



Byron Generating Station

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Byron Station, Units 1 and 2
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Subject: 2014 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 Mr. Douglas Spitzer, Regulatory Assurance Manager, at (815) 406-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "F. Kearney", written over a horizontal line.

Faber A. Kearney
Site Vice President
Byron Generating Station

FAK/JG/AC/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 2014

Prepared By

Teledyne Brown Engineering
Environmental Services



Byron Nuclear Generating Station
Byron, IL 61010

May 2015

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(ARGPPR)

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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 2014 through 31 December 2014. During that time period, 1,453 analyses were performed on 1,307 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 Ni-63 and 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 2014 through 31 December 2014.

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 2014. 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 freshwater drum, smallmouth bass, shorthead redhorse, 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 location was 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 August 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 2014. 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 2014 the BNGS REMP had a sample recovery rate in excess of 98%. 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
WG	BY-18-1	01/14/14	No sample – water turned off and no answer at house; obtained on 03/08/14.
WG	BY-32	01/14/14	No sample – water turned off and no answer at house; obtained on 03/04/14.
A/I	BY-24	01/28/14	Unable to obtain sample due to blocked access road; obtained on 01/29/14.
OSLD	BY-22-1	02/24/14	OSLD found on ground (plastic case torn); rehung.
OSLD	BY-22-1	04/01/14	Result greater than 3 sigma (outlier).
A/I	BY-04	04/29/14	Replaced vacuum gauge due to broken needle.
A/I	BY-04, BY-06	07/01/14	Lower timer reading due to power outage from storms.
A/I	All locations	07/08/14	Rotameter not delivered in time to perform scheduled field checks; performed on 07/15/14.
A/I	BY-01	07/15/14	Low timer reading due to circuit breaker trip as a result of storms.
A/I	BY-04	08/19/14	Vacuum gauge found not working; replaced.
A/I	BY-01	11/04/14	Timer would not reset; replaced.
A/I	BY-23	12/02/14	Timer would not reset; replaced.
A/I	BY-22	12/22/14	Timer would not reset; replaced.
OSLD	All locations	12/29/14	Collector unable to exchange; dosimeters exchanged 01/11/15 – 01/15/15.

Table D-2 LISTING OF MISSED SAMPLES

Sample Type	Location Code	Collection Date	Reason
SW	BY-12, BY-29	01/08/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	01/14/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	01/20/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	01/28/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	02/04/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	02/11/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	02/18/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	02/24/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	03/04/14	Sample unobtainable due to ice on river.
SW	BY-29	03/11/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	11/18/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	11/24/14	Sample unobtainable due to ice on river.
SW	BY-12, BY-29	12/02/14	Sample unobtainable due to ice on river.
OSLD	BY-309-4	12/31/14	Fourth quarter dosimeter lost in transit, no sample results.

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

There are no program changes in 2014.

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 3.0 to 7.6 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 two samples. The concentrations ranged from 352 – 985 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 freshwater drum, shorthead redhorse, smallmouth bass, 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 analyses were performed:

Nickel

The edible portion of fish samples from both locations was analyzed for Nickel-63 (Table C–III.1, Appendix C). Nickel-63 was not detected and the required LLD was met.

Gamma Spectrometry

The edible portion of fish samples from both locations was analyzed for 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 analyses were performed:

Nickel

Sediment samples from both locations were analyzed for Nickel-63 (Table C–IV.1, Appendix C). Nickel-63 was not detected and the required LLD was met.

Gamma Spectrometry

Sediment samples from both locations were analyzed for gamma emitting nuclides (Table C–IV.1, Appendix C). Cesium-137 was detected in three samples. The concentrations ranged from 68 to 183 pCi/kg dry. 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 6 to 37 E–3 pCi/m³ with a mean of 17 E–3 pCi/m³. The results from the Far Field locations (Group II) ranged from 5 to 37 E–3 pCi/m³ with a mean of 17 E–3 pCi/m³. The results from the Control location (Group III) ranged from 8 to 37 E–3 pCi/m³ with a mean of 19 E–3 pCi/m³. Comparison of the 2014 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 2014 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 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–IX.1 to C–IX.3, Appendix C.

All OSLD measurements were below 30 mR/standard quarter, with a range of 17 to 29 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 2014 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	6.1	-
C	NE	1.1	4.7	-
D	ENE	1.4	3.5	-
E	E	1.2	4.1	-
F	ESE	1.5	1.5	-
G	SE	1.7	4.3	-
H	SSE	0.7	3.5	-
J	S	0.6	0.7	-
K	SSW	0.7	1.9	-
L	SW	0.8	2.1	-
M	WSW	1.7	0.8	4.5
N	W	1.8	3.4	-
P	WNW	1.6	6.2	11.5
Q	NW	0.9	3.8	-
R	NNW	0.9	1.4	-

E. Errata Data

AREOR reports from 2010-2013 contained errors in the Appendix E, Section 1.2, Liquids Released to the Rock River, summary information. The maximum quarterly average concentrations reported for fission and activation products, tritium, and dissolved and entrained gases were incorrectly summed between the Unit 1 and Unit 2 quarterly average concentrations, which are identical because liquid releases are divided evenly between the two units. The original and corrected quarterly average concentrations are summarized in Appendix G:

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 $\pm 20\%$ of the reference value. Performance is acceptable with warning when a mean result falls in the range from $\pm 20\%$ to $\pm 30\%$ of the reference value (i.e., $20\% < \text{bias} < 30\%$). If the bias is greater than 30%, the results are deemed not acceptable.

In reviewing our environmental inter-laboratory crosscheck programs, we identified 1) duplication of efforts on some matrices and isotopes and 2) that we are performing crosscheck samples on some matrices and isotopes that we do not perform for clients. Since the DOE MAPEP is designed to evaluate the ability of analytical facilities to correctly analyze for radiological constituents representative of those at DOE sites, the needed changes were made to the MAPEP program. Therefore, the following isotopes were removed from the MAPEP program:

Soil – gamma – will be provided by Analytics twice per year, starting in 2015. For 2014, one soil gamma is provided by MAPEP, the 2nd soil gamma is provided by Analytics.

AP – gamma – is currently provided by Analytics.

Water – gamma, H-3, Sr-90, uranium, gross alpha and gross beta currently provided by ERA.

MAPEP evaluates non-reported (NR) analyses as failed if they were

reported in the previous series.

For the TBE laboratory, 163 out of 169 analyses performed met the specified acceptance criteria. Six analyses (Ni-63, K-40 and I-131 in water, and two Sr-90s and one Gross Alpha in AP samples) did not meet the specified acceptance criteria for the following reasons:

1. Teledyne Brown Engineering's MAPEP March 2014 Ni-63 in water result of 32.7 ± 1.69 Bq/L was overlooked when reporting the data but would have passed the acceptance range of 23.9 – 44.2 Bq/L. NCR 14-04
2. Teledyne Brown Engineering's MAPEP March 2014 K-40 in water result of 1.63 ± 2.49 Bq/L was overlooked when reporting the data but would have passed the false positive test. NCR 14-04
3. Teledyne Brown Engineering's ERA November 2014 I-131 in water result of 15.8 pCi/L was lower than the known value of 20.3 pCi/L, failing below the lower acceptance limit of 16.8. The result was evaluated as failed with a found to known ratio of 0.778. No cause could be found for the slightly low result. All ERA I-131 evaluations since 2004 have been acceptable. NCR 14-08
4. Teledyne Brown Engineering's MAPEP March 2014 Sr-90 in AP result of 0.822 Bq/sample was lower than the known value of 1.18 Bq/sample, failing below the lower acceptance limit of 0.83 Bq/sample. The rerun result was still low, but fell within the lower acceptance range of 0.836. The rerun result was statistically the same number as the original result. No cause could be found for the slightly low results. NCR 14-04
5. Teledyne Brown Engineering's MAPEP September 2014 Sr-90 in AP result of 0.310 Bq/sample was lower than the known value of 0.703 Bq/sample. The gravimetric yield of 117% was very high (we normally see yields of 60% to 70 %) and could account for the low activity. NCR 14-09
6. Teledyne Brown Engineering's MAPEP September 2014 Gr-Alpha in AP result of 0.153 Bq/sample was lower than the known value of 0.53 Bq/sample. The AP sample was counted on the wrong side. The AP was flipped over and recounted with acceptable results. NCR 14-09

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, 2014**

NAME OF FACILITY: BYRON LOCATION OF FACILITY: BYRON; IL				DOCKET NUMBER: 50-454 & 50-455 2014 REPORTING PERIOD:				
MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR	CONTROL	LOCATION WITH HIGHEST ANNUAL MEAN (M)		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
SURFACE WATER (PCI/LITER)	GR-B	20	4	5.3 (9/10) (3.0/7.6)	4.9 (9/10) (3.2/6.7)	5.3 (9/10) (3.0/7.6)	BY-12 INDICATOR OREGON POOL OF ROCK RIVER - DOWNSTREAM 4.5 MILES SSW OF SITE	0
	H-3	8	200	669 (2/4) (352/985)	<LLD	669 (2/4) (352/985)	BY-12 INDICATOR OREGON POOL OF ROCK RIVER - DOWNSTREAM 4.5 MILES SSW OF SITE	0
	NI-63	20	30	<LLD	<LLD	-		0
	GAMMA MN-54	20	15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0

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

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NAME OF FACILITY: BYRON				DOCKET NUMBER: 50-454 & 50-455 2014					
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	CONTROL	LOCATION WITH HIGHEST ANNUAL MEAN (M)			NUMBER OF NONROUTINE REPORTED MEASUREMENTS
				MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION		
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
	LA-140		15	<LLD	<LLD	-			0

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				MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
GROUND WATER (PCI/LITER)	H-3	24	200	<LLD	NA	-		0
	GAMMA MN-54	24	15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0

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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	CONTROL	LOCATION WITH HIGHEST ANNUAL MEAN (M)		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
GROUND WATER (PCI/LITER)	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
FISH (PCI/KG WET)	NI-63	8	260	<LLD	<LLD	-		0
	GAMMA MN-54	8	130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0

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				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
FISH (PCI/KG WET)	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0

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				MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
FISH (PCI/KG WET)	LA-140		NA	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	NI-63	4	260	<LLD	<LLD	-		0
	GAMMA MN-54	4	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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				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
SEDIMENT (PCI/KG DRY)	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	183 (1/2)	91 (2/2) (68/115)	183 (1/2)	BY-12 INDICATOR OREGON POOL OF ROCK RIVER - DOWNSTREAM 4.5 MILES SSW OF SITE	0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	416	10	17 (364/364) (5/37)	19 (52/52) (8/37)	19 (52/52) (8/37)	BY-08 CONTROL LEAF RIVER 6.8 MILES WNW OF SITE	0
	GAMMA MN-54	32	NA	<LLD	<LLD	-		0
	CO-58		NA	<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	CONTROL	LOCATION WITH HIGHEST ANNUAL MEAN (M)			NUMBER OF NONROUTINE REPORTED MEASUREMENTS
				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION		
AIR PARTICULATE (E-3 PCI/CU.METER)	FE-59		NA	<LLD	<LLD	-			0
	CO-60		NA	<LLD	<LLD	-			0
	ZN-65		NA	<LLD	<LLD	-			0
	NB-95		NA	<LLD	<LLD	-			0
	ZR-95		NA	<LLD	<LLD	-			0
	CS-134		150	<LLD	<LLD	-			0
	CS-137		180	<LLD	<LLD	-			0
	BA-140		NA	<LLD	<LLD	-			0

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				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
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
	CO-60		NA	<LLD	<LLD	-		0

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				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
MILK (PCI/LITER)	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
	LA-140		15	<LLD	<LLD	-		0
VEGETATION (PCI/KG WET)	GAMMA MN-54	10	NA	<LLD	<LLD	-		0

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				LOCATIONS MEAN (M) (F) RANGE	LOCATION MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
VEGETATION (PCI/KG WET)	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0

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				MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	
VEGETATION (PCI/KG WET)	CS-137		80	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
DIRECT RADIATION (MILLIREM/QTR.)	OSLD-QUARTERLY	363	NA	22.9 (355/355) (16.9/28.8)	19.5 (8/8) (17.5/20.9)	26.1 (4/4) (22.5/28.2)	BY-216-1 INDICATOR 4.6 MILES NNW	0

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

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, 2014

Location	Location Description	Distance & Direction From Site
<u>A.Surface Water</u>		
BY-12	Oregon Pool of Rock River, Downstream	4.5 miles SSW
BY-29	Byron, Upstream (control)	3.0 miles N
<u>B.Ground/Well Water</u>		
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
<u>C.Milk</u>		
BY-20-1	Ron Snodgrass Farm	4.8 miles WSW
BY-26-2	Joseph Akins Farm (control)	12.2 miles WNW
<u>D.Air Particulates / Air Iodine</u>		
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
<u>E.Fish</u>		
BY-29	Byron, Upstream (control)	3.0 miles N
BY-31	Byron, Discharge	2.6 miles WNW
<u>F.Sediment</u>		
BY-12	Oregon Pool of Rock River, Downstream	4.6 miles SSW
BY-34	Rock River, Upstream of Discharge (control)	2.6 miles WNW
<u>G.Vegetation</u>		
Quadrant 1	5186 N. Cox Road, Stillman Valley	4.8 miles ENE
Quadrant 2	5671 Brick Road, Oregon	4.4 miles SE
Quadrant 3	2002 Deer Path Road, Oregon	0.9 miles SW
Quadrant 4	6120 Razorville Road, Byron	2.1 miles NNW
Control	3933 South Bend Road, New Mulford	10.7 miles NE
<u>H.Environmental Dosimetry - OSLD</u>		
<u>Inner Ring</u>		
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, 2014

Location	Location Description	Distance & Direction From Site
<u>H. Environmental Dosimetry – OSLD (continued)</u>		
<u>Inner Ring</u>		
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
<u>Outer Ring</u>		
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, 2014

Location	Location Description	Distance & Direction From Site
<u>Special Interest</u>		
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
<u>Other</u>		
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
<u>Control</u>		
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, 2014

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 ₂ O ₃ :C Landauer Incorporated elements.	Landauer Incorporated

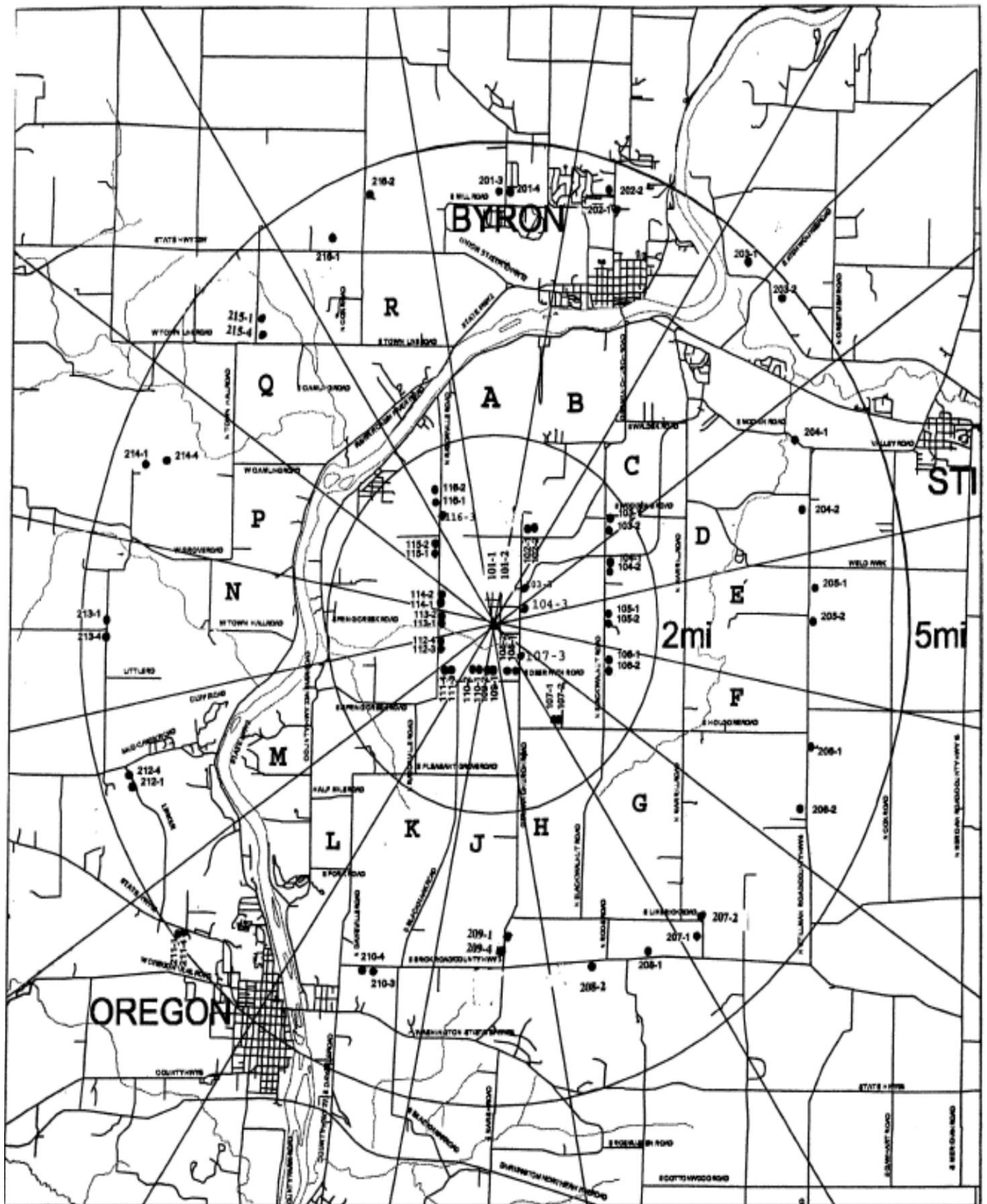


Figure B-1
 Inner and Outer Ring OSRD Locations of the
 Byron Nuclear Generating Station, 2014

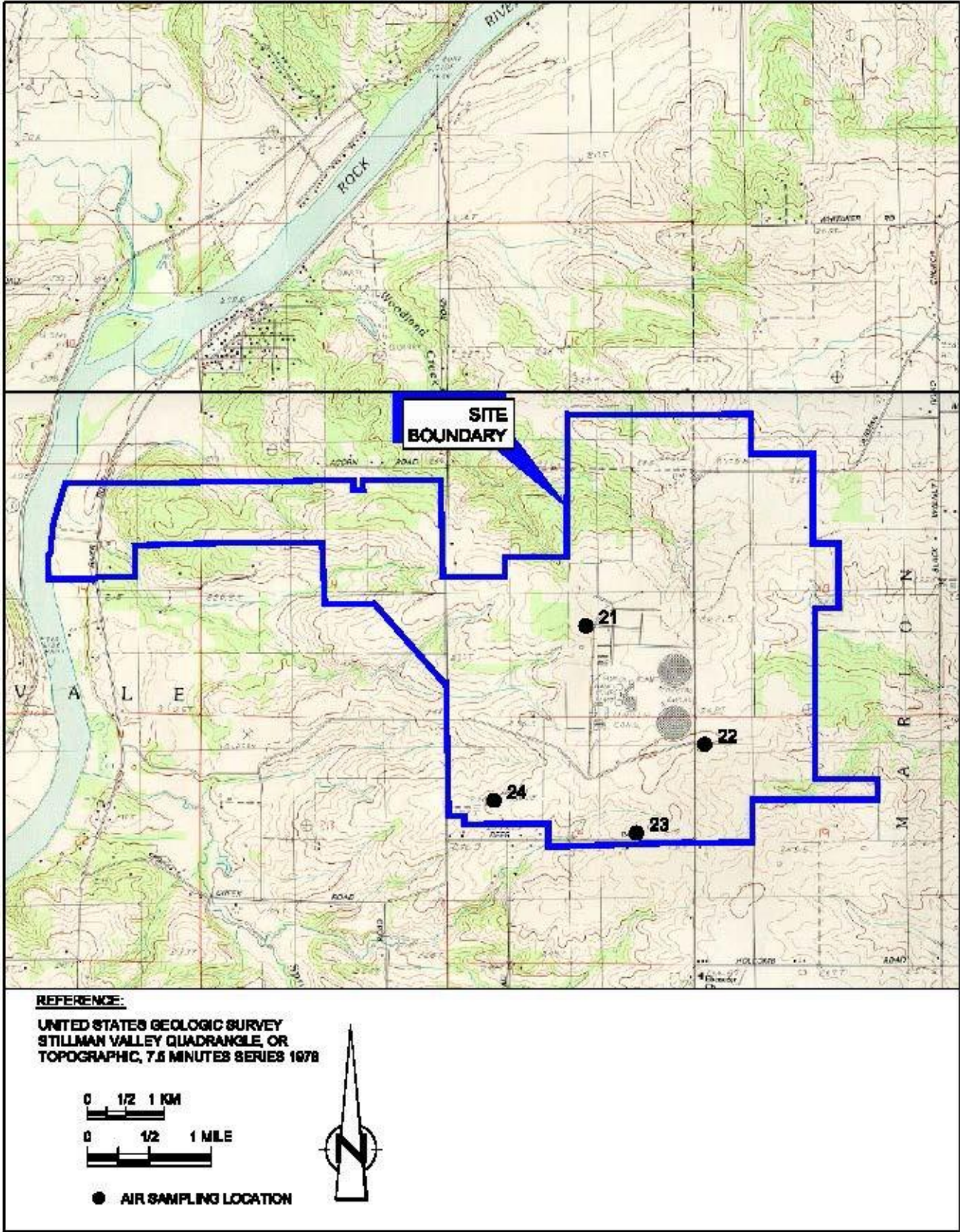
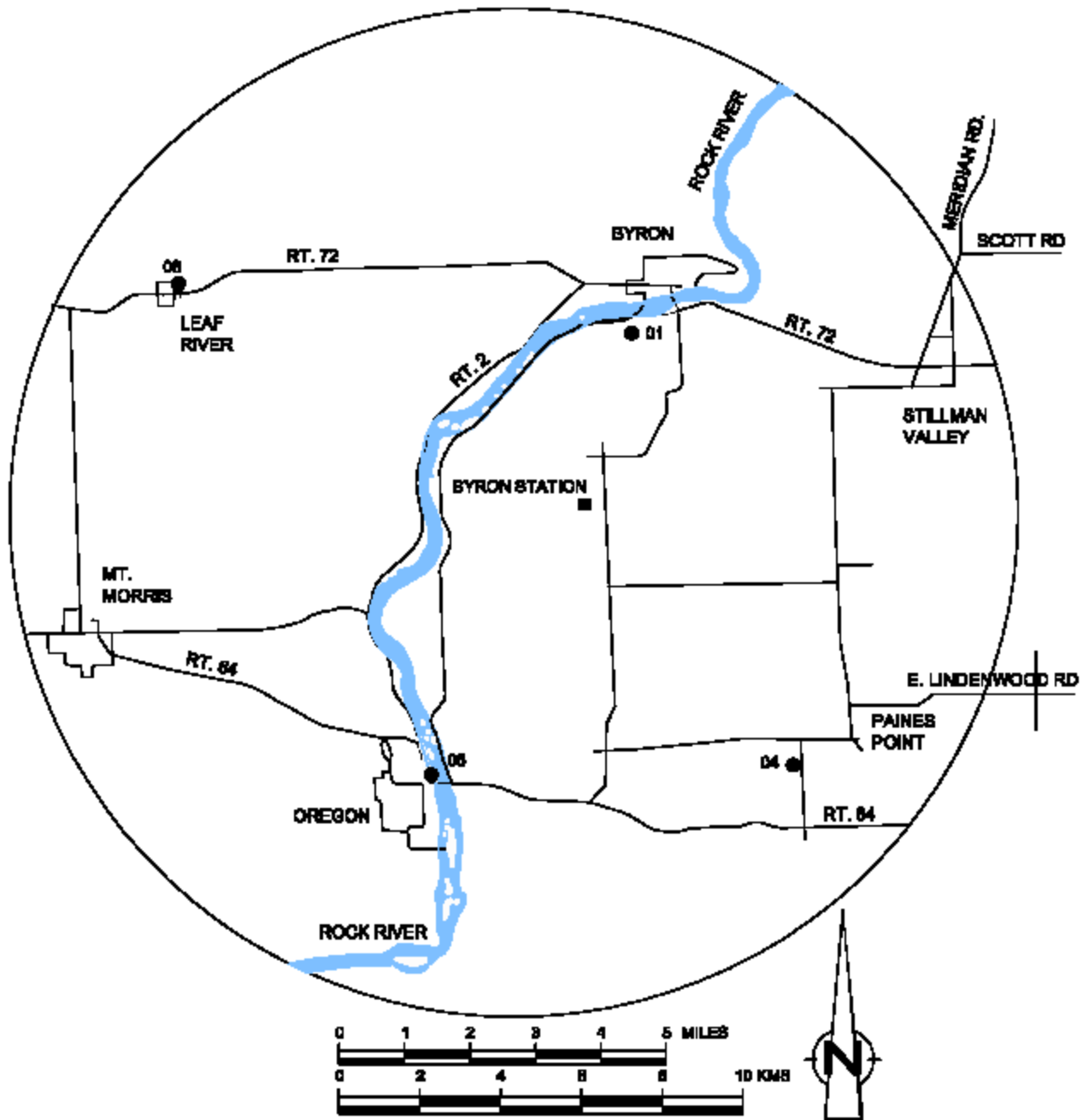


Figure B-2
 Onsite Air Sampling Locations of the
 Byron Nuclear Generating Station, 2014



- Air Sampling Location
- Byron Station

Figure B-3
 Offsite Air Sampling Locations of the
 Byron Nuclear Generating Station, 2014

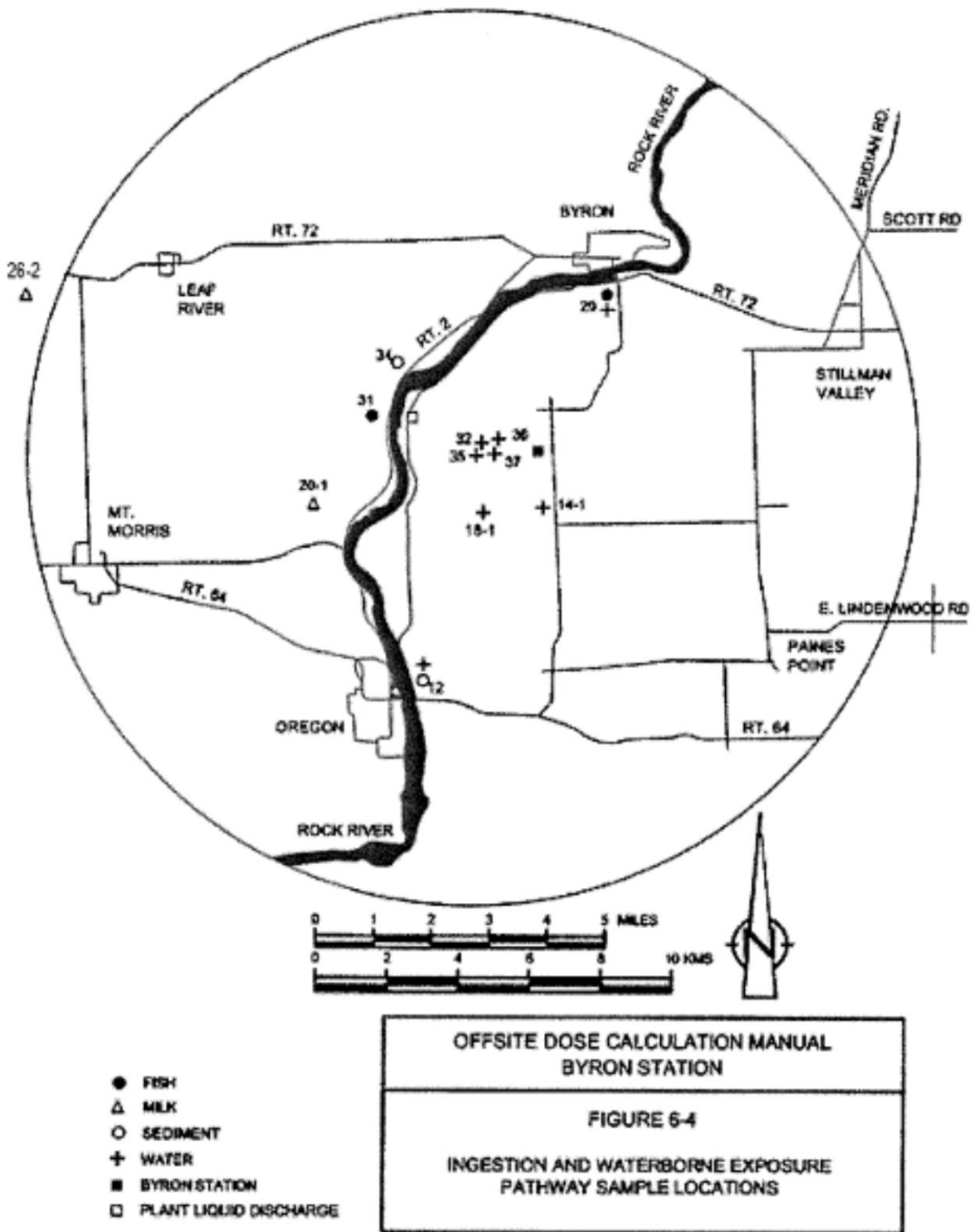


Figure B-4
Ingestion and Waterborne Exposure Pathway Sampling Locations
of the Byron Nuclear Generating Station, 2014

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, 2014

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12	BY-29
01/08/14 - 01/28/14	(1)	(1)
02/04/14 - 02/24/14	(1)	(1)
03/11/14 - 03/25/14	7.6 ± 2.2 (1)	6.7 ± 2.0 (1)
04/01/14 - 04/29/14	5.9 ± 2.1	5.9 ± 2.2
05/06/14 - 05/27/14	6.5 ± 2.2	4.5 ± 2.1
06/03/14 - 06/24/14	6.2 ± 2.4	6.2 ± 2.5
07/01/14 - 07/29/14	4.6 ± 2.2	4.8 ± 2.2
08/05/14 - 08/26/14	5.3 ± 2.4	5.1 ± 2.3
09/02/14 - 09/30/14	4.0 ± 2.2	3.2 ± 2.1
10/07/14 - 10/28/14	3.0 ± 2.0	4.0 ± 2.1
11/04/14 - 11/11/14	4.9 ± 2.3 (1)	4.2 ± 2.1 (1)
12/09/14 - 12/29/14	< 2.9 (1)	< 2.9 (1)
MEAN	5.3 ± 2.8	4.9 ± 2.3

Table C-I.2 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12	BY-29
03/11/14 - 03/25/14	< 172 (1)	< 169 (1)
04/01/14 - 06/24/14	352 ± 139	< 194
07/01/14 - 09/30/14	985 ± 170	< 186
10/07/14 - 12/29/14	< 189 (1)	< 188 (1)
MEAN	669 ± 895	-

Table C-I.3 CONCENTRATIONS OF NI-63 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-12	BY-29
1/8/2014 - 01/28/14	(1)	(1)
02/04/14 - 02/24/14	(1)	(1)
03/11/14 - 03/25/14	< 18 (1)	< 18 (1)
04/01/14 - 04/29/14	< 5	< 17
05/06/14 - 05/27/14	< 17	< 17
06/03/14 - 06/24/14	< 11	< 11
07/01/14 - 07/29/14	< 14	< 13
08/05/14 - 08/26/14	< 15	< 14
09/02/14 - 09/30/14	< 15	< 15
10/07/14 - 10/28/14	< 16	< 16
11/04/14 - 11/11/14	< 15 (1)	< 13 (1)
12/09/14 - 12/29/14	< 17 (1)	< 18 (1)
MEAN	-	-

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

Table C-I.4

**CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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	01/08/14 - 01/28/14 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	02/04/14 - 02/24/14 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	03/11/14 - 03/25/14 (1)	< 4	< 5	< 12	< 5	< 11	< 6	< 10	< 15	< 5	< 5	< 34	< 10
	04/01/14 - 04/29/14	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 10	< 1	< 1	< 16	< 6
	05/06/14 - 05/27/14	< 1	< 1	< 3	< 1	< 3	< 1	< 2	< 6	< 1	< 1	< 11	< 4
	06/03/14 - 06/24/14	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 7	< 2	< 2	< 14	< 4
	07/01/14 - 07/29/14	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 12	< 2	< 2	< 19	< 6
	08/05/14 - 08/26/14	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 15	< 2	< 2	< 24	< 7
	09/02/14 - 09/30/14	< 1	< 1	< 3	< 1	< 2	< 2	< 3	< 8	< 1	< 1	< 13	< 4
	10/07/14 - 10/28/14	< 3	< 3	< 7	< 3	< 6	< 3	< 5	< 13	< 3	< 3	< 25	< 7
	11/04/14 - 11/11/14 (1)	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 11	< 1	< 1	< 17	< 6
	12/09/14 - 12/29/14 (1)	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 10	< 2	< 2	< 18	< 5
	MEAN		-	-	-	-	-	-	-	-	-	-	-
BY-29	01/08/14 - 01/28/14 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	02/04/14 - 02/24/14 (1)	-	-	-	-	-	-	-	-	-	-	-	-
	03/18/14 - 03/25/14 (1)	< 5	< 5	< 9	< 5	< 10	< 6	< 9	< 11	< 4	< 4	< 25	< 9
	04/01/14 - 04/29/14	< 2	< 2	< 4	< 7	< 3	< 2	< 3	< 11	< 1	< 2	< 18	< 5
	05/06/14 - 05/27/14	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 17	< 6
	06/03/14 - 06/24/14	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 17	< 5
	07/01/14 - 07/29/14	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 10	< 1	< 2	< 16	< 5
	08/05/14 - 08/26/14	< 1	< 1	< 4	< 1	< 3	< 2	< 3	< 10	< 1	< 1	< 17	< 5
	09/02/14 - 09/30/14	< 2	< 3	< 6	< 2	< 5	< 3	< 5	< 12	< 2	< 2	< 23	< 8
	10/07/14 - 10/28/14	< 3	< 3	< 6	< 3	< 7	< 4	< 6	< 13	< 3	< 3	< 26	< 7
	11/04/14 - 11/11/14 (1)	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 12	< 1	< 2	< 18	< 6
	12/09/14 - 12/29/14 (1)	< 2	< 2	< 6	< 2	< 5	< 3	< 4	< 12	< 2	< 2	< 21	< 6
	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, 2014**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BY-14-1	BY-18-1	BY-32	BY-35	BY-36	BY-37
01/14/14 - 03/08/14	< 183	< 176 (1)	< 176 (1)	< 181	< 182	< 181
04/08/14 - 04/08/14	< 164	< 166	< 173	< 171	< 172	< 170
07/08/14 - 07/08/14	< 171	< 174	< 175	< 170	< 174	< 174
10/14/14 - 10/14/14	< 161	< 161	< 159	< 161	< 159	< 158
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, 2014**

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	01/14/14 - 01/14/14	< 6	< 6	< 14	< 5	< 14	< 7	< 11	< 11	< 6	< 7	< 32	< 9
	04/08/14 - 04/08/14	< 4	< 3	< 8	< 4	< 9	< 5	< 6	< 8	< 4	< 4	< 20	< 6
	07/08/14 - 07/08/14	< 3	< 3	< 7	< 3	< 7	< 4	< 6	< 5	< 3	< 3	< 16	< 6
	10/14/14 - 10/14/14	< 4	< 4	< 9	< 3	< 8	< 5	< 7	< 15	< 4	< 4	< 30	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-18-1	03/08/14 - 03/08/14 (1)	< 3	< 3	< 7	< 3	< 5	< 3	< 6	< 6	< 3	< 3	< 16	< 6
	04/08/14 - 04/08/14	< 5	< 6	< 10	< 8	< 13	< 6	< 11	< 11	< 5	< 5	< 31	< 8
	07/08/14 - 07/08/14	< 4	< 5	< 11	< 6	< 9	< 5	< 8	< 9	< 5	< 5	< 22	< 7
	10/14/14 - 10/14/14	< 4	< 4	< 10	< 4	< 8	< 4	< 8	< 12	< 3	< 4	< 27	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-32	03/04/14 - 03/04/14 (1)	< 7	< 6	< 14	< 8	< 12	< 7	< 13	< 13	< 7	< 7	< 33	< 11
	04/08/14 - 04/08/14	< 5	< 6	< 11	< 6	< 12	< 6	< 11	< 12	< 5	< 7	< 32	< 8
	07/08/14 - 07/08/14	< 4	< 3	< 8	< 4	< 6	< 4	< 6	< 6	< 4	< 4	< 15	< 6
	10/14/14 - 10/14/14	< 4	< 4	< 7	< 3	< 7	< 4	< 6	< 11	< 3	< 3	< 24	< 7
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-35	01/14/14 - 01/14/14	< 6	< 6	< 8	< 4	< 14	< 7	< 9	< 9	< 6	< 6	< 31	< 6
	04/08/14 - 04/08/14	< 5	< 4	< 11	< 4	< 9	< 5	< 8	< 9	< 5	< 5	< 24	< 8
	07/08/14 - 07/08/14	< 5	< 6	< 13	< 5	< 13	< 6	< 10	< 8	< 4	< 6	< 26	< 8
	10/14/14 - 10/14/14	< 5	< 5	< 13	< 5	< 11	< 5	< 8	< 13	< 4	< 5	< 33	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-36	01/14/14 - 01/14/14	< 5	< 5	< 10	< 6	< 11	< 6	< 10	< 11	< 6	< 6	< 28	< 9
	04/08/14 - 04/08/14	< 6	< 5	< 11	< 6	< 10	< 5	< 9	< 9	< 5	< 5	< 28	< 11
	07/08/14 - 07/08/14	< 4	< 5	< 8	< 5	< 9	< 6	< 8	< 9	< 5	< 5	< 25	< 8
	10/14/14 - 10/14/14	< 4	< 3	< 9	< 5	< 8	< 5	< 8	< 14	< 4	< 5	< 31	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-37	01/14/14 - 01/14/14	< 6	< 7	< 14	< 7	< 11	< 7	< 11	< 12	< 7	< 7	< 35	< 8
	04/08/14 - 04/08/14	< 6	< 6	< 12	< 6	< 11	< 6	< 8	< 11	< 5	< 6	< 29	< 7
	07/08/14 - 07/08/14	< 4	< 4	< 9	< 4	< 8	< 5	< 7	< 7	< 3	< 4	< 21	< 6
	10/14/14 - 10/14/14	< 5	< 5	< 12	< 5	< 8	< 5	< 10	< 15	< 4	< 5	< 26	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-III.1

**CONCENTRATIONS OF NICKEL-63 AND GAMMA EMITTERS IN FISH SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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
<hr/>													
BY-29													
Freshwater Drum	05/14/14	< 208	< 85	< 90	< 169	< 71	< 156	< 90	< 166	< 82	< 90	< 795	< 233
Shorthead Redhorse	05/14/14	< 189	< 67	< 79	< 180	< 75	< 146	< 99	< 182	< 79	< 79	< 736	< 231
Freshwater Drum	10/16/14	< 111	< 95	< 75	< 208	< 49	< 122	< 93	< 176	< 73	< 74	< 918	< 273
Shorthead Redhorse	10/16/14	< 107	< 41	< 46	< 101	< 43	< 102	< 48	< 92	< 39	< 42	< 463	< 160
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-31													
Freshwater Drum	05/14/14	< 177	< 24	< 26	< 56	< 20	< 47	< 27	< 50	< 23	< 25	< 257	< 68
Channel Catfish	05/14/14	< 184	< 69	< 68	< 138	< 66	< 148	< 78	< 124	< 67	< 61	< 665	< 169
Smallmouth Bass	10/16/14	< 118	< 54	< 53	< 137	< 64	< 109	< 60	< 109	< 55	< 47	< 678	< 159
Common Carp	10/16/14	< 118	< 85	< 109	< 243	< 94	< 173	< 123	< 183	< 91	< 94	< 1296	< 324
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IV.1 CONCENTRATIONS OF NICKEL-63 AND GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014

RESULTS IN UNITS OF PCI/KG DRY \pm 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	05/13/14	< 218	< 89	< 87	< 195	< 82	< 202	< 102	< 156	< 106	183 \pm 87	< 428	< 143
	10/07/14	< 256	< 66	< 70	< 117	< 57	< 124	< 65	< 132	< 59		< 99	< 728
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-34	05/13/14	< 217	< 46	< 47	< 101	< 33	< 126	< 51	< 77	< 48	115 \pm 64	< 228	< 45
	10/07/14	< 258	< 45	< 48	< 120	< 57	< 93	< 62	< 90	< 43		68 \pm 39	< 449
	MEAN	-	-	-	-	-	-	-	-	-	91 \pm 66	-	-

Table C-V.1

**CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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

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

(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, 2014

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
12/31/13 - 02/04/14	13	28	21 ± 9	12/31/13 - 02/04/14	11	29	21 ± 10	12/31/13 - 02/04/14	16	27	24 ± 10
02/04/14 - 03/04/14	17	29	23 ± 6	02/04/14 - 03/04/14	20	27	24 ± 4	02/04/14 - 03/04/14	20	24	22 ± 4
03/04/14 - 04/01/14	14	23	18 ± 6	03/04/14 - 04/01/14	15	24	18 ± 6	03/04/14 - 04/01/14	16	23	19 ± 6
04/01/14 - 04/29/14	9	19	13 ± 6	04/01/14 - 04/29/14	9	21	14 ± 8	04/01/14 - 04/29/14	11	18	15 ± 7
04/29/14 - 06/03/14	6	18	13 ± 7	04/29/14 - 06/03/14	5	19	12 ± 8	04/29/14 - 06/03/14	8	15	12 ± 6
06/03/14 - 07/01/14	7	17	12 ± 5	06/03/14 - 07/01/14	9	20	13 ± 7	06/03/14 - 07/01/14	13	16	14 ± 2
07/01/14 - 07/29/14	11	24	15 ± 8	07/01/14 - 07/29/14	10	23	16 ± 8	07/01/14 - 07/29/14	13	24	17 ± 11
07/29/14 - 09/02/14	11	25	18 ± 8	07/29/14 - 09/02/14	14	25	18 ± 6	07/29/14 - 09/02/14	16	23	20 ± 6
09/02/14 - 09/30/14	10	33	19 ± 13	09/02/14 - 09/30/14	8	29	19 ± 15	09/02/14 - 09/30/14	11	30	21 ± 18
09/30/14 - 11/04/14	10	20	14 ± 6	09/30/14 - 11/04/14	9	23	13 ± 8	09/30/14 - 11/04/14	12	19	14 ± 6
11/04/14 - 12/02/14	15	22	18 ± 4	11/04/14 - 12/02/14	12	22	17 ± 7	11/04/14 - 12/02/14	16	21	19 ± 5
12/02/14 - 12/29/14	16	37	24 ± 13	12/02/14 - 12/29/14	14	37	24 ± 14	12/02/14 - 12/29/14	22	37	26 ± 15
12/31/13 - 12/29/14	6	37	17 ± 11	12/31/13 - 12/29/14	5	37	17 ± 11	12/31/13 - 12/29/14	8	37	19 ± 11

Table C-V.3

**CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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	12/31/13 - 04/01/14	< 3	< 7	< 18	< 3	< 10	< 7	< 10	< 4	< 3	< 585	< 181
	04/01/14 - 07/01/14	< 4	< 7	< 21	< 3	< 11	< 8	< 13	< 4	< 4	< 689	< 170
	07/01/14 - 09/30/14	< 3	< 4	< 15	< 2	< 6	< 5	< 8	< 2	< 2	< 732	< 364
	09/30/14 - 12/29/14	< 4	< 7	< 25	< 4	< 9	< 8	< 17	< 3	< 4	< 914	< 382
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-04	12/31/13 - 04/01/14	< 2	< 4	< 11	< 2	< 5	< 4	< 6	< 2	< 1	< 337	< 116
	04/01/14 - 07/01/14	< 2	< 6	< 15	< 2	< 6	< 7	< 11	< 3	< 3	< 596	< 160
	07/01/14 - 09/30/14	< 3	< 6	< 20	< 3	< 6	< 6	< 13	< 3	< 3	< 840	< 351
	09/30/14 - 12/29/14	< 3	< 4	< 17	< 4	< 7	< 5	< 7	< 3	< 3	< 516	< 323
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-06	12/31/13 - 04/01/14	< 3	< 4	< 16	< 3	< 5	< 4	< 9	< 3	< 2	< 428	< 174
	04/01/14 - 07/01/14	< 2	< 3	< 12	< 2	< 6	< 4	< 6	< 2	< 2	< 303	< 110
	07/01/14 - 09/30/14	< 3	< 7	< 14	< 3	< 8	< 6	< 12	< 2	< 3	< 1009	< 379
	09/30/14 - 12/29/14	< 4	< 7	< 22	< 4	< 11	< 8	< 13	< 3	< 3	< 822	< 329
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-08	12/31/13 - 04/01/14	< 3	< 4	< 15	< 3	< 7	< 4	< 8	< 3	< 2	< 326	< 117
	04/01/14 - 07/01/14	< 2	< 4	< 10	< 1	< 5	< 4	< 6	< 1	< 2	< 294	< 110
	07/01/14 - 09/30/14	< 2	< 4	< 13	< 1	< 6	< 4	< 7	< 2	< 2	< 705	< 326
	09/30/14 - 12/29/14	< 2	< 3	< 16	< 2	< 4	< 5	< 7	< 2	< 2	< 506	< 228
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-21	12/31/13 - 04/01/14	< 4	< 8	< 21	< 4	< 11	< 7	< 16	< 4	< 3	< 489	< 277
	04/01/14 - 07/01/14	< 3	< 4	< 16	< 3	< 6	< 5	< 10	< 3	< 2	< 307	< 149
	07/01/14 - 09/30/14	< 3	< 5	< 16	< 3	< 7	< 5	< 5	< 2	< 3	< 921	< 393
	09/30/14 - 12/29/14	< 2	< 4	< 12	< 3	< 2	< 3	< 6	< 1	< 2	< 405	< 127
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-V.3

**CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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-22	12/31/13 - 04/01/14	< 3	< 4	< 19	< 3	< 8	< 6	< 10	< 3	< 3	< 438	< 246
	04/01/14 - 07/01/14	< 3	< 5	< 15	< 3	< 8	< 4	< 7	< 3	< 2	< 372	< 188
	07/01/14 - 09/30/14	< 3	< 4	< 16	< 2	< 6	< 5	< 9	< 2	< 2	< 874	< 322
	09/30/14 - 12/29/14	< 3	< 5	< 18	< 3	< 8	< 5	< 9	< 3	< 2	< 728	< 242
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-23	12/31/13 - 04/01/14	< 4	< 7	< 20	< 4	< 10	< 7	< 11	< 4	< 4	< 513	< 222
	04/01/14 - 07/01/14	< 3	< 5	< 12	< 2	< 7	< 4	< 6	< 3	< 2	< 416	< 148
	07/01/14 - 09/30/14	< 4	< 6	< 22	< 2	< 7	< 7	< 12	< 3	< 3	< 1439	< 544
	09/30/14 - 12/29/14	< 3	< 4	< 16	< 2	< 7	< 5	< 10	< 3	< 2	< 740	< 114
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-24	12/31/13 - 04/01/14	< 4	< 7	< 21	< 3	< 8	< 7	< 13	< 4	< 4	< 520	< 215
	04/01/14 - 07/01/14	< 3	< 4	< 9	< 2	< 6	< 5	< 8	< 3	< 2	< 397	< 132
	07/01/14 - 09/30/14	< 4	< 7	< 28	< 3	< 9	< 8	< 17	< 4	< 3	< 1547	< 616
	09/30/14 - 12/29/14	< 4	< 8	< 20	< 5	< 10	< 8	< 14	< 4	< 3	< 930	< 368
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.1

**CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED
IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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

COLLECTION PERIOD	GROUP I				GROUP II			GROUP III
	BY-21	BY-22	BY-23	BY-24	BY-01	BY-04	BY-06	BY-08
12/31/13 - 01/06/14	< 68	< 68	< 67	< 67	< 64	< 63	< 63	< 62
01/08/14 - 01/14/14	< 70	< 69	< 69	< 69	< 55	< 55	< 53	< 54
01/14/14 - 01/20/14	< 68	< 68	< 24	< 69	< 43	< 42	< 42	< 67
01/20/14 - 01/28/14	< 21	< 21	< 21	< 18 (1)	< 19	< 19	< 19	< 20
01/28/14 - 02/04/14	< 33	< 33	< 33	< 23	< 51	< 50	< 49	< 50
02/04/14 - 02/11/14	< 59	< 59	< 59	< 60	< 69	< 65	< 65	< 69
02/11/14 - 02/18/14	< 55	< 60	< 60	< 60	< 23	< 54	< 54	< 54
02/18/14 - 02/24/14	< 56	< 56	< 56	< 56	< 69	< 69	< 69	< 67
02/24/14 - 03/04/14	< 29	< 32	< 32	< 32	< 29	< 12	< 29	< 30
03/04/14 - 03/11/14	< 60	< 60	< 61	< 61	< 64	< 65	< 65	< 62
03/11/14 - 03/18/14	< 55	< 51	< 51	< 51	< 56	< 55	< 23	< 54
03/18/14 - 03/25/14	< 52	< 52	< 51	< 51	< 54	< 55	< 56	< 57
03/25/14 - 04/01/14	< 28	< 66	< 66	< 66	< 51	< 52	< 52	< 67
04/01/14 - 04/08/14	< 60	< 60	< 59	< 59	< 46	< 46	< 46	< 45
04/08/14 - 04/15/14	< 23	< 68	< 70	< 70	< 56	< 56	< 56	< 54
04/15/14 - 04/22/14	< 54	< 54	< 55	< 55	< 70	< 67	< 67	< 69
04/22/14 - 04/29/14	< 70	< 29	< 69	< 69	< 56	< 57 (1)	< 57	< 59
04/29/14 - 05/06/14	< 64	< 63	< 63	< 63	< 53	< 53	< 53	< 54
05/06/14 - 05/13/14	< 55	< 55	< 56	< 56	< 47	< 47	< 47	< 47
05/13/14 - 05/20/14	< 66	< 66	< 65	< 65	< 62	< 63	< 63	< 63
05/20/14 - 05/27/14	< 52	< 51	< 51	< 22	< 55	< 55	< 55	< 53
05/27/14 - 06/03/14	< 67	< 67	< 67	< 67	< 55	< 56	< 56	< 58
06/03/14 - 06/10/14	< 19	< 18	< 19	< 19	< 31	< 50	< 51	< 49
06/10/14 - 06/17/14	< 59	< 59	< 58	< 58	< 57	< 59	< 59	< 60
06/17/14 - 06/24/14	< 57	< 65	< 65	< 65	< 55	< 24	< 55	< 55
06/24/14 - 07/01/14	< 64	< 63	< 63	< 63	< 60	< 61 (1)	< 67 (1)	< 62
07/01/14 - 07/08/14	< 46 (1)	< 35 (1)	< 35 (1)	< 35 (1)	< 48 (1)	< 46 (1)	< 19 (1)	< 46 (1)
07/08/14 - 07/15/14	< 35	< 35	< 35	< 35	< 44 (1)	< 36	< 36	< 36
07/15/14 - 07/22/14	< 40	< 40	< 40	< 40	< 40	< 40	< 39	< 16
07/22/14 - 07/29/14	< 61	< 61	< 60	< 60	< 60	< 60	< 61	< 62
07/29/14 - 08/05/14	< 22	< 51	< 51	< 51	< 53	< 54	< 54	< 54
08/05/14 - 08/12/14	< 26	< 26	< 26	< 26	< 22	< 23	< 23	< 23
08/12/14 - 08/19/14	< 62	< 24	< 62	< 62	< 63	< 63 (1)	< 64	< 64
08/19/14 - 08/26/14	< 52	< 52	< 52	< 52	< 68	< 69	< 69	< 67
08/26/14 - 09/02/14	< 68	< 68	< 28	< 68	< 68	< 69	< 69	< 67
09/02/14 - 09/08/14	< 60	< 60	< 60	< 60	< 60	< 60	< 61	< 63
09/08/14 - 09/15/14	< 34	< 34	< 33	< 14	< 43	< 43	< 43	< 42
09/15/14 - 09/22/14	< 69	< 69	< 69	< 69	< 61	< 60	< 60	< 59
09/22/14 - 09/30/14	< 57	< 70	< 69	< 69	< 20	< 52	< 54	< 55
09/30/14 - 10/07/14	< 42	< 42	< 42	< 42	< 39	< 39	< 39	< 39
10/07/14 - 10/14/14	< 22	< 23	< 23	< 23	< 23	< 9	< 22	< 22
10/14/14 - 10/21/14	< 30	< 30	< 30	< 30	< 25	< 25	< 25	< 25
10/21/14 - 10/28/14	< 61	< 54	< 54	< 54	< 62	< 64	< 24	< 61
10/28/14 - 11/04/14	< 67	< 67	< 67	< 66	< 57 (1)	< 57	< 58	< 59
11/04/14 - 11/11/14	< 32	< 33	< 33	< 33	< 33	< 32	< 32	< 12
11/11/14 - 11/18/14	< 64	< 64	< 63	< 64	< 55	< 55	< 54	< 54
11/18/14 - 11/24/14	< 19	< 45	< 45	< 45	< 47	< 49	< 49	< 50
11/24/14 - 12/02/14	< 25	< 25	< 25 (1)	< 25	< 26	< 26	< 27	< 27
12/02/14 - 12/09/14	< 56	< 29	< 56	< 56	< 49	< 50	< 49	< 48
12/09/14 - 12/16/14	< 62	< 62	< 62	< 61	< 60	< 60	< 60	< 60
12/16/14 - 12/22/14	< 38	< 38 (1)	< 21	< 38	< 44	< 44	< 44	< 45
12/22/14 - 12/29/14	< 41	< 41	< 41	< 42	< 64	< 65	< 65	< 65
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, 2014

RESULTS IN UNITS OF PCI/LITER \pm 2 SIGMA

COLLECTION PERIOD	CONTROL FARM	INDICATOR FARM
	BY-26-2	BY-20-1
01/07/14	< 0.7	< 0.7
02/04/14	< 0.8	< 0.7
03/04/14	< 0.8	< 0.8
04/01/14	< 0.8	< 0.7
05/06/14	< 0.7	< 0.9
05/20/14	< 0.8	< 0.7
06/03/14	< 0.8	< 0.8
06/17/14	< 0.5	< 0.5
07/01/14	< 0.6	< 0.7
07/15/14	< 0.6	< 0.7
07/29/14	< 0.5	< 0.5
08/12/14	< 0.6	< 0.5
08/26/14	< 0.8	< 0.7
09/08/14	< 0.7	< 0.7
09/22/14	< 0.5	< 0.7
10/07/14	< 0.7	< 0.8
10/21/14	< 0.8	< 0.7
11/04/14	< 0.7	< 0.4
12/02/14	< 0.3	< 0.4
MEAN	-	-

Table C-VII.2

**CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

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	01/07/14	< 6	< 7	< 13	< 10	< 14	< 8	< 13	< 7	< 8	< 43	< 12
	02/04/14	< 5	< 5	< 14	< 9	< 14	< 5	< 11	< 5	< 6	< 37	< 10
	03/04/14	< 7	< 8	< 16	< 12	< 17	< 9	< 14	< 9	< 11	< 48	< 15
	04/01/14	< 5	< 5	< 12	< 5	< 11	< 5	< 10	< 5	< 5	< 30	< 8
	05/06/14	< 8	< 9	< 21	< 11	< 21	< 8	< 14	< 7	< 9	< 47	< 12
	05/20/14	< 5	< 5	< 9	< 6	< 11	< 5	< 9	< 4	< 5	< 22	< 7
	06/03/14	< 7	< 5	< 15	< 7	< 16	< 7	< 9	< 5	< 7	< 36	< 7
	06/17/14	< 7	< 5	< 17	< 7	< 18	< 8	< 12	< 7	< 7	< 35	< 11
	07/01/14	< 7	< 6	< 14	< 6	< 16	< 7	< 12	< 6	< 7	< 28	< 7
	07/15/14	< 6	< 7	< 14	< 9	< 12	< 7	< 13	< 6	< 8	< 36	< 11
	07/29/14	< 8	< 9	< 24	< 9	< 22	< 9	< 16	< 8	< 8	< 43	< 10
	08/12/14	< 5	< 5	< 13	< 5	< 12	< 5	< 11	< 5	< 5	< 30	< 7
	08/26/14	< 6	< 6	< 15	< 6	< 15	< 6	< 11	< 5	< 7	< 28	< 11
	09/08/14	< 6	< 8	< 15	< 11	< 18	< 9	< 13	< 7	< 8	< 42	< 14
	09/22/14	< 5	< 6	< 11	< 7	< 12	< 6	< 10	< 5	< 5	< 48	< 12
	10/07/14	< 7	< 7	< 14	< 8	< 16	< 6	< 10	< 7	< 6	< 31	< 9
	10/21/14	< 6	< 6	< 13	< 7	< 13	< 6	< 10	< 5	< 5	< 44	< 15
11/04/14	< 7	< 7	< 12	< 6	< 14	< 6	< 12	< 5	< 6	< 30	< 9	
12/02/14	< 5	< 5	< 11	< 4	< 9	< 5	< 9	< 4	< 5	< 33	< 7	
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BY-26-2	01/07/14	< 9	< 8	< 22	< 11	< 20	< 8	< 15	< 7	< 10	< 45	< 13
	02/04/14	< 6	< 7	< 16	< 7	< 14	< 7	< 11	< 5	< 6	< 41	< 15
	03/04/14	< 8	< 9	< 19	< 10	< 19	< 9	< 13	< 7	< 9	< 40	< 11
	04/01/14	< 5	< 6	< 12	< 5	< 11	< 6	< 9	< 5	< 6	< 26	< 7
	05/06/14	< 10	< 9	< 23	< 9	< 23	< 11	< 20	< 9	< 10	< 48	< 10
	05/20/14	< 5	< 5	< 12	< 6	< 13	< 5	< 10	< 5	< 5	< 25	< 5
	06/03/14	< 7	< 7	< 15	< 9	< 15	< 8	< 13	< 8	< 8	< 40	< 11
	06/17/14	< 8	< 6	< 16	< 9	< 18	< 8	< 15	< 7	< 8	< 44	< 11
	07/01/14	< 7	< 9	< 14	< 6	< 15	< 7	< 13	< 6	< 7	< 32	< 7
	07/15/14	< 6	< 6	< 13	< 7	< 16	< 6	< 10	< 5	< 7	< 33	< 9
	07/29/14	< 8	< 8	< 16	< 9	< 16	< 7	< 12	< 7	< 8	< 36	< 11
	08/12/14	< 6	< 6	< 14	< 6	< 14	< 6	< 12	< 6	< 7	< 31	< 8
	08/26/14	< 7	< 6	< 16	< 8	< 17	< 7	< 13	< 6	< 7	< 39	< 14
	09/08/14	< 7	< 7	< 13	< 6	< 15	< 7	< 11	< 5	< 7	< 34	< 13
	09/22/14	< 5	< 7	< 19	< 6	< 12	< 6	< 11	< 6	< 6	< 55	< 15
	10/07/14	< 6	< 6	< 16	< 8	< 17	< 7	< 13	< 6	< 6	< 31	< 13
	10/21/14	< 6	< 7	< 15	< 6	< 15	< 7	< 11	< 5	< 6	< 48	< 13
11/04/14	< 3	< 4	< 10	< 4	< 10	< 5	< 7	< 4	< 4	< 19	< 5	
12/02/14	< 4	< 4	< 12	< 4	< 9	< 6	< 9	< 4	< 4	< 32	< 9	
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VIII.1

**CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATING STATION, 2014**

RESULTS IN UNITS OF PCI/KG WET \pm 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													
Kohlrabi	08/05/14	< 23	< 22	< 54	< 25	< 54	< 27	< 46	< 49	< 22	< 28	< 120	< 48
Lettuce	08/05/14	< 29	< 27	< 53	< 30	< 71	< 30	< 48	< 56	< 23	< 36	< 147	< 48
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 1													
Cabbage	08/05/14	< 11	< 10	< 28	< 9	< 23	< 11	< 19	< 24	< 10	< 9	< 49	< 20
Potatoes	08/05/14	< 23	< 20	< 50	< 26	< 56	< 26	< 45	< 45	< 21	< 24	< 147	< 38
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 2													
Cabbage	08/05/14	< 18	< 14	< 35	< 19	< 39	< 17	< 30	< 44	< 18	< 19	< 101	< 24
Onions	08/05/14	< 13	< 16	< 29	< 11	< 34	< 15	< 26	< 32	< 13	< 15	< 89	< 25
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 3													
Cabbage	08/05/14	< 15	< 14	< 34	< 16	< 37	< 17	< 28	< 34	< 14	< 15	< 88	< 29
Rutabagas	08/05/14	< 23	< 18	< 59	< 18	< 57	< 21	< 39	< 51	< 20	< 23	< 124	< 34
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BY-QUAD 4													
Cabbage	08/05/14	< 20	< 22	< 41	< 20	< 34	< 21	< 37	< 47	< 21	< 22	< 117	< 24
Onions/beets (comp.)	08/05/14	< 15	< 17	< 37	< 19	< 46	< 18	< 33	< 34	< 16	< 19	< 90	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-IX.1 QUARTERLY OSLD RESULTS FOR BYRON NUCLEAR GENERATING STATION, 2014

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	21 ± 3	19	21	21	22 (1)
BY-01-2	20 ± 3	19	22	21	20 (1)
BY-04-1	23 ± 7	19	22	24	27 (1)
BY-04-2	23 ± 6	19	23	25	26 (1)
BY-06-1	20 ± 3	18	20	21	22 (1)
BY-06-2	20 ± 2	19	20	21	22 (1)
BY-08-1	20 ± 3	18	20	21	21 (1)
BY-08-2	19 ± 2	18	19	21	18 (1)
BY-21-1	19 ± 2	18	20	19	18 (1)
BY-21-2	19 ± 1	18	19	19	18 (1)
BY-22-1	25 ± 1	26 (1)	25	25	26 (1)
BY-22-2	24 ± 3	22	23	25	25 (1)
BY-23-1	23 ± 3	21	23	23	24 (1)
BY-23-2	22 ± 5	18	23	23	24 (1)
BY-24-1	21 ± 3	21	21	23	20 (1)
BY-24-2	22 ± 4	19	22	22	25 (1)
BY-101-1	18 ± 2	17	19	18	19 (1)
BY-101-2	19 ± 2	18	19	20	19 (1)
BY-102-1	24 ± 5	21	26	27	24 (1)
BY-102-2	24 ± 4	21	25	25	25 (1)
BY-103-1	23 ± 5	20	22	25	24 (1)
BY-103-2	24 ± 3	22	25	24	25 (1)
BY-103-3	24 ± 3	22	24	24	25 (1)
BY-104-1	24 ± 5	21	24	26	27 (1)
BY-104-2	25 ± 7	21	25	26	29 (1)
BY-104-3	23 ± 3	20	22	23	24 (1)
BY-105-1	24 ± 6	20	25	26	26 (1)
BY-105-2	25 ± 4	22	25	25	27 (1)
BY-106-1	23 ± 6	19	26	24	24 (1)
BY-106-2	23 ± 7	19	23	26	27 (1)
BY-107-1	25 ± 6	21	27	27	27 (1)
BY-107-2	25 ± 8	20	25	27	29 (1)
BY-107-3	22 ± 5	20	21	23	25 (1)
BY-108-1	24 ± 8	19	24	26	28 (1)
BY-108-2	22 ± 6	18	22	23	24 (1)
BY-109-1	23 ± 5	20	25	24	25 (1)
BY-109-2	22 ± 4	20	22	24	23 (1)
BY-110-1	22 ± 6	19	21	23	25 (1)
BY-110-2	23 ± 5	19	23	25	24 (1)
BY-111-3	24 ± 6	20	24	26	27 (1)
BY-111-4	22 ± 7	18	23	22	26 (1)
BY-112-3	23 ± 7	18	25	24	26 (1)
BY-112-4	23 ± 5	21	21	24	26 (1)
BY-113-1	23 ± 5	19	24	24	25 (1)
BY-113-2	21 ± 5	18	21	23	23 (1)
BY-114-1	20 ± 4	17	21	21	21 (1)
BY-114-2	23 ± 4	20	23	25	24 (1)

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.1 QUARTERLY OSLD RESULTS FOR BYRON NUCLEAR GENERATING STATION, 2014

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATIONS

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
BY-115-1	23 ± 6	19	23	25	26 (1)
BY-115-2	22 ± 3	20	22	23	23 (1)
BY-116-1	21 ± 3	19	21	22	22 (1)
BY-116-2	22 ± 6	17	22	23	25 (1)
BY-116-3	22 ± 3	20	22	24	22 (1)
BY-201-3	24 ± 4	21	24	25	25 (1)
BY-201-4	24 ± 5	21	25	26	24 (1)
BY-202-1	23 ± 5	19	24	25	25 (1)
BY-202-2	26 ± 6	22	28	27	28 (1)
BY-203-1	19 ± 3	18	19	20	21 (1)
BY-203-2	21 ± 2	20	22	21	22 (1)
BY-204-1	21 ± 5	18	22	23	20 (1)
BY-204-2	24 ± 5	20	25	26	25 (1)
BY-205-1	25 ± 6	20	26	27	26 (1)
BY-205-2	23 ± 4	21	23	25	22 (1)
BY-206-1	24 ± 4	21	25	25	25 (1)
BY-206-2	25 ± 5	22	24	26	28 (1)
BY-207-1	24 ± 7	19	24	26	28 (1)
BY-207-2	22 ± 6	18	23	24	25 (1)
BY-208-1	24 ± 8	18	26	26	26 (1)
BY-208-2	23 ± 8	18	25	27	24 (1)
BY-209-1	25 ± 6	21	25	27	27 (1)
BY-209-4	24 ± 6	20	24	28	26 (1)
BY-210-3	23 ± 7	18	24	25	24 (1)
BY-210-4	24 ± 5	21	24	25	27 (1)
BY-211-1	25 ± 4	22	24	27	26 (1)
BY-211-4	24 ± 6	19	25	26	26 (1)
BY-212-1	26 ± 6	21	26	28	27 (1)
BY-212-4	26 ± 6	22	26	29	28 (1)
BY-213-1	25 ± 7	20	26	26	28 (1)
BY-213-4	24 ± 6	20	26	22	27 (1)
BY-214-1	23 ± 5	20	25	25	25 (1)
BY-214-4	24 ± 6	20	25	28	24 (1)
BY-215-1	24 ± 7	19	24	26	27 (1)
BY-215-4	25 ± 7	20	25	25	28 (1)
BY-216-1	26 ± 5	23	26	28	28 (1)
BY-216-2	24 ± 6	20	27	24	24 (1)
BY-301-1	19 ± 1	18	20	19	18 (1)
BY-302-1	24 ± 3	22	23	26	25 (1)
BY-309-1	22 ± 4	19	21	24	22 (1)
BY-309-2	24 ± 7	19	25	28	25 (1)
BY-309-3	22 ± 6	18	21	24	25 (1)
BY-309-4	20 ± 3	18	21	21	(1)
BY-314-1	19 ± 4	18	17	21	21 (1)

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

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, 2014

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

COLLECTION PERIOD	INNER RING \pm 2 S.D.	OUTER RING	SPECIAL INTEREST	OTHER	CONTROL
JAN-MAR	20 \pm 3	20 \pm 3	19 \pm 3	20 \pm 4	18 \pm 1
APR-JUN	23 \pm 4	25 \pm 3	21 \pm 5	22 \pm 3	20 \pm 2
JUL-SEP	24 \pm 4	25 \pm 4	23 \pm 6	22 \pm 4	21 \pm 0
OCT-DEC	25 \pm 5	25 \pm 4	23 \pm 6	23 \pm 6	20 \pm 4

TABLE C-IX.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR BYRON NUCLEAR GENERATING STATION, 2014

RESULTS IN UNITS OF MREM/QUARTER

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN \pm 2 S.D.
INNER RING	144	17	29	23 \pm 6
OUTER RING	128	18	29	24 \pm 6
SPECIAL INTEREST	27	17	28	21 \pm 6
OTHER	56	18	27	22 \pm 5
CONTROL	8	18	21	19 \pm 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

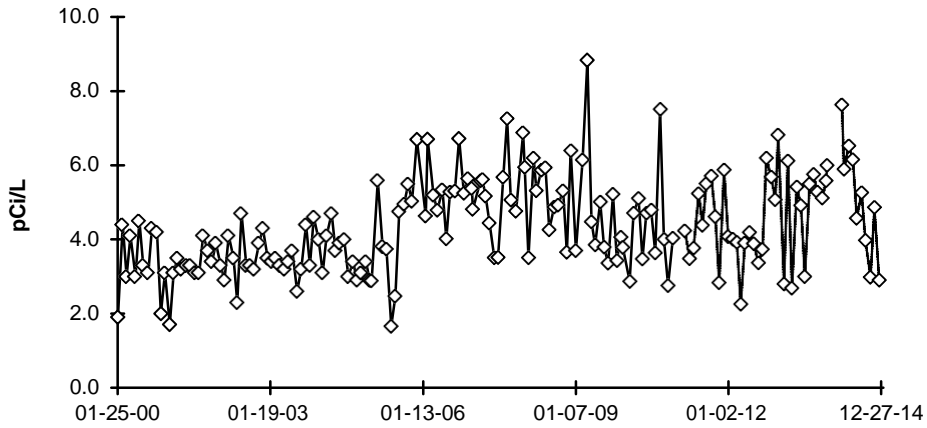
SPECIAL INTEREST STATIONS - BY-301-1, BY-302-1, BY-309-1, BY-309-2, BY-309-3, BY-309-4, BY-314-1,

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

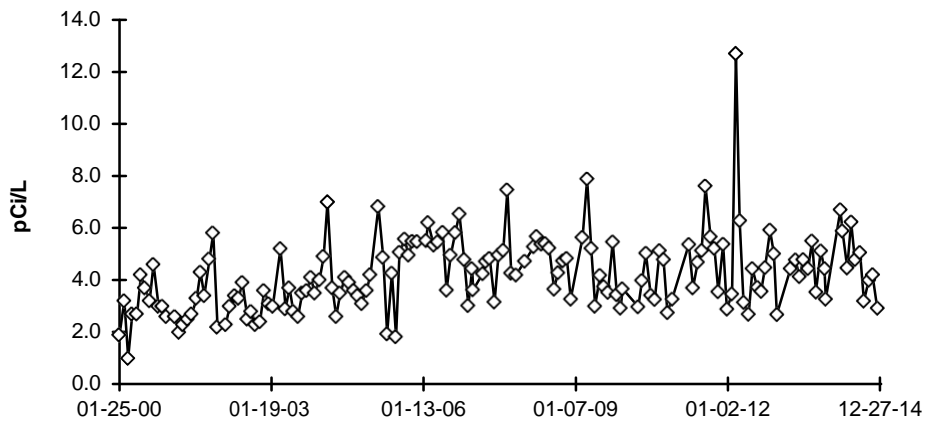
CONTROL STATIONS - BY-08-1, BY-08-2

FIGURE C-1
Surface Water - Gross Beta - Station BY-12 and BY-29 (C)
Collected in the Vicinity of BNGS, 2000 - 2014

BY-12 Oregon Pool of Rock River, Downstream



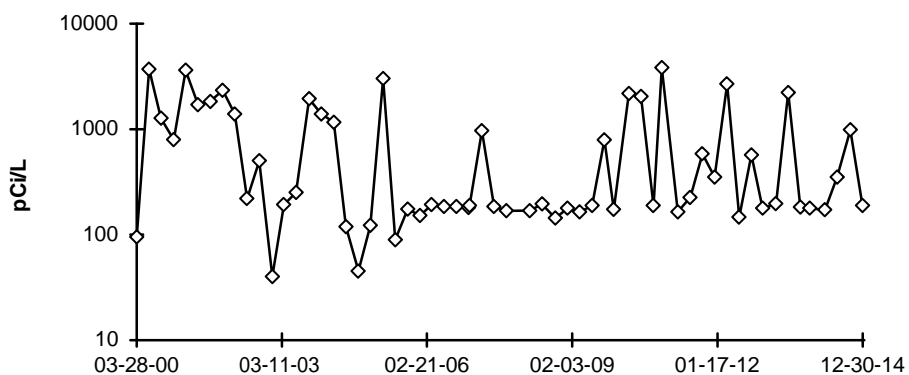
BY-29 (C) Byron, Rock River Upstream



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 - 2014

BY-12 Oregon Pool of Rock River, Downstream



BY-29 (C) Byron, Rock River Upstream

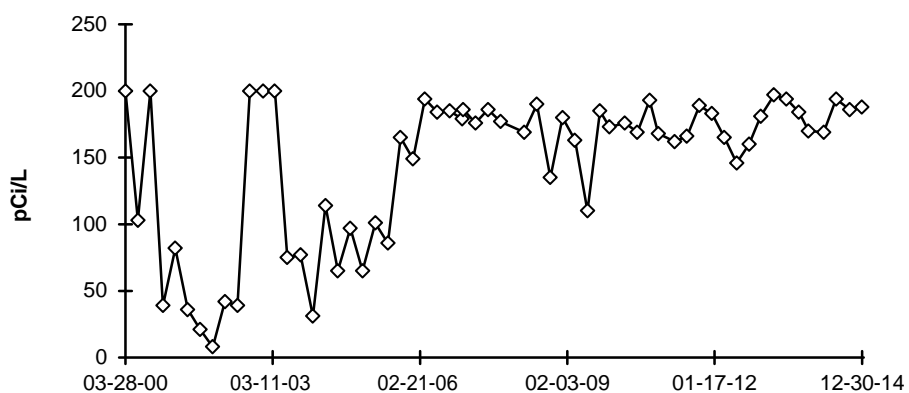
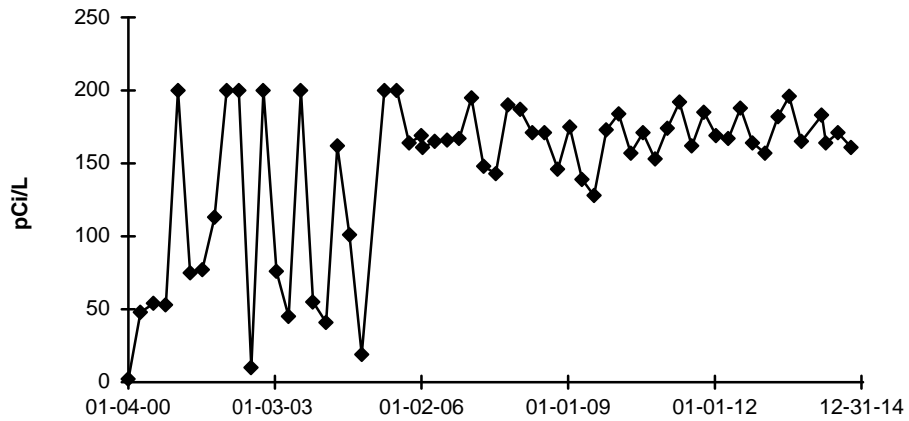


FIGURE C-3

Ground Water - Tritium - Station BY-14-1 Collected in the Vicinity of BNGS, 2000 - 2014

BY-14-1 3200 N. German Church Road 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 - 2014

BY-18-1 Calhoun Well

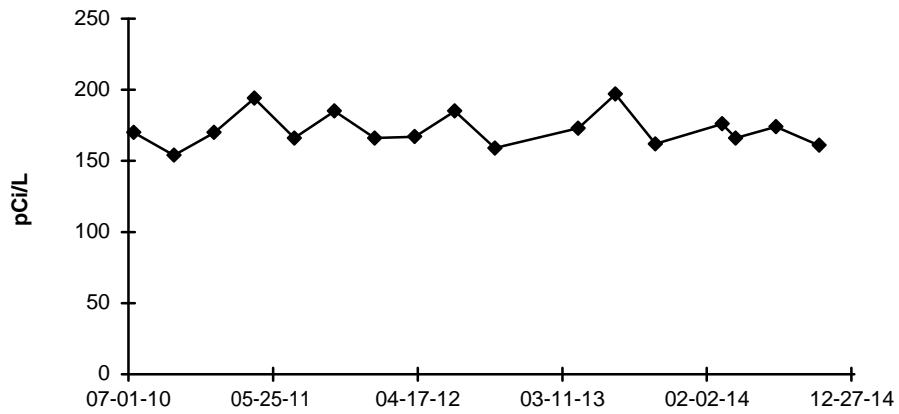
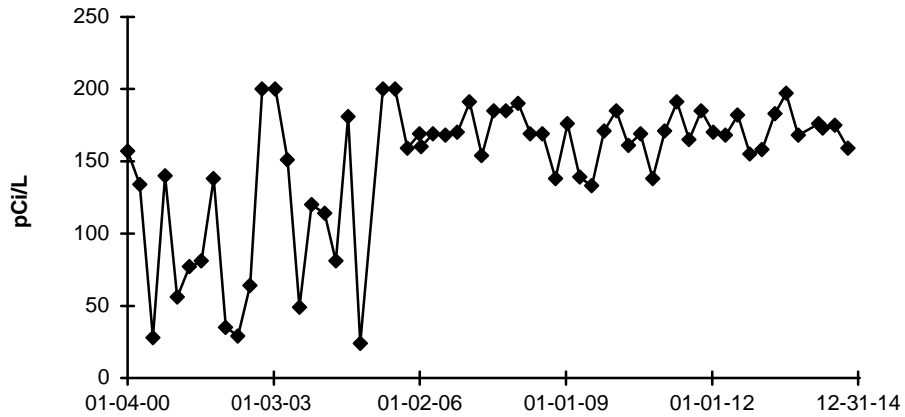


FIGURE C-5
Ground Water - Tritium - Station BY-32
Collected in the Vicinity of BNGS, 2000 - 2014

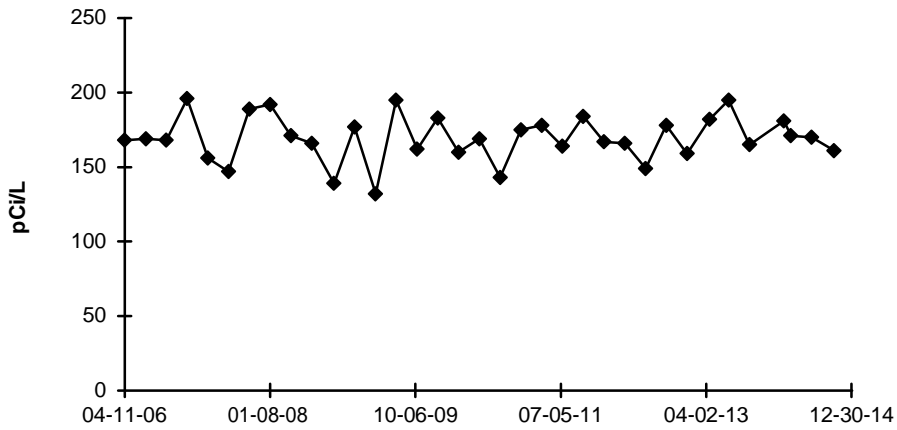
BY-32 WOLFORD WELL



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 - 2014

BY-35 Vancko Well



BY-36 Blanchard Well

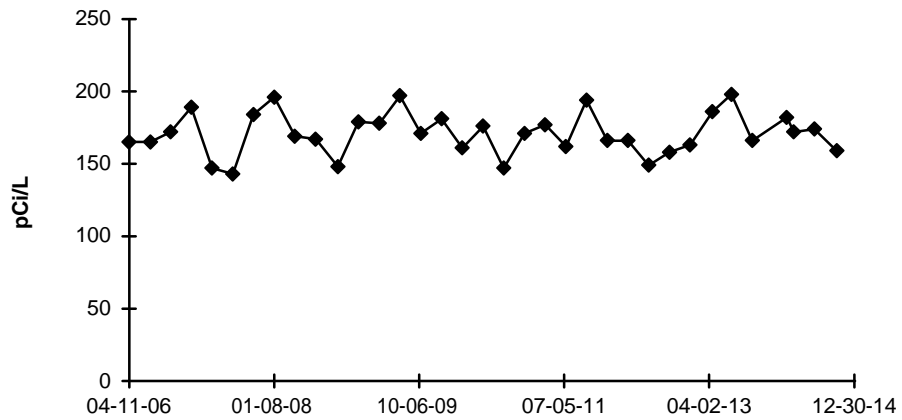


FIGURE C-7
Ground Water - Tritium - Stations BY-37
Collected in the Vicinity of BNGS, 2006 - 2014

BY-37 Alexander Well

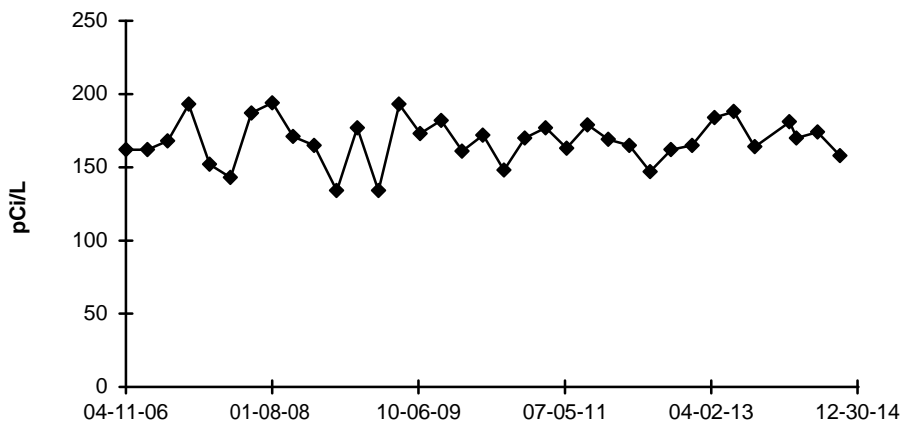
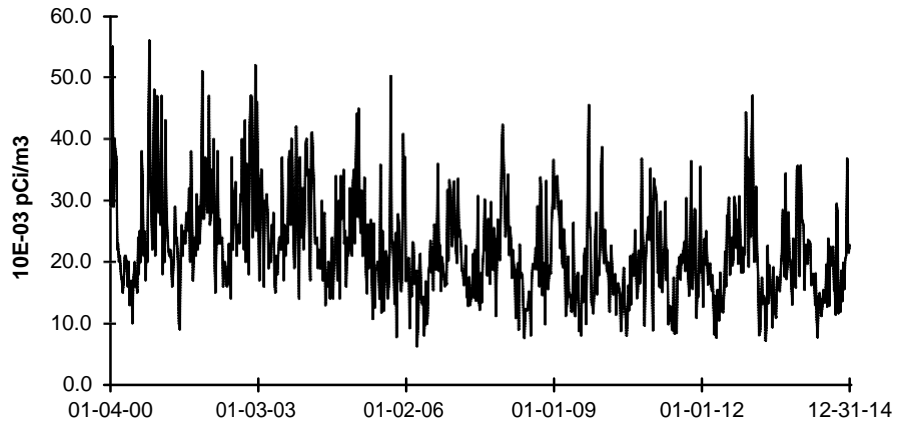


FIGURE C-8
Air Particulates - Gross Beta - Stations BY-08 (C) and
BY-21 Collected in the Vicinity of BNGS, 2000 - 2014

BY-08 (C) Leaf River WNW



BY-21 Byron Nearsite N

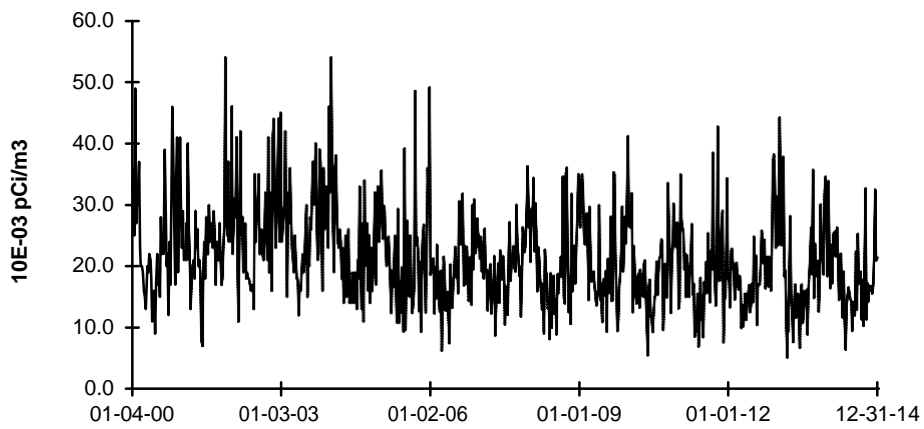
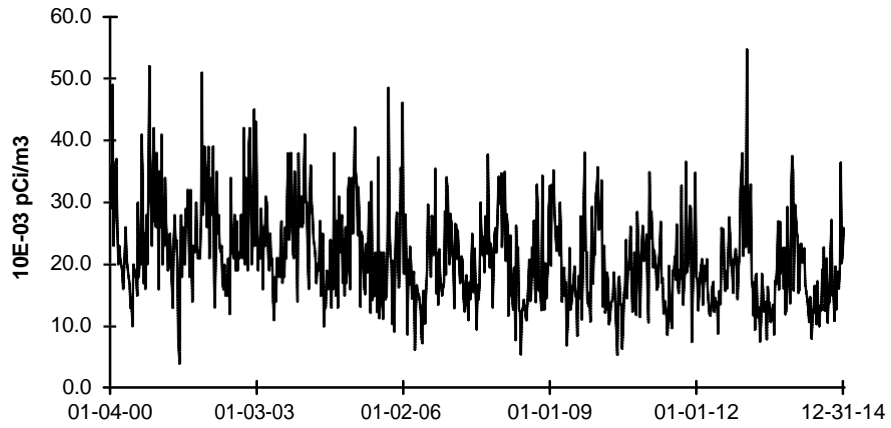


FIGURE C-9
Air Particulates - Gross Beta - Stations BY-22 and
BY-23 Collected in the Vicinity of BNGS, 2000 - 2014

BY-22 Byron Nearsite SE



BY-23 Byron Nearsite S

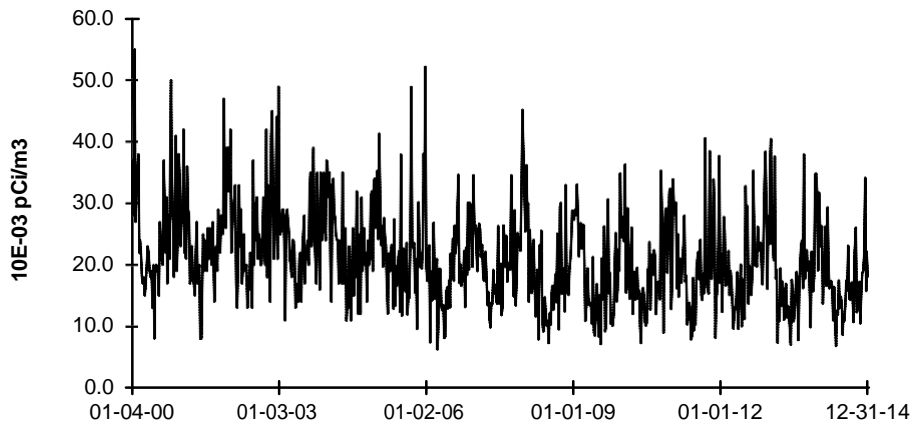


FIGURE C-10
Air Particulates - Gross Beta - Station BY-24
Collected in the Vicinity of BNGS, 2000 - 2014

BY-24 Byron Nearsite SW

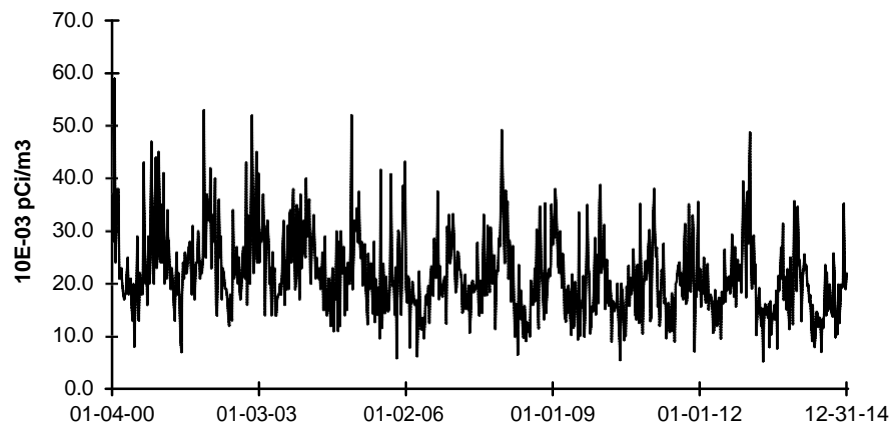
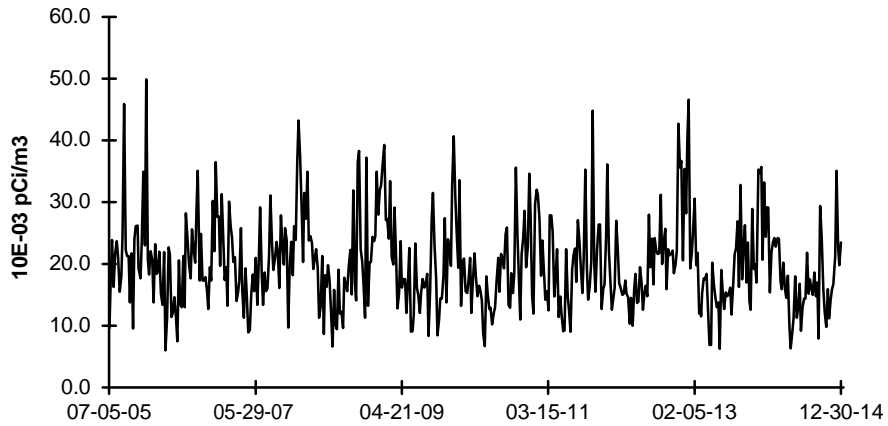
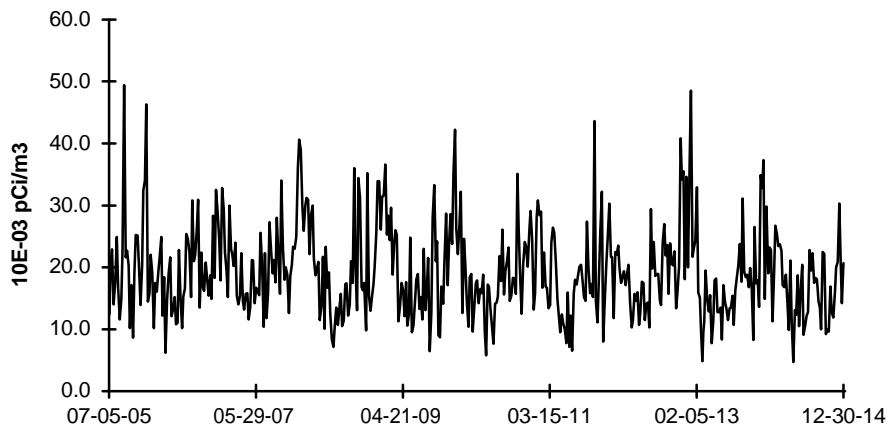


FIGURE C-11
Air Particulates - Gross Beta - Stations BY-01 and
BY-04 Collected in the Vicinity of BNGS, 2005 - 2014

BY-01 Byron N



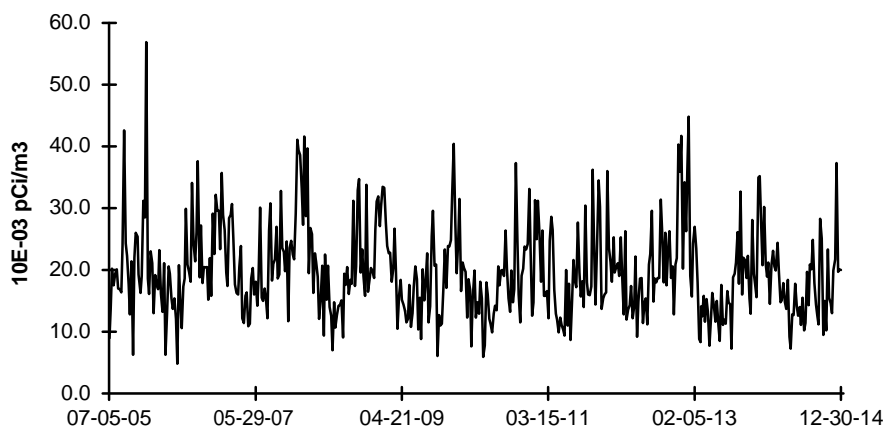
BY-04 Paynes Point SE



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 - 2014

BY-06 Oregon SSW



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

APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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TABLE D-1

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014**

(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2014	E10854	Milk	Sr-89	pCi/L	95.1	91.7	1.04	A
			Sr-90	pCi/L	10.9	15.1	0.72	W
March 2014	E10855	Milk	I-131	pCi/L	96.6	98.5	0.98	A
			Ce-141	pCi/L	112	119	0.94	A
			Cr-51	pCi/L	449	491	0.91	A
			Cs-134	pCi/L	186	210	0.89	A
			Cs-137	pCi/L	250	253	0.99	A
			Co-58	pCi/L	248	268	0.93	A
			Mn-54	pCi/L	292	297	0.98	A
			Fe-59	pCi/L	230	219	1.05	A
			Zn-65	pCi/L	312	323	0.97	A
			Co-60	pCi/L	321	337	0.95	A
	E10857	AP	Ce-141	pCi	53.0	53.9	0.98	A
			Cr-51	pCi	232	223	1.04	A
			Cs-134	pCi	100	95.3	1.05	A
			Cs-137	pCi	122	115	1.06	A
			Co-58	pCi	122	121	1.01	A
			Mn-54	pCi	135	135	1.00	A
			Fe-59	pCi	111	99.3	1.12	A
			Zn-65	pCi	140	147	0.95	A
	Co-60	pCi	187	153	1.22	W		
E10856	Charcoal	I-131	pCi	74.1	76.4	0.97	A	
E10858	Water	Fe-55	pCi/L	2090	1760	1.19	A	
June 2014	E10913	Milk	Sr-89	pCi/L	85.9	91.3	0.94	A
			Sr-90	pCi/L	13.8	14.5	0.95	A
June 2014	E10914	Milk	I-131	pCi/L	86.5	90.9	0.95	A
			Ce-141	pCi/L	111	124	0.90	A
			Cr-51	pCi/L	255	253	1.01	A
			Cs-134	pCi/L	147	162	0.91	A
			Cs-137	pCi/L	123	120	1.03	A
			Co-58	pCi/L	105	112	0.94	A
			Mn-54	pCi/L	155	156	0.99	A
			Fe-59	pCi/L	106	102	1.04	A
			Zn-65	pCi/L	251	252	1.00	A
			Co-60	pCi/L	218	224	0.97	A
	E10916	AP	Ce-141	pCi	95.1	92.6	1.03	A
			Cr-51	pCi	215	190	1.13	A
			Cs-134	pCi	122	122	1.00	A
Cs-137			pCi	95.1	89.8	1.06	A	
Co-58			pCi	88.7	84.1	1.05	A	
E10916	AP	Mn-54	pCi	115	116	0.99	A	
		Fe-59	pCi	72.6	76.7	0.95	A	
		Zn-65	pCi	193	189	1.02	A	
		Co-60	pCi	179	168	1.07	A	
		E10915	Charcoal	I-131	pCi	85.6	85.2	1.00
E10917	Water	Fe-55	pCi/L	1680	1810	0.93	A	

**TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 2 OF 3)**

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
September 2014	E10946	Milk	Sr-89	pCi/L	90.7	96.9	0.94	A
			Sr-90	pCi/L	14.0	16.4	0.85	A
	E10947	Milk	I-131	pCi/L	92.0	97.6	0.94	A
			Ce-141	pCi/L	117	126	0.93	A
			Cr-51	pCi/L	281	288	0.98	A
			Cs-134	pCi/L	141	158	0.89	A
			Cs-137	pCi/L	186	193	0.96	A
			Co-58	pCi/L	137	143	0.96	A
			Mn-54	pCi/L	138	142	0.97	A
			Fe-59	pCi/L	162	158	1.03	A
			Zn-65	pCi/L	75.2	73.0	1.03	A
			Co-60	pCi/L	286	297	0.96	A
	E10949	AP	Ce-141	pCi	97.8	82.1	1.19	A
			Cr-51	pCi	212	188	1.13	A
			Cs-134	pCi	106	103	1.03	A
			Cs-137	pCi	131	126	1.04	A
			Co-58	pCi	85.7	93.0	0.92	A
			Mn-54	pCi	92.8	92.3	1.01	A
			Fe-59	pCi	113	103	1.10	A
			Zn-65	pCi	53.2	47.5	1.12	A
	E10948	Charcoal	I-131	pCi	83.9	89.8	0.93	A
					202	193	1.05	A
	E10950	Water	Fe-55	pCi/L	2010	1720	1.17	A
	E10951	Soil	Ce-141	pCi/g	0.208	0.186	1.12	A
			Cr-51	pCi/g	0.398	0.425	0.94	A
			Cs-134	pCi/g	0.216	0.233	0.93	A
			Cs-137	pCi/g	0.398	0.365	1.09	A
			Co-58	pCi/g	0.197	0.211	0.93	A
			Mn-54	pCi/g	0.242	0.209	1.16	A
			Fe-59	pCi/g	0.238	0.233	1.02	A
Zn-65			pCi/g	0.117	0.108	1.08	A	
Co-60			pCi/g	0.447	0.438	1.02	A	
December 2014	E11078	Milk	Sr-89	pCi/L	85.7	95.7	0.90	A
			Sr-90	pCi/L	12.9	15.6	0.83	A
	E11079	Milk	I-131	pCi/L	85.9	95.1	0.90	A
			Ce-141	pCi/L	205	219	0.94	A
			Cr-51	pCi/L	402	406	0.99	A
			Cs-134	pCi/L	156	164	0.95	A
			Cs-137	pCi/L	194	198	0.98	A
			Co-58	pCi/L	122	130	0.94	A
			Mn-54	pCi/L	220	225	0.98	A
			Fe-59	pCi/L	183	175	1.05	A
			Zn-65	pCi/L	287	297	0.97	A
			Co-60	pCi/L	224	235	0.95	A

**TABLE D-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014
(PAGE 3 OF 3)**

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2014	E11081	AP	Ce-141	pCi	96.4	102	0.95	A
			Cr-51	pCi	171	190	0.90	A
			Cs-134	pCi	73.1	76.9	0.95	A
			Cs-137	pCi	99.0	92.6	1.07	A
			Co-58	pCi	57.5	60.8	0.95	A
			Mn-54	pCi	107	105	1.02	A
			Fe-59	pCi	74.2	81.6	0.91	A
			Zn-65	pCi	144	139	1.04	A
			Co-60	pCi	114	110	1.04	A
				E11080	Charcoal	I-131	pCi	93.5
	E11082	Water	Fe-55	pCi/L	1760	1970	0.89	A

(a) Teledyne Brown Engineering reported result.

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

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

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

TABLE D-2

**ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2014**

(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
Mav 2014	RAD-97	Water	Sr-89	pCi/L	38.25	36.7	27.5 - 43.6	A
			Sr-90	pCi/L	24.65	26.5	19.2 - 30.9	A
			Ba-133	pCi/L	89.1	87.9	74.0 - 96.7	A
			Cs-134	pCi/L	45.55	44.3	35.5 - 48.7	A
			Cs-137	pCi/L	91.15	89.1	80.2 - 101	A
			Co-60	pCi/L	65.10	64.2	57.8 - 73.1	A
			Zn-65	pCi/L	244	235	212 - 275	A
			Gr-A	pCi/L	45.65	61.0	31.9 - 75.8	A
			Gr-B	pCi/L	27.95	33.0	21.4 - 40.7	A
			I-131	pCi/L	23.75	25.7	21.3 - 30.3	A
			U-Nat	pCi/L	9.61	10.2	7.95 - 11.8	A
			H-3	pCi/L	8435	8770	7610 - 9650	A
				MRAD-20	Filter	Gr-A	pCi/filter	28.0
November 2014	RAD-99	Water	Sr-89	pCi/L	30.4	31.4	22.8 - 38.1	A
			Sr-90	pCi/L	18.6	21.8	15.6 - 25.7	A
			Ba-133	pCi/L	46.8	49.1	40.3 - 54.5	A
			Cs-134	pCi/L	88.0	89.8	73.7 - 98.8	A
			Cs-137	pCi/L	99.0	98.8	88.9 - 111	A
			Co-60	pCi/L	92.5	92.1	82.9 - 104	A
			Zn-65	pCi/L	325	310	279 - 362	A
			Gr-A	pCi/L	29.9	37.6	19.4 - 48.1	A
			Gr-B	pCi/L	27.5	27.4	17.3 - 35.3	A
			I-131	pCi/L	15.8	20.3	16.8 - 24.4	N (1)
			U-Nat	pCi/L	5.74	5.80	4.34 - 6.96	A
			H-3	pCi/L	6255	6880	5940 - 7570	A
				MRAD-21	Filter	Gr-A	pCi/filter	27.3

(1) The **Iodine-131** was evaluated as failed with a ratio of 0.778. No cause could be found for the slightly low activity. TBE would evaluate this as acceptable with warning. A rerun was not possible due to I-131 decay. All other ERA Iodine-131 evaluations since 2004 have been acceptable. NCR 14-08

(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, 2014

(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2014	14-MaW30	Water	Am-241	Bq/L	0.764	0.720	0.504 - 0.936	A
			Cs-134	Bq/L	20.7	23.1	16.2 - 30.0	A
			Cs-137	Bq/L	28.0	28.9	20.2 - 37.6	A
			Co-57	Bq/L	26.5	27.5	19.3 - 35.8	A
			Co-60	Bq/L	15.6	16.0	11.2 - 20.8	A
			H-3**	Bq/L	NR	321	225 - 417	N (3)
			Mn-54	Bq/L	13.5	13.9	9.7 - 18.1	A
			Ni-63	Bq/L	NR	34.0	23.8 - 44.2	N (3)
			Pu-238	Bq/L	0.911	0.828	0.580 - 1.076	
			Pu-239/240	Bq/L	0.751	0.676	0.473 - 0.879	
			K-40	Bq/L	NR		(1)	N (3)
			Sr-90**	Bq/L	NR	8.51	5.96 - 11.06	N (3)
			U-234/233**	Bq/L	NR	0.225	0.158 - 0.293	N (3)
			U-238**	Bq/L	NR	1.45	1.02 - 1.89	N (3)
			Zn-65	Bq/L	-0.201		(1)	A
	14-MaS30	Soil	Cs-134	Bq/kg	2.02		(1)	A
			Cs-137	Bq/kg	1300	1238	867 - 1609	A
			Co-57	Bq/kg	1069	966	676 - 1256	A
			Co-60	Bq/kg	1.32	1.22	(2)	A
			Mn-54	Bq/kg	1510	1430	1001 - 1859	A
			K-40	Bq/kg	669	622	435 - 809	A
			Sr-90	Bq/kg	4.14		(1)	A
	14-RdF30	AP	Cs-134**	Bq/sample	NR	1.91	1.34 - 2.48	N (3)
			Cs-137**	Bq/sample	NR	1.76	1.23 - 2.29	N (3)
			Co-57**	Bq/sample	NR		(1)	N (3)
			Co-60**	Bq/sample	NR	1.39	0.97 - 1.81	N (3)
			Mn-54**	Bq/sample	NR		(1)	N (3)
			Sr-90	Bq/sample	0.8220	1.18	0.83 - 1.53	N (3)
			Zn-65**	Bq/sample	NR		(1)	N (3)
	14-GrF30	AP	Gr-A	Bq/sample	0.606	1.77	0.53 - 3.01	A
			Gr-B	Bq/sample	0.7507	0.77	0.39 - 1.16	A
	14-RdV30	Vegetation	Cs-134	Bq/sample	5.96	6.04	4.23 - 7.85	A
			Cs-137	Bq/sample	5.06	4.74	3.32 - 6.16	A
			Co-57	Bq/sample	11.8	10.1	7.1 - 13.1	A
			Co-60	Bq/sample	7.34	6.93	4.85 - 9.01	A
			Mn-54	Bq/sample	8.95	8.62	6.03 - 11.21	A
Sr-90			Bq/sample	1.23	1.46	1.02 - 1.90	A	
Zn-65			Bq/sample	8.91	7.86	5.50 - 10.22	A	

TABLE D-3

DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2014

(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide*	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2014	14-MaW31	Water	Am-241	Bq/L	0.705	0.88	0.62 - 1.14	A
			Cs-134***	Bq/L	NR		(1)	N (4)
			Cs-137***	Bq/L	NR	18.4	12.9 - 23.9	N (4)
			Co-57***	Bq/L	NR	24.7	17.3 - 32.1	N (4)
			Co-60***	Bq/L	NR	12.4	8.7 - 16.1	N (4)
			Mn-54***	Bq/L	NR	14.0	9.8 - 18.2	N (4)
			Ni-63	Bq/L	24.07	24.6	17.2 - 32.0	A
			Pu-238	Bq/L	0.591	0.618	0.433 - 0.803	A
			Pu-239/240	Bq/L	0.0153	0.0048	(2)	A
			K-40***	Bq/L	NR	161	113 - 209	N (4)
	Zn-65***	Bq/L	NR	10.9	7.6 - 14.2	N (4)		
	14-MaS31	Soil	Cs-134***	Bq/kg	NR	622	435 - 809	N (4)
			Cs-137***	Bq/kg	NR		(1)	N (4)
			Co-57***	Bq/kg	NR	1116	781 - 1451	N (4)
			Co-60***	Bq/kg	NR	779	545 - 1013	N (4)
			Mn-54***	Bq/kg	NR	1009	706 - 1312	N (4)
			K-40***	Bq/kg	NR	824	577 - 1071	N (4)
			Sr-90	Bq/kg	694	858	601 - 1115	A
			Zn-65***	Bq/kg	NR	541	379 - 703	N (4)
	14-RdF31	AP	Sr-90	Bq/sample	0.310	0.703	0.492 - 0.914	N (4)
14-GrF31	AP	Gr-A	Bq/sample	0.153	0.53	0.16 - 0.90	N (4)	
		Gr-B	Bq/sample	0.977	1.06	0.53 - 1.59	A	
September 2014	14-RdV31	Vegetation	Cs-134	Bq/sample	7.31	7.38	5.17 - 9.59	A
			Cs-137	Bq/sample	8.93	8.14	5.70 - 10.58	A
			Co-57	Bq/sample	10.8	9.2	6.4 - 12.0	A
			Co-60	Bq/sample	6.31	6.11	4.28 - 7.94	A
			Mn-54	Bq/sample	7.76	7.10	4.97 - 9.23	A
			Sr-90	Bq/sample	0.738	0.85	0.60 - 1.11	A
			Zn-65	Bq/sample	7.16	6.42	4.49 - 8.35	A

* The MAPEP cross check isotope list has been reduced due to duplication of effort or analysis not being performed for clients.

** These nuclides are no longer part of the TBE cross check program due to duplication of effort or analysis not being performed for clients. MAPEP evaluates non-reported analyses as failed if they were reported in the previous series.

*** All future gamma cross check samples for these isotopes will be provided by Analytics.

(1) False positive test.

(2) Sensitivity evaluation.

(3) **Water, Ni-63** overlooked when reporting, but the result of 32.7 +/- 1.69 would have passed the acceptance criteria. NCR 14-04

Water, the non-detected **K-40** was overlooked when reporting, but would have passed the false positive test. NCR 14-04

AP, Sr-90 rerun was within the low range of the acceptance criteria. The original and rerun results were statistically the same. No cause could be identified for the slightly low Sr-90 activity. NCR 14-04

For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-04

(4) **AP, Sr-90** gravimetric yield was very high at 117%. Could indicate larger than normal amounts of calcium in the AP. A second fuming HNO₃ separation would be required to remove the excess calcium. NCR 14-09

AP, Gr-Alpha was counted on the wrong side. When flipped over and recounted the results were acceptable. NCR 14-09

For non reported (NR) analyses, MAPEP evaluates as failed if they were reported in the previous series. NCR 14-09

(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^a
ENVIRONMENTAL, INC., 2014

(Page 1 of 1)

Lab Code	Date	Analysis	Concentration (pCi/L)			Acceptance
			Laboratory Result b	ERA Result c	Control Limits	
ERW-1384	04/07/14	Sr-89	40.29 ± 5.76	36.70	27.50 - 43.60	Pass
ERW-1384	04/07/14	Sr-90	24.08 ± 2.35	26.50	19.20 - 30.90	Pass
ERW-1385	04/07/14	Ba-133	78.23 ± 3.93	87.90	74.00 - 96.70	Pass
ERW-1385	04/07/14	Co-60	62.75 ± 3.53	64.20	57.80 - 73.10	Pass
ERW-1385	04/07/14	Cs-134	44.97 ± 3.99	44.30	35.50 - 48.70	Pass
ERW-1385	04/07/14	Cs-137	88.54 ± 4.93	89.10	80.20 - 101.00	Pass
ERW-1385	04/07/14	Zn-65	249.1 ± 10.44	235.0	212.0 - 275.0	Pass
ERW-1388	04/07/14	Gr. Alpha	56.70 ± 2.47	61.00	31.90 - 75.80	Pass
ERW-1388	04/07/14	Gr. Beta	32.10 ± 1.20	33.00	21.40 - 40.70	Pass
ERW-1391	04/07/14	I-131	25.52 ± 1.12	25.70	21.30 - 30.30	Pass
ERW-1394	04/07/14	Uranium	10.76 ± 0.74	10.20	7.95 - 11.80	Pass
ERW-1397	04/07/14	H-3	8982 ± 279	8770	7610 - 9650	Pass
ERW-5382	10/06/14	Sr-89	29.40 ± 5.32	31.40	22.80 - 38.10	Pass
ERW-5382	10/06/14	Sr-90	19.19 ± 1.85	21.80	15.60 - 25.70	Pass
ERW-5385	10/06/14	Ba-133	43.54 ± 4.54	49.10	40.30 - 54.50	Pass
ERW-5385	10/06/14	Cs-134	81.95 ± 7.49	89.80	73.70 - 98.80	Pass
ERW-5385	10/06/14	Cs-137	95.76 ± 5.50	98.80	88.90 - 111.00	Pass
ERW-5385	10/06/14	Co-60	90.25 ± 2.77	92.10	82.90 - 104.00	Pass
ERW-5385	10/06/14	Zn-65	327.4 ± 23.3	310.00	279.0 - 362.0	Pass
ERW-5388	10/06/14	Gr. Alpha	30.88 ± 8.05	37.60	19.40 - 46.10	Pass
ERW-5388	10/06/14	G. Beta	20.47 ± 4.75	27.40	17.30 - 35.30	Pass
ERW-5392	10/06/14	I-131	19.58 ± 2.35	20.30	16.80 - 24.40	Pass
ERW-5394	10/06/14	Uranium	5.51 ± 0.37	5.80	4.34 - 6.96	Pass
ERW-5397	10/06/14	H-3	6876 ± 383	6880	5940 - 7570	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., 2014

(Page 1 of 2)

Lab Code b	Date	Analysis	Laboratory result	Concentration a		Acceptance
				Known Activity	Control Limits c	
MAW-1140	02/01/14	Gr. Alpha	0.77 ± 0.06	0.85	0.26 - 1.44	Pass
MAW-1140	02/01/14	Gr. Beta	4.31 ± 0.08	4.19	2.10 - 6.29	Pass
MAW-1184	02/01/14	Fe-55	0.40 ± 3.20	0.00	-0.01 - 2.00	Pass
MAW-1184	02/01/14	H-3	345.10 ± 10.60	321.00	225.00 - 417.00	Pass
MAW-1184	02/01/14	Ni-63	32.40 ± 3.20	34.00	23.80 - 44.20	Pass
MAW-1184	02/01/14	Pu-238	1.28 ± 0.12	0.83	0.58 - 1.08	Fail (1)
MAW-1184	02/01/14	Pu-239/240	0.91 ± 0.10	0.68	0.47 - 0.88	Fail (1)
MAW-1184	02/01/14	Sr-90	7.00 ± 0.70	8.51	5.96 - 11.06	Pass
MAW-1184	02/01/14	U-233/234	0.20 ± 0.07	0.23	0.16 - 0.29	Pass
MAW-1184	02/01/14	U-238	1.25 ± 0.18	1.45	1.02 - 1.89	Pass
MAW-1184	02/01/14	Co-57	27.86 ± 0.38	27.50	19.30 - 35.80	Pass
MAW-1184	02/01/14	Co-60	15.99 ± 0.27	16.00	11.20 - 20.80	Pass
MAW-1184	02/01/14	Cs-134	21.85 ± 0.54	23.10	16.20 - 30.00	Pass
MAW-1184	02/01/14	Cs-137	28.74 ± 0.49	28.90	20.20 - 37.60	Pass
MAW-1184	02/01/14	K-40	1.80 ± 2.00	0.00	0.00 - 10.00	Pass
MAW-1184	02/01/14	Mn-54	14.06 ± 0.40	13.90	9.70 - 18.10	Pass
MAW-1184	02/01/14	Zn-65	0.00 ± 0.19	0.00	-0.01 - 0.00	Pass
MAVE-1148	02/01/14	Co-57	11.63 ± 0.19	10.10	7.10 - 13.10	Pass
MAVE-1148	02/01/14	Co-60	7.28 ± 0.18	6.93	4.85 - 9.01	Pass
MAVE-1148	02/01/14	Cs-134	6.29 ± 0.29	6.04	4.23 - 7.85	Pass
MAVE-1148	02/01/14	Cs-137	5.18 ± 0.20	4.74	3.32 - 6.16	Pass
MAVE-1148	02/01/14	Mn-54	9.22 ± 0.26	8.62	6.03 - 11.21	Pass
MAVE-1148	02/01/14	Zn-65	8.59 ± 0.40	7.86	5.50 - 10.22	Pass
MAAP-1151	02/01/14	Co-57	1.60 ± 0.05	0.00	NA	Fail (2)
MAAP-1151	02/01/14	Co-60	1.38 ± 0.08	1.39	0.97 - 1.81	Pass
MAAP-1151	02/01/14	Cs-134	1.75 ± 0.11	1.91	1.34 - 2.48	Pass
MAAP-1151	02/01/14	Cs-137	1.81 ± 0.10	1.76	1.23 - 2.29	Pass
MAAP-1151	02/01/14	Mn-54	0.01 ± 0.03	0.00	NA	Pass
MAAP-1151	02/01/14	Zn-65	-0.24 ± 0.09	0.00	-0.50 - 1.00	Pass
MAAP-1151	02/01/14	Sr-90	1.11 ± 0.14	1.18	0.83 - 1.53	Pass
MAAP-1154	02/01/14	Gr. Alpha	0.56 ± 0.06	1.77	0.53 - 3.01	Pass
MAAP-1154	02/01/14	Gr. Beta	0.98 ± 0.06	0.77	0.39 - 1.16	Pass
MASO-1146	02/01/14	Ni-63	4.80 ± 15.30	0.00	NA	Pass
MASO-1146	02/01/14	Co-57	1064.50 ± 3.60	966.00	676.00 - 1256.00	Pass
MASO-1146	02/01/14	Co-60	1.70 ± 0.50	1.22	(3)	Pass
MASO-1146	02/01/14	Cs-134	6.10 ± 1.80	0.00	NA	Fail (4)
MASO-1146	02/01/14	Cs-137	1364.30 ± 5.30	1238.00	867.00 - 1609.00	Pass
MASO-1146	02/01/14	K-40	728.90 ± 15.90	622.00	435.00 - 809.00	Pass
MASO-1146	02/01/14	Mn-54	1588.00 ± 6.00	1430.00	1001.00 - 1859.00	Pass
MASO-1146	02/01/14	Zn-65	763.50 ± 6.80	695.00	487.00 - 904.00	Pass
MASO-1146	02/01/14	Sr-90	1.23 ± 1.37	0.00	NA	Pass

TABLE D-5

DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
ENVIRONMENTAL, INC., 2014

(Page 2 of 2)

Lab Code ^b	Date	Analysis	Laboratory result	Concentration ^a		Acceptance
				Known Activity	Control Limits ^c	
MASO-4439	08/01/14	Ni-63	771.62 ± 23.29	980.00	686.00 - 1274.00	Pass
MASO-4439	08/01/14	Sr-90	778.34 ± 17.82	858.00	601.00 - 1115.00	Pass
MASO-4439	08/01/14	Cs-134	520.60 ± 7.09	622.00	435.00 - 809.00	Pass
MASO-4439	08/01/14	Co-57	1135.00 ± 7.40	1116.00	781.00 - 1451.00	Pass
MASO-4439	08/01/14	Co-60	768.20 ± 7.70	779.00	545.00 - 1013.00	Pass
MASO-4439	08/01/14	Mn-54	1050.70 ± 12.60	1009.00	706.00 - 1312.00	Pass
MASO-4439	08/01/14	Zn-65	407.89 ± 15.03	541.00	379.00 - 703.00	Pass
MAW-4431	08/01/14	Am-241	0.79 ± 0.08	0.88	0.62 - 1.14	Pass
MAW-4431	08/01/14	Cs-137	18.62 ± 0.54	18.40	12.90 - 23.90	Pass
MAW-4431	08/01/14	Co-57	24.85 ± 0.42	24.70	17.30 - 32.10	Pass
MAW-4431	08/01/14	Co-60	12.27 ± 0.38	12.40	8.70 - 16.10	Pass
MAW-4431	08/01/14	H-3	207.20 ± 10.60	208.00	146.00 - 270.00	Pass
MAW-4431	08/01/14	Fe-55	55.10 ± 14.80	31.50	22.10 - 41.00	Fail (5)
MAW-4431	08/01/14	Mn-54	14.36 ± 0.53	14.00	9.80 - 18.20	Pass
MAW-4431	08/01/14	Zn-65	11.46 ± 0.78	10.90	7.60 - 14.20	Pass
MAW-4493	08/01/14	Gr. Alpha	0.93 ± 0.07	1.40	0.42 - 2.38	Pass
MAW-4493	08/01/14	Gr. Beta	6.31 ± 1.35	6.50	3.25 - 9.75	Pass
MAAP-4433	08/01/14	Sr-90	0.74 ± 0.10	0.70	0.49 - 0.91	Pass
MAAP-4444	08/01/14	Sr-89	7.82 ± 0.52	9.40	6.60 - 12.20	Pass
MAAP-4444	08/01/14	Sr-90	0.76 ± 0.10	0.76	0.53 - 0.99	Pass
MAVE-4436	08/01/14	Cs-134	7.49 ± 0.18	7.38	5.17 - 9.59	Pass
MAVE-4436	08/01/14	Co-57	11.20 ± 0.19	9.20	6.40 - 12.00	Pass
MAVE-4436	08/01/14	Co-60	6.84 ± 0.17	6.11	4.28 - 7.94	Pass
MAVE-4436	08/01/14	Mn-54	8.11 ± 0.26	7.11	4.97 - 9.23	Pass
MAVE-4436	08/01/14	Zn-65	7.76 ± 0.43	6.42	4.49 - 8.35	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 high bias on the plutonium crosscheck samples was traced to contamination from a newly purchased standard.

The results of reanalysis with replacement tracer purchased from NIST:

MAW-1184 Pu-238 0.68 ± 0.10 Bq / L

MAW-1184 Pu-239/240 0.66 ± 0.10 Bq / L

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

(3) Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

(4) False positive test. Long sample counting time lead to interference from naturally occurring Bi-214 in sample matrix with a close spectral energy.

(5) Result of reanalysis Fe-55 32.63 ± 16.30 Bq/L

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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 2.64E-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 2014.

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 2014 gaseous dose was vegetation. The critical pathway for 2014 liquid dose was freshwater fish.

1.1 EFFLUENTS

1.2 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 $9.33\text{E-}01$ curies of fission and activation gases were released with a maximum average quarterly release rate of $4.32\text{E-}02$ $\mu\text{Ci/sec}$.

A total of $6.16\text{E-}06$ curies of 1-131 were released during the year with a maximum average quarterly release rate of $7.58\text{E-}07$ $\mu\text{Ci/sec}$.

A total of $5.74\text{E-}07$ curies were released as airborne particulate matter with a maximum average quarterly release rate of $7.30\text{E-}08$ $\mu\text{Ci/sec}$.

A total of $8.55\text{E+}00$ curies of other (C-14) radioisotopes were released with a maximum average quarterly release rate of $2.93\text{E-}01$ $\mu\text{Ci/sec}$.

A total of $8.48\text{E+}01$ curies of tritium were released with a maximum average quarterly release rate of $3.90\text{E+}00$ $\mu\text{Ci/sec}$.

Gross alpha-emitting radionuclides were below detectable limits.

1.3 Liquids Released to Rock River

A total of $2.78\text{E+}10$ liters of radioactive liquid wastes containing $1.43\text{E-}02$ curies of fission and activation products were discharged with a maximum quarterly average concentration of $8.40\text{E-}10$ $\mu\text{Ci/ml}$.

A total of $2.94\text{E+}03$ curies of tritium were discharged with a maximum quarterly average concentration of $2.83\text{E-}04$ uCi/ml .

A total of $7.68\text{E-}04$ curies of dissolved and entrained gases were discharged with a maximum quarterly average concentration of $8.82\text{E-}11$ 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 2014 Annual Radiological Effluent Release Report.

3.1 DOSE TO MAN

3.2 Gaseous Effluent Pathways

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

3.2.1 Noble Gases

3.2.1.1 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 4.63E-05 mrad based on measured effluents and average meteorological data, and 9.25E-06 mrad based on measured effluents and concurrent meteorological data. (Table 3.4-1).

3.2.1.2 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 $1.89\text{E-}05$ mrem, and $1.29\text{E-}05$ 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 $1.58\text{E-}05$ mrad. The beta air dose based on measured effluents and concurrent meteorological data was $1.30\text{E-}05$ mrad.

3.2.2 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 $6.96\text{E-}01$ mrem (child/bone) based on measured effluents and average meteorological data and $7.36\text{E-}01$ 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 $1.44\text{E-}01$ mrem (child) based on measured effluents and average meteorological data and $1.53\text{E-}01$ mrem based on measured effluents and concurrent meteorological data.

3.2.3 Gaseous Total Dose

The maximum total dose from gaseous releases to any organ was 6.96E-01 mrem (child/bone) based on measured effluents and average meteorological data, and 7.36E-01 mrem (child/bone) based on measured effluents and concurrent meteorological data. The maximum total dose from gaseous releases to the whole body was 1.44E-01 mrem (child) based on measured effluents and average meteorological data, and 1.53E-01 mrem (child) based on measured effluents and concurrent meteorological data.

3.3 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 2.23E-01 mrem (adult/gilli). The maximum dose from liquid releases to the whole body was 1.44E-01 mrem (adult).

3.4 Total Dose

The maximum total dose to any organ via both gaseous and liquid effluents to any organ is 7.01E-01 mrem (child/bone). The maximum dose to the whole body via both gaseous and liquid effluents is 2.64E-01 mrem (child).

3.5 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 99.7% during 2014.

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APPENDIX E-1

DATA TABLES AND FIGURES

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Table 1.1-1

RG 1.21 EFFLUENT AND WASTE DISPOSAL REPORT
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
 Unit 1

REPORT FOR 2014	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
1. Total Release	Ci	1.81E-01	3.08E-02	1.60E-01	5.54E-02	4.26E-01
2. Avg. Release Rate	uCi/sec	2.33E-02	3.92E-03	2.01E-02	6.97E-03	1.35E-02
Iodine-131						
1. Total Release	Ci	2.03E-06	(1)	(1)	(1)	2.03E-06
2. Avg. Release Rate	uCi/sec	2.62E-07	(1)	(1)	(1)	6.45E-08
Particulates Half Life >= 8 days						
1. Total Release	Ci	(1)	2.87E-07	(1)	(1)	2.87E-07
2. Avg. Release Rate	uCi/sec	(1)	3.65E-08	(1)	(1)	9.10E-09
Others						
1. Total Release	Ci	8.84E-01	1.11E+00	1.18E+00	1.12E+00	4.30E+00
2. Avg. Release Rate	uCi/sec	1.14E-01	1.42E-01	1.48E-01	1.41E-01	1.36E-01
Tritium						
1. Total Release	Ci	5.57E+00	4.14E+00	3.96E+00	1.25E+01	2.61E+01
2. Avg. Release Rate	uCi/sec	7.17E-01	5.27E-01	4.99E-01	1.57E+00	8.29E-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.)

RG 1.21 EFFLUENT AND WASTE DISPOSAL REPORT
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
 Unit 2

REPORT FOR 2014	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Gases						
1. Total Release	Ci	1.55E-01	1.75E-02	1.58E-01	1.77E-01	5.07E-01
2. Avg. Release Rate	uCi/sec	1.99E-02	2.23E-03	1.99E-02	2.23E-02	1.61E-02
Iodine-131						
1. Total Release	Ci	3.86E-06	(1)	2.77E-07	(1)	4.13E-06
2. Avg. Release Rate	uCi/sec	4.96E-07	(1)	3.48E-08	(1)	1.31E-07
Particulates Half Life >= 8 days						
1. Total Release	Ci	(1)	2.87E-07	(1)	(1)	2.87E-07
2. Avg. Release Rate	uCi/sec	(1)	3.65E-08	(1)	(1)	9.10E-09
Others						
1. Total Release	Ci	1.08E+00	1.18E+00	1.13E+00	8.52E-01	4.25E+00
2. Avg. Release Rate	uCi/sec	1.39E-01	1.51E-01	1.42E-01	1.07E-01	1.35E-01
Tritium						
1. Total Release	Ci	1.89E+01	1.01E+01	1.11E+01	1.86E+01	5.87E+01
2. Avg. Release Rate	uCi/sec	2.43E+00	1.29E+00	1.40E+00	2.33E+00	1.86E+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

RG 1.21 EFFLUENT AND WASTE DISPOSAL REPORT
 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
 Unit 1

REPORT FOR 2014	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
1. Total Release	Ci	2.56E-03	1.29E-03	6.96E-04	2.58E-03	7.13E-03
2. Avg. Diluted Conc.	uCi/ml	8.40E-10	3.52E-10	1.79E-10	7.76E-10	5.12E-10
Tritium						
1. Total Release	Ci	8.62E+02	9.74E+01	3.89E+02	1.24E+02	1.47E+03
2. Avg. Diluted Conc.	uCi/ml	2.83E-04	2.65E-05	1.00E-04	3.73E-05	1.06E-04
Dissolved and Entrained Gases						
1. Total Release	Ci	2.69E-04	(1)	8.93E-05	2.63E-05	3.84E-04
2. Avg. Diluted Conc.	uCi/ml	8.82E-11	(1)	2.30E-11	7.91E-12	2.76E-11
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
Volume of liquid waste	liters	3.05E+09	3.67E+09	3.89E+09	3.32E+09	1.39E+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.)

RG 1.21 EFFLUENT AND WASTE DISPOSAL REPORT
 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
 Unit 2

REPORT FOR 2014	Units	QTR 1	QTR 2	QTR 3	QTR 4	YEAR
Fission and Activation Products						
1. Total Release	Ci	2.56E-03	1.29E-03	6.96E-04	2.58E-03	7.13E-03
2. Avg. Diluted Conc.	uCi/ml	8.40E-10	3.52E-10	1.79E-10	7.76E-10	5.12E-10
Tritium						
1. Total Release	Ci	8.62E+02	9.74E+01	3.89E+02	1.24E+02	1.47E+03
2. Avg. Diluted Conc.	uCi/ml	2.83E-04	2.65E-05	1.00E-04	3.73E-05	1.06E-04
Dissolved and Entrained Gases						
1. Total Release	Ci	2.69E-04	(1)	8.93E-05	2.63E-05	3.84E-04
2. Avg. Diluted Conc.	uCi/ml	8.82E-11	(1)	2.30E-11	7.91E-12	2.76E-11
Gross Alpha Radioactivity						
1. Total Release	Ci	(1)	(1)	(1)	(1)	(1)
Volume of liquid waste	liters	3.05E+09	3.67E+09	3.89E+09	3.32E+09	1.39E+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

Units 1 & 2

Report for: 2014

Unit Range - From: 1 To: 2

Liquid Receptor

=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) === ANNUAL 2014 ===

Agegrp	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB
ADULT	5.28E-03	1.43E-01	1.42E-01	1.42E-01	1.42E-01	2.23E-01	0.00E+00	1.44E-01
TEEN	4.83E-03	1.08E-01	1.07E-01	1.07E-01	1.07E-01	1.64E-01	0.00E+00	1.08E-01
CHILD	5.46E-03	1.20E-01	1.19E-01	1.19E-01	1.19E-01	1.39E-01	0.00E+00	1.20E-01
INFANT	9.40E-05	5.27E-02	5.27E-02	5.27E-02	5.27E-02	5.27E-02	0.00E+00	5.27E-02

=== SITE DOSE LIMIT ANALYSIS === ANNUAL 2014 ===

Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2014 - Admin. Any Organ	ADULT	GILLI	2.23E-01	7.50E+00	2.98E+00
2014 - Admin. Total Body	ADULT	TBODY	1.44E-01	2.25E+00	6.38E+00

2014 - T.Spc. Any Organ ADULT GILLI 2.23E-01 1.00E+01 2.23E+00

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	6.37E+01
CR-51	4.88E-02
MN-54	2.07E-01
FE-55	5.59E-02
FE-59	7.58E-02
CO-58	1.94E+00
CO-60	2.13E+00
SR-89	2.50E-02
SR-90	5.12E-02
ZR-95	1.89E-03
ZR-97	5.59E-04
NB-95	3.14E+01
TE-132	3.37E-01
I-132	1.06E-05

2014 - T.Spc. Total Body ADULT TBODY 1.44E-01 3.00E+00 4.78E+00

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	9.91E+01
CR-51	3.02E-04
MN-54	2.00E-02
FE-55	3.54E-02

Table 3.1-1 (cont.)

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Nuclide	Percentage
-----	-----
FE-59	1.36E-02
CO-58	3.34E-01
CO-60	3.90E-01
SR-89	6.95E-03
SR-90	6.37E-02
ZR-95	6.27E-07
ZR-97	1.28E-09
NB-95	4.33E-03
TE-132	1.04E-02
I-132	3.06E-05

Table 3.2-1
 40CFR190 URANIUM FUEL CYCLE DOSE REPORT

 GASEOUS DOSE SUMMARY

Units 1 & 2

Report for: 2014
 Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS ===== ANNUAL 2014 =====

Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2014 - Admin. Any Organ	CHILD	BONE	6.96E-01	1.13E+01	6.19E+00
2014 - Admin. Total Body	CHILD	TBODY	1.44E-01	1.05E+01	1.37E+00

2014 - T.Spc. Any Organ CHILD BONE 6.96E-01 1.50E+01 4.64E+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
CR-51	1.76E-08
CO-58	1.15E-06
CO-60	4.51E-05
ZR-95	1.81E-07
NB-95	7.54E-08
I-131	1.57E-04
I-133	8.27E-06

2014 - T.Spc. Total Body CHILD TBODY 1.44E-01 1.50E+01 9.60E-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	3.33E+00
C-14	9.67E+01
CR-51	8.97E-08
CO-58	9.72E-06
CO-60	2.31E-04
ZR-95	7.99E-07
NB-95	3.52E-07
I-131	4.37E-04
I-133	2.08E-05

Table 3.2-1 (cont.)
 40CFR190 URANIUM FUEL CYCLE DOSE REPORT

 GASEOUS DOSE SUMMARY

Units 1 & 2

Report for: 2014
 Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS ===== ANNUAL 2014 =====

Annual - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit

2014 - Admin. Gamma	4.63E-05	7.50E+00	6.18E-04
2014 - Admin. Beta	1.58E-05	1.50E+01	1.05E-04
2014 - T.Spc. Gamma	4.63E-05	1.00E+01	4.63E-04
Receptor: 4 Composite Crit. Receptor - NG			
Distance: 800 (meters) Compass Point: SSE			
Nuclide	Percentage		
-----	-----		
AR-41	5.94E+01		
KR-85M	1.01E-02		
XE-135	1.86E+00		
XE-133M	3.32E-02		
XE-133	3.87E+01		
2014 - T.Spc. Beta	1.58E-05	2.00E+01	7.89E-05
Receptor: 4 Composite Crit. Receptor - NG			
Distance: 800 (meters) Compass Point: SSE			
Nuclide	Percentage		
-----	-----		
AR-41	1.51E+01		
KR-85M	1.17E-02		
XE-135	1.72E+00		
XE-133M	1.08E-01		
XE-133	8.30E+01		

Table 3.2-1 (cont.)
 40CFR190 URANIUM FUEL CYCLE DOSE REPORT

 Units 1 & 2

Report for: 2014
 Unit Range - From: 1 To: 2

=== MAXIMUM DOSE ANALYSIS ===== ANNUAL 2014 =====

Dose Type	Age Group	Organ	Dose (mrem)
Any Organ	CHILD	BONE	7.01E-01
Liquid Receptor: 0	Liquid Receptor		
Gaseous Receptor: 5	Composite Crit. Receptor - IP		
Distance: 800 (meters)	Compass Point: SSE		

Liquid Dose: 5.46E-03 % of Total: 7.79E-01
 Critical Pathway: Fresh Water Fish - Sport (FFSP)
 Major Contributors (0% or greater to total) Nuclide Percentage

Nuclide	Percentage
H-3	0.00E+00
CR-51	0.00E+00
MN-54	0.00E+00
FE-55	7.95E+00
FE-59	4.96E-01
CO-58	0.00E+00
CO-60	0.00E+00
SR-89	9.08E+00
SR-90	8.14E+01
ZR-95	1.05E-04
ZR-97	5.53E-07
NB-95	4.52E-01
TE-132	5.93E-01
I-132	1.14E-03

Gaseous Dose: 6.96E-01 % of Total: 9.93E+01
 Critical Pathway: Vegetation (VEG)
 Major Contributors (0% or greater to total) Nuclide Percentage

Nuclide	Percentage
H-3	0.00E+00
C-14	1.00E+02
CR-51	1.76E-08
CO-58	1.15E-06
CO-60	4.51E-05
ZR-95	1.81E-07
NB-95	7.54E-08
I-131	1.57E-04
I-133	8.27E-06

Table 3.2-1 (cont.)
 40CFR190 URANIUM FUEL CYCLE DOSE REPORT

=== MAXIMUM DOSE ANALYSIS ===== ANNUAL 2014 =====

Dose Type	Age Group	Organ	Dose (mrem)

Total Body	CHILD	TBODY	2.64E-01
Liquid Receptor: 0	Liquid Receptor		
Gaseous Receptor: 5	Composite Crit. Receptor - IP		
Distance: 800 (meters)	Compass Point: SSE		

Liquid Dose: 1.20E-01 % of Total: 4.56E+01
 Critical Pathway: Fresh Water Fish - Sport (FFSP)
 Major Contributors (0% or greater to total) Nuclide Percentage

-----	-----
H-3	9.88E+01
CR-51	3.96E-04
MN-54	2.57E-02
FE-55	5.94E-02
FE-59	1.81E-02
CO-58	4.35E-01
CO-60	5.09E-01
SR-89	1.18E-02
SR-90	7.44E-02
ZR-95	9.36E-07
ZR-97	2.14E-09
NB-95	5.71E-03
TE-132	1.44E-02
I-132	4.38E-05

Gaseous Dose: 1.44E-01 % of Total: 5.45E+01
 Critical Pathway: Vegetation (VEG)
 Major Contributors (0% or greater to total) Nuclide Percentage

-----	-----
H-3	3.33E+00
C-14	9.67E+01
CR-51	8.97E-08
CO-58	9.72E-06
CO-60	2.31E-04
ZR-95	7.99E-07
NB-95	3.52E-07
I-131	4.37E-04
I-133	2.08E-05

Table 3.4-1

The following are the maximum annual calculated cumulative offsite doses resulting from Byron airborne releases in 2014 based on concurrent meteorological data:

Unit 1:

<u>Dose</u>	<u>Maximum Value</u>	<u>Sector Affected</u>
gamma air ⁽¹⁾	6.13 x10 ⁻⁶ mrad	North-Northwest
beta air ⁽²⁾	6.41 x10 ⁻⁶ mrad	North-Northwest
whole body ⁽³⁾	7.59 x10 ⁻² mrem	North-Northwest
skin ⁽⁴⁾	8.34 x10 ⁻⁶ mrem	North-Northwest
organ ⁽⁵⁾ (child-bone)	3.70 x10 ⁻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:

<u>Dose</u>	<u>Maximum Value</u>	<u>Sector Affected</u>
gamma air ⁽¹⁾	3.12 x10 ⁻⁶ mrad	North-Northwest
beta air ⁽²⁾	6.58 x10 ⁻⁶ mrad	North-Northwest
whole body ⁽³⁾	7.72 x10 ⁻² mrem	North-Northwest
skin ⁽⁴⁾	4.58 x10 ⁻⁶ mrem	North-Northwest
organ ⁽⁵⁾ (child-bone)	3.66 x10 ⁻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

-
- (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: 99.7%

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APPENDIX F

METEOROLOGICAL DATA

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Byron Generating Station

Period of Record: January - March 2014

Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
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	1	1	0	0	2
S	0	0	1	4	0	0	5
SSW	0	0	3	0	0	0	3
SW	0	1	0	0	0	0	1
WSW	0	0	2	0	0	0	2
W	0	0	2	0	0	0	2
WNW	0	0	1	0	0	0	1
NW	0	0	1	1	0	0	2
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	1	11	6	0	0	18

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: January - March 2014

Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
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	1	0	0	1
SSE	0	0	0	0	1	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	1	0	0	1
W	0	0	0	0	0	0	0
WNW	0	0	3	0	0	0	3
NW	0	0	0	2	0	0	2
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	3	4	1	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: 2

Byron Generating Station

Period of Record: January - March 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	3	0	0	3
ENE	0	0	0	1	0	0	1
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	1	0	0	1
SSE	0	0	0	3	1	0	4
S	0	0	1	6	0	0	7
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	2	1	0	0	3
W	0	0	0	0	0	0	0
WNW	0	0	0	1	0	0	1
NW	0	0	2	3	0	0	5
NNW	0	0	1	1	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	0	6	20	1	0	27

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: January - March 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	10	54	59	1	0	126
NNE	0	10	33	9	0	0	52
NE	1	17	12	8	2	0	40
ENE	3	9	24	5	0	0	41
E	1	2	8	0	0	0	11
ESE	1	0	7	5	1	0	14
SE	1	7	24	14	1	0	47
SSE	0	25	32	28	10	2	97
S	0	24	30	29	14	0	97
SSW	0	12	11	22	11	1	57
SW	0	8	23	33	4	0	68
WSW	3	9	31	13	2	13	71
W	2	21	69	62	12	3	169
WNW	2	46	80	86	11	0	225
NW	6	37	62	33	4	0	142
NNW	4	15	55	10	1	0	85
Variable	0	0	0	0	0	0	0
Total	26	252	555	416	74	19	1342

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: January - March 2014 Stability
 Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	7	0	0	0	0	9
NNE	1	4	4	1	0	0	10
NE	2	2	1	0	0	0	5
ENE	2	5	3	1	0	0	11
E	9	6	4	0	0	0	19
ESE	2	15	11	2	2	0	32
SE	1	9	13	1	1	0	25
SSE	3	11	18	10	3	0	45
S	3	12	16	23	3	0	57
SSW	6	7	8	15	0	0	36
SW	3	15	14	8	0	0	40
WSW	4	22	35	5	0	6	72
W	5	33	34	6	0	1	79
WNW	9	25	15	2	1	0	52
NW	5	37	7	2	0	0	51
NNW	2	13	2	0	0	0	17
Variable	1	0	0	0	0	0	1
Total	60	223	185	76	10	7	561

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: 2

Byron Generating Station

Period of Record: January - March 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	4	1	0	0	0	0	5
NNE	1	1	0	0	0	0	2
NE	1	0	1	0	0	0	2
ENE	0	0	3	0	0	0	3
E	4	9	0	0	0	0	13
ESE	1	12	3	0	0	0	16
SE	0	5	1	0	0	0	6
SSE	6	8	11	2	0	0	27
S	4	3	5	0	0	0	12
SSW	2	3	0	0	0	0	5
SW	1	1	0	0	0	0	2
WSW	2	0	0	0	0	0	2
W	7	9	0	0	0	0	16
WNW	7	5	0	0	0	0	12
NW	5	5	0	0	0	0	10
NNW	0	3	0	0	0	0	3
Variable	0	0	0	0	0	0	0
Total	45	65	24	2	0	0	136

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: January - March 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	0	0	0	0	0	1
NNE	2	0	0	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	1	0	0	0	0	0	1
ESE	0	6	0	0	0	0	6
SE	1	0	1	0	0	0	2
SSE	0	2	3	0	0	0	5
S	2	2	4	0	0	0	8
SSW	0	1	0	0	0	0	1
SW	4	0	0	0	0	0	4
WSW	3	0	0	0	0	0	3
W	3	0	0	0	0	0	3
WNW	4	0	0	0	0	0	4
NW	8	1	0	0	0	0	9
NNW	3	1	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	32	13	8	0	0	0	53

Hours of calm in this stability class: 8
 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: January - March 2014

Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
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	1	0	1
S	0	0	0	0	3	2	5
SSW	0	0	0	3	1	0	4
SW	0	0	1	0	0	0	1
WSW	0	0	0	2	0	0	2
W	0	0	0	1	0	0	1
WNW	0	0	0	2	0	0	2
NW	0	0	0	0	2	0	2
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	1	8	7	2	18

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: January - March 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
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	2	2
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0
WSW	0	0	0	0	1	0	1
W	0	0	0	0	0	0	0
WNW	0	0	0	3	0	0	3
NW	0	0	0	0	2	0	2
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	0	0	3	3	2	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: 2

Byron Generating Station

Period of Record: January - March 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

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

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: January - March 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	7	25	46	41	2	122
NNE	0	5	10	36	23	0	74
NE	1	9	11	17	6	3	47
ENE	1	4	7	18	3	0	33
E	0	2	2	14	1	0	19
ESE	1	0	1	3	2	1	8
SE	0	5	8	11	11	5	40
SSE	0	4	24	21	19	9	77
S	0	7	43	20	15	32	117
SSW	0	6	9	15	14	17	61
SW	0	3	12	21	21	18	75
WSW	3	7	10	26	7	16	69
W	0	17	20	69	33	18	157
WNW	2	15	43	71	61	22	214
NW	1	14	40	44	42	14	155
NNW	1	3	24	39	5	2	74
Variable	0	0	0	0	0	0	0
Total	11	108	289	471	304	159	1342

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: January - March 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	4	4	0	0	9
NNE	1	1	4	1	1	0	8
NE	0	0	4	0	1	0	5
ENE	1	5	5	0	3	0	14
E	1	8	2	2	1	2	16
ESE	0	3	2	7	6	2	20
SE	1	4	3	8	1	3	20
SSE	1	1	6	12	11	3	34
S	2	3	5	13	16	27	66
SSW	2	2	10	4	14	10	42
SW	1	3	6	14	9	9	42
WSW	1	2	8	54	5	5	75
W	1	3	14	40	9	2	69
WNW	0	4	17	23	3	0	47
NW	0	8	23	31	5	3	70
NNW	2	0	14	9	1	0	26
Variable	0	0	0	0	0	0	0
Total	14	48	127	222	86	66	563

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: 2

Byron Generating Station

Period of Record: January - March 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	5	3	0	0	11
NNE	0	1	1	2	0	0	4
NE	1	2	1	2	0	0	6
ENE	0	1	0	0	0	0	1
E	0	2	5	4	2	0	13
ESE	0	1	2	4	5	0	12
SE	0	1	0	5	2	0	8
SSE	0	0	2	4	8	1	15
S	0	1	1	5	8	1	16
SSW	0	0	4	1	2	1	8
SW	0	0	1	0	0	0	1
WSW	1	1	3	0	0	0	5
W	0	1	3	3	0	0	7
WNW	0	0	4	4	0	0	8
NW	0	0	4	9	0	0	13
NNW	0	1	4	3	0	0	8
Variable	0	0	0	0	0	0	0
Total	2	15	40	49	27	3	136

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: January - March 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	7	4	2	0	16
NNE	0	1	2	2	0	0	5
NE	0	0	1	1	0	0	2
ENE	0	1	0	0	0	0	1
E	1	1	0	0	0	0	2
ESE	0	0	0	2	0	0	2
SE	1	1	1	3	1	0	7
SSE	0	0	0	0	0	0	0
S	0	1	0	1	4	0	6
SSW	0	1	3	0	4	0	8
SW	0	1	1	0	0	0	2
WSW	0	1	1	0	0	0	2
W	0	0	0	0	0	0	0
WNW	1	0	0	0	0	0	1
NW	0	2	1	0	0	0	3
NNW	0	1	0	3	0	0	4
Variable	0	0	0	0	0	0	0
Total	3	14	17	16	11	0	61

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: April - June 2014
 Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	0	1	5	0	0	0	6
NE	0	1	1	0	0	0	2
ENE	0	1	6	0	0	0	7
E	0	9	2	0	0	0	11
ESE	0	2	0	0	0	0	2
SE	0	0	0	0	0	0	0
SSE	0	1	0	0	0	0	1
S	0	2	2	0	0	0	4
SSW	0	1	1	0	0	0	2
SW	0	0	1	1	0	0	2
WSW	0	1	3	1	0	0	5
W	0	0	2	0	0	0	2
WNW	0	0	1	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	0	1	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	19	25	2	0	0	46

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 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

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

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 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	1	0	0	0	1
NNE	0	0	1	0	0	0	1
NE	0	0	3	0	0	0	3
ENE	0	1	3	2	0	0	6
E	0	1	5	2	0	0	8
ESE	0	2	2	0	0	0	4
SE	0	0	2	0	0	0	2
SSE	0	1	0	5	4	0	10
S	0	0	6	4	1	0	11
SSW	0	4	8	3	2	0	17
SW	0	3	5	0	0	0	8
WSW	0	0	3	1	1	0	5
W	0	1	5	3	4	0	13
WNW	0	2	0	0	0	0	2
NW	0	0	4	1	0	0	5
NNW	0	0	0	0	1	0	1
Variable	0	0	0	0	0	0	0
Total	0	15	48	21	13	0	97

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 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	4	24	22	4	1	0	55
NNE	1	12	23	0	0	0	36
NE	1	10	26	2	0	0	39
ENE	2	14	35	37	1	0	89
E	0	41	59	21	0	0	121
ESE	1	21	20	8	0	0	50
SE	0	9	20	3	0	0	32
SSE	0	10	37	21	10	1	79
S	0	15	38	16	1	0	70
SSW	4	20	43	19	2	0	88
SW	1	31	42	4	0	0	78
WSW	4	9	33	13	3	3	65
W	1	18	48	28	6	2	103
WNW	5	19	31	16	7	0	78
NW	3	21	27	6	0	0	57
NNW	1	21	35	14	1	0	72
Variable	0	0	0	0	0	0	0
Total	28	295	539	212	32	6	1112

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 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	10	6	0	0	0	17
NNE	2	5	4	0	0	0	11
NE	2	9	5	1	0	0	17
ENE	3	15	18	8	0	0	44
E	5	42	20	2	0	0	69
ESE	1	16	15	5	1	0	38
SE	4	20	22	2	0	0	48
SSE	3	21	41	26	0	0	91
S	7	26	41	10	0	0	84
SSW	3	23	18	5	2	0	51
SW	8	15	5	1	1	0	30
WSW	12	5	4	1	0	0	22
W	10	10	11	0	0	0	31
WNW	10	19	13	0	0	0	42
NW	12	25	5	0	0	0	42
NNW	5	25	10	1	0	0	41
Variable	0	0	0	0	0	0	0
Total	88	286	238	62	4	0	678

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 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	3	1	0	0	0	0	4
NNE	4	3	0	0	0	0	7
NE	3	1	0	0	0	0	4
ENE	4	0	0	0	0	0	4
E	3	11	1	0	0	0	15
ESE	4	8	4	0	0	0	16
SE	1	17	3	0	0	0	21
SSE	4	18	14	0	0	0	36
S	7	7	2	0	0	0	16
SSW	2	4	0	0	0	0	6
SW	5	4	0	0	0	0	9
WSW	4	1	0	0	0	0	5
W	3	2	0	0	0	0	5
WNW	4	2	0	0	0	0	6
NW	6	4	0	0	0	0	10
NNW	4	4	0	0	0	0	8
Variable	0	0	0	0	0	0	0
Total	61	87	24	0	0	0	172

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: 5

Byron Generating Station

Period of Record: April - June 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	1	0	0	0	0	0	1
ESE	3	3	2	0	0	0	8
SE	0	4	0	0	0	0	4
SSE	2	1	2	0	0	0	5
S	2	3	0	0	0	0	5
SSW	1	0	0	0	0	0	1
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	4	0	0	0	0	0	4
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	26	11	4	0	0	0	41

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: 5

Byron Generating Station

Period of Record: April - June 2014
 Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	1	0	0	1
NNE	0	0	0	5	0	0	5
NE	0	0	0	1	0	0	1
ENE	0	1	4	3	0	0	8
E	0	6	3	2	0	0	11
ESE	0	0	3	0	0	0	3
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	2	0	2	0	4
SSW	0	1	1	1	0	0	3
SW	0	0	0	0	1	0	1
WSW	0	0	2	3	0	0	5
W	0	0	2	1	0	0	3
WNW	0	0	0	1	0	0	1
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	8	17	18	3	0	46

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 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

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

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 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	0	0	0	1	0	0	1
NE	0	0	2	2	0	0	4
ENE	0	0	2	2	0	0	4
E	0	0	4	3	2	0	9
ESE	0	0	5	1	0	0	6
SE	0	0	0	2	0	0	2
SSE	0	0	0	3	4	4	11
S	0	0	1	5	1	1	8
SSW	0	0	7	8	0	2	17
SW	0	1	4	3	1	0	9
WSW	0	0	0	3	1	0	4
W	0	0	4	4	4	2	14
WNW	0	0	1	0	0	0	1
NW	0	0	2	3	0	0	5
NNW	0	0	0	1	0	1	2
Variable	0	0	0	0	0	0	0
Total	0	1	32	41	13	10	97

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 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	12	27	9	7	1	57
NNE	0	6	11	16	2	0	35
NE	0	4	13	16	9	0	42
ENE	0	5	20	12	31	4	72
E	0	18	38	47	37	4	144
ESE	1	7	21	15	7	0	51
SE	0	3	12	10	3	2	30
SSE	0	2	11	26	23	15	77
S	0	5	19	21	17	1	63
SSW	2	8	27	33	22	3	95
SW	1	6	31	36	4	0	78
WSW	0	10	18	17	9	4	58
W	3	7	32	42	17	8	109
WNW	0	10	14	23	10	10	67
NW	0	6	29	21	7	0	63
NNW	1	15	12	32	10	1	71
Variable	0	0	0	0	0	0	0
Total	9	124	335	376	215	53	1112

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 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	5	12	12	1	0	31
NNE	0	2	5	4	1	0	12
NE	0	0	9	3	2	0	14
ENE	1	7	6	17	7	2	40
E	0	8	30	24	8	3	73
ESE	0	2	8	14	7	6	37
SE	1	0	6	15	9	2	33
SSE	0	2	9	22	34	20	87
S	1	3	7	30	32	2	75
SSW	0	2	23	26	13	10	74
SW	0	3	6	9	5	1	24
WSW	0	6	12	8	2	0	28
W	0	6	10	5	4	0	25
WNW	0	2	14	24	0	0	40
NW	1	3	15	20	2	1	42
NNW	0	8	10	24	1	0	43
Variable	0	0	0	0	0	0	0
Total	5	59	182	257	128	47	678

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 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	2	4	0	0	0	6
NNE	1	1	3	1	0	0	6
NE	1	4	1	1	0	0	7
ENE	2	0	2	0	0	0	4
E	1	1	5	1	3	0	11
ESE	1	4	6	5	3	0	19
SE	1	2	3	7	3	0	16
SSE	0	2	3	12	5	1	23
S	0	2	0	10	9	0	21
SSW	0	1	1	10	1	0	13
SW	0	0	2	6	0	0	8
WSW	0	0	2	6	0	0	8
W	1	1	1	1	0	0	4
WNW	0	1	4	2	1	0	8
NW	1	3	6	2	0	0	12
NNW	0	3	6	2	0	0	11
Variable	0	0	0	0	0	0	0
Total	9	27	49	66	25	1	177

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 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	1	0	0	0	2
NNE	0	0	0	0	0	0	0
NE	0	1	1	0	0	0	2
ENE	2	0	0	0	0	0	2
E	1	0	0	0	0	0	1
ESE	1	1	2	0	0	0	4
SE	0	0	1	3	1	0	5
SSE	0	0	0	1	1	0	2
S	0	0	2	2	1	0	5
SSW	0	0	4	1	0	0	5
SW	0	1	1	0	0	0	2
WSW	0	0	0	1	0	0	1
W	0	2	0	0	0	0	2
WNW	0	1	0	0	0	0	1
NW	0	2	2	3	0	0	7
NNW	1	2	1	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	5	11	15	11	3	0	45

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 2014
 Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	1	0	0	0	0	2
NNE	0	2	0	0	0	0	2
NE	0	4	0	0	0	0	4
ENE	0	4	0	0	0	0	4
E	2	2	0	0	0	0	4
ESE	2	1	0	0	0	0	3
SE	3	0	0	0	0	0	3
SSE	2	4	0	0	0	0	6
S	0	5	0	2	0	0	7
SSW	0	1	0	0	0	0	1
SW	0	4	1	0	0	0	5
WSW	0	1	2	0	0	0	3
W	0	2	0	0	0	0	2
WNW	0	2	0	0	0	0	2
NW	0	1	0	0	0	0	1
NNW	1	0	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	11	34	3	2	0	0	50

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	1	3	0	0	0	5
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	4	1	0	0	0	5
ESE	0	0	1	0	0	0	1
SE	0	3	0	0	0	0	3
SSE	0	2	1	0	0	0	3
S	0	4	4	1	0	0	9
SSW	0	8	1	0	0	0	9
SW	0	8	2	0	0	0	10
WSW	0	4	6	0	0	0	10
W	0	1	2	0	0	0	3
WNW	0	2	1	0	0	0	3
NW	0	2	1	0	0	0	3
NNW	0	5	0	0	0	0	5
Variable	0	0	0	0	0	0	0
Total	1	44	23	1	0	0	69

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	2	3	0	0	0	6
NNE	0	0	1	0	0	0	1
NE	0	1	0	0	0	0	1
ENE	0	3	0	0	0	0	3
E	0	4	1	0	0	0	5
ESE	0	4	1	0	0	0	5
SE	0	4	4	1	0	0	9
SSE	0	4	2	0	0	0	6
S	0	8	9	0	0	0	17
SSW	0	11	2	0	0	0	13
SW	0	7	2	0	0	0	9
WSW	0	9	5	0	0	0	14
W	0	6	5	0	0	0	11
WNW	0	2	4	0	0	0	6
NW	0	6	2	0	0	0	8
NNW	0	6	1	1	0	0	8
Variable	0	0	0	0	0	0	0
Total	1	77	42	2	0	0	122

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	4	19	22	2	0	0	47
NNE	2	13	12	0	0	0	27
NE	4	12	12	0	0	0	28
ENE	9	15	3	0	0	0	27
E	6	24	5	0	0	0	35
ESE	2	5	10	0	0	0	17
SE	4	10	7	2	0	0	23
SSE	5	32	10	0	0	0	47
S	9	48	34	6	0	0	97
SSW	6	22	25	0	0	0	53
SW	4	29	24	0	0	0	57
WSW	5	22	17	9	0	0	53
W	9	31	17	6	0	0	63
WNW	6	26	35	8	0	0	75
NW	9	40	37	3	0	0	89
NNW	5	30	29	3	0	0	67
Variable	0	0	0	0	0	0	0
Total	89	378	299	39	0	0	805

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	8	3	6	0	0	0	17
NNE	7	6	1	0	0	0	14
NE	10	5	0	0	0	0	15
ENE	10	23	5	0	0	0	38
E	8	26	0	0	0	0	34
ESE	4	17	2	0	0	0	23
SE	7	23	2	1	0	0	33
SSE	8	43	13	1	0	0	65
S	8	38	28	0	0	0	74
SSW	9	7	14	0	0	0	30
SW	10	11	9	0	0	0	30
WSW	11	8	5	0	0	0	24
W	12	18	8	0	0	0	38
WNW	8	19	8	0	0	0	35
NW	16	18	2	0	0	0	36
NNW	7	25	7	0	0	0	39
Variable	0	0	0	0	0	0	0
Total	143	290	110	2	0	0	545

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	5	7	0	0	0	0	12
NNE	5	4	0	0	0	0	9
NE	0	2	0	0	0	0	2
ENE	2	8	1	0	0	0	11
E	5	30	0	0	0	0	35
ESE	6	29	0	0	0	0	35
SE	9	25	0	0	0	0	34
SSE	11	40	6	0	0	0	57
S	17	14	0	0	0	0	31
SSW	16	7	0	0	0	0	23
SW	10	1	0	0	0	0	11
WSW	10	0	0	0	0	0	10
W	12	4	0	0	0	0	16
WNW	17	3	0	0	0	0	20
NW	23	2	0	0	0	0	25
NNW	10	4	0	0	0	0	14
Variable	0	0	0	0	0	0	0
Total	158	180	7	0	0	0	345

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	2	0	0	0	0	0	2
NE	1	0	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	9	6	0	0	0	0	15
ESE	12	28	0	0	0	0	40
SE	11	17	0	0	0	0	28
SSE	20	18	0	0	0	0	38
S	38	11	0	0	0	0	49
SSW	23	6	0	0	0	0	29
SW	14	0	0	0	0	0	14
WSW	11	0	0	0	0	0	11
W	7	1	0	0	0	0	8
WNW	12	0	0	0	0	0	12
NW	9	1	0	0	0	0	10
NNW	1	0	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	171	88	0	0	0	0	259

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	0	0	0	0	1
NNE	0	1	0	0	0	0	1
NE	0	0	3	0	0	0	3
ENE	0	3	3	0	0	0	6
E	0	2	2	0	0	0	4
ESE	1	2	0	0	0	0	3
SE	0	3	0	0	0	0	3
SSE	0	2	1	1	0	0	4
S	0	1	4	1	2	0	8
SSW	0	0	2	0	0	0	2
SW	0	0	4	1	0	0	5
WSW	0	0	1	2	0	0	3
W	0	0	2	0	0	0	2
WNW	0	0	2	0	0	0	2
NW	0	0	1	0	0	0	1
NNW	0	2	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	1	17	25	5	2	0	50

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	4	2	1	0	0	7
NNE	0	0	0	1	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	2	2	1	0	0	5
ESE	0	0	1	0	0	0	1
SE	0	1	2	0	0	0	3
SSE	0	1	1	1	0	0	3
S	0	1	3	2	1	0	7
SSW	0	2	8	0	0	0	10
SW	0	3	6	2	0	0	11
WSW	0	0	3	4	1	0	8
W	0	2	2	1	0	0	5
WNW	0	0	2	0	1	0	3
NW	0	0	1	2	0	0	3
NNW	0	1	1	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	17	34	15	3	0	69

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	3	2	0	0	8
NNE	0	0	0	1	0	0	1
NE	0	1	0	0	0	0	1
ENE	0	2	0	0	0	0	2
E	0	2	3	1	0	0	6
ESE	0	1	2	2	1	0	6
SE	0	3	3	2	0	1	9
SSE	0	1	3	0	0	0	4
S	0	3	6	8	1	0	18
SSW	0	2	9	2	0	0	13
SW	0	2	4	3	1	0	10
WSW	0	4	5	3	1	0	13
W	0	4	4	2	0	0	10
WNW	0	1	4	2	0	0	7
NW	0	0	6	2	0	0	8
NNW	0	2	2	1	1	0	6
Variable	0	0	0	0	0	0	0
Total	0	31	54	31	5	1	122

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	3	9	20	15	2	1	50
NNE	1	4	10	14	1	0	30
NE	0	8	5	8	1	0	22
ENE	4	11	13	3	0	0	31
E	3	12	17	5	1	0	38
ESE	1	2	3	8	3	0	17
SE	5	10	3	4	2	2	26
SSE	2	16	15	7	2	0	42
S	2	19	32	36	2	4	95
SSW	2	15	21	19	2	0	59
SW	4	11	19	16	6	0	56
WSW	1	13	8	18	9	0	49
W	3	21	24	16	3	0	67
WNW	5	9	27	20	13	4	78
NW	3	14	24	26	13	2	82
NNW	2	12	21	23	7	0	65
Variable	0	0	0	0	0	0	0
Total	41	186	262	238	67	13	807

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	5	4	7	0	0	18
NNE	0	5	4	7	0	0	16
NE	2	5	7	2	0	0	16
ENE	1	14	9	8	2	0	34
E	2	10	18	11	0	0	41
ESE	2	0	7	14	2	0	25
SE	0	2	7	8	1	1	19
SSE	0	8	15	23	15	2	63
S	1	2	13	34	18	0	68
SSW	1	3	12	20	8	0	44
SW	2	5	6	10	7	0	30
WSW	0	7	13	6	0	0	26
W	1	7	11	11	4	0	34
WNW	1	3	13	15	2	0	34
NW	0	4	23	12	1	0	40
NNW	1	4	19	16	0	0	40
Variable	0	0	0	0	0	0	0
Total	16	84	181	204	60	3	548

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	2	2	6	0	0	11
NNE	0	1	5	3	0	0	9
NE	1	4	5	1	0	0	11
ENE	0	3	1	1	0	0	5
E	1	4	15	19	2	0	41
ESE	0	2	3	9	5	0	19
SE	0	2	5	7	9	0	23
SSE	2	1	11	10	13	0	37
S	1	3	13	19	6	0	42
SSW	0	4	16	12	0	0	32
SW	1	1	9	3	0	0	14
WSW	0	3	13	2	0	0	18
W	1	3	10	4	0	0	18
WNW	0	2	15	3	0	0	20
NW	0	2	12	19	0	0	33
NNW	2	4	7	2	0	0	15
Variable	0	0	0	0	0	0	0
Total	10	41	142	120	35	0	348

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: 3

Byron Generating Station

Period of Record: July - September 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	3	3	0	0	7
NNE	0	0	0	0	0	0	0
NE	1	2	1	0	0	0	4
ENE	0	0	0	0	0	0	0
E	0	1	1	0	1	0	3
ESE	0	2	1	4	14	0	21
SE	1	0	4	15	5	1	26
SSE	1	2	12	7	2	0	24
S	0	0	17	14	1	0	32
SSW	0	4	24	9	0	0	37
SW	1	3	16	10	0	0	30
WSW	0	4	17	1	0	0	22
W	1	3	13	0	0	0	17
WNW	1	3	4	3	0	0	11
NW	2	2	11	2	0	0	17
NNW	1	3	4	2	0	0	10
Variable	0	0	0	0	0	0	0
Total	9	30	128	70	23	1	261

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: 3

Byron Generating Station

Period of Record: October - December 2014 Stability
 Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	2	0	0	0	0	2
NNE	1	3	0	0	0	0	4
NE	0	2	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	3	3	5	3	0	0	14
SE	0	2	4	0	0	0	6
SSE	1	4	1	0	0	0	6
S	4	5	1	1	0	0	11
SSW	0	3	3	2	0	0	8
SW	0	4	4	0	0	0	8
WSW	0	1	3	0	1	0	5
W	2	6	2	10	0	0	20
WNW	0	1	6	1	0	0	8
NW	1	1	1	2	0	0	5
NNW	2	0	2	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	14	37	32	19	1	0	103

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	1	0	0	0	2
NNE	0	1	1	0	0	0	2
NE	0	1	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	2	2	0	0	0	4
ESE	0	2	0	1	0	0	3
SE	0	3	5	0	0	0	8
SSE	0	1	2	0	0	0	3
S	0	3	0	3	0	0	6
SSW	0	3	4	1	0	0	8
SW	0	1	1	1	0	0	3
WSW	0	2	2	1	0	0	5
W	0	1	5	3	0	0	9
WNW	0	0	5	1	0	0	6
NW	1	0	3	0	0	0	4
NNW	0	4	2	0	0	0	6
Variable	0	0	0	0	0	0	0
Total	1	25	33	11	0	0	70

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	3	1	0	0	5
NNE	0	1	1	0	0	0	2
NE	0	1	0	0	0	0	1
ENE	0	1	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	2	1	1	0	0	4
SE	0	1	1	0	0	0	2
SSE	0	2	3	3	0	0	8
S	0	2	3	1	0	0	6
SSW	0	4	0	3	0	0	7
SW	0	4	0	1	0	0	5
WSW	1	3	4	0	0	0	8
W	0	2	0	4	1	0	7
WNW	0	2	7	5	0	0	14
NW	0	0	4	1	0	0	5
NNW	0	3	8	0	0	0	11
Variable	0	0	0	0	0	0	0
Total	1	29	35	20	1	0	86

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	8	37	44	8	5	0	102
NNE	4	24	10	0	0	0	38
NE	3	8	1	0	0	0	12
ENE	1	3	2	0	0	0	6
E	6	10	2	0	0	0	18
ESE	7	9	6	4	0	0	26
SE	4	19	28	2	0	0	53
SSE	4	19	56	15	0	0	94
S	0	15	25	12	0	0	52
SSW	1	14	33	13	0	0	61
SW	7	15	19	7	0	0	48
WSW	2	12	28	7	4	0	53
W	6	18	74	58	12	0	168
WNW	6	30	96	32	0	0	164
NW	5	21	58	7	0	0	91
NNW	7	26	56	17	0	0	106
Variable	0	0	0	0	0	0	0
Total	71	280	538	182	21	0	1092

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	6	9	7	0	0	0	22
NNE	4	12	0	0	0	0	16
NE	3	4	0	0	0	0	7
ENE	1	5	1	0	0	0	7
E	1	11	1	0	0	0	13
ESE	2	11	5	0	0	0	18
SE	4	7	6	0	0	0	17
SSE	3	18	45	5	0	0	71
S	5	15	32	7	0	0	59
SSW	11	19	36	14	0	0	80
SW	18	30	14	0	0	0	62
WSW	4	28	17	1	1	0	51
W	11	22	18	1	0	0	52
WNW	9	20	7	0	0	0	36
NW	6	19	2	0	0	0	27
NNW	6	7	4	0	0	0	17
Variable	1	0	0	0	0	0	1
Total	95	237	195	28	1	0	556

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	6	0	0	0	0	6
NNE	3	4	0	0	0	0	7
NE	0	0	0	0	0	0	0
ENE	0	2	0	0	0	0	2
E	4	4	0	0	0	0	8
ESE	0	13	3	0	0	0	16
SE	0	16	0	0	0	0	16
SSE	5	16	2	0	0	0	23
S	7	7	0	0	0	0	14
SSW	4	4	1	0	0	0	9
SW	3	4	0	0	0	0	7
WSW	1	1	0	0	0	0	2
W	5	7	0	0	0	0	12
WNW	3	7	0	0	0	0	10
NW	5	3	0	0	0	0	8
NNW	1	3	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	41	97	6	0	0	0	144

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 30 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	0	0	0	0	3
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	3	0	0	0	0	3
ESE	0	6	1	0	0	0	7
SE	1	7	0	0	0	0	8
SSE	2	1	0	0	0	0	3
S	4	4	0	0	0	0	8
SSW	4	0	0	0	0	0	4
SW	3	0	0	0	0	0	3
WSW	2	0	0	0	0	0	2
W	5	0	0	0	0	0	5
WNW	2	0	0	0	0	0	2
NW	2	0	0	0	0	0	2
NNW	4	0	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	29	24	1	0	0	0	54

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: 98

Byron Generating Station

Period of Record: October - December 2014 Stability
 Class - Extremely Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	1	0	0	0	1
NNE	0	2	3	0	0	0	5
NE	0	0	1	0	0	0	1
ENE	0	0	1	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	0	1	3	6	0	10
SE	1	1	3	3	1	0	9
SSE	1	3	2	1	0	0	7
S	0	4	3	0	1	0	8
SSW	0	3	1	4	2	0	10
SW	0	2	3	1	1	0	7
WSW	0	2	2	4	0	1	9
W	0	1	3	1	8	2	15
WNW	0	2	1	7	1	0	11
NW	0	2	0	1	1	1	5
NNW	0	2	0	1	1	0	4
Variable	0	0	0	0	0	0	0
Total	2	24	25	26	22	4	103

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Moderately Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	1	1	0	0	2
NNE	0	0	0	1	0	0	1
NE	0	0	2	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	1	0	1	1	0	3
ESE	0	0	1	1	1	0	3
SE	0	1	2	4	1	0	8
SSE	0	2	1	0	1	0	4
S	0	0	2	1	3	0	6
SSW	0	1	2	3	2	0	8
SW	0	1	0	2	0	0	3
WSW	0	0	4	2	0	0	6
W	0	1	0	5	1	0	7
WNW	0	0	0	5	1	0	6
NW	0	0	0	2	1	0	3
NNW	0	3	3	1	0	0	7
Variable	0	0	0	0	0	0	0
Total	0	10	18	29	12	0	69

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Slightly Unstable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	1	1	3	0	6
NNE	0	0	1	0	0	0	1
NE	0	0	2	0	0	0	2
ENE	0	1	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	0	1	0	0	0	1	2
SE	0	0	2	3	0	0	5
SSE	0	0	1	4	2	0	7
S	0	1	0	3	1	0	5
SSW	0	1	3	0	3	0	7
SW	0	2	3	0	1	0	6
WSW	0	2	1	4	0	0	7
W	0	1	2	0	4	0	7
WNW	0	1	1	5	7	1	15
NW	0	0	1	2	2	0	5
NNW	0	0	2	8	0	0	10
Variable	0	0	0	0	0	0	0
Total	0	11	20	30	23	2	86

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Neutral - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	24	21	30	2	9	88
NNE	0	12	30	13	3	0	58
NE	1	7	7	0	0	0	15
ENE	1	0	5	1	0	0	7
E	1	7	8	2	0	0	18
ESE	3	7	8	3	4	0	25
SE	1	9	10	27	7	0	54
SSE	0	7	10	35	21	4	77
S	0	3	9	29	20	1	62
SSW	0	2	20	25	16	0	63
SW	0	5	16	17	9	1	48
WSW	0	11	12	20	2	2	47
W	3	9	16	65	45	16	154
WNW	1	10	32	79	41	6	169
NW	9	8	17	42	23	1	100
NNW	2	16	18	45	9	9	99
Variable	0	0	0	0	0	0	0
Total	24	137	239	433	202	49	1084

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 8
 Hours of missing stability measurements in all stability classes: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Slightly Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	6	3	16	0	0	26
NNE	1	3	8	6	0	0	18
NE	0	1	6	6	0	0	13
ENE	0	4	5	3	0	0	12
E	1	3	1	3	1	0	9
ESE	0	2	2	11	4	0	19
SE	0	1	2	7	2	0	12
SSE	0	3	4	12	26	1	46
S	1	1	6	19	37	4	68
SSW	0	2	4	32	41	4	83
SW	0	1	18	18	12	0	49
WSW	0	3	21	29	5	1	59
W	1	6	24	23	8	0	62
WNW	1	4	16	16	4	0	41
NW	0	2	13	16	0	0	31
NNW	1	1	4	2	0	0	8
Variable	0	0	0	0	0	0	0
Total	7	43	137	219	140	10	556

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Moderately Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	2	2	4	0	0	8
NNE	0	0	1	6	1	0	8
NE	0	1	1	0	0	0	2
ENE	0	2	3	0	0	0	5
E	0	1	5	0	0	0	6
ESE	1	1	2	5	0	0	9
SE	0	0	3	10	14	0	27
SSE	0	1	1	2	5	0	9
S	0	1	3	5	4	0	13
SSW	0	0	2	5	5	0	12
SW	0	0	4	9	0	0	13
WSW	0	0	0	2	0	0	2
W	0	0	2	10	0	0	12
WNW	0	2	3	3	0	0	8
NW	0	0	3	8	0	0	11
NNW	0	0	0	2	0	0	2
Variable	0	0	0	0	0	0	0
Total	1	11	35	71	29	0	147

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: 98

Byron Generating Station

Period of Record: October - December 2014
 Stability Class - Extremely Stable - 250Ft-30Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	1	0	3	0	0	5
NNE	1	2	0	4	1	0	8
NE	0	0	0	0	0	0	0
ENE	0	4	0	0	0	0	4
E	1	2	0	0	0	0	3
ESE	0	1	1	0	0	0	2
SE	0	0	0	4	7	1	12
SSE	0	0	0	4	1	0	5
S	0	0	0	1	0	0	1
SSW	0	0	1	4	0	0	5
SW	0	0	3	3	0	0	6
WSW	0	1	1	0	0	0	2
W	0	1	0	0	0	0	1
WNW	0	1	0	0	0	0	1
NW	0	0	0	0	0	0	0
NNW	0	1	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	3	14	6	23	9	1	56

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: 98

APPENDIX G

ERRATA DATA

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Errata Data

2013	Original Maximum Quarterly average concentration (uCi/ml)	Corrected Maximum Quarterly average concentration (uCi/ml)
Fission & Activation Products	2.50E-09	1.25E-09
Tritium	1.72E-04	8.58E-05
Dissolved & Entrained Gases	5.18E-11	2.59E-11

2012	Original Maximum Quarterly average concentration (uCi/ml)	Corrected Maximum Quarterly average concentration (uCi/ml)
Fission & Activation Products	1.95E-09	9.74E-10
Tritium	3.34E-04	1.67E-04
Dissolved & Entrained Gases	6.88E-10	3.44E-10

2011	Original Maximum Quarterly average concentration (uCi/ml)	Corrected Maximum Quarterly average concentration (uCi/ml)
Fission & Activation Products	2.46E-09	1.23E-09
Tritium	4.26E-04	2.13E-04
Dissolved & Entrained Gases	2.90E-10	1.45E-10

2010	Original Maximum Quarterly average concentration (uCi/ml)	Corrected Maximum Quarterly average concentration (uCi/ml)
Fission & Activation Products	1.23E-09	6.13E-10
Tritium	2.30E-04	1.15E-04
Dissolved & Entrained Gases	3.24E-10	1.62E-10

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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 2014

Prepared By

Teledyne Brown Engineering
Environmental Services



Byron Nuclear Generating Station
Byron, IL 61010

May 2015

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Appendices

Appendix A Location Designation

Tables

Table A-1 Radiological Groundwater Protection Program - Sampling Locations, Distance and Direction, Byron Nuclear Generating Station, 2014

Figures

Figure A-1 Monitoring Well Locations, Byron Nuclear Generating Station, 2014 (Extra wells noted on map are for reference only.)

Appendix B Data Tables

Tables

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, 2014.

Table B-I.2 Concentrations of Gamma Emitters in Groundwater Samples Collected in the Vicinity of Byron Nuclear Generating Station, 2014.

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 2014. During that time period, 122 analyses were performed on 54 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 2014, fifteen (15) Radiological Groundwater Protection Program (RGPP) monitoring wells were sampled. The samples were obtained throughout the year 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, with concentrations ranging from 459 – 791 pCi/L; AR-7, with concentrations ranging from 325 – 791 pCi/L; and AR-11, with concentrations ranging from 822 – 984 pCi/L. Wells AR-4 and AR-11 are near the Circulating Water Blowdown piping, where historical leakage through vacuum breakers was known to have occurred. Tritium concentrations in these wells have decreased since being first sampled in 2006. In 2014, tritium was measured in Well AR-7, located on-site, just west plant structures, at concentrations between 701 and 325 pCi/L. 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 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).

In August 2014, a break in the well piping was discovered about six feet below the surface that could have served as the entry point for tritium in the recapture water. Since the well was repaired, 3 of the 4 tritium samples obtained have measured less than 370 pCi/L. 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 three wells would be negligible.

Strontium-89 and strontium-90 were not detected in any samples above their respective LLDs of 10 and 1 pCi/L.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater samples during the second quarter sampling in 2014. Gross Alpha (dissolved) was not detected in any of eight groundwater locations. Gross Alpha (suspended) was detected in one of eight groundwater locations at a concentration of 6.3 pCi/L. Gross Beta (dissolved) was detected in five of eight groundwater locations. The concentrations ranged from 2.9 to 23 pCi/L. Gross Beta (suspended) was detected in two of eight groundwater locations. The concentration ranged from 4.4 to 13 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 2014.

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 2014.

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 2014.

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 \pm 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 984 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 2014, fifteen (15) Radiological Groundwater Protection Program (RGPP) monitoring wells were sampled. The samples were obtained throughout the year 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, with concentrations ranging from 459 – 791 pCi/L; AR-7, with concentrations ranging from 325 – 791 pCi/L; and AR-11, with concentrations ranging from 822 – 984 pCi/L. Wells AR-4 and AR-11 are near the Circulating Water Blowdown piping, where historical leakage through vacuum breakers was known to have occurred. Tritium concentrations in these wells have decreased since being first sampled in 2006. In 2014, tritium was measured in Well AR-7, located on-site, just west plant structures, at concentrations between 701 and 325 pCi/L. 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 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). In August 2014, a break in the well piping was discovered about six feet below the surface that could have served as the entry point for tritium in the recapture water. Since the well was repaired, 3 of the 4 tritium samples obtained have measured less than 370 pCi/L. 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-89 and strontium-90 were not detected in any samples above their respective LLDs of 10 and 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 samples during the second quarter sampling in 2014. Gross Alpha (dissolved) was not detected in any of eight groundwater locations. Gross Alpha (suspended) was detected in one of eight groundwater locations at a concentration of 6.3 pCi/L. Gross Beta (dissolved) was detected in five of eight groundwater locations. The concentrations ranged from 2.9 to 23 pCi/L. Gross Beta (suspended) was detected in two of eight groundwater locations. The concentration ranged from 4.4 to 13 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 98 pCi/L. All other gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective LLDs in any of the samples during 2014.

Hard-To-Detect

Hard-To-Detect analyses were not performed in 2014.

B. Drinking Water Well Survey

No drinking water well surveys were conducted in 2014.

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 2014.

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 2014 as a result of groundwater sample results.

G. Actions Taken

1. Compensatory Actions

No compensatory actions were initiated in 2014.

2. Installation of Monitoring Wells

No new monitoring wells were installed in 2014.

3. Actions to Recover/Reverse Plumes

No actions were undertaken to recover/reverse plumes in 2014.

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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, 2014

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

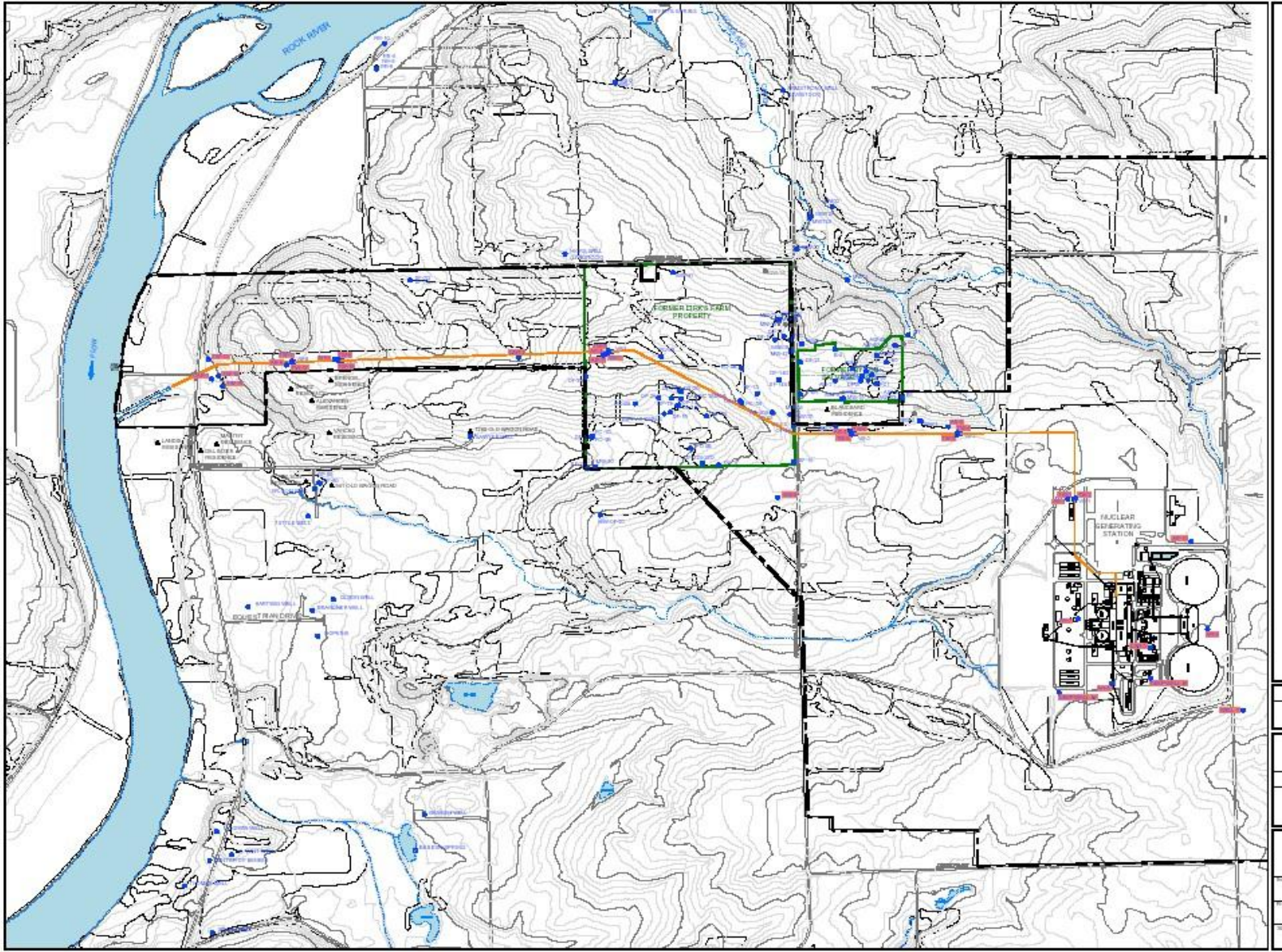


Figure A-1
Monitoring Well Locations, Byron Nuclear Generating Station, 2014

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, 2014

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)
BY-AR-1	03/17/14	< 182						
BY-AR-1	05/13/14	< 167	< 6.8	< 0.6	< 1.1	< 1.5	< 2.1	< 2.7
BY-AR-1	08/13/14	< 182						
BY-AR-1	10/20/14	< 186						
BY-AR-10	03/17/14	< 181						
BY-AR-10	05/13/14	< 183	< 6.4	< 0.5	< 3.6	6.3 \pm 3.2	< 6.7	13.0 \pm 2.9
BY-AR-10	08/13/14	< 182						
BY-AR-10	10/20/14	< 187						
BY-AR-11	03/19/14	984 \pm 167						
BY-AR-11	05/14/14	822 \pm 154						
BY-AR-11	08/14/14	950 \pm 166						
BY-AR-11	10/22/14	907 \pm 164						
BY-AR-2	05/14/14	< 182						
BY-AR-2	10/22/14	< 157						
BY-AR-3	05/14/14	< 180	< 6.6	< 0.6	< 1.4	< 2.2	4.8 \pm 1.7	< 2.7
BY-AR-3	08/14/14	< 182						
BY-AR-3	10/22/14	< 156						
BY-AR-4	03/19/14	746 \pm 151						
BY-AR-4	05/14/14	791 \pm 151	< 6.9	< 0.7	< 1.7	< 1.9	< 2.7	< 2.5
BY-AR-4	08/14/14	459 \pm 140						
BY-AR-4	10/22/14	580 \pm 127						
BY-AR-7	03/17/14	Original Recount	701 \pm 153					
BY-AR-7	03/17/14	564 \pm 151						
BY-AR-7	04/28/14	572 \pm 131	< 5.5	< 0.4	< 2.0	< 1.2	14.8 \pm 1.8	< 1.9
BY-AR-7	05/12/14	557 \pm 133	< 5.7	< 0.6	< 3.5	< 3.0	23.0 \pm 2.9	< 3.0
BY-AR-7	06/20/14	647 \pm 145						
BY-AR-7	07/18/14	570 \pm 129						
BY-AR-7	08/26/14	369 \pm 118						
BY-AR-7	09/19/14	325 \pm 132						
BY-AR-7	10/20/14	570 \pm 147						
BY-AR-7	11/12/14	359 \pm 144						
BY-AR-8	03/17/14	< 183						
BY-AR-8	05/12/14	< 182	< 6.9	< 0.6	< 1.1	< 3.3	2.9 \pm 1.4	4.4 \pm 2.2
BY-AR-8	08/13/14	< 183						
BY-AR-8	10/20/14	< 183						
BY-AR-9	03/17/14	< 183						
BY-AR-9	05/13/14	< 184	< 7.0	< 0.6	< 2.0	< 1.9	3.4 \pm 1.9	< 2.5
BY-AR-9	08/26/14	< 158						
BY-AR-9	10/20/14	< 187						
BY-CAR-1	05/14/14	< 197						
BY-CAR-1	10/22/14	< 187						
BY-CAR-3	03/17/14	< 199						
BY-CAR-3	05/12/14	< 180	< 4.5	< 0.5	< 4.0	< 1.9	5.5 \pm 2.4	< 2.5
BY-CAR-3	08/13/14	< 180						
BY-CAR-3	10/20/14	< 187						
BY-DF-24	03/19/14	< 178						
BY-DF-24	05/14/14	< 183						
BY-DF-24	08/14/14	< 180						
BY-DF-24	10/22/14	< 184						
BY-MW-1	05/14/14	< 195						
BY-MW-1	10/22/14	< 187						
BY-MW-3	05/14/14	< 194						
BY-MW-3	10/22/14	< 188						
BY-TW-13	05/14/14	< 178						
BY-TW-13	10/22/14	< 187						

TABLE B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES
COLLECTED IN THE VICINITY OF BYRON NUCLEAR GENERATION STATION, 2014

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
BY-AR-1	05/13/14	< 32	< 33	< 3	< 3	< 6	< 3	< 7	< 4	< 7	< 7	< 3	< 4	< 17	< 7
BY-AR-10	05/13/14	< 52	< 55	< 6	< 6	< 11	< 6	< 13	< 7	< 11	< 12	< 8	< 7	< 31	< 11
BY-AR-11	05/14/14	< 29	< 70	< 3	< 3	< 7	< 3	< 7	< 3	< 6	< 6	< 3	< 4	< 18	< 6
BY-AR-2	05/14/14	< 31	< 66	< 3	< 4	< 6	< 3	< 6	< 4	< 7	< 6	< 3	< 4	< 16	< 5
BY-AR-3	05/14/14	< 36	< 35	< 4	< 4	< 9	< 5	< 7	< 5	< 7	< 7	< 4	< 4	< 22	< 7
BY-AR-4	05/14/14	< 32	< 27	< 3	< 3	< 6	< 3	< 7	< 3	< 5	< 6	< 3	< 3	< 15	< 5
BY-AR-7	04/28/14	< 11	< 28	< 1	< 1	< 3	< 1	< 2	< 1	< 2	< 4	< 1	< 1	< 9	< 2
BY-AR-7	05/12/14	< 43	< 83	< 4	< 4	< 9	< 5	< 9	< 5	< 8	< 9	< 4	< 5	< 24	< 11
BY-AR-8	05/12/14	< 34	< 82	< 3	< 4	< 8	< 3	< 7	< 4	< 6	< 8	< 4	< 4	< 21	< 7
BY-AR-9	05/13/14	< 37	< 32	< 4	< 4	< 10	< 4	< 8	< 5	< 7	< 9	< 4	< 4	< 25	< 7
BY-CAR-1	05/14/14	< 39	< 36	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 8	< 5	< 4	< 21	< 5
BY-CAR-3	05/12/14	< 37	< 40	< 4	< 4	< 10	< 4	< 9	< 4	< 8	< 9	< 3	< 4	< 23	< 10
BY-TW-13	05/14/14	< 36	98 ± 53	< 3	< 4	< 7	< 5	< 8	< 4	< 7	< 7	< 4	< 4	< 17	< 5