

# Environmental Monitoring Report

## For 2016

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Pilgrim, Seabrook, and Vermont Yankee  
Nuclear Power Station  
Emergency Planning Zones

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July 2018

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## EXECUTIVE SUMMARY

The Massachusetts Department of Public Health (MDPH) Bureau of Environmental Health's (MDPH/BEH) Environmental Toxicology and Radiation Control Programs collaborate to conduct routine environmental monitoring within the three Emergency Planning Zones (EPZs) of nuclear power stations in the Commonwealth. This monitoring is part of the department's regulatory responsibility, and provides a system of watchfulness over environmental radiation in Massachusetts communities surrounding nuclear power plants. These EPZs include communities located within a 10-mile radius of Pilgrim Nuclear Power Station (Pilgrim) in Plymouth, MA, Seabrook Nuclear Power Station (Seabrook) in Seabrook, NH, and the Vermont Yankee Nuclear Power Station (VY), in Vernon, VT. VY ceased operations on December 29, 2014 and is undergoing decommissioning. This report summarizes the 2016 monitoring activities and results for each nuclear plant EPZ.

Radiation monitoring results in 2016 for areas surrounding the three nuclear power stations affecting Massachusetts have been either non-detect, naturally occurring, at levels expected to be present in the environment from background fallout from historic bomb testing and past nuclear accidents, or attributable to a known source. Three fish samples outside the VY EPZ and one fish sample within the Pilgrim EPZ detected Cesium-137 which MDPH/BEH has determined is attributable to historic radiation fallout in the environment.

Overall, no radiation indicators or radionuclides were detected at a level of health concern.

## 1. INTRODUCTION

The MDPH/BEH radiation environmental monitoring program is designed to monitor radiation levels and to protect public health in the Commonwealth from radiation. MDPH/BEH samples a variety of media within and just outside the EPZs surrounding nuclear power plants, monitors the airborne gamma radiation in the Pilgrim EPZ , and gamma and beta radiation in the Massachusetts communities within the Seabrook EPZ. . Samples are analyzed for radiation by the MDPH/BEH Massachusetts Environmental Radiation Laboratory (MERL). Environmental media samples analyzed in 2016 included: food crops, vegetation, milk, surface water, sediment, shellfish, fish, and air.

MDPH/BEH has a network of stationary monitors surrounding Pilgrim that measures gamma radiation in real-time and is monitored online by MDPH/BEH staff. The C-IO Research & Education Foundation, Inc., a non-profit under contract to MDPH/BEH, conducts direct radiation monitoring in Massachusetts communities within the Seabrook EPZ and provides summary reports.

The radiation environmental monitoring of Pilgrim and Seabrook EPZs has been in place since the 1980s. The environmental monitoring program for Massachusetts communities within the VY EPZ began in 2011. A focused investigation of tritium in groundwater on the Pilgrim Nuclear Power Plant property is ongoing and not part of this report. Updates on this monitoring effort are posted on the MDPH website: [Tritium investigation update reports](#).

The Nuclear Regulatory Commission requires specific environmental monitoring and annual reporting by operating nuclear power plants. The reports summarizing Seabrook and Pilgrim's environmental monitoring can be found on the NRC website: [Pilgrim's 2016 Environmental Radiological Monitoring Report](#) and [Seabrook's 2016 Environmental Radiological Monitoring Report](#). Vermont Yankee's reports are no longer on the NRC website.

MDPH/BEH's monitoring activities for each nuclear plant are described in the Environmental Monitoring sections of this report. This report is organized into three sections: sample location and analysis information for each of the three EPZs; analyses of the sample results; and a summary of the monitoring results for each EPZ.

## ENVIRONMENTAL RADIATION

Radiation in the environment comes from three general sources: naturally occurring radiation, radioactive fallout from past weapons testing or nuclear accidents, and radiation from active operations.

Naturally occurring radionuclides such as Potassium-40 and Beryllium-7 are present in most environmental media. Potassium-40 is a naturally occurring radioactive form of potassium, an essential nutrient. Beryllium-7 is produced when cosmic energy collides with nitrogen and oxygen in the atmosphere. Additional natural sources of radiation include cosmic radiation and carbon-14 and contribute to an annual background dose of approximately 310 mrems/year (NRC, 2017). Man-made sources include medical treatments and nuclear research. All contribute to the 620 mrem annual dose of environmental radiation for average U.S. residents.

**Figure 1.** Background Radiation Dose for Average U.S. Resident (NRC, 2017)

Annual dose	Millirems/year
Due to natural background radiation	310
Total of all sources	620

Background radiation includes fallout radiation from historic weapons testing, primarily in the 1950s and 1960s, and from nuclear power plant accidents such as Chernobyl and Fukushima. This fallout includes radioisotopes such as Cesium-137 (Cs-137) and Strontium-90 (Sr-90) which persist in the environment due to their 28-30 year half-lives. These radionuclides are also released in small quantities from nuclear power plant operations.

During active operation, nuclear power plants emit direct gamma radiation from nuclear reactor systems, discharge gases and particulates from the station's air stack, and discharge water containing alpha, beta and gamma radiation. These emissions can be classified as: noble gases, tritium, and iodines and particulates. **Noble gases** are chemically inert, have short half-lives, disperse quickly in the environment, and do not bioconcentrate or easily incorporate into biological tissue. **Tritium** is created when water passes through the reactor core; the hydrogen atoms in the water molecules and other trace elements like boron absorb neutrons from the fission of the reactor fuel. **Iodines and particulates**, notably Cesium-137, Iodine-131, Cobalt-60, Magnesium-54, Iron-59, and Zinc-65, have environmental and public health significance: their half-lives range from weeks to years, are readily incorporated into biological tissue, and will bioconcentrate.

Exposure to radiation from nuclear power plants may occur from permitted air or liquid discharges or from unmonitored releases or leaks. MDPH/BEH evaluates possible routes of exposure for radionuclides, particularly those that accumulate in the food chain, and samples environmental media along these routes to measure potential radiation.

## LABORATORY METHODS

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The MDPH/BEH Radiation Control Program's Massachusetts Environmental Radiation Laboratory (MERL) analyzes collected samples. MERL maintains its standard of excellence in analytical capability through participation with several federal agencies in inter-laboratory quality assurance measures.

The MERL analyzes samples for a suite of more than 30 radiation isotopes. Gamma spectroscopy is used to identify and detect environmentally significant and natural radioisotopes; gas proportion counters measure gross beta and alpha radiation; and liquid scintillation counters measure tritium. Environmental media sample results are compared to typical background levels. In the event that gamma emitters are present above typical background, the MERL protocol calls for additional testing at an outside laboratory for alpha emitters, such as transuranic (high atomic number) elements, and beta emitters, such as Strontium-90.

Analysis methods by media are summarized below:

### AIR

Air filters are collected weekly and analyzed for gross alpha and gross beta radioactivity using a gas proportion counter. Air cartridges are analyzed for iodine-131 using gamma spectroscopy. Iodine is usually the first radioactive particulate detected in the event of an accidental release of power plant radiation. Gross alpha and beta analysis is a screening-level tool that does not identify individual radionuclides; therefore, air filters are also analyzed quarterly for gamma radionuclides using gamma spectroscopy. Results are compared to results from a background monitor located in Boston.

Direct gamma radiation in air is measured with thermoluminescent dosimeters (TLDs) and analyzed using gamma spectroscopy.

### WATER

Surface water samples are tested for total alpha and beta radioactivity with a gas proportional counter, and for gamma-emitting materials with a gamma spectrometer. Tritium is lighter and more mobile in water than other radionuclides and is a sentinel indicator of radionuclides in water bodies. Water samples are also tested for tritium with a liquid scintillation counter.

### MILK

Cow's milk is tested for gamma radionuclides and iodine-131 using gamma spectroscopy. Milk is a good indicator media for radioactive particulates, particularly iodine-131, which can be detected in milk soon after cows graze on contaminated pastures or feed.

### SEDIMENT, BIOTA, CROPS, SEAFOOD AND SHELLFISH

Produce, sediment, biota, seafood and shellfish media were chosen to represent various stages of the food chain where radionuclides may be identified. Shellfish filter-feed soil and sand where heavy and soil-bound radionuclides may accumulate; lobsters eat clams, mussels and small fish; and radionuclides biomagnify from smaller to larger surface-dwelling fish. Analyses of biota and crop samples aim to identify radionuclides and particulates which may settle on surfaces, and be absorbed through the roots. Samples are tested for gamma-emitting radionuclides using a gamma spectrometer.

#### QUALITY ASSURANCE

Laboratory sample detection levels are affected by sample size, time between collection and analysis, and equipment processing and counting time. Where detection levels fall outside our analytic sensitivity guidelines they are noted in the tables as “NR” (Result is not reported for quality control reason).

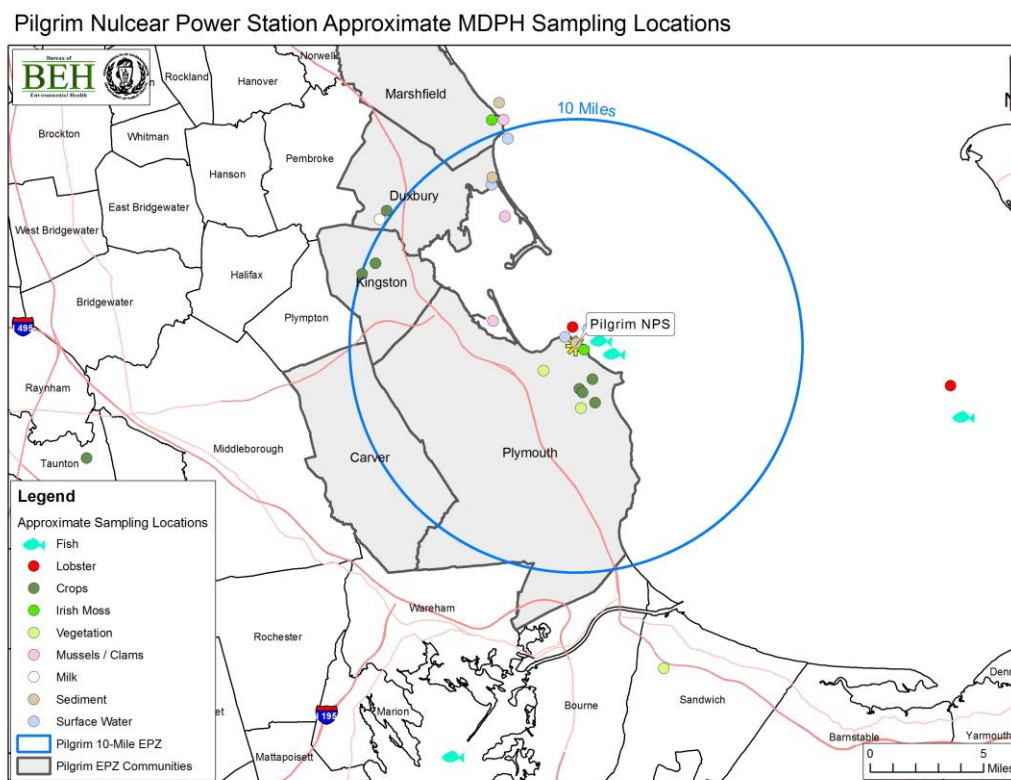
## 2. ENVIRONMENTAL MONITORING AND SAMPLING

This section describes the three nuclear power station 10-mile EPZs in Massachusetts and summarizes the environmental samples collected and analyzed in 2016.

### A. PILGRIM NUCLEAR POWER STATION

The Pilgrim Nuclear Power Station (Pilgrim) is located in Plymouth, MA. Five Massachusetts communities are included in the 10-mile EPZ of Pilgrim: Carver, Duxbury, Kingston, Marshfield, and Plymouth, all shown below.

Figure 2. Pilgrim EPZs and sampling locations



MDPH/BEH's radiation monitoring conducted within and outside the Pilgrim EPZ is a combination of independent direct radiation monitoring; air, milk and cranberry sampling; and analysis of split samples provided by Entergy of water, fish, lobsters, shellfish, sediment, Irish moss, and crops.



#### Air/Direct Radiation

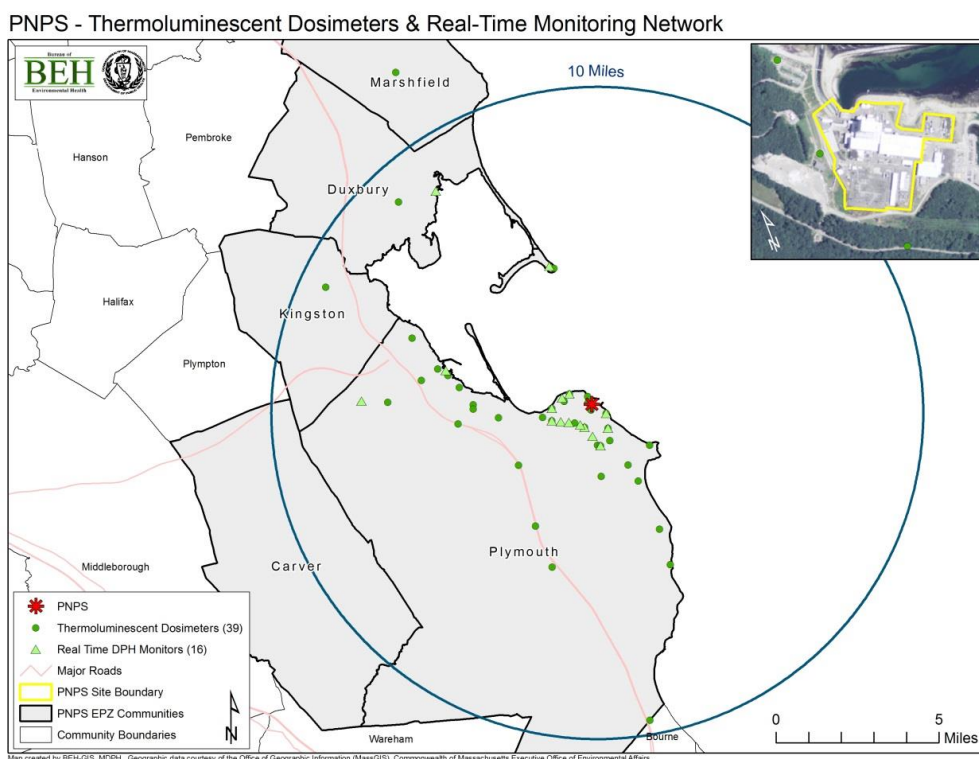
MDPH/BEH's direct radiation monitoring at Pilgrim is comprised of three systems operating on real-time, weekly, and quarterly bases. The redundant systems are designed to independently monitor the land areas within the 10-mile EPZ and to verify the utility's radiation monitoring.

MDPH/BEH maintains a network of 15 stationary radiation monitoring stations that detects gamma radiation in real-time and transmits data to a computer which is remotely accessed by staff. Emergency alerts are sent to MDPH and MEMA officials if radiation is detected above three times the typical background level. In 2012 and 2013, MDPH/BEH relocated three monitors to locations that better evaluate the area's coastal and more densely populated areas. In 2016, MDPH/BEH completely replaced the older system with new monitors and servers, and installed an internet-based communication system.

MDPH/BEH co-locates an air particulate filter and a charcoal air cartridge with Entergy's air sampler at Pilgrim and collects them weekly. In April 2016, this location was moved outside the PNPS plant fence, noted in the result table as the "lot" location. Moving the site eliminated the need to enter the plant through security for sample retrieval. During the second quarter of 2016, both locations were sampled simultaneously to provide comparison results for alpha and beta radiation and iodine-131. Filters are analyzed for gross beta and gross alpha radioactivity and cartridges are analyzed for iodine-131. A filter composite sample is also analyzed quarterly for gamma radionuclides. The same analyses are done for an air particulate filter and charcoal cartridge at a background location in Boston.

MDPH/BEH also has a network of 39 TLDs placed throughout the Pilgrim EPZ and surrounding communities which measure total gamma radiation in milliroentgen (mR). The majority of the TLDs are located in the inner perimeter of the EPZ, and three are at the site border. These TLDs are collected and analyzed quarterly, and the results are compared to those of a background location in Boston.

Figure 3. The MDPH/BEH Radiation -monitoring network at Pilgrim



### Surface Water

Entergy collects seawater on a monthly basis from the Pilgrim discharge canal and the Powder Point Bridge in Duxbury and provides split samples to MDPH/BEH for analysis of gamma radionuclides. MERL also analyzes composites of surface water samples from both locations for tritium.

### Fish, Lobster and Shellfish

Entergy provides split samples of fish, lobster, and shellfish samples from Plymouth Harbor, Marshfield Bay and the Pilgrim discharge canal to MERL for analysis. Entergy provides control and background samples of fish, shellfish and lobster from Cape Cod Bay, and MERL analyzes split samples.

Entergy collects mussels semiannually from Green Harbor in Marshfield and collects clams from Duxbury Bay and Plymouth Harbor. These three locations are reported to be background locations by Entergy for federal reporting requirements, but are considered to be “indicator” locations by MDPH/BEH because they fall within the 10-mile EPZ. MERL analyzes the split samples for gamma radionuclides.

### Sediment

Entergy collects sediment from the Pilgrim discharge canal and Green Harbor in Marshfield semiannually and Duxbury Bay annually; MERL analyzes the split samples.

### Irish moss

Irish moss readily absorbs iodine and is a good reference indicator of iodine-131 in the environment. Entergy collects samples of Irish moss from the Pilgrim discharge canal and a background location at Brant Rock in Marshfield semiannually; split samples are analyzed by MERL.

### Crops

MDPH/BEH collects and analyzes background cranberry samples from a bog in East Taunton annually.

Crops, including corn, apples, gourds, gourd leaves, pumpkins, squash, and hay forage, are collected during the growing season annually by Entergy from a Plymouth County farm located within the Pilgrim EPZ. A representative portion of the samples are analyzed by MERL.

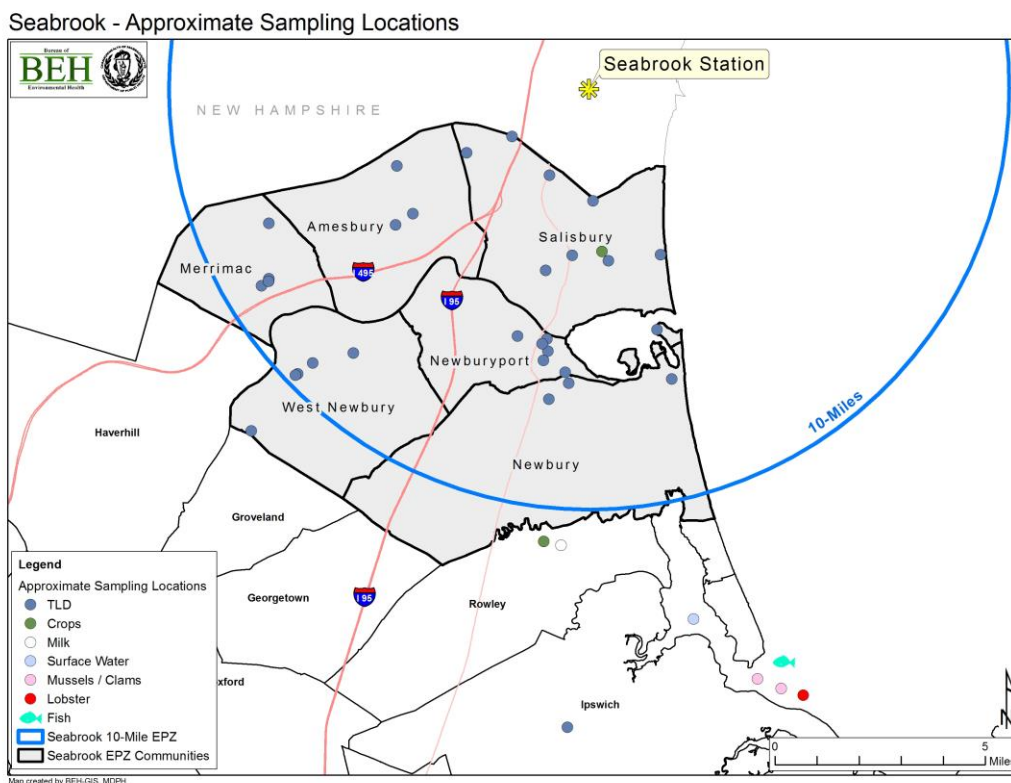
#### Milk

MDPH/BEH collects samples of cow's milk monthly from a farm in Duxbury. The milk is analyzed for gamma radionuclides and Iodine-131. Although this farm is located just outside the EPZ (11 miles from Pilgrim), it is the closest dairy farm to Pilgrim with available milk samples.

## B. SEABROOK NUCLEAR POWER STATION

The Seabrook Nuclear Power Station (Seabrook) is located in Seabrook, New Hampshire, approximately two miles north of the Massachusetts border. Six Massachusetts communities are included in the 10-mile EPZ of Seabrook: Amesbury, Merrimac, Newbury, Newburyport, Salisbury, and West Newbury shown in Figure 4.

Figure 4. Seabrook EPZs and sampling locations within Massachusetts



Radiation monitoring conducted within and outside the Seabrook EPZ includes the following environmental media: air, surface water, fish, lobster, shellfish, sediment, Irish moss, crops, and milk. MDPH/BEH receives split samples from Nextera, the utility that owns Seabrook, for all media except milk and air. Sampling locations and activities within Massachusetts are described below:

### Air/Direct Radiation

MDPH/BEH collects air particulate filters and charcoal cartridges weekly at the Salisbury Fire Station. Filters are analyzed for gross beta and alpha radioactivity, and cartridges for iodine-131. Additionally, a filter composite is analyzed quarterly for gamma emitting radionuclides. The same analyses are done for air particulate filters and charcoal cartridges at the background location in Boston.

MDPH/BEH measures total ambient gamma radiation using a network of 34 TLDs placed at locations throughout the Seabrook EPZ in Massachusetts. These are collected and analyzed quarterly and results are compared to those of a background location in Boston.

MDPH/BEH contracts with the C-10 Research & Education Foundation, Inc. to conduct radiation monitoring in Massachusetts communities located in the Seabrook EPZ. The C-10 system consists of a

network of 16 real-time radiation sensors and weather probes located in Massachusetts within a 10-mile radius of Seabrook station. Beta, gamma, and weather data are collected and uploaded every 15 minutes to a secure web-based central repository. C-10 compiles and graphs the data monthly and sends reports to MDPH/BEH. All 16 monitoring sites are located at private homes, schools, and businesses. MDPH and MEMA officials receive text alerts from C-10 if levels go above three times the typical background readings.

#### Surface Water

Seawater samples are typically collected monthly by Nextera from a background location in Ipswich Bay. MERL analyzed split samples for gamma radionuclides and analyzed monthly composites of these samples for tritium.

#### Fish, Lobster, and Shellfish

Nextera semi-annually collects samples of fish, lobster, and shellfish, including *Modiolus* (Atlantic mussels) and *Mytilus* (Blue mussels), from Ipswich Bay, which is considered a background location; the MERL analyzes the split samples for gamma radionuclides.

#### Sediment

Nextera semi-annually collects sediment samples from Ipswich Bay and the tidal flats on Plum Island, both background locations; the MERL analyzes the split samples for gamma radionuclides.

#### Irish moss

As noted earlier, Irish moss (*Chondrus*) readily absorbs iodine and is a sentinel indicator of environmental iodine-131. Nextera collects samples of Irish moss semiannually from a background location in Ipswich Bay, and split samples are analyzed by MERL for gamma radionuclides.

#### Crops

Nextera collects crops (e.g., strawberries and tomatoes) from a farm located within the Seabrook EPZ in Salisbury and split samples are analyzed by MERL. In addition, strawberries, tomatoes, and squash are collected from a background location by Nextera in Ipswich and split samples are analyzed by MERL for gamma radionuclides.

#### Milk

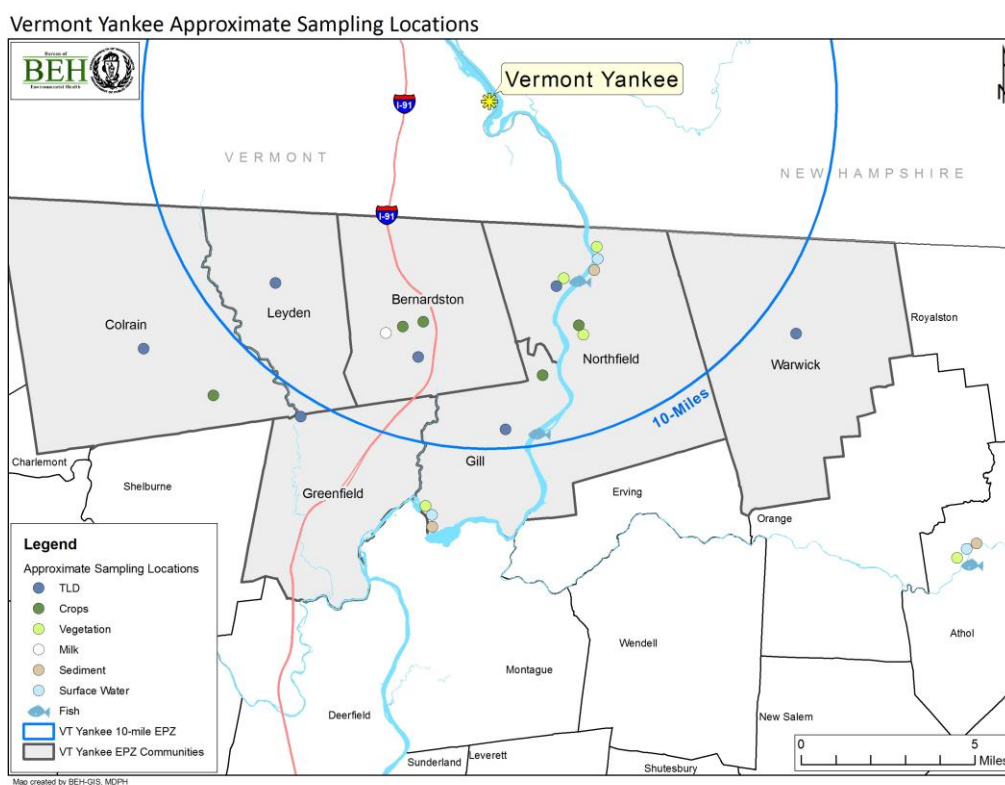
MDPH/BEH collects samples of cow's milk monthly from a farm located in Rowley and MERL analyzes them for gamma-emitting radionuclides and for iodine-131.

### C. VERMONT YANKEE NUCLEAR POWER STATION

The Vermont Yankee Nuclear Power Station (VY) is located in Vernon, VT, approximately four miles north of the Massachusetts border. The reactor was permanently shut down on December 29, 2014, and the fuel was removed on January 12, 2016. On April 16, 2016 the Nuclear Regulatory Commission (NRC) reduced the EPZ of Vermont Yankee to the perimeter line of the plant in Vernon, VT. The MDPH/BEH monitoring protocol was revised to annual fish and semi-annual surface water sampling in the Connecticut River and at a comparison background location.

Seven Massachusetts communities were located in the 10-mile EPZ of VY: Bernardston, Colrain, Gill, Greenfield, Leyden, Northfield, and Warwick. Radiation monitoring in the EPZ of VY included air, surface water, fish, sediment, grass, crops, and milk.

Figure 5. VY EPZs and Sampling Locations within Massachusetts until April 16, 2016.



#### Air/Direct Radiation

MDPH/BEH collected air particulate filters and charcoal cartridges weekly for the first quarter of 2016 at the Northfield Transfer Station. The filters were analyzed for gross beta and gross alpha radioactivity and the cartridges for iodine-131. Additionally, a filter composite was analyzed in February and May for gamma radionuclides. The same analyses were done for air particulate filters and charcoal cartridges at the background location in Boston.

MDPH measured total gamma radiation using a network of 7 TLDs placed at locations throughout and just outside the VY EPZ. These TLDs were collected and analyzed during the first quarter and results were compared to those of a background location in Boston.

### Surface Water

MDPH/BEH collected surface water samples from a location in the Connecticut River in Northfield, and from three background locations: Lake Dennison in Winchendon, and Barton's Cove and Miller's River in Athol. Surface water samples were analyzed for gamma radionuclides and for tritium.

### Fish

MDPH/BEH collected fish annually from the Connecticut River in Northfield and from Lake Dennison in Winchendon, and analyzed them for gamma radionuclides.

### Milk

MDPH/BEH collected samples of cow's milk until May from a farm in Bernardston and analyzed them for gamma radionuclides and iodine-131.

### 3. 2016 ENVIRONMENTAL MONITORING RESULTS

Radiation monitoring results in 2016 for Massachusetts have been either non-detect, naturally occurring (i.e., Potassium-40, Beryllium-7), or at levels expected to be present in the environment from historic background fallout and nuclear accidents including Chernobyl and Fukushima Dai-chi (i.e., Cesium-137). No detectable radionuclides were at levels of health concern or were indicative of an unintentional release of radiation at Pilgrim, Seabrook, or VY. Cesium-137, attributable to historic fallout, was detected in fish and soil samples within and outside VY's EPZ and within Pilgrim's EPZ.

Results of environmental monitoring conducted by MDPH/BEH in the Massachusetts communities in the vicinity of each of the three nuclear power stations are discussed below and presented in Tables 1-9. The tables are organized by nuclear power station and by sample media. Sampling results presented in this report include:

- Air particulate filter for gross alpha and beta radiation, charcoal filter for radioactive iodine and thermoluminescent devices (TLDs) for gamma radiation doses.
- Surface and ground water for gamma radionuclides, and composites for tritium. Milk for natural and man-made radioactive materials including radioactive iodine.
- Fish, shellfish, crops, vegetation and sediment for gamma radionuclides.

#### A. PILGRIM NUCLEAR POWER STATION

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Results are provided in Tables 1, 2 and 3.

Naturally occurring Potassium-40 and Beryllium-7 were detected in nearly all samples of environmental media for which they were analyzed from within and outside of the Pilgrim EPZ. Cesium-137 was identified in one bluefish sample from the Pilgrim discharge canal at a level of 5 pCi/L, just over the detection limit, on October 6. No other radionuclides were detected in the fish, in discharge canal surface water samples taken on September 27 and October 24, or in mussels taken from the discharge canal on November 17. MDPH determined this detection result is most likely from background Cs-137 in the environment. This concentration of Cs-137 in fish presents a very low health risk.

Air filter and cartridge analyses indicated low levels of gross alpha and gross beta radiation, as well as naturally occurring Beryllium-7 and Potassium-40 in most samples. These results are consistent with those obtained from the background location in Boston.

Real-time monitoring did not show radiation levels above typical background levels of approximately 0.007 - 0.009 mrem/hour with the exception of brief increases up to 0.002 mrem/hour that are expected due to rainfall washout from naturally occurring radionuclides and from cosmic radiation fluctuations. No alerts at three times background were recorded. TLD total gamma exposure results ranged from 15.1 to 16.4 mR/quarter, with an average of 15.9 mR/quarter. This value is compared to an average value of 12.5 mR/quarter measured at a background location in Boston, and results in an average gamma exposure of 3.4 mR/quarter above background.



## B. SEABROOK NUCLEAR POWER STATION

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Seabrook sampling results are provided in Tables 4, 5 and 6.

Naturally occurring Potassium-40 and Beryllium-7 were detected in nearly all samples of environmental media from both within and outside of the Seabrook EPZ.

Air filter and cartridge sample results found low levels of gross alpha and gross beta radiation, as well as naturally occurring Beryllium-7 and Potassium-40. No gamma radionuclides of concern were detected in quarterly composite samples. The results are consistent with results obtained from the background location in Boston.

In 2016, real-time monitoring for the Seabrook EPZ did not show gamma radiation levels above typical background levels (approximately 0.010 mrem/hour) with the exception of brief increases (0.002 mrem/hour) that are expected due to rainfall washout from naturally occurring radionuclides such as airborne radon daughters, and cosmic radiation events. Beta readings ranged from 40 to 50 counts per minute with the exception of brief increases similar to the gamma results.

TLD results for total gamma exposure ranged from 16.5 to 17.6 mR/quarter with an average exposure of 16.8 mR/quarter, compared to an average of 13.2 mR/quarter at the background location in Boston. The result is an average gamma exposure level of 3.6 mR/quarter over background.

### C. VERMONT YANKEE NUCLEAR POWER STATION

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Vermont Yankee sampling results are provided in Tables 7, 8, and 9.

Naturally occurring Potassium-40 and Beryllium-7 were detected in nearly all samples of environmental media from both within and outside of the VY EPZ.

Cesium-137 was detected at levels ranging from 27.5-145 pCi/kg in three fish samples from the background location Lake Dennison in Winchendon. These results are consistent with those from other locations reported in the scientific literature, and are considered attributable to historical fallout from weapons testing and past nuclear power plant accidents (VTDOH, 2012; Burger et al., 2007; ATSDR, 2004; Amund et al., 1996). Other power plant produced radionuclides were not detected in the fish, nor was Cs-137 detected in surface water collected at this location, supporting the conclusion that residual deposition is the source of the Cs-137. These concentrations of Cs-137 in fish present a very low health risk.

No detectable radioactive iodine was identified in surface water samples.

Air filter and cartridge analyses found low levels of gross alpha and gross beta radiation. The results are consistent with those obtained from the background location in Boston.

TLD results for total gamma exposure ranged from 12.3 to 15.0 mR/quarter with an average of 13.7 mR/quarter, which is just above the 13.2 mR/quarter average at the background location in Boston.

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## E. TABLES

Table 1. Pilgrim Nuclear Power Station 2016 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)
Surface water	Discharge Canal	1/26/2016	<114	<3.3	<8	<3	<6.9	<20.8	-	<3.3	-
Surface water	Discharge Canal	2/23/2016	<115	<3	<7.3	<2.9	<6.5	<15.5	-	<3	-
Surface water	Discharge Canal	3/29/2016	325	<3.1	<24	<2.8	<7.4	NR	-	<2.6	-
Surface water	Discharge Canal	4/25/2016	278	<3.7	<19.9	<2.6	<8	NR	-	<2.9	-
Surface water	Discharge Canal	5/31/2016	226	<3.3	<15.2	<2.8	<7.1	NR	-	<2.8	-
Surface water	Discharge Canal	6/28/2016	270	<3.4	<11.2	<2.9	<6.6	NR	-	<2.7	-
Surface water	Discharge Canal	7/26/2016	983	<3.1	<9.2	<3.3	<7.1	NR	-	<3.3	-
Surface water	Discharge Canal	8/29/2016	322	<2.3	<5	<2.5	<5.1	<3.2	-	<2.5	-
Surface water	Discharge Canal	9/27/2016	355	<3.2	<10.6	<2.9	<6.9	NR	-	<3	-
Surface water	Discharge Canal	10/24/2016	995	<3	<8.8	<3.3	<7	<23.2	-	<3.3	-
Surface water	Discharge Canal	11/29/2016	309	<3.3	<11.2	<3.1	<7.4	NR	-	<3	-
Surface water	Discharge Canal	12/27/2016	308	<3.2	<8	<2.8	<6.7	<20.9	-	<2.9	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	1/26/2016	320	<2.5	<6.9	<2.8	<6.2	<17.7	-	<2.7	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	2/23/2016	285	<2.7	<6.3	<2.9	<6.1	<13.4	-	<2.6	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	3/29/2016	892	<4	NR	<3.4	<9	NR	-	<3.3	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	4/25/2016	1,000	<3.5	<20.4	<3.2	<8.7	NR	-	<3.4	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	5/31/2016	283	<2.8	<12.8	<2.6	<6.3	NR	-	<2.4	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	6/28/2016	949	<3.6	<11.7	<3	<7.2	NR	-	<3.1	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	7/26/2016	287	<2.6	<7.4	<2.6	<5.6	<27.3	-	<2.6	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	8/29/2016	342	<3.1	<6.1	<3	<6.2	<6.2	-	<2.9	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	9/27/2016	274	<3	<8.9	<3	<6.7	NR	-	<2.9	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	10/24/2016	308	<2.5	<6.3	<2.7	<5.1	<17.7	-	<2.6	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	11/29/2016	359	<2.9	<10.1	<2.6	<6.6	NR	-	<2.8	-
Surface water	Powder Point Bridge (background) <sup>1</sup>	12/27/2016	1,010	<3.7	<11.8	<3.5	<7.6	NR	-	<3.5	-
Milk	Duxbury	1/14/2016	1,260	-	-	-	-	<3.2	<2.6	<3	<10.2

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

1. Sample considered "background" for the purpose of NRC regulations, but considered "indicator" by MDPH because it falls within the 10-mile EPZ.

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)
Milk	Duxbury	2/11/2016	1,330	-	-	-	-	<2.7	<2.6	<3	<10.4
Milk	Duxbury	3/9/2016	1,270	-	-	-	-	<3.2	<2.7	<3.1	<10.8
Milk	Duxbury	4/14/2016	1,740	-	-	-	-	<2.4	<2.5	<3.1	<9.8
Milk	Duxbury	5/11/2016	1,640	-	-	-	-	<2.6	<2.4	<2.8	<10.3
Milk	Duxbury	6/23/2016	1,240	-	-	-	-	<2.3	<2.4	<3	<9.4
Milk	Duxbury	7/28/2016	1,350	-	-	-	-	<3.2	<2.7	<3.1	<10.4
Milk	Duxbury	8/12/2016	1,300	-	-	-	-	<3.8	<2.5	<3.2	<11.4
Milk	Duxbury	9/7/2016	1,020	-	-	-	-	<3.1	<2.9	<3.6	<11.7
Milk	Duxbury	10/7/2016	1,390	-	-	-	-	<4.3	<2.6	<3.3	<12.8
Milk	Duxbury	11/30/2016	1,480	-	-	-	-	<2.9	<3	<3.4	<11.6
Milk	Duxbury	12/30/2016	1,180	-	-	-	-	<4.5	<3.4	<3.9	<15.3
Milk	Duxbury	12/30/2016	1,460	-	-	-	-	<3.7	<2.6	<3.1	<12.2

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

1. Sample considered "background" for the purpose of NRC regulations, but considered "indicator" by MDPH because it falls within the 10-mile EPZ.

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Table 2. Pilgrim Nuclear Power Station 2016 Environmental Monitoring Data – Solid matrices

Sample	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)	I-131* (pCi/kg)
Chondrus	PNPS-Discharge Canal	5/9/2016	276	14,400	<13.2	<34.4	<14.8	<32.5	<13.1	<34.8
Chondrus	Manomet Point	5/11/2016	1,180	17,900	<19	NR	<19.6	<47.2	<17.7	NR
Chondrus	Brant Rock, Marshfield (background) <sup>1</sup>	5/26/2016	684	32,500	<17.3	<54.8	<16.8	<44.1	<14.5	NR
Chondrus	PNPS-Discharge Canal	10/21/2016	1,210	21,700	<17.5	<42.1	<17.8	<43.6	<16.1	<40.5
Chondrus	Brant Rock, Marshfield (background) <sup>1</sup>	11/14/2016	395	12,400	<9.3	<25.2	<10.4	<22.8	<9.5	<36.4
Clams	Plymouth Harbor, Plymouth (background) <sup>1</sup>	5/7/2016	62.8	1,500	<4	<14.5	<4.1	<9.5	<4	-
Mussels	Green Harbor-Marshfield (background)	5/10/2016	<65	1,570	<4.6	<17.5	<4.1	<10.4	<4.1	-
Mussels	Plymouth Harbor, Plymouth (background) <sup>1</sup>	5/6/2016	<64	1,410	<4.2	<17.1	<4.3	<9.3	<4	-
Mussels	PNPS Discharge Canal	5/26/2016	<67	2,550	<5.2	<15.8	<5.2	<11.5	<5.5	-
Clams	Duxbury (background) <sup>1</sup>	5/7/2016	<64	1,520	<4	<16	<4.3	<9.3	<4	-
Clams	Duxbury (background) <sup>1</sup>	9/16/2016	<60	1,440	<4.6	<17.3	<4.1	<10.8	<4.3	-
Mussels	Green Harbor, Marshfield	9/19/2016	<79	820	<5.5	<18.5	<5.4	<12	<5.6	-
Clams	Plymouth Harbor, Plymouth (background) <sup>1</sup>	9/20/2016	<70	2,070	<5.9	<18.9	<6	<13.3	<5.7	-
Mussels	PNPS Discharge Canal	11/17/2016	<36	1,090	<3.4	<7.7	<3.7	<7.8	<3.6	-
Winter Flounder	PNPS Discharge Canal	5/11/2016	<80	3,460	<6.1	<23	<6.3	<14.5	<6.2	-
Winter Flounder	Cape Cod Bay (background)	5/10/2016	<57	3,460	<4.5	<18	<4.2	<10.7	<4	-
Striped Bass	Vineyard Sound (background)	9/19/2016	<57	4,250	<4.7	<17.6	<4.8	<12.2	<5	-
Bluefish	Buzzards Bay (background)	9/22/2016	<67	3,500	<5.1	<19.4	<5.1	<12.1	<5.3	-
Tautog	Buzzards Bay (background)	9/21/2016	<495	4,900	<33.4	NR	<30.3	<70.2	<35.5	-
Bluefish	PNPS Discharge Canal	10/6/2016	<49	2,870	<4.3	<13.7	<3.9	<9.7	<5.4	-
Bluefish	PNPS Discharge Canal	10/6/2016	<45.4	2,820	<3.7	<12.8	<3.7	<9.2	5.26	-
Lobster	PNPS Discharge Canal	6/27/2016	<244	1,270	<7.7	<76.6	<6.8	<18.7	<6.6	-
Lobster	Powder Point Bridge-Duxbury	8/29/2016	<84	2,240	<5.3	<25.4	<5.7	<12.1	<4.8	-
Sediment	Manomet Point (background)	5/11/2016	-	9,760	-	-	<16.6	-	<18.3	-
Sediment	Green Harbor-Marshfield (background)	5/10/2016	-	10,700	-	-	<21.9	-	<24.5	-
Sediment	Duxbury (background) <sup>1</sup>	5/7/2016	-	12,200	-	-	<26.4	-	<27.3	-
Sediment	PNPS Discharge Canal	5/9/2016	-	18,600	-	-	<20.4	-	<19.4	-
Sediment	Plymouth Harbor, Plymouth (background) <sup>1</sup>	5/7/2016	-	8,350	-	-	<29	-	<32.5	-
Sediment	Green Harbor-Marshfield (background)	9/19/2016	-	8,440	-	-	<23	-	<24.7	-
Sediment	Duxbury (background) <sup>1</sup>	9/20/2016	-	11,400	-	-	<26.4	-	<28.1	-
Sediment	PNPS Discharge Canal	10/21/2016	-	7,470	-	-	<18.4	-	<18.3	-

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

1. Sample considered "background" for the purpose of NRC regulations, but considered "indicator" by MDPH because it falls within the 10-mile EPZ.

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Table 3. Pilgrim Nuclear Power Station 2016 Environmental Monitoring Data - Air Samples

Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Pilgrim Station	1/7/2016	<0.0216	-	-	-	-	-	-	-	0.012	0.0326
Air	Pilgrim Station	1/14/2016	<0.0228	-	-	-	-	-	-	-	0.00734	0.0267
Air	Pilgrim Station	1/22/2016	<0.0157	-	-	-	-	-	-	-	0.00942	0.0269
Air	Pilgrim Station	1/28/2016	<0.0291	-	-	-	-	-	-	-	0.00815	0.0292
Air	Pilgrim Station	2/5/2016	<0.0291	-	-	-	-	-	-	-	0.0093	0.0283
Air	Pilgrim Station	2/11/2016	<0.02	-	-	-	-	-	-	-	0.00699	0.0248
Air	Pilgrim Station Quarterly composite	2/15/2016	-	0.119	0.095	<0.001	<0.009	<0.001	<0.002	<0.001	-	-
Air	Pilgrim Station	2/18/2016	<0.0184	-	-	-	-	-	-	-	0.00789	0.0261
Air	Pilgrim Station	2/26/2016	<0.0145	-	-	-	-	-	-	-	0.0043	0.0244
Air	Pilgrim Station	3/4/2016	<0.0228	-	-	-	-	-	-	-	0.00648	0.0273
Air	Pilgrim Station - lot	3/9/2016	<0.0133	-	-	-	-	-	-	-	0.00596	0.03
Air	Pilgrim Station	3/9/2016	<0.035	-	-	-	-	-	-	-	0.00362	0.0223
Air	Pilgrim Station - lot	3/17/2016	<0.0119	-	-	-	-	-	-	-	0.00235	0.0176
Air	Pilgrim Station	3/17/2016	<0.0194	-	-	-	-	-	-	-	0.00386	0.0186
Air	Pilgrim Station - lot	3/25/2016	<0.0174	-	-	-	-	-	-	-	0.00315	0.0184
Air	Pilgrim Station	3/25/2016	<0.0143	-	-	-	-	-	-	-	0.00256	0.0206
Air	Pilgrim Station - lot	3/30/2016	<0.0166	-	-	-	-	-	-	-	0.0036	0.0202
Air	Pilgrim Station	3/30/2016	<0.0299	-	-	-	-	-	-	-	0.00273	0.0205
Air	Pilgrim Station - lot	4/5/2016	<0.0143	-	-	-	-	-	-	-	0.00918	0.0242
Air	Pilgrim Station	4/5/2016	<0.0249	-	-	-	-	-	-	-	0.00712	0.0223
Air	Pilgrim Station - lot	4/14/2016	<0.0119	-	-	-	-	-	-	-	0.00531	0.0228
Air	Pilgrim Station	4/14/2016	<0.0185	-	-	-	-	-	-	-	0.00383	0.0123
Air	Pilgrim Station - lot	4/22/2016	<0.0113	-	-	-	-	-	-	-	0.00672	0.0247
Air	Pilgrim Station	4/22/2016	<0.0195	-	-	-	-	-	-	-	0.00698	0.0168
Air	Pilgrim Station - lot	4/29/2016	<0.0131	-	-	-	-	-	-	-	0.00698	0.0252
Air	Pilgrim Station	4/29/2016	<0.022	-	-	-	-	-	-	-	0.00440	0.0167
Air	Pilgrim Station - lot	5/5/2016	<0.0206	-	-	-	-	-	-	-	0.00322	0.0191
Air	Pilgrim Station	5/5/2016	<0.0207	-	-	-	-	-	-	-	0.00376	0.0178
Air	Pilgrim Station	5/11/2016	<0.0213	-	-	-	-	-	-	-	0.00462	0.0175
Air	Pilgrim Station - lot	5/20/2016	<0.011	-	-	-	-	-	-	-	0.00486	0.0168

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.



Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Pilgrim Station - lot	5/27/2016	<0.0221	-	-	-	-	-	-	-	0.00623	0.0277
Air	Pilgrim Station - lot	5/31/2016	<0.0281	-	-	-	-	-	-	-	0.00526	0.0247
Air	Pilgrim Station - lot	6/8/2016	<0.0133	-	-	-	-	-	-	-	0.00317	0.0185
Air	Pilgrim Station - lot	6/17/2016	<0.0132	-	-	-	-	-	-	-	0.00261	0.0146
Air	Pilgrim Station - lot	6/22/2016	<0.0259	-	-	-	-	-	-	-	0.00559	0.0235
Air	Pilgrim Station - lot	6/29/2016	<0.0168	-	-	-	-	-	-	-	0.00484	0.0250
Air	Pilgrim Station - lot	7/15/2016	<0.0077	-	-	-	-	-	-	-	0.00432	0.0143
Air	Pilgrim Station - lot	7/21/2016	<0.0191	-	-	-	-	-	-	-	0.00998	0.0339
Air	Pilgrim Station - lot	7/28/2016	<0.0125	-	-	-	-	-	-	-	0.00757	0.0276
Air	Pilgrim Station - lot	8/12/2016	<0.0063	-	-	-	-	-	-	-	0.00455	0.0193
Air	Pilgrim Station - lot	8/19/2016	<0.0177	-	-	-	-	-	-	-	0.00486	0.0224
Air	Pilgrim Station - lot	8/25/2016	<0.0213	-	-	-	-	-	-	-	0.00365	0.0248
Air	Pilgrim Station - lot	8/31/2016	<0.0209	-	-	-	-	-	-	-	0.00648	0.0290
Air	Pilgrim Station - lot	9/7/2016	<0.0194	-	-	-	-	-	-	-	0.00436	0.0316
Air	Pilgrim Station - lot	9/14/2016	<0.0158	-	-	-	-	-	-	-	0.00496	0.0276
Air	Pilgrim Station - lot	9/22/2016	<0.0155	-	-	-	-	-	-	-	0.00385	0.0237
Air	Pilgrim Station - lot	9/29/2016	<0.0166	-	-	-	-	-	-	-	0.00269	0.0205
Air	Pilgrim Station - lot	10/7/2016	<0.0141	-	-	-	-	-	-	-	0.00413	0.0154
Air	Pilgrim Station - lot	10/13/2016	<0.0156	-	-	-	-	-	-	-	0.00858	0.0239
Air	Pilgrim Station - lot	10/21/2016	<0.0151	-	-	-	-	-	-	-	0.00616	0.0322
Air	Pilgrim Station - lot	10/28/2016	<0.0183	-	-	-	-	-	-	-	0.00404	0.0190
Air	Pilgrim Station - lot	11/2/2016	<0.0194	-	-	-	-	-	-	-	0.00712	0.0254
Air	Pilgrim Station - lot	11/18/2016	<0.0075	-	-	-	-	-	-	-	0.00311	0.0213
Air	Pilgrim Station - lot	11/23/2016	<0.0167	-	-	-	-	-	-	-	0.00348	0.0172
Air	Pilgrim Station - lot	11/30/2016	<0.0194	-	-	-	-	-	-	-	0.00467	0.0217
Air	Pilgrim Station - lot	12/16/2016	<0.0081	-	-	-	-	-	-	-	0.00256	0.0206
Air	Pilgrim Station - lot	12/22/2016	<0.023	-	-	-	-	-	-	-	0.00771	0.0366
Air	Pilgrim Station - lot	12/30/2016	<0.0168	-	-	-	-	-	-	-	0.00351	0.0268
Air	Background	1/5/2016	<0.0205	-	-	-	-	-	-	-	0.0142	0.0308
Air	Background	1/12/2016	<0.0213	-	-	-	-	-	-	-	0.00615	0.025
Air	Background	1/19/2016	<0.0197	-	-	-	-	-	-	-	0.0066	0.0205
Air	Background	1/26/2016	<0.0243	-	-	-	-	-	-	-	0.00519	0.0204
Air	Background	2/2/2016	<0.0204	-	-	-	-	-	-	-	0.00694	0.027
Air	Background	2/9/2016	<0.0167	-	-	-	-	-	-	-	0.00519	0.0217
Air	Background quarterly composite	2/15/2016	-	0.123	0.199	<0.001	<0.016	<0.001	<0.003	<0.001	-	-

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Background	2/16/2016	<0.0217	-	-	-	-	-	-	-	0.00621	0.0274
Air	Background	2/23/2016	<0.0217	-	-	-	-	-	-	-	0.00619	0.026
Air	Background	3/1/2016	<0.0154	-	-	-	-	-	-	-	0.00568	0.0235
Air	Background	3/8/2016	<0.022	-	-	-	-	-	-	-	0.00398	0.0202
Air	Background	3/15/2016	<0.0215	-	-	-	-	-	-	-	0.00452	0.0291
Air	Background	3/22/2016	<0.021	-	-	-	-	-	-	-	0.00311	0.016
Air	Background	3/29/2016	<0.015	-	-	-	-	-	-	-	0.0038	0.0195
Air	Background	4/5/2016	<0.015	-	-	-	-	-	-	-	0.00893	0.0306
Air	Background	4/12/2016	<0.0155	-	-	-	-	-	-	-	0.0068	0.0232
Air	Background	4/19/2016	<0.0187	-	-	-	-	-	-	-	0.00707	0.0252
Air	Background	4/26/2016	<0.0213	-	-	-	-	-	-	-	0.00822	0.0302
Air	Background	5/3/2016	<0.0165	-	-	-	-	-	-	-	0.00403	0.0222
Air	Background	5/10/2016	<0.0196	-	-	-	-	-	-	-	0.00299	0.0152
Air	Background quarterly composite	5/15/2016	-	0.117	0.212	<0.001	<0.007	<0.001	<0.002	<0.001	-	-
Air	Background	5/17/2016	<0.016	-	-	-	-	-	-	-	0.00335	0.0252
Air	Background	5/24/2016	<0.0302	-	-	-	-	-	-	-	0.00584	0.0342
Air	Background	5/31/2016	<0.0185	-	-	-	-	-	-	-	0.00634	0.0302
Air	Background	6/7/2016	<0.015	-	-	-	-	-	-	-	0.00294	0.0224
Air	Background	6/14/2016	<0.0211	-	-	-	-	-	-	-	0.00134	0.0209
Air	Background	6/21/2016	<0.0204	-	-	-	-	-	-	-	0.0024	0.0206
Air	Background	6/28/2016	<0.0207	-	-	-	-	-	-	-	0.00285	0.027
Air	Background	7/5/2016	<0.0208	-	-	-	-	-	-	-	0.019	0.0534
Air	Background	7/12/2016	<0.0194	-	-	-	-	-	-	-	0.00452	0.0231
Air	Background	7/19/2016	<0.0157	-	-	-	-	-	-	-	0.00809	0.0324
Air	Background	7/26/2016	<0.0203	-	-	-	-	-	-	-	0.00726	0.0301
Air	Background	8/2/2016	<0.0194	-	-	-	-	-	-	-	0.00532	0.028
Air	Background	8/9/2016	<0.0211	-	-	-	-	-	-	-	0.00505	0.0268
Air	Background quarterly composite	8/15/2016	-	0.117	0.304	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Background	8/16/2016	<0.0201	-	-	-	-	-	-	-	0.00587	0.0252
Air	Background	8/23/2016	<0.0195	-	-	-	-	-	-	-	0.00491	0.0287
Air	Background	8/26/2016	<0.0479	-	-	-	-	-	-	-	0.00671	0.0388
Air	Background	9/6/2016	<0.0197	-	-	-	-	-	-	-	0.00306	0.025
Air	Background	9/12/2016	<0.0237	-	-	-	-	-	-	-	0.00485	0.0334
Air	Background	9/19/2016	<0.0147	-	-	-	-	-	-	-	0.0039	0.0317

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

<b>Sample Type</b>	<b>Location</b>	<b>Date</b>	<b>I-131*</b> (pCi/m <sup>3</sup> )	<b>Be-7*</b> (pCi/m <sup>3</sup> )	<b>K-40*</b> (pCi/m <sup>3</sup> )	<b>Mn-54*</b> (pCi/m <sup>3</sup> )	<b>Fe-59*</b> (pCi/m <sup>3</sup> )	<b>Co-60*</b> (pCi/m <sup>3</sup> )	<b>Zn-65*</b> (pCi/m <sup>3</sup> )	<b>Cs-137*</b> (pCi/m <sup>3</sup> )	<b>Gross Alpha</b> (pCi/m <sup>3</sup> )	<b>Gross Beta</b> (pCi/m <sup>3</sup> )
Air	Background	9/26/2016	<0.0198	-	-	-	-	-	-	-	0.00387	0.0287
Air	Background	10/3/2016	<0.0164	-	-	-	-	-	-	-	0.00937	0.0234
Air	Background	10/11/2016	<0.0127	-	-	-	-	-	-	-	0.0115	0.028
Air	Background	10/17/2016	<0.0245	-	-	-	-	-	-	-	0.0167	0.0355
Air	Background	10/25/2016	<0.0189	-	-	-	-	-	-	-	0.0129	0.0305
Air	Background	10/31/2016	<0.0247	-	-	-	-	-	-	-	0.0105	0.0268
Air	Background	11/7/2016	<0.016	-	-	-	-	-	-	-	0.00874	0.0232
Air	Background	11/14/2016	<0.0206	-	-	-	-	-	-	-	0.00953	0.0278
Air	Background quarterly composite	11/15/2016	-	0.071	<0.029	<0.001	<0.006	<0.001	<0.002	<0.001	-	-
Air	Background	11/21/2016	<0.016	-	-	-	-	-	-	-	0.00918	0.0269
Air	Background	11/28/2016	<0.022	-	-	-	-	-	-	-	0.00439	0.0213
Air	Background	12/5/2016	<0.0173	-	-	-	-	-	-	-	0.00794	0.0257
Air	Background	12/12/2016	<0.0182	-	-	-	-	-	-	-	0.00631	0.0276
Air	Background	12/19/2016	<0.0228	-	-	-	-	-	-	-	0.00759	0.0346
Air	Background	12/30/2016	<0.0114	-	-	-	-	-	-	-	0.00384	0.0312

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Table 4. Seabrook Nuclear Power Station 2016 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)
Surface water	Ipswich bay (background)	1/21/2016	281	<3.2	<8.2	<3	<6.6	<36.5	-	<2.8	-
Surface water	Ipswich bay (background)	2/15/2016	287	<3.2	<14	<2.8	<7.1	NR	-	<2.9	-
Surface water	Ipswich bay (background)	3/21/2016	256	<3.1	<30.1	<3	<7.6	NR	-	<2.9	-
Surface water	Ipswich bay (background)	4/12/2016	262	<3.5	<24.8	<3	<7.8	NR	-	<2.9	-
Surface water	Ipswich bay (background)	5/17/2016	255	<4.3	<24.1	<3.7	<9.6	NR	-	<3.6	-
Surface water	Ipswich bay (background)	6/15/2016	278	<3.3	<14.4	<2.8	<7.1	NR	-	<2.9	-
Surface water	Ipswich bay (background)	7/12/2016	142	<3.3	<10.2	<2.8	<6.4	<120	-	<2.9	-
Surface water	Ipswich bay (background)	8/18/2016	285	<3.2	<8.6	<2.9	<6.6	<49.6	-	<3	-
Surface water	Ipswich bay (background)	9/12/2016	1,030	<3.5	<15.7	<3.2	<7.1	NR	-	<3.3	-
Surface water	Ipswich bay (background)	10/19/2016	316	<3	<8.6	<2.8	<6.7	<37.1	-	<2.9	-
Surface water	Ipswich bay (background)	11/14/2016	1,040	<3.7	<14.7	<3.2	<8.4	NR	-	<3.5	-
Surface water	Ipswich bay (background)	12/16/2016	287	<2.7	<7	<2.8	<5.3	<23.1	-	<2.8	-
Milk	Rowley	1/6/2016	1,340	-	-	-	-	<2.7	<2.4	<2.8	<9.6
Milk	Rowley	2/4/2016	1,420	-	-	-	-	<3.1	<2.7	<3.1	<10.4
Milk	Rowley	3/2/2016	1,360	-	-	-	-	<3.6	<2.7	<3	<11.2
Milk	Rowley	4/6/2016	1,430	-	-	-	-	<3.1	<2.5	<2.9	<10.6
Milk	Rowley	5/4/2016	1,440	-	-	-	-	<3.3	<2.5	<2.9	<9.9
Milk	Rowley	6/1/2016	1,440	-	-	-	-	<4.6	<2.5	<2.9	<13.8
Milk	Rowley	7/6/2016	1,460	-	-	-	-	<2.4	<2.4	<2.8	<9
Milk	Rowley	8/3/2016	1,450	-	-	-	-	<3.2	<2.6	<3.1	<10
Milk	Rowley	9/13/2016	1,170	-	-	-	-	<2.9	<3.1	<3.4	<12
Milk	Rowley	10/5/2016	1,360	-	-	-	-	<3.1	<2.4	<2.9	<10.5
Milk	Rowley	11/2/2016	1,040	-	-	-	-	<3.1	<2.8	<3.4	<11.7
Milk	Rowley	12/7/2016	1,360	-	-	-	-	<2.6	<2.6	<3.1	<10.3

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Table 5. Seabrook Nuclear Power Station 2016 Environmental Monitoring Data –Solid Matrices

Sample	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)	I-131* (pCi/kg)
Chondrus	Ipswich Bay (background)	5/17/2016	339	15,400	<9.2	NR	<9.9	<24.9	<9.4	<46.1
Chondrus	Ipswich Bay (background)	11/14/2016	1,070	19,900	<26.5	NR	<27.3	<64.4	<24.2	NR
Mytilus	Ipswich Bay (background)	5/16/2016	<393	1,480	<6.4	NR	<5.4	<16.7	<5.1	-
Modiolus	Ipswich Bay (background)	5/17/2016	<313	1,920	<4.8	NR	<4.1	<13.5	<3.8	-
Modiolus	Ipswich Bay (background)	11/14/2016	<421	1,080	<5.3	NR	<3.9	<12.7	<3.4	-
Mytilus	Ipswich Bay (background)	11/16/2016	<345	1,100	<4.6	NR	<3.5	<11.9	<3.1	-
Yellow Tail and Winter Flounder	Ipswich Bay (background)	5/17/2016	<516	3,250	<8.8	NR	<7.1	<22.7	<6.4	-
Yellow Tail and Winter Flounder	Ipswich Bay (background)	8/18/2016	<82	3,130	<4	<28.7	<3.9	<11.3	<3.9	-
Longhorn Sculpin	Ipswich Bay (background)	11/14/2016	<2270	2,680	<28.5	<86.1	<19.1	<62	<18.7	-
Lobster	Ipswich Bay (background)	5/16/2016	<337	2,700	<6.5	NR	<4.7	<17.8	<4.5	-
Lobster	Ipswich Bay (background)	11/18/2016	<752	2,140	<9.3	NR	<7.3	<25.9	<6.7	-
Sediment	Ipswich Bay- beach (background)	5/16/2016	-	21,800	-	-	<18.5	-	<18.4	-
Sediment	Ipswich Bay-Subtidal (background)	5/17/2016	-	12,300	-	-	<22.3	-	<24.1	-
Sediment	Ipswich Bay-Subtidal (background)	11/14/2016	-	13,500	-	-	<27.1	-	<26.8	-
Sediment	Ipswich Bay- beach (background)	11/14/2016	-	22,100	-	-	<20.8	-	<20.2	-
Strawberries	Russell Orchards/Ipswich	6/21/2016	<24.6	1,280	<3	<5.9	<3	<6.4	<3.1	-
Strawberries	Bartlett Farm/Salisbury	6/21/2016	<22.9	1,250	<2.5	<5.1	<2.9	<5.6	<2.7	-
Green Beans	Bartlett Farm/Salisbury	7/20/2016	<29.9	2,380	<3.9	<7.9	<3.7	<9.2	<3.7	-
Tomatoes	Russell Orchards/Ipswich	7/20/2016	<21.8	1,410	<2.5	<5.6	<2.8	<5.9	<2.8	-
Tomatoes	Russell Orchards/Ipswich	8/17/2016	<25.7	1,340	<3.1	<6.2	<3.1	<6.6	<3	-
Tomatoes	Bartlett Farm/Salisbury	8/17/2016	<22.4	2,030	<2.8	<6	<3.3	<6.5	<2.8	-

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

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Table 6. Seabrook Nuclear Power Station 2016 Environmental Monitoring Data - Air Samples

Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Salisbury Fire Station	1/5/2016	<0.0237	-	-	-	-	-	-	-	0.0111	0.0326
Air	Salisbury Fire Station	1/13/2016	<0.0168	-	-	-	-	-	-	-	0.00594	0.0169
Air	Salisbury Fire Station	1/20/2016	<0.0208	-	-	-	-	-	-	-	0.00931	0.0286
Air	Salisbury Fire Station	1/27/2016	<0.0198	-	-	-	-	-	-	-	0.00542	0.0224
Air	Salisbury Fire Station	2/4/2016	<0.016	-	-	-	-	-	-	-	0.00812	0.0241
Air	Salisbury Fire Station	2/10/2016	<0.0245	-	-	-	-	-	-	-	0.00597	0.0251
Air	Salisbury Fire Station quarterly composite	2/15/2016	-	0.098	0.197	<0.001	<0.014	<0.001	<0.003	<0.001	-	-
Air	Salisbury Fire Station	2/17/2016	<0.0248	-	-	-	-	-	-	-	0.0043	0.0238
Air	Salisbury Fire Station	2/24/2016	<0.022	-	-	-	-	-	-	-	0.00586	0.0226
Air	Salisbury Fire Station	3/2/2016	<0.0165	-	-	-	-	-	-	-	0.00524	0.0239
Air	Salisbury Fire Station	3/9/2016	<0.0179	-	-	-	-	-	-	-	0.00392	0.0231
Air	Salisbury Fire Station	3/16/2016	<0.0251	-	-	-	-	-	-	-	0.00538	0.0211
Air	Salisbury Fire Station	3/22/2016	<0.0171	-	-	-	-	-	-	-	0.00468	0.0229
Air	Salisbury Fire Station	3/30/2016	<0.0233	-	-	-	-	-	-	-	0.0036	0.0185
Air	Salisbury Fire Station	4/6/2016	<0.0172	-	-	-	-	-	-	-	0.00765	0.0242
Air	Salisbury Fire Station	4/13/2016	<0.109	-	-	-	-	-	-	-	0.0131	0.0749
Air	Salisbury Fire Station	4/20/2016	<0.0225	-	-	-	-	-	-	-	0.00653	0.0253
Air	Salisbury Fire Station	4/27/2016	<0.0237	-	-	-	-	-	-	-	0.00456	0.0219
Air	Salisbury Fire Station	5/4/2016	<0.0145	-	-	-	-	-	-	-	0.00374	0.0202
Air	Salisbury Fire Station	5/11/2016	<0.019	-	-	-	-	-	-	-	0.00145	0.0138
Air	Salisbury Fire Station quarterly composite	5/15/2016	-	0.113	0.298	<0.001	<0.005	<0.001	<0.002	<0.001	-	-
Air	Salisbury Fire Station	5/19/2016	<0.0175	-	-	-	-	-	-	-	0.00374	0.0194
Air	Salisbury Fire Station	5/25/2016	<0.0191	-	-	-	-	-	-	-	0.00374	0.0207
Air	Salisbury Fire Station	6/1/2016	<0.0163	-	-	-	-	-	-	-	0.00473	0.0282
Air	Salisbury Fire Station	6/8/2016	<0.0241	-	-	-	-	-	-	-	0.00164	0.0148
Air	Salisbury Fire Station	6/15/2016	<0.0169	-	-	-	-	-	-	-	0.00329	0.0167
Air	Salisbury Fire Station	6/21/2016	<0.0166	-	-	-	-	-	-	-	0.00292	0.0233
Air	Salisbury Fire Station	6/29/2016	<0.0179	-	-	-	-	-	-	-	0.00298	0.0172
Air	Salisbury Fire Station	7/6/2016	<0.0201	-	-	-	-	-	-	-	0.00616	0.0262
Air	Salisbury Fire Station	7/13/2016	<0.0164	-	-	-	-	-	-	-	0.00482	0.0183
Air	Salisbury Fire Station	7/20/2016	<0.0152	-	-	-	-	-	-	-	0.00639	0.0265

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Salisbury Fire Station	7/27/2016	<0.0211	-	-	-	-	-	-	-	0.00588	0.0223
Air	Salisbury Fire Station	8/3/2016	<0.02	-	-	-	-	-	-	-	0.00781	0.0286
Air	Salisbury Fire Station	8/10/2016	<0.0205	-	-	-	-	-	-	-	0.00476	0.022
Air	Salisbury Fire Station quarterly composite	8/15/2016	-	0.111	0.199	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Salisbury Fire Station	8/17/2016	<0.0207	-	-	-	-	-	-	-	0.00426	0.0256
Air	Salisbury Fire Station	8/23/2016	<0.0195	-	-	-	-	-	-	-	0.004	0.0221
Air	Salisbury Fire Station	9/1/2016	<0.0162	-	-	-	-	-	-	-	0.00378	0.0269
Air	Salisbury Fire Station	9/6/2016	<0.023	-	-	-	-	-	-	-	0.00587	0.0304
Air	Salisbury Fire Station	9/13/2016	<0.0207	-	-	-	-	-	-	-	0.00406	0.0267
Air	Salisbury Fire Station	9/20/2016	<0.016	-	-	-	-	-	-	-	0.00347	0.0259
Air	Salisbury Fire Station	9/28/2016	<0.0163	-	-	-	-	-	-	-	0.00363	0.0237
Air	Salisbury Fire Station	10/5/2016	<0.0199	-	-	-	-	-	-	-	0.00796	0.0182
Air	Salisbury Fire Station	10/12/2016	<0.0222	-	-	-	-	-	-	-	0.0115	0.0258
Air	Salisbury Fire Station	10/18/2016	<0.0231	-	-	-	-	-	-	-	0.00995	0.0278
Air	Salisbury Fire Station	10/26/2016	<0.0143	-	-	-	-	-	-	-	0.00584	0.0205
Air	Salisbury Fire Station	11/2/2016	<0.0208	-	-	-	-	-	-	-	0.0045	0.0175
Air	Salisbury Fire Station	11/9/2016	<0.0203	-	-	-	-	-	-	-	0.00686	0.0248
Air	Salisbury Fire Station quarterly composite	11/15/2016	-	0.068	0.198	<0.001	<0.006	<0.001	<0.002	<0.001	-	-
Air	Salisbury Fire Station	11/16/2016	<0.0304	-	-	-	-	-	-	-	0.0055	0.0227
Air	Salisbury Fire Station	11/22/2016	<0.0275	-	-	-	-	-	-	-	0.0055	0.0191
Air	Salisbury Fire Station	12/1/2016	<0.0237	-	-	-	-	-	-	-	0.00396	0.0163
Air	Salisbury Fire Station	12/7/2016	<0.0277	-	-	-	-	-	-	-	0.00842	0.0239
Air	Salisbury Fire Station	12/13/2016	<0.0267	-	-	-	-	-	-	-	0.00601	0.0262
Air	Salisbury Fire Station	12/21/2016	<0.0351	-	-	-	-	-	-	-	0.0111	0.0373
Air	Salisbury Fire Station	12/28/2016	<0.0189	-	-	-	-	-	-	-	0.00813	0.031
Air	Background	1/5/2016	<0.0205	-	-	-	-	-	-	-	0.0142	0.0308
Air	Background	1/12/2016	<0.0213	-	-	-	-	-	-	-	0.00615	0.025
Air	Background	1/19/2016	<0.0197	-	-	-	-	-	-	-	0.0066	0.0205
Air	Background	1/26/2016	<0.0243	-	-	-	-	-	-	-	0.00519	0.0204
Air	Background	2/2/2016	<0.0204	-	-	-	-	-	-	-	0.00694	0.027
Air	Background	2/9/2016	<0.0167	-	-	-	-	-	-	-	0.00519	0.0217
Air	Background quarterly composite	2/15/2016	-	0.123	0.199	<0.001	<0.016	<0.001	<0.003	<0.001	-	-
Air	Background	2/16/2016	<0.0217	-	-	-	-	-	-	-	0.00621	0.0274

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Background	2/23/2016	<0.0217	-	-	-	-	-	-	-	0.00619	0.026
Air	Background	3/1/2016	<0.0154	-	-	-	-	-	-	-	0.00568	0.0235
Air	Background	3/8/2016	<0.022	-	-	-	-	-	-	-	0.00398	0.0202
Air	Background	3/15/2016	<0.0215	-	-	-	-	-	-	-	0.00452	0.0291
Air	Background	3/22/2016	<0.021	-	-	-	-	-	-	-	0.00311	0.016
Air	Background	3/29/2016	<0.015	-	-	-	-	-	-	-	0.0038	0.0195
Air	Background	4/5/2016	<0.015	-	-	-	-	-	-	-	0.00893	0.0306
Air	Background	4/12/2016	<0.0155	-	-	-	-	-	-	-	0.0068	0.0232
Air	Background	4/19/2016	<0.0187	-	-	-	-	-	-	-	0.00707	0.0252
Air	Background	4/26/2016	<0.0213	-	-	-	-	-	-	-	0.00822	0.0302
Air	Background	5/3/2016	<0.0165	-	-	-	-	-	-	-	0.00403	0.0222
Air	Background	5/10/2016	<0.0196	-	-	-	-	-	-	-	0.00299	0.0152
Air	Background quarterly composite	5/15/2016	-	0.117	0.212	<0.001	<0.007	<0.001	<0.002	<0.001	-	-
Air	Background	5/17/2016	<0.016	-	-	-	-	-	-	-	0.00335	0.0252
Air	Background	5/24/2016	<0.0302	-	-	-	-	-	-	-	0.00584	0.0342
Air	Background	5/31/2016	<0.0185	-	-	-	-	-	-	-	0.00634	0.0302
Air	Background	6/7/2016	<0.015	-	-	-	-	-	-	-	0.00294	0.0224
Air	Background	6/14/2016	<0.0211	-	-	-	-	-	-	-	0.00134	0.0209
Air	Background	6/21/2016	<0.0204	-	-	-	-	-	-	-	0.0024	0.0206
Air	Background	6/28/2016	<0.0207	-	-	-	-	-	-	-	0.00285	0.027
Air	Background	7/5/2016	<0.0208	-	-	-	-	-	-	-	0.019	0.0534
Air	Background	7/12/2016	<0.0194	-	-	-	-	-	-	-	0.00452	0.0231
Air	Background	7/19/2016	<0.0157	-	-	-	-	-	-	-	0.00809	0.0324
Air	Background	7/26/2016	<0.0203	-	-	-	-	-	-	-	0.00726	0.0301
Air	Background	8/2/2016	<0.0194	-	-	-	-	-	-	-	0.00532	0.028
Air	Background	8/9/2016	<0.0211	-	-	-	-	-	-	-	0.00505	0.0268
Air	Background quarterly composite	8/15/2016	-	0.117	0.304	<0.001	<0.004	<0.001	<0.002	<0.001	-	-
Air	Background	8/16/2016	<0.0201	-	-	-	-	-	-	-	0.00587	0.0252
Air	Background	8/23/2016	<0.0195	-	-	-	-	-	-	-	0.00491	0.0287
Air	Background	8/26/2016	<0.0479	-	-	-	-	-	-	-	0.00671	0.0388
Air	Background	9/6/2016	<0.0197	-	-	-	-	-	-	-	0.00306	0.025
Air	Background	9/12/2016	<0.0237	-	-	-	-	-	-	-	0.00485	0.0334
Air	Background	9/19/2016	<0.0147	-	-	-	-	-	-	-	0.0039	0.0317
Air	Background	9/26/2016	<0.0198	-	-	-	-	-	-	-	0.00387	0.0287

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.



Sample Type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Background	10/3/2016	<0.0164	-	-	-	-	-	-	-	0.00937	0.0234
Air	Background	10/11/2016	<0.0127	-	-	-	-	-	-	-	0.0115	0.028
Air	Background	10/17/2016	<0.0245	-	-	-	-	-	-	-	0.0167	0.0355
Air	Background	10/25/2016	<0.0189	-	-	-	-	-	-	-	0.0129	0.0305
Air	Background	10/31/2016	<0.0247	-	-	-	-	-	-	-	0.0105	0.0268
Air	Background	11/7/2016	<0.016	-	-	-	-	-	-	-	0.00874	0.0232
Air	Background	11/14/2016	<0.0206	-	-	-	-	-	-	-	0.00953	0.0278
Air	Background quarterly composite	11/15/2016	-	0.071	<0.029	<0.001	<0.006	<0.001	<0.002	<0.001	-	-
Air	Background	11/21/2016	<0.016	-	-	-	-	-	-	-	0.00918	0.0269
Air	Background	11/28/2016	<0.022	-	-	-	-	-	-	-	0.00439	0.0213
Air	Background	12/5/2016	<0.0173	-	-	-	-	-	-	-	0.00794	0.0257
Air	Background	12/12/2016	<0.0182	-	-	-	-	-	-	-	0.00631	0.0276
Air	Background	12/19/2016	<0.0228	-	-	-	-	-	-	-	0.00759	0.0346
Air	Background	12/30/2016	<0.0114	-	-	-	-	-	-	-	0.00384	0.0312

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Table 7. Vermont Yankee Nuclear Power Station 2016 Environmental Monitoring Data – Liquid Matrices

Sample Type	Location	Date	K-40* (pCi/L)	Mn-54* (pCi/L)	Fe-59* (pCi/L)	Co-60* (pCi/L)	Zn-65* (pCi/L)	I-131* (pCi/L)	Cs-134* (pCi/L)	Cs-137* (pCi/L)	Ba-140* (pCi/L)
Surface water	Barton's Cove, Gill (background)	1/28/2016	353	<2.4	<5.7	<2.3	<5.3	<15.8	-	<2.5	-
Surface water	Pachaug Brook, Northfield	1/28/2016	<109	<3	<7.3	<2.6	<6.1	<20.5	-	<2.9	-
Surface water	Miller's River, Athol (background)	2/25/2016	358	<2.5	<9.7	<2.5	<5.6	<177	-	<2.5	-
Surface water	Barton's Cove, Gill (background)	5/26/2016	730	<3.7	<18.6	<3.2	<8.4	NR	-	<3.3	-
Surface water	Pachaug Brook, Northfield	5/26/2016	359	<3.2	<15.9	<2.9	<7.1	NR	-	<3	-
Surface water	Lake Dennison, Winchendon (background)	6/7/2016	697	<4	<17.4	<3.7	<8.6	NR	-	<3.7	-
Surface water	Pachaug Brook, Northfield	12/1/2016	711	<3.4	<12.2	<3.1	<6.6	<184	-	<3.4	-
Surface water	Pachaug Brook, Northfield	12/1/2016	367	<2.5	<8.9	<2.7	<5.6	<148	-	<2.7	-
Milk	Bernardston	1/28/2016	1,280	-	-	-	-	<2.7	<2.7	<2.9	<10.7
Milk	Bernardston	2/25/2016	1,340	-	-	-	-	<3.3	<2.6	<2.9	<10.7
Milk	Bernardston	3/29/2016	1,260	-	-	-	-	<3.2	<2.5	<2.9	<10.4
Milk	Bernardston	4/26/2016	1,400	-	-	-	-	<3.2	<2.5	<3	<10.3
Milk	Bernardston	5/26/2016	1,670	-	-	-	-	<2.6	<2.5	<2.9	<9.7
Milk	Bernardston	6/20/2016	1,420	-	-	-	-	<2.5	<2.3	<2.8	<10

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Table 8. Vermont Yankee Nuclear Power Station 2016 Environmental Monitoring Data – Solid matrices

Sample	Location	Date	Be-7* (pCi/kg)	K-40* (pCi/kg)	Mn-54* (pCi/kg)	Fe-59* (pCi/kg)	Co-60* (pCi/kg)	Zn-65* (pCi/kg)	Cs-137* (pCi/kg)
Sediment	Athol-Millers River (background)	5/26/2016	-	13,200	-	-	<26.6	-	88.9
Sediment	Gill-Barton's Cove (background)	5/26/2016	-	14,200	-	-	<20.1	-	<21.6
Sediment	Northfield-Pauchaug Boat Ramp	5/26/2016	-	14,100	-	-	<28.1	-	75.8
Sediment	Winchendon-Lake Dennison (background)	6/7/2016	-	12,300	-	-	<18.5	-	<19.8
Brown bullhead	Winchendon-Lake Dennison (background)	6/7/2016	NR	4,190	NR	NR	<77.8	NR	<80.5
Chain pickerel	Winchendon-Lake Dennison (background)	6/7/2016	NR	<1490	<83.3	NR	<49.2	<220	136
Largemouth bass	Winchendon-Lake Dennison (background)	6/7/2016	NR	3,330	<11.7	NR	<6.39	<33.4	145
Brown bullhead	Winchendon-Lake Dennison (background)	6/7/2016	NR	24,700	NR	NR	<66.7	<328	<65.7
Blue gill/pumpkin seed	Winchendon-Lake Dennison (background)	6/7/2016	NR	2,910	<108	NR	<51	<255	<53.7
Yellow perch/white perch	Winchendon-Lake Dennison (background)	6/7/2016	NR	2,640	<80	NR	<39.8	<210	<44.5
White sucker	Winchendon-Lake Dennison (background)	6/7/2016	NR	1,770	<38.1	NR	<21.6	<107	27.5
Wild grass	Northfield (Route 5 and 10 )	5/26/2016	414	5,960	<15.3	<45.1	<13.9	-	<14.5

"-" Not analyzed

\* K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134=Cesium 134; Cs-137=Cesium 137; Ba-140 = Beryllium 140; H-3 = Tritium

"<" = value is less than the listed MDA value.

"NR"= result not reported for quality control reasons.

Table 9. Vermont Yankee Nuclear Power Station 2016 Environmental Monitoring Data - Air Samples

Sample type	Location	Date	I-131* (pCi/m <sup>3</sup> )	Be-7* (pCi/m <sup>3</sup> )	K-40* (pCi/m <sup>3</sup> )	Mn-54* (pCi/m <sup>3</sup> )	Fe-59* (pCi/m <sup>3</sup> )	Co-60* (pCi/m <sup>3</sup> )	Zn-65* (pCi/m <sup>3</sup> )	Cs-137* (pCi/m <sup>3</sup> )	Gross Alpha (pCi/m <sup>3</sup> )	Gross Beta (pCi/m <sup>3</sup> )
Air	Northfield	1/6/2016	<0.0283	-	-	-	-	-	-	-	0.01350	0.0346
Air	Northfield	1/13/2016	<0.0145	-	-	-	-	-	-	-	0.00905	0.0293
Air	Northfield	1/20/2016	<0.0238	-	-	-	-	-	-	-	0.00820	0.0224
Air	Northfield	1/26/2016	<0.025	-	-	-	-	-	-	-	0.00909	0.0245
Air	Northfield	2/3/2016	<0.015	-	-	-	-	-	-	-	0.00878	0.0251
Air	Northfield	2/10/2016	<0.0249	-	-	-	-	-	-	-	0.00742	0.0266
Air	Northfield quarterly composite	2/15/2016	-	0.097	0.287	<0.001	<0.013	<0.001	<0.002	<0.001	-	-
Air	Northfield	2/17/2016	<0.0286	-	-	-	-	-	-	-	0.0079	0.0277
Air	Northfield	2/24/2016	<0.0217	-	-	-	-	-	-	-	0.00556	0.0242
Air	Northfield	3/2/2016	<0.0167	-	-	-	-	-	-	-	0.0063	0.0239
Air	Northfield	3/9/2016	<0.0207	-	-	-	-	-	-	-	0.0079	0.0285
Air	Northfield	3/16/2016	<0.0166	-	-	-	-	-	-	-	0.00695	0.0266
Air	Northfield	3/23/2016	<0.0261	-	-	-	-	-	-	-	0.00449	0.0194
Air	Northfield	3/30/2016	<0.0232	-	-	-	-	-	-	-	0.00392	0.0179
Air	Northfield	4/6/2016	<0.022	-	-	-	-	-	-	-	0.0069	0.0252
Air	Northfield	4/13/2016	<0.0324	-	-	-	-	-	-	-	0.00737	0.0227
Air	Northfield	4/20/2016	<0.0171	-	-	-	-	-	-	-	0.00762	0.0271
Air	Northfield quarterly composite	5/15/2016	-	0.173	0.795	<0.004	<0.023	<0.003	<0.009	<0.004		
Air	Background	1/5/2016	<0.0205	-	-	-	-	-	-	-	0.0142	0.0308
Air	Background	1/12/2016	<0.0213	-	-	-	-	-	-	-	0.00615	0.025
Air	Background	1/19/2016	<0.0197	-	-	-	-	-	-	-	0.0066	0.0205
Air	Background	1/26/2016	<0.0243	-	-	-	-	-	-	-	0.00519	0.0204
Air	Background	2/2/2016	<0.0204	-	-	-	-	-	-	-	0.00694	0.027
Air	Background	2/9/2016	<0.0167	-	-	-	-	-	-	-	0.00519	0.0217
Air	Background quarterly composite	2/15/2016	-	0.123	0.199	<0.001	<0.016	<0.001	<0.003	<0.001	-	-
Air	Background	2/16/2016	<0.0217	-	-	-	-	-	-	-	0.00621	0.0274
Air	Background	2/23/2016	<0.0217	-	-	-	-	-	-	-	0.00619	0.026
Air	Background	3/1/2016	<0.0154	-	-	-	-	-	-	-	0.00568	0.0235
Air	Background	3/8/2016	<0.022	-	-	-	-	-	-	-	0.00398	0.0202

- = Not analyzed

\* I-131 = iodine 131; Be-7 = Beryllium 7; K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134 = Cesium 134; Cs-137=Cesium 137; 3-H = Tritium

< = value is less than the listed MDA value, with the exception of Alpha and Beta where exact values sampled are included.

“NR”= result not reported for quality control reasons.

Sample type	Location	Date	I-131*	Be-7*	K-40*	Mn-54*	Fe-59*	Co-60*	Zn-65*	Cs-137*	Gross Alpha	Gross Beta
			(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )	(pCi/m <sup>3</sup> )
Air	Background	3/15/2016	<0.0215	-	-	-	-	-	-	-	0.00452	0.0291
Air	Background	3/22/2016	<0.021	-	-	-	-	-	-	-	0.00311	0.016
Air	Background	3/29/2016	<0.015	-	-	-	-	-	-	-	0.0038	0.0195
Air	Background	4/5/2016	<0.015	-	-	-	-	-	-	-	0.00893	0.0306
Air	Background	4/12/2016	<0.0155	-	-	-	-	-	-	-	0.0068	0.0232
Air	Background	4/19/2016	<0.0187	-	-	-	-	-	-	-	0.00707	0.0252
Air	Background	4/26/2016	<0.0213	-	-	-	-	-	-	-	0.00822	0.0302
Air	Background	5/3/2016	<0.0165	-	-	-	-	-	-	-	0.00403	0.0222
Air	Background	5/10/2016	<0.0196	-	-	-	-	-	-	-	0.00299	0.0152
Air	Background quarterly composite	5/15/2016	-	0.117	0.212	<0.001	<0.007	<0.001	<0.002	<0.001	-	-

- = Not analyzed

\* I-131 = iodine 131; Be-7 = Beryllium 7; K-40 = Potassium-40; Mn-54=Manganese-54; Fe-59=Iron 59; Co-60 = Cobalt 60; Zn-65=Zinc 65; Cs-134 = Cesium 134; Cs-137=Cesium 137; 3-H = Tritium

"<" = value is less than the listed MDA value, with the exception of Alpha and Beta where exact values sampled are included.

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