NEXTera ENERGY
DUANE ARNOLD

May 14, 2019

NG-19-0060
TS 5.6.2

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

Subject: 2018 Annual Radiological Environmental Operating Report

Please find as Enclosure 1 to this letter, a copy of NextEra Energy Duane Arnold, LLC's 2018 Annual Radiological Environmental Operating Report for the Duane Arnold Energy Center, pursuant to the requirements of ODAM Section 8.2.2 and Technical Specification Section 5.6.2.

This letter contains no new commitments nor does it revise any existing commitments.

Should you have any questions regarding this matter, please contact Michael Casey at (319) 851-7606.

Sincerely,

Dean Curtland

Dean Curtland
Site Director
NextEra Energy Duane Arnold, LLC

Enclosure

cc: Regional Administrator, USNRC, Region III
Resident Inspector, USNRC, Duane Arnold Energy Center
Project Manager, USNRC, Duane Arnold Energy Center

Enclosure 1 to
NG-19-0060

Duane Arnold Energy Center

2018 Annual Radiological Environmental Operating Report

139 pages follow

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2018

Annual Radiological Environmental Operating Report

Duane Arnold Energy Center

Cedar Rapids, Iowa

Docket No. 50-331

January 1, 2018 through December 31, 2018

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2018
Annual Radiological Environmental Operating Report

Duane Arnold Energy Center
DOCKET NUMBER. 50-331

Prepared By: _____ Date: 4/29/19
Daron Tanko

Reviewed By: _____ Date: 4/30/19
Michael Casey

Approved By: _____ Date: 5/1/19
Dean Curtland

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Fact Sheet

Duane Arnold Energy Center

SITE ADDRESS
3277 DAEC Road
Palo, IA 52324

CORPORATE MEDIA LINE
(561) 694-4442

Safety Information

Built in a low-risk seismic zone: Duane Arnold is in a very seismically stable area of the country.

Constructed to withstand earthquakes and tornados: Despite the low risk from seismic events, the plant is designed to withstand earthquakes, tornados and other events stronger than ever recorded in the region.

Protected from flooding: The plant is elevated 20 feet above river level to protect against flooding.

- During 2008's historic 500-year flood, the Cedar River crested 14 feet below the plant's design flood level
- During this event, DAEC was able to continue safe and reliable operations

Seven-day power supply: Safety and cooling systems can be powered for seven days without requiring any offsite power or additional fuel.

Designed with multiple safety systems: The Nuclear Regulatory Commission has mandated several structural improvements over time, enhancing Duane Arnold's ability to deal with significant events:

- Four offsite power lines power the site's cooling system
- Two on-site diesel generators are available to provide back-up emergency power to plant safety equipment
- Multiple steam-driven cooling pumps are available to power cooling systems (do not require external power)
- Back-up batteries for all critical cooling and control room systems are stored on-site
- External cooling options (i.e. injection and fire pumps) are pre-staged on-site; can use river water for cooling

Highly trained plant operators: For one full week out of every six weeks, plant operators must prove their ability to safely operate the plant in a variety of worst-case scenarios that include earthquakes, severe storms, flooding, loss-of-power and loss of reactor core cooling.

System Information

PRIMARY SYSTEM	
Reactor Type	One General Electric Boiling Water Reactor with a net electrical output of 615 MWe
Reactor Core	368 fuel assemblies
Reactor Vessel	67' high; 15' wide
Reactor Design	General Electric Mark 1
SECONDARY SYSTEM	
Turbine/Generator	General Electric
Cooling Towers	Mechanical draft type — two towers, 12 cells each, makeup water from Cedar River

General Information

The Duane Arnold Energy Center (DAEC) is located in Palo, Iowa, approximately nine miles northwest of Cedar Rapids. It is bordered by cornfields of neighboring farms and the banks of the Cedar River.

- **Workforce**
  600 during normal operations; nearly 1,500 during outage operations
- **Salaries**
  Approximately $85 million annually
- **Economic impact**
  Stimulates $255 million in economic activity in Iowa, $514 million nationally
- **Property taxes paid**
  Approximately $3 million annually
- **Construction permit granted**
  June 1970
- **Full power operating license**
  February 1974
- **Commercial operation**
  February 1975

For More Information:
nexteraenergyresources.com
duanearnold.com
nrc.gov

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DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
DOCKET NO. 50-331

REPORT

to the

UNITED STATES
NUCLEAR REGULATORY COMMISSION

Annual Radiological Environmental Operating Report

January 1 to December 31, 2018

Prepared by

ATI ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Approved: A Banavali 4/18/19

Ashok Banavali, Ph.D..
Laboratory Manager

PREFACE

Staff members of the Environmental, Inc., Midwest Laboratory were responsible for the acquisition of data presented in this report, with the exception of Appendices D and E which were completed by DAEC personnel. All environmental samples, with the exception of aquatic, were collected by personnel of DAEC. Aquatic samples were collected by the University of Iowa Hygienic Laboratory.

The report was prepared by Environmental, Inc., Midwest Laboratory, with the exception of Appendices D and E, which were prepared by DAEC personnel.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program (REMP) conducted by Environmental, Inc., Midwest Laboratory at the Duane Arnold Energy Center, Palo, Iowa, during the period January - December, 2018. This Program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the plant on its surroundings.

The REMP fulfills the requirements of Sections IV.B.2 and IV.B.3 of Appendix I to 10 CFR 50 for the operation of the plant. The REMP also fulfills the requirements of 10 CFR 72.44(d)(2) for operation of the ISFSI.

Tabulations of individual analyses made during the year are included in Part II of this report.

The Duane Arnold Energy Center (DAEC) is a boiling water reactor, located in Linn County, Iowa, on the Cedar River, and owned and operated by NextEra Energy Resources. Initial criticality was attained on March 23, 1974. The reactor reached 100% power on August 12, 1974. Commercial operation began on February 1, 1975.

2.0 SUMMARY

The Radiological Environmental Monitoring Program, as required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Duane Arnold Energy Center, is herein described. Results for the year 2018 are summarized and discussed. Information regarding DAEC effluents and the Offsite Dose Assessment Manual (ODAM) can be found in the 2018 Annual Radiological Material Release Report (ARMRR).

Program findings show only background levels of radioactivity in the environmental samples collected in the vicinity of the Duane Arnold Energy Center.

No effect on the environment is indicated in the areas surrounding the site of the Duane Arnold Energy Center.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program at the Duane Arnold Energy Center (DAEC) is to assess the impact of the plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLDs).

Sources of environmental radiation include the following:

(1) Natural background radiation arising from cosmic rays and primordial radionuclides;
(2) Fallout from atmospheric nuclear detonations;
(3) Releases from nuclear power plants; and
(4) Industrial and medical radioactive waste.

In interpreting the data, effects due to the DAEC operation must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the DAEC which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A station effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in the environmental samples collected from the DAEC site. The DAEC's monitoring program includes analyses for strontium-90 and iodine-131, which are fission products, and tritium, which is produced by cosmic rays, atmospheric nuclear detonations, and also by nuclear power plants. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, and cerium-144. These three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products ten (10) days after reactor shutdown. On the other hand, ten (10) days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud,1963). The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the next group, manganese-54, cobalt-58 and-60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of nuclear power plant effluents, but are not produced in significant quantities by nuclear detonations. Nuclides of the final group, beryllium-7, which is of cosmogenic origin, and potassium-40, a naturally-occurring isotope, were chosen as calibration monitors and provide a comparison between levels of naturally occurring radionuclides and radionuclides that could be attributed to the operation of the plant.

Characteristic properties of isotopes quantified in gamma-spectroscopic analysis are presented in Table 5.1. Other means of distinguishing sources of environmental radiation can be employed in interpreting the data. Current radiation levels can be compared with previous levels, including those measured before the Plant became operational. Results of the DAEC's Monitoring Program

can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.2 Program Description

3.2.1 Environmental Monitoring

The sampling and analysis schedule for the Radiological Environmental Monitoring Program (REMP) at the DAEC is summarized in Table 5.2 and is briefly reviewed below. Table 5.3 defines the sampling location codes used in Table 5.2 and specifies for each location its distance, direction, and sector relative to the reactor site. The types of samples collected at each location and the frequency of collections are presented in Table 5.4 using codes defined in Table 5.5.

To monitor the air environment, a continuous air sampler is employed. Airborne particulates and activated charcoal canisters are mounted on the intake of the air sampler to collect airborne particulates and airborne iodine respectively. 2018 began with nine sampling locations. Eight of the nine locations are indicators and one is a control (D-13). One additional indicator location, (D-4), was added in September 2018. Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity. If gross beta activity exceeds ten times the yearly mean of the control samples, gamma isotopic analysis is performed. Quarterly composites of airborne particulates from each location are analyzed for gamma emitting isotopes. Charcoal canister samples are analyzed weekly for iodine-131.

Ambient gamma radiation is monitored at a total of 52 locations. A TLD is placed at each location and exchanged and analyzed quarterly. The TLD locations are distributed as follows:

- Two on-site locations
- Eighteen in a circle within a 0.5 mi. radius from the DAEC stack.
- Six in 22.5° sectors within 1 mi. from the DAEC stack.
- Ten in 22.5° sectors between 1 and 3 miles from the DAEC stack.
- Twelve control locations greater than 3 miles from the DAEC stack.
- Four along sections of the Independent Spent Fuel Storage Installation (ISFSI) fence line.

Surface water is collected monthly from five river locations, D-49 (Lewis Access, Control, 4 mi. upstream), D-50 (Inlet), D-51 (Discharge) and D-61 (downstream of Discharge) and also from Pleasant Creek Lake (D-99). The monthly samples are analyzed for tritium and gamma-emitting isotopes. Additional analyses are performed on samples collected from the control and indicator locations, D-49 and D-61. Analyses for low-level iodine-131 are performed on monthly collections and quarterly composites are prepared and analyzed for strontium-89 and strontium-90.

The aquatic environment is also monitored by upstream and downstream (D-49 and D-61) semiannual collections of fish.

River bottom sediment is collected semiannually at the plant's intake (D-49) and discharge (D-51) and the site's north drainage ditch (D-107A). The samples are analyzed for gamma-emitting isotopes.

Potable groundwater is collected monthly from the Cedar Rapids treated municipal water system (D-53), the inlet to the Cedar Rapids municipal water treatment system (D-54), four indicator locations (D-52, D-55, D-57, D-58) and one control location (D-72). The samples are analyzed for tritium and gamma emitting isotopes. Any positive identification of a reactor by-product material initiates analyses for hard to detect isotopes of Ni-63, Sr-89, Sr-90, Fe-55 and gross alpha. The samples are analyzed for tritium, I-131 by chemical separation to an MDC of 1 pCi/L, and gamma emitting isotopes.

For 2018, dairy cow milk is collected monthly from one indicator (D-110) and one control location (D-138) from January to December. Monthly sampling was determined to be sufficient due to the milk sampling locations more than five miles from the facility. The samples are analyzed for iodine-131 and gamma-emitting isotopes. This sampling is supplemented with goat's milk when available from indicator location (D-76).

Additional monitoring of the terrestrial environment, grain, hay, grass and broadleaf vegetation samples are collected annually, as available, from seven locations: one control (D-138) and six indicators (D-57, D-77, D-96, D-108, D-110 and D-118). Grain, hay and broadleaf (green leafy) vegetation samples are analyzed for gamma-emitting isotopes and at least two broad leaf vegetation samples are analyzed for iodine-131. Vegetation control samples are purchased from local grocery and feed stores provided the sample source is outside the State of Iowa.

If any of the cattle grazing on-site are slaughtered for home use, a meat sample is collected. The sample is analyzed for gamma-emitting isotopes. A single deer meat sample from a legally harvested animal was collected near D-99.

3.2.2 Groundwater Protection Program

Environmental, Inc., Midwest Laboratory provides laboratory services for the Duane Arnold Energy Center Groundwater Protection Program (GWPP). The GWPP is formally included within REMP and the standards are set forth in the ODAM, Table 6.3-2. The Groundwater Protection Program encompasses activities to ensure the protection of groundwater within the owner controlled area by sampling the groundwater, soil, precipitation, electrical vault and sewage effluent. For sewage effluent results only, refer to the Duane Arnold Energy Center, 2018 Annual Radioactive Material Release Report and Table 23 of Part II of this report for groundwater, soil, electrical vault, and precipitation sample results.

3.3 Program Execution

The program was executed as described in the preceding section with the following exceptions:

(1) Airborne Particulates / Airborne Iodine:

Air particulate / air iodine sampling was brought on-line at new air station location D-4, 09/07/18. The air station at location D-11 was affected by a power outage (07/20/18). The air station at location D-16 experienced an outage beginning after the 07/06/18 collection and was not restored until after 08/24/18. Details of the outages are listed in table 5.6.

(2) Thermoluminescent Dosimetry

TLD's were found missing for the first quarter at location D-40, The fourth quarter TLD's at both locations D-17 and D-82 were found missing. Location D-4 was added to the TLD network.

(3) Milk

Goat's milk was unavailable at location D-76 throughout 2018 due to limited herd production. Details of the missed scheduled collections are listed in table 5.6.

(4) Well Water

Well water was also not available at locations D-58 and D-72 for the 2/21/18 collection due to freezing. Well water was also unavailable at D-111A on 02/14/18.

(5) Surface Water

Surface water was unavailable at location D-99 for the 01/26/18 sampling event due to freezing.

(6) Precipitation

Precipitation was unavailable at location D-16 for the 08/01/18 sampling event due to no sampler at the location.

(7) Potable Water

Potable water was not available at location D-52 due to maintenance at source.

3.4 Laboratory Procedures

The Iodine-131 analyses in milk and water were made using a sensitive radiochemical procedure involving separation of iodine using an ion-exchange method, solvent extraction and subsequent beta counting. Levels of iodine-131 in vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. The gamma isotopic analysis provides a spectrum with an energy range from 80 to 2048 KeV. Specific isotopes included in the gamma library are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters, such as Be-7, K-40 and Ra daughters, are frequently detected but may not be listed.

Tritium was measured by liquid scintillation spectrometry.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2018). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

There were a few changes to the REMP program in 2018. Air sampling and TLD at location D-4 were added to the program in 2018. Precipitation sampling location D-115 was added and D-114 discontinued in 2018. REMP and GWPP standards and requirements can be found in the Duane Arnold Energy Center 2018 Annual Radiological Material Release Report in Attachment 2, ODAM.

4.0 RESULTS AND DISCUSSION

All collections and analyses were made as scheduled, except for those listed in Table 5.6.

Results are summarized in Table 5.7 as recommended by the Nuclear Regulatory Commission. For each type of analysis and sample medium, the table lists the mean and range of all indicator and control locations, as well as that location with the highest mean and range.

Tabulated results of measurements are not included in this section, although reference to these results will be made in discussion. A complete tabulation of results for 2018 is contained in Part II of the Annual Report on the Radiological Environmental Monitoring Program for the Duane Arnold Energy Center.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

There were no reported accidents involving significant release to the environment at nuclear reactor facilities in 2018. The Fukushima Daiichi nuclear accident occurred March 11, 2011.

There were no reported atmospheric nuclear tests in 2018. The last reported test was conducted on October 16, 1980 by the People's Republic of China.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected outside of the Owner Controlled Area in 2018. The trace levels of cesium-137, still measurable in soil, are attributed to deposition of fallout from nuclear weapons testing from previous decades.

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were similar at indicator and control locations (0.028 and 0.026 pCi/m3, respectively) and similar to levels observed from 1995 through 2016. The results are tabulated below.

Year	Indicators	Controls		Year	Indicators	Controls
Concentration (pCi/m^3)				Concentration (pCi/m^3)		
2000	0.026	0.027		2010	0.028	0.028
2001	0.026	0.026		2011	0.030	0.029
2002	0.027	0.027		2012	0.030	0.029
2003	0.029	0.029		2013	0.028	0.025
2004	0.028	0.028		2014	0.026	0.025
2005	0.031	0.031		2015	0.027	0.024
2006	0.029	0.027		2016	0.027	0.023
2007	0.031	0.031		2017	0.028	0.025
2008	0.029	0.029		2018	0.028	0.026
2009	0.031	0.030				

Average annual gross beta concentrations in airborne particulates.

4.2 Program Findings, Airborne Particulates (continued)

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7,produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955), was detected in all samples, with an average activity of 0.080 pCi/m^3 for indicator locations and 0.077 pCi/m^3 for the control location. No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the ODAM.

Airborne Iodine

Levels of airborne iodine-131 measured below the required limit of 0.030 pCi/m^3 with the exception of the sample collected at location D-11 for the week ending 6/15/18 (Power outage) and 7/20/18 (low volume) and for location D-16 for the period 07/06/18 through 08/24/18 due to the air sampler being removed from service.

Ambient Radiation (TLDs)

At twelve control locations, thermoluminescent dosimeter (TLD) readings averaged 17.1 mR/quarter. At locations within a half mile, one mile and three mile radius of the stack, the measurements averaged 19.5, 19.1 and 17.1 mR/quarter, respectively. The two on-site locations D-15 and D-16 averaged 17.4 and 17.7 mR/quarter respectively. These average measurements are similar to the estimated average natural background radiation for Middle America, 19.5 mR/quarter, which is based on data on Pages 71 and 108 of the report, "Natural Background Radiation in the United States" (National Council on Radiation Protection and Measurements, 1975). The terrestrial absorbed dose (uncorrected for structural and body shielding) ranges from 8.8 to 18.8 mrad/quarter and averages 11.5 mrad/quarter for Middle America. Cosmic radiation and cosmogenic radionuclides contribute 8.0 mrad/quarter for a total average of 19.5 mrad/quarter. No plant effect is indicated.

ISFSI Facility Operations Monitoring

Four TLDs, placed directionally along the ISFSI fence line, averaged 33.7 mR/quarter. The TLD site D-30, located between the nearest residence and the ISFSI site averaged 21.0 mR/quarter. Calculated dose rates indicate the site is in compliance with 10 CFR 72.104 and 40 CFR 190.

Milk

Iodine-131 concentrations in milk samples were less than the LLD level of 1.0 pCi/L.

No gamma-emitting isotopes, excepting naturally occurring potassium-40, were detected in any milk samples. This is consistent with findings that most radio-contaminants in feed do not find their way into milk due to the selective metabolism of the cow. The common exceptions are radioisotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the ODAM.

Groundwater (drinking water-potable)

Tritium concentrations in ground water samples were less than the MDC of 160 pCi/L in all samples analyzed. Gamma-emitting isotopes were below detection limits.

No reactor by-product radionuclides could be identified. All samples met required lower limits of detection as specified in the ODAM.

4.2 Program Findings (continued)

Vegetation

Iodine-131 concentrations in vegetation samples were less than the LLD level of 0.054 pCi/g wet weight in all samples analyzed. Samples of both broadleaf vegetation as well as grain and forage types were analyzed.

With the exception of potassium-40, which was observed in all vegetation samples, all other gamma-emitting isotopes were below detection limits. No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the ODAM.

Surface Water

Surface water was tested for tritium and gamma emitting isotopes in fifty-nine samples from five locations. No measurable tritium activity was detected above an LLD of 160 pCi/L.

Analyses for I-131 were performed on samples from locations D-49 (control) and D-61 (0.5 mi. downstream, indicator). No measurable I-131 was detected above an LLD of 0.5 pCi/L.

Quarterly composites were also prepared from the samples collected at locations D-49 and D-61 and tested for strontium-89 and strontium-90. All samples tested below detection limits.

No plant effect on surface water is indicated.

Fish

Fish were collected in July and August, 2018, and analyzed for gamma-emitting isotopes. With the exception of naturally-occurring potassium-40, no gamma-emitting isotopes were identified in edible portions of fish. The potassium-40 level was similar at both the indicator and control locations (3.38 and 3.08 pCi/g wet, respectively).

No reactor by-product radionuclides were identified. All samples met required lower limits of detection as specified in the ODAM.

River Sediments

Six river sediments were collected in 2018 during the months of April and October, and analyzed for gamma-emitting isotopes. Potassium-40 activity ranged from 5.65 to 8.08 pCi/g dry weight at the indicator locations and between 8.54 and 8.98 pCi/g dry weight at the control location.

All samples met required lower limits of detection as specified in the ODAM.

4.3 Ground Water Protection Program Findings

Environmental, Inc., Midwest Laboratory provides laboratory services for the Duane Arnold Energy Center Ground Water Protection Program except for sewage effluent results; refer to Appendix E. Sewage effluent sample results can be found in the Duane Arnold Energy Center 2018 Annual Radiological Material Release Report.

Groundwater

351 groundwater samples (non-potable water) were collected from 56 permitted monitoring wells and three permitted extraction wells in 2018. Tritium was the only plant by-product identified. Concentrations of tritium ranged from less than 151 pCi/L to 290,521 pCi/L at D-63A, monitoring

well MW-19A. An explanation of tritium mitigation can be found in the Duane Arnold Energy Center 2018 Radioactive Material Release Report. Tritium was not identified in any drinking water well on-site or at off-site wells. Tritium was not identified in any Cedar Rapids municipal drinking water sample. Lastly, the monitoring well farthest down gradient prior to reaching the boundary of the owner controlled area, MW-33A, did not indicate tritium above 170 pCi/L (+/- 80 pCi/L), which is within error limits for non-detectable range of less than 151 pCi/L.

Soil

Two soil samples were collected in 2018, from D-15A and from D-16. Both samples were positive for cesium-137 with an average level of 0.09 pCi/g dry weight which is consistent with previous results at these locations. The cesium-137 source is determined to be from nuclear weapons testing and not from plant activities.

Precipitation

80 precipitation samples were collected in 2018 from six precipitation collection locations. Tritium was consistently identified at locations D-127 and D-128. Tritium concentrations range from less than 151 pCi/L to 5,193 pCi/L from D-127. The proximity of the plant gaseous effluent release points coupled with atmospheric conditions enables recapture of gaseous effluent, specifically tritiated water vapor, to be entrained in precipitation and deposited within the protected area. Occasionally, tritiated precipitation collects in a basin or pit. This water is then sampled and released in accordance with the Offsite Dose Assessment Manual (ODAM), "Clean" system batch release of a liquid effluent as documented in ODAM, Table 7.1-2.

Electrical Vaults

18 electrical vaults samples were collected in 2018 from ten electrical vaults. Electrical vaults are below grade structures designed for electrical cabling. Surface water and groundwater may seep into the vaults. Tritium concentrations range from less than 151 pCi/L to 2,280 pCi/L (+/- 161 pCi/L) from D-24, which is consistent with rainfall recapture of tritiated water vapor from plant gaseous effluent release points.

Storm Drains, Sluice Pond, and Drainage Ditches.

14 samples were collected in 2018 from storm drains, sluice ponds and drainage ditches. Surface water sampling from these locations is consistent with non-point source runoff sampling activities. Similar to electrical vaults, tritium recapture is the source for tritium. Tritium concentrations range from less than 151 pCi/L to 2,404 pCi/L(+/- 161 pCi/L) from D-125.

5.0 TABLES AND FIGURES

Table 5.1 Characteristic properties of isotopes quantified in gamma-spectroscopic analyses.

Designation	Comment	Isotope	Half-life [a]
Naturally Occurring			
A. Cosmogenic	Produced by interaction of cosmic rays with atmosphere	Be-7	53.2 d
B. Terrestrial	Primordial	K-40	1.26×10^9 y
II. Fission Products [b]	Nuclear accidents and detonations constitute the major environmental source.		
A. Short-lived		I-131	8.04 d
		Ba-140	12.8 d
B. Other than Short-lived		Nb-95	35.15 d
		Zr-95	65 d
		Ru-103	39.35 d
		Ru-106	368.2 d
		Cs-134	2.061 y
		Cs-137	30.174 y
		Ce-141	32.5 d
		Ce-144	284.31 d
III. Activation Products	Typically found in nuclear power plant effluents	Mn-54	312.5 d
		Fe-59	45.0 d
		Co-58	70.78 d
		Co-60	5.26 y
		Zn-65	245 d

[a] Half-lives are taken from Appendix E of Environmental Quarterly, 1 January 1978, EML-334 (U. S. Department of Energy, 1978).

[b] Includes fission-product daughters.

Table 5.2 Sample collection and analysis program.

Sampling Location [a]				
Exposure Pathway and/or Sample Type	Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis [b]
Airborne Particulates	3 4 5A 6 7 11 13 15 16 40	Hiawatha Pleasant Creek SRA Palo[c] Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Wickiup Hill	Continuous operation of sampler with sample collection at least once per week or as required by dust loading	Analyze for gross beta activity more than 72 hours after filter change. Perform gamma isotopic analysis on each sample having gross beta activity greater than ten times the yearly mean of the control samples. Composite weekly samples to form a quarterly composite (by location). Analyze quarterly composite for gamma isotopic.
Airborne Iodine	3 4 5A 6 7 11 13 15 16 40	Hiawatha Pleasant Creek SRA North Palo[c] Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Wickiup Hill	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine-131.
Ambient Radiation	1-3, 5A, 6-8 10, 11, 13 15-23, 28-32, 4, 33-42 43-48 82-86, 91 161-164	(Controls) (Controls) (Indicators) Within 0.5 mile of Stack Within 3.0 miles of Stack Within 1.0 mile of Stack ISFSI Fence line	One dosimeter continuously at each location. Dosimeters are changed at least quarterly.	Read gamma radiation dose quarterly.
Surface Water	49 50 51 61 99	Lewis Access (C) Plant Intake Plant Discharge ~ ½ mi. downstream from Plant Discharge Pleasant Creek Lake	Once per month.	Gamma isotopic and tritium analysis for each sample (by location). Locations 49 and 61, analyses for low-level I-131. Quarterly composites for Sr-89, Sr-90.

Table 5.2 Sample collection and analysis program, (continued).

Sampling Location [a]				
Exposure Pathway and/or Sample Type	Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis [b]
Ground Water	52 53 54 55 57, 58 72 (C)	Plant potable water Treated Municipal Water Inlet to Municipal Water Treatment System On-site well Wells off-site and within 4 km of DAEC	Grab sample at least once per quarter	Analysis gamma emitting isotopes, iodine-131 and tritium on quarterly samples. If reactor by-product gamma emitters are identified, or if tritium concentrations measure > MDA, then analyze for Ni-63, Sr-89, Sr-90 and alpha emitters.
River Sediment	49 50 51 107a	Lewis Access Plant Intake (C) Plant Discharge North Drainage Ditch (on-site)	At least once every six months.	Gamma isotopic analysis of each sample
Vegetation	16,57 56, 77 96,108 110,118 138 (C)	Farms raising food crops	Annually at harvest time. Two samples of each: grain, green leafy, and forage.	Gamma isotopic analysis, including iodine-131, on each sample.
Fish	49 56 61	Cedar River upstream of DAEC not influenced by effluent (C) Downstream of DAEC in influence of effluent	One sample per 6 months (once during January through June and once during July through December).	Gamma isotopic analysis on edible portions.
Milk	138 (C) 110 76	Farm near Newhall, IA Dairy Farm within 7.8 miles from Site Goat Farm ENE of site.	Monthly. Monthly. Monthly depending on availability.	Gamma isotopic and iodine-131 analyses of each sample.

[a] (C) denotes control location. All other locations are indicators.
[b] Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Sampling Location		
Code	Location Description	Distance and Direction from Site Stack
D-1	Cedar Rapids	20,800 meters SE
D-2	Marion	16,900 meters ESE
D-3	Hiawatha	10,800 meters SE
D-5	Palo	4,500 meters SSW
D-4	Pleasant Creek SRA	4,960 meters NW
D-5A	Palo	3,470 meters SSW
D-6	Center Point	9,660 meters N
D-7	Shellsburg	7,950 meters W
D-8	Urbana	15,000 meters NNW
D-10	Atkins	13,600 meters SSW
D-11	Toddville	4,980 meters E
D-13	Alburnett	14,500 meters ENE
D-15	On-site, North-Northwest	1,050 meters NNW
D-16	On-site, South-Southeast	520 meters SSE
D-17	On-site, N	1,050 meters N
D-18	On-site, NNE	630 meters NNE
D-19	On-site, NE	590 meters NE
D-20	On-site, ENE	550 meters ENE
D-21	On-site, ENE	515 meters ENE
D-22	On-site, ESE	535 meters ESE
D-23	On-site, SE	490 meters SE
D-28	On-site, WSW	730 meters WSW
D-29	On-site, W	630 meters W
D-30	On-site, WNW	640 meters WNW
D-31	On-site, NW	1,020 meters NW
D-32	On-site, NNW	1,110 meters NNW
D-33	3 mile ring	4,340 meters N
D-34	3 mile ring	3,930 meters NNE
D-35	3 mile ring	2,800 meters NE
D-36	3 mile ring	3,500 meters ENE
D-37	3 mile ring	2,960 meters E
D-38	3 mile ring	3,180 meters ESE
D-39	3 mile ring	2,510 meters SE
D-40	3 mile ring	2,430 meters SSE
D-41	3 mile ring	5,680 meters S
D-42	3 mile ring	4,380 meters SSE
D-43	1 mile ring	1,590 meters SSW
D-44	1 mile ring	1,580 meters WSW
D-45	1 mile ring	1,420 meters W
D-46	1 mile ring	1,580 meters WNW
D-47	1 mile ring	1,760 meters NW
D-48	1 mile ring	1,680 meters NNW

Table 5.3 Sampling locations, Duane Arnold Energy Center (continued).

Sampling Location		
Code	Location Description	Distance and Direction from Site Stack
D-49	Lewis Access, upstream of DAEC	6,750 meters NNW
D-50	Plant Intake	560 meters SE
D-51	Plant Discharge	600 meters SE
D-52	Plant potable water	On-site
D-53	Treated Municipal Water	13,900 meters SE
D-54	Inlet, Municipal Water Treatment System	13,900 meters SE
D-55	Production Well	Production wells A-D
D-56	Control samples from various locations	Sample location varies
D-57	Farm (Off-site Well)	805 meters W
D-58	Farm (Off-site Well)	974 meters WSW-SW
D-61	Downstream of plant discharge	670 meters SSE
D-72	Farm	3,200 meters SSW
D-76	Farm	2,888 meters ENE
D-77	Farm	2,288 meters SW
D-82	On-site, SSE	660 meters SSE
D-83	On-site, SSE	620 meters SSE
D-84	On-site, S	610 meters S
D-85	On-site, SSW	660 meters SSW
D-86	On-site, SW	850 meters SW
D-91	On-site, NNW	1,090 meters NNW
D-96	Farm	11,400 meters SSW
D-99	Pleasant Creek Lake	3,880 meters WNW
D-107A	North Drainage Ditch	On-site
D-109	Farm	5,890 meters SW
D-110	Farm	12,700 meters SW
D-118	Farm	2,230 meters NW
D-138	Farm	21,600 meters WSW
D-161	ISFSI Fence East	On-site
D-162	ISFSI Fence South	On-site
D-163	ISFSI Fence West	On-site
D-164	ISFSI Fence North	On-site

Table 5.4 Type and Frequency of collection.

Location	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1			TLD		
D-2			TLD		
D-3	AP, AI		TLD		
D-4	AP, AI		TLD		
D-5			TLD		
D-5A	AP, AI		TLD		
D-6	AP, AI		TLD		
D-7	AP, AI		TLD		
D-8			TLD		
D-10			TLD		
D-11	AP, AI		TLD		
D-13	AP, AI		TLD		
D-15	AP, AI		TLD		
D-15A					SO
D-16	AP, AI		TLD		G, SO
D-17 to D-23			TLD		
D-28 to D-39			TLD		
D-40	AP, AI		TLD		
D-41 to D-48			TLD		
D-49		SW		F	
D-50		SW		BS	
D-51		SW		BS	
D-52			WW		
D-53			WW		
D-54			WW		
D-55			WW		
D-56					
D-57			WW		G
D-58			WW		
D-61		SW		F	
D-72			WW		
D-76		MI*			
D-77					G
D-82 to D-86			TLD		
D-91			TLD		
D-99		SW			ME**
D-107A				BS	
D-108					G
D-110		MI			G
D-118					G
D-138		MI			G
D-161 to D-164			TLD		
On-site					

* Goat's milk sampled when available.

**Meat sampled when available.

Table 5.5. Sample codes used in Table 5.4 and Table 5.6.

Code	Description
AP	Airborne Particulates
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
MI	Milk
WW	Well Water
G	Vegetation
ME	Meat
SW	Surface Water
F	Fish
BS	River Sediment
SO	Soil

Table 5.6. Program Deviations, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
MI	I-131, Gamma	D-76	01-09-18	Goat's milk unavailable due to limited herd production.
SW	H-3, Gamma	D-99	01-26-18	No sample, water frozen.
MI	I-131, Gamma	D-76	02-14-18	Goat's milk unavailable due to limited herd production.
WW	H-3, I-131, Gamma	D-58	02-21-18	No sample, water frozen.
WW	H-3, I-131, Gamma	D-72	02-21-18	No sample, water frozen.
WW	Gamma	D-111A	02-14-18	No sample, water unavailable.
MI	I-131, Gamma	D-76	03-13-18	Goat's milk unavailable due to limited herd production.
TLD	Gamma	D-40	04-03-18	Missing in field.
MI	I-131, Gamma	D-76	04-10-18	Goat's milk unavailable due to limited herd production.
WW	H-3, I-131, Gamma	D-52	05-07-18	No sample sent.
MI	I-131, Gamma	D-76	05-16-18	Goat's milk unavailable due to limited herd production.
MI	I-131, Gamma	D-76	06-06-18	Goat's milk unavailable due to limited herd production.
AP/AI	I-131, Gross Beta	D-16	07-13-18	Sampler removed from service for meteorology tower maintenance-repairs.
AP/AI	I-131, Gross Beta	D-11	07-20-18	Air particulate not sent, I-131 result = 0.011 pCi/m^3.
MI	I-131, Gamma	D-76	07-11-18	Goat's milk unavailable due to limited herd production.

Table 5.6. Program Deviations, Duane Arnold Energy Center.(Continued).

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
MI	I-131, Gamma	D-76	08-08-18	Goat's milk unavailable due to limited herd production.
P	H-3, Gamma	D-16	08-01-18	Sampler removed from service for meteorology tower maintenance-repairs.
MI	I-131, Gamma	D-76	09-12-18	Goat's milk unavailable due to limited herd production.
MI	I-131, Gamma	D-76	10-09-18	Goat's milk unavailable due to limited herd production.
MI	I-131, Gamma	D-76	11-07-18	Goat's milk unavailable due to limited herd production.
MI	I-131, Gamma	D-76	12-11-18	Goat's milk unavailable due to limited herd production.
TLD	Gamma	D-17	01-02-18	Missing in field.
TLD	Gamma	D-82	01-02-19	Missing in field.

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa	Reporting Period	January-December, 2018

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean		Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results
				Location [d]	Mean (F) [c] Range [c]		
Airborne Pathway							
Airborne Particulates (pCi/m^3)	GB 476	0.003	0.028 (424/424) (0.004-0.069)	D-3	0.029 (52/52) (0.011-0.066)	0.026 (52/52) (0.011-0.058)	0
	GS 34						
	Be-7	0.020	0.080 (34/34) (0.049-0.127)	D-4	0.102 (2/2) (0.08-0.13)	0.077 (4/4) (0.069-0.088)	0
	Mn-54	0.0038	< LLD	-	-	< LLD	0
	Fe-59	0.0092	< LLD	-	-	< LLD	0
	Co-58	0.0053	< LLD	-	-	< LLD	0
	Co-60	0.0030	< LLD	-	-	< LLD	0
	Zn-65	0.0057	< LLD	-	-	< LLD	0
	Nb-95	0.0058	< LLD	-	-	< LLD	0
	Zr-95	0.0091	< LLD	-	-	< LLD	0
	Ru-103	0.0040	< LLD	-	-	< LLD	0
	Ru-106	0.0384	< LLD	-	-	< LLD	0
	Cs-134	0.0044	< LLD	-	-	< LLD	0
	Cs-137	0.0037	< LLD	-	-	< LLD	0
	Ce-141	0.0056	< LLD	-	-	< LLD	0
	Ce-144	0.0170	< LLD	-	-	< LLD	0
Airborne Iodine (pCi/m^3)	I-131 476	0.030	< LLD	-	-	< LLD	0
Direct Radiation							
TLDs (m R/quarter) Control Locations	Gamma 45	1.0	None	D-8	20.1 (4/4) (15.7-27.7)	17.1 (45/45) (10.9-27.8)	0
Within 0.5 mi. of Stack	Gamma 78	1.0	19.5 (78/78) (12.0-29.4)	D-29 D-48	23.4 (4/4) (18.9-29.0)	None	0
Within 1.0 mi. of Stack	Gamma 24	1.0	19.1 (24/24) (13.3-26.1)	D-37	21.2 (4/4) (17.0-25.5)	None	0
Within 3.0 mi.of Stack	Gamma 39	1.0	17.1 (39/39) (10.8-26.1)	D-161	20.3 (4/4) (16.0-25.5)	None	0
ISFSI border	Gamma 16	1.0	33.7 (16/16) (7.9-60.8)		50.4 (4/4) (46.3-60.8)	None	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa	Reporting Period	January-December, 2018

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean		Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results
				Location [d]	Mean (F) [c] Range [c]		
Waterborne Pathway							
Surface Water (pCi/L)	H-3 59	160	< LLD	-	-	< LLD	0
	I-131[chem] 24	0.5	< LLD	-	-	< LLD	0
	Sr-89 8	0.81	< LLD	-	-	< LLD	0
	Sr-90 8	0.58	< LLD	-	-	< LLD	0
	GS 59						
	Mn-54	4.6	< LLD	-	-	< LLD	0
	Fe-59	8.7	< LLD	-	-	< LLD	0
	Co-58	6.5	< LLD	-	-	< LLD	0
	Co-60	4.1	< LLD	-	-	< LLD	0
	Zn-65	11.7	< LLD	-	-	< LLD	0
	Nb-95	6.9	< LLD	-	-	< LLD	0
	Zr-95	8.2	< LLD	-	-	< LLD	0
	I-131	9.9	< LLD	-	-	< LLD	0
	Cs-134	5.3	< LLD	-	-	< LLD	0
	Cs-137	5.4	< LLD	-	-	< LLD	0
	Ba-140	25.6	< LLD	-	-	< LLD	0
	La-140	5.5	< LLD	-	-	< LLD	0
Sediments (pCi/g dry)	GS 6						
	K-40	1.0	7.15 (4/4) (5.65-8.08)	D-49	8.76 (2/2) (8.54-8.98)	8.76 (2/2) (8.54-8.98)	0
	Mn-54	0.026	< LLD	-	-	< LLD	0
	Fe-59	0.052	< LLD	-	-	< LLD	0
	Co-58	0.020	< LLD	-	-	< LLD	0
	Co-60	0.018	< LLD	-	-	< LLD	0
	Zn-65	0.046	< LLD	-	-	< LLD	0
	Nb-95	0.031	< LLD	-	-	< LLD	0
	Zr-95	0.051	< LLD	-	-	< LLD	0
	Ru-103	0.025	< LLD	-	-	< LLD	0
	Ru-106	0.162	< LLD	-	-	< LLD	0
	Cs-134	0.018	< LLD	-	-	< LLD	0
	Cs-137	0.021	< LLD	-	-	< LLD	0
	Ce-141	0.054	< LLD	-	-	< LLD	0
	Ce-144	0.123	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa	Reporting Period	January-December, 2018

Sample Type (Units)	Type and Number of Analyses	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean		Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results
				Location [d]	Mean (F) [c] Range [c]		
Waterborne Pathway							
Ground Water, potable (pCi/L)	I-131 49	0.9	< LLD	-	-	< LLD	0
	H-3 49	160	< LLD	-	-	< LLD	0
	GS 49						
	Mn-54	4.5	< LLD	-	-	< LLD	0
	Fe-59	8.6	< LLD	-	-	< LLD	0
	Co-58	4.0	< LLD	-	-	< LLD	0
	Co-60	5.0	< LLD	-	-	< LLD	0
	Zn-65	9.3	< LLD	-	-	< LLD	0
	Nb-95	4.1	< LLD	-	-	< LLD	0
	Zr-95	8.6	< LLD	-	-	< LLD	0
	I-131	8.8	< LLD	-	-	< LLD	0
	Cs-134	5.2	< LLD	-	-	< LLD	0
	Cs-137	5.9	< LLD	-	-	< LLD	0
	Ba-140	22.7	< LLD	-	-	< LLD	0
	La-140	5.1	< LLD	-	-	< LLD	0
Ingestion Pathway							
Milk (pCi/L)	1-131 24	0.5	< LLD	-	-	< LLD	0
	GS 24						
	K-40	100	1462(12/12) (1256-1637)	D-110	1462 (12/12) (1256-1637)	1304(12/12) (1086-1472)	0
	Cs-134	5	< LLD	-	-	< LLD	0
	Cs-137	5	< LLD	-	-	< LLD	0
	Ba-140	60	< LLD	-	-	< LLD	0
	La-140	5	< LLD	-	-	< LLD	0
Broadleaf Vegetation (pCi/g wet)	GS 7						
	K-40	0.05	3.64 (6/6) (2.19-4.41)	D-77	4.41 (1/1)	2.67 (1/1)	0
	Mn-54	0.017	< LLD	-	-	< LLD	0
	Fe-59	0.036	< LLD	-	-	< LLD	0
	Co-58	0.019	< LLD	-	-	< LLD	0
	Co-60	0.014	< LLD	-	-	< LLD	0
	Zn-65	0.037	< LLD	-	-	< LLD	0
	Nb-95	0.020	< LLD	-	-	< LLD	0
	Zr-95	0.036	< LLD	-	-	< LLD	0
	Ru-103	0.022	< LLD	-	-	< LLD	0
	Ru-106	0.160	< LLD	-	-	< LLD	0
	I-131	0.054	< LLD	-	-	< LLD	0
	Cs-134	0.021	< LLD	-	-	< LLD	0
	Cs-137	0.021	< LLD	-	-	< LLD	0
	Ce-141	0.037	< LLD	-	-	< LLD	0
	Ce-144	0.097	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility: Duane Arnold Energy Center | Docket No. 50-331

Location of Facility: Linn, Iowa (County, State) | Reporting Period January-December, 2018

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean		Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
				Location [d]	Mean (F) [c] Range [c]		
Ingestion Pathway (cont.)							
Vegetation (Grain and Forage) (pCi/g wet)	GS 8						
	K-40	0.05	11.16 (6/6) (2.40-23.19)	D-10	12.90 (1/1) (2.60-23.19)	2.67 (1/1) (2.50-14.21)	0
	Mn-54	0.020	< LLD	-	-	< LLD	0
	Fe-59	0.056	< LLD	-	-	< LLD	0
	Co-58	0.024	< LLD	-	-	< LLD	0
	Co-60	0.026	< LLD	-	-	< LLD	0
	Zn-65	0.057	< LLD	-	-	< LLD	0
	Nb-95	0.029	< LLD	-	-	< LLD	0
	Zr-95	0.051	< LLD	-	-	< LLD	0
	Ru-103	0.028	< LLD	-	-	< LLD	0
	Ru-106	0.15	< LLD	-	-	< LLD	0
	I-131	0.051	< LLD	-	-	< LLD	0
	Cs-134	0.026	< LLD	-	-	< LLD	0
	Cs-137	0.031	< LLD	-	-	< LLD	0
	Ce-141	0.047	< LLD	-	-	< LLD	0
	Ce-144	0.15	< LLD	-	-	< LLD	0
Fish (pCi/g wet)	GS 14						
	K-40	1.0	3.38 (7/7) (2.56-4.24)	D-61	3.38 (7/7) -	3.08 (7/7) (2.31-3.96)	0 0
	Mn-54	0.025	< LLD	-	-	< LLD	0
	Fe-59	0.101	< LLD	-	-	< LLD	0
	Co-58	0.038	< LLD	-	-	< LLD	0
	Co-60	0.025	< LLD	-	-	< LLD	0
	Zn-65	0.053	< LLD	-	-	< LLD	0
	Nb-95	0.066	< LLD	-	-	< LLD	0
	Zr-95	0.068	< LLD	-	-	< LLD	0
	Ru-103	0.053	< LLD	-	-	< LLD	0
	Ru-106	0.258	< LLD	-	-	< LLD	0
	Cs-134	0.027	< LLD	-	-	< LLD	0
	Cs-137	0.023	< LLD	-	-	< LLD	0
	Ce-141	0.105	< LLD	-	-	< LLD	0
	Ce-144	0.171	< LLD	-	-	< LLD	0

[a] GB = Gross beta; GS = Gamma spectroscopy

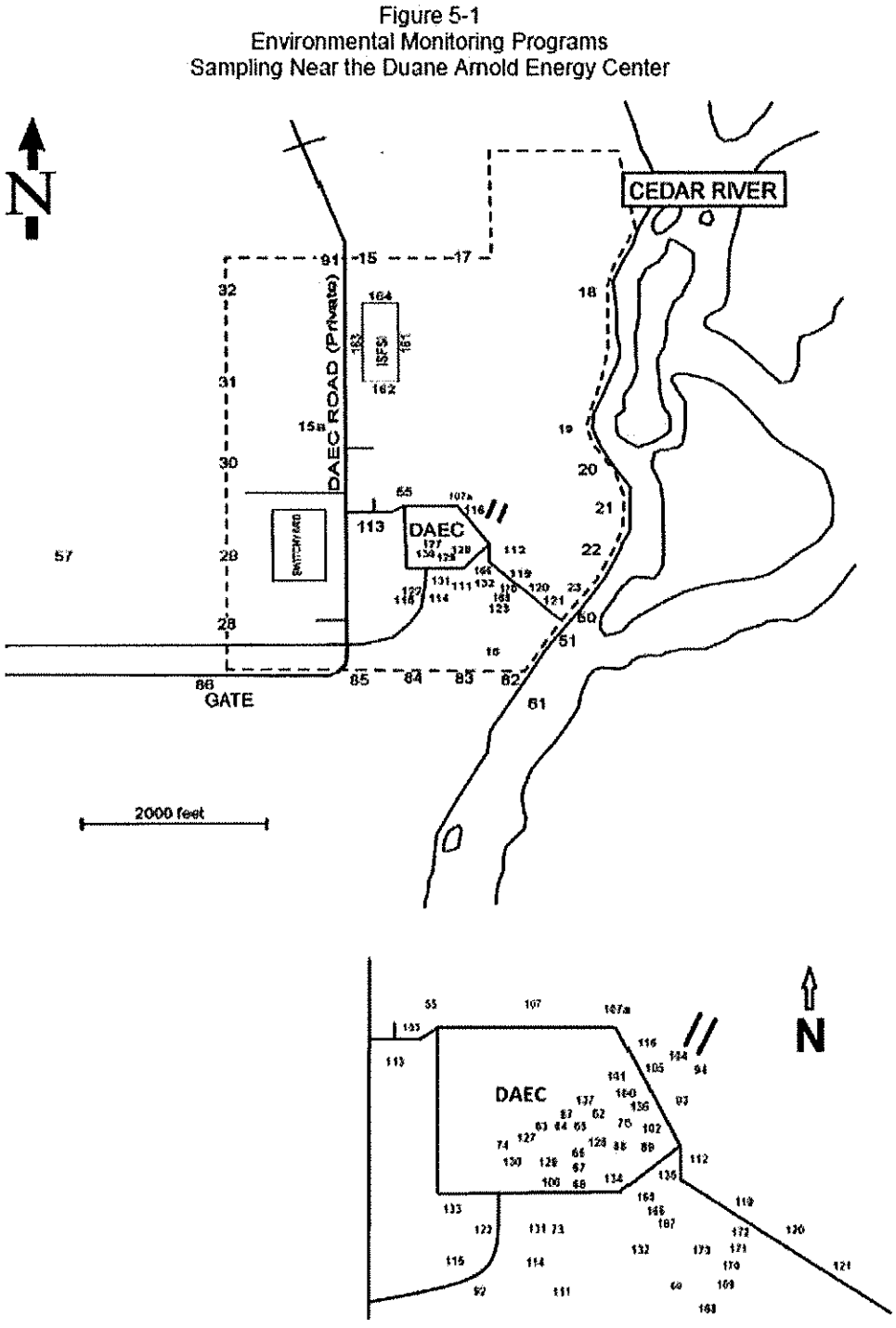
[b] LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

[c] Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

[d] Locations are specified by: (1) Name and code (Table 5.3); and (2) distance, direction and sector relative to reactor site.

[e] Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

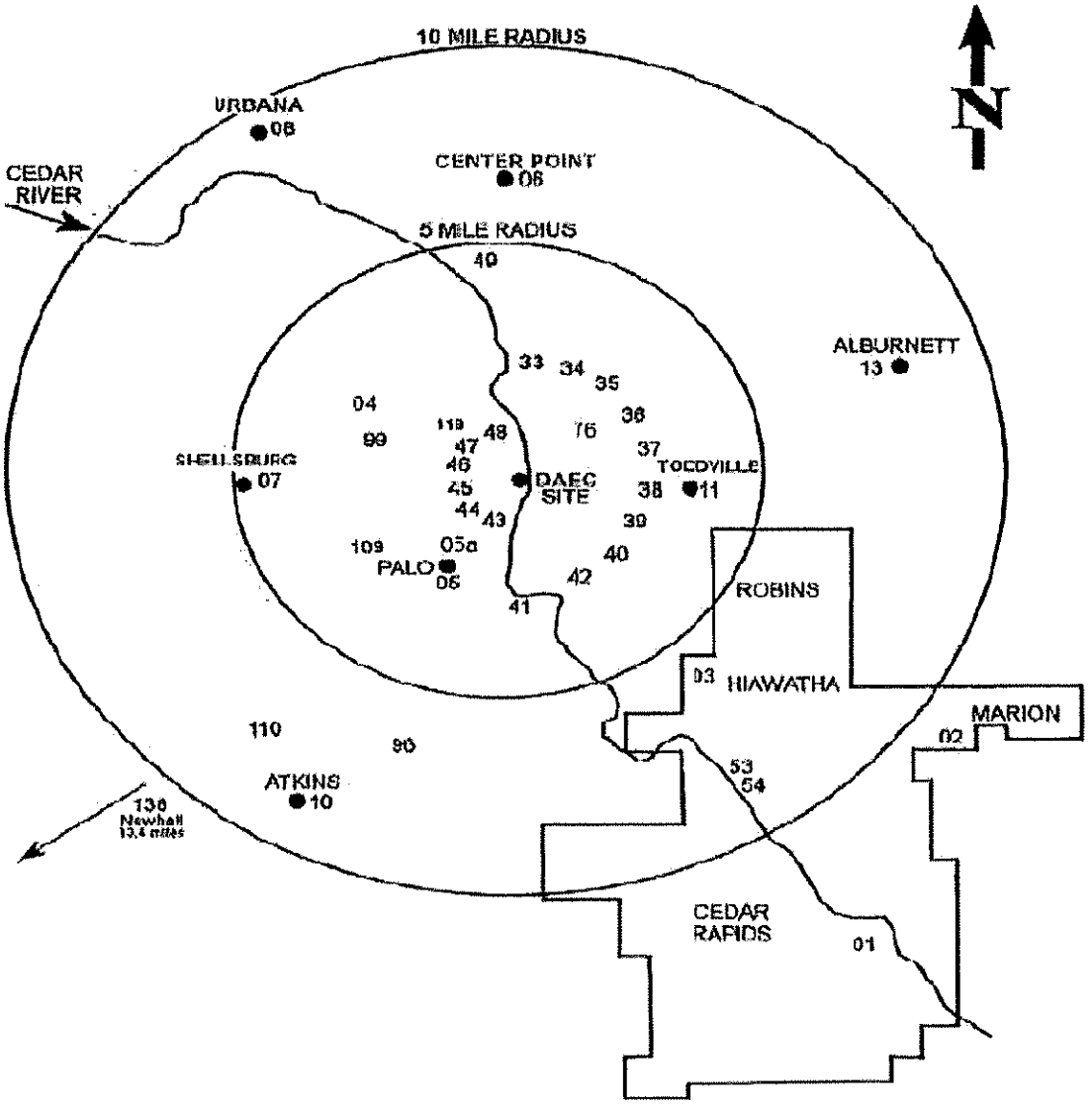
Figure 5.1 Radiological Environmental Monitoring Program Sampling Stations near the Duane Arnold Energy Center.



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

Figure 5.2. Radiological Environmental Monitoring Program Sampling Stations Outside 0.5 Miles.

Figure 5-2
Radiological Environmental Monitoring Program
Sampling Stations Outside 0.5 Miles from DAEC



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

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APPENDIX A

INTERLABORATORY AND INTRALABORATORY COMPARISON PROGRAM RESULTS

NOTE: Appendix A is updated four times a year. The complete appendix is included in March, June, September and December monthly progress reports only.

January, 2018 through December, 2018

Appendix A

Interlaboratory/ Intralaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of it's quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Table A-1 lists results that were obtained through participation in the RAD PT Study Proficiency Testing Program administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via irradiation and evaluation by the University of Wisconsin-Madison Radiation Calibration Laboratory at the University of Wisconsin Medical Radiation Research Center.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Acceptance criteria is detailed on Attachment A page A2. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists analytical results from the in-house "duplicate" program for the past twelve months. The Precision Acceptance limit is ±25% of the mean for Sr-89,90, Gross Alpha and Gross Beta or the 2-sigma uncertainty overlaps the mean value. For all other analytes the precision acceptance limit is ±20% of the mean or the 2-sigma uncertainty overlaps the mean value.
Complete analytical data for duplicate analyses is available upon request.

Table A-6 list results that were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Table A-7 lists results that were obtained through participation in the MRAD PT Study Proficiency Testing Progra administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

Analysis	Ratio of lab result to known value.
Gamma Emitters	0.8 to 1.2
Strontium-89, Strontium-90	0.8 to 1.2
Potassium-40	0.8 to 1.2
Gross alpha	0.5 to 1.5
Gross beta	0.8 to 1.2
Tritium	0.8 to 1.2
Radium-226, Radium-228	0.7 to 1.3
Plutonium	0.8 to 1.2
Iodine-129, Iodine-131	0.8 to 1.2
Nickel-63, Technetium-99, Uranium-238	0.7 to 1.3
Iron-55	0.8 to 1.2
Other Analyses	0.8 to 1.2

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)[a].
RAD study

Lab Code	Date	Analysis	Concentration (pCi/L) Laboratory Result	ERA Result	Control Limits	Acceptance
ERW-52	1/8/2018	Sr-89	61.6 ± 5.8	65.2	52.9 - 73.2	Pass
ERW-52	1/8/2018	Sr-90	39.7 ± 2.3	39.2	28.2 - 45.1	Pass
ERW-54	1/8/2018	Ba-133	89.7 ± 4.7	95.1	80.2 - 105	Pass
ERW-54	1/8/2018	Cs-134	62.1 ± 5.4	65.6	53.4 - 72.2	Pass
ERW-54	1/8/2018	Cs-137	111.2 ± 6.1	112	101 - 126	Pass
ERW-54	1/8/2018	Co-60	115.8 ± 4.7	114.0	103.0 - 128.0	Pass
ERW-54	1/8/2018	Zn-65	292.2 ± 14.0	277.0	249 - 324	Pass
ERW-52	1/8/2018	Gr. Alpha	70.1 ± 3.0	72.4	38.1 - 89.2	Pass
ERW-52	1/8/2018	Gr. Beta	47.4 ± 1.4	54.8	37.5 - 61.7	Pass
ERW-58	1/8/2018	I-131	25.3 ± 1.0	28.1	23.4 - 33.0	Pass
ERW-61	1/8/2018	Ra-226	12.4 ± 0.4	14.20	10.60 - 16.30	Pass
ERW-60	1/8/2018	Ra-228	4.9 ± 0.8	4.21	2.43 - 5.81	Pass
ERW-60	1/8/2018	Uranium	52.2 ± 0.9	58.6	47.8 - 64.5	Pass
ERW-62	1/8/2018	H-3	21,780 ± 437	21,200	18,600 - 23,300	Pass
ERW-2555	7/9/2018	Sr-89	62.8 ± 4.0	62.7	50.7 - 70.6	Pass
ERW-2555	7/9/2018	Sr-90	40.1 ± 1.3	40.1	29.5 - 46.1	Pass
ERW-2557	7/9/2018	Ba-133	23.1 ± 2.3	25.6	19.9 - 29	Pass
ERW-2557	7/9/2018	Cs-134	15.2 ± 1.7	15.7	11.4 - 18.2	Pass
ERW-2557	7/9/2018	Cs-137	22.3 ± 4.9	192	173 - 213	Fail[b]
ERW-2557	7/9/2018	Co-60	110.4 ± 3.7	119.0	107 - 133	Pass
ERW-2557	7/9/2018	Zn-65	189.5 ± 7.5	177.0	159 - 208	Pass
ERW-2559	7/9/2018	Gr. Alpha	13.5 ± 0.7	16.0	7.79 - 22.6	Pass
ERW-2559	7/9/2018	Gr. Beta	41.1 ± 0.9	49.0	33.2 - 56.1	Pass
ERW-2561	7/9/2018	I-131	24.9 ± 0.9	28.1	23.4 - 33.0	Pass
ERW-2563	7/9/2018	Ra-226	9.0 ± 0.3	9.08	6.81 - 10.6	Pass
ERW-2563	7/9/2018	Ra-228	3.2 ± 0.4	2.28	1.07 - 3.60	Pass
ERW-2563	7/9/2018	Uranium	38.2 ± 1.4	51.8	42.2 - 57.1	Fail[c]
ERW-2565	7/9/2018	H-3	21,039 ± 302	20,400	17,900 - 22,400	Pass
ERW-3832[b]	10/7/2016	Ba-133	57.0 ± 3.1	54.9	45 - 61	Pass
ERW-3832[b]	10/7/2016	Cs-134	79.2 ± 3.0	81.8	67 - 90	Pass
ERW-3832[b]	10/7/2016	Cs-137	222.4 ± 4.5	210	189 - 233	Pass
ERW-3832[b]	10/7/2016	Co-60	67.7 ± 3.5	64.5	58 - 73	Pass
ERW-3832[b]	10/7/2016	Zn-65	274.1 ± 3.0	245	220 - 287	Pass

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

[b] A transcription error caused the Cs-137 result submitted to be understated by a factor of 10.
The actual result obtained was slightly higher than the acceptance criteria for the study.
A "Quick Response" proficiency test was analyzed to help determine the cause of the high result. (See ERW-3832 above)
No definitive cause for the previous high Cs-137 result was determined.

[c] An investigation was conducted on the apparent cause of failure in the Uranium isotopic PT analysis. In order to get to the root cause of the failure a NIST U-natural 4321d-standard was purchased and a new U-232 diluted tracer was standardized.
The analysis was rerun and the results were found to be within the acceptance criteria. It appears that the original U-232 tracer used in the analysis may have been compromised (concentrated) resulting in a very high negative bias.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

Lab Code	Irradiation Date	Description	Delivered Dose	mrem Reported Dose [b]	Performance Quotient (P) [c]	
Environmental, Inc.		Group 1				
2018-1	11/15/2018	Spike 1	97.0	81.6	-0.16	
2018-1	11/15/2018	Spike 2	97.0	88.5	-0.09	
2018-1	11/15/2018	Spike 3	97.0	87.9	-0.09	
2018-1	11/15/2018	Spike 4	97.0	85.6	-0.12	
2018-1	11/15/2018	Spike 5	97.0	86.5	-0.11	
2018-1	11/15/2018	Spike 6	97.0	89.0	-0.08	
2018-1	11/15/2018	Spike 7	97.0	85.1	-0.12	
2018-1	11/15/2018	Spike 8	97.0	90.6	-0.07	
2018-1	11/15/2018	Spike 9	97.0	91.3	-0.06	
2018-1	11/15/2018	Spike 10	97.0	84.5	-0.13	
2018-1	11/15/2018	Spike 11	97.0	90.8	-0.06	
2018-1	11/15/2018	Spike 12	97.0	93.8	-0.03	
2018-1	11/15/2018	Spike 13	97.0	85.3	-0.12	
2018-1	11/15/2018	Spike 14	97.0	85.5	-0.12	
2018-1	11/15/2018	Spike 15	97.0	86.9	-0.10	
2018-1	11/15/2018	Spike 16	97.0	88.6	-0.09	
2018-1	11/15/2018	Spike 17	97.0	83.1	-0.14	
2018-1	11/15/2018	Spike 18	97.0	85.4	-0.12	
2018-1	11/15/2018	Spike 19	97.0	83.3	-0.14	
2018-1	11/15/2018	Spike 20	97.0	85.5	-0.12	
Mean (Spike 1-20)				86.9	-0.10	Pass[d]
Standard Deviation (Spike 1-20)				3.1	0.03	Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a = 1.20$. mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).[a]

			mrem			
Lab Code	Irradiation Date	Description	Delivered Dose	Reported Dose [b]	Performance Quotient (P) [c]	
Environmental, Inc.		Group 2				
2018-2	11/15/2018	Spike 21	143.0	130.3	-0.09	
2018-2	11/15/2018	Spike 22	143.0	128.1	-0.10	
2018-2	11/15/2018	Spike 23	143.0	134.4	-0.06	
2018-2	11/15/2018	Spike 24	143.0	129.0	-0.10	
2018-2	11/15/2018	Spike 25	143.0	132.5	-0.07	
2018-2	11/15/2018	Spike 26	143.0	126.1	-0.12	
2018-2	11/15/2018	Spike 27	143.0	126.2	-0.12	
2018-2	11/15/2018	Spike 28	143.0	122.4	-0.14	
2018-2	11/15/2018	Spike 29	143.0	118.8	-0.17	
2018-2	11/15/2018	Spike 30	143.0	123.2	-0.14	
2018-2	11/15/2018	Spike 31	143.0	137.2	-0.04	
2018-2	11/15/2018	Spike 32	143.0	144.4	0.01	
2018-2	11/15/2018	Spike 33	143.0	137.8	-0.04	
2018-2	11/15/2018	Spike 34	143.0	140.2	-0.02	
2018-2	11/15/2018	Spike 35	143.0	143.8	0.01	
2018-2	11/15/2018	Spike 36	143.0	146.7	0.03	
2018-2	11/15/2018	Spike 37	143.0	150.0	0.05	
2018-2	11/15/2018	Spike 38	143.0	126.1	-0.12	
2018-2	11/15/2018	Spike 39	143.0	136.2	-0.05	
2018-2	11/15/2018	Spike 40	143.0	144.8	0.01	
Mean (Spike 21-40)				133.9	-0.06	Pass[d]
Standard Deviation (Spike 21-40)				9.0	0.06	Pass[d]

a TLD's were irradiated by the University of Wisconsin-Madison Radiation Calibration Laboratory following ANSI N13.37 protocol from a known air kerma rate. TLD's were read and the results were submitted by Environmental Inc. to the University of Wisconsin-Madison Radiation Calibration Laboratory for comparison to the delivered dose.

b Reported dose was converted from exposure (R) to Air Kerma (cGy) using a conversion of 0.876. Conversion from air kerma to ambient dose equivalent for Cs-137 at the reference dose point $H^*(10)K_a = 1.20$. mrem/cGy = 1000.

c Performance Quotient (P) is calculated as ((reported dose - conventially true value) ÷ conventially true value) where the conventially true value is the delivered dose.

d Acceptance is achieved when neither the absolute value of mean of the P values, nor the standard deviation of the P values exceed 0.15.

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a]					
		Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance	Ratio Lab/Known
SPW-1749	4/21/2016	Fe-55	1,576 ± 81	1,482	1,186 - 1,778	Pass	1.06
SPW-95	1/11/2018	H-3	16,457 ± 381	16,507	13,206 - 19,808	Pass	1.00
SPW-109	1/12/2018	Sr-90	18.9 ± 1.7	17.9	14.3 - 21.5	Pass	1.06
SPW-175	1/19/2018	H-3	16,261 ± 382	16,507	13,206 - 19,808	Pass	0.99
SPW-210	1/23/2018	H-3	16,461 ± 382	16,507	13,206 - 19,808	Pass	1.00
SPW-212	1/10/2018	Ra-226	12.9 ± 0.4	12.3	8.6 - 16.0	Pass	1.05
SPW-272	1/30/2018	H-3	16,607 ± 384	16,507	13,206 - 19,808	Pass	1.01
W-013118	4/29/2016	Cs-134	33.9 ± 7.4	36.2	29.0 - 43.4	Pass	0.94
W-013118	4/29/2016	Cs-137	80.0 ± 7.9	71.9	57.5 - 86.3	Pass	1.11
SPW-330	2/1/2018	Ni-63	168 ± 2	198	139 - 258	Pass	0.85
SPW-338	2/2/2018	H-3	16,512 ± 381	16,507	13,206 - 19,808	Pass	1.00
SPW-384	2/6/2018	H-3	16,429 ± 380	16,507	13,206 - 19,808	Pass	1.00
W-020618	4/29/2016	Cs-134	39.0 ± 12.0	36.2	29.0 - 43.4	Pass	1.08
W-020618	4/29/2016	Cs-137	81.0 ± 15.7	71.9	57.5 - 86.3	Pass	1.13
SPW-461	2/13/2018	H-3	16,799 ± 385	16,507	13,206 - 19,808	Pass	1.02
SPW-516	2/19/2018	H-3	16,323 ± 382	16,507	13,206 - 19,808	Pass	0.99
SPW-556	2/8/2018	Ra-226	12.2 ± 0.3	12.3	8.6 - 16.0	Pass	0.99
SPW-582	2/22/2018	H-3	16,200 ± 380	16,507	13,206 - 19,808	Pass	0.98
SPW-609	2/23/2018	H-3	16,467 ± 383	16,507	13,206 - 19,808	Pass	1.00
SPW-650	2/21/2018	Ra-226	11.8 ± 0.5	12.3	8.6 - 16.0	Pass	0.96
SPW-666	2/28/2018	Gr. Alpha	67.1 ± 2.8	72.4	36.2 - 108.6	Pass	0.93
SPW-666	2/28/2018	Gr. Beta	48.1 ± 1.4	54.8	43.8 - 65.8	Pass	0.88
W-022818	4/29/2016	Cs-134	32.7 ± 8.5	36.2	29.0 - 43.4	Pass	0.90
W-022818	4/29/2016	Cs-137	73.8 ± 9.3	71.9	57.5 - 86.3	Pass	1.03
SPW-748	3/6/2018	H-3	16,209 ± 381	16,507	13,206 - 19,808	Pass	0.98
SPW-787	3/8/2018	H-3	16,934 ± 388	16,507	13,206 - 19,808	Pass	1.03
W-030718	4/29/2016	Cs-134	33.4 ± 7.9	36.2	29.0 - 43.4	Pass	0.92
W-030718	4/29/2016	Cs-137	78.9 ± 9.6	71.9	57.5 - 86.3	Pass	1.10
SPW-885	3/15/2018	H-3	16,475 ± 384	16,507	13,206 - 19,808	Pass	1.00
SPW-931	3/20/2018	H-3	16,467 ± 384	16,507	13,206 - 19,808	Pass	1.00
SPW-957	3/12/2018	Ra-226	11.4 ± 0.4	12.3	8.6 - 16.0	Pass	0.93
SPW-969	3/23/2018	Ni-63	260 ± 12	329	230 - 428	Pass	0.79
W-031418	4/29/2016	Cs-134	36.9 ± 11.2	36.2	29.0 - 43.4	Pass	1.02
W-031418	4/29/2016	Cs-137	82.3 ± 15.5	71.9	57.5 - 86.3	Pass	1.14
SPW-985	3/27/2018	H-3	16,544 ± 386	16,507	13,206 - 19,808	Pass	1.00
SPW-1037	4/4/2018	H-3	16,298 ± 384	16,507	13,206 - 19,808	Pass	0.99
SPW-1149	4/12/2018	H-3	16,361 ± 383	16,507	13,206 - 19,808	Pass	0.99
SPW-1200	4/13/2018	U-238	44.2 ± 2.3	41.7	29.2 - 54.2	Pass	1.06
SPW-1426	4/20/2018	H-3	16,573 ± 390	16,507	13,206 - 19,808	Pass	1.00
SPW-1454	4/24/2018	H-3	16,495 ± 384	16,507	13,206 - 19,808	Pass	1.00
SPW-1493	4/26/2018	Ra-228	4.59 ± 1.10	4.21	2.95 - 5.47	Pass	1.09
SPW-1518	4/27/2018	H-3	16,483 ± 382	16,507	13,206 - 19,808	Pass	1.00
SPW-1522	4/27/2018	Tc-99	105 ± 2	108	75 - 140	Pass	0.98
W-050118	4/29/2016	Cs-134	35.2 ± 9.9	36.2	29.0 - 43.4	Pass	0.97
W-050118	4/29/2016	Cs-137	82.4 ± 7.7	71.9	57.5 - 86.3	Pass	1.15

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance	Ratio Lab/Known
SPW-1573	5/2/2018	Gr. Alpha	25.2 ± 0.5	20.1	10.1 - 30.2	Pass	1.25
SPW-1573	5/2/2018	Gr. Beta	28.2 ± 0.3	27.5	22.0 - 33.0	Pass	1.03
SPW-1618	5/3/2018	H-3	14,834 ± 366	16,507	13,206 - 19,808	Pass	0.90
W-050318	4/29/2016	Cs-134	32.9 ± 7.6	36.2	29.0 - 43.4	Pass	0.91
W-050318	4/29/2016	Cs-137	83.1 ± 8.5	71.9	57.5 - 86.3	Pass	1.16
SPW-1644	5/4/2018	Sr-90	20.0 ± 1.3	17.9	14.3 - 21.5	Pass	1.12
W-050718	4/29/2018	Cs-134	42.4 ± 8.5	36.2	29.0 - 43.4	Pass	1.17
W-050718	4/29/2018	Cs-137	80.6 ± 13.6	71.9	57.5 - 86.3	Pass	1.12
SPW-1695	5/8/2018	H-3	16,450 ± 384	16,507	13,206 - 19,808	Pass	1.00
W-050818	4/29/2016	Cs-134	32.3 ± 6.9	36.2	29.0 - 43.4	Pass	0.89
W-050818	4/29/2016	Cs-137	73.0 ± 8.2	71.9	57.5 - 86.3	Pass	1.02
SPW-1780	5/11/2018	H-3	16,784 ± 388	16,507	13,206 - 19,808	Pass	1.02
W-051518	4/29/2016	Cs-134	33.0 ± 6.7	36.2	29.0 - 43.4	Pass	0.91
W-051518	4/29/2016	Cs-137	76.0 ± 7.4	71.9	57.5 - 86.3	Pass	1.06
W-051718	4/29/2016	Cs-134	35.1 ± 5.7	36.2	29.0 - 43.4	Pass	0.97
W-051718	4/29/2016	Cs-137	73.7 ± 6.7	71.9	57.5 - 86.3	Pass	1.03
SPW-1897	5/18/2018	H-3	16,650 ± 387	16,507	13,206 - 19,808	Pass	1.01
SPW-1899	5/18/2018	H-3	16,754 ± 365	16,507	13,206 - 19,808	Pass	1.01
W-052418	4/29/2016	Cs-134	33.9 ± 6.2	36.2	29.0 - 43.4	Pass	0.94
W-052418	4/29/2016	Cs-137	78.8 ± 7.4	71.9	57.5 - 86.3	Pass	1.10
SPW-1994	5/24/2018	H-3	16,488 ± 384	16,507	13,206 - 19,808	Pass	1.00
W-053118	4/29/2016	Cs-134	38.9 ± 9.5	36.2	29.0 - 43.4	Pass	1.07
W-053118	4/29/2016	Cs-137	74.0 ± 7.5	71.9	57.5 - 86.3	Pass	1.03
SPW-2042	5/31/2018	H-3	16,901 ± 390	16,507	13,206 - 19,808	Pass	1.02
W-060518	4/29/2016	Cs-134	33.0 ± 10.1	36.2	29.0 - 43.4	Pass	0.91
W-060518	4/29/2016	Cs-137	83.3 ± 8.7	71.9	57.5 - 86.3	Pass	1.16
SPW-2186	6/6/2018	H-3	16,551 ± 385	16,507	13,206 - 19,808	Pass	1.00
SPW-2914	6/19/2018	Ra-226	12.7 ± 0.4	12.3	8.6 - 16.0	Pass	1.03
SPW-2437	6/27/2018	Sr-90	18.0 ± 1.1	17.9	14.3 - 21.5	Pass	1.00
SPW-2447	6/29/2018	H-3	16,595 ± 387	16,507	13,206 - 19,808	Pass	1.01
W-070518	4/29/2016	Cs-134	38.9 ± 8.1	36.2	29.0 - 43.4	Pass	1.08
W-070518	4/29/2016	Cs-137	73.4 ± 9.4	71.9	57.5 - 86.3	Pass	1.02
SPW-2546	7/10/2018	H-3	15,949 ± 373	16,507	13,206 - 19,808	Pass	0.97
W-071218	4/29/2016	Cs-134	33.1 ± 7.7	36.2	29.0 - 43.4	Pass	0.91
W-071218	4/29/2016	Cs-137	74.5 ± 7.7	71.9	57.5 - 86.3	Pass	1.04
SPW-2706	7/16/2018	H-3	15,474.7 ± 366.6	16,507	13,206 - 19,808	Pass	0.94
SPW-2772	7/19/2018	H-3	15,994.0 ± 374.0	16,507	13,206 - 19,808	Pass	0.97
SPW-2811	7/20/2018	Gr. Alpha	21.1 ± 0.4	20.1	10.1 - 30.2	Pass	1.05
SPW-2811	7/20/2018	Gr. Beta	26.9 ± 0.3	27.5	22.0 - 33.0	Pass	0.98
W-072118	4/29/2016	Cs-134	33.6 ± 7.3	36.2	29.0 - 43.4	Pass	0.93
W-072118	4/29/2016	Cs-137	80.3 ± 7.9	71.9	57.5 - 86.3	Pass	1.12
SPW-3689	7/23/2018	Ra-226	12.7 ± 0.3	12.3	8.6 - 16.0	Pass	1.03
W-072718	2/1/2017	U-234	26.8 ± 3.4	31.4	22.0 - 40.8	Pass	0.85
W-072718	2/1/2017	U-238	24.1 ± 3.2	32.4	22.7 - 42.1	Pass	0.74
SPW-3018	7/31/2018	H-3	16,166 ± 376	16,507	13,206 - 19,808	Pass	0.98
SPW-3154	8/6/2018	H-3	15,686 ± 370	16,507	13,206 - 19,808	Pass	0.95
W-081218	4/29/2016	Cs-134	38.6 ± 11.5	36.2	29.0 - 43.4	Pass	1.07
W-081218	4/29/2016	Cs-137	83.7 ± 13.4	71.9	57.5 - 86.3	Pass	1.16

TABLE A-3. In-House "Spiked" Samples

Lab Code [b]	Date	Concentration [a] Analysis	Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance	Ratio Lab/Known
SPW-3278	8/16/2018	H-3	15,587 ± 370	16,507	13,206 - 19,808	Pass	0.94
SPW-3378	8/23/2018	Ni-63	378 ± 44	465	325 - 604	Pass	0.81
SPW-3420	8/23/2018	H-3	15,536 ± 368	16,507	13,206 - 19,808	Pass	0.94
SPW-3691	8/23/2018	Ra-226	15.5 ± 0.4	12.3	8.6 - 16.0	Pass	1.26
SPW-3477	8/27/2018	Ra-228	11.3 ± 1.6	15.1	10.6 - 19.7	Pass	0.75
W-082818	4/29/2016	Cs-134	33.0 ± 2.7	36.2	29.0 - 43.4	Pass	0.91
W-082818	4/29/2016	Cs-137	80.7 ± 3.0	71.9	57.5 - 86.3	Pass	1.12
SPW-3648	9/7/2018	H-3	15,876 ± 371	16,507	13,206 - 19,808	Pass	0.96
SPW-4755	9/7/2018	Ra-226	11.2 ± 0.3	12.3	8.6 - 16.0	Pass	0.91
W-091118	4/29/2016	Cs-134	35.3 ± 2.7	36.2	29.0 - 43.4	Pass	0.98
W-091118	4/29/2016	Cs-137	80.7 ± 3.2	71.9	57.5 - 86.3	Pass	1.12
SPW-3843	9/19/2018	H-3	15,759 ± 372	16,507	13,206 - 19,808	Pass	0.95
W-092818	4/29/2016	Cs-134	36.1 ± 10.0	36.2	29.0 - 43.4	Pass	1.00
W-092818	4/29/2016	Cs-137	73.6 ± 9.9	71.9	57.5 - 86.3	Pass	1.02
SPW-3991	10/1/2018	H-3	15,614 ± 369	16,507	13,206 - 19,808	Pass	0.95
SPW-4105	10/5/2018	H-3	15,669 ± 370	16,507	13,206 - 19,808	Pass	0.95
W-101118	4/29/2016	Cs-134	33.5 ± 3.1	36.2	29.0 - 43.4	Pass	0.92
W-101118	4/29/2016	Cs-137	79.7 ± 3.2	71.9	57.5 - 86.3	Pass	1.11
SPW-4205	10/12/2018	H-3	15,821 ± 372	16,507	13,206 - 19,808	Pass	0.96
SPW-4274	10/17/2018	H-3	15,575 ± 369	16,507	13,206 - 19,808	Pass	0.94
SPW-4596	10/31/2018	H-3	15,650 ± 369	16,507	13,206 - 19,808	Pass	0.95
SPW-4682	11/1/2018	H-3	15,742 ± 371	16,507	13,206 - 19,808	Pass	0.95
SPW-4684	11/1/2018	Sr-90	19.1 ± 1.2	17.9	14.3 - 21.5	Pass	1.07
SPW-4790	11/9/2018	H-3	15,887 ± 373	16,507	13,206 - 19,808	Pass	0.96
SPW-4839	11/13/2018	Ni-63	381 ± 43	465	326 - 605	Pass	0.82
SPW-4863	11/16/2018	H-3	15,610 ± 370	16,507	13,206 - 19,808	Pass	0.95
W-111618	4/29/2016	Cs-134	38.0 ± 12.4	36.2	29.0 - 43.4	Pass	1.05
W-111618	4/29/2016	Cs-137	83.8 ± 13.8	71.9	57.5 - 86.3	Pass	1.17
SPW-5049	11/30/2018	H-3	15,370 ± 366	16,507	13,206 - 19,808	Pass	0.93
SPW-5148	12/7/2018	H-3	15,522 ± 368	16,507	13,206 - 19,808	Pass	0.94
W-121118	4/29/2016	Cs-134	39.4 ± 7.9	36.2	29.0 - 43.4	Pass	1.09
W-121118	4/29/2016	Cs-137	78.5 ± 7.7	71.9	57.5 - 86.3	Pass	1.09
W-121218	4/29/2016	Cs-134	42.0 ± 13.8	36.2	29.0 - 43.4	Pass	1.16
W-121218	4/29/2016	Cs-137	79.2 ± 13.1	71.9	57.5 - 86.3	Pass	1.10
W-121318	4/29/2016	Cs-134	35.1 ± 7.8	36.2	29.0 - 43.4	Pass	0.97
W-121318	4/29/2016	Cs-137	77.5 ± 8.4	71.9	57.5 - 86.3	Pass	1.08
SPW-5279	12/14/2018	H-3	15,686 ± 370	16,507	13,206 - 19,808	Pass	0.95
W-121418	4/29/2016	Cs-134	34.5 ± 8.2	36.2	29.0 - 43.4	Pass	0.95
W-121418	4/29/2016	Cs-137	82.7 ± 8.0	71.9	57.5 - 86.3	Pass	1.15
W-121718	4/29/2016	Cs-134	34.9 ± 10.5	36.2	29.0 - 43.4	Pass	0.96
W-121718	4/29/2016	Cs-137	80.3 ± 8.1	71.9	57.5 - 86.3	Pass	1.12
SPW-5351	12/19/2018	H-3	15,855 ± 375	16,507	13,206 - 19,808	Pass	0.96
SPW-5404	12/31/2018	H-3	15,179 ± 365	16,507	13,206 - 19,808	Pass	0.92

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m3), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

[b] Laboratory codes : W (Water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

[c] Results are based on single determinations.

[d] Control limits are listed in Attachment A of this report.

NOTE: For fish, gelatin is used for the spike matrix. For vegetation, cabbage is used for the spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-94	Water	1/11/2018	H-3	154	1 ± 74	200
SPW-108	Water	1/12/2018	Sr-89	0.63	0.41 ± 0.53	5
SPW-108	Water	1/12/2018	Sr-90	0.55	0.05 ± 0.26	1
SPW-174	Water	1/19/2018	H-3	152	23 ± 73	200
SPW-209	Water	1/23/2018	H-3	154	78 ± 78	200
SPW-211	Water	1/10/2018	Ra-226	0.03	0.19 ± 0.03	2
SPW-213	Water	1/23/2018	I-131	0.23	-0.05 ± 0.13	1
SPW-271	Water	1/30/2018	H-3	156	- 36 ± 77	200
SPW-329	Water	2/1/2018	Ni-63	74	-13 ± 45	200
SPW-337	Water	2/2/2018	H-3	154	-16 ± 71	200
SPW-385	Water	2/6/2018	H-3	150	-19 ± 71	200
SPW-461	Water	2/13/2018	H-3	156	56 ± 80	200
SPW-515	Water	2/19/2018	H-3	153	-1 ± 80	200
SPW-555	Water	2/8/2018	Ra-226	0.04	0.14 ± 0.03	2
SPW-581	Water	2/22/2018	H-3	156	43 ± 77	200
SPW-608	Water	2/23/2018	H-3	151	58 ± 75	200
SPW-649	Water	2/21/2018	Ra-226	0.04	0.17 ± 0.03	2
SPW-665	Water	2/28/2018	Gr. Alpha	0.43	0.70 ± 0.36	2
SPW-665	Water	2/28/2018	Gr. Beta	0.68	0.86 ± 0.51	4
SPW-747	Water	3/6/2018	H-3	154	11 ± 82	200
SPW-786	Water	3/8/2018	H-3	156	62 ± 76	200
SPW-865	Water	3/14/2018	I-131	0.18	0.07 ± 0.10	1
SPW-930	Water	3/20/2018	H-3	155	44 ± 84	200
SPW-956	Water	3/12/2018	Ra-226	0.03	0.18 ± 0.03	2
SPW-984	Water	3/27/2018	H-3	153	32 ± 82	200
SPW-1036	Water	4/4/2018	H-3	162	14 ± 77	200
SPW-1148	Water	4/12/2018	H-3	159	-15 ± 73	200
SPW-1202	Water	4/13/2018	U-234	0.15	0.00 ± 0.09	1
SPW-1202	Water	4/13/2018	U-238	0.15	0.06 ± 0.13	1
SPW-1425	Water	4/20/2018	H-3	159	45 ± 98	200
SPW-1453	Water	4/24/2018	H-3	155	43 ± 77	200
SPW-1492	Water	4/26/2018	Ra-228	0.68	0.25 ± 0.35	2
SPW-1517	Water	4/27/2018	H-3	150	54 ± 75	200
SPW-1521	Water	4/27/2018	Tc-99	5.38	2.64 ± 3.31	10
SPW-1572	Water	5/2/2018	Gr. Alpha	0.41	-0.23 ± 0.26	2
SPW-1572	Water	5/2/2018	Gr. Beta	0.69	-0.28 ± 0.47	4
SPW-1617	Water	5/3/2018	H-3	155	-113 ± 68	200
SPW-1643	Water	5/4/2018	Sr-89	0.66	0.36 ± 0.50	5
SPW-1643	Water	5/4/2018	Sr-90	0.57	-0.07 ± 0.25	1

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-1694	Water	5/8/2018	H-3	157	86 ± 80	200
SPW-1779	Water	5/11/2018	H-3	156	11 ± 74	200
SPW-1895	Water	5/17/2018	I-131	0.12	0.00 ± 0.08	1
SPW-1896	Water	5/18/2018	H-3	155	46 ± 75	200
SPW-1898	Water	5/18/2018	H-3	186	2 ± 92	200
SPW-1993	Water	5/24/2018	H-3	158	103 ± 79	200
SPW-2041	Water	5/31/2018	H-3	156	115 ± 81	200
SPW-2185	Water	6/6/2018	H-3	150	29 ± 74	200
SPW-2383	Water	6/6/2018	Ra-226	0.03	0.20 ± 0.02	2
SPW-2264	Water	6/11/2018	Gr. Alpha	0.39	-0.02 ± 0.27	2
SPW-2264	Water	6/11/2018	Gr. Beta	0.73	-0.35 ± 0.50	4
SPW-2913	Water	6/19/2018	Ra-226	0.02	0.18 ± 0.02	2
SPW-2436	Water	6/27/2018	Sr-89	0.66	0.00 ± 0.46	5
SPW-2436	Water	6/27/2018	Sr-90	0.61	-0.10 ± 0.27	1
SPW-2447	Water	6/29/2018	H-3	160	-6 ± 79	200
SPW-2545	Water	7/10/2018	H-3	154	20 ± 74	200
SPW-2705	Water	7/16/2018	H-3	153	15 ± 73	200
SPW-2771	Water	7/19/2018	H-3	156	-27 ± 71	200
SPW-2810	Water	7/20/2018	Gr. Alpha	0.42	-0.09 ± 0.29	2
SPW-2810	Water	7/20/2018	Gr. Beta	0.70	0.31 ± 0.50	4
SPW-3688	Water	7/23/2018	Ra-226	0.02	0.21 ± 0.02	2
SPW-3017	Water	7/31/2018	H-3	157	-5 ± 74	200
SPW-3153	Water	8/6/2018	H-3	152	13 ± 72	200
SPW-3377	Water	8/23/2018	Ni-63	66	18 ± 40	200
SPW-3446	Water	8/27/2018	H-3	151	-15 ± 69	200
SPW-3476	Water	8/27/2018	Ra-228	0.77	0.05 ± 0.36	2
SPW-3648	Water	9/7/2018	H-3	148	89 ± 75	200
SPW-4754	Water	9/7/2018	Ra-226	0.03	0.13 ± 0.08	2
SPW-3842	Water	9/19/2018	H-3	156	29 ± 74	200
SPW-3990	Water	10/1/2018	H-3	153	-6 ± 71	200
SPW-4105	Water	10/5/2018	H-3	150	7 ± 71	200
SPW-4565	Water	10/11/2018	Ra-228	0.86	-0.26 ± 0.36	2
SPW-4205	Water	10/12/2018	H-3	154	-9 ± 71	200
SPW-4273	Water	10/17/2018	H-3	153	67 ± 76	200
SPW-4595	Water	10/30/2018	H-3	150	75 ± 74	200
SPW-4681	Water	11/1/2018	H-3	152	19 ± 72	200
SPW-4789	Water	11/9/2018	H-3	148	27 ± 73	200
SPW-4862	Water	11/16/2018	H-3	154	15 ± 77	200
SPW-5048	Water	11/30/2018	H-3	151	-6 ± 69	200

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis[b]	Concentration [a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-4681	Water	11/1/2018	H-3	152	19 ± 72	200
SPW-4683	Water	11/1/2018	Sr-89	0.64	0.25 ± 0.45	5
SPW-4683	Water	11/1/2018	Sr-90	0.51	-0.10 ± 0.22	1
SPW-4799	Water	11/9/2018	I-131	0.43	-0.01 ± 0.20	1
SPW-4838	Water	11/13/2018	Ni-63	62	34 ± 38	200
SPW-5028	Water	11/19/2018	Ra-226	0.04	-0.14 ± 0.03	2
SPW-5028	Water	11/19/2018	Ra-228	0.96	-0.11 ± 0.43	2
SPW-5147	Water	12/7/2018	H-3	151	14 ± 71	200
SPW-5278	Water	12/14/2018	H-3	153	83 ± 76	200
SPW-5350	Water	12/19/2018	H-3	153	71 ± 75	200
SPW-5403	Water	12/31/2018	H-3	156	51 ± 75	200

[a] Liquid sample results are reported in pCi/Liter, air filters (pCi/m^3), charcoal (pCi/charcoal canister), and solid samples (pCi/g).

[b] I-131(G); iodine-131 as analyzed by gamma spectroscopy.

[c] Activity reported is a net activity result.

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-010218	1/2/2018	Gr. Beta	0.048 ± 0.004	0.057 ± 0.004	0.052 ± 0.003	Pass
AP-010218	1/2/2018	Be-7	0.073 ± 0.008	0.073 ± 0.007	0.073 ± 0.005	Pass
AP-010318	1/3/2018	Gr. Beta	0.039 ± 0.005	0.034 ± 0.005	0.037 ± 0.003	Pass
AP-6846,6847	1/3/2018	Be-7	0.058 ± 0.010	0.062 ± 0.010	0.060 ± 0.007	Pass
AP-010318	1/3/2018	Be-7	0.059 ± 0.009	0.059 ± 0.007	0.059 ± 0.006	Pass
AP-010818	1/8/2018	Gr. Beta	0.053 ± 0.007	0.055 ± 0.007	0.054 ± 0.005	Pass
WW-164,165	1/11/2018	Gr. Beta	21.9 ± 2.2	20.4 ± 2.1	21.1 ± 1.5	Pass
WW-189,190	1/11/2018	H-3	501 ± 100	498 ± 100	499 ± 71	Pass
AP-011518	1/15/2018	Gr. Beta	0.032 ± 0.005	0.033 ± 0.005	0.032 ± 0.003	Pass
AP-012318	1/23/2018	Gr. Beta	0.031 ± 0.005	0.032 ± 0.005	0.031 ± 0.003	Pass
LW-280,281	1/25/2018	Gr. Beta	1.10 ± 0.52	1.19 ± 0.55	1.15 ± 0.38	Pass
AP-013018	1/30/2018	Gr. Beta	0.024 ± 0.005	0.023 ± 0.005	0.024 ± 0.003	Pass
SG-301,302	1/30/2018	Ac-228	3.01 ± 0.49	3.11 ± 0.71	3.06 ± 0.43	Pass
SG-301,302	1/30/2018	Pb-214	2.47 ± 0.31	2.22 ± 0.35	2.34 ± 0.23	Pass
SG-301,302	1/30/2018	K-40	7.44 ± 1.93	6.52 ± 2.25	6.98 ± 1.48	Pass
SWU-322,323	1/30/2018	Gr. Beta	1.48 ± 1.10	3.06 ± 1.31	2.27 ± 0.85	Pass
P-391,392	2/2/2018	H-3	428 ± 94	332 ± 89	380 ± 65	Pass
S-433,434	2/7/2018	Pb-214	0.16 ± 0.04	0.13 ± 0.05	0.15 ± 0.03	Pass
S-433,434	2/7/2018	Ac-228	0.24 ± 0.06	0.26 ± 0.07	0.25 ± 0.05	Pass
S-433,434	2/7/2018	K-40	6.45 ± 0.58	6.50 ± 0.59	6.48 ± 0.41	Pass
AP-454,455	2/8/2018	Be-7	0.233 ± 0.102	0.271 ± 0.111	0.252 ± 0.075	Pass
AP-021218	2/12/2018	Gr. Beta	0.037 ± 0.005	0.035 ± 0.005	0.036 ± 0.004	Pass
CF-477,478	2/12/2018	Be-7	0.31 ± 0.17	0.21 ± 0.08	0.26 ± 0.09	Pass
AP-021918	2/19/2018	Gr. Beta	0.036 ± 0.005	0.033 ± 0.008	0.035 ± 0.005	Pass
AP-022118	2/21/2018	Gr. Beta	0.030 ± 0.003	0.025 ± 0.003	0.028 ± 0.002	Pass
SWU-704,705	2/27/2018	Gr. Beta	2.50 ± 0.65	1.72 ± 0.58	2.11 ± 0.44	Pass
W-849,850	2/28/2018	H-3	567 ± 105	730 ± 112	649 ± 77	Pass
AP-030518	3/5/2018	Gr. Beta	0.024 ± 0.005	0.025 ± 0.005	0.024 ± 0.004	Pass
DW-90026,90027	3/7/2018	Gr. Alpha	55.4 ± 2.5	60.3 ± 2.6	57.8 ± 1.8	Pass
DW-90026,90027	3/7/2018	Gr. Beta	28.0 ± 1.2	27.4 ± 1.2	27.7 ± 0.8	Pass
S-800,801	3/8/2018	Ra-226	1.06 ± 0.15	1.17 ± 0.17	1.12 ± 0.11	Pass
S-800,801	3/8/2018	Ra-228	1.08 ± 0.19	1.05 ± 0.20	1.07 ± 0.14	Pass
S-800,801	3/8/2018	K-40	15.5 ± 1.3	15.7 ± 1.4	15.6 ± 0.9	Pass
SG-863,864	3/8/2018	Ra-226	5.56 ± 0.28	5.92 ± 0.27	5.74 ± 0.19	Pass
SG-863,864	3/8/2018	Ra-228	7.77 ± 0.44	8.19 ± 0.53	7.98 ± 0.34	Pass
SG-863,864	3/8/2018	K-40	10.75 ± 1.29	12.28 ± 1.39	11.52 ± 0.95	Pass
WW-842,843	3/9/2018	H-3	415 ± 99	423 ± 99	419 ± 70	Pass
AP-030918	3/9/2018	Gr. Beta	0.027 ± 0.004	0.021 ± 0.004	0.024 ± 0.003	Pass
AP-031318	3/13/2018	Gr. Beta	0.030 ± 0.004	0.031 ± 0.004	0.031 ± 0.003	Pass
AP-031318	3/13/2018	Gr. Beta	0.026 ± 0.005	0.024 ± 0.005	0.025 ± 0.003	Pass
WW-934,935	3/13/2018	H-3	266 ± 95	294 ± 96	280 ± 68	Pass
S-972,973	3/20/2018	K-40	23.1 ± 3.3	19.8 ± 2.5	21.4 ± 2.1	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-032018	3/20/2018	Gr. Beta	0.021 ± 0.005	0.023 ± 0.005	0.022 ± 0.004	Pass
WW-1016,1017	3/22/2018	H-3	716 ± 110	790 ± 113	753 ± 79	Pass
SW-995,996	3/26/2018	H-3	14,538 ± 364	14,647 ± 365	14,593 ± 258	Pass
WW-1900,1901	3/30/2018	H-3	863 ± 123	865 ± 123	864 ± 87	Pass
AP-1299,1300	4/3/2018	Be-7	0.075 ± 0.017	0.073 ± 0.014	0.074 ± 0.011	Pass
SG-1470,1471	4/3/2018	Pb-214	1.45 ± 0.14	1.39 ± 0.12	1.42 ± 0.09	Pass
SG-1470,1471	4/3/2018	Ac-228	2.39 ± 0.31	2.55 ± 0.31	2.47 ± 0.22	Pass
WW-1123,1124	4/5/2018	H-3	11,266 ± 319	11,175 ± 320	11,220 ± 226	Pass
DW-90035,90036	4/6/2018	Ra-226	1.04 ± 0.13	0.88 ± 0.14	0.96 ± 0.10	Pass
DW-90035,90036	4/6/2018	Ra-228	0.84 ± 0.13	1.08 ± 0.42	0.96 ± 0.22	Pass
AP-041018	4/10/2018	Gr. Beta	0.023 ± 0.004	0.019 ± 0.004	0.021 ± 0.003	Pass
SS-1611,1612	4/18/2018	K-40	10.01 ± 0.54	8.93 ± 0.56	9.47 ± 0.39	Pass
SW-1427,1428	4/18/2018	H-3	180 ± 84	114 ± 81	147 ± 58	Pass
WW-1494,1495	4/20/2018	H-3	326 ± 84	270 ± 89	298 ± 61	Pass
AP-042518	4/25/2018	Gr. Beta	0.028 ± 0.004	0.023 ± 0.004	0.026 ± 0.003	Pass
SO-1634,1635	4/25/2018	K-40	5.72 ± 0.51	6.36 ± 0.56	6.04 ± 0.38	Pass
BS-1546,1547	4/26/2018	K-40	8.35 ± 0.53	8.54 ± 0.57	8.44 ± 0.39	Pass
AP-042618	4/26/2018	Gr. Beta	0.023 ± 0.004	0.021 ± 0.004	0.022 ± 0.003	Pass
DW-90043,90044	4/27/2018	Gr. Alpha	11.9 ± 1.1	11.3 ± 1.1	11.6 ± 0.8	Pass
AP-050118	5/1/2018	Gr. Beta	0.020 ± 0.006	0.022 ± 0.006	0.021 ± 0.004	Pass
AP-050218	5/2/2018	Gr. Beta	0.020 ± 0.002	0.019 ± 0.002	0.020 ± 0.002	Pass
F-2333,2334	5/2/2018	Cs-137	2.53 ± 0.34	2.51 ± 0.32	2.52 ± 0.24	Pass
DW-90048,90049	5/2/2018	Ra-226	0.18 ± 0.11	0.14 ± 0.08	0.16 ± 0.07	Pass
DW-90048,90049	5/2/2018	Ra-228	0.86 ± 0.60	0.78 ± 0.60	0.82 ± 0.42	Pass
WW-1833,1834	5/8/2018	H-3	182 ± 83	304 ± 98	243 ± 64	Pass
SG-1747,1748	5/8/2018	Pb-214	13.0 ± 0.6	13.0 ± 0.6	13.0 ± 0.4	Pass
SG-1747,1748	5/8/2018	Ac-228	21.0 ± 1.2	21.1 ± 1.4	21.0 ± 0.9	Pass
AP-050818	5/8/2018	Gr. Beta	0.027 ± 0.005	0.025 ± 0.004	0.026 ± 0.003	Pass
F-1812,1813	5/9/2018	K-40	4.30 ± 0.47	3.40 ± 0.47	3.85 ± 0.33	Pass
SG-1767,1768	5/9/2018	Pb-214	0.96 ± 0.24	0.72 ± 0.24	0.84 ± 0.17	Pass
SG-1767,1768	5/9/2018	Ac-228	1.28 ± 0.34	1.15 ± 0.37	1.22 ± 0.25	Pass
AP-051418	5/14/2018	Gr. Beta	0.038 ± 0.006	0.033 ± 0.005	0.036 ± 0.004	Pass
DW-90061,90062	5/17/2018	Ra-226	1.53 ± 0.13	1.78 ± 0.15	1.66 ± 0.10	Pass
DW-90061,90062	5/17/2018	Ra-228	0.82 ± 0.45	0.87 ± 0.44	0.85 ± 0.31	Pass
F-2201,2202	5/18/2018	K-40	2.73 ± 0.40	2.68 ± 0.45	2.71 ± 0.30	Pass
AP-051818	5/18/2018	Gr. Beta	0.020 ± 0.004	0.026 ± 0.004	0.023 ± 0.003	Pass
WW-2050,2051	5/22/2018	H-3	28,404 ± 502	28,666 ± 504	28,535 ± 356	Pass
AP-052218	5/22/2018	Gr. Beta	0.024 ± 0.004	0.021 ± 0.004	0.023 ± 0.003	Pass
AP-052918	5/29/2018	Gr. Beta	0.028 ± 0.004	0.024 ± 0.004	0.026 ± 0.003	Pass
AP-052918	5/29/2018	Gr. Beta	0.023 ± 0.005	0.025 ± 0.005	0.024 ± 0.003	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration [a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
G-2133,2134	6/4/2018	Be-7	0.55 ± 0.64	0.32 ± 0.16	0.43 ± 0.33	Pass
G-2133,2134	6/4/2018	K-40	7.12 ± 0.64	6.53 ± 0.58	6.82 ± 0.43	Pass
WW-2270,2271	6/8/2018	H-3	90 ± 84	71 ± 83	80 ± 59	Pass
VE-2312,2313	6/11/2018	K-40	6.06 ± 0.17	5.50 ± 0.46	5.78 ± 0.24	Pass
AP-2375,2376	6/14/2018	Be-7	0.310 ± 0.134	0.240 ± 0.100	0.275 ± 0.084	Pass
AP-2893,2894	6/27/2018	Be-7	0.111 ± 0.016	0.111 ± 0.016	0.111 ± 0.011	Pass
SG-24511,2512	7/2/2018	Gr. Alpha	19.60 ± 3.08	19.55 ± 3.06	19.58 ± 2.17	Pass
SG-2469,2470	7/2/2018	Pb-214	9.16 ± 0.48	9.46 ± 0.37	9.31 ± 0.30	Pass
SG-2469,2470	7/2/2018	Ac-228	9.94 ± 0.87	10.00 ± 0.64	9.97 ± 0.54	Pass
SG-2511,2512	7/2/2018	Pb-214	4.46 ± 0.31	4.57 ± 0.34	4.52 ± 0.23	Pass
SG-2511,2512	7/2/2018	Ac-228	6.15 ± 0.57	5.83 ± 0.66	5.99 ± 0.44	Pass
VE-2610,2611	7/9/2018	K-40	6.52 ± 0.75	5.92 ± 0.75	6.22 ± 0.53	Pass
F-2851,2852	7/11/2018	K-40	2.93 ± 0.38	2.83 ± 0.32	2.88 ± 0.25	Pass
AP-071218	7/12/2018	Gr. Beta	0.021 ± 0.003	0.024 ± 0.004	0.023 ± 0.002	Pass
AP-2721,2722	7/12/2018	Be-7	0.204 ± 0.100	0.275 ± 0.127	0.240 ± 0.081	Pass
WW-2742,2743	7/12/2018	H-3	253 ± 86	278 ± 97	265 ± 65	Pass
DW-90123,90124	7/24/2018	Ra-226	0.97 ± 0.18	1.06 ± 0.12	1.02 ± 0.11	Pass
DW-90123,90124	7/24/2018	Ra-228	3.61 ± 0.74	4.05 ± 0.80	3.83 ± 0.54	Pass
G-3000,3001	7/24/2018	Be-7	3.29 ± 0.25	3.24 ± 0.26	3.26 ± 0.18	Pass
G-3000,3001	7/24/2018	K-40	4.98 ± 0.40	5.06 ± 0.41	5.02 ± 0.29	Pass
S-2916,2917	7/24/2018	Pb-214	1.00 ± 0.51	0.94 ± 0.53	0.97 ± 0.37	Pass
S-2916,2917	7/24/2018	Ac-228	0.98 ± 0.11	0.98 ± 0.09	0.98 ± 0.07	Pass
AP-073018	7/30/2018	Gr. Beta	0.029 ± 0.004	0.022 ± 0.004	0.026 ± 0.003	Pass
DW-90133,90134	8/7/2018	Ra-228	2.34 ± 0.68	3.28 ± 0.73	2.81 ± 0.50	Pass
DW-90138,90139	8/10/2018	Gr. Alpha	4.02 ± 0.68	3.87 ± 0.66	3.95 ± 0.51	Pass
VE-3281,3282	8/14/2018	K-40	11.40 ± 0.831	11.39 ± 0.524	11.39 ± 0.491	Pass
VE-3323,3324	8/14/2018	K-40	3.41 ± 0.227	3.67 ± 0.262	3.54 ± 0.173	Pass
VE-3323,3324	8/14/2018	Be-7	0.25 ± 0.069	0.33 ± 0.092	0.29 ± 0.058	Pass
AP-081518	8/15/2018	Gr. Beta	0.022 ± 0.003	0.028 ± 0.003	0.025 ± 0.002	Pass
PM-3365,3366	8/16/2018	K-40	14.77 ± 0.76	14.19 ± 0.69	14.48 ± 0.51	Pass
S-3478,3479	8/27/2018	Pb-214	0.70 ± 0.05	0.70 ± 0.05	0.70 ± 0.04	Pass
S-3478,3479	8/27/2018	Ac-228	0.84 ± 0.11	0.89 ± 0.08	0.87 ± 0.07	Pass
SWT-3501,3502	8/27/2018	Gr. Beta	0.64 ± 0.48	1.42 ± 0.56	1.03 ± 0.37	Pass
VE-3522,3523	8/28/2018	K-40	2.51 ± 0.20	2.63 ± 0.20	2.57 ± 0.14	Pass
WW-3745,3746	8/31/2018	H-3	1035 ± 119	1056 ± 99	1045 ± 77	Pass
S-3542,3543	8/30/2018	K-40	6.10 ± 0.72	5.69 ± 0.63	5.90 ± 0.48	Pass
W-3703,3704	9/11/2018	Gr. Alpha	0.71 ± 0.80	1.03 ± 0.81	0.87 ± 0.57	Pass
W-3703,3704	9/11/2018	Gr. Beta	1.67 ± 1.08	0.53 ± 1.00	1.10 ± 0.74	Pass
SG-3796,3797	9/14/2018	Gr. Alpha	42.3 ± 3.6	50.9 ± 3.8	46.6 ± 2.6	Pass

TABLE A-5. In-House "Duplicate" Samples

			Concentration[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
SG-3796,3797	9/14/2018	Gr. Beta	43.9 ± 1.9	44.1 ± 1.8	44.0 ± 1.3	Pass
SG-3796,3797	9/14/2018	Pb-214	10.4 ± 0.6	14.2 ± 0.5	12.3 ± 0.4	Pass
SG-3796,3797	9/14/2018	Ac-228	15.8 ± 1.2	15.7 ± 1.2	15.8 ± 0.8	Pass
DW-90173,90174	10/24/2018	Ra-226	1.13 ± 0.15	1.38 ± 0.17	1.26 ± 0.11	Pass
DW-90173,90174	10/24/2018	Ra-228	5.09 ± 0.84	6.59 ± 0.89	5.84 ± 0.61	Pass
SW-4782,4783	11/7/2018	H-3	192 ± 82	238 ± 84	215 ± 59	Pass
WW-4959,4960	11/13/2018	H-3	330 ± 88	286 ± 86	308 ± 61	Pass
SG-4850,4851	11/14/2018	Pb-214	15.0 ± 0.4	14.7 ± 0.4	14.9 ± 0.3	Pass
SG-4850,4851	11/14/2018	Ac-228	17.5 ± 0.7	16.7 ± 0.6	17.1 ± 0.5	Pass
VE-4917,4918	11/20/2018	K-40	4.54 ± 0.45	4.05 ± 0.46	4.30 ± 0.32	Pass
VE-4917,4918	11/20/2018	Be-7	9.42 ± 0.45	9.42 ± 0.46	9.42 ± 0.32	Pass
SG-5046,5047	11/21/2018	K-40	8.65 ± 1.18	9.12 ± 1.02	8.88 ± 0.78	Pass
SG-5046,5047	11/21/2018	Cs-137	0.18 ± 0.06	0.10 ± 0.05	0.14 ± 0.04	Pass
SG-5046,5047	11/21/2018	Gr. Alpha	22.8 ± 5.6	17.5 ± 4.8	20.2 ± 3.7	Pass
SG-5046,5047	11/21/2018	Gr. Beta	31.8 ± 3.5	26.8 ± 3.1	29.3 ± 2.4	Pass
SG-6286,6287	12/1/2018	Pb-214	11.3 ± 0.4	10.7 ± 0.5	11.0 ± 0.3	Pass
SG-6286,6287	12/1/2018	Ac-228	13.5 ± 0.9	13.2 ± 1.0	13.4 ± 0.7	Pass
SWU-5132,5133	12/4/2018	H-3	159 ± 82	204 ± 80	181 ± 57	Pass
SWU-5132,5133	12/4/2018	Gr. Beta	1.32 ± 0.56	1.33 ± 0.57	1.32 ± 0.40	Pass
XAP-5499,5500	1/2/2019	Fe-55	941 ± 220	1027 ± 226	984 ± 158	Pass
XAP-5499,5500	1/2/2019	Sr-89	20.2 ± 7.3	14.9 ± 5.7	17.5 ± 4.7	Pass
XAP-5499,5500	1/2/2019	Ni-63	12.1 ± 8.5	15.6 ± 8.5	13.8 ± 6.0	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

[a] Results are reported in units of pCi/L, except for air filters (pCi/Filter or pCi/m3), food products, vegetation, soil and sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

		Concentration [a]				
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MASO-765	2/1/2018	Am-241	1.57 ± 4.46	0	NA [c]	Pass
MASO-765	2/1/2018	Cs-137	4.69 ± 2.59	4.6	NA [d]	Pass
MASO-765	2/1/2018	Co-57	886 ± 7	826	578 - 1074	Pass
MASO-765	2/1/2018	Co-60	579 ± 7	560	392 - 728	Pass
MASO-765	2/1/2018	Mn-54	1135 ± 15	1010	707 - 1313	Pass
MASO-765	2/1/2018	K-40	653 ± 47	577	404 - 750	Pass
MASO-765	2/1/2018	Zn-65	1096 ± 19	960	672 - 1248	Pass
MASO-765	2/1/2018	Pu-238	54.4 ± 5.6	45.2	31.6 - 58.8	Pass
MASO-765	2/1/2018	Pu-239/240	58.9 ± 5.6	50.8	35.6 - 66.0	Pass
MASO-765	2/1/2018	Sr-90	1.07 ± 1.15	0	NA [c]	Pass
MAAP-769	2/1/2018	Am-241	0.070 ± 0.021	0.067	0.047 - 0.087	Pass
MAAP-769	2/1/2018	Cs-134	0.55 ± 0.04	0.675	0.473 - 0.878	Pass
MAAP-769	2/1/2018	Cs-137	0.01 ± 0.01	0	NA [c]	Pass
MAAP-769	2/1/2018	Co-57	1.06 ± 0.04	1.18	0.83 - 1.53	Pass
MAAP-769	2/1/2018	Co-60	0.01 ± 0.01	0	NA [c]	Pass
MAAP-769	2/1/2018	Mn-54	1.01 ± 0.05	1.03	0.72 - 1.34	Pass
MAAP-769	2/1/2018	Zn-65	1.37 ± 0.11	1.33	0.93 - 1.73	Pass
MAAP-769	2/1/2018	Pu-238	0.042 ± 0.017	0.0445	0.0312 - 0.0579	Pass
MAAP-769	2/1/2018	Pu-239/240	-0.001 ± 0.006	0	NA [c]	Pass
MAAP-769	2/1/2018	Sr-90	1.12 ± 0.13	1.01	0.71 - 1.31	Pass
MAAP-769	2/1/2018	U-234/233	0.117 ± 0.023	0.124	0.087 - 0.161	Pass
MAAP-769	2/1/2018	U-238	0.126 ± 0.023	0.128	0.090 - 0.166	Pass
MAVE-767	2/1/2018	Cs-134	3.03 ± 0.10	3.23	2.26 - 4.20	Pass
MAVE-767	2/1/2018	Cs-137	3.86 ± 0.05	3.67	2.57 - 4.77	Pass
MAVE-767	2/1/2018	Co-57	4.86 ± 0.09	4.42	3.09 - 5.75	Pass
MAVE-767	2/1/2018	Co-60	2.24 ± 0.06	2.29	1.60 - 2.98	Pass
MAVE-767	2/1/2018	Mn-54	2.75 ± 0.08	2.66	1.86 - 3.46	Pass
MAVE-767	2/1/2018	Zn-65	0.02 ± 0.05	0	NA [c]	Pass
MAW-656	2/1/2018	I-129	1.66 ± 0.07	1.93	1.35 - 2.51	Pass
MAW-662	2/1/2018	Am-241	0.581 ± 0.050	0.709	0.496 - 0.922	Pass
MAW-662	2/1/2018	Cs-134	9.35 ± 0.38	10.2	7.1 - 13.3	Pass
MAW-662	2/1/2018	Cs-137	13.0 ± 0.2	12.2	8.5 - 15.9	Pass
MAW-662	2/1/2018	Co-57	0.003 ± 0.039	0	NA [c]	Pass
MAW-662	2/1/2018	Co-60	11.73 ± 0.19	11.5	8.1 - 15.0	Pass
MAW-662	2/1/2018	Mn-54	0.060 ± 0.019	0	NA [c]	Pass
MAW-662	2/1/2018	Zn-65	15.85 ± 0.27	14.3	10.0 - 18.6	Pass
MAW-662	2/1/2018	Fe-55	10.7 ± 11.7	11.1	7.80 - 14.40	Pass
MAW-662	2/1/2018	Ni-63 [e]	11.0 ± 1.4	14.0	9.8 - 18.2	Warning
MAW-662	2/1/2018	Ni-63 [e]	12.9 ± 1.7	14.0	9.8 - 18.2	Pass
MAW-662	2/1/2018	H-3	-0.3 ± 3.0	0	NA [c]	Pass
MAW-662	2/1/2018	Pu-238	0.02 ± 0.01	0.023	NA [d]	Pass
MAW-662	2/1/2018	Pu-239/240	0.585 ± 0.056	0.600	0.420 - 0.780	Pass
MAW-662	2/1/2018	Ra-226 [f]	0.340 ± 0.040	0.257	0.180 - 0.334	Fail
MAW-662	2/1/2018	Ra-226 [f]	0.297 ± 0.048	0.257	0.180 - 0.334	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP).

			Concentration [a]			
Lab Code [b]	Reference Date	Analysis	Laboratory result	Known Activity	Control Limits [c]	Acceptance
MAW-662	2/1/2018	Sr-90	9.92 ± 0.75	11.4	8.0 - 14.8	Pass
MAW-662	2/1/2018	Tc-99	4.9 ± 0.4	4.37	3.06 - 5.68	Pass
MAW-662	2/1/2018	U-233/234	0.404 ± 0.041	0.430	0.301 - 0.559	Pass
MAW-662	2/1/2018	U-238	0.396 ± 0.041	0.437	0.306 - 0.568	Pass
MASO-3638	8/1/2018	Cs-134	688.7 ± 26.2	781	547 - 1015	Pass
MASO-3638	8/1/2018	Cs-137	605.9 ± 22.7	572	400 - 744	Pass
MASO-3638	8/1/2018	Co-57	976.7 ± 37.6	958	671 - 1245	Pass
MASO-3638	8/1/2018	Co-60	604.5 ± 24.9	608	426 - 790	Pass
MASO-3638	8/1/2018	Mn-54	5.2 ± 5.2	0	NA [c]	Pass
MASO-3638	8/1/2018	K-40	630 ± 31	566	396 - 736	Pass
MASO-3638	8/1/2018	Zn-65	556.4 ± 26.8	500	350 - 650	Pass
MAAP-3636	8/1/2018	Cs-134	0.37 ± 0.04	0.444	0.311 - 0.577	Pass
MAAP-3636	8/1/2018	Cs-137	0.34 ± 0.05	0.345	0.242 - 0.449	Pass
MAAP-3636	8/1/2018	Co-57	0.56 ± 0.04	0.592	0.414 - 0.770	Pass
MAAP-3636	8/1/2018	Co-60	0.28 ± 0.03	0.294	0.206 - 0.382	Pass
MAAP-3636	8/1/2018	Mn-54	0.26 ± 0.05	0.266	0.186 - 0.346	Pass
MAAP-3636	8/1/2018	Zn-65	0.22 ± 0.07	0.201	NA [d]	Pass
MAVE-3640	8/1/2018	Cs-134	1.87 ± 0.10	1.94	1.36 - 2.52	Pass
MAVE-3640	8/1/2018	Cs-137	2.69 ± 0.15	2.36	1.65 - 3.07	Pass
MAVE-3640	8/1/2018	Co-57	3.90 ± 0.12	3.31	2.32 - 4.30	Pass
MAVE-3640	8/1/2018	Co-60	1.76 ± 0.09	1.68	1.18 - 2.18	Pass
MAVE-3640	8/1/2018	Mn-54	2.91 ± 0.16	2.53	1.77 - 3.29	Pass
MAVE-3640	8/1/2018	Zn-65	1.53 ± 0.21	1.37	0.96 - 1.78	Pass
MAW-3480	8/1/2018	H-3	336.0 ± 10.7	338	237 - 439	Pass
MAW-3480	8/1/2018	Cs-134	7.86 ± 0.31	8.7	6.1 - 11.3	Pass
MAW-3480	8/1/2018	Cs-137	7.55 ± 0.33	6.9	4.8 - 9.0	Pass
MAW-3480	8/1/2018	Co-57	15.67 ± 0.36	14.9	10.4 - 19.4	Pass
MAW-3480	8/1/2018	Co-60	0.12 ± 0.12	0	NA [c]	Pass
MAW-3480	8/1/2018	Mn-54	13.38 ± 0.44	12.5	8.8 - 16.3	Pass
MAW-3480	8/1/2018	Zn-65	7.80 ± 0.53	7.53	5.27 - 9.79	Pass
MAW-3634	8/1/2018	I-129	1.32 ± 0.08	1.62	1.13 - 2.11	Pass

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

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

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

[d] Provided in the series for "sensitivity evaluation". MAPEP does not provide control limits.

[e] The lab was in the "warning zone" on this study(biased low). The sample was rerun applying an aggressive oxidation technique to remove a complexing agent that is utilized in the early steps of the procedure. Reanalysis was acceptable with this enhanced technique.

[f] An investigation was performed to determine reason for the failure of the Ra-226 result. A backup solution was reanalyzed with acceptable results. The current study as well as a past study were reanalyzed with acceptable results. No conclusion has been currently drawn from the results of this investigation.

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD-28 Study

Lab Code [b]	Date	Analysis	Concentration [a] Laboratory Result	ERA Result	Control Limits [c]	Acceptance
ERAP-942	3/19/2018	Am-241[d]	24.6	7.86	5.61 - 10.5	Fail
ERAP-942	3/19/2018	Am-241[d]	7.30	7.86	5.61 - 10.5	Pass
ERAP-942	3/19/2018	Cs-134	174	204	132 - 250	Pass
ERAP-942	3/19/2018	Cs-137	969	865	710 - 1130	Pass
ERAP-942	3/19/2018	Co-60	672	665	565 - 845	Pass
ERAP-942	3/19/2018	Fe-55	701	771	281 - 1230	Pass
ERAP-942	3/19/2018	Mn-54	< 50	< 50.0	0.00 - 50.0	Pass
ERAP-942	3/19/2018	Zn-65	594	668	548 - 1020	Pass
ERAP-942	3/19/2018	Pu-238	56.8	55.6	42.0 - 68.3	Pass
ERAP-942	3/19/2018	Pu-239	54.4	52.3	39.1 - 63.1	Pass
ERAP-942	3/19/2018	Sr-90	113	124	78.4 - 169	Pass
ERAP-942	3/19/2018	U-234	22.8	24.6	18.2 - 28.8	Pass
ERAP-942	3/19/2019	U-238	22.7	24.4	18.4 - 29.1	Pass
ERAP-944	3/19/2018	Gross Alpha	49.1	43.4	22.7 - 71.5	Pass
ERAP-944	3/19/2018	Gross Beta	44.8	52.0	31.5 - 78.6	Pass
ERSO-946	3/19/2018	Ac-228	1,480	1,240	818 - 1560	Pass
ERSO-946	3/19/2018	Am-241	48	74.7	40.3 - 106	Pass
ERSO-946	3/19/2018	Bi-212[e]	1,980	1,240	355 - 1,850	Fail
ERSO-946	3/19/2018	Bi-212[e]	1,285	1,240	355 - 1,850	Pass
ERSO-946	3/19/2018	Bi-214	2,180	1,760	845 - 2,620	Pass
ERSO-946	3/19/2018	Cs-134	5,230	5,330	3,640 - 6,370	Pass
ERSO-946	3/19/2018	Cs-137	4,820	4,210	3,180 - 5,320	Pass
ERSO-946	3/19/2018	Co-60	8,390	8,060	6,350 - 9,950	Pass
ERSO-946	3/19/2018	K-40[e]	14,100	10,600	7,300 - 12,700	Fail
ERSO-946	3/19/2018	K-40[e]	12,160	10,600	7,300 - 12,700	Pass
ERSO-946	3/19/2018	Mn-54	< 1000	< 1000	0 - 1,000	Pass
ERSO-946	3/19/2018	Pb-212	1,140	1,240	865 - 1,570	Pass
ERSO-946	3/19/2018	Pb-214	2,330	1,850	777 - 2910	Pass
ERSO-946	3/19/2018	Pu-238	1,830	1,470	733 - 2230	Pass
ERSO-946	3/19/2018	Pu-239	1,520	1,330	725 - 1910	Pass
ERSO-946	3/19/2018	Sr-90	3,500	4,500	1,400 - 7,010	Pass
ERSO-946	3/19/2018	Th-234	1,800	1,800	680 - 3,080	Pass
ERSO-946	3/19/2018	U-234	1,610	1,820	853 - 2,380	Pass
ERSO-946	3/19/2018	U-238	1,800	1,800	988 - 2,420	Pass
ERSO-946	3/19/2018	Zn-65	2,440	1,990	1,590 - 2,710	Pass
ERW-952	3/19/2018	Gr. Alpha	25.3	29.0	10.6 - 40.0	Pass
ERW-952	3/19/2018	Gr. Beta	61.3	73.1	36.6 - 101	Pass
ERW-954	3/19/2018	H-3	22,300	21,700	16,400 - 26,400	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck Program, Environmental Resource Associates (ERA)[a].

MRAD-28 Study

Lab Code [b]	Date	Analysis	Concentration [a] Laboratory Result	ERA Result	Control Limits [c]	Acceptance
ERVE-948	3/19/2018	Am-241	3,800	3,880	2,400 - 5,480	Pass
ERVE-948	3/19/2018	Cm-244	2,490	2,630	1,480 - 3,270	Pass
ERVE-948	3/19/2018	Co-60	579	491	385 - 642	Pass
ERVE-948	3/19/2018	Cs-134	2,090	1,950	1,290 - 2,600	Pass
ERVE-948	3/19/2018	Cs-137	2,640	2,160	1,660 - 2,910	Pass
ERVE-948	3/19/2018	K-40	34,000	30,900	23,200 - 39,100	Pass
ERVE-948	3/19/2018	Mn-54	< 300	< 300	0.00 - 300	Pass
ERVE-948	3/19/2018	Zn-65	3,080	2,400	1,790 - 3,560	Pass
ERVE-948	3/19/2018	Pu-238	2,400	2,020	1,400 - 2,600	Pass
ERVE-948	3/19/2018	Pu-239	5,140	4,160	2,880 - 5,270	Pass
ERVE-948	3/19/2018	Sr-90	3,570	3,330	1,880 - 4340	Pass
ERVE-948	3/19/2018	U-233/234	4,130	4,050	2,850 - 5,170	Pass
ERVE-948	3/19/2018	U-238	4,190	4,010	2,830 - 5,020	Pass
ERW-950	3/19/2018	Am-241	72.5	103	70.7 - 132	Pass
ERW-950	3/19/2018	Co-60	1,550	1,480	1,280 - 1,700	Pass
ERW-950	3/19/2018	Cs-134	1,280	1,330	1,000 - 1,460	Pass
ERW-950	3/19/2018	Cs-137	343	328	281 - 373	Pass
ERW-950	3/19/2018	Mn-54	< 100	< 100	0.00 - 100	Pass
ERW-950	3/19/2018	Pu-238	59.8	66.1	39.7 - 85.6	Pass
ERW-950	3/19/2018	Pu-239	84.8	91.8	56.8 - 113	Pass
ERW-950	3/19/2018	U-234	111	132	100 - 151	Pass
ERW-950	3/19/2018	U-238	113	131	102 - 154	Pass
ERW-950	3/19/2018	Zn-65	1,450	1,300	1160 - 1640	Pass
ERW-950	3/19/2018	Fe-55	533	445	261 - 647	Pass
ERW-950	3/19/2018	Sr-90	754	781	562 - 965	Pass

[a] Results obtained by Environmental, Inc., Midwest Laboratory (EIML) as a participant in the crosscheck program for proficiency testing administered by Environmental Resource Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

[b] Laboratory codes as follows: ERW (water), ERAP (air filter), ERSO (soil), ERVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

[c] Results are presented as the known values, expected laboratory precision (2 sigma, 1 determination) and control limits as provided by ERA.

[d] Reported result was higher than ERA's upper acceptance limit. An investigation was initiated. The sample was run with a pre-treatment technique. Rerunning the analysis with this pre-treatment gave a result of 7.30 pCi/total. Going forward all samples for Am-241 will be analyzed utilizing this pre-treatment.

[e] The ERA results for Bi-212 and K-40 were outside the acceptable limits. The sample analysis was rerun utilizing a different library with acceptable results. The library used in the original analysis contained many more energies than the second library used, rendering a less reliable result for Bi-212. The K-40 value was overstated due to the use of a background spectrum analysis that had not fully quantified the K-40 present. Going forward a table has been created to track the historical results for the background subtraction for each HPGe detector so that any changes in background can be more easily identified.

APPENDIX B. DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$

where: x = value of the measurement;

$s = 2\sigma$ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L, it is reported as: $< L$,
where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: $< L$, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, $< L$ Reported result: $x \pm s$ if $x \geq L$; $< L$ otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average $\bar{x}$ and standard deviation "s" of a set of n numbers $x_1, x_2 \ldots x_n$ are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas[a].

	Air (pCi/m^3)		Water (pCi/L)
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131[b]	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40[c]	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

[a] Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

[b] Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

[c] A natural radionuclide.

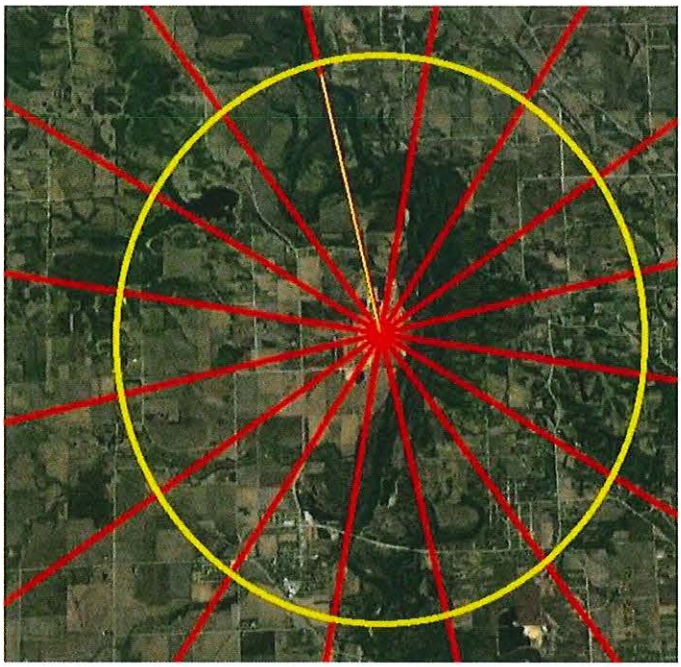
APPENDIX D

SUMMARY OF THE LAND USE CENSUS AND REMP-GWPP DATA

Appendix D

Summary of the 2018 Land Use Census and REMP-GWPP Data

The Duane Arnold Energy Center Land Use Census was completed during August-November 2018. All residences, milk animals, cattle, and gardens greater than 500 square feet were identified within three miles for each of the 16 meteorological sectors. If none were identified within three mile range, additional surveys were performed out to a distance of five miles. The 16 meteorological sectors were identified using Google Earth and digital compass rose overlay for accuracy and precision.



The 2018 Land Use Census identified 118 gardens, which is 3 fewer gardens than in 2017 and 26 fewer gardens than in 2016. A large private garden was identified in the SSW sector and the farmer provided vegetation samples in 2018. This farm location is included as location, D-108, in ODAM, Table 5-1. Gardens were identified using Google Earth, field observation, and interviewing local residents. Eight meteorological sectors had garden changes.

There are eight new residences added to the 2018 Land Use Survey. A large housing development was observed in SE sector to the west of Feather Ridge Road and within 3-miles of the facility. There is the potential for 20 or more single family homes in 2019-2020.

In addition, the Pleasant Creek State Recreation Area has a large transient population of 50-300 people camping in RV's and tents from April to October. An analysis of 2016 data indicated an air sampler should be installed near this population. Therefore, an air sampler and TLD were installed in 2018 and the location is identified as D-4, Pleasant Creek SRA.

There is one nearest livestock change attributed to field observation verification. A farm in SE sector was observed to have goats. If the farmer provides goat milk, the farm will be included as a sample location in the ODAM, Table 5-1.The Iowa Department of Agriculture and Land Stewardship provided a list of permitted commercial dairy farms located with Benton and Linn Counties. Large commercial dairies were included in the survey, but none were located within five miles of the DAEC facility. DAEC continues to collect milk samples from two permitted dairy farms located in WSW and SW sectors. No goat milk samples were collected in 2018 from D-76, ODAM table 5-1.

The Cedar River was surveyed by State of Iowa Hygienic Laboratory boat crew on October 31, 2018 for water use downstream of the DAEC to Cedar Rapids. This survey identified no new usages of river water when compared to previous surveys. Recreational fishing is the only identified food pathway use of Cedar River water between the DAEC and the City of Cedar Rapids eight miles down-river.

The State of Iowa Hygienic Laboratory performed fish sampling on June 21, 2018 and August 24, 2018. Fish filets from walleye, carp, bass, and bluegill were processed for off-site laboratory analysis and results indicate no impact to human consumable fish.

Benton County Public Health Department and Linn County Public Health Department provided ground water well permit data. In 2018, six new drinking wells were installed within three miles of the facility and none of these wells are impacted by plant activities.

As a result of the 2018 Land Use Census, adjustments were made to the Meteorological Information and Dose Assessment System (MIDAS-NU) projection software model for changes in receptor distances. No significant annual dose corrections were necessary. The 2018 annual radiation dose assessment can be found in Appendix E.

In accordance with the DAEC's Environmental Sampling Procedure ESP 4.4, "Land Use Census", no changes in land use were identified that would adversely affect the safe operation of the DAEC, or that would warrant an update of the DAEC Updated Final Safety Analysis Report (UFSAR). Examples of land use that would warrant an UFSAR update include new hazards near the DAEC such as new gas pipelines or new installations utilizing toxic gases.

NextEra Energy Resources, Duane Arnold has committed to compliance with NEI 07-07, "Nuclear Energy Institute's Industry Ground Water Protection Initiative". Per NEI 07-07, the following information is presented:

- Radioactive reactor-by-product material was identified in multiple groundwater samples collected by the DAEC's Ground Water Protection Program (GWPP). The following was included to the DAEC Offsite Dose Assessment Manual (ODAM):

  "In February 2016, the GWPP routine sampling identified a contaminate plume in the shallow aquifer (less than 25 feet deep). Release standards are set forth in Section 6.0, Radiological Liquid Effluent Release O.6.1.2, Table 7.1-2. In accordance with GWPP Administrative Control Procedure (ACP) 1411.35 and Environmental Protection Agency (EPA) drinking water standards for tritium, 20,000 pCi/L, groundwater batch and continuous releases are expected less than (<) 20,000 pCi/L. Groundwater samples are analyzed on-site and validated by off-site secondary laboratory. Off-site laboratory results are published Annual Radiological Environmental Operating Report."

- There are 56 monitoring wells on-site. Tritium concentrations from on-site monitoring wells range from non-detectable at less than (<) 151 pCi/L to 290,521 pCi/L, monitoring well MW-19A (D-63A). Gross alpha values in several samples are believed to be influenced by naturally occurring radioactive materials in the environment, i.e. radon. No on-site or neighboring drinking water wells are installed in this shallow aquifer. No plant by-product was identified in any drinking water samples or surface-water samples from the Cedar River at the intake, D-50, and the discharge point, D-51. Tritiated groundwater remains within the owner controlled area and the shallow aquifer is undergoing mitigation in accordance with ACP 1411.35.

  From January 1 to December 31, 2018, three extraction wells were in operation and are designed to remove tritiated groundwater continuously from the shallow aquifer. In addition, temporary mitigation of monitoring well, D-127A, was performed. For specific liquid effluent release data, see the 2018 Duane Arnold Annual Radioactive Material Release Report.

- The United States Nuclear Regulatory Commission, NRC, provides an informative resource for tritium. The information can be found at:

  https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html

Updates to REMP and GWPP sampling include:

1. D-4 Pleasant Creek SRA air sampler and TLD.
2. D-6 Center Point and D-7 Shellsburg air samplers will be discontinued in 2019, but the TLDs shall remain at their respective locations.
3. A new vegetation sample location, D-77, was added.
4. Deer meat sample was added to D-99.

APPENDIX E

ANNUAL RADIATION DOSE ASSESSMENT

Appendix E

Annual Radiation Dose Assessment

The annual offsite radiation dose to a member of the public was determined by assessment of environmental dosimetry results and by calculations based on monitored effluent releases.

Section A. Dose Contribution from Direct Radiation

Direct radiation dose from the operation of the DAEC was reported by TLDs placed at locations in the surrounding environment as described in the Offsite Dose Assessment Manual (ODAM).

1. Pre-operational and 2018 TLD results were evaluated with a paired difference statistical test. The evaluation concluded that there were no significant differences in the TLD populations for the 0.5 mile and 1 mile TLD populations as per Environmental Sampling Procedure, ESP 4.5.

2. As stated in Part 1 of this report, no plant effect was indicated by the TLDs when dose results were compared to the estimated average natural background for the central United States.

Section B. Estimated Offsite Dose from Effluent Releases

1. The contribution of dose to a member of the public most likely to be exposed from liquid and gaseous effluent releases was calculated using the Meteorological Information and Dose Assessment System (MIDAS) computer program in accordance with the ODAM. The calculation methods follow those prescribed by Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I".

2. Following calculation of offsite doses, the appropriateness of REMP sampling station types and locations was reviewed. The current sampling scheme was determined to be adequate for the identified receptors.

Results of the MIDAS dose calculations are displayed below.

1.) There were 34 releases of radioactive material to liquid effluents (groundwater mitigation) in 2018. The maximum dose from tritiated groundwater release was 0.0301 mrem.

2.) The maximum dose to air at the site boundary from noble gases released was 0.00269 mrad from gamma radiation at 481 meters towards the South-Southeast.

3.) The maximum dose to air at the site boundary from noble gases released was 0.00016 mrad beta radiation at 2,416 meters towards the North.

4.) The whole body dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.00510 mrem, at 1,760 meters towards the North.

5.) The skin dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.00520 mrem, at 1,760 meters towards the North.

6.) The hypothetical maximally exposed organ due to airborne iodines and particulates with half-lives greater than eight days (excluding carbon-14) was the lungs of a child at 974 meters towards the West-Southwest, with an estimated dose equivalent of 0.00674 mrem.

7.) The hypothetical maximally exposed organ due to airborne carbon-14 was the bone of a child located 4,022 meters to the West-Northwest of the site. The dose was 0.115 mrem.

Conclusion

No measurable dose due to the operation of the DAEC or the DAEC ISFSI was detected by environmental TLDs in 2018. The calculated doses are below the regulatory limits stated in Appendix I to 10CFR50, 40CFR190, and 10 CFR 72.104.

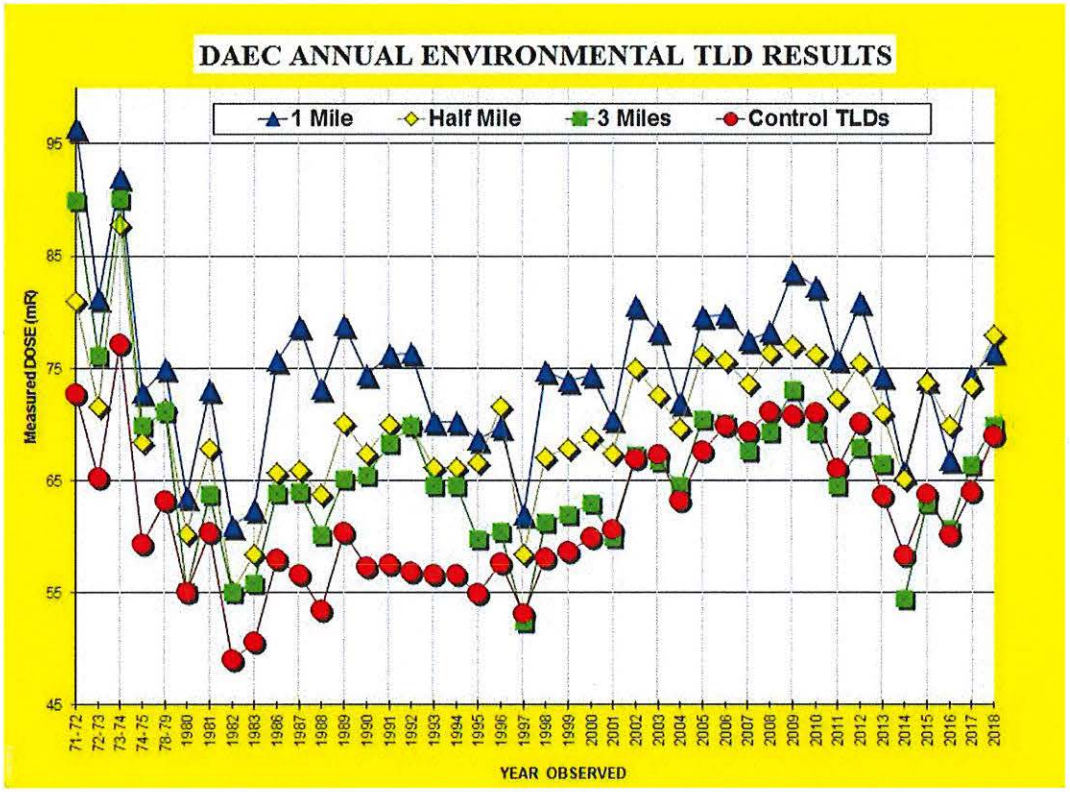
Estimated Maximum Offsite Individual Doses for 2017

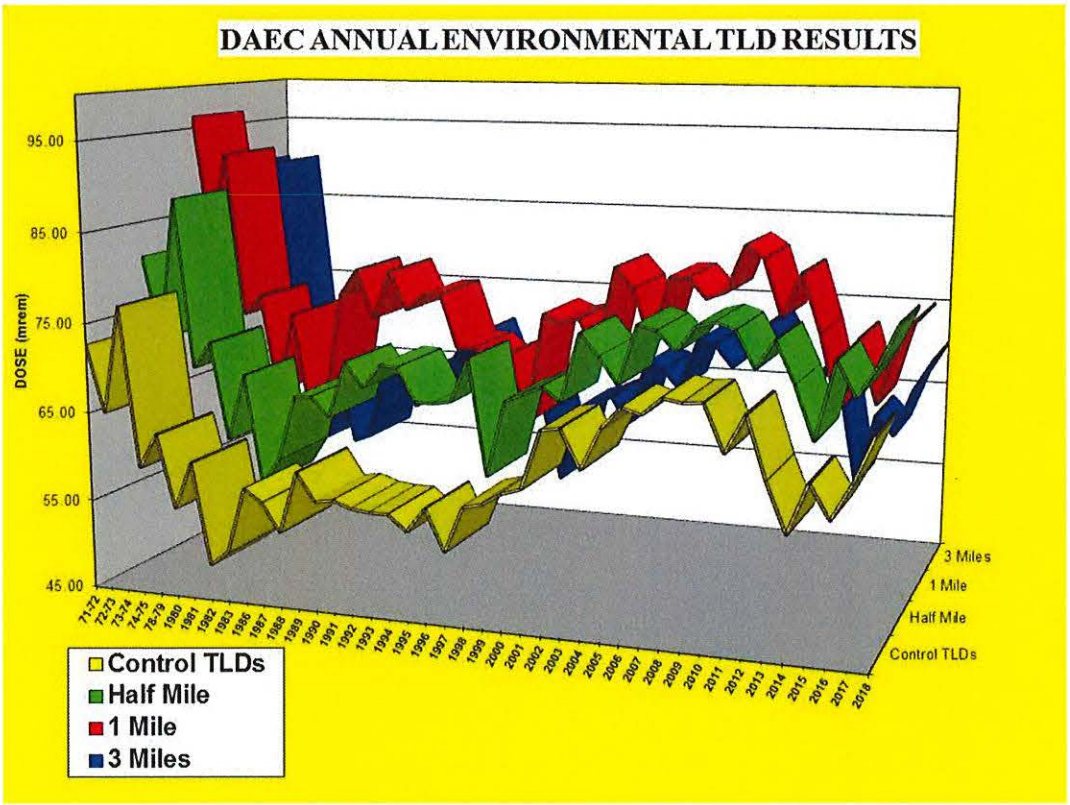
Type	Age Group	Distance (meters)	Direction	Dose or Dose Equivalent (mrem)	Annual 10 CFR 50, Appendix I "Limit"
Direct Radiation (as measured by TLDs)				None	*
Liquid Releases					
Whole Body Dose	Child	D*	SE	0.0301 mrem	3 mrem
Organ Dose	Child - Liver	D*	SE	0.0301 mrem	10 mrem
Noble Gas					
Gamma Air Dose		481	SSE	0.00269 mrad	10 mrad
Beta Air Dose		2,416	N	0.00016 mrad	20 mrad
Whole Body	All	1,760	N	0.00510 mrem	5 mrem
Skin	Child	1,760	N	0.00520 mrem	15 mrem
Particulates & Iodines					
Organ Dose	Child – Lungs	974	WSW	0.00647 mrem	15 mrem
Carbon 14					
Organ Dose	Child – Bone	4,022	WNW	0.115 mrem	15 mrem

* There is no Appendix I limit for direct radiation. Compliance with 40 CFR 190 limits of 25 mrem whole body and 75 mrem thyroid is demonstrated in the Duane Arnold Energy Center 2018 Annual Radiological Environmental Operating Report, subsections "Ambient Radiation (TLDs)" and "ISFSI Facility Operations Monitoring".

D* Receptor location is aquatic pathway at Cedar River, See Offsite Dose Assessment Manual, ODAM, figure 3-2.

The following graphs are TLD trends based on distance to the facility over time.





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DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

January 1 to December 31, 2018

Prepared by

ATI ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Reviewed and Approved

4/25/19

Ashok Banavali, Ph.D.
Laboratory Manager

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LIST OF TABLES

1.0 INTRODUCTION

The following constitutes a supplement to the Annual Report for the Radiological Environmental Monitoring Program conducted at the Duane Arnold Energy Center, Palo, Iowa in 2018. Results of completed analyses are presented in the attached tables.

For information regarding sampling locations, type and frequency of collection, and sample codes, please refer to Part I, Tables 5.3 - 5.5 and Figures 5.1 and 5.2.

All concentrations, except gross beta and airborne iodine, are decay corrected to the time of collection. Airborne I-131 is decayed to the midpoint of the collection period.

The required values for lower limits of detection (LLD) for gamma emitting isotopes are established through the Offsite Dose Assessment Manual (ODAM). Naturally occurring radioisotopes, such as Be-7, K-40 and Ra daughters, are frequently detected, but may not be listed for every sample medium.

2.0 PROGRAM DEVIATIONS

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
MI		D-76	01-09-18	Goat's milk unavailable due to limited herd production.
SW		D-99	01-26-18	No sample, water frozen.
MI		D-76	02-14-18	Goat's milk unavailable due to limited herd production.
WW		D-58	02-21-18	No sample, water frozen.
WW		D-72	02-21-18	No sample, water frozen.
WW		D-111A	02-14-18	No sample, water unavailable.
MI		D-76	03-13-18	Goat's milk unavailable due to limited herd production.
TLD		D-40	04-03-18	Missing in field.
MI		D-76	04-10-18	Goat's milk unavailable due to limited herd production.
WW		D-52	05-07-18	No sample sent.
MI		D-76	05-16-18	Goat's milk unavailable due to limited herd production.
MI		D-76	06-06-18	Goat's milk unavailable due to limited herd production.
AP/AI		D-16	07-13-18	Sampler removed from service for meteorology tower maintenance-repairs.
AP/AI		D-11	07-20-18	Air particulate not sent, I-131 result = 0.011 pCi/m^3.
MI		D-76	07-11-18	Goat's milk unavailable due to limited herd production.

2.0 PROGRAM DEVIATIONS

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
MI		D-76	08-08-18	Goat's milk unavailable due to limited herd production.
P		D-16	08-01-18	Sampler removed from service for meteorology tower maintenance-repairs
MI		D-76	09-12-18	Goat's milk unavailable due to limited herd production.
MI		D-76	10-09-18	Goat's milk unavailable due to limited herd production.
MI		D-76	11-07-18	Goat's milk unavailable due to limited herd production.
MI		D-76	12-11-18	Goat's milk unavailable due to limited herd production.
TLD		D-17	01-02-18	Missing in field.
TLD		D-82	01-02-19	Missing in field.

3.0 DATA TABLES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-3 (Hiawatha)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	277	0.061 ± 0.005	07-06-18	281	0.025 ± 0.004
01-12-18	275	0.032 ± 0.004	07-13-18	278	0.036 ± 0.004
01-19-18	278	0.039 ± 0.004	07-20-18	280	0.024 ± 0.004
01-26-18	277	0.035 ± 0.004	07-27-18	283	0.026 ± 0.004
02-02-18	279	0.034 ± 0.004	08-03-18	277	0.026 ± 0.004
02-08-18	236	0.031 ± 0.005	08-10-18	280	0.035 ± 0.004
02-16-18	316	0.040 ± 0.004	08-17-18	280	0.029 ± 0.004
02-23-18	277	0.021 ± 0.004	08-24-18	280	0.034 ± 0.004
03-02-18	277	0.028 ± 0.004	08-31-18	279	0.034 ± 0.004
03-09-18	276	0.026 ± 0.004	09-07-18	279	0.013 ± 0.003
03-16-18	276	0.040 ± 0.005	09-14-18	278	0.025 ± 0.004
03-23-18	276	0.027 ± 0.004	09-21-18	280	0.030 ± 0.004
03-30-18	298	0.026 ± 0.004	09-28-18	285	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.034 ± 0.010	3rd Quarter Mean ± s.d.		0.028 ± 0.006
04-06-18	297	0.027 ± 0.004	10-05-18	285	0.015 ± 0.003
04-13-18	296	0.029 ± 0.004	10-12-18	285	0.014 ± 0.003
04-20-18	297	0.018 ± 0.003	10-19-18	285	0.021 ± 0.004
04-27-18	296	0.024 ± 0.004	10-26-18	286	0.020 ± 0.004
			11-02-18	287	0.027 ± 0.004
05-04-18	297	0.011 ± 0.003			
05-11-18	298	0.027 ± 0.004	11-09-18	285	0.021 ± 0.003
05-18-18	298	0.029 ± 0.004	11-15-18	245	0.036 ± 0.005
05-25-18	299	0.026 ± 0.004	11-21-18	245	0.042 ± 0.005
06-01-18	294	0.044 ± 0.004	11-30-18	367	0.047 ± 0.004
06-08-18	302	0.024 ± 0.004	12-07-18	289	0.027 ± 0.004
06-15-18	292	0.025 ± 0.004	12-14-18	282	0.066 ± 0.005
06-21-18	255	0.019 ± 0.004	12-21-18	285	0.031 ± 0.004
06-29-18	319	0.020 ± 0.003	12-28-18	289	0.027 ± 0.004
2nd Quarter Mean ± s.d.		0.025 ± 0.008	4th Quarter Mean ± s.d.		0.030 ± 0.015
			Cumulative Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-4 (NW Sector)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
			09-07-18		ND[b]
			09-14-18	284	0.026 ± 0.004
			09-21-18	309	0.029 ± 0.004
			09-28-18	282	0.025 ± 0.004
			3rd Quarter Mean ± s.d.		0.027 ± 0.004
			10-05-18	310	0.012 ± 0.003
			10-12-18	308	0.011 ± 0.003
			10-19-18	308	0.025 ± 0.004
			10-26-18	309	0.021 ± 0.004
			11-02-18	309	0.027 ± 0.004
			11-09-18	308	0.018 ± 0.003
			11-15-18	264	0.032 ± 0.004
			11-21-18	264	0.032 ± 0.004
			11-30-18	397	0.048 ± 0.004
			12-07-18	311	0.025 ± 0.003
			12-14-18	305	0.063 ± 0.005
			12-21-18	308	0.032 ± 0.004
			12-28-18	311	0.030 ± 0.004
			4th Quarter Mean ± s.d.		0.029 ± 0.014
			Cumulative Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

[b] No data, new sampler, D-4, added to REMP air sampling network.

Table 3. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-5A (Palo)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	278	0.023 ± 0.004	07-06-18	275	0.030 ± 0.004
01-12-18	275	0.034 ± 0.004	07-13-18	272	0.030 ± 0.004
01-19-18	278	0.028 ± 0.004	07-20-18	285	0.026 ± 0.004
01-26-18	275	0.036 ± 0.004	07-27-18	285	0.026 ± 0.004
02-02-18	280	0.028 ± 0.004	08-03-18	280	0.025 ± 0.004
02-08-18	236	0.028 ± 0.004	08-10-18	282	0.036 ± 0.004
02-16-18	317	0.043 ± 0.004	08-17-18	282	0.034 ± 0.004
02-23-18	278	0.020 ± 0.004	08-24-18	283	0.026 ± 0.004
03-02-18	276	0.029 ± 0.004	08-31-18	281	0.026 ± 0.004
03-09-18	276	0.024 ± 0.004	09-07-18	282	0.016 ± 0.003
03-16-18	275	0.035 ± 0.004	09-14-18	282	0.025 ± 0.004
03-23-18	277	0.017 ± 0.003	09-21-18	283	0.030 ± 0.004
03-30-18	278	0.022 ± 0.004	09-28-18	282	0.022 ± 0.003
1st Quarter Mean ± s.d.		0.028 ± 0.007	3rd Quarter Mean ± s.d.		0.027 ± 0.005
04-06-18	274	0.024 ± 0.004	10-05-18	284	0.017 ± 0.004
04-13-18	273	0.029 ± 0.004	10-12-18	282	0.011 ± 0.003
04-20-18	274	0.014 ± 0.003	10-19-18	282	0.021 ± 0.004
04-27-18	273	0.024 ± 0.004	10-26-18	283	0.018 ± 0.004
			11-02-18	284	0.032 ± 0.004
05-04-18	274	0.021 ± 0.004			
05-11-18	275	0.025 ± 0.004	11-09-18	283	0.020 ± 0.003
05-18-18	275	0.024 ± 0.004	11-15-18	242	0.035 ± 0.005
05-25-18	275	0.026 ± 0.004	11-21-18	242	0.035 ± 0.005
06-01-18	272	0.030 ± 0.004	11-30-18	364	0.042 ± 0.004
06-08-18	276	0.024 ± 0.004	12-07-18	282	0.027 ± 0.004
06-15-18	273	0.018 ± 0.003	12-14-18	283	0.040 ± 0.004
06-21-18	235	0.013 ± 0.004	12-21-18	282	0.032 ± 0.004
06-29-18	312	0.020 ± 0.003	12-28-18	282	0.031 ± 0.004
2nd Quarter Mean ± s.d.		0.023 ± 0.005	4th Quarter Mean ± s.d.		0.028 ± 0.010
			Cumulative Average		0.026

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 4. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-6 (Center Point)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	267	0.048 ± 0.005	07-06-18	283	0.025 ± 0.004
01-12-18	264	0.032 ± 0.004	07-13-18	282	0.032 ± 0.004
01-19-18	405	0.038 ± 0.004	07-20-18	284	0.024 ± 0.004
01-26-18	270	0.036 ± 0.004	07-27-18	284	0.020 ± 0.004
02-02-18	297	0.024 ± 0.004	08-03-18	280	0.022 ± 0.004
02-08-18	250	0.032 ± 0.004	08-10-18	283	0.033 ± 0.004
02-16-18	337	0.046 ± 0.004	08-17-18	283	0.029 ± 0.004
02-23-18	266	0.023 ± 0.004	08-24-18	283	0.029 ± 0.004
03-02-18	265	0.035 ± 0.004	08-31-18	281	0.028 ± 0.004
03-09-18	265	0.025 ± 0.004	09-07-18	282	0.012 ± 0.003
03-16-18	265	0.030 ± 0.004	09-14-18	273	0.024 ± 0.004
03-23-18	264	0.026 ± 0.004	09-21-18	283	0.028 ± 0.004
03-30-18	266	0.030 ± 0.004	09-28-18	271	0.022 ± 0.003
1st Quarter Mean ± s.d.		0.033 ± 0.008	3rd Quarter Mean ± s.d.		0.025 ± 0.006
04-06-18	265	0.027 ± 0.004	10-05-18	284	0.015 ± 0.003
04-13-18	273	0.023 ± 0.004	10-12-18	282	0.011 ± 0.003
04-20-18	265	0.018 ± 0.004	10-19-18	283	0.022 ± 0.004
04-27-18	265	0.029 ± 0.004	10-26-18	283	0.018 ± 0.004
			11-02-18	284	0.027 ± 0.004
05-04-18	265	0.026 ± 0.004			
05-11-18	266	0.025 ± 0.004	11-09-18	282	0.016 ± 0.003
05-18-18	267	0.026 ± 0.004	11-15-18	242	0.033 ± 0.005
05-25-18	284	0.024 ± 0.004	11-21-18	242	0.032 ± 0.004
06-01-18	281	0.037 ± 0.004	11-30-18	364	0.045 ± 0.004
06-08-18	284	0.026 ± 0.004	12-07-18	286	0.024 ± 0.004
06-15-18	281	0.023 ± 0.004	12-14-18	279	0.063 ± 0.005
06-21-18	242	0.018 ± 0.004	12-21-18	282	0.033 ± 0.004
06-29-18	322	0.018 ± 0.003	12-28-18	285	0.027 ± 0.004
2nd Quarter Mean ± s.d.		0.025 ± 0.005	4th Quarter Mean ± s.d.		0.028 ± 0.014
			Cumulative Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 5. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-7 (Shellsburg)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	279	0.053 ± 0.005	07-06-18	306	0.021 ± 0.003
01-12-18	286	0.035 ± 0.004	07-13-18	305	0.032 ± 0.004
01-19-18	436	0.041 ± 0.004	07-20-18	307	0.022 ± 0.003
01-26-18	288	0.033 ± 0.004	07-27-18	307	0.024 ± 0.004
02-02-18	306	0.028 ± 0.004	08-03-18	303	0.035 ± 0.004
02-08-18	258	0.030 ± 0.004	08-10-18	305	0.037 ± 0.004
02-16-18	346	0.041 ± 0.004	08-17-18	306	0.039 ± 0.004
02-23-18	275	0.020 ± 0.004	08-24-18	306	0.035 ± 0.004
03-02-18	273	0.031 ± 0.004	08-31-18	270	0.033 ± 0.004
03-09-18	274	0.027 ± 0.004	09-07-18	271	0.016 ± 0.003
03-16-18	273	0.035 ± 0.004	09-14-18	276	0.021 ± 0.004
03-23-18	273	0.023 ± 0.004	09-21-18	272	0.026 ± 0.004
03-30-18	275	0.020 ± 0.004	09-28-18	276	0.019 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.009	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-06-18	274	0.022 ± 0.004	10-05-18	273	0.015 ± 0.004
04-13-18	273	0.028 ± 0.004	10-12-18	271	0.008 ± 0.003
04-20-18	274	0.015 ± 0.003	10-19-18	271	0.018 ± 0.004
04-27-18	273	0.024 ± 0.004	10-26-18	271	0.020 ± 0.004
			11-02-18	272	0.030 ± 0.004
05-04-18	274	0.025 ± 0.004			
05-11-18	275	0.027 ± 0.004	11-09-18	271	0.023 ± 0.004
05-18-18	275	0.022 ± 0.004	11-15-18	232	0.030 ± 0.005
05-25-18	307	0.022 ± 0.003	11-21-18	232	0.034 ± 0.005
06-01-18	303	0.033 ± 0.004	11-30-18	349	0.049 ± 0.004
06-08-18	307	0.021 ± 0.003	12-07-18	270	0.027 ± 0.004
06-15-18	304	0.019 ± 0.003	12-14-18	272	0.063 ± 0.005
06-21-18	231	0.018 ± 0.004 [b]	12-21-18	271	0.031 ± 0.004
06-29-18	348	0.018 ± 0.003	12-28-18	271	0.029 ± 0.004
2nd Quarter Mean ± s.d.		0.023 ± 0.005	4th Quarter Mean ± s.d.		0.029 ± 0.014
			Cumulative Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

[b] Lower volume due to power outage.

Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-11 (Toddville)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta		Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010		Required LLD		0.010
01-05-18	269	0.055 ± 0.005		07-06-18	270	0.022 ± 0.004
01-12-18	263	0.036 ± 0.005		07-13-18	267	0.030 ± 0.004
01-19-18	413	0.044 ± 0.005		07-20-18		ND[d]
01-26-18	274	0.036 ± 0.004		07-27-18	272	0.021 ± 0.004
02-02-18	271	0.041 ± 0.005		08-03-18	265	0.023 ± 0.004
02-08-18	233	0.034 ± 0.005		08-10-18	269	0.030 ± 0.004
02-16-18	309	0.046 ± 0.005		08-17-18	268	0.024 ± 0.004
02-23-18	272	0.023 ± 0.004		08-24-18	277	0.032 ± 0.004
03-02-18	270	0.028 ± 0.004		08-31-18	276	0.030 ± 0.004
03-09-18	271	0.023 ± 0.004		09-07-18	277	0.017 ± 0.003
03-16-18	271	0.039 ± 0.005		09-14-18	293	0.023 ± 0.004
03-23-18	270	0.027 ± 0.004		09-21-18	278	0.027 ± 0.004
03-30-18	272	0.026 ± 0.004		09-28-18	273	0.020 ± 0.003
1st Quarter Mean ± s.d.		0.035 ± 0.010		3rd Quarter Mean ± s.d.		0.025 ± 0.005
04-06-18	271	0.024 ± 0.004		10-05-18	279	0.016 ± 0.004
04-13-18	271	0.028 ± 0.004		10-12-18	276	0.012 ± 0.003
04-20-18	271	0.004 ± 0.003	[b]	10-19-18	277	0.019 ± 0.004
04-27-18	271	0.025 ± 0.004		10-26-18	277	0.019 ± 0.004
				11-02-18	278	0.029 ± 0.004
05-04-18	271	0.023 ± 0.004				
05-11-18	269	0.028 ± 0.004		11-09-18	277	0.017 ± 0.003
05-18-18	269	0.021 ± 0.004		11-15-18	237	0.035 ± 0.005
05-25-18	271	0.010 ± 0.003		11-21-18	237	0.036 ± 0.005
06-01-18	266	0.023 ± 0.004		11-30-18	360	0.055 ± 0.004
06-08-18	270	0.021 ± 0.004		12-07-18	282	0.023 ± 0.004
06-15-18	58	0.024 ± 0.012	[c]	12-14-18	276	0.060 ± 0.005
06-21-18	230	0.015 ± 0.004		12-21-18	280	0.029 ± 0.004
06-29-18	306	0.021 ± 0.003		12-28-18	283	0.027 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.007		4th Quarter Mean ± s.d.		0.029 ± 0.015
				Cumulative Average		0.027

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

[b] Filter light.

[c] Power outage due to storms in the area; due to the low volume I-131 = 0.06 pCi/m^3.

[d] "ND" = No data; see Table 2.0, Program Deviations.

Table 7. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-13 (Alburnett)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	360	0.058 ± 0.005	07-06-18	294	0.022 ± 0.003
01-12-18	324	0.030 ± 0.004	07-13-18	293	0.023 ± 0.004
01-19-18	245	0.037 ± 0.004	07-20-18	295	0.021 ± 0.003
01-26-18	373	0.034 ± 0.004	07-27-18	296	0.021 ± 0.003
02-02-18	300	0.031 ± 0.004	08-03-18	291	0.022 ± 0.004
02-08-18	255	0.039 ± 0.005	08-10-18	294	0.031 ± 0.004
02-16-18	338	0.048 ± 0.004	08-17-18	295	0.024 ± 0.004
02-23-18	297	0.022 ± 0.004	08-24-18	294	0.032 ± 0.004
03-02-18	296	0.032 ± 0.004	08-31-18	293	0.032 ± 0.004
03-09-18	297	0.026 ± 0.004	09-07-18	294	0.015 ± 0.003
03-16-18	296	0.036 ± 0.004	09-14-18	268	0.016 ± 0.003
03-23-18	295	0.029 ± 0.004	09-21-18	295	0.016 ± 0.003
03-30-18	292	0.028 ± 0.004	09-28-18	276	0.020 ± 0.003
1st Quarter Mean ± s.d.		0.035 ± 0.010	3rd Quarter Mean ± s.d.		0.023 ± 0.006
04-06-18	291	0.023 ± 0.004	10-05-18	276	0.014 ± 0.003
04-13-18	290	0.028 ± 0.004	10-12-18	274	0.013 ± 0.003
04-20-18	291	0.019 ± 0.004	10-19-18	274	0.019 ± 0.004
04-27-18	290	0.023 ± 0.004	10-26-18	274	0.018 ± 0.004
			11-02-18	275	0.026 ± 0.004
05-04-18	291	0.011 ± 0.003			
05-11-18	292	0.024 ± 0.004	11-09-18	274	0.017 ± 0.003
05-18-18	292	0.022 ± 0.003	11-15-18	235	0.029 ± 0.005
05-25-18	294	0.019 ± 0.003	11-21-18	235	0.030 ± 0.004
06-01-18	289	0.033 ± 0.004	11-30-18	353	0.044 ± 0.004
06-08-18	293	0.016 ± 0.003	12-07-18	277	0.025 ± 0.004
06-15-18	290	0.023 ± 0.004	12-14-18	271	0.058 ± 0.005
06-21-18	250	0.016 ± 0.004	12-21-18	274	0.039 ± 0.004
06-29-18	333	0.019 ± 0.003	12-28-18	277	0.021 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.006	4th Quarter Mean ± s.d.		0.027 ± 0.013
			Cumulative Average		0.026

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 8. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-15 (On-site, north)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	246	0.060 ± 0.005	07-06-18	268	0.023 ± 0.004
01-12-18	272	0.030 ± 0.004	07-13-18	270	0.032 ± 0.004
01-19-18	275	0.046 ± 0.005	07-20-18	275	0.024 ± 0.004
01-26-18	280	0.041 ± 0.005	07-27-18	281	0.024 ± 0.004
02-02-18	269	0.035 ± 0.004	08-03-18	267	0.025 ± 0.004
02-08-18	255	0.032 ± 0.004	08-10-18	277	0.040 ± 0.004
02-16-18	326	0.042 ± 0.004	08-17-18	278	0.031 ± 0.004
02-23-18	292	0.021 ± 0.004	08-24-18	278	0.038 ± 0.004
03-02-18	290	0.024 ± 0.004	08-31-18	273	0.031 ± 0.004
03-09-18	291	0.028 ± 0.004	09-07-18	277	0.016 ± 0.003
03-16-18	289	0.036 ± 0.004	09-14-18	271	0.025 ± 0.004
03-23-18	291	0.024 ± 0.004	09-21-18	277	0.027 ± 0.004
03-30-18	292	0.030 ± 0.004	09-28-18	255	0.025 ± 0.004
1st Quarter Mean ± s.d.		0.035 ± 0.011	3rd Quarter Mean ± s.d.		0.028 ± 0.006
04-06-18	291	0.026 ± 0.004	10-05-18	276	0.013 ± 0.003
04-13-18	290	0.028 ± 0.004	10-12-18	277	0.016 ± 0.003
04-20-18	291	0.014 ± 0.003	10-19-18	277	0.021 ± 0.004
04-27-18	290	0.029 ± 0.004	10-26-18	271	0.022 ± 0.004
			11-02-18	261	0.033 ± 0.004
05-04-18	291	0.021 ± 0.003			
05-11-18	275	0.026 ± 0.004	11-09-18	265	0.017 ± 0.003
05-18-18	275	0.020 ± 0.004	11-15-18	227	0.031 ± 0.005
05-25-18	275	0.025 ± 0.004	11-21-18	227	0.034 ± 0.005
06-01-18	272	0.044 ± 0.005	11-30-18	342	0.043 ± 0.004
06-08-18	275	0.020 ± 0.004	12-07-18	266	0.025 ± 0.004
06-15-18	273	0.020 ± 0.004	12-14-18	265	0.069 ± 0.006
06-21-18	235	0.016 ± 0.004	12-21-18	265	0.033 ± 0.004
06-29-18	311	0.023 ± 0.003	12-28-18	267	0.031 ± 0.004
2nd Quarter Mean ± s.d.		0.024 ± 0.008	4th Quarter Mean ± s.d.		0.030 ± 0.015
			Cumulative Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 9. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].

Location: D-16 (On-site)

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	261	0.046 ± 0.005	07-06-18	272	0.028 ± 0.004
01-12-18	258	0.040 ± 0.005	07-13-18		ND[b]
01-19-18	261	0.044 ± 0.005	07-20-18		ND[b]
01-26-18	266	0.036 ± 0.004	07-27-18		ND[b]
02-02-18	254	0.038 ± 0.005	08-03-18		ND[b]
02-08-18	228	0.036 ± 0.005	08-10-18		ND[b]
02-16-18	291	0.052 ± 0.005	08-17-18		ND[b]
02-23-18	272	0.022 ± 0.004	08-24-18		ND[b]
03-02-18	270	0.039 ± 0.005	08-31-18	229	0.006 ± 0.003 [c]
03-09-18	271	0.027 ± 0.004	09-07-18	282	0.016 ± 0.003
03-16-18	269	0.032 ± 0.004	09-14-18	282	0.023 ± 0.004
03-23-18	271	0.027 ± 0.004	09-21-18	272	0.030 ± 0.004
03-30-18	272	0.029 ± 0.004	09-28-18	280	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.036 ± 0.009	3rd Quarter Mean ± s.d.		0.020 ± 0.009
04-06-18	271	0.032 ± 0.004	10-05-18	273	0.016 ± 0.004
04-13-18	271	0.032 ± 0.004	10-12-18	271	0.010 ± 0.003
04-20-18	271	0.015 ± 0.004	10-19-18	271	0.023 ± 0.004
04-27-18	271	0.027 ± 0.004	10-26-18	272	0.016 ± 0.004
			11-02-18	272	0.029 ± 0.004
05-04-18	271	0.023 ± 0.004			
05-11-18	271	0.028 ± 0.004	11-09-18	271	0.020 ± 0.003
05-18-18	272	0.025 ± 0.004	11-15-18	232	0.031 ± 0.005
05-25-18	272	0.026 ± 0.004	11-21-18	232	0.031 ± 0.005
06-01-18	270	0.039 ± 0.005	11-30-18	349	0.045 ± 0.004
06-08-18	272	0.024 ± 0.004	12-07-18	270	0.024 ± 0.004
06-15-18	270	0.023 ± 0.004	12-14-18	270	0.057 ± 0.005
06-21-18	233	0.018 ± 0.004	12-21-18	271	0.029 ± 0.004
06-29-18	309	0.024 ± 0.003	12-28-18	272	0.026 ± 0.004
2nd Quarter Mean ± s.d.		0.026 ± 0.006	4th Quarter Mean ± s.d.		0.027 ± 0.013
			Cumulative Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

[b] "ND" = No data; see Table 2.0, Program Deviations.

[c] Low volume due to the recent power restoration

Table 10. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-40 (Wickiup Hill)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-05-18	277	0.029 ± 0.004	07-06-18	284	0.025 ± 0.004
01-12-18	246	0.037 ± 0.005	07-13-18	285	0.038 ± 0.004
01-19-18	372	0.042 ± 0.005	07-20-18	282	0.024 ± 0.004
01-26-18	244	0.032 ± 0.004	07-27-18	283	0.022 ± 0.004
02-02-18	275	0.031 ± 0.004	08-03-18	278	0.027 ± 0.004
02-08-18	234	0.028 ± 0.004	08-10-18	280	0.038 ± 0.004
02-16-18	311	0.045 ± 0.005	08-17-18	285	0.027 ± 0.004
02-23-18	280	0.019 ± 0.004	08-24-18	280	0.033 ± 0.004
03-02-18	274	0.033 ± 0.004	08-31-18	281	0.029 ± 0.004
03-09-18	276	0.028 ± 0.004	09-07-18	282	0.015 ± 0.003
03-16-18	274	0.038 ± 0.004	09-14-18	292	0.024 ± 0.004
03-23-18	278	0.036 ± 0.004	09-21-18	285	0.027 ± 0.004
03-30-18	278	0.023 ± 0.004	09-28-18	308	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.007	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-06-18	277	0.025 ± 0.004	10-05-18	284	0.010 ± 0.003
04-13-18	276	0.032 ± 0.004	10-12-18	282	0.011 ± 0.003
04-20-18	277	0.014 ± 0.003	10-19-18	283	0.022 ± 0.004
04-27-18	276	0.012 ± 0.003	10-26-18	283	0.017 ± 0.004
			11-02-18	284	0.023 ± 0.004
05-04-18	277	0.021 ± 0.004			
05-11-18	277	0.030 ± 0.004	11-09-18	282	0.018 ± 0.003
05-18-18	284	0.024 ± 0.004	11-15-18	242	0.032 ± 0.005
05-25-18	286	0.024 ± 0.004	11-21-18	242	0.033 ± 0.005
06-01-18	279	0.039 ± 0.004	11-30-18	389	0.046 ± 0.004
06-08-18	287	0.025 ± 0.004	12-07-18	303	0.026 ± 0.004
06-15-18	278	0.023 ± 0.004	12-14-18	302	0.066 ± 0.005
06-21-18	243	0.015 ± 0.004	12-21-18	302	0.031 ± 0.004
06-29-18	322	0.023 ± 0.003	12-28-18	307	0.030 ± 0.004
2nd Quarter Mean ± s.d.		0.024 ± 0.007	4th Quarter Mean ± s.d.		0.028 ± 0.015
			Cumulative Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 11. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-3			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1408	DAP- 3028	DAP- 4429	DAP- 5558
Volume (m^3)	3618	3840	3640	3714
Be-7	0.078 ± 0.016	0.09 ± 0.020	0.09 ± 0.021	0.075 ± 0.019
Mn-54	< 0.0006	< 0.0011	< 0.0016	< 0.0012
Fe-59	< 0.0016	< 0.0031	< 0.0014	< 0.0027
Co-58	< 0.0004	< 0.0007	< 0.0013	< 0.0010
Co-60	< 0.0008	< 0.0007	< 0.0005	< 0.0010
Zn-65	< 0.0013	< 0.0013	< 0.0013	< 0.0043
Nb-95	< 0.0012	< 0.0010	< 0.0016	< 0.0034
Zr-95	< 0.0013	< 0.0019	< 0.0016	< 0.0029
Ru-103	< 0.0014	< 0.0015	< 0.0016	< 0.0010
Ru-106	< 0.0061	< 0.0046	< 0.0098	< 0.0075
Cs-134	< 0.0008	< 0.0010	< 0.0013	< 0.0013
Cs-137	< 0.0008	< 0.0008	< 0.0007	< 0.0015
Ce-141	< 0.0014	< 0.0016	< 0.0027	< 0.0015
Ce-144	< 0.0049	< 0.0061	< 0.0056	< 0.0049
Location	D-4			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	NS[a]	NS[a]	DAP- 4430	DAP- 5559
Volume (m^3)			875[b]	4014
Be-7	-	-	0.13 ± 0.046	0.08 ± 0.025
Mn-54	-	-	< 0.0038	< 0.0011
Fe-59	-	-	< 0.0092	< 0.0018
Co-58	-	-	< 0.0053	< 0.0014
Co-60	-	-	< 0.0030	< 0.0010
Zn-65	-	-	< 0.0057	< 0.0039
Nb-95	-	-	< 0.0058	< 0.0025
Zr-95	-	-	< 0.0091	< 0.0015
Ru-103	-	-	< 0.0040	< 0.0016
Ru-106	-	-	< 0.0384	< 0.0104
Cs-134	-	-	< 0.0044	< 0.0013
Cs-137	-	-	< 0.0037	< 0.0011
Ce-141	-	-	< 0.0056	< 0.0024
Ce-144	-	-	< 0.0170	< 0.0055
Location	D-5A			
Lab Code	DAP- 1409	DAP- 3029	DAP- 4431	DAP- 5560
Volume (m^3)	3599	3561	3653	3676
Be-7	0.064 ± 0.020	0.09 ± 0.021	0.049 ± 0.018	0.052 ± 0.018
Mn-54	< 0.0011	< 0.0010	< 0.0008	< 0.0010
Fe-59	< 0.0021	< 0.0028	< 0.0024	< 0.0022
Co-58	< 0.0010	< 0.0006	< 0.0011	< 0.0009
Co-60	< 0.0011	< 0.0005	< 0.0007	< 0.0008
Zn-65	< 0.0011	< 0.0013	< 0.0018	< 0.0037
Nb-95	< 0.0011	< 0.0011	< 0.0008	< 0.0025
Zr-95	< 0.0014	< 0.0015	< 0.0017	< 0.0013
Ru-103	< 0.0013	< 0.0010	< 0.0011	< 0.0014
Ru-106	< 0.0067	< 0.0090	< 0.0077	< 0.0113
Cs-134	< 0.0009	< 0.0011	< 0.0009	< 0.0014
Cs-137	< 0.0006	< 0.0005	< 0.0009	< 0.0007
Ce-141	< 0.0026	< 0.0021	< 0.0013	< 0.0014
Ce-144	< 0.0061	< 0.0042	< 0.0036	< 0.0065

Table 11. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-6			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1410	DAP- 3030	DAP- 4433	DAP- 5561
Volume (m^3)	3681	3562	3653	3679
Be-7	0.082 ± 0.015	0.095 ± 0.019	0.062 ± 0.015	0.068 ± 0.016
Mn-54	< 0.0006	< 0.0010	< 0.0009	< 0.0006
Fe-59	< 0.0013	< 0.0032	< 0.0022	< 0.0017
Co-58	< 0.0005	< 0.0013	< 0.0010	< 0.0012
Co-60	< 0.0004	< 0.0009	< 0.0004	< 0.0006
Zn-65	< 0.0005	< 0.0018	< 0.0011	< 0.0017
Nb-95	< 0.0010	< 0.0018	< 0.0012	< 0.0014
Zr-95	< 0.0009	< 0.0031	< 0.0019	< 0.0018
Ru-103	< 0.0012	< 0.0017	< 0.0007	< 0.0012
Ru-106	< 0.0043	< 0.0055	< 0.0087	< 0.0038
Cs-134	< 0.0007	< 0.0012	< 0.0009	< 0.0010
Cs-137	< 0.0006	< 0.0009	< 0.0005	< 0.0009
Ce-141	< 0.0015	< 0.0030	< 0.0015	< 0.0016
Ce-144	< 0.0023	< 0.0073	< 0.0040	< 0.0063
Location	D-7			
Lab Code	DAP- 1411	DAP- 3031	DAP- 4434	DAP- 5562
Volume (m^3)	3841	3718	3809	3527
Be-7	0.076 ± 0.014	0.090 ± 0.016	0.085 ± 0.014	0.084 ± 0.018
Mn-54	< 0.0005	< 0.0005	< 0.0005	< 0.0009
Fe-59	< 0.0014	< 0.0008	< 0.0019	< 0.0030
Co-58	< 0.0004	< 0.0005	< 0.0010	< 0.0013
Co-60	< 0.0004	< 0.0003	< 0.0008	< 0.0007
Zn-65	< 0.0009	< 0.0008	< 0.0013	< 0.0016
Nb-95	< 0.0011	< 0.0012	< 0.0009	< 0.0013
Zr-95	< 0.0012	< 0.0010	< 0.0018	< 0.0020
Ru-103	< 0.0011	< 0.0012	< 0.0008	< 0.0011
Ru-106	< 0.0052	< 0.0077	< 0.0074	< 0.0083
Cs-134	< 0.0008	< 0.0008	< 0.0008	< 0.0011
Cs-137	< 0.0004	< 0.0007	< 0.0005	< 0.0012
Ce-141	< 0.0021	< 0.0018	< 0.0015	< 0.0021
Ce-144	< 0.0047	< 0.0030	< 0.0036	< 0.0064
Location	D-11			
Lab Code	DAP- 1412	DAP- 3032	DAP- 4435	DAP- 5564
Volume (m^3)	3657	3293	3283	3619
Be-7	0.079 ± 0.016	0.080 ± 0.017	0.083 ± 0.016	0.049 ± 0.013
Mn-54	< 0.0010	< 0.0010	< 0.0009	< 0.0007
Fe-59	< 0.0025	< 0.0022	< 0.0023	< 0.0015
Co-58	< 0.0008	< 0.0007	< 0.0011	< 0.0007
Co-60	< 0.0010	< 0.0006	< 0.0009	< 0.0008
Zn-65	< 0.0007	< 0.0011	< 0.0018	< 0.0016
Nb-95	< 0.0013	< 0.0008	< 0.0008	< 0.0009
Zr-95	< 0.0019	< 0.0012	< 0.0018	< 0.0007
Ru-103	< 0.0017	< 0.0013	< 0.0008	< 0.0014
Ru-106	< 0.0095	< 0.0077	< 0.0067	< 0.0053
Cs-134	< 0.0009	< 0.0009	< 0.0010	< 0.0011
Cs-137	< 0.0005	< 0.0009	< 0.0009	< 0.0007
Ce-141	< 0.0023	< 0.0019	< 0.0016	< 0.0016
Ce-144	< 0.0051	< 0.0060	< 0.0040	< 0.0072

Table 11. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-13			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1413	DAP- 3033	DAP- 4436	DAP- 5565
Volume (m^3)	3669	3787	3779	3569
Be-7	0.080 ± 0.014	0.088 ± 0.020	0.072 ± 0.013	0.069 ± 0.014
Mn-54	< 0.0007	< 0.0011	< 0.0007	< 0.0006
Fe-59	< 0.0011	< 0.0023	< 0.0010	< 0.0016
Co-58	< 0.0006	< 0.0004	< 0.0010	< 0.0010
Co-60	< 0.0003	< 0.0005	< 0.0010	< 0.0007
Zn-65	< 0.0006	< 0.0008	< 0.0017	< 0.0009
Nb-95	< 0.0007	< 0.0016	< 0.0011	< 0.0010
Zr-95	< 0.0012	< 0.0027	< 0.0017	< 0.0017
Ru-103	< 0.0011	< 0.0015	< 0.0009	< 0.0010
Ru-106	< 0.0055	< 0.0064	< 0.0077	< 0.0063
Cs-134	< 0.0005	< 0.0008	< 0.0010	< 0.0008
Cs-137	< 0.0006	< 0.0009	< 0.0008	< 0.0005
Ce-141	< 0.0017	< 0.0017	< 0.0012	< 0.0018
Ce-144	< 0.0035	< 0.0056	< 0.0036	< 0.0030
Location	D-15			
Lab Code	DAP- 1414	DAP- 3034	DAP- 4437	DAP- 5566
Volume (m^3)	3669	3646	3546	3487
Be-7	0.092 ± 0.017	0.093 ± 0.018	0.083 ± 0.017	0.066 ± 0.017
Mn-54	< 0.0007	< 0.0010	< 0.0009	< 0.0011
Fe-59	< 0.0017	< 0.0020	< 0.0023	< 0.0021
Co-58	< 0.0003	< 0.0011	< 0.0010	< 0.0006
Co-60	< 0.0004	< 0.0007	< 0.0007	< 0.0008
Zn-65	< 0.0007	< 0.0019	< 0.0014	< 0.0008
Nb-95	< 0.0013	< 0.0019	< 0.0014	< 0.0010
Zr-95	< 0.0013	< 0.0021	< 0.0020	< 0.0014
Ru-103	< 0.0012	< 0.0014	< 0.0007	< 0.0010
Ru-106	< 0.0072	< 0.0076	< 0.0079	< 0.0082
Cs-134	< 0.0008	< 0.0010	< 0.0008	< 0.0009
Cs-137	< 0.0004	< 0.0009	< 0.0006	< 0.0009
Ce-141	< 0.0022	< 0.0024	< 0.0015	< 0.0023
Ce-144	< 0.0045	< 0.0048	< 0.0043	< 0.0045
Location	D-16			
Lab Code	DAP- 1415	DAP- 3035	DAP- 4438	DAP- 5567
Volume (m^3)	3445	3524	1617	3527
Be-7	0.087 ± 0.017	0.112 ± 0.024	0.095 ± 0.031	0.062 ± 0.014
Mn-54	< 0.0010	< 0.0014	< 0.0021	< 0.0006
Fe-59	< 0.0021	< 0.0026	< 0.0039	< 0.0020
Co-58	< 0.0008	< 0.0012	< 0.0023	< 0.0005
Co-60	< 0.0009	< 0.0005	< 0.0023	< 0.0003
Zn-65	< 0.0017	< 0.0013	< 0.0018	< 0.0009
Nb-95	< 0.0016	< 0.0023	< 0.0025	< 0.0013
Zr-95	< 0.0018	< 0.0019	< 0.0048	< 0.0013
Ru-103	< 0.0009	< 0.0013	< 0.0023	< 0.0013
Ru-106	< 0.0098	< 0.0080	< 0.0117	< 0.0053
Cs-134	< 0.0011	< 0.0012	< 0.0024	< 0.0010
Cs-137	< 0.0007	< 0.0011	< 0.0018	< 0.0005
Ce-141	< 0.0028	< 0.0023	< 0.0033	< 0.0019
Ce-144	< 0.0076	< 0.0057	< 0.0080	< 0.0033

Table 11. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-40			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1416	DAP- 3036	DAP- 4439	DAP- 5568
Volume (m^3)	3619	3639	3705	3786
Be-7	0.070 ± 0.018	0.100 ± 0.018	0.080 ± 0.016	0.057 ± 0.014
Mn-54	< 0.0005	< 0.0015	< 0.0011	< 0.0004
Fe-59	< 0.0016	< 0.0034	< 0.0022	< 0.0013
Co-58	< 0.0006	< 0.0013	< 0.0010	< 0.0006
Co-60	< 0.0003	< 0.0010	< 0.0007	< 0.0005
Zn-65	< 0.0011	< 0.0026	< 0.0011	< 0.0006
Nb-95	< 0.0011	< 0.0015	< 0.0009	< 0.0009
Zr-95	< 0.0007	< 0.0018	< 0.0014	< 0.0006
Ru-103	< 0.0011	< 0.0014	< 0.0010	< 0.0009
Ru-106	< 0.0066	< 0.0050	< 0.0060	< 0.0061
Cs-134	< 0.0007	< 0.0011	< 0.0009	< 0.0007
Cs-137	< 0.0005	< 0.0009	< 0.0007	< 0.0007
Ce-141	< 0.0015	< 0.0028	< 0.0014	< 0.0009
Ce-144	< 0.0032	< 0.0062	< 0.0038	< 0.0040

[a] No sample collection at this location.

[b] Volume low due to recent establishment of the location.

Table 12. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD). Quarterly collection. Units: mR/91 days

Control Locations	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
D-1	21.3 ± 1.9	16.9 ± 1.9	14.8 ± 1.0	19.6 ± 1.8
D-2	20.4 ± 1.4	13.5 ± 1.1	13.9 ± 0.9	15.6 ± 0.9
D-3	20.9 ± 1.7	12.2 ± 0.6	13.3 ± 1.4	15.5 ± 0.7
D-4	NS[b]	NS[b]	NS[b]	15.3 ± 0.9
D-5	25.3 ± 2.3	16.8 ± 0.8	16.3 ± 1.4	19.6 ± 0.6
D-5A	21.9 ± 1.1	16.4 ± 1.1	13.7 ± 0.9	20.3 ± 1.0
D-6	23.1 ± 1.3	15.3 ± 1.0	15.2 ± 0.8	17.3 ± 0.6
D-7	19.3 ± 1.2	12.6 ± 1.3	11.8 ± 1.3	16.4 ± 0.9
D-8	27.7 ± 1.4	15.7 ± 1.6	18.2 ± 1.2	19.0 ± 0.9
D-10	27.8 ± 1.7	14.3 ± 0.7	17.0 ± 1.9	17.3 ± 0.9
D-11	21.2 ± 0.9	13.1 ± 1.7	10.9 ± 1.3	15.1 ± 1.4
D-13	21.5 ± 0.7	14.0 ± 1.3	13.1 ± 1.4	17.0 ± 1.8
Mean ± s.d.	22.8 ± 2.9	14.6 ± 1.7	14.4 ± 2.2	17.3 ± 1.9
[b] No sample; new location				
Within 0.5 mi. of Stack				
D-15	22.5 ± 1.1	15.3 ± 0.5	14.0 ± 1.3	17.7 ± 0.4
D-16	22.6 ± 1.0	16.6 ± 0.9	14.1 ± 0.9	17.5 ± 1.1
D-17	29.4 ± 0.9	21.9 ± 1.7	17.7 ± 0.7	ND[a]
D-18	25.3 ± 1.9	17.0 ± 0.7	13.8 ± 1.3	17.8 ± 0.7
D-19	25.4 ± 1.9	15.5 ± 1.1	14.5 ± 1.2	16.9 ± 0.6
D-20	26.2 ± 1.0	19.4 ± 2.0	17.1 ± 1.0	19.4 ± 1.6
D-21	25.1 ± 1.0	16.4 ± 2.0	15.3 ± 0.8	18.4 ± 0.9
D-22	26.8 ± 1.1	14.4 ± 1.5	14.2 ± 0.8	18.5 ± 1.3
D-23	22.0 ± 1.5	16.4 ± 1.7	12.0 ± 1.3	17.1 ± 0.9
D-28	28.6 ± 2.0	16.6 ± 1.1	17.3 ± 1.4	19.0 ± 0.9
D-29	29.0 ± 0.9	22.8 ± 1.7	18.9 ± 1.0	23.0 ± 0.8
D-30	27.6 ± 1.9	20.4 ± 2.7	15.1 ± 1.2	21.1 ± 2.2
D-31	28.5 ± 2.0	17.9 ± 1.7	17.5 ± 1.4	19.8 ± 1.4
D-32	27.1 ± 0.7	20.2 ± 1.5	16.7 ± 0.9	20.8 ± 1.4
D-82	26.6 ± 1.4	14.9 ± 1.1	15.0 ± 0.9	ND[a]
D-83	25.5 ± 1.0	18.2 ± 1.0	13.0 ± 0.9	17.9 ± 0.6
D-84	26.1 ± 1.3	14.9 ± 0.9	15.9 ± 1.1	16.8 ± 0.8
D-85	27.5 ± 0.7	20.9 ± 1.4	17.2 ± 0.6	20.3 ± 1.2
D-86	25.5 ± 1.6	13.4 ± 0.6	15.6 ± 1.2	15.3 ± 1.1
D-91	25.7 ± 1.6	18.4 ± 1.6	16.4 ± 1.2	18.6 ± 1.4
Mean ± s.d.	26.2 ± 2.1	17.6 ± 2.6	15.6 ± 1.8	18.7 ± 1.9

Table 12. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD).
Quarterly collection. Units: mR/91 days

Within 1.0 mi. of Stack	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
D-43	25.7 ± 0.8	14.1 ± 1.9	13.8 ± 1.0	15.2 ± 1.2
D-44	26.1 ± 1.4	17.6 ± 1.0	15.6 ± 1.1	18.0 ± 0.6
D-45	23.7 ± 0.8	14.7 ± 1.7	13.3 ± 1.1	15.2 ± 1.2
D-46	25.5 ± 1.3	21.7 ± 3.1	16.2 ± 1.2	19.8 ± 1.6
D-47	26.0 ± 1.4	18.4 ± 1.0	15.6 ± 1.4	17.6 ± 0.9
D-48	25.5 ± 1.4	21.8 ± 1.4	17.0 ± 1.9	20.4 ± 0.7
Mean ± s.d.	25.4 ± 0.9	18.1 ± 3.3	15.2 ± 1.4	17.7 ± 2.2
Within 3.0 mi. of Stack				
D-33	19.5 ± 0.9	13.7 ± 0.7	10.8 ± 0.8	14.4 ± 0.7
D-34	20.4 ± 0.7	13.2 ± 1.2	10.9 ± 1.0	14.1 ± 0.9
D-35	22.4 ± 0.7	17.9 ± 1.3	12.6 ± 1.1	16.6 ± 0.9
D-36	22.8 ± 1.0	15.0 ± 1.3	12.9 ± 0.9	14.7 ± 0.9
D-37	25.5 ± 1.3	21.1 ± 2.1	16.0 ± 1.3	18.6 ± 0.9
D-38	24.0 ± 1.3	17.6 ± 1.5	14.2 ± 1.3	17.5 ± 1.3
D-39	24.5 ± 1.0	17.2 ± 0.8	13.4 ± 1.0	16.9 ± 0.5
D-40	ND[a]	21.7 ± 0.6	15.6 ± 2.0	16.0 ± 0.7
D-41	26.1 ± 1.5	15.0 ± 0.9	14.9 ± 0.9	15.2 ± 0.9
D-42	20.9 ± 1.3	13.9 ± 1.2	12.4 ± 1.1	15.2 ± 1.0
Mean ± s.d.	22.9 ± 2.3	16.6 ± 3.0	13.4 ± 1.8	15.9 ± 1.5
ISFSI Fenceline				
D-161	60.8 ± 2.4	47.1 ± 2.0	46.3 ± 1.7	47.3 ± 1.3
D-162	28.0 ± 1.7	21.1 ± 2.1	17.7 ± 1.1	18.6 ± 1.7
D-163	53.7 ± 2.4	47.3 ± 2.3	43.1 ± 1.5	46.7 ± 2.4
D-164	24.0 ± 1.5	15.7 ± 0.9	14.0 ± 1.2	7.9 ± 0.7
Mean ± s.d.	41.6 ± 18.3	32.8 ± 16.8	30.3 ± 16.8	30.1 ± 20.0

[a] "ND" = No data; see Table 2.0, Program Deviations.

Table 13. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
Collection: Milk samples are collected monthly throughout the year.

Location		D-76					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-09-18				ND[a]			
02-14-18				ND[a]			
03-13-18				ND[a]			
04-10-18				ND[a]			
05-16-18				ND[a]			
06-06-18				ND[a]			
07-11-18				ND[a]			
08-08-18				ND[a]			
09-12-18				ND[a]			
10-09-18				ND[a]			
11-07-18				ND[a]			
12-11-18				ND[a]			

Location		D-110					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-09-18	DMI- 85	< 0.5	1256 ± 111	< 4.2	< 4.2	< 18.6	< 2.5
02-14-18	DMI- 517	< 0.4	1637 ± 124	< 3.9	< 3.6	< 13.3	< 1.6
03-13-18	DMI- 879	< 0.2	1620 ± 104	< 3.3	< 1.9	< 8.7	< 1.0
04-10-18	DMI- 1151	< 0.3	1322 ± 114	< 3.8	< 3.6	< 13.9	< 1.3
05-16-18	DMI- 1928	< 0.4	1546 ± 126	< 3.8	< 3.4	< 17.0	< 3.4
06-06-18	DMI- 2237	< 0.5	1523 ± 122	< 4.4	< 2.4	< 18.8	< 1.8
07-11-18	DMI- 2652	< 0.3	1384 ± 105	< 3.1	< 3.5	< 10.0	< 2.0
08-08-18	DMI- 3233	< 0.4	1429 ± 101	< 3.7	< 3.9	< 12.4	< 1.9
09-12-18	DMI- 3784	< 0.4	1540 ± 121	< 4.1	< 3.4	< 15.3	< 1.4
10-09-18	DMI- 4186	< 0.3	1409 ± 125	< 4.3	< 4.2	< 15.0	< 2.3
11-07-18	DMI- 4784	< 0.3	1465 ± 113	< 3.4	< 3.6	< 10.9	< 1.5
12-11-18	DMI- 5267	< 0.4	1408 ± 123	< 4.5	< 4.5	< 17.9	< 1.3

[a] "ND" = No data; see Table 2.0, Program Deviations.

Table 13. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
Collection: Milk samples are collected monthly throughout the year.

Location		D-138					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-09-18	DMI- 86	< 0.5	1239 ± 109	< 3.5	< 3.4	< 7.4	< 2.6
02-14-18	DMI- 518	< 0.5	1193 ± 113	< 3.8	< 3.4	< 16.0	< 3.1
03-13-18	DMI- 880	< 0.4	1183 ± 97	< 2.9	< 3.3	< 11.5	< 2.0
04-10-18	DMI- 1152	< 0.5	1423 ± 113	< 3.6	< 3.4	< 12.0	< 2.0
05-16-18	DMI- 1929	< 0.4	1365 ± 100	< 2.9	< 3.4	< 12.8	< 2.7
06-06-18	DMI- 2238	< 0.5	1296 ± 113	< 3.3	< 3.4	< 9.0	< 3.1
07-11-18	DMI- 2653	< 0.3	1254 ± 100	< 3.4	< 3.6	< 15.5	< 1.5
08-08-18	DMI- 3234	< 0.3	1349 ± 104	< 4.0	< 2.8	< 10.8	< 2.1
09-12-18	DMI- 3785	< 0.3	1472 ± 119	< 4.3	< 2.5	< 10.2	< 3.4
10-09-18	DMI- 4187	< 0.3	1403 ± 130	< 4.6	< 3.6	< 15.1	< 2.0
11-07-18	DMI- 4785	< 0.3	1391 ± 115	< 3.5	< 4.4	< 11.7	< 3.3
12-11-18	DMI- 5268	< 0.4	1086 ± 107	< 3.4	< 3.6	< 13.8	< 3.1

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-52 Drinking Water			
Lab Code	DWW- 176	DWW- 616	DWW- 981	DWW- 1445
Date Collected	01-17-18	02-21-18	03-22-18	04-18-18
H-3	< 156	< 151	< 153	< 155
I-131	< 0.3	< 0.4	< 0.2	< 0.3
Mn-54	< 2.2	< 1.8	< 2.5	< 1.9
Fe-59	< 5.5	< 4.7	< 3.3	< 5.6
Co-58	< 3.1	< 1.7	< 2.3	< 2.6
Co-60	< 2.7	< 2.3	< 1.7	< 1.8
Zn-65	< 5.5	< 4.9	< 3.2	< 5.9
Nb-95	< 2.6	< 3.6	< 2.7	< 2.2
Zr-95	< 3.6	< 4.2	< 2.8	< 3.9
I-131	< 3.4	< 3.9	< 4.7	< 5.4
Cs-134	< 2.9	< 3.8	< 2.8	< 2.8
Cs-137	< 3.3	< 3.3	< 1.4	< 2.3
Ba-140	< 13.5	< 15.3	< 10.5	< 14.6
La-140	< 2.1	< 2.4	< 2.8	< 3.0
Lab Code	ND[a]	DWW- 2444	DWW- 2783	DWW- 3337
Date Collected	05-07-18	06-25-18	07-17-18	08-16-18
H-3	-	< 160	< 158	< 152
I-131	-	< 0.3	< 0.3	< 0.3
Mn-54	-	< 2.2	< 1.8	< 1.9
Fe-59	-	< 4.6	< 3.4	< 3.3
Co-58	-	< 3.6	< 2.1	< 2.5
Co-60	-	< 1.8	< 2.5	< 2.1
Zn-65	-	< 4.5	< 1.8	< 2.7
Nb-95	-	< 3.3	< 3.2	< 2.7
Zr-95	-	< 4.5	< 4.9	< 6.4
I-131	-	< 5.4	< 5.2	< 3.8
Cs-134	-	< 3.8	< 3.9	< 3.3
Cs-137	-	< 4.1	< 4.0	< 2.9
Ba-140	-	< 17.2	< 10.1	< 13.5
La-140	-	< 1.4	< 2.2	< 2.8

[a] "ND" = No data; see Table 2.0, Program Deviations.

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-52 Drinking Water			
Lab Code	DWW- 3879	DWW- 4332	DWW- 4792	DWW- 5224
Date Collected	09-18-18	10-16-18	11-08-18	12-06-18
H-3	< 153	< 153	< 154	< 153
I-131	< 0.4	< 0.2	< 0.3	< 0.8
Mn-54	< 3.6	< 2.0	< 2.4	< 2.4
Fe-59	< 4.8	< 3.7	< 4.6	< 5.2
Co-58	< 2.7	< 1.7	< 2.1	< 1.6
Co-60	< 2.0	< 1.7	< 2.0	< 2.8
Zn-65	< 3.3	< 3.1	< 2.4	< 4.3
Nb-95	< 3.1	< 2.3	< 4.1	< 3.0
Zr-95	< 2.6	< 6.1	< 5.0	< 4.5
I-131	< 5.4	< 3.8	< 6.6	< 4.0
Cs-134	< 3.6	< 3.1	< 4.0	< 2.5
Cs-137	< 3.1	< 3.4	< 3.4	< 2.7
Ba-140	< 16.5	< 12.5	< 12.0	< 9.3
La-140	< 1.8	< 2.6	< 4.9	< 2.4

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-53 Treated Municipal Water, Drinking Water			
Lab Code	DWW- 177	DWW- 617	DWW- 982	DWW- 1446
Date Collected	01-17-18	02-21-18	03-22-18	04-18-18
H-3	< 156	< 151	< 153	< 155
I-131	< 0.4	< 0.3	< 0.2	< 0.4
Mn-54	< 2.3	< 3.1	< 2.1	< 2.3
Fe-59	< 4.9	< 5.4	< 3.5	< 3.2
Co-58	< 2.4	< 2.6	< 2.6	< 2.2
Co-60	< 2.3	< 3.3	< 2.4	< 2.1
Zn-65	< 4.9	< 3.4	< 1.6	< 4.2
Nb-95	< 3.5	< 2.5	< 3.1	< 2.5
Zr-95	< 4.3	< 3.7	< 3.6	< 5.2
I-131	< 5.6	< 4.4	< 3.3	< 5.0
Cs-134	< 3.6	< 3.1	< 2.9	< 2.8
Cs-137	< 2.1	< 2.2	< 2.5	< 3.2
Ba-140	< 14.7	< 12.5	< 11.8	< 10.8
La-140	< 4.0	< 2.7	< 2.4	< 2.5
Lab Code	DWW- 1740	DWW- 2445	DWW- 2784	DWW- 3338
Date Collected	05-07-18	06-25-18	07-17-18	08-16-18
H-3	< 156	< 160	< 158	< 152
I-131	< 0.9	< 0.3	< 0.3	< 0.4
Mn-54	< 2.2	< 4.3	< 2.1	< 3.3
Fe-59	< 2.8	< 2.9	< 5.7	< 4.4
Co-58	< 1.4	< 1.3	< 2.4	< 1.3
Co-60	< 2.5	< 2.2	< 3.2	< 2.0
Zn-65	< 4.4	< 2.9	< 4.0	< 1.7
Nb-95	< 2.4	< 3.5	< 2.0	< 2.9
Zr-95	< 4.1	< 2.9	< 4.6	< 4.7
I-131	< 2.8	< 4.5	< 3.7	< 3.6
Cs-134	< 2.5	< 3.2	< 2.9	< 2.5
Cs-137	< 2.5	< 1.9	< 2.9	< 2.5
Ba-140	< 8.5	< 11.4	< 10.8	< 12.8
La-140	< 2.6	< 3.0	< 2.0	< 4.3

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-53 Treated Municipal Water, Drinking Water			
Lab Code	DWW- 3880	DWW- 4333	DWW- 4793	DWW- 5225
Date Collected	09-18-18	10-16-18	11-08-18	12-06-18
H-3	< 153	< 153	< 154	< 153
I-131	< 0.4	< 0.4	< 0.3	< 0.8
Mn-54	< 2.1	< 3.5	< 2.3	< 2.8
Fe-59	< 2.7	< 4.4	< 4.6	< 2.7
Co-58	< 3.0	< 2.0	< 2.5	< 2.4
Co-60	< 1.8	< 1.6	< 3.1	< 1.6
Zn-65	< 4.3	< 6.3	< 3.2	< 4.1
Nb-95	< 3.2	< 2.6	< 2.5	< 2.3
Zr-95	< 6.0	< 5.1	< 4.0	< 2.1
I-131	< 4.7	< 3.7	< 5.0	< 4.5
Cs-134	< 3.7	< 3.2	< 3.5	< 2.3
Cs-137	< 4.3	< 3.7	< 2.0	< 2.9
Ba-140	< 12.2	< 12.9	< 14.1	< 11.8
La-140	< 1.8	< 2.7	< 3.7	< 2.1

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-54 Untreated Municipal Water, Drinking Water			
Lab Code	DWW- 178	DWW- 618	DWW- 983	DWW- 1447
Date Collected	01-17-18	02-21-18	03-22-18	04-18-18
H-3	< 156	< 151	< 153	< 155
I-131	< 0.4	< 0.3	< 0.2	< 0.4
Mn-54	< 2.0	< 3.8	< 2.3	< 2.0
Fe-59	< 6.3	< 4.5	< 3.0	< 2.8
Co-58	< 2.9	< 2.2	< 1.2	< 2.1
Co-60	< 2.2	< 2.6	< 2.0	< 2.8
Zn-65	< 4.6	< 6.5	< 5.3	< 5.4
Nb-95	< 2.7	< 3.1	< 2.8	< 3.0
Zr-95	< 3.4	< 5.3	< 5.6	< 3.8
I-131	< 6.0	< 3.0	< 3.8	< 5.0
Cs-134	< 3.1	< 3.2	< 3.1	< 3.2
Cs-137	< 2.1	< 2.9	< 2.9	< 2.0
Ba-140	< 11.3	< 13.9	< 11.6	< 14.9
La-140	< 2.7	< 3.6	< 3.4	< 2.5
Lab Code	DWW- 1741	DWW- 2446	DWW- 2785	DWW- 3339
Date Collected	05-07-18	06-25-18	07-17-18	08-16-18
H-3	< 156	< 160	< 158	< 152
I-131	< 0.8	< 0.3	< 0.3	< 0.4
Mn-54	< 2.3	< 2.0	< 1.7	< 2.7
Fe-59	< 5.9	< 4.4	< 3.4	< 8.0
Co-58	< 2.4	< 3.0	< 2.1	< 2.0
Co-60	< 2.8	< 1.6	< 2.4	< 3.3
Zn-65	< 4.7	< 6.0	< 5.2	< 3.6
Nb-95	< 2.6	< 1.9	< 3.0	< 3.7
Zr-95	< 5.4	< 6.1	< 5.0	< 8.6
I-131	< 4.1	< 3.5	< 2.8	< 6.4
Cs-134	< 2.8	< 3.6	< 3.3	< 4.8
Cs-137	< 3.1	< 2.8	< 3.2	< 3.0
Ba-140	< 15.8	< 13.6	< 8.3	< 17.3
La-140	< 3.4	< 3.1	< 2.3	< 3.2

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Monthly
Units: pCi/L

Location	D-54 Untreated Municipal Water, Drinking Water			
Lab Code	DWW- 3881	DWW- 4334	DWW- 4794	DWW- 5226
Date Collected	09-18-18	10-16-18	11-08-18	12-06-18
H-3	< 153	< 153	< 154	< 153
I-131	< 0.3	< 0.4	< 0.3	< 0.9
Mn-54	< 4.5	< 3.9	< 2.7	< 3.3
Fe-59	< 5.4	< 8.6	< 4.3	< 7.8
Co-58	< 4.0	< 3.6	< 2.2	< 2.1
Co-60	< 5.0	< 2.1	< 1.4	< 3.8
Zn-65	< 8.9	< 9.3	< 6.1	< 8.1
Nb-95	< 3.8	< 3.3	< 2.9	< 3.4
Zr-95	< 7.2	< 7.4	< 5.0	< 5.8
I-131	< 7.2	< 6.2	< 3.9	< 4.5
Cs-134	< 5.2	< 4.9	< 3.4	< 3.9
Cs-137	< 5.9	< 3.7	< 3.4	< 3.8
Ba-140	< 22.7	< 14.5	< 14.4	< 16.8
La-140	< 4.6	< 2.6	< 1.3	< 5.1

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Quarterly
Units: pCi/L

Location	D-55 On-site Treated Drinking Water			
Lab Code	DWW- 619	DWW- 1742	DWW- 3421	DWW- 4795
Date Collected	02-21-18	05-07-18	08-22-18	11-08-18
H-3	< 151	< 156	< 151	< 154
I-131	< 0.5	< 0.9	< 0.4	< 0.3
Mn-54	< 2.4	< 3.0	< 2.3	< 4.0
Fe-59	< 4.3	< 4.8	< 4.7	< 6.7
Co-58	< 3.1	< 2.6	< 1.8	< 2.2
Co-60	< 2.2	< 1.9	< 1.9	< 2.8
Zn-65	< 5.0	< 5.7	< 6.1	< 4.1
Nb-95	< 3.5	< 2.7	< 2.4	< 4.1
Zr-95	< 5.0	< 4.0	< 5.3	< 8.3
I-131	< 3.8	< 3.2	< 5.6	< 8.8
Cs-134	< 3.1	< 3.1	< 4.2	< 4.6
Cs-137	< 3.2	< 2.7	< 3.3	< 3.3
Ba-140	< 10.8	< 13.8	< 15.3	< 21.8
La-140	< 2.5	< 4.2	< 1.9	< 3.5

Location	D-57 Untreated Drinking Water			
Lab Code	DWW- 620	DWW- 1743	DWW- 3422	DWW- 4796
Date Collected	02-21-18	05-07-18	08-22-18	11-08-18
H-3	< 151	< 156	< 151	< 154
I-131	< 0.2	< 0.8	< 0.4	< 0.3
Mn-54	< 3.1	< 3.1	< 2.6	< 2.2
Fe-59	< 5.0	< 4.9	< 3.4	< 4.2
Co-58	< 3.6	< 3.0	< 2.4	< 2.0
Co-60	< 2.1	< 2.5	< 3.7	< 3.0
Zn-65	< 3.4	< 5.4	< 6.7	< 7.3
Nb-95	< 2.7	< 2.9	< 3.6	< 3.3
Zr-95	< 4.9	< 4.4	< 5.0	< 5.7
I-131	< 3.2	< 4.2	< 4.3	< 5.5
Cs-134	< 3.1	< 2.6	< 4.2	< 4.0
Cs-137	< 3.0	< 3.3	< 2.5	< 2.9
Ba-140	< 9.6	< 13.7	< 9.9	< 11.2
La-140	< 1.4	< 4.6	< 2.1	< 1.9

Table 14. Well water samples, analyses for gamma emitting isotopes iodine-131 and tritium.
Collection: Quarterly
Units: pCi/L

Location		D-58 Untreated Drinking Water		
Lab Code	ND[a]	DWW- 1744	DWW- 3423	DWW- 4797
Date Collected	02-21-18	05-07-18	08-22-18	11-08-18
H-3	-	< 156	< 151	< 154
I-131	-	< 0.9	< 0.5	< 0.5
Mn-54	-	< 3.4	< 1.6	< 1.7
Fe-59	-	< 4.2	< 4.1	< 5.3
Co-58	-	< 2.8	< 1.2	< 2.6
Co-60	-	< 3.0	< 1.7	< 2.8
Zn-65	-	< 4.6	< 2.1	< 4.4
Nb-95	-	< 3.9	< 3.8	< 3.5
Zr-95	-	< 3.1	< 4.6	< 4.3
I-131	-	< 4.5	< 3.9	< 6.1
Cs-134	-	< 3.3	< 2.7	< 3.7
Cs-137	-	< 3.2	< 3.6	< 3.7
Ba-140	-	< 12.2	< 13.5	< 15.8
La-140	-	< 3.9	< 2.3	< 3.7

Location		D-72(C) Untreated Drinking Water		
Lab Code	ND[a]	DWW- 1745	DWW- 3424	DWW- 4798
Date Collected	02-21-18	05-07-18	08-22-18	11-08-18
H-3	-	< 156	< 151	< 154
I-131	-	< 0.9	< 0.5	< 0.3
Mn-54	-	< 2.6	< 2.4	< 2.5
Fe-59	-	< 5.0	< 5.7	< 3.7
Co-58	-	< 1.4	< 2.3	< 1.4
Co-60	-	< 1.6	< 2.3	< 1.9
Zn-65	-	< 4.1	< 5.6	< 2.4
Nb-95	-	< 1.9	< 2.7	< 2.7
Zr-95	-	< 4.1	< 6.0	< 3.7
I-131	-	< 4.0	< 3.1	< 5.7
Cs-134	-	< 2.5	< 3.5	< 2.8
Cs-137	-	< 2.8	< 4.1	< 3.4
Ba-140	-	< 11.0	< 11.9	< 16.7
La-140	-	< 3.1	< 3.3	< 1.3

[a] "ND" No data; see Table 2.0, Program Deviations.

Table 15. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

	Indicators			
Location	D-57	D-77	D-108	D-110
Lab Code	DVE- 4405	DVE- 3329	DVE- 3330	DVE- 4412
Date Collected	10-18-18	08-16-18	08-16-18	10-18-18
Sample Type	Rhubarb	Broadleaf	Broadleaf	Rhubarb
K-40	4.27 ± 0.50	4.41 ± 0.38	2.19 ± 0.36	3.95 ± 0.48
Mn-54	< 0.017	< 0.007	< 0.011	< 0.017
Fe-59	< 0.036	< 0.013	< 0.019	< 0.020
Co-58	< 0.019	< 0.011	< 0.008	< 0.014
Co-60	< 0.007	< 0.012	< 0.013	< 0.011
Zn-65	< 0.037	< 0.030	< 0.026	< 0.031
Nb-95	< 0.018	< 0.010	< 0.020	< 0.015
Zr-95	< 0.036	< 0.019	< 0.017	< 0.031
Ru-103	< 0.020	< 0.017	< 0.020	< 0.022
Ru-106	< 0.08	< 0.10	< 0.105	< 0.12
I-131	< 0.054	< 0.029	< 0.026	< 0.040
Cs-134	< 0.021	< 0.012	< 0.015	< 0.019
Cs-137	< 0.019	< 0.010	< 0.014	< 0.021
Ce-141	< 0.037	< 0.020	< 0.021	< 0.024
Ce-144	< 0.093	< 0.062	< 0.097	< 0.093

	Indicator	Indicator	Control
Location	D-118	D-118	D-138
Lab Code	DVE- 3331	DVE- 4410	DVE- 4417
Date Collected	08-16-18	10-18-18	10-18-18
Sample Type	Broadleaf	Rhubarb	Rhubarb
K-40	3.04 ± 0.28	4.00 ± 0.42	2.67 ± 0.15
Mn-54	< 0.012	< 0.007	< 0.009
Fe-59	< 0.027	< 0.016	< 0.016
Co-58	< 0.008	< 0.008	< 0.006
Co-60	< 0.007	< 0.014	< 0.008
Zn-65	< 0.010	< 0.028	< 0.014
Nb-95	< 0.012	< 0.012	< 0.008
Zr-95	< 0.018	< 0.023	< 0.009
Ru-103	< 0.009	< 0.017	< 0.006
Ru-106	< 0.058	< 0.160	< 0.071
I-131	< 0.017	< 0.021	< 0.017
Cs-134	< 0.009	< 0.014	< 0.007
Cs-137	< 0.008	< 0.013	< 0.005
Ce-141	< 0.013	< 0.016	< 0.013
Ce-144	< 0.060	< 0.090	< 0.051

Table 16. Vegetation (hay and grain), analyses for gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

	Indicators				
Location	D-57	D-96	D-96	D-96	D-110
Lab Code	DVE- 4406	DVE- 4407	DVE- 4408	DVE- 4409	DVE- 4413
Date Collected	10-18-18	10-18-18	10-18-18	10-18-18	10-18-18
Sample Type	Hay	Corn	Beans	Hay	Corn
K-40	5.24 ± 0.54	2.40 ± 0.23	12.82 ± 0.59	20.53 ± 0.68	2.60 ± 0.31
Mn-54	< 0.019	< 0.006	< 0.012	< 0.014	< 0.009
Fe-59	< 0.048	< 0.017	< 0.026	< 0.026	< 0.023
Co-58	< 0.022	< 0.005	< 0.011	< 0.024	< 0.009
Co-60	< 0.025	< 0.006	< 0.013	< 0.026	< 0.005
Zn-65	< 0.057	< 0.011	< 0.025	< 0.053	< 0.016
Nb-95	< 0.018	< 0.009	< 0.012	< 0.029	< 0.007
Zr-95	< 0.051	< 0.009	< 0.019	< 0.025	< 0.019
Ru-103	< 0.028	< 0.008	< 0.008	< 0.016	< 0.008
Ru-106	< 0.15	< 0.07	< 0.09	< 0.150	< 0.07
I-131	< 0.043	< 0.013	< 0.015	< 0.051	< 0.015
Cs-134	< 0.026	< 0.008	< 0.013	< 0.020	< 0.011
Cs-137	< 0.031	< 0.009	< 0.009	< 0.019	< 0.009
Ce-141	< 0.047	< 0.013	< 0.015	< 0.029	< 0.014
Ce-144	< 0.15	< 0.056	< 0.06	< 0.128	< 0.05

	Indicator	Control	Control
Location	D-110	D-138	D-138
Lab Code	DVE- 4414	DVE- 4415	DVE- 4416
Date Collected	10-18-18	10-18-18	10-18-18
Sample Type	Hay	Corn	Hay
K-40	23.19 ± 0.67	2.50 ± 0.34	14.21 ± 0.47
Mn-54	< 0.020	< 0.010	< 0.014
Fe-59	< 0.056	< 0.022	< 0.033
Co-58	< 0.020	< 0.009	< 0.016
Co-60	< 0.020	< 0.012	< 0.015
Zn-65	< 0.036	< 0.019	< 0.043
Nb-95	< 0.027	< 0.011	< 0.022
Zr-95	< 0.040	< 0.019	< 0.030
Ru-103	< 0.026	< 0.010	< 0.021
Ru-106	< 0.108	< 0.070	< 0.16
I-131	< 0.043	< 0.016	< 0.036
Cs-134	< 0.019	< 0.012	< 0.018
Cs-137	< 0.023	< 0.010	< 0.023
Ce-141	< 0.047	< 0.014	< 0.029
Ce-144	< 0.147	< 0.055	< 0.09

Table 17. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-49

Lab Code	DSW- 273	DSW- 485	DSW- 976	DSW- 1331	DSW- 1981	DSW- 2409
Date Collected	01-26-18	02-13-18	03-22-18	04-17-18	05-21-18	06-19-18
H-3	< 154	< 153	< 153	< 155	< 156	< 160
I-131(Chemistry)	< 0.2	< 0.4	< 0.2	< 0.4	< 0.3	< 0.4
Mn-54	< 1.8	< 2.5	< 2.3	< 2.5	< 3.2	< 3.6
Fe-59	< 4.7	< 3.1	< 3.2	< 3.1	< 4.9	< 5.1
Co-58	< 1.9	< 3.3	< 2.2	< 1.6	< 2.6	< 3.9
Co-60	< 2.0	< 2.1	< 2.3	< 2.1	< 1.7	< 1.3
Zn-65	< 4.9	< 4.8	< 2.8	< 5.5	< 6.5	< 2.9
Nb-95	< 1.9	< 3.2	< 2.1	< 1.7	< 2.3	< 3.2
Zr-95	< 5.3	< 5.1	< 4.9	< 4.3	< 4.8	< 6.8
I-131	< 3.1	< 4.9	< 6.8	< 2.6	< 3.2	< 6.4
Cs-134	< 2.8	< 3.1	< 2.7	< 2.2	< 4.0	< 4.0
Cs-137	< 2.8	< 2.7	< 3.2	< 2.2	< 2.6	< 3.4
Ba-140	< 10.7	< 14.9	< 14.1	< 12.1	< 16.2	< 11.7
La-140	< 2.8	< 3.4	< 2.2	< 1.9	< 2.6	< 2.6

Lab Code	DSW- 2778	DSW- 3332	DSW- 3882	DSW- 4339	DSW- 4906	DSW- 5344
Date Collected	07-17-18	08-16-18	09-20-18	10-17-18	11-19-18	12-17-18
H-3	< 158	< 152	< 153	< 150	< 151	< 153
I-131(Chemistry)	< 0.3	< 0.4	< 0.3	< 0.3	< 0.4	< 0.5
Mn-54	< 2.8	< 2.7	< 1.3	< 3.4	< 2.3	< 4.0
Fe-59	< 4.9	< 3.6	< 2.7	< 3.1	< 3.0	< 6.5
Co-58	< 2.2	< 2.5	< 2.2	< 3.3	< 1.9	< 3.6
Co-60	< 2.4	< 1.8	< 2.0	< 2.3	< 2.4	< 2.2
Zn-65	< 4.7	< 4.3	< 5.4	< 3.9	< 1.9	< 6.9
Nb-95	< 2.4	< 3.0	< 2.8	< 3.3	< 2.3	< 5.3
Zr-95	< 4.2	< 5.6	< 5.8	< 6.1	< 5.3	< 5.5
I-131	< 3.8	< 5.2	< 6.1	< 4.8	< 3.4	< 6.9
Cs-134	< 2.9	< 3.6	< 3.7	< 4.2	< 3.0	< 5.2
Cs-137	< 3.3	< 3.3	< 2.9	< 2.6	< 2.4	< 5.4
Ba-140	< 14.5	< 16.5	< 9.5	< 14.4	< 5.7	< 20.5
La-140	< 2.3	< 1.5	< 4.1	< 1.6	< 3.6	< 3.1

Table 17. Surface water samples, analyses for tritium and gamma-emitting isotopes.

Collection: Monthly
Units: pCi/L
Location: D-50

Lab Code	DSW- 274	DSW- 623	DSW- 977	DSW- 1332	DSW- 1982	DSW- 2410
Date Collected	01-26-18	02-21-18	03-22-18	04-17-18	05-21-18	06-19-18
H-3	< 154	< 151	< 153	< 155	< 156	< 160
Mn-54	< 2.3	< 3.6	< 1.7	< 1.8	< 3.5	< 3.8
Fe-59	< 3.1	< 6.8	< 1.7	< 4.6	< 4.9	< 7.3
Co-58	< 1.8	< 2.3	< 2.2	< 1.8	< 3.9	< 2.7
Co-60	< 2.8	< 2.2	< 2.0	< 2.3	< 4.1	< 2.3
Zn-65	< 4.3	< 4.4	< 2.7	< 3.3	< 8.6	< 2.7
Nb-95	< 2.4	< 3.7	< 2.7	< 2.1	< 2.7	< 3.7
Zr-95	< 4.2	< 3.6	< 4.7	< 3.9	< 5.1	< 5.2
I-131	< 3.1	< 6.6	< 3.8	< 4.2	< 6.0	< 9.9
Cs-134	< 3.1	< 3.9	< 3.2	< 2.7	< 4.4	< 4.2
Cs-137	< 3.3	< 3.9	< 3.0	< 2.7	< 3.6	< 4.6
Ba-140	< 12.0	< 17.2	< 12.3	< 16.8	< 12.0	< 18.8
La-140	< 2.0	< 2.2	< 3.0	< 3.6	< 2.1	< 1.9

Lab Code	DSW- 2779	DSW- 3333	DSW- 3883	DSW- 4340	DSW- 4907	DSW- 5345
Date Collected	07-17-18	08-16-18	09-20-18	10-17-18	11-19-18	12-17-18
H-3	< 158	< 152	< 153	< 150	< 151	< 153
Mn-54	< 2.3	< 2.7	< 3.9	< 4.6	< 1.9	< 3.5
Fe-59	< 4.5	< 6.5	< 3.1	< 8.7	< 6.0	< 6.4
Co-58	< 0.9	< 1.4	< 1.9	< 2.8	< 2.5	< 3.4
Co-60	< 3.7	< 2.0	< 1.4	< 2.8	< 1.9	< 2.8
Zn-65	< 3.2	< 4.8	< 5.6	< 10.1	< 5.0	< 9.4
Nb-95	< 1.7	< 2.8	< 3.4	< 5.7	< 3.4	< 3.6
Zr-95	< 2.0	< 3.0	< 3.7	< 8.2	< 4.7	< 5.2
I-131	< 3.4	< 3.9	< 3.3	< 8.1	< 4.7	< 5.6
Cs-134	< 2.7	< 3.0	< 3.4	< 5.1	< 4.0	< 3.7
Cs-137	< 3.3	< 3.0	< 3.9	< 3.9	< 4.3	< 4.9
Ba-140	< 8.4	< 7.2	< 12.9	< 23.4	< 16.9	< 15.7
La-140	< 1.9	< 3.5	< 3.5	< 2.5	< 2.2	< 3.4

Table 17. Surface water samples, analyses for tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-51

Lab Code	DSW- 275	DSW- 486	DSW- 978	DSW- 1333	DSW- 1983	DSW- 2411
Date Collected	01-26-18	02-13-18	03-22-18	04-17-18	05-21-18	06-19-18
H-3	< 154	< 153	< 153	< 155	< 156	< 160
Mn-54	< 3.0	< 3.0	< 2.7	< 2.9	< 1.8	< 2.8
Fe-59	< 3.1	< 7.1	< 5.7	< 3.7	< 5.3	< 2.7
Co-58	< 2.9	< 3.2	< 2.4	< 2.2	< 2.6	< 2.2
Co-60	< 3.1	< 4.1	< 3.7	< 1.9	< 1.6	< 2.0
Zn-65	< 3.6	< 11.7	< 6.4	< 3.9	< 4.3	< 6.5
Nb-95	< 2.0	< 6.2	< 2.8	< 3.0	< 3.1	< 2.3
Zr-95	< 4.9	< 6.5	< 3.2	< 3.4	< 6.7	< 6.9
I-131	< 4.8	< 3.6	< 4.9	< 5.5	< 8.0	< 7.6
Cs-134	< 3.5	< 5.2	< 3.2	< 3.4	< 4.0	< 3.7
Cs-137	< 2.9	< 5.3	< 3.4	< 2.7	< 3.3	< 4.0
Ba-140	< 16.1	< 15.0	< 14.7	< 10.5	< 23.6	< 22.1
La-140	< 1.5	< 2.7	< 3.9	< 2.5	< 2.0	< 2.9

Lab Code	DSW- 2780	DSW- 3334	DSW- 3884	DSW- 4341	DSW- 4908	DSW- 5346
Date Collected	07-17-18	08-16-18	09-20-18	10-17-18	11-19-18	12-17-18
H-3	< 158	< 152	< 153	< 150	< 151	< 153
Mn-54	< 2.2	< 4.4	< 2.2	< 2.6	< 2.7	< 4.6
Fe-59	< 5.6	< 6.6	< 6.4	< 4.9	< 4.5	< 4.5
Co-58	< 3.4	< 2.9	< 2.6	< 2.9	< 3.5	< 2.4
Co-60	< 2.2	< 2.4	< 3.1	< 2.2	< 2.2	< 2.5
Zn-65	< 4.8	< 4.1	< 4.9	< 5.3	< 4.2	< 7.0
Nb-95	< 2.5	< 3.9	< 4.3	< 4.3	< 3.5	< 3.6
Zr-95	< 4.1	< 4.6	< 5.6	< 5.5	< 6.7	< 4.8
I-131	< 5.4	< 7.2	< 5.2	< 5.8	< 7.4	< 6.9
Cs-134	< 4.0	< 5.2	< 4.3	< 3.5	< 3.2	< 5.3
Cs-137	< 3.0	< 4.5	< 3.7	< 3.5	< 4.0	< 3.9
Ba-140	< 19.7	< 15.0	< 10.5	< 16.6	< 18.8	< 25.6
La-140	< 1.9	< 3.2	< 2.5	< 2.0	< 5.5	< 2.2

Table 17. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
Units: pCi/L
Location: D-61

Lab Code	DSW- 276	DSW- 487	DSW- 979	DSW- 1334	DSW- 1984	DSW- 2412
Date Collected	01-26-18	02-13-18	03-22-18	04-17-18	05-21-18	06-19-18
H-3	< 154	< 153	< 153	< 155	< 156	< 160
I-131(Chemistry)	< 0.2	< 0.3	< 0.3	< 0.4	< 0.5	< 0.4
Mn-54	< 2.2	< 2.5	< 2.8	< 2.2	< 2.2	< 1.7
Fe-59	< 4.7	< 5.8	< 4.2	< 4.3	< 2.9	< 2.6
Co-58	< 1.2	< 1.7	< 1.5	< 2.0	< 2.7	< 2.2
Co-60	< 2.4	< 2.1	< 2.8	< 1.4	< 1.8	< 2.3
Zn-65	< 5.6	< 5.4	< 3.5	< 4.0	< 3.6	< 1.5
Nb-95	< 2.6	< 1.7	< 2.7	< 2.2	< 3.0	< 2.8
Zr-95	< 4.3	< 5.4	< 5.0	< 4.5	< 6.0	< 5.1
I-131	< 4.7	< 2.8	< 3.8	< 2.9	< 4.2	< 5.9
Cs-134	< 3.0	< 2.7	< 3.3	< 3.0	< 3.0	< 3.1
Cs-137	< 3.0	< 2.6	< 2.7	< 3.3	< 2.4	< 3.6
Ba-140	< 9.7	< 12.5	< 10.5	< 11.1	< 12.3	< 10.9
La-140	< 2.3	< 1.6	< 4.3	< 2.0	< 1.4	< 3.8

Lab Code	DSW- 2781	DSW- 3335	DSW- 3885	DSW- 4342	DSW- 4909	DSW- 5348
Date Collected	07-17-18	08-16-18	09-20-18	10-17-18	11-19-18	12-17-18
H-3	< 158	< 152	< 153	< 150	< 151	< 153
I-131(Chemistry)	< 0.3	< 0.4	< 0.2	< 0.3	< 0.3	< 0.4
Mn-54	< 3.0	< 2.2	< 3.0	< 3.5	< 1.9	< 2.9
Fe-59	< 4.6	< 6.2	< 3.8	< 6.9	< 4.4	< 5.5
Co-58	< 2.4	< 1.5	< 3.0	< 1.9	< 2.6	< 2.8
Co-60	< 2.2	< 1.7	< 1.9	< 2.3	< 1.9	< 3.5
Zn-65	< 2.9	< 4.4	< 2.4	< 5.2	< 4.7	< 3.9
Nb-95	< 2.4	< 1.7	< 2.1	< 3.3	< 3.1	< 3.5
Zr-95	< 4.3	< 5.5	< 4.0	< 3.7	< 6.0	< 7.0
I-131	< 2.6	< 3.6	< 2.9	< 6.0	< 4.8	< 4.9
Cs-134	< 3.2	< 3.4	< 3.1	< 3.4	< 2.8	< 4.5
Cs-137	< 3.1	< 2.4	< 3.7	< 3.6	< 2.5	< 2.3
Ba-140	< 12.1	< 17.0	< 10.2	< 10.9	< 13.1	< 15.2
La-140	< 2.6	< 1.7	< 4.3	< 1.7	< 2.4	< 4.0

Table 17. Surface water samples, analyses for tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-99

Lab Code Date Collected	ND[a]	DSW- 624 02-21-18	DSW- 980 03-22-18	DSW- 1335 04-17-18	DSW- 1986 05-21-18	DSW- 2413 06-19-18
H-3	-	< 151	< 153	< 155	< 156	< 160
Mn-54	-	< 1.9	< 2.4	< 1.8	< 2.8	< 1.0
Fe-59	-	< 4.1	< 3.3	< 3.1	< 6.0	< 3.0
Co-58	-	< 3.1	< 3.0	< 1.9	< 2.1	< 3.0
Co-60	-	< 3.3	< 1.1	< 2.1	< 3.5	< 2.2
Zn-65	-	< 3.1	< 3.8	< 4.9	< 3.5	< 2.5
Nb-95	-	< 2.7	< 2.7	< 2.5	< 1.7	< 1.6
Zr-95	-	< 4.8	< 4.9	< 3.7	< 4.2	< 4.6
I-131	-	< 4.3	< 6.3	< 6.1	< 7.0	< 6.0
Cs-134	-	< 3.1	< 3.0	< 3.4	< 3.2	< 3.4
Cs-137	-	< 3.0	< 2.9	< 2.9	< 1.8	< 2.0
Ba-140	-	< 10.4	< 15.4	< 15.3	< 15.5	< 17.0
La-140	-	< 2.1	< 1.5	< 1.8	< 2.0	< 4.1

Lab Code Date Collected	DSW- 2782 07-17-18	DSW- 3336 08-16-18	DSW- 3886 09-20-18	DSW- 4343 10-17-18	DSW- 4910 11-19-18	DSW- 5349 12-17-18
H-3	< 158	< 152	< 153	< 150	< 151	< 153
Mn-54	< 1.7	< 2.2	< 2.1	< 3.2	< 3.6	< 4.0
Fe-59	< 3.2	< 5.8	< 4.9	< 4.7	< 4.3	< 3.1
Co-58	< 2.7	< 3.0	< 2.5	< 1.9	< 2.9	< 3.2
Co-60	< 1.9	< 2.5	< 2.2	< 1.3	< 1.6	< 2.8
Zn-65	< 4.4	< 4.2	< 3.5	< 5.5	< 6.3	< 3.5
Nb-95	< 2.9	< 3.6	< 3.6	< 2.5	< 2.5	< 3.8
Zr-95	< 5.1	< 2.8	< 5.1	< 5.6	< 5.3	< 4.7
I-131	< 3.3	< 6.6	< 3.6	< 3.5	< 5.4	< 4.9
Cs-134	< 2.7	< 4.1	< 3.2	< 3.3	< 2.8	< 4.1
Cs-137	< 3.3	< 4.5	< 2.9	< 3.5	< 3.0	< 3.7
Ba-140	< 10.7	< 18.2	< 16.3	< 12.2	< 16.9	< 11.8
La-140	< 2.2	< 1.6	< 3.8	< 3.8	< 4.1	< 3.9

[a] "ND" = No data; see Table 2.0, Program Deviations.

Table 18. Surface water, analysis for strontium.
Collection: Quarterly composites of monthly samples.
Units: pCi/L

Location	D-49			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-986	DSW-2428	DSW-4106	DSW-5353
Sr-89	< 0.71	< 0.55	< 0.61	< 0.69
Sr-90	< 0.52	< 0.47	< 0.50	< 0.58

Location	D-61			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-987	DSW-2429	DSW-4107	DSW-5354
Sr-89	< 0.81	< 0.52	< 0.66	< 0.61
Sr-90	< 0.53	< 0.46	< 0.53	< 0.46

Table 19. Fish, analyses of edible portion for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Upstream, D-49			Control, D-56
Lab Code	DF- 2850	DF- 2851	DF- 2853	DF- 2858
Date Collected	07-11-18	07-11-18	07-11-18	07-11-18
Sample Type	White Crappie	Channel Catfish	Largemouth Bass	Catfish
K-40	2.65 ± 0.27	2.83 ± 0.32	3.96 ± 0.51	2.31 ± 0.42
Mn-54	< 0.014	< 0.018	< 0.022	< 0.019
Fe-59	< 0.048	< 0.064	< 0.035	< 0.056
Co-58	< 0.014	< 0.023	< 0.029	< 0.013
Co-60	< 0.013	< 0.018	< 0.012	< 0.020
Zn-65	< 0.030	< 0.040	< 0.043	< 0.031
Nb-95	< 0.032	< 0.041	< 0.049	< 0.038
Zr-95	< 0.020	< 0.040	< 0.053	< 0.050
Ru-103	< 0.023	< 0.036	< 0.042	< 0.037
Ru-106	< 0.10	< 0.20	< 0.13	< 0.15
Cs-134	< 0.014	< 0.016	< 0.019	< 0.015
Cs-137	< 0.017	< 0.015	< 0.014	< 0.016
Ce-141	< 0.045	< 0.052	< 0.10	< 0.054
Ce-144	< 0.085	< 0.086	< 0.14	< 0.075

Lab Code	DF- 3511	DF- 3512	DF- 3513
Date Collected	08-24-18	08-24-18	08-24-18
Sample Type	White crappie	Channel catfish	Black bass
K-40	3.19 ± 0.34	3.53 ± 0.51	3.09 ± 0.33
Mn-54	< 0.017	< 0.015	< 0.016
Fe-59	< 0.053	< 0.056	< 0.054
Co-58	< 0.019	< 0.025	< 0.019
Co-60	< 0.013	< 0.021	< 0.017
Zn-65	< 0.038	< 0.049	< 0.029
Nb-95	< 0.031	< 0.034	< 0.039
Zr-95	< 0.042	< 0.052	< 0.034
Ru-103	< 0.030	< 0.037	< 0.028
Ru-106	< 0.13	< 0.20	< 0.14
Cs-134	< 0.017	< 0.021	< 0.016
Cs-137	< 0.021	< 0.021	< 0.012
Ce-141	< 0.070	< 0.048	< 0.053
Ce-144	< 0.096	< 0.136	< 0.087

Table 19. Fish, analyses of edible portion for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Downstream, D-61			
Lab Code	DF- 2854	DF- 2855	DF- 2856	DF- 2857
Date Collected	07-11-18	07-11-18	07-11-18	07-11-18
Sample Type	Freshwater Drum	Common Carp	Smallmouth Buffalo	Walleye/Sunfish White Crappie
K-40	3.45 ± 0.47	3.06 ± 0.46	2.56 ± 0.30	3.72 ± 0.48
Mn-54	< 0.018	< 0.019	< 0.016	< 0.019
Fe-59	< 0.089	< 0.083	< 0.053	< 0.053
Co-58	< 0.021	< 0.023	< 0.021	< 0.017
Co-60	< 0.010	< 0.011	< 0.017	< 0.014
Zn-65	< 0.053	< 0.029	< 0.037	< 0.032
Nb-95	< 0.044	< 0.034	< 0.035	< 0.036
Zr-95	< 0.051	< 0.037	< 0.040	< 0.054
Ru-103	< 0.032	< 0.036	< 0.030	< 0.046
Ru-106	< 0.11	< 0.16	< 0.13	< 0.12
Cs-134	< 0.017	< 0.020	< 0.016	< 0.023
Cs-137	< 0.018	< 0.021	< 0.014	< 0.014
Ce-141	< 0.068	< 0.076	< 0.051	< 0.073
Ce-144	< 0.13	< 0.17	< 0.11	< 0.12

Lab Code	DF- 3514	DF- 3515	DF- 3516
Date Collected	08-24-18	08-24-18	08-24-18
Sample Type	Channel catfish	White crappie	Largemouth bass
K-40	3.93 ± 0.60	2.72 ± 0.29	4.24 ± 0.62
Mn-54	< 0.019	< 0.020	< 0.025
Fe-59	< 0.068	< 0.054	< 0.101
Co-58	< 0.024	< 0.018	< 0.038
Co-60	< 0.025	< 0.017	< 0.017
Zn-65	< 0.049	< 0.039	< 0.031
Nb-95	< 0.066	< 0.032	< 0.062
Zr-95	< 0.068	< 0.041	< 0.047
Ru-103	< 0.053	< 0.034	< 0.043
Ru-106	< 0.26	< 0.10	< 0.17
Cs-134	< 0.027	< 0.015	< 0.025
Cs-137	< 0.019	< 0.014	< 0.023
Ce-141	< 0.084	< 0.041	< 0.079
Ce-144	< 0.162	< 0.095	< 0.143

Table 20. River sediment, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-49 (Control)	
Lab Code	DBS- 1546	DBS- 4678
Date Collected	04-26-18	10-29-18
K-40	8.54 ± 0.57	8.98 ± 0.44
Mn-54	< 0.026	< 0.016
Fe-59	< 0.034	< 0.051
Co-58	< 0.020	< 0.010
Co-60	< 0.014	< 0.009
Zn-65	< 0.039	< 0.030
Nb-95	< 0.017	< 0.018
Zr-95	< 0.051	< 0.027
Ru-103	< 0.025	< 0.017
Ru-106	< 0.162	< 0.12
Cs-134	< 0.018	< 0.012
Cs-137	< 0.021	< 0.016
Ce-141	< 0.054	< 0.041
Ce-144	< 0.12	< 0.08

Location	D-51 (Discharge)	
Lab Code	DBS- 1548	DBS- 4679
Date Collected	04-26-18	10-29-18
K-40	8.08 ± 0.48	7.50 ± 0.46
Mn-54	< 0.013	< 0.020
Fe-59	< 0.052	< 0.041
Co-58	< 0.015	< 0.016
Co-60	< 0.011	< 0.018
Zn-65	< 0.036	< 0.046
Nb-95	< 0.023	< 0.031
Zr-95	< 0.028	< 0.033
Ru-103	< 0.018	< 0.018
Ru-106	< 0.12	< 0.106
Cs-134	< 0.009	< 0.014
Cs-137	< 0.014	< 0.014
Ce-141	< 0.035	< 0.045
Ce-144	< 0.093	< 0.09

Table 20. River sediment, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-107A (North Drainage Ditch)	
Lab Code	DBS- 1549	DBS- 4680
Date Collected	04-26-18	10-29-18
K-40	7.35 ± 0.46	5.65 ± 0.39
Mn-54	< 0.016	< 0.015
Fe-59	< 0.026	< 0.023
Co-58	< 0.017	< 0.018
Co-60	< 0.010	< 0.012
Zn-65	< 0.031	< 0.033
Nb-95	< 0.021	< 0.025
Zr-95	< 0.031	< 0.025
Ru-103	< 0.018	< 0.018
Ru-106	< 0.091	< 0.08
Cs-134	< 0.010	< 0.010
Cs-137	< 0.014	< 0.014
Ce-141	< 0.036	< 0.036
Ce-144	< 0.10	< 0.086

Table 21. Soil, analysis for strontium-90 and gamma-emitting isotopes.
Collection: Annually
Units: pCi/g dry

Location	D-15a	D-16
Lab Code	DSO- 2668	DSO- 2669
Date Collected	07-10-18	07-10-18
Sr-90	< 0.046	< 0.050
H-3 (pCi/L)	< 156	< 156
K-40	13.45 ± 0.73	9.15 ± 0.52
Mn-54	< 0.020	< 0.014
Fe-59	< 0.069	< 0.037
Co-58	< 0.034	< 0.019
Co-60	< 0.022	< 0.011
Zn-65	< 0.048	< 0.028
Nb-95	< 0.041	< 0.026
Zr-95	< 0.056	< 0.034
Ru-103	< 0.032	< 0.020
Ru-106	< 0.18	< 0.11
Cs-134	< 0.018	< 0.011
Cs-137	0.084 ± 0.024	0.10 ± 0.019
Ce-141	< 0.099	< 0.038
Ce-144	< 0.19	< 0.075

Identified Cs-137 determined to be from nuclear weapons testing.

Table 22. Supplemental wildlife meat (liver) sample, analysis for gamma emitting isotopes. Deer meat collected from legally harvested deer.

Location	D-99
Lab Code	DME- 4571
Date Collected	10-19-18
K-40	1.85 ± 0.25
Mn-54	< 0.01
Fe-59	< 0.03
Co-58	< 0.01
Co-60	< 0.01
Zn-65	< 0.03
Nb-95	< 0.01
Zr-95	< 0.02
Ru-103	< 0.02
Ru-106	< 0.11
Cs-134	< 0.01
Cs-137	< 0.01
Ce-141	< 0.02
Ce-144	< 0.09

Table 23. Groundwater Protection Program Summary.

Precipitation samples for tritium analysis. Units: pCi/L

Lab Code	Date	H-3	Lab Code	Date	H-3
D- 16			D-111		
DP- 132	01/10/18	322 ± 89	DP- 133	01/10/18	214 ± 84
DP- 386	02/02/18	< 150	DP- 387	02/02/18	< 150
DP- 741	03/01/18	443 ± 102	DP- 742	03/01/18	205 ± 91
DP- 1086	04/03/18	< 159	DP- 1088	04/03/18	< 159
DP- 1650	05/02/18	< 157	DP- 1652	05/02/18	706 ± 108
DP- 2242	06/04/18	< 160	DP- 2244	06/04/18	< 160
DP- 2538	07/05/18	< 154	DP- 2540	07/05/18	< 154
DP- 3145	08/01/18	Nd[a]	DP- 3139	08/01/18	< 152
DP- 3652	09/03/18	< 156	DP- 3654	09/03/18	< 156
DP- 4087	10/01/18	< 154	DP- 4090	10/01/18	< 154
DP- 4747	11/01/18	< 149	DP- 4749	11/01/18	< 149
DP- 5153	12/04/18	< 153	DP- 5155	12/04/18	< 153
D-112			D-114		
DP- 134	01/10/18	346 ± 90	DP- 135	01/10/18	< 152
DP- 388	02/02/18	< 150	DP- 389	02/02/18	< 150
DP- 743	03/01/18	220 ± 92	DP- 744	03/01/18	< 154
DP- 1089	04/03/18	< 159	DP- 1090	04/03/18	< 159
DP- 1653	05/02/18	< 157	DP- 1654	05/02/18	696 ± 108
DP- 2245	06/04/18	< 160	DP- 2247	06/04/18	172 ± 88
DP- 2541	07/05/18	< 154		ND[a]	
DP- 3140	08/01/18	< 152		ND[a]	
DP- 3655	09/03/18	< 156		ND[a]	
DP- 4091	10/01/18	< 154		ND[a]	
DP- 4750	11/01/18	232 ± 84		ND[a]	
DP- 5157	12/04/18	< 153		ND[a]	
D-127			D-128		
DP- 136	01/10/18	2238 ± 157	DP- 137	01/10/18	1798 ± 144
DP- 390	02/02/18	2192 ± 154	DP- 391	02/02/18	332 ± 89
DP- 745	03/01/18	1046 ± 125	DP- 746	03/01/18	430 ± 101
DP- 1091	04/04/18	1474 ± 135	DP- 1092	04/04/18	177 ± 83
DP- 1655	05/02/18	5193 ± 225	DP- 1656	05/02/18	355 ± 93
DP- 2248	06/04/18	1037 ± 124	DP- 2249	06/04/18	322 ± 95
DP- 2543	07/05/18	1381 ± 130	DP- 2544	07/05/18	565 ± 100
DP- 3142	08/01/18	508 ± 97	DP- 3143	08/01/18	250 ± 85
DP- 3657	09/03/18	741 ± 107	DP- 3659	09/03/18	217 ± 84
DP- 4093	10/01/18	515 ± 97	DP- 4094	10/01/18	194 ± 82
DP- 4752	11/01/18	561 ± 99	DP- 4753	11/01/18	361 ± 90
DP- 5159	12/04/18	1194 ± 123	DP- 5160	12/04/18	< 153
D- 81			D-115		
DP- 1087	04/03/18	< 159	DP- 2542	07/05/18	161 ± 81
DP- 1651	05/02/18	230 ± 87	DP- 3141	08/01/18	< 152
DP- 2243	06/04/18	< 160	DP- 3656	09/03/18	< 156
DP- 2539	07/05/18	< 154	DP- 4092	10/01/18	< 154
DP- 3144	08/01/18	< 152	DP- 4751	11/01/18	< 149
DP- 3653	09/03/18	< 156	DP- 5158	12/04/18	< 153
DP- 4089	10/01/18	< 154			
DP- 4748	11/01/18	156 ± 80			
DP- 5154	12/04/18	< 153			

[a] No sampler at the location.

Table 23. Groundwater Protection Program Summary.

Precipitation, monthly collections, analyses for gamma emitting isotopes.

Location: D-16

Lab Code	Date	Concentration (pCi/L)											
		^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{131}I	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
DP- 132	01/10/18	< 20.4	< 23.9	< 21.3	< 13.9	< 36.1	< 18.5	< 30.1	< 21.2	< 20.4	< 21.9	< 80.8	< 23.0 [a]
DP- 386	02/02/18	< 4.3	< 8.2	< 3.5	< 3.3	< 7.5	< 4.5	< 6.9	< 7.1	< 4.3	< 3.1	< 20.6	< 2.8
DP- 741	03/01/18	< 2.1	< 4.8	< 2.6	< 2.7	< 4.5	< 2.9	< 4.6	< 4.3	< 2.8	< 3.4	< 11.4	< 4.4
DP- 1086	04/03/18	< 2.5	< 3.7	< 2.8	< 2.8	< 4.1	< 2.4	< 3.2	< 3.9	< 3.3	< 2.8	< 9.2	< 3.5
DP- 1650	05/02/18	< 3.7	< 4.5	< 2.6	< 2.1	< 5.9	< 2.7	< 2.6	< 4.3	< 3.0	< 3.4	< 12.8	< 3.0
DP- 2242	06/04/18	< 5.5	< 12.2	< 6.2	< 4.6	< 4.7	< 5.1	< 6.9	< 12.4	< 6.0	< 5.9	< 27.7	< 4.9
DP- 2538	07/05/18	< 2.7	< 4.2	< 1.2	< 1.6	< 1.9	< 3.0	< 4.0	< 4.0	< 2.9	< 1.9	< 12.0	< 1.5
DP- 3145	08/01/18						ND [b]						
DP- 3652	09/03/18	< 2.5	< 4.8	< 3.1	< 1.3	< 5.3	< 2.3	< 3.0	< 5.9	< 2.7	< 2.9	< 8.2	< 2.9
DP- 4087	10/01/18	< 2.5	< 2.7	< 2.3	< 1.6	< 4.6	< 3.1	< 4.6	< 4.3	< 2.4	< 2.2	< 11.0	< 2.6
DP- 4747	11/01/18	< 2.5	< 5.1	< 1.7	< 2.4	< 5.9	< 2.8	< 5.0	< 4.1	< 3.1	< 2.7	< 10.6	< 2.1
DP- 5153	12/04/18	< 3.1	< 3.8	< 3.7	< 3.6	< 6.8	< 3.2	< 3.8	< 4.2	< 3.0	< 3.8	< 12.2	< 3.6

[a] LLDs not reached due to extremely small sample volume (0.1 L).

Table 23. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
		D-111A		(MW-01A)	
DWW- 1852	05/10/18	193 ± 84			
DWW- 3347	08/13/18	256 ± 84			
DWW- 3379	08/15/18	2057 ± 149			
DWW- 4965	11/12/18	< 154			
		D-111B		(MW-01B)	
DWW- 584	02/14/18	< 152	DWW- 4966	11/12/18	< 154
DWW- 1853	05/10/18	< 155			
DWW- 3348	08/13/18	< 152			
		D-112A		(MW-02A)	
DWW- 585	02/14/18	< 152	DWW- 4948	11/12/18	< 151
DWW- 1854	05/10/18	< 155			
DWW- 3380	08/14/18	< 152			
		D-112B		(MW-02B)	
DWW- 586	02/14/18	< 152	DWW- 3428	08/22/18	< 151
DWW- 1856	05/10/18	< 155	DWW- 4949	11/12/18	< 151
DWW- 3381	08/14/18	< 152			
		D-113A		(MW-03A)	
DWW- 658	02/21/18	< 156	DWW- 4950	11/12/18	< 151
DWW- 1857	05/10/18	< 155			
DWW- 3382	08/14/18	< 152			
		D-113B		(MW-03B)	
DWW- 660	02/21/18	< 156	DWW- 4951	11/12/18	< 151
DWW- 1858	05/10/18	< 155			
DWW- 3383	08/14/18	< 152			
		D-114A		(MW-04A)	
DWW- 587	02/15/18	206 ± 83	DWW- 4929	11/14/18	227 ± 83
DWW- 1859	05/11/18	210 ± 100			
DWW- 3384	08/14/18	302 ± 86			
		D-114B		(MW-04B)	
DWW- 561	02/15/18	< 156	DWW- 4930	11/14/18	< 151
DWW- 1860	05/11/18	< 186			
DWW- 3385	08/14/18	< 152			
		D-115A		(MW-05A)	
DWW- 588	02/15/18	< 152	DWW- 4931	11/12/18	227 ± 83
DWW- 1861	05/10/18	< 186			
DWW- 3386	08/14/18	285 ± 86			
		D-115B		(MW-05B)	
DWW- 562	02/15/18	< 156	DWW- 4932	11/12/18	< 151
DWW- 1862	05/10/18	< 186			
DWW- 3387	08/14/18	< 152			
		D-116A		(MW-06A)	
DWW- 590	02/14/18	< 152	DWW- 4933	11/12/18	155 ± 79
DWW- 1863	05/10/18	< 186			
DWW- 3388	08/14/18	< 152			
		D-116B		(MW-06B)	
DWW- 591	02/14/18	< 152	DWW- 4934	11/12/18	< 151
DWW- 1864	05/10/18	227 ± 101			
DWW- 3390	08/14/18	< 152			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L.

Table 23. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date		H-3 (pCi/L)
		D-127A		(MW-07A)		
DWW- 187	01/12/18	2719 ± 171	DWW- 2738	07/11/18	14:55	149,722 ± 1126
DWW- 501	02/07/18	3038 ± 180	DWW- 2740	07/11/18	8:25	159,089 ± 1160
DWW- 938	03/13/18	11,870 ± 330	DWW- 2744	07/12/18		14,478 ± 357
DWW- 1125	03/28/18	7682 ± 268	DWW- 2975	07/13/18		41,263 ± 593
DWW- 1123	04/05/18	11,175 ± 319	DWW- 2973	07/15/18		13,491 ± 344
DWW- 1327	04/10/18	2440 ± 163	DWW- 2972	07/19/18		4836 ± 214
DWW- 1475	04/16/18	1413 ± 132	DWW- 2974	07/23/18		13,671 ± 346
DWW- 1827	05/10/18	10,792 ± 314	DWW- 3429	08/20/18		4754 ± 212
DWW- 2048	05/22/18	21,100 ± 434	DWW- 3802	09/10/18		18,108 ± 397
DWW- 2359	06/11/18	9554 ± 299	DWW- 4919	11/13/18		869 ± 111
			DWW- 5360	12/12/18		2042 ± 150
		D-127B		(MW-07B)		
DWW- 466	02/05/18	< 156	DWW- 4920	11/13/18		< 151
DWW- 2047	05/22/18	< 156				
DWW- 3391	08/15/18	< 152				
		D-128A		(MW-08A)		
DWW- 188	01/11/18	27,874 ± 495				
DWW- 502	02/06/18	28,502 ± 500				
DWW- 939	03/13/18	20,987 ± 433				
DWW- 1328	04/10/18	10,949 ± 316				
DWW- 1828	05/10/18	4292 ± 210				
DWW- 2045	05/22/18	5705 ± 235				
DWW- 2360	06/11/18	4320 ± 209				
DWW- 2739	07/11/18	3796 ± 193				
DWW- 3392	08/15/18	24,297 ± 457				
DWW- 3430	08/20/18	27,588 ± 486				
DWW- 3803	09/10/18	1139 ± 124				
DWW- 4196	10/08/18	762 ± 107				
DWW- 4921	11/13/18	12,678 ± 334				
DWW- 5292	12/11/18	3157 ± 179				
		D-128B		(MW-08B)		
DWW- 467	02/06/18	385 ± 96				
DWW- 1866	05/10/18	350 ± 105				
DWW- 3393	08/15/18	253 ± 84				
DWW- 4922	11/13/18	501 ± 96				
		D-129A		(MW-09A)		
DWW- 468	02/05/18	164 ± 86	DWW- 3804	09/10/18		504 ± 100
DWW- 1323	04/10/18	< 156	DWW- 4958	11/13/18		408 ± 91
DWW- 1829	05/10/18	216 ± 94				
DWW- 2044	05/22/18	314 ± 91				
DWW- 2361	06/11/18	325 ± 95				
DWW- 2741	07/12/18	699 ± 106				
DWW- 3394	08/15/18	279 ± 85				

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 23. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
		D-129B		(MW-09B)	
DWW- 469	02/05/18	338 ± 94			
DWW- 1830	05/10/18	330 ± 99			
DWW- 3395	08/15/18	302 ± 86			
DWW- 4959	11/13/18	286 ± 86			
		D-130A		(MW-10A)	
DWW- 470	02/05/18	< 156			
DWW- 1831	05/10/18	165 ± 82			
DWW- 2742	07/12/18	278 ± 87			
DWW- 3396	08/15/18	218 ± 82			
DWW- 4961	11/13/18	172 ± 80			
		D-130B		(MW-10B)	
DWW- 471	02/05/18	< 156			
DWW- 1832	05/10/18	< 155			
DWW- 3397	08/15/18	< 152			
DWW- 4962	11/13/18	< 154			
		D-131A		(MW-11A)	
DWW- 563	02/15/18	320 ± 91			
DWW- 1867	05/11/18	317 ± 90			
DWW- 3398	08/14/18	< 152			
DWW- 4963	11/14/18	195 ± 82			
		D-131B		(MW-11B)	
DWW- 592	02/15/18	< 152			
DWW- 1868	05/11/18	< 186			
DWW- 3399	08/14/18	< 152			
DWW- 4964	11/14/18	< 154			
		D-132A		(MW-12A)	
DWW- 593	02/15/18	8342 ± 277			
DWW- 642	02/20/18	7262 ± 260			
DWW- 933	03/13/18	3763 ± 198			
DWW- 1869	05/11/18	1050 ± 128			
DWW- 2362	06/11/18	536 ± 104			
DWW- 3400	08/14/18	411 ± 92			
DWW- 4942	11/14/18	3429 ± 184			
		D-132B		(MW-12B)	
DWW- 594	02/15/18	< 152			
DWW- 1870	05/11/18	299 ± 89			
DWW- 3401	08/14/18	549 ± 98			
DWW- 4943	11/14/18	336 ± 88			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
		D-133A		(MW-13A)	
DWW- 564	02/15/18	< 156			
DWW- 1871	05/11/18	< 155			
DWW- 3402	08/14/18	< 152			
DWW- 4944	11/14/18	< 151			
		D-133B		(MW-13B)	
DWW- 565	02/15/18	< 156			
DWW- 1872	05/11/18	< 155			
DWW- 3403	08/14/18	< 152			
DWW- 4945	11/14/18	< 151			
		D-134A		(MW-14A)	
DWW- 189	01/11/18	498 ± 100			
DWW- 472	02/05/18	279 ± 91			
DWW- 934	03/13/18	294 ± 96			
DWW- 1324	04/10/18	312 ± 91			
DWW- 1833	05/08/18	304 ± 98			
DWW- 2363	06/11/18	260 ± 91			
DWW- 2737	07/11/18	213 ± 84			
DWW- 3404	08/15/18	272 ± 85			
DWW- 3805	09/10/18	250 ± 88			
DWW- 4946	11/13/18	351 ± 89			
		D-134B		(MW-14B)	
DWW- 473	02/05/18	298 ± 92			
DWW- 1835	05/08/18	254 ± 87			
DWW- 3405	08/15/18	< 152			
DWW- 4947	11/13/18	< 151			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
		D-135A		(MW-15A)	
DWW- 595	02/15/18	< 152			
DWW- 1873	05/11/18	< 155			
DWW- 3406	08/14/18	< 151			
DWW- 4923	11/14/18	< 151			
		D-135B		(MW-15B)	
DWW- 567	02/15/18	< 156			
DWW- 1874	05/11/18	< 155			
DWW- 3407	08/14/18	< 151			
DWW- 4924	11/14/18	< 151			
		D-136A		(MW-16A)	
DWW- 474	02/07/18	< 156			
DWW- 1836	05/09/18	< 155			
DWW- 3408	08/15/18	< 151			
DWW- 4925	11/13/18	< 151			
		D-136B		(MW-16B)	
DWW- 475	02/07/18	< 156			
DWW- 1837	05/09/18	< 155			
DWW- 3409	08/15/18	< 151			
DWW- 4926	11/13/18	< 151			
		D-137		(MW-17C)	
DWW- 596	02/09/18	< 152			
DWW- 1875	05/09/18	< 155			
DWW- 3411	08/15/18	< 151			
DWW- 4927	11/13/18	< 151			
		D-62		(MW-18A)	
DWW- 191	01/12/18	451 ± 98			
DWW- 476	02/07/18	595 ± 105			
DWW- 991	03/14/18	1055 ± 123			
DWW- 1325	04/10/18	916 ± 116			
DWW- 1877	05/08/18	968 ± 125			
DWW- 2364	06/11/18	858 ± 116			
DWW- 3412	08/15/18	1080 ± 118			
DWW- 3431	08/20/18	1058 ± 117			
DWW- 3806	09/10/18	846 ± 113			
DWW- 4928	11/13/18	1158 ± 121			
		D-63		(MW-19A)	
DWW- 634	02/20/18	487 ± 96	DWW- 3807	09/10/18	2065 < 152
DWW- 1878	05/09/18	897 ± 123	DWW- 4198	10/08/18	11,005 < 313
DWW- 2043	05/22/18	3026 ± 178	DWW- 4952	11/13/18	< 151
DWW- 2365	06/11/18	4438 ± 211	DWW- 5293	12/11/18	< 157
DWW- 2970	07/23/18 7:45	15,326 ± 366			
DWW- 2976	07/23/18 10:05	24,543 ± 460			
DWW- 3432	08/15/18	290,521 ± 1563			
DWW- 3434	08/20/18	77,542 ± 809			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
		D-64		(MW-20A)	
DWW- 635	02/20/18	344 ± 90	DWW- 4199	10/08/18	532 ± 98
DWW- 1838	05/10/18	66,797 ± 764[b]	DWW- 4953	11/13/18	193 ± 81
DWW- 2050	05/22/18	28,666 ± 504	DWW- 5294	12/11/18	< 157
DWW- 2366	06/11/18	5320 ± 229			
DWW- 2746	07/11/18	305 ± 89			
DWW- 2968	07/13/18	2509 ± 162			
DWW- 2969	07/23/18	1552 ± 135			
DWW- 3413	08/15/18	711 ± 104			
DWW- 3435	08/20/18	727 ± 105			
DWW- 3808	09/10/18	1595 ± 138			
		D-65		(MW-21A)	
DWW- 636	02/20/18	204 ± 83	DWW- 4200	10/08/18	7381 ± 260
DWW- 1839	05/09/18	7351 ± 265	DWW- 4954	11/13/18	6066 ± 237
DWW- 2052	05/22/18	7397 ± 264	DWW- 5295	12/11/18	3324 ± 183
DWW- 2367	06/11/18	17,678 ± 400			
DWW- 2736	07/11/18	3158 ± 179			
DWW- 2971	07/23/18	18,214 ± 398			
DWW- 3414	08/15/18	22,373 ± 439			
DWW- 3436	08/20/18	20,346 ± 419			
DWW- 3810	09/10/18	8981 ± 285			
		D-66		(MW-22A)	
DWW- 192	01/11/18	17,556 ± 396			
DWW- 503	02/05/18	14,005 ± 356			
DWW- 940	03/13/18	15,511 ± 375			
DWW- 1329	04/10/18	22,279 ± 445			
DWW- 1840	05/10/18	21,759 ± 441			
DWW- 2049	05/22/18	15,909 ± 379			
DWW- 2368	06/11/18	4846 ± 220			
DWW- 2745	07/11/18	1586 ± 136			
DWW- 3415	08/15/18	1493 ± 132			
DWW- 3437	08/20/18	1374 ± 128			
DWW- 3811	09/10/18	2157 ± 154			
DWW- 4201	10/08/18	939 ± 114			
DWW- 4955	11/13/18	5506 ± 227			
DWW- 5296	12/11/18	36,233 ± 559			
		D-67		(MW-23A)	
DWW- 193	01/11/18	2866 ± 174			
DWW- 504	02/05/18	33,852 ± 544			
DWW- 941	03/13/18	11,170 ± 321			
DWW- 1330	04/10/18	6520 ± 249			
DWW- 1879	05/10/18	1403 ± 138			
DWW- 2046	05/22/18	4438 ± 210			
DWW- 2369	06/11/18	2881 ± 177			
DWW- 2747	07/11/18	1666 ± 139			
DWW- 3416	08/15/18	2933 ± 172			
DWW- 3812	09/10/18	1267 ± 128			
DWW- 4202	10/08/18	2557 ± 163			
DWW- 4956	11/13/18	4981 ± 217			
DWW- 5297	12/11/18	5149 ± 221			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

[b] Sample recounted with a result of 67,135±766 pCi/L.

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

		D-165	(MW-24A)
DWW- 568	02/15/18	< 156	
DWW- 1880	05/11/18	< 186	
DWW- 3417	08/14/18	< 151	
DWW- 4957	11/14/18	< 151	

		D-167	(MW-26A)
DWW- 597	02/15/18	518 ± 98	
DWW- 1881	05/11/18	542 ± 112	
DWW- 3418	08/14/18	291 ± 86	
DWW- 4935	11/14/18	336 ± 88	

		D-168A	(MW-27A)
DWW- 598	02/14/18	342 ± 90	
DWW- 1882	05/10/18	566 ± 113	
DWW- 3349	08/13/18	558 ± 98	
DWW- 4967	11/12/18	400 ± 92	
		D-168B	(MW-27B)
DWW- 569	02/14/18	< 156	
DWW- 1889	05/10/18	< 186	
DWW- 3350	08/13/18	< 152	
DWW- 4968	11/12/18	< 154	
		D-169A	(MW-28A)
DWW- 599	02/14/18	709 ± 106	
DWW- 936	03/13/18	725 ± 114	
DWW- 1883	05/10/18	305 ± 104	
DWW- 3351	08/13/18	220 ± 82	
DWW- 4969	11/12/18	< 154	

		D-169B	(MW-28B)
DWW- 570	02/14/18	< 156	
DWW- 1884	05/10/18	< 186	
DWW- 3352	08/13/18	< 152	
DWW- 4970	11/12/18	< 154	

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

		D-170A	(MW-29A)
DWW- 600	02/14/18	258 ± 85	
DWW- 1326	04/11/18	< 155	
DWW- 1885	05/10/18	< 186	
DWW- 3353	08/13/18	310 ± 87	
DWW- 4936	11/13/18	199 ± 81	
		D-170B	(MW-29B)
DWW- 571	02/14/18	< 156	
DWW- 1886	05/10/18	< 186	
DWW- 3354	08/13/18	< 152	
DWW- 4971	11/12/18	343 ± 89	
		D171A	(MW-30A)
DWW- 601	02/14/18	316 ± 88	
DWW- 1887	05/10/18	1467 ± 139	
DWW- 3355	08/13/18	< 152	
DWW- 4973	11/12/18	< 154	
		D-171B	(MW-30B)
DWW- 602	02/14/18	< 152	
DWW- 1888	05/10/18	< 186	
DWW- 3356	08/13/18	< 152	
DWW- 4974	11/12/18	< 154	
		D172A	(MW-31A)
DWW- 603	02/14/18	< 152	
DWW- 1903	05/10/18	176 ± 83	
DWW- 3357	08/13/18	< 152	
DWW- 4937	11/12/18	< 151	
		D-172B	(MW-31B)
DWW- 572	02/14/18	< 156	
DWW- 1904	05/10/18	< 155	
DWW- 3358	08/13/18	< 152	
DWW- 4938	11/12/18	< 151	
		D-173A	(MW-32A)
DWW- 604	02/14/18	625 ± 102	
DWW- 937	03/13/18	221 ± 93	
DWW- 1905	05/10/18	< 155	
DWW- 3359	08/13/18	285 ± 86	
DWW- 4975	11/12/18	< 154	
		D-173B	(MW-32B)
DWW- 573	02/14/18	256 ± 88	
DWW- 1906	05/10/18	453 ± 96	
DWW- 3360	08/13/18	329 ± 88	
DWW- 4976	11/12/18	257 ± 85	
		D-79	(MW-33A)
DWW- 605	02/15/18	< 152	
DWW- 1902	05/10/18	< 186	
DWW- 3361	08/13/18	170 ± 80	
DWW- 4940	11/12/18	< 151	

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Ground water, Monitoring wells, analyses for tritium [a].

		D-80 (MW-34A)			
DWW- 606	02/15/18	168 ± 81			
DWW- 1907	05/10/18	< 155			
DWW- 3362	08/13/18	< 152			
DWW- 4941	11/12/18	< 151			
		D-81 (MW-35A)			
DWW- 607	02/15/18	385 ± 92	DWW- 4203	10/08/18	183 ± 82
DWW- 1908	05/10/18	460 ± 96	DWW- 4972	11/12/18	< 154
DWW- 2370	06/11/18	393 ± 98	DWW- 5361	12/11/18	< 157
DWW- 2748	07/11/18	225 ± 85			
DWW- 3363	08/13/18	163 ± 80			
DWW- 3813	09/10/18	< 152			
		D-68 (EW-01A)			
DWW- 1900	03/30/18	865 ± 123			
DWW- 1841	05/08/18	315 ± 98			
		D-88 (MH219)			
DWW- 2330	06/05/18	2280 ± 161			
		D-89 (MH221)			
DWW- 1844	05/08/18	< 155			
		D-92 (MH202)			
DWW- 1844	05/08/18	< 155			
		D-95 (MH217)			
DWW- 2329	06/05/18	< 160			
		D-97 (MH102)			
DWW- 1843	05/08/18	174 ± 83			
		D-101 (1MH109)			
DWW- 1097	04/03/18	460 ± 97			
		D-103 (1MH101)			
DWW- 1097	04/03/18	460 ± 97			

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

Table 22. Groundwater Protection Program Summary.

Surface water, analysis for tritium.

D-119			(2MH209)		
DSW- 637	02/20/18	432 ± 94	DSW- 1992	05/17/18	514 ± 100
			DSW- 3441	08/22/18	161 ± 79
D-120			(2MH210)		
DSW- 3442	08/22/18	213 ± 82			
DSW- 4809	11/06/18	< 154			
D-121			(2MH211)		
DSW- 3443	08/22/18	< 151			
DSW- 4810	11/06/18	< 154			
D-122			(Sluice Pond)		
DSW- 638	02/20/18	326 ± 89	DSW- 3438	08/22/18	264 ± 84
DSW- 2035	05/24/18	249 ± 88	DSW- 4335	10/10/18	< 154
DSW- 2977	07/23/18	< 152	DSW- 4811	11/06/18	407 ± 96
D-123			(S. Drainage Ditch)		
DSW- 639	02/20/18	< 151			
DSW- 4812	11/06/18	< 154			
D-124			(N. Drainage Ditch)		
DSW- 640	02/20/18	< 156	DSW- 3439	08/22/18	< 151
DSW- 1990	05/17/18	< 156	DSW- 4813	11/06/18	< 154
D-125			(Onsite S. Storm Drain Outfall)		
DSW- 641	02/20/18	535 ± 98	DSW- 3440	08/22/18	< 151
DSW- 1991	05/17/18	809 ± 112	DSW- 4814	11/06/18	2404 ± 161[a]
D-24			(MW-104)		
DSW- 4113	10/02/18	< 154			
D-25			(MW-105)		
DSW- 4109	10/01/18	< 154			
D-26			(MW-106)		
DSW- 4110	10/02/18	167 ± 81			
D-27			(MW-107)		
DSW- 4112	10/01/18	< 154			

[a] Reanalysis = 2645 ± 165

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-127A (MW-07A)						
DWW- 187	1/12/2018	< 2.9	< 3.2	< 2.4	< 2.4	< 5.2	< 3.3	< 5.4	< 2.6	< 2.2	< 17.8	< 8.7
DWW- 501	2/7/2018	< 1.6	< 8.4	< 3.0	< 3.1	< 5.8	< 4.1	< 4.0	< 2.7	< 3.1	< 23.3	< 5.8
DWW- 938	3/13/2018	< 2.2	< 5.6	< 2.4	< 2.3	< 5.3	< 3.1	< 6.3	< 2.6	< 2.9	< 25.6	< 7.5
DWW- 1125	3/28/2018	< 2.3	< 4.9	< 2.1	< 2.8	< 6.1	< 4.8	< 6.2	< 2.5	< 2.3	< 75.4	< 19.4 [a]
DWW- 1123	4/5/2018	< 3.3	< 6.0	< 2.7	< 2.0	< 3.2	< 4.4	< 6.1	< 2.8	< 2.5	< 17.4	< 7.7
DWW- 1327	4/10/2018	< 2.7	< 5.6	< 2.8	< 3.3	< 3.9	< 3.4	< 5.4	< 2.4	< 2.5	< 37.5	< 8.4
DWW- 1827	5/10/2018	< 3.2	< 4.6	< 3.6	< 2.8	< 4.5	< 4.4	< 6.1	< 3.1	< 1.7	< 20.7	< 3.5
DWW- 2048	5/22/2018	< 2.2	< 7.3	< 2.6	< 2.4	< 4.4	< 5.3	< 4.7	< 2.4	< 2.5	< 45.1	< 10.7
DWW- 2359	6/11/2018	< 2.0	< 5.3	< 1.7	< 1.7	< 2.9	< 2.1	< 4.3	< 2.0	< 1.7	< 30.5	< 6.6
DWW- 2738	7/11/2018	< 1.2	< 3.2	< 1.6	< 1.3	< 3.5	< 1.8	< 3.3	< 1.5	< 1.4	< 18.1	< 5.2
DWW- 2740	7/11/2018	< 1.4	< 3.0	< 1.7	< 1.5	< 3.4	< 2.6	< 3.6	< 1.5	< 1.3	< 18.4	< 4.2
DWW- 2744	7/12/2018	< 1.4	< 2.0	< 1.2	< 1.4	< 2.7	< 2.7	< 3.0	< 1.6	< 1.6	< 14.9	< 5.0
DWW- 2975	7/13/2018	< 1.4	< 3.0	< 2.0	< 0.9	< 2.9	< 2.1	< 3.7	< 1.5	< 1.9	< 32.0	< 9.9
DWW- 2973	7/15/2018	< 2.7	< 6.0	< 3.3	< 1.9	< 4.7	< 4.3	< 4.2	< 2.6	< 1.9	< 44.8	< 12.5
DWW- 2972	7/19/2018	< 2.1	< 3.8	< 2.0	< 1.7	< 3.6	< 2.4	< 3.9	< 1.8	< 2.0	< 30.3	< 5.6
DWW- 2974	7/23/2018	< 1.6	< 3.6	< 2.0	< 1.3	< 2.5	< 2.0	< 2.3	< 1.4	< 1.5	< 18.8	< 5.1
DWW- 3429	8/20/2018	< 2.3	< 6.7	< 2.0	< 1.5	< 3.1	< 5.0	< 3.3	< 2.2	< 2.1	< 60.4	< 16.0 [a]
DWW- 3802	9/10/2018	< 3.5	< 8.6	< 3.4	< 2.2	< 4.9	< 9.0	< 5.6	< 2.9	< 2.1	< 224.1	< 62.8 [a]
DWW- 5360	12/12/2018	< 1.9	< 3.1	< 1.6	< 1.9	< 3.0	< 2.8	< 4.4	< 2.0	< 2.1	< 29.8	< 8.0
						D-128A (MW-08A)						
DWW- 188	1/11/2018	< 3.1	< 4.6	< 2.4	< 2.1	< 4.2	< 3.1	< 3.9	< 3.1	< 2.5	< 26.0	< 4.7
DWW- 502	2/6/2018	< 2.5	< 3.5	< 3.1	< 2.7	< 5.0	< 4.3	< 5.5	< 2.8	< 3.1	< 37.1	< 8.1
DWW- 939	3/13/2018	< 2.8	< 5.4	< 2.3	< 2.8	< 4.7	< 2.6	< 5.0	< 2.7	< 2.7	< 23.4	< 6.3
DWW- 1328	4/10/2018	< 2.7	< 6.5	< 3.1	< 2.4	< 4.8	< 4.9	< 3.6	< 3.0	< 2.3	< 43.4	< 12.2
DWW- 1828	5/10/2018	< 2.4	< 4.8	< 3.0	< 2.1	< 5.2	< 2.9	< 3.5	< 2.3	< 2.2	< 22.2	< 7.6
DWW- 2045	5/22/2018	< 2.0	< 7.1	< 2.7	< 1.8	< 4.1	< 4.7	< 4.7	< 2.4	< 2.4	< 38.4	< 17.7
DWW- 2360	6/11/2018	< 1.5	< 3.0	< 1.6	< 1.4	< 3.0	< 2.7	< 4.2	< 1.5	< 1.2	< 30.8	< 7.6
DWW- 2739	7/11/2018	< 1.7	< 2.9	< 1.8	< 1.8	< 3.7	< 1.9	< 3.5	< 2.0	< 1.8	< 25.9	< 4.1
DWW- 3392	8/15/2018	< 1.7	< 4.7	< 1.8	< 1.3	< 2.2	< 2.3	< 2.0	< 1.5	< 1.5	< 32.6	< 6.7
DWW- 3430	8/20/2018	< 1.6	< 3.2	< 2.0	< 1.4	< 3.5	< 3.8	< 3.9	< 1.5	< 1.8	< 61.2	< 12.2 [a]
DWW- 3803	9/10/2018	< 2.3	< 5.2	< 2.8	< 1.6	< 3.5	< 6.0	< 3.2	< 1.8	< 1.9	< 113.3	< 36.4 [a]
DWW- 4921	11/13/2018	< 1.0	< 3.4	< 0.8	< 0.8	< 2.0	< 2.5	< 1.7	< 1.1	< 1.1	< 19.6	< 8.5
DWW- 5292	12/11/2018	< 1.6	< 2.4	< 1.9	< 1.6	< 3.6	< 2.4	< 3.1	< 1.4	< 1.6	< 27.9	< 7.2
						D-128B (MW-08B)						
DWW- 1866	5/10/2018	< 3.6	< 9.7	< 3.5	< 5.1	< 3.8	< 5.6	< 9.8	< 4.7	< 4.0	< 29.5	< 4.6
						D-129A (MW-09A)						
DWW- 1829	5/10/2018	< 3.8	< 5.0	< 4.1	< 3.4	< 4.3	< 6.3	< 7.3	< 4.6	< 4.5	< 28.8	< 8.1
						D-129B (MW-09B)						
DWW- 1830	5/10/2018	< 2.9	< 8.3	< 2.9	< 2.7	< 4.9	< 5.3	< 3.6	< 2.8	< 1.8	< 37.8	< 10.6

[a] LLDs not reached due to age and small sample volume.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-130A (MW-10A)						
DWW- 1831	5/10/2018	< 4.0	< 7.5	< 3.0	< 3.0	< 3.2	< 4.8	< 7.6	< 3.8	< 4.2	< 19.2	< 5.0
						D-130B (MW-10B)						
DWW- 1832	5/10/2018	< 3.5	< 8.4	< 4.1	< 2.1	< 6.5	< 4.6	< 5.4	< 4.7	< 5.1	< 35.4	< 7.3
						D-132A (MW-12A)						
DWW- 593	2/15/2018	< 1.9	< 5.5	< 2.8	< 2.6	< 4.7	< 2.4	< 4.9	< 2.4	< 3.0	< 18.7	< 6.8
DWW- 642	2/20/2018	< 2.5	< 6.2	< 2.5	< 3.0	< 4.9	< 2.3	< 3.9	< 2.5	< 3.1	< 16.6	< 5.0
DWW- 933	3/13/2018	< 3.3	< 5.6	< 2.7	< 1.8	< 4.4	< 3.5	< 5.2	< 2.9	< 2.6	< 21.0	< 5.4
DWW- 1869	5/11/2018	< 2.2	< 6.7	< 4.3	< 2.9	< 5.3	< 5.0	< 6.4	< 3.0	< 2.6	< 56.0	< 13.8
DWW- 4942	11/14/2018	< 1.6	< 4.4	< 1.6	< 1.2	< 2.7	< 1.9	< 2.8	< 1.5	< 1.6	< 23.7	< 5.1
						D-132B (MW-12B)						
DWW- 1870	5/11/2018	< 2.3	< 5.8	< 3.2	< 1.5	< 4.2	< 4.1	< 7.2	< 2.9	< 3.5	< 50.4	< 14.6
						D-134A (MW-14A)						
DWW- 1833	5/8/2018	< 3.1	< 6.2	< 3.8	< 4.9	< 4.5	< 3.9	< 6.5	< 4.2	< 3.0	< 19.3	< 5.1
						D-134B (MW-14B)						
DWW- 1835	5/8/2018	< 4.8	< 8.7	< 3.6	< 3.9	< 7.3	< 5.1	< 7.8	< 5.7	< 3.1	< 29.2	< 6.7

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-62 (MW-18A)						
DWW- 991	3/14/2018	< 2.9	< 5.0	< 2.5	< 2.8	< 4.1	< 7.0	< 7.5	< 2.7	< 2.1	< 86.9	< 18.9 [a]
DWW- 1877	5/8/2018	< 3.3	< 6.8	< 4.0	< 2.2	< 2.3	< 4.8	< 4.0	< 3.5	< 3.5	< 34.3	< 13.9
DWW- 3412	8/15/2018	< 1.7	< 3.8	< 2.2	< 1.5	< 2.8	< 4.3	< 2.5	< 1.8	< 1.9	< 59.2	< 17.4 [a]
DWW- 3431	8/20/2018	< 1.8	< 2.5	< 1.7	< 1.1	< 2.4	< 2.3	< 4.4	< 1.5	< 1.7	< 46.6	< 13.9
DWW- 4928	11/13/2018	< 1.9	< 4.1	< 2.5	< 1.9	< 3.4	< 3.1	< 4.6	< 1.7	< 2.0	< 36.7	< 8.3
						D-63 (MW-19A)						
DWW- 1878	5/9/2018	< 3.1	< 7.4	< 2.9	< 1.8	< 5.0	< 4.8	< 7.5	< 4.1	< 5.0	< 42.5	< 10.2
DWW- 2043	5/22/2018	< 2.6	< 8.3	< 4.4	< 3.2	< 6.4	< 5.2	< 7.2	< 2.8	< 2.7	< 53.2	< 13.0
DWW- 2365	6/11/2018	< 1.5	< 1.9	< 1.6	< 1.7	< 3.2	< 1.6	< 2.6	< 1.7	< 1.3	< 6.0	< 1.4
DWW- 2970	7/23/2018	< 1.7	< 4.0	< 2.2	< 1.6	< 3.1	< 3.1	< 4.1	< 1.7	< 2.2	< 45.1	< 12.2
DWW- 2976	7/23/2018	< 1.4	< 5.2	< 1.9	< 1.6	< 3.3	< 2.8	< 2.8	< 1.9	< 1.8	< 16.5	< 6.8
DWW- 3432	8/15/2018	< 1.9	< 2.8	< 1.5	< 1.6	< 3.5	< 3.6	< 2.8	< 1.5	< 1.5	< 44.6	< 13.1
DWW- 3434	8/20/2018	< 2.3	< 8.5	< 3.3	< 2.4	< 4.2	< 5.4	< 5.4	< 2.3	< 2.1	< 66.2	< 19.1 [a]
DWW- 3807	9/10/2018	< 1.7	< 6.9	< 2.4	< 1.3	< 2.6	< 5.0	< 5.0	< 1.5	< 1.9	< 122.0	< 28.9 [a]
DWW- 4198	10/8/2018	< 1.6	< 3.7	< 1.5	< 1.6	< 3.4	< 2.3	< 3.4	< 1.4	< 1.5	< 28.6	< 7.2
						D-64 (MW-20A)						
DWW- 1838	5/10/2018	< 3.0	< 7.3	< 2.9	< 2.5	< 3.9	< 3.0	< 4.7	< 2.6	< 2.9	< 36.7	< 11.0
DWW- 2050	5/22/2018	< 2.3	< 9.6	< 1.8	< 2.7	< 5.9	< 5.7	< 4.3	< 2.6	< 3.2	< 64.2	< 22.5 [a]
DWW- 2366	6/11/2018	< 1.6	< 4.7	< 1.8	< 1.6	< 2.8	< 1.7	< 3.9	< 1.4	< 1.9	< 20.9	< 6.1
DWW- 2968	7/13/2018	< 2.6	< 5.9	< 2.0	< 2.3	< 3.7	< 4.5	< 5.5	< 2.6	< 2.4	< 46.4	< 6.3
DWW- 2969	7/23/2018	< 1.3	< 3.3	< 2.1	< 1.8	< 3.4	< 2.4	< 3.9	< 1.9	< 1.4	< 20.9	< 3.4
DWW- 3808	9/10/2018	< 1.9	< 5.4	< 2.6	< 1.7	< 3.3	< 5.1	< 6.4	< 1.9	< 1.9	< 153.2	< 25.8 [a]
						D-65 (MW-21A)						
DWW- 1839	5/9/2018	< 1.6	< 7.6	< 3.5	< 2.7	< 5.2	< 3.3	< 5.6	< 2.6	< 2.9	< 39.4	< 13.2
DWW- 2052	5/22/2018	< 2.4	< 6.1	< 1.7	< 3.1	< 4.9	< 3.4	< 5.9	< 2.7	< 1.8	< 12.8	< 3.9
DWW- 2367	6/11/2018	< 1.7	< 2.6	< 2.2	< 1.6	< 2.9	< 1.9	< 3.0	< 1.4	< 1.6	< 27.4	< 4.1
DWW- 2736	7/11/2018	< 1.5	< 3.5	< 1.3	< 1.4	< 2.5	< 2.1	< 3.0	< 1.5	< 1.2	< 17.9	< 4.6
DWW- 2971	7/23/2018	< 2.0	< 6.7	< 2.0	< 2.1	< 3.4	< 1.7	< 4.5	< 2.2	< 2.2	< 29.0	< 5.0
DWW- 3414	8/15/2018	< 2.2	< 6.2	< 2.2	< 1.2	< 3.3	< 4.3	< 3.1	< 2.0	< 2.3	< 71.9	< 9.8 [a]
DWW- 3436	8/20/2018	< 1.7	< 2.5	< 2.4	< 1.3	< 2.9	< 3.2	< 3.3	< 1.5	< 1.7	< 46.2	< 7.6
DWW- 3810	9/10/2018	< 1.6	< 6.2	< 2.1	< 1.7	< 3.2	< 5.3	< 3.0	< 1.5	< 1.7	< 125.1	< 41.9 [a]
DWW- 4200	10/8/2018	< 1.8	< 5.0	< 1.9	< 1.6	< 2.7	< 2.3	< 4.4	< 1.5	< 1.6	< 31.5	< 8.9
DWW- 4954	11/13/2018	< 1.6	< 4.2	< 1.8	< 1.0	< 3.4	< 2.9	< 3.8	< 1.5	< 1.6	< 26.2	< 7.8
DWW- 5295	12/11/2018	< 1.7	< 4.6	< 1.6	< 1.0	< 2.8	< 2.2	< 3.6	< 1.5	< 1.6	< 17.6	< 6.6

[a] LLDs for Ba-140 and/or La-140 not reached due to age of samples and smaller sample size.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-66 (MW-22A)						
DWW- 192	1/11/2018	< 3.0	< 7.6	< 1.9	< 3.3	< 5.3	< 5.0	< 3.7	< 3.2	< 3.0	< 38.8	< 6.3
DWW- 503	2/5/2018	< 3.1	< 6.2	< 1.7	< 2.9	< 5.5	< 4.1	< 3.2	< 2.7	< 3.2	< 27.0	< 5.7
DWW- 940	3/13/2018	< 2.4	< 6.1	< 3.2	< 1.5	< 4.2	< 3.1	< 6.3	< 2.7	< 2.8	< 23.9	< 6.8
DWW- 1329	4/10/2018	< 2.6	< 7.4	< 3.0	< 1.9	< 4.5	< 3.4	< 4.8	< 2.4	< 3.0	< 37.3	< 12.1
DWW- 1840	5/10/2018	< 3.1	< 4.7	< 4.0	< 1.9	< 6.1	< 4.4	< 4.5	< 3.0	< 2.9	< 52.1	< 14.9
DWW- 2049	5/22/2018	< 2.0	< 5.7	< 2.4	< 1.9	< 3.9	< 4.8	< 4.4	< 2.4	< 2.8	< 32.3	< 17.4 [a]
DWW- 2368	6/11/2018	< 1.0	< 4.6	< 1.9	< 1.1	< 2.4	< 2.4	< 2.9	< 1.6	< 1.2	< 35.2	< 6.5
DWW- 2745	7/11/2018	< 1.9	< 4.3	< 1.8	< 1.5	< 2.9	< 1.7	< 3.0	< 1.6	< 1.7	< 10.8	< 4.6
DWW- 3415	8/15/2018	< 1.7	< 5.3	< 1.5	< 1.6	< 3.9	< 2.3	< 3.7	< 1.6	< 1.5	< 64.0	< 18.6 [a]
DWW- 3437	8/20/2018	< 1.6	< 5.5	< 2.5	< 2.0	< 3.8	< 3.9	< 4.5	< 1.7	< 1.6	< 39.7	< 9.3
DWW- 3811	9/10/2018	< 2.6	< 10.1	< 3.0	< 2.0	< 5.3	< 6.3	< 7.3	< 2.5	< 2.5	< 131.3	< 42.1 [a]
DWW- 4955	11/13/2018	< 2.3	< 3.4	< 1.1	< 1.8	< 1.8	< 2.6	< 2.4	< 2.0	< 1.3	< 25.0	< 7.3
DWW- 5296	12/11/2018	< 1.7	< 4.3	< 1.8	< 1.7	< 3.4	< 3.2	< 3.1	< 1.8	< 2.0	< 32.8	< 9.9
						D-67 (MW-23A)						
DWW- 193	1/11/2018	< 2.4	< 6.8	< 2.2	< 1.9	< 3.6	< 3.0	< 4.7	< 2.5	< 2.5	< 20.0	< 6.1
DWW- 504	2/5/2018	< 1.9	< 6.9	< 2.5	< 1.3	< 2.8	< 3.9	< 5.0	< 2.5	< 2.8	< 27.8	< 5.4
DWW- 941	3/13/2018	< 3.1	< 6.6	< 3.4	< 2.9	< 4.7	< 3.6	< 3.2	< 2.6	< 2.7	< 19.7	< 5.6
DWW- 1330	4/10/2018	< 3.0	< 8.1	< 3.5	< 1.2	< 4.0	< 4.9	< 5.9	< 2.6	< 2.0	< 21.2	< 7.6
DWW- 1879	5/10/2018	< 3.6	< 8.6	< 3.8	< 2.3	< 3.4	< 4.2	< 5.8	< 4.0	< 3.2	< 28.0	< 7.5
DWW- 2046	5/22/2018	< 3.0	< 6.2	< 3.3	< 2.0	< 4.5	< 4.8	< 6.6	< 2.5	< 2.7	< 53.4	< 10.6
DWW- 2369	6/11/2018	< 1.8	< 3.3	< 1.7	< 1.3	< 2.5	< 2.6	< 3.3	< 1.5	< 1.4	< 28.3	< 6.8
DWW- 2747	7/11/2018	< 2.1	< 2.2	< 2.0	< 1.8	< 4.2	< 3.0	< 3.5	< 2.0	< 2.0	< 13.8	< 4.6
DWW- 3416	8/15/2018	< 2.1	< 4.6	< 2.0	< 1.6	< 3.2	< 4.1	< 4.2	< 2.0	< 1.9	< 60.7	< 12.3 [a]
DWW- 3812	9/10/2018	< 2.0	< 5.1	< 2.4	< 1.6	< 3.0	< 4.7	< 4.7	< 1.5	< 1.6	< 102.3	< 20.5 [a]
DWW- 4202	10/8/2018	< 1.7	< 3.7	< 2.2	< 1.5	< 2.6	< 3.1	< 4.0	< 1.8	< 1.9	< 44.1	< 8.7
DWW- 4956	11/13/2018	< 1.9	< 3.5	< 2.7	< 1.0	< 2.4	< 2.4	< 4.1	< 1.9	< 2.1	< 31.3	< 8.8
DWW- 5297	12/11/2018	< 1.4	< 5.7	< 2.3	< 1.5	< 4.1	< 1.9	< 2.9	< 2.2	< 2.2	< 28.1	< 4.3
						D-165 (MW-24A)						
DWW- 1880	5/11/2018	< 1.6	< 2.9	< 1.5	< 1.4	< 2.7	< 2.6	< 2.5	< 1.4	< 1.7	< 35.3	< 9.2

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-167 (MW-26A)						
DWW- 1881	5/11/2018	< 3.1	< 7.6	< 3.1	< 2.6	< 5.8	< 4.1	< 5.1	< 3.0	< 3.6	< 46.1	< 14.6
						D-168A (MW-27A)						
DWW- 1882	5/10/2018	< 1.9	< 4.5	< 1.3	< 1.8	< 3.6	< 3.7	< 4.3	< 1.9	< 2.2	< 41.1	< 10.8
						D-168B (MW-27B)						
DWW- 1889	5/10/2018	< 1.4	< 4.7	< 1.9	< 1.5	< 3.5	< 3.2	< 3.3	< 1.5	< 1.8	< 33.2	< 9.0
						D-169A (MW-28A)						
DWW- 1883	5/10/2018	< 3.1	< 8.0	< 2.3	< 2.7	< 5.9	< 5.3	< 7.9	< 3.2	< 2.9	< 59.9	< 13.0
						D-169B (MW-28B)						
DWW- 1884	5/10/2018	< 2.5	< 4.9	< 1.7	< 2.3	< 5.4	< 3.3	< 5.5	< 3.4	< 3.5	< 50.5	< 14.4
						D-170A (MW-29A)						
DWW- 1885	5/10/2018	< 3.6	< 8.2	< 4.3	< 2.5	< 4.3	< 5.5	< 7.6	< 3.6	< 2.4	< 56.8	< 14.4
						D-170B (MW-29B)						
DWW- 1886	5/10/2018	< 1.6	< 5.3	< 2.1	< 1.5	< 2.6	< 2.5	< 2.2	< 1.5	< 2.2	< 32.2	< 8.9
						D-171A (MW-30A)						
DWW- 1887	5/10/2018	< 1.1	< 4.3	< 2.0	< 1.0	< 2.7	< 1.7	< 3.4	< 1.7	< 1.7	< 40.7	< 12.7
						D-171B (MW-30B)						
DWW- 1888	5/10/2018	< 1.9	< 4.3	< 2.0	< 1.7	< 2.6	< 2.2	< 3.1	< 1.5	< 1.2	< 30.5	< 10.1

[a] LLDs for Ba-140 and/or La-140 not reached due to age of samples and smaller sample size.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-172A (MW-31A)						
DWW- 1903	5/10/2018	< 1.8	< 4.2	< 2.0	< 1.1	< 2.5	< 1.9	< 2.8	< 1.5	< 1.7	< 20.5	< 9.3
						D-172B (MW-31B)						
DWW- 1904	5/10/2018	< 1.4	< 4.6	< 1.8	< 1.7	< 3.6	< 3.5	< 4.0	< 1.8	< 1.6	< 38.6	< 12.0
						D-173A (MW-32A)						
DWW- 1905	5/10/2018	< 1.4	< 3.4	< 1.9	< 1.3	< 3.5	< 3.0	< 2.6	< 1.5	< 1.8	< 28.1	< 9.7
						D-173B (MW-32B)						
DWW- 1906	5/10/2018	< 3.5	< 9.7	< 3.7	< 3.2	< 7.1	< 4.5	< 7.1	< 3.2	< 4.4	< 30.2	< 14.3
						D-79 (MW-33A)						
DWW- 1902	5/10/2018	< 1.8	< 3.8	< 1.8	< 0.9	< 3.3	< 2.3	< 3.0	< 1.6	< 2.0	< 22.1	< 9.4
						D-80 (MW-34A)						
DWW- 1907	5/10/2018	< 2.6	< 7.4	< 3.0	< 1.6	< 5.1	< 2.8	< 5.1	< 2.4	< 3.0	< 43.0	< 14.3
						D-81 (MW-35A)						
DWW- 1908	5/10/2018	< 1.2	< 3.9	< 1.7	< 1.1	< 2.5	< 3.1	< 3.5	< 1.5	< 1.8	< 29.2	< 10.7
						D-111A (MW-01A)						
DWW- 1852	5/10/2018	< 2.0	< 4.3	< 1.4	< 1.5	< 3.1	< 3.0	< 3.5	< 1.8	< 1.9	< 35.3	< 7.3
DWW- 3379	8/15/2018	< 1.6	< 6.3	< 1.7	< 1.9	< 3.1	< 3.0	< 3.3	< 1.5	< 1.4	< 53.0	< 9.1
						D-111B (MW-01B)						
DWW- 1853	5/10/2018	< 2.6	< 8.2	< 2.3	< 2.7	< 4.4	< 6.3	< 9.3	< 4.5	< 4.0	< 31.2	< 10.4
						D-112A (MW-02A)						
DWW- 1854	5/10/2018	< 3.2	< 9.6	< 3.3	< 1.7	< 4.2	< 5.5	< 7.5	< 3.6	< 2.0	< 53.5	< 14.0
						D-112B (MW-02B)						
DWW- 1856	5/10/2018	< 1.8	< 4.4	< 1.9	< 0.9	< 2.7	< 1.6	< 3.2	< 1.6	< 1.6	< 24.3	< 7.9

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-113A (MW-03A)						
DWW- 1857	5/10/2018	< 2.2	< 6.9	< 2.4	< 2.1	< 4.2	< 5.3	< 4.1	< 2.9	< 2.2	< 55.7	< 11.7
						D-113B (MW-03B)						
DWW- 1858	5/10/2018	< 3.2	< 5.7	< 3.3	< 2.4	< 2.3	< 6.1	< 5.1	< 3.0	< 3.2	< 58.5	< 12.8
						D-114A (MW-04A)						
DWW- 1859	5/11/2018	< 4.3	< 4.9	< 3.2	< 2.6	< 4.1	< 3.5	< 8.0	< 3.7	< 3.6	< 26.3	< 10.2
						D-114B (MW-04B)						
DWW- 1860	5/11/2018	< 3.7	< 9.5	< 3.5	< 3.2	< 4.4	< 5.9	< 7.2	< 5.1	< 6.3	< 29.6	< 10.7
						D-115A (MW-05A)						
DWW- 1861	5/10/2018	< 2.6	< 7.8	< 4.0	< 3.9	< 3.2	< 6.0	< 8.6	< 3.8	< 4.9	< 31.2	< 6.1
						D-115B (MW-05B)						
DWW- 1862	5/10/2018	< 1.9	< 2.7	< 1.7	< 0.9	< 2.2	< 2.7	< 2.3	< 1.7	< 1.9	< 39.5	< 6.7
						D-116A (MW-06A)						
DWW- 1863	5/10/2018	< 4.0	< 11.2	< 2.6	< 1.9	< 4.6	< 6.6	< 6.2	< 4.3	< 2.5	< 59.8	< 13.3
						D-116B (MW-06B)						
DWW- 1864	5/10/2018	< 2.1	< 7.8	< 4.1	< 3.2	< 5.1	< 3.7	< 8.2	< 3.6	< 2.2	< 58.7	< 14.0
						D-131A (MW-11A)						
DWW- 1867	5/11/2018	< 1.5	< 4.7	< 1.7	< 1.6	< 2.9	< 2.5	< 4.9	< 1.9	< 1.8	< 26.8	< 10.0
						D-131B (MW-11B)						
DWW- 1868	5/11/2018	< 3.4	< 9.7	< 3.9	< 2.8	< 6.4	< 3.4	< 8.1	< 4.4	< 3.0	< 39.7	< 11.1
						D-133A (MW-13A)						
DWW- 1871	5/11/2018	< 3.1	< 3.8	< 2.3	< 2.3	< 3.6	< 3.5	< 4.8	< 3.0	< 3.1	< 54.9	< 12.9

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-133B (MW-13B)						
DWW- 1872	5/11/2018	< 2.7	< 6.2	< 2.5	< 2.2	< 4.3	< 3.6	< 3.6	< 2.2	< 2.4	< 38.7	< 14.4
						D-135A (MW-15A)						
DWW- 1873	5/11/2018	< 2.1	< 4.5	< 2.0	< 1.6	< 3.8	< 3.8	< 4.9	< 1.9	< 2.1	< 26.2	< 10.6
						D-135B (MW-15B)						
DWW- 1874	5/11/2018	< 1.5	< 4.5	< 1.7	< 1.3	< 3.3	< 1.8	< 3.1	< 1.4	< 1.6	< 37.5	< 10.8
						D-136A (MW-16A)						
DWW- 1836	5/9/2018	< 2.7	< 6.7	< 2.2	< 2.3	< 4.4	< 3.2	< 7.0	< 3.8	< 3.0	< 26.3	< 7.7
						D-136B (MW-16B)						
DWW- 1837	5/9/2018	< 3.3	< 6.0	< 3.1	< 3.2	< 7.0	< 4.5	< 7.5	< 3.5	< 2.5	< 46.6	< 12.4
						D-137 (MW-17C)						
DWW- 1875	5/9/2018	< 3.2	< 9.8	< 4.8	< 4.7	< 6.9	< 4.8	< 7.3	< 3.7	< 3.4	< 35.6	< 7.8
						D-68 (EW-01A)						
DWW- 1900	3/30/2018	< 2.0	< 7.0	< 3.4	< 1.5	< 4.4	< 6.4	< 4.5	< 1.7	< 2.0	< 372.9	< 75.4 [a]
DWW- 1841	5/8/2018	< 4.7	< 8.9	< 4.4	< 3.0	< 8.2	< 2.7	< 5.6	< 4.2	< 3.2	< 35.6	< 7.2

[a] LLDs for Ba-140 and/or La-140 not reached due to age of samples and smaller sample size.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, analyses for gamma-emitting isotopes.

Lab Code	Collection Date	^{54}Mn	^{59}Fe	^{58}Co	^{60}Co	^{65}Zn	^{95}Nb	^{95}Zr	^{134}Cs	^{137}Cs	^{140}Ba	^{140}La
						D-103 (MH101)						
DWW- 1842	5/9/2018	< 3.2	< 4.4	< 3.1	< 2.3	< 6.9	< 6.3	< 6.2	< 3.9	< 4.7	< 19.1	< 8.0
						D-97 (MH102)						
DWW- 1843	5/8/2018						ND[a]					
						D-92 (MH202)						
DWW- 1844	5/8/2018	< 2.9	< 7.0	< 5.2	< 2.7	< 4.7	< 7.0	< 8.3	< 4.6	< 2.4	< 39.4	< 9.7
						D-90 (MH222)						
DWW- 1845	5/8/2018	< 3.5	< 9.0	< 2.6	< 2.6	< 5.9	< 4.2	< 5.8	< 3.6	< 4.8	< 48.4	< 11.0

[a] "ND" = No data; sample leaked in transit; not enough water to do gamma scan.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, conditional analyses for gross alpha, iron-55, nickel-63, strontium-89 and strontium-90 [a].

Lab Code	Collection Date	Location	Gross Alpha	^{55}Fe	^{63}Ni	^{89}Sr	^{90}Sr
DWW- 188	1/11/2018	D-128A(MW-08A)	4.1 ± 1.1	< 690	< 69	< 1.7	< 1.2
DWW- 192	1/11/2018	D-66(MW-22A)	2.0 ± 1.2	< 682	< 71	< 1.4	< 0.9
DWW- 193	1/11/2018	D-67(MW-23A)	< 1.2	< 670	< 72	< 1.4	< 1.0
DWW- 187	1/12/2018	D-127A(MW-07A)	< 0.8	< 690	< 71	< 1.6	< 1.1
DWW- 503	2/5/2018	D-66(MW-22A)	3.0 ± 1.2	< 712	< 71	< 1.3	< 0.9
DWW- 504	2/5/2018	D-67(MW-23A)	< 1.3	< 721	< 76	< 1.3	< 0.8
DWW- 502	2/6/2018	D-128A(MW-08A)	< 1.2	< 707	< 74	< 1.5	< 1.0
DWW- 501	2/7/2018	D-127A(MW-07A)	< 0.8	< 720	< 76	< 1.5	< 1.1
DWW- 593	2/15/2018	D-132A(MW-12A)	1.6 ± 0.9	< 729	< 79	< 1.1	< 1.1
DWW- 642	2/20/2018	D-132A(MW-12A)	2.0 ± 0.9	< 689	< 79	< 1.2	< 1.2
DWW- 933	3/13/2018	D-132A(MW-12A)	2.1 ± 0.9	< 663	< 76	< 1.4	< 1.0
DWW- 938	3/13/2018	D-127A(MW-07A)	3.6 ± 0.8	< 655	< 75	< 1.7	< 1.1
DWW- 939	3/13/2018	D-128A(MW-08A)	1.2 ± 0.8	< 655	< 72	< 1.3	< 0.9
DWW- 940	3/13/2018	D-66(MW-22A)	1.5 ± 1.1	< 655	< 76	< 1.3	< 0.9
DWW- 941	3/13/2018	D-67(MW-23A)	< 1.4	< 671	< 77	< 1.2	< 0.9
DWW- 991	3/14/2018	D-62(MW-18A)	5.3 ± 2.2	< 712	< 72	< 1.5	< 1.0
DWW- 1123	4/5/2018	D-127A(MW-07A)	1.0 ± 0.6	< 659	< 63	< 1.7	< 1.1
DWW- 1125	3/28/2018	D-127A(MW-07A)	< 0.8	< 654	< 65	< 1.6	< 0.8
DWW- 1327	4/10/2018	D-127A(MW-07A)	1.4 ± 1.0	< 645	< 62	< 1.5	< 0.9
DWW- 1328	4/10/2018	D-128A(MW-08A)	< 1.2	< 661	< 62	< 1.5	< 0.9
DWW- 1329	4/10/2018	D-66(MW-22A)	< 1.3	< 649	< 64	< 1.7	< 1.1
DWW- 1330	4/10/2018	D-67(MW-23A)	< 1.1	< 637	< 62	< 1.7	< 1.1
DWW- 2043	5/22/2018	D-63(MW-19A)	4.2 ± 2.1	< 655	< 63	< 1.7	< 0.9
DWW- 2045	5/22/2018	D-128A(MW-08A)	< 1.0	< 667	< 63	< 1.8	< 1.0
DWW- 2046	5/22/2018	D-67(MW-23A)	< 1.1	< 655	< 63	< 1.9	< 1.1
DWW- 2048	5/22/2018	D-127A(MW-07A)	< 0.8	< 671	< 66	< 1.6	< 0.9
DWW- 2049	5/22/2018	D-66(MW-22A)	< 1.1	< 688	< 63	< 1.5	< 0.9
DWW- 2050	5/22/2018	D-64(MW-20A)	1.7 ± 1.2	< 667	< 63	< 1.7	< 1.0
DWW- 2052	5/22/2018	D-65(MW-21A)	< 1.3	< 667	< 63	< 1.8	< 1.0
DWW- 2359	6/11/2018	D-127A(MW-07A)	< 0.9	< 698	< 63	< 1.5	< 1.0
DWW- 2360	6/11/2018	D-128A(MW-08A)	< 1.1	< 648	< 64	< 1.6	< 1.1
DWW- 2365	6/11/2018	D-63(MW-19A)	< 1.9	< 629	< 63	< 1.7	< 1.2
DWW- 2366	6/11/2018	D-64(MW-20A)	< 1.7	< 663	< 64	< 1.8	< 1.3
DWW- 2367	6/11/2018	D-65(MW-21A)	< 2.2	< 663	< 64	< 1.4	< 1.0
DWW- 2368	6/11/2018	D-66(MW-22A)	< 1.1	< 672	< 65	< 1.3	< 1.0
DWW- 2369	6/11/2018	D-67(MW-23A)	1.5 ± 0.9	< 648	< 64	< 1.5	< 1.1
DWW- 2736	7/11/2018	D-65(MW-21A)	< 1.3	< 637	< 68	< 1.3	< 0.9
DWW- 2740	7/11/18 8:25	D-127A(MW-07A)	< 0.8	< 607	< 68	< 1.5	< 1.0
DWW- 2738	7/11/18 14:55	D-127A(MW-07A)	< 0.7	< 621	< 67	< 1.7	< 1.1
DWW- 2739	7/11/2018	D-128A(MW-08A)	1.1 ± 0.8	< 599	< 66	< 1.4	< 0.9

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

NOTE: Gross alpha values are related to the natural radioactive decay of radon gas held dissolved in groundwater.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, conditional analyses for gross alpha, iron-55, nickel-63, strontium-89 and strontium-90 [a].

Lab Code	Collection Date	Location	Gross Alpha	^{55}Fe	^{63}Ni	^{89}Sr	^{90}Sr
DWW- 2745	7/11/2018	D-66(MW-22A)	< 1.2	< 653	< 68	< 1.4	< 1.0
DWW- 2747	7/11/2018	D-67(MW-23A)	1.0 ± 0.7	< 603	< 66	< 1.8	< 1.1
DWW- 2744	7/12/2018	D-127A(MW-07A)	< 0.8	< 633	< 69	< 1.2	< 0.9
DWW- 2968	7/13/2018	D-64(MW-20A)	< 1.5	< 607	< 73	< 2.0	< 0.9
DWW- 2975	7/13/2018	D-127A(MW-07A)	< 0.9	< 618	< 69	< 2.1	< 1.3
DWW- 2973	7/15/2018	D-127A(MW-07A)	< 1.2	< 640	< 74	< 2.3	< 1.1
DWW- 2972	7/19/2018	D-127A(MW-07A)	< 1.3	< 655	< 72	< 2.0	< 1.1
DWW- 2969	7/23/2018	D-64(MW-20A)	< 1.5	< 641	< 74	< 2.0	< 1.0
DWW- 2970	7/23/2018	D-63(MW-19A)	2.4 ± 1.2	< 617	< 72	< 1.7	< 0.9
DWW- 2971	7/23/2018	D-65(MW-21A)	< 1.5	< 603	< 70	< 1.6	< 1.2
DWW- 2974	7/23/2018	D-127A(MW-07A)	< 0.8	< 629	< 71	< 2.3	< 1.1
DWW- 2976	7/23/2018	D-63(MW-19A)	< 1.9	< 614	< 72	< 1.6	< 0.8
DWW- 3379	8/15/2018	D-111A(MW-01A)	< 1.3	< 696	< 74	< 2.6	< 0.9
DWW- 3392	8/15/2018	D-128A(MW-08A)	< 1.3	< 709	< 76	< 2.9	< 1.0
DWW- 3412	8/15/2018	D-62(MW-18A)	1.6 ± 1.1	< 731	< 75	< 1.8	< 0.8
DWW- 3414	8/15/2018	D-65(MW-21A)	6.6 ± 1.8	< 688	< 72	< 1.9	< 0.9
DWW- 3415	8/15/2018	D-66(MW-22A)	2.6 ± 0.9	< 676	< 73	< 1.8	< 0.9
DWW- 3416	8/15/2018	D-67(MW-23A)	2.3 ± 1.0	< 696	< 72	< 2.1	< 1.0
DWW- 3432	8/15/2018	D-63(MW-19A)	< 1.8	< 680	< 74	< 2.1	< 1.0
DWW- 3429	8/20/2018	D-127A(MW-07A)	< 0.7	< 690	< 75	< 2.0	< 1.0
DWW- 3430	8/20/2018	D-128A(MW-08A)	< 1.1	< 702	< 76	< 1.6	< 0.8
DWW- 3431	8/20/2018	D-62(MW-18A)	6.9 ± 1.9	< 694	< 72	< 1.8	< 0.9
DWW- 3434	8/20/2018	D-63(MW-19A)	< 1.5	< 670	< 74	< 2.3	< 0.8
DWW- 3436	8/20/2018	D-65(MW-21A)	< 1.4	< 694	< 70	< 1.9	< 1.0
DWW- 3437	8/20/2018	D-66(MW-22A)	1.3 ± 0.7	< 702	< 73	< 1.6	< 0.9
DWW- 3802	9/10/2018	D-127A(MW-07A)	< 0.7	< 643	< 68	< 2.9	< 1.0
DWW- 3803	9/10/2018	D-128A(MW-08A)	< 1.0	< 652	< 65	< 4.5	< 1.1
DWW- 3807	9/10/2018	D-63(MW-19A)	4.1 ± 3.6	< 589	< 67	< 3.6	< 0.9
DWW- 3808	9/10/2018	D-64(MW-20A)	< 1.6	< 623	< 70	< 2.6	< 0.8
DWW- 3810	9/10/2018	D-65(MW-21A)	< 1.3	< 683	< 67	< 2.4	< 0.9
DWW- 3811	9/10/2018	D-66(MW-22A)	5.2 ± 2.3	< 619	< 66	< 2.7	< 1.0
DWW- 3812	9/10/2018	D-67(MW-23A)	< 1.1	< 635	< 66	< 3.1	< 1.1
DWW- 4198	10/8/2018	D-63(MW-19A)	< 1.8	< 635	< 67	< 1.8	< 0.9
DWW- 4200	10/8/2018	D-65(MW-21A)	< 1.3	< 623	< 66	< 1.8	< 0.9
DWW- 4202	10/8/2018	D-67(MW-23A)	< 1.3	< 635	< 68	< 2.2	< 1.2
DWW- 4921	11/13/2018	D-128A(MW-08A)	< 1.3	< 542	< 68	< 1.7	< 0.8
DWW- 4928	11/13/2018	D-62(MW-18A)	2.5 ± 1.6	< 553	< 67	< 1.8	< 0.8
DWW- 4954	11/13/2018	D-65(MW-21A)	2.1 ± 1.2	< 542	< 65	< 1.5	< 0.7

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

NOTE: Gross alpha values are related to the natural radioactive decay of radon gas held dissolved in groundwater.

Table 23. Groundwater Protection Program Summary.

Monitoring wells, conditional analyses for gross alpha, iron-55, nickel-63, strontium-89 and strontium-90 [a].

Lab Code	Collection Date	Location	Gross Alpha	^{55}Fe	^{63}Ni	^{89}Sr	^{90}Sr
DWW- 4955	11/13/2018	D-66(MW-22A)	< 1.3	< 556	< 65	< 1.5	< 0.7
DWW- 4956	11/13/2018	D-67(MW-23A)	1.3 ± 0.9	< 549	< 63	< 1.9	< 0.9
DWW- 4942	11/14/2018	D-132A(MW-12A)	< 1.3	< 538	< 66	< 1.6	< 0.7
DWW- 5292	12/11/2018	D-128A(MW-08A)	< 1.1	< 600	< 63	< 1.9	< 1.2
DWW- 5295	12/11/2018	D-65(MW-21A)	< 1.5	< 600	< 66	< 1.8	< 1.2
DWW- 5296	12/11/2018	D-66(MW-22A)	< 1.1	< 632	< 63	< 1.5	< 1.0
DWW- 5297	12/11/2018	D-67(MW-23A)	1.2 ± 0.8	< 620	< 62	< 1.8	< 0.9
DWW- 5360	12/12/2018	D-127A(MW-07A)	< 0.9	< 615	< 66	< 1.7	< 1.2

[a] Analyses for gamma, gross alpha, Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L .

NOTE: Gross alpha values are related to the natural radioactive decay of radon gas held dissolved in groundwater.