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BRAIDWOOD STATION

UNIT 1 and UNIT 2

Annual Radiological
Environmental Operating Report

1 January through 31 December 2019

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Environmental Services

Exelon Generation®

Braidwood Station
Braceville, IL 60407

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Table Of Contents

Appendices

I. Preface

The following sections of the preface are meant to help define key concepts, provide clarity, and give context to the readers of this report.

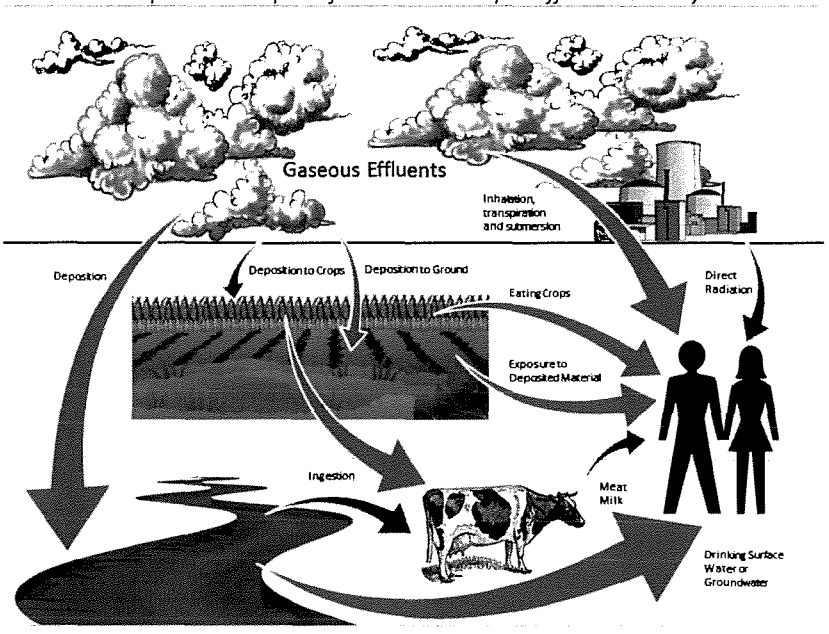
Annual Reports

The Nuclear Regulatory Commission (NRC) is the federal agency who has the role to protect public health and safety through the development of regulations governing nuclear power reactors and ensuring their compliance. As part of the many commitments Nuclear Power Plants have to the NRC to ensure this safety, they provide two reports annually to specifically address how the station's operation impacts the environment of local communities. The NRC then reviews these reports and makes them available to the public. The names of the reports are the Annual Radioactive Effluent Release Report (ARERR) and the Annual Radiological Environmental Operating Report (AREOR).

The ARERR reports the results of the sampling from the effluent release paths at the station analyzed for radioactivity. An effluent is a liquid or gaseous waste containing plant-related radioactive material emitted at the boundary of the facility.

The AREOR reports the results of the samples obtained in the environment surrounding the station. Environmental samples include air, water, vegetation, and other sample types that are identified as potential pathways radioactivity can reach humans.

Graphic 1. Examples of Gaseous and Liquid Effluent Pathways



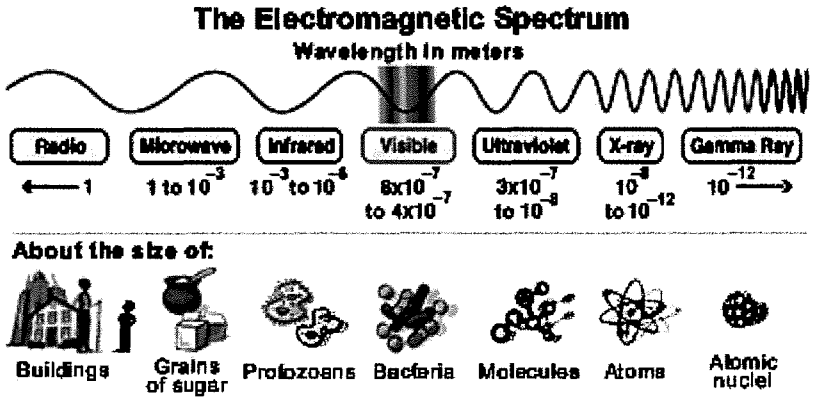
Graphic 1 demonstrates some potential exposure pathways from Braidwood

Nuclear Power Station. The ARERR and AREOR together ensure Nuclear Power Plants are operating in a manner that is within established regulatory commitments meant to adequately protect the public.

Understanding Radiation

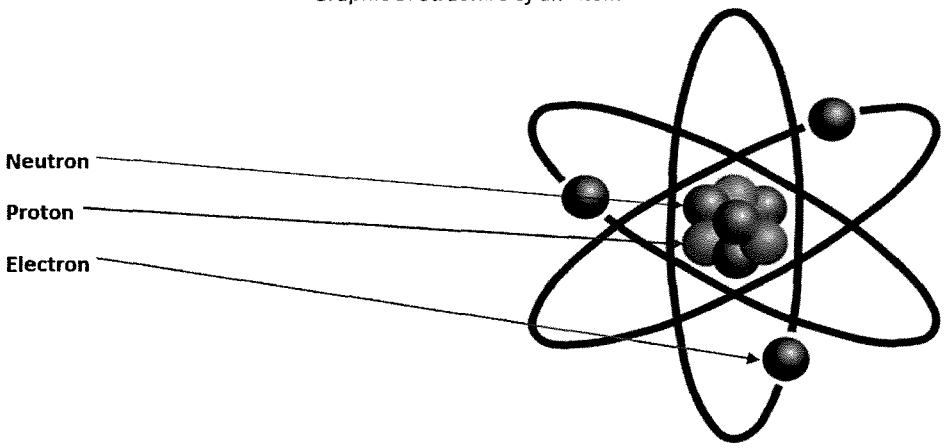
Generally radiation is defined as emitted energy in the form of waves or particles. If radiation has enough energy to displace electrons from an atom it is termed "ionizing", otherwise it is "non-ionizing". Non-Ionizing radiation includes light, heat given off from a stove, radiowaves and microwaves. Ionizing radiation occurs in atoms, particles too small for the eye to see. So, what are atoms and how does radiation come from them?

Graphic 2. Types of Radiation, from NASA Hubblesite



An atom is the smallest part of an element that maintains the characteristics of that element. Atoms are made up of three parts: protons, neutrons, and electrons.

Graphic 3. Structure of an Atom



The number of protons in an atom determines the element. For example, a hydrogen atom will always have one proton while an oxygen atom will always have eight protons. The protons are clustered with the neutrons forming the nucleus at the center of the atom. Orbiting around the nucleus are the relatively small electrons.

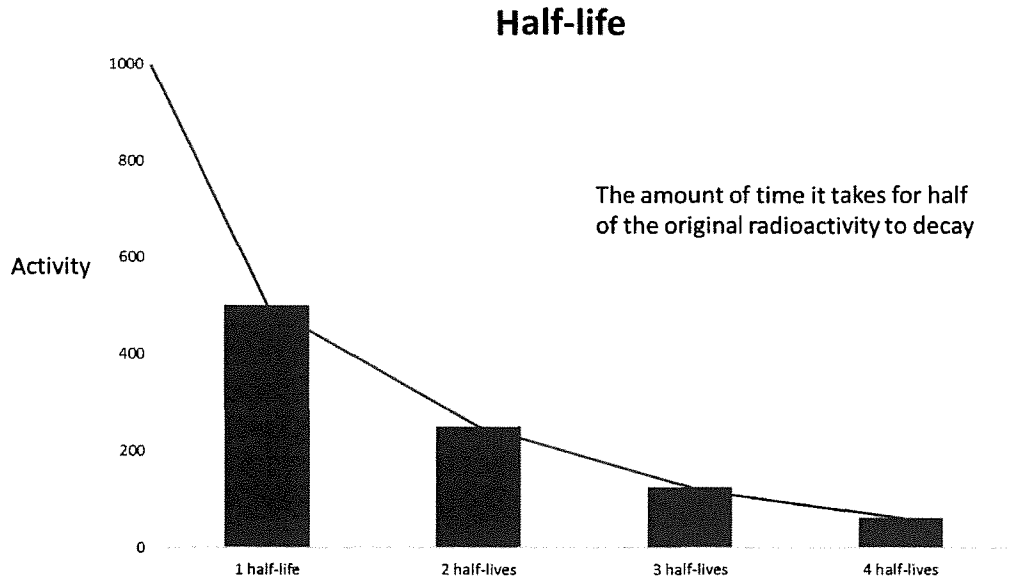
Isotopes are atoms that have the same number of protons but different numbers of neutrons. Different isotopes of an element will all have the same chemical properties and many isotopes are radioactive while other isotopes are not radioactive. A radioactive isotope can emit radiation because it contains excess energy in its nucleus. Radioactive atoms and isotopes are also referred to as radionuclides and radioisotopes.

There are two basic ways that radionuclides are produced at a nuclear power plant. The first is fission, which creates radionuclides that are called *fission products*. Fission occurs when a very large atom, such as uranium-235 (U-235) or plutonium-239 (Pu-239), absorbs a neutron into its nucleus making the atom unstable. The unstable atom can then split into smaller atoms. When fission occurs there is a large amount of energy released, in the form of heat. A nuclear power plant uses the heat generated to boil water that spins turbines to produce electricity.

The second way a radionuclide is produced at a nuclear power plant is through a process called activation. Radionuclides produced in this method are termed *activation products*. Pure water that passes over the fissioning atoms is used to cool the reactor and also produce steam to turn the turbines. Although this water is considered to be very pure, there are always some contaminants within the water from material used in the plant's construction and operation. These contaminants are exposed to the fission process and may become activation products. The atoms in the water itself can also become activated and create radionuclides.

Over time, radioactive atoms will reach a stable state and no longer be radioactive. To do this they must release their excess energy. This release of excess energy is called radioactive decay. The time it takes for a radionuclide to become stable is measured in units called half-lives. A half-life is the amount of time it takes for half of the original radioactivity to decay. Each radionuclide has a specific half-life. Some half-lives can be very long and measured in years while others may be very short and measured in seconds.

Graphic 4. Radioactive Decay Half-Life



In the annual reports you will see both man made and naturally ocurring radionuclides listed, for example potassium-40 (K-40, natural) and cobalt-60 (Co-60, man-made). We are mostly concerned about man-made radionuclides because they can be produced as by-products when generating electricity at a nuclear power plant. It is important to note that there are also other ways man-made radionuclides are produced, such as detonating nuclear weapons. Weapons testing has deposited some of the same man-made radionuclides into the environment as those generated by nuclear power, and some are still present today because of long half-lives.

Measuring Radiation

There are four different but interrelated units for measuring radioactivity, exposure, absorbed dose, and dose equivalent. Together, they are used to scientifically report the amount of radiation and its effects on humans.

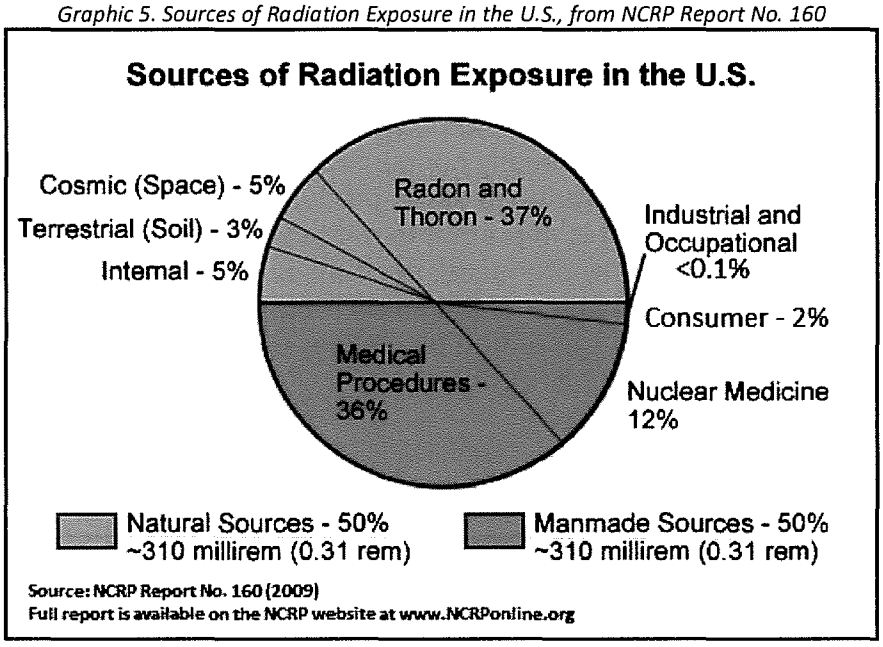
- Radioactivity refers to the amount of ionizing radiation released by a material. The units of measure for radioactivity used within the AREOR and ARERR are the Curie (Ci). Small fractions of the Ci often have a prefix, such as the microCurie (μCi), which means 1/1,000,000 of a Curie.
- Exposure describes the amount of radiation traveling through the air. The units of measure for exposure used within the AREOR and ARERR are the Roentgen (R). Traditionally direct radiation monitors placed around the site are measured milliRoentgen (mR), 1/1,000 of one R.
- Absorbed dose describes the amount of radiation absorbed by an object or person. The units of measure for absorbed dose used within the AREOR and ARERR are the rad. Noble gas air doses are reported by the site are measured in millirad (mrad), 1/1,000 of one rad.

- Dose equivalent (or effective dose) combines the amount of radiation absorbed and the health effects of that type of radiation. The units used within the AREOR and ARERR are the Roentgen equivalent man (rem). Regulations require doses to the whole body, specific organ, and direct radiation to be reported in millirem (mrem), 1/1,000 of one rem.

Sources of Radiation

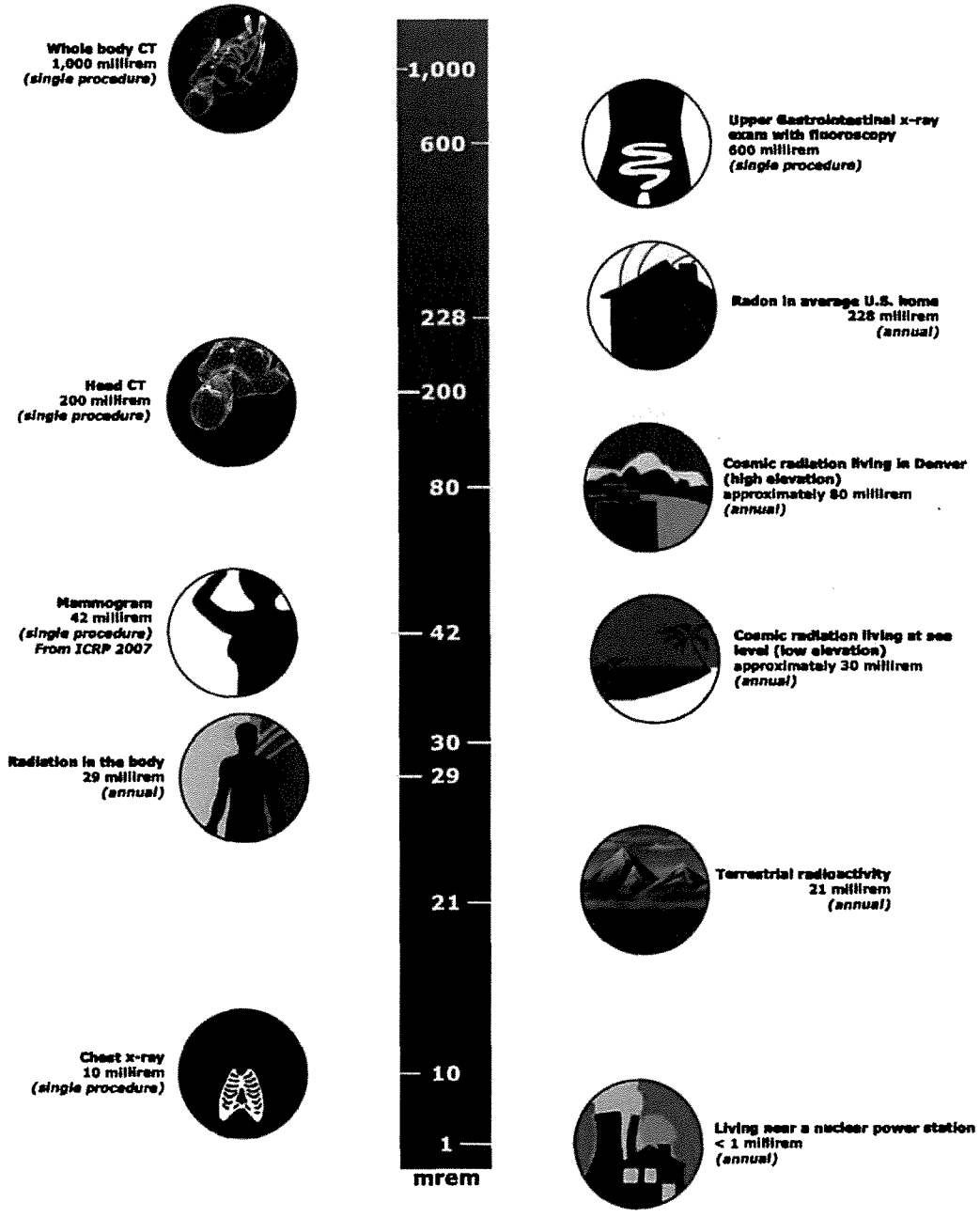
People are exposed to radiation every day of their lives and have been since the dawn of mankind. Some of this radiation is naturally occurring while some is man-made. There are many factors that will determine the amount of radiation individuals will be exposed to such as where they live, medical treatments, etc. The average person in the United States is exposed to approximately 620 mrem each year. Half of this exposure, 310 mrem, comes from natural sources and the other half, 310 mrem, from man-made sources. Graphic 5 shows what the typical sources of radiation are for an individual over a calendar year:

Graphic 5. Sources of Radiation Exposure in the U.S., from NCRP Report No. 160



The radiation from a nuclear power plant is included in the chart as part of the "Industrial and Occupational" fraction, <0.1%. The largest natural source of radiation is from radon, because radon gas travels in the air we breathe. Perhaps you know someone who had a CT scan at a hospital to check his or her bones, brain, or heart. CT scans are included in the chart as "Medical Procedures" which make up the next largest fraction. Graphic 6 on the following page shows some of the common doses humans receive from radiation every year.

Graphic 6 .Relative Doses from Radiation Sources, from EPA Radiation Doses and Sources

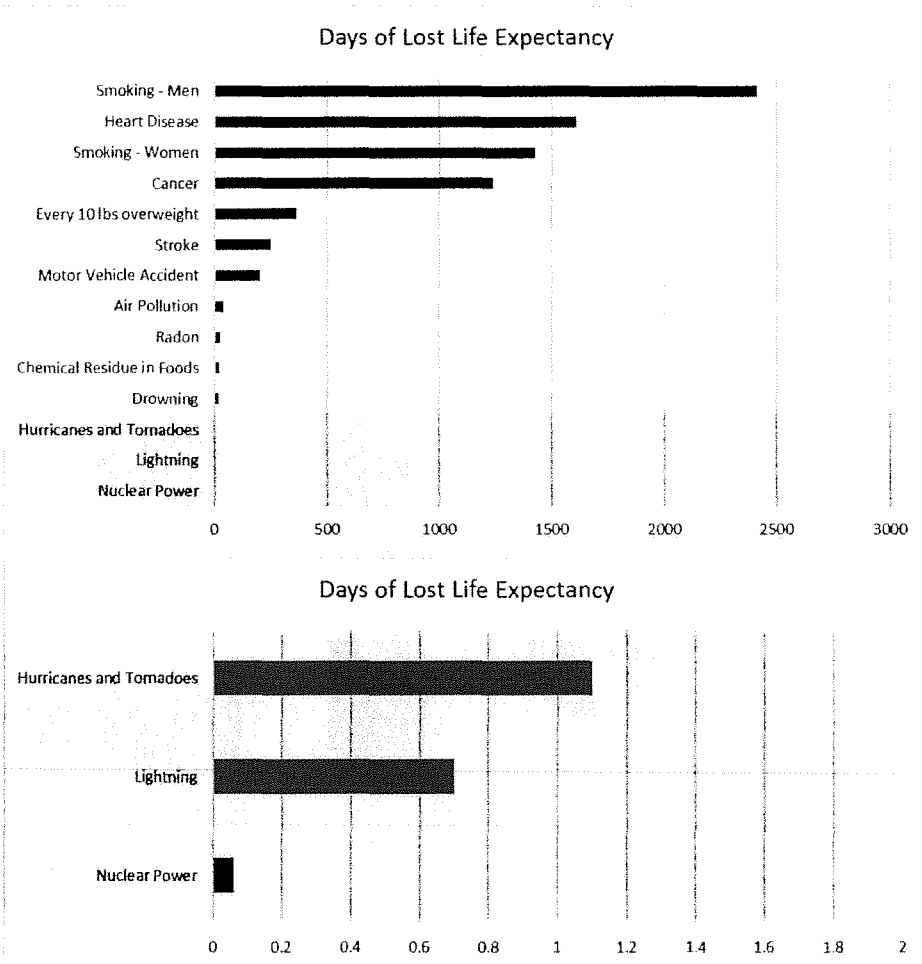


Radiation Risk

Current science suggests there is some risk from any exposure to radiation. However, it is very hard to tell whether cancers or deaths can be attributed to very low doses of radiation or by something else. U.S. radiation protection standards are based on the premise that any radiation exposure carries some risk.

The following graph is an example of one study that tries to relate risk from many different factors. This graph represents risk as "Days of Lost Life Expectancy". All the categories are averaged over the entire population except Male Smokers, Female Smokers, and individuals that are overweight. Those risks are only for people that fall into those categories. The category for Nuclear Power is a government estimate based on all radioactivity releases from nuclear power, including accidents and wastes.

Graphic 7. Days of Lost Life Expectancy, Adapted from the Journal of American Physicians and Surgeons Volume 8 Number 2 Summer 2003



II. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program (REMP) conducted for Exelon's Braidwood Station covers the period January 1, 2019 through December 31, 2019. During that time period 1,488 analyses were performed on 1,208 samples. In assessing all the data gathered for this report and comparing these results with preoperational data, it was concluded that the operation of Braidwood Station had no adverse radiological impact on the environment.

Surface, public, and ground/well water samples were analyzed for concentrations of tritium and gamma-emitting nuclides. Surface water and public water samples were also analyzed for concentrations of gross beta. Gross beta and tritium activities detected were consistent with those detected in previous years. No fission or activation products were detected. As part of an effort to implement industry best practices, both gaseous and liquid station effluents were evaluated for all 10CFR61 required nuclides. Nuclides exceeding 1% relative abundance in the waste stream were added to the list of nuclides that Teledyne Brown evaluates in potentially impacted REMP matrices. For Braidwood Station, Nickel-63 (Ni-63) exceeds 1% relative abundance in the radwaste resins. Occasionally, Ni-63 is observed in liquid release tank quarterly composites, therefore, beginning in the fall of 2013 the station requested that Ni-63 be evaluated in the downstream surface water, sediment, and fish analyses. Ni-63 has not been observed in downstream surface water.

Fish (commercially and/or recreationally-important species) and sediment samples were analyzed for concentrations of gamma-emitting nuclides. No fission or activation products were detected in fish. Nickel-63 was not detected in any fish or sediment samples analyzed. One of six sediment samples had Cs-137. The concentration was consistent with levels observed during the preoperational years. No plant-produced fission or activation products were found in sediment.

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

High sensitivity Iodine-131 (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. Iodine-131 was not detected in any milk samples. Concentrations of naturally-occurring Potassium-40 (K-40) were detected. No fission or activation products were found in any samples and all required LLDs (Lower Limit of Detection) were met.

Food Product samples were analyzed for concentrations of gamma-emitting nuclides. No fission or activation products were found in any samples and all required LLDs were met.

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 Thermo-luminescent Dosimetry (TLD) were discontinued. This change may result in a step change in readings, up or down, depending on site characteristics. The relative comparison to control locations remains valid. OSLD technology is different than that used in a TLD but has the same purpose (to measure direct radiation). A dose evaluation was performed by taking the highest readings at the ISFSI pad and extrapolating dose to the nearest resident. The dose to the resident was estimated to be 3.20E-01 mrem in 2019.

III. Introduction

The Braidwood Station, consisting of two 3,645 MWt pressurized water reactors owned and operated by Exelon Corporation is located in Will County, Illinois. Unit No. 1 went critical on May 29, 1987. Unit No. 2 went critical on March 08, 1988. The site is located in northeastern Illinois, 20 miles south-southwest of Joliet, Illinois, 60 miles southwest of Chicago and southwest of the Kankakee River.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Landauer Technologies on samples collected during the period January 1, 2019 through December 31, 2019.

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.

IV. Program Description

A. Sample Collection

Samples for the Braidwood Station REMP were collected for Exelon Nuclear by Environmental Inc. Midwest Labs (EIML). This section describes the general collection methods used by EIML to obtain environmental samples for the Braidwood Station REMP in 2019. Sample locations and descriptions can be found in Table B–1 and Figures B–1 through B–3, Appendix B. The sampling methods used by EIML are listed in Table B-2.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, public water, well water, fish, and sediment. Two gallon water samples were collected weekly from six surface water locations [BD-10, BD-25 (Control (C)), BD-38, BD-40, BD-55 and BD-56], and one weekly composite sample of public drinking water at location (BD-22) and ground/well water samples collected quarterly from eight locations (BD-13, BD-34, BD-35, BD-36, BD-37, BD-50, BD-51 and BD-54). All samples were collected in new plastic bottles, which were rinsed with source water prior to collection per procedure. Fish samples comprising the flesh of quillback, golden redhorse, smallmouth bass, shorthead redhorse, common carp and largemouth bass were collected semiannually at three locations, BD-25 (C), BD-28 and BD-41. Sediment samples composed of recently deposited substrate were collected at three locations semiannually, BD-10, BD-25 (C), and BD-57.

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulate and airborne iodine. Air particulate samples were collected and analyzed weekly at eight locations [BD-02, BD-03 (C), BD-04, BD-05, BD-06, BD-19, BD-20 and BD-21]. Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters installed. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The air particulate filters and air iodine cartridges were replaced weekly and sent to the laboratory for analysis.

Terrestrial Environment

The terrestrial environment was evaluated by performing radiological analyses on milk and food product samples. Milk samples were collected biweekly at one location, BD-18 (C), from May through October and monthly from November through April. All samples were collected in new two-gallon plastic bottles from the bulk tank at each location, preserved with sodium bisulfite and shipped promptly to the laboratory.

Food products and broadleaf vegetation were collected at six locations (BD-Control, BD-Quad 1, BD-Quad 2, BD-Quad 3, BD-Quad 4, BWD-G1 and BWD-G2). 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 Dosimeters (OSLD) were deployed and the use of Thermoluminescent Dosimeters (TLD) was 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 two OSLDs. The OSLDs were exchanged quarterly and sent to Landauer for analysis. The OSLDs were placed at locations on and around the Braidwood Station site as follows:

An inner ring consisting of sixteen locations (BD-101, BD-102, BD-103, BD-104, BD-105, BD-106, BD-107, BD-108, BD-109, BD-110, BD-111a, BD-112, BD-113a, BD-114, BD-115 and BD-116) at or near the site boundary.

An outer ring consisting of sixteen locations (BD-201, BD-202, BD-203, BD-204, BD-205, BD-206, BD-207, BD-208, BD-209, BD-210, BD-211, BD-212, BD-213, BD-214, BD-215 and BD-216) extending to approximately 5 miles from the site.

An additional set located at the eight fixed air sampling locations (BD-02, BD-3 (C), BD-04, BD-05, BD-06, BD-19, BD-20 and BD-21).

An ISFSI set consisting of six locations (BD-ISFSI-104-3, BD-ISFSI-104-4, BD-ISFSI-105-3, BD-ISFSI-105-4, BD-ISFSI-110-3 and BD-ISFSI-110-4).

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;
3. Where estimated annual dose from Braidwood Station, if any, would be most significant.

B. Sample Analysis

This section describes the general analytical methodologies used by TBE to analyze the environmental samples for radioactivity for the Braidwood Station REMP in 2019. The analytical procedures used by the laboratories are listed in Table B-2.

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

1. Concentrations of beta emitters in public and surface water and air particulates.
2. Concentrations of gamma emitters in public, ground/well and surface water, air particulates, milk, grass, fish, sediment and food products.
3. Concentrations of tritium in public, ground/well and surface water.
4. Concentrations of I-131 in air, milk and public water.
5. Concentrations of Ni-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 Braidwood Station becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, Braidwood Station was considered operational at initial criticality. In addition, data was 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 Braidwood Station detection capabilities for environmental sample analysis.

The MDC is the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The MDC is an *a posteriori* determination.

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 resulting in 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, public water, ground/well water, air

particulate/radioiodine, milk, vegetation and fish, 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 sediment, 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 the single analysis uncertainty.

D. Program Exceptions

For 2019, the Braidwood Station REMP had a sample recovery rate in excess of 99.3%. 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
WW	BD-36	01/10/19	Sample not collected due to winterized outside tap and absence of the owners. Sample collected on 01/17/19.
AP/AI	BD-04	01/01/19	Lower reading of 141.5 hrs on the 8-day interval, possibly due to a power failure caused by severe cold.
OSLD	BD-21	02/01/19	Dosimeter not checked due to heavy snow. NOTE: OSLD checked on 02/07/19 and found in satisfactory state.
AP/AI	BD-21	02/07/19	Due to heavy snow on 02/01/19, samples collected on 02/07/19 after 2 weeks' run.
SED	BD-25	06/11/19	Sample collected in June instead of May due to dangerously high water level during entire month.
AP/AI	BD-02	07/18/19	Lower reading of 100.0 hrs on the 7 days period, possibly due to thunderstorms in the area. NOTE: Timer indicated 167.1 during 07/25/19 collection; normal reading for 7 days period.
AP/AI	BD-04	10/23/19	Approximately 5 hrs missing, possibly due to a power failure. NOTE: During the 10/31/19 collection, the timer showed 193.7 hrs; normal reading for the 8 days period.
Air Sampler	BD-03	10/31/19	Lower flow rate of 55 cfh due to snow clogging the intake port. Port cleaned, flow rate back to 60 cfh.
Air Sampler	BD-04	10/31/19	Lower flow rate of 53 cfh due to snow clogging the intake port. Port cleaned, flow rate back to 58 cfh.
Water Compositor	BD-22	11/29/19	Unusually low water level noticed in the compositor. All components checked; water intake valve readjusted. Compositor checked daily 12/02/19 to 12/04/19. Maintenance and recalibration performed on 12/05/19. Compositor now works as intended.

Table D-2 LISTING OF MISSED SAMPLES

Sample Type	Location Code	Collection Date	Reason
WW	BD-54	01/10/19	House vacant; water turned off
SW	BD-55, BD-56	01/17/19	No sample; water frozen
SW	BD-10, BD-25, BD-55, BD-56	01/24/19	No sample; water frozen
SW	BD-10, BD-25, BD-38 BD-55, BD-56	02/01/19	No sample; water frozen
SW	BD-25, BD-55	02/07/19	No sample; water frozen
SW	BD-25, BD-55, BD-56	02/14/19	No sample; water frozen
SW	BD-55, BD-56	02/21/19	No sample; water frozen
SW	BD-25, BD-55, BD-56	02/28/19	No sample; water frozen
SW	BD-10, BD-25 BD-55, BD-56	03/07/19	No sample; water frozen
OSLD	BD-106	03/07/19	Dosimeters found missing during monthly visual check. Collector placed spares EX00041782S and EX00073339J. NOTE: Dosimeters found on 03/28/19 in a nearby ditch immersed in water. Due to water exposure, sample determined damaged; discarded per station request.
SED	BD-25	May, 2019	Water level dangerously high during entire month. Location monitored, collection will be performed after water level decreases
SW	BD-25	05/09/19	No sample; gate locked due to high water level
VE	BWD-N1, BWD-N2, Control	05/02/19 05/16/19 05/30/19	No vegetation available; planting delayed due to heavy rains and flooding
VE	BWD-N1	06/13/19	Planted vegetation too small to collect
VE	BWD-N2, Control	06/13/19 06/27/19	No vegetation available; planting delayed due to heavy rains and flooding
VE	Quads 1/2/3/4, Control	June, 2019	No vegetables available. Planting and growth delayed due to heavy rains and flooding.
VE	Quads 1/3/4, Control	July, 2019	No vegetables available. Planting and growth delayed due to heavy rains and flooding.
VE	BWD-G2	07/11/19 07/25/19	No suitable vegetation available; planting delayed due to heavy rains and flooding.
VE	Quads 1/3, Control	August & September 2019	No suitable vegetables available due to very few local residents planting gardens due to heavy rains and floods in Spring and Summer. Some farmers changed or abandoned growing a bigger variety of crops.

Table D-2 LISTING OF MISSED SAMPLES (cont'd)

Sample Type	Location Code	Collection Date	Reason
VE	Control	09/19/19 10/03/19 10/17/19	No suitable vegetation available. Heavy rains and flooding in Spring and early Summer caused farmers to change or abandon growing a bigger variety of crops.
MI	BD-18	09/19/19 10/03/19 10/17/19 10/31/19 11/14/19	Milk not available; cows idled due to owner injury.
SW	BD-25	10/03/19	No sample; area inaccessible due to flood.
VE	Quads 1/2/3/4, Control	October, 2019	No suitable vegetation available due to late in season.
SW	BD-56	11/14//19	No sample; water frozen
SW	BD-55, BD-56	12/19/19	No sample; water frozen

Each program exception was reviewed to understand the causes of the program exception. Sampling and maintenance issues were reviewed with the personnel involved to prevent recurrence. Occasional equipment breakdowns, power outages and weather related issues 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 were no program changes in 2019.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water (SW)

Samples were taken weekly and composited monthly at six locations (BD-10, BD-25 (C), BD-38, BD-40, BD-55 and BD-56). Of these locations, only BD-10 could be affected by Braidwood Station's effluent releases as it is downstream of the NPDES permitted outfall. The following analyses were performed:

Gross Beta

Samples from all locations were analyzed for concentrations of gross beta (Table C–I.1, Appendix C). Gross beta was detected in 68 of 71 samples. The values ranged from 2.7 to 11.5 pCi/L. Concentrations detected were consistent with those detected in previous years. (Figures C–1 through C-3, Appendix C)

Tritium

Quarterly composites of weekly collections were analyzed for tritium activity (Table C–I.2, Appendix C). Tritium activity was detected in 1 of 24 samples at a concentration of 1240 ± 201 pCi/L. Concentrations detected were consistent with those detected in previous years. (Figures C–4 through C-6, Appendix C)

Nickel-63

Monthly samples beginning in April were analyzed for Ni-63 activity (Table C–I.3, Appendix C). Ni-63 was not detected and the required LLD was met.

Iron-55

Monthly samples beginning in April were analyzed for Ni-63 activity (Table C–I.3, Appendix C). Fe-55 was not detected and the required LLD was met.

Gamma Spectrometry

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

2. Public Water (PW)

Monthly composites of weekly samples were made at one location (BD-22). This location could be affected by Braidwood Station's effluent releases. The following analyses were performed:

Gross Beta

Samples from the location were analyzed for concentrations of gross

beta (Tables C–II.1, Appendix C). Gross beta was detected in 12 of 12 samples. The values ranged from 2.1 to 6.7 pCi/L. Concentrations detected were consistent with those detected in previous years. (Figure C–7, Appendix C)

Tritium

Monthly composites of weekly samples from BD-22 were analyzed for tritium activity (Table C–II.2, Appendix C). Tritium was detected in 10 of 12 samples. Concentrations ranged from 200 to 2,110 pCi/L. Concentrations detected were consistent with those detected in previous years (Figure C–8, Appendix C).

Iodine

Monthly composites of weekly samples from the location were analyzed for I-131 (Table C-II.3, Appendix C). Iodine was not detected in any samples and the required LLD was met.

Nickel-63

Monthly samples were analyzed for Ni-63 activity. Ni-63 was not detected and the required LLD was met. (Table C–II.4, Appendix C)

Iron-55

Monthly samples were analyzed for Ni-63 activity. Fe-55 was not detected and the required LLD was met. (Table C–II.5, Appendix C)

Gamma Spectrometry

Samples from the location were analyzed for gamma-emitting nuclides (Table C–II.6, Appendix C). No nuclides were detected and all required LLDs were met.

3. Ground/Well Water (WW)

Quarterly samples were collected at eight locations (BD-13, BD-34, BD-35, BD-36, BD-37, BD-50, BD-51 and BD-54). The following analyses were performed:

Tritium

Quarterly grab samples from the locations were analyzed for tritium activity (Table C–III.1, Appendix C). Tritium was not detected in any sample and the required LLD was met. Concentrations were consistent with those in previous years. (Figures C–9 through C–13, Appendix C)

Gamma Spectrometry

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

4. Fish

Fish samples comprised of quillback, golden redhorse, smallmouth bass, shorthead redhorse, common carp and largemouth bass were collected at three locations (BD-25, BD-28, and BD-41) semiannually. Location BD-28 could be affected by Braidwood Station's effluent releases. The following analyses were performed:

Iron-55

The edible portion of fish samples from all three locations was analyzed for Fe-55 activity (Table C–IV.1, Appendix C). Ni-63 was not detected and the required LLD was met.

Nickel-63

The edible portion of fish samples from all three locations was analyzed for Ni-63 activity (Table C–IV.1, Appendix C). Ni-63 was not detected and the required LLD was met.

Gamma Spectrometry

The edible portion of fish samples from all three locations was analyzed for gamma-emitting nuclides (Table C–IV.1, Appendix C). No fission or activation products were found. No nuclides were detected and all required LLDs were met.

5. Sediment (BS)

Aquatic sediment samples were collected at three locations (BD-10, BD-25 (C), and BD-57) semiannually. The locations at the Braidwood Station outfall to the Kankakee River (BD-57) and downstream of the outfall (BD-10), could be affected by Braidwood Station's effluent releases. The following analyses were performed:

Iron-55

Sediment samples from all three locations was analyzed for Fe-55 activity (Table C–V.1, Appendix C). Fe-55 was not detected and the required LLD was met.

Nickel-63

Sediment samples from all three locations was analyzed for Ni-63 activity (Table C–V.1, Appendix C). Ni-63 was not detected and the required LLD was met.

Gamma Spectrometry

Sediment samples from the location were analyzed for gamma-emitting nuclides (Table C–V.1, Appendix C). The fission product Cs-137 was detected at one location at a concentration of 169 ± 99 pCi/kg dry. This concentration of Cs-137 were less than the required LLD for Cs-137 in sediment of 180 pCi/kg dry. Based on values calculated using NCRP

Report 154, *Cesium-137 In the Environment: Radioecology and Approaches to Assessment and Management (2006),* expected decay-corrected concentrations of Cs-137 from fallout would be between 321 and 4819 pCi/kg dry. The activity detected is below these levels and consistent with fallout. No other Braidwood fission or activation products were found and all required LLDs were met.

B. Atmospheric Environment

1. Airborne (AP/AI)

a. Air Particulates

Continuous air particulate samples were collected from eight locations on a weekly basis. The eight locations were separated into three groups: Near field samplers (BD-06, BD-19, BD-20 and BD-21), far field samplers within 10 km of the site (BD-02, BD-04 and BD-05) and the Control sampler between 10 and 30 km from the site (BD-03). The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–VI.1 and C-VI.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 Braidwood Station. The results from the near field (Group I) ranged from 5E-03 to 30E-03 pCi/m^3 with a mean of 15E-03 pCi/m^3. The results from the far field (Group II) ranged from 6E-03 to 29E-03 pCi/m^3 with a mean of 15E-03 pCi/m^3. The results from the Control location (Group III) ranged from 7E-03 to 29E-03 pCi/m^3 with a mean of 15E-03 pCi/m^3. Comparison of the 2019 air particulate data with previous years' data indicate no effects from the operation of Braidwood Station. Additionally, a comparison of the weekly values for 2019 indicate no notable differences among the three groups. (Figures C–14 through C-18, Appendix C)

Gamma Spectrometry

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

b. Airborne Iodine

Continuous air samples were collected from eight locations (BD-02, BD-03, BD-04, BD-05, BD-06, BD-19, BD-20 and BD-21) and analyzed weekly. The following analysis was performed:

I-131

Continuous air samples were collected from eight locations for I-131 (Table C–VII.1, Appendix C). All results were less than the

minimum detectable concentration for I-131. The required LLD was met for all analyses.

C. Terrestrial Environment

1. Milk (MI)

Samples were collected from one location (control location BD-18). Sampling frequencies were increased to biweekly in May and continued through October and monthly sampling was performed November through April. Location BD-17 sold all dairy cows in June, 2019, and milk location was discontinued. The following analyses were performed:

Iodine-131

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

Gamma Spectrometry

Each milk sample was analyzed for concentrations of gamma-emitting nuclides. No nuclides were detected and all required LLDs were met. (Table C–VIII.2 & Table C-VIII.3, Appendix C)

2. Food Products (VE)

Food product samples were collected at eight locations: BD-Control, BD-Quad 1, BD-Quad 2, BD-Quad 3, BD-Quad 4, BWD-N1 and BWD-N2 when available. The following analysis was performed:

Gamma Spectrometry

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

D. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing Optically Stimulated Luminescence Dosimeter (OSLD). Forty-eight OSLD locations were established around the site, each with two OSLD's installed for measurement. The data was analyzed using methods acceptable for demonstrating compliance with the Environmental Protection Agency (EPA) 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operations". It incorporates the concepts of ANSI/HPS N13.37, "Environmental Dosimetry". Results of OSLD measurements are listed in Tables C–X.1 to C–X.3, Appendix C.

In January 2020, discrepancies were identified with the 4th Quarter 2019 REMP OSLD dose readings when the report was provided to Braidwood Station by the vendor. The OSLD dose readings were unexpectedly higher than the previous three quarters. The control and spare OSLDs were 20-40 mrem higher, while the field OSLDs dose readings were 2-4 mrem higher

compared to quarters 1, 2, and 3 of 2019. As documented in IR 04328318, an average of the 3rd and 4th quarter 2018 as well as the 1st, 2nd, and 3rd quarters in 2019 were used to estimate a dose for the 4th quarter 2019 OSLDs.

The 2019 calendar year resulted in 40 field OSLDs out of 57 total field OSLDs with positive annual facility dose on Attachment 6 from CY-AA-170-1001, "Environmental Dosimetry-Performance Specifications, Testing, and Data Analysis". In the past, Braidwood has reported no dose (ND) for annual facility dose because the sum of the 4 quarters for the year were within 3 standard deviations of the 5-year annual baseline. In the third quarter 2018, the method for calculating dose was revised. Control OSLDs are now kept inside a vault and a normalized field dose is calculated. The higher dose is in part because the control OSLD's are now inside of a "lead shielded" vault; they typically receive less dose than the previous storage method, which was not in a lead vault. Normalized field dose is the measured field dose adjusted to a standardized 91-day period of time for one quarter. This correction adjusts for the actual number of days of field deployment which could vary depending on such factors as weather, staff availability, holidays and the fact that the number of days in a year divided by 4 quarters is not a whole number. The corresponding normalized annual dose is then the sum of the four normalized quarterly doses. The standard 91-day quarter for normalizing dose is used for calculational purposes only. This mid-year 2018 change resulted in the doses for the last two quarters being higher than the first two quarters. However, the annual facility dose was within 3 standard deviations of the 5-year baseline from data gathered before the change to normalized dose. The first year with all four quarters calculated using normalized dose which resulted in an annual facility dose that was not within 3 standard deviations of the 5-year baseline data occurred in 2019. As additional data is collected in the next five years, the baseline will slowly trend towards a more representative dose value.

All OSLD measurements had a range of 12.5 to 34.2 mrem/std. quarter. A comparison of the Inner Ring, Outer Ring and Other data to the Control Location data, indicate that the ambient gamma radiation levels from all locations were similar.

Annual Facility Dose was reported for station BD-ISFSI-105-4. The direct dose to the nearest resident was estimated to be 0.32 mrem for the year.

E. Land Use Survey

A Land Use Survey conducted during September 11, 2019, around the Braidwood Station was performed by EIML for Exelon Nuclear to comply with section 12.5.2 of the Braidwood Station's Offsite Dose Calculation Manual ODCM). The purpose of the survey was to document the nearest resident, milk-producing animal and garden of greater than 500 ft^2 in each of the sixteen 22 ½ degree sectors around the site. For dose calculation, a garden is assumed at the nearest residence. There were no notable

changes to the 2019 land use census. The results of this survey are summarized below:

Distance in Miles from the Braidwood Station Reactor Buildings				
Sector		Residence Miles	Livestock Miles	Milk Farm Miles
A	N	0.50	2.6	-
B	NNE	0.88	-	-
C	NE	0.65	-	-
D	ENE	0.60	-	-
E	E	1.50	2.3	-
F	ESE	2.20	2.3	-
G	SE	2.70	2.7	-
H	SSE	4.50	-	-
J	S	4.20	-	-
K	SSW	1.30	5.3	-
L	SW	0.40	-	-
M	WSW	0.45	-	-
N	W	0.35	1.6	8.7
P	WNW	0.40	-	-
Q	NW	0.40	-	-
R	NNW	0.40	-	-

F. Errata Data

There was no errata data for 2019 REMP. Appendix E includes errata information for the RGPP.

G. Summary of Results – Inter-Laboratory Comparison Program

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

1. Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE evaluates the reported ratios based on internal QC requirements 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, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (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. MAPEP defines three levels of performance:

   - Acceptable (flag = "A") - result within ± 20% of the reference value
   - Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 30% of the reference value
   - Not Acceptable (flag = "N") – bias is greater than 30% of the reference value

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

For the TBE laboratory, 119 out of 129 analyses performed met the specified acceptance criteria. Ten analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program. A summary is found below:

1. The MAPEP February 2019 soil Sr-90 result was not submitted and therefore evaluated as *Not Acceptable*. The sample was run in duplicate, with results of -1.32 ± 4.09 Bq/kg (<6.87) and -1.030 ± 3.55 Bq/kg (<5.97). The known result was a false positive test (no significant activity). TBE did not submit a result because it appeared that the results may not be accurate. TBE analyzed a substitute soil Sr-90 sample from another vendor, with a result within the acceptable range. (NCR 19-12)
2. The MAPEP February 2019 water Am-241 result was evaluated as *Not Acceptable*. The reported value was 0.764 ± 0.00725 Bq/L with a known result of 0.582 Bq/L (acceptable range 0.407 - 0.757 Bq/L). TBE's result falls within the upper acceptable range with the error. It

appeared that a non-radiological interference was added and lead to an increased mass and higher result. (NCR 19-13)

3. The MAPEP February 2019 vegetation Sr-90 result was evaluated as *Not Acceptable*. The reported result was -0.1060 ± 0.0328 Bq/kg and the known result was a false positive test (no significant activity). TBE's result was correct in that there was no activity. MAPEP's evaluation was a "statistical failure" at 3 standard deviations. (NCR 19-14)

4. The ERA April 2019 water Cs-134 result was evaluated as *Not Acceptable*. The reported value was 15.2 pCi/L (error 2.82 pCi/L) and the known result was 12.1 pCi/L (acceptance range of 8.39 - 14.4 pCi/L). With the error, the reported result overlaps the acceptable range. This sample was run as the workgroup duplicate on a different detector with a result of 10.7 pCi/L (within acceptable range). (NCR 19-10)

5. The ERA April 2019 water Sr-89 result was evaluated as *Not Acceptable*. The reported value was 44.9 pCi/L and the known result was 33.3 pCi/L (acceptance range of 24.5 - 40.1 pCi/L). The sample was only counted for 15 minutes instead of 200 minutes. The sample was re-prepped in duplicate and counted for 200 minutes with results of 30.7 ± 5.37 pCi/L and 33.0 ± 8.71 pCi/L. This was the 1st "high" failure for Sr-89 in 5 years. (NCR 19-11)

6. The MAPEP August 2019 soil Ni-63 result of 436 ± 22.8 Bq/kg was evaluated as Not Acceptable. The known result was 629 Bq/kg (acceptable range 440 - 818 Bq/sample). With the associated error, the TBE result falls within the lower acceptance range. All associated QC was acceptable. No reason for failure could be found. This is the first failure for soil Ni-63 since 2012. (NCR 19-25).

7. The MAPEP August 2019 water Am-241 result was not reported and therefore evaluated as *Not Acceptable*. Initial review of the results showed a large peak where Am-241 should be (same as the February, 2019 sample results). It is believed that Th-228 was intentionally added as an interference. The sample was re-prepped and analyzed using a smaller sample aliquot. The unusual large peak (Th-228) was seen again and also this time a smaller peak (Am-241). The result was 436 ± 22.8 Bq/L (acceptable range 0.365 ± 0.679 Bq/L). Th-228 is not a typical nuclide requested by clients, so there is no analytical purpose to take samples through an additional separation step. TBE will pursue using another vendor for Am-241 water cross-checks that more closely reflects actual customer samples. (NCR 19-26)

8. The Analytics September 2019 soil Cr-51 sample was evaluated as *Not Acceptable*. TBE's reported result of 0.765 ± 0.135 pCi/g exceeded the upper acceptance range (140% of the known result of 0.547 pCi/g). The TBE result was within the acceptable range (0.63 - 0.90 pCi/g) with the associated error. The Cr-51 result is very close to TBE's normal

detection limit. In order to get a reportable result, the sample must be counted for 15 hours (10x longer than client samples). There is no client or regulatory requirement for this nuclide and TBE will remove Cr-51 from the reported gamma nuclides going forward. (NCR 19-27)

9. The ERA October 2019 water Gross Alpha result was evaluated as *Not Acceptable*. TBE's reported result was 40.5 ± 10.3 pCi/L and the known result was 27.6 pCi/L (ratio of TBE to known result at 135%). With the associated error, the result falls within the acceptable range (14.0 - 36.3 pCi/L). The sample was run as the workgroup duplicate on a different detector with a result of 30.8 ± 9.17 pCi/L (within the acceptable range). This was the first failure for drinking water Gross Alpha since 2012. (NCR 19-23)
10. The ERA October 2019 water Sr-90 result was evaluated as *Not Acceptable*. TBE's reported result was 32.5 ± 2.12 pCi/L and the known result was 26.5 pCi/L (ratio of TBE to known result at 123%). With the associated error, the result falls within the acceptable range (19.2 - 30.9 pCi/L). The sample was run as the workgroup duplicate on a different detector with a result of 20.0 ± 1.91 pCi/L (within the acceptable range). Both TBE results are within internal QC limits. A substitute "quick response" sample was analyzed with an acceptable result of 18.6 pCi/L (known range of 13.2 - 22.1 pCi/L). (NCR 19-24)

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 ANNUAL SUMMARY

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TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BRAIDWOOD STATION, 2019

NAME OF FACILITY: BRAIDWOOD **DOCKET NUMBERS: 50-456 & 50-457**

LOCATION OF FACILITY: BRACEVILLE, IL **REPORTING PERIOD: 2019**

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	**INDICATOR LOCATIONS** MEAN (M) (F) *RANGE*	**CONTROL LOCATION** MEAN (M) (F) *RANGE*	**LOCATION WITH HIGHEST ANNUAL MEAN (M)** MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER *(PCI/LITER)*	**GR-B**	71	4	5.4 (47/59) *2.7 - 11.5*	4.4 (11/12) *3.0 - 8.0*	7.5 (12/12) *5.8 - 11.5*	BD-40 INDICATOR BRAIDWOOD STATION COOLING LAKE ONSITE	0
	H-3	24	200	1240 (1/20)	<LLD	1240 (1/20)	BD-10 INDICATOR KANKAKEE RIVER DOWNSTREAM 5.4 MILES NE OF SITE	0
	NI-63	18	30	<LLD	<LLD	-		0
	FE-55	18	200	<LLD	<LLD	-		0
	GAMMA	71						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	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
PUBLIC WATER *(PCI/LITER)*	**GR-B**	12	4	3.8 (12/12) *2.1 - 6.7*	NA	3.8 (12/12) *2.1 - 6.7*	BD-22 INDICATOR WILMINGTON 6.0 MILES NE OF SITE	0
	H-3	12	200	936 (10/12) *200 - 2110*	NA	936 (10/12) *200 - 2110*	BD-22 INDICATOR WILMINGTON 6.0 MILES NE OF SITE	0
	I-131	12	1	<LLD	NA	-		0
	NI-63	9	30	<LLD	<LLD	-		0
	FE-55	9	200	<LLD	<LLD	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BRAIDWOOD STATION, 2019

NAME OF FACILITY: BRAIDWOOD **DOCKET NUMBERS: 50-456 & 50-457**

LOCATION OF FACILITY: BRACEVILLE, IL **REPORTING PERIOD: 2019**

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	**INDICATOR LOCATIONS** MEAN (M) (F) *RANGE*	**CONTROL LOCATION** MEAN (M) (F) *RANGE*	**LOCATION WITH HIGHEST ANNUAL MEAN (M)** MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
PUBLIC WATER	**GAMMA**	12						
(PCI/LITER)	*MN-54*		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
GROUND WATER *(PCI/LITER)*	**H-3**	31	200	<LLD	NA	-		0
	GAMMA	31						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	I-131		15	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0
	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
FISH *(PCI/KG WET)*	**FE-55**	12	260	<LLD	<LLD	-		0
	NI-63	12	260	<LLD	<LLD	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BRAIDWOOD STATION, 2019

NAME OF FACILITY: BRAIDWOOD **DOCKET NUMBERS: 50-456 & 50-457**
LOCATION OF FACILITY: BRACEVILLE, IL **REPORTING PERIOD: 2019**

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) *RANGE*	CONTROL LOCATION MEAN (M) (F) *RANGE*	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
FISH	**GAMMA**	12						
(PCI/KG WET)	*MN-54*		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	I-131		NA	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
SEDIMENT *(PCI/KG DRY)*	**FE-55**	6	2000	<LLD	<LLD	-		0
	NI-63	6	260	<LLD	<LLD	-		0
	GAMMA	6						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	169 (1/4)	<LLD	169 (1/4)	BD-57 INDICATOR CIRC. WATER BLOWDOWN DISCH 5.4 MILES E OF SITE	0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BRAIDWOOD STATION, 2019

NAME OF FACILITY: BRAIDWOOD						DOCKET NUMBERS:	50-456 & 50-457	
LOCATION OF FACILITY: BRACEVILLE, IL						REPORTING PERIOD:	2019	
MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) *RANGE*	CONTROL LOCATION MEAN (M) (F) *RANGE*	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) *RANGE*	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE *(E-3 PCI/CU.METER)*	**GR-B**	415	10	15 (363/363) *5 - 30*	15 (52/52) *7 - 29*	16 (51/51) *8 - 30*	BD-21 INDICATOR NEARSITE NE 0.5 MILES NE OF SITE	0
	GAMMA	32						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
AIR IODINE *(E-3 PCI/CU.METER)*	**GAMMA** *I-131*	415	70	<LLD	<LLD	-		0
MILK *(PCI/LITER)*	**I-131**	15	1	<LLD	<LLD	-		0
	GAMMA	15						
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR BRAIDWOOD STATION, 2019

NAME OF FACILITY: BRAIDWOOD **DOCKET NUMBERS: 50-456 & 50-457**

LOCATION OF FACILITY: BRACEVILLE, IL **REPORTING PERIOD: 2019**

MEDIUM OR PATHWAY SAMPLED *(UNIT OF MEASUREMENT)*	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	**INDICATOR LOCATIONS** MEAN (M) (F) *RANGE*	**CONTROL LOCATION** MEAN (M) (F) *RANGE*	**LOCATION WITH HIGHEST ANNUAL MEAN (M)** MEAN (M) (F) *RANGE*	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GRASS	**GAMMA**	0						
(PCI/KG WET)	*MN-54*		NA					
	CO-58		NA					
	FE-59		NA					
	CO-60		NA					
	ZN-65		NA					
	NB-95		NA					
	ZR-95		NA					
	CS-134		60					
	CS-137		60					
	BA-140		80					
	LA-140		NA					
			NA					
VEGETATION	**GAMMA**	66						
(PCI/KG WET)	*MN-54*		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	FE-59		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0
	ZN-65		NA	<LLD	<LLD	-		0
	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD			0
	BA-140		NA	<LLD	<LLD	-		0
	LA-140		NA	<LLD	<LLD	-		0
DIRECT RADIATION	**OSLD-QUARTERLY**	184	NA	15.9	13	32.3	BD-ISFSI-105-4 INDICATOR	0
(MILLIREM/QTR.)				(180/180)	(4/4)	(4/4)		
				12.5 - 34.2	*14.7 - 15.6*	*30.2 - 34.2*	0.20 MILES SE	

(M) The Mean Values are calculated using the positive values. (F) Fraction of detectable measurement are indicated in parentheses.

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APPENDIX B

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

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TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Braidwood Station, 2019

Location	Location Description	Distance & Direction From Site
A. Surface Water		
BD-10	Kankakee River Downstream (indicator)	5.4 miles NE
BD-25	Kankakee River Upstream (control)	9.6 miles E
BD-38	Main Drainage Ditch (indicator)	1.5 miles SE
BD-40	Braidwood Station Cooling Lake (indicator)	Onsite
BD-55	North Pond Fatlan Site (indicator)	0.6 miles NE
BD-56	South Pond Fatlan Site (indicator)	0.6 miles NE
B. Drinking (Potable) Water		
BD-22	Wilmington (indicator)	6.0 miles NE
C. Ground/Well Water		
BD-13	Braidwood City Hall Well (indicator)	1.7 miles NNE
BD-34	Gibson Well (indicator)	4.7 miles E
BD-35	Joly Well (indicator)	4.7 miles E
BD-36	Hutton Well (indicator)	4.7 miles E
BD-37	Nurczyk Well (indicator)	4.7 miles E
BD-50	Skole Well (indicator)	4.7 miles E
BD-51	Fatlan Well (indicator)	0.6 miles NE
BD-54	Cash Well (indicator)	0.9 miles NE
D. Milk - Bi-Weekly / Monthly		
BD-18	Biros' Farm (control)	8.7 miles W
E. Air Particulates / Air Iodine		
BD-02	Custer Park (indicator)	5.0 miles E
BD-03	County Line Road (control)	6.2 miles ESE
BD-04	Essex (indicator)	4.8 miles SSE
BD-05	Gardner (indicator)	5.5 miles SW
BD-06	Godley (indicator)	0.5 miles WSW
BD-19	Nearsite NW (indicator)	0.3 miles NW
BD-20	Nearsite N (indicator)	0.6 miles N
BD-21	Nearsite NE (indicator)	0.5 miles NE
F. Fish		
BD-25	Kankakee River, Upstream (control)	9.6 miles E
BD-28	Kankakee River, Discharge (indicator)	5.4 miles E
BD-41	Cooling Lake (indicator)	1.0 mile E
G. Sediment		
BD-10	Kankakee River, Downstream (indicator)	5.4 miles NE
BD-25	Kankakee River Upstream (control)	9.6 miles E
BD-57	Circulating Water Blowdown Discharge (indicator)	5.4 miles E
H. Food Products		
BWD-G1	Nearsite NE	0.54 miles NE
BWD-G2	Nearsite W	0.21 miles W
Quadrant 1	Clark Farm	3.8 miles ENE
Quadrant 2	W.F. Soltwisch	4.5 miles SSE
Quadrant 3	Terri Schultz	4.8 miles SSW
Quadrant 4	Bruce Sinkular	1.9 miles NNW
Control	Gorman Farm	9.0 miles NE

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Braidwood Station, 2019

Location	Location Description	Distance & Direction From Site
I. Environmental Dosimetry - OSLD		
Inner Ring		
BD-101		0.5 miles N
BD-102		1.1 miles NNE
BD-103		1.0 mile NE
BD-104		0.7 miles ENE
BD-105		2.2 miles E
BD-106		2.5 miles ESE
BD-107		3.2 miles SE
BD-108		3.2 miles SSE
BD-109		3.8 miles S
BD-110		2.8 miles SSW
BD-111a		1.4 miles SW
BD-112		0.7 miles WSW
BD-113a		0.5 miles W
BD-114		0.4 miles WNW
BD-115		0.3 miles NW
BD-116		0.4 miles NNW
Outer Ring		
BD-201		4.2 miles N
BD-202		4.8 miles NNE
BD-203		4.9 miles NE
BD-204		4.3 miles ENE
BD-205		4.0 miles E
BD-206		4.5 miles ESE
BD-207		4.5 miles SE
BD-208		4.5 miles SSE
BD-209		4.8 miles S
BD-210		5.3 miles SSW
BD-211		4.8 miles SW
BD-212		5.0 miles WSW
BD-213		4.8 miles W
BD-214		4.3 miles WNW
BD-215		4.5 miles NW
BD-216		4.0 miles NNW
Other		
BD-02	Custer Park (indicator)	5.0 miles E
BD-03	13000 W. Road (control)	6.2 miles ESE
BD-04	Essex (indicator)	4.8 miles SSE
BD-05	Gardner (indicator)	5.5 miles SW
BD-06	Godley (indicator)	0.5 miles WSW
BD-19	Nearsite NW (indicator)	0.3 miles NW
BD-20	Nearsite N (indicator)	0.6 miles N
BD-21	Nearsite NE (indicator)	0.5 miles NE
ISFSI		
BD-ISFSI-104-3		0.11 miles E
BD-ISFSI-104-4		0.13 miles E
BD-ISFSI-105-3		0.23 miles SE
BD-ISFSI-105-4		0.20 miles SE
BD-ISFSI-110-3		0.18 miles SE
BD-ISFSI-110-4		0.15 miles SE

TABLE B-1: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Braidwood Station, 2019

Distance in Miles from the Braidwood Station ISFSI Pad, 2019		
Sector		Residence Miles
N	WNW	0.7
P	WNW	0.7
Q	NW	0.7
R	NNW	0.7

Distance in Miles from the Braidwood Station Reactor Buildings, 2019				
Sector		Residence Miles	Livestock Miles	Milk Farm Miles
A	N	0.5	2.6	-
B	NNE	0.9	-	-
C	NE	0.7	-	-
D	ENE	0.8	3.3	-
E	E	1.5	2.3	-
F	ESE	2.2	2.3	-
G	SE	2.7	2.7	-
H	SSE	4.5	-	-
J	S	4.2	4.8	-
K	SSW	1.3	5.3	-
L	SW	0.4	1.2	-
M	WSW	0.5	-	-
N	W	0.4	1.6	8.7
P	WNW	0.4	-	-
Q	NW	0.4	-	-
R	NNW	0.4	-	-

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Braidwood Station, 2019

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	Iron-55	Monthly composite from weekly grab samples	TBE, TBE-2006 Iron-55 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
Drinking Water	Gamma Spectroscopy	Monthly composite from weekly composite samples	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis TBE. TBE-2023 Compositing of Samples
Drinking Water	Gross Beta	Monthly composite from weekly composite samples	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices TBE. TBE-2023 Compositing of Samples
Drinking Water	Iodine	Monthly composite from weekly composite samples	TBE, TBE-2012 Radioiodine in Various Matrices TBE. TBE-2023 Compositing of Samples
Drinking Water	Iron-55	Monthly composite from weekly grab samples	TBE, TBE-2006 Iron-55 Activity in Various Matrices
Drinking Water	Nickel-63	Monthly composite from weekly grab samples	TBE, TBE-2013 Radionickel Activity in Various Matrices
Drinking Water	Tritium	Monthly composite from weekly composite samples	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation TBE. TBE-2023 Compositing of Samples
Ground/ Well Water	Gamma Spectroscopy	Quarterly grab sample	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Ground/ Well Water	Tritium	Quarterly grab sample	TBE, TBE-2011 Tritium analysis in Drinking Water by Liquid Scintillation
Fish	Gamma Spectroscopy	Semi-annual samples collected via electro-shocking or other techniques	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Fish	Iron-55	Semi-annual samples collected via electro-shocking or other techniques	TBE, TBE-2006 Iron-55 Activity in Various Matrices
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-2007 Gamma-Emitting Radioisotope Analysis
Sediment	Iron-55	Semi-annual grab samples	TBE, TBE-2006 Iron-55 Activity in Various Matrices
Sediment	Nickel-63	Semi-annual grab samples	TBE, TBE-2013 Radionickel Activity in Various Matrices

TABLE B-2: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Braidwood Station, 2019

Sample Medium	Analysis	Sampling Method	Analytical Procedure Number
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 TBE. TBE-2023 Compositing of Samples
Air Iodine	I-131	Weekly composite of continuous air sampling through charcoal filter	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Milk	Gamma Spectroscopy	Bi-weekly grab sample May through October. Monthly all other times	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Milk	I-131	Bi-weekly grab sample May through October. Monthly all other times	TBE, TBE-2012 Radioiodine in Various Matrices
Food Products	Gamma Spectroscopy	Grab samples during the growing season	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	Landauer Incorporated

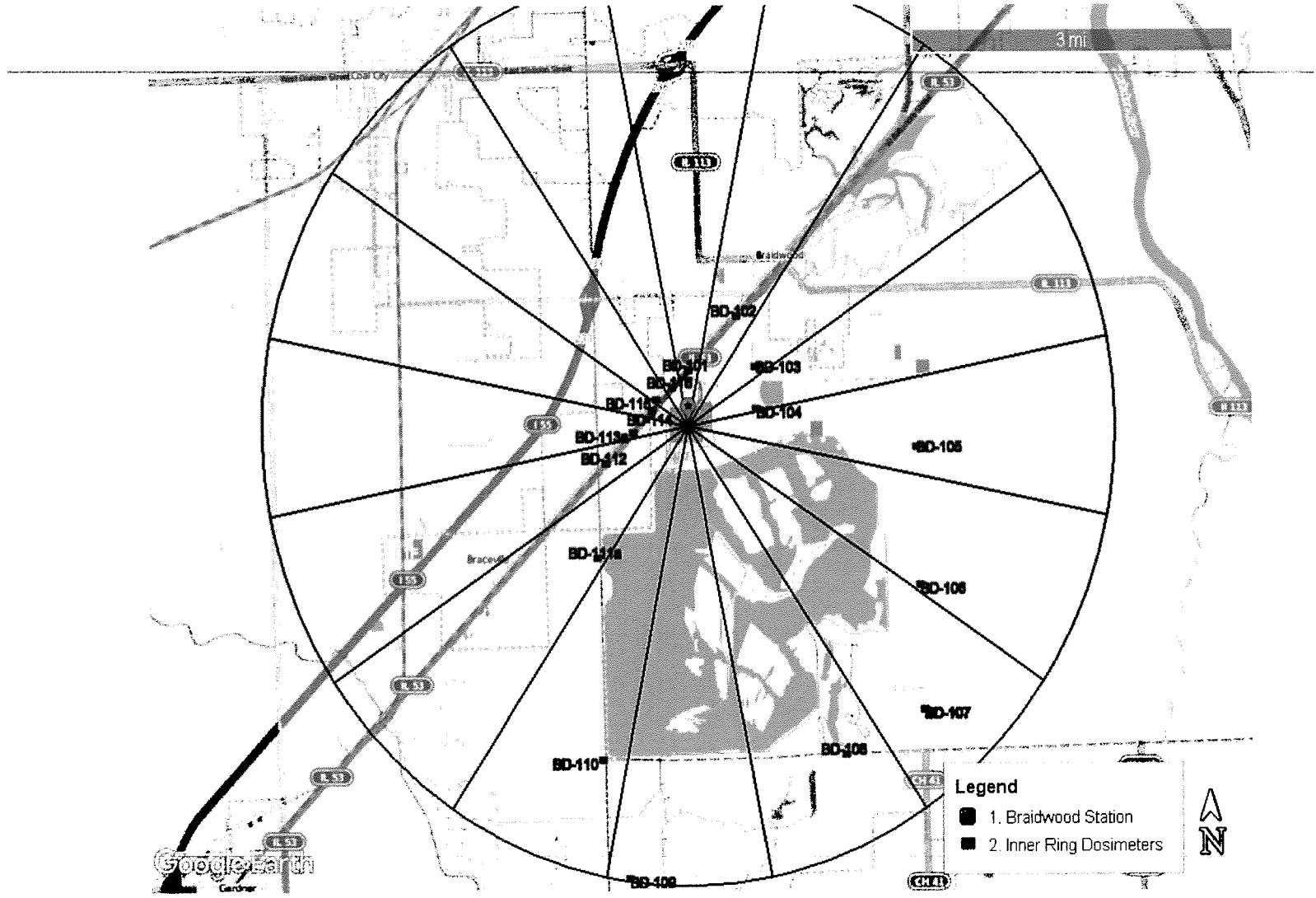

Figure B-1
Inner Ring and Other OSLD Locations
of Braidwood Station, 2019

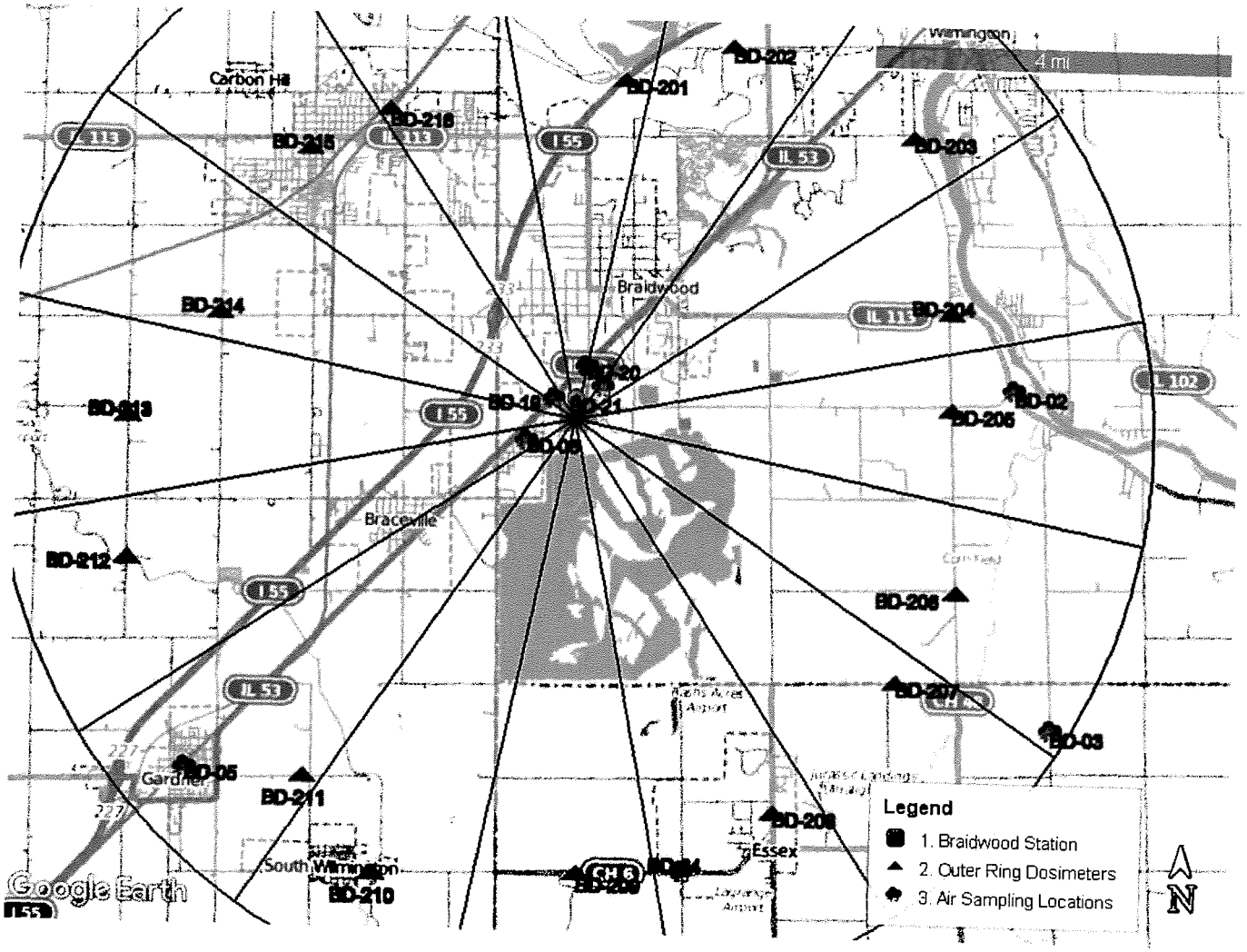

Figure B-2
Fixed Air Sampling and Outer Ring
OSLD Locations of Braidwood Station, 2019

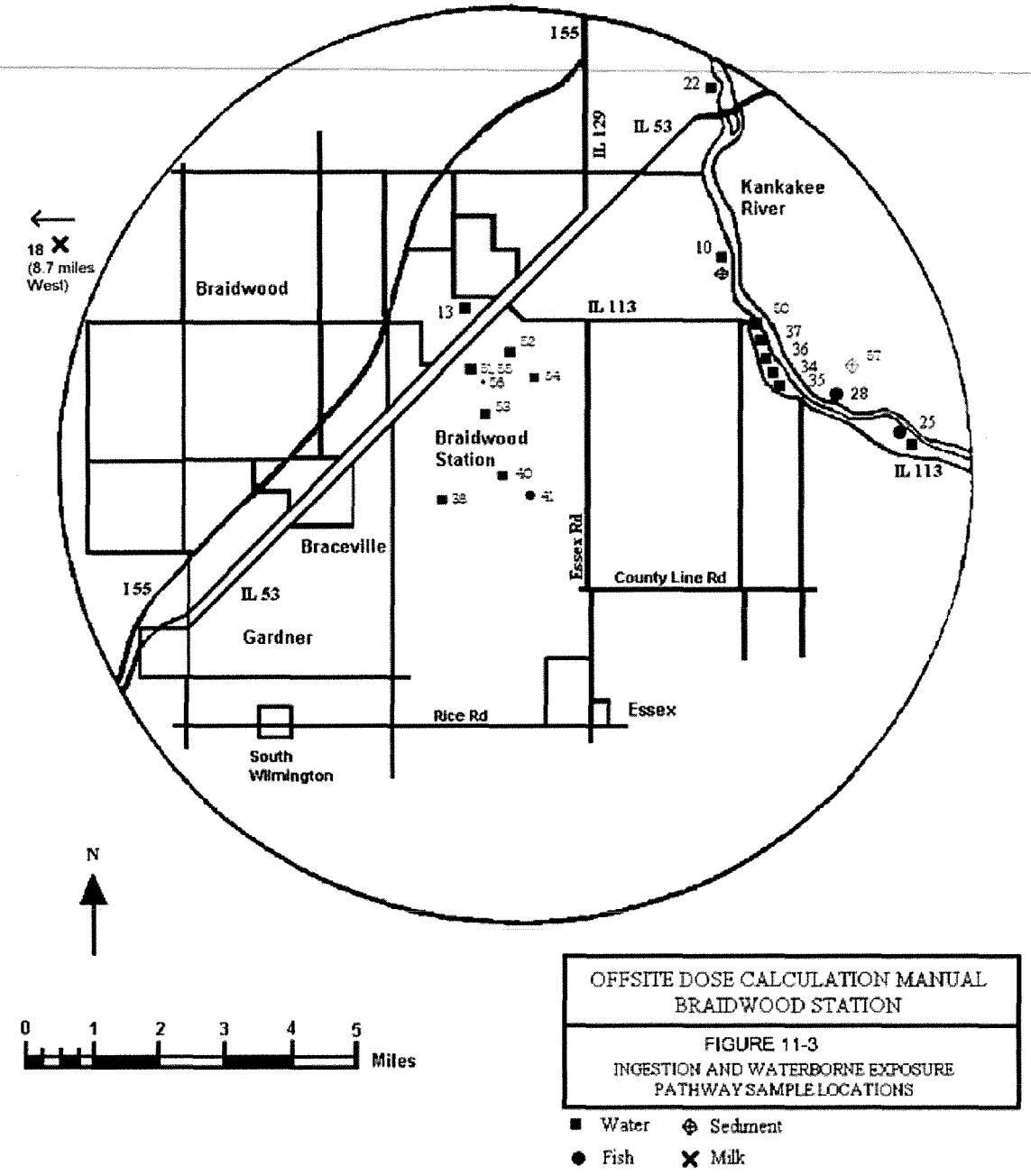

Figure B-3
Ingestion and Waterborne Exposure Pathway
Sample Locations of Braidwood Station, 2019

APPENDIX C

DATA TABLES AND FIGURES

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Table C-I.1 CONCENTRATIONS OF GROSS BETA IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-10	BD-25	BD-38	BD-40	BD-55	BD-56
01/03/19 - 01/10/19	4.9 ± 2.1	4.0 ± 2.0	4.3 ± 2.3	6.5 ± 2.3	2.7 ± 1.7	< 2.9
02/01/19 - 02/28/19	4.7 ± 2.1	3.3 ± 2.1	3.7 ± 2.3	8.1 ± 2.6	*(1)*	< 2.4
03/07/19 - 03/28/19	5.8 ± 2.0	3.0 ± 1.8	3.7 ± 2.2	5.8 ± 2.2	3.1 ± 1.7	< 2.6
04/04/19 - 04/25/19	< 3.1	3.3 ± 2.2	< 3.5	6.9 ± 2.5	< 2.5	< 3.4
05/02/19 - 05/30/19	5.9 ± 2.0	6.9 ± 2.1	4.2 ± 2.2	9.2 ± 2.7	3.2 ± 1.7	5.7 ± 2.1
06/06/19 - 06/27/19	3.5 ± 2.2	3.4 ± 2.1	< 3.7	8.2 ± 2.9	< 2.7	6.1 ± 2.5
07/03/19 - 07/25/19	3.9 ± 1.8	3.0 ± 1.7	4.0 ± 1.9	7.2 ± 2.2	3.9 ± 1.6	4.7 ± 1.9
08/01/19 - 08/29/19	4.7 ± 2.2	4.8 ± 2.2	11.1 ± 3.3	11.5 ± 2.8	3.6 ± 1.8	< 2.8
09/05/19 - 09/26/19	3.7 ± 2.1	5.1 ± 2.2	5.3 ± 2.6	7.4 ± 2.4	3.7 ± 1.8	7.3 ± 2.5
10/03/19 - 10/31/19	3.5 ± 1.9	4.0 ± 1.9	4.0 ± 2.2	6.0 ± 2.3	3.2 ± 1.7	< 2.7
11/07/19 - 11/29/19	3.8 ± 2.1	< 2.7	7.3 ± 2.8	7.4 ± 2.6	3.0 ± 1.7	7.4 ± 2.2
12/06/19 - 12/26/19	4.4 ± 1.9	8.0 ± 2.2	5.1 ± 2.2	5.8 ± 2.2	2.7 ± 1.6	< 2.6
MEAN ± 2 STD DEV	4.4 ± 1.7	4.4 ± 3.3	5.3 ± 4.6	7.5 ± 3.2	3.2 ± 0.8	6.3 ± 2.3

Table C-I.2 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-10	BD-25	BD-38	BD-40	BD-55	BD-56
01/03/19 - 03/28/19	< 190	< 194	< 181	< 185	< 187	< 190
04/04/19 - 06/27/19	< 195	< 188	< 195	< 195	< 193	< 197
07/03/19 - 09/26/19	1240 ± 201	< 193	< 190	< 191	< 193	< 193
10/03/19 - 12/26/19	< 194	< 199	< 193	< 198	< 195	< 198
MEAN ± 2 STD DEV	544 ± 802	-	-	-	-	-

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

(1) SEE PROGRAM EXCEPTIONS FOR EXPLANATION

Table C-I.3 CONCENTRATIONS OF NICKEL-63 IN SURFACE WATER SAMPLES COLLECTED IN THE VACINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-10	BD-25
04/04/19 - 04/25/19	< 18	< 17
05/02/19 - 05/30/19	< 19	< 18
06/06/19 - 06/27/19	< 17	< 16
07/03/19 - 07/25/19	< 17	< 16
08/01/19 - 08/29/19	< 17	< 16
09/05/19 - 09/26/19	< 17	< 18
10/03/19 - 10/31/19	< 18	< 17
11/07/19 - 11/29/19	< 16	< 16
12/06/19 - 12/26/19	< 18	< 17
MEAN	-	-

Table C-I.4 CONCENTRATIONS OF IRON-55 IN SURFACE WATER SAMPLES COLLECTED IN THE VACINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-10	BD-25
04/04/19 - 04/25/19	< 112	< 69
05/02/19 - 05/30/19	< 43	< 72
06/06/19 - 06/27/19	< 68	< 44
07/03/19 - 07/25/19	< 84	< 50
08/01/19 - 08/29/19	< 70	< 70
09/05/19 - 09/26/19	< 49	< 44
10/03/19 - 10/31/19	< 51	< 115
11/07/19 - 11/29/19	< 38	< 61
12/06/19 - 12/26/19	< 86	< 87
MEAN	-	-

Table C-I.5 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

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
BD-10	01/03/19 - 01/17/19	< 3	< 3	< 7	< 3	< 6	< 3	< 5	< 14	< 3	< 3	< 23	< 8
	02/07/19 - 02/28/19	< 5	< 5	< 11	< 5	< 10	< 5	< 9	< 9	< 6	< 6	< 24	< 7
	03/14/19 - 03/28/19	< 8	< 7	< 15	< 6	< 11	< 7	< 14	< 12	< 7	< 8	< 37	< 12
	04/04/19 - 04/25/19	< 7	< 6	< 19	< 6	< 14	< 7	< 10	< 11	< 8	< 6	< 33	< 12
	05/02/19 - 05/30/19	< 5	< 6	< 11	< 6	< 11	< 6	< 9	< 13	< 6	< 6	< 33	< 10
	06/06/19 - 06/27/19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 9	< 2	< 2	< 18	< 5
	07/03/19 - 07/25/19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 7	< 2	< 2	< 15	< 5
	08/01/19 - 08/29/19	< 4	< 4	< 10	< 5	< 10	< 5	< 9	< 14	< 5	< 4	< 33	< 13
	09/05/19 - 09/26/19	< 7	< 6	< 15	< 6	< 12	< 7	< 12	< 15	< 5	< 7	< 33	< 9
	10/03/19 - 10/31/19	< 4	< 5	< 7	< 6	< 10	< 3	< 8	< 12	< 4	< 5	< 26	< 10
	11/07/19 - 11/29/19	< 5	< 5	< 13	< 5	< 9	< 6	< 9	< 13	< 5	< 5	< 34	< 11
	12/06/19 - 12/26/19	< 5	< 5	< 11	< 6	< 8	< 5	< 10	< 13	< 6	< 6	< 39	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-25	01/03/19 - 01/17/19	< 2	< 2	< 6	< 3	< 5	< 3	< 5	< 12	< 3	< 2	< 23	< 9
	02/21/19 - 02/28/19	< 6	< 6	< 16	< 7	< 14	< 6	< 11	< 14	< 7	< 7	< 37	< 11
	03/14/19 - 03/28/19	< 6	< 8	< 12	< 7	< 10	< 8	< 12	< 13	< 7	< 6	< 38	< 14
	04/04/19 - 04/25/19	< 6	< 5	< 13	< 7	< 15	< 8	< 12	< 10	< 6	< 7	< 23	< 9
	05/02/19 - 05/30/19	< 6	< 7	< 13	< 8	< 10	< 9	< 12	< 14	< 7	< 7	< 41	< 12
	06/06/19 - 06/27/19	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 8	< 2	< 2	< 16	< 5
	07/03/19 - 07/25/19	< 2	< 2	< 5	< 3	< 5	< 2	< 4	< 7	< 2	< 2	< 15	< 6
	08/01/19 - 08/29/19	< 4	< 4	< 10	< 4	< 9	< 5	< 8	< 11	< 5	< 4	< 29	< 10
	09/05/19 - 09/26/19	< 6	< 6	< 13	< 5	< 10	< 7	< 10	< 14	< 6	< 6	< 34	< 8
	10/10/19 - 10/31/19	< 6	< 5	< 13	< 6	< 12	< 5	< 8	< 12	< 6	< 6	< 32	< 11
	11/07/19 - 11/29/19	< 3	< 5	< 9	< 5	< 9	< 5	< 7	< 13	< 5	< 5	< 30	< 10
	12/06/19 - 12/26/19	< 3	< 3	< 7	< 3	< 7	< 3	< 6	< 9	< 3	< 3	< 22	< 7
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-38	01/03/19 - 01/24/19	< 5	< 5	< 10	< 4	< 9	< 6	< 9	< 13	< 5	< 5	< 31	< 10
	02/07/19 - 02/28/19	< 5	< 6	< 12	< 4	< 12	< 4	< 9	< 11	< 5	< 5	< 29	< 10
	03/07/19 - 03/28/19	< 5	< 8	< 15	< 9	< 21	< 9	< 15	< 13	< 6	< 9	< 42	< 13
	04/04/19 - 04/25/19	< 9	< 6	< 17	< 9	< 14	< 7	< 12	< 10	< 6	< 6	< 35	< 11
	05/02/19 - 05/30/19	< 5	< 6	< 11	< 6	< 13	< 6	< 7	< 15	< 5	< 6	< 30	< 7
	06/06/19 - 06/27/19	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 9	< 2	< 2	< 16	< 5
	07/03/19 - 07/25/19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 7	< 2	< 2	< 16	< 5
	08/01/19 - 08/29/19	< 4	< 4	< 11	< 5	< 10	< 5	< 7	< 14	< 5	< 5	< 33	< 12
	09/05/19 - 09/26/19	< 7	< 6	< 12	< 7	< 12	< 5	< 9	< 13	< 5	< 7	< 35	< 15
	10/03/19 - 10/31/19	< 5	< 4	< 12	< 5	< 12	< 6	< 9	< 14	< 6	< 6	< 31	< 11
	11/07/19 - 11/29/19	< 3	< 3	< 8	< 4	< 7	< 3	< 5	< 10	< 4	< 4	< 22	< 8
	12/06/19 - 12/26/19	< 3	< 3	< 7	< 3	< 5	< 3	< 4	< 8	< 3	< 2	< 18	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-I.5 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

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
BD-40	01/03/19 - 01/24/19	< 5	< 5	< 10	< 4	< 12	< 6	< 9	< 14	< 5	< 6	< 31	< 11
	02/01/19 - 02/28/19	< 4	< 4	< 11	< 3	< 7	< 5	< 11	< 8	< 5	< 7	< 29	< 8
	03/07/19 - 03/28/19	< 9	< 7	< 17	< 7	< 17	< 11	< 16	< 15	< 9	< 7	< 39	< 12
	04/04/19 - 04/25/19	< 6	< 5	< 10	< 5	< 11	< 6	< 4	< 12	< 7	< 5	< 33	< 7
	05/02/19 - 05/30/19	< 6	< 6	< 11	< 7	< 11	< 6	< 11	< 14	< 6	< 5	< 29	< 9
	06/06/19 - 06/27/19	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 9	< 2	< 2	< 16	< 5
	07/03/19 - 07/25/19	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 6	< 2	< 2	< 13	< 5
	08/01/19 - 08/29/19	< 5	< 5	< 11	< 5	< 11	< 5	< 9	< 14	< 6	< 5	< 33	< 10
	09/05/19 - 09/26/19	< 5	< 5	< 10	< 4	< 10	< 5	< 9	< 11	< 5	< 4	< 26	< 10
	10/03/19 - 10/31/19	< 4	< 6	< 11	< 6	< 11	< 5	< 9	< 12	< 5	< 5	< 27	< 8
	11/07/19 - 11/29/19	< 4	< 5	< 13	< 6	< 9	< 5	< 7	< 15	< 5	< 5	< 36	< 12
	12/06/19 - 12/26/19	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 8	< 3	< 3	< 21	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-55	01/03/19 - 01/10/19	< 3	< 3	< 8	< 3	< 5	< 4	< 6	< 12	< 3	< 3	< 39	< 11
	02/01/19 - 02/28/19 *(1)*												
	03/14/19 - 03/28/19	< 7	< 8	< 16	< 10	< 13	< 8	< 12	< 14	< 8	< 8	< 36	< 14
	04/04/19 - 04/25/19	< 7	< 7	< 15	< 7	< 14	< 6	< 14	< 11	< 7	< 9	< 29	< 11
	05/02/19 - 05/30/19	< 6	< 6	< 11	< 5	< 10	< 7	< 11	< 14	< 7	< 7	< 41	< 13
	06/06/19 - 06/27/19	< 2	< 2	< 5	< 2	< 4	< 2	< 3	< 9	< 2	< 2	< 17	< 6
	07/03/19 - 07/25/19	< 3	< 3	< 6	< 3	< 5	< 3	< 5	< 10	< 3	< 3	< 20	< 6
	08/01/19 - 08/29/19	< 5	< 5	< 11	< 5	< 11	< 6	< 10	< 14	< 5	< 5	< 38	< 12
	09/05/19 - 09/26/19	< 6	< 6	< 12	< 7	< 15	< 6	< 10	< 15	< 6	< 7	< 36	< 11
	10/03/19 - 10/31/19	< 5	< 7	< 13	< 5	< 10	< 4	< 8	< 12	< 4	< 4	< 33	< 9
	11/07/19 - 11/29/19	< 5	< 5	< 11	< 5	< 10	< 6	< 9	< 13	< 5	< 5	< 32	< 9
	12/06/19 - 12/26/19	< 5	< 5	< 12	< 5	< 10	< 5	< 9	< 14	< 5	< 5	< 30	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-56	01/03/19 - 01/10/19	< 3	< 3	< 7	< 3	< 5	< 3	< 6	< 10	< 3	< 3	< 38	< 13
	02/07/19 - 02/07/19	< 3	< 3	< 7	< 3	< 6	< 4	< 6	< 13	< 3	< 3	< 40	< 13
	03/14/19 - 03/28/19	< 5	< 9	< 17	< 9	< 16	< 8	< 13	< 11	< 9	< 8	< 36	< 14
	04/04/19 - 04/25/19	< 5	< 5	< 13	< 7	< 13	< 7	< 13	< 9	< 5	< 6	< 27	< 13
	05/02/19 - 05/30/19	< 5	< 8	< 10	< 8	< 14	< 6	< 12	< 15	< 6	< 6	< 40	< 13
	06/06/19 - 06/27/19	< 1	< 2	< 4	< 2	< 4	< 2	< 3	< 9	< 2	< 2	< 17	< 6
	07/03/19 - 07/25/19	< 2	< 2	< 6	< 2	< 4	< 3	< 4	< 7	< 2	< 2	< 16	< 5
	08/01/19 - 08/29/19	< 5	< 5	< 10	< 6	< 14	< 6	< 10	< 14	< 6	< 6	< 40	< 11
	09/05/19 - 09/26/19	< 6	< 5	< 13	< 7	< 10	< 5	< 10	< 13	< 5	< 6	< 29	< 12
	10/03/19 - 10/31/19	< 5	< 5	< 12	< 6	< 12	< 6	< 7	< 11	< 6	< 5	< 32	< 12
	11/07/19 - 11/29/19	< 4	< 5	< 8	< 4	< 9	< 5	< 7	< 12	< 5	< 4	< 27	< 9
	12/06/19 - 12/26/19	< 4	< 4	< 10	< 5	< 11	< 6	< 11	< 14	< 6	< 5	< 35	< 14
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS FOR EXPLANATION

Table C-II.1 **CONCENTRATIONS OF GROSS BETA IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-22
12/27/18 - 01/24/19	2.4 ± 1.5
01/24/19 - 02/28/19	2.1 ± 1.4
02/28/19 - 03/28/19	3.8 ± 1.6
03/28/19 - 04/25/19	3.0 ± 1.6
04/25/19 - 05/30/19	4.1 ± 1.7
05/30/19 - 06/27/19	3.7 ± 1.6
06/27/19 - 07/25/19	3.4 ± 1.7
07/25/19 - 08/29/19	4.1 ± 1.9
08/29/19 - 09/26/19	3.4 ± 1.6
09/26/19 - 10/31/19	5.8 ± 1.7
10/31/19 - 11/29/19	6.7 ± 1.7
11/29/19 - 12/26/19	3.8 ± 1.6
MEAN ± 2 STD DEV	3.8 ± 1.9

Table C-II.2 **CONCENTRATIONS OF TRITIUM IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-22
12/27/18 - 01/24/19	764 ± 155
01/24/19 - 02/28/19	< 193
02/28/19 - 03/28/19	200 ± 125
03/28/19 - 04/25/19	< 192
04/25/19 - 05/30/19	325 ± 128
05/30/19 - 06/27/19	420 ± 134
06/27/19 - 07/25/19	562 ± 140
07/25/19 - 08/29/19	1940 ± 263
08/29/19 - 09/26/19	2110 ± 278
09/26/19 - 10/31/19	1170 ± 189
10/31/19 - 11/29/19	1180 ± 192
11/29/19 - 12/26/19	690 ± 150
MEAN ± 2 STD DEV	936 ± 1319

Table C-II.3 **CONCENTRATIONS OF I-131 IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-22
12/27/18 - 01/24/19	< 0.7
01/24/19 - 02/28/19	< 0.8
02/28/19 - 03/28/19	< 0.8
03/28/19 - 04/25/19	< 0.7
04/25/19 - 05/30/19	< 0.7
05/30/19 - 06/27/19	< 0.8
06/27/19 - 07/25/19	< 0.8
07/25/19 - 08/29/19	< 0.6
08/29/19 - 09/26/19	< 0.8
09/26/19 - 10/31/19	< 0.8
10/31/19 - 11/29/19	< 0.6
11/29/19 - 12/26/19	< 0.8
MEAN	-

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

Table C-II.4 CONCENTRATIONS OF NICKEL-63 IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-22
03/28/19 - 04/25/19	< 21
04/25/19 - 05/30/19	< 25
05/30/19 - 06/27/19	< 23
06/27/19 - 07/25/19	< 24
07/25/19 - 08/29/19	< 22
08/29/19 - 09/26/19	< 18
09/26/19 - 10/31/19	< 20
10/31/19 - 11/29/19	< 16
11/29/19 - 12/26/19	< 20
MEAN	-

Table C-II.5 CONCENTRATIONS OF IRON-55 IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-22
03/28/19 - 04/25/19	< 62
04/25/19 - 05/30/19	< 55
05/30/19 - 06/27/19	< 78
06/27/19 - 07/25/19	< 14
07/25/19 - 08/29/19	< 55
08/29/19 - 09/26/19	< 24
09/26/19 - 10/31/19	< 74
10/31/19 - 11/29/19	< 58
11/29/19 - 12/26/19	< 58
MEAN	-

Table C-II.6

CONCENTRATIONS OF GAMMA EMITTERS IN PUBLIC WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
BD-22	12/27/18 - 01/24/19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 17	< 5
	01/24/19 - 02/28/19	< 7	< 8	< 16	< 7	< 14	< 8	< 15	< 8	< 7	< 39	< 9
	02/28/19 - 03/28/19	< 5	< 5	< 8	< 5	< 8	< 4	< 9	< 4	< 4	< 28	< 10
	03/28/19 - 04/25/19	< 4	< 5	< 10	< 5	< 10	< 4	< 9	< 5	< 4	< 31	< 11
	04/25/19 - 05/30/19	< 7	< 7	< 14	< 5	< 13	< 7	< 12	< 6	< 6	< 31	< 12
	05/30/19 - 06/27/19	< 4	< 4	< 10	< 4	< 8	< 4	< 7	< 4	< 4	< 27	< 10
	06/27/19 - 07/25/19	< 2	< 2	< 4	< 2	< 3	< 2	< 4	< 2	< 2	< 16	< 5
	07/25/19 - 08/29/19	< 7	< 6	< 15	< 6	< 15	< 8	< 13	< 7	< 5	< 41	< 13
	08/29/19 - 09/26/19	< 5	< 5	< 9	< 5	< 10	< 5	< 8	< 4	< 6	< 24	< 8
	09/26/19 - 10/31/19	< 6	< 6	< 16	< 7	< 12	< 8	< 10	< 7	< 5	< 37	< 14
	10/31/19 - 11/29/19	< 6	< 5	< 12	< 5	< 12	< 6	< 10	< 5	< 5	< 27	< 7
	11/29/19 - 12/26/19	< 3	< 3	< 6	< 3	< 5	< 3	< 5	< 3	< 3	< 18	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 **CONCENTRATIONS OF TRITIUM IN GROUND/WELL WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	BD-13	BD-34	BD-35	BD-36	BD-37	BD-50	BD-51	BD-54
01/10/19 - 01/17/19	< 187	< 185	< 189	< 196	< 191	< 186	< 193	*(1)*
04/11/19 - 04/11/19	< 182	< 189	< 185	< 187	< 185	< 185	< 190	< 189
07/11/19 - 07/11/19	< 193	< 199	< 196	< 195	< 197	< 196	< 191	< 195
10/10/19 - 10/10/19	< 192	< 194	< 192	< 194	< 189	< 194	< 193	< 191
MEAN	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS FOR EXPLANATION

Table C-III.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUND/WELL WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
BD-13	01/10/19 - 01/10/19	< 7	< 4	< 10	< 10	< 13	< 8	< 13	< 10	< 5	< 7	< 32	< 15
	04/11/19 - 04/11/19	< 8	< 5	< 15	< 7	< 11	< 7	< 11	< 10	< 7	< 7	< 31	< 9
	07/11/19 - 07/11/19	< 5	< 5	< 9	< 5	< 9	< 5	< 9	< 8	< 5	< 5	< 21	< 6
	10/10/19 - 10/10/19	< 8	< 8	< 16	< 12	< 23	< 11	< 18	< 13	< 11	< 9	< 36	< 14
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-34	01/10/19 - 01/10/19	< 7	< 8	< 12	< 7	< 14	< 8	< 12	< 11	< 7	< 6	< 36	< 7
	04/11/19 - 04/11/19	< 7	< 8	< 16	< 8	< 15	< 8	< 13	< 12	< 8	< 7	< 41	< 9
	07/11/19 - 07/11/19	< 6	< 6	< 11	< 6	< 14	< 5	< 11	< 10	< 6	< 7	< 29	< 9
	10/10/19 - 10/10/19	< 7	< 6	< 15	< 9	< 17	< 9	< 11	< 10	< 7	< 6	< 37	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-35	01/10/19 - 01/10/19	< 6	< 6	< 12	< 8	< 14	< 8	< 11	< 11	< 8	< 8	< 35	< 11
	04/11/19 - 04/11/19	< 7	< 6	< 14	< 8	< 15	< 6	< 13	< 12	< 7	< 8	< 35	< 5
	07/11/19 - 07/11/19	< 4	< 5	< 11	< 4	< 10	< 6	< 10	< 8	< 6	< 5	< 24	< 7
	10/10/19 - 10/10/19	< 7	< 7	< 16	< 8	< 14	< 9	< 11	< 11	< 7	< 8	< 37	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-36	01/17/19 - 01/17/19	< 6	< 6	< 12	< 6	< 14	< 8	< 13	< 12	< 8	< 8	< 34	< 14
	04/11/19 - 04/11/19	< 5	< 5	< 12	< 8	< 11	< 6	< 10	< 9	< 6	< 5	< 27	< 12
	07/11/19 - 07/11/19	< 5	< 4	< 9	< 4	< 8	< 5	< 7	< 8	< 5	< 4	< 18	< 8
	10/10/19 - 10/10/19	< 7	< 8	< 16	< 8	< 13	< 9	< 15	< 9	< 8	< 7	< 31	< 13
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-37	01/10/19 - 01/10/19	< 5	< 6	< 12	< 7	< 11	< 5	< 11	< 9	< 6	< 6	< 26	< 10
	04/11/19 - 04/11/19	< 8	< 8	< 18	< 9	< 17	< 8	< 14	< 14	< 9	< 7	< 38	< 10
	07/11/19 - 07/11/19	< 6	< 5	< 11	< 5	< 12	< 5	< 9	< 8	< 6	< 6	< 25	< 9
	10/10/19 - 10/10/19	< 6	< 7	< 12	< 6	< 14	< 8	< 11	< 10	< 8	< 7	< 28	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-III.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUND/WELL WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
BD-50	01/10/19 - 01/10/19	< 4	< 4	< 9	< 5	< 8	< 6	< 8	< 9	< 6	< 5	< 24	< 6
	04/11/19 - 04/11/19	< 7	< 7	< 15	< 8	< 15	< 8	< 11	< 10	< 8	< 8	< 30	< 10
	07/11/19 - 07/11/19	< 4	< 5	< 9	< 5	< 10	< 5	< 9	< 7	< 5	< 5	< 18	< 6
	10/10/19 - 10/10/19	< 9	< 7	< 18	< 8	< 17	< 9	< 15	< 11	< 9	< 8	< 35	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-51	01/10/19 - 01/10/19	< 6	< 7	< 13	< 6	< 12	< 7	< 15	< 10	< 9	< 6	< 35	< 11
	04/11/19 - 04/11/19	< 7	< 8	< 15	< 5	< 16	< 8	< 11	< 11	< 7	< 7	< 34	< 9
	07/11/19 - 07/11/19	< 4	< 5	< 9	< 4	< 9	< 4	< 8	< 7	< 5	< 4	< 24	< 7
	10/10/19 - 10/10/19	< 7	< 8	< 15	< 8	< 16	< 8	< 11	< 13	< 9	< 9	< 37	< 13
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-54	01/10/19 - 01/10/19 *(1)*												
	04/11/19 - 04/11/19	< 8	< 8	< 16	< 7	< 18	< 9	< 15	< 15	< 9	< 8	< 40	< 12
	07/11/19 - 07/11/19	< 5	< 4	< 9	< 6	< 9	< 5	< 9	< 9	< 6	< 5	< 22	< 6
	10/10/19 - 10/10/19	< 7	< 9	< 22	< 8	< 19	< 9	< 14	< 10	< 7	< 7	< 29	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS FOR EXPLANATION

Table C-IV.1

CONCENTRATIONS OF IRON-55, NICKEL-63 AND GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Fe-55	Ni-63	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BD-25															
Quillback	05/22/19	< 194	< 73	< 61	< 61	< 159	< 81	< 152	< 67	< 109	< 227	< 63	< 69	< 464	< 110
Golden Redhorse	05/22/19	< 243	< 58	< 35	< 45	< 139	< 53	< 128	< 62	< 87	< 126	< 61	< 56	< 350	< 87
Smallmouth Bass	10/17/19	< 240	< 123	< 24	< 24	< 58	< 26	< 48	< 21	< 40	< 32	< 22	< 23	< 111	< 37
Golden Redhorse	10/17/19	< 236	< 169	< 20	< 18	< 47	< 26	< 41	< 21	< 36	< 29	< 25	< 24	< 94	< 28
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD-28															
Shorthead Redhorse	05/22/19	< 187	< 52	< 63	< 71	< 97	< 68	< 148	< 77	< 104	< 155	< 67	< 56	< 443	< 182
Quillback	05/22/19	< 68	< 70	< 64	< 81	< 104	< 51	< 117	< 72	< 95	< 195	< 57	< 61	< 380	< 169
Shorthead Redhorse	10/17/19	< 247	< 168	< 36	< 35	< 66	< 36	< 84	< 36	< 61	< 53	< 39	< 35	< 150	< 48
Smallmouth Bass	10/17/19	< 222	< 105	< 29	< 32	< 71	< 29	< 77	< 34	< 56	< 50	< 35	< 35	< 151	< 43
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BD-41															
Common Carp	05/22/19	< 258	< 60	< 58	< 61	< 104	< 42	< 146	< 61	< 117	< 140	< 53	< 52	< 331	< 165
Largemouth Bass	05/22/19	< 255	< 52	< 58	< 55	< 100	< 77	< 83	< 48	< 81	< 178	< 47	< 60	< 454	< 103
Common Carp	10/15/19	< 112	< 131	< 24	< 26	< 50	< 27	< 56	< 24	< 41	< 32	< 29	< 26	< 116	< 44
Largemouth Bass	10/15/19	< 160	< 101	< 26	< 25	< 55	< 29	< 57	< 27	< 43	< 53	< 29	< 25	< 142	< 44
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table C-V.1 **CONCENTRATIONS OF IRON-55, NICKEL-63 AND GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	Fe-55	Ni-63	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
BD-10	05/29/19	< 1600	< 206	< 83	< 73	< 262	< 133	< 269	< 134	< 178	< 109	< 130	< 666	< 263
	10/15/19	< 1211	< 157	< 68	< 78	< 196	< 114	< 188	< 82.7	< 148	< 90	< 94	< 351	< 100
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
BD-25	06/11/19	< 1935	< 210	< 51	< 56	< 133	< 51	< 126	< 61.8	< 104	< 66	< 67	< 289	< 95
	10/15/19	< 1834	< 243	< 102	< 91	< 180	< 75	< 174	< 92.3	< 117	< 82	< 111	< 396	< 90
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-	-
BD-57	05/29/19	< 1609	< 191	< 95	< 90	< 272	< 100	< 241	< 132	< 169	< 132	169 ± 99	< 681	< 219
	10/31/19	< 1897	< 214	< 112	< 90	< 203	< 112	< 223	< 109	< 171	< 98	< 132	< 443	< 148
	MEAN ± 2 STD DEV	-	-	-	-	-	-	-	-	-	-	169 ± 0	-	-

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

Table C-VI.1

CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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

COLLECTION PERIOD	GROUP I - NEAR FIELD				GROUP II - FAR FIELD			GROUP III - CONTROL
	BD-06	BD-19	BD-20	BD-21	BD-02	BD-04	BD-05	BD-03
12/27/18 - 01/03/19	15 ± 4	13 ± 4	13 ± 4	12 ± 4	12 ± 4	13 ± 4	14 ± 4	16 ± 4
01/03/19 - 01/10/19	22 ± 5	21 ± 4	23 ± 5	27 ± 5	23 ± 5	22 ± 5	24 ± 5	25 ± 5
01/10/19 - 01/17/19	17 ± 4	16 ± 4	14 ± 4	17 ± 4	13 ± 4	15 ± 4	15 ± 4	13 ± 4
01/17/19 - 01/24/19	13 ± 4	14 ± 4	17 ± 4	18 ± 4	12 ± 4	20 ± 4	21 ± 4	15 ± 4
01/24/19 - 02/01/19	23 ± 4	24 ± 4	21 ± 4	19 ± 3	26 ± 4	27 ± 5	23 ± 4	22 ± 4
02/01/19 - 02/07/19	15 ± 5	12 ± 4	16 ± 5	*(1)*	15 ± 5	12 ± 4	16 ± 5	12 ± 4
02/07/19 - 02/14/19	12 ± 4	14 ± 4	13 ± 4	17 ± 4	10 ± 3	12 ± 4	14 ± 4	13 ± 4
02/14/19 - 02/21/19	14 ± 4	17 ± 4	15 ± 4	17 ± 4	16 ± 4	15 ± 4	13 ± 4	13 ± 4
02/21/19 - 02/28/19	26 ± 5	26 ± 5	21 ± 4	26 ± 5	21 ± 5	22 ± 4	25 ± 5	23 ± 5
02/28/19 - 03/07/19	21 ± 4	21 ± 4	18 ± 4	19 ± 4	22 ± 5	20 ± 4	17 ± 4	18 ± 4
03/07/19 - 03/14/19	17 ± 4	18 ± 4	18 ± 4	17 ± 4	15 ± 4	16 ± 4	17 ± 4	17 ± 4
03/14/19 - 03/21/19	16 ± 4	14 ± 4	19 ± 4	16 ± 4	13 ± 4	14 ± 4	15 ± 4	15 ± 4
03/21/19 - 03/28/19	11 ± 3	12 ± 4	12 ± 4	12 ± 4	11 ± 4	11 ± 3	10 ± 3	13 ± 4
03/28/19 - 04/04/19	14 ± 4	11 ± 4	13 ± 4	13 ± 4	12 ± 4	12 ± 4	14 ± 4	13 ± 4
04/04/19 - 04/11/19	7 ± 4	6 ± 3	7 ± 4	8 ± 4	7 ± 4	7 ± 4	6 ± 3	11 ± 4
04/11/19 - 04/18/19	13 ± 4	11 ± 3	10 ± 3	11 ± 3	12 ± 4	11 ± 3	10 ± 3	10 ± 4
04/18/19 - 04/25/19	10 ± 4	10 ± 4	11 ± 4	10 ± 4	12 ± 4	10 ± 4	11 ± 4	10 ± 4
04/25/19 - 05/02/19	7 ± 3	10 ± 4	10 ± 3	10 ± 3	8 ± 4	11 ± 4	11 ± 4	11 ± 4
05/02/19 - 05/09/19	12 ± 4	14 ± 4	10 ± 4	12 ± 4	11 ± 4	11 ± 4	10 ± 4	12 ± 4
05/09/19 - 05/16/19	13 ± 4	12 ± 4	14 ± 4	11 ± 4	14 ± 4	15 ± 4	9 ± 4	14 ± 4
05/16/19 - 05/23/19	5 ± 3	5 ± 3	8 ± 3	8 ± 3	7 ± 3	7 ± 3	9 ± 3	8 ± 4
05/23/19 - 05/30/19	9 ± 3	7 ± 3	10 ± 3	11 ± 4	10 ± 4	8 ± 3	9 ± 3	7 ± 3
05/30/19 - 06/06/19	13 ± 4	12 ± 3	15 ± 4	14 ± 4	15 ± 4	15 ± 4	12 ± 4	11 ± 4
06/06/19 - 06/13/19	12 ± 4	10 ± 4	14 ± 4	15 ± 4	15 ± 4	14 ± 4	13 ± 4	14 ± 4
06/13/19 - 06/20/19	8 ± 4	9 ± 4	9 ± 4	10 ± 4	11 ± 4	9 ± 4	11 ± 4	11 ± 4
06/20/19 - 06/27/19	18 ± 4	14 ± 4	16 ± 4	14 ± 4	13 ± 4	16 ± 4	13 ± 4	15 ± 4
06/27/19 - 07/03/19	19 ± 5	15 ± 5	17 ± 5	20 ± 5	18 ± 5	20 ± 5	20 ± 5	21 ± 5
07/03/19 - 07/11/19	12 ± 3	13 ± 3	12 ± 3	9 ± 3	6 ± 3	9 ± 3	11 ± 3	10 ± 3
07/11/19 - 07/18/19	16 ± 4	12 ± 4	12 ± 4	16 ± 4	27 ± 8	14 ± 4	16 ± 4	13 ± 4
07/18/19 - 07/25/19	11 ± 4	11 ± 4	9 ± 3	10 ± 4	11 ± 3	12 ± 4	10 ± 3	12 ± 4
07/25/19 - 08/01/19	16 ± 4	17 ± 4	16 ± 4	13 ± 4	13 ± 4	18 ± 4	16 ± 4	19 ± 4
08/01/19 - 08/08/19	14 ± 4	12 ± 3	14 ± 4	14 ± 4	15 ± 4	18 ± 4	12 ± 3	13 ± 4
08/08/19 - 08/15/19	17 ± 4	20 ± 4	18 ± 4	21 ± 4	20 ± 4	17 ± 4	20 ± 4	15 ± 4
08/15/19 - 08/22/19	16 ± 4	15 ± 4	16 ± 4	16 ± 4	15 ± 4	12 ± 4	14 ± 4	16 ± 4
08/22/19 - 08/29/19	15 ± 4	9 ± 4	15 ± 4	13 ± 4	14 ± 4	13 ± 4	12 ± 4	14 ± 4
08/29/19 - 09/05/19	18 ± 4	16 ± 4	18 ± 4	16 ± 4	15 ± 4	19 ± 4	17 ± 4	14 ± 4
09/05/19 - 09/12/19	21 ± 4	20 ± 4	17 ± 4	20 ± 4	21 ± 4	17 ± 4	21 ± 4	22 ± 4
09/12/19 - 09/19/19	23 ± 5	27 ± 5	28 ± 5	22 ± 5	20 ± 4	27 ± 5	25 ± 5	26 ± 5
09/19/19 - 09/26/19	19 ± 4	19 ± 4	19 ± 4	18 ± 4	16 ± 4	21 ± 5	24 ± 5	20 ± 5
09/26/19 - 10/03/19	9 ± 4	13 ± 4	10 ± 4	12 ± 4	13 ± 4	13 ± 4	12 ± 4	11 ± 4
10/03/19 - 10/10/19	13 ± 4	13 ± 4	16 ± 4	13 ± 4	12 ± 4	13 ± 4	16 ± 4	16 ± 4
10/10/19 - 10/17/19	14 ± 4	12 ± 4	12 ± 4	14 ± 4	12 ± 4	13 ± 4	14 ± 4	17 ± 4
10/17/19 - 10/23/19	19 ± 5	20 ± 5	17 ± 5	16 ± 5	16 ± 5	15 ± 5	18 ± 5	20 ± 5
10/23/19 - 10/31/19	11 ± 3	11 ± 3	9 ± 3	11 ± 3	12 ± 3	11 ± 4	12 ± 3	11 ± 4
10/31/19 - 11/07/19	16 ± 4	11 ± 4	12 ± 4	14 ± 4	10 ± 4	12 ± 4	13 ± 4	9 ± 4
11/07/19 - 11/14/19	17 ± 4	17 ± 4	18 ± 4	18 ± 4	18 ± 4	16 ± 4	18 ± 4	18 ± 4
11/14/19 - 11/21/19	25 ± 5	22 ± 4	25 ± 5	26 ± 5	25 ± 5	27 ± 5	25 ± 5	24 ± 5
11/21/19 - 11/29/19	16 ± 4	15 ± 3	13 ± 3	12 ± 3	12 ± 3	12 ± 3	14 ± 4	12 ± 3
11/29/19 - 12/06/19	8 ± 4	14 ± 4	10 ± 4	14 ± 4	11 ± 4	11 ± 4	9 ± 4	10 ± 4
12/06/19 - 12/12/19	22 ± 5	28 ± 6	26 ± 5	20 ± 5	24 ± 5	20 ± 5	21 ± 5	18 ± 5
12/12/19 - 12/19/19	24 ± 5	25 ± 5	26 ± 5	24 ± 5	28 ± 5	27 ± 5	27 ± 5	29 ± 5
12/19/19 - 12/26/19	24 ± 5	24 ± 5	27 ± 5	30 ± 5	25 ± 5	29 ± 5	26 ± 5	27 ± 5
MEAN ± 2 STD DEV	15 ± 10	15 ± 11	15 ± 10	16 ± 10	15 ± 11	15 ± 11	15 ± 11	15 ± 10

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

Table C-VI.2 **MONTHLY AND YEARLY VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

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

GROUP I - NEAR FIELD 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
12/27/18 - 02/07/19	12	27	18 ± 9	12/27/18 - 02/01/19	12	27	19 ± 11	12/27/18 - 02/01/19	13	25	18 ± 10
02/01/19 - 02/28/19	12	26	17 ± 10	02/01/19 - 02/28/19	10	25	16 ± 9	02/01/19 - 02/28/19	12	23	16 ± 10
02/28/19 - 03/28/19	11	21	16 ± 7	02/28/19 - 03/28/19	10	22	15 ± 7	02/28/19 - 03/28/19	13	18	16 ± 4
03/28/19 - 05/02/19	6	14	10 ± 4	03/28/19 - 05/02/19	6	14	10 ± 4	03/28/19 - 05/02/19	10	13	11 ± 2
05/02/19 - 05/30/19	5	14	10 ± 5	05/02/19 - 05/30/19	7	15	10 ± 5	05/02/19 - 05/30/19	7	14	10 ± 6
05/30/19 - 06/27/19	8	18	13 ± 5	05/30/19 - 06/27/19	9	16	13 ± 4	05/30/19 - 06/27/19	11	15	13 ± 4
06/27/19 - 08/01/19	9	20	14 ± 7	06/27/19 - 08/01/19	6	27	15 ± 10	06/27/19 - 08/01/19	10	21	15 ± 10
08/01/19 - 08/29/19	9	21	15 ± 6	08/01/19 - 08/29/19	12	20	15 ± 6	08/01/19 - 08/29/19	13	16	14 ± 3
08/29/19 - 09/26/19	16	28	20 ± 7	08/29/19 - 09/26/19	15	27	20 ± 7	08/29/19 - 09/26/19	14	26	20 ± 10
09/26/19 - 10/31/19	9	20	13 ± 6	09/26/19 - 10/31/19	11	18	14 ± 4	09/26/19 - 10/31/19	11	20	15 ± 8
10/31/19 - 11/29/19	11	26	17 ± 9	10/31/19 - 11/29/19	10	27	17 ± 12	10/31/19 - 11/29/19	9	24	16 ± 13
11/29/19 - 12/26/19	8	30	22 ± 13	11/29/19 - 12/26/19	9	29	22 ± 14	11/29/19 - 12/26/19	10	29	21 ± 18
12/27/18 - 12/26/19	5	30	15 ± 10	12/27/18 - 12/26/19	6	29	15 ± 11	12/27/18 - 12/26/19	7	29	15 ± 10

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

Table C-VI.3

CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
BD-02	12/27/18 - 03/28/19	< 2	< 2	< 5	< 1	< 5	< 2	< 3	< 2	< 2	< 12	< 5
	03/28/19 - 06/27/19	< 2	< 4	< 8	< 4	< 7	< 3	< 7	< 3	< 3	< 36	< 11
	06/27/19 - 09/26/19	< 2	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 2	< 23	< 8
	09/26/19 - 12/26/19	< 3	< 3	< 5	< 3	< 5	< 3	< 3	< 2	< 2	< 19	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-03	12/27/18 - 03/28/19	< 2	< 2	< 5	< 3	< 3	< 3	< 4	< 3	< 2	< 11	< 8
	03/28/19 - 06/27/19	< 3	< 3	< 7	< 2	< 7	< 3	< 6	< 3	< 2	< 33	< 13
	06/27/19 - 09/26/19	< 2	< 2	< 5	< 2	< 5	< 3	< 3	< 2	< 2	< 17	< 11
	09/26/19 - 12/26/19	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 14	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-04	12/27/18 - 03/28/19	< 2	< 3	< 6	< 3	< 6	< 3	< 4	< 2	< 2	< 14	< 6
	03/28/19 - 06/27/19	< 2	< 2	< 7	< 2	< 6	< 3	< 4	< 2	< 2	< 27	< 8
	06/27/19 - 09/26/19	< 3	< 3	< 5	< 3	< 6	< 3	< 5	< 3	< 2	< 24	< 8
	09/26/19 - 12/26/19	< 2	< 3	< 5	< 2	< 5	< 3	< 3	< 2	< 2	< 14	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-05	12/27/18 - 03/28/19	< 3	< 2	< 5	< 3	< 7	< 3	< 4	< 3	< 3	< 17	< 6
	03/28/19 - 06/27/19	< 3	< 2	< 6	< 2	< 8	< 3	< 5	< 2	< 3	< 27	< 14
	06/27/19 - 09/26/19	< 2	< 2	< 5	< 2	< 4	< 2	< 5	< 2	< 2	< 15	< 11
	09/26/19 - 12/26/19	< 2	< 3	< 6	< 3	< 5	< 2	< 4	< 2	< 1	< 19	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-06	12/27/18 - 03/28/19	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 12	< 3
	03/28/19 - 06/27/19	< 3	< 2	< 5	< 2	< 5	< 3	< 4	< 3	< 2	< 32	< 8
	06/27/19 - 09/26/19	< 3	< 3	< 6	< 2	< 7	< 3	< 5	< 3	< 2	< 21	< 9
	09/26/19 - 12/26/19	< 1	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 1	< 14	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VI.3

CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
BD-19	12/27/18 - 03/28/19	< 2	< 2	< 5	< 3	< 4	< 2	< 4	< 2	< 2	< 11	< 5
	03/28/19 - 06/27/19	< 3	< 4	< 9	< 4	< 9	< 3	< 5	< 3	< 3	< 43	< 17
	06/27/19 - 09/26/19	< 2	< 2	< 4	< 2	< 6	< 3	< 3	< 2	< 2	< 16	< 6
	09/26/19 - 12/26/19	< 2	< 2	< 4	< 2	< 5	< 2	< 4	< 2	< 2	< 17	< 6
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-20	12/27/18 - 03/28/19	< 2	< 2	< 4	< 2	< 6	< 2	< 4	< 2	< 2	< 13	< 6
	03/28/19 - 06/27/19	< 3	< 3	< 10	< 4	< 10	< 4	< 6	< 4	< 3	< 48	< 8
	06/27/19 - 09/26/19	< 2	< 2	< 4	< 2	< 5	< 2	< 4	< 2	< 2	< 14	< 3
	09/26/19 - 12/26/19	< 1	< 3	< 3	< 2	< 5	< 2	< 4	< 2	< 2	< 15	< 4
	MEAN	-	-	-	-	-	-	-	-	-	-	-
BD-21	12/27/18 - 03/28/19	< 3	< 3	< 7	< 4	< 6	< 3	< 5	< 4	< 3	< 18	< 7
	03/28/19 - 06/27/19	< 2	< 3	< 3	< 2	< 7	< 3	< 4	< 2	< 2	< 32	< 13
	06/27/19 - 09/26/19	< 2	< 1	< 7	< 3	< 4	< 2	< 3	< 2	< 2	< 11	< 7
	09/26/19 - 12/26/19	< 3	< 3	< 6	< 3	< 4	< 3	< 5	< 3	< 3	< 23	< 7
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VII.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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

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

(1) SEE PROGRAM EXCEPTIONS FOR EXPLANATION

Table C-VIII.1 CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	CONTROL FARM BD-18
01/03/19	< 0.5
02/06/19	< 0.9
03/06/19	< 0.8
04/04/19	< 0.7
05/01/19	< 0.8
05/16/19	< 0.4
05/30/19	< 0.8
06/13/19	< 0.9
06/26/19	< 0.9
07/10/19	< 0.8
07/24/19	< 0.5
08/08/19	< 0.8
08/22/19	< 0.5
09/04/19	< 0.9
09/19/19	*(1)*
10/03/19	*(1)*
10/17/09	*(1)*
10/31/19	*(1)*
11/14/19	*(1)*
12/05/19	< 0.6
MEAN	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-VIII.2 **CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

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
BD-18	01/03/19	< 7	< 8	< 16	< 8	< 17	< 8	< 9	< 7	< 7	< 35	< 8
	02/06/19	< 7	< 7	< 14	< 8	< 18	< 8	< 14	< 9	< 8	< 37	< 9
	03/06/19	< 5	< 6	< 13	< 6	< 11	< 5	< 10	< 6	< 6	< 20	< 7
	04/04/19	< 8	< 9	< 21	< 9	< 14	< 9	< 14	< 9	< 8	< 37	< 11
	05/01/19	< 6	< 6	< 14	< 5	< 14	< 7	< 11	< 6	< 6	< 32	< 8
	05/16/19	< 8	< 9	< 18	< 11	< 17	< 8	< 14	< 9	< 8	< 40	< 10
	05/30/19	< 8	< 8	< 15	< 10	< 17	< 9	< 12	< 7	< 8	< 37	< 12
	06/13/19	< 5	< 5	< 13	< 7	< 13	< 6	< 10	< 6	< 6	< 24	< 6
	06/26/19	< 7	< 8	< 13	< 7	< 17	< 8	< 11	< 8	< 8	< 35	< 13
	07/10/19	< 8	< 9	< 16	< 9	< 19	< 8	< 14	< 7	< 8	< 43	< 7
	07/24/19	< 8	< 7	< 19	< 7	< 20	< 7	< 14	< 8	< 7	< 30	< 9
	08/08/19	< 10	< 8	< 19	< 9	< 16	< 8	< 14	< 10	< 9	< 37	< 9
	08/22/19	< 8	< 8	< 13	< 9	< 19	< 7	< 14	< 10	< 9	< 33	< 13
	09/04/19	< 8	< 9	< 21	< 10	< 18	< 8	< 13	< 9	< 9	< 36	< 11
	09/19/19 *(1)*											
	10/03/19 *(1)*											
	10/17/09 *(1)*											
	10/31/19 *(1)*											
	11/14/19 *(1)*											
	12/05/19	< 9	< 10	< 24	< 12	< 20	< 9	< 17	< 9	< 9	< 39	< 14
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-VIII.3 **CONCENTRATIONS OF GAMMA EMITTERS IN GRASS SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140

No Substitute Grass Samples Taken in 2019

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

Table C-IX.1

CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
BD-CONTROL													
Burdock Leaves	05/16/19	< 17	< 17	< 35	< 18	< 37	< 17	< 29	< 25	< 19	< 18	< 79	< 23
Carrot Leaves	08/01/19	< 53	< 50	< 104	< 52	< 107	< 53	< 91	< 77	< 56	< 54	< 236	< 70
Radishes	08/01/19	< 26	< 27	< 52	< 27	< 52	< 29	< 44	< 43	< 27	< 26	< 111	< 41
Radishes	08/29/19	< 18	< 19	< 43	< 20	< 44	< 21	< 34	< 35	< 20	< 20	< 101	< 29
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-QUAD 2													
Green Onions	07/03/19	< 27	< 27	< 50	< 26	< 54	< 27	< 48	< 50	< 28	< 27	< 137	< 41
Lettuce	07/03/19	< 32	< 31	< 63	< 33	< 71	< 34	< 54	< 56	< 37	< 36	< 164	< 50
Leeks	07/03/19	< 25	< 26	< 54	< 28	< 55	< 32	< 38	< 46	< 29	< 27	< 121	< 36
Cabbage	08/29/19	< 25	< 23	< 62	< 34	< 69	< 30	< 54	< 43	< 28	< 33	< 158	< 47
Onion	08/29/19	< 34	< 37	< 71	< 38	< 73	< 37	< 56	< 56	< 29	< 41	< 149	< 53
Potatoes	08/29/19	< 19	< 17	< 39	< 18	< 40	< 19	< 32	< 29	< 20	< 20	< 86	< 23
Cabbage	09/12/19	< 25	< 28	< 62	< 32	< 78	< 29	< 41	< 40	< 37	< 25	< 112	< 29
Potatoes	09/12/19	< 13	< 13	< 27	< 13	< 29	< 14	< 22	< 18	< 15	< 15	< 58	< 17
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-QUAD 3													
Cabbage	07/25/19	< 31	< 28	< 64	< 31	< 69	< 33	< 65	< 53	< 36	< 27	< 183	< 55
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BD-QUAD 4													
Beets/Beet Leaves	08/01/19	< 31	< 32	< 84	< 28	< 67	< 41	< 68	< 54	< 38	< 38	< 130	< 43
Red Beets	08/29/19	< 19	< 18	< 41	< 20	< 42	< 21	< 34	< 34	< 19	< 20	< 93	< 27
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BWD-G1													
Kale	06/27/19	< 26	< 25	< 52	< 29	< 58	< 26	< 46	< 39	< 30	< 28	< 117	< 36
Cabbage	06/27/19	< 30	< 28	< 50	< 32	< 54	< 32	< 50	< 36	< 31	< 22	< 139	< 38
Swiss Chard	06/27/19	< 17	< 16	< 34	< 15	< 37	< 16	< 27	< 26	< 17	< 17	< 74	< 25
Kale	07/11/19	< 38	< 32	< 81	< 35	< 71	< 42	< 62	< 56	< 42	< 32	< 173	< 46
Cabbage	07/11/19	< 31	< 41	< 91	< 50	< 84	< 52	< 63	< 58	< 38	< 40	< 206	< 65
Kohlrabi	07/11/19	< 15	< 14	< 27	< 13	< 30	< 15	< 25	< 28	< 16	< 16	< 75	< 19
Cabbage	07/25/19	< 32	< 32	< 53	< 33	< 68	< 30	< 58	< 54	< 35	< 29	< 166	< 33
Kale	07/25/19	< 24	< 26	< 53	< 32	< 66	< 34	< 52	< 51	< 35	< 35	< 157	< 41
Turnip Greens	07/25/19	< 27	< 26	< 54	< 24	< 53	< 28	< 46	< 49	< 29	< 29	< 131	< 35
Cabbage	08/08/19	< 33	< 32	< 75	< 34	< 88	< 43	< 61	< 59	< 47	< 35	< 162	< 48
Kale	08/08/19	< 26	< 25	< 52	< 25	< 49	< 31	< 48	< 38	< 30	< 30	< 127	< 37
Pink Kale	08/08/19	< 16	< 16	< 37	< 20	< 37	< 18	< 29	< 25	< 18	< 18	< 75	< 26
Kale	08/22/19	< 42	< 39	< 62	< 48	< 81	< 44	< 76	< 43	< 50	< 43	< 168	< 53

Table C-IX.1

CONCENTRATIONS OF GAMMA EMITTERS IN VEGETATION SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-14(
BWD-G1 (cont'd)													
Cabbage	08/22/19	< 39	< 36	< 72	< 32	< 74	< 33	< 60	< 57	< 34	< 45	< 156	< 56
Swiss Chard	08/22/19	< 28	< 30	< 75	< 33	< 77	< 44	< 49	< 50	< 39	< 41	< 146	< 47
Kale	09/05/19	< 37	< 30	< 75	< 35	< 72	< 34	< 57	< 50	< 36	< 37	< 146	< 61
Pink Kale	09/05/19	< 39	< 40	< 78	< 42	< 96	< 38	< 56	< 54	< 37	< 40	< 207	< 74
Cabbage	09/05/19	< 35	< 42	< 80	< 43	< 92	< 45	< 66	< 51	< 35	< 38	< 169	< 46
Cabbage	09/19/19	< 17	< 14	< 28	< 18	< 27	< 17	< 29	< 23	< 17	< 17	< 64	< 18
Kale	09/19/19	< 43	< 36	< 86	< 48	< 87	< 48	< 80	< 57	< 45	< 41	< 181	< 68
Pink Kale	09/19/19	< 37	< 31	< 75	< 38	< 84	< 43	< 68	< 51	< 43	< 41	< 165	< 46
Cabbage	10/03/19	< 20	< 18	< 51	< 21	< 43	< 26	< 32	< 32	< 31	< 28	< 102	< 28
Kale	10/03/19	< 27	< 32	< 75	< 35	< 82	< 37	< 57	< 51	< 36	< 37	< 140	< 32
Pink Kale	10/03/19	< 37	< 28	< 76	< 45	< 78	< 35	< 63	< 58	< 33	< 40	< 168	< 46
Cabbage	10/17/19	< 22	< 25	< 60	< 32	< 64	< 39	< 48	< 51	< 24	< 25	< 123	< 38
Kale	10/17/19	< 39	< 34	< 77	< 45	< 77	< 41	< 66	< 56	< 45	< 43	< 187	< 55
Pink Kale	10/17/19	< 33	< 29	< 65	< 32	< 66	< 38	< 66	< 51	< 39	< 39	< 131	< 37
Cabbage	10/31/19	< 26	< 24	< 52	< 29	< 52	< 26	< 47	< 40	< 26	< 27	< 114	< 36
Kale	10/31/19	< 40	< 37	< 92	< 44	< 78	< 43	< 68	< 53	< 43	< 40	< 157	< 60
Pink Kale	10/31/19	< 28	< 28	< 54	< 22	< 51	< 36	< 47	< 49	< 31	< 33	< 129	< 32
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-
BWD-G2													
Field Grass	05/16/19	< 22	< 21	< 46	< 26	< 49	< 24	< 38	< 33	< 24	< 23	< 98	< 28
Cabbage	08/08/19	< 34	< 42	< 82	< 53	< 84	< 39	< 74	< 56	< 45	< 43	< 142	< 48
Pink Kale	08/08/19	< 26	< 27	< 57	< 29	< 52	< 27	< 47	< 47	< 30	< 30	< 129	< 37
Cabbage	08/22/19	< 36	< 31	< 86	< 45	< 27	< 44	< 58	< 54	< 50	< 32	< 162	< 56
Red Kale	08/22/19	< 31	< 29	< 49	< 28	< 74	< 29	< 54	< 54	< 37	< 34	< 167	< 41
Kale	08/22/19	< 36	< 25	< 74	< 35	< 80	< 24	< 68	< 51	< 40	< 38	< 126	< 46
Cabbage	09/05/19	< 41	< 38	< 85	< 46	< 111	< 46	< 83	< 56	< 49	< 45	< 187	< 49
Red beets	09/05/19	< 28	< 25	< 68	< 21	< 66	< 31	< 65	< 48	< 38	< 39	< 142	< 41
Kohlrabi	09/05/19	< 39	< 37	< 67	< 35	< 63	< 23	< 22	< 50	< 36	< 36	< 157	< 10
Cabbage	09/19/19	< 37	< 32	< 75	< 37	< 80	< 42	< 49	< 51	< 36	< 32	< 142	< 32
Kohlrabi	09/19/19	< 29	< 30	< 58	< 36	< 44	< 30	< 48	< 47	< 29	< 29	< 140	< 41
Red Beets	09/19/19	< 15	< 15	< 31	< 16	< 34	< 15	< 24	< 20	< 15	< 16	< 64	< 20
Cabbage	10/03/19	< 30	< 21	< 52	< 34	< 57	< 26	< 45	< 37	< 32	< 28	< 139	< 41
Kohlrabi	10/03/19	< 29	< 28	< 67	< 39	< 53	< 27	< 50	< 48	< 19	< 30	< 150	< 34
Red kale	10/03/19	< 34	< 29	< 56	< 30	< 64	< 32	< 49	< 47	< 30	< 31	< 136	< 39
Cabbage	10/17/19	< 22	< 21	< 43	< 24	< 50	< 22	< 32	< 33	< 26	< 24	< 92	< 26
Kohlrabi	10/17/19	< 22	< 21	< 47	< 22	< 38	< 23	< 37	< 29	< 24	< 22	< 88	< 22
Red Kale	10/17/19	< 21	< 18	< 40	< 21	< 39	< 19	< 35	< 28	< 22	< 19	< 87	< 25
Cabbage	10/31/19	< 26	< 27	< 55	< 27	< 68	< 30	< 47	< 42	< 30	< 28	< 123	< 29
Kohlrabi	10/31/19	< 39	< 32	< 65	< 35	< 70	< 43	< 68	< 54	< 39	< 38	< 122	< 38
Kale	10/31/19	< 39	< 34	< 68	< 37	< 94	< 41	< 56	< 54	< 41	< 40	< 181	< 33
	MEAN	-	-	-	-	-	-	-	-	-	-	-	-

Table C-X.1

QUARTERLY OSLD RESULTS FOR BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATIONS

2019	Monitoring Location	Location Quarterly Baseline, BQ (mrem)	B_Q + MDD_Q (mrem)	2019 Normalized Net Dose, MQx (mrem/std. Qtr.)				Quarterly Facility Dose, F_Q (mrem)				Annual Baseline, B_A (mrem)	B_A + MDD_A (mrem)	Normalized Annual Dose, M_A (mrem/yr)	Annual Facility Dose, F_A
				1	2	3	4	1	2	3	4				
Control	BD-03	9.60	16.86	15.0	14.7	15.6	15.0	ND	ND	ND	ND	38.60	60.38	60.35	ND
Ind - Far	BD-02	9.40	16.66	14.7	15.8	14.6	14.9	ND	ND	ND	ND	37.40	59.18	60.03	22.63
	BD-04	8.50	15.76	13.8	14.9	15.1	14.3	ND	ND	ND	ND	34.10	55.88	58.11	24.01
	BD-05	9.60	16.86	15.8	16.1	16.4	15.8	ND	ND	ND	ND	38.30	60.08	64.15	25.85
Ind - Inner	BD-101	9.10	16.36	14.5	14.9	14.7	14.7	ND	ND	ND	ND	36.60	58.38	58.79	22.19
	BD-102	9.00	16.26	13.3	12.6	12.5	13.2	ND	ND	ND	ND	36.10	57.88	51.61	ND
	BD-103	9.00	16.26	14.7	13.9	14.1	14.1	ND	ND	ND	ND	35.90	57.68	56.83	ND
	BD-104	8.00	15.26	13.3	13.2	13.5	13.3	ND	ND	ND	ND	32.00	53.78	53.35	ND
	BD-105	8.30	15.56	14.3	12.9	13.8	13.8	ND	ND	ND	ND	33.10	54.88	54.83	ND
	BD-106	7.90	15.16	14.3	12.7	13.7	13.9	ND	ND	ND	ND	31.70	53.48	54.57	22.87
	BD-107	8.20	15.46	14.3	14.4	14.6	14.6	ND	ND	ND	ND	32.60	54.38	57.87	25.27
	BD-108	8.70	15.96	13.4	13.5	14.2	13.8	ND	ND	ND	ND	34.90	56.68	54.87	ND
	BD-109	11.80	19.06	17.1	17.4	18.6	17.5	ND	ND	ND	ND	47.10	68.88	70.63	23.53
	BD-110	7.90	15.16	14.3	14.6	13.8	14.2	ND	ND	ND	ND	31.70	53.48	56.95	25.25
	BD-111a	8.60	15.86	13.6	13.6	13.7	13.5	ND	ND	ND	ND	34.40	56.18	54.41	ND
	BD-112	7.90	15.16	12.9	13.6	14.0	13.7	ND	ND	ND	ND	31.80	53.58	54.19	22.39
	BD-113a	9.10	16.36	15.4	14.8	15.0	14.7	ND	ND	ND	ND	36.50	58.28	59.91	23.41
	BD-114	8.80	16.06	14.8	13.8	14.6	14.3	ND	ND	ND	ND	35.30	57.08	57.55	22.25
	BD-115	8.90	16.16	14.3	14.4	14.5	14.4	ND	ND	ND	ND	35.70	57.48	57.65	21.95
	BD-116	9.60	16.86	15.5	15.5	15.5	15.0	ND	ND	ND	ND	38.20	59.98	61.55	23.35
Ind - Outer	BD-201	12.20	19.46	19.0	19.0	18.5	18.5	ND	ND	ND	ND	44.00	65.78	75.05	31.05
	BD-202	9.10	16.36	14.1	14.2	14.6	14.2	ND	ND	ND	ND	36.30	58.08	57.07	ND
	BD-203	8.80	16.06	15.0	15.1	14.9	15.1	ND	ND	ND	ND	35.10	56.88	60.07	24.97
	BD-204	7.90	15.16	13.4	13.1	14.5	13.6	ND	ND	ND	ND	31.60	53.38	54.57	22.97
	BD-205	8.20	15.46	13.1	14.2	13.7	13.5	ND	ND	ND	ND	32.90	54.68	54.53	ND
	BD-206	8.80	16.06	14.2	14.2	15.1	14.4	ND	ND	ND	ND	35.40	57.18	57.95	22.55
	BD-207	7.80	15.06	12.9	13.2	13.9	13.4	ND	ND	ND	ND	31.10	52.88	53.37	22.27
	BD-208	8.70	15.96	14.0	14.2	14.2	14.1	ND	ND	ND	ND	34.90	56.68	56.55	ND
	BD-209	13.20	20.46	16.7	17.0	17.9	17.5	ND	ND	ND	ND	52.90	74.68	69.07	ND
	BD-210	10.70	17.96	17.1	16.7	16.9	16.6	ND	ND	ND	ND	42.60	64.38	67.35	24.75
	BD-211	13.20	20.46	18.5	18.7	19.3	18.7	ND	ND	ND	ND	52.70	74.48	75.23	22.53
	BD-212	11.30	18.56	14.1	14.8	14.9	14.3	ND	ND	ND	ND	45.10	66.88	58.09	ND
	BD-213	7.70	14.96	14.0	14.0	14.7	14.1	ND	ND	ND	ND	31.00	52.78	56.77	25.77
	BD-214	10.10	17.36	16.6	16.5	18.6	17.4	ND	ND	8.50	7.29	40.40	62.18	69.09	28.69
	BD-215	8.40	15.66	14.6	13.9	14.4	14.2	ND	ND	ND	ND	33.50	55.28	57.13	23.63
	BD-216	10.80	18.06	16.0	16.0	15.8	15.9	ND	ND	ND	ND	43.10	64.88	63.71	ND
Ind- Near	BD-06	8.50	15.76	13.8	14.1	15.4	14.3	ND	ND	ND	ND	33.80	55.58	57.61	23.81
	BD-19	9.80	17.06	16.2	15.7	15.6	16.0	ND	ND	ND	ND	39.20	60.98	63.55	24.35
	BD-20	9.50	16.76	15.4	15.1	15.0	14.5	ND	ND	ND	ND	37.90	59.68	60.03	22.13
	BD-21	8.90	16.16	15.4	14.4	15.2	14.9	ND	ND	ND	ND	35.60	57.38	59.89	24.29
Other (ISFSI)	BD-ISFSI-104-3	12.80	20.06	17.8	18.5	20.0	17.6	ND	ND	ND	ND	51.10	72.88	73.91	22.81
	BD-ISFSI-104-4	12.80	20.06	18.5	19.9	20.4	19.5	ND	ND	7.6	ND	51.40	73.18	78.27	26.87
	BD-ISFSI-105-3	13.20	20.46	19.9	22.6	24.3	20.6	ND	9.40	11.10	7.39	52.80	74.58	87.39	34.59
	BD-ISFSI-105-4	17.10	24.36	30.6	34.2	34.1	30.2	13.50	17.10	17.00	13.11	68.40	90.18	129.11	60.71
	BD-ISFSI-110-3	11.40	18.66	16.1	17.8	18.1	20.1	ND	ND	ND	8.69	45.80	67.58	72.09	26.29
	BD-ISFSI-110-4	13.20	20.46	22.1	23.5	23.6	21.6	8.90	10.30	10.40	8.41	52.80	74.58	90.81	38.01

ND= Non-Detect

TABLE C-X.2 MEAN QUARTLY OSLD RESULTS FOR THE INNER RING, OUTER RING, OTHER, CONTROL, AND INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) LOCATIONS FOR BRAIDWOOD STATION, 2019

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

COLLECTION PERIOD	SITE BOUNDARY ± 2 S.D.	INTERMEDIATE DIST ± 2 S.D.	OTHER ± 2 S.D.	CONTROL ± 2 S.D.	ISFSI ± 2 S.D.
JAN-MAR	14.4 ± 2.1	15.2 ± 3.8	15.0 ± 1.9	15.0 ± 0.0	20.8 ± 10.4
APR-JUN	14.1 ± 2.4	15.3 ± 3.7	15.2 ± 1.5	14.7 ± 0.0	22.8 ± 12.1
JUL-SEP	14.4 ± 2.6	15.7 ± 3.7	15.3 ± 1.1	15.6 ± 0.0	23.4 ± 11.5
OCT-DEC	14.3 ± 2.0	15.3 ± 3.7	15.0 ± 1.4	15.0 ± 0.0	21.6 ± 8.8

TABLE C-X.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF MREM/QUARTER ± 2 STANDARD DEVIATION

LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
SITE BOUNDARY	64	12.5	18.6	14.3 ± 2.3
INTERMEDIATE DISTANCE	64	12.9	19.3	15.4 ± 3.6
OTHER	28	13.8	16.4	15.1 ± 1.5
CONTROL	4	14.7	15.6	15.1 ± 0.8
ISFSI	24	16.1	34.2	22.1 ± 10.2

SITE BOUNDARY STATIONS - BD-101, BD-102, BD-103, BD-104, BD-105, BD-106, BD-107, BD-108, BD-109, BD-110, BD-111A, BD-112 BD-113A, BD-114, BD-115, BD-116

INTERMEDIATE DISTANCE STATIONS - BD-201, BD-202, BD-203, BD-204, BD-205, BD-206, BD-207, BD-208, BD-209, BD-210, BD-211, BD-212, BD-213, BD-214, BD-215, BD-216

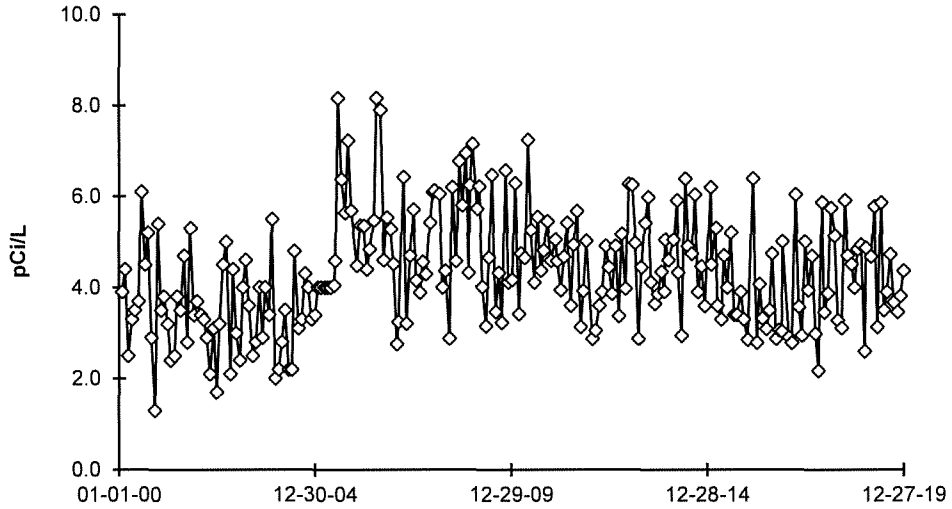
OTHER STATIONS - BD-02, BD-04, BD-05, BD-06, BD-19, BD-20, BD-21

CONTROL STATION - BD-03

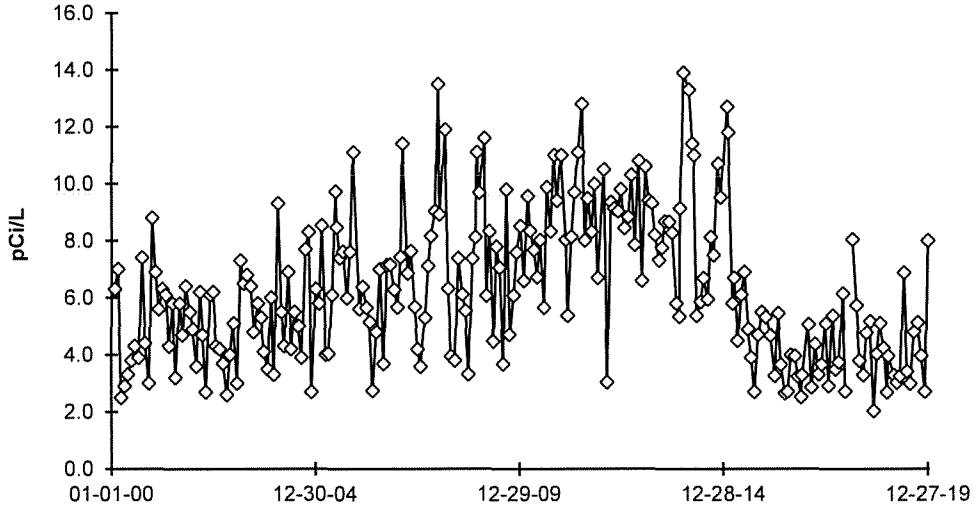
ISFSI STATIONS - BD-ISFSI-104-3, BD-ISFSI-104-4, BD-ISFSI-105-3, BD-ISFSI-105-4, BD-ISFSI-110-3, BS-ISFSI-110-4

FIGURE C-1
Surface Water - Gross Beta - Stations BD-10 and BD-25 (C) Collected in the Vicinity of Braidwood Station, 2000 - 2019

BD-10 Kankaee River, Downstream



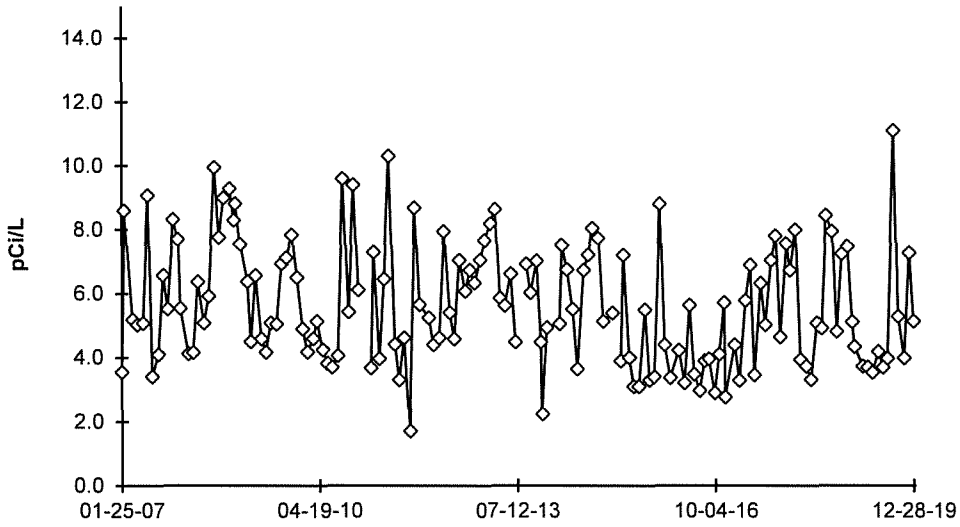
BD-25 (C) Kankakee River, Upstream



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 - Gross Beta - Stations BD-38 and BD-40 Collected in the Vicinity of Braidwood Station, 2007 - 2019

BD-38 Main Drainage Ditch



BD-40 Braidwood Station Cooling Lake

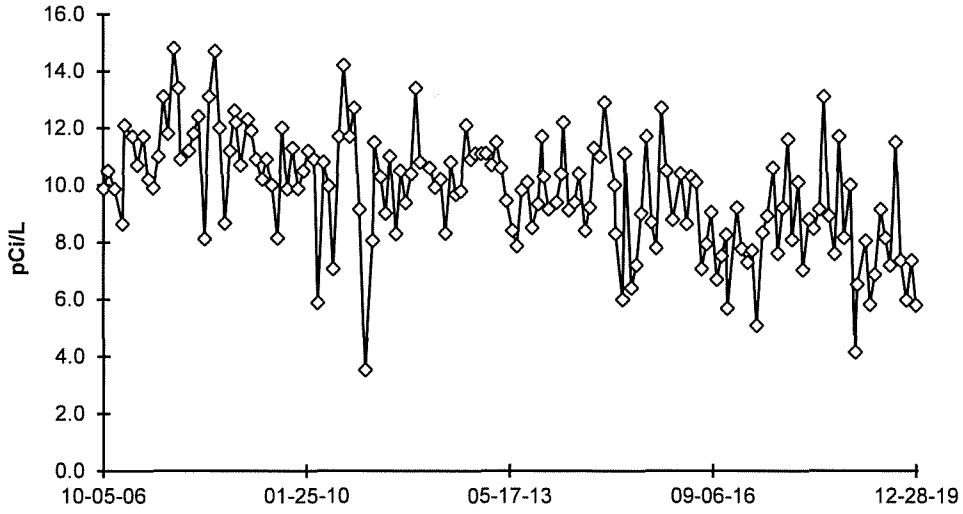
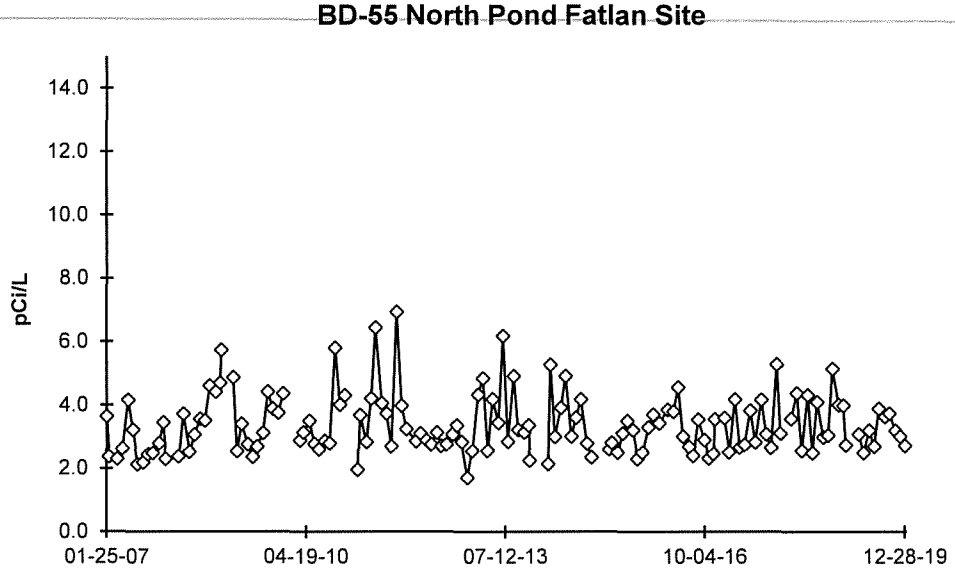
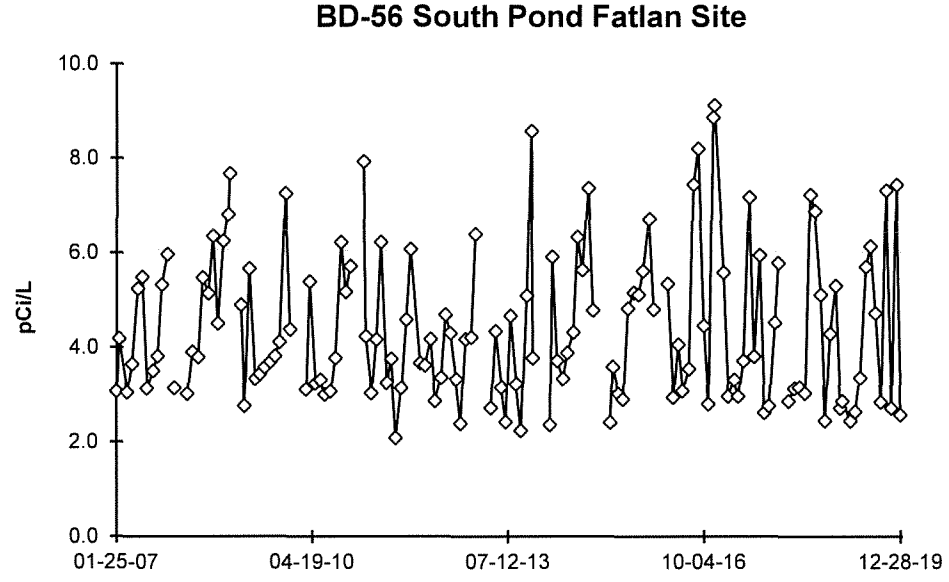


FIGURE C-3
Surface Water - Gross Beta - Stations BD-55 and BD-56 Collected in the Vicinity of Braidwood Station, 2007 - 2019

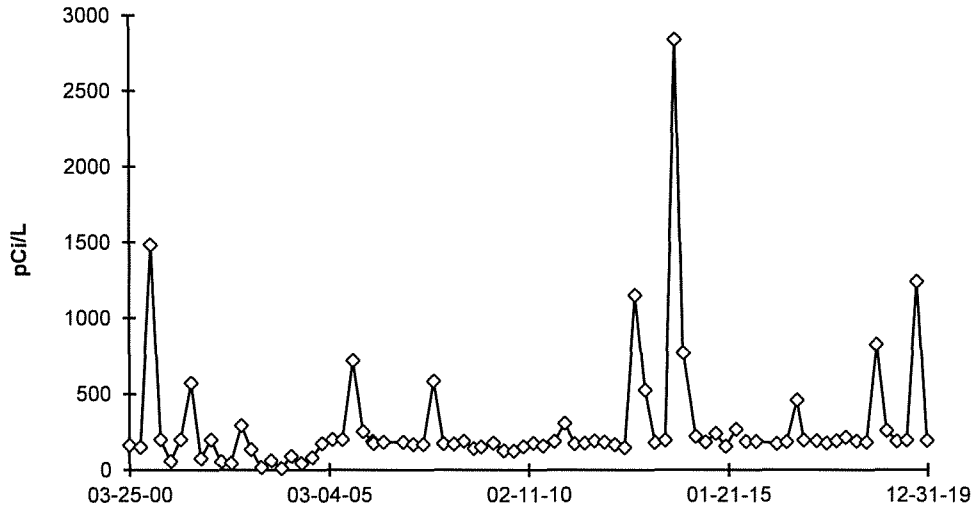




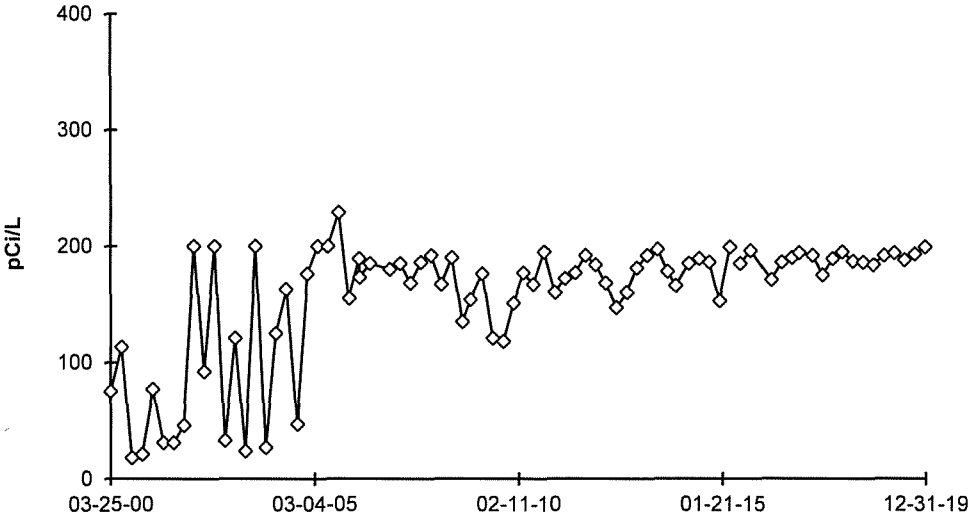
GAPS IN DATA ARE DUE TO SAMPLING POINTS BEING FROZEN AT TIME OF COLLECTION

FIGURE C-4
Surface Water - Tritium - Stations BD-10 and BD-25 (C) Collected in the Vicinity of Braidwood Station, 2000 - 2019

BD-10 Kankakee River, Downstream



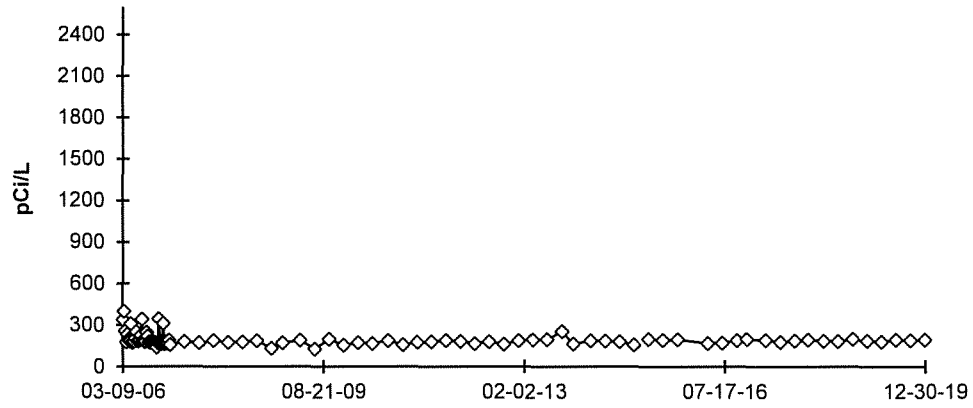
BD-25 (C) Kankakee River, Upstream



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

FIGURE C-5
Surface Water - Tritium - Stations BD-38 and BD-40
Collected in the Vicinity of Braidwood Station, 2006 - 2019

BD-38 Main Drainage Ditch



BD-40 Braidwood Station Cooling Lake

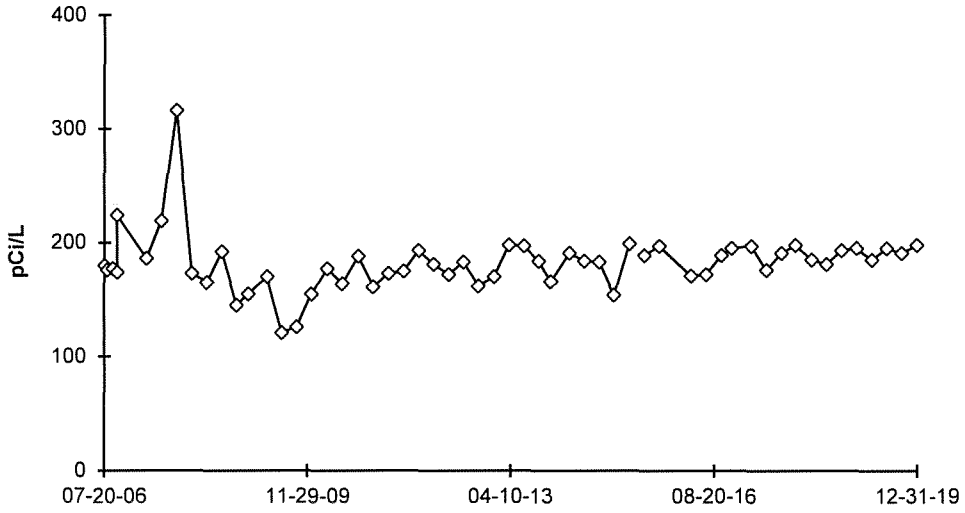
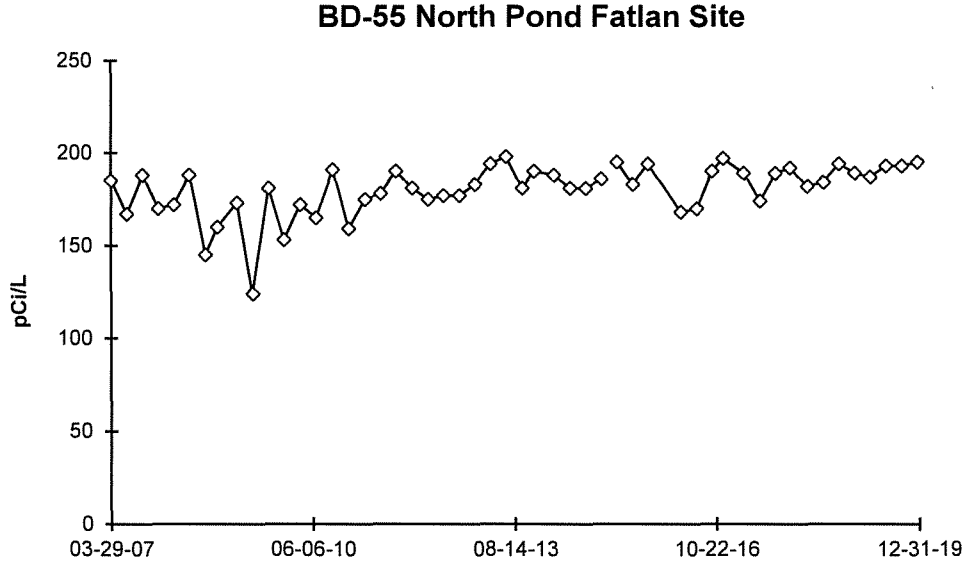


FIGURE C-6
Surface Water - Tritium - Stations BD-55 and BD-56 Collected in the Vicinity of Braidwood Station, 2007 - 2019



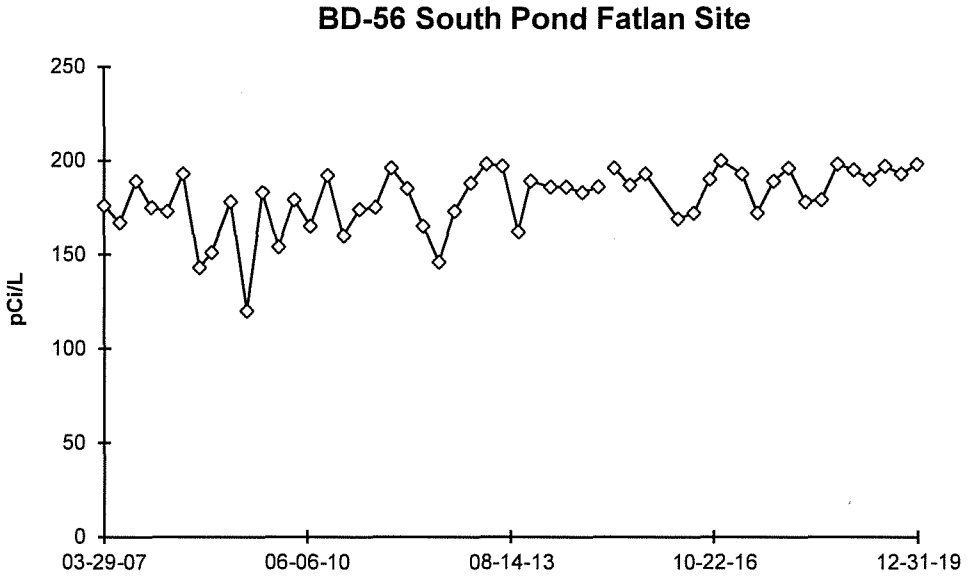
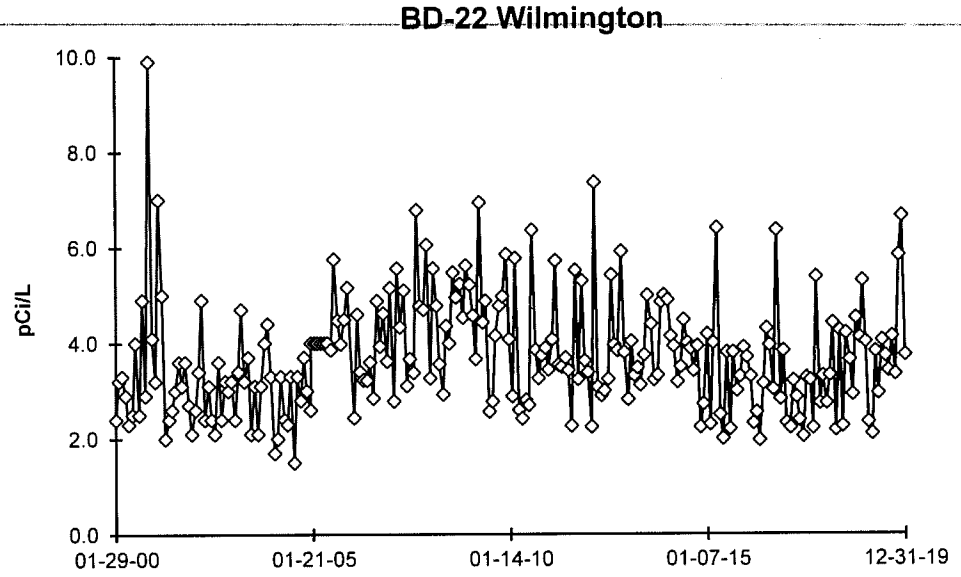
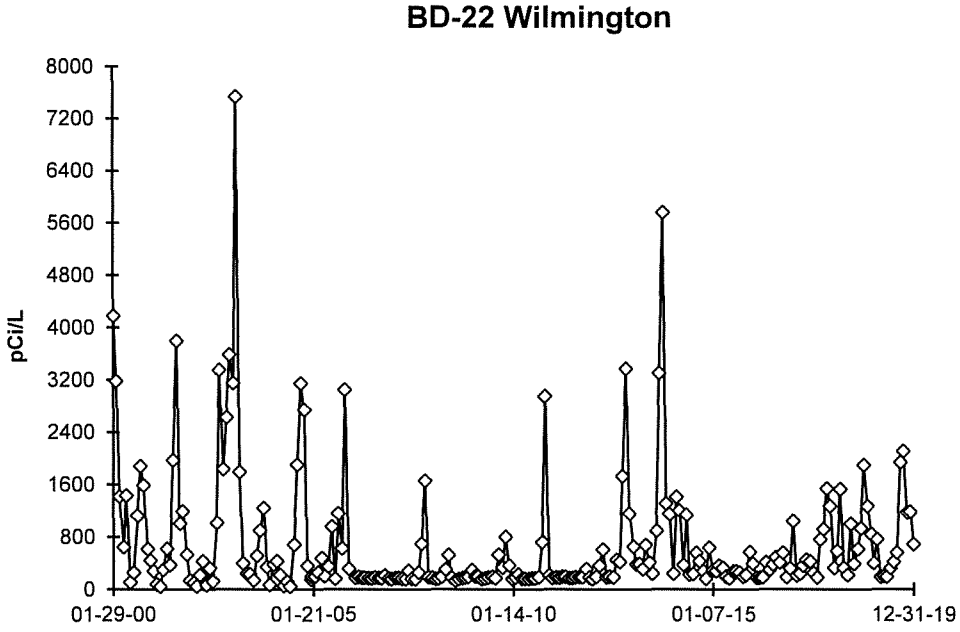


FIGURE C-7
Public Water - Gross Beta - Station BD-22
Collected in the Vicinity of Braidwood Station, 2000 - 2019



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

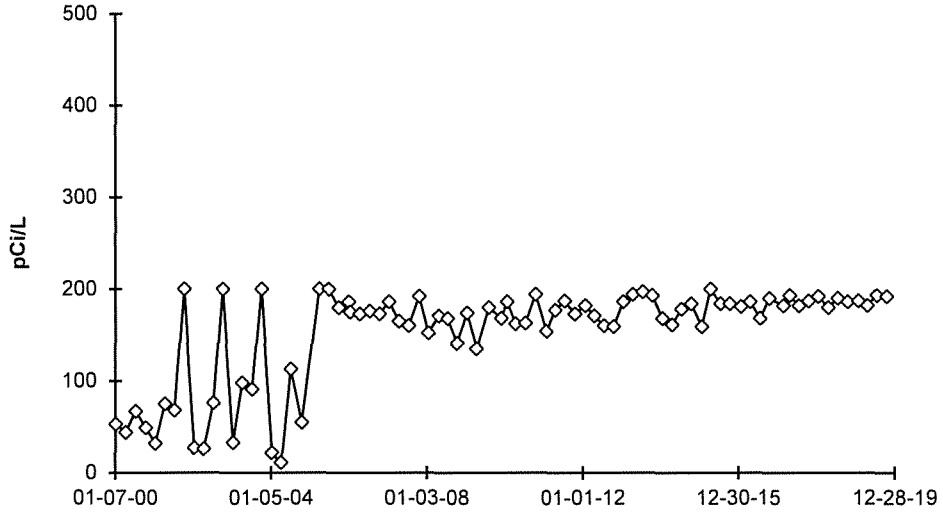
FIGURE C-8
Public Water - Tritium - Station BD-22
Collected in the Vicinity of Braidwood Station, 2000 - 2019



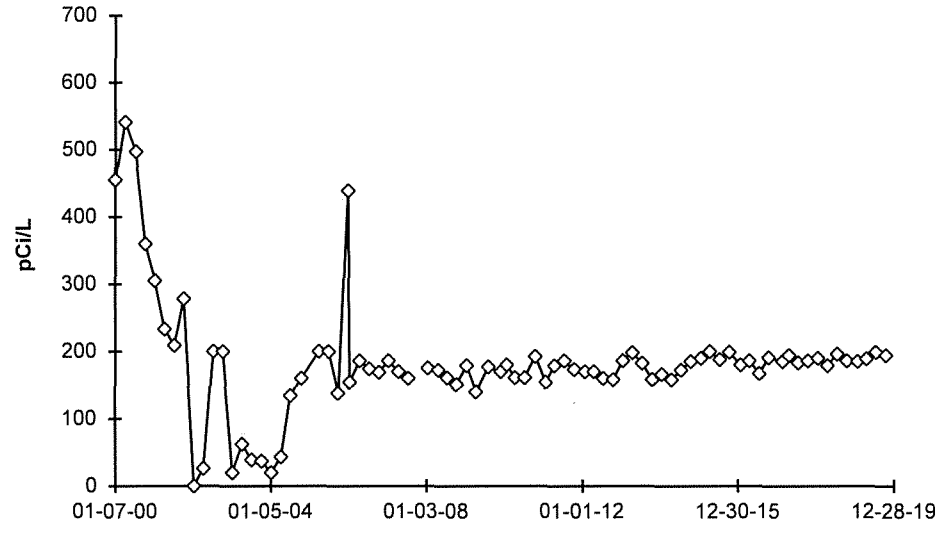
DUE TO VENDOR CHANGE, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JUNE 2005

FIGURE C-9
Ground/Well Water - Tritium - Stations BD-13 and BD-34 Collected in the Vicinity of Braidwood Station, 2000 - 2019

BD-13 Braidwood City Hall Well

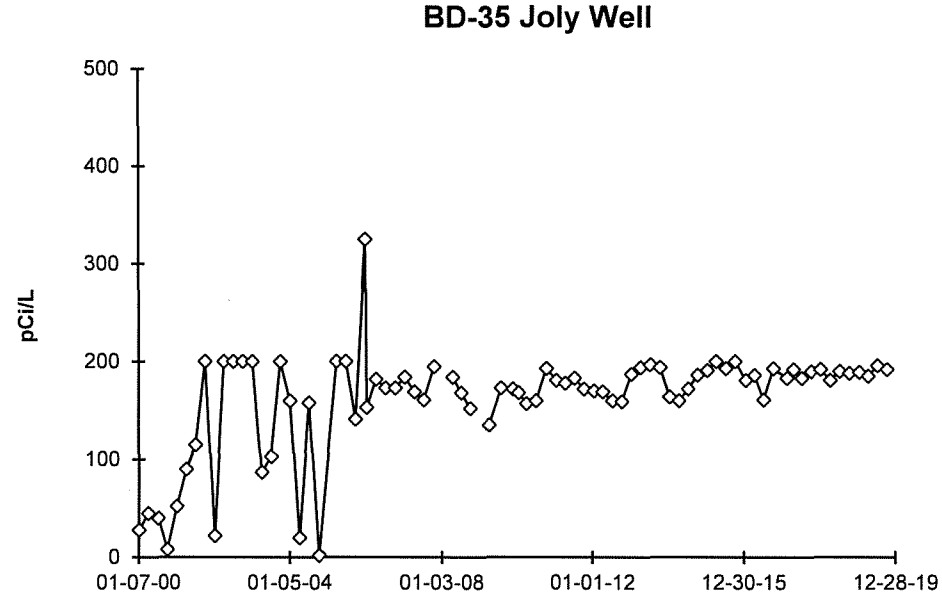


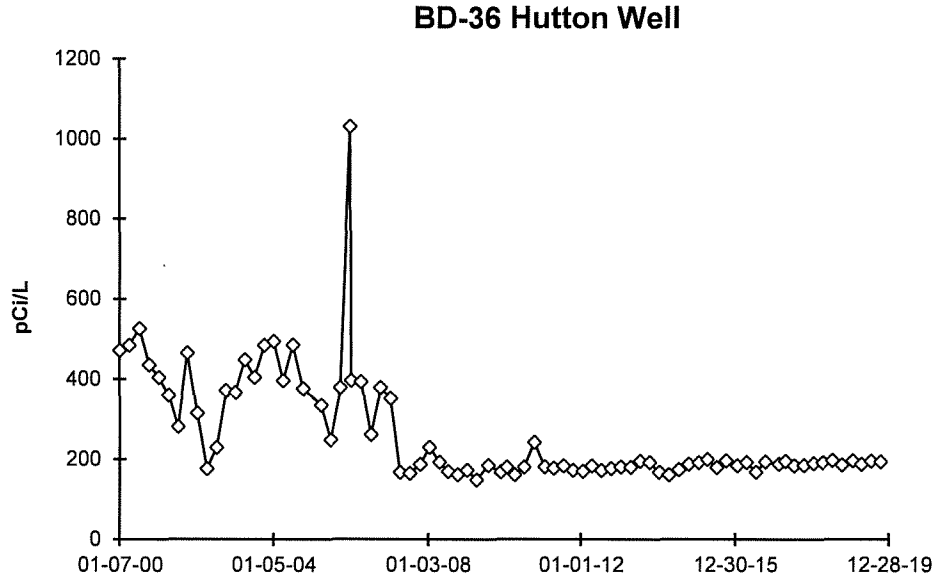
BD-34 Gibson Well



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

FIGURE C-10
Ground/Well Water - Tritium - Stations BD-35 and BD-36 Collected in the Vicinity of Braidwood Station, 2000 - 2019

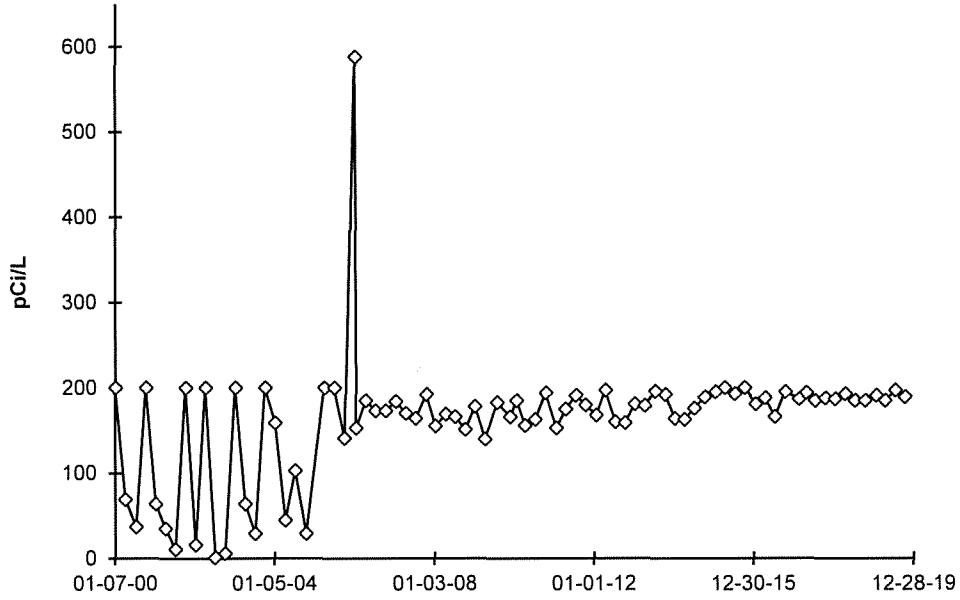




DUE TO VENDOR CHANGE IN 2005, < VALUES ARE LLD VALUES JANUARY THROUGH JUNE 2005 AND MDC VALUES AFTER JULY.

FIGURE C-11
Ground/Well Water - Tritium - Station BD-37
Collected in the Vicinity of Braidwood Station, 2000 - 2019

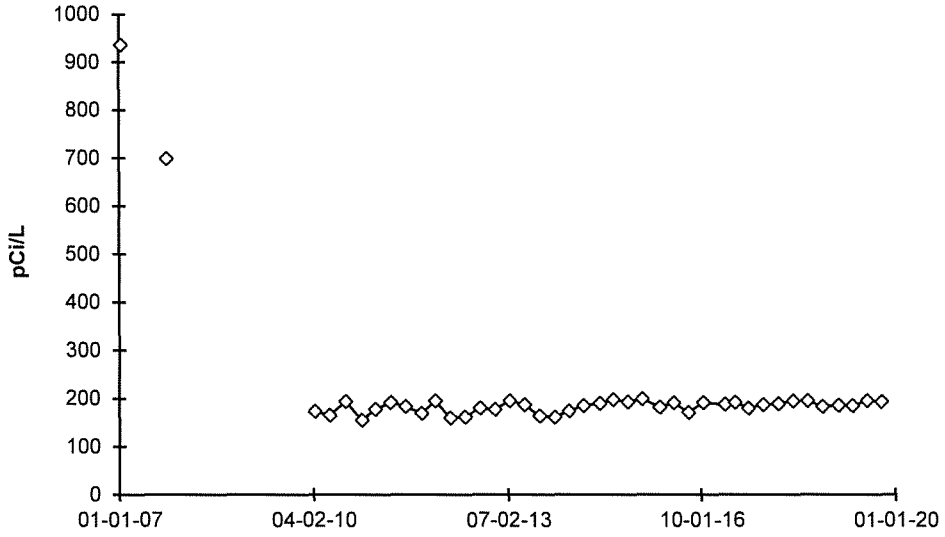
BD-37 Nurczyk Well



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

FIGURE C-12
Ground/Well Water - Tritium - Station BD-50 and BD-51 Collected in the Vicinity of Braidwood Station, 2007 - 2019

BD-50 Skole Well



STATION BD-50 WAS INITIALLY DISCONTINUED ON 10/18/07 AND RESUMED ON 04/08/10

BD-51 Fatlan Well

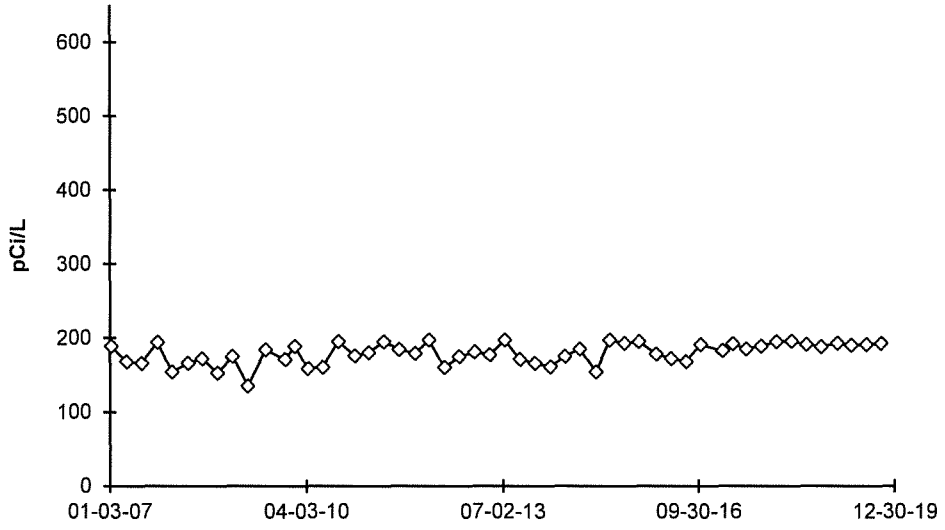


FIGURE C-13
Ground/Well Water - Tritium - Station BD-54
Collected in the Vicinity of Braidwood Station, 2007 - 2019

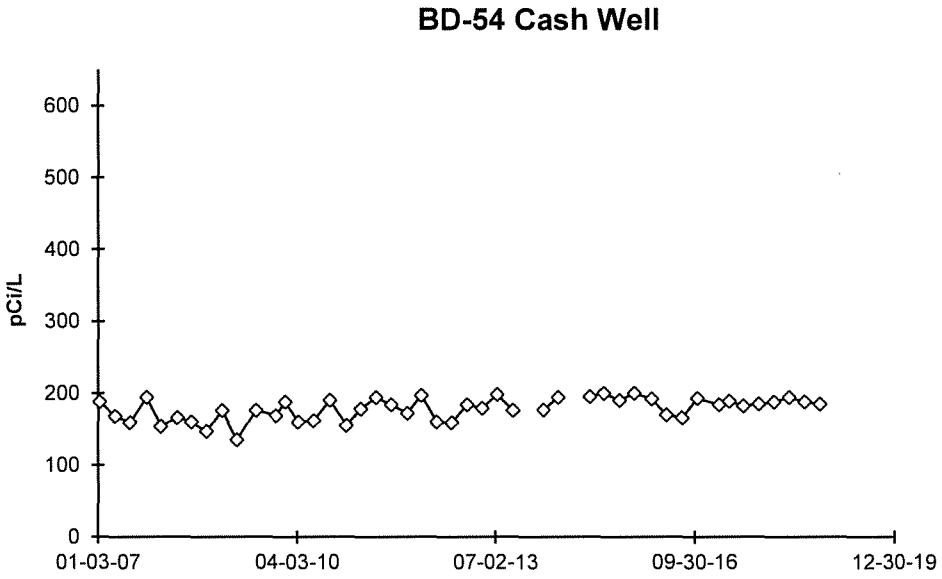
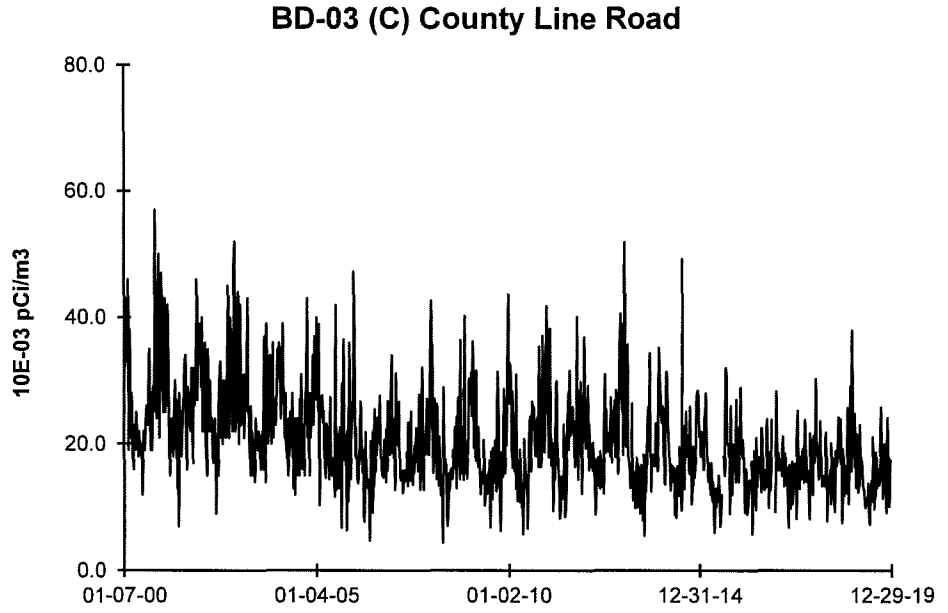


FIGURE C-14
Air Particulate - Gross Beta- Stations BD-03 (C) and BD-06 Collected in the Vicinity of Braidwood Station, 2000 - 2019



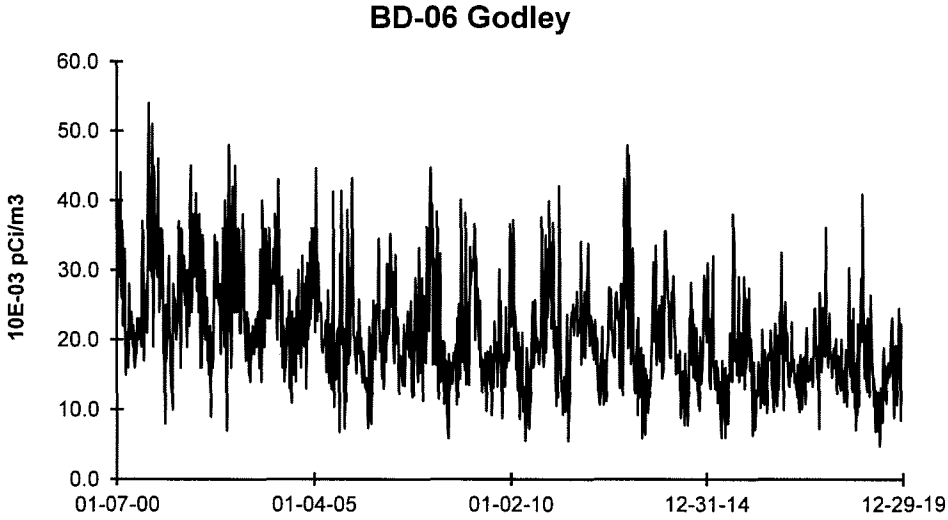
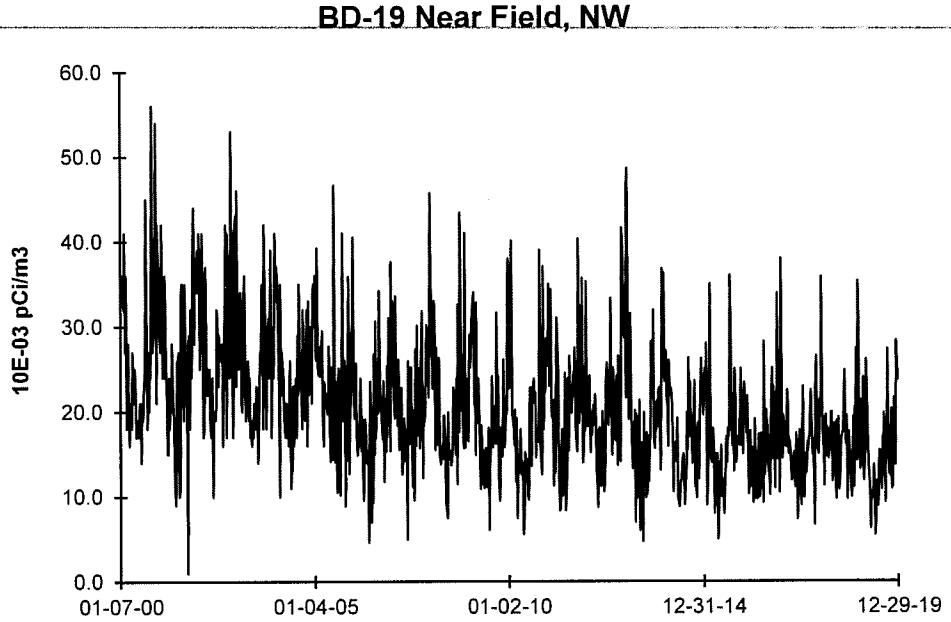


FIGURE C-15
Air Particulate - Gross Beta- Stations BD-19 and BD-20 Collected in the Vicinity of Braidwood Station, 2000 - 2019



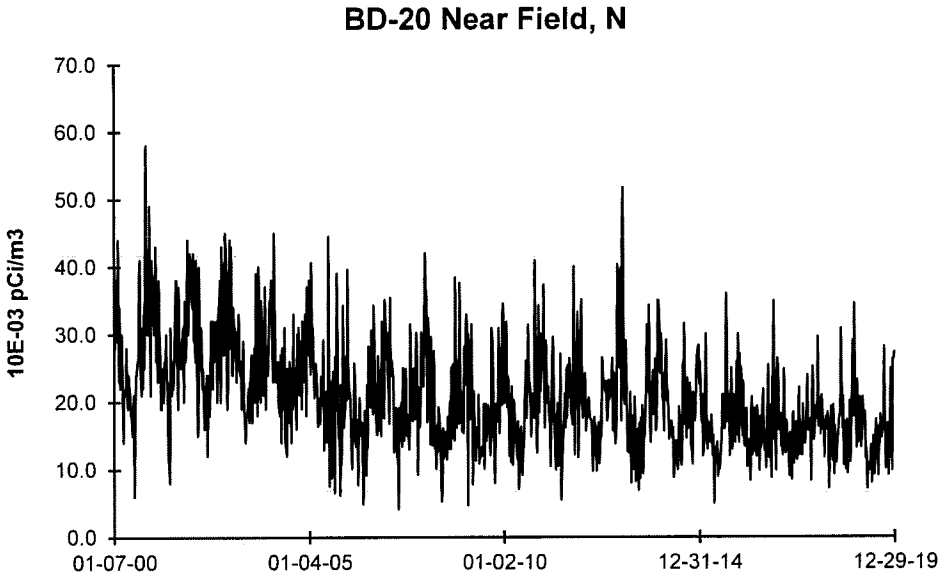


FIGURE C-16
Air Particulate - Gross Beta- Station BD-21
Collected in the Vicinity of Braidwood Station, 2000 - 2019

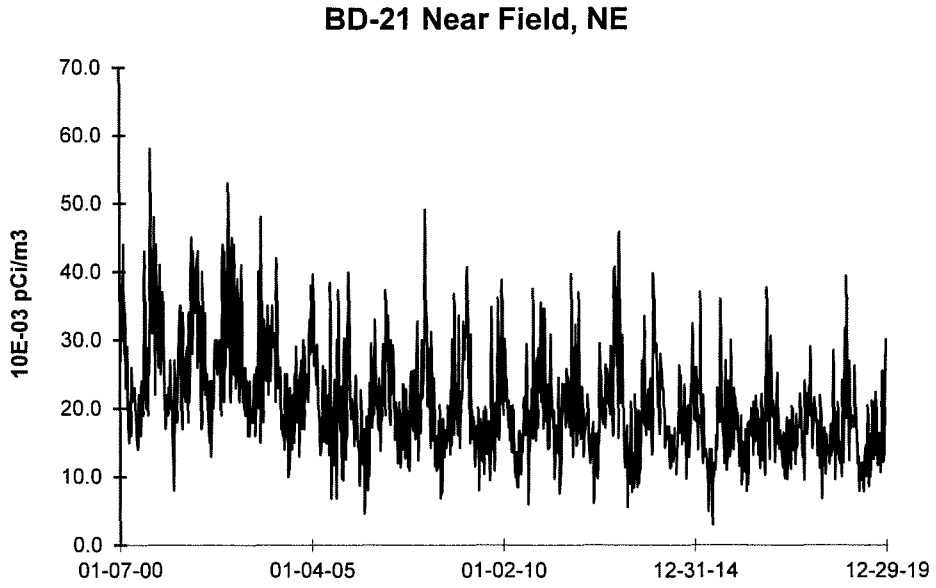
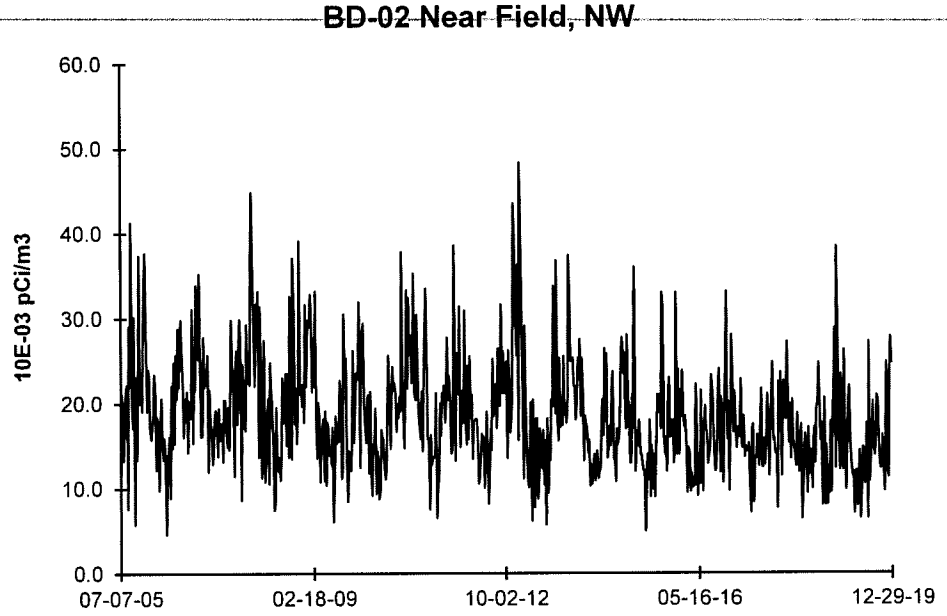


FIGURE C-17
Air Particulate - Gross Beta- Stations BD-02 and BD-04 Collected in the Vicinity of Braidwood Station, 2005 - 2019



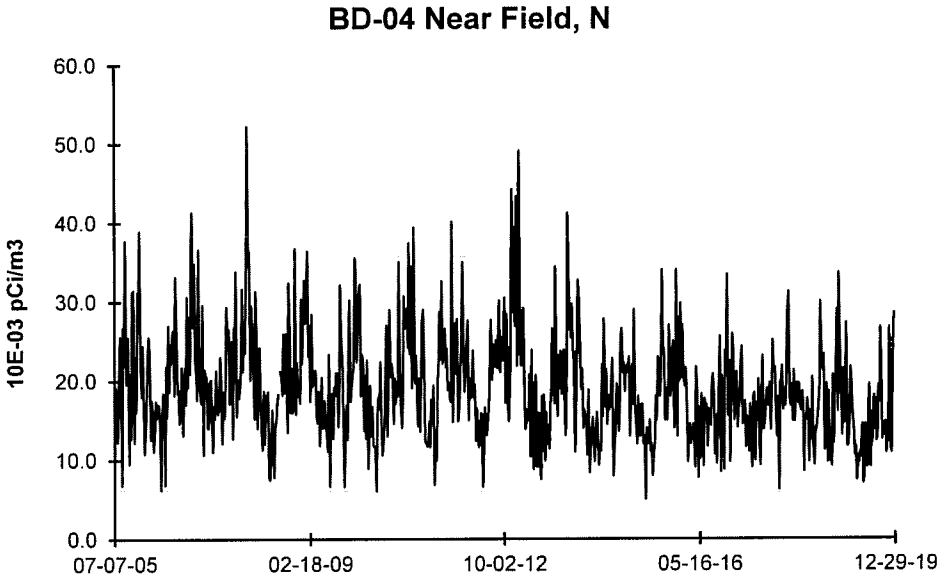
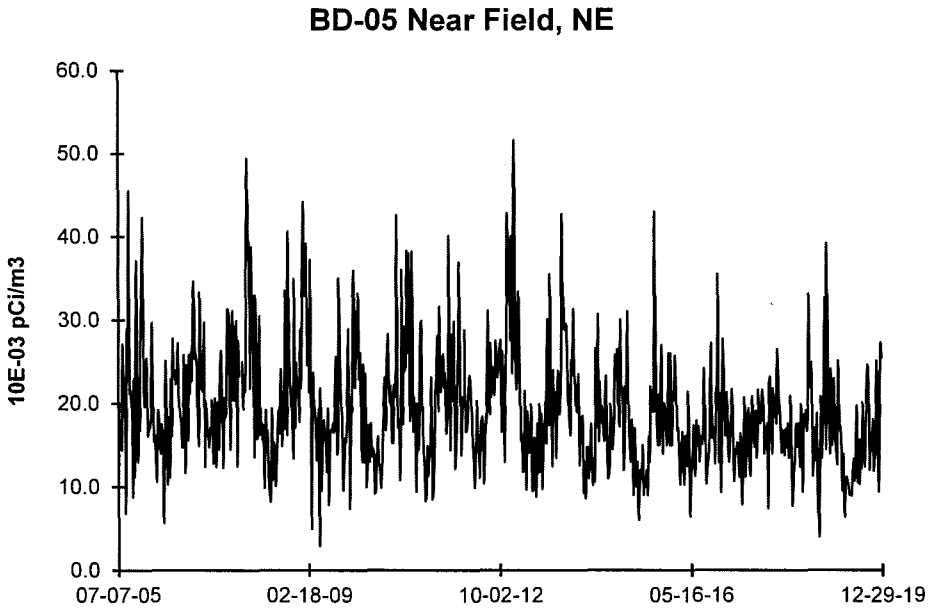


FIGURE C-18
Air Particulate - Gross Beta- Station BD-05
Collected in the Vicinity of Braidwood Station, 2005 - 2019



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APPENDIX D

INTER-LABORATORY COMPARISON PROGRAM

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Table D.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
March 2019	E12468A	Milk	Sr-89	pCi/L	87.1	96	0.91	A
			Sr-90	pCi/L	12.6	12.6	1.00	A
	E12469A	Milk	Ce-141	pCi/L	113	117	0.97	A
			Co-58	pCi/L	153	143	1.07	A
			Co-60	pCi/L	289	299	0.97	A
			Cr-51	pCi/L	233	293	0.80	A
			Cs-134	pCi/L	147	160	0.92	A
			Cs-137	pCi/L	193	196	0.98	A
			Fe-59	pCi/L	153	159	0.96	A
			I-131	pCi/L	91.5	89.5	1.02	A
			Mn-54	pCi/L	149	143	1.04	A
			Zn-65	pCi/L	209	220	0.95	A
	E12470	Charcoal	I-131	pCi	77.5	75.2	1.03	A
	E12471	AP	Ce-141	pCi	60.7	70.2	0.87	A
			Co-58	pCi	87.9	85.8	1.02	A
			Co-60	pCi	175	179	0.98	A
			Cr-51	pCi	165	176	0.94	A
			Cs-134	pCi	91.2	95.9	0.95	A
			Cs-137	pCi	120	118	1.02	A
			Fe-59	pCi	108	95.3	1.13	A
			Mn-54	pCi	94.2	85.7	1.10	A
			Zn-65	pCi	102	132	0.77	W
	E12472	Water	Fe-55	pCi/L	2230	1920	1.16	A
	E12473	Soil	Ce-141	pCi/g	0.189	0.183	1.03	A
			Co-58	pCi/g	0.209	0.224	0.93	A
			Co-60	pCi/g	0.481	0.466	1.03	A
			Cr-51	pCi/g	0.522	0.457	1.14	A
			Cs-134	pCi/g	0.218	0.250	0.87	A
			Cs-137	pCi/g	0.370	0.381	0.97	A
			Fe-59	pCi/g	0.263	0.248	1.06	A
			Mn-54	pCi/g	0.248	0.223	1.11	A
			Zn-65	pCi/g	0.371	0.344	1.08	A
	E12474	AP	Sr-89	pCi	88.3	95.2	0.93	A
			Sr-90	pCi	11.7	12.5	0.94	A
August 2019	E12562	Soil	Sr-90	pCi/g	4.710	6.710	0.70	W

(a) 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

(b) 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.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Ratio of TBE to Analytics Result	Evaluation [b]
September 2019	E12475	Milk	Sr-89	pCi/L	70.0	93.9	0.75	W
			Sr-90	pCi/L	12.0	12.9	0.93	A
	E12476	Milk	Ce-141	pCi/L	150	167	0.90	A
			Co-58	pCi/L	170	175	0.97	A
			Co-60	pCi/L	211	211	1.00	A
			Cr-51	pCi/L	323	331	0.98	A
			Cs-134	pCi/L	180	207	0.87	A
			Cs-137	pCi/L	147	151	0.97	A
			Fe-59	pCi/L	156	148	1.05	A
			I-131	pCi/L	81.1	92.1	0.88	A
			Mn-54	pCi/L	160	154	1.04	A
			Zn-65	pCi/L	303	293	1.03	A
	E12477	Charcoal	I-131	pCi	95.9	95.1	1.01	A
	E12478	AP	Ce-141	pCi	129	138	0.93	A
			Co-58	pCi	128	145	0.88	A
			Co-60	pCi	181	174	1.04	A
			Cr-51	pCi	292	274	1.07	A
			Cs-134	pCi	166	171	0.97	A
			Cs-137	pCi	115	125	0.92	A
			Fe-59	pCi	119	123	0.97	A
			Mn-54	pCi	129	128	1.01	A
			Zn-65	pCi	230	242	0.95	A
	E12479	Water	Fe-55	pCi/L	1810	1850	0.98	A
	E12480	Soil	Ce-141	pCi/g	0.305	0.276	1.10	A
			Co-58	pCi/g	0.270	0.289	0.93	A
			Co-60	pCi/g	0.358	0.348	1.03	A
			Cr-51	pCi/g	0.765	0.547	1.40	N[1]
			Cs-134	pCi/g	0.327	0.343	0.95	A
			Cs-137	pCi/g	0.308	0.321	0.96	A
			Fe-59	pCi/g	0.257	0.245	1.05	A
			Mn-54	pCi/g	0.274	0.255	1.07	A
			Zn-65	pCi/g	0.536	0.485	1.11	A
	E12481	AP	Sr-89	pCi	95.9	91.9	1.04	A
			Sr-90	pCi	12.3	12.6	0.97	A
	E12563	Soil	Sr-90	pCi/g	0.392	0.360	1.09	A

(a) 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

(b) 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

*(1) See **NCR 19-27***

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)

Table D.2 **Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2019	19-GrF40	AP	Gross Alpha	Bq/sample	0.184	0.528	0.158 - 0.898	A
			Gross Beta	Bq/sample	0.785	0.948	0.474 - 1.422	A
	19-MaS40	Soil	Ni-63	Bq/kg	420	519.0	363 - 675	A
			Sr-90	Bq/kg			*(1)*	NR(3)
	19-MaW40	Water	Am-241	Bq/L	0.764	0.582	0.407 - 0.757	N(4)
			Ni-63	Bq/L	4.72	5.8	4.1 - 7.5	A
			Pu-238	Bq/L	0.443	0.451	0.316 - 0.586	A
			Pu-239/240	Bq/L	-0.00161	0.0045	*(2)*	A
	19-RdF40	AP	U-234/233	Bq/sample	0.1138	0.106	0.074 - 0.138	A
			U-238	Bq/sample	0.107	0.110	0.077 - 0.143	A
	19-RdV40	Vegetation	Cs-134	Bq/sample	2.14	2.44	1.71 - 3.17	A
			Cs-137	Bq/sample	2.22	2.30	1.61 - 2.99	A
			Co-57	Bq/sample	2.16	2.07	1.45 - 2.69	A
			Co-60	Bq/sample	0.02382		*(1)*	A
			Mn-54	Bq/sample	-0.03607		*(1)*	A
			Sr-90	Bq/sample	-0.1060		*(1)*	N(5)
			Zn-65	Bq/sample	1.35	1.71	1.20 - 2.22	W
August 2019	19-GrF41	AP	Gross Alpha	Bq/sample	0.192	0.528	0.158 - 0.898	W
			Gross Beta	Bq/sample	0.722	0.937	0.469 - 1.406	A
	19-MaS41	Soil	Ni-63	Bq/kg	436	629	440 - 818	N(6)
			Sr-90	Bq/kg	444	572	400 - 744	W
	19-MaW41	Water	Am-241	Bq/L				NR(7)
			Ni-63	Bq/L	7.28	9.7	6.8 - 12.6	W
			Pu-238	Bq/L	0.0207	0.0063	*(2)*	A
			Pu-239/240	Bq/L	0.741	0.727	0.509 - 0.945	A
	19-RdF41	AP	U-234/233	Bq/sample	0.0966	0.093	0.065 - 0.121	A
			U-238	Bq/sample	0.0852	0.096	0.067-0.125	A
	19-RdV41	Vegetation	Cs-134	Bq/sample	0.0197		*(1)*	A
			Cs-137	Bq/sample	3.21	3.28	2.30 - 4.26	A
			Co-57	Bq/sample	4.62	4.57	3.20 - 5.94	A
			Co-60	Bq/sample	4.88	5.30	3.71 - 6.89	A
			Mn-54	Bq/sample	4.54	4.49	3.14 - 5.84	A
			Sr-90	Bq/sample	0.889	1.00	0.70 - 1.30	A
			Zn-65	Bq/sample	2.78	2.85	2.00 - 3.71	A

(a) 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

(b) DOE/MAPEP evaluation:
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

(1) False positive test
(2) Sensitivity evaluation
*(3) See **NCR 19-12***
*(4) See **NCR 19-13***
*(5) See **NCR 19-14***
*(6) See **NCR 19-25***
*(7) See **NCR 19-26***

Table D.3 **ERA Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
April 2019	Rad-117	Water	Ba-133	pCi/L	26.3	24.1	18.6 - 27.8	A
			Cs-134	pCi/L	15.2	12.1	8.39 - 14.4	N(1)
			Cs-137	pCi/L	33.6	33.1	28.8 - 39.4	A
			Co-60	pCi/L	11.9	11.5	8.67 - 15.5	A
			Zn-65	pCi/L	87.1	89.2	80.3 - 107	A
			GR-A	pCi/L	19	19.3	9.56 - 26.5	A
			GR-B	pCi/L	20.2	29.9	19.1 - 37.7	A
			U-Nat	pCi/L	55.5	55.9	45.6 - 61.5	A
			H-3	pCi/L	21500	21400	18700 - 23500	A
			Sr-89	pCi/L	44.9	33.3	24.5 - 40.1	N(2)
			Sr-90	pCi/L	24.5	26.3	19.0 - 30.7	A
			I-131	pCi/L	28.9	28.4	23.6 - 33.3	A
October 2019	Rad-119	Water	Ba-133	pCi/L	42.7	43.8	35.7 - 48.8	A
			Cs-134	pCi/L	53.5	55.9	45.2 - 61.5	A
			Cs-137	pCi/L	77.7	78.7	70.8 - 89.2	A
			Co-60	pCi/L	51.5	53.4	48.1 - 61.3	A
			Zn-65	pCi/L	36.6	34.0	28.5 - 43.1	A
			GR-A	pCi/L	40.5	27.6	14.0 - 36.3	N(3)
			GR-B	pCi/L	36.3	39.8	26.4 - 47.3	A
			U-Nat	pCi/L	27.66	28.0	22.6 - 31.1	A
			H-3	pCi/L	22800	23400	20500 - 25700	A
			Sr-89	pCi/L	47.1	45.5	35.4 - 52.7	A
			Sr-90	pCi/L	32.5	26.5	19.2 - 30.9	N(4)
			I-131	pCi/L	26.0	23.9	19.8 - 28.4	A
December 2019	QR 120419D	Water	Sr-90	pCi/L	20.1	18.6	13.2 - 22.1	A

(a) 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.

(b) ERA evaluation:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 19-10***
*(2) See **NCR 19-11***
*(3) See **NCR 19-23***
*(4) See **NCR 19-24***

APPENDIX E

ERRATA DATA

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In 2019, the Annual Radiological Groundwater Protection Program Report (ARGPPR) did not include the following information regarding missed sample analyses:

> *AR 0427997 - Braidwood Station did not analyze seven (7) Radiological Groundwater Protection Program wells in 2018 for Gamma, Strontium 89 and 90, and Gross Alpha and Beta. These seven RGPP wells were:*
> *VB-10-R, VB-9-1, VB-8-2R, VB-6-1, VB-7-1, VB-5-2, VB-11-1.*
>
> *EN-BR-408-4160 specifies the well type (Background, Detection, Surface Water) for Braidwood Station. Revision 4 of EN-BR-408-4160 specified these wells as Consent Order wells. Revision 5 (implemented on 8/28/2017) specified these wells as Detection wells. In 2017, these wells were sampled per procedure. EN-AA-408-4000 specifies the sampling parameters for a Detection well. These wells are sampled by the vendor GHD with Environmental oversight.*
>
> *As extent of condition, Environmental discovered PS-10 was not sampled for Gamma, Strontium 89 and 90, or Gross Alpha and Beta. PS-10 is a Detection well and is required by procedure for these sampling parameters.*

It was found that the sampling vendor used Revision 4 of the EN-BR-408-4160 instead of the current Revision 9.

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

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Docket No: 50-456
50-457

BRAIDWOOD STATION

UNIT 1 and UNIT 2

Annual Radiological
Groundwater Protection Program Report

1 January through 31 December 2019

Prepared By
Teledyne Brown Engineering
Environmental Services

Exelon Generation®

Braidwood Station
Braceville, IL 60407

May 2020

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Table Of Contents

Appendices

I. Summary and Conclusions

In 2019, Exelon continued a comprehensive program that evaluates the impact of station operations on groundwater and surface water in the vicinity of Braidwood Station. This report reviews groundwater and surface water samples collected from the environment, both on and off station property, in 2019. During that time period, 352 analyses were performed on 157 samples from 45 locations.

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

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 or surface water samples. In the case of tritium, Exelon specified that its laboratories achieve a lower limit of detection 10 times less than Braidwood's ODCM and 100 times less than federal regulation.

Strontium-89/90 (Sr-89/90) was not detected at a concentration greater than the LLD of 10.0 and 1.0 picocuries per liter (pCi/L) respectively in any of the groundwater samples tested.

No tritium was detected in any sample at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Low levels of tritium were detected in groundwater and surface water at concentrations greater than the LLD of 200 pCi/L in 74 of 157 samples. The tritium concentrations ranged from 193 ± 122 pCi/L to 1,440 ± 216 pCi/L. The tritium that was detected in the groundwater or surface water is believed to be the result of isolated historical releases and/or background from external sources greater than 200 pCi/L.

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater water samples throughout the sampling year in 2019. Gross Alpha (dissolved) was detected in 2 groundwater samples. The concentrations ranged from 1.3 to 7.7 pCi/L. Gross Alpha (suspended) was detected in 1 groundwater sample at a concentration of 2.2 ± 1.0 pCi/L. Gross Beta (dissolved and suspended) was not detected in any groundwater samples.

Gross Alpha analyses in the dissolved and suspended fractions were performed on surface water samples during the 3rd quarter of 2019. No Gross Alpha (dissolved and suspended) was detected in surface water samples.

Hard-To-Detect analyses including Americium-241 (Am-241), Cerium-242 (Cm-242, Cerium 243/244 (Cm-243/244), Plutonium-238 (Pu-238), Plutonium-239/240, (Pu-239/240), Uranium-234 (U-234), Uranium-235 (U-235) and Uranium-238 (U-238) were not performed in 2019.

II. Introduction

The Braidwood Station, consisting of two 3,645 MWt pressurized water reactors owned and operated by Exelon Corporation is located in Will County, Illinois. Unit No. 1 went critical on May 29, 1987. Unit No. 2 went critical on March 08, 1988. The site is located in northeastern Illinois, 20 miles south-southwest of Joliet, Illinois, 60 miles southwest of Chicago and southwest of the Kankakee River.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Environmental Inc. Midwest Labs (EIML) on samples collected in 2019.

A. Objective of the Radiological Groundwater Protection Program (RGPP)

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

1. Identify suitable locations to monitor and evaluate potential impacts from station operations to preclude 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 Braidwood Station as discussed below:

1. Exelon identified locations to monitor and evaluated potential impacts from station operations

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

3. Braidwood Station will continue to perform routine sampling and

radiological analysis of water from selected locations

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

5. Braidwood Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends

C. Program Description

1. Sample Collection

Sample locations can be found in Table A-1 and Figures A-1 through A-5, Appendix A.

2. Groundwater and Surface Water

Samples of groundwater and surface water are collected, managed, transported and analyzed in accordance with EPA methods. Sample locations, sample collection frequencies and analytical frequencies are managed 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 as it is received. Additionally, analytical data results are reviewed by an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium is a radioactive isotope of hydrogen. Its chemical properties are the same as hydrogen. Tritiated water behaves the same as ordinary water in both the environment and the body. Tritiated water can be taken into the body by drinking water, breathing air, eating food or absorption through the skin. Once tritiated water enters the body, it disperses quickly and is uniformly distributed. Tritiated water is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. With such a short biological half-life, an acute ingestion would be cleared rapidly. Organically bound tritium (tritium that is incorporated into carbon containing compounds) can remain in the body for a longer period. Tritium is produced naturally in the upper atmosphere when cosmic rays interact with air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity and in

special production reactors. 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 non tritiated groundwater.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by Teledyne Brown Engineering (TBE) and Environmental Incorporated Midwest Laboratory (EIML) to analyze the environmental samples for radioactivity for the Braidwood Station RGPP in 2019.

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

1. Concentrations of gamma emitters in groundwater and surface water
2. Concentrations of strontium in groundwater and surface water
3. Concentrations of tritium in groundwater and surface water
4. Concentrations of Gross Alpha and Gross Beta (Dissolved and Suspended) in groundwater and surface water
5. Concentrations of Am-241 in groundwater
6. Concentrations of Cm-242 and Cm-243/244 in groundwater
7. Concentrations of Pu-238 and Pu-239/240 in groundwater
8. Concentrations of U-234, U-235 and U-238 in groundwater
9. Concentrations of Fe-55 in groundwater
10. Concentrations of Ni-63 in groundwater

B. Data Interpretation

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

1. Lower Limit of Detection and Minimum Detectable Concentration

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

2. Laboratory Measurements Uncertainty

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

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

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

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

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

C. Background Analysis

A pre-operational radiological environmental monitoring program (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 Braidwood Nuclear Power Station Commonwealth Edison Company, Annual Report 1986, May 1987.

1. Background Concentrations of Tritium

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

a. Tritium Production

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

A major anthropogenic source of tritium and Sr-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 worldwide from 1960 to 2014. RadNet provides tritium precipitation concentration data for samples collected at stations throughout the U.S. from 1960 up to and including 2019. 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. These sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

A. Missed Samples

1. Well MW-2 was not sampled in the 1st Quarter, 2019. (IR 04251679) Two samples were taken during the 2nd Quarter in order to have 4 sets of data for the 2019 calendar year.

B. Groundwater Results

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. Tritium values ranged from the lower detection limit to 1,440 pCi/L.
(Tables B-I.1 & B-II-1, Appendix B)

Strontium

Sr-89 and Sr-90 were analyzed for in 35 samples. Sr-89 was less than the required detection limit of 10.0 pCi/liter. Sr-90 was less than the required detection limit of 1.0 pCi/liter. (Table B-I.1, Appendix B)

Gross Alpha and Beta (dissolved and suspended)

Gross Alpha and Gross Beta analyses in the dissolved and suspended fractions were performed on groundwater water samples throughout the sampling year in 2019. Gross Alpha (dissolved) was detected in 2 groundwater samples. The concentrations ranged from 1.3 to 7.7 pCi/L. Gross Alpha (suspended) was detected in 1 groundwater sample at a concentration of 2.2 ± 1.0 pCi/L. Gross Beta (dissolved and suspended) was not detected in any groundwater samples. (Table B-I.1, Appendix B)

Hard-To-Detect

Hard-To-Detect analyses including Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238 were not analyzed in 2019.
(Table B-I.3, Appendix B)

Gamma Emitters

Naturally-occurring K-40 was detected in one sample at a concentration of from 42 ± 24 pCi/L. No other gamma-emitting nuclides were detected in any of the samples analyzed. (Table B–I.2, Appendix B)

C. Surface Water Results

Samples were collected from two surface water locations 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. Tritium values were all less than the lower limit of detection. (Table B-II.1, Appendix B)

Strontium

Sr-89 and Sr-90 were analyzed in two samples. Sr-89 was less than the required detection limit of 10.0 pCi/liter. Sr-90 was less than the required detection limit of 1.0 pCi/liter. (Table B-II.1, Appendix B)

Gross Alpha (dissolved and suspended)

Two surface water samples were analyzed for Gross Alpha in the dissolved and suspended fractions. No Gross Alpha (dissolved and suspended) was detected in any of the samples analyzed. (Table B-II.1, Appendix B)

Gamma Emitters

Two surface water samples were analyzed for gamma emitters. No gamma-emitting nuclides were detected in any of the samples analyzed. (Table B–II.2, Appendix B)

D. Summary of Results – Inter-Laboratory Comparison Program

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

E. Leaks, Spills, and Releases

There were no leaks, spills or releases to groundwater in 2019.

F. Trends and Analyses

Since June 2017, the CWBD House well tritium concentrations have been decreasing steadily. Monitoring of groundwater wells surrounding the plant indicate that tritium concentrations in affected areas near the Turbine Building have remained relatively unchanged since 2010.

RW-11 and RW-12 remediation wells have been discontinued as of April 1, 2019.

G. Investigations

There were no new investigations in 2019.

H. Actions Taken

1. Installation of Monitoring Wells

   Corrective actions taken in response to the CWBD House event included the placement of multiple monitoring wells at various depths in the vicinity of the CWBD house to determine soil contamination levels, as well as the establishment of soil remediation efforts to remove the

tritium contamination from the area.

2. Compensatory Actions

   The discharges of the CWBD House remediation wells are treated as non-routine planned discharges. They are sampled regularly and permitted in the same manner as other ODCM pathways. The corresponding activity values are included as part of Table B-I.1 in this report.

3. Actions to Recover/Reverse Plumes

   Remediation efforts for the CWBD House area included the placement of multiple monitoring wells at various depths in the vicinity of the CWBD house to determine soil contamination levels, as well as the establishment of groundwater remediation efforts to remove the tritium contamination from the area.

APPENDIX A

LOCATION DESIGNATION

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TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Braidwood Station, 2019

Station Code	Sample Description
DITCH F (DS-2)	Surface Water
MW-102R	Monitoring Well
MW-11	Monitoring Well
MW-141D	Monitoring Well
MW-142D	Monitoring Well
MW-143D	Monitoring Well
MW-144D	Monitoring Well
MW-145D	Monitoring Well
MW-154	Background Well
MW-155	Background Well
MW-159D	Monitoring Well
MW-162D	Monitoring Well
MW-2	Monitoring Well
MW-4	Monitoring Well
MW-5	Monitoring Well
MW-6	Monitoring Well
MW-7	Monitoring Well
MW-9	Monitoring Well
MW-BW-201S	Monitoring Well
MW-BW-202S	Monitoring Well
MW-BW-203S	Monitoring Well
MW-BW-207I	Monitoring Well
OWM31P	Drinking Water
PS-7	Monitoring Well
PS-8	Monitoring Well
PS-9	Monitoring Well
PS-10	Monitoring Well
PS-11	Monitoring Well
PS-12	Monitoring Well
PS-13	Monitoring Well
PS-14	Monitoring Well
PS-15	Monitoring Well
PS-16	Monitoring Well
RW-6	Recovery Well
RW-11	Recovery Well
RW-12	Recovery Well
SG-BW-102 DITCH C	Surface Water
VB10-1R	Monitoring Well
VB1-1	Monitoring Well
VB11-1	Monitoring Well
VB2-5DR	Monitoring Well
VB3-2	Monitoring Well
VB5-2	Monitoring Well
VB6-1	Monitoring Well
VB7-1	Monitoring Well
VB8-2R	Monitoring Well
VB9-1	Monitoring Well

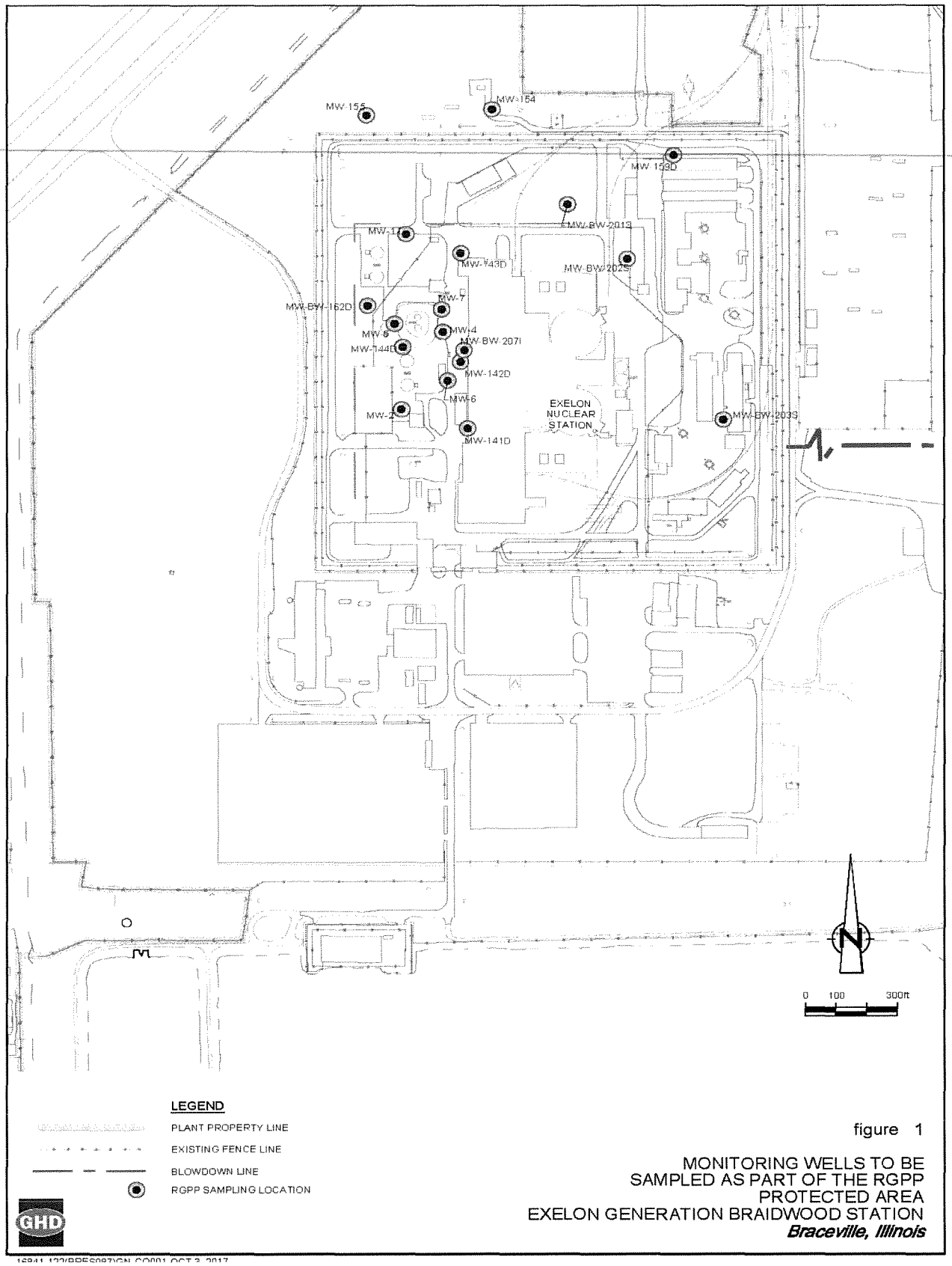

Figure A-1
RGPP Protected Area Monitoring Well Sample Locations
Braidwood Station, 2019

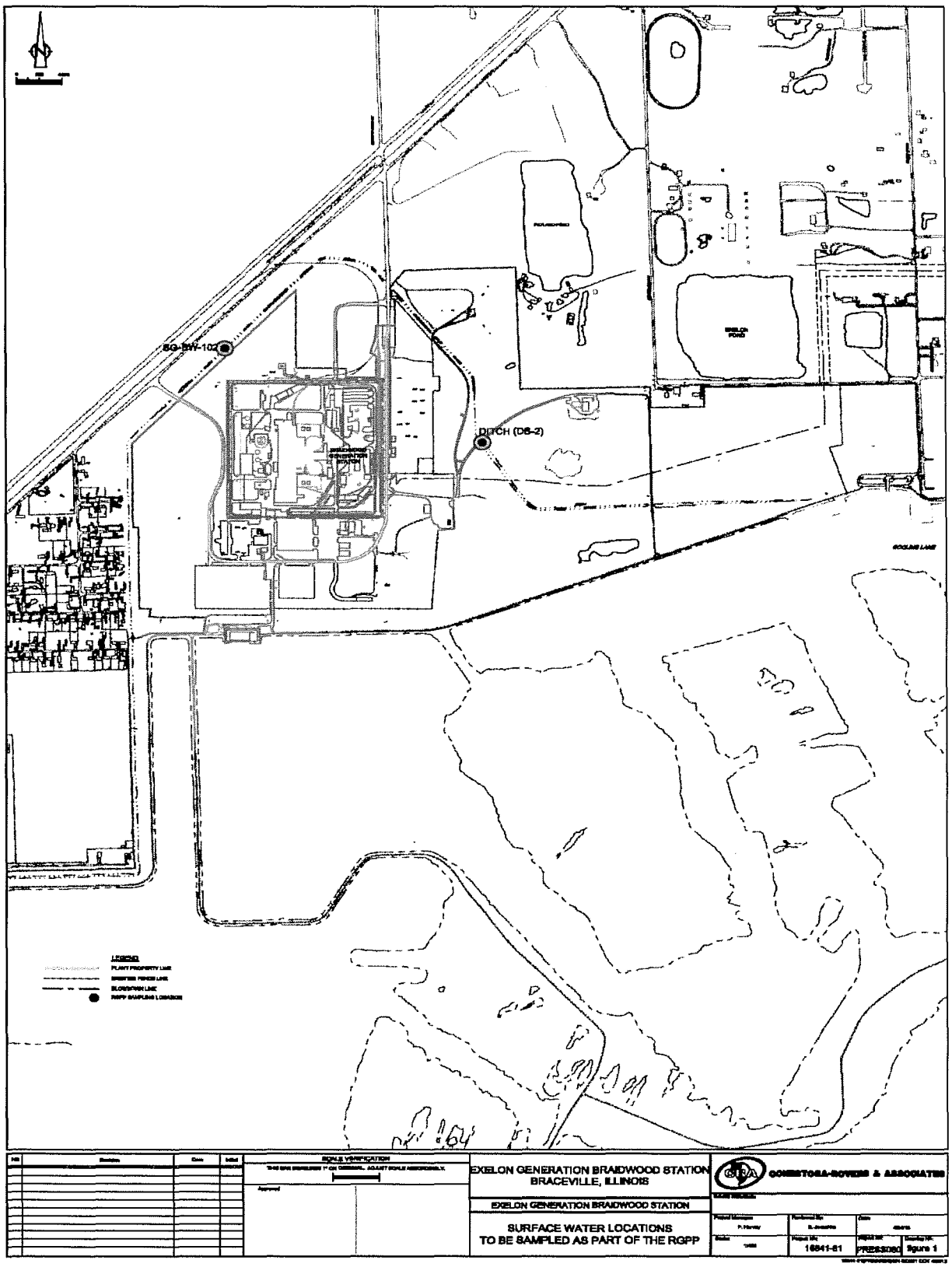

Figure A-2
RGPP Surface Water Sample Locations
Braidwood Station, 2019

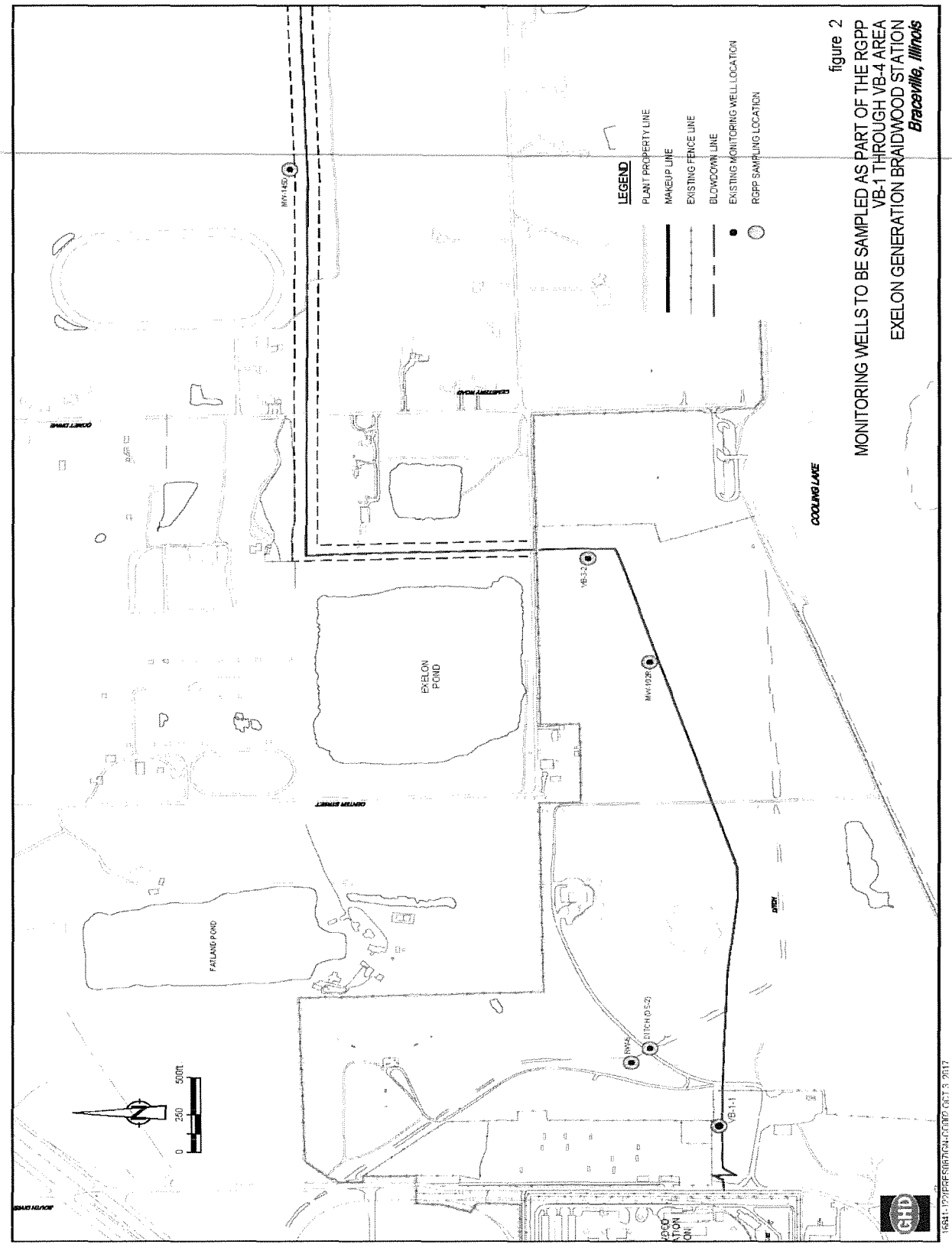

Figure A-3
RGPP VB-1 – VB-4 Area Monitoring Well Sample Locations
Braidwood Station, 2019

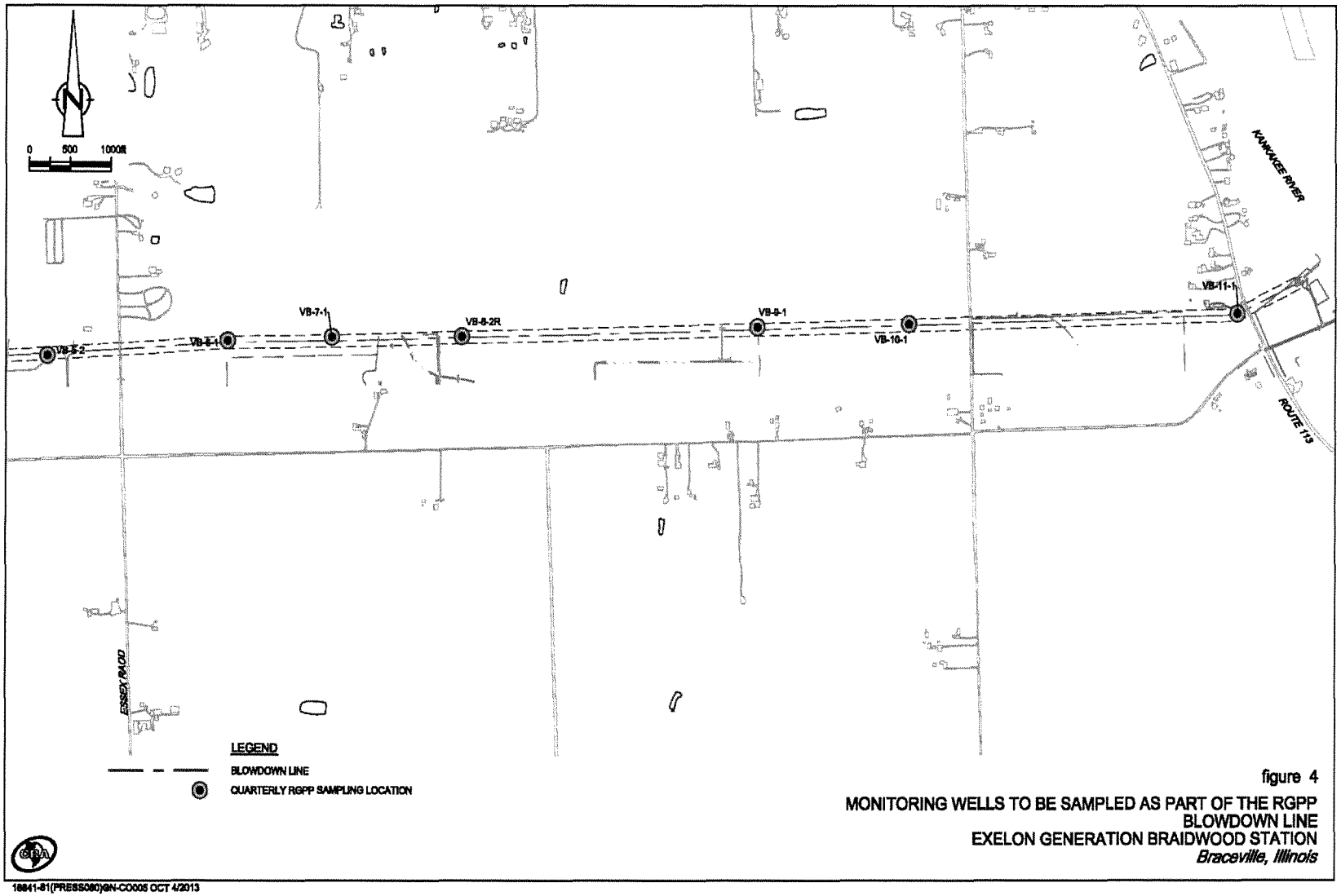

Figure A-4
RGPP Blowdown Line Monitoring Well Sample Locations
Braidwood Station, 2019

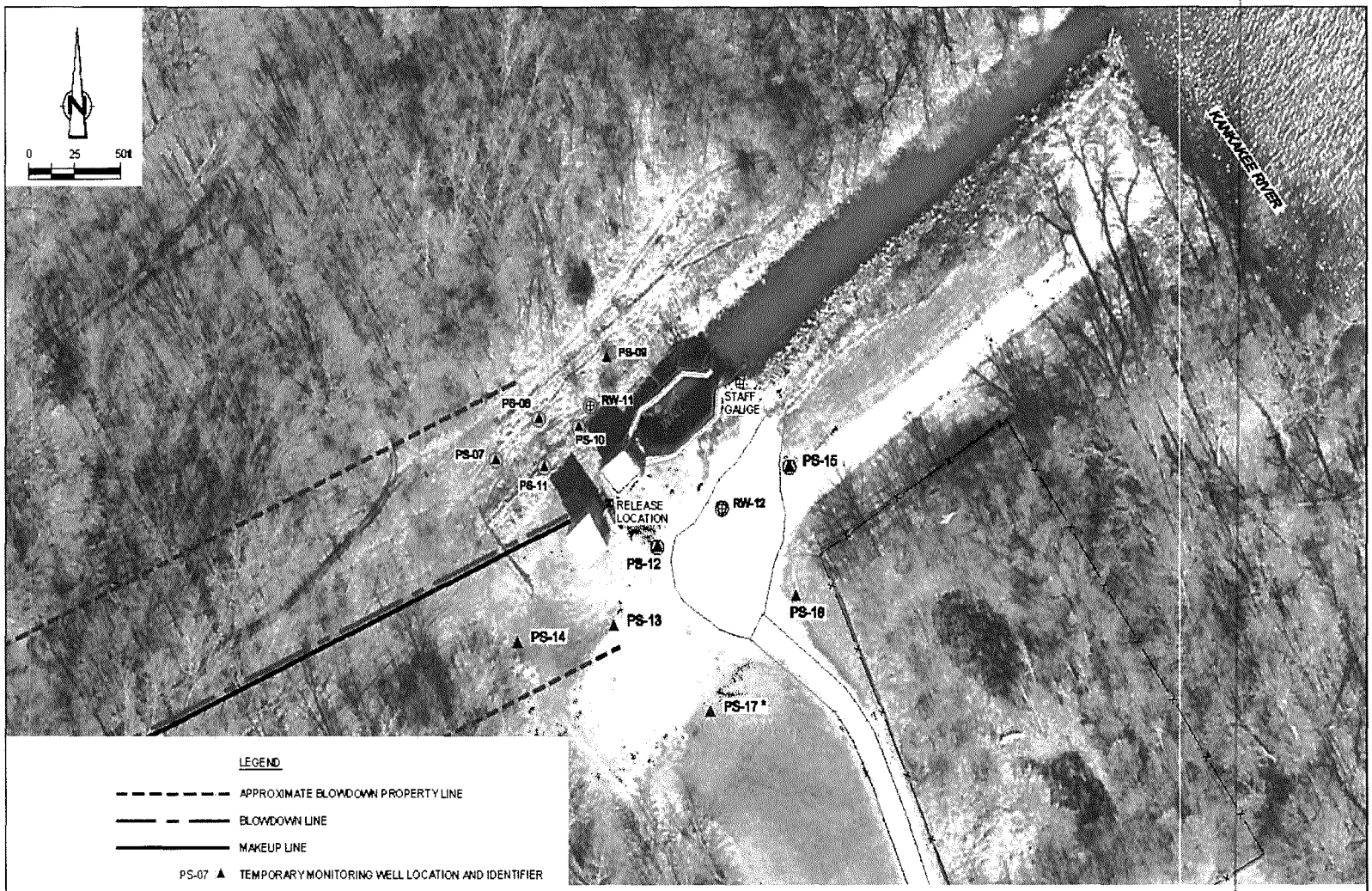

figure 3

MONITORING WELLS TO BE SAMPLED AS PART OF THE RGPP
CIRC WATER BLOWDOWN HOUSE
EXELON GENERATION BRAIDWOOD STATION
Braceville, Illinois

16841-122(PRES087)GN-C0003 OCT 3, 2017

Figure A-5
RGPP CWBD Monitoring Water Sample Locations
Braidwood Station, 2019

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 VICINITIY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)	Gr-B (Dis)	Gr-B (Sus)
MW-2	05/07/19		667 ± 149						
MW-2	06/11/19		252 ± 130						
MW-2	08/27/19		407 ± 134	< 5.0	< 1.0	1.7 ± 0.8	< 0.6	3.7 ± 0.9	< 1.4
MW-2	08/27/19	*Recount*				2.4 ± 0.8			
MW-2	08/27/19	*Reanalysis*				< 0.6			
MW-2	10/10/19		216 ± 123						
MW-4	03/07/19		722 ± 154						
MW-4	05/10/19		731 ± 152						
MW-4	09/24/19		362 ± 131	< 4.9	< 0.5	< 1.9	< 0.7		
MW-4	10/10/19		419 ± 133						
MW-5	03/20/19		355 ± 133						
MW-5	06/20/19		283 ± 132						
MW-5	08/28/19		< 189	< 7.3	< 0.9	< 0.7	< 0.6		
MW-5	10/15/19		208 ± 122	< 2.4	< 0.8	< 1.0	< 0.4		
MW-6	03/14/19		1120 ± 188						
MW-6	05/17/19		618 ± 146						
MW-6	09/24/19		582 ± 139	< 5.9	< 0.7	< 2.0	< 1.6		
MW-6	10/13/19		752 ± 153						
MW-7	03/19/19		254 ± 129						
MW-7	06/20/19		244 ± 128						
MW-7	09/24/19		198 ± 123	< 5.0	< 0.6	< 0.9	2.2 ± 1.0		
MW-7	10/15/19		257 ± 125						
MW-9	05/07/19		212 ± 133						
MW-102R	03/05/19		< 196						
MW-102R	06/11/19		< 195						
MW-102R	09/27/19		< 182	< 6.7	< 0.9	< 0.3	< 0.9		
MW-102R	10/16/19		< 184						
MW-11	03/07/19		214 ± 130						
MW-11	05/10/19		< 191						
MW-11	08/27/19		377 ± 135	< 5.3	< 0.8	< 0.8	< 0.6	2.8 ± 0.8	< 1.4
MW-11	10/10/19		< 187						
MW-141D	03/14/19		519 ± 142						
MW-141D	05/17/19		388 ± 137						
MW-141D	09/25/19		435 ± 136	< 8.0	< 0.8	< 2.7	< 1.6		
MW-141D	10/10/19		516 ± 136						
MW-142D	03/07/19		1330 ± 208						
MW-142D	06/17/19		1370 ± 212						
MW-142D	09/24/19		1440 ± 216	< 1.8	< 0.7	< **4.3**	< 3.1		
MW-142D	10/10/19		1320 ± 203						
MW-143D	03/19/19		< 195						
MW-143D	05/07/19		< 192						
MW-143D	09/30/19		< 189	< 7.3	< 0.9	7.7 ± 1.4	< 0.9		
MW-143D	10/10/19		< 184						
MW-144D	03/20/19		329 ± 134						
MW-144D	06/20/19		346 ± 134						
MW-144D	08/28/19		396 ± 135	< 7.1	< 1.0	< 0.7	< 0.6		
MW-144D	10/15/19		361 ± 134	< 2.4	< 0.7	< 0.8	< 0.4		
MW-145D	03/12/19		< 196						
MW-145D	06/24/19		< 188						
MW-145D	09/17/19		< 188	< 6.7	< 0.9	< 0.6	< 1.1		
MW-145D	12/19/19		< 188						

***BOLD** Values = Unable to meet detection limits due to high solids conten*

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA, AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITIY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)	Gr-B (Dis)	Gr-B (Sus)
MW-154	03/06/19	< 197						
MW-154	06/12/19	< 192						
MW-154	09/26/19	< 168	< 6.8	< 0.8	< 0.4	< 0.9		
MW-154	10/17/19	< 190						
MW-155	03/06/19	< 192						
MW-155	06/12/19	< 193						
MW-155	09/26/19	< 192	< 4.3	< 1.0	< 0.6	< 0.9		
MW-155	10/17/19	< 189						
MW-159D	02/19/19	394 ± 138						
MW-159D	05/10/19	433 ± 139						
MW-159D	08/27/19	452 ± 135	< 4.5	< 0.7	< 1.2	< 0.6	5.3 ± 1.1	< 1.4
MW-159D	10/13/19	238 ± 126						
MW-162D	03/20/19	209 ± 127						
MW-162D	06/20/19	224 ± 127						
MW-162D	08/27/19	519 ± 140	< 5.5	< 0.8	< 1.0	< 0.6	4.7 ± 1.0	< 1.4
MW-162D	10/15/19	236 ± 124						
MW-BW-201S	02/19/19	741 ± 157						
MW-BW-201S	05/17/19	486 ± 143						
MW-BW-201S	09/25/19	544 ± 142	< 9.0	< 0.6	< 0.9	< 0.6		
MW-BW-201S	10/13/19	491 ± 133						
MW-BW-202S	02/19/19	288 ± 135						
MW-BW-202S	05/10/19	235 ± 131						
MW-BW-202S	09/23/19	232 ± 126	< 5.7	< 1.0	< 1.9	< 0.6		
MW-BW-202S	10/12/19	269 ± 127						
MW-BW-203S	02/19/19	< 196						
MW-BW-203S	05/10/19	< 194						
MW-BW-203S	09/23/19	237 ± 127	< 5.1	< 0.6	< 2.0	< 0.6		
MW-BW-203S	10/13/19	193 ± 122						
MW-BW-207I	03/07/19	895 ± 169						
MW-BW-207I	05/17/19	848 ± 161						
MW-BW-207I	06/17/19	792 ± 160						
MW-BW-207I	09/24/19	822 ± 160	< 6.1	< 0.8	< 2.4	< 1.6		
MW-BW-207I	11/20/19	833 ± 161						
OWM31P	09/26/19	< 189						
PS-7	01/22/19	< 192						
PS-8	01/23/19	< 187						
PS-9	01/22/19	< 185						
PS-10	01/23/19	829 ± 154						
PS-10	03/05/19	573 ± 143						
PS-10	06/04/19	229 ± 130						
PS-10	09/30/19	224 ± 119	< 6.4	< 0.9	< 0.7	< 1.0		
PS-10	10/14/19	277 ± 124						
PS-11	01/22/19	< 187						
PS-12	01/22/19	494 ± 137						
PS-12	03/05/19	403 ± 139						
PS-12	06/04/19	< 192						
PS-12	09/30/19	< 191	< 7.7	< 0.8	< 0.5	< 0.9		
PS-12	10/14/19	< 185						
PS-13	01/22/19	< 186						
PS-14	01/22/19	< 186						
PS-15	01/22/19	< 193						
PS-16	01/22/19	< 189						
RW-6	01/04/19	280 ± 134						

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, GROSS ALPHA, AND GROSS BETA IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITIY OF BRAIDWOOD STATION, 2019

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)
RW-6	02/25/19	406 ± 136						
RW-6	03/21/19	306 ± 132						
RW-6	04/16/19	246 ± 133						
RW-6	05/30/19	247 ± 131						
RW-6	06/04/19	242 ± 132						
RW-6	07/29/19	284 ± 135						
RW-6	08/22/19	308 ± 128	< 4.8	< 0.7	< 3.0	< 0.6	2.4 ± 1.3	< 1.4
RW-6	09/30/19	231 ± 122	< 3.0	< 0.7	< 0.8	< 1.0		
RW-6	10/13/19	318 ± 127						
RW-6	11/07/19	< 189						
RW-6	12/09/19	< 195						
RW-12	01/23/19	< 186						
VB1-1	03/06/19	< 196						
VB1-1	06/12/19	< 192						
VB1-1	09/26/19	< 177	< 7.9	< 0.9	< 0.8	< 0.9		
VB1-1	10/17/19	< 187						
VB3-2	06/11/19	< 192						
VB3-2	09/27/19	< 183	< 4.1	< 1.0	1.3 ± 0.7	< 0.9		
VB3-2	10/16/19	< 186						
VB5-2	03/12/19	< 196						
VB5-2	06/24/19	< 189						
VB5-2	09/17/19	< 188	< 5.7	< 0.7	< 0.7	< 1.4		
VB5-2	12/19/19	< 188						
VB6-1	03/12/19	< 197						
VB6-1	06/24/19	< 187						
VB6-1	09/17/19	< 186	< 6.2	< 0.8	< 0.7	< 0.6		
VB6-1	12/19/19	< 186						
VB7-1	03/12/19	< 197						
VB7-1	06/24/19	< 189						
VB7-1	09/17/19	< 186	< 6.5	< 0.8	< 0.7	< 0.6		
VB7-1	12/19/19	< 185						
VB8-2R	03/12/19	< 190						
VB8-2R	06/24/19	< 190						
VB8-2R	09/17/19	< 182	< 8.1	< 0.7	< 0.8	< 0.6		
VB8-2R	12/19/19	< 191						
VB9-1	03/12/19	< 190						
VB9-1	06/24/19	< 186						
VB9-1	09/17/19	< 187	< 5.3	< 0.8	< 1.0	< 0.7		
VB9-1	12/19/19	< 185						
VB10-1R	03/12/19	< 191						
VB10-1R	06/24/19	< 192						
VB10-1R	09/17/19	< 186	< 5.5	< 0.9	< 0.9	< 0.6		
VB10-1R	12/19/19	< 188						
VB11-1	03/12/19	< 192						
VB11-1	06/24/19	< 189						
VB11-1	09/17/19	< 186	< 7.6	< 0.9	< 0.8	< 1.2		
VB11-1	12/19/19	< 184						

TABLE B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	I-131	Cs-134	Cs-137	Ba-140	La-140
MW-2	08/27/19	< 14	< 15	< 1	< 1	< 3	< 2	< 3	< 2	< 3	< 5	< 2	< 1	< 11	< 4
MW-4	09/24/19	< 46	< 97	< 5	< 4	< 9	< 5	< 10	< 6	< 9	< 15	< 4	< 4	< 31	< 10
MW-5	08/28/19	< 18	< 33	< 1	< 2	< 5	< 1	< 3	< 2	< 4	< **46**	< 2	< 1	< 42	< 15
MW-5	10/15/19	< 57	< 61	< 6	< 7	< 12	< 6	< 15	< 8	< 11	< 13	< 8	< 7	< 35	< 12
MW-6	09/24/19	< 44	< 95	< 6	< 6	< 10	< 4	< 10	< 5	< 10	< 14	< 6	< 4	< 32	< 9
MW-7	09/24/19	< 47	< 85	< 5	< 4	< 12	< 4	< 9	< 5	< 9	< 14	< 6	< 5	< 40	< 14
MW-102R	09/27/19	< 42	< 92	< 5	< 5	< 10	< 6	< 11	< 5	< 9	< 12	< 6	< 5	< 33	< 8
MW-11	08/27/19	< 16	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 6	< 2	< 2	< 12	< 4
MW-141D	09/25/19	< 42	< 72	< 4	< 5	< 10	< 3	< 9	< 4	< 8	< 12	< 5	< 4	< 24	< 9
MW-142D	09/24/19	< 43	< 57	< 4	< 5	< 12	< 5	< 10	< 5	< 10	< 14	< 6	< 4	< 33	< 11
MW-143D	09/30/19	< 51	< 69	< 6	< 7	< 12	< 8	< 15	< 8	< 11	< 13	< 7	< 7	< 36	< 12
MW-144D	08/28/19	< 18	< 12	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< **45**	< 1	< 1	< 38	< 15
MW-144D	10/15/19	< 57	< 95	< 7	< 7	< 14	< 7	< 16	< 9	< 11	< 14	< 7	< 7	< 35	< 14
MW-145D	09/17/19	< 47	< 106	< 3	< 5	< 11	< 4	< 9	< 5	< 8	< 6	< 6	< 4	< 18	< 8
MW-154	09/26/19	< 39	< 89	< 4	< 5	< 12	< 5	< 8	< 4	< 8	< 11	< 5	< 5	< 28	< 9
MW-155	09/26/19	< 53	< 122	< 6	< 5	< 12	< 5	< 12	< 6	< 10	< 13	< 5	< 5	< 35	< 9
MW-159D	08/27/19	< 16	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 6	< 2	< 2	< 13	< 4
MW-162D	08/27/19	< 15	< 17	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 6	< 2	< 2	< 12	< 5
MW-BW-201S	09/25/19	< 51	< 109	< 5	< 5	< 12	< 6	< 9	< 6	< 10	< 15	< 6	< 6	< 37	< 13
MW-BW-202S	09/23/19	< 37	< 63	< 4	< 4	< 8	< 4	< 8	< 4	< 7	< 14	< 4	< 4	< 28	< 12
MW-BW-203S	09/23/19	< 38	< 87	< 4	< 5	< 8	< 4	< 6	< 4	< 8	< 14	< 5	< 4	< 28	< 10
MW-BW-207I	09/24/19	< 42	< 99	< 4	< 5	< 11	< 5	< 11	< 4	< 9	< 15	< 5	< 5	< 26	< 11
PS-10	09/30/19	< 58	< 118	< 6	< 8	< 15	< 7	< 12	< 8	< 9	< 11	< 7	< 6	< 32	< 11
PS-12	09/30/19	< 67	< 154	< 7	< 7	< 13	< 7	< 14	< 6	< 11	< 12	< 10	< 5	< 37	< 14
RW-6	08/22/19	< 15	42 ± 24	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 8	< 2	< 2	< 15	< 5
RW-6	09/30/19	< 58	< 153	< 4	< 5	< 18	< 5	< 14	< 8	< 14	< 11	< 8	< 6	< 39	< 14
VB1-1	09/26/19	< 45	< 90	< 5	< 5	< 12	< 6	< 11	< 5	< 10	< 11	< 5	< 5	< 29	< 9
VB3-2	09/27/19	< 59	< 58	< 6	< 6	< 13	< 5	< 10	< 6	< 10	< 14	< 7	< 6	< 35	< 10
VB5-2	09/17/19	< 40	< 77	< 5	< 4	< 9	< 5	< 8	< 5	< 8	< 6	< 4	< 5	< 19	< 7
VB6-1	09/17/19	< 44	< 113	< 5	< 5	< 10	< 5	< 12	< 5	< 9	< 6	< 5	< 6	< 19	< 8
VB7-1	09/17/19	< 46	< 94	< 5	< 6	< 12	< 6	< 12	< 5	< 10	< 8	< 7	< 5	< 23	< 7
VB8-2R	09/17/19	< 54	< 142	< 8	< 6	< 10	< 7	< 11	< 6	< 10	< 8	< 7	< 5	< 23	< 11
VB9-1	09/17/19	< 50	< 68	< 5	< 7	< 14	< 7	< 14	< 7	< 10	< 8	< 7	< 8	< 33	< 5
VB10-1R	09/17/19	< 48	< 102	< 4	< 6	< 8	< 8	< 16	< 7	< 11	< 9	< 6	< 7	< 22	< 10
VB11-1	09/17/19	< 43	< 50	< 5	< 5	< 10	< 6	< 11	< 5	< 9	< 8	< 5	< 5	< 24	< 8

***BOLD** Values = Lab unable to meet client required detection limit due to the age of sample at time of receipt/analysis*

TABLE B-I.3

CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

There were no Hard To Detect Analyses in 2019

TABLE B-II.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, AND GROSS ALPHA IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)
DITCH F (DS-2)	03/05/19	< 196				
DITCH F (DS-2)	06/11/19	< 193				
DITCH F (DS-2)	09/30/19	< 182	< 6.2	< 0.8	< 0.7	< 1.2
DITCH F (DS-2)	10/13/19	< 187				
SG-BW-102 DITCH C	03/05/19	< 197				
SG-BW-102 DITCH C	06/04/19	< 194				
SG-BW-102 DITCH C	09/30/19	< 179	< 5.4	< 0.9	< 1.7	< 4.8
SG-BW-102 DITCH C	10/16/19	< 186				

TABLE B-II.2

CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF BRAIDWOOD STATION, 2019

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
DITCH F (DS-2)	09/30/19	< 49	< 107	< 5	< 5	< 11	< 6	< 12	< 7	< 8	< 10	< 6	< 6	< 28	< 8
SG-BW-102 DITCH C	09/30/19	< 62	< 151	< 7	< 7	< 16	< 7	< 16	< 7	< 15	< 14	< 7	< 7	< 33	< 11

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