4 (1)	20 ± 4
01/22/13 - 01/29/13	35 ± 5	25 ± 5	21 ± 5	27 ± 5	25 ± 5	24 ± 5	24 ± 5	26 ± 5
01/29/13 - 02/05/13	38 ± 5	33 ± 5	38 ± 5	29 ± 5	31 ± 5	33 ± 5	27 ± 5	32 ± 5
02/05/13 - 02/12/13	18 ± 4	18 ± 4	18 ± 4	20 ± 4	20 ± 4	16 ± 4	24 ± 5	22 ± 4
02/12/13 - 02/19/13	19 ± 5	16 ± 4	19 ± 5	24 ± 5	22 ± 5	15 ± 4	18 ± 4	18 ± 4
02/19/13 - 02/26/13	10 ± 5	12 ± 5	7 ± 4	10 ± 5	12 ± 5	10 ± 5	9 ± 5	8 ± 4
02/26/13 - 03/04/13	5 ± 3	17 ± 4	13 ± 4	15 ± 4	13 ± 4	5 ± 3	8 ± 4	8 ± 4
03/04/13 - 03/08/13	< 9 (1)	< 9 (1)	12 ± 7	15 ± 7	12 ± 7	< 9 (1)	14 ± 7 (1)	< 9 (1)
03/08/13 - 03/12/13	< 9	18 ± 7	11 ± 7	16 ± 7	15 ± 7 (1)	11 ± 7 (1)	13 ± 7 (1)	13 ± 7 (1)
03/12/13 - 03/19/13	19 ± 5	19 ± 5	20 ± 5	19 ± 5	18 ± 5	20 ± 5	16 ± 4	18 ± 5
03/19/13 - 03/26/13	28 ± 5	12 ± 4	13 ± 4	15 ± 4	18 ± 4	15 ± 4	12 ± 4	13 ± 4
03/26/13 - 04/02/13	15 ± 4	12 ± 4	17 ± 4	12 ± 4	18 ± 5	13 ± 4	15 ± 4	15 ± 4
04/02/13 - 04/09/13	12 ± 4	13 ± 4	15 ± 4	15 ± 5	13 ± 4	16 ± 5	13 ± 4	13 ± 4
04/09/13 - 04/16/13	8 ± 4	8 ± 4	11 ± 4	5 ± 3	7 ± 4	8 ± 4	8 ± 4	7 ± 4
04/16/13 - 04/23/13	13 ± 4	11 ± 4	15 ± 4	13 ± 4	7 ± 3	12 ± 4	12 ± 4	11 ± 4
04/23/13 - 04/30/13	17 ± 4	19 ± 4	17 ± 4	16 ± 4	20 ± 5	18 ± 4	16 ± 4	23 ± 5
04/30/13 - 05/07/13	12 ± 4	16 ± 5	12 ± 4	14 ± 4	17 ± 5	18 ± 5	14 ± 4	13 ± 5
05/07/13 - 05/14/13	14 ± 4	12 ± 4	13 ± 4	15 ± 4	15 ± 4	13 ± 4	12 ± 4	20 ± 4
05/14/13 - 05/21/13	16 ± 4	14 ± 4	12 ± 4	14 ± 4	13 ± 4	13 ± 4	15 ± 4	16 ± 4
05/21/13 - 05/29/13	12 ± 3	14 ± 4	10 ± 3	16 ± 4	14 ± 4	14 ± 4	(1) 11 ± 3	16 ± 4
05/29/13 - 06/04/13	7 ± 4	8 ± 5	7 ± 4	8 ± 5	< 6	8 ± 5	9 ± 5	9 ± 5
06/04/13 - 06/11/13	16 ± 4	16 ± 4	18 ± 4	17 ± 4	19 ± 4	17 ± 4	18 ± 4	19 ± 4
06/11/13 - 06/18/13	17 ± 4	14 ± 4	15 ± 4	10 ± 4	15 ± 4	14 ± 4	11 ± 4	12 ± 4
06/18/13 - 06/25/13	11 ± 4	14 ± 4	11 ± 4	14 ± 4	13 ± 4	13 ± 4	12 ± 4	12 ± 4
06/25/13 - 07/02/13	12 ± 4	11 ± 4	12 ± 4	14 ± 4	15 ± 4	12 ± 4	11 ± 4	11 ± 4
07/02/13 - 07/09/13	16 ± 4	12 ± 4	16 ± 4	16 ± 4	15 ± 4	13 ± 4	17 ± 4	18 ± 4
07/09/13 - 07/16/13	14 ± 3	12 ± 3	19 ± 4	13 ± 3	15 ± 4	14 ± 3	15 ± 4	17 ± 4
07/16/13 - 07/23/13	16 ± 4	14 ± 4	17 ± 4	19 ± 4	16 ± 4	15 ± 4	14 ± 4	17 ± 4
07/23/13 - 07/30/13	9 ± 4	9 ± 4	8 ± 3	8 ± 3	12 ± 4	11 ± 4	7 ± 3	15 ± 4
07/30/13 - 08/06/13	16 ± 4	17 ± 4	15 ± 4	22 ± 5	16 ± 4	16 ± 4	19 ± 4	19 ± 4
08/06/13 - 08/13/13	19 ± 5	17 ± 4	20 ± 5	19 ± 4	22 ± 5	19 ± 4	19 ± 4	21 ± 5
08/13/13 - 08/20/13	22 ± 5	20 ± 4	23 ± 5	22 ± 5	23 ± 5	20 ± 5	21 ± 5	28 ± 5
08/20/13 - 08/27/13	26 ± 5	27 ± 5	24 ± 5	27 ± 5	27 ± 5	24 ± 5	26 ± 5	28 ± 5
08/27/13 - 09/03/13	19 ± 4	16 ± 4	16 ± 4	21 ± 5	16 ± 4	18 ± 4	18 ± 4	18 ± 4
09/03/13 - 09/10/13	36 ± 5	27 ± 5	38 ± 5	31 ± 5	33 ± 5	31 ± 5	33 ± 5	34 ± 5
09/10/13 - 09/17/13	15 ± 4	19 ± 5	18 ± 5	17 ± 5	18 ± 5	19 ± 5	16 ± 4	17 ± 4
09/17/13 - 09/24/13	24 ± 5	22 ± 4	19 ± 4	18 ± 4	22 ± 4	18 ± 4	22 ± 5	20 ± 4
09/24/13 - 10/01/13	18 ± 4	23 ± 5	22 ± 5	21 ± 5	26 ± 5	19 ± 5	22 ± 5	28 ± 5
10/01/13 - 10/08/13	18 ± 5	16 ± 4	19 ± 5	15 ± 9	17 ± 4	17 ± 4	19 ± 4	21 ± 5
10/08/13 - 10/15/13	21 ± 5	23 ± 5	21 ± 5	23 ± 5	(1) 24 ± 5	20 ± 5	22 ± 5	20 ± 4
10/15/13 - 10/22/13	13 ± 4	12 ± 4	15 ± 4	15 ± 4	14 ± 4	17 ± 4	15 ± 4	16 ± 4
10/22/13 - 10/29/13	17 ± 4	13 ± 4	10 ± 4	11 ± 4	13 ± 4	8 ± 4	13 ± 4	13 ± 4
10/29/13 - 11/05/13	30 ± 5	29 ± 5	22 ± 4	25 ± 5	29 ± 5	27 ± 5	28 ± 5	24 ± 5
11/05/13 - 11/12/13	23 ± 5	17 ± 4	19 ± 4	16 ± 4	19 ± 4	17 ± 4	19 ± 4	18 ± 4
11/12/13 - 11/19/13	22 ± 4	17 ± 4	16 ± 4	19 ± 4	20 ± 4	18 ± 4	18 ± 4	18 ± 4
11/19/13 - 11/25/13	19 ± 5	14 ± 5	18 ± 5	12 ± 4	17 ± 5	14 ± 5	16 ± 5	16 ± 5
11/25/13 - 12/03/13	32 ± 5	32 ± 5	35 ± 5	36 ± 5	35 ± 5	35 ± 5	35 ± 5	35 ± 5
12/03/13 - 12/10/13	35 ± 5	38 ± 5	35 ± 5	31 ± 5	35 ± 5	33 ± 5	35 ± 5	36 ± 5
12/10/13 - 12/17/13	31 ± 5	35 ± 6	32 ± 5	33 ± 5	36 ± 6	37 ± 6	27 ± 5	33 ± 5
12/17/13 - 12/23/13	18 ± 5	16 ± 5	19 ± 5	19 ± 5	21 ± 5	15 ± 5	21 ± 5	18 ± 5
12/23/13 - 12/31/13	34 ± 5	30 ± 5	32 ± 5	35 ± 5	33 ± 5	30 ± 5	30 ± 5	36 ± 5
MEAN	20 ± 18	19 ± 17	19 ± 16	19 ± 16	20 ± 16	18 ± 17	18 ± 15	20 ± 17

THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-V.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

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

GROUP I - NEARSITE LOCATIONS				GROUP II - FAR FIELD LOCATIONS				GROUP III - CONTROL LOCATIONS			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
01/02/13 - 01/29/13	19	55	31 ± 22	01/02/13 - 01/29/13	16	49	28 ± 23	01/02/13 - 01/29/13	20	47	29 ± 24
01/29/13 - 02/26/13	7	38	21 ± 19	01/29/13 - 02/26/13	9	33	20 ± 16	01/29/13 - 02/26/13	8	32	20 ± 20
02/26/13 - 04/02/13	5	28	15 ± 9	02/26/13 - 04/02/13	5	20	14 ± 7	02/26/13 - 04/02/13	8	18	13 ± 7
04/02/13 - 04/30/13	5	19	13 ± 8	04/02/13 - 04/30/13	7	20	12 ± 9	04/02/13 - 04/30/13	7	23	14 ± 13
04/30/13 - 05/29/13	10	16	13 ± 4	04/30/13 - 05/29/13	11	18	14 ± 4	04/30/13 - 05/29/13	13	20	16 ± 5
05/29/13 - 07/02/13	7	18	13 ± 7	05/29/13 - 07/02/13	8	19	13 ± 6	05/29/13 - 07/02/13	9	19	13 ± 8
07/02/13 - 07/30/13	8	19	14 ± 8	07/02/13 - 07/30/13	7	17	14 ± 5	07/02/13 - 07/30/13	15	18	17 ± 2
07/30/13 - 09/03/13	15	27	20 ± 7	07/30/13 - 09/03/13	16	27	20 ± 7	07/30/13 - 09/03/13	18	28	23 ± 10
09/03/13 - 10/01/13	15	38	23 ± 14	09/03/13 - 10/01/13	16	33	23 ± 12	09/03/13 - 10/01/13	17	34	25 ± 16
10/01/13 - 10/29/13	10	23	16 ± 8	10/01/13 - 10/29/13	8	24	16 ± 9	10/01/13 - 10/29/13	13	21	18 ± 7
10/29/13 - 12/03/13	12	36	23 ± 14	10/29/13 - 12/03/13	14	35	23 ± 15	10/29/13 - 12/03/13	16	35	22 ± 16
12/03/13 - 12/31/13	16	38	29 ± 14	12/03/13 - 12/31/13	15	37	29 ± 14	12/03/13 - 12/31/13	18	36	31 ± 17
01/02/13 - 12/31/13	5	55	19 ± 17	01/02/13 - 12/31/13	5	49	19 ± 16	01/02/13 - 12/31/13	7	47	20 ± 17

Table C-V.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

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

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-01	01/02/13 - 04/02/13	< 3	< 5	< 19	< 3	< 10	< 6	< 14	< 3	< 3	< 471	< 171
	04/02/13 - 07/02/13	< 2	< 3	< 9	< 1	< 3	< 3	< 4	< 1	< 1	< 225	< 108
	07/02/13 - 10/01/13	< 4	< 7	< 22	< 4	< 9	< 8	< 14	< 4	< 3	< 1068	< 446
	10/01/13 - 12/31/13	< 4	< 6	< 21	< 3	< 10	< 5	< 13	< 4	< 3	< 452	< 162
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-04	01/02/13 - 04/02/13	< 4	< 4	< 18	< 3	< 9	< 7	< 11	< 4	< 3	< 555	< 166
	04/02/13 - 07/02/13	< 2	< 3	< 7	< 2	< 4	< 3	< 5	< 1	< 2	< 189	< 68
	07/02/13 - 10/01/13	< 3	< 5	< 11	< 2	< 6	< 6	< 10	< 3	< 2	< 692	< 407
	10/01/13 - 12/31/13	< 2	< 3	< 9	< 2	< 4	< 4	< 8	< 2	< 2	< 344	< 79
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-06	01/02/13 - 04/02/13	< 4	< 7	< 26	< 5	< 13	< 9	< 15	< 4	< 4	< 724	< 281
	04/02/13 - 07/02/13	< 1	< 2	< 5	< 1	< 3	< 2	< 3	< 2	< 1	< 167	< 58
	07/02/13 - 10/01/13	< 2	< 4	< 11	< 2	< 6	< 5	< 9	< 2	< 3	< 863	< 274
	10/01/13 - 12/31/13	< 3	< 5	< 16	< 3	< 8	< 5	< 8	< 3	< 2	< 379	< 122
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-08	01/02/13 - 04/02/13	< 4	< 6	< 19	< 2	< 9	< 6	< 10	< 4	< 3	< 482	< 82
	04/02/13 - 07/02/13	< 2	< 2	< 9	< 2	< 5	< 3	< 6	< 2	< 1	< 142	< 44
	07/02/13 - 10/01/13	< 2	< 5	< 19	< 2	< 5	< 6	< 9	< 2	< 2	< 691	< 316
	10/01/13 - 12/31/13	< 3	< 6	< 11	< 2	< 6	< 5	< 8	< 2	< 3	< 407	< 187
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-V.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

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

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-21	01/02/13 - 04/02/13	< 3	< 6	< 13	< 4	< 8	< 6	< 11	< 3	< 3	< 566	< 134
	04/02/13 - 07/02/13	< 2	< 3	< 15	< 3	< 7	< 5	< 8	< 2	< 2	< 312	< 133
	07/02/13 - 10/01/13	< 2	< 4	< 17	< 3	< 6	< 4	< 8	< 3	< 2	< 685	< 283
	10/01/13 - 12/31/13	< 3	< 8	< 22	< 4	< 11	< 9	< 12	< 4	< 4	< 698	< 153
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-22	01/02/13 - 04/02/13	< 5	< 6	< 19	< 4	< 8	< 8	< 13	< 4	< 4	< 616	< 168
	04/02/13 - 07/02/13	< 2	< 4	< 10	< 2	< 4	< 3	< 4	< 2	< 2	< 326	< 53
	07/02/13 - 10/01/13	< 3	< 5	< 17	< 3	< 7	< 8	< 11	< 3	< 3	< 714	< 310
	10/01/13 - 12/31/13	< 3	< 5	< 9	< 2	< 4	< 4	< 7	< 3	< 2	< 431	< 183
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-23	01/02/13 - 04/02/13	< 2	< 4	< 11	< 2	< 9	< 3	< 8	< 3	< 2	< 366	< 128
	04/02/13 - 07/02/13	< 2	< 3	< 6	< 2	< 4	< 4	< 5	< 1	< 2	< 292	< 65
	07/02/13 - 10/01/13	< 3	< 5	< 18	< 4	< 8	< 8	< 11	< 4	< 3	< 1012	< 289
	10/01/13 - 12/31/13	< 3	< 5	< 13	< 4	< 8	< 6	< 11	< 3	< 3	< 391	< 167
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-24	01/02/13 - 04/02/13	< 2	< 3	< 14	< 2	< 7	< 3	< 9	< 3	< 3	< 412	< 130
	04/02/13 - 07/02/13	< 1	< 4	< 11	< 2	< 4	< 5	< 6	< 2	< 2	< 307	< 145
	07/02/13 - 10/01/13	< 2	< 6	< 15	< 2	< 11	< 8	< 13	< 4	< 3	< 1161	< 431
	10/01/13 - 12/31/13	< 3	< 8	< 20	< 4	< 9	< 7	< 10	< 4	< 3	< 536	< 187
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.1 **CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

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

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

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VII.1 **CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM BY-26-1	CONTROL FARM BY-26-2	INDICATOR FARM BY-20-1
01/02/13	< 0.5		< 0.8
02/05/13	< 0.7 (1)		< 0.6
03/04/13		< 0.7 (1)	< 0.7
04/02/13		< 0.7	< 0.7
05/07/13		< 0.5	< 0.6
05/21/13		< 0.8	< 0.7
06/04/13		< 0.7	< 0.5
06/18/13		< 0.8	< 0.7
07/02/13		< 0.7	< 0.7
07/16/13		< 1.0	< 0.8
07/30/13		< 0.8	< 0.5
08/13/13		< 0.7	< 0.7
08/27/13		< 0.5	< 0.5
09/10/13		< 0.6	< 0.5
09/24/13		< 0.5	< 0.6
10/08/13		< 0.7	< 0.7
10/22/13		< 0.9	< 0.8
11/05/13		< 0.8	< 0.6
12/03/13		< 0.7	< 0.7
MEAN	-	-	-

SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-VII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-20-1	01/02/13		< 6	< 7	< 16	< 9	< 16	< 8	< 11	< 7	< 6	< 35	< 8
	02/05/13		< 5	< 6	< 13	< 7	< 13	< 5	< 10	< 5	< 6	< 29	< 7
	03/04/13		< 6	< 6	< 14	< 9	< 14	< 6	< 11	< 5	< 5	< 38	< 10
	04/02/13		< 4	< 5	< 10	< 5	< 9	< 5	< 8	< 4	< 5	< 22	< 9
	05/07/13		< 5	< 3	< 7	< 4	< 13	< 4	< 9	< 4	< 4	< 38	< 15
	05/21/13		< 6	< 7	< 18	< 9	< 16	< 6	< 13	< 6	< 6	< 33	< 10
	06/04/13		< 7	< 7	< 16	< 8	< 16	< 6	< 12	< 6	< 7	< 29	< 9
	06/18/13		< 5	< 7	< 14	< 7	< 14	< 7	< 11	< 5	< 5	< 31	< 7
	07/02/13		< 4	< 4	< 10	< 5	< 9	< 5	< 8	< 4	< 4	< 30	< 7
	07/16/13		< 7	< 6	< 17	< 7	< 13	< 7	< 10	< 6	< 6	< 32	< 11
	07/30/13		< 4	< 5	< 10	< 5	< 10	< 5	< 9	< 4	< 4	< 24	< 6
	08/13/13		< 8	< 9	< 22	< 9	< 23	< 8	< 15	< 7	< 8	< 41	< 14
	08/27/13		< 6	< 6	< 13	< 6	< 14	< 6	< 11	< 5	< 5	< 48	< 12
	09/10/13		< 9	< 9	< 16	< 12	< 19	< 10	< 13	< 8	< 10	< 51	< 11
	09/24/13		< 6	< 6	< 15	< 8	< 15	< 7	< 12	< 5	< 6	< 44	< 14
	10/08/13		< 4	< 4	< 10	< 4	< 10	< 4	< 7	< 4	< 4	< 25	< 6
	10/22/13		< 6	< 7	< 16	< 8	< 15	< 7	< 12	< 6	< 7	< 35	< 12
	11/05/13		< 7	< 8	< 19	< 9	< 16	< 6	< 12	< 7	< 7	< 36	< 9
	12/03/13		< 7	< 6	< 16	< 8	< 18	< 8	< 12	< 6	< 8	< 40	< 12
	MEAN		-	-	-	-	-	-	-	-	-	-	-
BY-26-1	01/02/13		< 5	< 6	< 12	< 7	< 12	< 6	< 10	< 5	< 6	< 26	< 9
	02/05/13	(1)	< 6	< 6	< 12	< 7	< 14	< 5	< 10	< 6	< 6	< 29	< 7
	MEAN		-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-VII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BY-26-2	03/04/13	(1)	< 6	< 6	< 16	< 9	< 13	< 6	< 11	< 4	< 6	< 27	< 7
	04/02/13		< 4	< 5	< 11	< 5	< 10	< 4	< 8	< 4	< 5	< 24	< 7
	05/07/13		< 4	< 4	< 12	< 5	< 9	< 5	< 10	< 4	< 5	< 49	< 14
	05/21/13		< 5	< 7	< 14	< 6	< 16	< 7	< 11	< 6	< 7	< 31	< 11
	06/04/13		< 7	< 8	< 20	< 10	< 18	< 9	< 14	< 7	< 8	< 35	< 11
	06/18/13		< 6	< 6	< 14	< 8	< 12	< 6	< 12	< 5	< 6	< 32	< 7
	07/02/13		< 5	< 6	< 15	< 7	< 12	< 6	< 10	< 5	< 6	< 44	< 11
	07/16/13		< 6	< 6	< 14	< 9	< 15	< 6	< 10	< 6	< 6	< 39	< 9
	07/30/13		< 5	< 6	< 13	< 8	< 11	< 6	< 10	< 5	< 6	< 28	< 8
	08/13/13		< 7	< 8	< 18	< 8	< 14	< 8	< 13	< 7	< 7	< 38	< 8
	08/27/13		< 5	< 6	< 12	< 6	< 10	< 6	< 10	< 5	< 6	< 39	< 8
	09/10/13		< 4	< 4	< 8	< 5	< 8	< 4	< 7	< 4	< 4	< 22	< 7
	09/24/13		< 4	< 6	< 14	< 7	< 13	< 6	< 12	< 5	< 6	< 44	< 11
	10/08/13		< 5	< 5	< 12	< 7	< 11	< 6	< 9	< 4	< 5	< 29	< 6
	10/22/13		< 6	< 6	< 15	< 7	< 15	< 8	< 13	< 6	< 6	< 41	< 15
	11/05/13		< 7	< 7	< 16	< 6	< 18	< 7	< 12	< 5	< 7	< 35	< 7
	12/03/13		< 6	< 7	< 17	< 8	< 16	< 7	< 11	< 6	< 8	< 36	< 9
	MEAN		-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM CHANGES SECTION FOR EXPLANATION

Table C-VIII.1 **CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2013**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BY-CONTROL													
Beet greens	09/16/13	< 10	< 11	< 26	< 12	< 23	< 12	< 21	< 57	< 10	< 11	< 104	< 24
Beets	09/16/13	< 9	< 10	< 24	< 11	< 22	< 11	< 18	< 53	< 9	< 10	< 91	< 25
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 1													
Beets	09/16/13	< 11	< 12	< 32	< 12	< 24	< 11	< 24	< 58	< 10	< 13	< 122	< 30
Cabbage	09/16/13	< 8	< 9	< 23	< 10	< 22	< 9	< 19	< 46	< 7	< 9	< 81	< 20
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 2													
Corn leaves	09/16/13	< 10	< 10	< 25	< 10	< 21	< 11	< 20	< 55	< 9	< 10	< 96	< 26
No root vegetation found	09/16/13	(1) -	-	-	-	-	-	-	-	-	-	-	-
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 3													
Cabbage	09/16/13	< 8	< 8	< 23	< 9	< 18	< 10	< 15	< 38	< 6	< 7	< 71	< 22
Rutabagas/radishes	09/16/13	< 11	< 12	< 30	< 13	< 25	< 12	< 21	< 55	< 10	< 11	< 99	< 31
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 4													
Beet greens	09/16/13	< 11	< 11	< 29	< 14	< 26	< 11	< 20	< 52	< 9	< 10	< 103	< 29
Beets	09/16/13	< 12	< 13	< 30	< 13	< 24	< 13	< 24	< 58	< 10	< 11	< 110	< 33
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.1 QUARTERLY OSLD RESULTS FOR BYRON NUCLEAR GENERATING STATION, 2013

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC	
BY-01-1	20 ± 4	17	21	19	22	
BY-01-2	19 ± 3	18	21	18	21	
BY-04-1	22 ± 5	19	24	21	25	
BY-04-2	23 ± 4	21	24	23	26	
BY-06-1	20 ± 4	18	20	18	23	
BY-06-2	19 ± 3	18	18	19	21	
BY-08-1	20 ± 4	18	21	19	22	
BY-08-2	20 ± 3	18	21	19	22	
BY-21-1	18 ± 3	17	19	16	19	
BY-21-2	17 ± 3	18	17	15	19	
BY-22-1	23 ± 3	22	23	23	26	
BY-22-2	22 ± 4	19	22	23	24	
BY-23-1	23 ± 6	20	26	21	25	(1)
BY-23-2	22 ± 4	20	22	21	24	
BY-24-1	20 ± 4	18	22	19	22	
BY-24-2	21 ± 3	20	21	20	23	
BY-101-1	18 ± 5	16	19	16	20	
BY-101-2	17 ± 2	17	17	17	19	
BY-102-1	25 ± 6	20	25	25	27	
BY-102-2	24 ± 4	22	26	26	24	
BY-103-1	23 ± 4	21	25	23	25	
BY-103-2	24 ± 5	21	25	22	27	
BY-103-3	22 ± 5	20	24	20	23	
BY-104-1	24 ± 3	22	25	25	24	
BY-104-2	23 ± 5	20	25	22	25	
BY-104-3	21 ± 4	19	22	20	24	
BY-105-1	25 ± 5	22	27	24	26	
BY-105-2	23 ± 3	23	23	22	26	
BY-106-1	24 ± 4	22	24	22	26	
BY-106-2	22 ± 3	20	23	21	24	
BY-107-1	25 ± 6	23	25	24	29	
BY-107-2	24 ± 3	22	25	23	25	
BY-107-3	21 ± 5	19	21	20	25	
BY-108-1	23 ± 5	22	22	23	27	
BY-108-2	22 ± 4	19	22	22	25	
BY-109-1	22 ± 4	20	24	22	24	
BY-109-2	23 ± 3	20	24	23	23	
BY-110-1	21 ± 5	20	22	19	25	
BY-110-2	22 ± 5	20	25	22	23	
BY-111-3	25 ± 4	22	25	24	27	
BY-111-4	23 ± 4	21	23	22	25	
BY-112-3	23 ± 5	20	24	21	26	
BY-112-4	22 ± 4	20	23	21	25	
BY-113-1	22 ± 5	21	23	20	26	
BY-113-2	20 ± 2	19	20	19	21	
BY-114-1	20 ± 3	18	21	19	21	

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.1 QUARTERLY OSLD RESULTS FOR BYRON NUCLEAR GENERATING STATION, 2013

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
BY-114-2	22 ± 4	20	23	20	24
BY-115-1	22 ± 4	20	23	22	25
BY-115-2	22 ± 5	19	23	20	25
BY-116-1	20 ± 3	18	21	20	22
BY-116-2	21 ± 4	19	22	20	23
BY-116-3	21 ± 4	19	23	20	23
BY-201-3	22 ± 4	21	22	22	25
BY-201-4	23 ± 4	21	24	25	24
BY-202-1	22 ± 4	20	21	22	24
BY-202-2	25 ± 3	23	26	25	27
BY-203-1	20 ± 4	18	21	18	22
BY-203-2	23 ± 4	20	24	24	24
BY-204-1	20 ± 3	18	21	21	22
BY-204-2	24 ± 4	22	26	23	25
BY-205-1	25 ± 5	22	27	24	26
BY-205-2	22 ± 3	19	22	22	23
BY-206-1	23 ± 2	22	24	23	24
BY-206-2	23 ± 6	19	25	23	25
BY-207-1	25 ± 3	23	27	25	26
BY-207-2	24 ± 2	23	25	23	25
BY-208-1	24 ± 7	20	26	24	28
BY-208-2	22 ± 4	20	24	21	24
BY-209-1	24 ± 4	21	24	24	27
BY-209-4	26 ± 4	23	26	27	27
BY-210-3	23 ± 4	20	25	24	24
BY-210-4	22 ± 5	20	24	19	23
BY-211-1	23 ± 4	21	24	22	25
BY-211-4	24 ± 4	21	25	24	25
BY-212-1	24 ± 3	22	26	25	25
BY-212-4	25 ± 4	23	26	24	27
BY-213-1	23 ± 4	21	24	23	25
BY-213-4	24 ± 2	23	25	26	24
BY-214-1	24 ± 5	21	24	26	26
BY-214-4	24 ± 5	22	25	23	27
BY-215-1	24 ± 4	22	25	23	27
BY-215-4	23 ± 3	22	23	23	26
BY-216-1	25 ± 3	23	27	23	25
BY-216-2	23 ± 3	20	23	23	24
BY-301-1	17 ± 3	15	18	18	18
BY-302-1	22 ± 3	22	23	21	24
BY-309-1	21 ± 3	20	22	21	23
BY-309-2	23 ± 2	22	23	23	24
BY-309-3	22 ± 2	21	23	21	23
BY-309-4	20 ± 4	18	20	20	23
BY-314-1	19 ± 4	17	20	17	21

TABLE C-IX.2 MEAN QUARTLY OSLD RESULTS FOR THE INNER RING, OUTER RING, SPECIAL INTEREST, OTHER AND CONTROL LOCATIONS FOR BYRON NUCLEAR GENERATING STATION, 2013

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

COLLECTION PERIOD	INNER RING ± 2 S.D.	OUTER RING	SPECIAL INTEREST	OTHER	CONTROL
JAN-MAR	20 ± 3	21 ± 3	19 ± 5	19 ± 3	18 ± 1
APR-JUN	23 ± 4	24 ± 3	21 ± 4	21 ± 5	21 ± 1
JUL-SEP	21 ± 4	23 ± 4	20 ± 4	20 ± 5	19 ± 0
OCT-DEC	24 ± 4	25 ± 3	22 ± 4	23 ± 4	22 ± 1

TABLE C-IX.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR BYRON NUCLEAR GENERATING STATION, 2013

RESULTS IN UNITS OF MREM/QUARTER

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
INNER RING	144	16	29	22 ± 5
OUTER RING	128	18	28	23 ± 4
SPECIAL INTEREST	28	15	24	21 ± 5
OTHER	56	15	26	21 ± 5
CONTROL	8	18	22	20 ± 3

INNER RING STATIONS - BY-101-1, BY-101-2, BY-102-1, BY-102-2, BY-103-1, BY-103-2, BY-103-3, BY-104-1, BY-104-2, BY-104-3, BY-105-1, BY-105-2, BY-106-1, BY-106-2, BY-107-1, BY-107-2, BY-107-3, BY-108-1, BY-108-2, BY-109-1, BY-109-2, BY-110-1, BY-110-2, BY-111-3, BY-111-4, BY-112-3, BY-112-4, BY-113-1, BY-113-2, BY-114-1, BY-114-2, BY-115-1, BY-115-2, BY-116-1, BY-116-2, BY-116-3

OUTER RING STATIONS - BY-201-3, BY-201-4, BY-202-1, BY-202-2, BY-203-1, BY-203-2, BY-204-1, BY-204-2, BY-205-1, BY-205-2, BY-206-1, BY-206-2, BY-207-1, BY-207-2, BY-208-1, BY-208-2, BY-209-1, BY-209-4, BY-210-3, BY-210-4, BY-211-1, BY-211-4, BY-212-1, BY-212-4, BY-213-1, BY-213-4, BY-214-1, BY-214-4, BY-215-1, BY-215-4, BY-216-1, BY-216-2

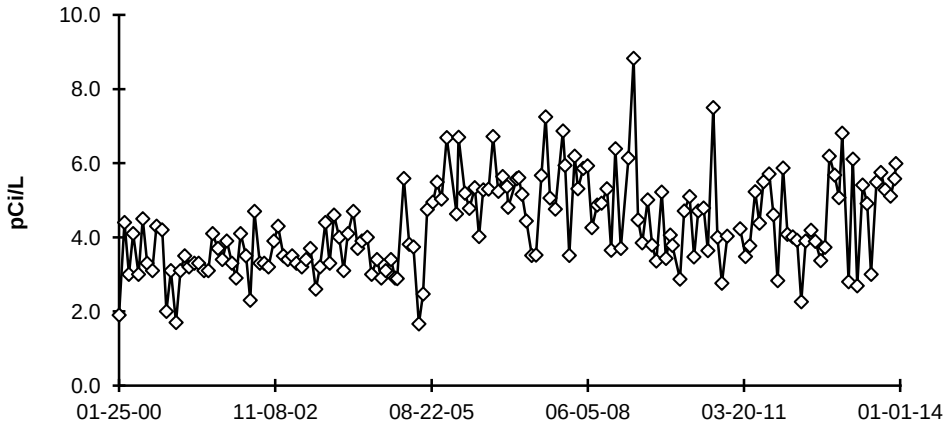
SPECIAL INTEREST STATIONS - BY-301-1, BY-302-1, BY-309-1, BY-309-2, BY-309-3, BY-309-4, BY-314-1

OTHER STATIONS - BY-01-1, BY-01-2, BY-04-1, BY-04-2, BY-06-1, BY-06-2, BY-21-1, BY-21-2, BY-22-1, BY-22-2, BY-23-1, BY-23-2, BY-24-1, BY-24-2

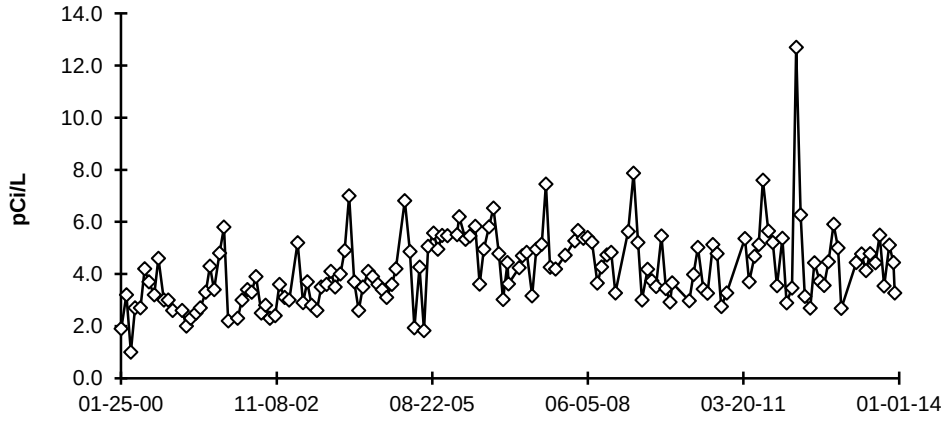
CONTROL STATIONS - BY-08-1, BY-08-2

FIGURE C-1
Surface Water - Gross Beta - Station BY-12 and BY-29 (C) Collected in the Vicinity of BNGS, 2000 - 2013

BY-12 Oregon Pool of Rock River, Downstream



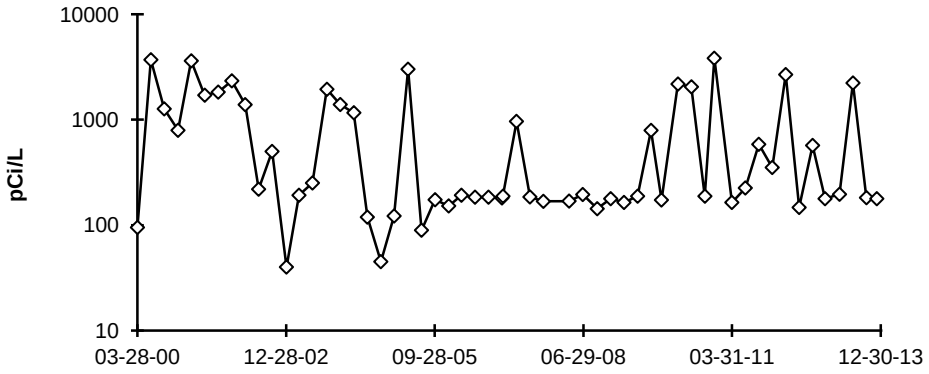
BY-29 (C) Byron, Rock River Upstream



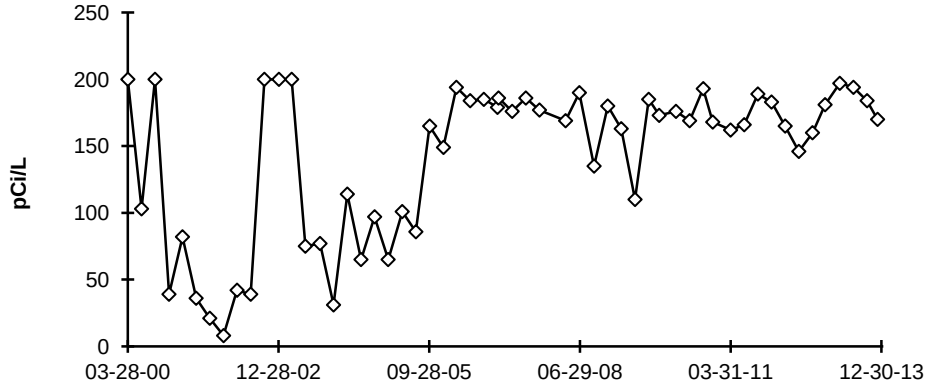
DUE TO VENDOR CHANGE IN 2005, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JUNE 2005

FIGURE C-2
Surface Water - Tritium - Stations BY-12 and BY-29 (C) Collected in the Vicinity of BNGS, 2000 - 2013

BY-12 Oregon Pool of Rock River, Downstream



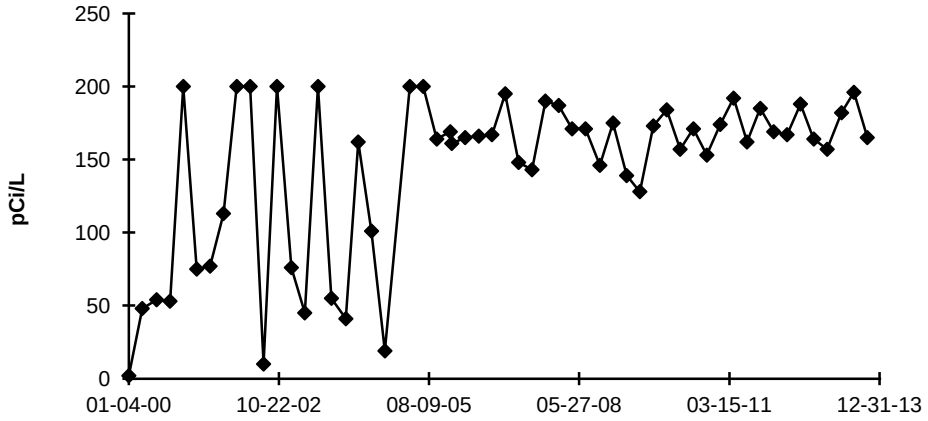
BY-29 (C) Byron, Rock River Upstream



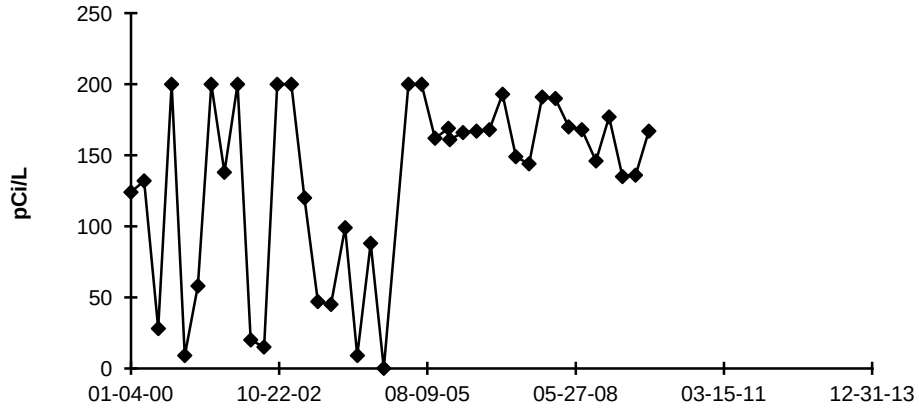
DUE TO VENDOR CHANGE IN 2005, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JUNE 2005

FIGURE C-3
Ground Water - Tritium - Stations BY-14-1 and BY-18 Collected in the Vicinity of BNGS, 2000 - 2013

BY-14-1 3200 N. German Church Road Well



BY-18 McCoy Farmstead Well



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

FIGURE C-4
Ground Water - Tritium - Stations BY-18-1
Collected in the Vicinity of BNGS, 2010 - 2013

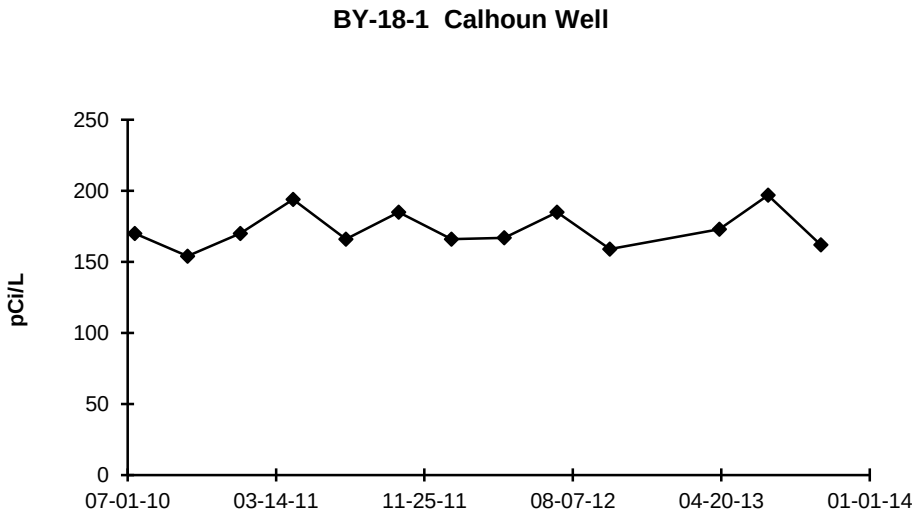
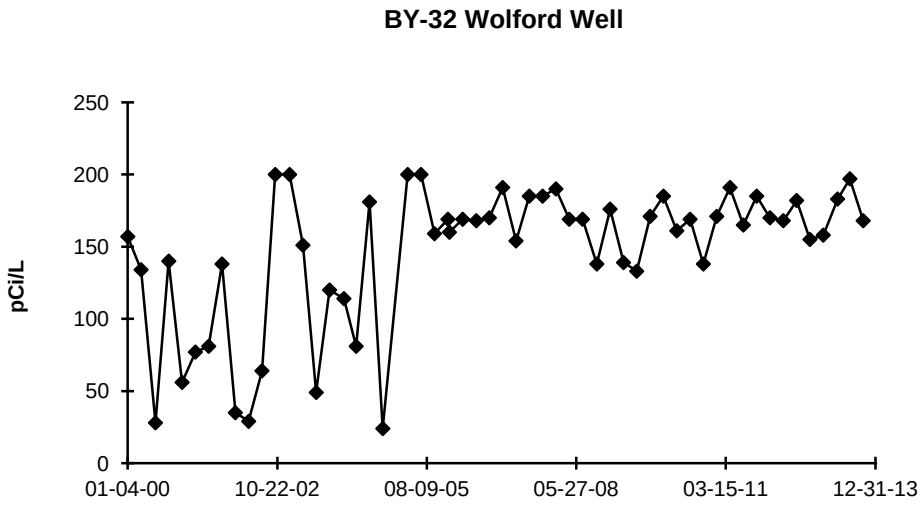


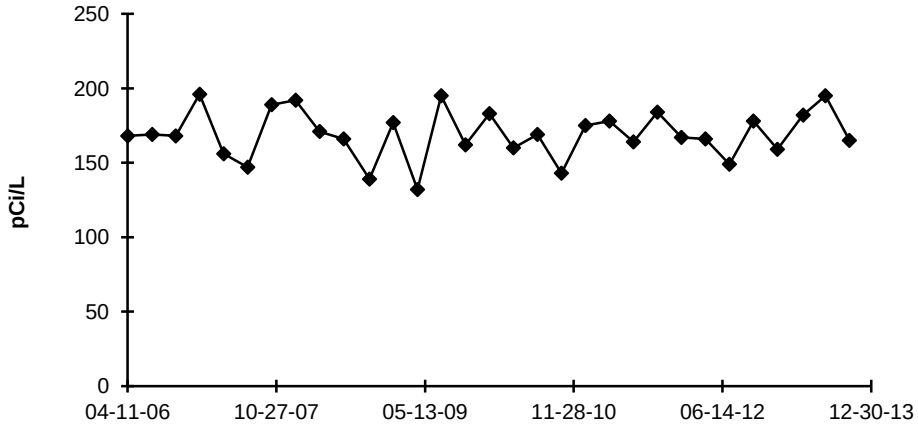
FIGURE C-5
Ground Water - Tritium - Station BY-32
Collected in the Vicinity of BNGS, 2000 - 2013



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

FIGURE C-6
Ground Water - Tritium - Stations BY-35 and BY-36 Collected in the Vicinity of BNGS, 2006 - 2013

BY-35 Vancko Well



BY-36 Blanchard Well

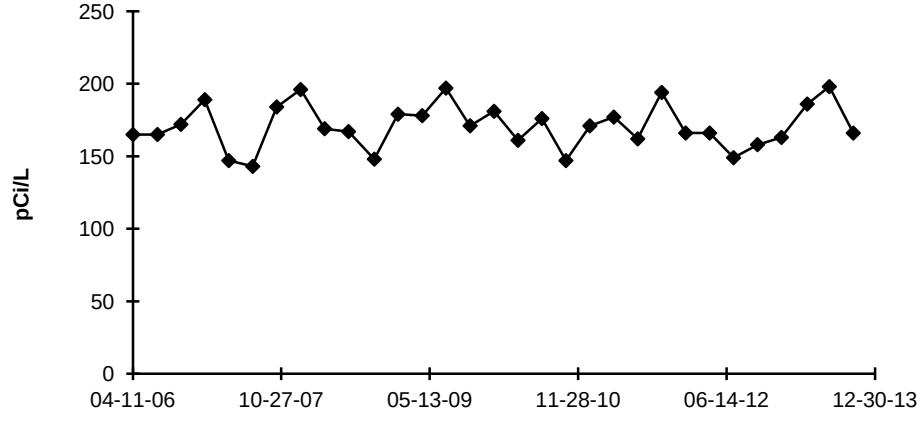


FIGURE C-7
Ground Water - Tritium - Stations BY-37
Collected in the Vicinity of BNGS, 2006 - 2013

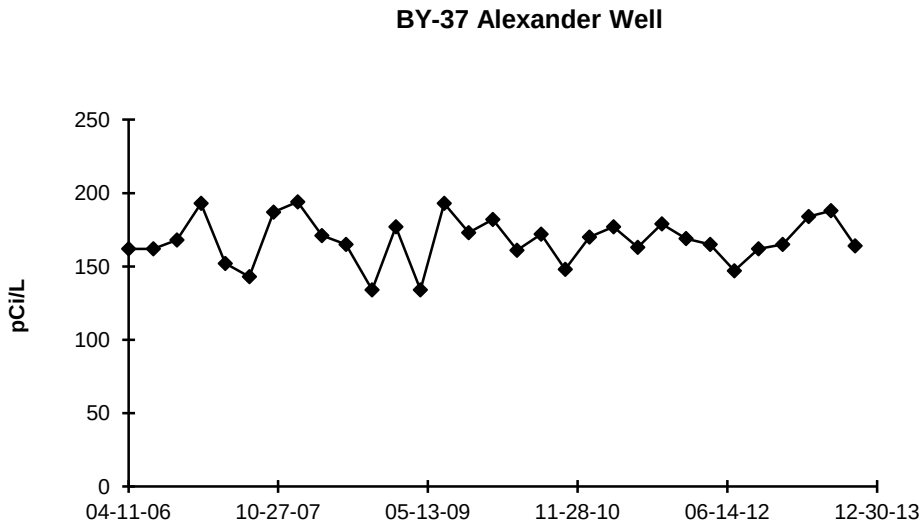
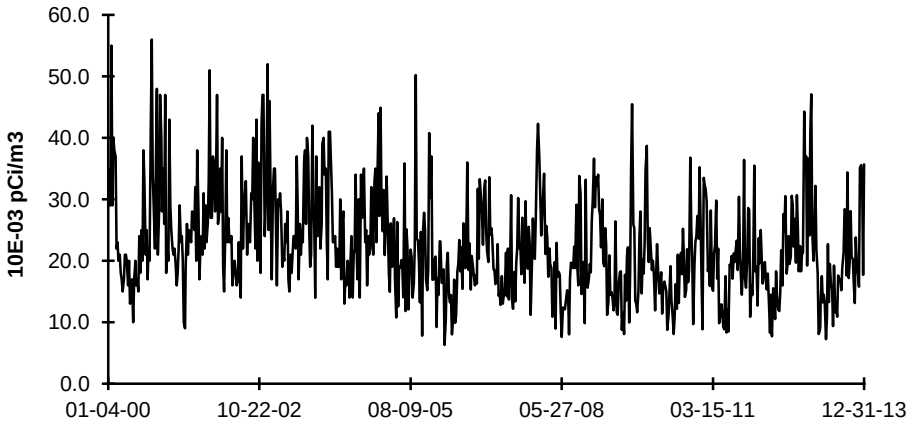


FIGURE C-8
Air Particulates - Gross Beta - Stations BY-08 (C) and BY-21 Collected in the Vicinity of BNGS, 2000 - 2013

BY-08 (C) Leaf River WNW



BY-21 Byron Nearsite N

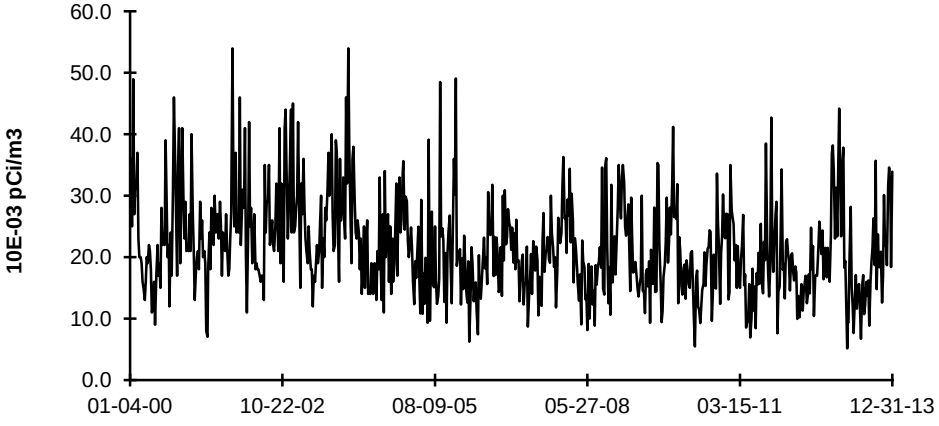
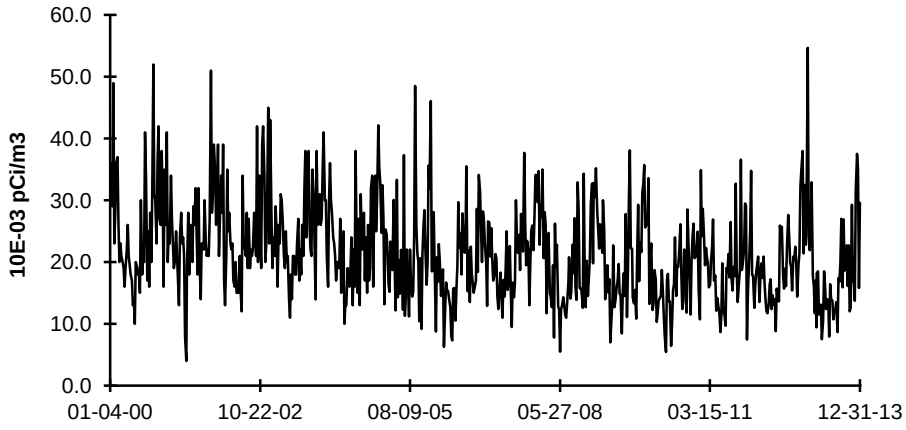


FIGURE C-9
Air Particulates - Gross Beta - Stations BY-22 and BY-23 Collected in the Vicinity of BNGS, 2000 - 2013

BY-22 Byron Nearsite SE



BY-23 Byron Nearsite S

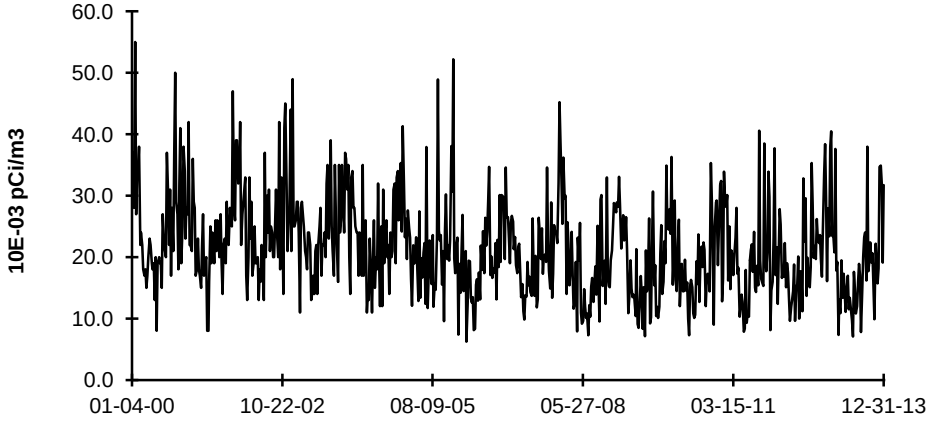


FIGURE C-10
Air Particulates - Gross Beta - Station BY-24
Collected in the Vicinity of BNGS, 2000 - 2013

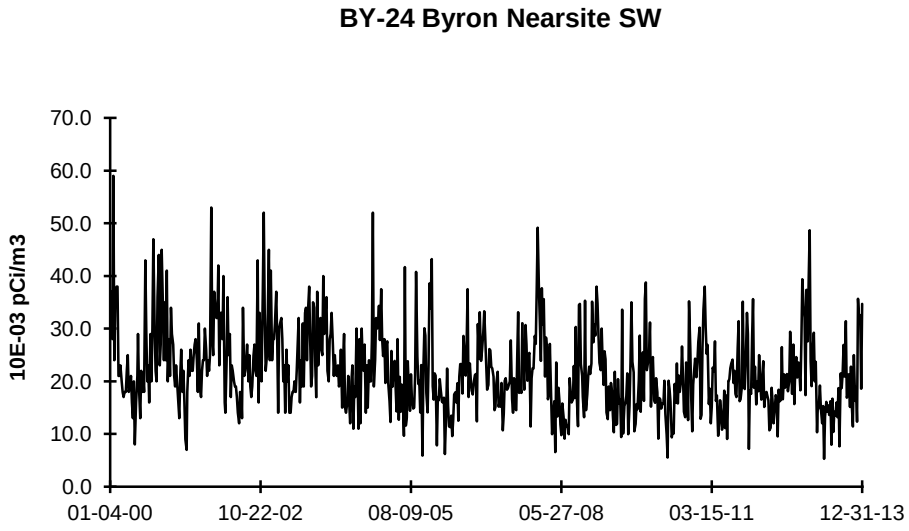
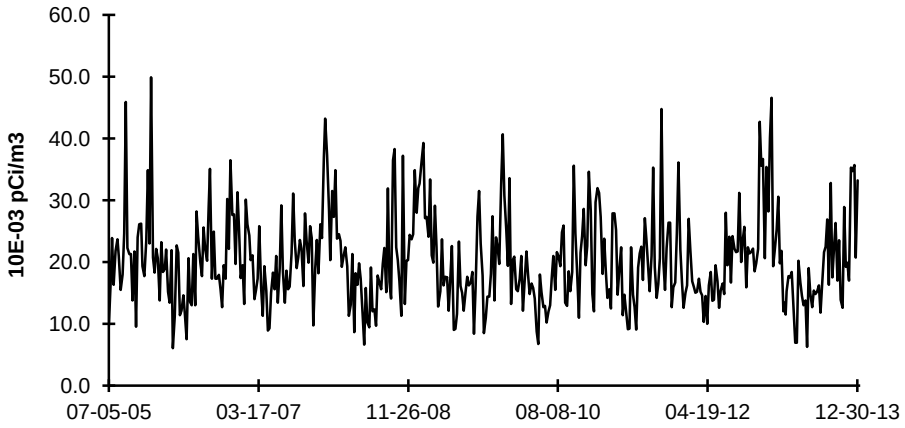
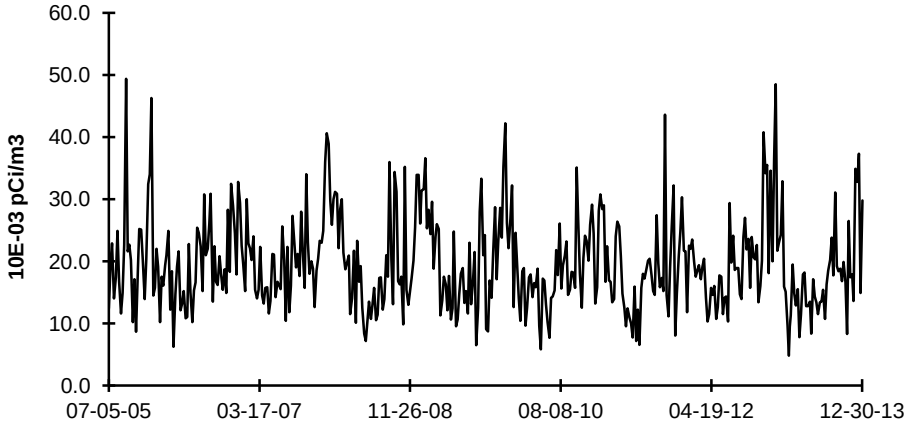


FIGURE C-11
Air Particulates - Gross Beta - Stations BY-01 and BY-04 Collected in the Vicinity of BNGS, 2005 - 2013

BY-01 Byron N

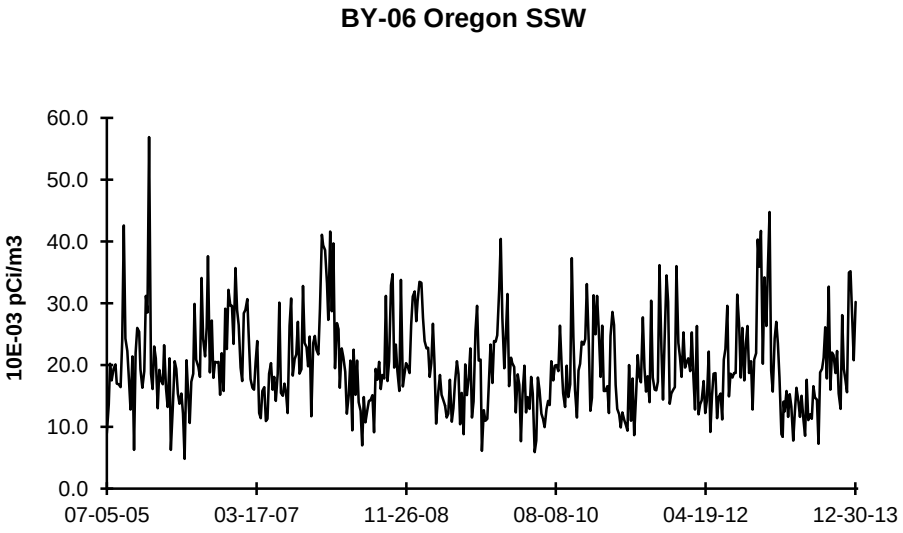


BY-04 Paynes Point SE



Regular analysis of far field air particulate & gross beta did not take place prior to 2005.

FIGURE C-12
Air Particulates - Gross Beta - Station BY-06
Collected in the Vicinity of BNGS, 2005 - 2013



Regular analysis of far field air particulate & gross beta did not take place prior to 2005.

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APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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

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

TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 2 OF 3)

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

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

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

(1) Milk, Sr-89/90 - The failure was due to analyst error. No client samples were affected by this failure. NCR 13-15

(2) The sample was not spiked with Ce-141.

(a) Teledyne Brown Engineering reported result.

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

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

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

TABLE D-2 ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2013
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2013	RAD-93	Water	Sr-89	pCi/L	48.3	41.3	31.6 - 48.4	A
			Sr-90	pCi/L	19.3	23.9	17.2 - 28.0	A
			Ba-133	pCi/L	81.9	82.1	69.0 - 90.3	A
			Cs-134	pCi/L	40.9	42.8	34.2 - 47.1	A
			Cs-137	pCi/L	44.0	41.7	37.0 - 48.8	A
			Co-60	pCi/L	61.9	65.9	59.3 - 75.0	A
			Zn-65	pCi/L	202	189	170 - 222	A
			Gr-A	pCi/L	34.2	40.8	21.1 - 51.9	A
			Gr-B	pCi/L	18.0	21.6	13.0 - 29.7	A
			I-131	pCi/L	23.8	23.8	19.7 - 28.3	A
			U-Nat	pCi/L	60.4	61.2	49.8 - 67.9	A
			H-3	pCi/L	3970	4050	3450 - 4460	A
	MRAD-18	Filter	Gr-A	pCi/filter	Lost during processing			
November 2013	RAD-95	Water	Sr-89	pCi/L	25.5	21.9	14.4 - 28.2	A
			Sr-90	pCi/L	14.3	18.1	12.8 - 21.5	A
			Ba-133	pCi/L	57.2	54.2	44.7 - 59.9	A
			Cs-134	pCi/L	83.3	86.7	71.1 - 95.4	A
			Cs-137	pCi/L	201	206	185 - 228	A
			Co-60	pCi/L	104	102	91.8 - 114	A
			Zn-65	pCi/L	361	333	300 - 389	A
			Gr-A	pCi/L	29.5	42.8	22.2 - 54.3	A
			Gr-B	pCi/L	30.1	32.2	20.8 - 39.9	A
			I-131	pCi/L	23.1	23.6	19.6 - 28.0	A
			U-Nat	pCi/L	5.53	6.24	4.70 - 7.44	A
			H-3	pCi/L	17650	17700	15500 - 19500	A
	MRAD-19	Filter	Gr-A	pCi/filter	33.0	83.0	27.8 - 129	A

(a) Teledyne Brown Engineering reported result.

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

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

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

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

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

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

(1) False positive test.

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

(a) Teledyne Brown Engineering reported result.

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

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE D-4 **ERA (a) STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM**
ENVIRONMENTAL, INC., 2013

Lab Code	Date	Concentration (pCi/L) Analysis	Laboratory Result (b)	ERA Result (c)	Control Limits	Acceptance
ERW-1593	04/08/13	Sr-89	43.6 ± 4.3	41.30	31.6 - 48.4	Pass
ERW-1593	04/08/13	Sr-90	23.2 ± 1.7	23.90	17.2 - 28.0	Pass
ERW-1596	04/08/13	Ba-133	74.80 4.00	82.10	69.00 90.30	Pass
ERW-1596	04/08/13	Co-60	65.50 3.42	65.90	59.30 75.00	Pass
ERW-1596	04/08/13	Cs-134	41.10 3.47	42.80	34.20 47.10	Pass
ERW-1596	04/08/13	Cs-137	42.30 4.03	41.70	37.00 48.80	Pass
ERW-1596	04/08/13	Zn-65	200.3 ± 10.1	189.0	170.0 - 222.0	Pass
ERW-1598	04/08/13	Gr. Alpha	34.30 1.98	40.80	21.10 51.90	Pass
ERW-1598	04/08/13	Gr. Beta	18.70 0.98	21.60	13.00 29.70	Pass
ERW-1600	04/08/13	I-131	23.00 ± 1.10	23.80	19.70 - 28.30	Pass
ERW-1600	04/08/13	I-131(Gamma)	23.48 ± 9.44	23.80	19.70 ± 28.30	Pass
ERW-1606	04/08/13	H-3	4041 ± 194	4050	3450 - 4460	Pass
ERW-6009	10/07/13	Sr-89	22.00 2.80	21.90	14.40 28.20	Pass
ERW-6009	10/07/13	Sr-90	17.10 2.55	18.10	12.80 21.50	Pass
ERW-6012	10/07/13	Ba-133	48.20 4.29	54.20	44.70 59.90	Pass
ERW-6012	10/07/13	Co-60	100.8 ± 4.7	102.0	91.8 - 114.0	Pass
ERW-6012	10/07/13	Cs-134	87.30 4.35	86.70	71.10 95.40	Pass
ERW-6012	10/07/13	Cs-137	199.6 ± 7.4	206.0	185.0 - 228.0	Pass
ERW-6012	10/07/13	Zn-65	356.2 ± 13.2	333.0	300.0 - 389.0	Pass
ERW-6015	10/07/13	Gr. Alpha	30.70 11.90	42.80	22.20 54.30	Pass
ERW-6015	10/07/13	Gr. Beta	25.70 6.48	32.20	20.80 39.90	Pass
ERW-6019	10/07/13	I-131	22.50 1.01	23.60	19.60 28.00	Pass
ERW-6024	10/07/13	H-3	18397 695	17700	15500 19500	Pass

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

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

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

TABLE D-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
ENVIRONMENTAL, INC., 2013

			Concentration (a)			
Lab Code (b)	Date	Analysis	Laboratory result	Known Activity	Control Limits (c)	Acceptance
MAAP-738	02/01/13	Co-57	2.58 ± 0.06	2.36	1.65 - 3.07	Pass
MAAP-738	02/01/13	Co-60	0.01 ± 0.03	0.00	0.00 - 0.10	Pass
MAAP-738	02/01/13	Cs-134	1.82 ± 0.13	1.78	1.25 - 2.31	Pass
MAAP-738	02/01/13	Cs-137	2.93 ± 0.10	2.60	1.82 - 3.38	Pass
MAAP-738	02/01/13	Mn-54	4.87 ± 0.13	4.26	2.98 - 5.54	Pass
MAAP-738	02/01/13	Sr-90	1.39 ± 0.14	1.49	1.04 - 1.94	Pass
MAAP-738	02/01/13	Zn-65	3.84 ± 0.20	3.13	2.19 - 4.07	Pass
MAAP-738 d	02/01/13	Gr. Alpha	0.14 ± 0.03	1.20	0.36 - 2.04	Fail (1)
MAAP-738	02/01/13	Gr. Beta	0.93 ± 0.06	0.85	0.43 - 1.28	Pass
MAW-806	02/01/13	Co-57	31.20 0.40	30.90	21.60 40.20	Pass
MAW-806	02/01/13	Co-60	19.70 ± 0.30	16.56	13.69 - 25.43	Pass
MAW-806	02/01/13	Cs-134	23.20 ± 0.50	24.40	17.10 - 31.70	Pass
MAW-806	02/01/13	Cs-137	0.03 ± 0.12	0.00	0.00 - 1.00	Pass
MAW-806	02/01/13	Fe-55	34.00 ± 3.30	44.00	30.80 - 57.20	Pass
MAW-806	02/01/13	H-3	511.60 ± 12.50	507.00	355.00 - 659.00	Pass
MAW-806	02/01/13	K-40	2.20 ± 0.90	0.00	0.00 - 5.00	Pass
MAW-806	02/01/13	Mn-54	27.60 ± 0.50	27.40	19.20 - 35.60	Pass
MAW-806	02/01/13	Sr-90	9.30 ± 0.80	10.50	7.40 - 13.70	Pass
MAW-806	02/01/13	Zn-65	31.60 ± 0.80	30.40	21.30 - 39.50	Pass
MAW-811	02/01/13	Gr. Alpha	1.87 ± 0.09	2.31	0.69 - 3.93	Pass
MAW-811	02/01/13	Gr. Beta	13.04 ± 0.13	13.00	6.50 - 19.50	Pass
MASO-739	02/01/13	Co-57	0.60 ± 0.50	0.00	0.00 - 5.00	Pass
MASO-739	02/01/13	Co-60	739.20 ± 28.50	691.00	484.00 - 898.00	Pass
MASO-739	02/01/13	Cs-134	863.30 ± 34.10	887.00	621.00 - 1153.00	Pass
MASO-739	02/01/13	Cs-137	661.80 ± 25.70	587.00	411.00 - 763.00	Pass
MASO-739	02/01/13	K-40	745.80 ± 33.30	625.30	437.70 - 812.90	Pass
MASO-739	02/01/13	Mn-54	1.10 ± 1.00	0.00	0.00 - 5.00	Pass
MASO-739	02/01/13	Zn-65	1109.60 ± 44.10	995.00	697.00 - 1294.00	Pass
MASO-744 e	02/01/13	Sr-90	408.40 ± 14.00	628.00	440.00 - 816.00	Fail (2)
MAVE-747	02/01/13	Co-57	10.37 ± 0.17	8.68	6.08 - 11.28	Pass
MAVE-747	02/01/13	Co-60	6.48 ± 0.17	5.85	4.10 - 7.61	Pass
MAVE-747	02/01/13	Cs-134	0.02 ± 0.04	0.00	0.00 - 0.10	Pass
MAVE-747	02/01/13	Cs-137	7.79 ± 0.21	6.87	4.81 - 8.93	Pass
MAVE-747	02/01/13	Mn-54	0.00 ± 0.05	0.00	0.00 - 0.10	Pass
MAVE-747	02/01/13	Zn-65	7.29 ± 0.33	6.25	4.38 - 8.13	Pass
MASO-5043 f	08/01/13	Co-57	699.60 ± 3.90	0.00	0.00 - 5.00	Fail (3)
MASO-5043	08/01/13	Cs-134	1191.70 ± 23.00	1172.00	820.00 - 1524.00	Pass
MASO-5043	08/01/13	Cs-137	1072.00 ± 5.10	977.00	684.00 - 1270.00	Pass
MASO-5043	08/01/13	K-40	760.00 ± 16.20	633.00	443.00 - 823.00	Pass
MASO-5043	08/01/13	Mn-54	753.80 ± 4.90	674.00	472.000 - 876.000	Pass

TABLE D-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
ENVIRONMENTAL, INC., 2013

			Concentration (a)			
Lab Code (b)	Date	Analysis	Laboratory result	Known Activity	Control Limits (c)	Acceptance
MASO-5043	08/01/13	Sr-90	383.90 ± 14.50	460.00	322.00 - 598.00	Pass
MASO-5043	08/01/13	Zn-65	-351.50 ± 5.50	0.00	0.00 - 0.00	Pass
MAW-5094	08/01/13	Co-57	0.01 ± 0.09	0.00	0.00 - 5.00	Pass
MAW-5094	08/01/13	Co-60	23.20 ± 0.32	23.58	16.51 - 30.65	Pass
MAW-5094	08/01/13	Cs-134	27.60 ± 0.58	30.40	21.00 - 39.00	Pass
MAW-5094	08/01/13	Cs-137	32.31 ± 0.52	31.60	22.10 - 41.10	Pass
MAW-5094	08/01/13	Fe-55	39.20 ± 3.50	53.30	37.30 - 69.30	Pass
MAW-5094	08/01/13	Gr. Alpha	0.54 ± 0.05	0.70	0.21 - 1.19	Pass
MAW-5094	08/01/13	Gr. Beta	5.85 ± 0.09	5.94	2.97 - 8.91	Pass
MAW-5094	08/01/13	H-3	1.20 ± 3.00	0.00	0.00 - 5.00	Pass
MAW-5094	08/01/13	K-40	2.22 ± 0.90	0.00	0.00 - 5.00	Pass
MAW-5094	08/01/13	Mn-54	0.010 ± 0.11	0.00	0.00 - 5.00	Pass
MAW-5094	08/01/13	Sr-90	6.40 ± 0.60	7.22	5.05 - 9.39	Pass
MAW-5094	08/01/13	Zn-65	35.30 ± 0.90	34.60	24.20 - 45.00	Pass
MAVE-5046	08/01/13	Co-57	0.01 ± 0.03	0.00	0.00 - 0.00	Pass
MAVE-5046	08/01/13	Co-60	0.00 ± 0.04	0.00	0.00 - 0.00	Pass
MAVE-5046	08/01/13	Cs-134	5.71 ± 0.23	5.20	3.64 - 6.76	Pass
MAVE-5046	08/01/13	Cs-137	7.64 ± 0.20	6.60	4.62 - 8.58	Pass
MAVE-5046	08/01/13	Mn-54	9.08 ± 0.24	7.88	5.52 - 10.24	Pass
MAVE-5046	08/01/13	Zn-65	2.92 ± 0.25	2.63	1.84 - 3.42	Pass
MAAP-5046	08/01/13	Co-57	3.48 ± 0.14	3.40	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Co-60	2.44 ± 0.08	3.40	1.60 - 3.00	Pass
MAAP-5046	08/01/13	Cs-134	0.01 ± 0.03	0.00	0.02 - 0.04	Pass
MAAP-5046	08/01/13	Cs-137	3.09 ± 0.13	2.70	1.90 - 3.50	Pass
MAAP-5046	08/01/13	Gr. Alpha	0.28 ± 0.04	0.90	0.27 - 1.53	Pass
MAAP-5046	08/01/13	Gr. Beta	1.90 ± 0.08	1.63	0.82 - 2.45	Pass
MAAP-5046	08/01/13	Mn-54	3.95 ± 0.12	3.50	2.50 - 4.60	Pass
MAAP-5046	08/01/13	Sr-90	1.69 ± 4.10	1.81	1.27 - 2.35	Pass
MAAP-5046	08/01/13	Zn-65	3.27 ± 0.18	2.70	2.50 - 4.60	Pass

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

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

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

(1) The filter was recounted overnight, no significant alpha activity could be detected.

(2) The sample was reanalyzed using additional fuming nitric separations. Result of reanalysis: 574.4 ± 35.2 Bq/kg.

(3) Interference from Eu-152 resulted in misidentification of Co-57.

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APPENDIX E

EFFLUENT REPORT

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SUMMARY

Calculations based on gaseous and liquid effluents and meteorological data indicate that public dose due to radioactive material attributable to Byron Station during the period does not exceed regulatory or Offsite Dose Calculation Manual (ODCM) limits.

The Total Effective Dose Equivalent (TEDE) due to licensed activities at Byron Station calculated for the maximum exposed individual for the period is 2.60E-01 mrem. The annual limit on TEDE is 100 mrem.

The assessment of radiation doses to the public is performed in accordance with the ODCM. The results of these analyses confirm that the station is operating in compliance with 10CFR50 Appendix I, 10CFR20 and 40CFR190.

There were no additional operational controls implemented which affected the areas of radiological effluents in 2013.

There were no measurements which exceeded the reporting levels, including any which would not have been attributable to station effluents.

The results of the current radiological environmental monitoring program are approximately the same as those found during the pre-operational studies conducted at Byron Station.

INTRODUCTION

Liquid effluents from Byron Station are released to the Rock River in controlled batches after radioassay of each batch. Gaseous effluents are released to the atmosphere and are calculated on the basis of analyses of weekly grab samples and grab samples of batch releases prior to the release of noble gases as well as continuously collected composite samples of iodine and particulate radioactivity sampled during the course of the year. The results of effluent analyses are summarized on a monthly basis. Airborne concentrations of noble gases, I-131, and particulate radioactivity in offsite areas are calculated using isotopic composition of effluents and meteorological data. C-14 concentration in offsite areas is calculated based on industry-approved methodology for estimation of the amount released and meteorological data.

Environmental monitoring is conducted by sampling at indicator and control (background) locations in the vicinity of Byron Station to measure changes in radiation or radioactivity levels that may be attributable to station operation. If significant changes attributable to Byron Station are measured, these changes are correlated with effluent releases. An environmental monitoring program is conducted which also includes all potential pathways at the site. Gaseous pathways include ground plane (direct), inhalation, vegetation, meat, and milk. Liquid pathways include potable water and freshwater fish. The critical pathway for 2013 gaseous dose was vegetation. The critical pathway for 2013 liquid dose was freshwater fish.

1.0 EFFLUENTS

1.1 Gaseous Effluents to the Atmosphere

Measured concentrations and isotopic composition of noble gases, radioiodine, tritium and particulate radioactivity released to the atmosphere during the year are listed in Table 1.1-1.

A total of 6.62E-01 curies of fission and activation gases were released with a maximum average quarterly release rate of 3.69E-02 µCi/sec.

A total of 5.05E-06 curies of 1-131 were released during the year with a maximum average quarterly release rate of 4.10E-07 µCi/sec.

A total of 3.02E-06 curies were released as airborne particulate matter with a maximum average quarterly release rate of 3.84E-07 µCi/sec.

A total of 8.70E+00 curies of other (C-14,Br-82) radioisotopes were released with a maximum average quarterly release rate of 2.87E-01 µCi/sec.

A total of 7.15E+01 curies of tritium were released with a maximum average quarterly release rate of 2.60E+00 µCi/sec.

Gross alpha-emitting radionuclides were below detectable limits.

1.2 Liquids Released to Rock River

A total of 2.88E+10 liters of radioactive liquid wastes containing 1.78E-02 curies of fission and activation products were discharged with a maximum quarterly average concentration of 2.50E-09 µCi/ml.

A total of 1.60E+03 curies of tritium were discharged with a maximum quarterly average concentration of 1.72E-04 uCi/ml.

A total of 3.36E-04 curies of dissolved and entrained gases were discharged with a maximum quarterly average concentration of 5.18E-11 uCi/ml.

Gross alpha-emitting radionuclides were below detectable limits.

Quarterly release totals of principal radionuclides in liquid effluents are given in Table 1.2-1.

2.0 SOLID RADIOACTIVE WASTE

Solid radioactive wastes were shipped by truck. For detail, refer to Byron Station 2013 Annual Radiological Effluent Release Report.

3.0 DOSE TO MAN

3.1 Gaseous Effluent Pathways

Table 3.2-1 summarizes the doses resulting from releases of airborne radioactivity via the different exposure pathways.

3.1.1 Noble Gases

3.1.1.1 Gamma Dose Rates

Offsite Gamma air and whole body dose rates are shown in Table 3.2-1 and were calculated based on measured release rates, isotopic composition of the noble gases, and average meteorological data for the period. Dose rates based on concurrent meteorological data are shown in Table 3.4-1. Based on measured effluents and average meteorological data, the maximum gamma air dose was 4.43E-05 mrad based on measured effluents and average meteorological data, and 9.20E-06 mrad based on measured effluents and concurrent meteorological data. (Table 3.4-1).

3.1.1.2 Beta Air and Skin Dose Rates

The range of beta particles in air is relatively small (on the order of a few meters or less); consequently, plumes of gaseous effluents may be considered "semi-infinite" for purpose of calculating the dose from beta radiation incident on the skin. However, the actual dose to sensitive skin tissues is difficult to calculate due to the effect of the beta particle energies, thickness of inert skin and clothing covering sensitive tissues. For purposes of this report the skin is taken to have a

thickness of 7.0 mg/cm^2 and an occupancy factor of 1.0 is used. The skin dose based on measured effluents and average meteorological data was 2.62E-05 mrem, and 1.13E-05 mrem based on measured effluents and concurrent meteorological data.

The maximum offsite beta air dose for the year based on measured effluents and average meteorological data was 1.18E-05 mrad. The beta air dose based on measured effluents and concurrent meteorological data was 1.01E-05 mrad.

3.1.2 Radioactive Iodine & Particulate

The human thyroid exhibits a significant capacity to concentrate ingested or inhaled iodine. I-131 released during routine operation of the station may be made available to man resulting in a dose to the thyroid. C-14 is also included in this category. C-14 exhibits a capacity to concentrate in bone. C-14 is released in gaseous form and is absorbed into vegetation through photosynthesis. The principal pathways of interest for C-14 are the consumption of vegetation by humans and milk from which animals have ingested C-14 through the consumption of vegetation. With the addition of C-14 to plant effluents, human dose in this category is primarily driven by the release of C-14 from the plant.

The hypothetical dose to the maximum exposed individual living near the station via ingestion of milk and vegetation was calculated. The source of milk and vegetation was assumed to be at the nearest site boundary with the cows pastured and vegetation grown from May through October. The maximum dose from radioactive iodine and particulate (including C-14) to any organ was 7.09E-01 mrem (child/bone) based on measured effluents and average meteorological data and 7.81E-01 mrem based on measured effluents and concurrent meteorological data. The maximum dose from radioactive iodine and particulate (including C-14) to the whole body was 1.46E-01 mrem (child) based on measured effluents and average meteorological data and 1.61E-01 mrem based on measured effluents and concurrent meteorological data.

3.1.3 Gaseous Total Dose

The maximum total dose from gaseous releases to any organ was 7.09E-01 mrem (child/bone) based on measured effluents and average meteorological data, and 7.81E-01 mrem (child/bone) based on measured effluents and concurrent meteorological data. The maximum total dose from gaseous releases to the whole body was 1.46E-01 mrem (child) based on measured effluents and average meteorological data, and 1.61E-01 mrem (child) based on measured effluents and concurrent meteorological data.

3.2 Liquid Effluent Pathways

The principal pathways through the aquatic environment for potential doses to man from liquid waste are ingestion of potable water and eating aquatic foods. Liquid dose was calculated based on the ingestion of potable water and sport fish. It should be noted, however, there were no communities within 10 km downstream of the plant using the Rock River for drinking water. NRC-developed equations were used to calculate the doses to the whole body, bone, liver, thyroid, kidney, lung, lower GI tract, and skin. Specific parameters for use in the equations are given in the Exelon Offsite Dose Calculation Manual (ODCM). The maximum dose from liquid releases to any organ was 1.53E-01 mrem (adult/gilli). The maximum dose from liquid releases to the whole body was 1.34E-01 mrem (adult).

3.3 Total Dose

The maximum total dose to any organ via both gaseous and liquid effluents to any organ is 8.40E-01 mrem (child/bone). The maximum dose to the whole body via both gaseous and liquid effluents is 2.60E-01 mrem (child).

3.4 Assessment of Dose to Member of Public

Byron Station did not exceed any of the dose limits as shown below based on concurrent or historical meteorological data.

- The RETS limits on dose or dose commitment to a member of the public due to radioactive materials in liquid effluents from each reactor is 1.5 mrem to the whole body or 5 mrem to any organ

during any calendar quarter and 3 mrem to the whole body or 10 mrem to any organ during a calendar year.

- The RETS limits on air dose in noble gases released in gaseous effluents to a member of the public from each reactor is 5 mrad for gamma radiation or 10 mrad for beta radiation during any calendar quarter and 10 mrad for gamma radiation or 20 mrad for beta radiation during a calendar year.

- The RETS limits on dose to a member of the public due to radioactive iodine & particulate with half-lives greater than eight days in gaseous effluents released from each reactor is 7.5 mrem to any organ during any calendar quarter and 15 mrem during a calendar year.

- The 10CFR20 limit on Total Effective Dose Equivalent to individual members of the public is 100 mrem during a calendar year.

4.0 SITE METEOROLOGY

Detailed records of the site meteorological measurements taken during each calendar quarter of the year are maintained by the meteorological vendor, retained on site, and are available upon request. The data are presented as cumulative joint frequency distributions of the wind direction for the 250' level and wind speed class by atmospheric stability class determined from the temperature difference between the 250' and 30' levels. Data recovery for all measurements on the meteorological tower was 99.6% during 2013.

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APPENDIX E-1

DATA TABLES AND FIGURES

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Table 1.1-1

EFFLUENT AND WASTE DISPOSAL REPORT
TABLE 1A
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
Unit 1

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
1. Total Release	Ci	6.05E-02	6.45E-02	6.28E-02	1.61E-01	3.49E-01
2. Avg. Release Rate	uCi/sec	7.78E-03	8.20E-03	7.90E-03	2.03E-02	1.11E-02
Iodine-131						
1. Total Release	Ci	(1)	6.63E-07	1.12E-06	(1)	1.78E-06
2. Avg. Release Rate	uCi/sec	(1)	8.43E-08	1.41E-07	(1)	5.65E-08
Particulates Half Life >= 8 days						
1. Total Release	Ci	(1)	3.02E-06	(1)	(1)	3.02E-06
2. Avg. Release Rate	uCi/sec	(1)	3.84E-07	(1)	(1)	9.58E-08
Others						
1. Total Release	Ci	1.13E+00	1.11E+00	1.12E+00	1.12E+00	4.48E+00
2. Avg. Release Rate	uCi/sec	1.45E-01	1.41E-01	1.41E-01	1.41E-01	1.42E-01
Tritium						
1. Total Release	Ci	8.67E+00	6.39E+00	6.87E+00	7.67E+00	2.96E+01
2. Avg. Release Rate	uCi/sec	1.11E+00	8.12E-01	8.64E-01	9.65E-01	9.38E-01
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
2. Avg. Release Rate	uCi/sec	(1)	(1)	(1)	(1)	(1)

(1) Less than minimum detectable activity which meets the lower limit of detection (LLD) requirements of TRM Section 3.11

Table 1.1-1 (cont.)

EFFLUENT AND WASTE DISPOSAL REPORT
TABLE 1A
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
Unit 2

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
1. Total Release	Ci	6.60E-02	6.95E-02	4.52E-02	1.32E-01	3.13E-01
2. Avg. Release Rate	uCi/sec	8.49E-03	8.84E-03	5.69E-03	1.66E-02	9.93E-03
Iodine-131						
1. Total Release	Ci	(1)	2.56E-06	(1)	7.09E-07	3.27E-06
2. Avg. Release Rate	uCi/sec	(1)	3.26E-07	(1)	8.93E-08	1.04E-07
Particulates Half Life >= 8 days						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
2. Avg. Release Rate	uCi/sec	(1)	(1)	(1)	(1)	(1)
Others						
1. Total Release	Ci	1.09E+00	8.48E-01	1.16E+00	1.12E+00	4.22E+00
2. Avg. Release Rate	uCi/sec	1.40E-01	1.08E-01	1.46E-01	1.41E-01	1.34E-01
Tritium						
1. Total Release	Ci	9.60E+00	8.66E+00	1.07E+01	1.30E+01	4.19E+01
2. Avg. Release Rate	uCi/sec	1.24E+00	1.10E+00	1.35E+00	1.63E+00	1.33E+00
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
2. Avg. Release Rate	uCi/sec	(1)	(1)	(1)	(1)	(1)

(1) Less than minimum detectable activity which meets the lower limit of detection (LLD) requirements of TRM Section 3.11

Table 1.2-1

EFFLUENT AND WASTE DISPOSAL REPORT
TABLE 2A
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
Unit 1

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
1. Total Release	Ci	1.73E-03	4.12E-03	1.69E-03	1.38E-03	8.92E-03
2. Avg. Diluted Conc.	uCi/ml	5.01E-10	1.25E-09	4.24E-10	3.71E-10	6.17E-10
Tritium						
1. Total Release	Ci	2.96E+02	2.23E+02	6.36E+01	2.16E+02	7.99E+02
2. Avg. Diluted Conc.	uCi/ml	8.58E-05	6.77E-05	1.60E-05	5.80E-05	5.53E-05
Dissolved and Entrained Gases						
1. Total Release	Ci	8.26E-05	8.53E-05	(1)	(1)	1.68E-04
2. Avg. Diluted Conc.	uCi/ml	2.39E-11	2.59E-11	(1)	(1)	1.16E-11
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
Volume of liquid waste	liters	3.45E+09	3.29E+09	3.98E+09	3.73E+09	1.44E+10

(1) Less than minimum detectable activity which meets the lower limit of detection (LLD) requirements of TRM Section 3.11

Table 1.2-1 (cont.)

EFFLUENT AND WASTE DISPOSAL REPORT
TABLE 2A
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
Unit 2

REPORT FOR 2013	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
1. Total Release	Ci	1.73E-03	4.12E-03	1.69E-03	1.38E-03	8.92E-03
2. Avg. Diluted Conc.	uCi/ml	5.01E-10	1.25E-09	4.24E-10	3.71E-10	6.17E-10
Tritium						
1. Total Release	Ci	2.96E+02	2.23E+02	6.36E+01	2.16E+02	7.99E+02
2. Avg. Diluted Conc.	uCi/ml	8.58E-05	6.77E-05	1.60E-05	5.80E-05	5.53E-05
Dissolved and Entrained Gases						
1. Total Release	Ci	8.26E-05	8.53E-05	(1)	(1)	1.68E-04
2. Avg. Diluted Conc.	uCi/ml	2.39E-11	2.59E-11	(1)	(1)	1.16E-11
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
Volume of liquid waste	liters	3.45E+09	3.29E+09	3.98E+09	3.73E+09	1.44E+10

(1) Less than minimum detectable activity which meets the lower limit of detection (LLD) requirements of TRM Section 3.11

Table 3.1-1

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Unit 1 & 2

Report for: 2013
Unit Range - From: 1 To: 2
Liquid Receptor

=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) ========== ANNUAL 2013 =========

Agegrp	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB
ADULT	9.53E-02	1.38E-01	1.29E-01	1.36E-01	1.29E-01	1.53E-01	0.00E+00	1.34E-01
TEEN	9.89E-02	1.06E-01	9.73E-02	9.68E-02	9.70E-02	1.15E-01	0.00E+00	1.02E-01
CHILD	1.30E-01	1.17E-01	1.09E-01	1.08E-01	1.08E-01	1.15E-01	0.00E+00	1.14E-01
INFANT	7.21E-04	4.79E-02	4.78E-02	4.78E-02	4.78E-02	4.78E-02	0.00E+00	4.79E-02

=== SITE DOSE LIMIT ANALYSIS ============================== ANNUAL 2013 =========

Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2013 - Admin. Any Organ	ADULT	GILLI	1.53E-01	7.50E+00	2.05E+00
2013 - Admin. Total Body	ADULT	TBODY	1.34E-01	2.25E+00	5.96E+00
2013 - T.Spc. Any Organ	ADULT	GILLI	1.53E-01	1.00E+01	1.53E+00

Critical Pathway: Fresh Water Fish – Sport (FFSP)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	8.41E+01
CR-51	2.47E-02
MN-54	2.84E-01
FE-59	1.61E+00
CO-58	5.18E+00
CO-60	3.17E+00
NI-63	8.79E-01
AG-110M	9.64E-04
TE-125M	4.79E+00

2013 - T.Spc. Total Body	ADULT	TBODY	1.34E-01	3.00E+00	4.47E+00

Critical Pathway: Fresh Water Fish – Sport (FFSP)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	9.62E+01
CR-51	1.13E-04
MN-54	2.03E-02
FE-59	2.12E-01
CO-58	6.55E-01
CO-60	4.25E-01
NI-63	2.33E+00
AG-110M	1.61E-06
TE-125M	1.84E-01

Table 3.2-1

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Unit 1 & 2

Report for: 2013
Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS ========== ANNUAL 2013 =========

Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2013 - Admin. Any Organ	CHILD	BONE	7.09E-01	1.13E+01	6.31E+00
2013 - Admin. Total Body	CHILD	TBODY	1.46E-01	1.05E+01	1.39E+00
2013 - T.Spc. Any Organ	CHILD	BONE	7.09E-01	1.50E+01	4.73E+00

Receptor: 5 Composite Crit. Receptor - IP
Distance: 800 (meters) Compass Point: SSE
Critical Pathway: Vegetation
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	0.00E+00
C-14	1.00E+02
CO-58	1.22E-05
CO-60	3.48E-04
I-131	1.26E-04
I-133	1.94E-05

2013 - T.Spc. Total Body	CHILD	TBODY	1.46E-01	1.50E+01	9.73E-01

Receptor: 5 Composite Crit. Receptor - IP
Distance: 800 (meters) Compass Point: SSE
Critical Pathway: Vegetation
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	2.77E+00
C-14	9.72E+01
CO-58	1.03E-04
CO-60	1.79E-03
I-131	3.54E-04
I-133	4.90E-05

Table 3.2-1 (Cont.)

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Unit 1 & 2

Report for: 2013
Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS ========== ANNUAL 2013 =========

Annual - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
2013 - Admin. Gamma	4.43E-05	7.50E+00	5.91E-04
2013 - Admin. Beta	1.18E-05	1.50E+01	7.86E-05
2013 - T.Spc. Gamma	4.43E-05	1.00E+01	4.43E-04

Receptor: 4 Composite Crit. Receptor - NG
Distance: 800 (meters) Compass Point: SSE

Nuclide	Percentage
AR-41	7.21E+01
KR-85M	1.07E-03
XE-135	1.42E-01
XE-133M	5.28E-03
XE-133	2.78E+01

2013 - T.Spc. Beta	1.18E-05	2.00E+01	5.90E-05

Receptor: 4 Composite Crit. Receptor - NG
Distance: 800 (meters) Compass Point: SSE

Nuclide	Percentage
AR-41	2.35E+01
KR-85M	1.58E-03
XE-135	1.68E-01
XE-133M	2.21E-02
XE-133	7.63E+01

Table 3.2-1 (Cont.)

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Unit 1 & 2

Report for: 2013
Unit Range - From: 1 To: 2

=== MAXIMUM DOSE ANALYSIS ================================ ANNUAL 2013 =========

Dose Type	Age Group	Organ	Dose (mrem)
Any Organ	CHILD	BONE	8.40E-01

Liquid Receptor: 0 Liquid Receptor
Gaseous Receptor: 5 Composite Crit. Receptor - IP
Distance: 800 (meters) Compass Point: SSE

Liquid Dose: 1.30E-01 % of Total: 1.55E+01
Critical Pathway: Fresh Water Fish - Sport (FFSP)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	0.00E+00
CR-51	0.00E+00
MN-54	0.00E+00
FE-59	3.04E-01
CO-58	0.00E+00
CO-60	0.00E+00
NI-63	9.77E+01
AG-110M	3.82E-06
TE-125M	1.98E+00

Gaseous Dose: 7.09E-01 % of Total: 8.45E+01
Critical Pathway: Vegetation (VEG)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	0.00E+00
C-14	1.00E+02
CO-58	1.22E-05
CO-60	3.48E-04
I-131	1.26E-04
I-133	1.94E-05

=== MAXIMUM DOSE ANALYSIS ================================ ANNUAL 2013 =========

Dose Type	Age Group	Organ	Dose (mrem)
Total Body	CHILD	TBODY	2.60E-01

Liquid Receptor: 0 Liquid Receptor
Gaseous Receptor: 5 Composite Crit. Receptor - IP
Distance: 800 (meters) Compass Point: SSE

Table 3.3-1

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Unit 1 & 2

=== MAXIMUM DOSE ANALYSIS ================================ ANNUAL 2012 =========

Dose Type	Age Group	Organ	Dose (mrem)
Total Body	CHILD	TBODY	2.75E-01

Liquid Receptor: 0 Liquid Receptor
Gaseous Receptor: 5 Composite Crit. Receptor - IP
Distance: 800 (meters) Compass Point: SSE

Liquid Dose: 1.34E-01 % of Total: 4.86E+01
Critical Pathway: Fresh Water Fish - Sport (FFSP)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	9.73E+01
CR-51	4.34E-04
MN-54	7.59E-02
FE-59	2.12E-02
CO-58	5.04E-01
CO-60	9.13E-01
NI-63	4.48E-01
ZN-65	2.13E-01
ZR-95	5.51E-07
NB-95	7.35E-03
TE-125M	7.78E-02
I-132	1.06E-05
I-133	2.55E-05
CS-134	4.25E-01

Gaseous Dose: 1.41E-01 % of Total: 5.13E+01
Critical Pathway: Vegetation (VEG)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	2.22E+00
C-14	9.78E+01
CO-58	6.33E-05
I-131	9.94E-04
I-132	1.40E-05

Liquid Dose: 1.14E-01 % of Total: 4.40E+01
Critical Pathway: Fresh Water Fish - Sport (FFSP)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	9.42E+01
CR-51	1.45E-04
MN-54	2.55E-02
FE-59	2.79E-01
CO-58	8.39E-01
CO-60	5.45E-01
NI-63	3.78E+00
AG-110M	2.35E-06
TE-125M	3.00E-01

Table 3.3-1 (Cont.)

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Unit 1 & 2

Gaseous Dose: 1.46E-01 % of Total: 5.61E+01
Critical Pathway: Vegetation (VEG)
Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	2.77E+00
C-14	9.72E+01
CO-58	1.03E-04
CO-60	1.79E-03
I-131	3.54E-04
I-133	4.90E-05

Table 3.4-1

The following are the maximum annual calculated cumulative offsite doses resulting from Byron airborne releases in 2013 based on concurrent meteorological data:

Unit 1:

Dose	*Maximum Value*		*Sector Affected*
gamma air [(1)]	7.05×10^{-6}	mrad	North-Northwest
beta air [(2)]	5.87×10^{-6}	mrad	North-Northwest
whole body [(3)]	8.24×10^{-2}	mrem	North-Northwest
skin [(4)]	8.27×10^{-6}	mrem	North-Northwest
organ [(5)] (child-bone)	4.02×10^{-1}	mrem	North-Northwest

Unit 1 Compliance Status

10 CFR 50 Appendix I	**Yearly Objective**		**% of Appendix I**
gamma air	10.0	mrad	0.00
beta air	20.0	mrad	0.02
whole body	5.0	mrem	1.65
skin	15.0	mrem	0.00
organ	15.0	mrem	2.68

Unit 2:

Dose	*Maximum Value*		*Sector Affected*
gamma air [(1)]	2.15×10^{-6}	mrad	North-Northwest
beta air [(2)]	4.24×10^{-6}	mrad	North-Northwest
whole body [(3)]	7.87×10^{-2}	mrem	North-Northwest
skin [(4)]	3.06×10^{-6}	mrem	North-Northwest
organ [(5)] (child-bone)	3.79×10^{-1}	mrem	North-Northwest

Unit 2 Compliance Status

10 CFR 50 Appendix I	**Yearly Objective**		**% of Appendix I**
gamma air	10.0	mrad	0.00
beta air	20.0	mrad	0.00
whole body	5.0	mrem	1.57
skin	15.0	mrem	0.00
organ	15.0	mrem	2.52

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(1) Gamma Air Dose - GASPAR II, NUREG-0597
(2) Beta Air Dose - GASPAR II, NUREG-0597
(3) Whole Body Dose - GASPAR II, NUREG-0597
(4) Skin Dose - GASPAR II, NUREG-0597
(5) Inhalation and Food Pathways Dose - GASPAR II, NUREG-0597

Data recovery: 99.6%

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APPENDIX F

METEOROLOGICAL DATA

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Byron Generating Station

Period of Record: January - March 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	1	0	0	0	1
SSW	0	0	2	0	0	0	2
SW	0	0	1	0	0	0	1
WSW	0	0	0	0	0	0	0
W	0	0	1	1	0	0	2
WNW	0	0	1	4	0	0	5
NW	0	0	0	1	0	0	1
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	6	6	0	0	12

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	1	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	3	0	0	0	3
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	1	1	0	0	2
S	0	0	1	0	0	0	1
SSW	0	0	2	0	0	0	2
SW	0	0	0	0	0	0	0
WSW	0	0	3	1	0	0	4
W	0	0	1	2	0	0	3
WNW	0	0	4	6	0	0	10
NW	0	1	2	0	0	0	3
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	1	17	11	0	0	29

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	1	1	1	0	0	0	3
ESE	0	1	0	0	0	0	1
SE	0	1	0	0	0	0	1
SSE	0	0	2	4	0	0	6
S	0	0	0	2	0	0	2
SSW	0	0	0	1	0	0	1
SW	0	0	1	0	0	0	1
WSW	0	0	3	0	0	0	3
W	0	0	2	6	1	0	9
WNW	0	2	9	2	1	0	14
NW	0	1	9	2	0	0	12
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	2	6	27	17	2	0	54

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	4	15	55	38	0	0	112
NNE	1	6	19	3	0	0	29
NE	2	8	16	7	2	0	35
ENE	2	9	29	5	0	0	45
E	3	14	25	0	0	0	42
ESE	1	12	13	14	0	0	40
SE	0	16	40	3	4	0	63
SSE	1	9	38	15	0	0	63
S	0	11	16	12	2	0	41
SSW	2	9	25	14	7	1	58
SW	6	14	19	13	0	0	52
WSW	3	9	36	32	6	5	91
W	7	19	55	61	33	5	180
WNW	2	46	86	71	22	1	228
NW	1	56	77	22	0	0	156
NNW	3	28	69	23	0	0	123
Variable	0	0	0	0	0	0	0
Total	38	281	618	333	76	12	1358

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 3
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	7	5	2	0	0	0	14
NNE	9	10	2	0	0	0	21
NE	3	5	3	0	0	0	11
ENE	4	5	6	1	0	0	16
E	3	8	3	0	0	0	14
ESE	3	5	8	3	0	0	19
SE	3	7	16	6	0	0	32
SSE	1	6	12	20	0	0	39
S	6	20	16	9	0	0	51
SSW	4	18	23	15	3	0	63
SW	3	23	4	9	0	0	39
WSW	5	18	6	6	1	0	36
W	7	22	3	1	1	1	35
WNW	10	20	4	0	0	0	34
NW	1	14	2	0	0	0	17
NNW	4	7	12	0	0	0	23
Variable	3	0	0	0	0	0	3
Total	76	193	122	70	5	1	467

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	0	0	0	0	0	1
NNE	1	0	0	0	0	0	1
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	4	8	0	0	0	0	12
ESE	1	12	11	0	0	0	24
SE	1	4	6	0	0	0	11
SSE	3	7	2	0	0	0	12
S	5	8	6	0	0	0	19
SSW	6	10	0	0	0	0	16
SW	4	1	0	0	0	0	5
WSW	5	0	0	0	0	0	5
W	7	2	0	0	0	0	9
WNW	6	1	0	0	0	0	7
NW	2	0	0	0	0	0	2
NNW	0	1	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	47	54	25	0	0	0	126

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	4	5	0	0	0	0	9
ESE	0	15	6	0	0	0	21
SE	1	1	1	0	0	0	3
SSE	3	1	0	0	0	0	4
S	0	1	0	0	0	0	1
SSW	1	1	0	0	0	0	2
SW	3	0	0	0	0	0	3
WSW	1	0	0	0	0	0	1
W	4	0	0	0	0	0	4
WNW	3	0	0	0	0	0	3
NW	3	0	0	0	0	0	3
NNW	1	0	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	24	24	7	0	0	0	55

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	1	0	0	1
SSW	0	0	0	2	0	0	2
SW	0	0	0	0	1	0	1
WSW	0	0	0	0	0	0	0
W	0	0	0	3	0	0	3
WNW	0	0	0	0	4	0	4
NW	0	0	0	0	1	0	1
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	0	6	6	0	12

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	2	1	0	3
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	1	1	0	2
S	0	0	0	0	0	0	0
SSW	0	0	0	2	1	0	3
SW	0	0	0	0	0	0	0
WSW	0	0	0	4	0	0	4
W	0	0	1	2	1	0	4
WNW	0	0	3	1	6	0	10
NW	0	1	0	1	0	0	2
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	1	4	13	10	0	28

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 1
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	1	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	1	0	0	1
ESE	0	1	1	0	0	0	2
SE	0	0	2	0	0	0	2
SSE	0	0	1	1	0	4	6
S	0	0	0	0	1	1	2
SSW	0	0	0	0	1	0	1
SW	0	0	0	1	0	0	1
WSW	0	0	0	3	0	0	3
W	0	0	0	2	7	0	9
WNW	0	0	4	8	3	1	16
NW	0	1	3	5	1	0	10
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	3	11	21	13	6	54

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	8	17	50	22	1	99
NNE	1	5	5	20	3	0	34
NE	2	3	7	9	5	4	30
ENE	2	7	11	18	7	2	47
E	0	5	11	25	7	0	48
ESE	1	2	11	9	14	3	40
SE	0	3	12	22	13	5	55
SSE	0	5	15	26	14	5	65
S	0	4	10	15	8	3	40
SSW	1	5	14	19	14	14	67
SW	0	6	10	16	15	1	48
WSW	3	5	14	49	20	9	100
W	3	12	14	67	35	46	177
WNW	4	15	48	81	57	18	223
NW	1	17	62	63	18	3	164
NNW	0	13	24	55	7	0	99
Variable	0	0	0	0	0	0	0
Total	19	115	285	544	259	114	1336

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 25
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	3	5	3	4	0	15
NNE	1	6	6	0	0	0	13
NE	0	2	8	4	0	0	14
ENE	2	6	6	3	3	1	21
E	4	3	3	3	1	0	14
ESE	0	2	2	2	5	3	14
SE	1	8	6	10	8	3	36
SSE	2	0	2	10	13	15	42
S	0	1	3	3	16	8	31
SSW	1	1	9	24	19	16	70
SW	0	1	11	10	11	4	37
WSW	0	2	20	13	7	1	43
W	0	1	18	10	1	3	33
WNW	1	5	24	8	1	0	39
NW	1	5	9	5	0	0	20
NNW	1	4	9	12	0	0	26
Variable	0	0	0	0	0	0	0
Total	14	50	141	120	89	54	468

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	2	1	0	0	5
NNE	0	2	0	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	0	2	0	0	0	0	2
E	0	0	5	1	0	0	6
ESE	1	2	4	3	6	0	16
SE	0	5	5	7	5	0	22
SSE	0	2	1	1	5	1	10
S	0	0	0	1	1	0	2
SSW	0	0	2	7	4	0	13
SW	0	1	5	9	0	0	15
WSW	1	3	2	0	0	0	6
W	1	2	4	1	0	0	8
WNW	0	1	6	0	0	0	7
NW	0	4	7	0	0	0	11
NNW	0	1	1	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	3	27	44	31	21	1	127

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: January - March 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	2	0	0	0	0	2
NE	0	1	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	1	1	4	2	0	8
SE	0	0	7	7	4	0	18
SSE	0	0	5	0	3	0	8
S	0	0	0	1	0	0	1
SSW	0	1	0	0	0	0	1
SW	0	0	2	0	0	0	2
WSW	0	0	0	0	0	0	0
W	0	1	1	0	0	0	2
WNW	0	0	1	0	0	0	1
NW	0	0	5	0	0	0	5
NNW	0	4	0	0	0	0	4
Variable	1	0	0	0	0	0	1
Total	2	10	22	12	9	0	55

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 54

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	3	0	0	3
S	0	0	0	0	0	0	0
SSW	0	0	0	1	0	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	1	0	0	0	1
WNW	0	0	1	1	0	0	2
NW	0	0	0	1	0	0	1
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	2	6	0	0	8

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	1	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	2	0	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	0	0	2	0	0	2
SSE	0	0	0	2	0	0	2
S	0	0	2	2	1	0	5
SSW	0	2	1	5	1	0	9
SW	0	0	0	2	0	0	2
WSW	0	0	4	0	0	0	4
W	0	0	5	1	0	0	6
WNW	0	0	4	2	0	0	6
NW	0	0	3	2	0	0	5
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	4	20	18	2	0	44

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	1	0	0	0	1
NNE	1	1	0	0	0	0	2
NE	0	1	5	0	0	0	6
ENE	0	0	2	0	0	0	2
E	0	3	0	0	0	0	3
ESE	0	3	0	0	0	0	3
SE	0	0	1	5	0	0	6
SSE	0	0	4	7	0	0	11
S	0	3	8	0	1	0	12
SSW	0	1	1	4	1	0	7
SW	0	1	4	2	0	0	7
WSW	0	0	0	1	0	0	1
W	0	0	7	2	0	0	9
WNW	0	2	11	2	0	0	15
NW	0	0	1	2	0	0	3
NNW	0	1	3	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	1	16	48	25	2	0	92

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	12	55	13	0	0	81
NNE	1	22	48	10	0	0	81
NE	1	16	29	12	0	0	58
ENE	2	16	68	13	2	0	101
E	2	26	26	5	0	0	59
ESE	3	16	18	10	3	0	50
SE	1	21	28	5	0	0	55
SSE	1	21	27	28	4	0	81
S	1	20	45	18	14	0	98
SSW	1	9	28	15	4	0	57
SW	3	18	28	7	1	0	57
WSW	0	19	23	15	16	0	73
W	0	22	24	30	10	3	89
WNW	5	29	28	12	0	0	74
NW	1	14	36	11	1	0	63
NNW	4	21	26	2	0	0	53
Variable	0	0	0	0	0	0	0
Total	27	302	537	206	55	3	1130

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	4	16	7	0	0	0	27
NNE	4	10	3	0	0	0	17
NE	3	4	9	0	0	0	16
ENE	2	17	15	3	0	0	37
E	4	60	25	1	0	0	90
ESE	4	20	27	4	0	0	55
SE	3	27	12	7	0	0	49
SSE	4	25	47	23	0	0	99
S	4	30	36	8	1	0	79
SSW	6	14	16	8	0	0	44
SW	4	6	8	2	0	0	20
WSW	4	6	5	3	0	0	18
W	4	7	8	1	0	0	20
WNW	5	34	5	0	0	0	44
NW	6	24	6	0	0	0	36
NNW	8	14	3	0	0	0	25
Variable	0	0	0	0	0	0	0
Total	69	314	232	60	1	0	676

Hours of calm in this stability class: 2
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	7	0	0	0	0	8
NNE	4	3	2	0	0	0	9
NE	0	2	0	0	0	0	2
ENE	1	1	3	0	0	0	5
E	1	11	0	1	0	0	13
ESE	2	20	3	0	0	0	25
SE	5	12	2	1	0	0	20
SSE	1	15	14	0	0	0	30
S	3	4	4	0	0	0	11
SSW	4	3	0	0	0	0	7
SW	7	1	0	0	0	0	8
WSW	4	2	0	0	0	0	6
W	9	1	1	0	0	0	11
WNW	4	1	0	0	0	0	5
NW	6	3	0	0	0	0	9
NNW	7	4	0	0	0	0	11
Variable	0	0	0	0	0	0	0
Total	59	90	29	2	0	0	180

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	0	0	0	0	2
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	1	7	3	0	0	0	11
SE	0	3	1	0	0	0	4
SSE	0	0	0	0	0	0	0
S	2	2	0	0	0	0	4
SSW	4	1	0	0	0	0	5
SW	2	0	0	0	0	0	2
WSW	3	0	0	0	0	0	3
W	5	0	0	0	0	0	5
WNW	3	0	0	0	0	0	3
NW	4	0	0	0	0	0	4
NNW	0	3	0	0	0	0	3
Variable	0	0	0	0	0	0	0
Total	24	18	4	0	0	0	46

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	1	2	0	3
S	0	0	0	0	0	0	0
SSW	0	0	0	1	0	0	1
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0
W	0	0	0	1	0	0	1
WNW	0	0	0	3	0	0	3
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	0	6	2	0	8

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	1	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	2	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	2	2
SSE	0	0	0	0	2	0	2
S	0	0	1	3	0	0	4
SSW	0	0	3	0	5	3	11
SW	0	0	0	0	1	0	1
WSW	0	0	1	4	0	0	5
W	0	0	2	4	0	0	6
WNW	0	0	2	2	1	0	5
NW	0	0	0	4	1	0	5
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	12	17	10	5	44

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	1	0	1	0	0	2
NNE	0	0	0	0	0	0	0
NE	0	1	5	0	0	0	6
ENE	0	0	2	1	0	0	3
E	0	3	0	0	0	0	3
ESE	0	1	2	0	0	0	3
SE	0	0	1	1	3	1	6
SSE	0	0	1	6	4	0	11
S	0	1	8	1	1	0	11
SSW	0	0	1	3	3	1	8
SW	0	0	1	4	2	0	7
WSW	0	0	0	1	0	0	1
W	0	0	2	7	1	0	10
WNW	0	1	6	8	1	0	16
NW	0	0	1	0	0	0	1
NNW	0	1	3	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	0	9	33	33	15	2	92

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	7	26	35	8	0	77
NNE	0	11	18	42	7	1	79
NE	1	5	17	21	16	3	63
ENE	1	7	19	39	12	4	82
E	1	10	34	33	7	1	86
ESE	2	11	10	14	7	7	51
SE	0	14	24	17	7	2	64
SSE	0	13	11	14	26	10	74
S	0	13	16	28	17	14	88
SSW	0	6	10	35	13	7	71
SW	3	3	18	21	6	2	53
WSW	0	6	17	29	4	16	72
W	1	13	22	27	23	11	97
WNW	1	16	21	16	10	0	64
NW	3	3	18	26	8	7	65
NNW	2	6	16	20	0	0	44
Variable	0	0	0	0	0	0	0
Total	16	144	297	417	171	85	1130

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	4	6	13	0	0	25
NNE	0	7	7	15	0	0	29
NE	1	3	3	10	1	0	18
ENE	0	0	11	16	5	1	33
E	1	7	41	24	9	1	83
ESE	0	3	9	27	15	3	57
SE	0	3	13	18	12	3	49
SSE	0	2	12	12	36	19	81
S	0	5	15	23	25	4	72
SSW	1	3	11	32	20	1	68
SW	1	8	10	13	2	1	35
WSW	1	3	4	6	3	0	17
W	2	2	4	8	2	0	18
WNW	0	2	16	12	2	0	32
NW	0	3	15	27	0	0	45
NNW	1	4	4	6	0	0	15
Variable	0	0	0	0	0	0	0
Total	10	59	181	262	132	33	677

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	2	2	3	0	0	8
NNE	0	0	1	6	2	0	9
NE	1	2	0	1	0	0	4
ENE	2	2	1	1	1	0	7
E	0	0	1	7	1	0	9
ESE	2	1	2	11	0	1	17
SE	0	2	5	16	3	0	26
SSE	0	1	5	6	5	3	20
S	0	3	7	8	8	0	26
SSW	0	0	2	5	0	0	7
SW	0	2	8	0	0	0	10
WSW	0	0	5	1	0	0	6
W	0	1	2	2	1	0	6
WNW	0	1	5	2	0	0	8
NW	1	1	2	2	0	0	6
NNW	1	0	4	6	0	0	11
Variable	0	0	0	0	0	0	0
Total	8	18	52	77	21	4	180

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: April - June 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	1	1	0	0	2
NNE	0	1	1	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	1	0	0	1
ESE	0	0	1	0	1	0	2
SE	0	0	1	7	0	1	9
SSE	0	1	1	2	0	0	4
S	0	2	1	1	0	0	4
SSW	0	1	1	0	0	0	2
SW	0	0	0	0	0	0	0
WSW	0	0	1	1	0	0	2
W	0	0	3	0	0	0	3
WNW	1	1	4	0	0	0	6
NW	0	1	3	2	0	0	6
NNW	0	1	2	1	0	0	4
Variable	0	0	0	0	0	0	0
Total	1	8	20	16	1	1	47

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 5

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	1	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	1	0	0	0	1
ESE	0	0	3	0	0	0	3
SE	0	1	0	0	0	0	1
SSE	0	1	1	0	0	0	2
S	0	0	2	1	0	0	3
SSW	0	2	5	0	0	0	7
SW	0	3	2	0	0	0	5
WSW	0	1	1	3	0	0	5
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	1	0	0	0	1
NNW	0	1	0	2	0	0	3
Variable	0	0	0	0	0	0	0
Total	0	10	16	6	0	0	32

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	1	4	0	0	0	5
NNE	0	1	3	0	0	0	4
NE	0	5	0	0	0	0	5
ENE	0	0	0	0	0	0	0
E	0	5	3	0	0	0	8
ESE	0	2	0	0	0	0	2
SE	0	1	3	0	0	0	4
SSE	0	0	6	0	0	0	6
S	0	1	1	1	1	0	4
SSW	0	2	7	0	0	0	9
SW	0	3	7	1	0	0	11
WSW	0	1	3	0	0	0	4
W	0	0	1	1	0	0	2
WNW	0	0	0	0	0	0	0
NW	0	1	0	0	0	0	1
NNW	0	0	1	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	23	39	3	1	0	66

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	5	2	0	0	0	7
NNE	0	2	3	0	0	0	5
NE	0	1	0	1	0	0	2
ENE	0	0	0	0	0	0	0
E	0	2	2	0	0	0	4
ESE	0	1	0	0	0	0	1
SE	0	11	4	0	0	0	15
SSE	0	0	2	1	0	0	3
S	0	2	2	0	0	0	4
SSW	0	2	6	1	0	0	9
SW	0	7	8	1	0	0	16
WSW	0	0	5	1	0	0	6
W	0	2	2	1	0	0	5
WNW	0	1	0	0	0	0	1
NW	0	1	5	0	0	0	6
NNW	0	2	3	2	0	0	7
Variable	0	0	0	0	0	0	0
Total	0	39	44	8	0	0	91

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 1
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	30	23	0	0	0	56
NNE	3	30	17	1	0	0	51
NE	1	14	5	3	0	0	23
ENE	4	10	12	0	0	0	26
E	8	38	10	0	0	0	56
ESE	4	33	19	0	0	0	56
SE	3	36	8	0	0	0	47
SSE	1	23	23	0	0	0	47
S	2	25	11	4	0	0	42
SSW	3	30	30	4	0	0	67
SW	3	40	32	2	0	0	77
WSW	2	25	32	8	0	0	67
W	5	17	21	0	0	0	43
WNW	3	23	22	2	0	0	50
NW	5	28	19	1	0	0	53
NNW	2	30	31	1	0	0	64
Variable	0	0	0	0	0	0	0
Total	52	432	315	26	0	0	825

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	4	27	6	0	0	0	37
NNE	2	13	4	0	0	0	19
NE	6	9	4	0	0	0	19
ENE	7	8	10	0	0	0	25
E	8	51	0	0	0	0	59
ESE	3	19	5	0	0	0	27
SE	7	19	3	0	0	0	29
SSE	6	28	21	0	0	0	55
S	5	41	8	0	0	0	54
SSW	8	35	27	1	0	0	71
SW	9	44	18	0	0	0	71
WSW	5	15	5	0	0	0	25
W	7	13	6	0	0	0	26
WNW	9	19	5	0	0	0	33
NW	6	13	0	1	0	0	20
NNW	10	28	2	0	0	0	40
Variable	0	0	1	0	0	0	1
Total	102	382	125	2	0	0	611

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	10	0	0	0	0	13
NNE	1	6	0	0	0	0	7
NE	1	0	0	0	0	0	1
ENE	3	3	0	0	0	0	6
E	7	46	0	0	0	0	53
ESE	7	29	5	0	0	0	41
SE	5	30	2	0	0	0	37
SSE	5	46	8	0	0	0	59
S	18	42	0	0	0	0	60
SSW	21	8	1	0	0	0	30
SW	7	2	0	0	0	0	9
WSW	6	0	0	0	0	0	6
W	9	5	0	0	0	0	14
WNW	14	3	0	0	0	0	17
NW	10	4	0	0	0	0	14
NNW	7	15	0	0	0	0	22
Variable	0	0	0	0	0	0	0
Total	124	249	16	0	0	0	389

Hours of calm in this stability class: 1
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	2	0	0	0	0	0	2
ENE	2	0	0	0	0	0	2
E	8	16	0	0	0	0	24
ESE	2	25	8	0	0	0	35
SE	4	13	0	0	0	0	17
SSE	3	6	1	0	0	0	10
S	11	10	0	0	0	0	21
SSW	14	1	0	0	0	0	15
SW	5	0	0	0	0	0	5
WSW	13	0	0	0	0	0	13
W	14	1	0	0	0	0	15
WNW	10	0	0	0	0	0	10
NW	10	1	0	0	0	0	11
NNW	4	0	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	102	73	9	0	0	0	184

Hours of calm in this stability class: 5
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	1	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	1	0	0	0	1
ESE	0	0	1	2	0	0	3
SE	0	0	1	0	0	0	1
SSE	0	0	0	1	0	0	1
S	0	0	1	2	0	1	4
SSW	0	0	3	4	0	0	7
SW	0	1	3	2	0	0	6
WSW	0	0	0	1	3	0	4
W	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	2	0	2
NNW	0	1	0	0	1	0	2
Variable	0	0	0	0	0	0	0
Total	0	3	10	12	6	1	32

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	4	1	0	0	5
NNE	0	0	3	0	0	0	3
NE	0	0	6	0	0	0	6
ENE	0	0	0	0	0	0	0
E	0	2	6	0	0	0	8
ESE	0	1	1	0	0	0	2
SE	0	0	2	3	0	0	5
SSE	0	0	0	4	0	0	4
S	0	0	0	1	1	1	3
SSW	0	0	6	5	0	0	11
SW	0	1	3	7	1	0	12
WSW	0	0	1	2	0	0	3
W	0	0	0	2	0	0	2
WNW	0	0	0	0	0	0	0
NW	0	0	0	1	0	0	1
NNW	0	1	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	5	32	26	2	1	66

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	2	0	0	0	4
NNE	0	2	3	3	0	0	8
NE	0	0	1	0	1	0	2
ENE	0	0	0	0	0	0	0
E	0	0	4	0	0	0	4
ESE	0	2	1	0	0	0	3
SE	0	1	10	2	0	0	13
SSE	0	0	1	1	0	0	2
S	0	0	3	2	0	0	5
SSW	0	2	4	3	1	0	10
SW	0	1	10	4	2	0	17
WSW	0	0	1	3	0	0	4
W	0	0	3	2	0	0	5
WNW	0	0	1	0	0	0	1
NW	0	0	1	4	0	0	5
NNW	0	2	2	2	2	0	8
Variable	0	0	0	0	0	0	0
Total	0	12	47	26	6	0	91

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 1
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	15	21	12	0	0	48
NNE	2	12	23	16	0	0	53
NE	3	10	9	4	5	0	31
ENE	0	8	4	10	1	0	23
E	2	15	37	5	0	0	59
ESE	2	15	30	7	0	0	54
SE	1	15	27	6	0	0	49
SSE	1	6	27	14	0	0	48
S	2	8	17	6	3	1	37
SSW	1	12	31	22	5	0	71
SW	3	15	34	23	6	0	81
WSW	1	15	22	28	5	0	71
W	3	9	24	2	0	0	38
WNW	0	15	21	13	3	0	52
NW	0	10	15	19	1	0	45
NNW	3	15	28	18	1	0	65
Variable	0	0	0	0	0	0	0
Total	24	195	370	205	30	1	825

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	5	8	11	0	0	24
NNE	0	5	8	21	3	0	37
NE	1	6	6	6	0	0	19
ENE	0	9	7	9	2	0	27
E	1	11	38	12	2	0	64
ESE	1	6	3	4	1	0	15
SE	0	2	9	15	2	0	28
SSE	1	2	8	18	13	0	42
S	1	2	10	16	8	0	37
SSW	2	1	22	53	12	0	90
SW	1	3	25	41	14	0	84
WSW	1	3	13	10	0	0	27
W	1	3	12	12	0	0	28
WNW	1	3	11	14	1	0	30
NW	0	3	10	11	0	0	24
NNW	0	2	13	20	0	0	35
Variable	0	0	0	1	0	0	1
Total	11	66	203	274	58	0	612

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	8	7	0	0	15
NNE	0	2	6	4	1	0	13
NE	0	1	8	3	0	0	12
ENE	0	2	5	0	0	0	7
E	0	5	20	13	4	0	42
ESE	0	0	4	17	12	1	34
SE	1	3	5	16	9	0	34
SSE	0	1	5	14	14	0	34
S	1	2	8	28	10	0	49
SSW	1	1	11	44	1	0	58
SW	0	1	10	7	0	0	18
WSW	1	2	15	2	0	0	20
W	1	2	4	3	0	0	10
WNW	0	2	3	6	0	0	11
NW	1	0	5	9	0	0	15
NNW	0	1	9	8	0	0	18
Variable	0	0	0	0	0	0	0
Total	6	25	126	181	51	1	390

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: July - September 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	7	2	0	0	9
NNE	0	0	2	0	0	0	2
NE	1	2	1	0	0	0	4
ENE	2	2	0	0	0	0	4
E	2	8	3	1	3	0	17
ESE	0	4	5	10	13	0	32
SE	0	0	9	10	12	0	31
SSE	0	5	1	5	9	0	20
S	0	1	3	4	1	0	9
SSW	0	1	5	9	0	0	15
SW	0	0	8	3	0	0	11
WSW	0	5	4	1	0	0	10
W	0	4	11	1	0	0	16
WNW	0	0	3	1	0	0	4
NW	0	0	0	0	0	0	0
NNW	0	0	4	1	0	0	5
Variable	0	0	0	0	0	0	0
Total	5	32	66	48	38	0	189

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	1	1	0	0	0	2
ESE	0	1	1	0	0	0	2
SE	0	7	7	0	0	0	14
SSE	0	10	6	3	0	0	19
S	0	2	2	0	0	0	4
SSW	0	0	1	3	0	0	4
SW	0	0	0	3	0	0	3
WSW	0	1	1	0	0	0	2
W	0	0	0	3	0	0	3
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	22	19	12	0	0	53

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	1	1	4	0	0	0	6
ESE	0	1	0	0	0	0	1
SE	0	1	2	0	0	0	3
SSE	0	1	4	0	0	0	5
S	0	0	1	0	0	0	1
SSW	0	0	1	0	0	0	1
SW	0	0	2	0	0	0	2
WSW	0	0	1	1	1	0	3
W	0	2	0	2	1	0	5
WNW	0	0	1	1	0	0	2
NW	0	0	1	0	0	0	1
NNW	0	0	1	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	1	6	18	4	2	0	31

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	1	2	0	0	0	3
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	1	3	0	0	0	4
SE	0	1	3	0	0	0	4
SSE	0	3	1	1	0	0	5
S	0	2	3	0	0	0	5
SSW	0	3	2	3	0	0	8
SW	0	1	4	0	0	0	5
WSW	0	2	2	3	0	0	7
W	0	2	1	3	4	0	10
WNW	0	2	4	3	0	0	9
NW	0	2	4	0	0	0	6
NNW	0	2	3	0	0	0	5
Variable	0	0	0	0	0	0	0
Total	0	22	32	13	4	0	71

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	3	18	21	11	0	0	53
NNE	3	13	12	1	0	0	29
NE	0	4	17	3	0	0	24
ENE	1	5	21	9	0	0	36
E	2	13	9	0	0	0	24
ESE	3	7	18	3	0	0	31
SE	0	20	18	1	0	0	39
SSE	3	17	34	24	3	0	81
S	0	14	20	16	4	0	54
SSW	1	14	34	25	4	0	78
SW	5	17	48	16	0	0	86
WSW	3	21	52	23	2	0	101
W	4	29	72	38	17	1	161
WNW	9	22	54	26	6	0	117
NW	10	36	59	12	0	0	117
NNW	2	25	46	20	0	0	93
Variable	0	0	0	0	0	0	0
Total	49	275	535	228	36	1	1124

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	4	2	0	0	0	8
NNE	1	5	0	0	0	0	6
NE	2	3	4	0	0	0	9
ENE	3	5	6	1	0	0	15
E	0	17	2	0	0	0	19
ESE	2	9	8	2	0	0	21
SE	2	26	31	1	0	0	60
SSE	1	17	45	9	0	0	72
S	1	15	18	5	0	0	39
SSW	6	24	30	27	2	0	89
SW	9	44	14	17	0	0	84
WSW	7	36	11	0	0	0	54
W	6	42	32	11	0	0	91
WNW	8	34	17	3	0	0	62
NW	4	26	3	0	0	0	33
NNW	2	8	6	0	0	0	16
Variable	1	0	0	0	0	0	1
Total	57	315	229	76	2	0	679

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	2	1	1	0	0	0	4
NNE	2	3	0	0	0	0	5
NE	2	0	0	0	0	0	2
ENE	0	1	0	0	0	0	1
E	2	4	0	0	0	0	6
ESE	2	4	4	0	0	0	10
SE	2	10	2	0	0	0	14
SSE	4	10	2	0	0	0	16
S	4	6	4	0	0	0	14
SSW	2	15	1	0	0	0	18
SW	8	5	0	0	0	0	13
WSW	3	2	0	0	0	0	5
W	8	11	0	0	0	0	19
WNW	10	4	0	0	0	0	14
NW	13	2	0	0	0	0	15
NNW	1	1	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	65	79	14	0	0	0	158

Hours of calm in this stability class: 3
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	4	0	0	0	0	0	4
NNE	1	0	0	0	0	0	1
NE	2	0	0	0	0	0	2
ENE	2	1	0	0	0	0	3
E	1	2	0	0	0	0	3
ESE	2	6	4	0	0	0	12
SE	4	6	0	0	0	0	10
SSE	3	4	0	0	0	0	7
S	3	9	0	0	0	0	12
SSW	3	2	0	0	0	0	5
SW	2	0	0	0	0	0	2
WSW	1	0	0	0	0	0	1
W	5	0	0	0	0	0	5
WNW	5	0	0	0	0	0	5
NW	6	0	0	0	0	0	6
NNW	1	0	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	45	30	4	0	0	0	79

Hours of calm in this stability class: 4
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	2	0	0	0	2
ESE	0	0	1	0	0	0	1
SE	0	0	5	2	0	0	7
SSE	0	0	7	10	1	2	20
S	0	0	3	5	2	0	10
SSW	0	0	0	1	3	0	4
SW	0	0	0	0	4	0	4
WSW	0	0	1	1	0	0	2
W	0	0	0	1	2	0	3
WNW	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	19	20	12	2	53

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	3	0	0	0	3
ESE	0	0	3	0	0	0	3
SE	0	0	2	2	0	0	4
SSE	0	0	0	3	1	0	4
S	0	0	0	2	0	0	2
SSW	0	0	1	0	0	0	1
SW	0	0	0	2	0	0	2
WSW	0	0	0	2	0	0	2
W	0	0	2	0	3	1	6
WNW	0	0	0	2	0	0	2
NW	0	0	1	0	0	0	1
NNW	0	0	1	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	0	13	13	4	1	31

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Speed (in mph)

Wind Direction	1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	0	1	0	0	1
NNE	0	0	0	0	0	0	0
NE	0	0	0	3	0	0	3
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	2	0	0	2
SE	0	0	3	3	0	0	6
SSE	0	0	2	0	2	0	4
S	0	1	3	2	0	0	6
SSW	0	0	2	3	3	0	8
SW	0	0	1	4	0	0	5
WSW	0	2	0	4	1	0	7
W	0	1	0	2	1	4	8
WNW	0	2	3	2	4	0	11
NW	0	1	5	0	0	0	6
NNW	0	0	4	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	0	7	23	26	11	4	71

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	1	9	12	23	7	0	52
NNE	2	10	10	16	0	0	38
NE	1	3	5	9	8	0	26
ENE	0	1	6	20	6	0	33
E	2	8	13	11	1	0	35
ESE	1	1	7	10	3	0	22
SE	1	3	14	14	2	0	34
SSE	0	3	29	22	15	8	77
S	1	3	14	18	14	11	61
SSW	0	10	12	29	19	8	78
SW	2	1	28	27	25	0	83
WSW	2	7	28	39	12	2	90
W	3	9	42	80	24	12	170
WNW	3	10	21	48	20	11	113
NW	3	6	41	47	22	1	120
NNW	4	9	17	47	15	0	92
Variable	0	0	0	0	0	0	0
Total	26	93	299	460	193	53	1124

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	2	5	2	0	0	9
NNE	0	3	0	2	0	0	5
NE	1	5	2	2	0	0	10
ENE	0	2	2	6	6	0	16
E	0	0	4	5	2	0	11
ESE	0	0	5	6	7	0	18
SE	0	0	8	14	13	1	36
SSE	1	1	5	22	29	5	63
S	1	1	6	25	17	6	56
SSW	0	1	6	27	30	9	73
SW	0	2	23	25	25	14	89
WSW	0	2	31	25	7	0	65
W	0	1	31	39	11	1	83
WNW	0	3	21	41	5	0	70
NW	0	5	18	24	1	0	48
NNW	0	0	13	14	0	0	27
Variable	0	0	0	0	0	0	0
Total	3	28	180	279	153	36	679

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	3	2	1	0	6
NNE	0	1	1	2	0	0	4
NE	1	1	1	2	0	0	5
ENE	3	1	0	0	0	0	4
E	0	2	1	1	0	0	4
ESE	0	1	0	1	4	0	6
SE	0	4	2	0	6	0	12
SSE	0	0	0	4	6	0	10
S	0	0	1	3	5	1	10
SSW	0	2	2	3	2	0	9
SW	0	1	4	11	0	0	16
WSW	0	1	8	4	0	0	13
W	0	3	6	3	0	0	12
WNW	0	2	11	16	0	0	29
NW	0	1	7	5	0	0	13
NNW	1	1	3	3	0	0	8
Variable	0	0	0	0	0	0	0
Total	5	21	50	60	24	1	161

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

Byron Generating Station

Period of Record: October - December 2013
Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph) 1-3	4-7	8-12	13-18	19-24	> 24	Total
N	0	0	2	0	0	0	2
NNE	1	0	0	1	0	0	2
NE	1	2	3	2	0	0	8
ENE	0	3	2	0	0	0	5
E	1	8	0	0	0	0	9
ESE	0	0	1	0	1	0	2
SE	0	1	0	2	6	0	9
SSE	0	0	2	3	1	0	6
S	0	0	6	4	1	0	11
SSW	1	1	1	2	0	0	5
SW	0	0	4	1	0	0	5
WSW	0	0	1	2	0	0	3
W	0	0	6	0	0	0	6
WNW	0	0	5	1	0	0	6
NW	0	0	0	1	0	0	1
NNW	0	0	3	0	0	0	3
Variable	0	0	0	0	0	0	0
Total	4	15	36	19	9	0	83

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 6

APPENDIX G

ERRATA DATA

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Due to an incorrect setting on gamma detector 08 discovered on April 9, 2013, 3.29 rather than 4.66 was used in the MDC calculation. Nonconformance 13-07 was initiated and corrective actions have been implemented to address this issue. All samples counted on detector 08 were reprocessed using the correct calculation. As a result, all MDCs for these samples have increased by 41.6%. The previously reported activities and uncertainties were not affected. In some cases, the increased MDC resulted in missed LLDs. All samples with MDCs affected by this issue are listed below. The samples with missed LLDs are shown in the table for 2012 and 2013. All other required LLDs were met.

2012

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
BY-18-1	1/10/2012	1/10/2012	Groundwater				
BY-35	1/10/2012	1/10/2012	Groundwater				
BY-29	3/6/2012	3/27/2012	Surface Water				
BY-37	4/10/2012	4/10/2012	Groundwater				
BY-12	4/3/2012	4/24/2012	Surface Water				
BY-AR-10	5/14/2012	5/14/2012	RGPP	I-131	<15	<15.9	pCi/L
BY-TW-13	5/16/2012	5/16/2012	RGPP	I-131	<15	<18.07	pCi/L
BY-26-1	5/29/2012	5/29/2012	Milk				
BY-26-1	6/26/2012	6/26/2012	Milk	La-140	<15	<15.03	pCi/L
BY-29	6/5/2012	6/26/2012	Surface Water	I-131	<15	<21.18	pCi/L
BY-01	4/3/2012	7/3/2012	Air Particulate				
BY-30-1	7/24/2012	7/24/2012	Milk	La-140	<15	<17.99	pCi/L
BY-QUAD 2	8/27/2012	8/27/2012	Vegetation				
BY-29	12/4/2012	12/18/2012	Surface Water	I-131	<15	<16.65	pCi/L
BY-06	10/2/2012	1/2/2013	Air Particulate				

2013

CLIENT ID	START DATE	END DATE	MATRIX	NUCLIDE	REQUIRED MDC	REVISED MDC	UNITS
BY-14-1	1/8/2013	1/8/2013	Groundwater				

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APPENDIX H

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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Docket No: 50-454
50-455

BYRON NUCLEAR GENERATING STATION
UNITS 1 and 2

Annual Radiological
Groundwater Protection Program Report

1 January Through 31 December 2013

Prepared By

Teledyne Brown Engineering
Environmental Services

Byron Nuclear Generating Station
Byron, IL 61010

May 2014

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Appendices

I. Summary and Conclusions

In 2006, Exelon instituted a comprehensive monitoring program to evaluate the impact of station operations on groundwater in the vicinity of Byron Nuclear Generating Station. The monitoring was conducted in two phases. Phase 1 of the monitoring was part of a comprehensive study initiated by Exelon to determine whether groundwater or surface water at and in the vicinity of Byron Nuclear Generating Station had been adversely impacted by any releases of radionuclides. Phase 1 was conducted by Conestoga Rovers and Associates (CRA) and the conclusions were made available to state and federal regulators as well as the public.

Phase 2 of the RGPP was conducted by Exelon corporate and station personnel to initiate follow up of Phase 1 and begin long-term monitoring at groundwater locations selected during Phase 1. This is the eighth in a series of annual reports on the status of the Radiological Groundwater Protection Program (RGPP) conducted at Byron Nuclear Generating Station. This report covers groundwater samples, collected from the environment, both on and off station property in 2013. During that time period, 110 analyses were performed on 50 samples from 15 locations.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in the Offsite Dose Calculation Manual (ODCM) in any of the groundwater samples tested. In the case of tritium, Exelon specified that its laboratories achieve a lower limit of detection 10 times lower than that required by federal regulation.

In 2013, fifteen (15) Radiological Groundwater Protection Program (RGPP) monitoring wells were sampled. The samples were obtained in March, May, August, and November and analyzed for tritium. In addition, a study of gamma, beta, and alpha radioisotopes was performed in accordance with Nuclear Energy Institute (NEI) 07-07, Groundwater Protection Initiative, for the samples obtained in May. None of the May samples showed concentrations of radionuclides above what is considered background levels. Three wells contained levels of tritium above the lower limit of detection (LLD) of 200 pCi/L. They were: AR-4 (818 pCi/L in March, 523 pCi/L in May, 746 pCi/L in August, 686 pCi/L in November), AR-7 (245 pCi/L in March, 351 pCi/L in May, 306 pCi/L in August, 310 pCi/L in November), and AR-11 (850 pCi/L in March, 933 pCi/L in May, 945 pCi/L in August, 912 pCi/L in November). Wells AR-4 and AR-11 are near the Circulating Water Blowdown piping, where historical leakage through vacuum breakers was known to have occurred. Both of these wells are showing a slow but gradual decrease in tritium concentration since being first sampled in 2006. Well AR-7 is located on-site, just west plant structures. Tritium has been measured in this well just above detectable limits on an intermittent basis since

the well was first drilled in 2006. The tritium in this well is believed to have originated from precipitation recapture of permitted gaseous releases of tritium from the plant that had entered the well during rainfall events as a result of improperly compacted soil around the well during original installation. The clay-based soil around the well was repacked in 2012. The tritium present in this well is at or below tritium levels that have been measured in rainwater as a result of precipitation recapture from permitted gaseous releases and it is not believed to be the result of new leak(s). Should the water in this aquifer migrate to off-site wells used for drinking, the off-site dose consequence from tritium present in any of these wells is negligible.

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

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater samples during the second sampling in 2013. Gross Alpha (dissolved) was not detected in any of 8 groundwater locations. Gross Alpha (suspended) was detected in 2 of 8 groundwater locations. The concentrations ranged from 0.8 to 3.8 pCi/L. Gross Beta (dissolved) was detected in all 8 groundwater locations. The concentrations ranged from 2.4 to 15.1 pCi/L. Gross Beta (suspended) was detected in 2 of the 8 groundwater locations. The concentrations ranged from 2.3 to 3.0 pCi/L. The concentrations of Gross Alpha and Gross Beta, which are slightly above detectable levels, are considered to be background and are not the result of plant effluents.

Hard-To-Detect analyses were not performed in 2013.

In assessing all the data gathered for this report, it was concluded that the operation of Byron Nuclear Generating Station had no adverse radiological impact on the environment, and there are no known active releases into the groundwater at Byron Nuclear Generating Station.

II. Introduction

The Byron Station, a two-unit PWR station, is located about two miles east of the Rock River and approximately three miles southwest of Byron in Ogle County, Illinois. The reactors are designed to have capacities of 1,268 and 1,241 MW gross, respectively. Unit One loaded fuel in November 1984 and went on line February 2, 1985. Unit Two went on line January 9, 1987.

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

A. Objectives of the RGPP

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

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

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

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

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

5. Regularly assess analytical results to identify adverse trends.

6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Byron Nuclear Generating Station as discussed below:

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

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

3. Byron Nuclear Generating Station will continue to perform routine sampling and radiological analysis of water from selected locations.

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

5. Byron Nuclear Generating 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 Figure A–1, Appendix A.

Groundwater

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures following EPA methods. Only groundwater is 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, industry cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables as data are received.

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 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 to analyze the environmental samples for radioactivity for the Byron Nuclear Generating Station RGPP in 2013.

In order to achieve the stated objectives, the current program includes the following analyses (as required by procedure):

1. Concentrations of gamma emitters in groundwater.

2. Concentrations of strontium in groundwater.

3. Concentrations of tritium in groundwater.

4. Concentrations of gross alpha and gross beta in groundwater.

B. Data Interpretation

The radiological data collected prior to Byron Nuclear Generating Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Byron Nuclear Generating Station was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

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

2. Laboratory Measurements Uncertainty

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

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

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the AREOR.

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, and foodstuffs. The results of the monitoring were detailed in the report entitled, Environmental Radiological Monitoring for Byron Nuclear Generating Nuclear Power Station, Commonwealth Edison Company, Annual Report 1984, April 1985.

The pre-operational REMP contained analytical results from samples collected from the surface water and groundwater. All groundwater samples listed in the pre-Operational REMP report were <200 pCi/L.

1. Background Concentrations of Tritium

The purpose of the following discussion is to summarize background measurements of tritium in various media performed by others. Additional detail may be found by consulting references (CRA 2006).

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. Water from previous years and decades is naturally captured in groundwater, so some well water sources today are affected by the surface water from the 1960s that was elevated in tritium.

c. Surface Water Data

Tritium concentrations are routinely measured in large surface water bodies, including Lake Michigan and the Mississippi River. Illinois surface water data were typically less than 100 pCi/L.

The USEPA RadNet surface water data typically has a reported 'Combined Standard Uncertainty' of 35 to 50 pCi/L. According to USEPA, this corresponds to a ± 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. Groundwater Results

Groundwater

Samples were collected from on and off-site wells throughout the year in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Samples from all locations were analyzed for tritium activity (Table B-I.1, Appendix B). Tritium values ranged from less than the detection limit to 1,210 pCi/L. Outside of the station boundary, tritium concentrations were all less than detection limit (<200 pCi/L). This is based on evaluation of groundwater sample results obtained as part of the Byron Station REMP. In 2013, fifteen (15) Radiological Groundwater Protection Program (RGPP) monitoring wells were sampled. The samples were obtained in March, May, August and November and analyzed for tritium. In addition, a study of gamma, beta and alpha radioisotopes was performed in accordance with Nuclear Energy Institute (NEI) 07-07, Groundwater Protection Initiative, for the samples obtained in May. Three wells contained levels of tritium above the lower limit of detection (LLD) of 200 pCi/L. They were: AR-4 (818 pCi/L in March, 523 pCi/L in May, 746 pCi/L in August, 686 pCi/L in November), AR-7 (245 pCi/L in March, 351 pCi/L in May, 306 pCi/L in August, 310 pCi/L in November), and AR-11 (850 pCi/L in March, 933 pCi/L in May, 945 pCi/L in August, 912 pCi/L in November). Wells AR-4 and AR-11 are near the Circulating Water Blowdown piping, where historical leakage through vacuum breakers was known to have occurred. Both of these wells are showing a slow but gradual decrease in tritium concentration since being first sampled in 2006. Well AR-7 is located on-site, just west plant structures. Tritium has been measured in this well just above detectable limits on an intermittent basis since the well was first drilled in 2006. The tritium in this well is believed to have originated from precipitation recapture of permitted gaseous releases of tritium from the plant that had entered the well during rainfall events as a result of improperly compacted soil around the well during original installation. The clay-based soil around the well was repacked in 2012. The tritium present in this well is at or below tritium levels that have been measured in rainwater as a result of precipitation recapture from permitted gaseous releases and it is not believed to be the result of new leak(s). The tritium detected in groundwater samples has been isolated to the Galena-Platteville aquifer, which is isolated from the deeper regional groundwater aquifer by the semi-confining Glenwood Formation. Groundwater quality data from production wells and monitoring wells at the station located below this aquifer do not indicate concentrations of tritium greater than the LLD of 200 pCi/L. As such, the tritium impact is limited to the Galena-Platteville aquifer.

Strontium

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

Gross Alpha and Gross Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater surface water samples during the second sampling in 2013. Gross Alpha (dissolved) was not detected in any of 8 groundwater locations. Gross Alpha (suspended) was detected in 2 of 8 groundwater locations. The concentrations ranged from 0.8 to 3.8 pCi/L. Gross Beta (dissolved) was detected in all 8 groundwater locations. The concentrations ranged from 2.4 to 15.1 pCi/L. Gross Beta (suspended) was detected in 2 of the 8 groundwater locations. The concentrations ranged from 2.3 to 3.0 pCi/L. The concentrations of Gross Alpha and Gross Beta, which are slightly above detectable levels, are considered to be background and are not the result of plant effluents.

Gamma Emitters

Naturally occurring K-40 was detected in one sample at a concentration of 152 pCi/L. All other gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) in any of the samples during 2013.

Hard-To-Detect

Hard-To-Detect analyses were not performed in 2013.

B. Drinking Water Well Survey

No drinking water well surveys were conducted in 2013.

C. Summary of Results – Inter-Laboratory Comparison Program

Inter-Laboratory Comparison Program results for TBE are presented in the AREOR.

D. Leaks, Spills, and Releases

There are no new previously unidentified leaks or plumes at Byron Station. There were no new leaks, spills or releases at Byron Station in 2013.

E. Trends

Wells AR-4 and AR-11 have shown an overall decrease in tritium concentration since first sampled in 2006. Tritium has been measured in Well AR-7 since 2012, however, tritium has been previously measured in

this well and it is believed to be the result of precipitation recapture, not the result of a new spill or leak.

F. Investigations

There were no investigations that took place in 2013 as a result of groundwater sample results.

G. Actions Taken

1. Compensatory Actions

   No compensatory actions were initiated in 2013.

2. Installation of Monitoring Wells

   No new monitoring wells were installed in 2013.

3. Actions to Recover/Reverse Plumes

   No actions were undertaken to recover/reverse plumes in 2013.

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APPENDIX A

LOCATION DESIGNATION

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TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Distance and Direction, Byron Nuclear Generating Station, 2013

Site	Site Type	Temporary/Permanent	Distance and Direction
AR-1	Monitoring Well	Permanent	0.36 miles/NNW
AR-10	Monitoring Well	Permanent	0.28 miles/NE
AR-11	Monitoring Well	Permanent	1.36 miles/WNW
AR-2	Monitoring Well	Permanent	0.6 miles/NW
AR-3	Monitoring Well	Permanent	0.8 miles/NW
AR-4	Monitoring Well	Permanent	1.36 miles/WNW
AR-5	Monitoring Well	Permanent	1.92 miles/WNW
AR-6	Monitoring Well	Permanent	2.04 miles/WNW
AR-7	Monitoring Well	Permanent	0.04 miles/W
AR-8	Monitoring Well	Permanent	0.12 miles/S
AR-9	Monitoring Well	Permanent	0.24 miles/E
CAR-1	Monitoring Well	Permanent	2.25 miles/WNW
CAR-2	Monitoring Well	Permanent	1.52 miles/WNW
CAR-3	Monitoring Well	Permanent	0.16 miles/SE
DF-24 (EPA well)	Monitoring Well	Permanent	1.36 miles/WNW
GW-9	Monitoring Well	Permanent	0.9 miles/WNW
MW-1 (EPA well)	Monitoring Well	Permanent	0.6 miles/NW
MW-3 (EPA well)	Monitoring Well	Permanent	0.8 miles/NW
TW-13	Monitoring Well	Permanent	2.3 miles/WNW
TW-14	Monitoring Well	Permanent	2.25 miles/WNW
TW-15	Monitoring Well	Permanent	2.2 miles/WNW
Well 7	Monitoring Well	Permanent	0.4 miles/SE

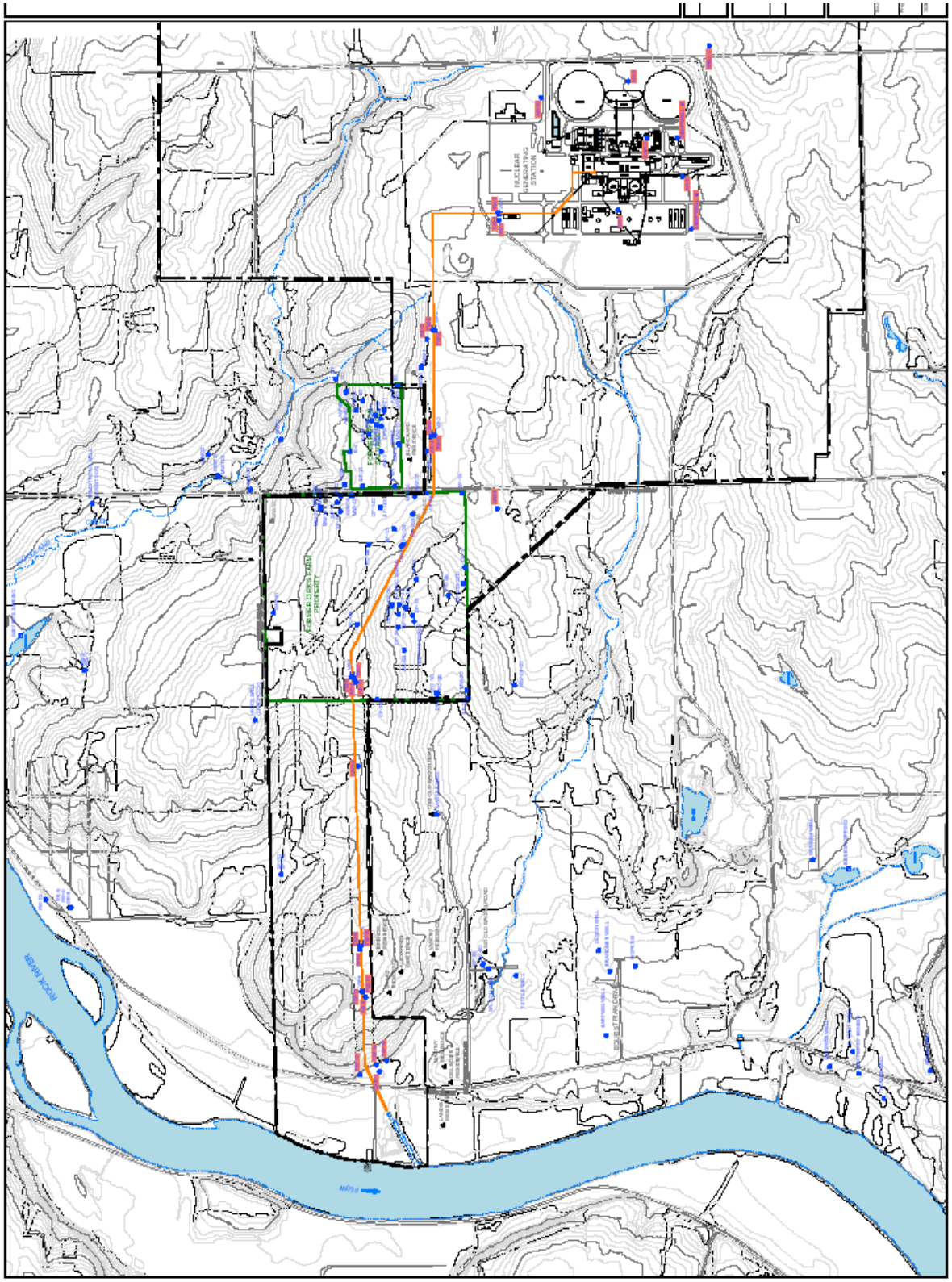

Figure A-1
Monitoring Well Locations, Byron Nuclear Generating Station, 2013

APPENDIX B

DATA TABLES

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

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)	Gr-B (Dis)	Gr-B (Sus)
AR-1	03/18/13	< 191						
AR-1	05/21/13	< 170	< 3.9	< 0.6	< 0.7	< 0.4	2.4 ± 0.9	< 1.4
AR-1	08/13/13	< 188						
AR-1	11/04/13	< 171						
AR-10	03/18/13	< 187						
AR-10	05/20/13	< 173	< 3.6	< 0.7	< 2.4	3.8 ± 1.2	2.4 ± 1.3	3.0 ± 1.2
AR-10	08/13/13	< 190						
AR-10	11/04/13	< 183						
AR-11	03/20/13	850 ± 157						
AR-11	05/22/13	933 ± 156						
AR-11	08/14/13	945 ± 168						
AR-11	11/07/13	912 ± 164						
AR-2	05/22/13	< 166						
AR-2	11/07/13	< 182						
AR-3	03/20/13	< 190						
AR-3	05/22/13	< 173	< 3.2	< 0.8	< 1.0	< 1.0	4.1 ± 1.1	< 1.6
AR-3	08/14/13	< 188						
AR-3	11/07/13	< 182						
AR-4	03/20/13	818 ± 158						
AR-4	05/22/13	523 ± 130	< 3.5	< 0.9	< 1.2	< 1.0	3.0 ± 1.1	< 1.6
AR-4	08/14/13	746 ± 156						
AR-4	11/07/13	686 ± 152						
AR-7	03/18/13	245 ± 126						
AR-7	05/20/13	351 ± 125	< 3.6	< 0.9	< 0.6	< 0.4	15.1 ± 1.3	< 1.4
AR-7	08/12/13	306 ± 134						
AR-7	11/04/13	310 ± 126						
AR-8	03/18/13	< 189						
AR-8	05/20/13	< 178	< 3.7	< 0.8	< 2.2	0.8 ± 0.6	6.7 ± 1.5	2.3 ± 1.1
AR-8	08/12/13	< 190						
AR-8	11/04/13	< 181						
AR-9	03/18/13	< 192						
AR-9	05/21/13	< 177	< 3.1	< 0.8	< 1.3	< 0.4	4.8 ± 1.2	< 1.4
AR-9	08/12/13	< 187						
AR-9	11/04/13	< 181						
CAR-1	05/22/13	< 179						
CAR-1	11/07/13	< 182						
CAR-3	03/18/13	< 188						
CAR-3	05/20/13	< 171	< 5.7	< 0.9	< 2.3	< 0.4	4.2 ± 1.4	< 1.5
CAR-3	08/12/13	< 185						
CAR-3	11/04/13	< 181						
DF-24	03/20/13	< 187						
DF-24	05/22/13	< 178						
DF-24	08/14/13	< 190						
DF-24	11/07/13	< 180						
MW-1	05/22/13	< 181						
MW-1	11/07/13	< 182						
MW-3	05/22/13	< 180						
MW-3	11/07/13	< 181						
TW-13	05/22/13	< 175						
TW-13	11/07/13	< 181						

TABLE B-I.2 **CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATION STATION, 2013**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
AR-1	05/21/13	< 21	< 32	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 23	< 8
AR-10	05/20/13	< 20	< 46	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 23	< 6
AR-11	05/22/13	< 41	< 51	< 5	< 6	< 13	< 4	< 13	< 5	< 8	< 12	< 4	< 5	< 28	< 9
AR-2	05/22/13	< 33	< 71	< 4	< 4	< 9	< 4	< 8	< 4	< 7	< 11	< 4	< 4	< 25	< 9
AR-3	05/22/13	< 44	< 78	< 5	< 5	< 12	< 5	< 9	< 5	< 8	< 13	< 5	< 4	< 26	< 10
AR-4	05/22/13	< 36	< 74	< 4	< 4	< 8	< 4	< 7	< 4	< 7	< 11	< 3	< 4	< 24	< 7
AR-7	05/20/13	< 22	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 25	< 8
AR-8	05/20/13	< 21	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 14	< 2	< 2	< 23	< 8
AR-9	05/21/13	< 18	< 31	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 12	< 2	< 2	< 19	< 7
CAR-1	05/22/13	< 35	< 36	< 4	< 4	< 10	< 4	< 8	< 4	< 7	< 11	< 4	< 4	< 26	< 8
CAR-3	05/20/13	< 19	< 16	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 13	< 2	< 2	< 21	< 7
TW-13	05/22/13	< 49	152 ± 53	< 6	< 5	< 11	< 6	< 11	< 5	< 10	< 14	< 4	< 5	< 34	< 9